



SENR9887-46 (en-us)
March 2020



Specifications

C11 and C13 Engines for Caterpillar Built Machines

Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards, including human factors that can affect safety. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you verify that you are authorized to perform this work, and have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "DANGER", "WARNING" or "CAUTION". The Safety Alert "WARNING" label is shown below.



The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

A non-exhaustive list of operations that may cause product damage are identified by "NOTICE" labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. You must not use this product in any manner different from that considered by this manual without first satisfying yourself that you have considered all safety rules and precautions applicable to the operation of the product in the location of use, including site-specific rules and precautions applicable to the worksite. If a tool, procedure, work method or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that you are authorized to perform this work, and that the product will not be damaged or become unsafe by the operation, lubrication, maintenance or repair procedures that you intend to use.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Cat dealers have the most current information available.

NOTICE

When replacement parts are required for this product Caterpillar recommends using original Caterpillar® replacement parts.

Other parts may not meet certain original equipment specifications.

When replacement parts are installed, the machine owner/user should ensure that the machine remains in compliance with all applicable requirements.

In the United States, the maintenance, replacement, or repair of the emission control devices and systems may be performed by any repair establishment or individual of the owner's choosing.

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Specifications Section

i03930092

Fuel Injector

SMCS Code: 1290

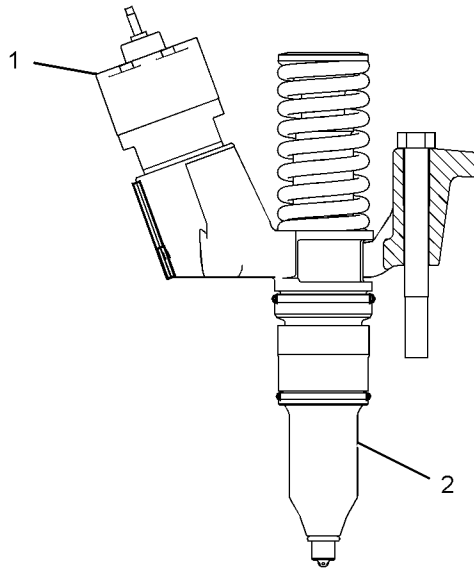


Illustration 1

g02153901

Note: Lubricate the threads and the bore for the valve assembly

(1) Torque for the valve assembly $165 \pm 10 \text{ N}\cdot\text{m}$
(($122 \pm 7 \text{ lb ft}$))

1. Use the following procedure to tighten the unit injector nozzle (2)
2. Lubricate the threads of the unit injector nozzle with lubricant
3. Tighten the unit injector nozzle to $25 \text{ N}\cdot\text{m}$ (221 lb in)
4. Again, tighten the unit injector nozzle to an angle of 54 ± 2 degrees to achieve the final installation torque of $230 + 60 - 50 \text{ N}\cdot\text{m}$ ($170 + 44 - 37 \text{ lb ft}$)

i04377192

Fuel Pressure Regulator

SMCS Code: 1277

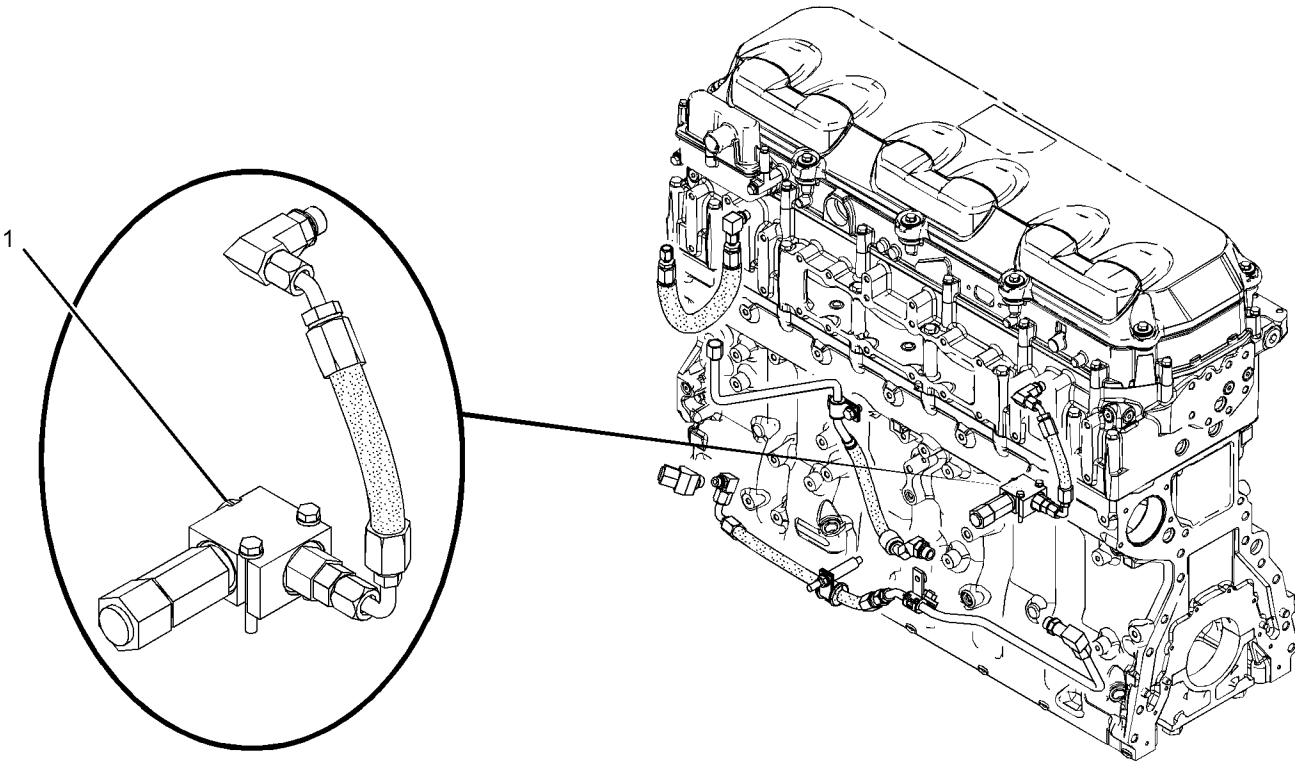


Illustration 2

g02542097

Table 1

Specification for 352 - 8928 Fuel Pressure Regulator Gp			
Item	Qty	Part	Specification Description
1	1	327 - 0376 Check Valve Gp	Torque to 28 ± 3 N·m (248 ± 27 lb in).

i03643498

Fuel Transfer Pump

SMCS Code: 1256

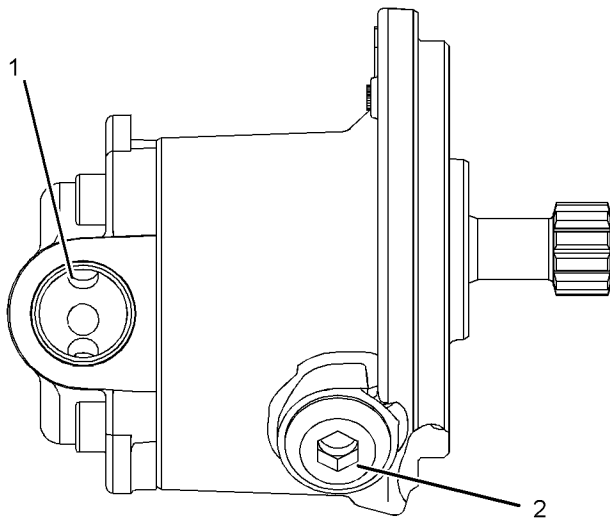


Illustration 3

g01176645

Right side view of fuel transfer pump

- (1) Inlet port
- (2) Pressure regulating valve

1. Run the pump at 2940 rpm. The full bypass pressure should be 716 to 786 kPa (104 to 114 psi).
2. Run the pump at 840 rpm. The flow at 550 kPa (80 psi) must be 3.0 L/min (0.8 US gpm).
3. Run the pump at 2940 rpm. The flow at 650 kPa (94 psi) must be 4.5 L/min (1.2 US gpm).
4. Run the pump at 120 rpm. Keep the inlet open to the atmosphere for 10 seconds. Block the inlet. The pump must maintain the vacuum of 30 kPa (4 psi) minimum in 30 seconds.
5. Run the pump at 840 rpm. Keep the inlet open to the atmosphere for 10 seconds. Block the inlet. The pump must maintain the vacuum of 45 kPa (6 psi) minimum in 30 seconds.
6. Run the pump at 120 rpm with a blocked inlet for 30 seconds. The pump inlet must have a suction lift of 60.9 kPa (9 psi) minimum.

When the pump is viewed from the drive end, the rotation of the pump is clockwise.

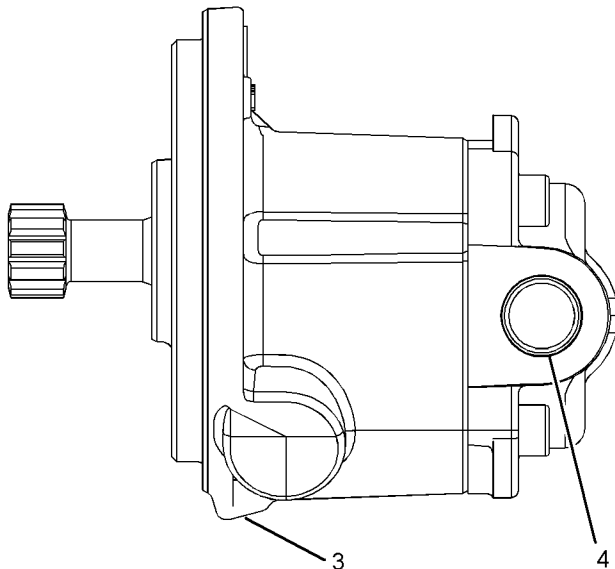


Illustration 4

g01176648

Left side of fuel transfer pump

- (3) Weep hole
- (4) Outlet port

When the fuel transfer pump is using diesel fuel, the fuel transfer pump has the following specifications:

i06715209

Fuel Transfer Pump

SMCS Code: 1256

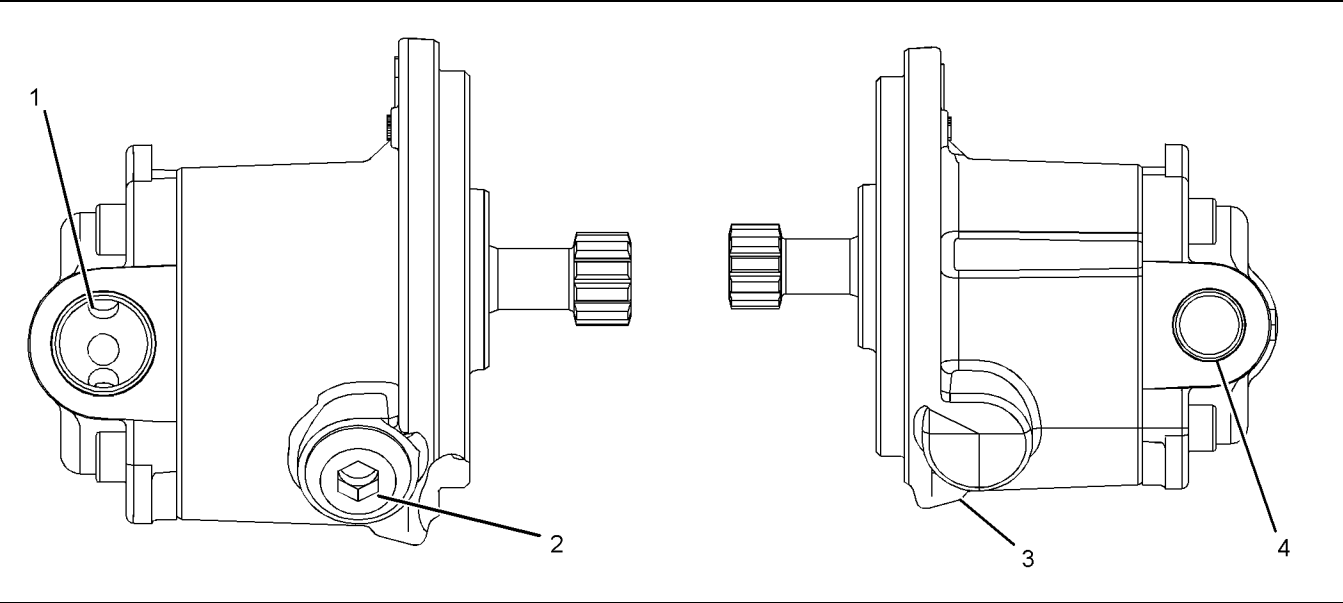


Illustration 5 g02555236

(1) Inlet port
(2) Pressure regulating valve
(3) Weep hole
(4) Outlet port

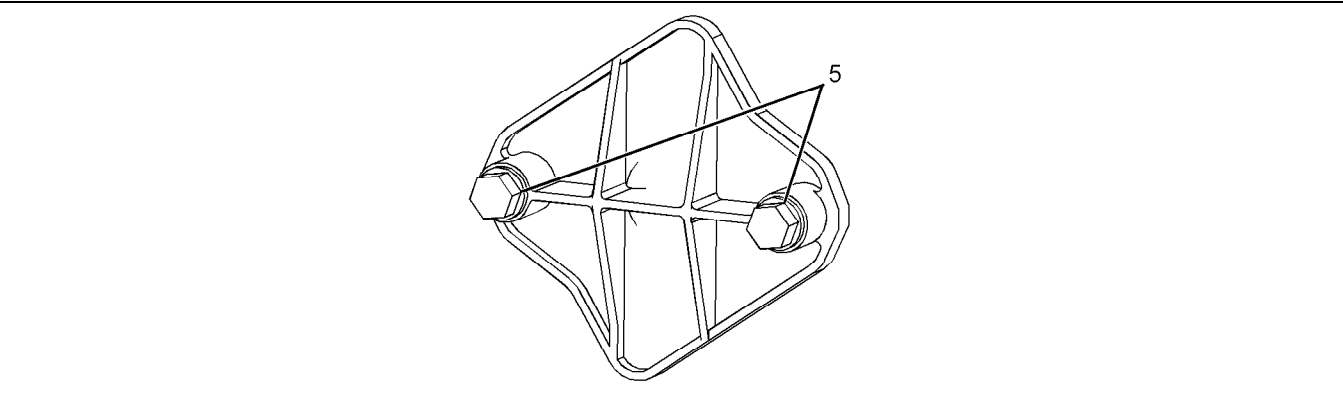


Illustration 6 g02555256

Typical front cover that is on the front housing for the fuel transfer pump

Table 2

Specification for 231 - 3946 Fuel Transfer Pump Gp, and 295 - 9259 Fuel Transfer Pump Gp			
Item	Qty	Part	Specification Description
5	2	-	Torque to 30 ± 5 N·m (265 ± 44 lb in).

i07989757

Fuel Transfer Pump

SMCS Code: 1256

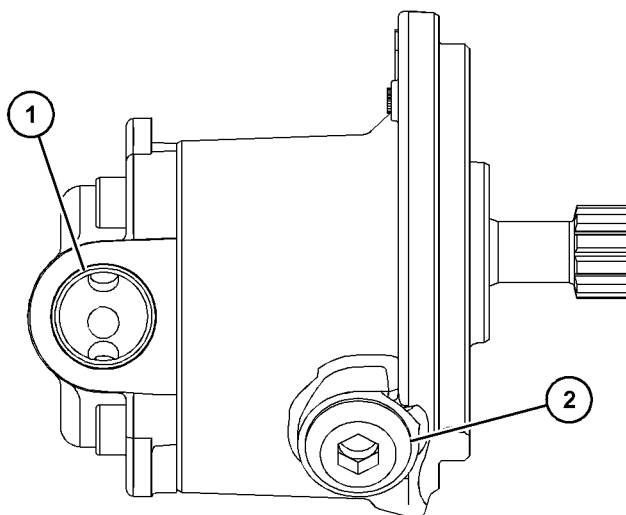


Illustration 7

g06500201

Right side view of fuel transfer pump

(1) Inlet port

(2) Pressure regulating valve

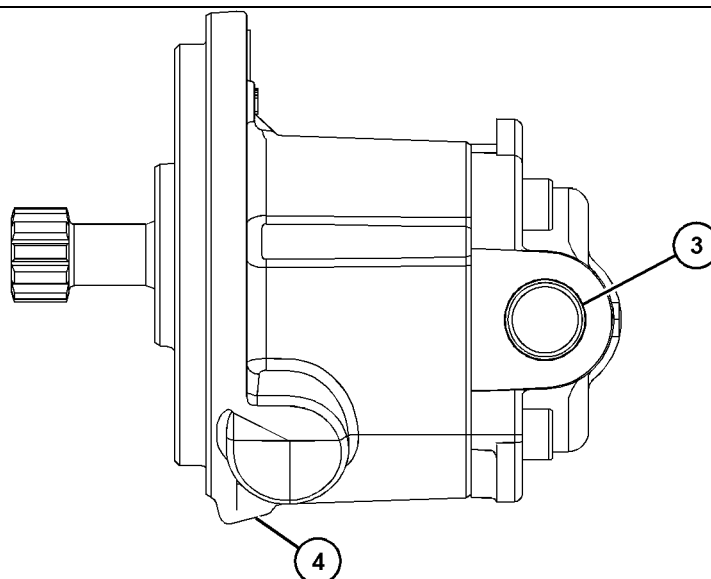


Illustration 8

g06500202

Left side view of fuel transfer pump

(3) Weep hole

(4) Outlet port

Table 3

Item	Qty	Part	Specification Description
-	-	-	Run the pump at 2940 rpm. The full bypass pressure should be 716 to 786 kPa (104 to 114 psi).
			Run the pump at 840 rpm. The flow at 550 kPa (80 psi) must be 3.0 L/min (0.8 US gpm).
			Run the pump at 2940 rpm. The flow at 650 kPa (94 psi) must be 4.50 L/min (1.19 US gpm).
			Run the pump at 120 rpm. Keep the inlet open to the atmosphere for 10 seconds. Block the inlet. The pump must maintain the vacuum of 30 kPa (4 psi) minimum in 30 seconds.
			Run the pump at 840 rpm. Keep the inlet open to the atmosphere for 10 seconds. Block the inlet. The pump must maintain the vacuum of 45 kPa (7 psi) minimum in 30 seconds.
			Run the pump at 120 rpm with a blocked inlet for 30 seconds. The pump inlet must have a suction lift of 60.9 kPa (8.8 psi) minimum.
			Run the pump at 140 rpm. The flow at 200 kPa (29 psi) must be 0.25 L/min (0.07 US gpm).
When the pump is viewed from the drive end, the rotation of the pump is clockwise direction.			

i04372697

Fuel Filter Base

SMCS Code: 1261; 1262

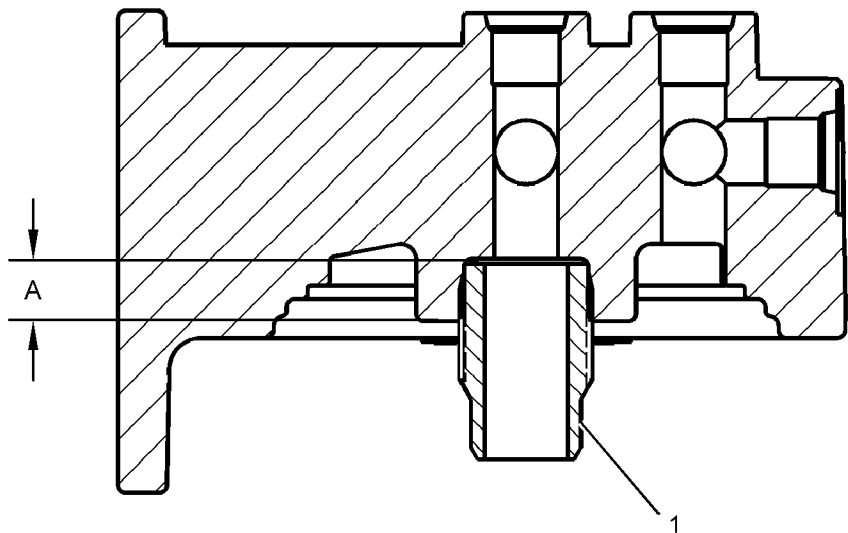


Illustration 9 g02546020
(A) Length 11 mm (0.4 inch)

Table 4

Specifications for 213-0064 Base As			
Item	Qty	Part	Specification Description
1	1	9S-4167 Hollow Stud	Apply red Loctite 271 to a length of (A) to the threads. Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i04374369

Fuel Filter Base

SMCS Code: 1261; 1262

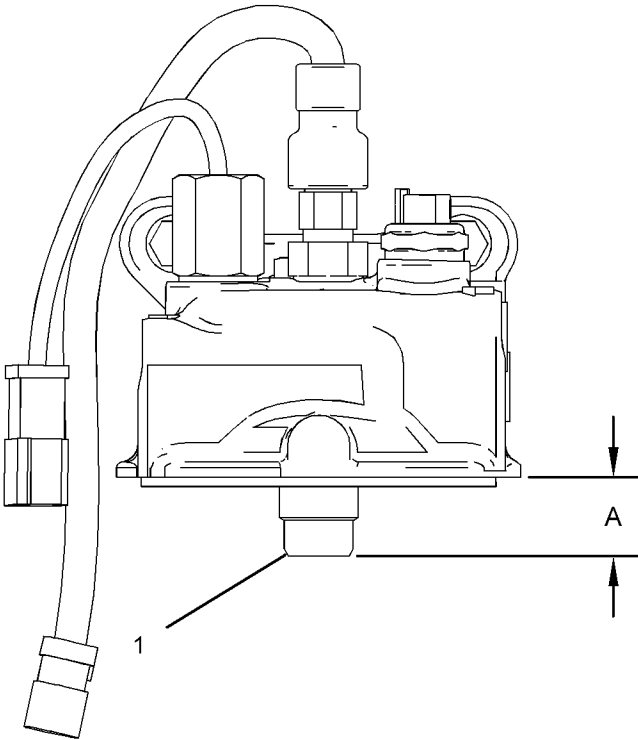


Illustration 10

g02544207

Table 5

Specifications for 237-9308 Base As and 237-9310 Base As			
Item	Qty	Part	Specification Description
A	-	-	Dimension from the surface of the base to the end of the hollow stud is 25.5 ± 1.0 mm (1.00 ± 0.04 inch).
1	1	9S-4167 Hollow Stud	Apply red Loctite 271 on the tapered end of the hollow stud before assembly into the base assembly. Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i04374373

Fuel Filter Base

SMCS Code: 1261; 1262

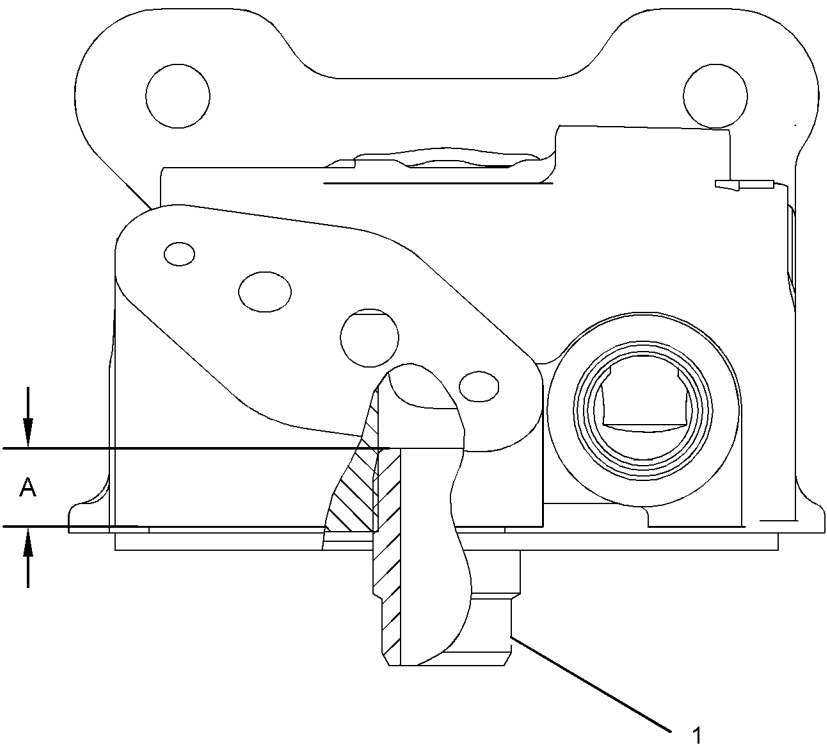


Illustration 11 g02544200
(A) Length 11 mm (0.4 inch)

Table 6

Specification for 177-9778 Base As			
Item	Qty	Part	Specification Description
1	1	9S-4167 Hollow Stud	Apply red Loctite 271 on the tapered end of the hollow stud for the length of (A). Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i04374430

Fuel Filter Base

SMCS Code: 1261; 1262

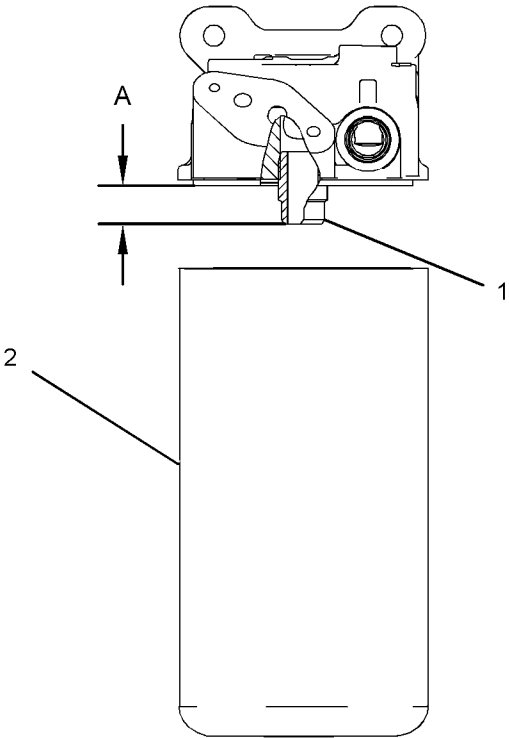


Illustration 12

g02543976

(2) Fuel filter

Table 7

Specifications for 237-9312 Fuel Filter Base As			
Item	Qty	Part	Specification Description
1	1	9S-4167 Hollow Stud	Before assembly, apply red Loctite 271 to the threads on the taperlock end of the hollow stud. Torque to 70 ± 15 N·m (52 ± 11 lb ft).
A	-	-	Distance from the base end to hollow stud end is 25.5 ± 1.0 mm (1.00 ± 0.04 inch).

i04405496

Fuel Filter Base

SMCS Code: 1261; 1262

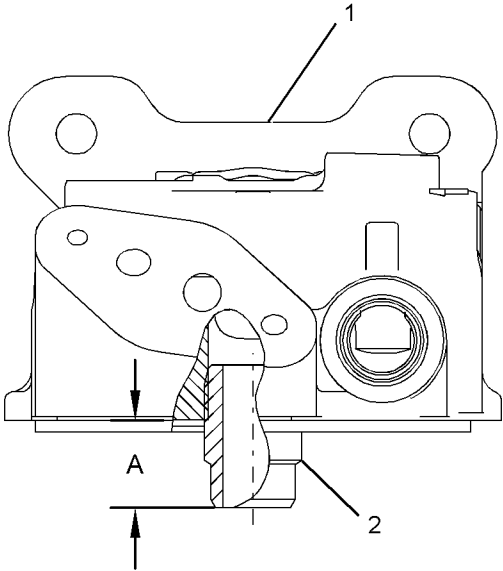


Illustration 13

g02596962

(1) Base

Table 8

Specifications for 237-9314 Base As			
Item	Qty	Part	Specification Description
A	-	-	Dimension from the surface of the base to the end of the hollow stud is 25.5 ± 1.0 mm (1.00 ± 0.04 inch).
2	1	9S-4167 Hollow Stud	Before assembly, apply red Loctite 271 to the threads on the tapered end of the hollow stud. Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i04405525

Fuel Filter Base

SMCS Code: 1261; 1262

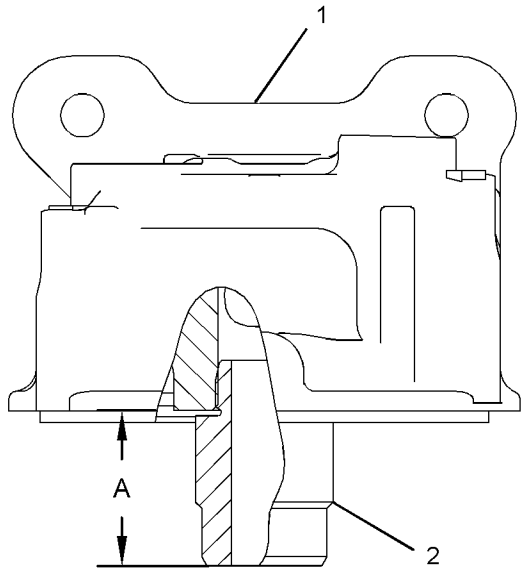


Illustration 14

g02599076

(1) Base

Table 9

Specifications for 237 - 9307 Fuel Filter Base As			
Item	Qty	Part	Specification Description
A	-	-	Dimension from the surface of the base to the end of the hollow stud is 39.5 ± 1.0 mm (1.56 ± 0.04 inch).
2	1	237 - 9323 Stud	Before assembly, apply red Loctite 271 to the threads on the tapered end of the stud. Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i04406141

Fuel Filter Base

SMCS Code: 1261; 1262

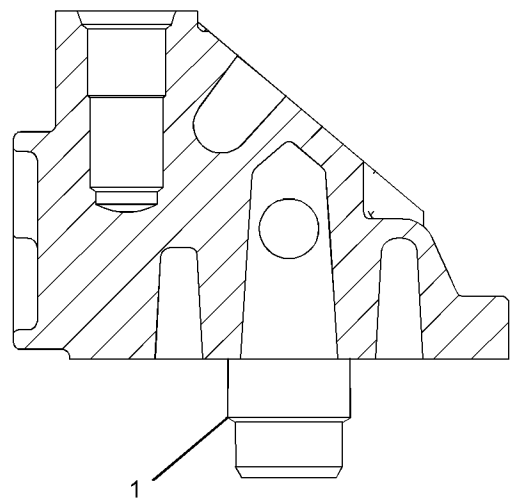


Illustration 15
Typical example

g02599078

Table 10

Specifications for 162-7838 Fuel Filter Base As and 1N-3789 Filter Base As			
Item	Qty	Part	Specification Description
1	1	9S-4167 Hollow Stud	Length for applying red Loctite 271 on the tapered end of the hollow stud is 7.6 ± 0.8 mm (0.30 ± 0.03 inch).
			Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i04553610

Fuel Filter Base

SMCS Code: 1261; 1262

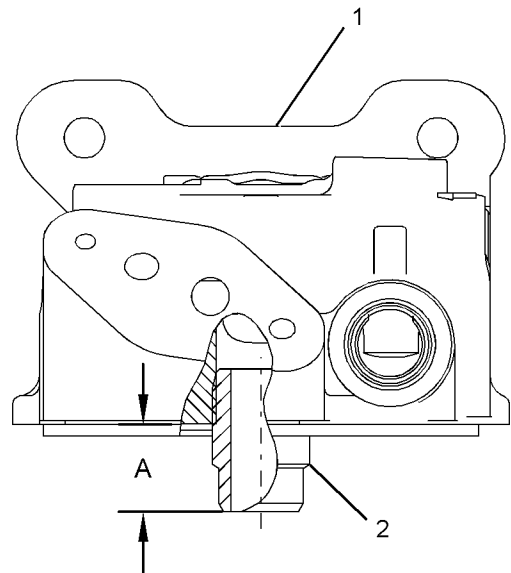


Illustration 16
Typical example

g02596962

Table 11

Specification for 237-9313 Base As, 237-9311 Base As and 237-9309 Base As			
Item	Qty	Part	Specification description
A	-	-	Dimension from the surface of the base (1) to the end of the stud is 39.5 ± 1.0 mm (1.56 ± 0.04 inch).
2	1	237-9323 Stud	Before assembly, apply red Loctite 271 to the threads on the tapered end of the stud.
			Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i05870130

Fuel Filter Base

SMCS Code: 1261; 1262

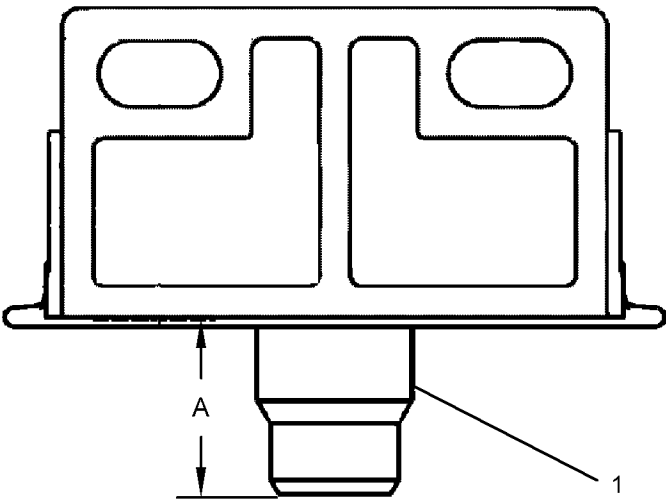


Illustration 17

g03703983

Table 12

Specification for 195 - 1068 Fuel Filter Base As			
Item	Qty	Part	Specification description
A	-	-	Dimension from the surface of the base to the end of the stud is 27.3 mm (1.07 inch).
1	1	9S-4167 Hollow Stud	Before assembly, apply red Loctite 271 to the threads on the stud.
			Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i06165189

Fuel Filter Base

SMCS Code: 1261; 1262

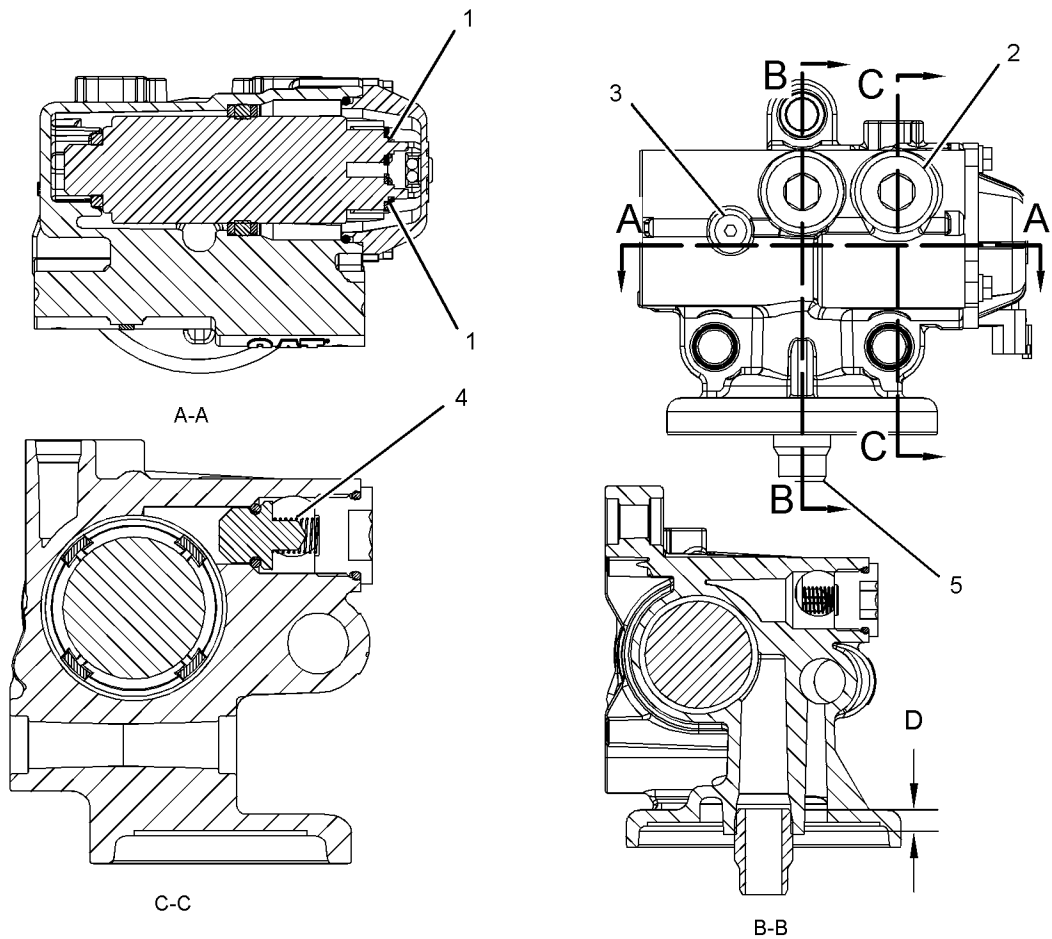


Illustration 18

g03834268

Typical example

Table 13

Specifications for 190-8970 Fuel Priming Pump Gp, 217-8339 Fuel Priming Pump As, and 235-8724 Fuel Transfer Pump Gp			
Item	Qty	Part	Specification Description
1	2	6D-5801 Locknut	Torque to $1.7 \pm 0.4 \text{ N}\cdot\text{m}$ ($15.0 \pm 3.5 \text{ lb in}$).
2	2	179-7267 Plug	Torque to $95 \pm 10 \text{ N}\cdot\text{m}$ ($70 \pm 7 \text{ lb ft}$).
3	1	9S-8002 O-Ring Plug	Torque to $11 \pm 2 \text{ N}\cdot\text{m}$ ($97 \pm 18 \text{ lb in}$).
4	1	162-2222 Spring	Length under test force is 20.21 mm (0.796 inch). Test force is $1.01 \pm 0.05 \text{ N}$ ($0.23 \pm 0.01 \text{ lb}$). Free length after test is 31.75 mm (1.250 inch).
5	1	9S-4167 Hollow Stud	Apply red Loctite 263 to the threads to the length (D) of $11.0 \pm 0.5 \text{ mm}$ ($0.43 \pm 0.02 \text{ inch}$). Torque to $70 \pm 15 \text{ N}\cdot\text{m}$ ($52 \pm 11 \text{ lb ft}$).

i07887558

Fuel Filter Base

SMCS Code: 1261; 1262

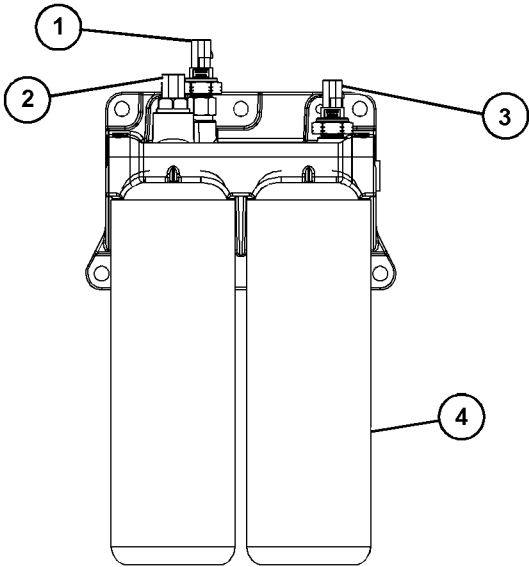


Illustration 19 g06469776

Table 14

Item	Qty	Part	Specification Description
1	1	325-8634 Pressure Sensor Gp	Torque fuel pressure sensor (pre-filter) to 10 ± 2 N·m (89 ± 18 lb in).
2	1	234-5013 Temperature Sensor Gp	Torque to 20 ± 3 N·m (177 ± 27 lb in).
1	1	325-8634 Pressure Sensor Gp	Torque fuel pressure sensor (post-filter) to 10 ± 2 N·m (89 ± 18 lb in).
4	1	1R-0749 Fuel Filter	Before assembly, lubricate the seal and bore lightly with Bonderite S-OT, Rubber lubricant.
			Tighten the filter to one full turn after the filter gasket contacts the filter base.

i04379788

Fuel Priming Pump

SMCS Code: 1258

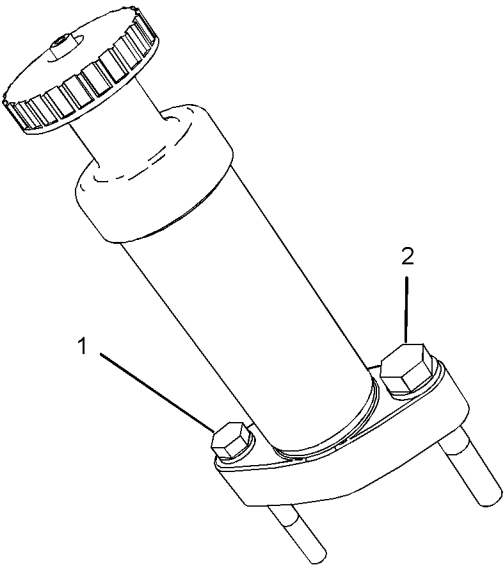


Illustration 20

g02543817

Table 15

Specification for 137 - 5541 Fuel Priming Pump Gp			
Item	Qty	Part	Specification Description
1	1	-	Torque the bolt to 12 ± 3 N·m (106 ± 27 lb in).
2	1	-	Torque the bolt to 25 ± 6 N·m (221 ± 53 lb in).

i02152525

i02685980

Electronic Unit Injector

SMCS Code: 1290

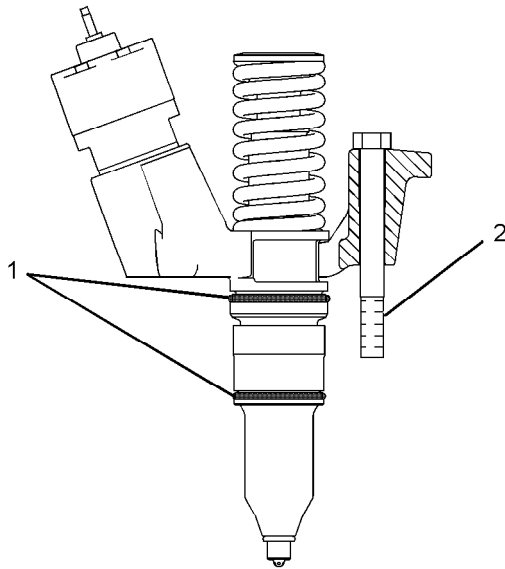


Illustration 21

g01091593

(1) Lubricate the seals and the bore with a 50 percent mix of 8T - 2998 Lubricant and engine oil.

(2) Bolt torque $.55 \pm 10 \text{ N}\cdot\text{m}$ ($(40 \pm 7 \text{ lb ft})$)

Electronic Unit Injector Mechanism

SMCS Code: 1290

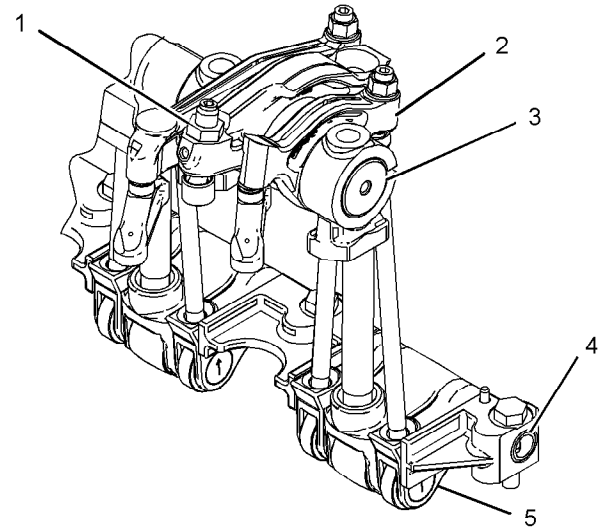


Illustration 22

g01103526

- (2) Rocker arm
- (3) Rocker arm shaft
- (4) Lifter group shaft
- (5) Unit injector lifter assembly

Use the following procedure for adjusting the unit injector:

1. Loosen the locknut (1).
2. Turn the adjustment screw clockwise. Stop turning the adjustment screw when contact is made with the unit injector.
3. Turn the adjustment screw clockwise.
Turn 180 degrees (1/2 of a turn)
4. Hold the adjustment screw. Tighten the locknut (1).

Tighten the locknut to the following torque.
. $.55 \pm 10 \text{ N}\cdot\text{m}$ ($(41 \pm 7 \text{ lb ft})$)

i04574662

i06544886

Electronic Unit Injector
Mechanism

SMCS Code: 1290

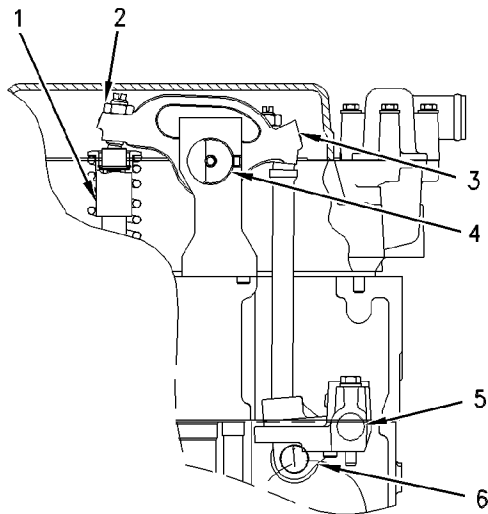


Illustration 23

g01364153

- (1) Electronic unit injector
- (2) Locknut
- (3) Electronic unit injector rocker arm
- (4) Rocker arm shaft
- (5) Lifter group shaft
- (6) Electronic unit injector lifter

The torque for the locknut (2) is: $55 \pm 10 \text{ N}\cdot\text{m}$
((41 $\pm$ 7 lb ft))

Electronic Unit Injector Rocker
Arm

SMCS Code: 1123

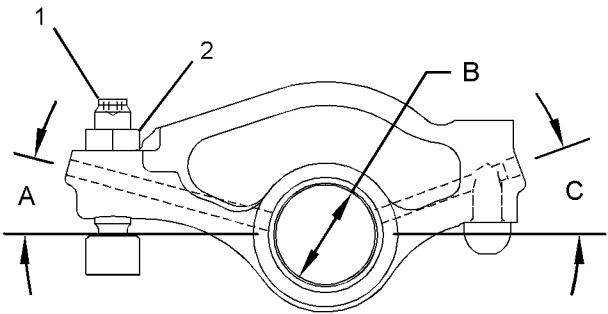


Illustration 24

g01349654

(1) Maximum free running torque of the adjustment
screw $0.4 \text{ N}\cdot\text{m}$ ((4 lb in))

(2) Torque for the hex thin nut $55 \pm 10 \text{ N}\cdot\text{m}$
((41 $\pm$ 7 lb ft))

(A) Oil passage angle 13 degrees

Note: Opening diameter for the oil hole must be
2.3 mm (0.09 inch) minimum after the assembly of
the bearing.

(B) Bearing bore diameter $34.050 \pm 0.015 \text{ mm}$
((1.3405 $\pm$ 0.0006 inch))

Bore in the rocker arm for the bearing
. $37.000 \pm 0.020 \text{ mm}$ ((1.4567 $\pm$ 0.0008 inch))

Note: The bearing in the rocker arm must not extend
beyond either face of the rocker arm.

(C) Oil passage angle 20 degrees

Note: The diameter for the oil hole opening must be
2.3 mm (0.09 inch) minimum after the assembly of
the bearing.

i02903989

Electronic Unit Injector Wiring

SMCS Code: 1290

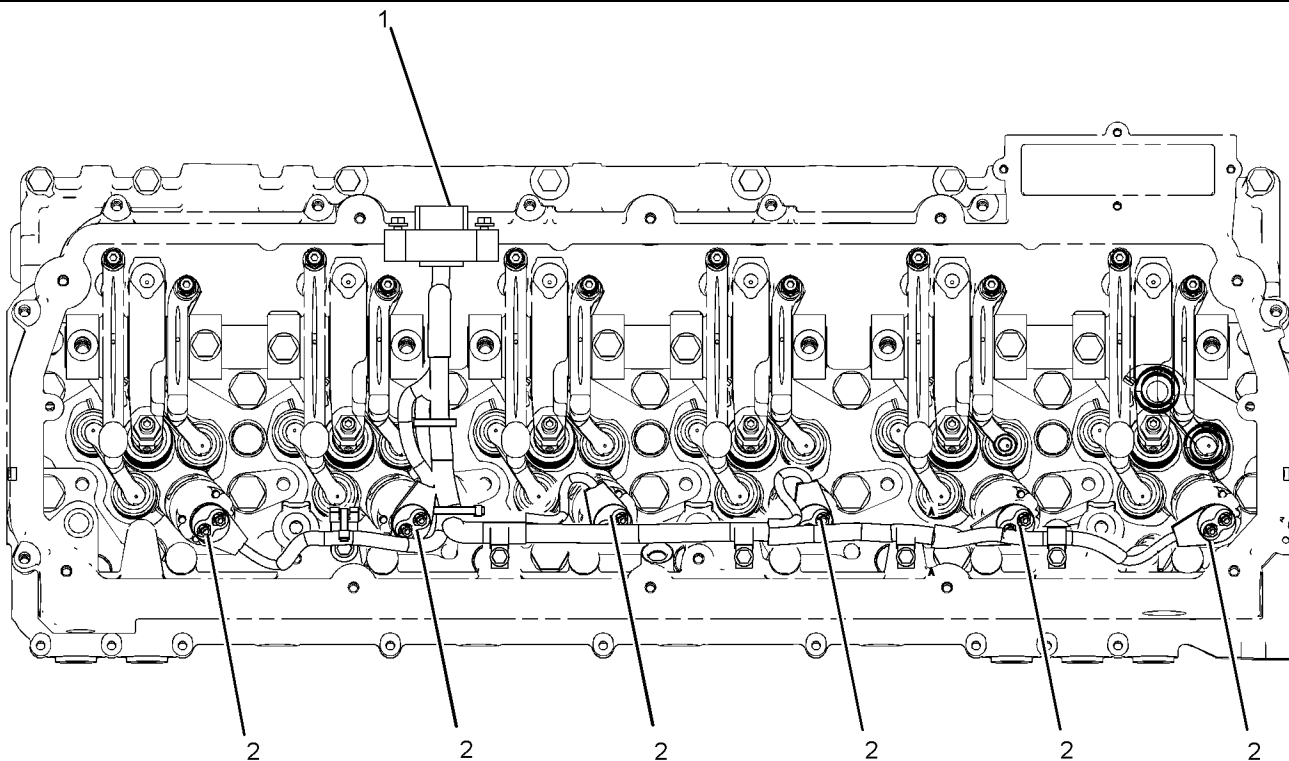


Illustration 25

g01450944

(1) Engine harness assembly

(2) Torque for the 12 retainer nuts . . 2.50 ± 0.25 N·m
(22 ± 2 lb in)

i05583531

Electronic Unit Injector Wiring

SMCS Code: 1290

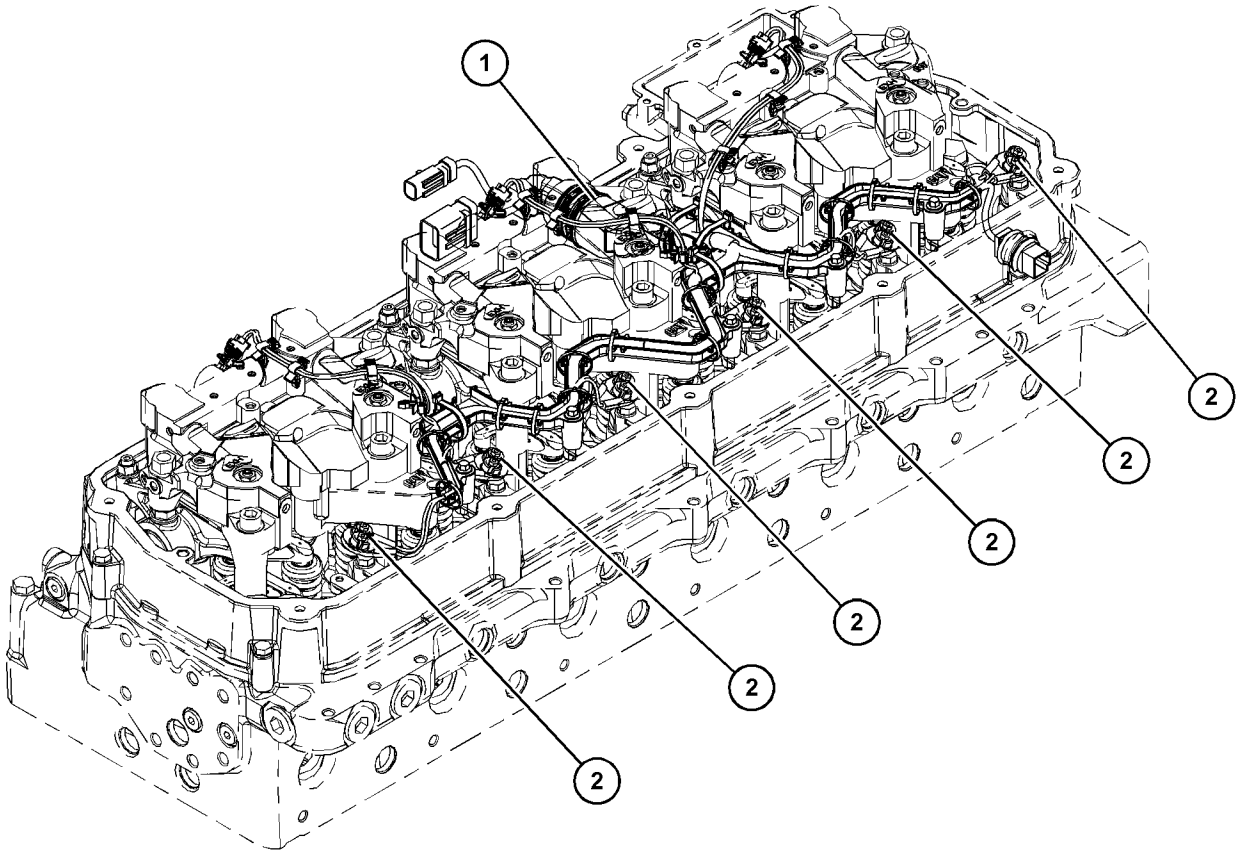


Illustration 26

g03542536

Table 16

Specification for 370 -3254 Unit Injector Wiring Gp			
Item	Qty	Part	Specification Description
1	-	-	Lubricate the bore lightly with the lubricant that is being sealed.
2	6	7E - 6508 Cap As	Tighten the cap nuts to 2.50 ± 0.25 N·m (22.13 ± 2.21 lb in).

i04575980

i02798835

Valve Mechanism

SMCS Code: 1102

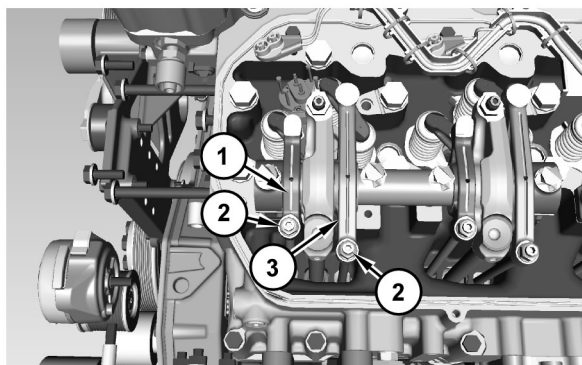


Illustration 27

g02733079

Torque for the jam nuts (2) after setting the valve lash $30 \pm 7 \text{ N}\cdot\text{m}$ ($(22 \pm 5 \text{ lb ft})$)

(1) Inlet rocker arm bore for shaft
..... $34.075 \pm 0.015 \text{ mm}$ ($(1.3415 \pm 0.0006 \text{ inch})$)

(3) Exhaust rocker arm bore for shaft
..... $34.075 \pm 0.015 \text{ mm}$ ($(1.3415 \pm 0.0006 \text{ inch})$)

Valve Rocker Arm

SMCS Code: 1123

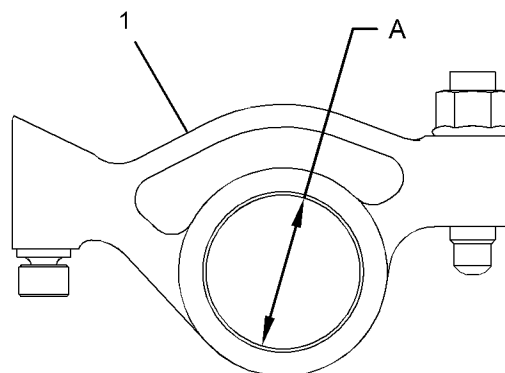


Illustration 28

g01398538

(1) Inlet rocker arm

(A) Bore for the rocker shaft $34.075 \pm 0.015 \text{ mm}$
($(1.3415 \pm 0.0006 \text{ inch})$)

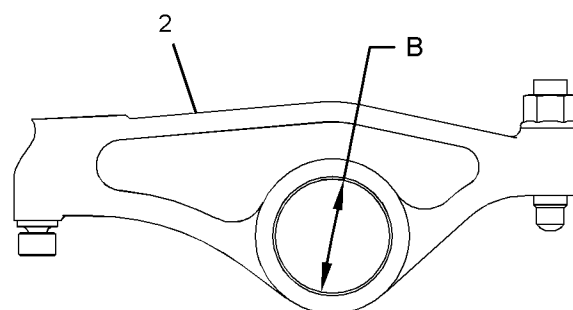


Illustration 29

g01398539

(2) Exhaust rocker arm

(B) Bore for the rocker shaft $34.075 \pm 0.015 \text{ mm}$
($(1.3415 \pm 0.0006 \text{ inch})$)

i05578789

Valve Rocker Arm

SMCS Code: 1123

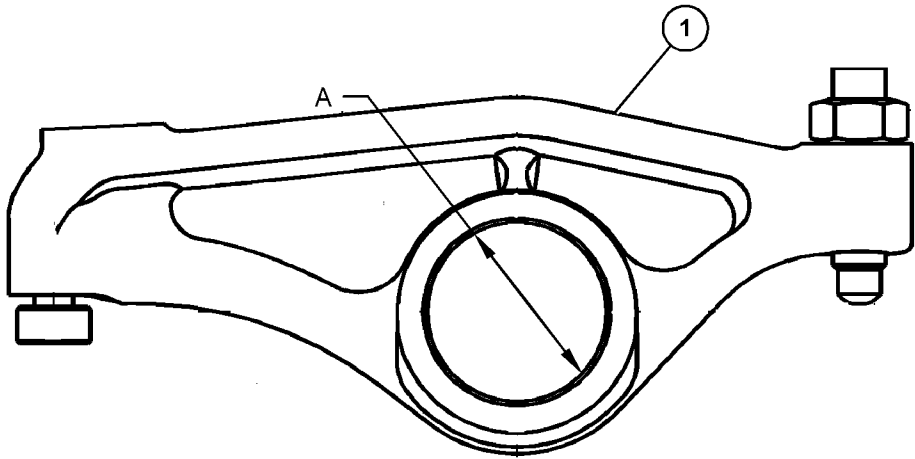


Illustration 30

g03538276

Table 17

Specification for 261 - 2294 Rocker Arm			
Item	Qty	Part	Specification Description
1	1	261 - 2293 Rocker Arm As	Bore (A) in the valve rocker arm for the rocker arm shaft is 34.075 ± 0.015 mm (1.3415 ± 0.0006 inch).

i07787167

Valve Rocker Arm

SMCS Code: 1123

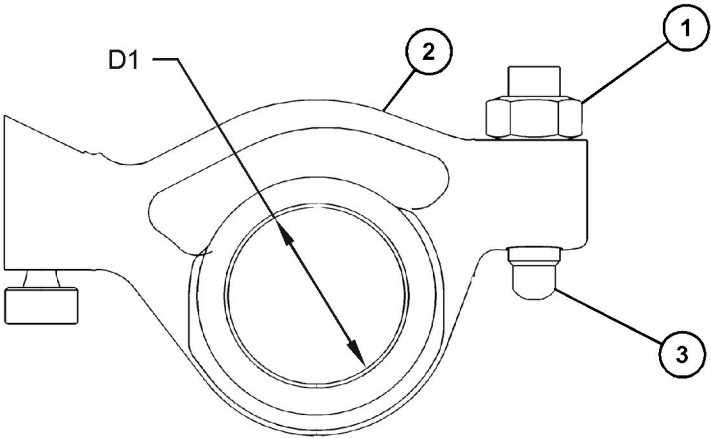


Illustration 31 g06436593

Table 18

Item	Qty	Part	Specification Description
1	1	2Y - 5829 Nut	Torque to 6 ± 3 N·m (53 ± 27 lb in).
2	1	385 - 5474 Rocker Arm As	Bore (A) in the valve rocker arm for the rocker arm shaft is 34.075 ± 0.015 mm (1.3415 ± 0.0006 inch).
3	1	260 - 7524 Valve Adjustment Screw	Free running torque of screw must not exceed 0.4 N·m (3.5 lb in).

i02173291

i02841017

Valve Mechanism Cover

SMCS Code: 1107

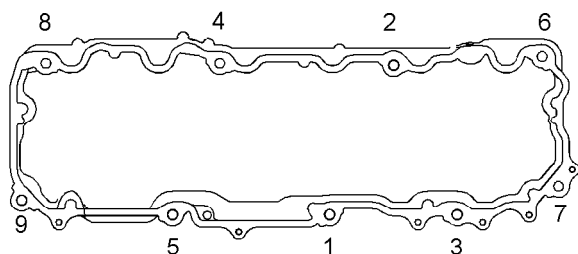


Illustration 32

g01061297

Valve cover base

Tighten the bolts for the valve cover base in the sequence that is shown in Illustration 32 .

Valve Mechanism Cover

SMCS Code: 1107

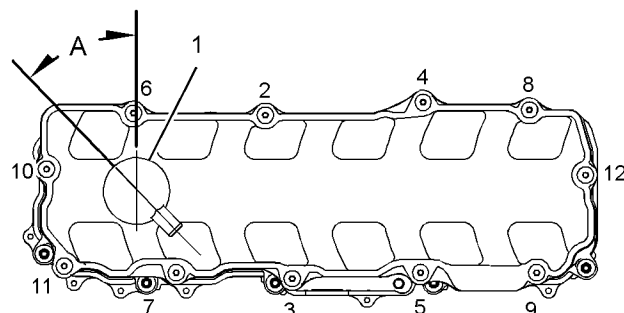


Illustration 34

g01418674

(1) Torque for the breather cap $30.0 \pm 7.5 \text{ N}\cdot\text{m}$
 (($22 \pm 6 \text{ lb ft}$))

(A) Angle of orientation for the breather cap 45 degrees

Torque the bolt (2) to bolt (12) in a numerical sequence. $20 \pm 3 \text{ N}\cdot\text{m}$ (($15 \pm 2 \text{ lb ft}$))

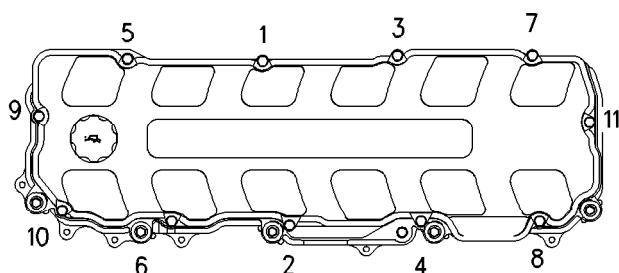


Illustration 33

g00728341

Valve mechanism cover

Note: Some engines may not be equipped with an oil filler cap that is located on the valve mechanism cover.

Tighten the bolts for the valve mechanism cover in the sequence that is shown in Illustration 33 to the following torque. $15 \pm 3 \text{ N}\cdot\text{m}$ (($11 \pm 2 \text{ lb ft}$))

Note: The valve cover seal is cut to size at assembly. Coat seal joints with 3S-6252 Sealant.

i04348429

Valve Mechanism Cover

SMCS Code: 1107

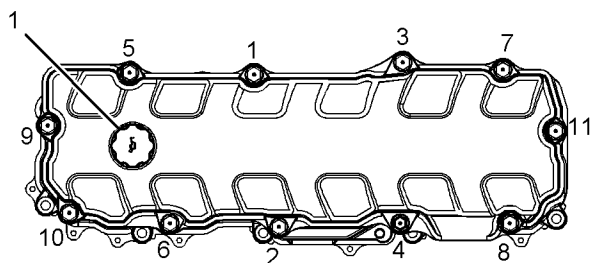


Illustration 35

g02503456

(1) Torque for the filler cap assembly $5 \pm 1 \text{ N}\cdot\text{m}$
((45 $\pm$ 9 lb in))

Tighten bolt (1) through bolt (11) in a numerical
sequence to the following torque. $28 \pm 7 \text{ N}\cdot\text{m}$
((248 $\pm$ 62 lb in))

i04407570

Valve Mechanism Cover

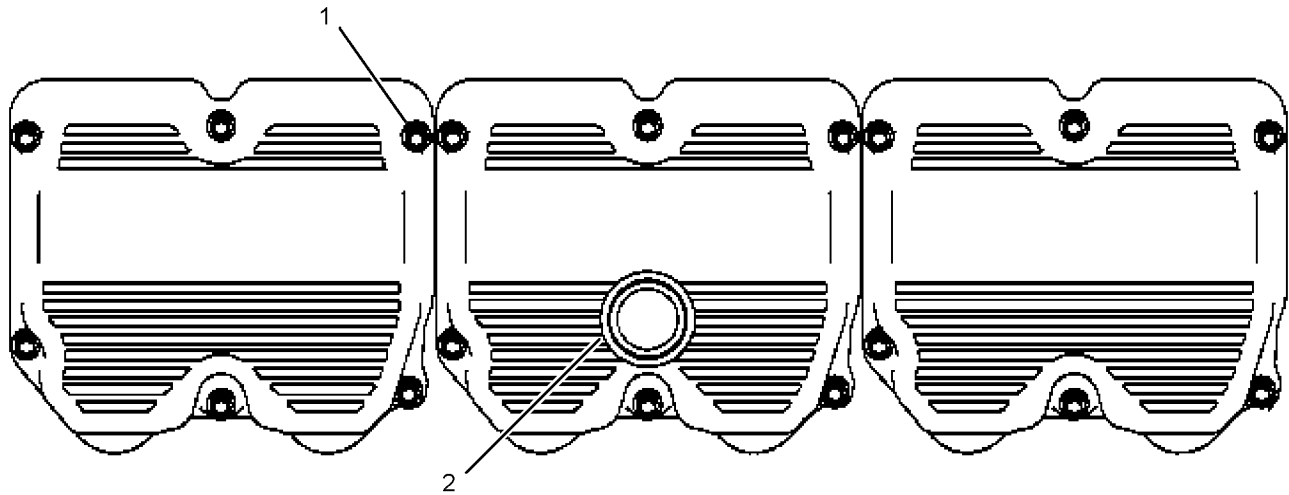
SMCS Code: 1107

Illustration 36

g02610317

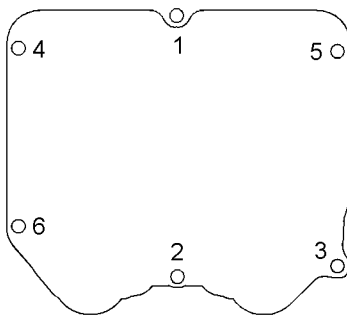


Illustration 37

g02610257

Tightening sequence for valve cover

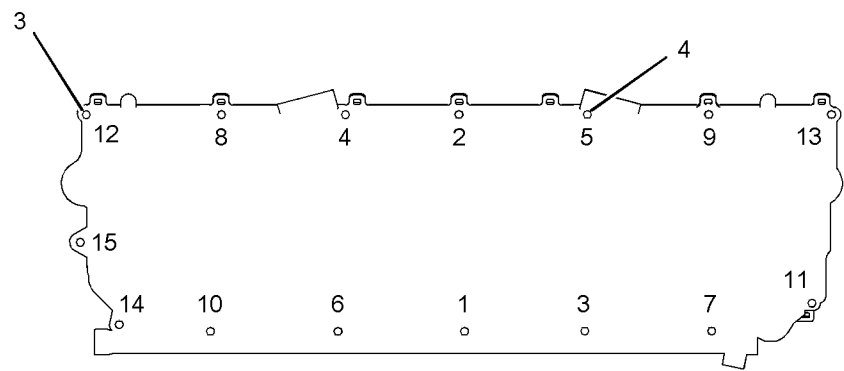


Illustration 38

g02610277

Tightening sequence for valve cover base

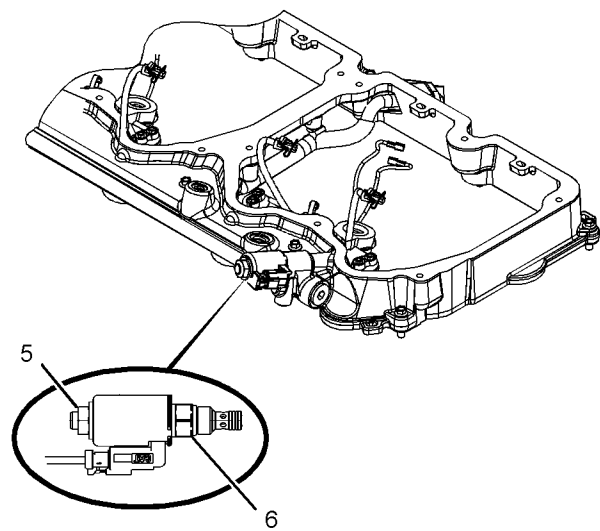


Illustration 39

g02603581

Table 19

Specification for 239-5820 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
1	6	243-1159 Fastener	Torque to 18 ± 3 N·m (159 ± 27 lb in) in the numerical sequence as shown in Illustration 37 .
2	1	272-2583 O-Ring Seal	Lubricate the joint surfaces and the O-ring seal with the clean engine oil.
3	14	9L-8925 Bolt	Tighten the bolts for the valve cover base in the numerical sequence that is shown in Illustration 38 .
4	1	122-1472 Bolt	
-	-	-	Apply blue Loctite 242 to the threads of the bolts that fasten the wiring for the electronic unit in-jectors to the valve cover base.
-	-	-	Orient the connector for the solenoid valve group in the position that is shown in Illustration 39 .
5	-	-	Torque the nut to 10.0 ± 1.5 N·m (90 ± 13 lb in).
6	-	-	Torque the solenoid valve group to 50 ± 5 N·m (37 ± 4 lb ft).

i04407623

Valve Mechanism Cover

SMCS Code: 1107

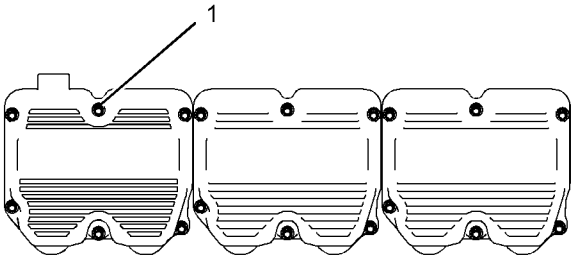


Illustration 40

g01199181

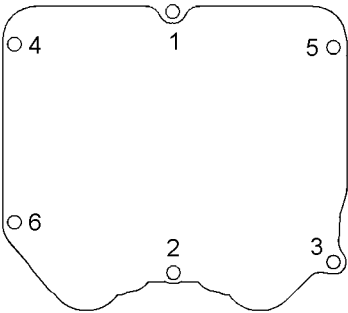


Illustration 41
Tightening sequence for valve cover

g02610257

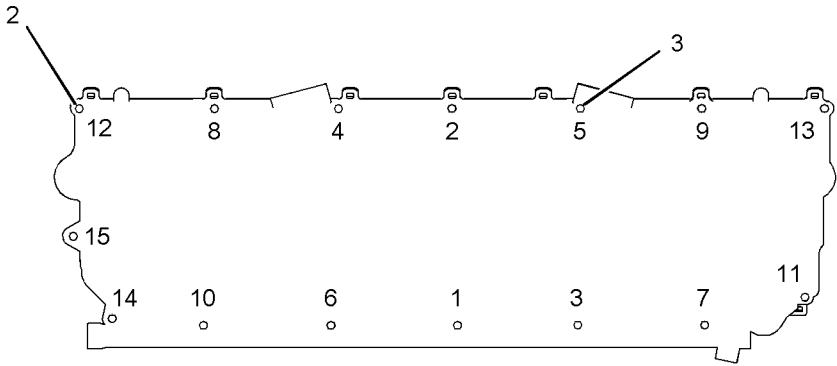


Illustration 42
Tightening sequence for valve cover base

g02610258

Specifications Section

Table 20

Specification for 187 - 1328 Valve Mechanism Cover Gp and 239 - 4113 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
1	6	243 - 1159 Fastener	Torque to 18 ± 3 N·m (159 ± 27 lb in) in the numerical sequence as shown in Illustration 41 .
2	14	9L - 8925 Bolt	Tighten the bolts in the numerical sequence as shown in Illustration 42 .
3	1	122 - 1472 Bolt	
-	-	-	Apply blue Loctite 242 to the threads of the bolts that fasten the wiring for the electronic unit injectors to the valve cover base.

i04412879

Valve Mechanism Cover

SMCS Code: 1107

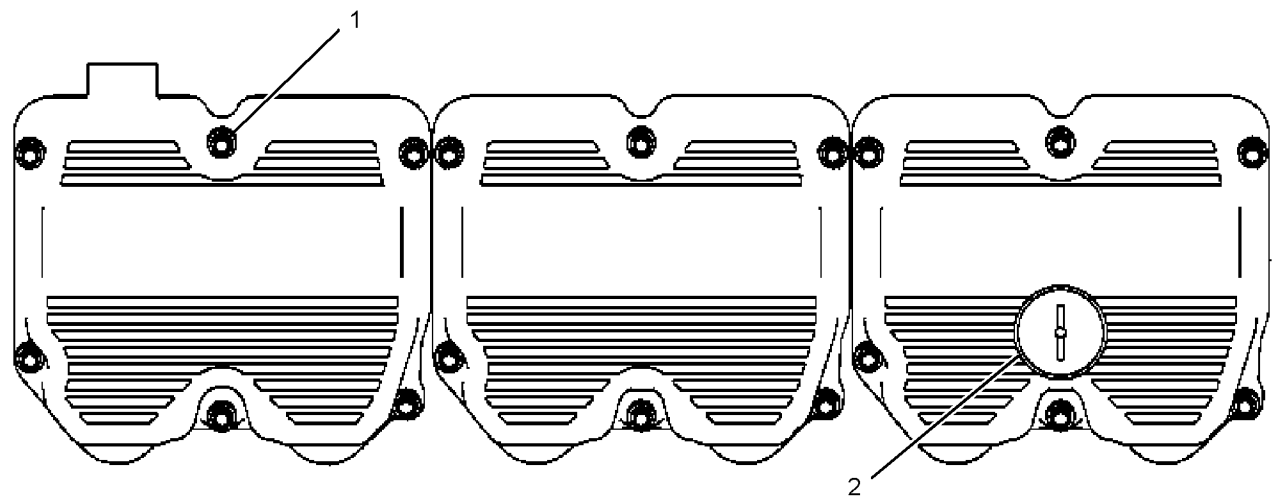


Illustration 43

g02610276

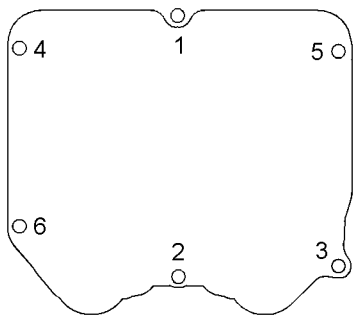


Illustration 44

Tightening sequence for valve cover

g02610257

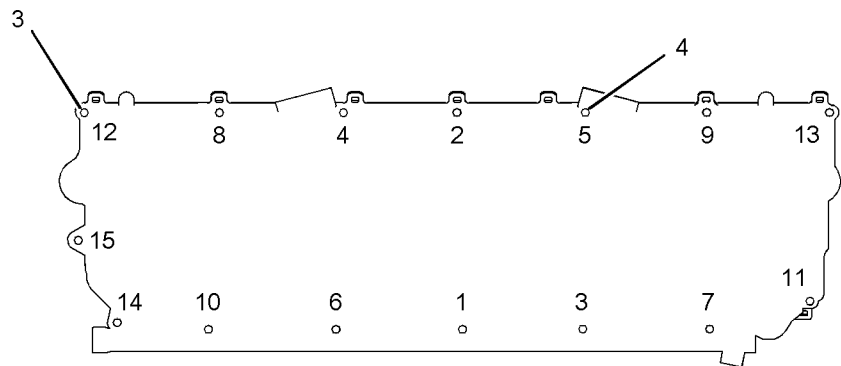


Illustration 45 g02610277
Tightening sequence for valve cover base

Table 21

Specification for 239 - 4112 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
1	6	243 - 1159 Fastener	Torque to $18 \pm 3 \text{ N}\cdot\text{m}$ ($159 \pm 27 \text{ lb in}$) in the numerical sequence as shown in Illustration 44 .
2	1	272 - 2583 O-Ring Seal	Lubricate the joint surfaces and the seals with the clean engine oil.
3	14	9L - 8925 Bolt	Tighten the bolts in the numerical sequence as shown in Illustration 45 .
4	1	122 - 1472 Bolt	
-	-	-	Apply blue Loctite 242 to the threads of the bolts that fasten the wiring for the electronic unit injectors to the valve cover base.

i04412886

Valve Mechanism Cover

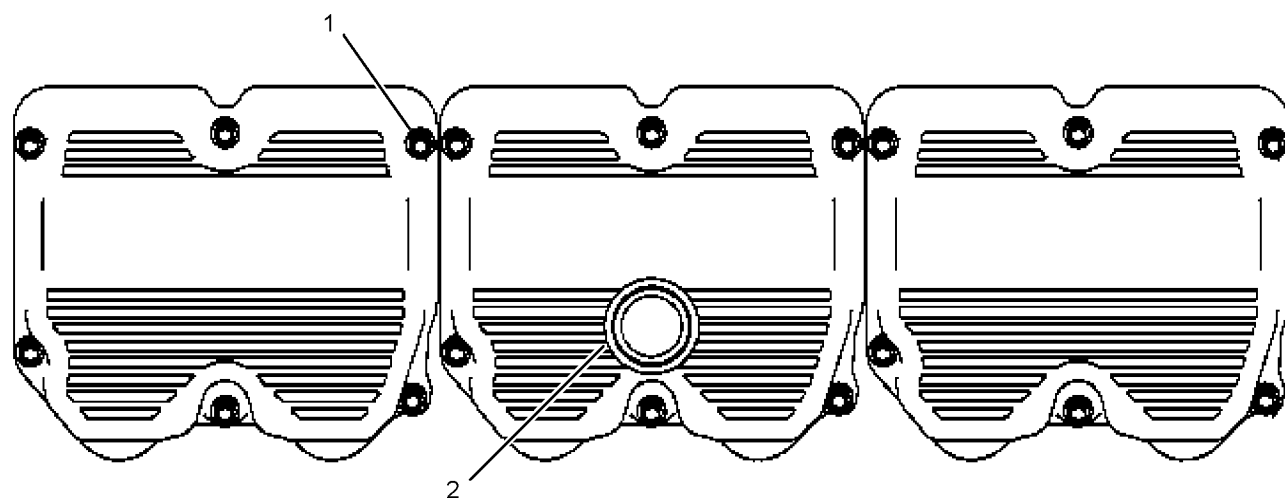
SMCS Code: 1107

Illustration 46

g02610317

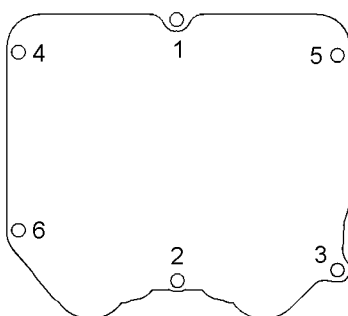


Illustration 47

Tightening sequence for valve cover

g02610257

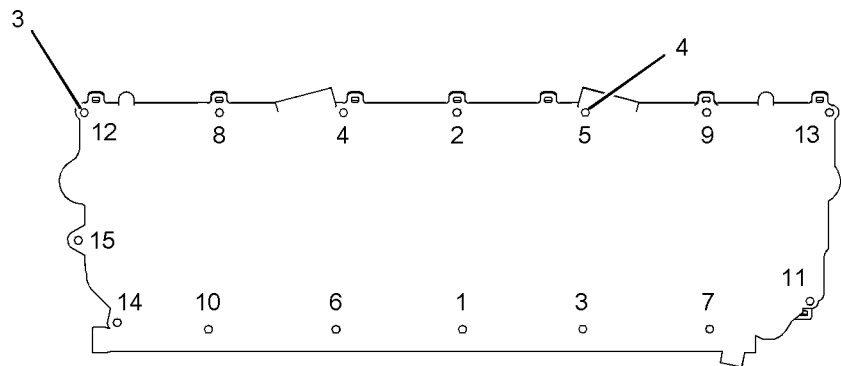


Illustration 48 g02610277
Tightening sequence for valve cover base

Table 22

Specification for 246- 5628 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
1	6	243-1159 Fastener	Torque to 18 ± 3 N·m (159 ± 27 lb in) in the numerical sequence as shown in Illustration 47 .
2	1	272-2583 O-Ring Seal	Lubricate the joint surfaces and the seals with the clean engine oil.
3	14	9L-8925 Bolt	Tighten the bolts in the numerical sequence as shown in Illustration 48 .
4	1	122-1472 Bolt	
Apply blue Loctite 242 to the threads of the bolts that fasten the wiring for the electronic unit injectors to the valve cover base.			

i04464691

Valve Mechanism Cover

SMCS Code: 1107

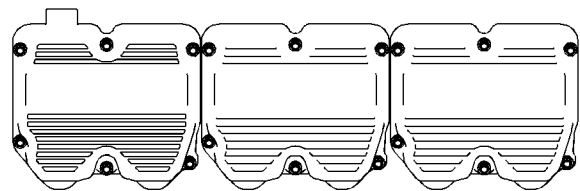


Illustration 49

g02648456

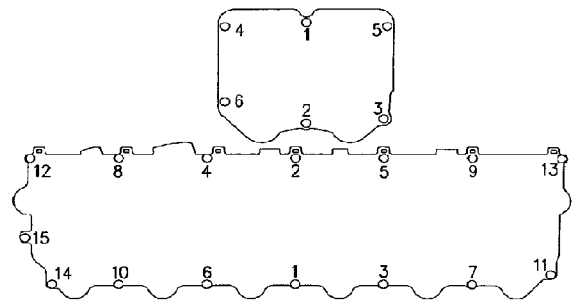


Illustration 50

g02648457

Tightening sequence for valve cover and valve cover base

Table 23

Specifications for 278 - 5662 Valve Cover and Injection Harness Base Gp, 286 - 7168 Valve Mechanism Cover Gp, and 239 - 5223 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
-	-	-	Apply blue Loctite 242 to the threads of the bolts.
-	-	-	Tighten the bolts in the numerical sequence as shown in Illustration 50 to 18 ± 3 N·m (160 ± 27 lb in).

i04483689

Valve Mechanism Cover

SMCS Code: 1107

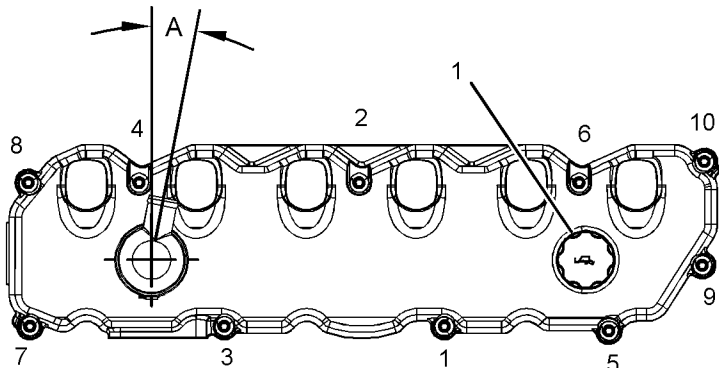


Illustration 51 g02663578

Table 24

Specification for 349- 1527 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
A	1	-	Orientation for the breather cap is $11^{\circ} \pm 5^{\circ}$.
1	1	227 - 4531 Engine Oil Filler Cap As	Hand tighten the engine oil filter cap assembly until the O-ring seal seats fully on the valve mechanism cover.

Tighten the bolt 1 through bolt 10 in a numerical sequence that is shown in Illustration 51 to standard torque.

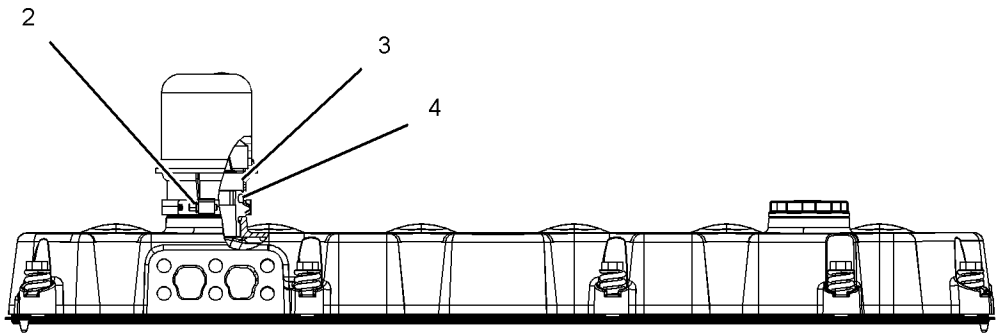


Illustration 52 g02663579

Table 25

Specification for 349- 1527 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
2	1	2N - 8109 Clamp	Torque to 4.5 ± 0.5 N·m (39.8 $\pm$ 4.4 lb in).
3	1	365 - 5169 Adapter	Torque to 15 ± 3 N·m (133 $\pm$ 27 lb in).
4	1	6V - 3831 O-Ring Seal	Lightly lubricate the bore of the O-ring seal with clean engine oil.

i05578804

Valve Mechanism Cover

SMCS Code: 1107

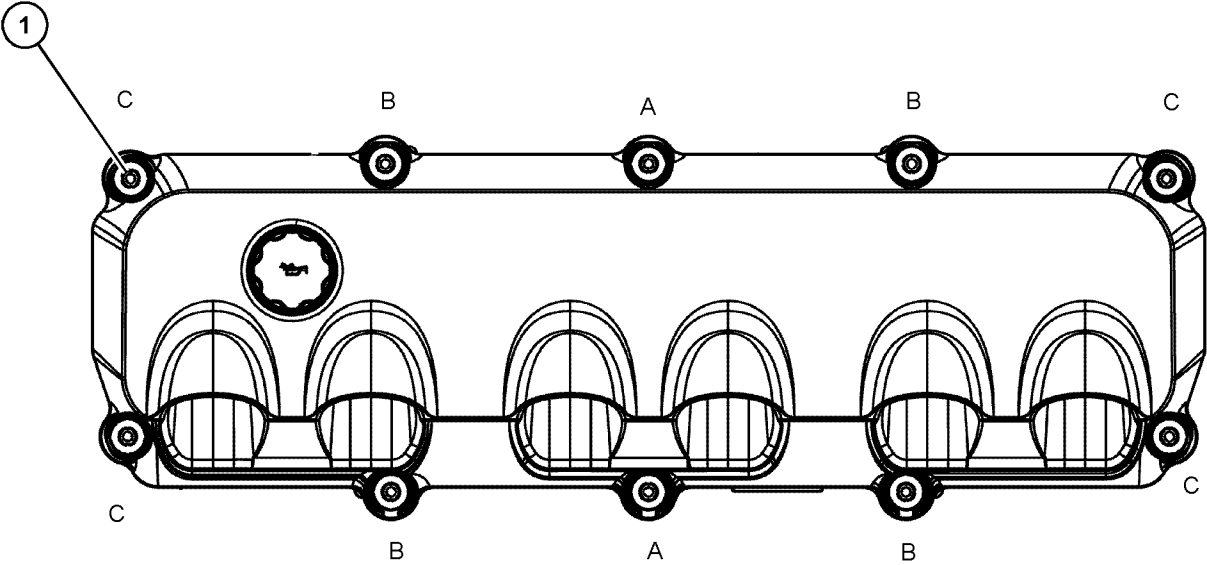


Illustration 53

g03538316

Table 26

Specification for 348 - 2707 Valve Mechanism Cover Gp			
Item	Qty	Part	Specification Description
1	10	211 - 3445 Stud	Refer to Illustration 53 . Tighten the bolts to standard torque. Use the sequence that follows. 1. First tighten bolts marked (A). 2. Then, tighten bolts marked (B). 3. Finally, tighten bolts marked (C).

i04166497

Cylinder Head Valves

SMCS Code: 1105

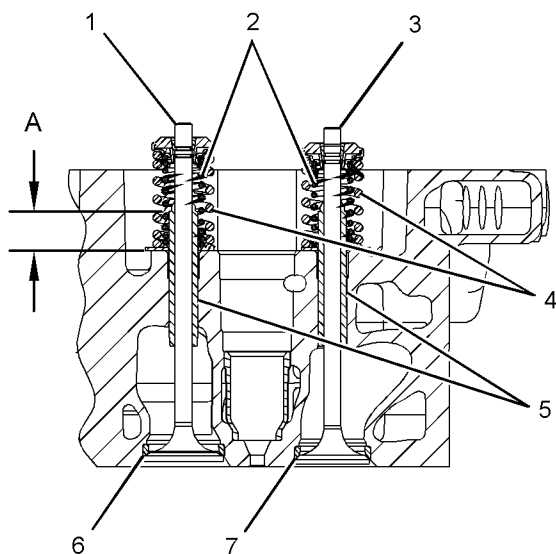


Illustration 54

g01445699

Note: Apply clean engine oil to the inlet valve stems and to the exhaust valve stems prior to installation in the cylinder head.

(A) Height to the step in the valve guide
..... 20.0 ± 0.5 mm ($(0.79 \pm 0.02$ inch))

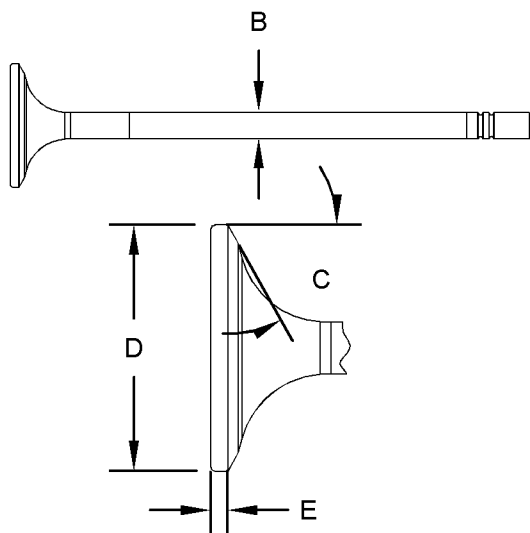


Illustration 55

g01445692

Inlet valve

(1) Inlet valve

(B) Valve stem diameter 9.441 ± 0.008 mm
($(0.3717 \pm 0.0003$ inch))

Minimum valve stem diameter 9.309 mm
($(0.3665$ inch))

(C) Valve face angle 60.75 ± 0.25 degrees

(D) Diameter of the valve head
..... 44.50 ± 0.13 mm ($(1.752 \pm 0.005$ inch))

(E) Minimum valve lip thickness
..... 3.50 ± 0.20 mm ($(0.138 \pm 0.008$ inch))

(2) 224-4441 Spring

Quantity 4

Length under test force 50.47 mm
($(1.987$ inch))

Test force 160 ± 13 N ($(36.0 \pm 2.9$ lb))

Approximate free length after test 64.1 mm
($(2.52$ inch))

Outside diameter 23.24 mm ($(0.915$ inch))

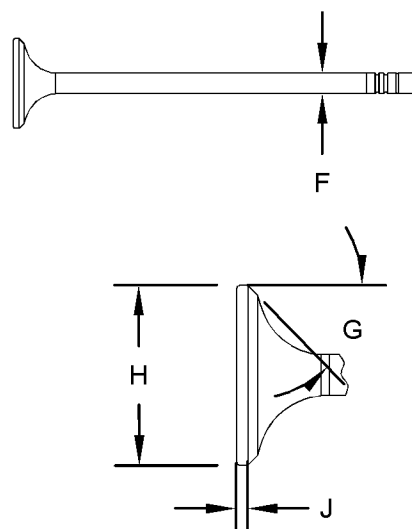


Illustration 56

g01445690

Exhaust valve

(3) Exhaust valve

(F) Valve stem diameter 9.441 ± 0.008 mm
($(0.3717 \pm 0.0003$ inch))

Minimum valve stem diameter 9.309 mm
($(0.3665$ inch))

(G) Valve face angle 45.75 ± 0.25 degrees

(H) Diameter of the valve head
..... 41.50 ± 0.13 mm ($(1.634 \pm 0.005$ inch))

(J) Minimum valve lip thickness
..... 3.50 ± 0.20 mm ($(0.138 \pm 0.008$ inch))

(4) 214-0586 Spring

Quantity 4

Length under test force 52.95 mm
((2.085 inch))
Test force 320 ± 31 N ((71.9 $\pm$ 7.0 lb))
Approximate free length after test 62.7 mm
((2.47 inch))
Outside diameter 34.00 mm ((1.339 inch))

Note: Apply clean engine oil to the valve guide bore before installing the valve guides.

(5) Valve guide

Quantity 4
Bore of the installed valve guide
. 9.508 ± 0.013 mm ((0.3743 $\pm$ 0.0005 inch))
Maximum recommended diameter of the valve
guide bore 9.544 mm ((0.3757 inch))

Note: Do not use a combination of a valve and a valve guide that has a difference of 0.13 mm (0.005 inch) or more.

(6) Inlet valve insert

Angle of the valve insert . . . 30.75 ± 0.25 degrees
Diameter of the valve insert
. 45.525 ± 0.013 mm ((1.7923 $\pm$ 0.0005 inch))
Bore in the cylinder head for the valve insert
. 45.461 ± 0.015 mm ((1.7898 $\pm$ 0.0006 inch))

(7) Exhaust valve insert

Angle of the valve insert . . . 44.75 ± 0.25 degrees
Diameter of the valve insert
. 42.390 ± 0.015 mm ((1.6689 $\pm$ 0.0006 inch))
Bore in the cylinder head for the valve insert
. 42.320 ± 0.015 mm ((1.6661 $\pm$ 0.0006 inch))

i04485689

Cylinder Head Valves

SMCS Code: 1105

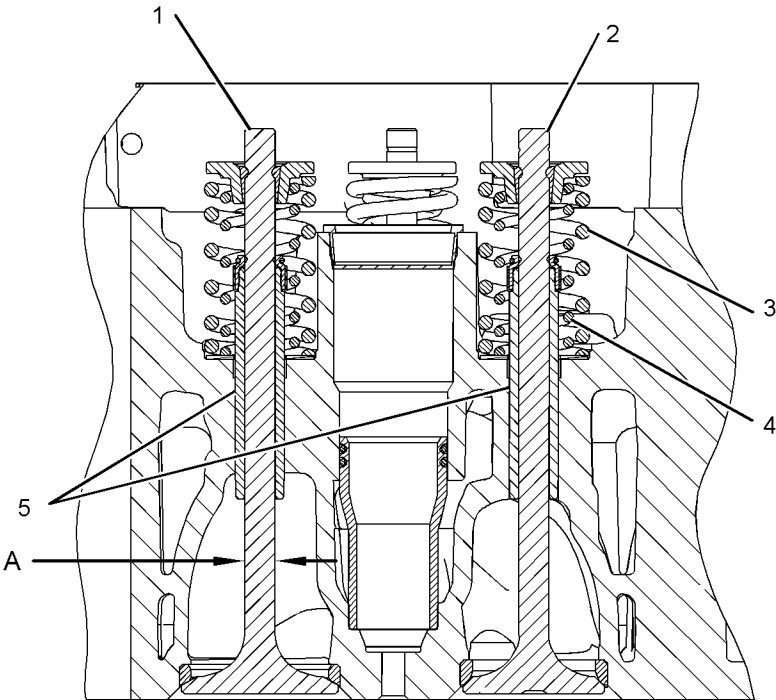


Illustration 57

g02665396

Table 27

Specification for 346 - 0485 Cylinder Head Gp			
Item	Qty	Part	Specification Description
1	12	262 - 2957 Inlet Valve	Before assembly of cylinder head valves, coat the valve guide inside diameter with clean engine oil.
			Diameter of valve head is 41.50 ± 0.13 mm (1.634 ± 0.005 inch).
			Face angle is 29.50 ± 0.25 degrees.
2	12	255 - 8676 Exhaust Valve	Before assembly of cylinder head valves, coat the valve guide inside diameter with clean engine oil.
			Diameter of valve head is 37.50 ± 0.13 mm (1.476 ± 0.005 inch).
			Face angle is 44.25 ± 0.25 degrees.
3	24	349 - 5307 Spring	Length under test force is 47.35 mm (1.864 inch).
			Test force is 465.0 ± 23.3 N (104.5 ± 5.2 lb).
			Approximate free length after test is 77.9 mm (3.07 inch).
4	24	349 - 5303 Spring	Length under test force is 46.15 mm (1.817 inch).

(continued)

(Table 27, contd)

			Test force is 232.5 ± 11.6 N (52.3 ± 2.6 lb).
			Approximate free length after test is 74.60 mm (2.937 inch).
Before assembly of valve guide, coat the cylinder head bore for valve guide with clean engine oil.			
5	24	255 - 8665 Valve Guide	Install the valve guide from the spring side of the cylinder head. Check the inside diameter of the valve guide for distortion after installation into the cylinder head.
			Outside diameter is 13.030 ± 0.008 mm (0.5130 ± 0.0003 inch).
			Inside diameter is 8.072 ± 0.013 mm (0.3178 ± 0.0005 inch).
After assembly of the valve guide into the cylinder head, install the seal onto the top of the valve guide.			
A		-	Diameter of valve stem is 8.000 ± 0.010 mm (0.3150 ± 0.0004 inch).

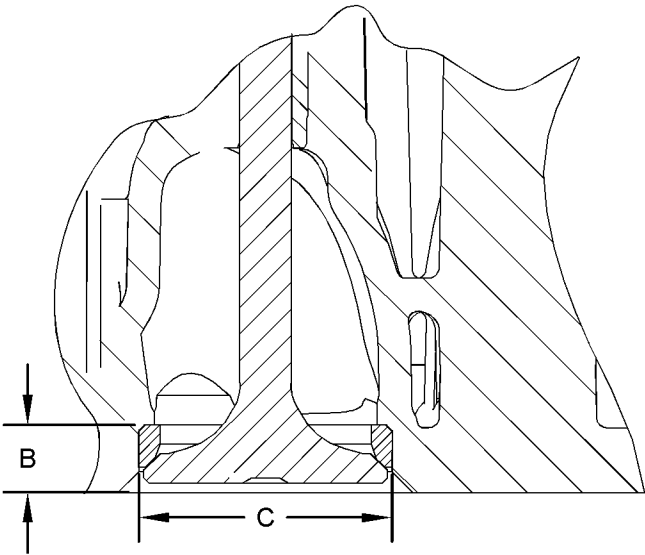


Illustration 58

g02665477

Typical Example

Table 28

Specification for 346 - 0485 Cylinder Head Gp			
Item	Qty	Part	Specification Description
B	-	-	Depth of the bore in the cylinder head for the inlet valve seat insert is 9.30 ± 0.05 mm (0.366 ± 0.002 inch).
			Depth of the bore in the cylinder head for the exhaust valve seat insert is 10.40 ± 0.05 mm (0.409 ± 0.002 inch).
C	24	-	Diameter of the inlet 255 - 8666 Valve Seat Insert is 42.560 ± 0.013 mm (1.6756 ± 0.0005 inch).
			Bore in cylinder head for the inlet valve seat insert is 42.500 ± 0.015 mm (1.6732 ± 0.0006 inch).
			Diameter of the exhaust 262 - 2959 Valve Seat Insert is 39.060 ± 0.013 mm (1.5378 ± 0.0005 inch).
			Bore in cylinder head for the exhaust valve seat insert is 39.000 ± 0.015 mm (1.5354 ± 0.0006 inch).

i05297857

Cylinder Head Valves

SMCS Code: 1105

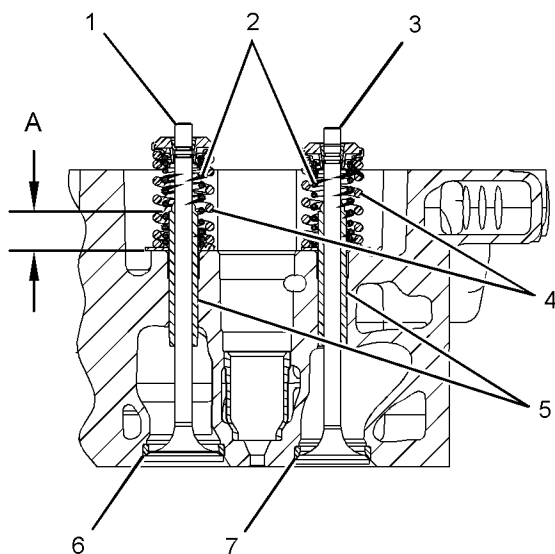


Illustration 59

g01445699

Note: Before installation of valves into the cylinder head, lubricate the inlet valve stem and the exhaust valve stem with clean engine oil.

(A) Height to the step in the valve guide
..... 20.0 ± 0.5 mm ($(0.79 \pm 0.02$ inch))

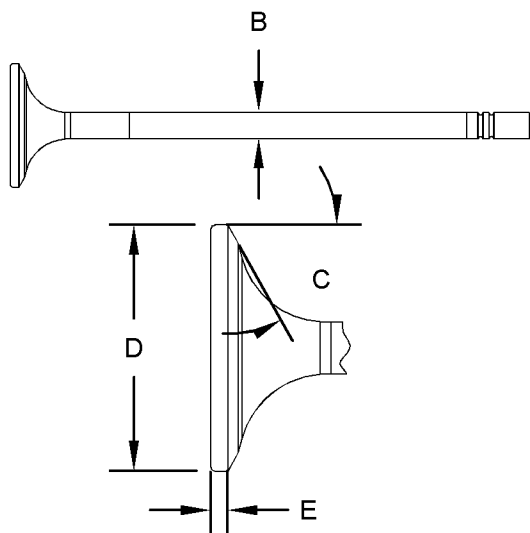


Illustration 60

g01445692

Inlet valve

(1) Inlet valve

(B) Valve stem diameter 9.441 ± 0.008 mm
..... ($(0.3717 \pm 0.0003$ inch))
(C) Valve face angle 60.75 ± 0.25 degrees
(D) Diameter of the valve head
..... 44.50 ± 0.13 mm ($(1.752 \pm 0.005$ inch))
(E) Valve lip thickness 3.50 ± 0.20 mm
..... ($(0.138 \pm 0.008$ inch))

(2) 224-4441 Spring

Length under test force 50.47 mm
..... ($(1.987$ inch))
Test force 160 ± 13 N ($(36.0 \pm 2.9$ lb))
Approximate free length after test 64.1 mm
..... ($(2.52$ inch))
Outside diameter 23.24 mm ($(0.915$ inch))

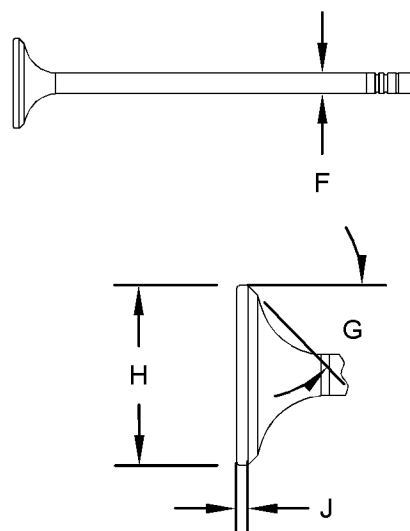


Illustration 61

g01445690

Exhaust valve

(3) Exhaust valve

(F) Valve stem diameter 9.441 ± 0.008 mm
..... ($(0.3717 \pm 0.0003$ inch))
(G) Valve face angle 45.75 ± 0.25 degrees
(H) Diameter of the valve head
..... 41.50 ± 0.13 mm ($(1.634 \pm 0.005$ inch))
(J) Valve lip thickness 3.25 ± 0.10 mm
..... ($(0.128 \pm 0.004$ inch))

(4) 332-2152 Spring

Length under test force 52.95 mm
..... ($(2.085$ inch))
Test force 320 ± 31 N ($(71.9 \pm 7.0$ lb))
Approximate free length after test 62.7 mm
..... ($(2.47$ inch))
Outside diameter 34.0 mm ($(1.34$ inch))

Note: Before installing the valve guides, apply clean engine oil to the valve guide bore.

i06141776

(5) Valve guide

Bore of the installed valve guide
 9.508 ± 0.013 mm ($(0.3743 \pm 0.0005$ inch))
 Maximum recommended diameter of the valve
 guide bore 9.544 mm ($(0.3757$ inch))

Note: Do not use a combination of a valve and a valve guide that has a difference of 0.13 mm (0.005 inch) or more.

(6) Inlet valve insert

Angle of the valve insert . . . 29.75 ± 0.25 degrees
 Diameter of the valve insert
 45.525 ± 0.013 mm ($(1.7923 \pm 0.0005$ inch))
 Bore in the cylinder head for the valve insert
 45.461 ± 0.015 mm ($(1.7898 \pm 0.0006$ inch))

(7) Exhaust valve insert

Angle of the valve insert . . . 44.75 ± 0.25 degrees
 Diameter of the valve insert
 42.390 ± 0.015 mm ($(1.6689 \pm 0.0006$ inch))
 Bore in the cylinder head for the valve insert
 42.320 ± 0.015 mm ($(1.6661 \pm 0.0006$ inch))

Cylinder Head Valves

SMCS Code: 1105

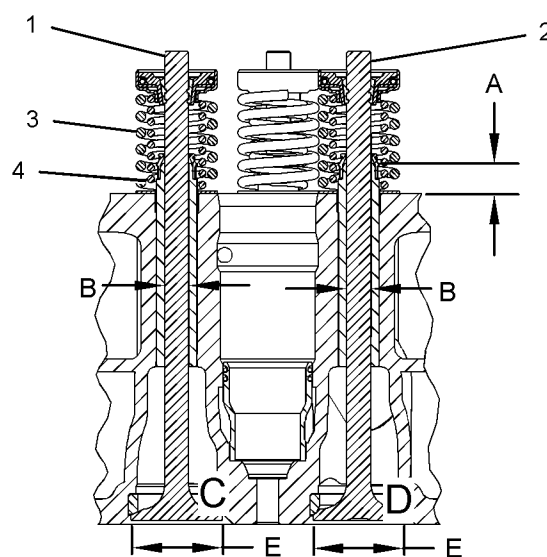


Illustration 62

g01416580

Section view of the cylinder head valves

(1) Inlet valve
 (2) Exhaust valve

Note: Coat the inlet valve stems and the exhaust valve stems with 8T-2998 Lubricant prior to installation into the cylinder head.

(A) Height to the valve guide above the top surface of the cylinder head 12.0 ± 0.5 mm ($(0.47 \pm 0.02$ inch))

(3) 190-6117 Spring

Length under test force 37.70 mm ($(1.484$ inch))
 Test force 350 ± 17 N ($(78.7 \pm 3.8$ lb))
 Approximate free length after test 57.80 mm ($(2.276$ inch))
 Outside diameter 31.79 mm ($(1.252$ inch))

(4) 190-6115 Spring

Length under test force . . . 36.5 mm ($(1.44$ inch))
 Test force 187 ± 8 N ($(42.0 \pm 1.8$ lb))
 Approximate free length after test 57.80 mm ($(2.276$ inch))
 Outside diameter 23.18 mm ($(0.913$ inch))

(B) New valve stem diameter 9.441 ± 0.010 mm ($(0.3717 \pm 0.0004$ inch))

(E) Diameter of valve heads 36.00 ± 0.13 mm
((1.417 ± 0.005 inch))

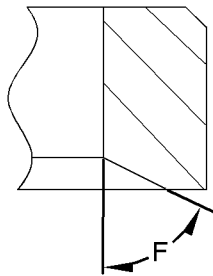


Illustration 63
View of area C

(F) Angle of face of inlet valve seat insert . . . 65.00 ± 0.25 degrees

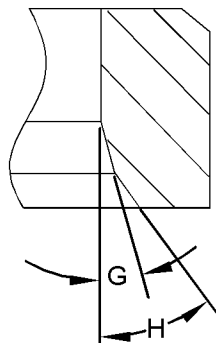


Illustration 64
View of area D

(G) Angle of face of exhaust valve seat insert (first cut) 20 ± 1 degrees

(H) Angle of face of exhaust valve seat insert (second cut) 45.00 ± 0.25 degrees

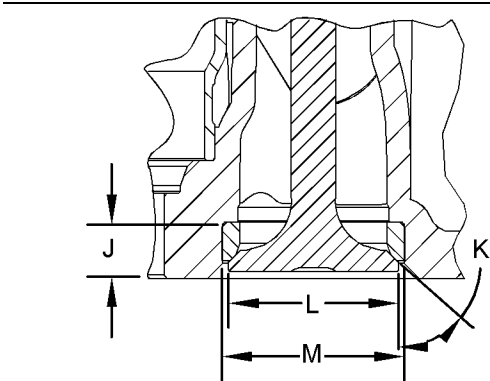


Illustration 65
g01416605

(J) Depth of the bore in the cylinder head for the valve seat insert

Inlet 9.50 ± 0.05 mm ((0.374 ± 0.002 inch))
Exhaust 12.00 ± 0.05 mm
((0.472 ± 0.002 inch))

Note: Shrink the valve seat inserts by reducing the temperature. Shrinking the valve seat inserts allows placement into the counterbore.

(K) Angle of valve face

Inlet valve 60.50 ± 0.25 degrees
Exhaust valve 45.75 ± 0.25 degrees

(L) Bore in cylinder head for valve seat insert

Inlet valve 37.000 ± 0.015 mm
((1.4567 ± 0.0006 inch))
Exhaust valve 37.500 ± 0.015 mm
((1.4764 ± 0.0006 inch))

(M) Outside diameter of the valve seat insert

Inlet valve 37.060 ± 0.013 mm
((1.4591 ± 0.0005 inch))
Exhaust valve 37.560 ± 0.013 mm
((1.4787 ± 0.0005 inch))

i06796921

Cylinder Head Valves

SMCS Code: 1105

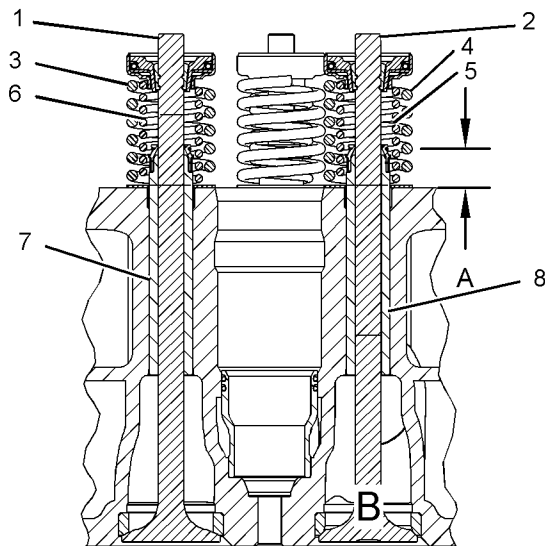


Illustration 66

g01417779

Note: Lubricate the inlet valve stems and the exhaust valve stems with clean engine oil prior to installation into the cylinder head.

(1) Inlet valve

Valve stem diameter 8.000 ± 0.010 mm
 ((0.3150 $\pm$ 0.0004 inch))
 Diameter of valve head 39.00 ± 0.13 mm
 ((1.535 $\pm$ 0.005 inch))
 Angle of valve face 60.25 ± 0.25 degrees

(2) Exhaust valve

Valve stem diameter 9.441 ± 0.010 mm
 ((0.3717 $\pm$ 0.0004 inch))
 Diameter of valve head 36.00 ± 0.13 mm
 ((1.417 $\pm$ 0.005 inch))
 Angle of valve face 45.75 ± 0.25 degrees

(3) 241 - 8385 Spring

Length under test force 44.0 mm ((1.73 inch))
 Test force 305 ± 15 N ((69 $\pm$ 3 lb))
 Approximate free length after test 67.69 mm
 ((2.665 inch))
 Outside diameter 28.56 mm ((1.124 inch))

(4) 190 - 6117 Spring

Length under test force 37.70 mm
 ((1.484 inch))

Test force 350 ± 17 N ((79 $\pm$ 4 lb))
 Approximate free length after test 57.80 mm
 ((2.276 inch))
 Outside diameter 31.79 mm ((1.252 inch))

(5) 190 - 6115 Spring

Length under test force 36.5 mm ((1.44 inch))
 Test force 187 ± 8 N ((42 $\pm$ 2 lb))
 Approximate free length after test 57.80 mm
 ((2.276 inch))
 Outside diameter 23.18 mm ((0.913 inch))

(6) 241 - 8386 Spring

Length under test force 42.8 mm ((1.69 inch))
 Test force 152.5 ± 7.0 N ((34.3 $\pm$ 1.6 lb))
 Approximate free length after test 56.68 mm
 ((2.231 inch))
 Outside diameter 21.33 mm ((0.840 inch))

Note: Lubricate the bores in the cylinder head for the valve guides with clean engine oil prior to installation.

(A) Height of the valve guides above the top of the cylinder head 12.0 ± 0.5 mm ((0.47 $\pm$ 0.02 inch))

(7) Valve guide (inlet)

Outside diameter 13.030 ± 0.008 mm
 ((0.5130 $\pm$ 0.0003 inch))
 Bore in the cylinder head for the valve guide
 13.000 ± 0.013 mm ((0.5118 $\pm$ 0.0005 inch))

(8) Valve guide (exhaust)

Outside diameter 16.000 ± 0.008 mm
 ((0.6299 $\pm$ 0.0003 inch))
 Bore in the cylinder head for the valve guide
 15.970 ± 0.013 mm ((0.6287 $\pm$ 0.0005 inch))

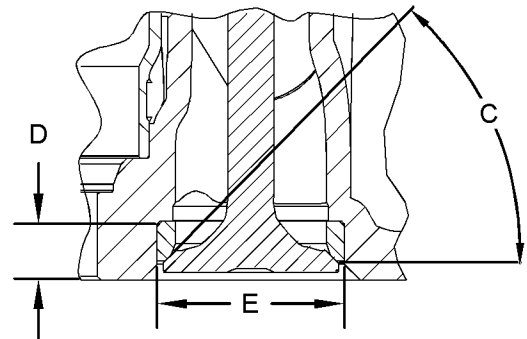


Illustration 67

g01418601

Detail B

Note: Shrink the valve seat inserts by reducing the temperature. Shrinking the valve seat inserts allows placement into the counterbore.

(C) Angle of the face of the valve seat insert

Angle (inlet) 30.25 ± 0.25 degrees
 Angle (exhaust) 45.00 ± 0.25 degrees

(D) Depth of the bore in the cylinder head for the valve seat insert

Depth (inlet) 9.30 ± 0.05 mm
 ((0.366 ± 0.002 inch))
 Depth (exhaust) 10.40 ± 0.05 mm
 ((0.409 ± 0.002 inch))

(E) Outside diameter of the valve seat insert

Diameter (inlet) 40.060 ± 0.013 mm
 ((1.5772 ± 0.0005 inch))
 Bore in the cylinder head for the valve seat insert
 (inlet) 40.000 ± 0.015 mm
 ((1.5748 ± 0.0006 inch))
 Diameter (exhaust) 37.560 ± 0.013 mm
 ((1.4787 ± 0.0005 inch))
 Bore in the cylinder head for the valve seat insert
 (exhaust) 37.500 ± 0.015 mm
 ((1.4764 ± 0.0006 inch))

i06797056

Cylinder Head Valves

SMCS Code: 1105

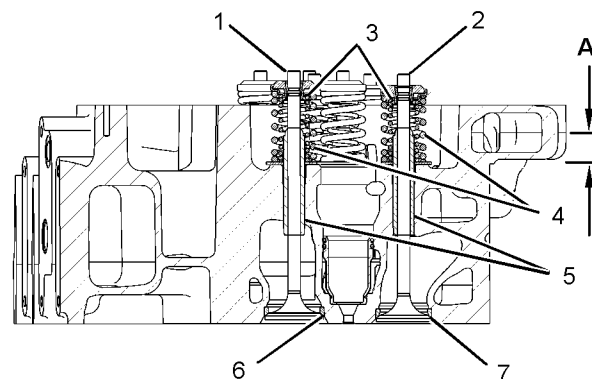


Illustration 68

g01351852

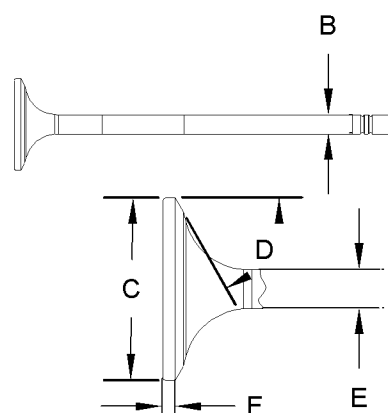


Illustration 69

g02745479

Inlet valve

Note: Apply 8T - 9548 Oil to the valve stems prior to installation in the cylinder head.

(1) Inlet valve

(B) Valve stem diameter 9.441 ± 0.008 mm
 ((0.3717 ± 0.0003 inch))
 (C) Diameter of valve head 44.50 ± 0.13 mm
 ((1.752 ± 0.005 inch))
 (D) Valve face angle 60.75 ± 0.25 degrees
 (E) Minimum valve stem diameter 9.309 mm
 ((0.3665 inch))

(F) Width of the valve head. 3.5 ± 0.2 mm
 ((0.14 ± 0.01 inch))

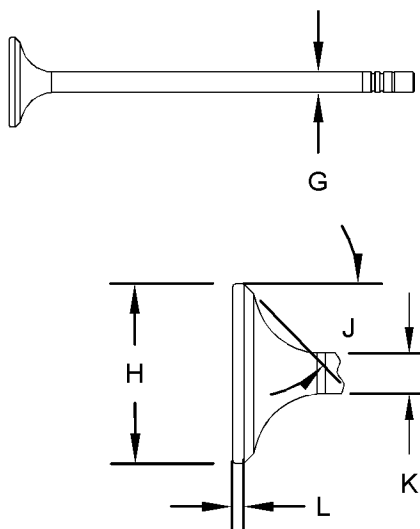


Illustration 70

g02746141

Exhaust valve

(2) Exhaust valve

(G) Valve stem diameter. 9.441 ± 0.008 mm
 ((0.3717 ± 0.0003 inch))
 (H) Diameter of valve head. 41.50 ± 0.13 mm
 ((1.634 ± 0.005 inch))
 (J) Valve face angle. 45.75 ± 0.25 degrees
 (K) Minimum valve stem diameter. 9.309 mm
 ((0.3665 inch))
 (L) Width of the valve head. 3.25 ± 0.10 mm
 ((0.128 ± 0.004 inch))

(3) 224-4441 Spring

Inner valve spring
 Assembled length. 50.47 mm ((1.987 inch))
 Load at assembled length. 160 ± 13 N
 ((36 ± 3 lb))
 Minimum operating length. 34.92 mm
 ((1.375 inch))
 Load at minimum operating length. 385 ± 18 N
 ((87 ± 4 lb))
 Outside diameter. 23.24 mm ((0.915 inch))
 Free length after test. 64.1 mm ((2.52 inch))

(4) 332-2152 Spring

Outer valve spring
 Assembled length. 52.95 mm ((2.085 inch))
 Load at assembled length. 320 ± 31 N
 ((72 ± 7 lb))
 Minimum operating length. 37.40 mm
 ((1.472 inch))

Load at minimum operating length. 860 ± 34 N
 ((193 ± 8 lb))
 Outside diameter. 34 mm ((1.3 inch))
 Free length after test. 62.7 mm ((2.47 inch))

Note: Apply clean 8T-9548 Oil to the valve guide bore before installing the valve guides.

(5) Valve guides

Bore of installed valve guide. 9.508 ± 0.013 mm
 ((0.3743 ± 0.0005 inch))
 Maximum recommended diameter of the valve guide bore. 9.544 mm ((0.3760 inch))
 (A) Height to the step in the valve guide. 22 ± 0.5 mm ((0.87 ± 0.012 inch))

Note: Do not use a combination of a valve and a valve guide that has a difference of 0.13 mm (0.005 inch) or more.

(6) Inlet valve seat

Angle of valve seat. 29.75 ± 0.25 degrees
 Diameter of valve seat. 45.525 ± 0.013 mm
 ((1.7923 ± 0.0005 inch))
 Bore in cylinder head for valve seat. 45.460 ± 0.015 mm ((1.7898 ± 0.0006 inch))

(7) Exhaust valve seat

Angle of valve seat. 44.75 ± 0.25 degrees
 Diameter of valve seat. 42.390 ± 0.015 mm
 ((1.6690 ± 0.0006 inch))
 Bore in cylinder head for valve seat. 42.320 ± 0.015 mm ((1.6661 ± 0.0006 inch))

i07730024

Cylinder Head Valves

SMCS Code: 1105

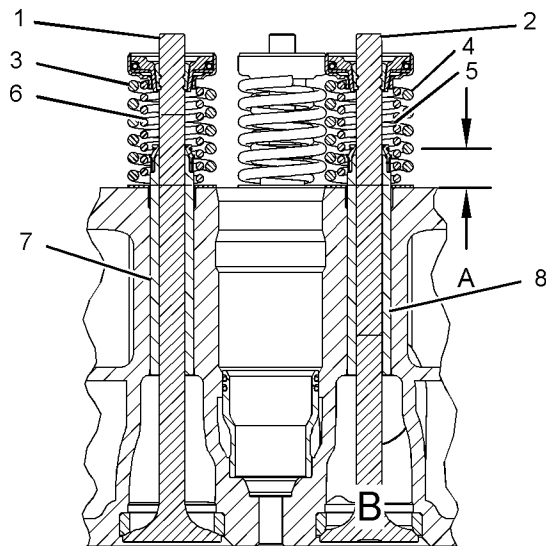


Illustration 71

g01417779

Section view of cylinder head valves

Note: Fully coat the assembled valve guide inner diameter with engine oil prior to valve installation.

(1) Inlet valve

Valve stem diameter 8.000 ± 0.010 mm
 ((0.3150 $\pm$ 0.0004 inch))
 Diameter of valve head 39.00 ± 0.13 mm
 ((1.535 $\pm$ 0.005 inch))

(2) Exhaust valve

Valve stem diameter 9.441 ± 0.010 mm
 ((0.3717 $\pm$ 0.0004 inch))
 Diameter of valve head 36.00 ± 0.13 mm
 ((1.417 $\pm$ 0.005 inch))

(3) 241 - 8385 Spring

Length under test force 44.0 mm ((1.73 inch))
 Test force 305 ± 15 N ((68.6 $\pm$ 3.3 lb))
 Approximate free length after test 67.69 mm
 ((2.665 inch))
 Outside diameter 28.56 mm ((1.124 inch))

(4) 190 - 6117 Spring

Length under test force 37.70 mm
 ((1.484 inch))
 Test force 350 ± 17 N ((78.7 $\pm$ 3.8 lb))

Approximate free length after test 57.80 mm
 ((2.276 inch))
 Outside diameter 31.79 mm ((1.252 inch))

(5) 190 - 6115 Spring

Length under test force 36.5 mm ((1.44 inch))
 Test force 187 ± 8 N ((42.0 $\pm$ 1.8 lb))
 Approximate free length after test 57.80 mm
 ((2.276 inch))
 Outside diameter 23.18 mm ((0.913 inch))

(6) 241 - 8386 Spring

Length under test force 42.8 mm ((1.69 inch))
 Test force 152.5 ± 7.0 N ((34.3 $\pm$ 1.6 lb))
 Approximate free length after test 56.68 mm
 ((2.231 inch))
 Outside diameter 21.33 mm ((0.84 inch))

Note: Lubricate the bores in the cylinder head for the valve guides with clean engine oil prior to installation.

(A) Height of the valve guides above the top of the cylinder head 12.0 ± 0.5 mm ((0.47 $\pm$ 0.02 inch))

(7) Valve guide (inlet)

Outside diameter 13.030 ± 0.008 mm
 ((0.5130 $\pm$ 0.0003 inch))
 Bore in the cylinder head for the valve guide
 13.000 ± 0.013 mm ((0.5118 $\pm$ 0.0005 inch))

(8) Valve guide (exhaust)

Outside diameter 16.000 ± 0.008 mm
 ((0.6299 $\pm$ 0.0003 inch))
 Bore in the cylinder head for the valve guide
 15.970 ± 0.013 mm ((0.6287 $\pm$ 0.0005 inch))

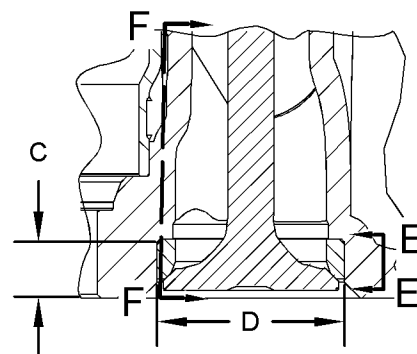


Illustration 72

g02137754

Detail B

Note: Shrink the valve seat inserts by reducing the temperature. Shrinking the valve seat inserts allows placement into the counterbore.

(C) Depth of the bore in the cylinder head for the valve seat insert

Depth (inlet) 9.30 ± 0.05 mm
 ((0.366 ± 0.002 inch))
 Depth (exhaust) 10.40 ± 0.05 mm
 ((0.409 ± 0.002 inch))

(D) Outside diameter of the valve seat insert

Diameter (inlet) 40.060 ± 0.013 mm
 ((1.5772 ± 0.0005 inch))
 Bore in the cylinder head for the valve seat insert
 (inlet) 40.000 ± 0.015 mm
 ((1.5748 ± 0.0006 inch))
 Diameter (exhaust) 37.560 ± 0.013 mm
 ((1.4787 ± 0.0005 inch))
 Bore in the cylinder head for the valve seat insert
 (exhaust) 37.500 ± 0.015 mm
 ((1.4764 ± 0.0006 inch))

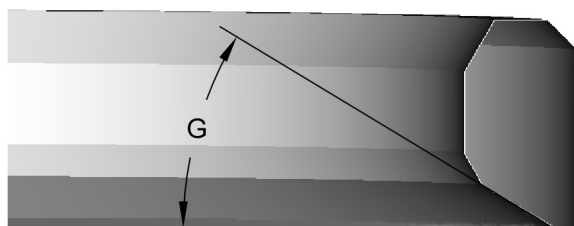


Illustration 73

g02137776

View E-E of Detail B

(G) Angle of the face of the valve seat insert

Angle (inlet) 30.25 ± 0.25 degrees

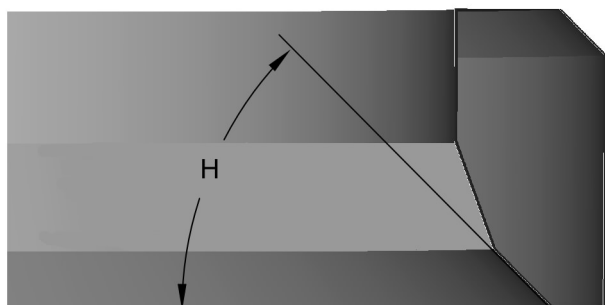


Illustration 74

g02137835

View E-E of Detail B

(H) Angle of the face of the valve seat insert

Angle (exhaust) 45.00 ± 0.25 degrees

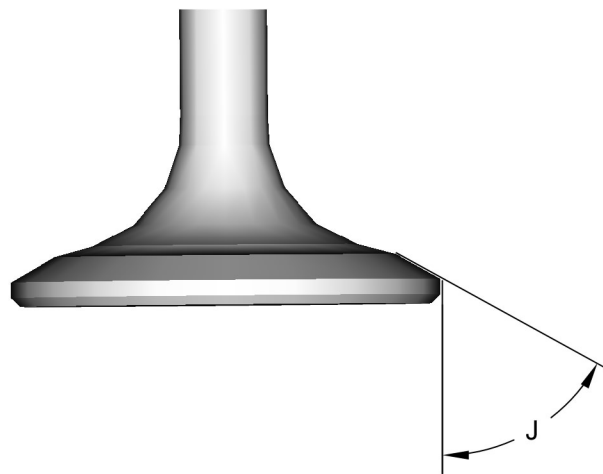


Illustration 75

g02137989

View F-F of Detail B

(J) Angle of the face of the valve

Angle (inlet) 60.5 ± 0.25 degrees

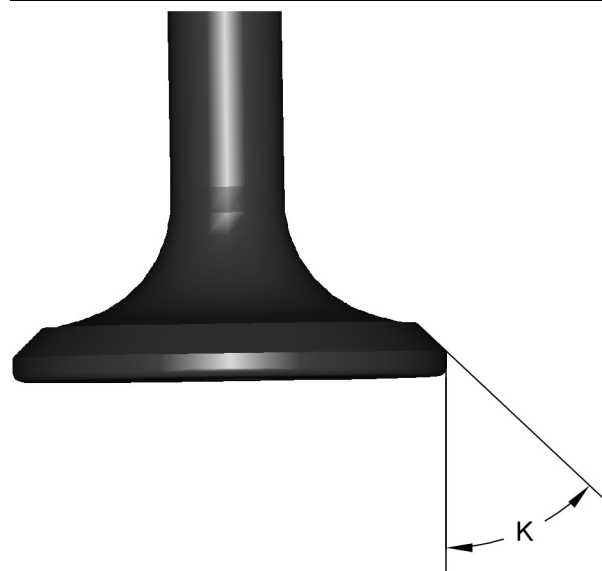


Illustration 76

g02137996

View F-F of Detail B

(K) Angle of the face of the valve

Angle (exhaust) 45.75 ± 0.25 degrees

i07755792

Cylinder Head Valves

SMCS Code: 1105

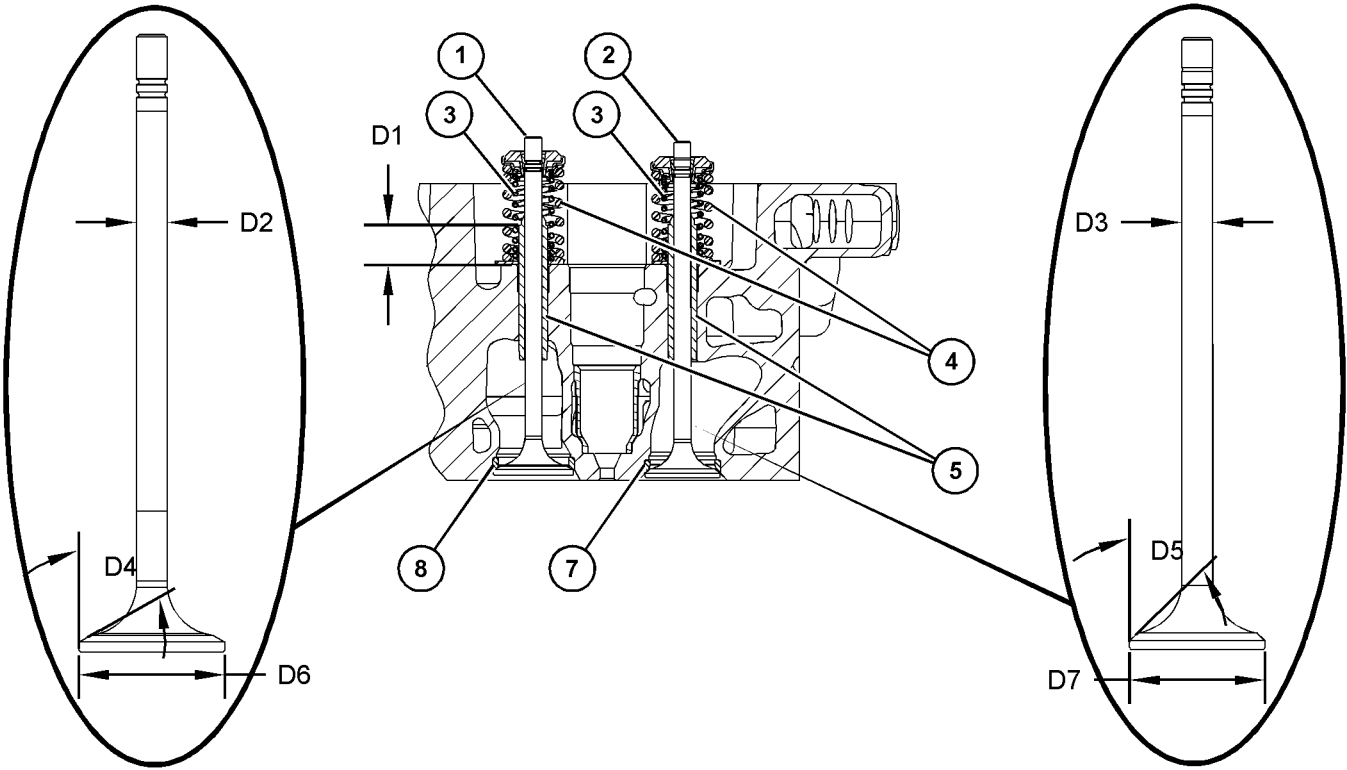


Illustration 77

g06422744

Table 29

Item	Qty	Part	Specification Description
1	12	252 - 7802 Inlet Valve	Apply clean engine oil to the stem prior to installation. Diameter (D2) is 9.441 ± 0.008 mm (0.3717 $\pm$ 0.0003 inch) Face angle (D4) is 60.75 ± 0.25 degrees Valve head diameter (D6) is 44.50 ± 0.13 mm (1.752 $\pm$ 0.005 inch)
2	12	248 - 1467 Exhaust Valve	Apply clean engine oil to the stem prior to installation. Diameter (D3) is 9.441 ± 0.008 mm (0.3717 $\pm$ 0.0003 inch) Face angle (D5) is 45.75 ± 0.25 degrees Valve head diameter (D7) is 41.50 ± 0.13 mm (1.634 $\pm$ 0.005 inch)
3	24	224 - 4441 Spring	Length under test force is 50.47 mm (1.987 inch) Test force is 160 ± 13 N (36 $\pm$ 3 lb) Approximate free length after test is 64.1 mm (2.52 inch)
4	24	332 - 2152 Spring	Length under test force is 52.95 mm (2.085 inch) Test force is 320 ± 31 N (72 $\pm$ 7 lb) Approximate free length after test is 62.7 mm (2.47 inch)
5	24	268 - 2953 Valve Guide	Apply clean engine oil to the bore prior to installation. Bore before assembly is 9.508 ± 0.013 mm (0.3743 $\pm$ 0.0005 inch) Installation height (D1) from the cylinder head surface to the step of the valve guide is 20.0 ± 0.5 mm (0.79 $\pm$ 0.02 inch)

(continued)

(Table 29, contd)

6	12	260 - 4855 Valve Seat Insert	Insert angle is 29.75 ± 0.25 degrees Outer diameter is 45.525 ± 0.013 mm (1.7923 ± 0.0005 inch) Bore in the cylinder head is 45.461 ± 0.015 mm (1.7898 ± 0.0006 inch)
7	12	224 - 1270 Valve Seat Insert	Insert angle is 44.75 ± 0.25 degrees Outer diameter is 42.390 ± 0.015 mm (1.6689 ± 0.0006 inch) Bore in the cylinder head is 42.320 ± 0.015 mm (1.6661 ± 0.0006 inch)

i08063595

Cylinder Head Valves

SMCS Code: 1105

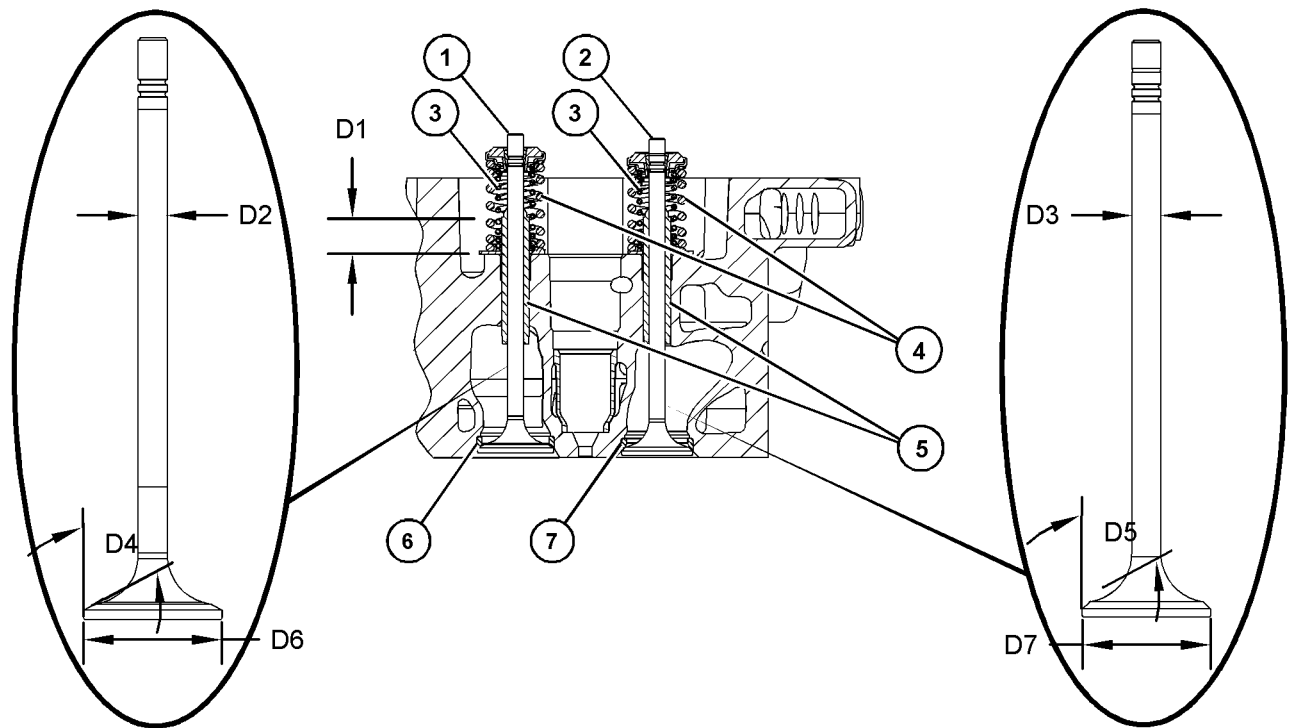


Illustration 78

g06530147

Table 30

Item	Qty	Part	Specification Description
1	12	252 - 7802 Inlet Valve	Apply clean engine oil to the stem prior to installation. Diameter (D2) is 9.441 ± 0.008 mm (0.3717 $\pm$ 0.0003 inch) Face angle (D4) is 60.75 ± 0.25 degrees Valve head diameter (D6) is 44.50 ± 0.13 mm (1.752 $\pm$ 0.005 inch)
2	12	394 - 4400 Exhaust Valve	Apply clean engine oil to the stem prior to installation. Diameter (D3) is 9.441 ± 0.010 mm (0.3717 $\pm$ 0.0004 inch) Face angle (D5) is 45.75 ± 0.25 degrees Valve head diameter (D7) is 41.50 ± 0.13 mm (1.634 $\pm$ 0.005 inch)
3	24	224 - 4441 Spring	Length under test force is 50.47 mm (1.987 inch) Test force is 160 ± 13 N (36 $\pm$ 3 lb) Approximate free length after test is 64.1 mm (2.52 inch)
4	24	332 - 2152 Spring	Length under test force is 52.95 mm (2.085 inch) Test force is 320 ± 31 N (72 $\pm$ 7 lb) Approximate free length after test is 62.7 mm (2.47 inch)
5	24	564 - 8809 Valve Guide	Apply clean engine oil to the bore prior to installation. Bore before assembly is 9.528 ± 0.013 mm (0.3751 $\pm$ 0.0005 inch) Installation height (D1) from the cylinder head surface to the step of the valve guide is 20.0 ± 0.5 mm (0.79 $\pm$ 0.02 inch)

(continued)

(Table 30, contd)

Item	Qty	Part	Specification Description
6	12	592 - 9280 Valve Seat Insert	Insert angle is 29.75 ± 0.25 degrees Outer diameter is 45.525 ± 0.013 mm (1.7923 ± 0.0005 inch) Bore in the cylinder head is 45.46 ± 0.015 mm (1.790 ± 0.0006 inch) Installation depth for valve seat insert is 6.40 ± 0.11 mm (0.251 ± 0.004 inch).
7	12	550 - 2998 Valve Seat Insert	Insert angle is 44.75 ± 0.25 degrees Outer diameter is 42.390 ± 0.013 mm (1.6689 ± 0.0005 inch) Bore in the cylinder head is 42.320 ± 0.015 mm (1.6661 ± 0.0006 inch) Installation depth for valve seat insert is 4.80 ± 0.11 mm (0.188 ± 0.004 inch).

i02843388

Cylinder Head

SMCS Code: 1100

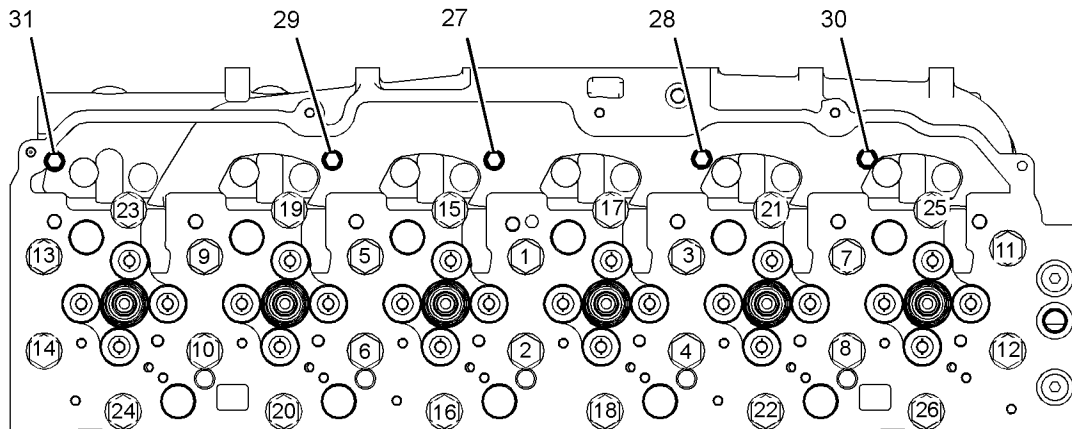


Illustration 79

g01417896

Note: The top face of the gasket and the top face of the cylinder block, cylinder liners and the bottom face of the gasket and the bottom face of the cylinder head must be free of oil, fuel, water and other contaminants before assembly.

Note: Use clean engine oil to lubricate the threads of the cylinder head bolts before assembly.

Use the following procedure to tighten the cylinder head bolts:

1. Torque the bolt (1) through bolt (26) in a numerical sequence to 130 ± 15 N·m (95 ± 11 lb ft).
2. Again torque the bolt (1) through bolt (26) in a numerical sequence to 130 ± 15 N·m (95 ± 11 lb ft).
3. Place a mark on bolt (1) through bolt (26). Rotate the bolt (1) through bolt (26) in the clockwise direction in a numerical sequence to 90 degrees ($1/4$ turn).
4. Loosen the bolt (1) through bolt (26) in a numerical sequence to 0 N·m (0 lb ft).
5. Repeat Step 1 through Step 3.
6. Torque the bolt (27) through bolt (31) in a numerical sequence to 28 ± 7 N·m (21 ± 5 lb ft).

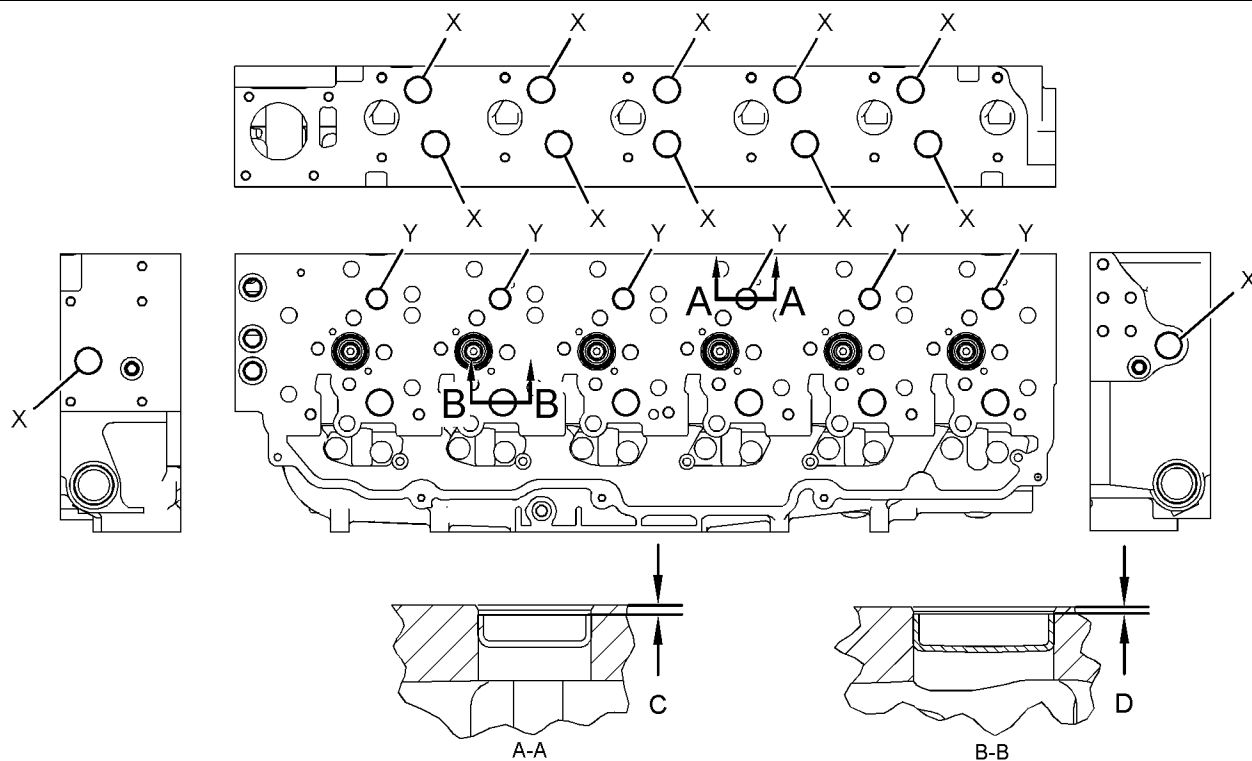


Illustration 80

g01417900

Note: Apply 6V-6640 Sealant to the bore of the cup plugs before assembly.

(C) The cup plugs (Y) are measured from the head face to the top edge of the plug. Depth of installation
 $2.0 \pm 0.5 \text{ mm}$ ($(0.08 \pm 0.02 \text{ inch})$)

(D) The cup plugs (X) are measured from the head face to the top edge of the plug. Depth of installation
 $1.5 \pm 0.5 \text{ mm}$ ($(0.06 \pm 0.02 \text{ inch})$)

(E) Height of new cylinder head . . $130.00 \pm 0.15 \text{ mm}$
 ($(5.118 \pm 0.006 \text{ inch})$)

Note: The flatness of the cylinder head should be within 0.15 mm (0.006 inch). The flatness should also be a maximum of 0.05 mm (0.002 inch) for any 150.00 mm (5.906 inch) span.

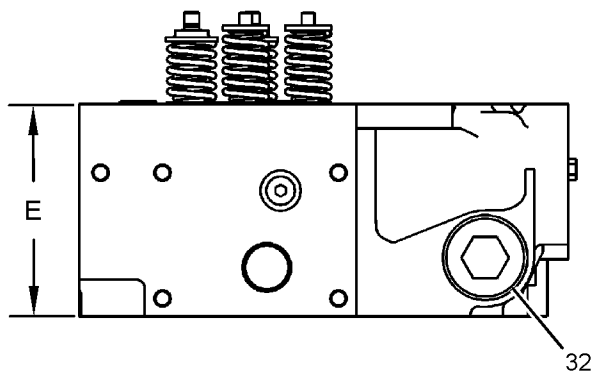


Illustration 81

g01417914

(32) Torque for the plugs $350 \pm 30 \text{ N}\cdot\text{m}$
 ($(260 \pm 22 \text{ lb ft})$)

i06059660

Cylinder Head

SMCS Code: 1100

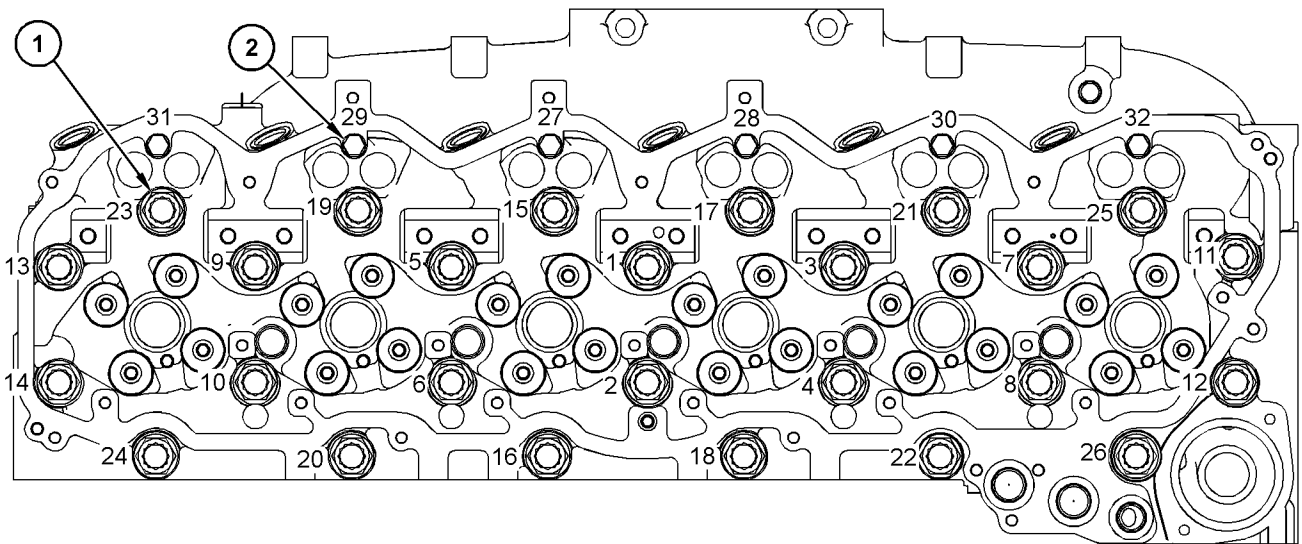


Illustration 82

g03330706

Bolt tightening sequence

Note: Examine bolts (1) for wear or for damage. Refer to Reuse And Salvage Guidelines, SEBF8301, "Inspection and Reuse of Critical Fasteners Used in All Engines". Replace with new bolts (1), if necessary.

Table 31

Specification for 346-0485 Cylinder Head Gp			
Item	Qty	Part	Specification Description
1	26	290-6884 Cylinder Head Fastener Gp	Use the following procedure in order to tighten the cylinder head bolts: Refer to the Illustration 82 for cylinder head bolt tightening sequence. Lightly lubricate the threads of the bolts with clean engine oil before assembly. 1. Tighten bolt 1 through bolt 26 in a numerical sequence to 160 ± 15 N·m (118 ± 11 lb ft). 2. Again, tighten bolt 1 through bolt 26 in a numerical sequence to 160 ± 15 N·m (118 ± 11 lb ft). 3. Place a mark on bolt 1 through bolt 26. Tighten bolt 1 through bolt 26 in a numerical sequence to an angle of 90 degrees (1/4 turn). 4. Loosen bolt 1 through bolt 26 until the washers are loose under the bolt heads.
2	6	9X-6000 Bolt	5. Tighten bolt 1 through bolt 26 in a numerical sequence to 160 ± 15 N·m (118 ± 11 lb ft). 6. Again, tighten bolt 1 through bolt 26 in a numerical sequence to 160 ± 15 N·m (118 ± 11 lb ft). 7. Place a mark on bolt 1 through bolt 26. Tighten bolt 1 through bolt 26 in a numerical sequence to an angle of 90 degrees (1/4 turn). 8. Tighten bolt 27 through bolt 32 in a numerical sequence to 28 ± 7 N·m (21 ± 5 lb ft).
-	-	-	Height of the new cylinder head is 163.00 ± 0.15 mm (6.417 ± 0.006 inch).

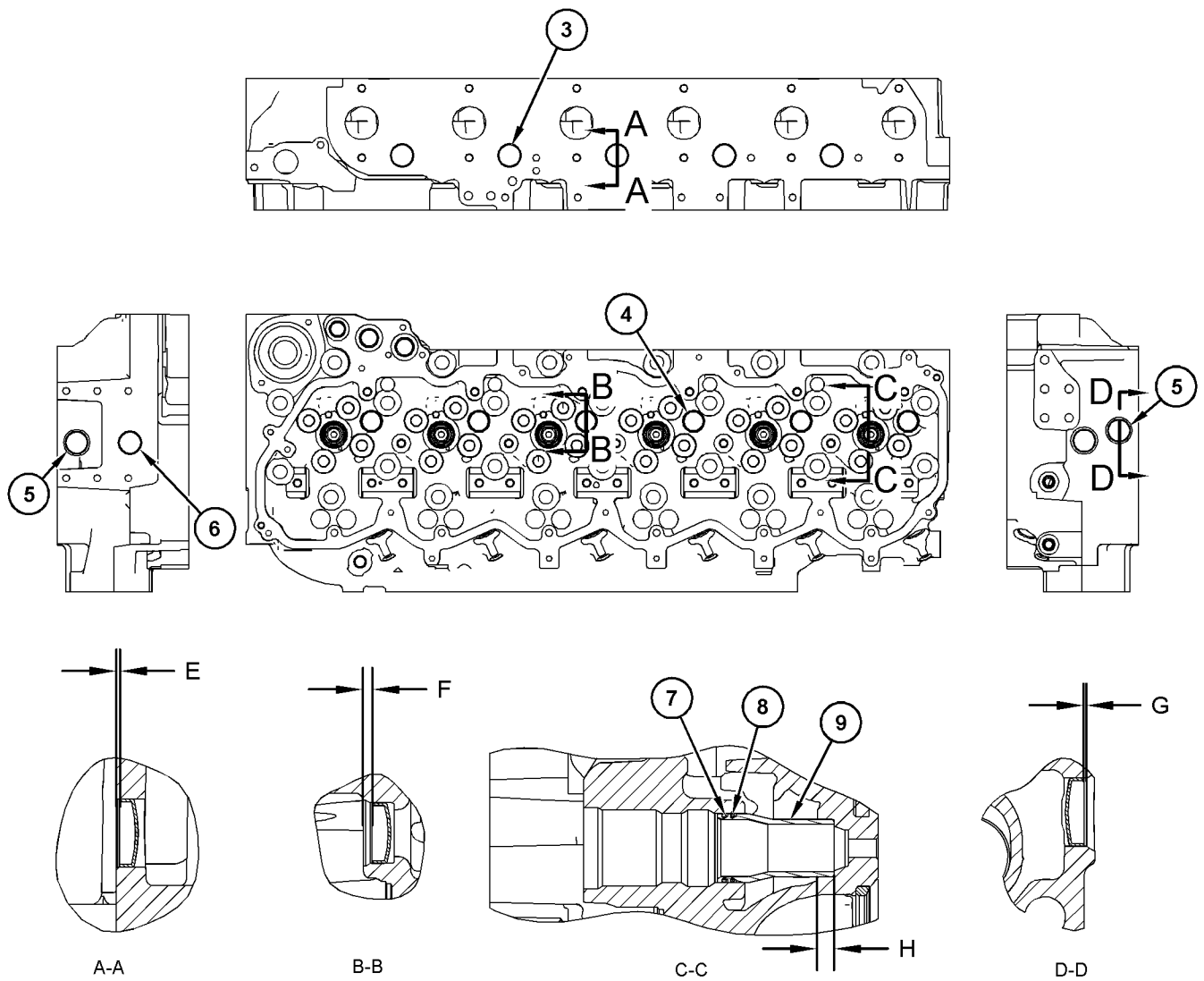


Illustration 83 g03330707

Table 32

Item	Qty	Part	Specification Description
3	5	8M - 5860 Cup Plug	Before installation, apply Loctite 11358 to the bores for the cup plugs.
4	6	3B - 0623 Cup Plug	Before installation, apply Loctite 11358 to the bores for the cup plugs.
5	3	8M - 5860 Cup Plug	Before installation, apply Loctite 11358 to the bores for the cup plugs.
6	1	8M - 5860 Cup Plug	Before installation, apply Loctite 11358 to the bores for the cup plugs.
7	6	310 - 7258 O-Ring Seal	Before assembly, apply clean engine oil to the bores.
8	6	310 - 7259 O-Ring Seal	Before assembly, apply clean engine oil to the bores.
9	6	325 - 6575 Injector Sleeve	Before assembly, apply green Loctite 620 on the outside surface of the injector sleeve to a distance (H).

(continued)

Specifications Section

(Table 32, contd)

E	-	-	Installation depth for cup plug (3) is 1.25 ± 0.25 mm (0.049 ± 0.010 inch).
F	-	-	Installation depth for cup plug (4) is 3.75 ± 0.50 mm (0.148 ± 0.020 inch).
G	-	-	Installation depth for cup plug (5) is 1.00 ± 0.50 mm (0.039 ± 0.020 inch).

i06238250

Cylinder Head

SMCS Code: 1100

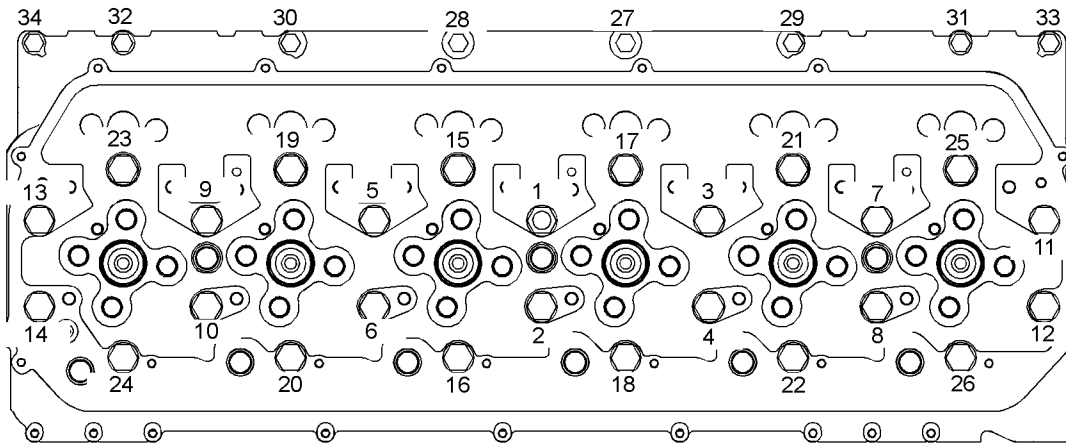


Illustration 84

g01451338

Top view of cylinder head

Note: The top surface of the cylinder block for the gasket, the cylinder liners, and the bottom surface of the cylinder head for the gasket must be free of oil, fuel, water, and other contaminants before assembly.

Note: Before assembly, lubricate the threads of the bolts and both sides of the washers with Loctite #51084 Graphite-50 Anti-Seize Lubricant.

Use the following procedure in order to tighten the cylinder head bolts:

1. Tighten bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft).
2. Again tighten the bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft).
3. Place a mark on bolt 1 through bolt 26. Rotate bolt 1 through bolt 26 in a numerical sequence to an additional 120 ± 5 degrees ($1/3$ turn).
4. Loosen bolt 1 through bolt 26 to 0 N·m (0 lb ft).
5. Tighten bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft).
6. Again tighten the bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft).
7. Place a mark on bolt 1 through bolt 26. Rotate bolt 1 through bolt 26 in a numerical sequence to an additional 120 ± 5 degrees ($1/3$ turn).
8. Tighten bolt 27 through bolt 34 in a numerical sequence to 55 ± 10 N·m (41 ± 7 lb ft).

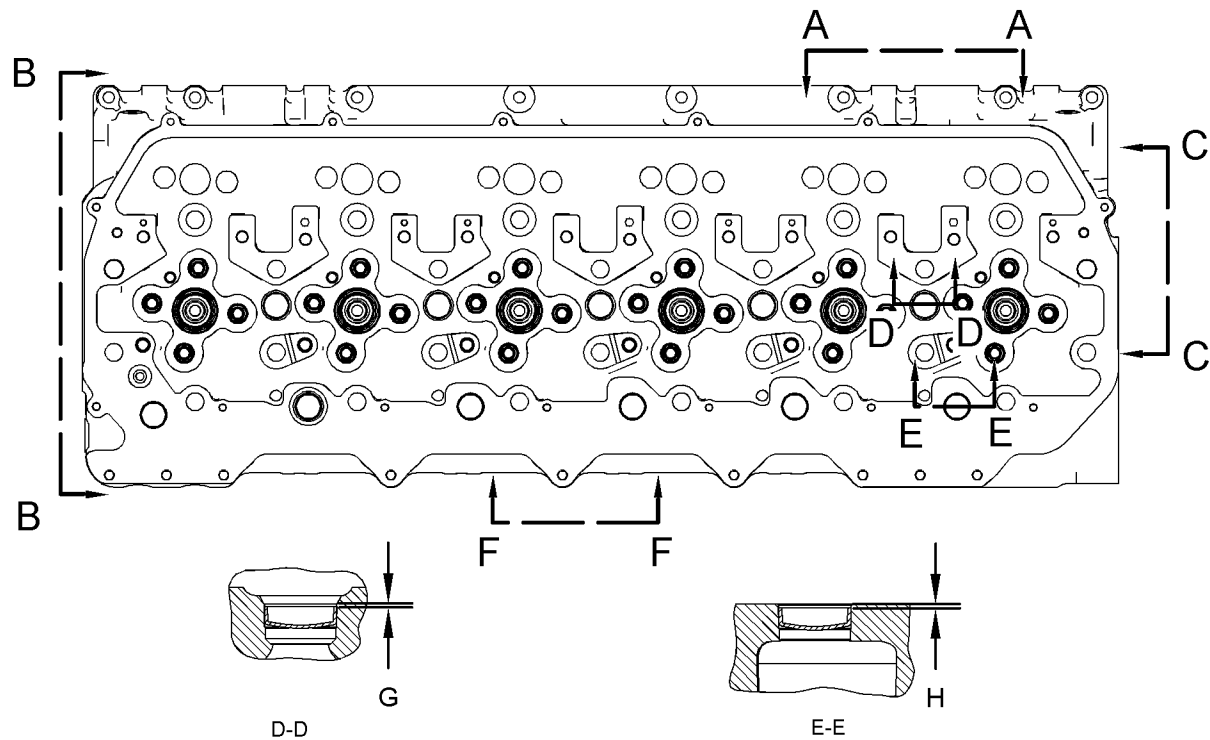


Illustration 85

g01446056

Top view of cylinder head

(D-D) five cup plugs

(E-E) six cup plugs

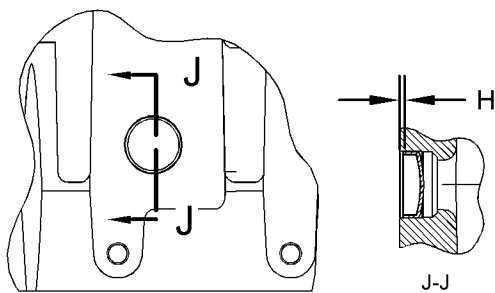


Illustration 86

g01451339

View A-A

(J-J) one cup plug

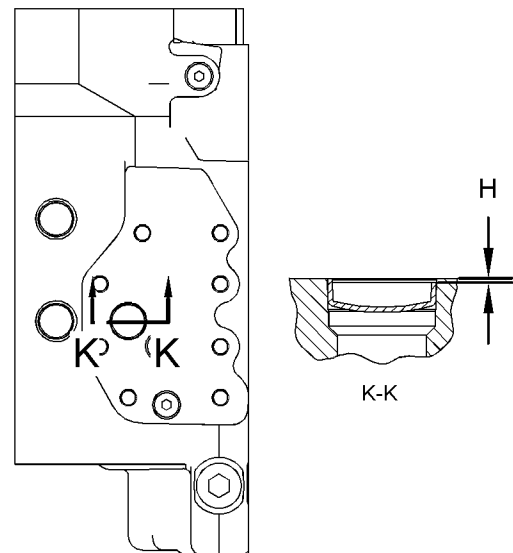
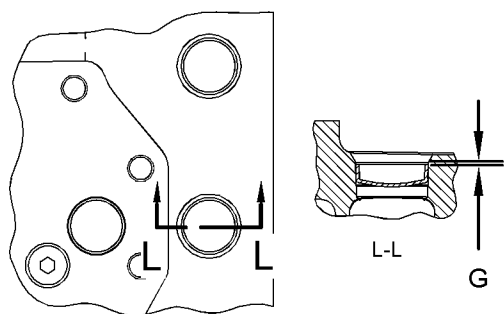


Illustration 87

g01451344

View B-B

(K-K) two cup plugs



Note: The flatness of the surface of the cylinder head that mates to the cylinder block should be within 0.15 mm (0.006 inch). The flatness should also be a maximum of 0.05 mm (0.002 inch) for any 150.00 mm (5.905 inch) span.

Illustration 88

g01451346

View C-C

(L-L) four cup plugs

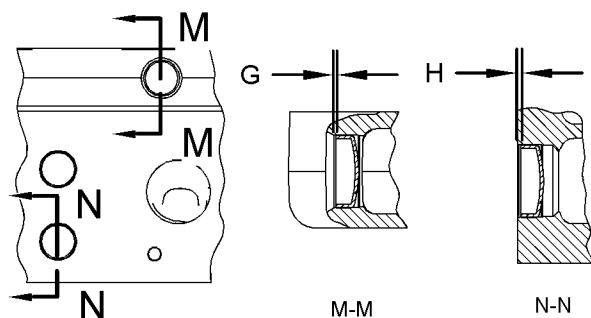


Illustration 89

g01451351

View F-F

(M-M) five cup plugs

(N-N) 12 cup plugs

Note: Apply Loctite Adhesive/Sealant, Cup/Core Plug # 54041 to the bores for the cup plugs prior to the installation of the cup plugs.

(G) Installation depth of the 14 cup plugs from the cylinder head surface 0.75 ± 0.25 mm
((0.030 $\pm$ 0.010 inch))

(H) Installation depth of the 21 cup plugs from the cylinder head surface 1.25 ± 0.25 mm
((0.049 $\pm$ 0.010 inch))

Maximum permissible thickness of cylinder head 165 mm ((6.496 inch))

Minimum permissible thickness of cylinder head 164.50 mm ((6.476 inch))

i06803367

Cylinder Head

SMCS Code: 1100

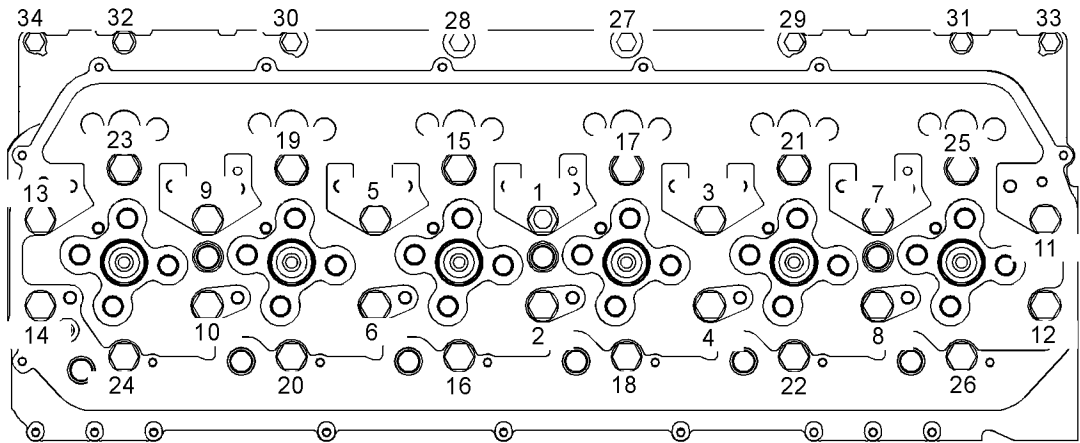


Illustration 90

g02557638

Typical example
Top view of cylinder head

Table 33

Specification for 331 - 2478 Cylinder Head Gp and 302 - 2202 Cylinder Head Gp			
Item	Qty	Part	Specification Description
-	26	242 - 1811 Bolt	Before assembly, lubricate the threads of the bolts and both sides of the washers with 4C - 5593 Thread Lubricant. Use the following procedure to tighten the bolts: 1. Torque bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft) as shown in Illustration 90 . 2. Torque again bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft) as shown in Illustration 90 . 3. Turn bolt 1 through bolt 26 in a numerical sequence to an extra 120 ± 5 degrees as shown in Illustration 90 . 4. Loosen bolt 1 through bolt 26 to 0 N·m (0 lb ft). 5. Torque bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft) as shown in Illustration 90 . 6. Torque again bolt 1 through bolt 26 in a numerical sequence to 170 ± 10 N·m (125 ± 7 lb ft) as shown in Illustration 90 . 7. Turn bolt 1 through bolt 26 in a numerical sequence to an extra 120 ± 5 degrees as shown in Illustration 90 . 8. Torque bolt 27 through 34 in a numerical sequence to 55 ± 10 N·m (41 ± 7 lb ft) as shown in Illustration 90 .
-	8	210 - 4460 Bolt	
Top gasket face of cylinder block, cylinder liners, and bottom gasket face of cylinder head must be free of oil, fuel, water, and other contaminants before assembly.			

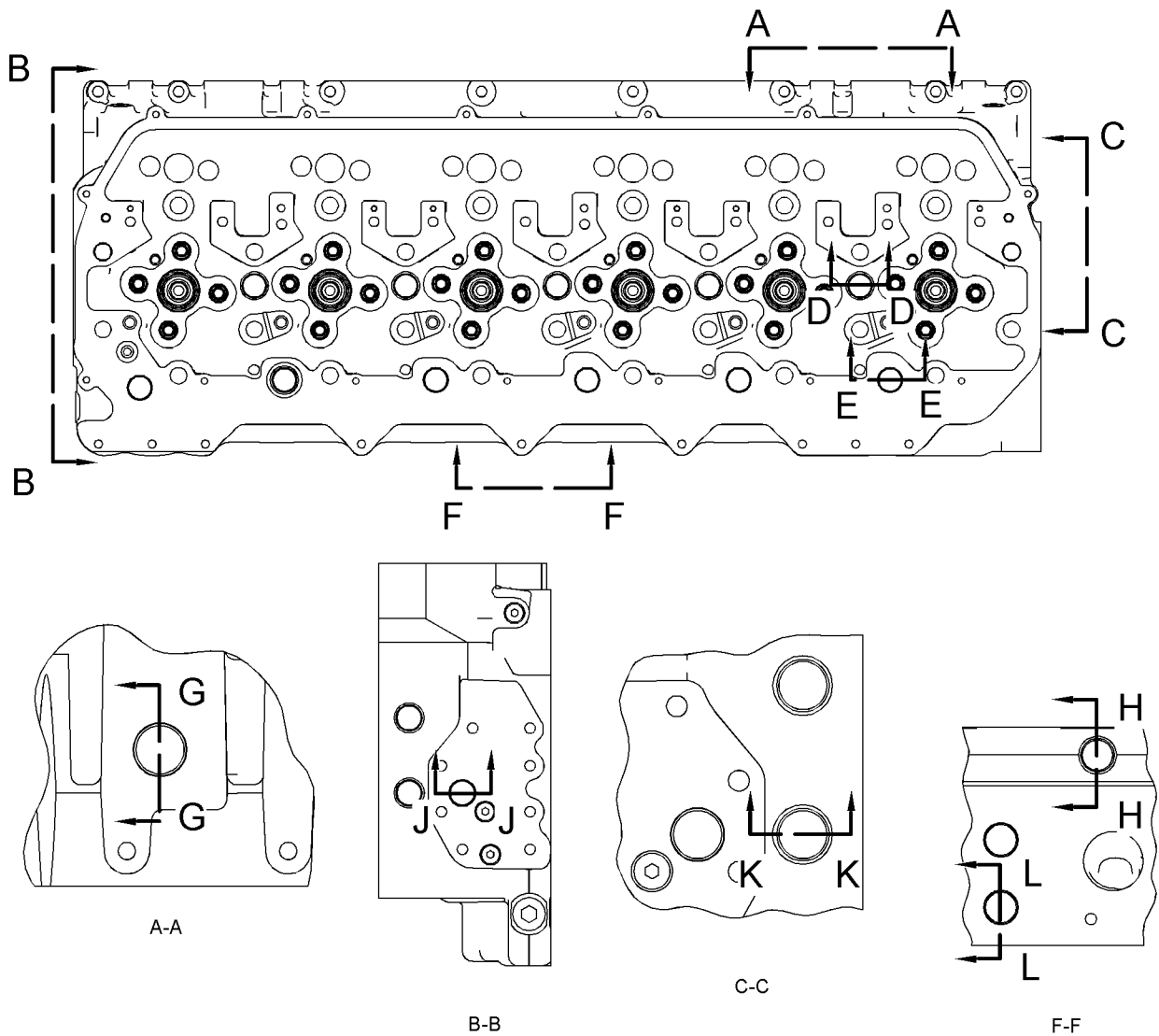


Illustration 91
Top view of cylinder head

g02558076

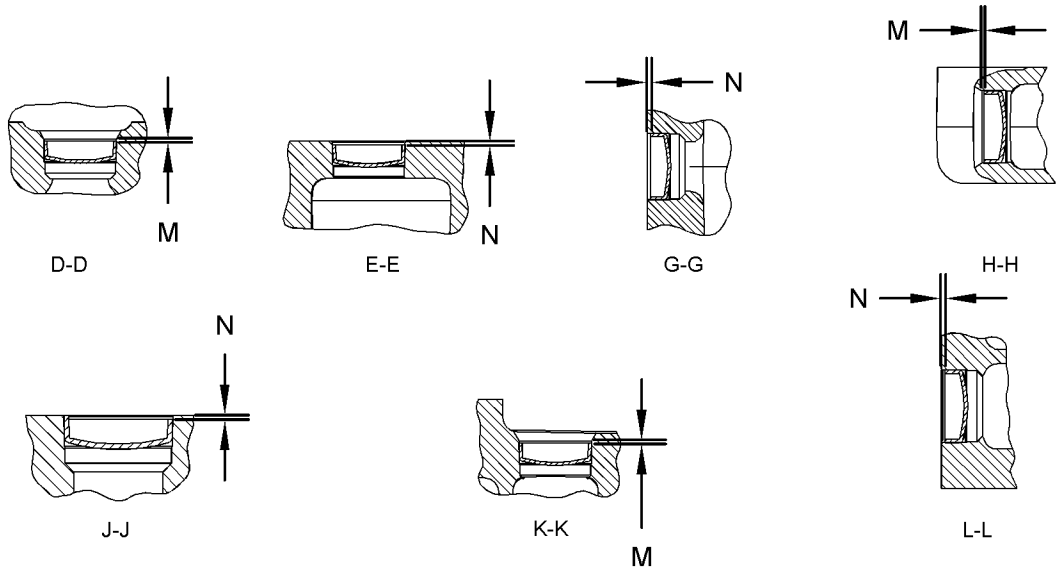


Illustration 92 g02558157

Table 34

Item	Qty	Part	Specification Description
-	35	3B-0623 Cup Plug	Installation depth (M) is 1.5 ± 0.5 mm (0.06 ± 0.02 inch).
			Installation depth (N) is 3.0 ± 1.0 mm (0.12 ± 0.04 inch).
Apply Loctite 11358 to the bores for the cup plugs prior to the installation.			

i02456547

i03019112

Turbocharger

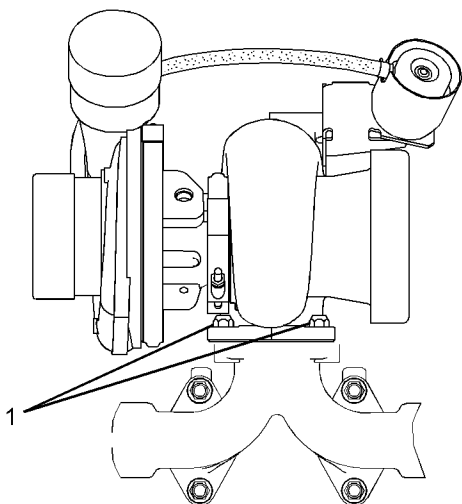
SMCS Code: 1052

Illustration 93

g01225956

(1) Apply 4C-5598 High Temperature Anti-Seize to the threads of the locknuts (1).

(1) Tighten the 4 locknuts that are on the turbocharger outlet. Tighten the locknuts to the following torque. $54 \pm 5 \text{ N}\cdot\text{m}$ ($(40 \pm 4 \text{ lb ft})$)

Turbocharger

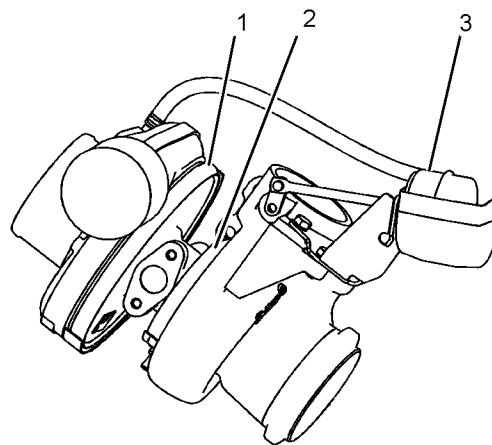
SMCS Code: 1052

Illustration 94

g01457326

(1) Torque for the clamp assembly . . . $13.5 \pm 1.0 \text{ N}\cdot\text{m}$
($(120 \pm 9 \text{ lb in})$)

(2) Use the following procedure to tighten the clamp assembly:

1. Torque the clamp assembly to $18.1 \text{ N}\cdot\text{m}$ (160 lb in).
2. Loosen the clamp assembly to $5.6 \text{ N}\cdot\text{m}$ (50 lb in).
3. Torque the clamp assembly again to $13.5 \pm 1.0 \text{ N}\cdot\text{m}$ ($(120 \pm 9 \text{ lb in})$).

(3) Opening pressure of the wastegate at 0.50 mm (0.020 inch) lift 145 kPa ((21 psi))

i03019117

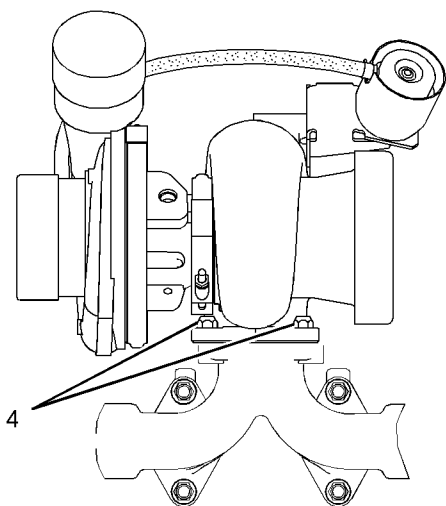


Illustration 95

g01419984

Note: Apply 4C-5599 Anti-Seize Compound to the locknuts (4) that are used to mount the turbocharger.

(4) Torque for four locknuts $54 \pm 5 \text{ N}\cdot\text{m}$
 (($40 \pm 4 \text{ lb ft}$))

Turbocharger

SMCS Code: 1052

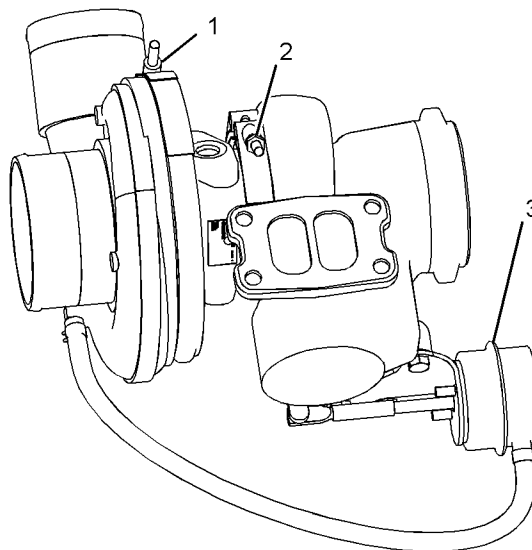


Illustration 96

g01321642

(1) Torque for the clamp assembly . . . $13.5 \pm 1.0 \text{ N}\cdot\text{m}$
 (($120 \pm 9 \text{ lb in}$))

(2) Use the following procedure to tighten the clamp assembly:

1. Torque the clamp assembly to $18.1 \text{ N}\cdot\text{m}$ (160 lb in).
2. Loosen the clamp assembly to $5.6 \text{ N}\cdot\text{m}$ (50 lb in).
3. Torque the clamp assembly again to $13.5 \pm 1.0 \text{ N}\cdot\text{m}$ ($120 \pm 9 \text{ lb in}$).

(3) Opening pressure of the wastegate at 1.00 mm (0.039 inch) lift 170 kPa ((25 psi))

i03019120

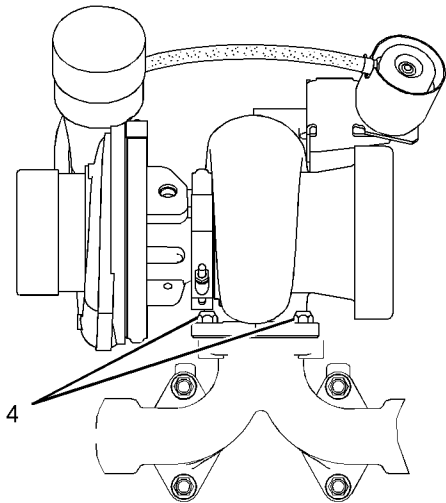


Illustration 97 g01419984

Note: Apply 4C-5599 Anti-Seize Compound to the locknuts (4) that are used to mount the turbocharger.

(4) Torque for the locknuts $54 \pm 5 \text{ N}\cdot\text{m}$
(($40 \pm 4 \text{ lb ft}$))

Turbocharger

SMCS Code: 1052

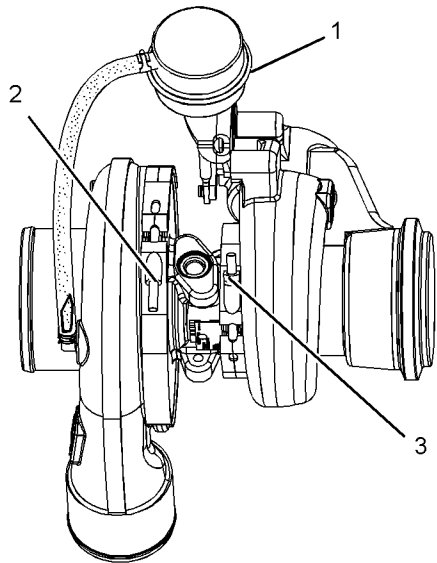


Illustration 98 g01418991

- (1) Opening pressure of the wastegate at 1.00 mm (0.039 inch) lift 157 kPa ((23 psi))
- (2) Torque for the V-band clamp assembly $10.17 \pm 0.70 \text{ N}\cdot\text{m}$ (($90 \pm 6 \text{ lb in}$))
- (3) Torque for the clamp assembly $14 \pm 1 \text{ N}\cdot\text{m}$ (($125 \pm 9 \text{ lb in}$))

i03019121

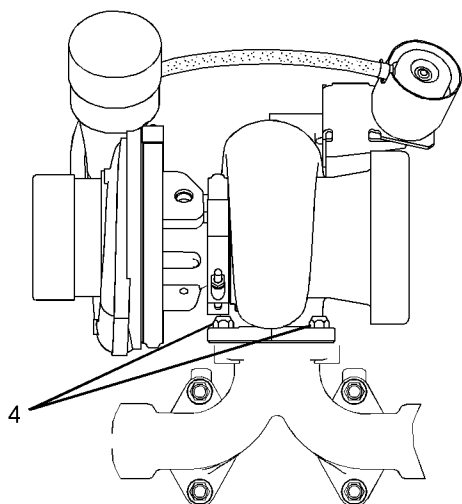


Illustration 99

g01418996

Note: Before assembly, apply 4C-5599 Anti-Seize Compound to the locknuts that are used to mount the turbocharger.

(3) Torque for the locknuts $54 \pm 5 \text{ N}\cdot\text{m}$
 (($40 \pm 4 \text{ lb ft}$))

Turbocharger

SMCS Code: 1052

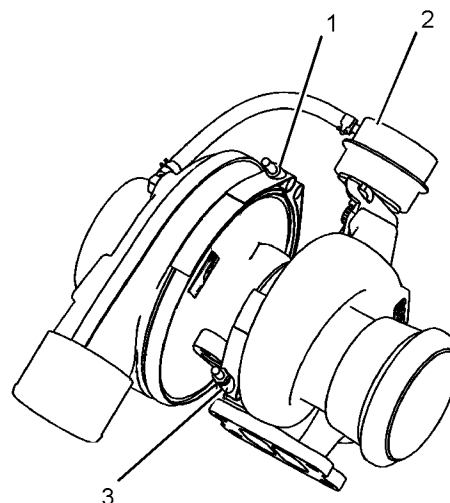


Illustration 100

g01457343

(1) Torque for the clamp assembly . . . $13.5 \pm 1.0 \text{ N}\cdot\text{m}$
 (($120 \pm 9 \text{ lb in}$))

(2) Opening pressure of the wastegate at 0.50 mm
 (0.020 inch) lift 130 kPa ((19 psi))

(3) Use the following procedure to tighten the clamp assembly:

1. Torque the clamp assembly to $18.1 \text{ N}\cdot\text{m}$
 (160 lb in).

2. Loosen the clamp assembly to $5.6 \text{ N}\cdot\text{m}$ (50 lb in).

3. Torque the clamp assembly again to
 $13.5 \pm 1.0 \text{ N}\cdot\text{m}$ ($120 \pm 9 \text{ lb in}$).

i03019122

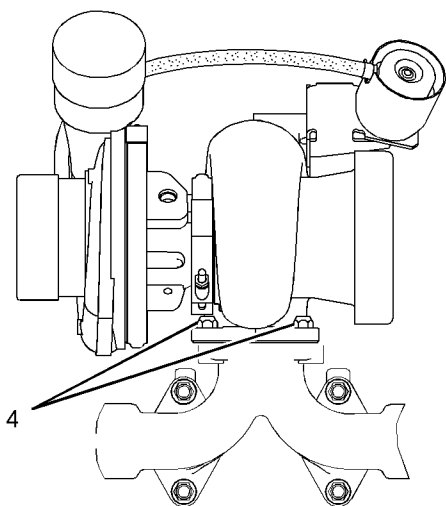


Illustration 101

g01419984

Note: Apply 4C-5599 Anti-Seize Compound to the locknuts (4) that are used to mount the turbocharger.

(4) Torque for four locknuts $54 \pm 5 \text{ N}\cdot\text{m}$
(($40 \pm 4 \text{ lb ft}$))

Turbocharger

SMCS Code: 1052

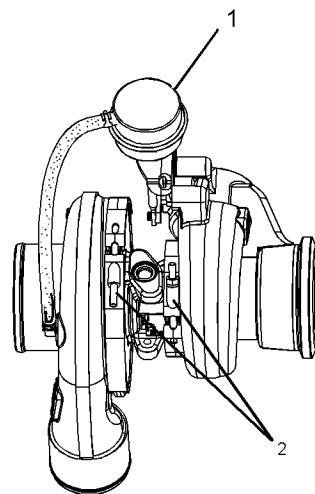


Illustration 102

g01526779

(1) Opening pressure of the wastegate at 0.50 mm (0.020 inch) lift 96.5 kPa ((14 psi))

(2) Use the following procedure to tighten the clamp assemblies of the turbocharger:

1. Tighten the two clamp assemblies to $10.2 \pm 1.1 \text{ N}\cdot\text{m}$ ($90 \pm 10 \text{ lb in}$).
2. Lightly tap both of the clamp assemblies with a hammer.
3. Again, tighten the two clamp assemblies to $10.2 \pm 1.1 \text{ N}\cdot\text{m}$ ($90 \pm 10 \text{ lb in}$).

i03563140

i03916090

Turbocharger

SMCS Code: 1052

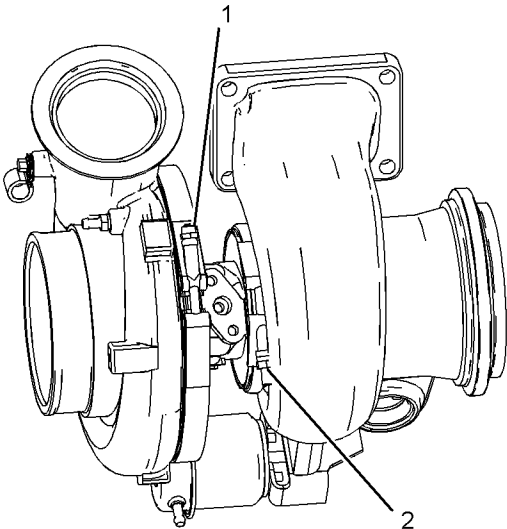


Illustration 103 g01424863

Typical example

(1) Torque for the compressor clamp assembly
..... $13.5 \pm 1 \text{ N}\cdot\text{m}$ (($119.5 \pm 8.9 \text{ lb in}$))

Use the following procedure to tighten the turbine
clamp assembly (2) :

1. Tighten the turbine clamp assembly to $18.1 \text{ N}\cdot\text{m}$
(160.2 lb in).
2. Loosen the turbine clamp assembly to $5.6 \text{ N}\cdot\text{m}$
(49.6 lb in).
3. Again, tighten the turbine clamp assembly to
 $13.5 \pm 1 \text{ N}\cdot\text{m}$ ($119.5 \pm 8.9 \text{ lb in}$).

Wastegate setting $151.7 \pm 3.4 \text{ kPa}$
(($22.0 \pm 0.5 \text{ psi}$))

Turbocharger

SMCS Code: 1052

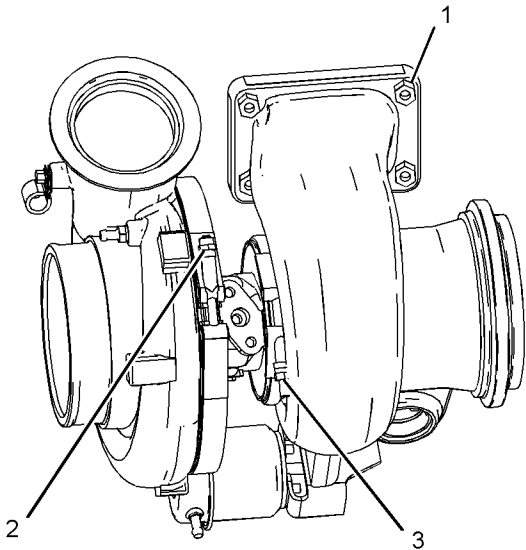


Illustration 104 g02151139

Typical example

Note: Before assembly, lubricate the threads and the
bearing surface of the locknuts with 4C-5599 Anti-
Seize Compound.

- (1) Torque for locknuts $55 \pm 5 \text{ N}\cdot\text{m}$ (($41 \pm 4 \text{ lb ft}$))
- (2) Torque for the compressor clamp assembly
..... $13.6 \pm 1.2 \text{ N}\cdot\text{m}$ (($120.4 \pm 10.6 \text{ lb in}$))

Use the following procedure to tighten the turbine
clamp assembly (3) :

1. Tighten the turbine clamp assembly to $18.1 \text{ N}\cdot\text{m}$
(160.2 lb in).
2. Loosen the turbine clamp assembly to $5.6 \text{ N}\cdot\text{m}$
(49.6 lb in).
3. Again, tighten the turbine clamp assembly to
 $13.6 \pm 1.2 \text{ N}\cdot\text{m}$ ($120.4 \pm 10.6 \text{ lb in}$).

Wastegate setting $165.5 \pm 3.4 \text{ kPa}$
(($24.0 \pm 0.5 \text{ psi}$))

i03918731

i03920895

Turbocharger

SMCS Code: 1052

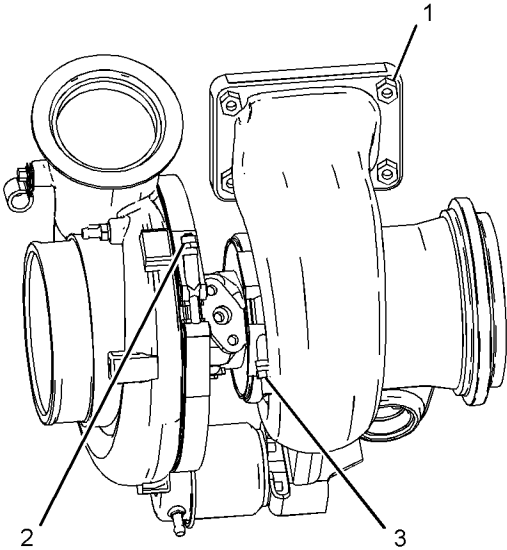


Illustration 105 g02151159

Typical example

Note: Before assembly, lubricate the threads and the bearing surface of the locknuts with 4C-5599 Anti-Seize Compound.

- (1) Torque for locknuts 55 ± 5 N·m ((41 ± 4 lb ft))
- (2) Torque for the compressor clamp assembly
..... 13.6 ± 1.2 N·m ((120.4 ± 10.6 lb in))

Use the following procedure to tighten the turbine clamp assembly (3) :

1. Tighten the turbine clamp assembly to 18.1 N·m (160.2 lb in).
2. Loosen the turbine clamp assembly to 5.6 N·m (49.6 lb in).
3. Again, tighten the turbine clamp assembly to 13.6 ± 1.2 N·m (120.4 ± 10.6 lb in).

Wastegate setting 158.6 ± 3.4 kPa ((23.0 ± 0.5 psi))

Turbocharger

SMCS Code: 1052

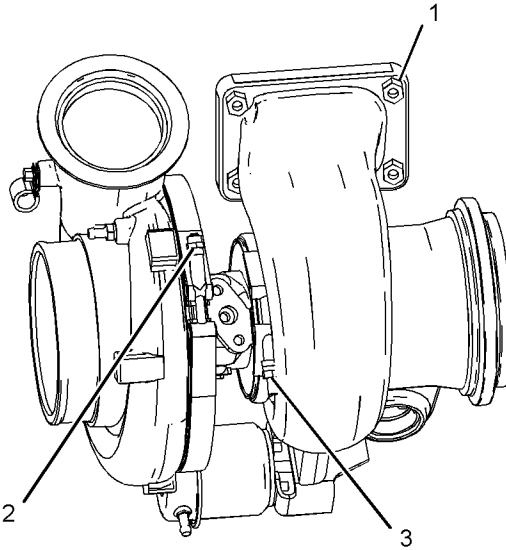


Illustration 106 g02151465

Typical example

Note: Before assembly, lubricate the threads and the bearing surface of the locknuts with 4C-5599 Anti-Seize Compound.

- (1) Torque for locknuts 55 ± 5 N·m ((41 ± 4 lb ft))
- (2) Torque for the compressor clamp assembly
..... 13.6 ± 1.2 N·m ((120.4 ± 10.6 lb in))

Use the following procedure to tighten the turbine clamp assembly (3) :

1. Tighten the turbine clamp assembly to 18.1 N·m (160.2 lb in).
2. Loosen the turbine clamp assembly to 5.6 N·m (49.6 lb in).
3. Again, tighten the turbine clamp assembly to 13.6 ± 1.2 N·m (120.4 ± 10.6 lb in).

Wastegate setting 125.5 ± 3.4 kPa ((18.2 ± 0.5 psi))

i04045631

Turbocharger

SMCS Code: 1052

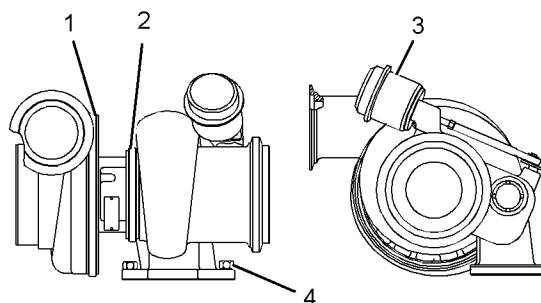


Illustration 107

g01417405

(1) Torque for the clamp assembly $14 \pm 1 \text{ N}\cdot\text{m}$
(($10 \pm 1 \text{ lb ft}$))

(2) Torque for the V-band clamp assembly
. $10.17 \pm 0.70 \text{ N}\cdot\text{m}$ (($90 \pm 6 \text{ lb in}$))

(3) Opening pressure of the wastegate at 1.00 mm
(0.039 inch) lift 152 kPa ((22 psi))

Note: Apply 4C-5599 Anti-Seize Compound to the locknuts.

(4) Torque for the locknuts $54 \pm 5 \text{ N}\cdot\text{m}$
(($40 \pm 4 \text{ lb ft}$))

i05579349

Turbocharger

SMCS Code: 1052

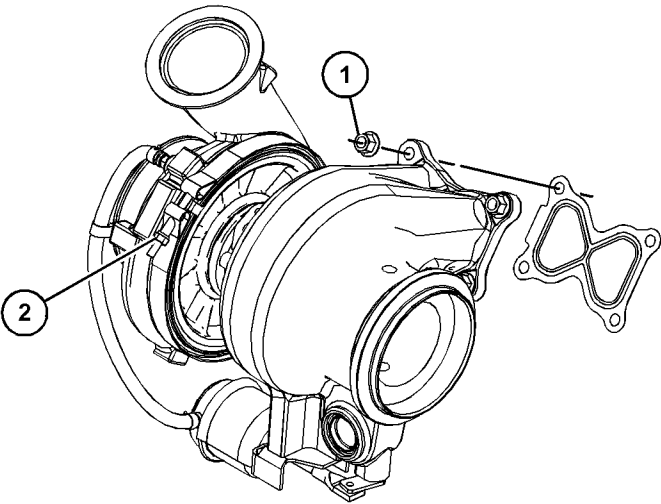


Illustration 108

g03538816

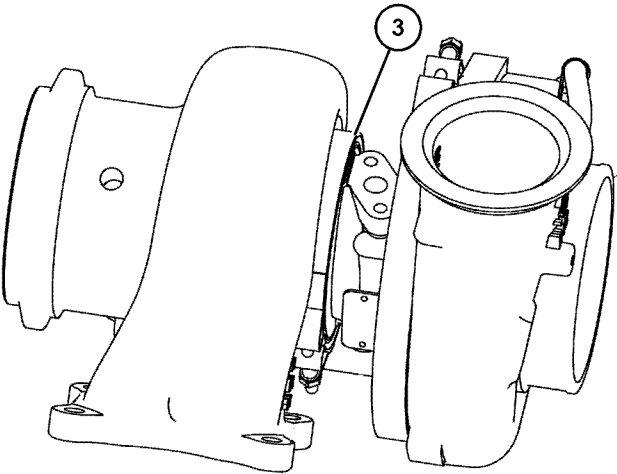


Illustration 109

g03538838

378 - 7689 Turbocharger Gp

Table 35

Specification for 378 - 7691 Turbocharger Gp			
Item	Qty	Part	Specification Description

(continued)

Specifications Section

(Table 35, contd)

1	4	375 - 2467 Flange Locknut	Before assembly, apply Loctite C5A copper anti-size to the threads.
			Torque to $70 \pm 5 \text{ N}\cdot\text{m}$ ($52 \pm 4 \text{ lb ft}$).
2	1	239 - 5858 Compressor Clamp Assembly	3. Torque to $13.6 \pm 1.2 \text{ N}\cdot\text{m}$ ($120.4 \pm 10.6 \text{ lb in}$).
3	1	1W - 9311 Turbine Clamp As	Use the following procedure to tighten the turbine clamp assembly: 1. Torque to $18.1 \text{ N}\cdot\text{m}$ (160.2 lb in). 2. Loosen to 1 to 2 turns. 3. Again, torque to $13.6 \pm 1.2 \text{ N}\cdot\text{m}$ ($120.4 \pm 10.6 \text{ lb in}$).

i05583491

Turbocharger

SMCS Code: 1052

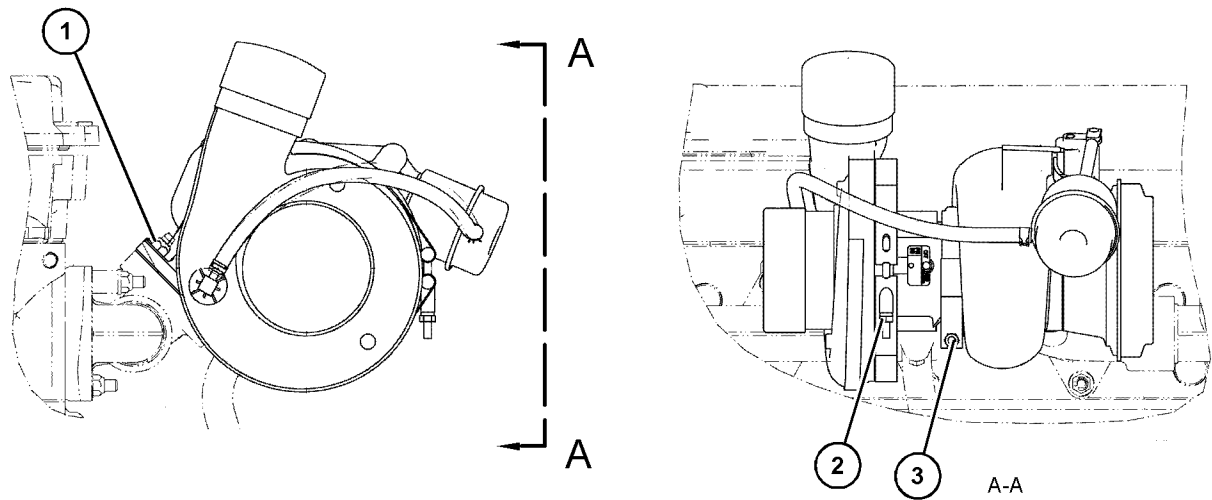


Illustration 110 g03542497

Table 36

Specification for 397 - 8596 Turbocharger Gp			
Item	Qty	Part	Specification Description
1	4	9X - 6620 Locknut	Before assembly, apply Loctite C5A copper anti-size to the threads.
			Torque to 70 ± 5 N·m (52 ± 4 lb ft).
2	1	-	Tighten the compressor clamp to 13.5 ± 1.0 N·m (119.5 ± 8.9 lb in).
3	1	-	Use the following procedure to tighten the turbine clamp assembly: 1. Tighten to 13.5 ± 1.0 N·m (119.5 ± 8.9 lb in).. 2. Loosen to 1 to 2 turns . 3. Again, tighten to 13.5 ± 1.0 N·m (119.5 ± 8.9 lb in)..

i06798713

Turbocharger

SMCS Code: 1052

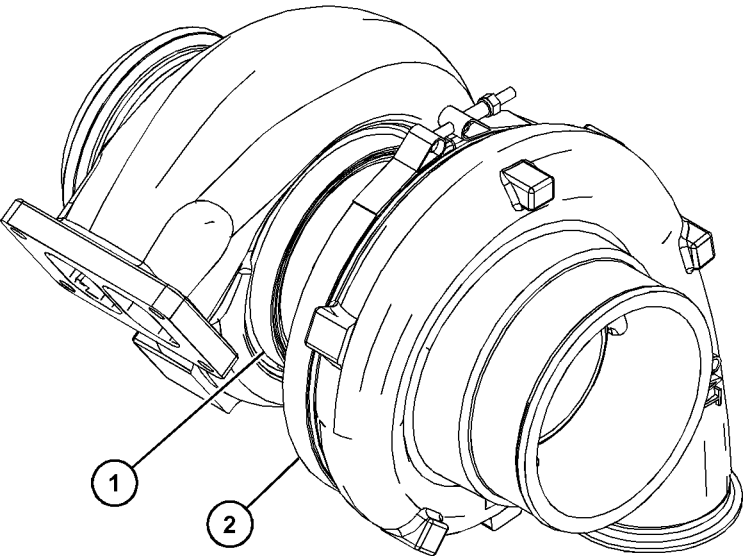


Illustration 111

g06119361

Table 37

Specification for 291 -2127 Turbocharger Gp			
Item	Qty	Part	Specification Description
1	1	9N -2038 Turbine Clamp As	Use the following procedure to tighten the turbine clamp assembly: 1. Torque to 18.1 N·m (160.2 lb in). 2. Loosen to 5.6 N·m (49.6 lb in). 3. Again, torque to 13.5 ± 1.0 N·m (119.5 ± 8.9 lb in).
2	1	268 -2960 Clamp As	Torque to 13.5 ± 1.0 N·m (119.5 ± 8.9 lb in).

i07257571

Turbocharger

SMCS Code: 1052

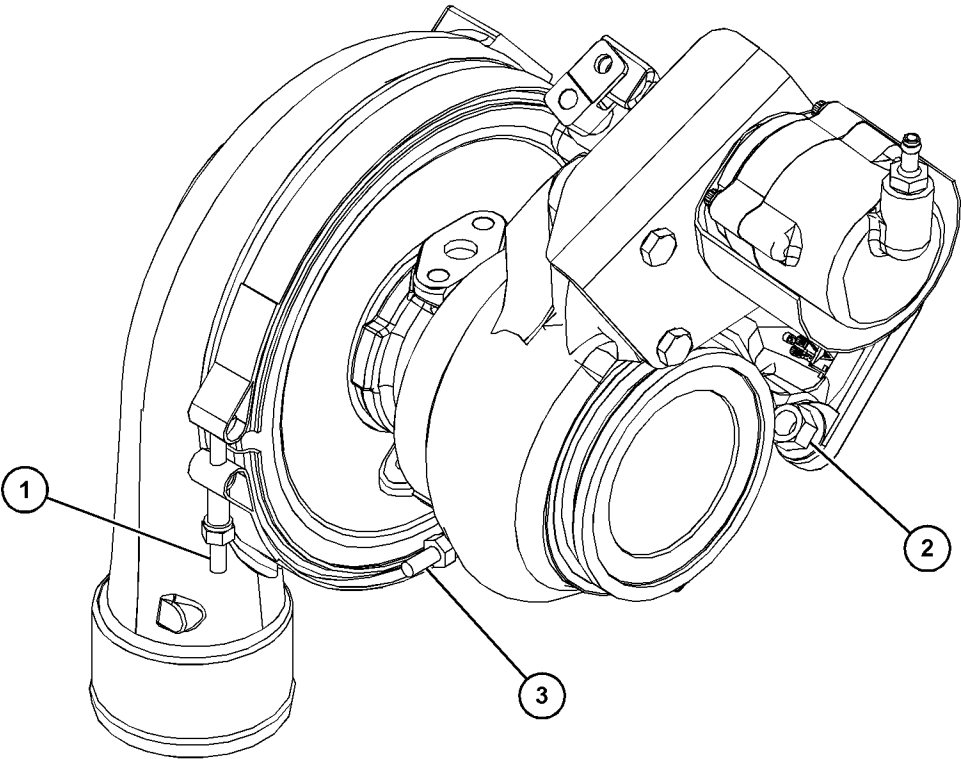


Illustration 112
Typical example

g03532197

Table 38

Item	Qty	Part	Specification Description
1	1	239-5858 Compressor Clamp Assembly	Torque to 13.6 ± 1.2 N·m (120.4 ± 10.6 lb in).
2	4	9X-6620 Locknut	Before assembly, lubricate the threads and bearing surfaces with Loctite C5A copper anti-seize. Torque to 55 ± 5 N.m (41 ± 4 lb ft).
3	1	1W-9311 Turbine Clamp As	Use the following procedure to tighten the turbine clamp assembly: (1.) Tighten the band clamp to 18.0 ± 1.6 N·m (159.3 ± 14.2 lb in). (2.) Loosen the band clamp by one to two turns. (3.) Again, tighten the band clamp to 13.6 ± 1.2 N·m (120.4 ± 10.6 lb in).

i04040776

i04343411

Air Cleaner

SMCS Code: 1051; 1054

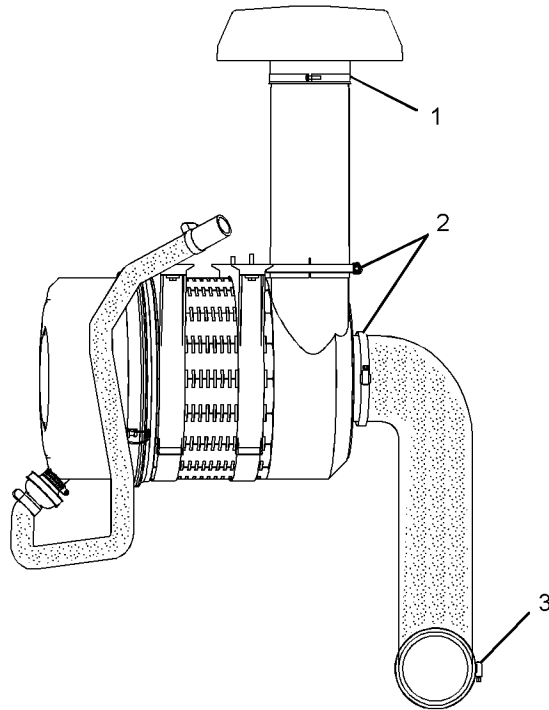


Illustration 113

g02247433

Front view

(1) Use the following torque to tighten the clamp:

Torque for the clamp when mounted on steel
..... 5 N·m ((44 lb in))

Torque for the clamp when mounted on plastic
..... 3 N·m ((27 lb in))

(2) Torque for the hose clamps 6 ± 1 N·m
((53 ± 9 lb in))

(3) Torque for the band clamp 11 ± 1 N·m
((97 ± 9 lb in))

Air Cleaner

SMCS Code: 1051; 1054

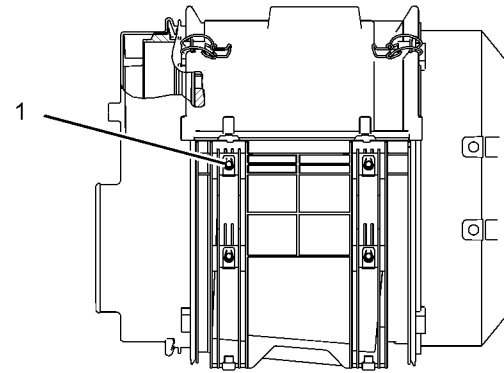


Illustration 114

g02503396

(1) Torque for 12 spring clips 17 ± 2 N·m
((150 ± 18 lb in))

i04757994

Air Cleaner

SMCS Code: 1051; 1054**S/N:** 3F31-Up**S/N:** 3F41-Up**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** GTA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** LCC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** A7D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** A7G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**S/N:** R9H1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** A7J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up**S/N:** GCL1-Up**S/N:** TAL1-Up**S/N:** WTL1-Up**S/N:** NLM1-Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

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S/N: NYY1–Up

S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

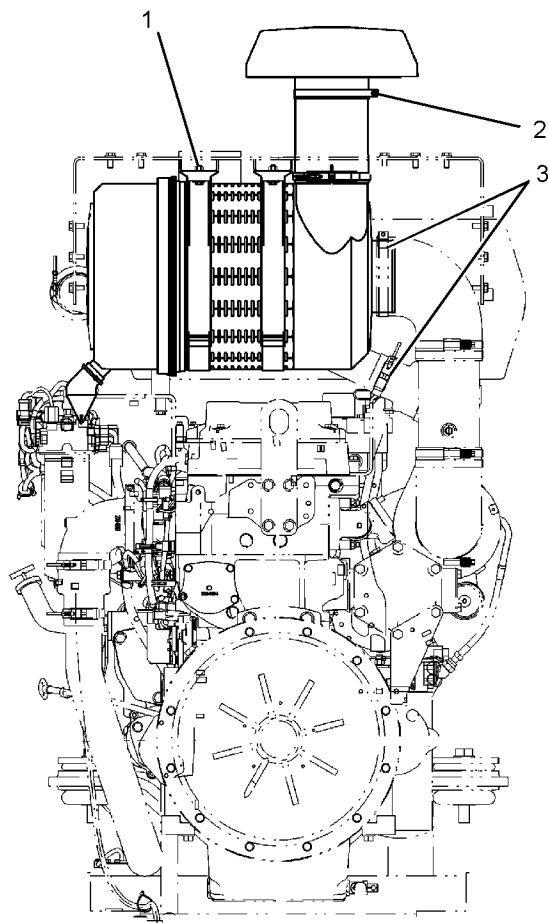


Illustration 115
Rear view

g02849638

Table 39

Specification for 235- 1075 Air Cleaner Gp			
Item	Qty	Part	Specification Description
1	4	7X-2537 Bolt	Torque to 15 ± 3 N·m (133 ± 27 lb in).
2	-	-	Installation torque for steel is 5 N·m (44 lb in). Installation torque for plastic is 3 N·m (27 lb in).
3	2	-	Tighten the clamps to 5 ± 1 N·m (44 ± 9 lb in).

i05583535

Air Cleaner

SMCS Code: 1051; 1054**Part No.:** 439-5331**S/N:** 3F31-Up**Part No.:** 439-5331**S/N:** 3F41-Up**Part No.:** 439-5331**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** GTA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** LCC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** A7D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** A7G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**S/N:** R9H1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** A7J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up**S/N:** GCL1-Up**S/N:** TAL1-Up

S/N: WTL1–Up

S/N: NLM1–Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: E9W1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

S/N: E9Y1–Up

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S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

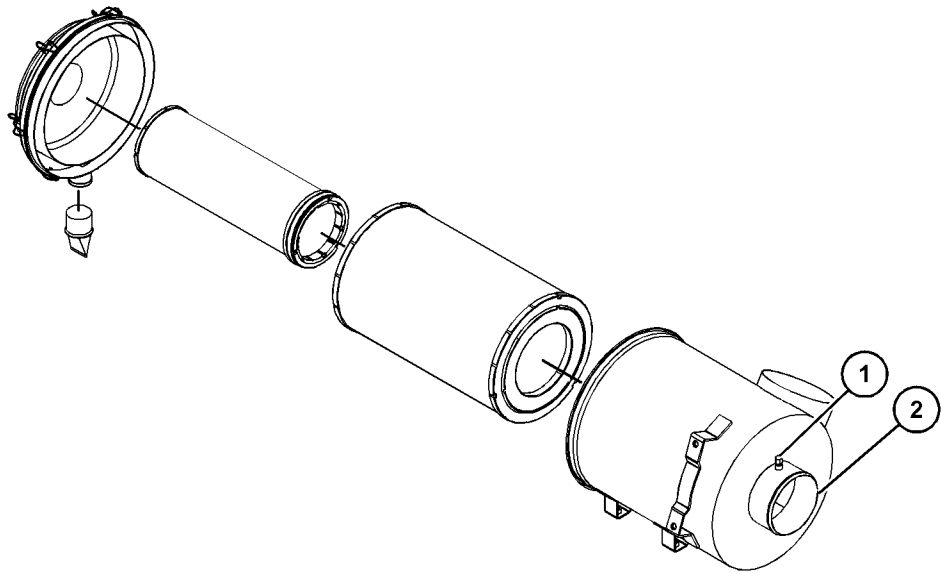


Illustration 116 g03542545

Table 40

Specification for 439 - 5331 Air Cleaner Gp			
Item	Qty	Part	Specification Description
1	-	-	Tighten the indicator to 2.0 ± 0.5 N·m (17.7 ± 4.4 lb in).
2	-	-	Tighten the connections to 3.5 ± 0.5 N·m (31.0 ± 4.4 lb in).

i05583571

Air Cleaner

SMCS Code: 1051; 1054

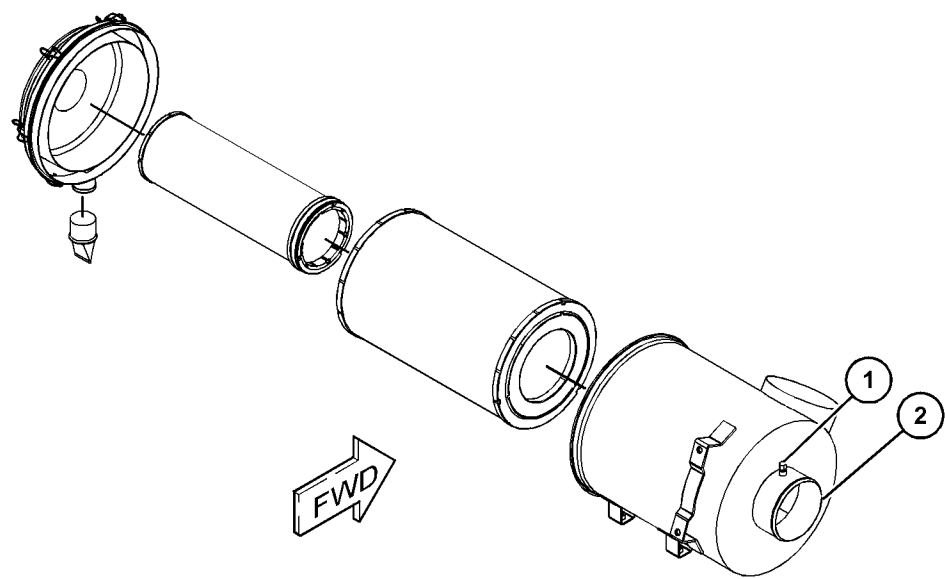


Illustration 117

g03542556

Table 41

Specification for 439 - 5332 Air Cleaner Gp			
Item	Qty	Part	Specification Description
1	-	-	Tighten the indicator to 2.0 ± 0.5 N·m (17.7 ± 4.4 lb in).
2	-	-	Tighten the connections to 3.5 ± 0.5 N·m (31.0 ± 4.4 lb in).

i06131365

Air Cleaner (Precleaner)

SMCS Code: 1051; 1054

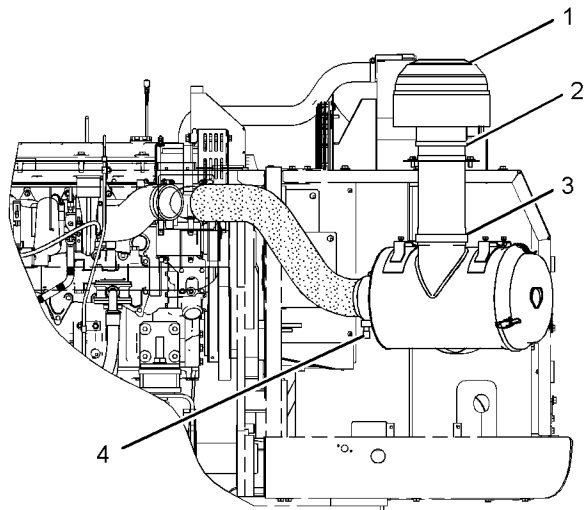


Illustration 118

g03819050

Table 42

Specifications for 239-6411 Air Cleaner Gp			
Item	Qty	Part	Specification Description
1	1	130-3280 Precleaner As	Position the exhaust port of the precleaner assembly toward the outside of the machine.
2	1	174-5415 Clamp	Torque the clamp to 16.7 ± 3.0 N·m (148.0 ± 27.0 lb in).
3	1	8T-4133 Nut	Torque the nut to 19.6 ± 3.0 N·m (173.0 ± 27.0 lb in).
4	1	1R-9953 Cap	Torque the cap to 1.5 ± 0.5 N·m (13.0 ± 4.0 lb in).

i03880870

i03918394

Air Lines

SMCS Code: 1058; 1071

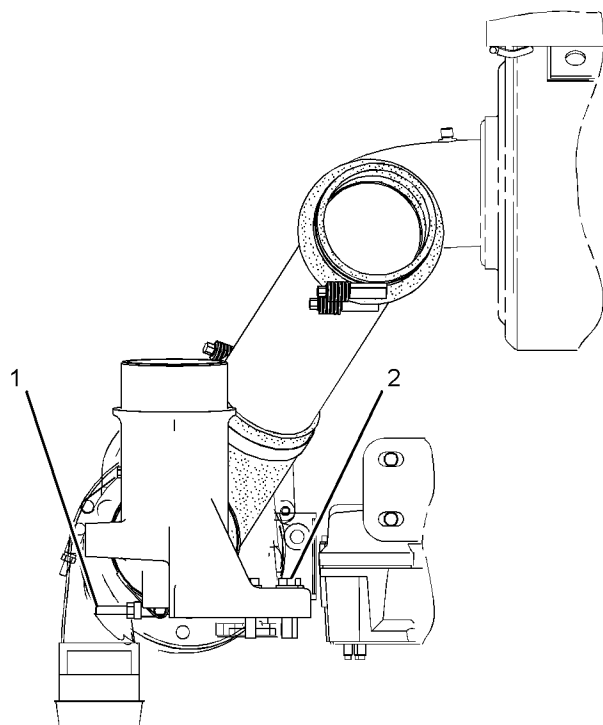


Illustration 119

g02126813

Front view

(1) Torque for the band clamp $12 \pm 4 \text{ N}\cdot\text{m}$
 (($106 \pm 35 \text{ lb in}$))

(2) Before assembly, lubricate the threads of the bolts with 4C-5599 Anti-Seize Compound.

Air Lines

SMCS Code: 1058; 1071

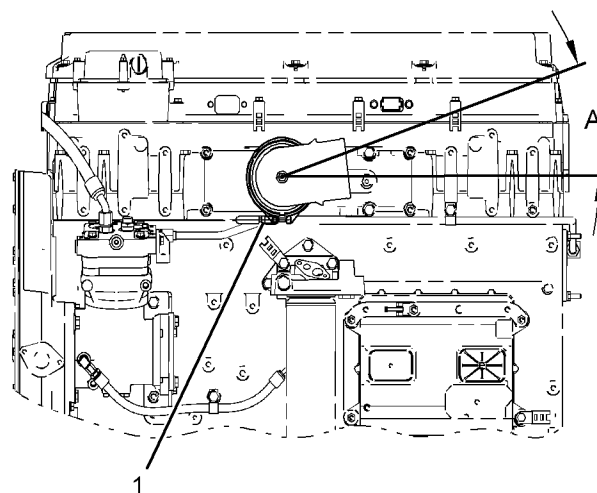


Illustration 120

g02151116

Left side view of engine

(A) Angle of the air elbow 7 ± 5 degrees

(1) Torque for the band clamp $8.5 \pm 2.0 \text{ N}\cdot\text{m}$
 (($75.2 \pm 17.7 \text{ lb in}$))

i03918530

i03918551

Air Lines

SMCS Code: 1058; 1071

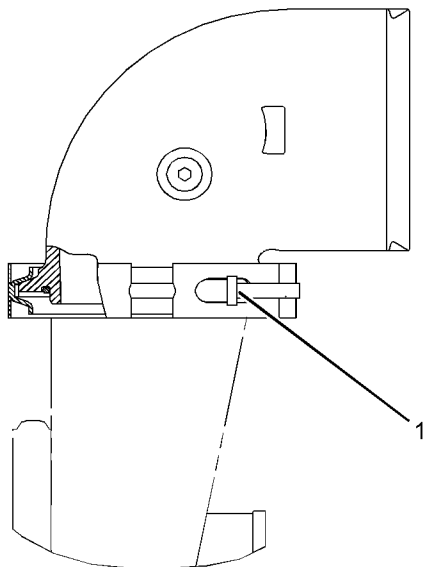


Illustration 121

g02151130

Right side view of engine

(1) Torque for the clamp $8.5 \pm 2.0 \text{ N}\cdot\text{m}$
(($75.2 \pm 17.7 \text{ lb in}$))

Air Lines

SMCS Code: 1058; 1071

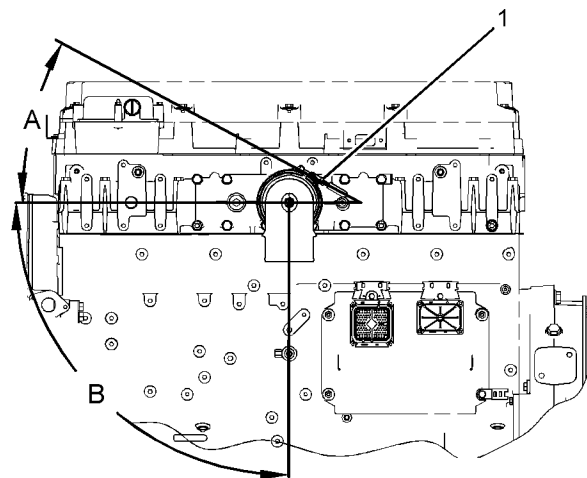


Illustration 122

g02151131

Left side view of engine

(A) Angle of the band clamp 30 ± 5 degrees
(B) Angle of the air elbow 90 ± 5 degrees
(1) Torque for the band clamp $8.5 \pm 2.0 \text{ N}\cdot\text{m}$
(($75.2 \pm 17.7 \text{ lb in}$))

i06589654

Air Lines

SMCS Code: 1058; 1071**S/N:** 3F31–Up**S/N:** 3F41–Up**S/N:** 3F51–Up**S/N:** MW51–Up**S/N:** BJ61–Up**S/N:** BS61–Up**S/N:** 2L71–Up**S/N:** 2L81–Up**S/N:** FLA1–Up**S/N:** GTA1–Up**S/N:** TBA1–Up**S/N:** JGB1–Up**S/N:** BYC1–Up**S/N:** FPC1–Up**S/N:** LCC1–Up**S/N:** MDC1–Up**S/N:** SPC1–Up**S/N:** WEC1–Up**S/N:** XAC1–Up**S/N:** 9SD1–Up**S/N:** A6D1–Up**S/N:** A7D1–Up**S/N:** ESD1–Up**S/N:** MGD1–Up**S/N:** P5D1–Up**S/N:** PFD1–Up**S/N:** RGD1–Up**S/N:** WTD1–Up**S/N:** M3E1–Up**S/N:** MTE1–Up**S/N:** NPE1–Up**S/N:** RAE1–Up**S/N:** WDE1–Up**S/N:** YAE1–Up**S/N:** YEE1–Up**S/N:** GKF1–Up**S/N:** M3F1–Up**S/N:** NNF1–Up**S/N:** RYF1–Up**S/N:** A6G1–Up**S/N:** A7G1–Up**S/N:** NEG1–Up**S/N:** PZG1–Up**S/N:** RGG1–Up**S/N:** TDG1–Up**S/N:** YAG1–Up**S/N:** B9H1–Up**S/N:** EEH1–Up**S/N:** GPH1–Up**S/N:** KFH1–Up**S/N:** KLH1–Up**S/N:** LFH1–Up**S/N:** R9H1–Up**S/N:** TAH1–Up**S/N:** A6J1–Up**S/N:** A7J1–Up**S/N:** B9J1–Up**S/N:** R9J1–Up**S/N:** RAJ1–Up**S/N:** RBJ1–Up**S/N:** TAJ1–Up**S/N:** MLK1–Up**S/N:** R5K1–Up**S/N:** A3L1–Up**S/N:** B1L1–Up**S/N:** GCL1–Up**S/N:** TAL1–Up**S/N:** WTL1–Up**S/N:** NLM1–Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

S/N: LKY1–Up

S/N: NYY1–Up

S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

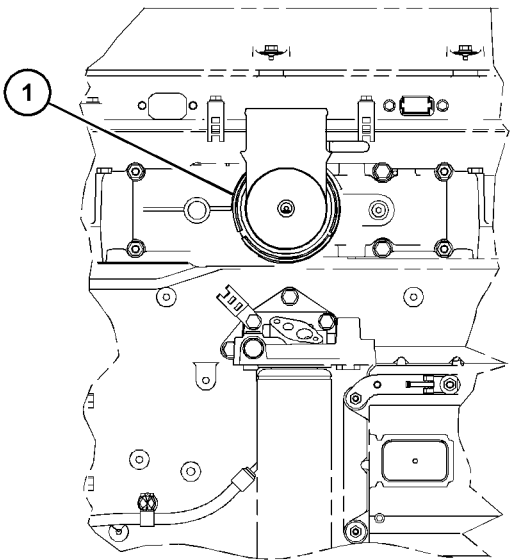


Illustration 123 g06037335

Table 43

Specification for 241 - 0983 Air Lines Gp			
Item	Qty	Part	Specification Description
1	1	248 - 4841 Band Clamp	Torque to 8 ± 4 N·m (70 ± 35 lb in).

i06798960

Air Lines

SMCS Code: 1058; 1071

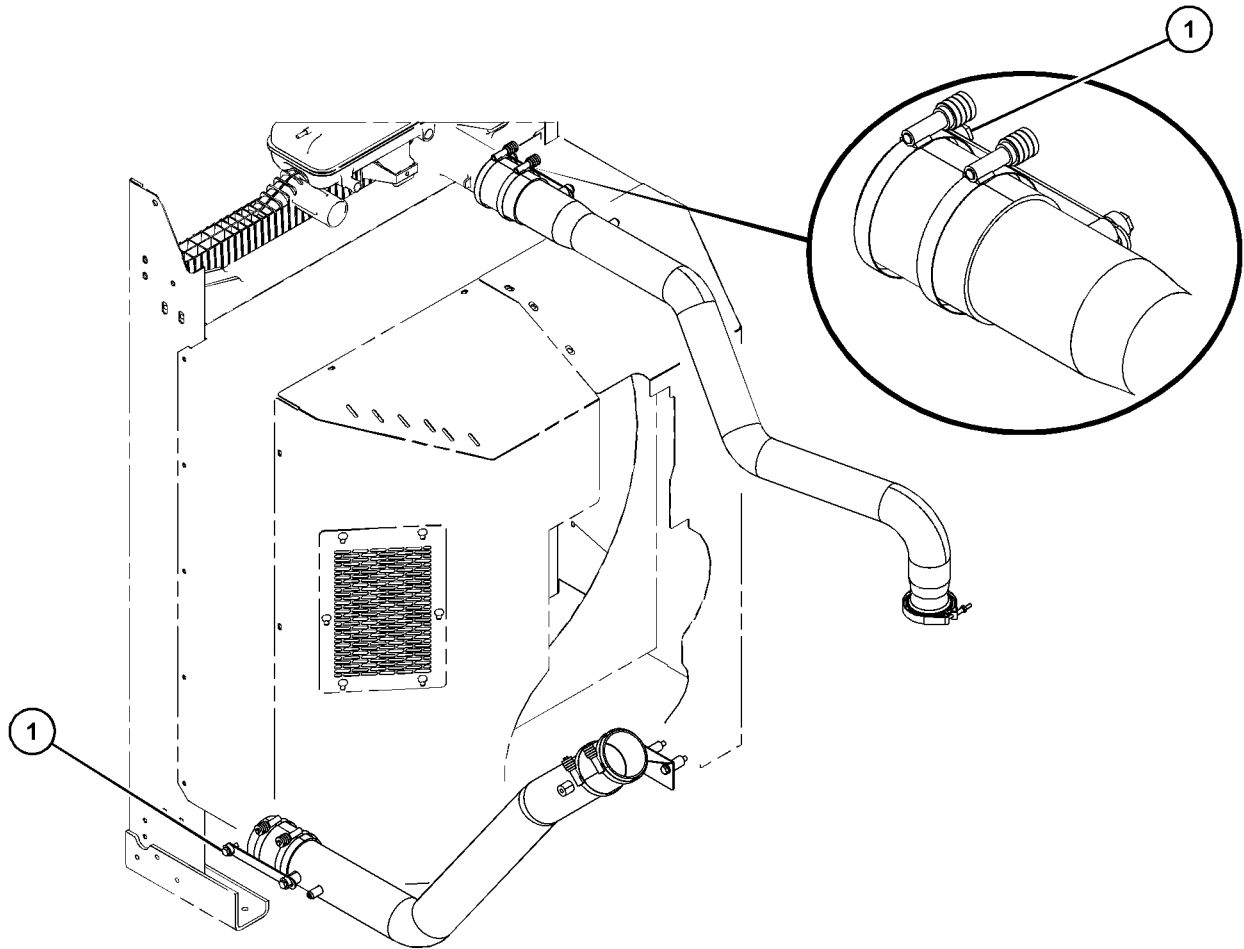


Illustration 124

g06119405

Table 44

Specification for the 463-2452 Air Lines Gp			
Item	Qty	Part	Specification Description
1	2	8T-4195 Bolt	Torque to 15 ± 3 N·m (133 ± 27 lb in).

i07257563

Air Lines

SMCS Code: 1058; 1071

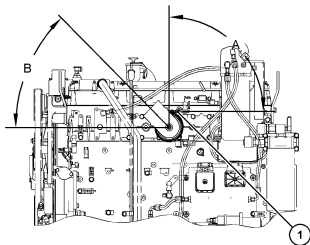


Illustration 125
Left side view of engine

g06267290

Table 45

Specification for 126-0081 Air Lines Gp			
Item	Qty	Part	Specification Description
1	1	248-4841 Band Clamp	Torque to 8.5 ± 2.0 N·m (75.2 ± 17.7 lb in).
A	-	-	Angle of the band clamp is 90 ± 5 degrees.
B	-	-	Angle of the air elbow is 45 ± 5 degrees.

i07979374

Air Lines

SMCS Code: 1058; 1071

S/N: 3F31–Up
S/N: 3F41–Up
S/N: 3F51–Up
S/N: MW51–Up
S/N: BJ61–Up
S/N: BS61–Up
S/N: 2L71–Up
S/N: 2L81–Up
S/N: FLA1–Up
S/N: GTA1–Up
S/N: TBA1–Up
S/N: JGB1–Up
S/N: BYC1–Up
S/N: FPC1–Up
S/N: LCC1–Up
S/N: MDC1–Up
S/N: SPC1–Up
S/N: WEC1–Up
S/N: XAC1–Up
S/N: 9SD1–Up
S/N: A6D1–Up
S/N: A7D1–Up
S/N: ESD1–Up
S/N: MGD1–Up
S/N: P5D1–Up
S/N: PFD1–Up
S/N: RGD1–Up
S/N: WTD1–Up
S/N: M3E1–Up
S/N: MTE1–Up
S/N: NPE1–Up
S/N: RAE1–Up
S/N: WDE1–Up
S/N: YAE1–Up

S/N: YEE1–Up
S/N: GKF1–Up
S/N: M3F1–Up
S/N: NNF1–Up
S/N: RYF1–Up
S/N: A6G1–Up
S/N: A7G1–Up
S/N: NEG1–Up
S/N: PZG1–Up
S/N: RGG1–Up
S/N: TDG1–Up
S/N: YAG1–Up
S/N: B9H1–Up
S/N: EEH1–Up
S/N: GPH1–Up
S/N: KFH1–Up
S/N: KLH1–Up
S/N: LFH1–Up
S/N: R9H1–Up
S/N: TAH1–Up
S/N: A6J1–Up
S/N: A7J1–Up
S/N: B9J1–Up
S/N: R9J1–Up
S/N: RAJ1–Up
S/N: RBJ1–Up
S/N: TAJ1–Up
S/N: MLK1–Up
S/N: R5K1–Up
S/N: A3L1–Up
S/N: B1L1–Up
S/N: GCL1–Up
S/N: TAL1–Up
S/N: WTL1–Up
S/N: NLM1–Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

S/N: LKY1–Up

S/N: NYY1–Up

S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

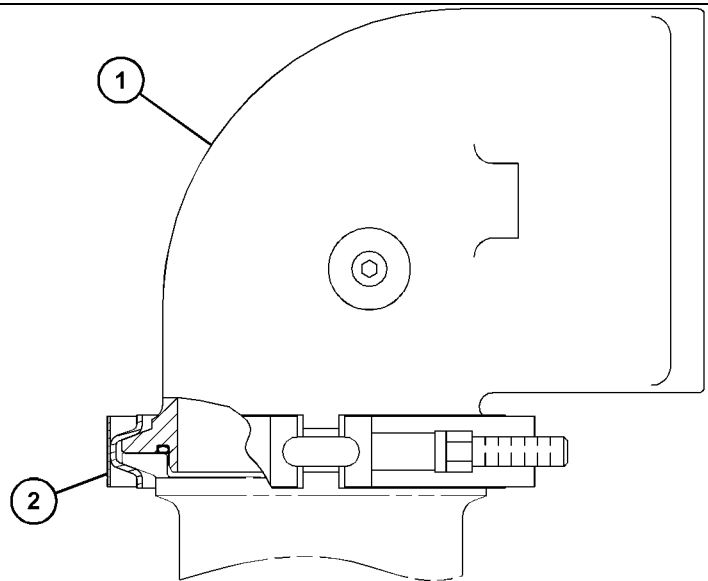


Illustration 126 g06497691

Table 46

Item	Qty	Part	Specification Description
1	1	217 - 8946 Elbow	Install the elbow pointing straight towards the front of the engine.
2	1	127 - 0929 Clamp	Torque to 8.5 ± 2.0 N·m (75.2 ± 17.7 lb in).

i02843259

Exhaust Manifold

SMCS Code: 1059

(2) Torque for 12 taperlock studs 35 ± 5 N·m
((26 ± 4 lb ft))

(3) Torque for four taperlock studs 35 ± 5 N·m
((26 ± 4 lb ft))

- (4) Install the gasket with the tab upward, as shown.
- (5) Apply 4C - 5599 Anti-Seize Compound to the threads of the locknuts and the bearing surface of the locknuts and the washers before assembly.

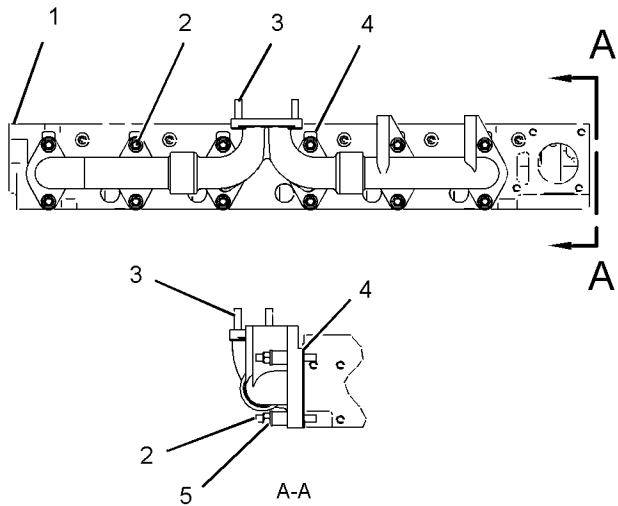


Illustration 127 g01417808

Typical example
(1) Cylinder head

i02843280

i02905350

Exhaust Manifold

SMCS Code: 1059

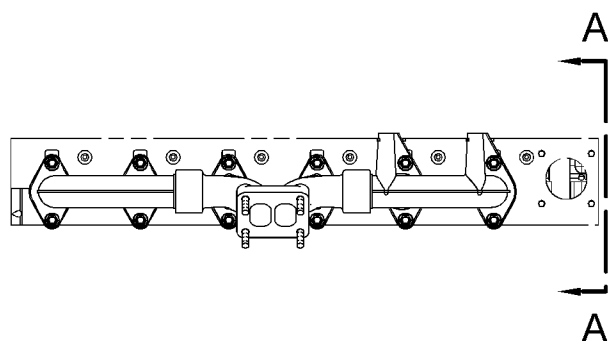


Illustration 128

g01417863

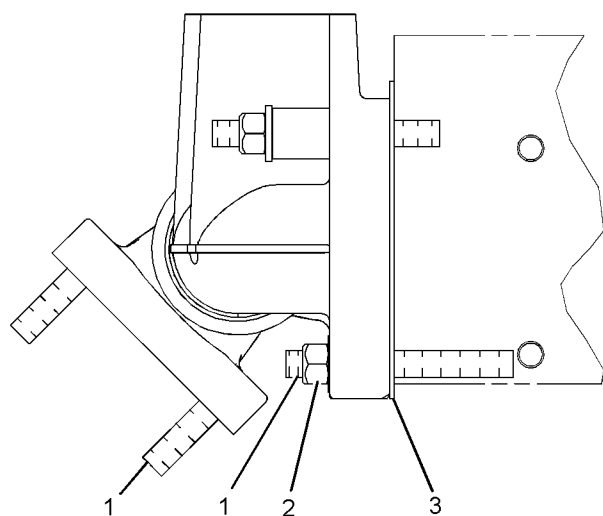


Illustration 129

g01417864

View A-A

(1) Torque for the taperlock studs $35 \pm 5 \text{ N}\cdot\text{m}$
 ((26 ± 4 lb ft))

(2) Apply 4C-5599 Anti-Seize Compound to the threads of the locknuts.

(3) Install the gasket with the tab upward.

Exhaust Manifold

SMCS Code: 1059

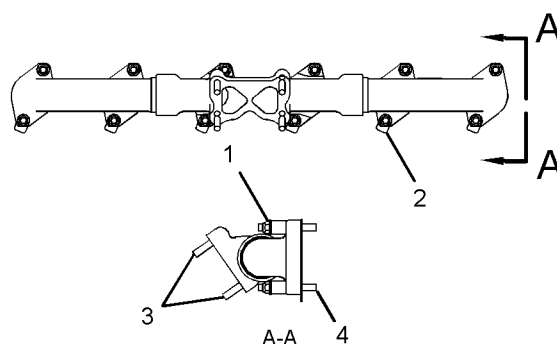


Illustration 130

g01446109

(1) Apply 4C-5599 Anti-Seize Compound to the threads of the locknuts and the bearing surface of the locknuts and the washers before assembly.

(2) Install the gasket with the tab downward, as shown.

(3) Torque for the four taperlock studs . . . $35 \pm 5 \text{ N}\cdot\text{m}$
 ((26 ± 4 lb ft))

(4) Torque for the 12 taperlock studs $35 \pm 5 \text{ N}\cdot\text{m}$
 ((26 ± 4 lb ft))

i03922646

Exhaust Manifold

SMCS Code: 1059

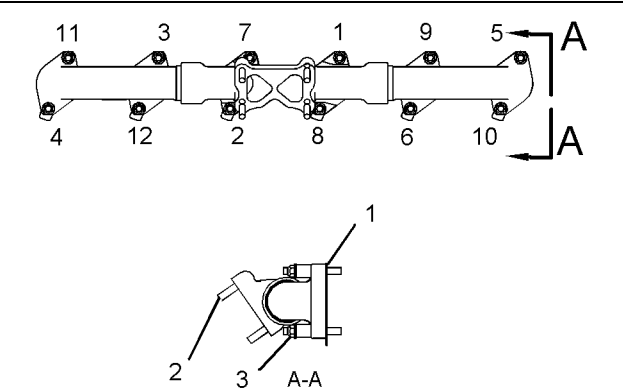


Illustration 131 g02151874

Note: Before you apply sealant, the male end and the female end of the exhaust manifold must be free from the following substance:dirt, rust, grease and oil. Apply a thin coat of 3M sealer EC - 1137 to the outside diameter and inside diameter of the exhaust manifolds. Remove excess sealer from the assembled joint.

- (1) Install the gasket with the tab downward, as shown in Illustration 131 .
- (2) Torque for taperlock studs $38 \pm 5 \text{ N}\cdot\text{m}$
(($28 \pm 4 \text{ lb ft}$))

Note: Use assembly spacers at positions 11, 7 and 9 to align the exhaust manifolds. Remove the assembly spacers before final assembly.

Note: Before assembly, lubricate the threads and the bearing surface of the locknuts with 4C-5599 Anti-Seize Compound.

- (3) Tighten the locknut (1) through locknut (12) in the numerical sequence that is shown in Illustration 131 to $55 \pm 5 \text{ N}\cdot\text{m}$ ($41 \pm 4 \text{ lb ft}$).

i03929890

Exhaust Manifold

SMCS Code: 1059

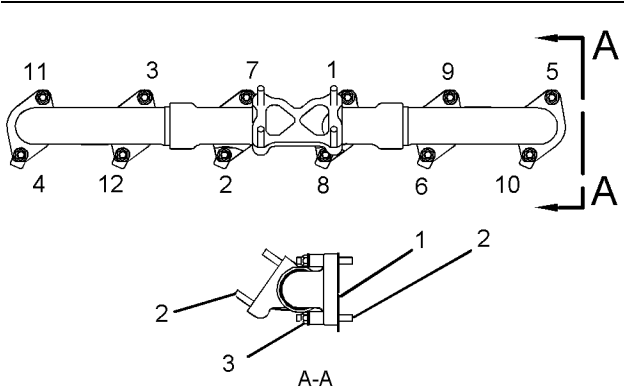


Illustration 132 g02153863

Note: Before you apply sealant, the male end and the female end of the exhaust manifold must be free from the following substance:dirt, rust, grease and oil. Apply a thin coat of 3M sealer EC - 1137 to the outside diameter and inside diameter of the exhaust manifolds. Remove excess sealer from the assembled joint.

- (1) Install the gasket with the tab downward, as shown in Illustration 132 .
- (2) Torque for taperlock studs $35 \pm 5 \text{ N}\cdot\text{m}$
(($26 \pm 4 \text{ lb ft}$))

Note: Use assembly spacers at positions 11, 7 and 9 to align the exhaust manifolds. Remove the assembly spacers before final assembly.

Note: Before assembly, lubricate the threads and the bearing surface of the locknuts with 4C-5599 Anti-Seize Compound.

- (3) Tighten the locknut (1) through locknut (12) in the numerical sequence that is shown in Illustration 132 to $55 \pm 5 \text{ N}\cdot\text{m}$ ($41 \pm 4 \text{ lb ft}$).

i04618450

Exhaust Manifold

SMCS Code: 1059

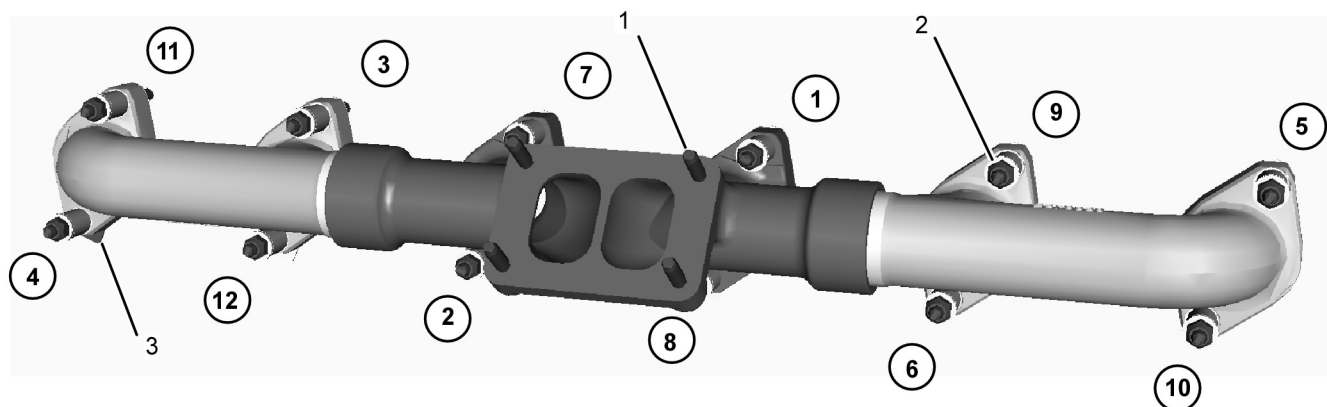


Illustration 133

g02765405

(1) Torque for taperlock studs $35 \pm 5 \text{ N}\cdot\text{m}$
 (($26 \pm 4 \text{ lb ft}$))

Note: Before applying sealant, the male and the female ends of the exhaust manifold must be free of the following substances: dirt, rust, grease and oil. Apply a thin coat of 2P - 2333 High Temperature Sealer to the outside diameter of the male ends and inside diameter of the female ends of the exhaust manifolds. Remove excess sealer from the assembled joint.

(3) Install the gaskets with the tabs downward on all six exhaust ports.

Note: Before assembly, apply Loctite # 51008 C5A CO BSE A/S on the washer faces and to the 12 threads of the exhaust manifold .

Note: Use assembly spacers at positions 11, 7 and 9 to align the exhaust manifolds. Remove the assembly spacers before final assembly.

(2) Tighten locknuts 1 through 12 in the numerical tightening sequence shown in Illustration 133 to $55 \pm 5 \text{ N}\cdot\text{m}$ ($41 \pm 4 \text{ lb ft}$).

i05581469

Exhaust Manifold

SMCS Code: 1059

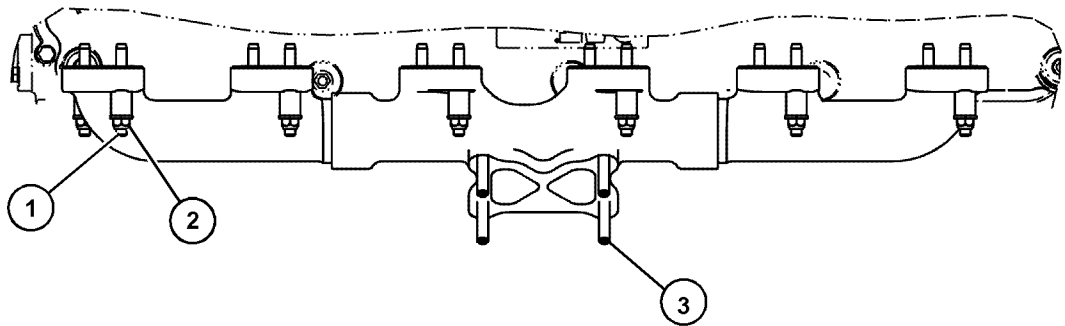


Illustration 134

g03540436

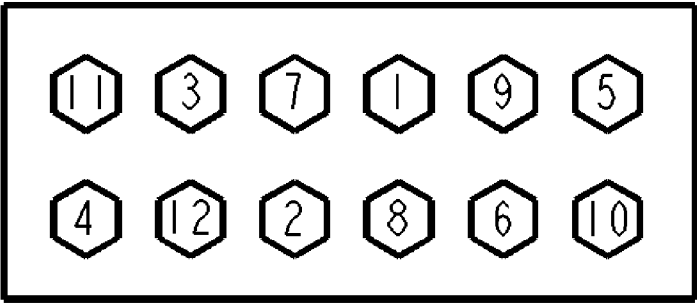


Illustration 135

g03540437

Tightening sequence

Table 47

Specification for 380 - 8509 Exhaust Manifold Gp			
Item	Qty	Part	Specification Description
1	12	116 - 3715 Taperlock Stud	Torque to 35 ± 5 N·m (26 ± 4 lb ft).
2	12	9X - 6620 Locknut	Before assembly, apply Loctite C5A copper anti-seize to the threads and bearing surfaces. Use the following procedure to tighten the locknuts: Tighten the locknuts in the numerical sequence that is shown in Illustration 2 to 20 ± 3 N·m (177 ± 27 lb in). Again, tighten the locknuts in the numerical sequence that is shown in Illustration 2 to 50 ± 5 N·m (37 ± 4 lb ft).
3	4	245 - 9750 Taperlock Stud	Torque to 35 ± 5 N·m (26 ± 4 lb ft).

i05581550

Exhaust Manifold

SMCS Code: 1059

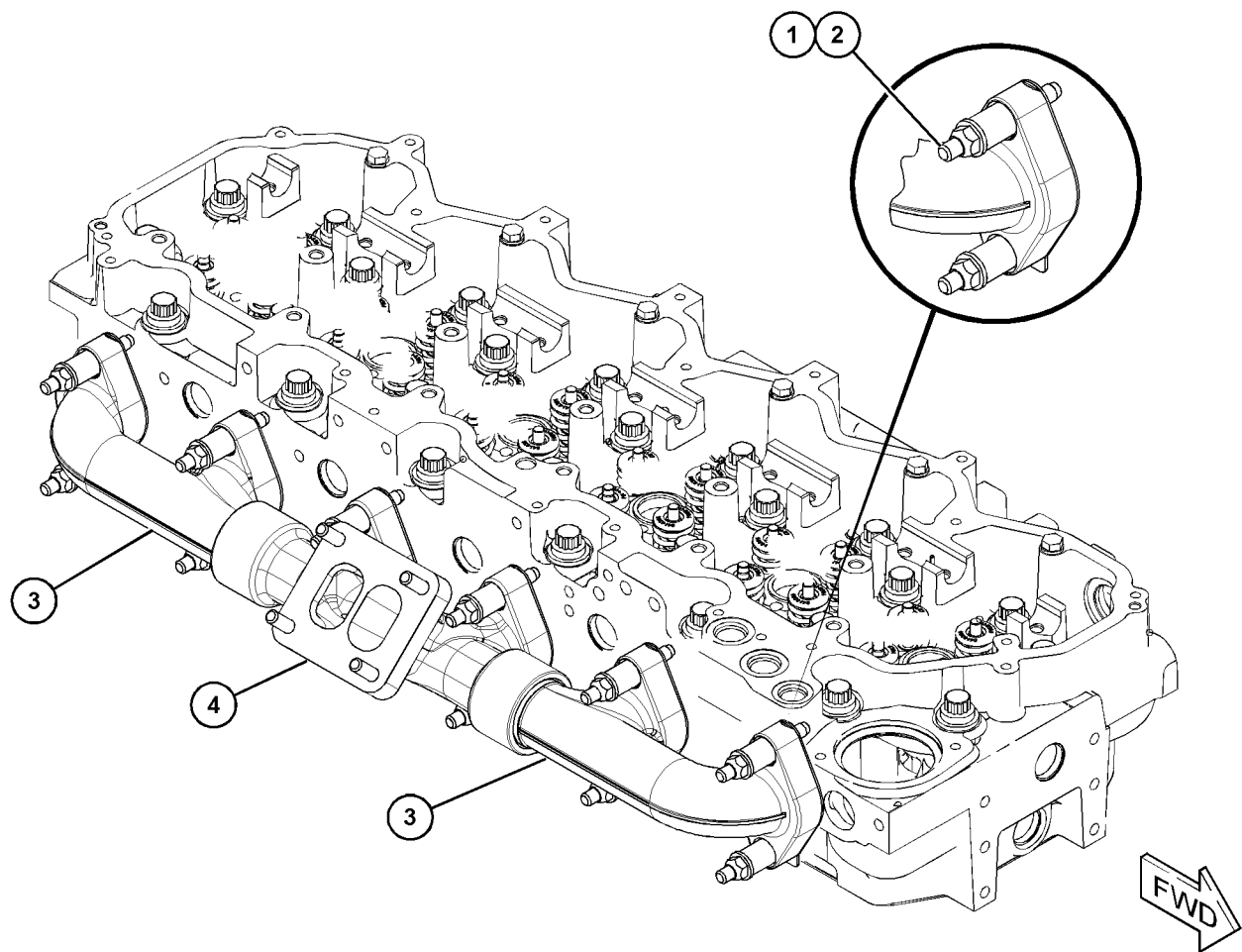


Illustration 136

g03540496

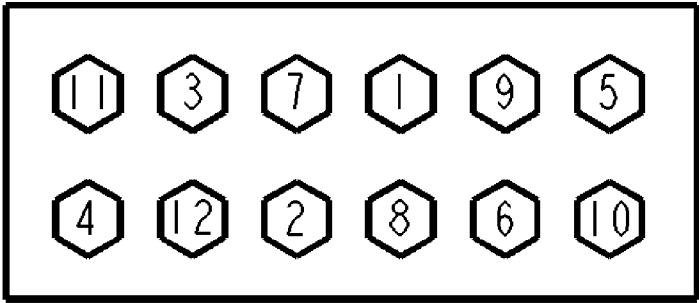


Illustration 137

g03540523

Table 48

Specification for 391 - 4948 Exhaust Manifold Gp			
Item	Qty	Part	Specification Description
1	12	116 - 3715 Taperlock Stud	Torque to 35 ± 5 N·m (26 ± 4 lb ft).
2	12	9X - 6620 Locknut	Before assembly, apply Loctite C5A copper anti-seize to the threads and bearing surfaces. Tighten the locknuts in the numerical sequence that is shown in Illustration 137 .
3	2	161 - 3398 Exhaust Manifold	Before assembly, apply a thin coat of 2P - 2333 High Temperature Sealer to the outside diameter of the male end of the exhaust manifold. Remove excess high temperature sealer from the assembled joint.
4	1	192 - 4697 Exhaust Manifold	Before assembly, apply a thin coat of 2P - 2333 High Temperature Sealer to the outside diameter of the male end of the exhaust manifold. Remove excess high temperature sealer from the assembled joint.

i03875214

Muffler

SMCS Code: 1062

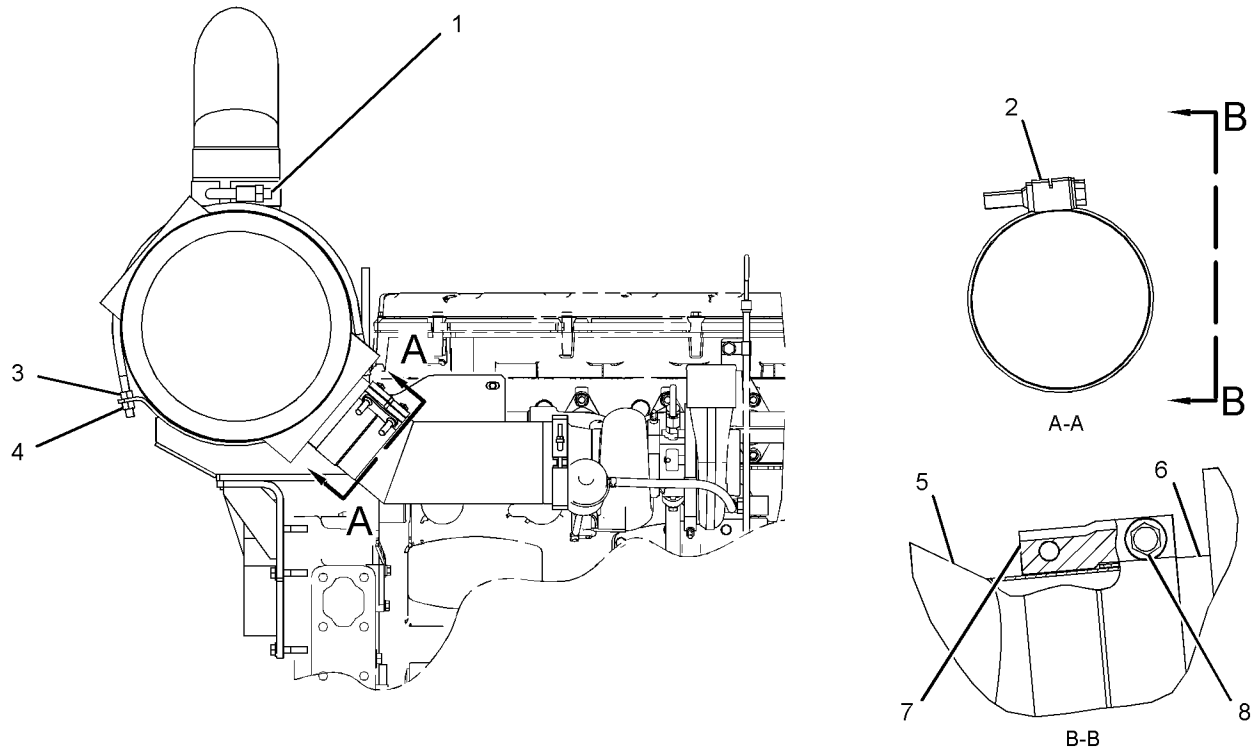


Illustration 138

Front view

(5) Pipe assembly

(6) Muffler assembly

(1) Torque for the clamp . . . $48 \pm 4 \text{ N}\cdot\text{m}$ ($(35 \pm 3 \text{ lb ft})$)

(2) Consider the groove of the clamp as a visual guide and tighten the bolt. Tighten the bolt until the groove of the clamp is half closed.

(3) Torque for four nuts . . . $50 \pm 10 \text{ N}\cdot\text{m}$ ($(37 \pm 7 \text{ lb ft})$)

(4) Torque for four nuts $15 \pm 3 \text{ N}\cdot\text{m}$
($(133 \pm 27 \text{ lb in})$)

Note: Refer to Illustration 138 in order to position the muffler clamp (7). Apply a thin coat of 2P-2333 High Temperature Sealer to the outside diameter of male pipe end and to the taper of turbocharger outlet pipe. Remove excess sealer from the joint before clamp assembly.

(8) Torque for the nut $68 \pm 12 \text{ N}\cdot\text{m}$ ($(50 \pm 9 \text{ lb ft})$)

g02126430

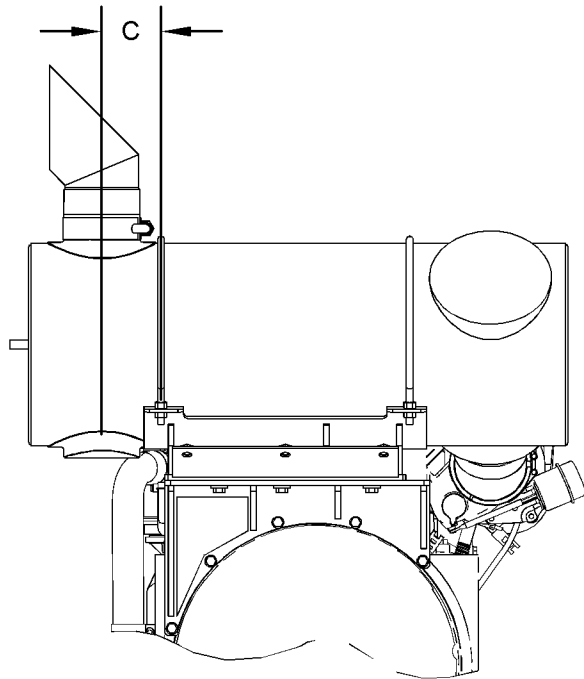


Illustration 139

g02126449

(C) Position the muffler and fasten the muffler with U-bolts at a distance of 105 ± 5 mm (4.1 ± 0.2 inch).

i03926470

Muffler

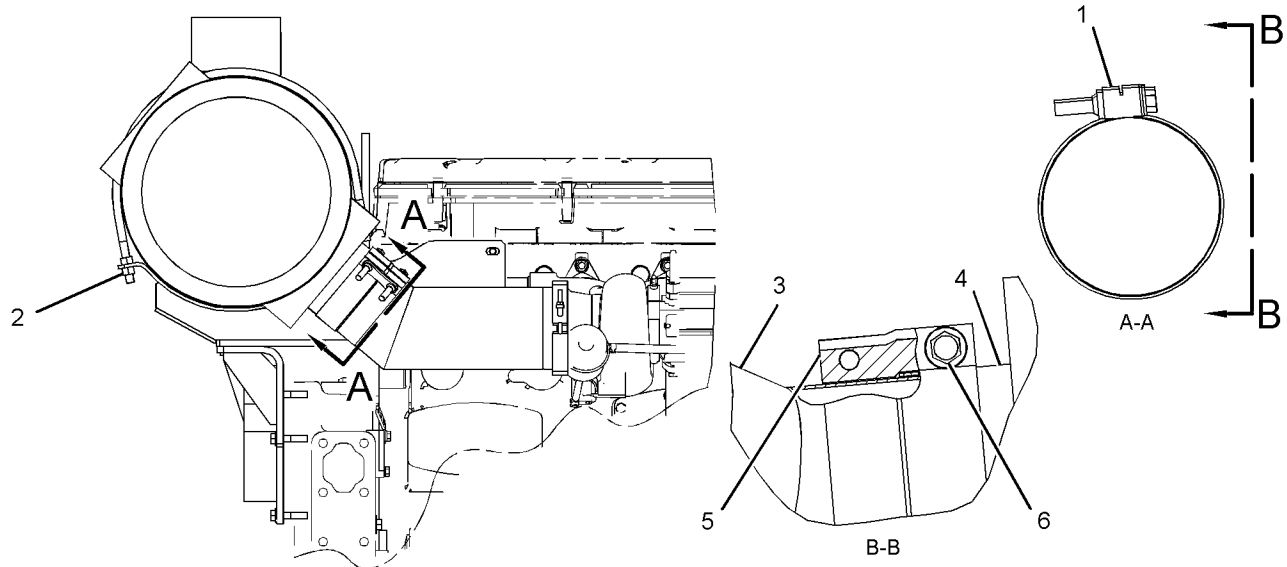
SMCS Code: 1062


Illustration 140

Front view

g02152963

(3) Tube assembly

(4) Muffler assembly

(1) Consider the groove of the clamp as a visual guide and tighten the bolt. Tighten the bolt until the groove of the clamp is half closed.

(2) Torque for nuts $50 \pm 10 \text{ N}\cdot\text{m}$ ($(37 \pm 7 \text{ lb ft})$)

Note: Refer to Illustration 140 in order to position the muffler clamp (5). Apply a thin coat of 3M sealer EC-1137 to the outside diameter of male pipe end and to the taper of turbocharger outlet pipe. Remove excess sealer from the joint before clamp assembly.

(6) Torque for the bolt $68 \pm 12 \text{ N}\cdot\text{m}$ ($(50 \pm 9 \text{ lb ft})$)

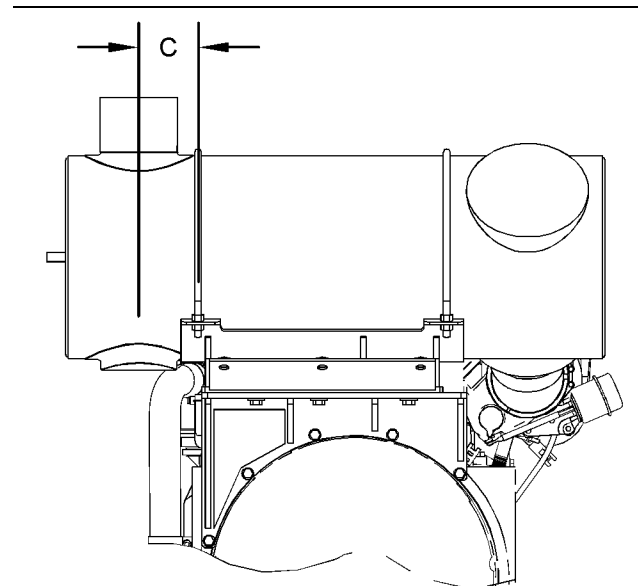


Illustration 141

g02152965

(C) Position the muffler and fasten the muffler with U-bolts at a distance of $107 \pm 5 \text{ mm}$ ($4.2 \pm 0.2 \text{ inch}$).

i04041569

Muffler

SMCS Code: 1062

S/N: 3F31-Up
S/N: 3F41-Up
S/N: 3F51-Up
S/N: MW51-Up
S/N: BJ61-Up
S/N: BS61-Up
S/N: 2L71-Up
S/N: 2L81-Up
S/N: FLA1-Up
S/N: GTA1-Up
S/N: TBA1-Up
S/N: JGB1-Up
S/N: BYC1-Up
S/N: FPC1-Up
S/N: LCC1-Up
S/N: MDC1-Up
S/N: SPC1-Up
S/N: WEC1-Up
S/N: XAC1-Up
S/N: 9SD1-Up
S/N: A6D1-Up
S/N: A7D1-Up
S/N: ESD1-Up
S/N: MGD1-Up
S/N: P5D1-Up
S/N: PFD1-Up
S/N: RGD1-Up
S/N: WTD1-Up
S/N: M3E1-Up
S/N: MTE1-Up
S/N: NPE1-Up
S/N: RAE1-Up
S/N: WDE1-Up
S/N: YAE1-Up

S/N: YEE1-Up
S/N: GKF1-Up
S/N: M3F1-Up
S/N: NNF1-Up
S/N: RYF1-Up
S/N: A6G1-Up
S/N: A7G1-Up
S/N: NEG1-Up
S/N: PZG1-Up
S/N: RGG1-Up
S/N: TDG1-Up
S/N: YAG1-Up
S/N: B9H1-Up
S/N: EEH1-Up
S/N: GPH1-Up
S/N: KFH1-Up
S/N: KLH1-Up
S/N: LFH1-Up
S/N: R9H1-Up
S/N: TAH1-Up
S/N: A6J1-Up
S/N: A7J1-Up
S/N: B9J1-Up
S/N: R9J1-Up
S/N: RAJ1-Up
S/N: RBJ1-Up
S/N: TAJ1-Up
S/N: MLK1-Up
S/N: R5K1-Up
S/N: A3L1-Up
S/N: B1L1-Up
S/N: GCL1-Up
S/N: TAL1-Up
S/N: WTL1-Up
S/N: NLM1-Up
S/N: SDM1-Up
S/N: WTM1-Up
S/N: DKN1-Up

S/N: JKN1-Up
S/N: MEN1-Up
S/N: RAN1-Up
S/N: RFN1-Up
S/N: SCN1-Up
S/N: WTN1-Up
S/N: DHP1-Up
S/N: WTP1-Up
S/N: BWR1-Up
S/N: JAR1-Up
S/N: M2R1-Up
S/N: SBR1-Up
S/N: XBR1-Up
S/N: D3S1-Up
S/N: ELS1-Up
S/N: KHS1-Up
S/N: LRS1-Up
S/N: LYS1-Up
S/N: PBT1-Up
S/N: E9W1-Up
S/N: PJW1-Up
S/N: GAX1-Up
S/N: BWY1-Up
S/N: LKY1-Up
S/N: NYY1-Up
S/N: SEY1-Up
S/N: SEZ1-Up
S/N: WXZ1-Up

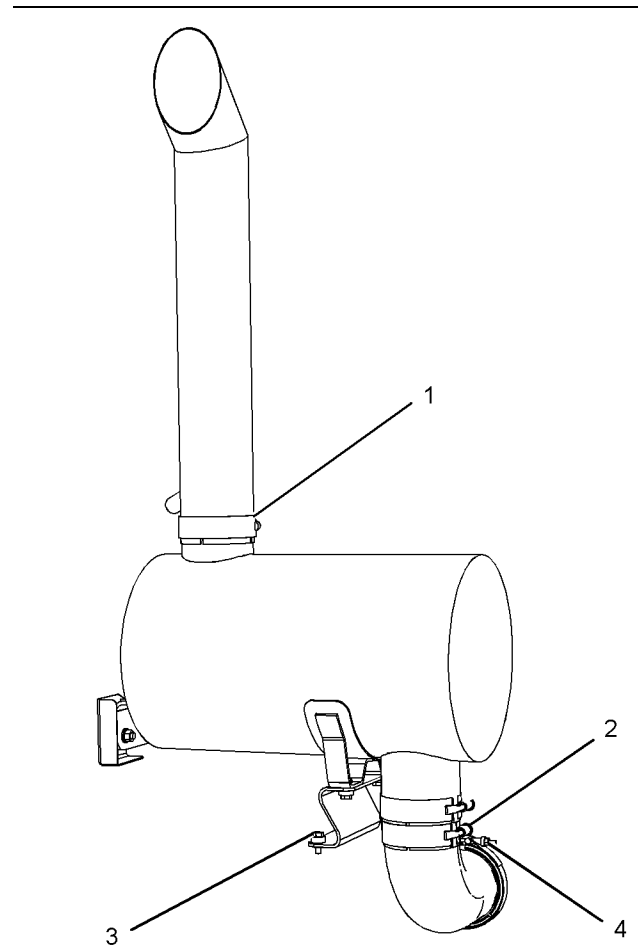


Illustration 142

g02250654

(1) Gaps in the clamp assembly must not align with the slots in the tube.

(2) Torque for the muffer clamp $68 \pm 12 \text{ N}\cdot\text{m}$
 (($50 \pm 9 \text{ lb ft}$))

Note: Gap in the muffer clamp (2) is to be oriented between the slots at the final assembly.

(3) Lubricate the threads and the washers of the bolts with 4C-5599 Anti-Seize Compound prior to assembly.

(4) Torque for the V-band clamp . . . $5 \text{ N}\cdot\text{m}$ ((44 lb in))

i05583311

Muffler

SMCS Code: 1062

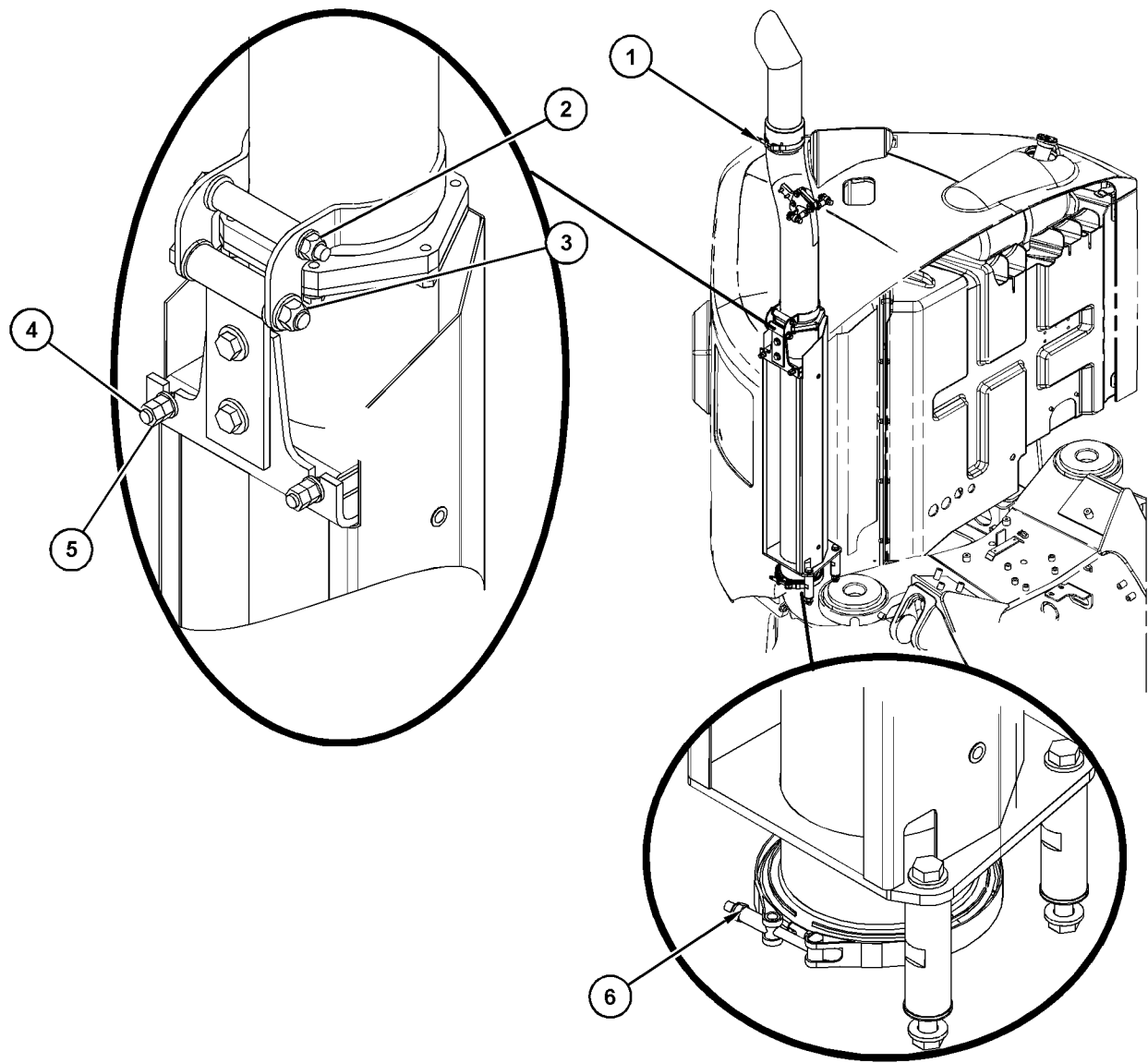


Illustration 143

g03542378

Table 49

Specification for 379-3762 Exhaust Gp			
Item	Qty	Part	Specification Description
1	1	176-8234 Clamp	Torque to 10 ± 1 N·m (89 ± 9 lb in).
2	1	6V-7744 Locknut	Torque to 20 ± 4 N·m (177 ± 35 lb in).
3	1	6V-7687 Locknut	Torque to 20 ± 4 N·m (177 ± 35 lb in).

(continued)

Specifications Section

(Table 49, contd)

4	1	6U - 5219 U-Clamp As	Torque to 20 ± 4 N·m (177 ± 35 lb in).
5	2	6V - 8801 Nut	Use wrench to secure clamp nuts, tighten the jam nuts to 20 ± 4 N·m (177 ± 35 lb in).
6	1	202 - 1838 V Band Clamp	Torque to 11 ± 2 N·m (97 ± 18 lb in).

i05709829

Muffler

SMCS Code: 1062**S/N:** 3F31-Up**S/N:** 3F41-Up**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** GTA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** LCC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** A7D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** A7G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**S/N:** R9H1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** A7J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up**S/N:** GCL1-Up**S/N:** TAL1-Up**S/N:** WTL1-Up**S/N:** NLM1-Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: E9W1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

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S/N: NYY1–Up

S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

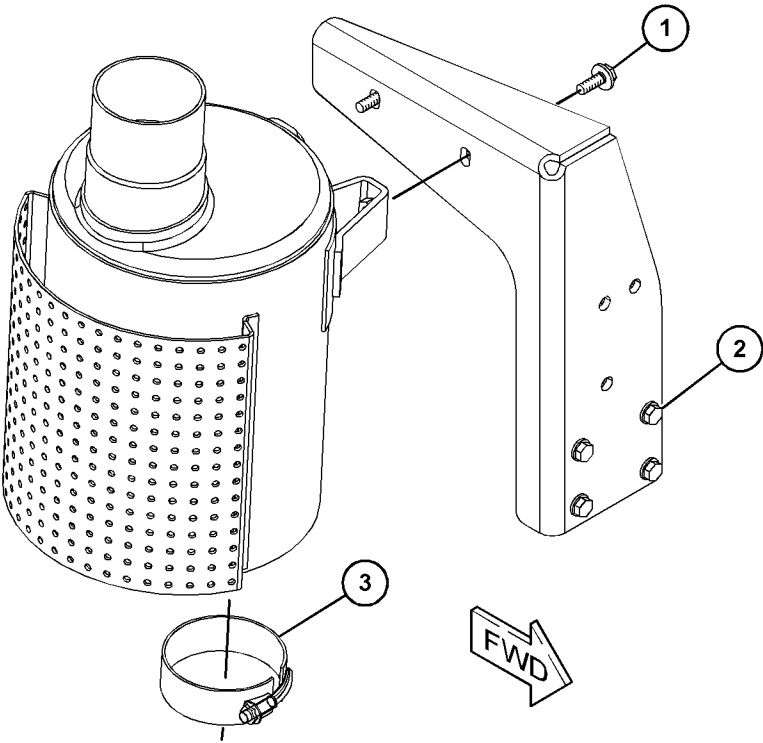


Illustration 144

g03627696

Table 50

Specification for 168-8382 Muffler Gp			
Item	Qty	Part	Specification description
-	-	-	Use the following procedure for tightening the bolts for the muffler assembly and the bracket assembly: 1. Loosen the four bolts (2). 2. Before assembly, apply blue Loctite 242 to the threads. Tighten the two bolts (1) to standard torque. 3. Tighten the wire clamp (3) to standard torque. 4. Tighten the four bolts (2) to standard torque.
-	-	-	The gap in the wire clamp (3) must not be aligned with the slots in the tube.

i05736049

Muffler

SMCS Code: 1062**S/N:** 3F31-Up**S/N:** 3F41-Up**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** GTA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** LCC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** A7D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** A7G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**S/N:** R9H1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** A7J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up**S/N:** GCL1-Up**S/N:** TAL1-Up**S/N:** WTL1-Up**S/N:** NLM1-Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: E9W1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

S/N: LKY1–Up

S/N: NYY1–Up

S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

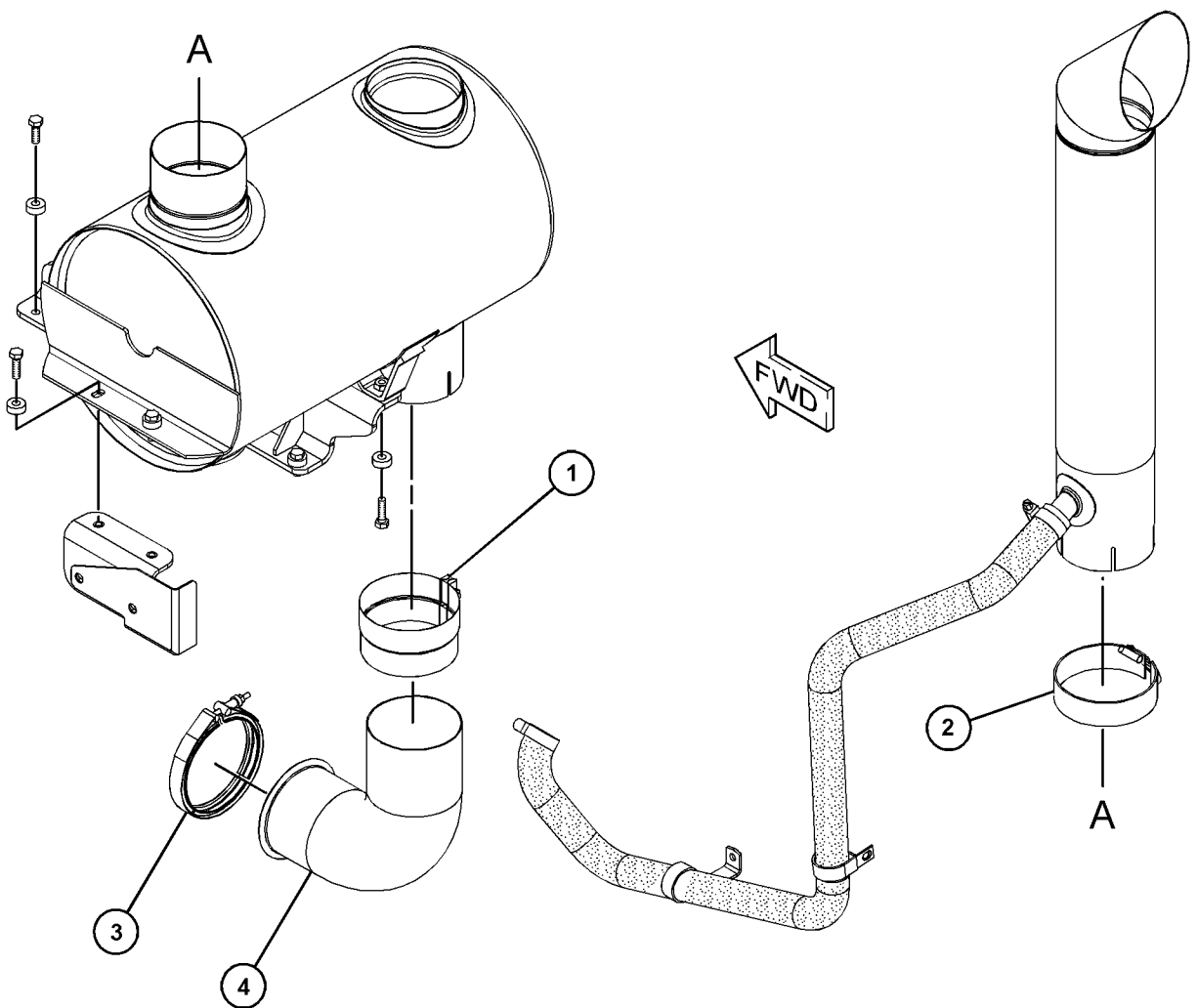


Illustration 145 g03644723

Table 51

Specification for 231 - 2160 Muffler and Mounting Gp			
Item	Qty	Part	Specification Description
1	1	380 - 9871 Muffler Clamp	Torque to 40 ± 5 N·m (30 ± 4 lb ft).
2	1	388 - 7016 Bent Bolt Clamp	Gaps in the clamp assembly must not align with the slots in the ejector. Torque to 47 ± 5 N·m (35 ± 4 lb ft).
3	1	9N - 1941 V Band Clamp	Torque to 8.5 ± 1.0 N·m (75.2 ± 8.9 lb in).
4	1	250 - 0832 Tube	Before assembly, lubricate thread and bearing surfaces with Loctite C5A Copper Anti-Seize.

i06801081

Muffler

SMCS Code: 1062

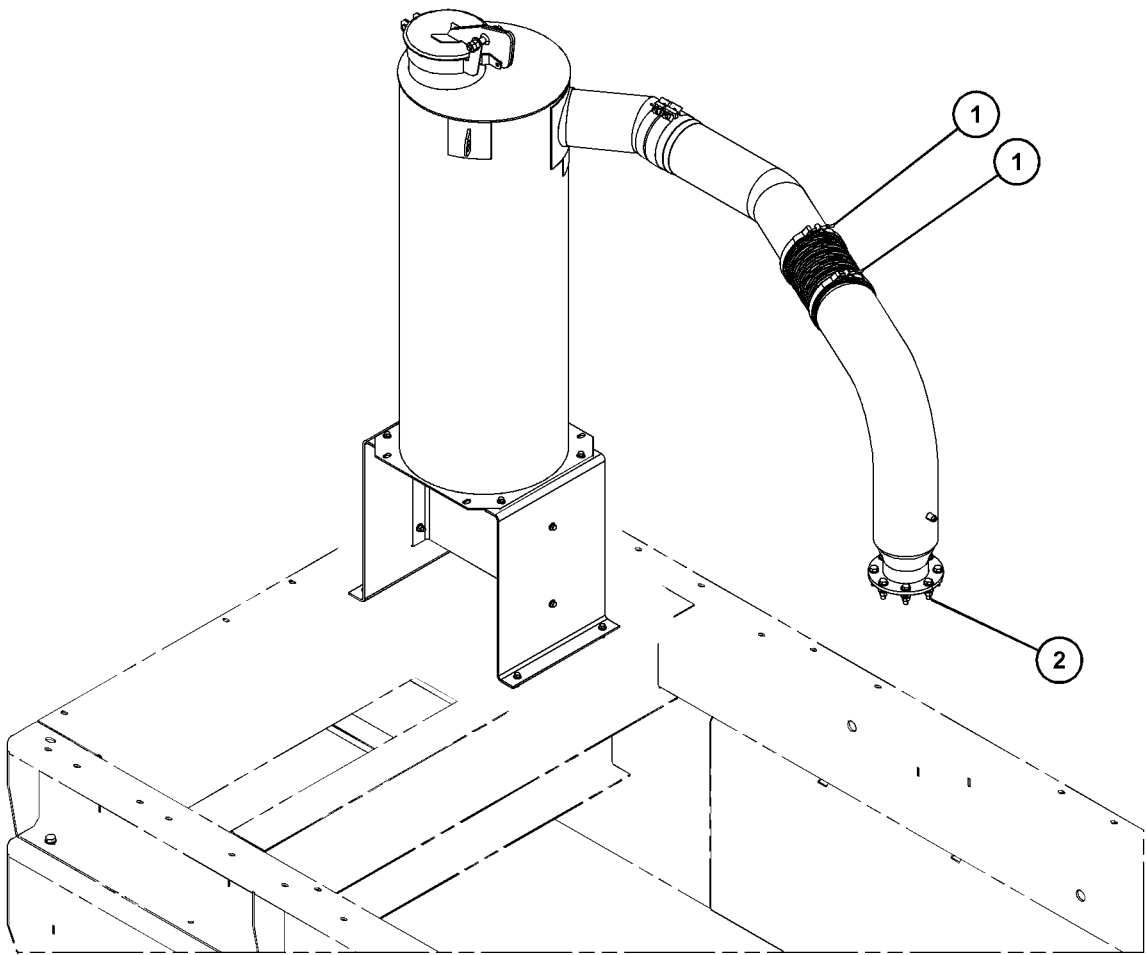


Illustration 146

g06119768

Table 52

Specification for 463-2474 Muffler Gp			
Item	Qty	Part	Specification Description
1	2	247-3393 Clamp As	Use the following procedure to tighten the clamp: 1. Torque to 7.5 ± 1.0 N·m (66.4 ± 8.9 lb in). 2. Tap the clamp gently all around. 3. Again tighten the clamp to 7.5 ± 1.0 N·m (66.4 ± 8.9 lb in).
2	8	6V-7673 Bolt	Torque to 50 ± 10 N·m (37 ± 7 lb ft).

i02845826

Camshaft

SMCS Code: 1210

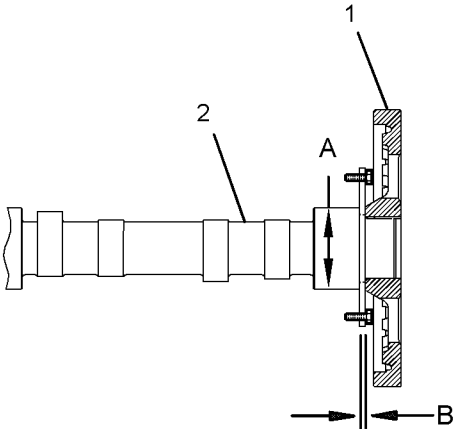


Illustration 147

g01419279

(1) Cam gear

(2) Camshaft

End play of a new camshaft 0.13 ± 0.08 mm
((0.005 ± 0.003 inch))

Maximum permissible end play of a worn
camshaft 0.46 mm ((0.018 inch))

(A) Diameter of the bearing journals for a new
camshaft 65.126 ± 0.013 mm
((2.5640 ± 0.0005 inch))

(B) Plate

Thickness of the new plate 4.7 mm
((0.19 inch))

Thickness of the groove in the new camshaft
. 4.83 ± 0.05 mm ((0.190 ± 0.002 inch))

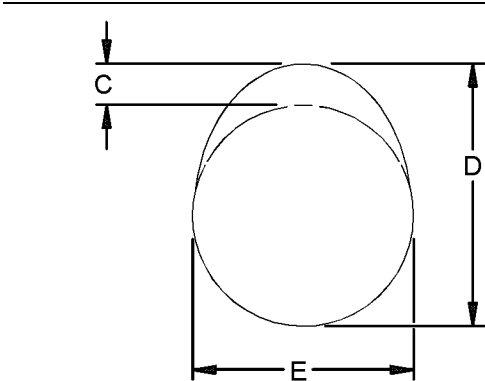


Illustration 148

g01419280

(C) Specified camshaft lobe lift

Exhaust lobe 6.858 mm ((0.2700 inch))
Inlet lobe 8.655 mm ((0.3407 inch))

In order to determine the actual camshaft lobe lift,
use the following procedure:

1. Measure the camshaft lobe height (D).
2. Measure the base circle (E).
3. Subtract the base circle (E) from the camshaft lobe height (D). The difference is the actual camshaft lobe lift.

Maximum permissible difference between actual lobe
lift and the specified lobe lift of a new camshaft
. ± 0.10 mm ((0.004 inch))

i03563404

Camshaft

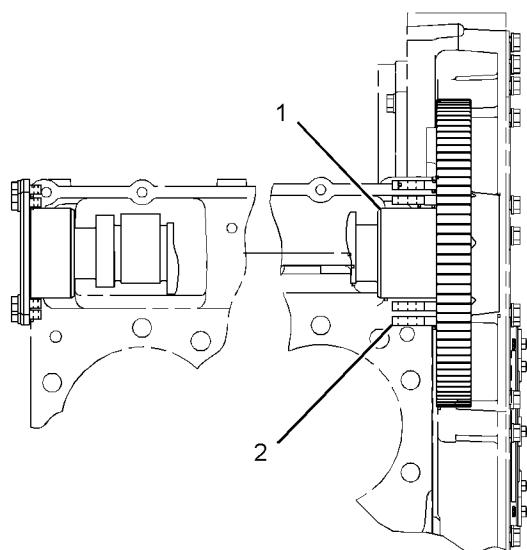
SMCS Code: 1210


Illustration 149

g01350428

Top view of engine

 (1) Diameter of camshaft bearing journal
 77.850 ± 0.025 mm ((3.0650 ± 0.0010 inch))

(2) Torque for the bolts 35 ± 8 N·m ((26 ± 6 lb ft))

Rotation of injector lobe for camshaft at zero lift . . 74 to 180 degrees

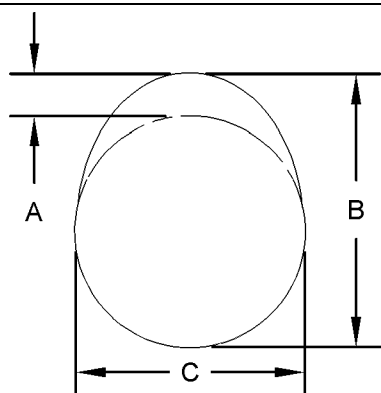


Illustration 150

g01446570

(A) Specified camshaft lobe lift

 Exhaust lobe 9.417 mm ((0.3707 inch))
 Inlet lobe 12.607 mm ((0.4963 inch))
 Injector lobe 12.703 mm ((0.5001 inch))

Use the following procedure in order to determine the actual camshaft lobe lift:

1. Measure the camshaft lobe height (B).
2. Measure the base circle (C).
3. Subtract the base circle (C) from the camshaft lobe height (B). The difference is the actual camshaft lobe lift.

i04638651

Camshaft

SMCS Code: 1210

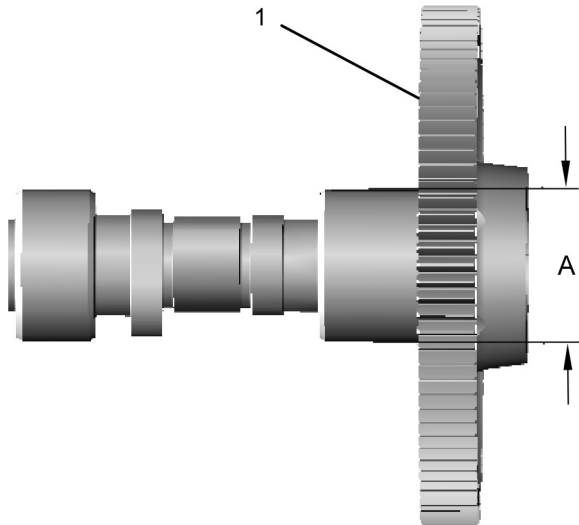


Illustration 151

g02783981

(1) Camshaft gear

(A) Diameter of camshaft bearing journal

..... 77.850 ± 0.025 mm ($(3.0650 \pm 0.0010$ inch))

The lobe on the camshaft for the injector has the most lift when the cam is at zero degrees of rotation.

..... 12.70327 ± 0.1 mm ($(0.50013 \pm 0.00394$ inch))

The lobe on the camshaft for the injector has 0.00 ± 0.05 mm (0.00000 ± 0.00197 inch) lift through the given rotation. 74 degrees to 254 degrees

When the injector lobe has an opening lift height of 5.23839 ± 0.038 mm (0.20624 ± 0.00150 inch), the camshaft should have an angle of rotation. 35 degrees

The lobe on the camshaft for the inlet has the most lift when the cam is at zero degrees of rotation.

..... 12.60667 ± 0.1 mm ($(0.49632 \pm 0.00394$ inch))

The lobe on the camshaft for the inlet has 0.00 ± 0.05 mm (0.00000 ± 0.00197 inch) lift through the given rotation. 78 degrees to 284 degrees

When the inlet lobe has an opening lift height of 5.13544 ± 0.2 mm (0.20218 ± 0.00787 inch), the camshaft should have an angle of rotation. 32 degrees

The lobe on the camshaft for the exhaust has the most lift when the cam is at zero degrees of rotation. 9.41704 ± 0.1 mm ($(0.37075 \pm 0.00394$ inch))

The lobe on the camshaft for the exhaust has 0.00 ± 0.05 mm (0.00000 ± 0.00197 inch) lift through the given rotation. 83 degrees to 279 degrees

When the exhaust lobe has an opening lift height of 5.57259 ± 0.2 mm (0.21939 ± 0.00787 inch), the camshaft should have an angle of rotation. 32 degrees

i05198752

Camshaft

SMCS Code: 1210

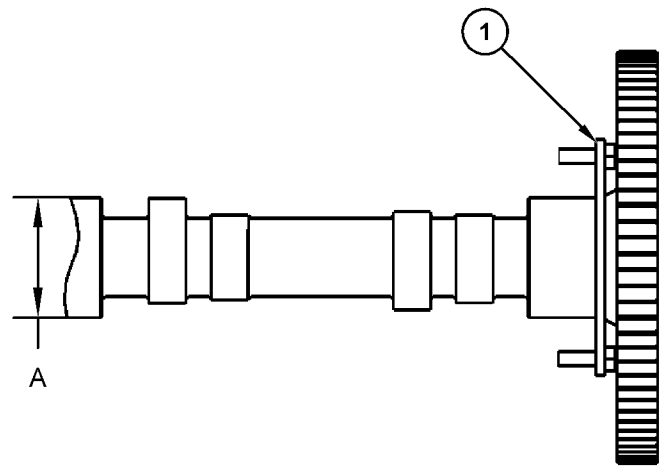


Illustration 152

g03331245

Table 53

Specification for 294 - 3593 Camshaft Gp			
Item	Qty	Part	Specification Description
1	1	107 - 7694 Thrust Plate	Thickness of a new thrust washer is 4.7 mm (0.19 inch). Distance between the shoulder of the camshaft and the shoulder of the gear is 4.83 ± 0.05 mm (0.190 ± 0.002 inch).
A	-	-	Diameter of camshaft bearing journal is 65.126 ± 0.013 mm (2.5640 ± 0.0005 inch).

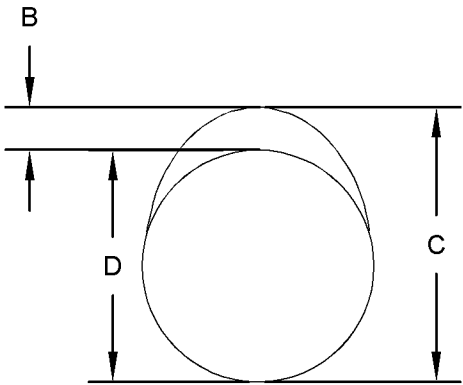


Illustration 153 g03331247

Table 54

Item	Qty	Part	Specification Description
-	-	-	Use the following procedure in order to determine the actual camshaft lobe lift: 1. Measure camshaft lobe height (C). 2. Measure base circle (D). 3. Subtract the base circle (D) from the camshaft lobe height (C). The difference is the actual camshaft lobe lift.
B	-	-	Specified camshaft lobe lift for: Inlet lobe is 9.366 mm (0.3687 inch). Exhaust lobe is 7.354 mm (0.2895 inch).

i05581609

Camshaft

SMCS Code: 1210

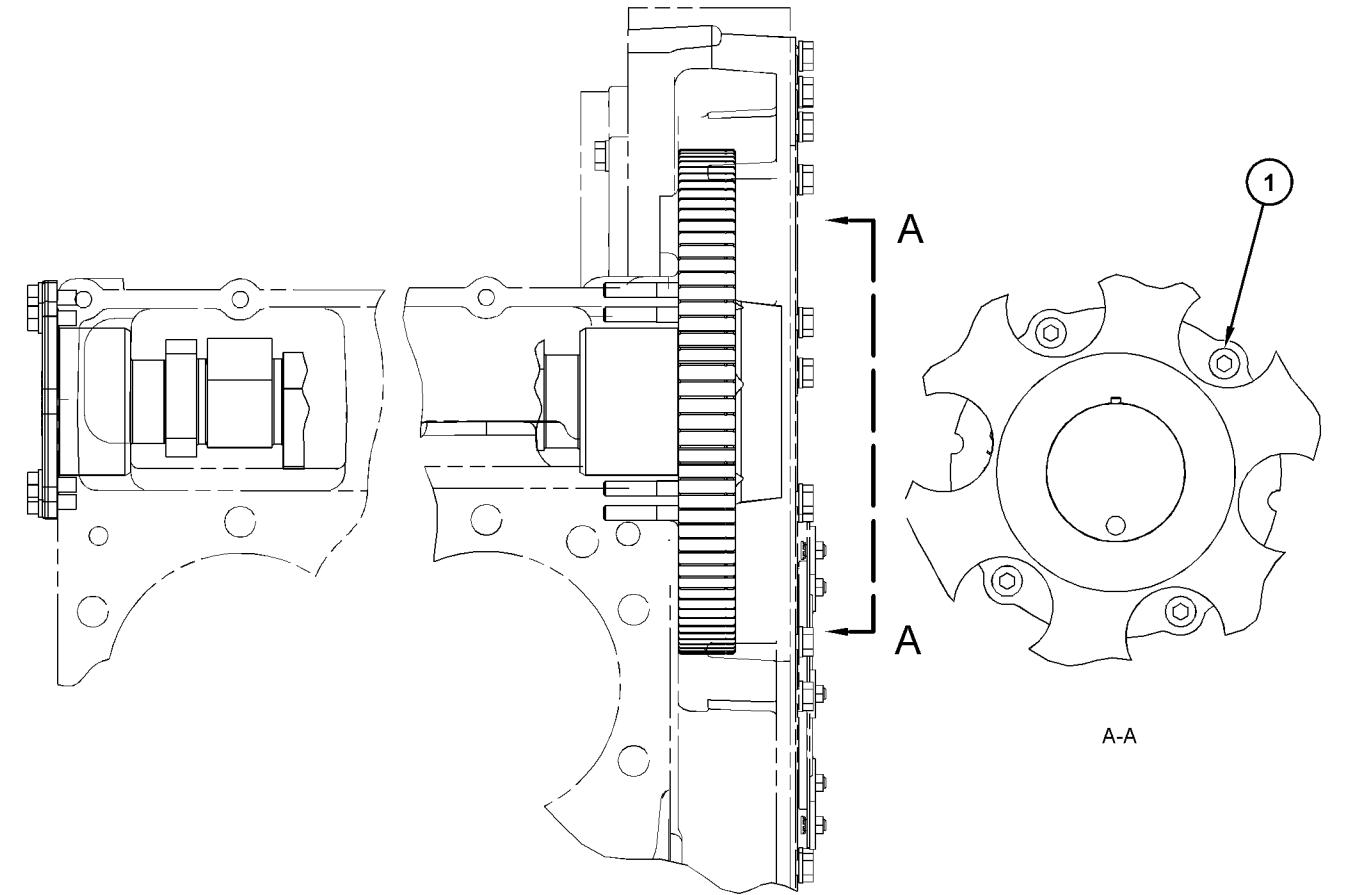


Illustration 154

g03369757

Table 55

Specification for 355 - 1288 Camshaft Gp			
Item	Qty	Part	Specification Description
1	4	8T - 0338 Bolt	Torque to 35 ± 8 N·m (26 ± 6 lb ft).

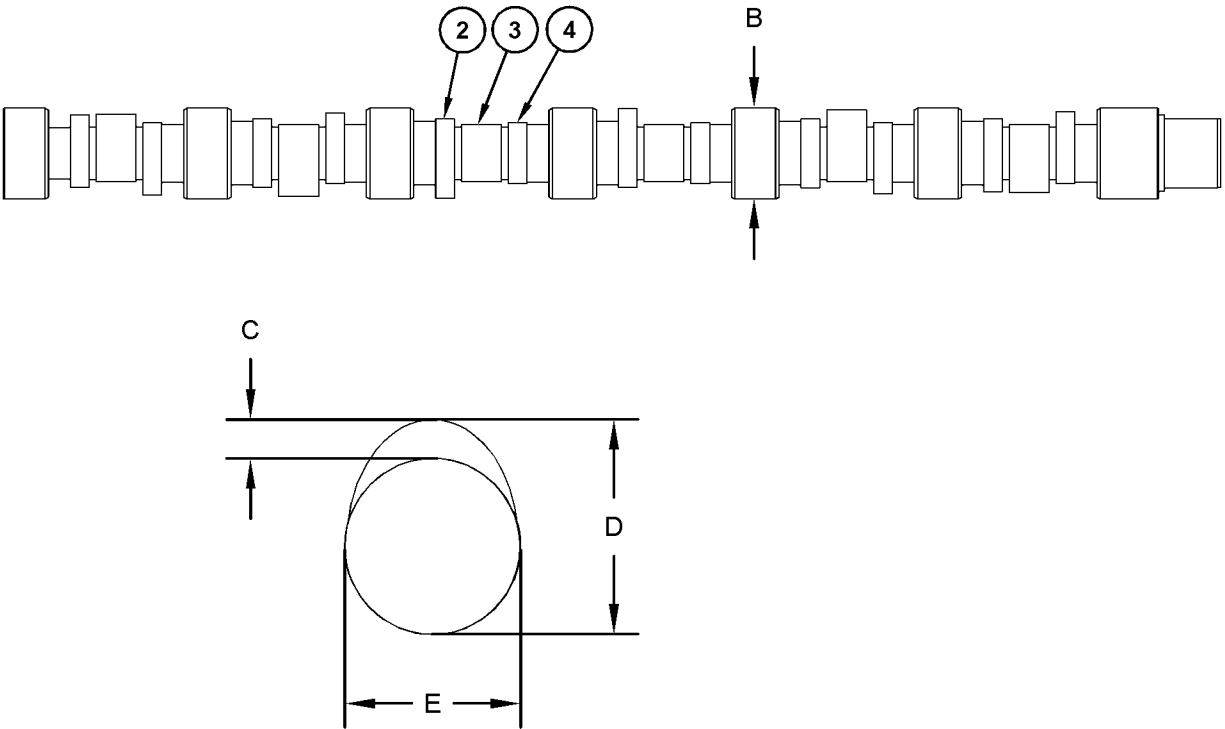


Illustration 155
344 - 9038 Camshaft

g03369759

Table 56

Item	Qty	Part	Specification Description
B	-	-	Diameter of camshaft bearing journal is 77.850 ± 0.025 mm (3.0650 ± 0.0010 inch).
2	-	-	Maximum exhaust lobe lift at zero degrees is 9.41655 mm (0.37073 inch).
3	-	-	Maximum injector lobe lift at zero degrees is 12.70343 mm (0.50013 inch).
4	-	-	Maximum inlet lobe lift at zero degrees is 12.60667 mm (0.49632 inch).
-	-	-	Use the following procedure to find the actual lobe lift (C):
-	-	-	1. Measure the camshaft lobe height (D).
-	-	-	2. Measure the base circle (E).
-	-	-	3. Subtract the base circle measurement in step 2 from the camshaft lobe height in step 1. The difference is the actual lobe lift.
-	-	-	The maximum permissible difference between the actual lobe lift in step 3 and the specified camshaft lobe lift of a new camshaft is ± 0.10 mm (± 0.0034 inch).

i02841054

Engine Oil Filter Base

SMCS Code: 1306

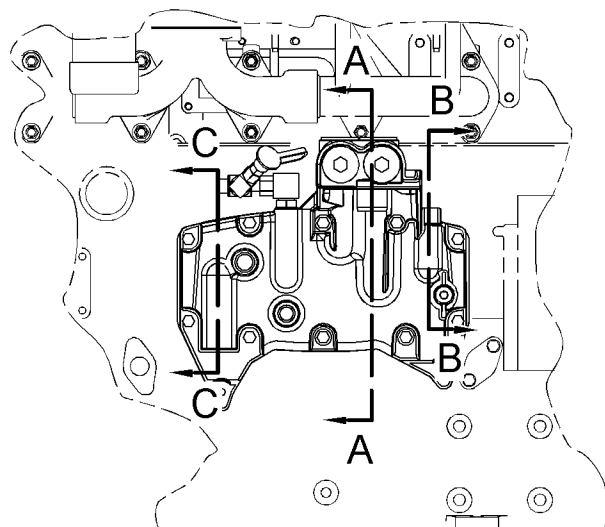


Illustration 156

g01417027

Note: The 242-3864 Spring is located in each of the bypass valves.

(2) 242-3864 Spring

Length under test force 43.18 mm
 ((1.700 inch))
 Test force 43.7 N ((9.8 lb))
 Free length after test 58.50 ± 0.50 mm
 ((2.303 ± 0.020 inch))
 Outside diameter 11 mm ((0.4 inch))

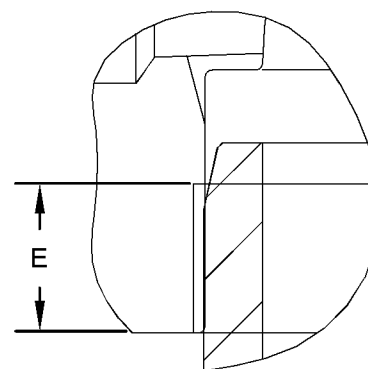


Illustration 158

g01417036

View of area D

(E) Length for applying 154-9731 Thread Lock Compound to the threads of the hollow stud
 10.0 ± 1.5 mm ((0.39 ± 0.06 inch))

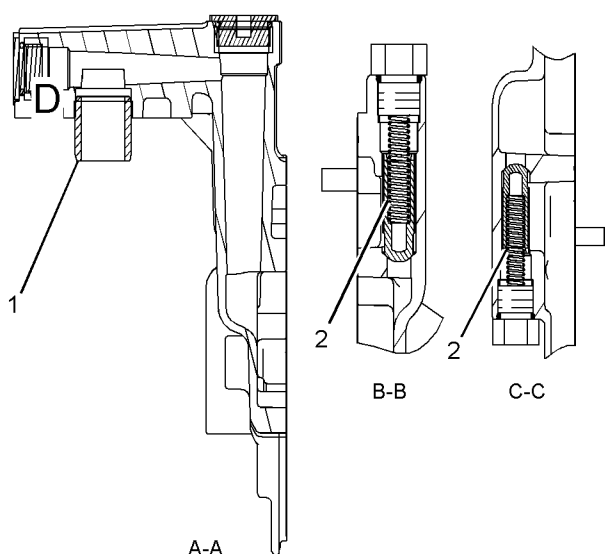


Illustration 157

g01417031

(1) Torque for the hollow stud 68 ± 7 N·m
 ((50 ± 5 lb ft))

i02841642

Engine Oil Filter Base

SMCS Code: 1306

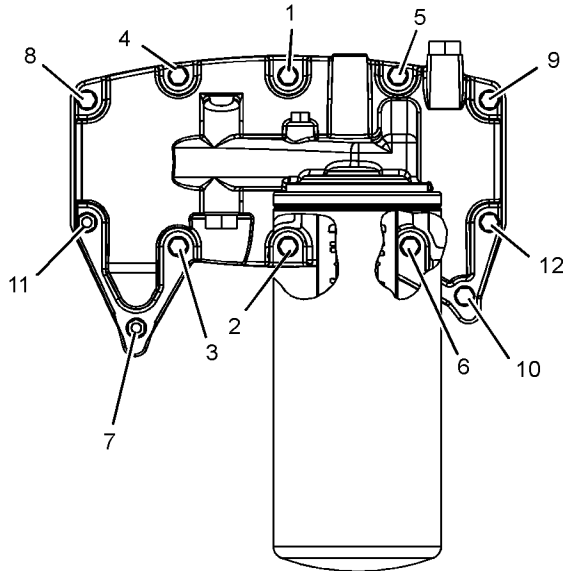


Illustration 159

g01419290

Bolt tightening sequence for oil filter base

Use the tightening sequence that is shown in Illustration 159 in order to torque the bolts for the oil filter base.

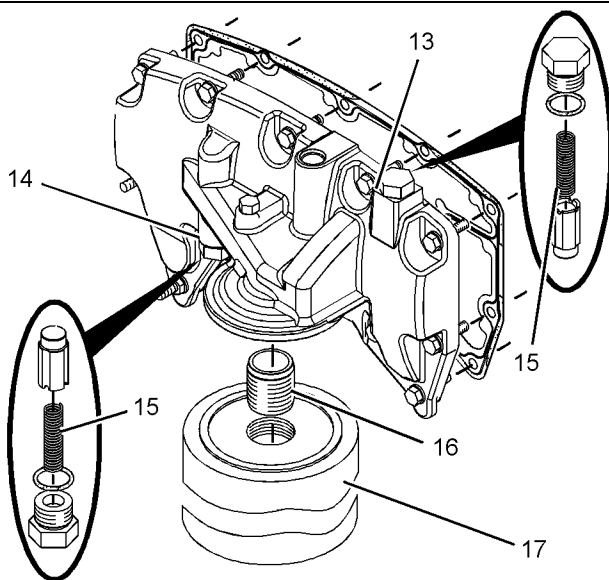


Illustration 160

g01419294

- (13) Oil cooler bypass valve
- (14) Oil filter bypass valve
- (17) Engine oil filter assembly

(15) 242-3864 Spring

Length under test force 43.18 mm
((1.700 inch))
Test force 43.7 N ((9.8 lb))
Free length after test 58.50 ± 0.50 mm
((2.303 ± 0.020 inch))
Outside diameter 11 mm ((0.4 inch))

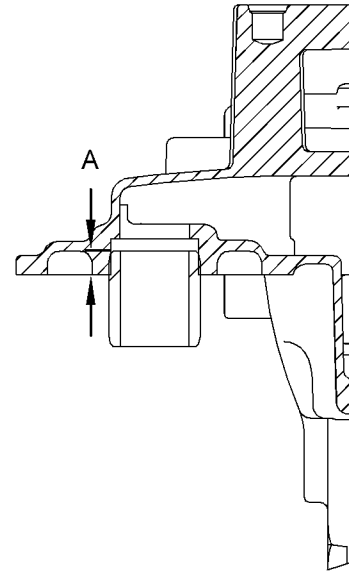


Illustration 161

g01417470

(A) Length for applying 154-9731 Thread Lock Compound to the threads of the hollow stud
..... 10.0 ± 1.5 mm ((0.39 ± 0.06 inch))

(16) Torque for the hollow stud 68 ± 7 N·m
((50 ± 5 lb ft))

i02921010

Engine Oil Filter Base

SMCS Code: 1306

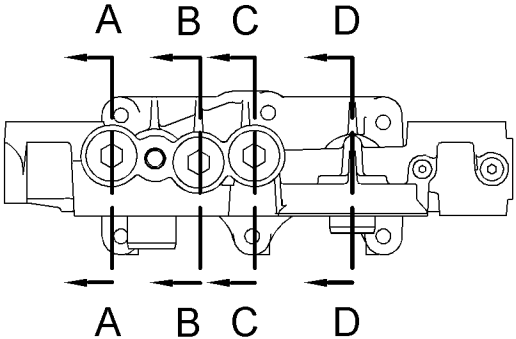


Illustration 162
Right side view

g01350923

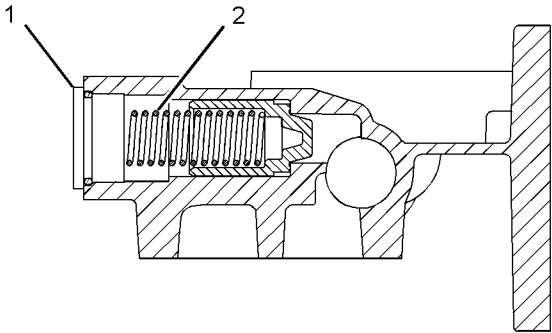


Illustration 163
Section A-A
Oil filter bypass

g01359083

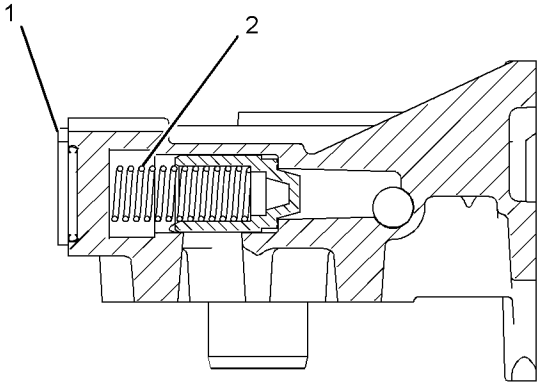


Illustration 164
Section B-B
Oil cooler bypass

g01350925

(1) Torque for the three plugs $100 \pm 15 \text{ N}\cdot\text{m}$
(($75 \pm 11 \text{ lb ft}$))

(2) 4N-8150 Spring

Quantity 2
Length under test force 55.24 mm
((2.175 inch))
Test force $75.619 \pm 5.800 \text{ N}$ (($17.0 \pm 1.3 \text{ lb}$))
Free length after test 93.726 mm
((3.6900 inch))
Outside diameter 20.6 mm ((0.81 inch))

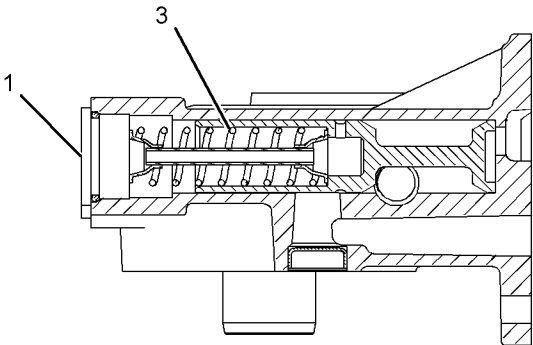


Illustration 165
Section C-C
Pump bypass valve

g01350927

(3) 2N-6005 Spring

Length under test force 96.52 mm
((3.800 inch))

Specifications Section

Test force	92.52 N ((21 lb))
Free length after test	124.71 mm
	((4.910 inch))
Outside diameter	21.84 mm ((0.860 inch))

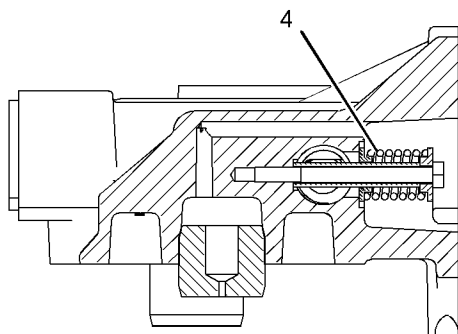


Illustration 166

g01350929

Section D-D

High pressure relief valve

(4) 1A-2170 Retainer Spring

Length under test force . . .	21.4 mm ((0.84 inch))
Test force	184.6 to 215.7 N ((41 to 48 lb))
Free length after test	31 mm ((1.2 inch))
Outside diameter	19.66 ± 0.20 mm
	((0.774 ± 0.008 inch))

Opening pressure for the engine oil filter bypass valve 204 kPa ((30 psi))

Closing pressure for the engine oil filter bypass valve 132 kPa ((19 psi))

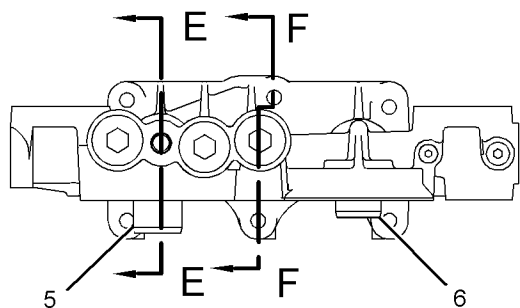


Illustration 167

g01452110

Right side view

(5) Torque for the hollow stud 68 ± 7 N·m
((50 ± 5 lb ft))

(6) Torque for the filter base stud 68 ± 7 N·m
((50 ± 5 lb ft))

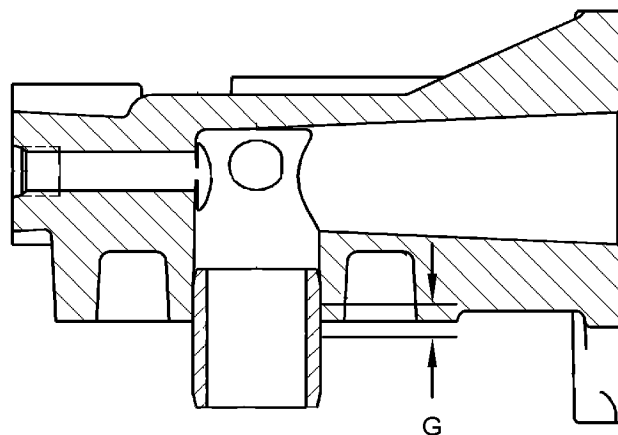


Illustration 168

g01452111

Section E-E

(G) Length for applying 154-9731 Thread Lock Compound to the threads of the hollow stud
..... 10.5 ± 1.5 mm ((0.41 ± 0.06 inch))

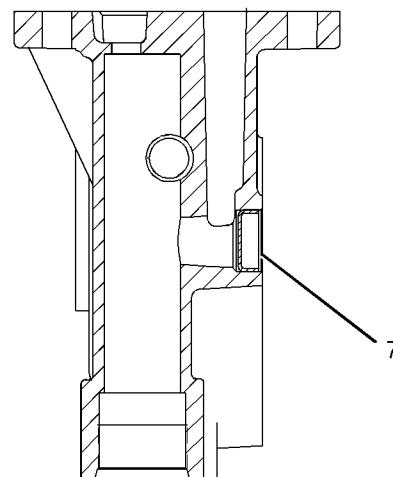


Illustration 169

g01452113

Section F-F

i03001185

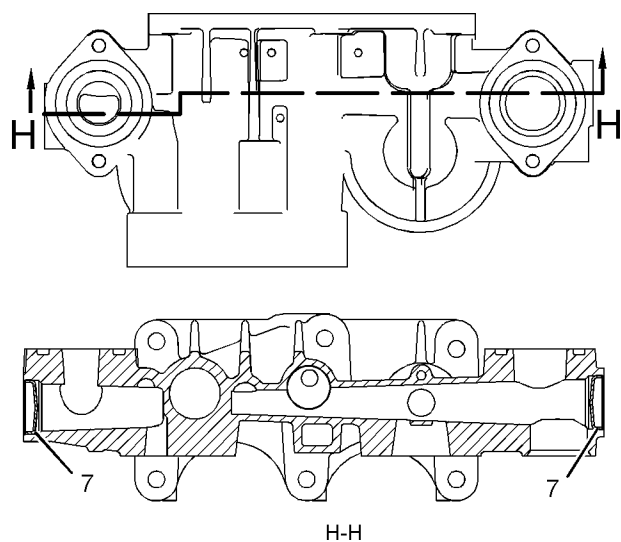


Illustration 170

g01452114

(7) Apply 6V-6640 Sealant to the bores of the cup plugs prior to assembly.

Engine Oil Filter Base

SMCS Code: 1306

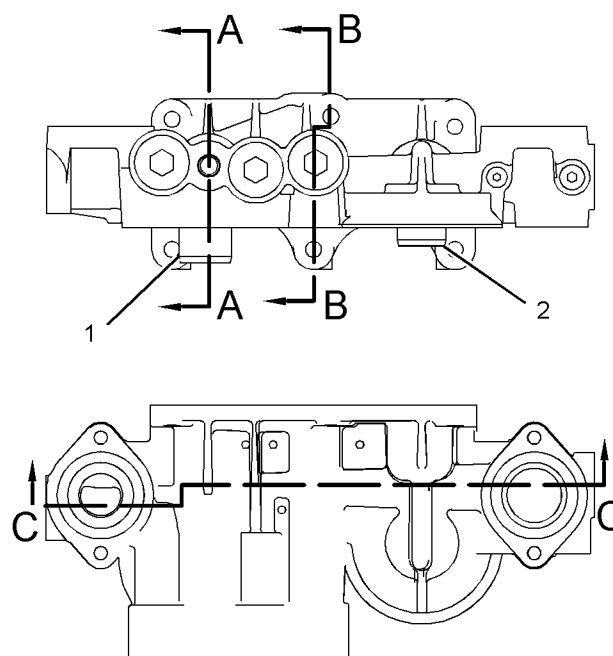


Illustration 171

g01521184

Engine oil filter base

- (1) Torque for the hollow stud $68 \pm 7 \text{ N}\cdot\text{m}$
((50 ± 5 lb ft))
- (2) Torque for the filter base stud $68 \pm 7 \text{ N}\cdot\text{m}$
((50 ± 5 lb ft))

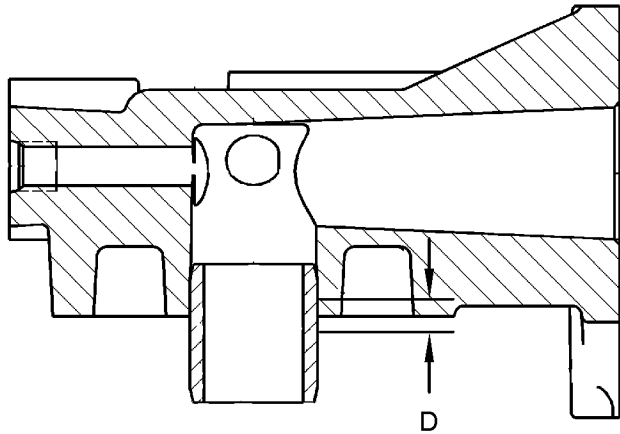


Illustration 172

g01521185

Section A-A

(D) Apply 154 - 9731 Thread Lock Compound to the threads of the hollow stud to the following length.
 10.5 ± 1.5 mm ($(0.41 \pm 0.06$ inch))

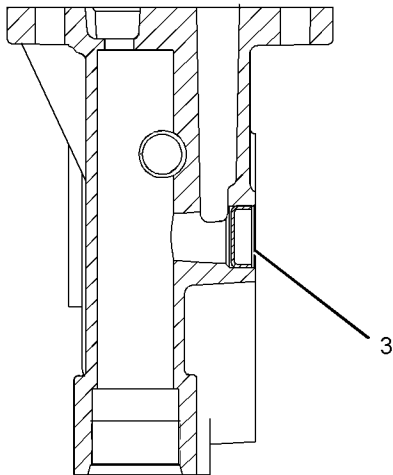


Illustration 173

g01367915

Section B-B

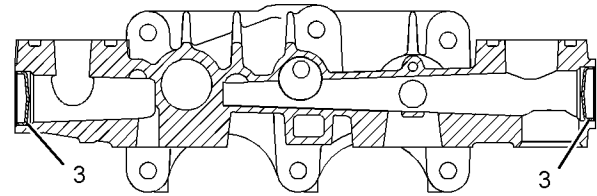


Illustration 174

g01521183

Section C-C

(3) Apply 6V - 6640 Sealant to the bores of the cup plugs prior to assembly.

i03207820

Engine Oil Filter Base

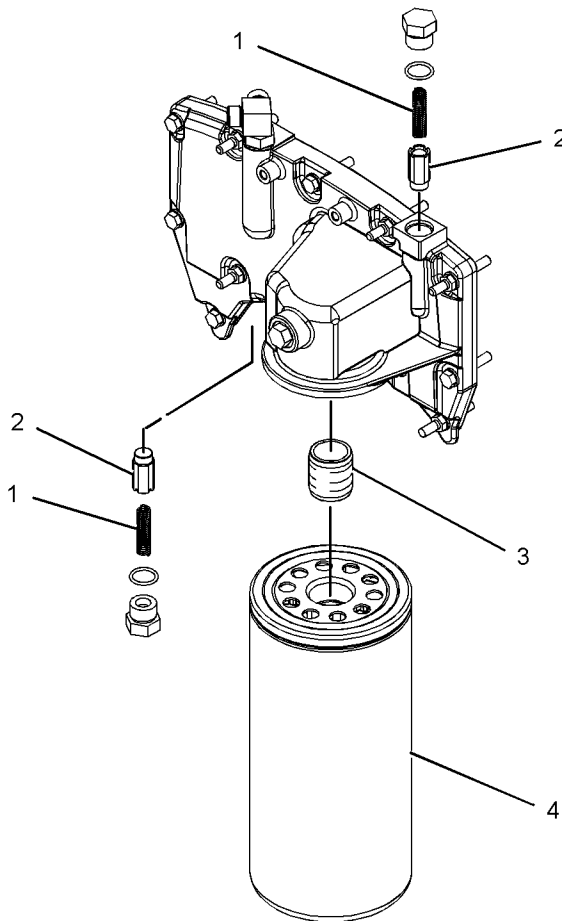
SMCS Code: 1306

Illustration 175

g01268423

(1) 242-3864 Spring

Quantity	2
Length under test force	43.18 mm (1.700 inch)
Test force	43.7 N ((9.8 lb)
Free length after test	58.50 ± 0.50 mm (2.303 ± 0.020 inch)
Outside diameter	11.0 mm ((0.43 inch))

(2) The oil filter bypass valves must open at the following pressure. . . 125 ± 30 kPa (18.1 ± 4.4 psi)

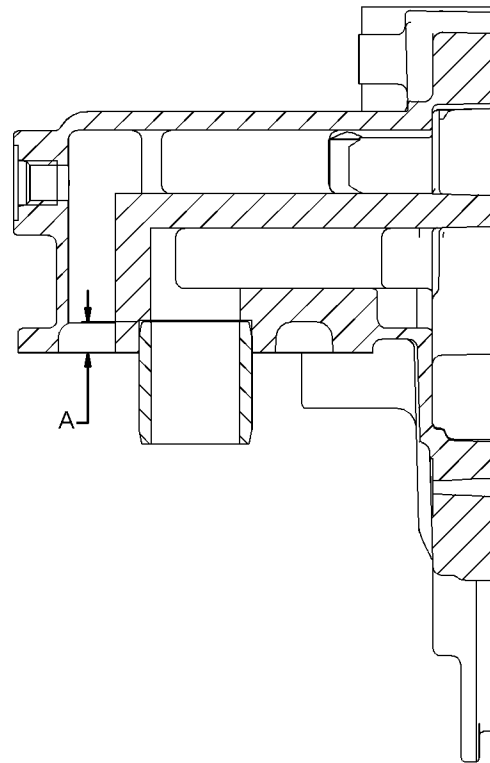


Illustration 176

g01268425

(A) Prior to installing the stud into the engine oil filter base, apply 9S-3263 Thread Lock Compound to the base end of the stud. Length 10.0 ± 1.5 mm
(0.39 ± 0.06 inch))

(3) Torque for the stud $68 \pm 7 \text{ N}\cdot\text{m}$ ($50 \pm 5 \text{ lb ft}$)

(4) Use clean unused engine oil to lubricate the oil filter's seal. Tighten the filter until the seal contacts the base. Hand tighten the filter for an additional 3/4 turn (270 degrees).

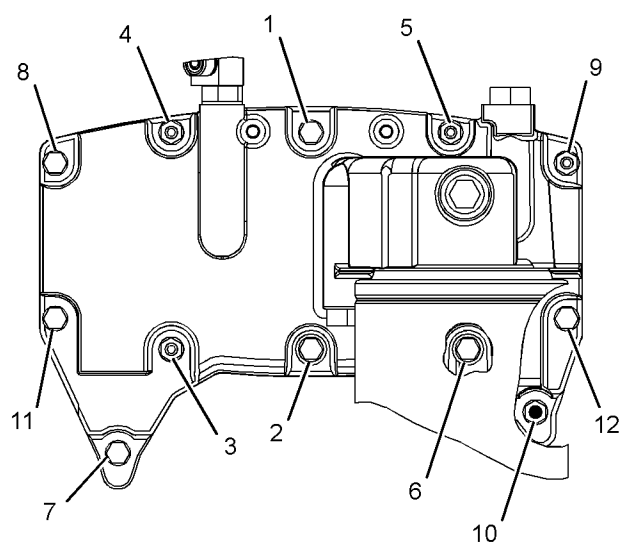


Illustration 177

g01268417

Tighten the engine oil filter base in a numerical sequence to the standard torque.

i04498870

Engine Oil Filter Base

SMCS Code: 1306

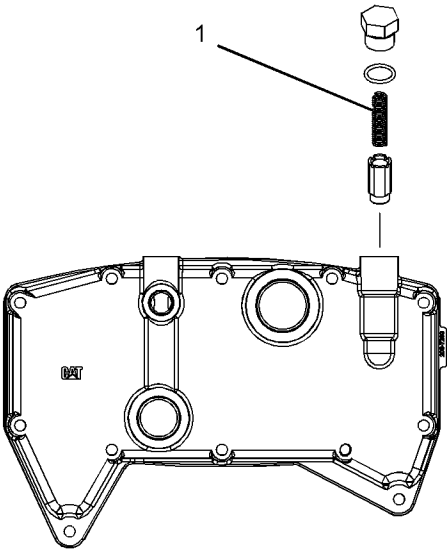


Illustration 178 g02678279

Table 57

Specification for 344 - 5154 Oil Filter Base Gp			
Item	Qty	Part	Specification Description
1	1	242-3864 Spring	Length under test force is 43.18 mm (1.700 inch).
			Test force is 43.7 N (9.8 lb).
			Free length after test is 58.50 ± 0.50 mm (2.303 ± 0.020 inch).

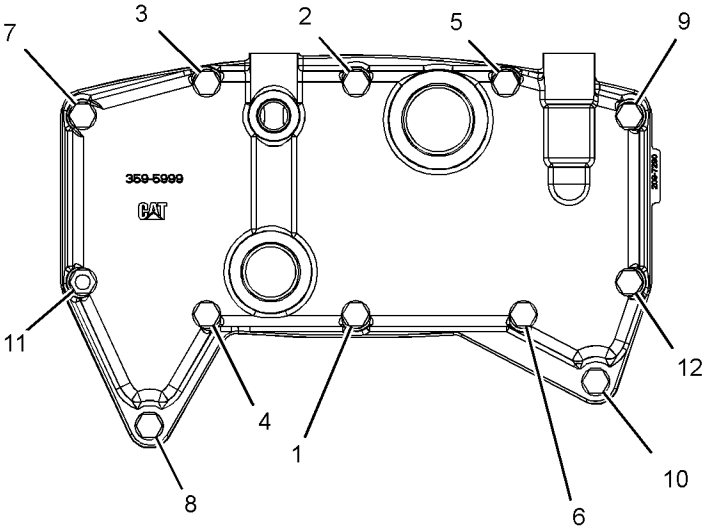


Illustration 179 g02678280

Table 58

Specification for 344 - 5154 Oil Filter Base Gp			
Item	Qty	Part	Specification Description
-	-	-	Tighten the 359 - 5999 Base bolts in a numerical sequence as shown in the Illustration 179 to the standard torque.

i05198136

Engine Oil Filter Base

SMCS Code: 1306

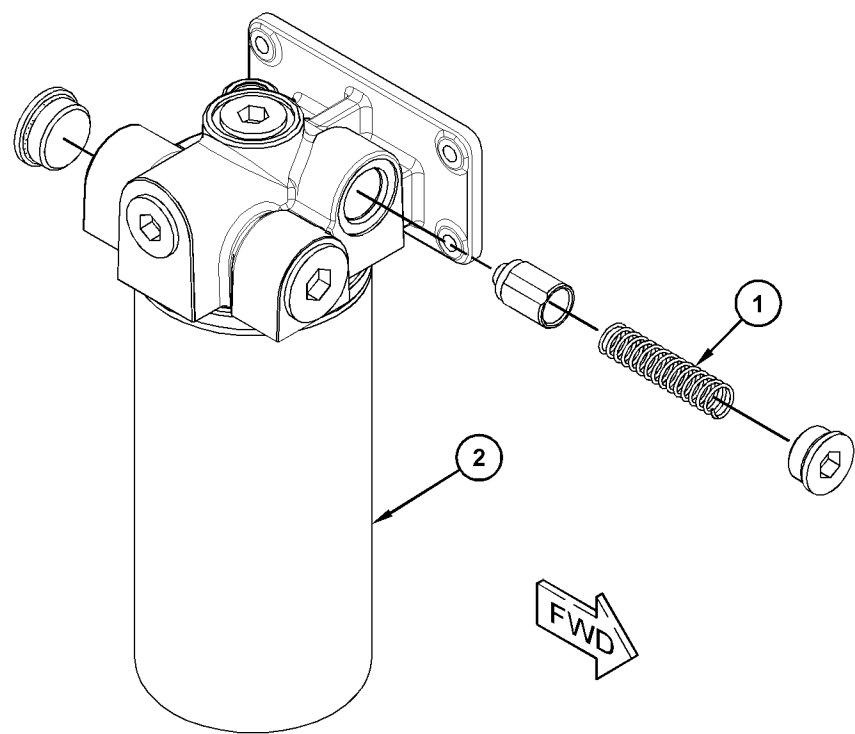


Illustration 180

g03330775

Table 59

Specification for 350 - 6627 Engine Oil Filter Gp			
Item	Qty	Part	Specification Description
1	1	4N - 8150 Spring	Length under test force is 55.24 mm (2.175 inch). Test force is 75.619 ± 5.800 N (18.000 ± 1.304 lb). Free length after test is 93.726 mm (3.6900 inch)
2	1	1R - 1808 Engine Oil Filter	Lubricate the seal with 309 - 6932 Hydraulic Oil.

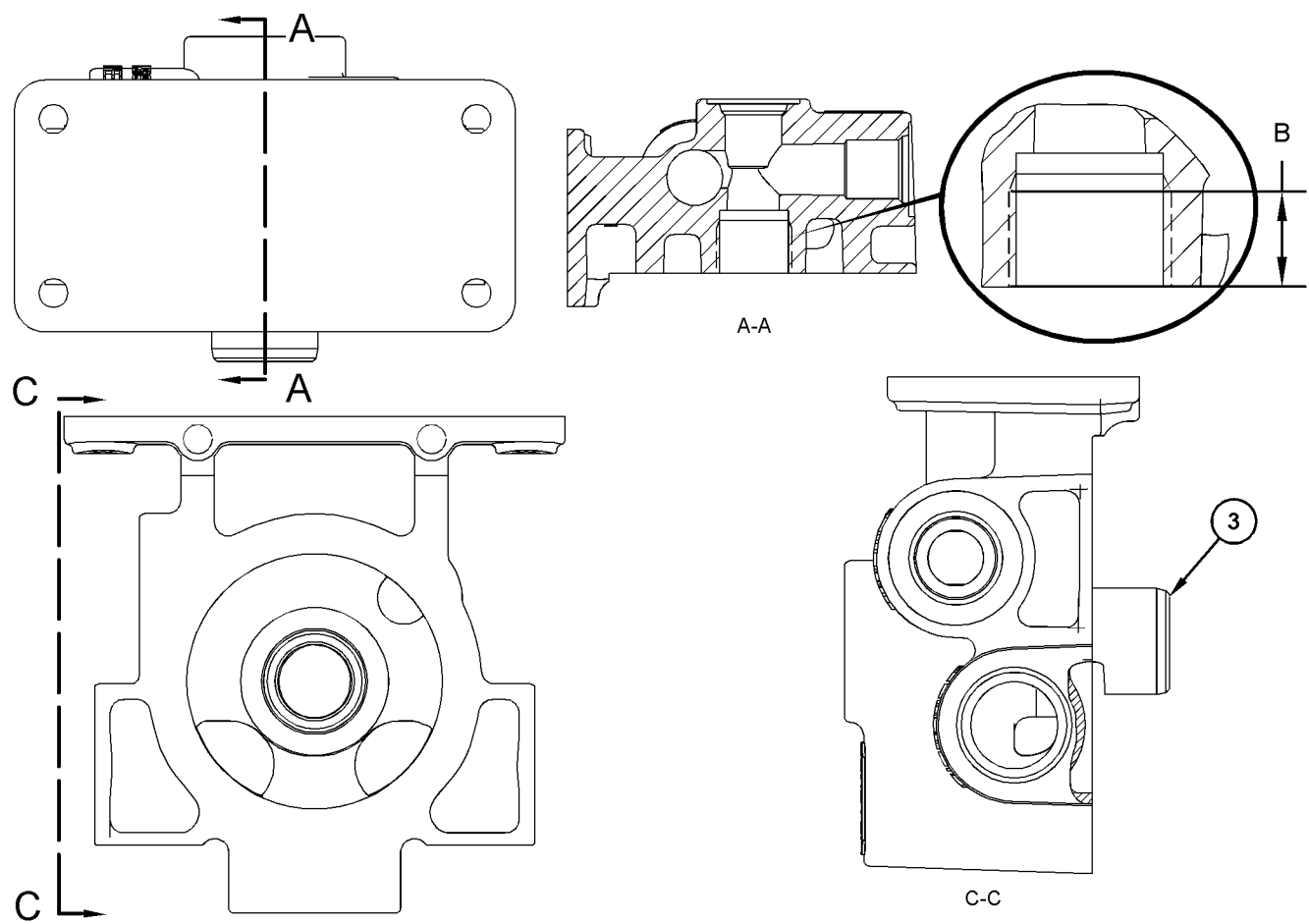


Illustration 181
362-3515 Oil Filter Base As

g03330777

Table 60

Item	Qty	Part	Specification Description
B	1	362-5032 Taperlock Stud	Length for applying red Loctite 271 to the threads of the taperlock stud is 20.0 ± 0.8 mm (0.79 ± 0.03 inch).
3			Torque to 68 ± 7 N·m (50 ± 5 lb ft).

i05304040

Engine Oil Filter Base

SMCS Code: 1306

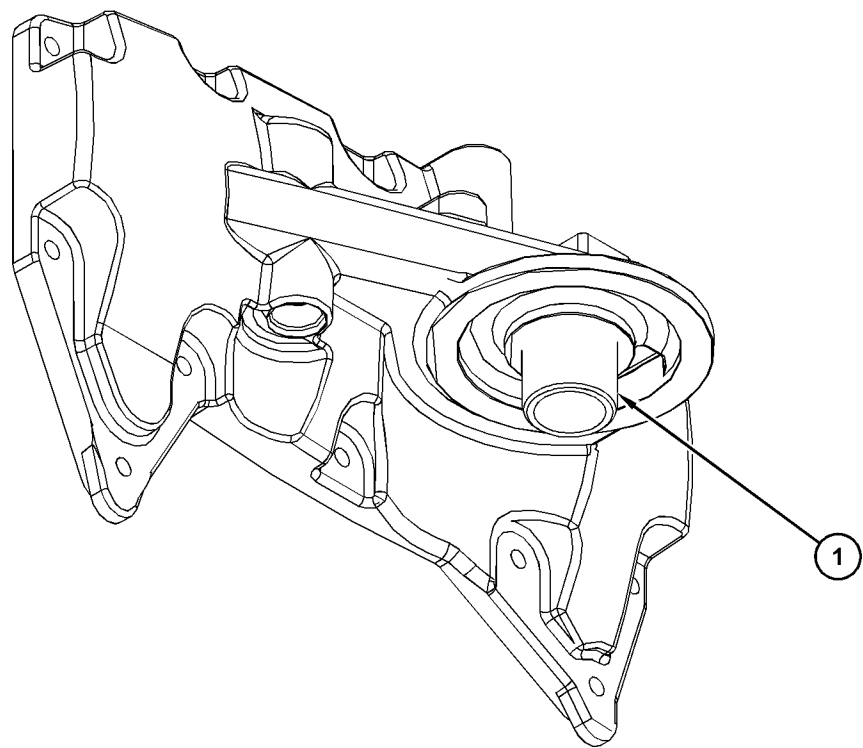


Illustration 182 g03366396

Table 61

Specification for 209 - 7291 Oil Filter Base As			
Item	Qty	Part	Specification Description
1	1	2P - 4304 Hollow Stud	Apply red Loctite 271 to threads. Torque to 68 ± 7 N·m (50 ± 5 lb ft).

i05317093

Engine Oil Filter Base

SMCS Code: 1306

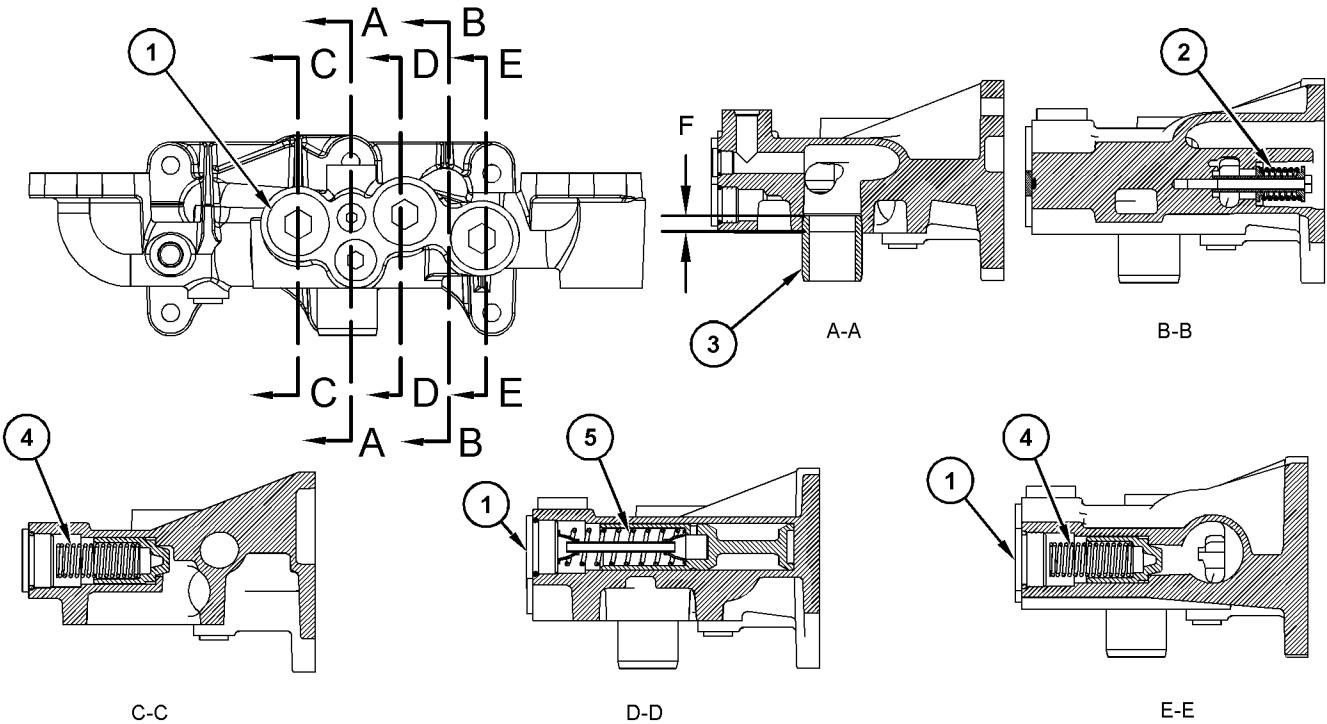


Illustration 183

g03369792

Table 62

Specification for 281 - 8367 Oil Filter Base Gp			
Item	Qty	Part	Specification Description
1	3	319-6234 Plug As	Torque to 100 ± 15 N·m (74 ± 11 lb ft).
2	1	1A-2170 Retainer Spring	Length under test force is 21.4 mm (0.84 inch). Test force is 184.6 to 215.7 N (41.5 to 48.5 lb). Free length after test is 31 mm (1.2 inch).
3	1	2P-4304 Hollow Stud	Apply red Loctite 271 to the length (F) of 10.5 ± 1.5 mm (0.41 ± 0.06 inch). Torque to 68 ± 7 N·m (50 ± 5 lb ft).
4	2	4N-8150 Spring	Length under test force is 55.24 mm (2.175 inch). Test force is 75.619 ± 5.800 N (17.000 ± 1.304 lb). Free length after test is 93.726 mm (3.6900 inch).
5	1	2N-6005 Spring	Length under test force is 96.52 mm (3.800 inch). Test force is 92.52 N (20.80 lb). Free length after test is 124.71 mm (4.910 inch).

i05581471

Engine Oil Filter Base

SMCS Code: 1306

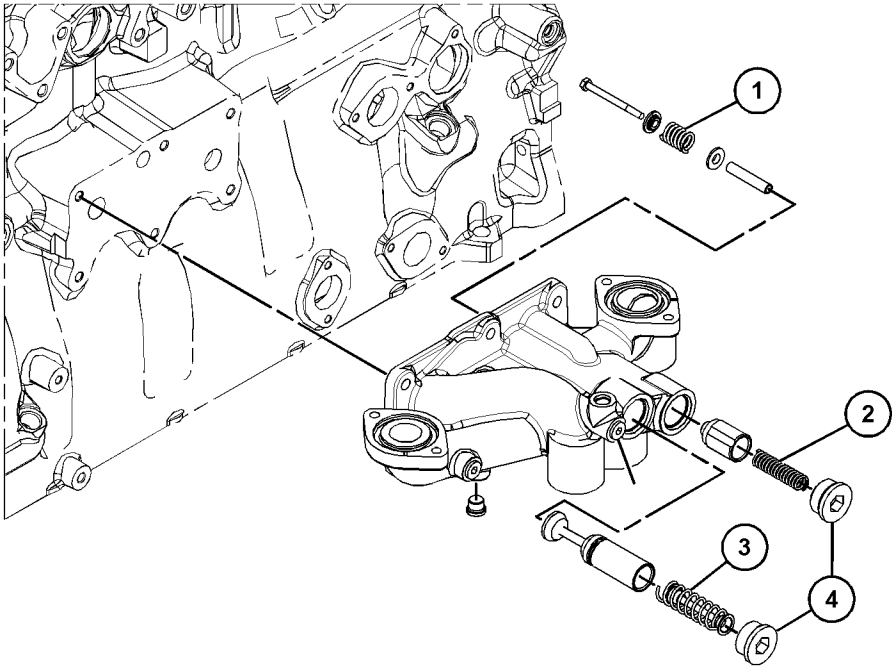


Illustration 184

g03540428

Table 63

Specification for 369-0818 Oil Filter Base Gp			
Item	Qty	Part	Specification Description
1	1	1A-2170 Retainer Spring	Length under test force is 21.4 mm (0.84 inch). Test force is 184.6 to 215.7 N (41.5 to 48.5 lb). Free length after test is 31 mm (1.2 inch).
2	1	4N-8150 Spring	Length under test force is 55.24 mm (2.175 inch). Test force is 75.619 ± 5.800 N (17.000 ± 1.304 lb). Free length after test is 93.726 mm (3.6900 inch).
3	1	2N-6005 Spring	Length under test force is 96.52 mm (3.800 inch). Test force is 92.52 N (20.80 lb). Free length after test is 124.71 mm (4.910 inch).
4	2	319-6234 Plug As	Torque to 100 ± 15 N·m (74 ± 11 lb ft).

i06058716

Engine Oil Filter Base

SMCS Code: 1306

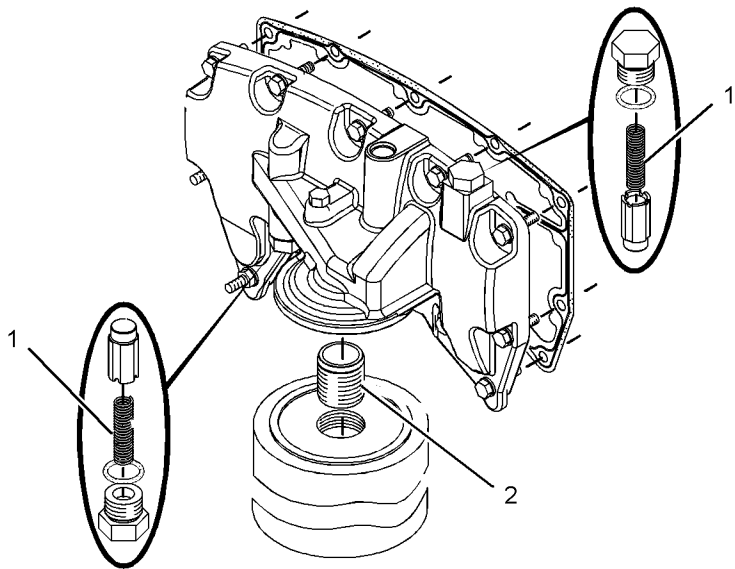


Illustration 185 g03794606

Table 64

Specification for 458-8815 Engine Oil Filter Gp			
Item	Qty	Part	Specification Description
1	1	242-3864 Spring	Length under test force is 43.18 mm (1.700 inch).
			Test force is 43.7 N (9.8 lb).
			Free length after test is 58.50 ± 0.50 mm (2.303 ± 0.020 inch).
2	1	2P-4304 Hollow Stud	Before assembly, apply red Loctite 263 to the threads. Torque to 68 ± 7 N·m (50 ± 5 lb ft).

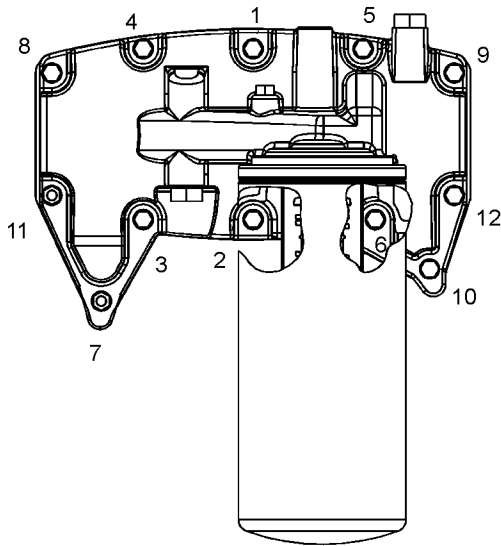


Illustration 186 g03794605

Table 65

Item	Qty	Part	Specification Description
-	-	-	Tighten the bolts in a numerical sequence as shown in the Illustration 186 to $28 \pm 7 \text{ N}\cdot\text{m}$ ($248 \pm 62 \text{ lb in}$).

i07979542

Engine Oil Filter Base

SMCS Code: 1306

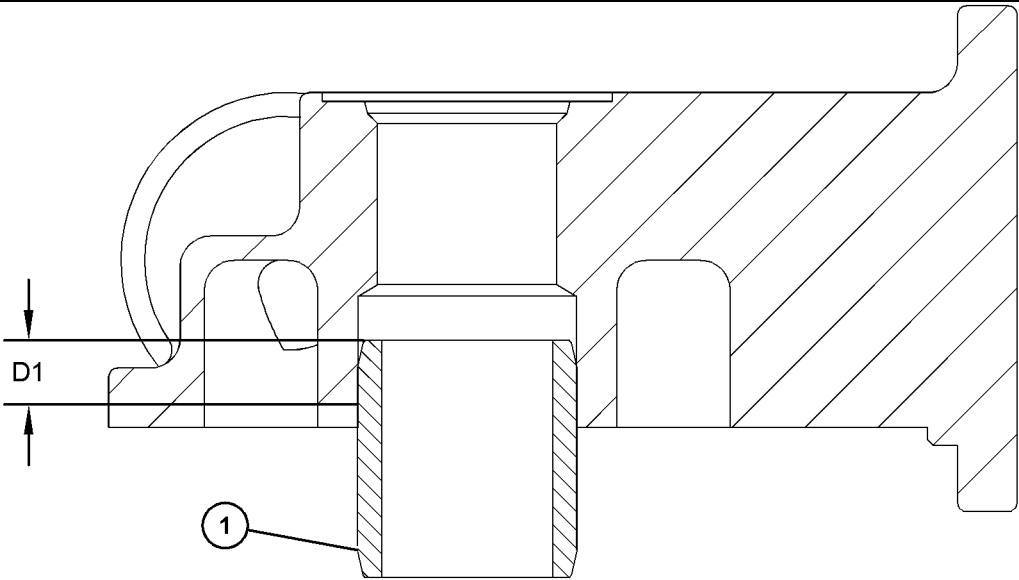


Illustration 187

g06497844

Table 66

Item	Qty	Part	Specification Description
1	1	2P - 4304 Hollow Stud	Use the following procedure to tighten the stud: 1. Apply Loctite ® 263 ⁽¹⁾ and Loctite ® 270 ⁽²⁾ on the tapered end of the hollow stud to the length of 10.0 mm (0.39 inch). 2. Torque to 80 ± 15 N·m (59 ± 11 lb ft).

⁽¹⁾ U.S. and rest of the world.
⁽²⁾ Europe only.

i07257520

Engine Oil Filter

SMCS Code: 1318

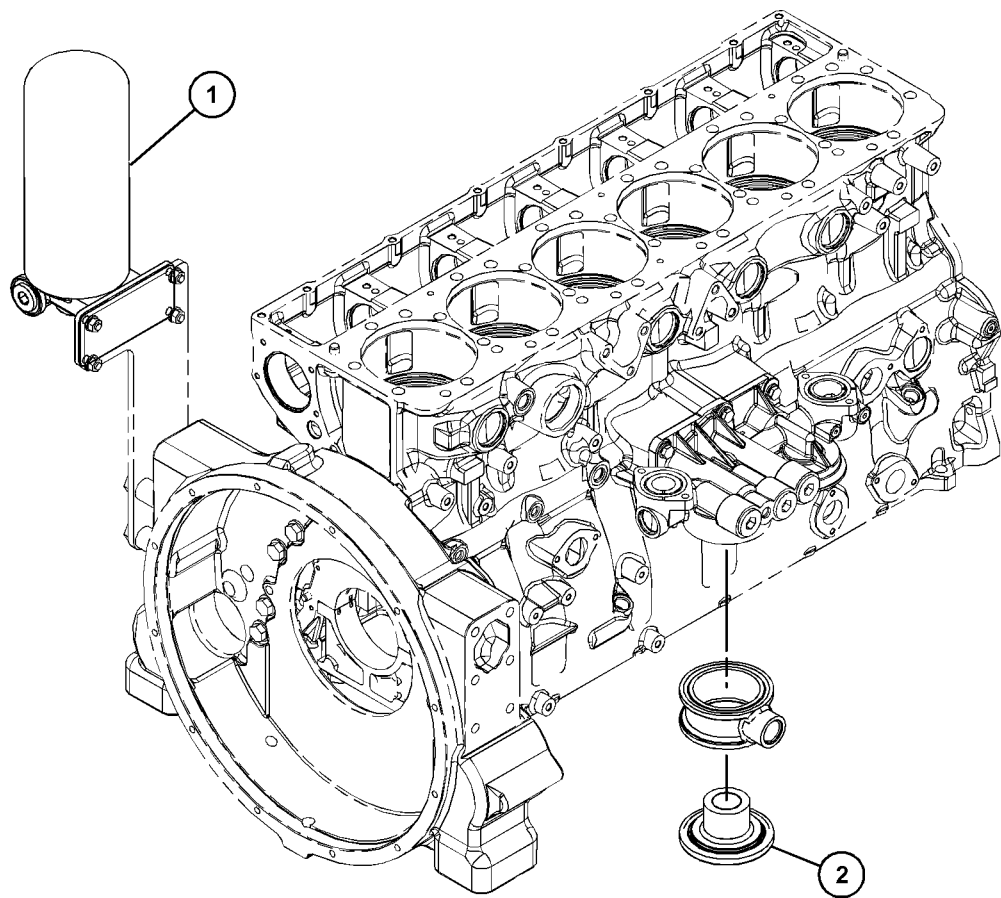


Illustration 188

g06267170

Table 67

Item	Qty	Part	Specification Description
1	1	1R - 1808 Engine Oil Filter	Before assembly, lubricate the seal with clean oil. Tighten to one full turn after the filter gasket contacts with filter base assembly.
2	1	102 - 5828 Cover	Torque to 70 ± 10 N.m (52 ± 7 lb ft).

i03926173

Engine Oil Cooler

SMCS Code: 1378

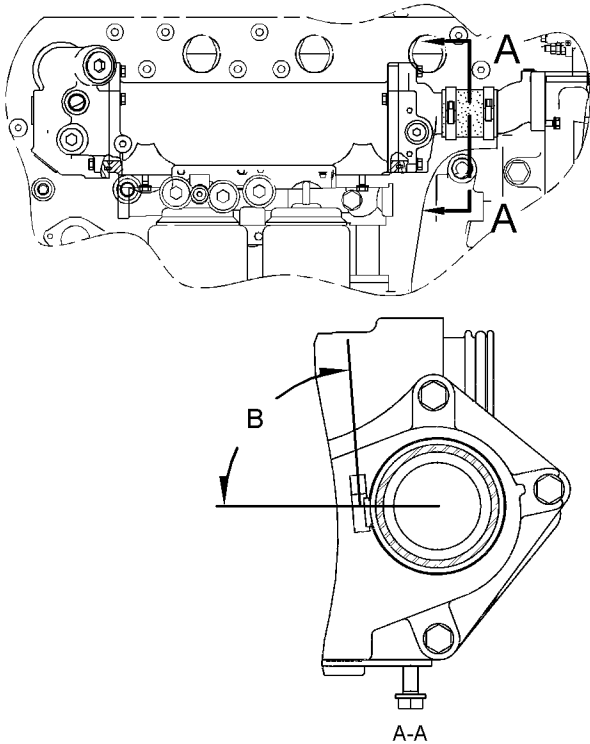


Illustration 189 g02152910
Right side view of engine

(B) Install the band clamps at the following angle
..... 85 ± 5 degrees

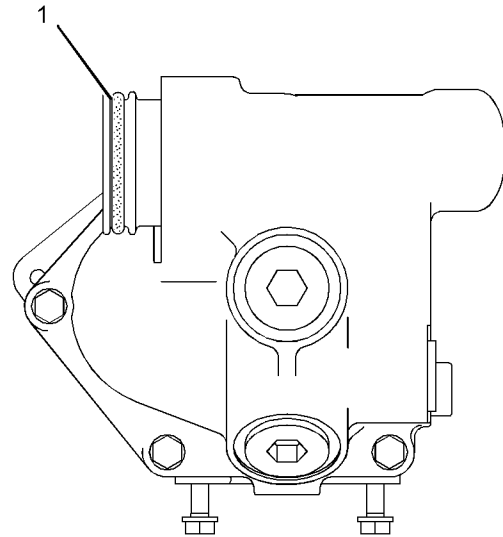


Illustration 190 g02152908
Rear view of engine

(1) Before assembly apply rubber lubricant to the bore for two O-ring seals.

i04041568

Engine Oil Cooler

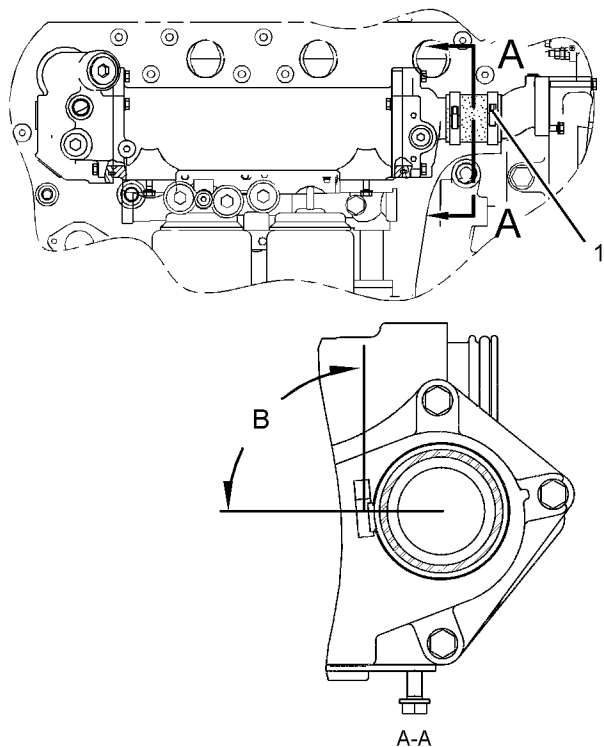
SMCS Code: 1378

Illustration 191

g02250653

Right side view of engine

(B) Install the band clamps at the following angle
..... 90 ± 5 degrees

(1) Torque for band clamps 14 ± 1 N·m
((125 ± 9 lb in))

i05581670

Engine Oil Cooler

SMCS Code: 1378

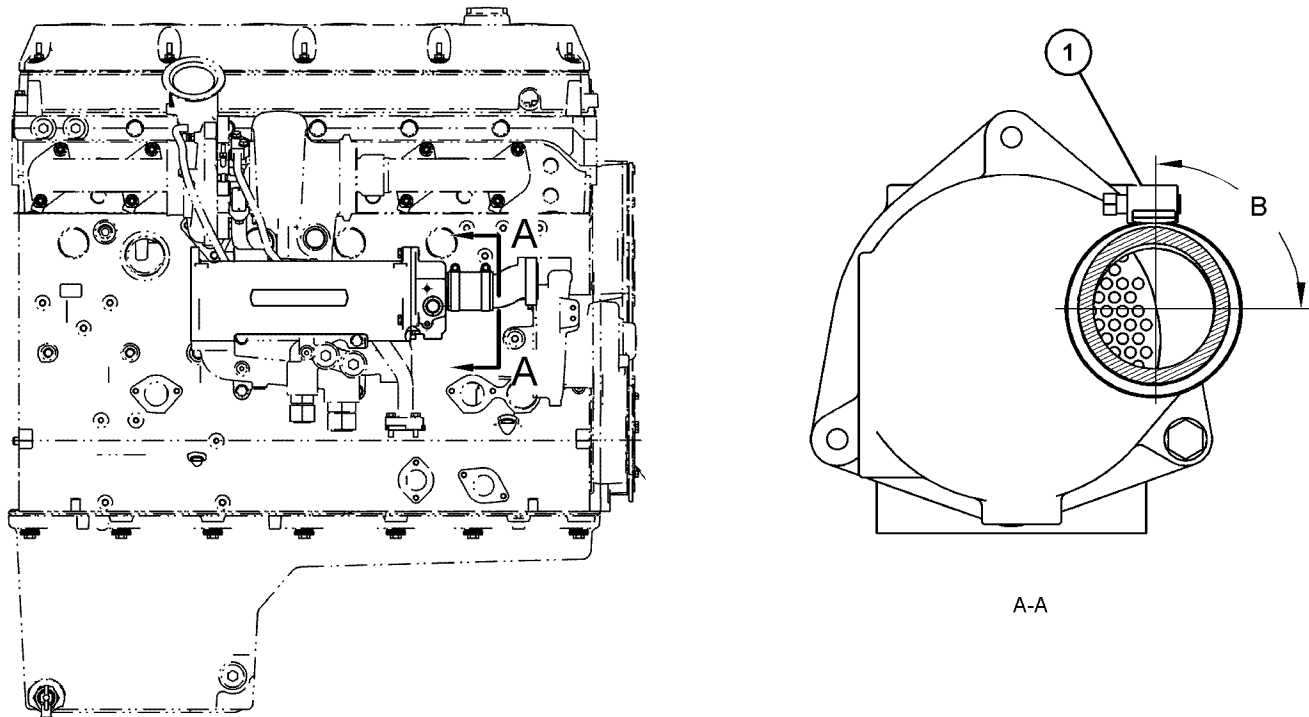


Illustration 192

g03540656

Table 68

Specification for 379-2168 Engine Oil Cooler Gp			
Item	Qty	Part	Specification Description
1	2	335-9214 Band Clamp	Install the band clamps at an angle (B) of 90 ± 15 degrees.

i06799115

Engine Oil Cooler

SMCS Code: 1378

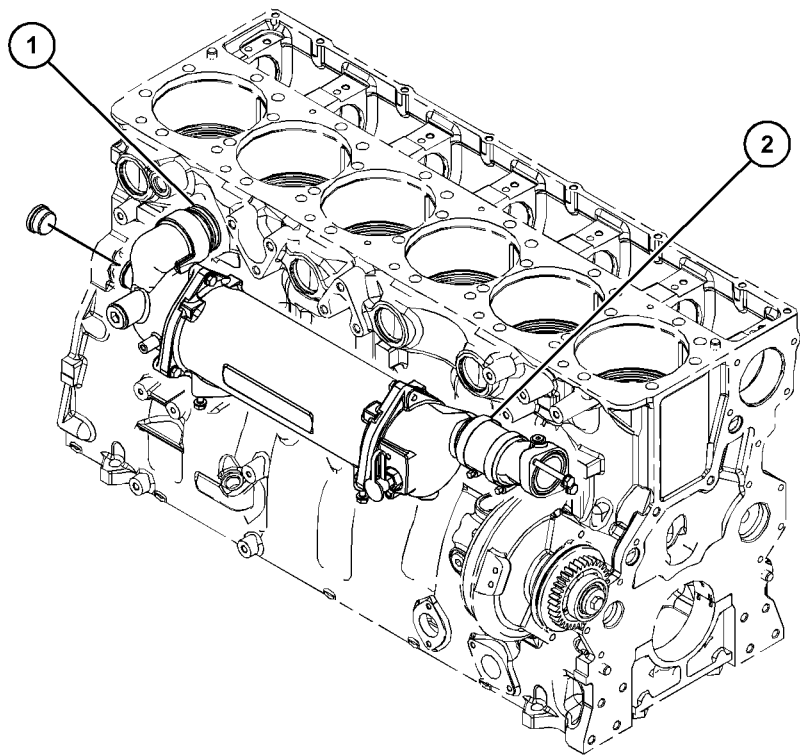


Illustration 193 g06119512

Table 69

Specification for 430 - 2533 Engine Oil Cooler Gp			
Item	Qty	Part	Specification Description
1	2	2N - 5243 O-Ring Seal	Lubricate the bore lightly with 5P - 3975 Rubber Lubricant.
2	2	335 - 9214 Band Clamp	Install the band clamps at an angle of 90 ± 15 degrees. Torque to 14 ± 1 N·m (124 ± 9 lb in).

i03096860

Engine Oil Pump

SMCS Code: 1304

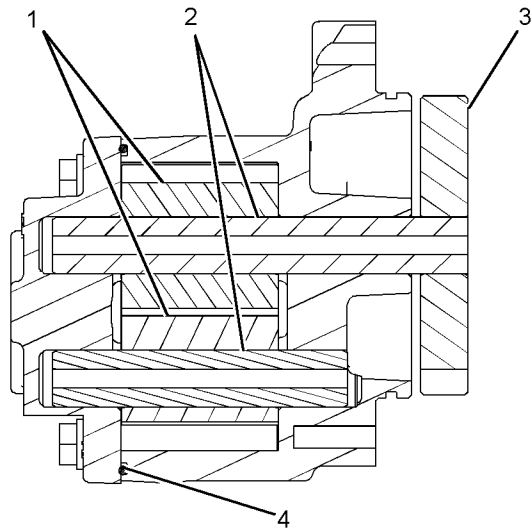


Illustration 194
(4) O-ring seal

NOTICE

Before operating the engine, the oil pump must be lubricated with clean engine oil. The oil pump must turn freely by hand. Damage to the drive gear and internal pump damage can occur if the oil pump is not lubricated with clean engine oil.

Oil type SAE 30
Oil temperature 50 °C ((122 °F))
Pump speed 3000 rpm
Oil pressure 359 kPa ((52 psi))
Minimum oil flow 185 L/min ((49 US gpm))

(1) Gear

Length of the new gear 50.000 ± 0.025 mm
((1.9685 ± 0.0010 inch))
Depth of bore in oil pump body for the gear
. 50.13 mm ((1.974 inch))

Note: Gears may be heated to a maximum temperature of 316 °C (601 °F) for installation in the shaft.

(2) Oil pump shaft assembly

Diameter of the shaft 18.000 ± 0.005 mm
((0.7087 ± 0.0002 inch))
Bore in oil pump body for the shaft
. . . . 18.050 ± 0.010 mm ((0.7106 ± 0.0004 inch))

(3) Oil pump drive gear may be heated to a maximum temperature of 316 °C (601 °F) for installation in the shaft.

i04653129

Engine Oil Pump

SMCS Code: 1304

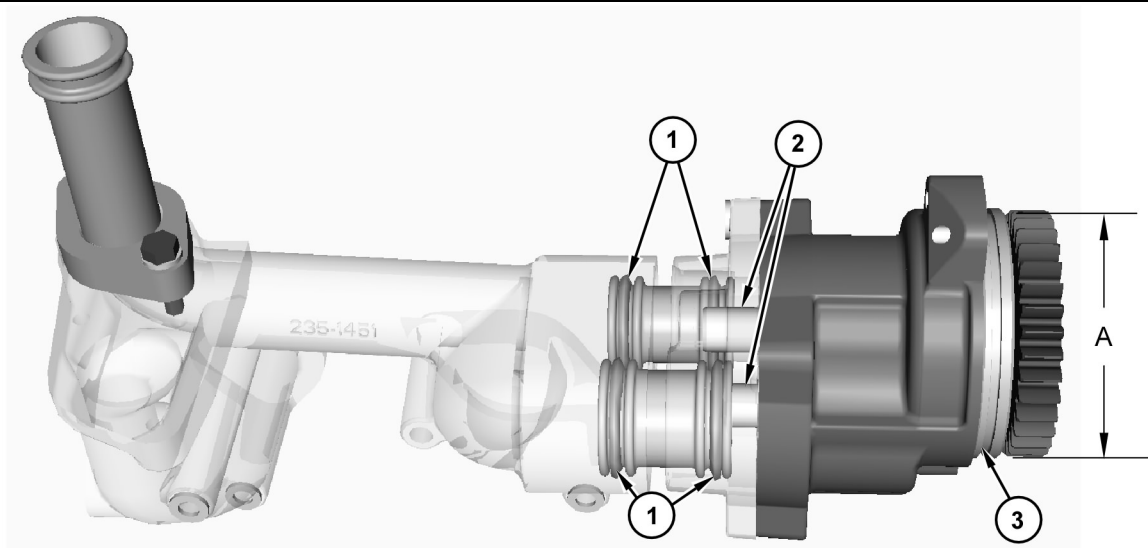


Illustration 195

g02790671

NOTICE

Before operating the engine, the oil pump must be lubricated with clean engine oil. The oil pump must turn freely by hand. Damage to the drive gear and internal pump damage can occur if the oil pump is not lubricated with clean engine oil.

(1) Seal

Prior to installation, lubricate the bores with the lubricant being sealed.

(2) Diameter of two shafts 18.000 ± 0.005 mm
 ((.7087 $\pm$.0002 inch))

Bores in pump body for two shafts
 18.050 ± 0.010 mm ((.7106 $\pm$.0004 inch))

(3) Seal groove

Prior to installation, lubricate the bore in the engine front cover with the lubricant being sealed.

(A) Drive gear

Average diameter of the drive gear
 95.28 ± 0.10 mm ((3.75117 $\pm$ 0.00394 inch))

Maximum diameter of the drive gear 95.42 mm
 ((3.75669 inch))

i04845483

Engine Oil Pump

SMCS Code: 1304

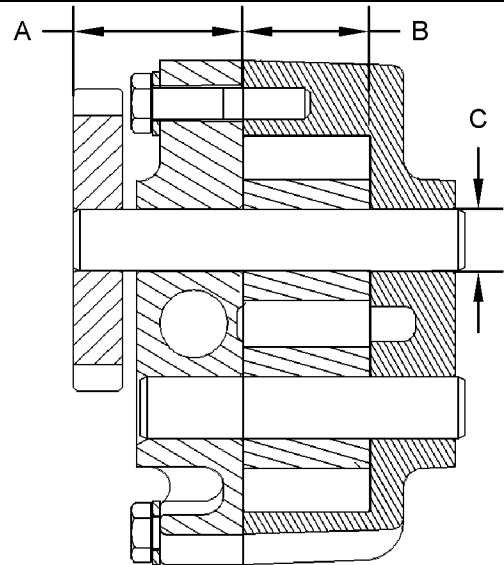


Illustration 196
Section view through pump gears
Typical example

g02976198

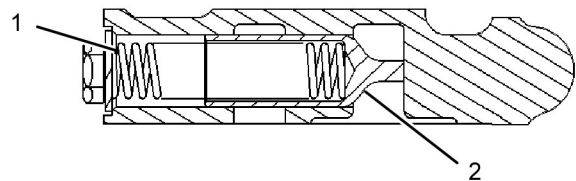


Illustration 197
The section view is of the bypass valve that is located in the pump assembly.

g02976196

Table 70

Specification for 189-8777 Engine Oil Pump Gp			
Item	Qty	Part	Specification Description
A	-	-	Distance between the front face of the gear and the housing is 43.00 ± 0.25 mm (1.693 ± 0.010 inch).

(continued)

(Table 70, contd)

B	-	-	Length of the gear is 33.00 ± 0.03 mm (1.299 $\pm$ 0.001 inch). Depth of the bore for the gear is 33.13 ± 0.02 mm (1.304 $\pm$ 0.001 inch).
C	-	-	Diameter of the gear shaft is 15.600 ± 0.005 mm (0.6142 $\pm$ 0.0002 inch). Bores in the pump bodies for the gear shaft is 15.641 ± 0.008 mm (0.6158 $\pm$ 0.0003 inch)
1	1	105 - 1805 Spring	Length under test force is 54.5 mm (2.15 inch). Test force is 51.99 ± 1.90 N (11.69 $\pm$ 0.43 lb). Free length after test is 64.98 mm (2.558 inch).
2	1	Relief valve plunger	Diameter of the plunger is 17.000 ± 0.013 mm (0.6693 $\pm$ 0.0005 inch). Bore in the pump body for the plunger is 17.100 ± 0.025 mm (0.6732 $\pm$ 0.0010 inch).

i05569850

Engine Oil Pump (Gerotor Pump)

SMCS Code: 1304

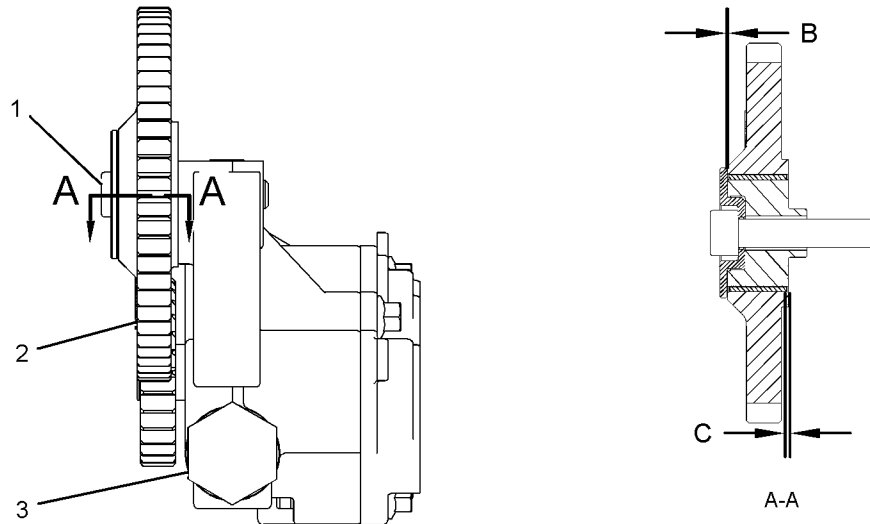


Illustration 198

g02126120

(2) Gear assembly

(1) Torque for the bolt . . . $55 \pm 10 \text{ N}\cdot\text{m}$ ($(41 \pm 7 \text{ lb ft})$)

(3) Torque for the plug . . . $110 \pm 10 \text{ N}\cdot\text{m}$ ($(81 \pm 7 \text{ lb ft})$)

Note: Apply loctite 271 on the middle section of the (3) plug.

(B) End play for the gear assembly after installation
. 0.05 to 0.35 mm ($(0.002 \text{ to } 0.014 \text{ inch})$)

(C) Installation depth of the bush 0.5 to 1.0 mm
((0.02 to 0.04 inch))

i02209827

Engine Oil Pan

SMCS Code: 1302

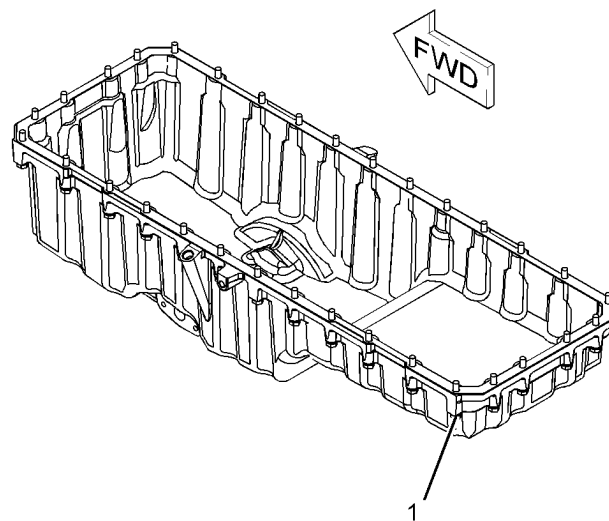


Illustration 199

g01115597

Apply 4C-9612 Silicone Sealant to the entire span of the joints. Make sure that all surfaces are clean and that all surfaces are free of oil and debris. The sealant must be applied with a consistent 5 mm (0.2 inch) cross section on the block.

Tighten the bolts (1) to the following torque.

..... $31 \pm 3 \text{ N}\cdot\text{m}$ ((23 $\pm$ 2 lb ft))

Again, tighten the bolts (1) to the following torque.

..... $31 \pm 3 \text{ N}\cdot\text{m}$ ((23 $\pm$ 2 lb ft))

i02694853

i03019166

Engine Oil Pan

SMCS Code: 1302

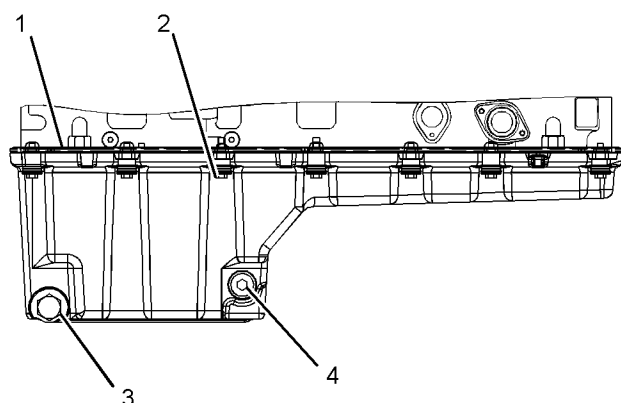


Illustration 200

g01351716

Right Side View

- (1) Oil pan
(2) Bolts

(3) Torque for the two drain plugs $70 \pm 15 \text{ N}\cdot\text{m}$
(($50 \pm 11 \text{ lb ft}$))

(4) Torque for the two plugs $70 \pm 15 \text{ N}\cdot\text{m}$
(($50 \pm 11 \text{ lb ft}$))

Engine Oil Pan

SMCS Code: 1302

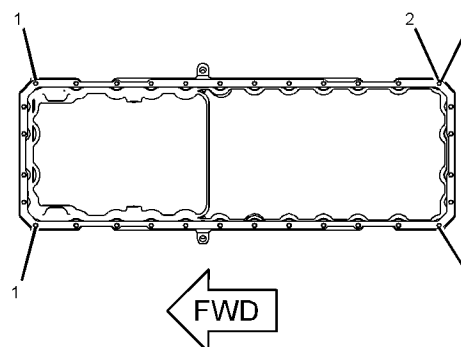


Illustration 201

g01526816

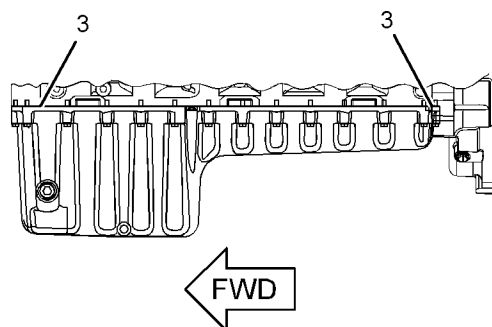


Illustration 202

g01526818

Note: The sealing surfaces of the oil pan shall be free of oil, debris, gasket material that is protruding, or any other sealant. The oil pan must be assembled and tightened to the cylinder block within five minutes of applying sealant.

Use the following procedure to install the oil pan:

1. Apply 4C-9612 Silicone Sealant to a bead of 5 mm (0.2 inch) at four places (3) on the sealing surface of the oil pan. The sealing surfaces are the following areas:
 - Connecting joint of the front housing and the front of the cylinder block
 - Connecting joint of the flywheel housing and the rear of the cylinder block
2. Tighten the four bolts (1) to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).

3. Start with bolt (2) and tighten all the bolts in a counterclockwise sequence to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).
4. Again start with bolt (2) and tighten all the bolts in a counterclockwise sequence to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).

i03019182

Engine Oil Pan

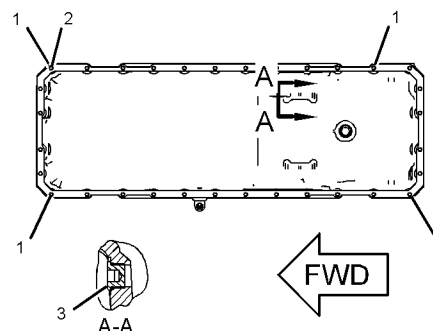
SMCS Code: 1302

Illustration 203

g01526827

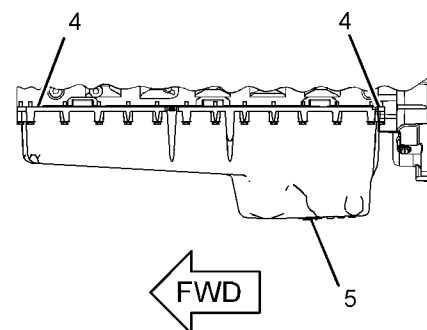


Illustration 204

g01526828

Note: The sealing surfaces of the oil pan shall be free of oil, debris, gasket material that is protruding, or any other sealant. The oil pan must be assembled and tightened to the cylinder block within five minutes of applying sealant.

Use the following procedure to install the oil pan:

1. Apply 4C-9612 Silicone Sealant to a bead of 5 mm (0.2 inch) at four places (4) on the sealing surface of the oil pan. The sealing surfaces are the following areas:
 - Connecting joint of the front housing and the front of the cylinder block
 - Connecting joint of the flywheel housing and the rear of the cylinder block
2. Tighten the four bolts (1) to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).

3. Start with bolt (2) and tighten all the bolts in a counterclockwise sequence to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).
4. Again start with bolt (2) and tighten all the bolts in a counterclockwise sequence to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).
- (3) Torque for the socket head plug $50 \pm 7 \text{ N}\cdot\text{m}$ ($37 \pm 5 \text{ lb ft}$)
- (5) Torque for the magnetic plug $70 \pm 15 \text{ N}\cdot\text{m}$ ($50 \pm 11 \text{ lb ft}$)

i03089360

Engine Oil Pan

SMCS Code: 1302

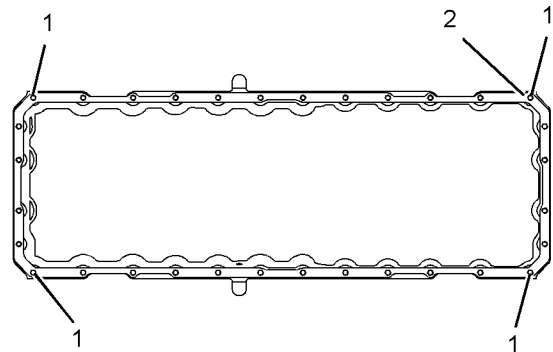


Illustration 205

g01571118

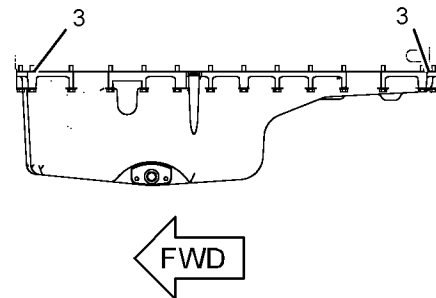


Illustration 206

g01571123

Note: The sealing surfaces of the oil pan shall be free of oil, debris, gasket material that is protruding, or any other sealant. The oil pan must be assembled and tightened to the cylinder block within five minutes of applying sealant.

Use the following procedure to install the oil pan:

1. Apply 4C-9612 Silicone Sealant to a bead of 5 mm (0.2 inch) at four places (3) on the sealing surface of the oil pan. The sealing surfaces are the following areas:
 - Connecting joint of the front housing and the front of the cylinder block
 - Connecting joint of the flywheel housing and the rear of the cylinder block
2. Tighten the four bolts (1) to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).

3. Start with bolt (2) and tighten all the bolts in a counterclockwise sequence to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).
4. Again start with bolt (2) and tighten all the bolts in a counterclockwise sequence to $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$).

i03880905

Engine Oil Pan

SMCS Code: 1302

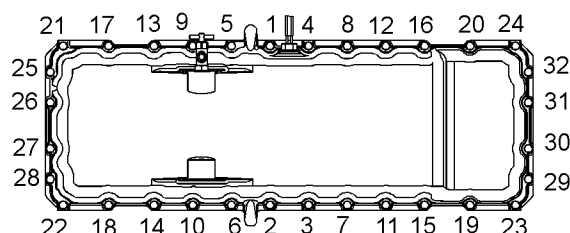


Illustration 207

g02126902

Tightening sequence

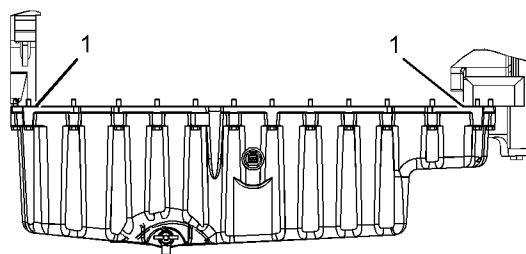


Illustration 208

g02126922

Typical example

Note: The sealing surfaces of the oil pan shall be free of oil, debris, gasket material that is protruding, or any other sealant. The oil pan must be assembled and tightened to the cylinder block within 10 minutes of applying sealant.

Use the following procedure to install the oil pan:

1. Apply 4C-9612 Silicone Sealant to a bead of 3.0 to 5.0 mm (0.12 to 0.20 inch) at four places (1) on the sealing surface of the oil pan. The sealing surfaces are the following areas:
 - Connecting joint of the front housing and the front of the cylinder block
 - Connecting joint of the flywheel housing and the rear of the cylinder block

2. Tighten bolt 1 through bolt 32 in a numerical sequence that is shown in Illustration 208 to $28 \pm 7 \text{ N}\cdot\text{m}$ ($248 \pm 62 \text{ lb in}$).
3. Again, tighten the bolt 1 through bolt 32 in a numerical sequence that is shown in Illustration 208 to $28 \pm 7 \text{ N}\cdot\text{m}$ ($248 \pm 62 \text{ lb in}$).

i04753210

Engine Oil Pan

SMCS Code: 1302

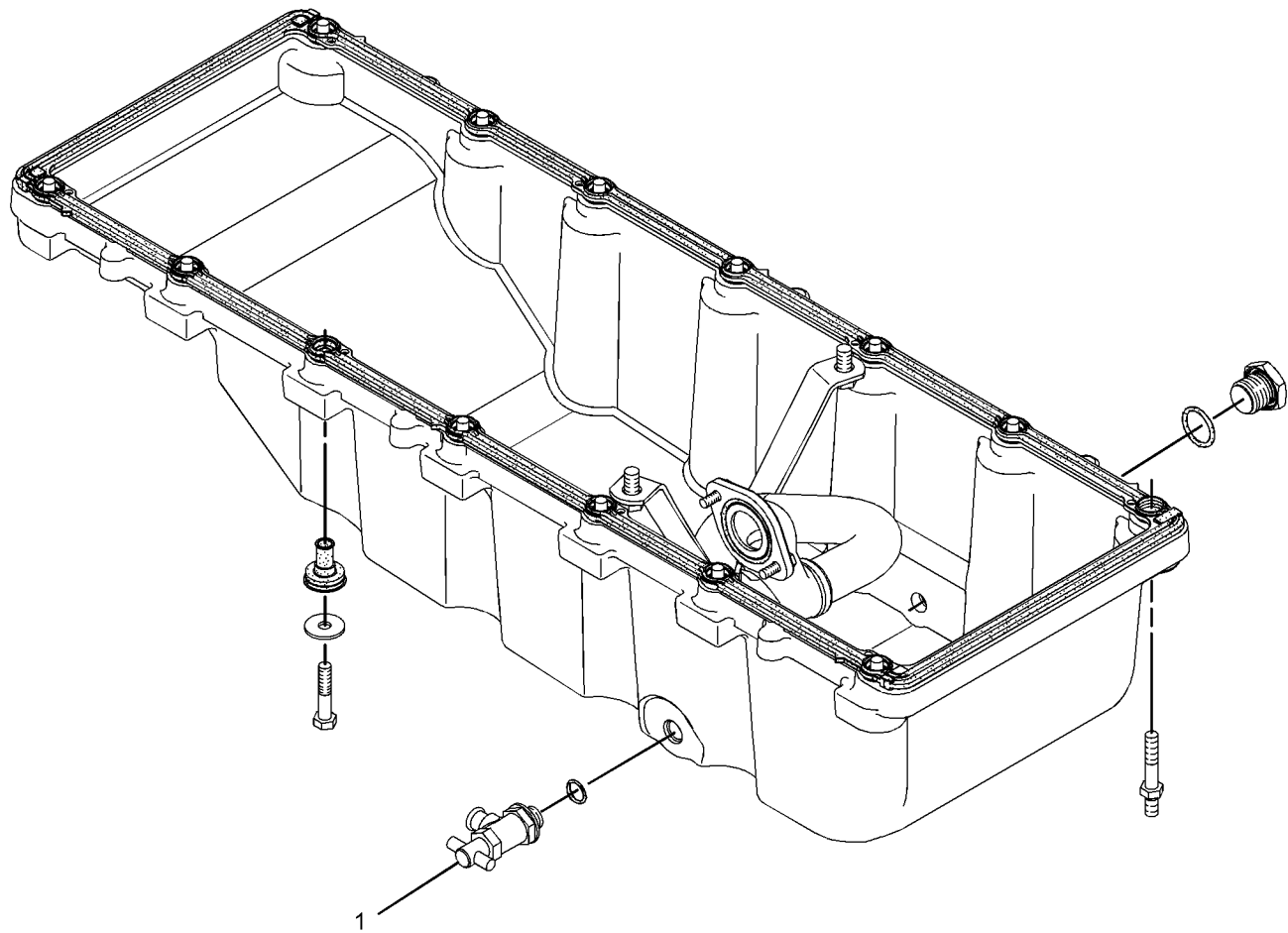


Illustration 209

g02848817

Table 71

Specification for 234 - 7847 Oil Pan Gp			
Item	Qty	Part	Specification Description
1	1	351 - 0283 Shutoff Valve Gp	Assembly torque is 24 to 30 N·m (212 to 266 lb in).
			Stem torque is 2 to 3 N·m (18 to 27 lb in).

i04758104

Engine Oil Pan

SMCS Code: 1302

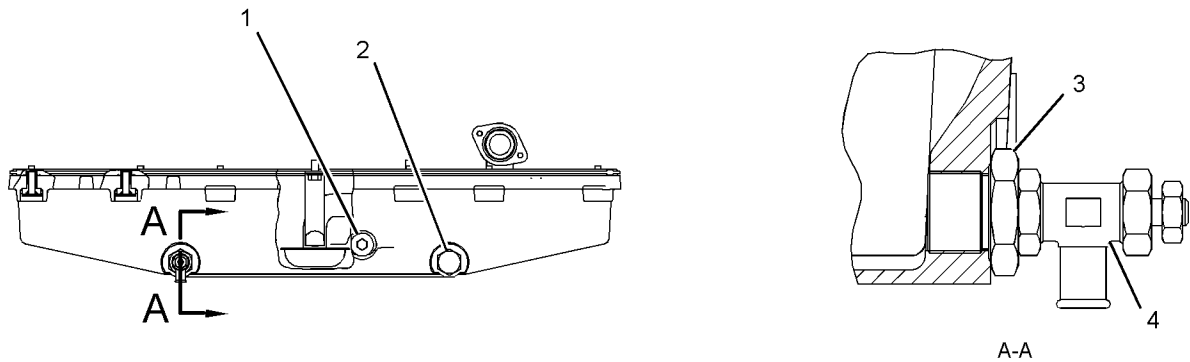


Illustration 210
Right side view of engine

g02850001

Table 72

Specification for 264 - 5081 Oil Pan Gp			
Item	Qty	Part	Specification Description
1	2	319 - 6234 Plug As	Torque to 90 ± 15 N·m (66 ± 11 lb ft).
2	3	9X - 6451 Drain Plug	Torque to 70 ± 15 N·m (52 ± 11 lb ft).
3	1	3E - 7427 Adapter	Torque to 70 ± 15 N·m (52 ± 11 lb ft).
4	1	351 - 0283 Shutoff Valve Gp	Assembly torque is 24 to 30 N·m (212 to 266 lb in).
			Stem torque is 2 to 3 N·m (18 to 27 lb in).

i04758244

Engine Oil Pan

SMCS Code: 1302

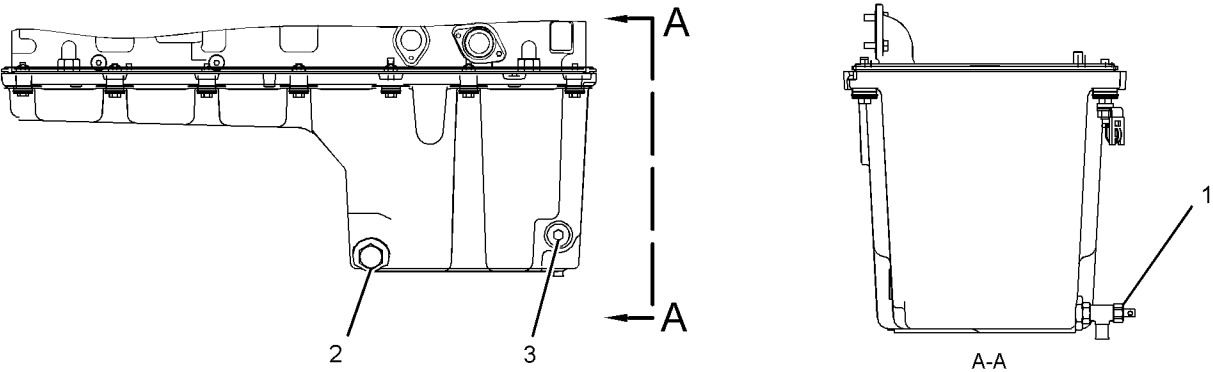


Illustration 211
Right side view of engine

g02850196

Table 73

Specification for 241 - 2944 Oil Pan Gp			
Item	Qty	Part	Specification Description
1	1	351 - 0283 Shutoff Valve Gp	Assembly torque is 24 to 30 N·m (212 to 266 lb in).
			Stem torque is 2 to 3 N·m (18 to 27 lb in).
2	1	9X - 6451 Drain Plug	Torque to 70 ± 15 N·m (52 ± 11 lb ft).
3	2	319 - 6234 Plug As	Torque to 90 ± 15 N·m (66 ± 11 lb ft).

i05579532

Engine Oil Pan

SMCS Code: 1302

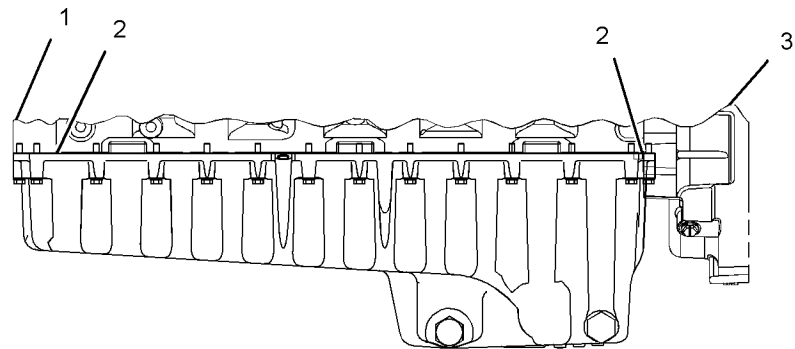


Illustration 212
Typical example

Table 74

Specification for 348 - 8371 Oil Pan Gp, and 381 - 6727 Oil Pan Gp			
Item	Qty	Part	Specification Description
The sealing surfaces of the oil pan shall be free of oil, debris, gasket material that is protruding, or any other sealant. The oil pan must be assembled and tightened to the cylinder block within 10 minutes of applying sealant.			
-	-	-	Apply Loctite blue RTV silicone to a bead of 5 mm (0.2 inch) at two places (2) on the connecting joint of the front housing (1) and the front of the cylinder block.
-	-	-	Apply Loctite blue RTV silicone to a bead of 5 mm (0.2 inch) at two places (2) on the connecting joint of the flywheel housing (3) and the rear of the cylinder block.

i06801088

Engine Oil Pan

SMCS Code: 1302

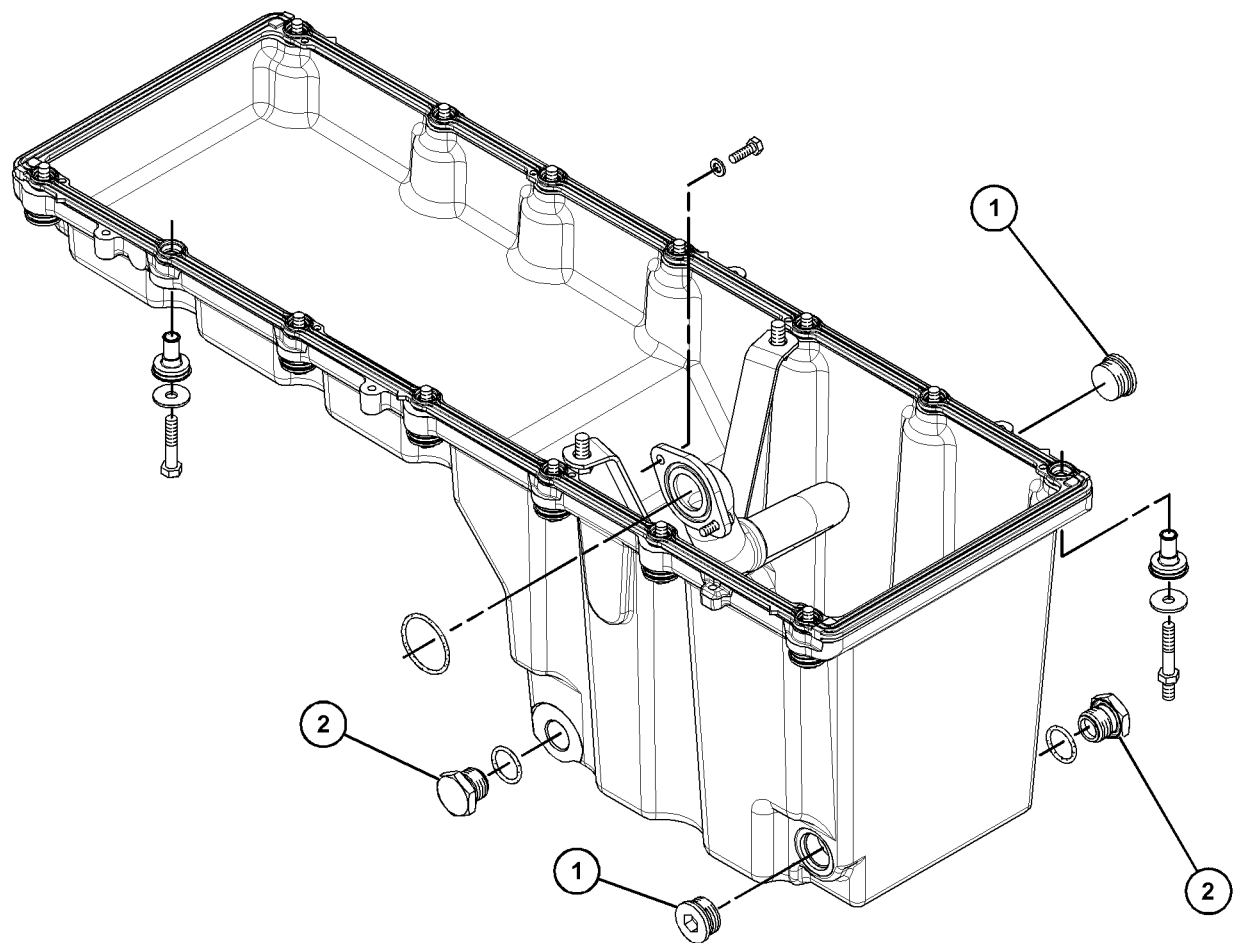


Illustration 213

g06119805

Table 75

Specification for 215-9005 Oil Pan Gp			
Item	Qty	Part	Specification Description
1	2	389-3728 Plug As	Torque to 90 ± 15 N·m (66 ± 11 lb ft).
2	2	9X-6451 Drain Plug	Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i07255513

Engine Oil Pan

SMCS Code: 1302

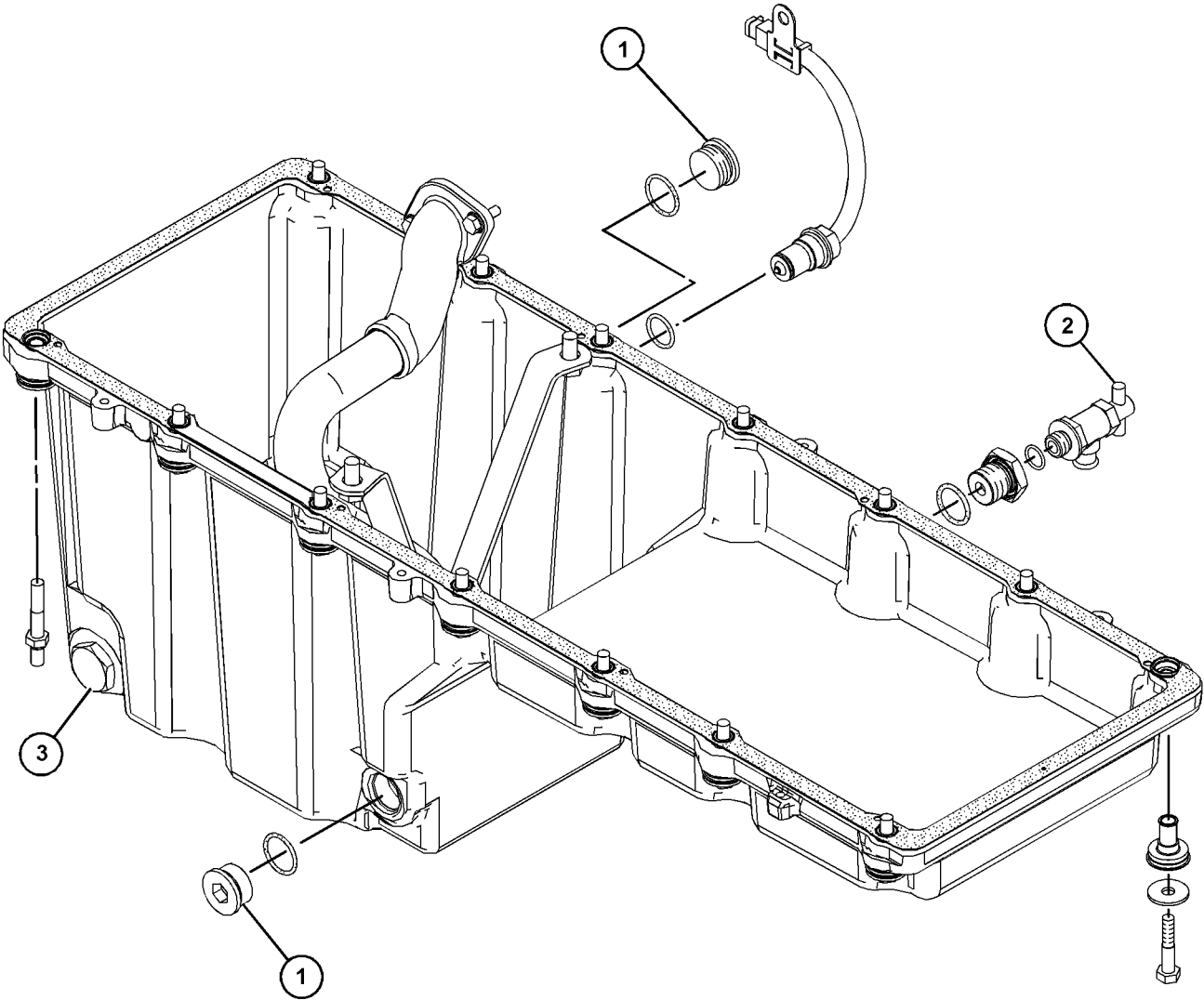


Illustration 214

g06266898

Table 76

Item	Qty	Part	Specification Description
1	2	389-3728 Plug As	Torque to 90 ± 15 N·m (66 ± 11 lb ft).
2	1	351-0283 Shutoff Valve Gp	Assembly torque is 24 to 30 N·m (212 to 266 lb in).
			Stem torque is 2 to 3 N·m (18 to 27 lb in).
3	1	9X-6451 Drain Plug	Torque to 70 ± 15 N·m (52 ± 11 lb ft).

i07754552

Engine Oil Pan

SMCS Code: 1302

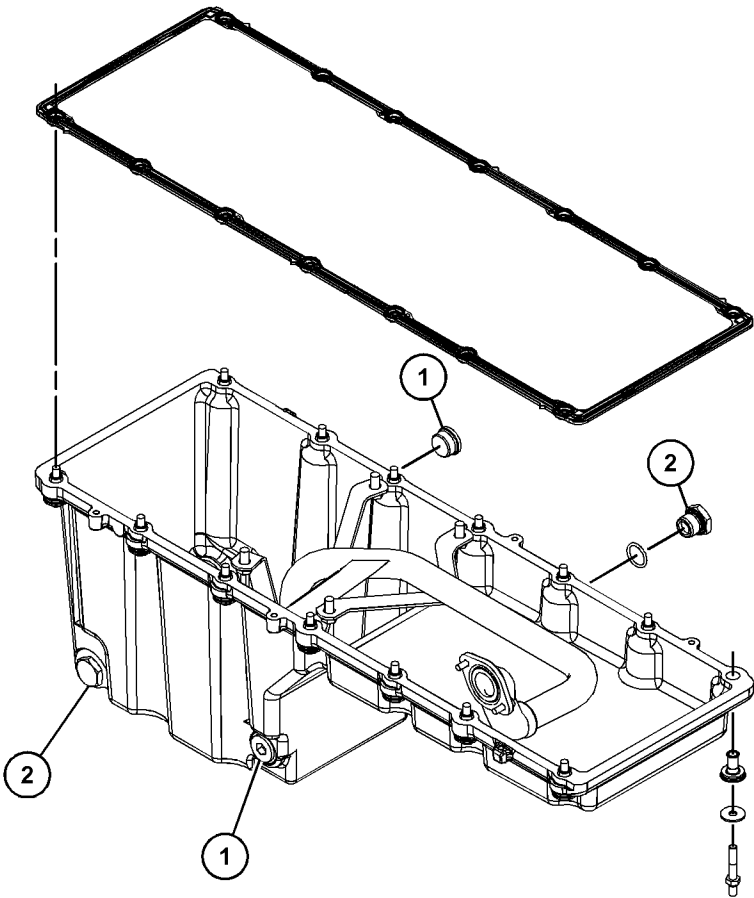


Illustration 215

g03539109

Table 77

Item	Qty	Part	Specification Description
1	2	319-6234 Plug As	Torque to 90 ± 15 N·m (66 ± 11 lb ft).
2	2	9X-6451 Drain Plug	Torque to 70 ± 15 N·m (52 ± 11 lb ft).
-	-	-	Before assembly, apply 3 to 5 mm (0.1 to 0.2 inch) ultra blue Loctite blue RTV silicone sealant to the following locations: 1. Connecting joint of the front housing and the front of the cylinder block. 2. Connecting joint of the flywheel housing and the rear of the cylinder block. 3. Apply bead of sealant to the gasket or to the housing face. At the T-joint location the bead should cover the entire span.

i03001200

Water Temperature Regulator Housing

SMCS Code: 1393

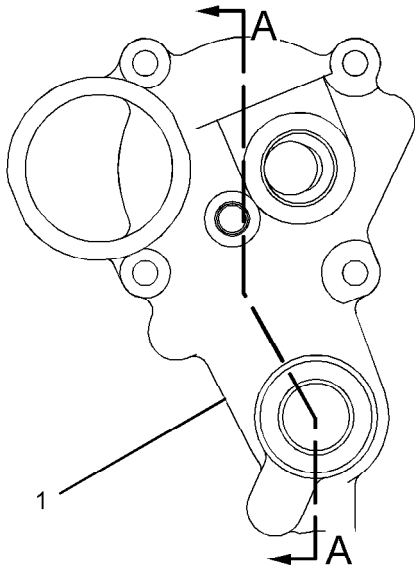


Illustration 216

g01074249

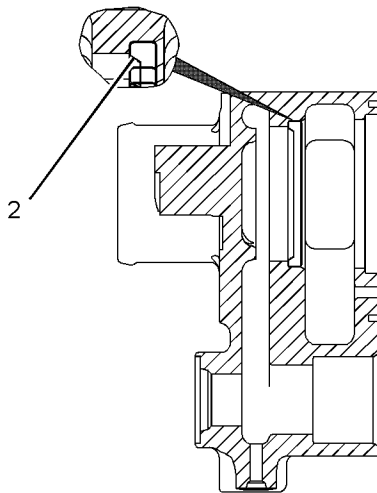


Illustration 217

g01521205

Section A-A

Note: Lightly lubricate the sealing lip of the lip type seal with glycerin.

The lip type seal (2) is installed in the water temperature regulator housing (1). This is shown in Illustration 217 .

i04379944

Water Temperature Regulator Housing

SMCS Code: 1393

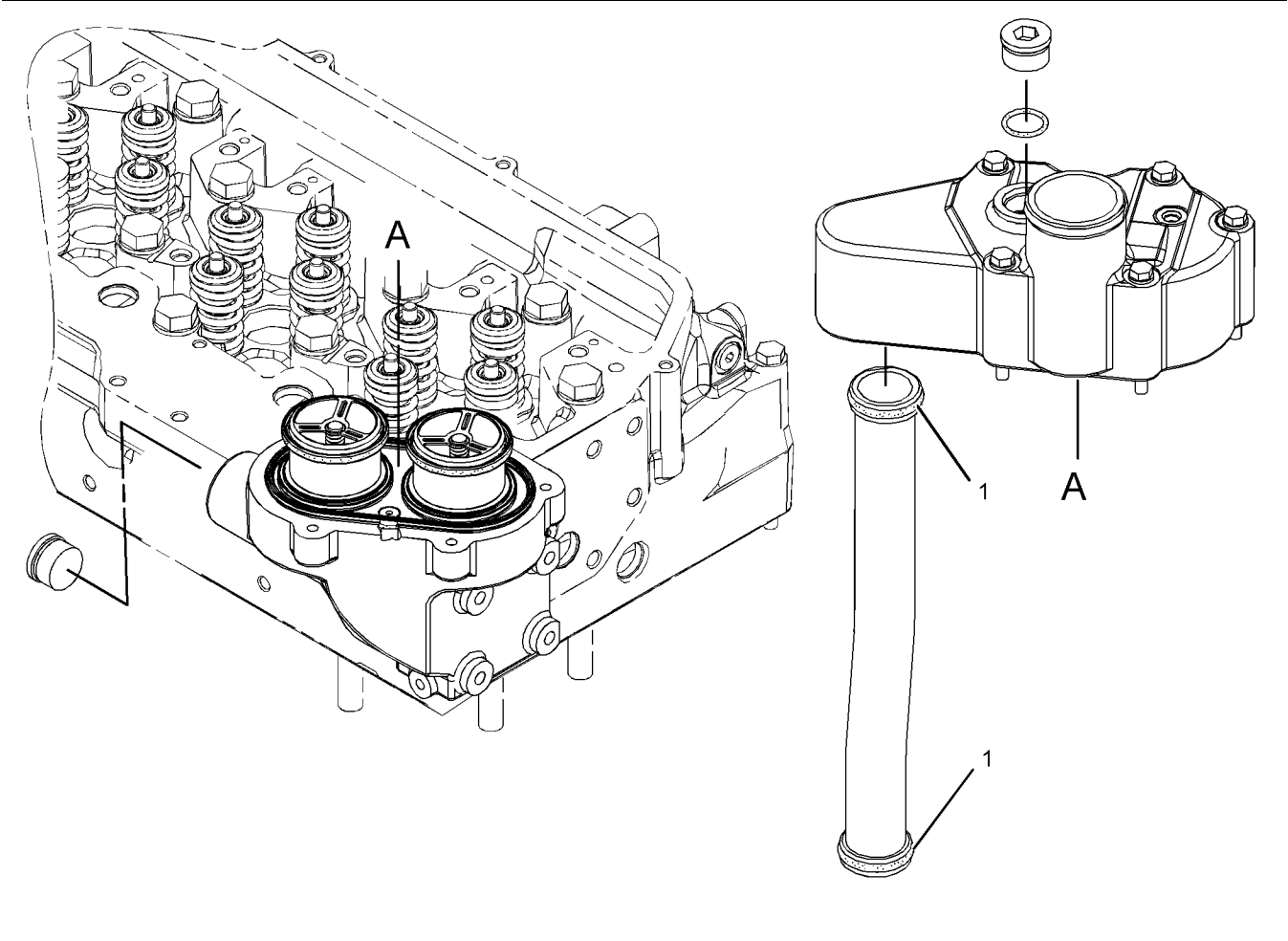


Illustration 218

g02544598

Table 78

Specification for 343 - 7192 Water Lines Gp, 343 - 7193 Housing and Regulator Gp, and 343 - 7194 Housing and Regulator Gp			
Item	Qty	Part	Specification Description
1	2	6V - 9769 O-Ring Seal	Lubricate the bore of the O-ring seals lightly with 5P - 3975 Rubber Lubricant before assembly.

i04377217

Water Temperature Regulator

SMCS Code: 1355

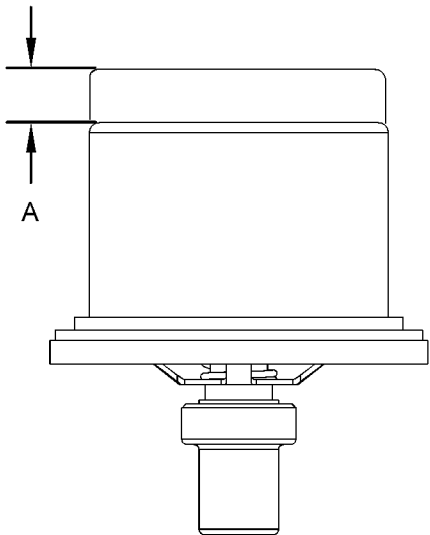


Illustration 219 g02542379

Table 79

Specification for the 247 - 7133 Water Temperature Regulator			
Item	Qty	Part	Specification Description
A	-	247 - 7133 Water Temperature Regulator	Minimum opening distance at fully open temperature is 10.4 mm (0.41 inch).
-	-	-	Start to open temperature is 86 to 90 °C (187 to 194 °F). Fully open temperature is 98 °C (208 °F).

i04380834

Water Temperature Regulator

SMCS Code: 1355

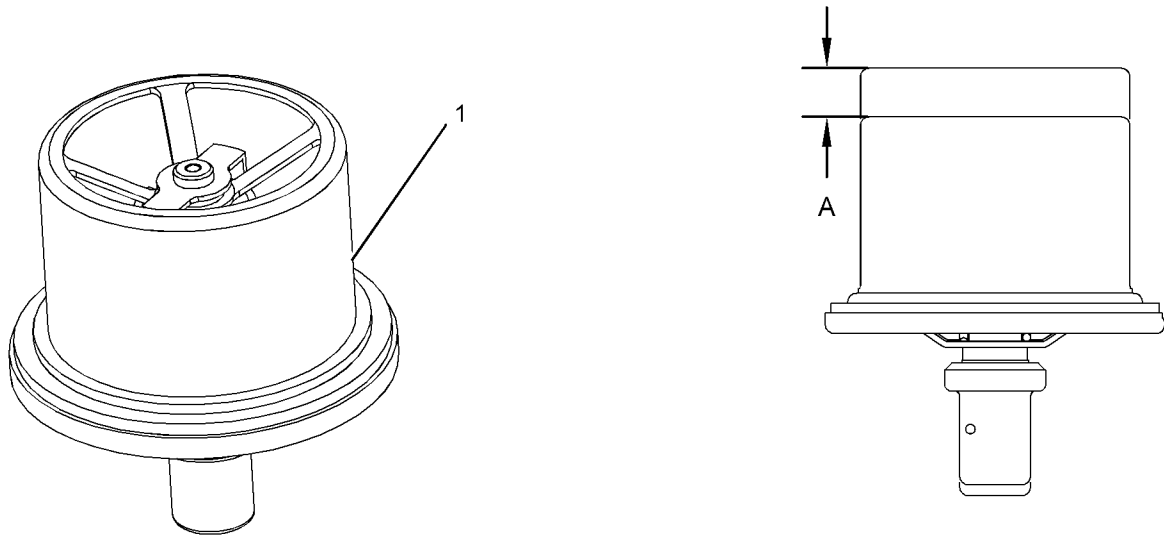


Illustration 220 g02545997

(1) Water temperature regulator

Table 80

Specification for 367 - 7900 Water Temperature Regulator			
Item	Qty	Part	Specification Description
A	-	-	Minimum opening distance at fully open temperature is 10.4 mm (0.41 inch).
-	-	-	Opening temperature is 81 to 84 °C (178 to 183 °F).
-	-	-	Fully open temperature is 92 °C (198 °F).
-	-	-	Air leakage at 210 kPa (30 psi) is 10.0 cc (0.6 cubic inch).

i04500849

Water Temperature Regulator

SMCS Code: 1355

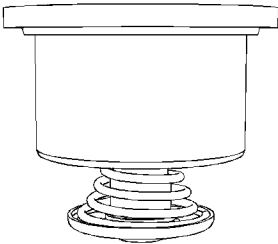


Illustration 221

g02680758

Table 81

Specification for 318 -0004 Water Temperature Regulator			
Item	Qty	Part	Specification Description
-	-	-	Closed dimension of the water temperature regulator is 59.2 ± 0.5 mm (2.33 ± 0.020 inch).
-	-	-	Minimum opening distance at fully open temperature is 10.4 mm (0.41 inch).
Start to open temperature is 81 to 84 °C (178 to 183 °F).			
Fully open temperature is 92 °C (198 °F).			

i04907651

Water Temperature Regulator

SMCS Code: 1355

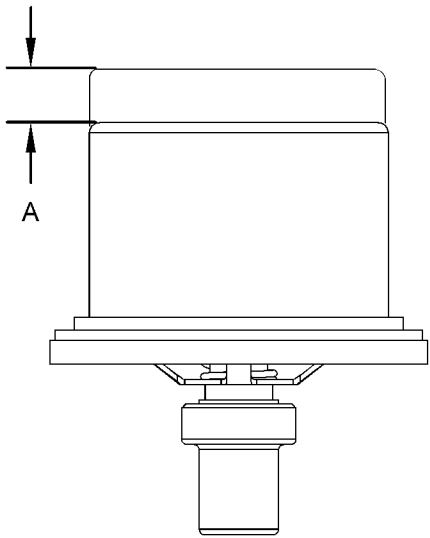


Illustration 222 g02545979

Table 82

Specification for 248 -5513 Temperature Regulator			
Item	Qty	Part	Specification Description
A	-	-	Minimum opening distance at fully open temperature is 10.4 mm (0.41 inch).
-	-	-	Opening temperature is 81 to 84 °C (178 to 183 °F).
-	-	-	Fully open temperature is 92 °C (198 °F).
-	-	-	Leakage at the seat and sleeve shall not exceed minimum 10.0 cc (0.6 cubic inch) at 207 kPa (30 psi).
-	-	-	Force required to separate valve from seat is 165 ± 9 N (37 ± 2 lb), measured at temperature 75 °C (167 °F).

i02843453

i02847499

Water Pump

SMCS Code: 1361

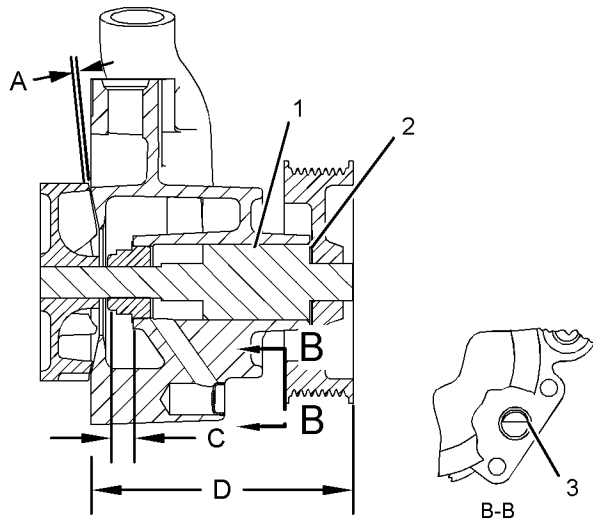


Illustration 223 g01417937

- (1) Shaft assembly
- (2) The bearing must be flush with the edge of the housing.
- (3) The plug must be flush with the edge of the housing. Refer to Illustration 223 for the correct orientation of the plug. If necessary, adjust the orientation of the plug.
- (A) Clearance between the pump impeller and the housing 0.75 ± 0.25 mm ((0.030 $\pm$ 0.010 inch))
- (C) Operating height of the water pump seal assembly . . . 12.19 ± 0.13 mm ((0.480 $\pm$ 0.005 inch))
- (D) Distance from the front face of the pulley to the face of the housing 132.88 ± 0.30 mm ((5.232 $\pm$ 0.012 inch))

Note: Refer to Disassembly and Assembly for the complete procedure for installing the shaft assembly and the water pump seal assembly.

Water Pump

SMCS Code: 1361

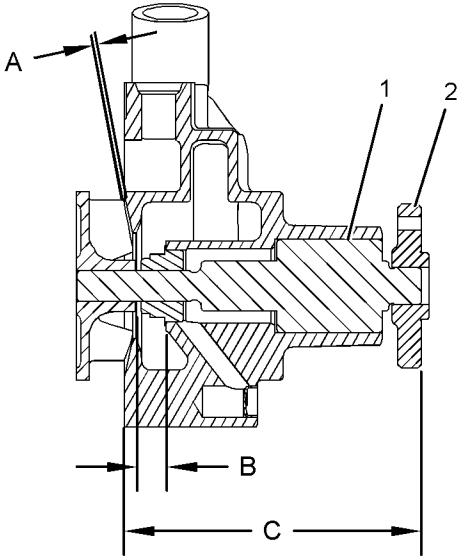


Illustration 224 g01419643

- (1) Water pump shaft
- (2) Hub
- (A) Clearance between the impeller and the housing 0.75 ± 0.25 mm ((0.030 $\pm$ 0.010 inch))
- (B) Height of the installed seal 12.19 ± 0.13 mm ((0.480 $\pm$ 0.005 inch))
- (C) Distance from the front face of the hub to the face of the housing 151.80 ± 0.30 mm ((5.976 $\pm$ 0.012 inch))

Note: Refer to Disassembly and Assembly for the complete procedure for installing the shaft and seal.

i03001211

(9) Maximum installation depth of the cup plug
 1.25 mm ((0.049 inch))

Water Pump

SMCS Code: 1361

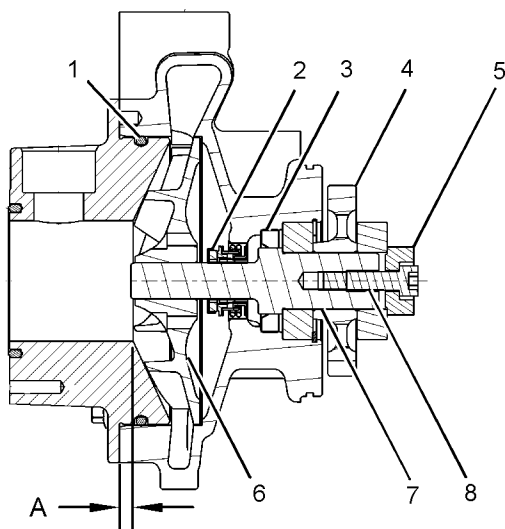


Illustration 225

g01455711

- (2) Seal group
- (4) Water pump gear
- (5) Ball bearing
- (6) Impeller
- (7) Water pump shaft
- (8) Bolt

(1) Lubricate the bore of the O-ring seal with the lubricant that is being sealed.

(3) Do not lubricate the lip of the lip type seal.

(A) Distance between the pump flange and the impeller hub . . 8.40 ± 0.25 mm ((0.331 ± 0.010 inch))

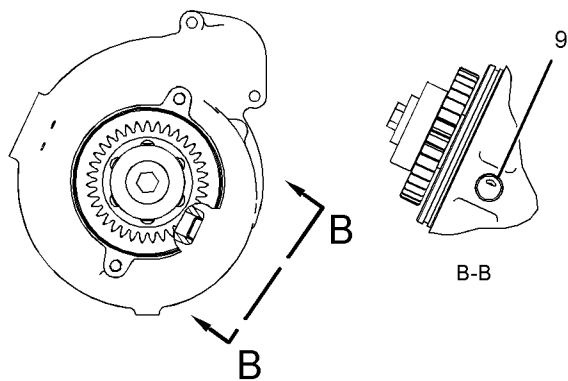


Illustration 226

g01447284

Note: Orient the cup plug (9) at ± 10 degrees, as shown.

i03873007

Water Pump

SMCS Code: 1361

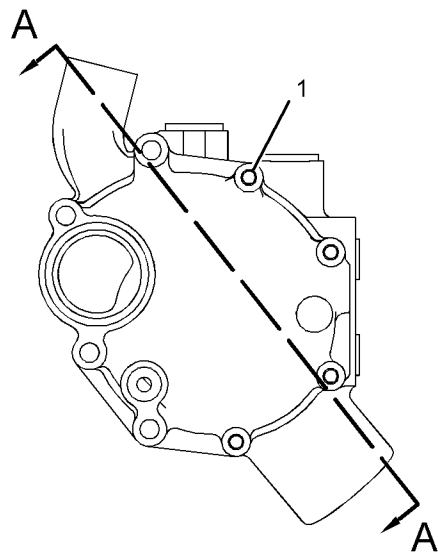


Illustration 227 g02119055

(1) Torque for bolt assemblies $30 \pm 7 \text{ N}\cdot\text{m}$
(($266 \pm 62 \text{ lb in}$))

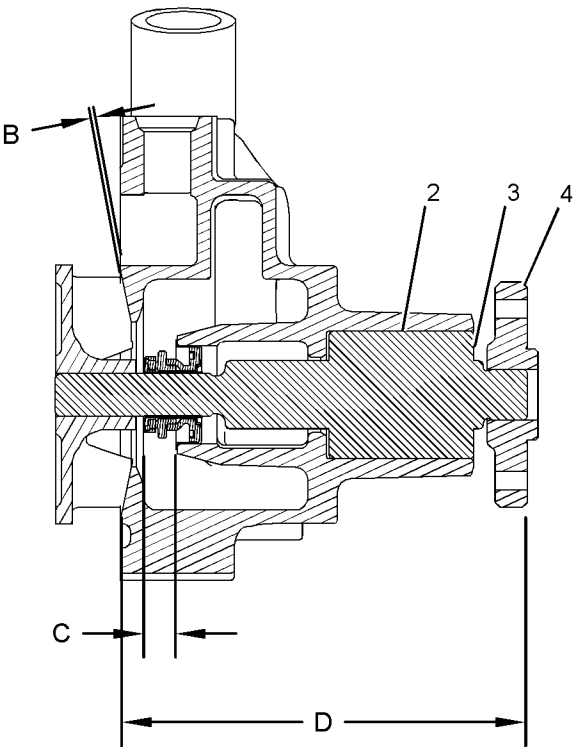


Illustration 228 g02114776

- Section A-A
- (2) Shaft assembly
- (B) Clearance between the pump impeller and the water pump housing assembly 0.75 mm
((0.030 inch))
- (3) Flush the bearing with the water pump housing assembly.
- (C) Operating height of the water pump seal assembly 12.19 mm ((0.480 inch))
- (D) Distance from the front face of the hub (4) to the face of the water pump housing assembly $151.8 \pm 0.3 \text{ mm}$ (($6.0 \pm 0.01 \text{ inch}$))

i04338151

Water Pump

SMCS Code: 1361

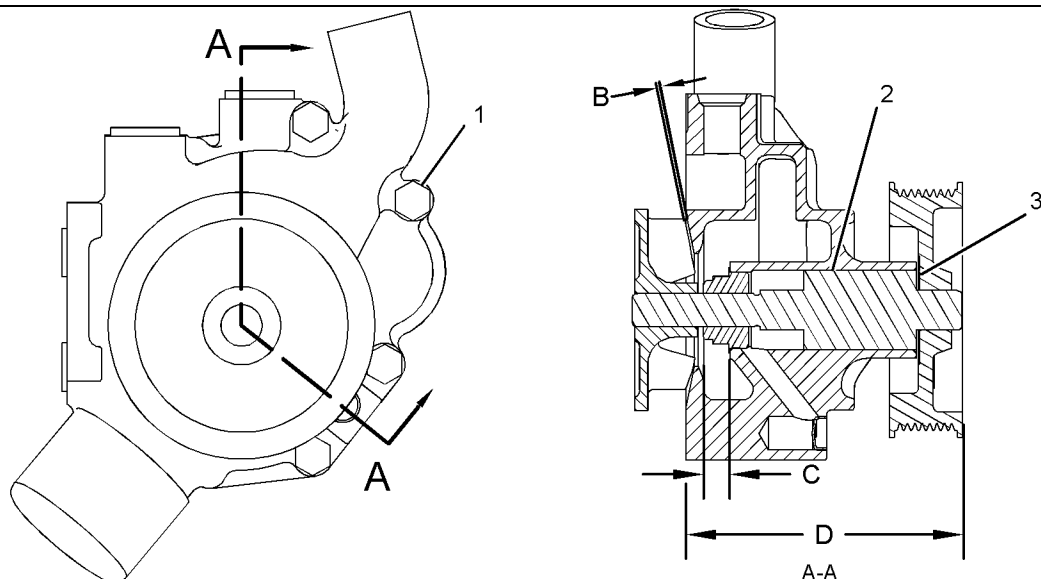


Illustration 229

g02146654

(2) Shaft assembly

(1) Torque for four bolts . . . $55 \pm 10 \text{ N}\cdot\text{m}$ ($(41 \pm 7 \text{ lb ft})$)

(3) Flush the bearing with the water pump housing assembly.

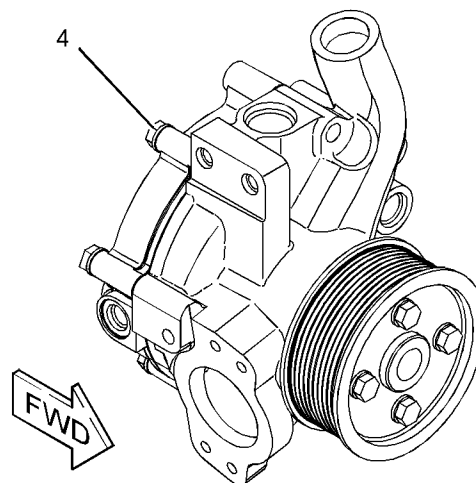
(B) Clearance between the pump impeller and the pump housing . . . $0.75 \pm 0.25 \text{ mm}$ ($(0.030 \pm 0.010 \text{ inch})$)(C) Operating height of the water pump seal assembly . . . $12.19 \pm 0.13 \text{ mm}$ ($(0.480 \pm 0.005 \text{ inch})$)(D) Distance from the front face of the pulley to the face of the pump housing . . . $132.9 \pm 0.3 \text{ mm}$ ($(5.23 \pm 0.01 \text{ inch})$)

Illustration 230

g02493856

(4) Torque for bolts . . . $30 \pm 7 \text{ N}\cdot\text{m}$ ($(266 \pm 62 \text{ lb in})$)

Note: Refer to Disassembly and Assembly for the complete procedure for installing the shaft assembly and the water pump seal assembly.

i04371747

Water Pump

SMCS Code: 1361

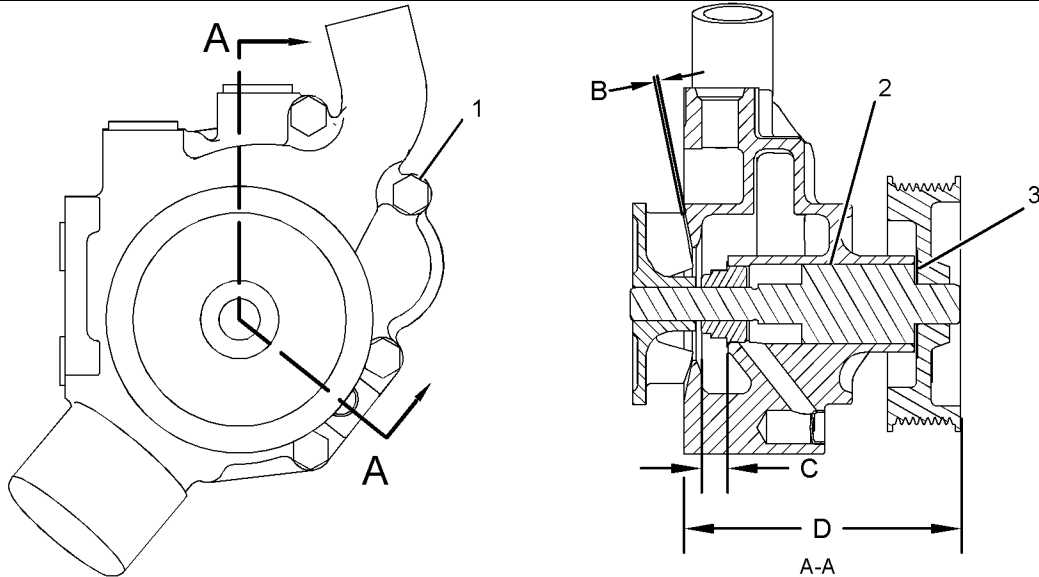


Illustration 231

g02146654

(2) Shaft assembly

(1) Torque for four bolts . . . $55 \pm 10 \text{ N}\cdot\text{m}$ ($(41 \pm 7 \text{ lb ft})$)

(3) Flush the bearing with the water pump housing assembly.

(B) Clearance between the pump impeller and the pump housing $0.75 \pm 0.25 \text{ mm}$
($(0.030 \pm 0.010 \text{ inch})$)

(C) Operating height of the water pump seal assembly . . . $10.92 \pm 0.13 \text{ mm}$ ($(0.430 \pm 0.005 \text{ inch})$)

(D) Distance from the front face of the pulley to the face of the pump housing $132.9 \pm 0.3 \text{ mm}$
($(5.23 \pm 0.01 \text{ inch})$)

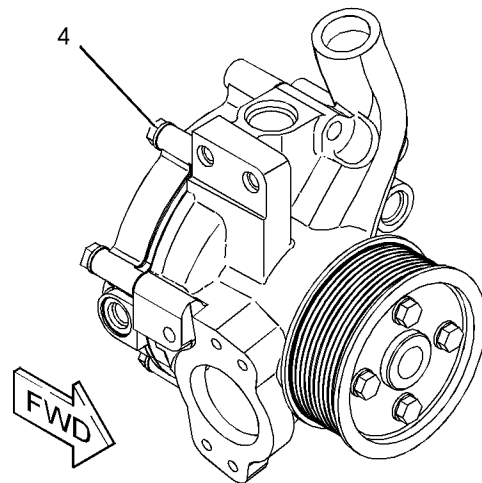


Illustration 232

g02531937

(4) Torque for bolts $30 \pm 7 \text{ N}\cdot\text{m}$ ($(266 \pm 62 \text{ lb in})$)

Note: Refer to Disassembly and Assembly for the complete procedure for installing the shaft assembly and the water pump seal assembly.

i04856957

Water Pump

SMCS Code: 1361

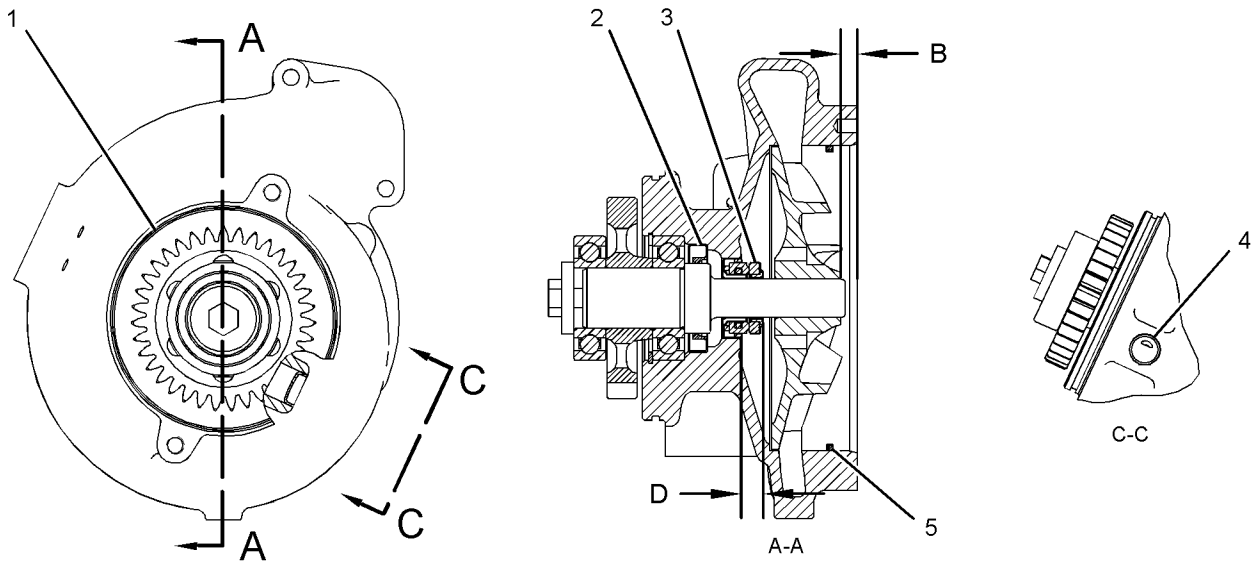


Illustration 233

g02986336

Table 83

Specification for 332 - 0984 Water Pump Gp			
Item	Qty	Part	Specification Description
1	1	6V - 7350 O-Ring Seal	Before assembly, lightly lubricate the bore with the lubricant that is being sealed.
2	1	8C - 3100 Lip Type Seal	Do not lubricate the seal lip. Install the lip type seal with the primary lip toward the water pump drive gear. Press the oil seal with a press until the oil seal is flush with face of counterbore as shown in the Illustration 233 . Use installation tool for installation. Do not install the lip type seal by hand.
3	1	349 - 2654 Water Pump Seal	Press the water pump seal assembly onto the shaft until the stationary cup is fully seated inside the pump housing. Installation height (D) is 10.92 ± 0.13 mm (0.430 ± 0.005 inch). Use installation tool for installation. Do not install the water pump seal by hand.
B	-	-	Distance between the impeller and the pump housing is 8.40 ± 0.25 mm (0.33 ± 0.010 inch).
4	1	203 - 3831 Cup Plug	Maximum installation depth of the cup plug from the machined surface is 1.25 mm (0.049 inch). Orient the cup plug as shown in the Illustration 233 within ± 10 degrees.
5	1	225 - 7003 O-Ring Seal	Before assembly, lightly lubricate the bore with 5P - 3975 Rubber Lubricant.

i06058972

Water Pump

SMCS Code: 1361

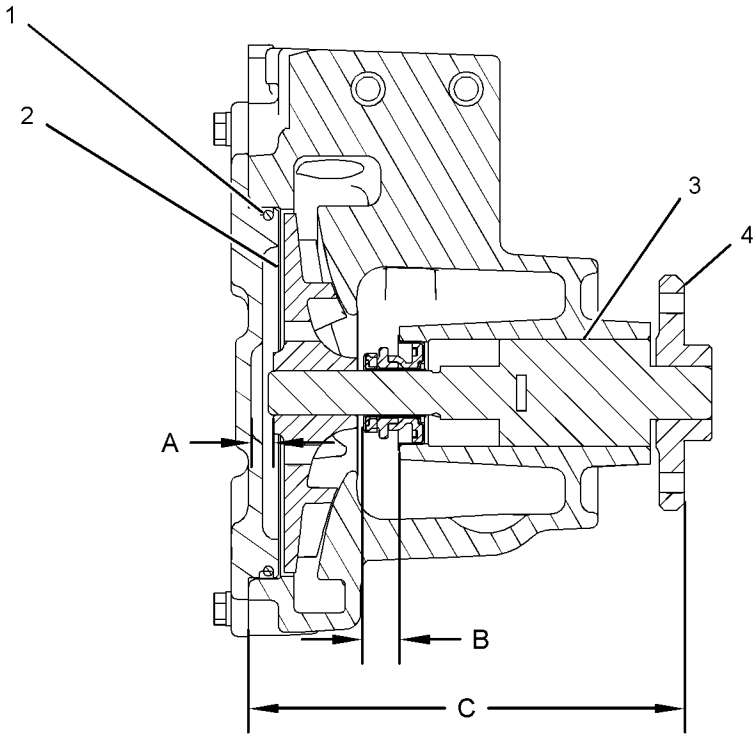


Illustration 234

g02680797

Table 84

Specification for 338 - 1148 Water Pump Gp			
Item	Qty	Part	Specification Description
1	1	5F - 3999 O-Ring Seal	Lubricate bore of the O-ring seal lightly with 5P - 3975 Rubber Lubricant.
3	1	397 - 1832 Shaft As	During installation, flush shaft assembly with the housing.
A	-	-	Distance from the 261 - 3423 Impeller (2) to the face of the housing is 9.00 ± 0.25 mm (0.354 ± 0.0010 inch).
B	1	350 - 5417 Seal	Operating height is 10.92 ± 0.13 mm (0.430 ± 0.0051inch).
C	-	-	Distance from the front face of the 203 - 6098 Hub (4) to the face of the housing is 155.8 ± 0.3 mm (6.13 ± 0.01 inch).

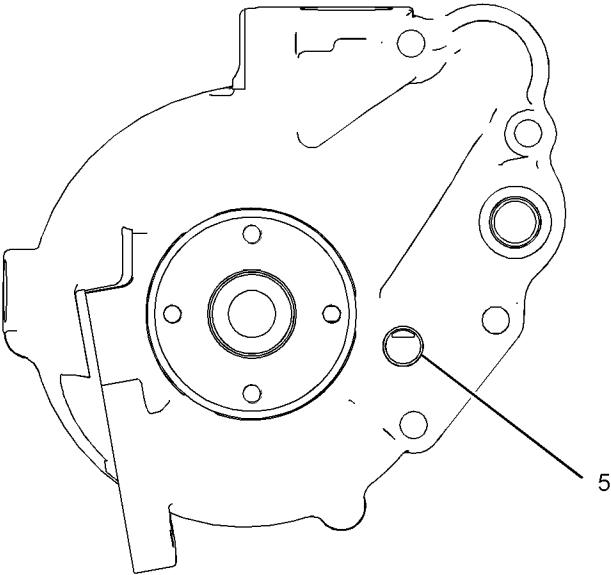


Illustration 235
Front view of engine

g02680856

Table 85

Specification for 338 - 1148 Water Pump Gp			
Item	Qty	Part	Specification Description
5	1	177 - 1058 Plug	During installation, flush plug with the housing and orient the plug as show in the Illustration 235 .

i04664259

Cylinder Block

SMCS Code: 1201

- S/N: 3F31–Up
- S/N: 3F41–Up
- S/N: NN41–Up
- S/N: 3F51–Up
- S/N: MW51–Up
- S/N: NN51–Up
- S/N: BJ61–Up
- S/N: BS61–Up
- S/N: NN61–Up
- S/N: 2L71–Up
- S/N: 2L81–Up
- S/N: FLA1–Up
- S/N: GTA1–Up
- S/N: TBA1–Up

- S/N: JGB1–Up
- S/N: BYC1–Up
- S/N: FPC1–Up
- S/N: LCC1–Up
- S/N: MDC1–Up
- S/N: SPC1–Up
- S/N: WEC1–Up
- S/N: XAC1–Up
- S/N: 9SD1–Up
- S/N: A6D1–Up
- S/N: ESD1–Up
- S/N: MGD1–Up
- S/N: P5D1–Up
- S/N: PFD1–Up
- S/N: RGD1–Up
- S/N: WTD1–Up
- S/N: M3E1–Up
- S/N: MTE1–Up

Specifications Section

S/N: NPE1-Up	S/N: SDM1-Up
S/N: RAE1-Up	S/N: WTM1-Up
S/N: WDE1-Up	S/N: DKN1-Up
S/N: YAE1-Up	S/N: JKN1-Up
S/N: YEE1-Up	S/N: MEN1-Up
S/N: GKF1-Up	S/N: RAN1-Up
S/N: M3F1-Up	S/N: RFN1-Up
S/N: NNF1-Up	S/N: SCN1-Up
S/N: RYF1-Up	S/N: WTN1-Up
S/N: A6G1-Up	S/N: DHP1-Up
S/N: A7G1-Up	S/N: WTP1-Up
S/N: NEG1-Up	S/N: BWR1-Up
S/N: PZG1-Up	S/N: JAR1-Up
S/N: RGG1-Up	S/N: M2R1-Up
S/N: TDG1-Up	S/N: SBR1-Up
S/N: YAG1-Up	S/N: XBR1-Up
S/N: B9H1-Up	S/N: D3S1-Up
S/N: EEH1-Up	S/N: E9S1-Up
S/N: GPH1-Up	S/N: ELS1-Up
S/N: KFH1-Up	S/N: KHS1-Up
S/N: KLH1-Up	S/N: LRS1-Up
S/N: LFH1-Up	S/N: LYS1-Up
S/N: TAH1-Up	S/N: PBT1-Up
S/N: A6J1-Up	S/N: E9W1-Up
S/N: A7J1-Up	S/N: PJW1-Up
S/N: B9J1-Up	S/N: GAX1-Up
S/N: R9J1-Up	S/N: BWY1-Up
S/N: RAJ1-Up	S/N: E9Y1-Up
S/N: RBJ1-Up	S/N: LKY1-Up
S/N: TAJ1-Up	S/N: NYY1-Up
S/N: MLK1-Up	S/N: SEY1-Up
S/N: R5K1-Up	S/N: SEZ1-Up
S/N: A3L1-Up	S/N: WXZ1-Up
S/N: B1L1-Up	
S/N: GCL1-Up	
S/N: TAL1-Up	
S/N: WTL1-Up	
S/N: NLM1-Up	

The flatness of the top contact surface of the cylinder block must be within 0.05 mm (0.002 inch) for any 150 mm (5.9 inch) section of the surface.

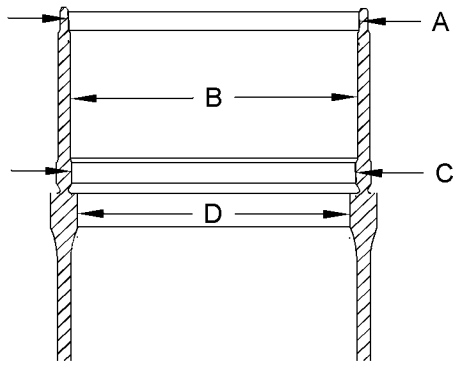


Illustration 236

g01568759

Bore diameter in the cylinder block for the cylinder liner:

- (A) 151.50 ± 0.03 mm ((5.965 ± 0.001 inch))
- (B) 149.80 ± 0.30 mm ((5.898 ± 0.012 inch))
- (C) 148.00 ± 0.03 mm ((5.827 ± 0.001 inch))
- (D) 141.90 ± 0.05 mm ((5.587 ± 0.002 inch))

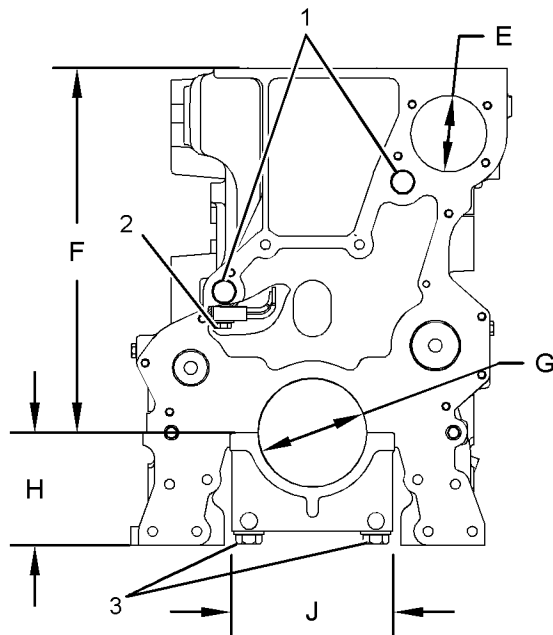


Illustration 237

g01568760

Front view

(2) Bolt for the piston cooling jet

(E) Diameter of the camshaft bore
 85.000 ± 0.015 mm ((3.3465 ± 0.0006 inch))

(F) Distance from the centerline of the crankshaft bore to the top surface of the cylinder block

. 387.00 mm ((15.236 inch))

(G) Bore in the cylinder block for the main bearing
 116.000 ± 0.013 mm ((4.5669 ± 0.0005 inch))

(H) Distance from the centerline of the crankshaft to the bottom surface of the cylinder block . . 120.0 mm ((4.72 inch))

(J) Dimensions of main bearing cap

Width of the main bearing cap
 . . . 178.000 ± 0.020 mm ((7.0079 ± 0.0008 inch))

Width in cylinder block for the main bearing cap
 . . . 178.000 ± 0.023 mm ((7.0079 ± 0.0009 inch))

(1) Apply Loctite 574 to the bore of three cup plugs.

Use the following procedure in order to tighten the main bearing cap bolts (3) :

1. Orient the main bearing cap correctly. The part number on the main bearing cap must face to the right and to the front face of the block. Also, the tab slots that are in the block and the main bearing caps must be adjacent.

Note: The main bearing caps are marked with identification numbers 1 through 7. Install the main bearing caps into the correct positions.

2. Lubricate the main bearing cap bolts. Use SAE 30W oil or molybdenum grease to lubricate the threads and the washer face.
3. Tighten the main bearing cap bolts to 150 ± 5 N·m (110 ± 4 lb ft).
4. Rotate each main bearing cap bolt in the clockwise direction for additional 60 ± 5 degrees.

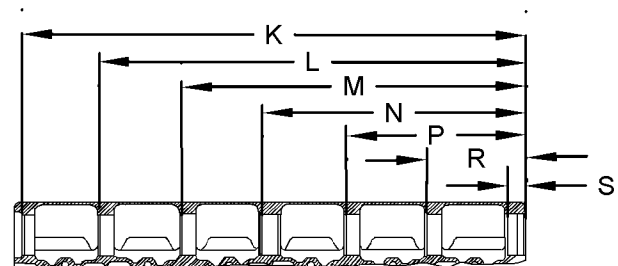


Illustration 238

g01568764

Install the camshaft bearings into the cylinder block at the location that is specified. The distance that is listed below is measured from the front face of the cylinder block.

(K)		972.50 mm ((38.287 inch))
(L)		816.50 mm ((32.146 inch))
(M)		660.50 mm ((26.004 inch))
(N)		504.50 mm ((19.862 inch))
(P)		348.50 mm ((13.720 inch))
(R)		192.50 mm ((7.579 inch))
(S)		36.50 mm ((1.437 inch))

NOTICE

Camshaft bearings must be installed into their correct position. Failure to do so will result in engine damage.

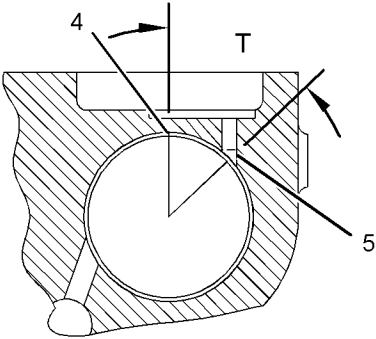


Illustration 239

g01352353

- (4) Bearing joint
- (5) Oil hole

(T) Bearing oil hole is located at the 45 degrees angle from vertical. All seven bearings have the same angle.

i06071159

Cylinder Block

SMCS Code: 1201**S/N:** 3F31-Up**S/N:** 3F41-Up**S/N:** NN41-Up**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** NN51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** NN61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up**S/N:** GCL1-Up**S/N:** TAL1-Up**S/N:** WTL1-Up**S/N:** NLM1-Up**S/N:** SDM1-Up**S/N:** WTM1-Up**S/N:** DKN1-Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: E9S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: E9W1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

S/N: E9Y1–Up

S/N: LKY1–Up

S/N: NYY1–Up

S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

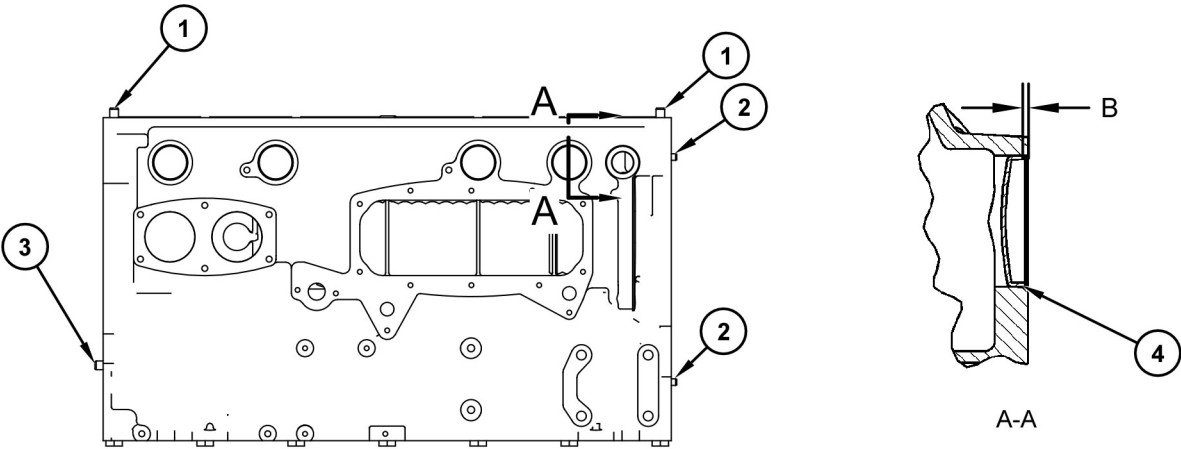


Illustration 240
Right side view of engine

g03330747

Table 86

Specification for 277 - 7261 Cylinder Block Gp and 425 - 3527 Cylinder Block Gp			
Item	Qty	Part	Specification Description
1	2	1W-8407 Sleeve	Extension of sleeve from the top deck of the cylinder block is 14.0 ± 0.5 mm (0.55 ± 0.02 inch).
2	2	6V-3538 Dowel	Extension of the new dowel is 8.0 ± 0.5 mm (0.31 ± 0.02 inch).
3	2	7N-5683 Dowel	Extension of the new dowel is 12.0 ± 0.5 mm (0.47 ± 0.02 inch).
4	4	4F-5695 Cup Plug	Before assembly, apply high temperature anaerobic flange sealant to the bores for the cup plug before assembly.
B	-	-	Installation depth for the cup plug (4) is 1.25 ± 0.25 mm (0.049 ± 0.010 inch).

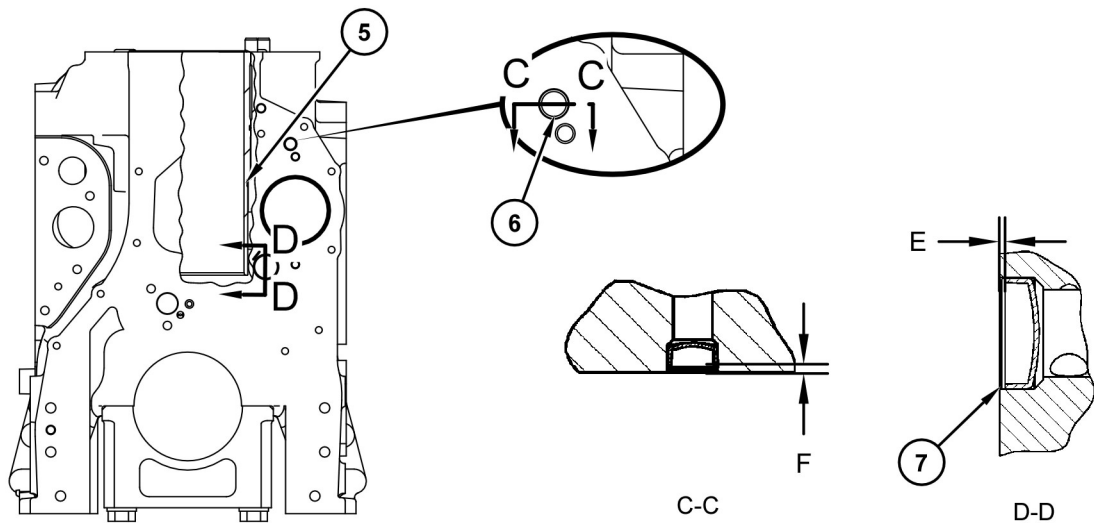


Illustration 241
Front view

g03330748

Table 87

Item	Qty	Part	Specification Description
5	6	167 - 0024 Liner Seal	Before assembly, apply 5P - 3975 Rubber Lubricant to the liner seal, and immediately install the cylinder liner into the cylinder block.
6	2	0L - 1026 Cup Plug	Before assembly, apply high temperature anaerobic flange sealant to the bores for the cup plug at both the ends.
7	2	3B - 0623 Cup Plug	Before assembly, apply high temperature anaerobic flange sealant to the bores of the cup plug at both the ends.
E	-	-	Installation depth for the cup plug (7) is 1.25 ± 0.25 mm (0.049 $\pm$ 0.010 inch).
F	-	-	Installation depth for the cup plug (6) is 1.25 ± 0.25 mm (0.049 $\pm$ 0.010 inch).

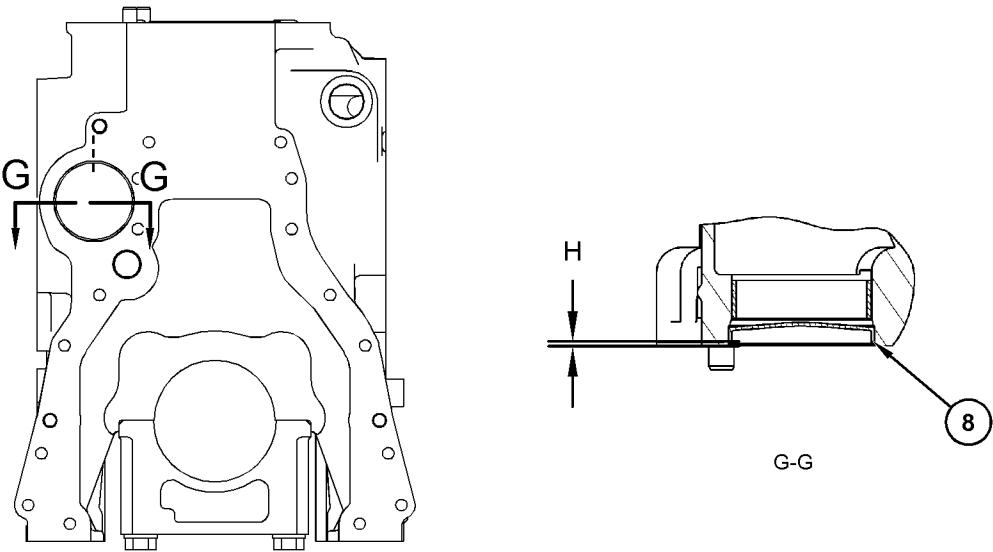


Illustration 242
Rear view

g03330749

Table 88

Item	Qty	Part	Specification Description
8	1	0S-0519 Cup Plug	Before assembly, apply high temperature anaerobic flange sealant to the bores for the cup plug at both the ends.
H	-	-	Installation depth for the cup plug (8) is 1.25 ± 0.25 mm (0.049 ± 0.010 inch).

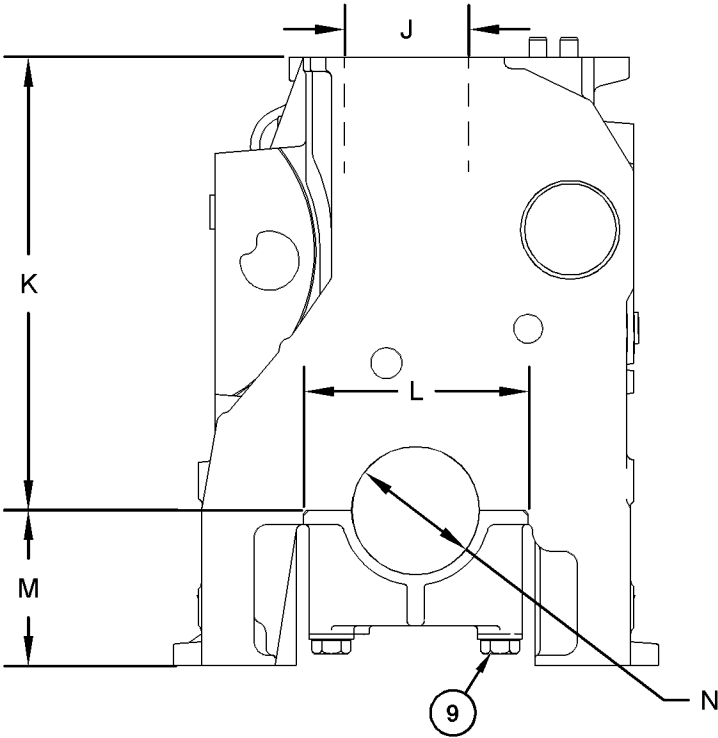


Illustration 243

g03330750

Table 89

Item	Qty	Part	Specification Description
J	-	-	Before installation, bore in the cylinder block for the new cylinder is 123.59 ± 0.15 mm (4.866 ± 0.006 inch).
K	-	-	New dimension from centerline of the crankshaft bore to the top surface of the cylinder block is 361.5 mm (14.23 inch).
L	7	212-7002 Bearing Cap	Width of the main bearing cap is 175.000 ± 0.020 mm (6.8897 ± 0.0008 inch). Width in the cylinder block for the main bearing cap is 175.000 ± 0.018 mm (6.8897 ± 0.0007 inch).
M	-	-	New dimension from centerline of the crankshaft bore to the pan rail is 110 mm (4.3 inch).
N	-	-	Bore in the cylinder block for the seven main bearings is 112.000 ± 0.013 mm (4.4094 ± 0.0005 inch).
9	14	175-0454 Bolt	Use the following procedure in order to tighten the main bearing cap bolts: 1. Install main bearing caps with the part number to the right and towards the front face of the block. 2. Apply molybdenum or SAE 30 oil to the threads of the bolts and faces of the washers. 3. Tighten bolts to 95 ± 5 N·m (70 ± 4 lb ft). 4. Again tighten bolts simultaneously on each bearing cap to a turn angle of 90 ± 5 degrees.

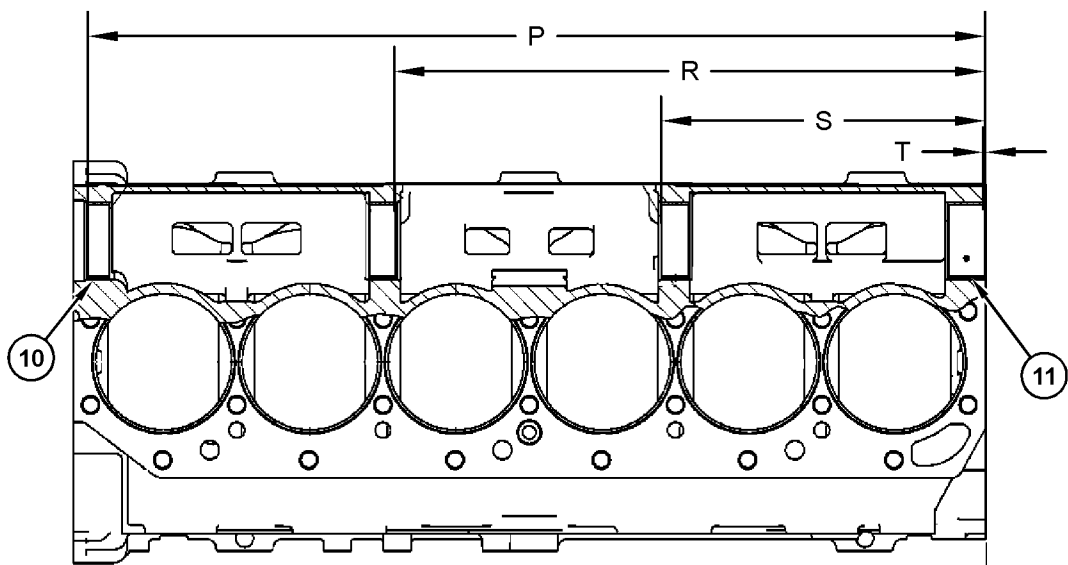


Illustration 244

g03330751

Table 90

Item	Qty	Part	Specification Description
10	1	203 - 6090 Bushing	Bore in the cylinder block for the bushing is 70.000 ± 0.038 mm (2.7559 ± 0.0015 inch).
11	1	216 - 5586 Bushing	Bore in the cylinder block for the bushing is 70.000 ± 0.025 mm (2.7559 ± 0.0010 inch).
-	-	-	Except for the front camshaft bearing (11), locate oil hole in each camshaft bearing so that oil hole is located at the top of the bore. Align oil hole in the front camshaft bearing (11) with the oil hole in the cylinder block.
The camshaft bearings are installed into the cylinder block at the following positions:			
P	-	-	Distance from front face of cylinder block is 816.5 ± 0.8 mm (32.15 ± 0.03 inch).
R			Distance from front face of cylinder block is 536.5 ± 0.8 mm (21.12 ± 0.03 inch).
S			Distance from front face of cylinder block is 294.5 ± 0.8 mm (11.59 ± 0.03 inch).
T			Distance from front face of cylinder block is 0.50 ± 0.25 mm (0.020 ± 0.010 inch).

i06192227

Cylinder Block

SMCS Code: 1201

S/N: 3F31–Up

S/N: 3F41–Up

S/N: NN41–Up

S/N: 3F51–Up

S/N: MW51–Up

S/N: NN51–Up

S/N: BJ61–Up

S/N: BS61–Up

S/N: NN61–Up

S/N: 2L71–Up

S/N: 2L81–Up

S/N: FLA1–Up

S/N: GTA1–Up

Specifications Section

S/N: TBA1–Up	S/N: KFH1–Up
S/N: JGB1–Up	S/N: KLH1–Up
S/N: BYC1–Up	S/N: LFH1–Up
S/N: FPC1–Up	S/N: TAH1–Up
S/N: LCC1–Up	S/N: A6J1–Up
S/N: MDC1–Up	S/N: A7J1–Up
S/N: SPC1–Up	S/N: B9J1–Up
S/N: WEC1–Up	S/N: R9J1–Up
S/N: XAC1–Up	S/N: RAJ1–Up
S/N: 9SD1–Up	S/N: RBJ1–Up
S/N: A6D1–Up	S/N: TAJ1–Up
S/N: ESD1–Up	S/N: MLK1–Up
S/N: MGD1–Up	S/N: R5K1–Up
S/N: P5D1–Up	S/N: A3L1–Up
S/N: PFD1–Up	S/N: B1L1–Up
S/N: RGD1–Up	S/N: GCL1–Up
S/N: WTD1–Up	S/N: TAL1–Up
S/N: M3E1–Up	S/N: WTL1–Up
S/N: MTE1–Up	S/N: NLM1–Up
S/N: NPE1–Up	S/N: SDM1–Up
S/N: RAE1–Up	S/N: WTM1–Up
S/N: WDE1–Up	S/N: DKN1–Up
S/N: YAE1–Up	S/N: JKN1–Up
S/N: YEE1–Up	S/N: MEN1–Up
S/N: GKF1–Up	S/N: RAN1–Up
S/N: M3F1–Up	S/N: RFN1–Up
S/N: NNF1–Up	S/N: SCN1–Up
S/N: RYF1–Up	S/N: WTN1–Up
S/N: A6G1–Up	S/N: DHP1–Up
S/N: A7G1–Up	S/N: WTP1–Up
S/N: NEG1–Up	S/N: BWR1–Up
S/N: PZG1–Up	S/N: JAR1–Up
S/N: RGG1–Up	S/N: M2R1–Up
S/N: TDG1–Up	S/N: SBR1–Up
S/N: YAG1–Up	S/N: XBR1–Up
S/N: B9H1–Up	S/N: D3S1–Up
S/N: EEH1–Up	S/N: E9S1–Up
S/N: GPH1–Up	S/N: ELS1–Up

S/N: KHS1-Up

S/N: LRS1-Up

S/N: LYS1-Up

S/N: PBT1-Up

S/N: E9W1-Up

S/N: PJW1-Up

S/N: GAX1-Up

S/N: BWY1-Up

S/N: E9Y1-Up

S/N: LKY1-Up

S/N: NYY1-Up

S/N: SEY1-Up

S/N: SEZ1-Up

S/N: WXZ1-Up

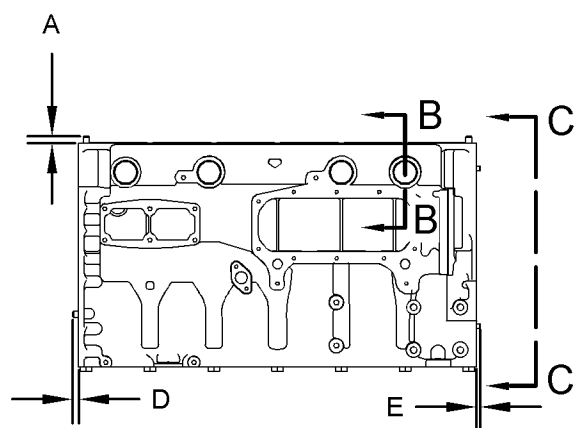


Illustration 245

g01418207

Right side view

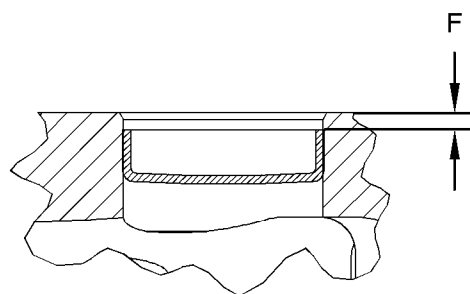


Illustration 246

g01418249

View B-B

(A) Distance from the top of the cylinder block to the top of the dowel . . . 14.0 ± 0.5 mm ($(0.55 \pm 0.02$ inch))

(D) Distance from the rear face of the cylinder block to the end of dowels 12.0 ± 0.5 mm ($(0.47 \pm 0.02$ inch))

(E) Distance from the front face of the cylinder block to the end of dowels 8.0 ± 0.5 mm ($(0.31 \pm 0.02$ inch))

(F) Installation depth of the cup plug from the block face to the top edge of the plug 1.25 ± 0.25 mm ($(0.049 \pm 0.010$ inch))

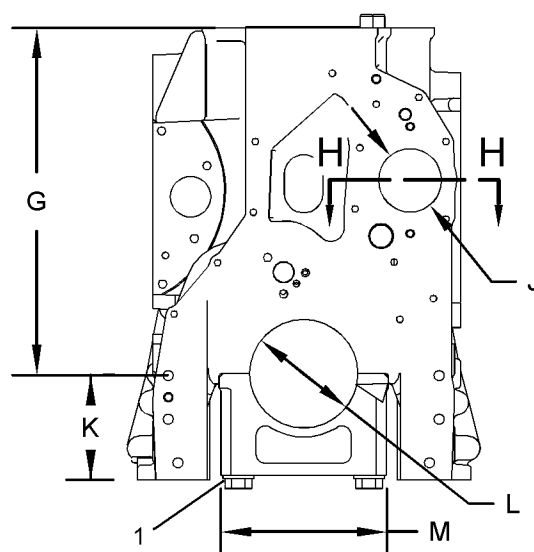


Illustration 247

g01418605

View C-C

(G) Distance from the centerline of the crankshaft bore to the top surface of the cylinder block 356.50 ± 0.15 mm ($(14.035 \pm 0.006$ inch))

(J) Camshaft bores

Bore diameters in the cylinder block for the camshaft bearings except for the front camshaft bearing. $70.000 \pm 0.038 \text{ mm}$
(($2.7559 \pm 0.0015 \text{ inch}$))

Bore diameter in the cylinder block for the front camshaft bearing. $70.000 \pm 0.025 \text{ mm}$
(($2.7559 \pm 0.0010 \text{ inch}$))

(K) Distance from the centerline of the crankshaft to the bottom surface of the cylinder block 110.00 mm ((4.331 inch))

(L) Bore in the cylinder block for the seven main bearings $112.000 \pm 0.013 \text{ mm}$
(($4.4094 \pm 0.0005 \text{ inch}$))

(M) Width of the main bearing cap $175.000 \pm 0.020 \text{ mm}$ (($6.8898 \pm 0.0008 \text{ inch}$))

- Use the following procedure in order to tighten the main bearing cap bolts (1) :
1. Orient the main bearing cap correctly. The part number on the main bearing cap must face to the right and to the front face of the block.

Note: The main bearing caps are marked with identification numbers “1” through “7” . Install the main bearing caps into the correct positions.

2. Lubricate the main bearing cap bolts. Use SAE 30W oil or molybdenum grease to lubricate the threads and the washer face.
3. Torque the main bearing cap bolts to $95 \pm 5 \text{ N}\cdot\text{m}$ ($70 \pm 4 \text{ lb ft}$).
4. Put an alignment mark on each cap and bolt.
5. Rotate the bolts in the clockwise direction to an angle of 90 ± 5 degrees.

NOTICE

Camshaft bearings must be installed into their correct position. Failure to do so will result in engine damage.

The camshaft bearings are installed into the cylinder block at the following positions:

- Position (N) $816.50 \pm 0.80 \text{ mm}$
(($32.146 \pm 0.031 \text{ inch}$))
- Position (P) $536.50 \pm 0.80 \text{ mm}$
(($21.122 \pm 0.031 \text{ inch}$))
- Position (S) $294.50 \pm 0.80 \text{ mm}$
(($11.594 \pm 0.031 \text{ inch}$))
- Position (T) $0.50 \pm 0.25 \text{ mm}$
(($0.020 \pm 0.010 \text{ inch}$))

(U) Installation depth of the cup plug from the block face to the top edge of the plug $1.25 \pm 0.25 \text{ mm}$
(($0.049 \pm 0.010 \text{ inch}$))

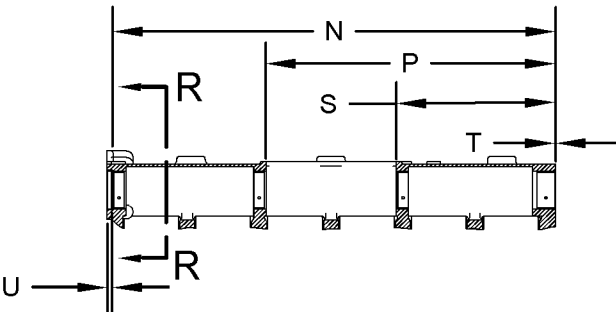


Illustration 248
View H-H

g01418610

i08040588

Cylinder Block

SMCS Code: 1201**S/N:** 3F31-Up**S/N:** 3F41-Up**S/N:** NN41-Up**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** NN51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** NN61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** GTA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** LCC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** A7D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** A7G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**Part No.:** 240-7271**S/N:** R9H1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** A7J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up

S/N: GCL1–Up

S/N: TAL1–Up

S/N: WTL1–Up

S/N: NLM1–Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: E9S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: E9W1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

S/N: E9Y1–Up

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S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

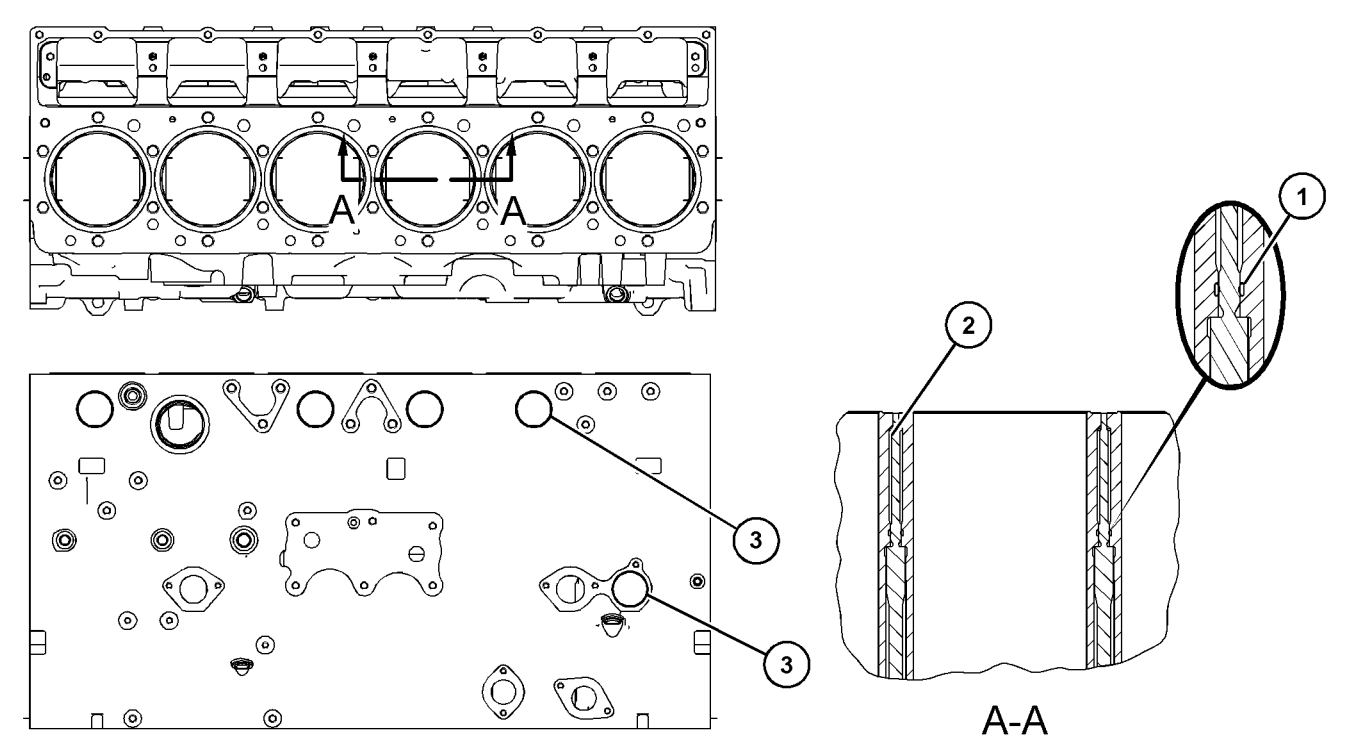


Illustration 249 g06520130

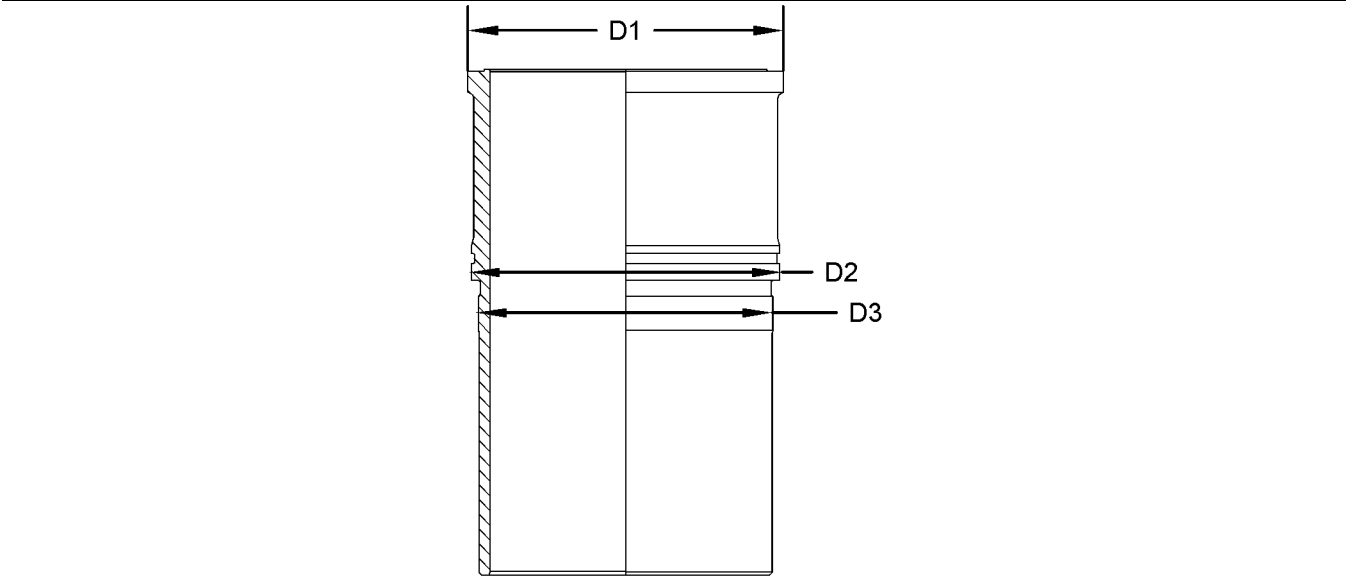


Illustration 250 g06520131

Table 91

Item	Qty	Part	Specification Description
1	6	437 - 1409 Liner Seal	Before assembly, apply 5P - 3975 Rubber Lubricant.

(continued)

Specifications Section

(Table 91, contd)

2	6	197 - 9330 Cylinder Block Liner	Bore diameter in the cylinder block for cylinder block liner:
			Dimension (B) is 151.50 ± 0.03 mm (5.965 ± 0.001 inch).
			Dimension (C) is 149.80 ± 0.30 mm (5.898 ± 0.012 inch).
			Dimension (D) is 148.00 ± 0.03 mm (5.827 ± 0.001 inch).
			Dimension (E) is 141.90 ± 0.15 mm (5.587 ± 0.111 inch).
-	-	-	The flatness of the top contact surface of the cylinder block must be within 0.05 mm (0.002 inch) for any 150 mm (5.9 inch) section of the surface.
3	5	4F - 5695 Cup Plug	Before assembly, apply High Strength or High Temperature Anaerobic Flange Sealant to the bores. Installation depth is 1.25 ± 0.25 mm (0.049 ± 0.010 inch).

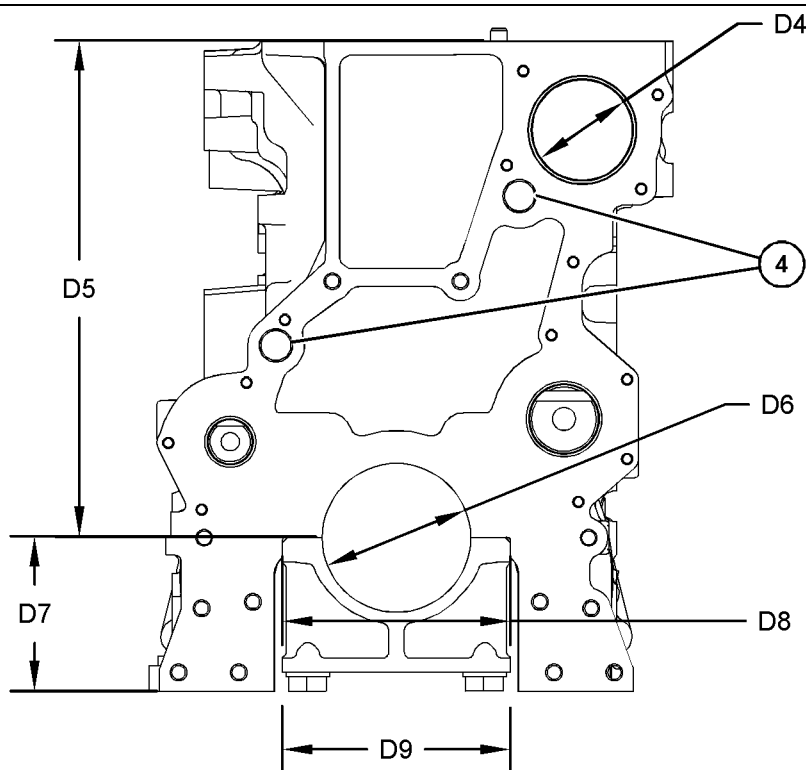


Illustration 251

g06520132

Table 92

Item	Qty	Part	Specification Description
D4	-	-	Bore for camshaft bearing is 85.000 ± 0.015 mm (3.3465 ± 0.0006 inch).
D5	-	-	Distance from the centerline of the crankshaft bore to the top surface of the cylinder block is 387.00 mm (15.236 inch).
4	3	3B - 0623 Cup Plug	Before assembly, apply High Strength or High Temperature Anaerobic Flange Sealant to the bores. Installation depth is 1.25 ± 0.25 mm (0.049 ± 0.010 inch).
D6	-	-	Bore in the cylinder block for the main bearing is 116.000 ± 0.013 mm (4.5669 ± 0.0005 inch).

(continued)

(Table 92, contd)

D7	-	-	Distance from the centerline of the crankshaft bore to the bottom surface of the cylinder block is 120.0 mm (4.72 inch).
D8	7	207 - 8572 Bearing Cap	Width in the cylinder block for main bearing cap is 178.000 ± 0.023 mm (7.008 ± 0.001 inch). Width of the bearing cap (D9) is 178.0 mm (7.01 inch).

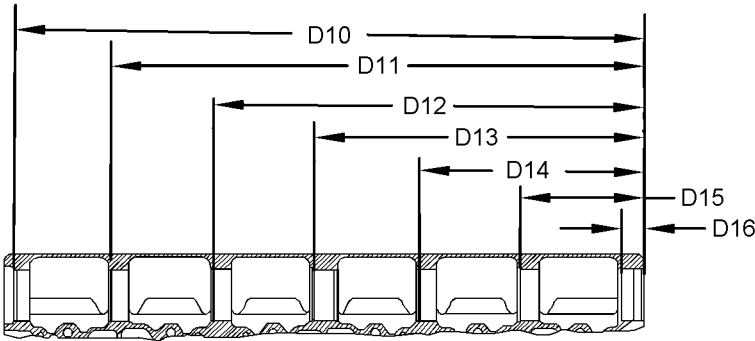


Illustration 252

g06520133

Table 93

Item	Qty	Part	Specification Description
-			Install the camshaft bearings into the cylinder block at the location specified. The distance that is listed below is measured from the front face of the cylinder block.
-	-	-	Dimension (D10) is 972.5 mm (38.29 inch).
-	-	-	Dimension (D11) is 816.5 mm (32.15 inch).
-	-	-	Dimension (D12) is 660.5 mm (26.00 inch).
-	-	-	Dimension (D13) is 504.5 mm (19.86 inch).
-	-	-	Dimension (D14) is 348.5 mm (13.72 inch).
-	-	-	Dimension (D15) is 192.5 mm (7.58 inch).
-	-	-	Dimension (D16) is 36.5 mm (1.44 inch).

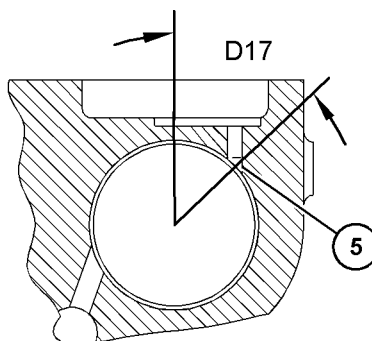


Illustration 253

q06520134

Table 94

Item	Qty	Part	Specification Description
D17	-	-	Bearing oil hole (5) is located at the 45 ± 5 degrees angle from vertical. All seven bearings have the same angle.

i02840286

i02844254

Cylinder Liner

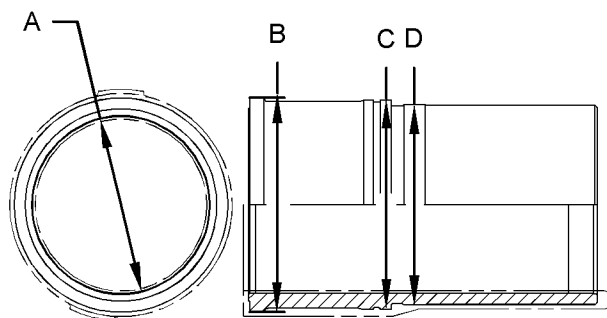
SMCS Code: 1216

Illustration 254

g01419644

Note: Apply 5P-3975 Rubber Lubricant to the cylinder liner seals prior to assembly.

(A) Bore diameter for the cylinder liner
..... 130.025 ± 0.025 mm ((5.1191 ± 0.0010 inch))

Outside diameters of the cylinder liner

Dimension (B) 151.42 ± 0.05 mm
 ((5.961 ± 0.002 inch))

Dimension (C) 147.90 ± 0.03 mm
((5.823 ± 0.001 inch))

Dimension (D) 141.38 ± 0.08 mm
 ((5.566 ± 0.003 inch))

Cylinder Liner

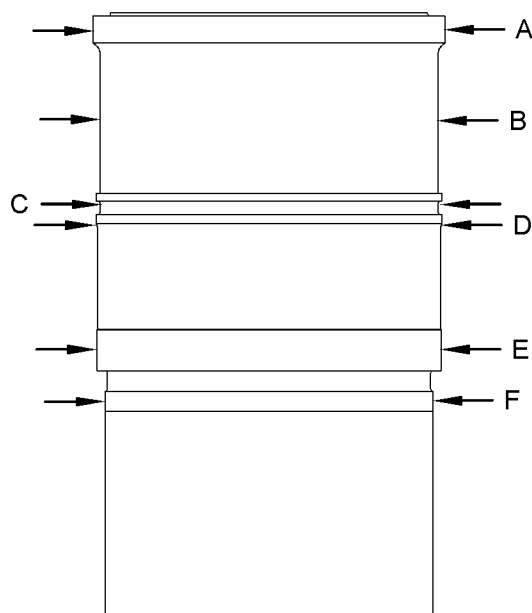
SMCS Code: 1216

Illustration 255

g01418223

Note: Apply 5P-3975 Rubber Lubricant to the cylinder liner seal prior to assembly.

Outside diameters of the cylinder liner

Position (A)	128.95 ± 0.03 mm ((5.077 ± 0.001 inch))
Position (B)	123.80 ± 0.30 mm ((4.874 ± 0.012 inch))
Position (C)	123.95 ± 0.13 mm ((4.880 ± 0.005 inch))
Position (D)	126.00 ± 0.27 mm ((4.961 ± 0.011 inch))
Position (E)	126.24 ± 0.03 mm ((4.970 ± 0.001 inch))
Position (F)	120.34 ± 0.08 mm ((4.738 ± 0.003 inch))

Bore diameter for the cylinder liner

. 112.025 ± 0.025 mm ((4.4104 ± 0.0010 inch))

i04379736

Cylinder Liner

SMCS Code: 1216

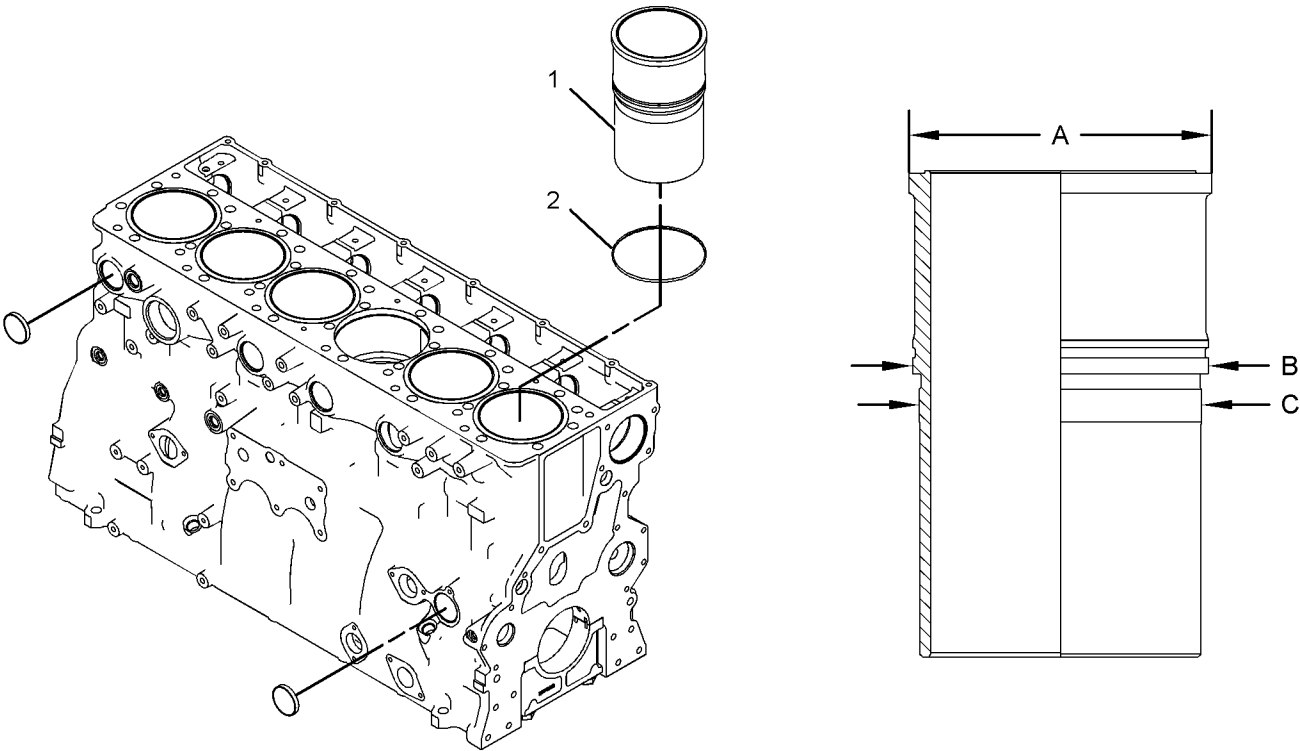


Illustration 256

g02543584

Outside diameter of the cylinder liners

(1) Cylinder block liner

(2) Liner seal

Table 95

Specification for 197 - 9330 Cylinder Block Liner			
Item	Qty	Part	Specification Description
A	-	-	Diameter is 151.42 ± 0.05 mm (5.961 ± 0.002 inch).
B	-	-	Diameter is 147.90 ± 0.03 mm (5.823 ± 0.001 inch).
C	-	-	Diameter is 141.38 ± 0.08 mm (5.566 ± 0.003 inch).
-	-	-	Apply 5P - 3975 Rubber Lubricant to the cylinder liner seals before assembly.

i06059178

Cylinder Liner

SMCS Code: 1216

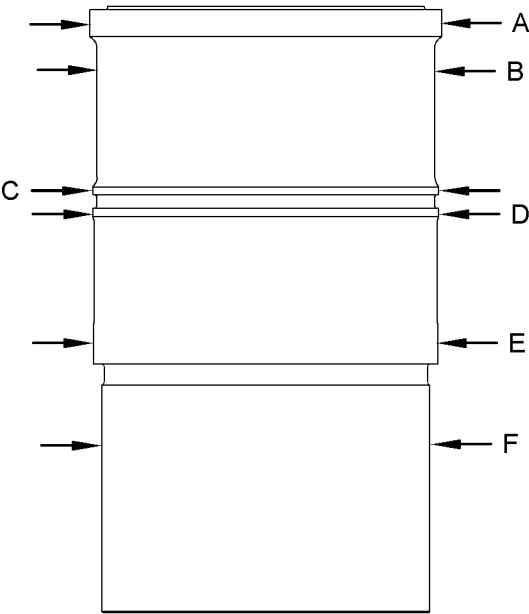


Illustration 257

g01662374

Table 96

Specification for 267 - 6686 Cylinder Block Liner			
Item	Qty	Part	Specification Description
A	-	-	Diameter is 128.95 ± 0.03 mm (5.077 ± 0.001 inch).
B	-	-	Diameter is 127 ± 0.38 mm (4.999 ± 0.015 inch)147.90 ± 0.03 mm (5.823 ± 0.001 inch).
C	-	-	Diameter is 128.85 ± 0.05 mm (5.073 ± 0.002 inch).
D	-	-	Diameter is 128.85 ± 0.05 mm (5.073 ± 0.002 inch).
E			Diameter is 128.15 ± 0.05 mm (5.045 ± 0.002 inch).
F			Diameter is 122.75 ± 0.2 mm (4.833 ± 0.008 inch).
-	-	-	Bore diameter for the cylinder liner 115.025 ± 0.025 mm (4.529 ± 0.001 inch).

i07003469

Cylinder Liner

SMCS Code: 1216

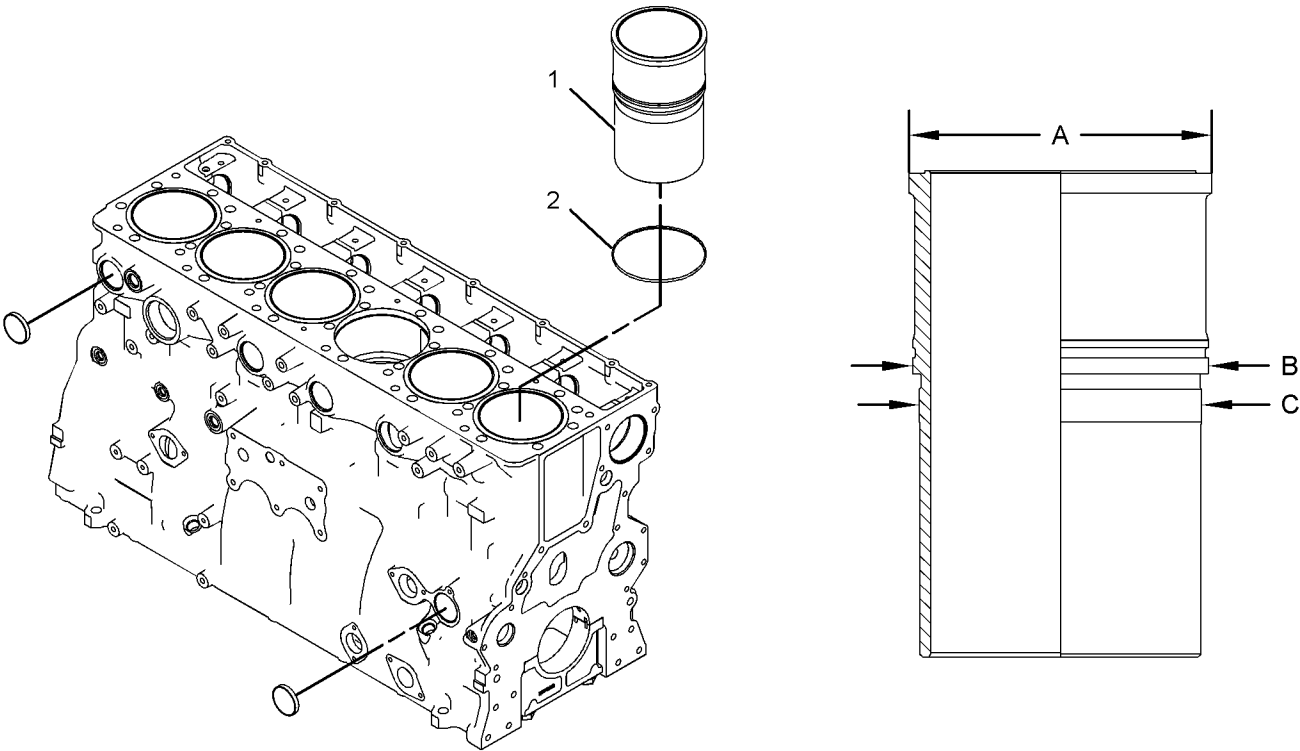


Illustration 258

g02543584

Outside diameter of the cylinder liners

(1) Cylinder block liner

(2) Liner seal

Table 97

Specification for 469 - 5315 Cylinder Liner			
Item	Qty	Part	Specification Description
A	-	-	Diameter is 147.9 mm (5.82 inch).
B	-	-	Diameter is 145.12 ± 0.05 mm (5.713 ± 0.001 inch).
C	-	-	Diameter is 139.57 ± 0.13 mm (5.494 ± 0.005 inch).

i02765209

i03812236

Crankshaft

SMCS Code: 1202

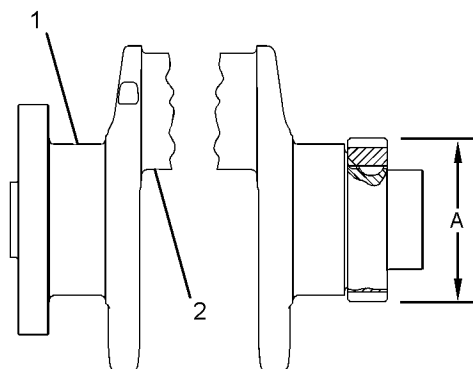


Illustration 259

g01384054

- (1) Main bearing journals
(2) Connecting rod bearing journals

(A) Average diameter of gear after assembly
..... 112.48 ± 0.10 mm ($(4.428 \pm 0.004$ inch))

Maximum diameter of gear after assembly
..... 112.63 mm ($(4.434$ inch))

Crankshaft end play after assembly into cylinder
block 0.21 to 0.60 mm ($(0.008$ to 0.024 inch))

Crankshaft

SMCS Code: 1202

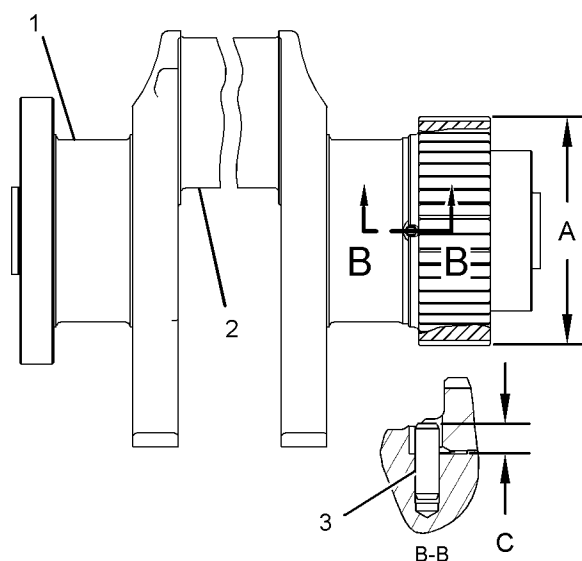


Illustration 260

g02066516

- (1) Main bearing journals
(2) Connecting rod bearing journals

The thrust plate should be used only on the center main bearing journals.

(A) Dimensions for crankshaft gear

Average diameter after assembly
..... 136.20 ± 0.11 mm ($(5.362 \pm 0.004$ inch))
Maximum diameter after assembly . . 136.36 mm
($(5.368$ inch))

(C) Height from top of the dowel (3) to the surface of the crankshaft . . . 8.0 ± 0.5 mm ($(0.31 \pm 0.02$ inch))

Note: After the crankshaft is assembled into the block, the crankshaft end play should be a maximum of 0.50 mm (0.020 inch) and a minimum of 0.10 mm (0.004 inch).

Note: The gap between the crankshaft gear and the crankshaft should not exceed 0.10 mm (0.004 inch).

i04393432

Crankshaft

SMCS Code: 1202

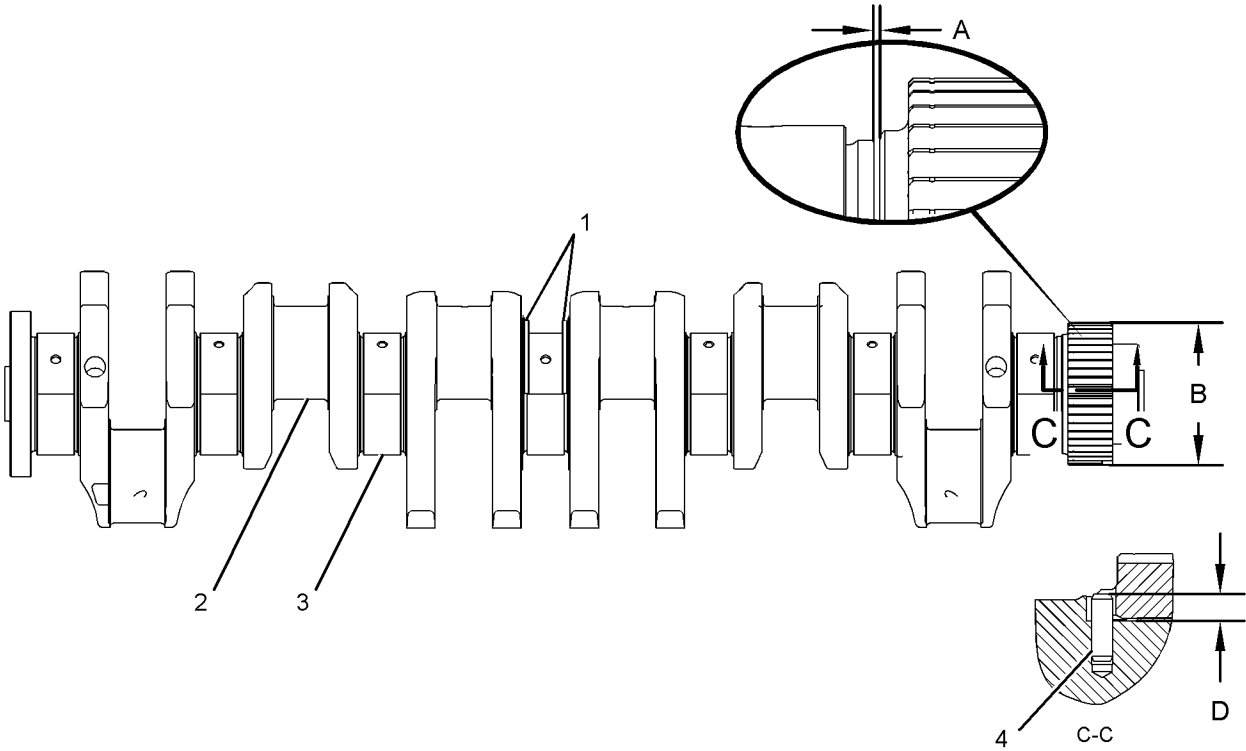


Illustration 261

g02563856

(2) Connecting rod bearing journal

(3) Main bearing journal

Table 98

Specification for 224 - 3881 Crankshaft Gp			
Item	Qty	Part	Specification Description
1	2	246 - 3144 Thrust Plate	The thrust plate should be used only on the center main bearing journals.
A	-	-	The gap between the crankshaft gear and the crankshaft should not exceed 0.10 mm (0.004 inch).
B	-	-	Average diameter of crankshaft gear is 136.20 ± 0.11 mm (5.362 $\pm$ 0.004 inch). Maximum diameter of crankshaft gear after assembly is 136.36 mm (5.368 inch).
D	-	-	Height from top of the dowel (4) to the surface of the crankshaft is 8.0 ± 0.5 mm (0.31 $\pm$ 0.02 inch).
-	-	-	After the crankshaft is assembled into the cylinder block, the crankshaft end play should be between maximum of 0.50 mm (0.020 inch) and minimum of 0.10 mm (0.004 inch).

i05447630

Crankshaft

SMCS Code: 1202

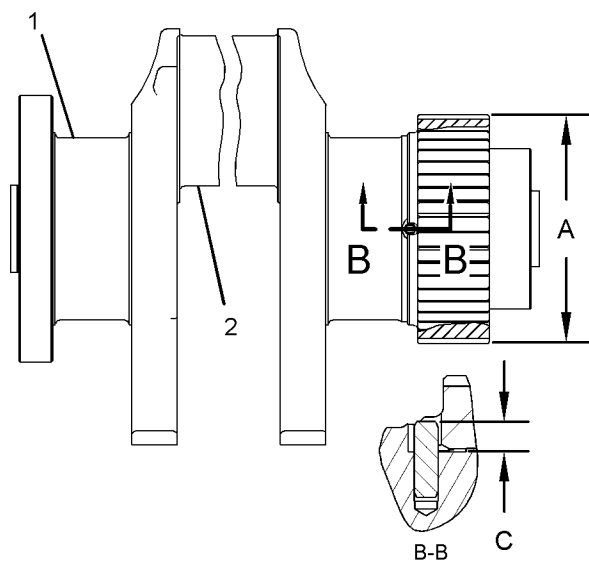


Illustration 262

g01447590

- (1) Main bearing journals
(2) Connecting rod bearing journals

The thrust plate should be used only on the center main bearing journals.

(A) Dimensions for crankshaft gear

Average diameter after assembly
 136.20 ± 0.11 mm ((5.362 ± 0.004) inch)
 Maximum diameter after assembly . . 136.36 mm
 ((5.368) inch)

(C) Height from top of the dowel to the surface of the crankshaft 8.0 ± 0.5 mm ((0.31 ± 0.02) inch)

Note: Crankshaft end play after assembly into cylinder block is 0.1 mm (0.004 inch) min to 0.5 mm (0.02 inch) max.

Note: The gap between the crankshaft gear and the crankshaft should not exceed 0.10 mm (0.004 inch).

i06059265

Crankshaft

SMCS Code: 1202

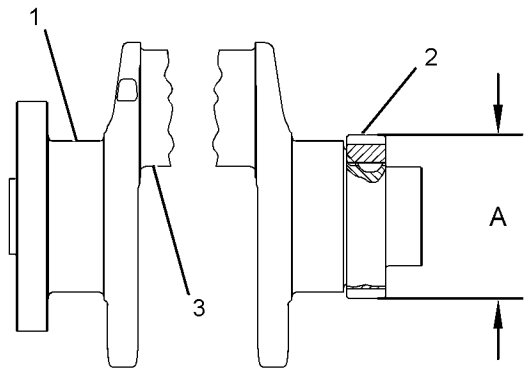


Illustration 263

g02685676

- (1) Main bearing journals
- (3) Connecting rod bearing journals

Table 99

Specification for 294 - 2987 Crankshaft Gp			
Item	Qty	Part	Specification Description
2	1	282 - 7955 Crankshaft Gear	Average diameter of gear after assembly (A) is 113.76 ± 0.12 mm (4.479 ± 0.005 inch).
			Maximum diameter of gear after assembly is 113.90 mm (4.484 inch).
Crankshaft end play after assembly into cylinder block is 0.21 to 0.60 mm (0.008 to 0.024 inch).			

i02844263

Crankshaft Seals

SMCS Code: 1160; 1161

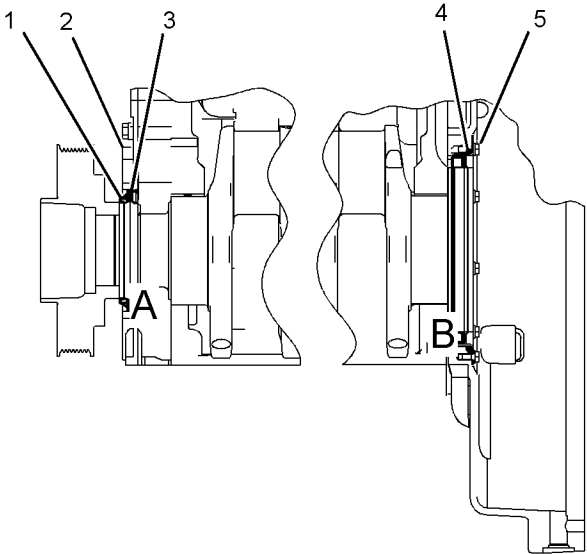


Illustration 264

g01418240

- (4) O-ring seal
- (5) Bolt

Note: Refer to Disassembly and Assembly for the complete procedure that is used for information that relates to the removal and the installation of the front and the rear crankshaft seals.

Note: The crankshaft seal excluder (1) can be installed with the front seal for use in applications that operate in harsh environments. If the extruder is used on your application, lubricate the inside diameter of the crankshaft seal excluder with liquid soap prior to assembly to the crankshaft pulley.

When the front crankshaft seal (3) is installed, the front face of the seal must be 2.5 mm (0.10 inch) from the face of the front housing (2).

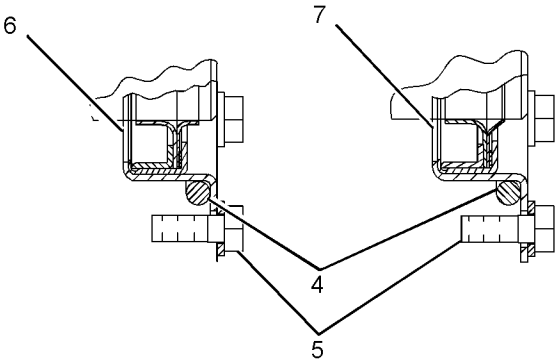


Illustration 266

g01419999

Detail B

(7) Rear crankshaft seal group with dust lip

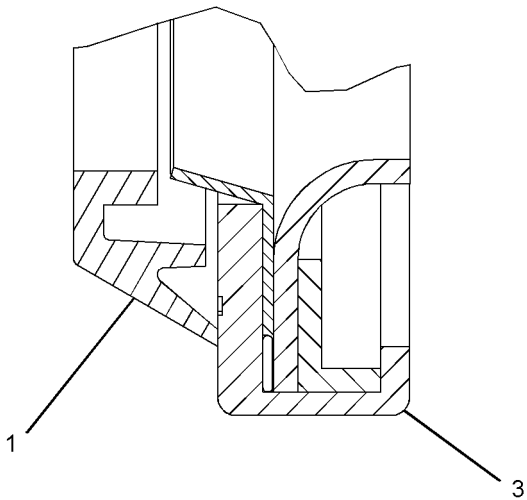


Illustration 265

g01123043

Detail A

Note: The rear crankshaft seal group (6) is a double lipped seal that is used for wet flywheel housing

applications.

i04394025

Crankshaft Seals

SMCS Code: 1160; 1161

226 - 4755 Crankshaft Seal Gp

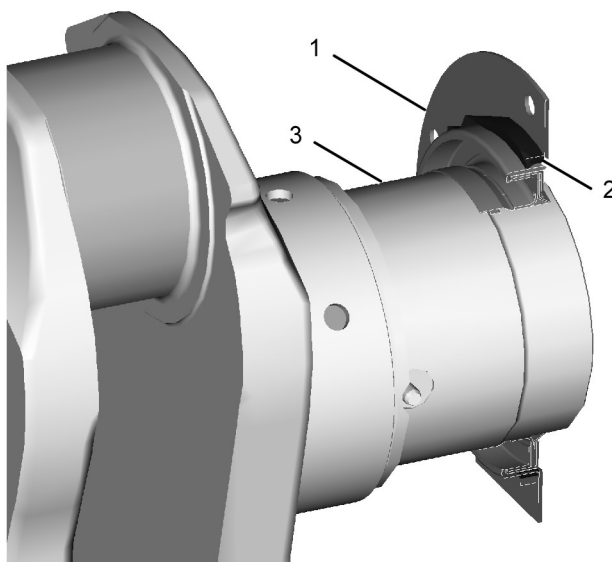


Illustration 267

g02565356

(1) Crankshaft seal group

(2) Ring seal

(3) Crankshaft

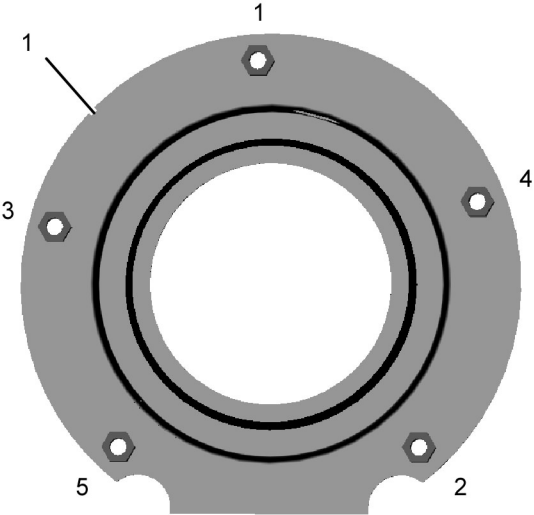


Illustration 268 g02565358

Table 100

Item	Qty	Part	Specification Description
1	1	226 - 4755 Crankshaft Seal Gp	Install dry.
			Tighten bolts in numerical sequence as shown in Illustration 268 .

116 - 1091 Crankshaft Seal Gp

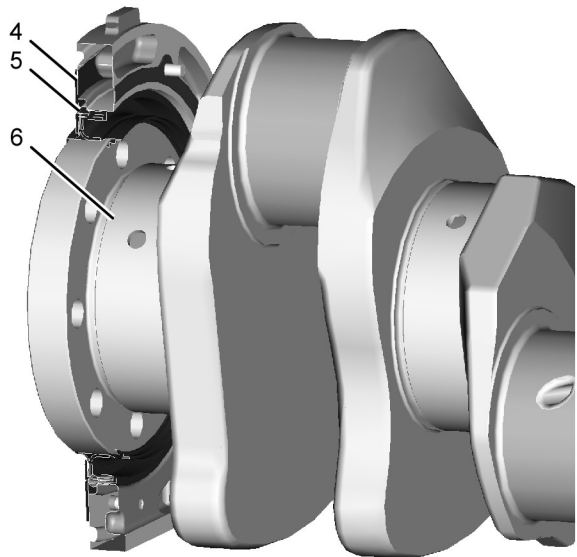


Illustration 269
(4) Crankshaft seal group (5) O-ring seal (6) Crankshaft g02565360

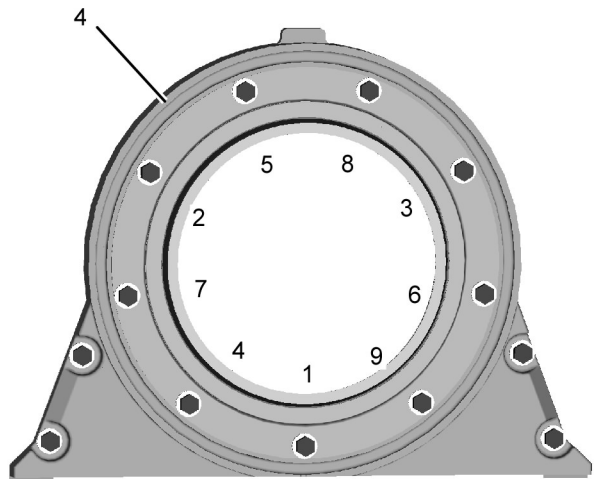


Illustration 270 g02565376

Table 101

Item	Qty	Part	Specification Description
4	1	116 - 1091 Crankshaft Seal Gp	Install dry.
			Tighten bolts in numerical sequence as shown in Illustration 270 .
Front face of the crankshaft seal and the rear face of the cylinder block must be free of oil, water, dirt, assembly compounds, and contaminants during assembly. Apply, 8T - 9022 Silicone Gasket in order to fill the space at the cylinder block, the crankshaft seal, and the flywheel housing.			

i04535374

Crankshaft Seals

SMCS Code: 1160; 1161

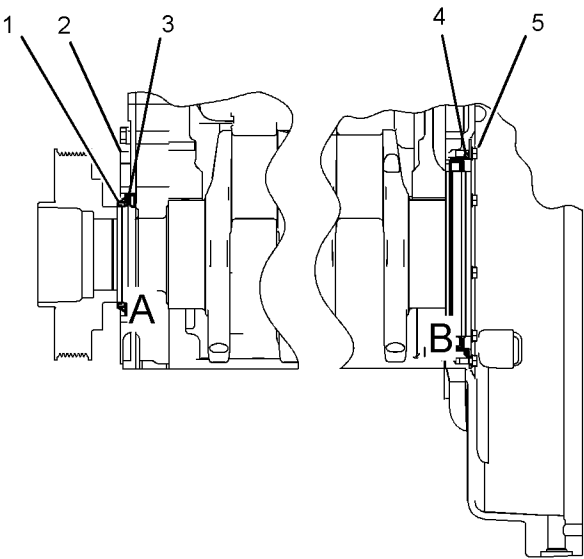


Illustration 271 g02685697

(2) Front housing
(3) Front crankshaft seal
(4) O-ring seal
(5) Bolt

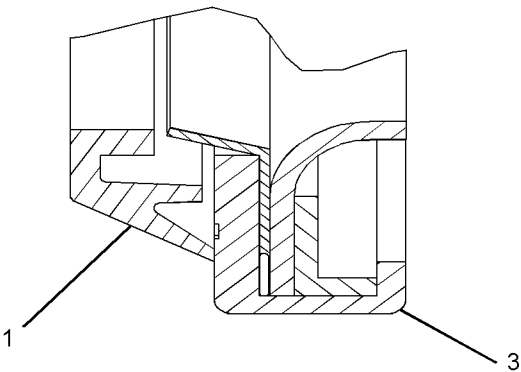


Illustration 272 g02685698

Detail A

Table 102

Specification for 296 - 1486 Crankshaft Seal Gp and 295 - 2351 Crankshaft Seal Gp			
Item	Qty	Part	Specification Description
1	1	4R - 9999 Crankshaft Seal Excluder	The crankshaft seal excluder can be installed with the front seal for use in applications that operate in harsh environments. If the extruder is used on your application, lubricate the inside diameter of the crankshaft seal excluder with liquid soap prior to assembly to the crankshaft pulley.
Refer to Disassembly and Assembly for the complete procedure that is used for information that relates to the removal and the installation of the front and the rear crankshaft seals.			

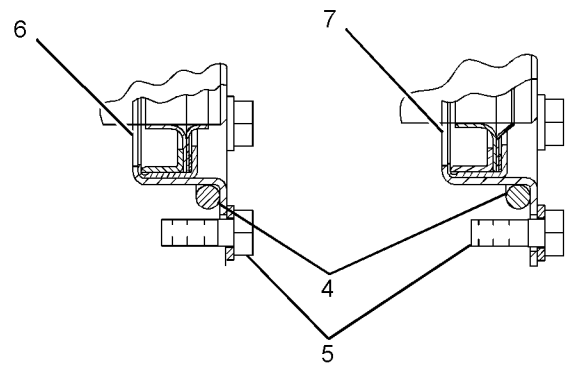


Illustration 273 g02685699

Detail B

(7) Rear crankshaft seal group with dust lip

Table 103

Specification for 296 - 1486 Crankshaft Seal Gp and 295 - 2351 Crankshaft Seal Gp			
Item	Qty	Part	Specification Description
-	-	-	The rear crankshaft seal group (6) is a double lipped seal that is used for wet flywheel housing applications.

i07762005

Crankshaft Seals

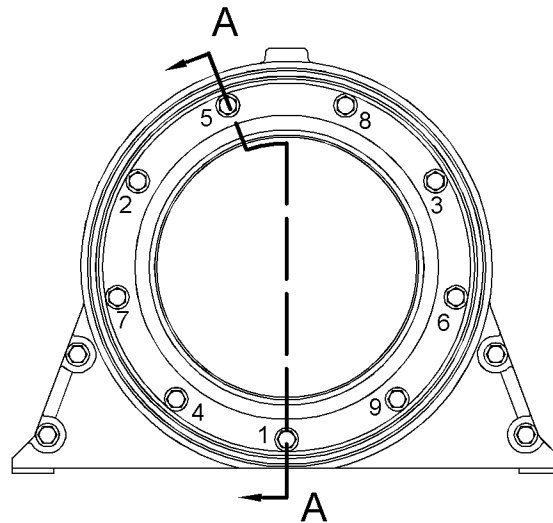
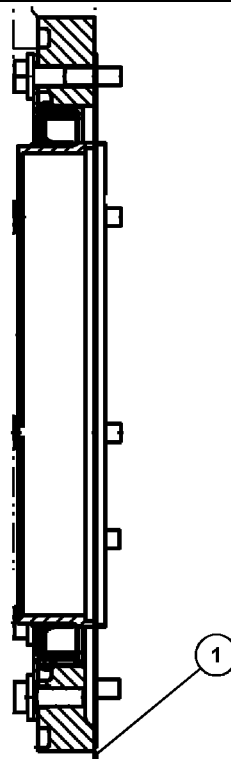
SMCS Code: 1160; 1161

Illustration 274

g01878654

Tightening sequence for the crankshaft seal group

Illustration 275
Section A-A

g06424884

Table 104

Item	Qty	Part	Specification Description
-	-	-	During assembly, the front face of the crankshaft seal and the rear face of the cylinder block must be free of oil, fuel, water, dirt, assembly compounds, and any other contaminants.
1	-	-	Apply Loctite Superflex [®] Ultra Blue 587 to fill the space at the cylinder block, the crankshaft seal, and the flywheel housing.

i06619588

For additional information, refer to Reuse And Salvage Guidelines.

Connecting Rod Bearing Journal

SMCS Code: 1202; 1219; 1225

Table 105

Connecting Rod Bearing Journal	
Original size journal	80.000 ± 0.020 mm (3.1496 ± 0.0008 inch)

i07104883

Connecting Rod Bearing Journal

SMCS Code: 1202; 1219; 1225

Table 106

Connecting Rod Bearing Journal	
Original size journal	89.000 ± 0.020 mm (3.5039 ± 0.0008 inch)
Undersize journal 0.508 mm (.0200 inch)	88.492 ± 0.020 mm (3.4839 ± 0.0008 inch)
Undersize journal 0.762 mm (.0300 inch)	88.238 ± .020 mm (3.4739 ± 0.0008 inch)

((.0023 to .0062 inch))

Clearance between a new bearing and a new journal
. 0.062 to 0.132 mm ((0.0024 to 0.0052 inch))

i02199495

Main Bearing Journal

SMCS Code: 1202; 1203

Table 107

Main Bearing Journal	
Original size journal	108.000 ± 0.020 mm (4.2520 ± .0008 inch)
Undersize journal 0.508 mm (.0200 inch)	107.492 ± 0.020 mm (4.2320 ± .0008 inch)
Undersize journal 0.762 mm (.0300 inch)	107.238 ± 0.020 mm (4.2220 ± .0008 inch)

The clearance between a new bearing and a new journal is the following value. . . . 0.059 to 0.157 mm

Table 108

Main Bearing Bore	
Main bearing bore (original size)	116.000 ± 0.013 mm (4.5669 ± .0005 inch)
Oversize bore in block 0.508 mm (.0200 inch)	116.508 ± 0.013 mm (4.5869 ± .0005 inch)

i02845841

Main Bearing Journal

SMCS Code: 1202; 1203

Table 109

Main Bearing Journal	
Original size journal	108.000 ± 0.020 mm (4.2520 ± 0.0008 inch)

(continued)

(Table 109, contd)

Undersize journal 0.510 mm (0.0201 inch)	107.490 ± 0.020 mm (4.2319 ± 0.0008 inch)
Undersize journal 0.760 mm (0.0299 inch)	107.240 ± 0.020 mm (4.2220 ± 0.0008 inch)

Clearance between a new bearing and a new journal
..... 0.081 to 0.181 mm ((0.0032 to 0.0071 inch))

Table 110

Main Bearing Bore	
Main bearing bore (original size)	116.000 ± 0.013 mm (4.5669 ± 0.0005 inch)
Oversize bore in block 0.510 mm (0.0201 inch)	116.510 ± 0.013 mm (4.5870 ± 0.0005 inch)

i06883113

Main Bearing Journal

SMCS Code: 1202; 1203

Table 111

Diameter of Crankshaft Journal (Bearing Surface) for Main Bearings	
Original size journal	104.000 ± 0.020 mm (4.0945 ± 0.0008 inch)
Undersized journal 0.25 mm (0.00984 inch)	103.75 ± 0.02 mm (4.08464 ± 0.00079 inch)
Undersized journal 0.51 mm (0.02008 inch)	103.49 ± 0.02 mm (4.07440 ± 0.00079 inch)

Clearance between bearing and new journal is
0.082 to 0.177 mm (0.0032 to 0.0070 inch).

Refer to Reuse And Salvage Guidelines, SEBF8041, “Main Bearings And Connecting Rod Bearings” for more Information.

Table 112

Main Bearing Bore	
Main bearing bore (original size)	112.000 ± 0.013 mm (4.4094 ± 0.0005 inch)

Refer to Reuse And Salvage Guidelines, SEBF8735 for more information.

Note: No oversized bearings exist for the main bore of the cylinder block.

i07572841

Main Bearing Journal

SMCS Code: 1202; 1203

Table 113

Main Bearing Journal	
Original size journal	108.000 ± 0.020 mm (4.2520 ± 0.0008 inch)
Undersize journal 0.510 mm (0.0201 inch)	107.490 ± 0.020 mm (4.2319 ± 0.0008 inch)
Undersize journal 0.760 mm (0.0299 inch)	107.240 ± 0.020 mm (4.2220 ± 0.0008 inch)
Clearance between a new bearing and a new journal is 0.083 to 0.197 mm (0.0033 to 0.0078 inch).	

Table 114

Main Bearing Bore	
Main bearing bore (original size)	116.000 ± 0.013 mm (4.5669 ± 0.0005 inch)
Oversize bore in block 0.510 mm (0.0201 inch)	116.510 ± 0.013 mm (4.5870 ± 0.0005 inch)

i02818273

Connecting Rod

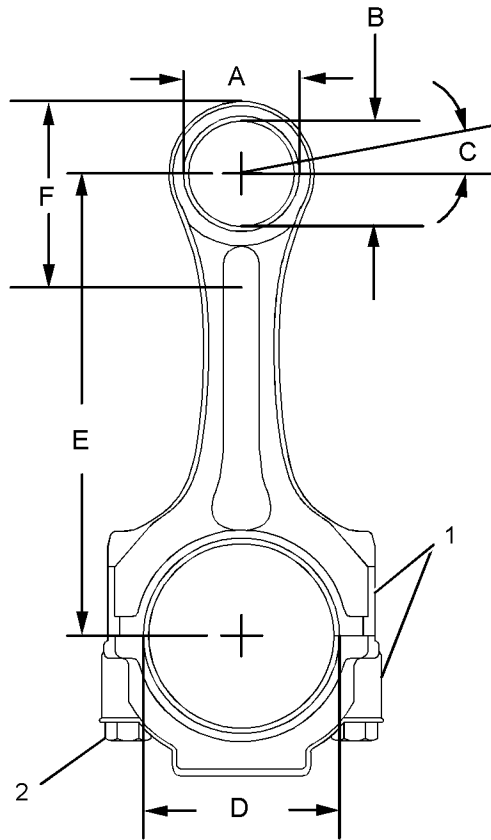
SMCS Code: 1218


Illustration 276

g01330221

(1) Etch the cylinder number on the connecting rod and the cap in this location. Mark the connecting rod and the cap with a number 1 through 6. Mark the numbers on the same side of the connecting rod as the bearing retainer notch.

Note: Install the connecting rod in the engine with the part number to the rear of the engine.

Note: If you replace a connecting rod make sure that you do not combine fractured connecting rods with machined connecting rods. Refer to Special Instruction, REHS3801, "Combining Machined Connecting Rods and Fractured Connecting Rods on C13 Engines" for more instruction.

(2) Tighten the connecting rod bolts. Use the instructions that follow.

1. Tighten the connecting rod bolts.

Tighten the connecting rod bolts to the following torque. $130 \pm 7 \text{ N}\cdot\text{m}$ ($95 \pm 5 \text{ lb ft}$)

2. Tighten each connecting rod bolt for an additional amount.

Rotate each connecting rod bolt in the clockwise direction. $60 \pm 5 \text{ degrees}$ ($1/6$ of a turn)

(A) Bore in the connecting rod for the piston pin bearing $57.810 \pm 0.013 \text{ mm}$
($2.2759 \pm 0.0005 \text{ inch}$)

(B) Bore in the bearing for the piston pin $53.205 \pm 0.008 \text{ mm}$
($2.0947 \pm 0.0003 \text{ inch}$)

Diameter of the piston pin $53.155 \pm 0.005 \text{ mm}$
($2.0927 \pm 0.0002 \text{ inch}$)

Thoroughly lubricate the piston pin with clean engine oil prior to assembly of the piston and connecting rod.

(C) Location of the bearing joint from the horizontal centerline of the pin bore $12.5 \pm 5 \text{ degrees}$

(D) Bore in the connecting rod for the crankshaft bearing $93.800 \pm 0.013 \text{ mm}$
($3.6929 \pm 0.0005 \text{ inch}$)

(E) Distance between the center of the bearings 247.5 mm (9.74 inch)

Note: The connecting rod must be heated for the installation of the piston pin bearing. Do not use a torch.

(F) The connecting rod may be heated from 175°C to 260°C (347°F to 500°F) for the installation of the piston pin bearing. Maximum distance for heating the connecting rod 88 mm
(3.5 inch)

i02840023

Connecting Rod

SMCS Code: 1218

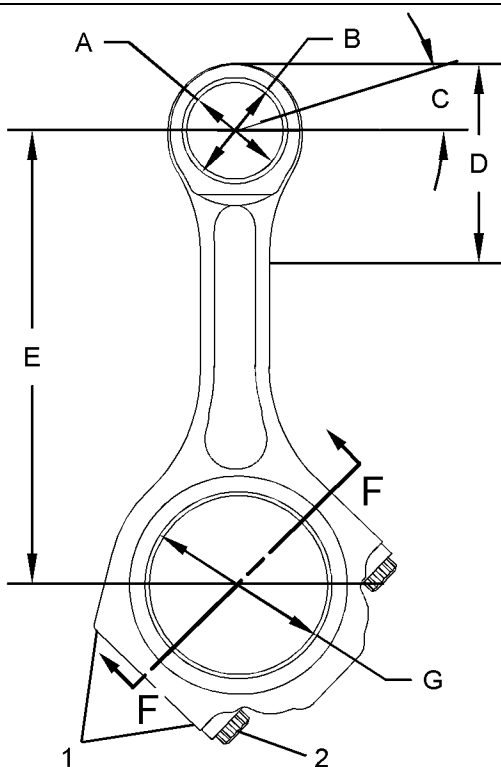


Illustration 277

g01418268

Note: Handle the fractured connecting rod with care. Use a soft jawed vise in order to hold the connecting rod when you are loosening the connecting rod cap bolts. Use a soft faced hammer in order to tap the connecting rod cap, if necessary.

(A) Bore in the bearing for the piston pin
..... 46.035 ± 0.008 mm ($(1.8124 \pm 0.0003$ inch))

(B) Bore in the connecting rod for the piston pin bearing
..... 50.640 ± 0.013 mm
($(1.9937 \pm 0.0005$ inch))

(C) The bearing joint must be within ± 5 degrees of either location.

Note: The connecting rod must be heated for the installation of the piston pin bearing. Do not use a torch.

(D) The connecting rod may be heated from 175 to 260 °C (347 to 500 °F) for the installation of the piston pin bearing. Maximum distance for heating the connecting rod 83.0 mm ($(3.27$ inch))

Note: Thoroughly lubricate the piston pin with clean engine oil prior to assembly of the piston and connecting rod.

(E) Distance between the center of the bearings
..... 217.00 mm ($(8.543$ inch))

(G) Bore in the connecting rod for the crankshaft bearing
..... 85.000 ± 0.013 mm
($(3.3465 \pm 0.0005$ inch))



Illustration 278

g01416591

View F-F

(1) Etch the cylinder number on the connecting rod and the cap in this location. Mark the connecting rod and the cap with a number 1 through 6. Mark the numbers on the same side of the connecting rod as the bearing retainer notch (3).

Note: Install the rod and piston group in the engine with the part number of the forging for the rod assembly to the rear of the engine. The rear of the engine is the flywheel end of the engine. Lubricate the rod and piston group with clean engine oil before you insert the rod and piston group into the block.

(2) Use the following procedure to tighten the connecting rod bolts:

1. Torque the bolts to 50 ± 5 N·m (37 ± 4 lb ft).

2. Rotate each bolt in a clockwise direction for 90 ± 5 degrees ($1/4$ of a turn).

i04690696

Connecting Rod

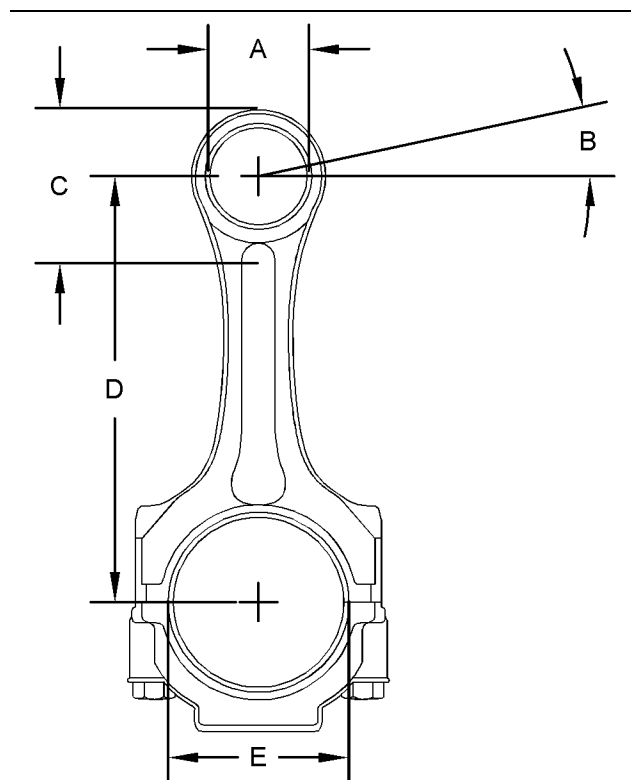
SMCS Code: 1218


Illustration 279

g02798863

Note: If you replace a connecting rod, make sure that you do not combine fractured connecting rods with machined connecting rods. Refer to Special Instruction, REHS3801, "Combining Machined Connecting Rods and Fractured Connecting Rods on C13 Engines" for more instruction.

(A) Dimensions for the piston pin

Bore in the connecting rod for the piston pin bearing 57.810 ± 0.013 mm
((2.2759 ± 0.0005 inch))

Bore in the bearing for the piston pin
. 53.205 ± 0.008 mm ((2.0947 ± 0.0003 inch))

Diameter of the piston pin . . . 53.155 ± 0.005 mm
((2.0927 ± 0.0002 inch))

(B) Location of the bearing joint from the horizontal centerline of the pin bore 12.5 ± 5 degrees

Note: The connecting rod must be heated for the installation of the piston pin bearing. Do not use a torch.

(C) The connecting rod may be heated from 175 °C to 260 °C (347 °F to 500 °F) for the installation of the piston pin bearing. Maximum distance for heating the connecting rod 88 mm
((3.5 inch))

(D) Distance between the center of the bearings 239 mm ((9.4 inch))

(E) Bore in the connecting rod for the crankshaft bearing 93.800 ± 0.013 mm
((3.6929 ± 0.0005 inch))

i07946504

Connecting Rod

SMCS Code: 1218

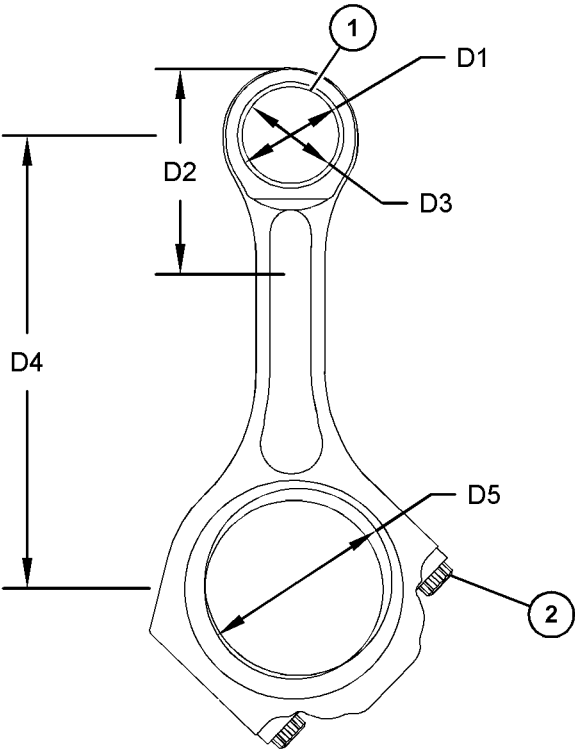


Illustration 280

g06492348

Typical example

Table 115

Item	Qty	Part	Specification Description
Lubricate the rod and piston group with clean engine oil before inserting the rod and piston group into the block.			
1	1	256-9656 Bushing	The bearing joint must be within ± 5 degrees of either location.
2	2	160-8197 Bolt	Use the following procedure to tighten the bolts: 1. Tighten the bolts to 50 ± 5 N·m (37 $\pm$ 4 lb ft). 2. Again, tighten the bolts to a torque angle of 90 ± 5 degrees.
D1	-	-	Bore in the connecting rod for the 256-9656 Bushing is 54.630 ± 0.013 mm (2.1508 $\pm$ 0.0005 inch).
D2	-	-	The connecting rod may be heated from 175 to 260 °C (347 to 500 °F) for the installation of the bushing. Maximum distance for heating the connecting rod is 85 mm (3.3 inch).
D3	12	-	Bore in the bushing for the piston pin is 50.035 ± 0.008 mm (1.9699 $\pm$ 0.0003 inch).
D4	-	-	Distance between the center of the bushings is 217 mm (8.5 inch).
D5	-	-	Bore in the connecting rod for the crankshaft bearing is 85.000 ± 0.013 mm (3.3465 $\pm$ 0.0005 inch).
-	-	-	Thoroughly lubricate the piston pin with clean engine oil prior to assembly of the piston and connecting rod.

i02690465

Piston and Rings

SMCS Code: 1214; 1215

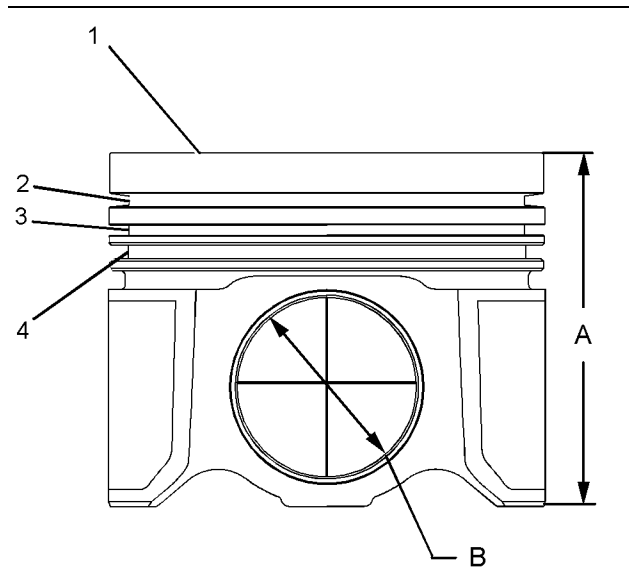


Illustration 281

g01329332

(1) The piston is symmetrical with a center crater.

Lubricate the entire piston to 360° in zone (A) prior to assembly into the cylinder block. Use clean engine oil.

Note: Install the top piston ring with the side marked “UP-1” toward the top of the piston.

(2) Top piston ring groove

The ends of the piston ring have a clearance when the piston ring is installed in a cylinder liner with a bore of 130.000 mm (5.1181 inch).
Clearance 0.40 ± 0.10 mm
((0.016 ± 0.004 inch))

The top piston ring has an increase in clearance for each 0.03 mm (0.001 inch) increase in the cylinder liner bore. Increase 0.09 mm
((0.004 inch))

Note: Install the intermediate piston ring with the side marked “UP-2” toward the top of the piston.

(3) Intermediate piston ring groove

Width of groove in new piston for intermediate piston ring 3.053 ± 0.013 mm
((0.1202 ± 0.0005 inch))

Thickness of new intermediate piston ring 2.980 ± 0.010 mm ((0.1173 ± 0.0004 inch))

The ends of the piston ring have a clearance when the piston ring is installed in a cylinder liner with a bore of 130.000 mm (5.1181 inch).

Clearance 1.000 ± 0.125 mm
((0.0393 ± 0.0049 inch))

The intermediate piston ring has an increase in clearance for each 0.03 mm (0.001 inch) increase in the cylinder liner bore. Increase 0.09 mm ((0.004 inch))

Note: The ends of the oil control piston ring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The white colored portion of the piston ring must be visible at the ring end gap.

(4) Oil control ring groove

Width of groove in new piston for oil control piston ring 4.052 ± 0.012 mm
((0.1595 ± 0.0005 inch))

Thickness of new oil control piston ring 3.980 ± 0.010 mm ((0.1567 ± 0.0004 inch))

The ends of the piston ring have a clearance when the piston ring is installed in a cylinder liner with a bore of 130.000 mm (5.1181 inch).

Clearance 0.45 ± 0.15 mm
((0.018 ± 0.006 inch))

The oil control piston ring has an increase in clearance for each 0.03 mm (0.001 inch) increase in the cylinder liner bore. Increase 0.09 mm ((0.004 inch))

Note: After the piston rings have been installed, rotate the piston rings so that the end gaps are 120 degrees from each other.

(B) Piston pin bore diameter 53.250 ± 0.010 mm
((2.0965 ± 0.0004 inch))

Note: Thoroughly lubricate the piston pin with clean engine oil prior to assembly.

i02961800

Piston and Rings

SMCS Code: 1214; 1215

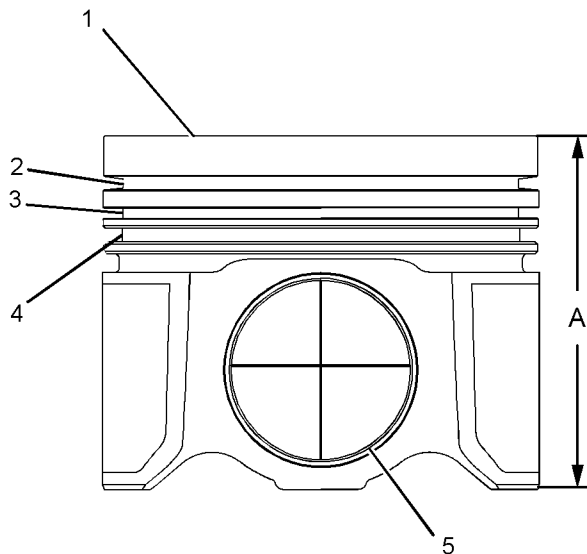


Illustration 282

g01481993

(1) The piston is symmetrical with a center crater.

Lubricate the entire piston to 360 degrees in zone (A) prior to assembly into the cylinder block. Use clean engine oil.

Top Piston Ring (2)

Note: Install the top piston ring with the side marked "UP-1" toward the top of the piston.

Thickness of the new top piston ring 4.0 mm
(0.16 inch))

Clearance between the ends of the piston ring in a cylinder liner bore of 130.000 mm (5.1181 inch)
. 0.40 ± 0.10 mm ((0.016 ± 0.004 inch))

Increase in the clearance between the ends of the piston ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Intermediate Piston Ring (3)

Note: Install the intermediate piston ring with the side marked "UP-2" toward the top of the piston.

Width of groove in new piston for intermediate piston ring 3.053 ± 0.013 mm ((0.1202 ± 0.0005 inch))

Thickness of the new intermediate piston ring
. 2.980 ± 0.010 mm ((0.1173 ± 0.0004 inch))

Clearance between the ends of the piston ring in a cylinder liner bore of 130.000 mm (5.1181 inch)
. 1.000 ± 0.125 mm ((0.0393 ± 0.0049 inch))

Increase in the clearance between the ends of the piston ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Oil Control Ring (4)

Note: The ends of the oil control piston ring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The white colored portion of the piston ring must be visible at the ring end gap.

Width of groove in new piston for oil control piston ring 4.052 ± 0.012 mm ((0.1595 ± 0.0005 inch))

Thickness of the new oil control ring
. 3.980 ± 0.010 mm ((0.1567 ± 0.0004 inch))

Clearance between the ends of the piston ring in a cylinder liner bore of 130.000 mm (5.1181 inch)
. 0.45 ± 0.15 mm ((0.018 ± 0.006 inch))

Increase in the clearance between the ends of the oil control ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Note: After the piston rings have been installed, rotate the piston rings so that the end gaps are 120 degrees from each other.

Piston Pin (5)

Note: Thoroughly lubricate the piston pin with clean engine oil prior to assembly.

Piston pin bore diameter 53.220 ± 0.010 mm
 ((2.0952 $\pm$ 0.0004 inch))

i03013664

Piston and Rings

SMCS Code: 1214; 1215

Two-Piece Articulated Piston

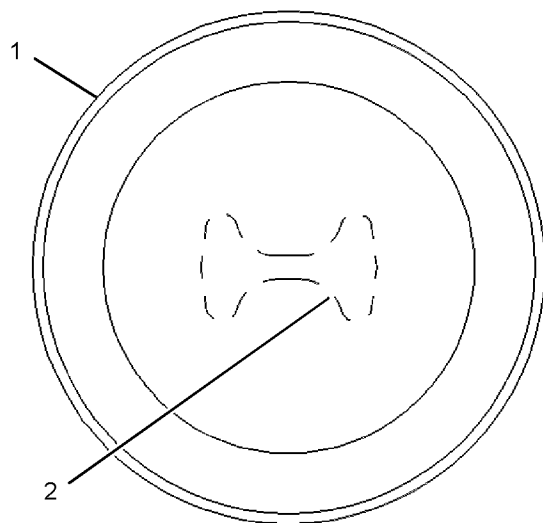


Illustration 283

g01525270

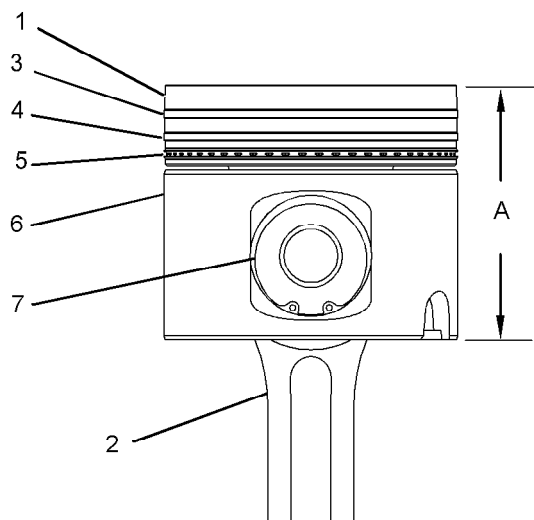


Illustration 284

g01093113

(1) Crown assembly
 (2) Connecting rod

Note: Install the rod and piston group in the engine with the part number of the forging for the rod assembly to the rear of the engine. The rear of the engine is the flywheel end of the engine. Lubricate the rod and piston group with clean engine oil before you insert the rod and piston group into the block.

Top Ring and Intermediate Ring

(3) The top ring has the mark "UP-1".

Install the piston ring with the side marked "UP-1" toward the top of the piston. The colored stripe faces to the right of the ring end gap.

Piston ring end gap 0.40 ± 0.10 mm
 ((0.016 $\pm$ 0.004 inch))

Minimum depth of the groove in new piston for the top ring 4.947 mm ((0.1948 inch))

Thickness of new top piston ring 3.453 mm
 ((0.1359 inch))

(4) The intermediate ring has the mark "UP-2".

Install the piston ring with the side marked "UP-2" toward the top of the piston. The colored stripe faces to the right of the piston ring end gap.

Piston ring end gap 1.50 ± 0.10 mm
 ((0.059 $\pm$ 0.004 inch))

Width of groove in new piston for intermediate piston ring 3.060 ± 0.010 mm ((0.1205 $\pm$ 0.0004 inch))

Minimum depth of the groove in new piston for the intermediate ring 4.948 mm ((0.1948 inch))

Thickness of new intermediate piston ring 2.980 ± 0.010 mm ((0.1173 $\pm$ 0.0004 inch))

Oil Control Ring

(5) The oil control piston ring has a spring that is installed with the ring. The gap in the spring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The colored portion can be to the right or to the left of the ring end gap.

Piston ring end gap 0.45 ± 0.15 mm
 ((0.018 $\pm$ 0.006 inch))

Width of groove in new piston for oil control piston ring 4.030 ± 0.010 mm ((0.1587 $\pm$ 0.0004 inch))

Minimum depth of groove in new piston for oil control piston ring 4.725 mm ((0.1860 inch))

Thickness of new oil control piston ring 3.980 ± 0.010 mm ((0.1567 $\pm$ 0.0004 inch))

After the piston rings have been installed, rotate the piston rings so that the end gaps are 120 degrees from each other.

(6) Piston skirt

Lubricate the entire piston in zone (A) prior to assembly into the cylinder block. Use clean engine oil.

Piston Pin

(7) Piston pin

Piston pin diameter 46.000 ± 0.005 mm
 ((1.8110 $\pm$ 0.0002 inch))
 Length of piston pin 91.50 ± 0.15 mm
 ((3.602 $\pm$ 0.006 inch))

Thoroughly lubricate the piston pin with clean engine oil prior to assembly.

i03552482

Piston and Rings

SMCS Code: 1214; 1215

Steel Piston

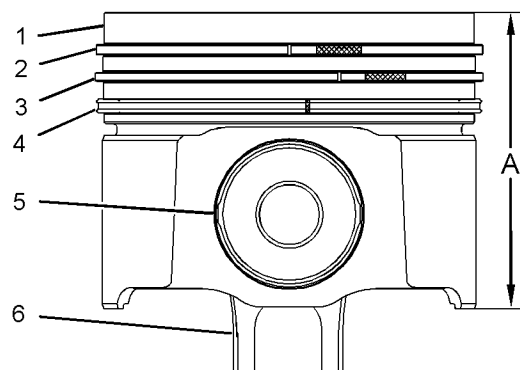


Illustration 285

g01375031

(6) Connecting rod

(A) Height of the tall piston 105.00 ± 0.10 mm
 ((4.134 $\pm$ 0.004 inch))

Note: Before assembly, lubricate the entire piston body assembly (1) to 360 degrees on zone (A) with the clean engine oil.

Top Piston Ring (2)

Note: Install the top piston ring with the side marked "UP-1" toward the top of the piston. The green colored stripe faces to the right of the ring end gap.

Thickness of the new top piston ring 3.95 mm
 ((0.156 inch))

Clearance between the ends of the piston ring in a cylinder liner bore of 130 mm (5.1 inch)
 0.51 ± 0.05 mm ((0.020 $\pm$ 0.002 inch))

Increase in the clearance between the ends of the piston ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Intermediate Piston Ring (3)

Note: Install the intermediate piston ring with the side marked "UP-2" toward the top of the piston. The violet and the orange colored stripe faces to the right of the piston ring end gap.

Thickness of the new intermediate piston ring
 2.98 ± 0.01 mm ((0.117 $\pm$ 0.001 inch))

Clearance between the ends of the piston ring in a cylinder liner bore of 130 mm (5.1 inch)
 1.00 ± 0.10 mm ((0.39 $\pm$ 0.004 inch))

Increase in the clearance between the ends of the piston ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Oil Control Piston Ring (4)

Note: The ends of the oil control piston ring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The green colored stripe can be to the right of the ring end gap or to the left of the ring end gap.

Thickness of the new oil control piston ring
 3.98 ± 0.01 mm ((0.157 $\pm$ 0.0004 inch))

Clearance between the ends of the piston ring in cylinder liner bore of 130 mm (5.1 inch)
 0.45 ± 0.15 mm ((0.018 $\pm$ 0.006 inch))

Increase in the clearance between the ends of the piston ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Note: After the piston rings have been installed, rotate the piston rings so that the end gaps are 120 degrees from each other.

Piston Pin (5)

Note: Before assembly, thoroughly lubricate the piston pin with clean engine oil.

Outside diameter 53.155 ± 0.005 mm
 ((2.0927 $\pm$ 0.0002 inch))

Inside diameter 23.00 ± 0.25 mm
 ((0.906 ± 0.010 inch))

Length 92.00 ± 0.15 mm ((3.622 ± 0.006 inch))

Bore diameter for the piston pin
 53.250 ± 0.010 mm ((2.0965 ± 0.0004 inch))

i03874479

Piston and Rings

SMCS Code: 1214; 1215

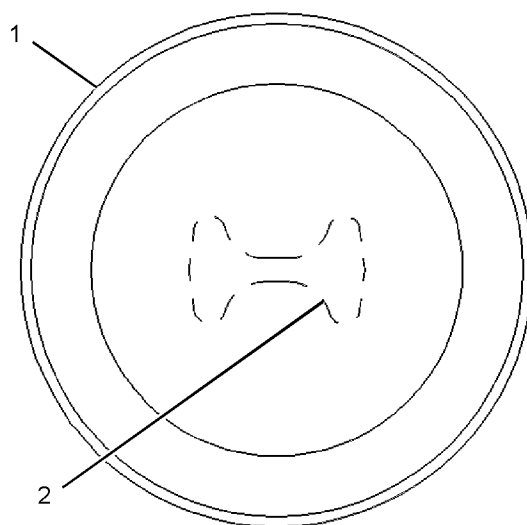


Illustration 286

g02117714

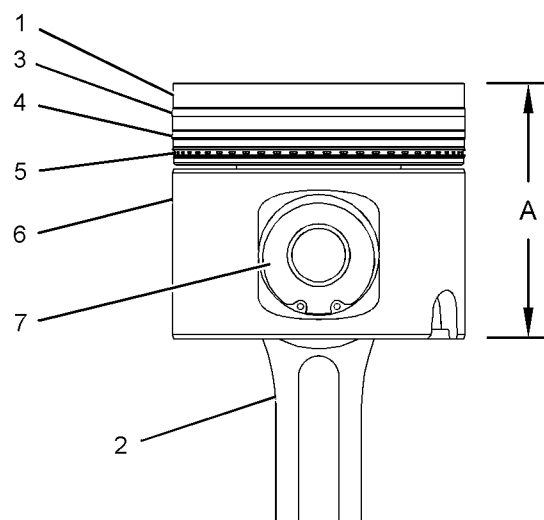


Illustration 287

g02117793

(1) Crown assembly
 (2) Connecting rod

Note: Install the rod and piston group in the engine with the part number of the forging for the rod assembly facing toward rear of the engine. The rear of the engine is the flywheel end of the engine. Lubricate the rod and piston group with clean engine oil before you insert the rod and piston group into the cylinder block.

Top Piston Ring (3)

Install the piston ring with the side marked “UP-1” toward the top of the piston. The colored stripe faces to the right of the ring end gap.

When the new top piston ring is installed in a new cylinder liner bore, the clearance between the ends of the piston ring is the following value.
..... 0.40 ± 0.10 mm ((0.016 ± 0.004 inch))

Thickness of new top piston ring 3.5 mm ((0.14 inch))

Intermediate Piston Ring (4)

Install the piston ring with the side marked “UP-2” toward the top of the piston. The colored stripe faces to the right of the piston ring end gap.

When the new intermediate piston ring is installed in a new cylinder liner bore, the clearance between the ends of the piston ring is the following value.
..... 1.20 ± 0.12 mm ((0.047 ± 0.005 inch))

Width of groove in new piston for intermediate piston ring 3.060 ± 0.010 mm ((0.1205 ± 0.0004 inch))

Thickness of new intermediate piston ring 3.000 ± 0.010 mm ((0.1181 ± 0.0004 inch))

Oil Control Piston Ring (5)

The oil control piston ring has a spring that is installed with the ring. The gap in the spring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The colored portion can be to the right or to the left of the ring end gap.

When the new oil control piston ring is installed in a new cylinder liner bore, the clearance between the ends of the piston ring is the following value.
..... 0.45 ± 0.15 mm ((0.018 ± 0.006 inch))

Width of groove in new piston for oil control piston ring 4.030 ± 0.010 mm ((0.1587 ± 0.0004 inch))

Thickness of new oil control piston ring 3.975 ± 0.015 mm ((0.1565 ± 0.0006 inch))

After the piston rings have been installed, rotate the piston rings so that the end gaps are 120 degrees from each other.

Piston Skirt (6)

Lubricate the entire piston of zone (A) prior to assembly into the cylinder block. Use clean engine oil.

Piston Pin (7)

Outside diameter of the piston pin 46.000 ± 0.005 mm ((1.8110 ± 0.0002 inch))

Length of the piston pin 91.50 ± 0.15 mm ((3.602 ± 0.006 inch))

Thoroughly lubricate the piston pin with clean engine oil prior to assembly.

i05198249

Piston and Rings

SMCS Code: 1214; 1215

One-Piece Aluminum Piston

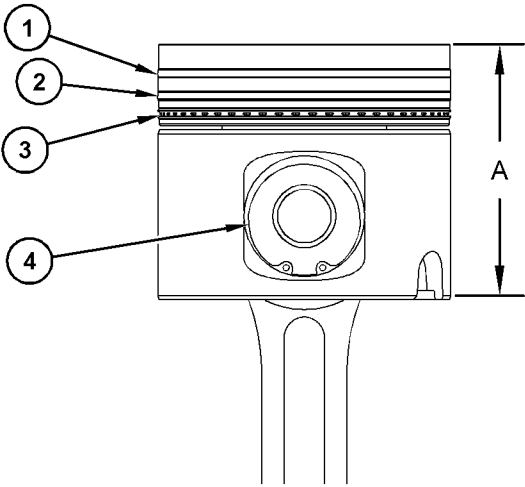


Illustration 288

g03330851

Table 116

Specification for 342 - 6646 Piston and Rod Gp			
Item	Qty	Part	Specification Description
Install the rod and piston group in the engine with the part number of the forging for the rod assembly to the rear of the engine. The rear of the engine is the flywheel end of the engine. Lubricate the rod and piston group with clean engine oil before you insert the rod and piston group into the block.			
1	1	300 - 1319 Piston Ring	Install the top piston ring with the side marked “UP-1” toward the top of the piston. The blue colored stripe faces to the right of the ring end gap.
			When the new top piston ring is installed in a cylinder liner bore with bore size of 115.025 ± 0.250 mm (4.5285± 0.0098 inch), the clearance between the ends of the piston ring is 0.40 ± 0.10 mm (0.016 ± 0.004 inch).
			Thickness is 3.5 mm (0.14 inch).
2	1	262 - 2888 Piston Ring	Install the intermediate piston ring with the side marked “UP-2” toward the top of the piston. The white-colored stripe faces to the right of the piston ring end gap.
			When the new intermediate piston ring is installed in a cylinder liner bore with bore size of 115.025 ± 0.250 mm(4.5285± 0.0098 inch), the clearance between the ends of the piston ring is 1.20 ± 0.12 mm (0.047 ± 0.005 inch).
			Width of groove in new 357 - 0447 Piston Body As for intermediate piston ring is 3.080 ± 0.010 mm (0.1213 ± 0.0004 inch).
			Thickness is 2.980 ± 0.010 mm (0.1173 ± 0.0004 inch).

(continued)

(Table 116, contd)

3	1	262 - 2891 Piston Ring	The oil control piston ring has a spring that is installed with the ring. The gap in the spring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The orange colored portion can be to the right or to the left of the ring end gap.
			When the new oil control piston ring is installed in a cylinder liner bore with bore size of 115.025 ± 0.250 mm (4.5285± 0.0098 inch), the clearance between the ends of the piston ring is 0.45 ± 0.15 mm (0.018 ± 0.006 inch).
			Width of groove in new 357 - 0447 Piston Body As for oil control piston ring is 4.050 ± 0.010 mm (0.1594 ± 0.0004 inch).
			Thickness is 3.985 ± 0.010 mm (0.1569 ± 0.0004 inch).
After the piston rings have been installed, rotate the piston rings so that the end gaps are 120 degrees from each other.			
Thoroughly lubricate the entire piston in zone (A) prior to assembly into the cylinder block with clean engine oil.			
4	1	238 - 2731 Piston Pin	Thoroughly lubricate the piston pin with clean engine oil prior to assembly.
			Outside diameter is 50.000 ± 0.005 mm (1.9685 ± 0.0002 inch).
			Inside diameter is 23.6 ± 0.5 mm (0.93 ± 0.02 inch).
			Length is 90.85 ± 0.15 mm (3.577 ± 0.006 inch).

i05640637

Piston and Rings

SMCS Code: 1214; 1215

Steel Piston

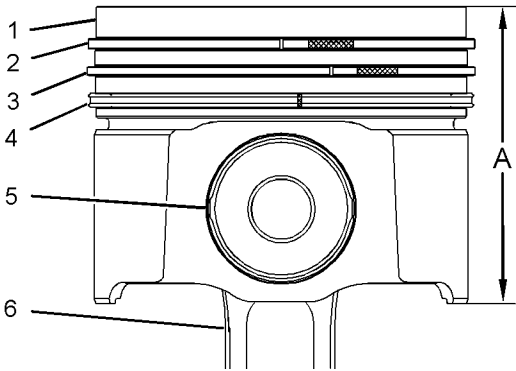


Illustration 289

g01375031

(6) Connecting rod

(A) Height of the tall piston 105.00 ± 0.10 mm
((4.134 ± 0.004 inch))

Note: Before assembly, lubricate the entire piston body assembly (1) to 360 degrees on zone (A) with the clean engine oil.

Top Piston Ring (2)

Note: Install the top piston ring with the side marked “UP-1” toward the top of the piston. The blue colored stripe faces to the right of the ring end gap.

Thickness of the new top piston ring 3.93 mm
((0.155 inch))

Clearance between the ends of the piston ring in a cylinder liner bore of 130 mm (5.1 inch)
. 0.35 ± 0.05 mm ((0.014 ± 0.002 inch))

Increase in the clearance between the ends of the piston ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Intermediate Piston Ring (3)

Note: Install the intermediate piston ring with the side marked “UP-2” toward the top of the piston. The colored stripe faces to the right of the piston ring end gap.

Thickness of the new intermediate piston ring 2.980 ± 0.010 mm ((0.1173 ± 0.0004 inch))

Clearance between the ends of the piston ring in a cylinder liner bore of 130 mm (5.1 inch)
. 0.7 ± 0.1 mm ((0.028 ± 0.004 inch))

Increase in the clearance between the ends of the piston ring for each 0.03 mm (0.001 inch) increase in the cylinder liner bore 0.09 mm ((0.004 inch))

Oil Control Piston Ring (4)

Note: The ends of the oil control piston ring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The green colored stripe can be to the right of the ring end gap or to the left of the ring end gap.

Thickness of the new oil control piston ring
..... 3.980 ± 0.010 mm ($(0.1567 \pm 0.0004$ inch))

Clearance between the ends of the piston ring in
cylinder liner bore of 130 mm (5.1 inch)
..... 0.45 ± 0.15 mm ($(0.018 \pm 0.006$ inch))

Increase in the clearance between the ends of the
piston ring for each 0.03 mm (0.001 inch) increase in
the cylinder liner bore 0.09 mm ($(0.004$ inch))

Note: After the piston rings have been installed,
rotate the piston rings so that the end gaps are 120
degrees from each other.

Piston Pin (5)

Note: Before assembly, thoroughly lubricate the
piston pin with clean engine oil.

Outside diameter 53.155 ± 0.005 mm
($(2.0927 \pm 0.0002$ inch))

Inside diameter 23.00 ± 0.25 mm
($(0.906 \pm 0.010$ inch))

Length 92.00 ± 0.15 mm ($(3.622 \pm 0.006$ inch))

Bore diameter for the piston pin
..... 53.250 ± 0.010 mm ($(2.0965 \pm 0.0004$ inch))

i06798636

Piston and Rings

SMCS Code: 1214; 1215

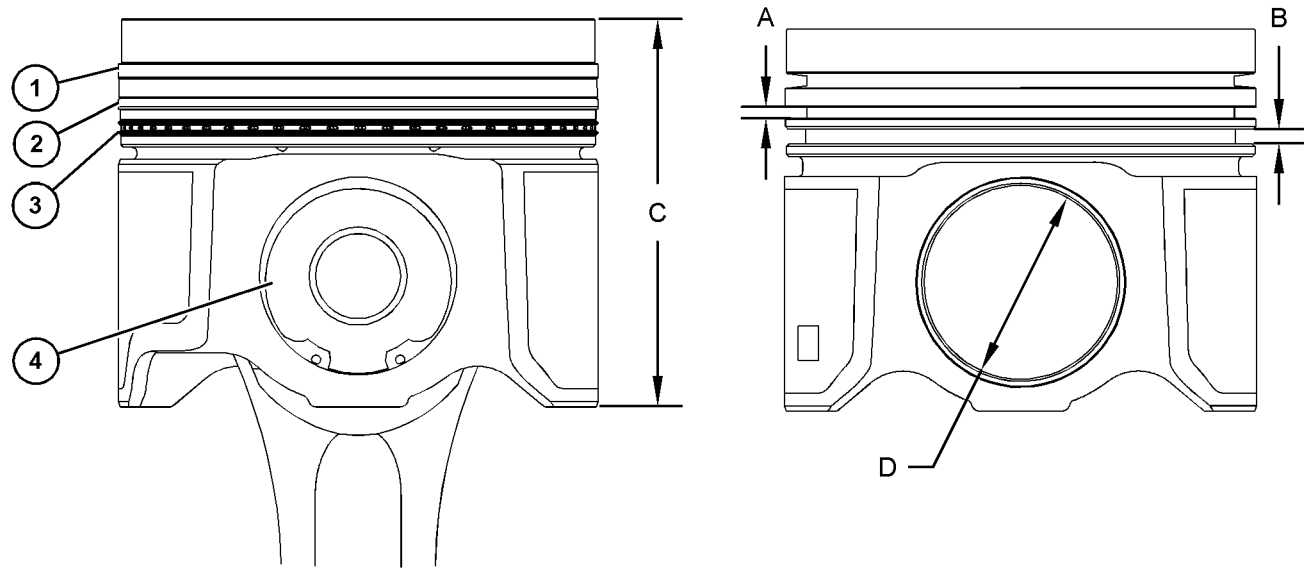


Illustration 290

g06119320

Table 117

Specification for 453 - 6655 Piston and Rod Gp			
Item	Qty	Part	Specification Description
1	1	415 - 7459 Piston Ring	Install with side marked "UP-1" toward top of the piston. The colored stripe faces to the right of the piston ring end gap.
			Thickness of new top piston ring is 3.945 mm (0.1553 inch).
			Clearance of the ends when assembled in a new cylinder liner of bore 130.025 ± 0.025 mm (5.1191 ± 0.0010 inch) is 0.51 ± 0.05 mm (0.020 ± 0.002 inch).
2	1	300 - 3086 Piston Ring	Install with side marked "UP-2" toward top of the piston. The colored stripe faces to the right of the piston ring end gap.
			Thickness of new piston ring is 2.980 ± 0.010 mm (0.1173 ± 0.0004 inch)
			Width (A) of the groove in the piston for piston is 3.0525 ± 0.0125 mm (0.12018 ± 0.00049 inch).
3	1	265 - 1113 Piston Ring	Clearance of the ends when assembled in a new cylinder liner of bore 130.025 ± 0.025 mm (5.1191 ± 0.0010 inch) is 0.70 ± 0.10 mm (0.028 ± 0.004 inch).
			The ends of the spring coil should be placed 180 degrees from the end gap of the oil control piston rings. The colored stripe in the spring coil must be visible at the oil control piston ring end gap.
			Thickness of new oil control piston ring is 3.980 ± 0.010 mm (0.1567 ± 0.0004 inch).
			Width (B) of the groove in the piston is 4.052 ± 0.012 mm (0.1595 ± 0.0005 inch).
			Clearance of the ends when assembled in a new cylinder liner of bore 130.025 ± 0.025 mm (5.1191 ± 0.0010 inch) is 0.45 ± 0.15 mm (0.018 ± 0.006 inch).

(continued)

Specifications Section

(Table 117, contd)

Specification for 453 - 6655 Piston and Rod Gp			
Item	Qty	Part	Specification Description
-			After installing the piston rings, rotate the piston rings so that the end gaps are placed at 120 degrees distance from each other.
			Lubricate the entire piston to 360 degrees in zone (C) prior to assembly into the cylinder block. Use clean engine oil.
4	1	197 - 9327 Piston Pin	Thoroughly lubricate the piston pin with clean engine oil prior to assembly.
			Diameter is 53.155 ± 0.005 mm (2.0927 $\pm$ 0.0002 inch). Length is 92.00 ± 0.15 mm (3.622 $\pm$ 0.006 inch).
			Bore (D) in the piston body for the piston pin is 53.250 ± 0.010 mm (2.0965 $\pm$ 0.0004 inch).

i07264240

Piston and Rings

SMCS Code: 1214; 1215

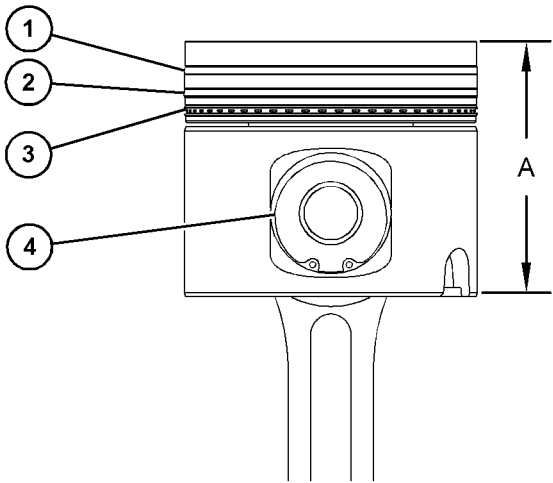


Illustration 291

g06024074

Table 118

Item	Qty	Part	Specification Description
Install the rod and piston group in the engine with the part number of the forging for the rod assembly to the rear of the engine. The rear of the engine is the flywheel end of the engine. Lubricate the rod and piston group with clean engine oil before you insert the rod and piston group into the block.			
1	1	347 - 2380 Piston Ring	Install the top piston ring with the side marked "UP-1" toward top of the piston. The black colored stripe faces to the right of the ring end gap.
			When the new top piston ring is installed in a cylinder liner bore with bore size of 112.025 ± 0.025 mm (4.4104 ± 0.0010 inch), the clearance between the ends of the piston ring is 0.40 ± 0.10 mm (0.016 ± 0.004 inch).
			Thickness is 3.5 mm (0.14 inch).
2	1	347 - 2381 Piston Ring	Install the intermediate piston ring with the side marked "UP-2" toward top of the piston. The purple colored stripe faces to the right of the piston ring end gap.
			When the new top piston ring is installed in a cylinder liner bore with bore size of 112.025 ± 0.025 mm (4.4104 ± 0.0010 inch), the clearance between the ends of the piston ring is 1.20 ± 0.12 mm (0.047 ± 0.005 inch).
			Width of groove in 385 - 1657 Piston Crown As for intermediate piston ring is 3.060 ± 0.010 mm (0.1205 ± 0.0004 inch).
3	1	347 - 2382 Piston Ring	Thickness is 3.000 $\pm$ 0.010 mm (0.1181 $\pm$ 0.0004 inch).
			The oil control piston ring has a spring that is installed with the ring. The gap in the spring should be a distance of 180 degrees from the ring end gap when the oil control piston ring is assembled. The blue colored stripe faces to the right of the ring end gap.

(continued)

(Table 118, contd)

			When the new top piston ring is installed in a cylinder liner bore with bore size of 112.025 ± 0.025 mm (4.4104 $\pm$ 0.0010 inch), the clearance between the ends of the piston ring is 0.45 ± 0.15 mm (0.018 $\pm$ 0.006 inch).
			Width of groove in 385 - 1657 Piston Crown As for intermediate piston ring is 4.030 ± 0.010 mm (0.1587 $\pm$ 0.0004 inch).
			Thickness is 3.975 ± 0.015 mm (0.1565 $\pm$ 0.0006 inch).
			After the piston rings have been installed, rotate the piston rings so that the end gaps are 120 degrees from each other.
Thoroughly lubricate the entire piston in zone (A) prior to assembly into the cylinder block with clean engine oil.			
4	1	524 -5611 Piston Pin	Thoroughly lubricate the piston pin with clean engine oil prior to assembly.
			Outside diameter of the piston pin is 46.000 ± 0.005 mm (1.8110 $\pm$ 0.0002 inch).
			Inside diameter of the piston pin is 20.6 ± 0.3 mm (0.81 $\pm$ 0.01 inch).
			Length of the piston pin is 91.50 ± 0.20 mm (3.602 $\pm$ 0.008 inch).

i02833773

Dimension (E) 42.20 ± 0.25 mm
((1.661 ± 0.010 inch))

Piston Cooling Jet

SMCS Code: 1331

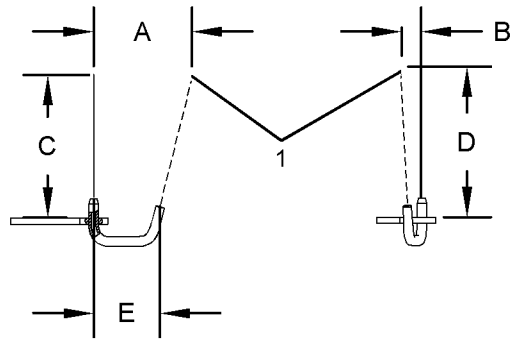


Illustration 292

g01412616

The piston cooling jet must be checked for the location of the stream of oil. Insert a drill rod with a diameter of 2 mm (0.1 inch) into the orifice. The drill rod simulates the stream of oil under normal operating pressure. The drill rod must pass through a circle with a diameter of 5.0 mm (0.20 inch) at point (1).

Use the following dimensions in order to locate point (1).

- Dimension (A) 71.88 ± 0.25 mm
((2.830 ± 0.010 inch))
- Dimension (B) 16.07 ± 0.25 mm
((0.633 ± 0.010 inch))
- Dimension (C) 120.00 ± 0.25 mm
((4.724 ± 0.010 inch))
- Dimension (D) 120.00 ± 0.25 mm
((4.724 ± 0.010 inch))

i04394039

Piston Cooling Jet

SMCS Code: 1331

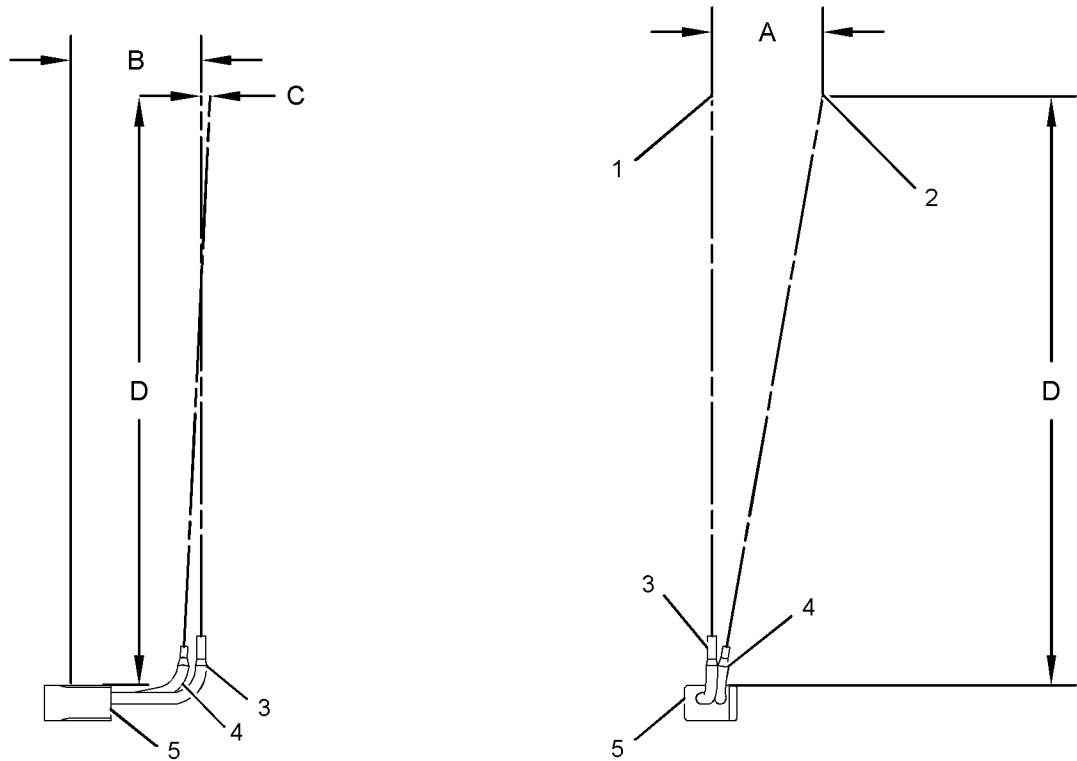


Illustration 293

g02565417

Table 119

Specification for 276 - 7222 Oil Jet Tube As			
Item	Qty	Part	Specification Description
A	-	-	Use the following dimensions in order to locate point (1) and point (2). Dimension is 47.11 ± 0.50 mm (1.854 ± 0.020 inch).
B	-	-	Dimension is 55.30 ± 0.25 mm (2.177 ± 0.010 inch).
C	-	-	Dimension is 3.84 ± 0.25 mm (0.151 ± 0.010 inch).
D	-	-	Dimension is 250.00 ± 0.25 mm (9.843 ± 0.010 inch).
Do not damage the inside surface of the piston jet orifices with the drill rod. Damage to the inside surface can cause the stream of oil to be altered.			
The piston cooling jets (5) must be checked for the location of the stream of oil. Insert a straight drill rod with a diameter that fits snugly in each piston jet orifice. The inside diameter of piston jet orifice (3) is 2.40 mm (0.094 inch). The inside diameter of piston jet orifice (4) is 1.5 mm (0.06 inch). This drill rod simulates the stream of oil under normal operating pressure. Place the drill rod in orifice (4). The drill rod must pass through a circle with a diameter of 15.0 mm (0.60 inch) at location (2D). Place the drill rod in orifice (3). The drill rod must pass through a circle with a diameter of 9.0 mm (0.35 inch) at location (1D).			

i04511989

Piston Cooling Jet

SMCS Code: 1331

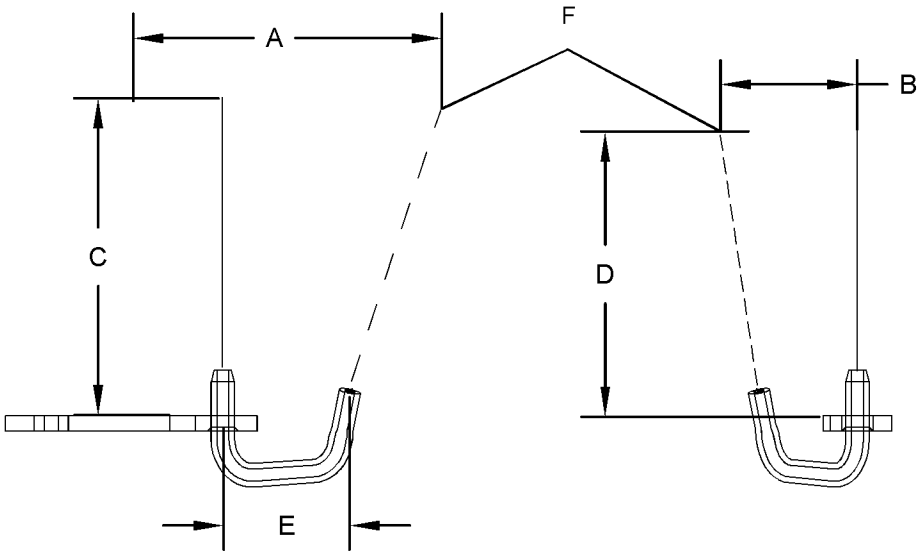


Illustration 294

g02689716

Table 120

Specification for 273 - 2600 Oil Jet Tube As			
Item	Qty	Part	Specification Description
Use compressed air in order to check the piston cooling jets for plugging.			
Visually inspect the piston cooling jets for damage or distortion. If damage to a cooling jet is suspected, replace the piston cooling jet.			
The proper operation of the piston cooling jet is essential to ensure correct cooling and lubrication of the piston. When you remove the piston cooling jets from the engine, be sure to handle the cooling jets in a manner that the jets will not become damaged.			
-	-	-	The piston cooling jet must be checked for the location of the stream of oil. Insert a drill rod with a diameter of 2 mm (0.08 inch) into the orifice. The drill rod simulates the stream of oil under normal operating pressure. The drill rod must pass through a circle with a diameter of 4.5 mm (0.18 inch) at point (F).
-	-	-	Use the following dimensions in order to locate point (F):
			Dimension (A) is 63.25 ± 0.25 mm (2.490 ± 0.010 inch).
			Dimension (B) is 54.99 ± 0.25 mm (2.165 ± 0.010 inch).
			Dimension (C) is 160.0 ± 0.3 mm (6.30 ± 0.01 inch).
			Dimension (D) is 160.0 ± 0.3 mm (6.30 ± 0.01 inch).
			Dimension (E) is 33.3 mm (1.31 inch).

i04698051

Piston Cooling Jet

SMCS Code: 1331

Dimension (C) 3.84 ± 0.5 mm
((0.15118 ± 0.01969 inch))
Dimension (D) 250.00 ± 0.25 mm
((9.842 ± 0.010 inch))
Dimension (E) 4.5 mm ((0.17717 inch))

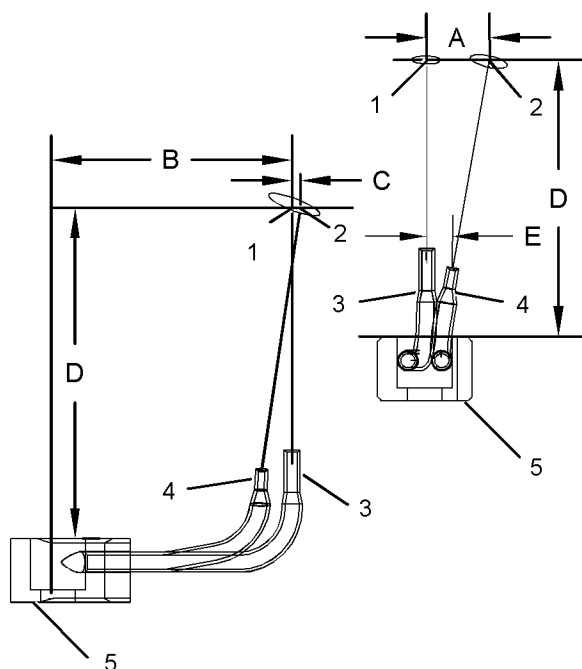


Illustration 295

q02803197

The piston cooling jets (5) must be checked for the location of the stream of oil. Insert a straight drill rod with a diameter that fits snugly in each piston jet orifice. The inside diameter of piston jet orifice (3) is 2.4 mm (0.09449 inch). The inside diameter of piston jet orifice (4) is 1.5 mm (0.05906 inch). This drill rod simulates the stream of oil under normal operating pressure. Place the drill rod in orifice (4). The drill rod must pass through a circle with a diameter of 15 mm (0.59055 inch) at location (2D). Place the drill rod in orifice (3). The drill rod must pass through a circle with a diameter of 9 mm (0.35433 inch) at location (1D).

Note: Do not damage the inside surface of the piston jet orifices with the drill rod. Damage to the inside surface can cause the stream of oil to be altered.

Use the following dimensions in order to locate point (1) and point (2).

Dimension (A) 47.1 ± 0.5 mm
((1.85433 ± 0.01969 inch))
Dimension (B) 55.30 ± 0.25 mm
((2.177 ± 0.010 inch))

i04864154

Housing (Front)

SMCS Code: 1151

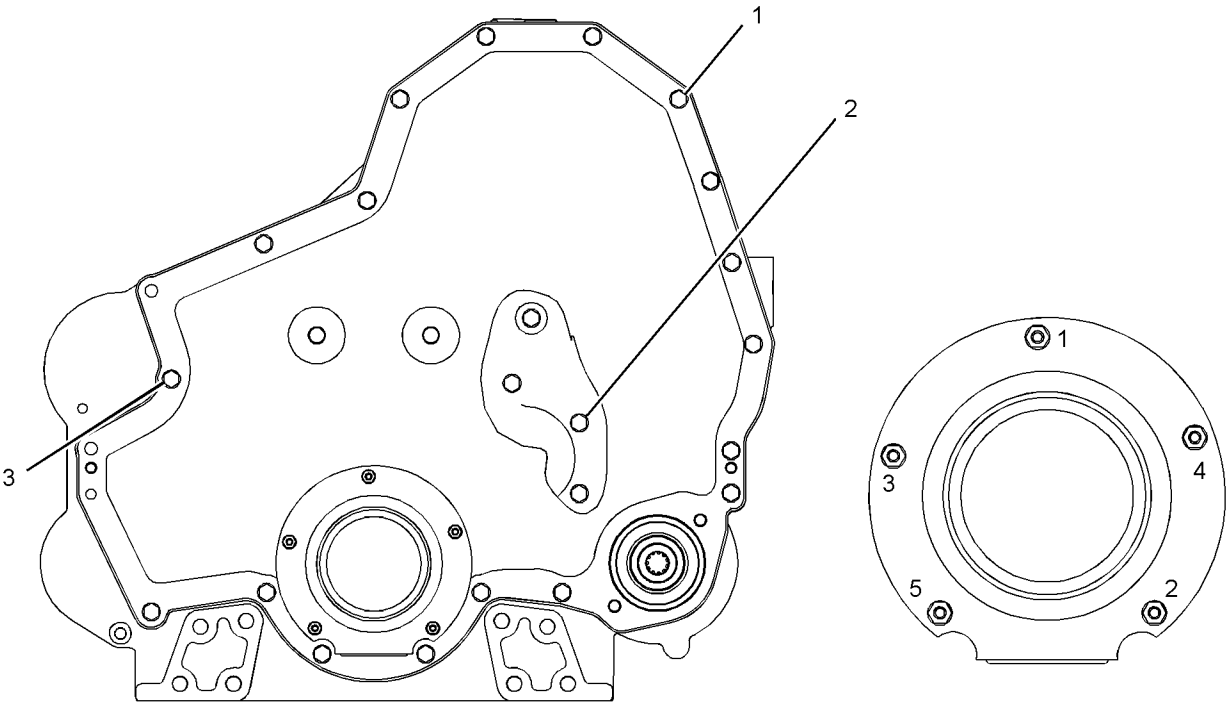


Illustration 296

g02991698

Table 121

Specification for 218- 7272 Front Housing Gp			
Item	Qty	Part	Specification Description
-	-	-	During assembly, the rear face of the housing and the front face of the cylinder block must be free of oil, fuel, water, dirt, assembly compounds, and any other contaminants.
-	-	-	Apply ultra blue Loctite 587 in order to fill the space at the connecting joint of the front housing, engine oil pan, and cylinder block.
1	17	6V - 2317 Bolt	Use the following bolts for mounting the front housing group: M8 X 1.25 X 30 mm.
2	9	6V - 5219 Bolt	M8 X 1.25 X 40 mm.
3	1	3E - 8016 Self-Locking Bolt	M8 X 1.25 X 25 mm.

i02818173

Front Housing and Covers

SMCS Code: 1162; 1166

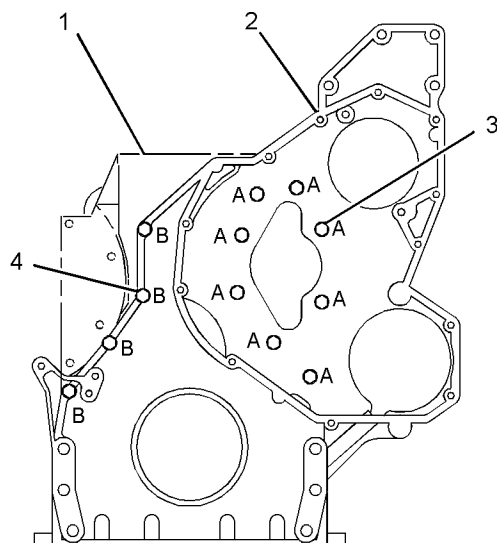


Illustration 297

g01405402

- (1) Cylinder block
(2) Front housing

Apply 1U-8846 Gasket Sealant to the front housing sealing surfaces before assembling the front housing to the cylinder block. The front housing must be assembled and the front housing must be tightened to the cylinder block within ten minutes.

- (3) Length of the bolts that are marked for location "A" 20.0 mm ((0.79 inch))
(4) Length of the bolts that are marked for location "B" 50.0 mm ((1.97 inch))

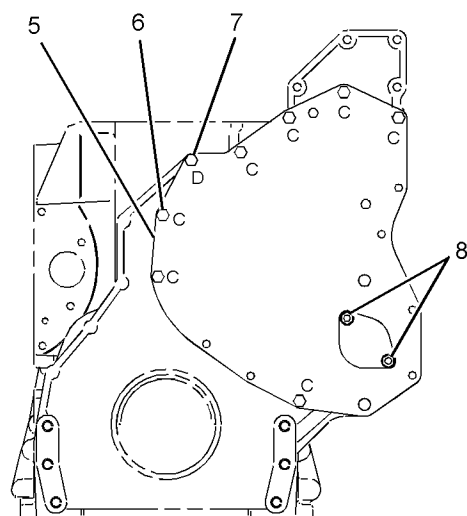


Illustration 298

g01405420

- (5) Front housing cover

- (6) Length of the bolts that are marked for location "C" 30.0 mm ((1.18 inch))
(7) Length of the bolt that is marked for location "D" 60.0 mm ((2.36 inch))
(8) Apply 154-9731 Thread Lock Compound to the serrations of the studs before installing the studs into the front housing cover (5).

i03022142

Front Housing and Covers

SMCS Code: 1162; 1166

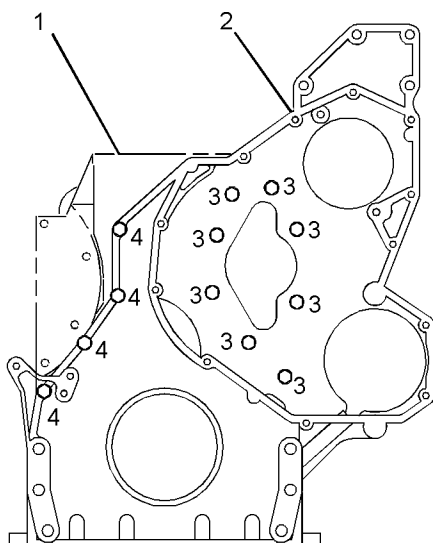


Illustration 299

g01527834

- (1) Cylinder block
(2) Front housing

Note: Apply 1U-8846 Gasket Sealant to the front housing sealing surfaces before assembling the front housing to the cylinder block. The front housing must be assembled and the front housing must be tightened to the cylinder block within ten minutes.

(3) Use eight bolts of M8 x 1.25 - 0.79 inch.

(4) Use four bolts of M8 x 1.25 - 1.97 inch.

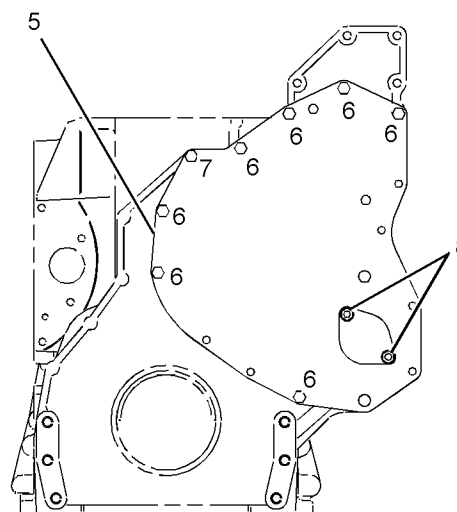


Illustration 300

g01527833

(5) Front housing cover

(6) Use twelve bolts of M8 x 1.25 - 1.18 inch.

(7) Use two bolts of M8 x 1.25 - 2.36 inch.

(8) Apply 154-9731 Thread Lock Compound to the serrations of the studs before installing the studs into the front housing cover (5).

i04394028

Front Housing and Covers

SMCS Code: 1162; 1166

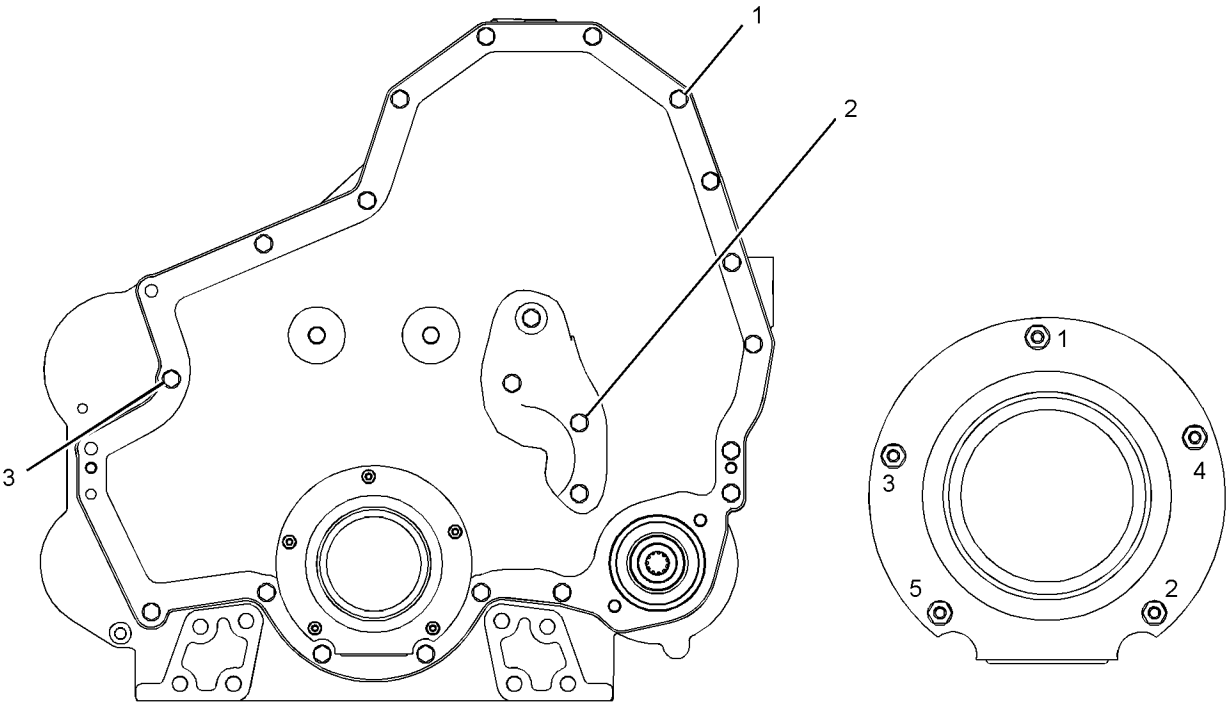


Illustration 301

g02565359

Table 122

Specification for 361 - 4680 Front Housing Gp and 218 - 7272 Front Housing Gp			
Item	Qty	Part	Specification Description
1	17	6V - 2317 Bolt	Use the following bolts for mounting the front housing group: M8 X 1.25 X 30 mm.
2	9	6V - 5219 Bolt	M8 X 1.25 X 40 mm.
3	1	3E - 8016 Self-Locking Bolt	M8 X 1.25 X 25 mm.
During assembly, the rear face of the housing and the front face of the cylinder block must be free of oil, fuel, water, dirt, assembly compounds, and any other contaminants.			
Apply ultra blue Loctite 587 in order to fill the space at the connecting joint of the front housing, engine oil pan, and cylinder block.			

i04522166

Front Housing and Covers

SMCS Code: 1162; 1166

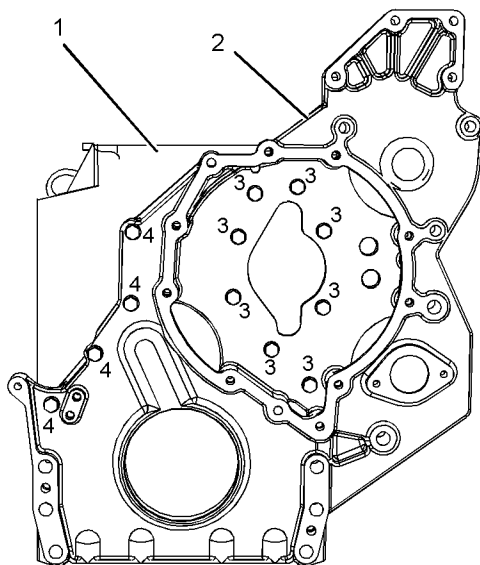


Illustration 302

g02698056

- (1) Cylinder block
- (2) Front housing

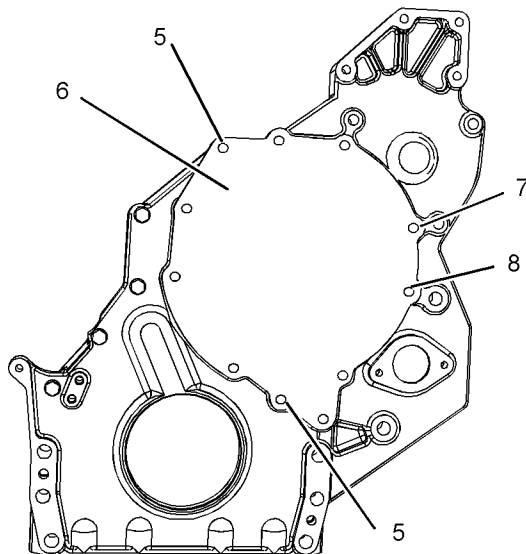


Illustration 303

g02698057

Front view of engine

- (6) Cover

Table 123

Specification for 299 - 8022 Front Housing Gp and 338 - 5813 Front Housing Gp			
Item	Qty	Part	Specification Description
Apply blue Loctite high flex GM to the front housing sealing surfaces before assembling the front housing to the cylinder block. The front housing must be assembled and tightened to the cylinder block within 10 minutes.			
3	8	6V - 5217 Bolt	Use bolts of M8 x 1.25 - 20 mm.
4	4	6V - 3918 Bolt	Use bolts of M8 x 1.25 - 50 mm.
5	2	8T - 0100 Bolt	Use bolts of M8 x 1.25 - 60 mm.
7	1	145 - 2264 Stud	Use the stud of M8 x 1.25 - 35 mm.
8	8	6V - 5218 Bolt	Use bolts of M8 x 1.25 - 35 mm.

i03869699

Gear Group (Front)

SMCS Code: 1206

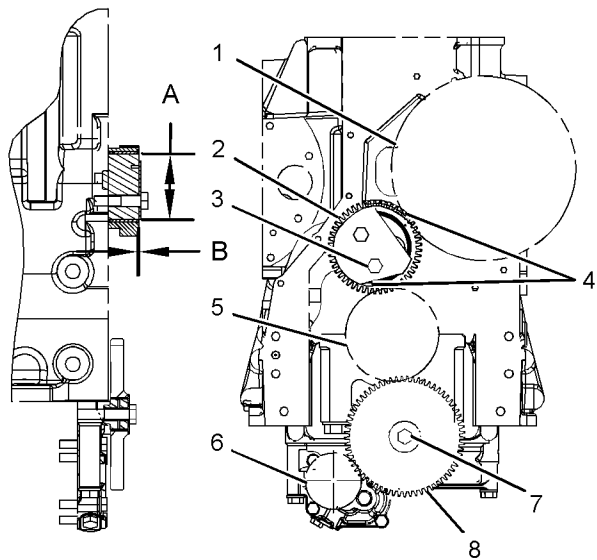


Illustration 304

g02112275

- (6) Oil pump idler gear
- (7) Bolt
- (8) Oil pump idler gear

(A) Diameter of the idler shaft . . . 74.000 ± 0.013 mm
((2.9134 ± 0.0005 inch))

(B) Installation depth of the bearing
..... 1.08 ± 0.25 mm ((0.043 ± 0.010 inch))

(3) Torque for the bolts for the camshaft idler gear
..... 70 ± 15 N·m ((52 ± 11 lb ft))

(4) Align the timing marks on the camshaft idler gear
(2) with the holes on the camshaft gear (1) and the
crankshaft gear (5).

i04393483

Gear Group (Front)

SMCS Code: 1206

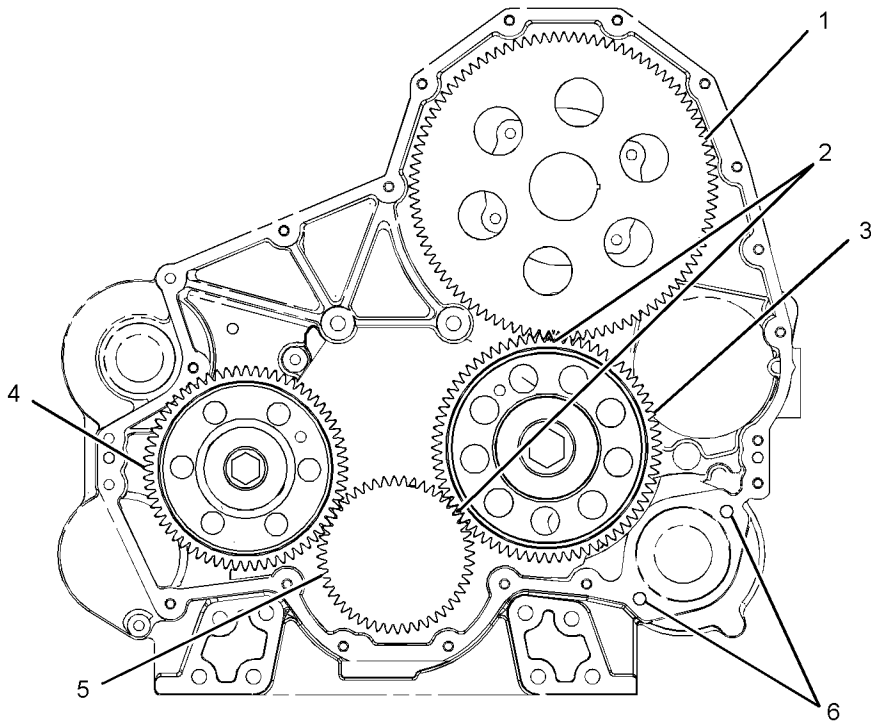


Illustration 305

g02564080

(6) Tapped holes for accessory drive

Table 124

Specification for 222 - 3088 Front Gear Gp			
Item	Qty	Part	Specification Description
1	1	222 - 3907 Gear	Number of teeth is 96.
			Bore of the gear is 58.900 ± 0.013 mm (2.3189 ± 0.0005 inch).
2	-	-	Align the timing marks on the idler gear to the timing marks on the camshaft gear and the marks on the crankshaft gear.
3	1	222 - 3905 Gear As	Number of teeth is 71.
			Bore of the gear for bearing is 74.452 ± 0.015 mm (2.9312 ± 0.0006 inch).
			Bore of the bearing after installation is 69.205 ± 0.013 mm (2.7246 ± 0.0005 inch).
4	1	222 - 3902 Gear As	The bearing is recessed from the back of the gear is 1.00 ± 0.25 mm (0.039 ± 0.010 inch).
			Number of teeth is 64.
			Bore of the gear for bearing is 60.163 ± 0.015 mm (2.3686 ± 0.0006 inch).
			Bore of the bearing after installation is 55.163 ± 0.041 mm (2.1718 ± 0.0016 inch).

(continued)

(Table 124, contd)

			The bearing is recessed from the back of the gear is 1.00 ± 0.25 mm (0.039 $\pm$ 0.010 inch).
5	1	187 - 8972 Crankshaft Gear	Number of teeth is 48.
			Bore of the gear is 96.900 ± 0.020 mm (3.8150 $\pm$ 0.0008 inch).

i04512069

Gear Group (Front)

SMCS Code: 1206

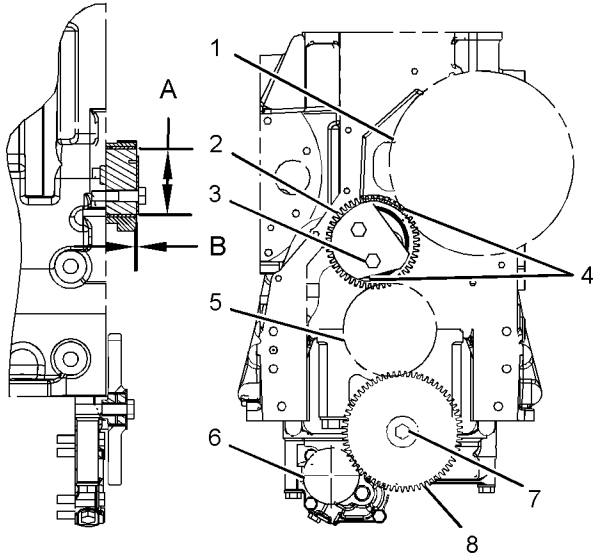


Illustration 306

g02689796

(6) Oil pump idler gear

(7) Bolt

(8) Oil pump idler gear

Table 125

Specification for 294 - 2931 Front Gear Gp			
Item	Qty	Part	Specification Description
A	1	200 - 4495 Idler Shaft	Diameter is 74.000 ± 0.013 mm (2.9134 ± 0.0005 inch).
B	1	296 - 5413 Bushing	Bore of the bushing after installation is 74.075 ± 0.013 mm (2.9163 ± 0.0005 inch) Installation depth is 1.08 ± 0.25 mm (0.043 ± 0.010 inch).
3	2	6V - 5843 Bolt	Torque to 70 ± 15 N·m (52 ± 11 lb ft).
4	-	-	Align the timing marks on the camshaft idler gear (2) with the holes on the camshaft gear (1) and the crankshaft gear (5).

i02934294

Flywheel

SMCS Code: 1156

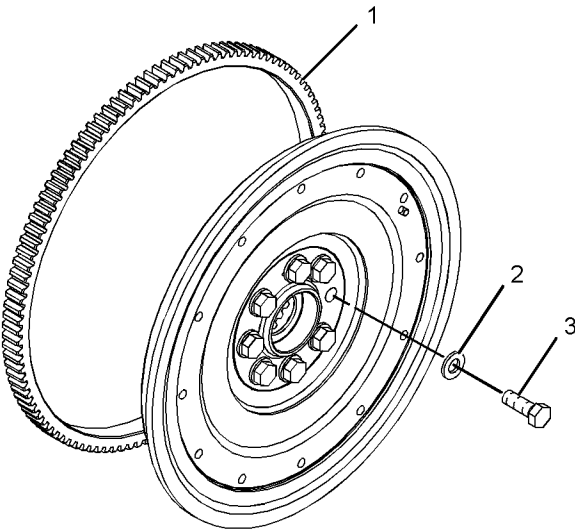


Illustration 307
g01220100
(1) Ring gear
(2) Washer

Note: Refer to System Operation, Testing and Adjusting for the correct method of inspecting the flywheel.

(3) Torque for eight locking bolts $300 \pm 40 \text{ N}\cdot\text{m}$
((220 ± 30 lb ft))

i02934295

Flywheel

SMCS Code: 1156

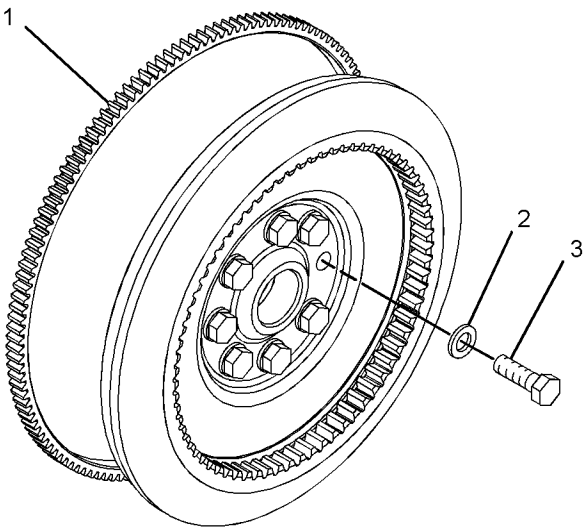


Illustration 308
g01113518
(1) Ring gear
(2) Washer

Note: Refer to System Operation, Testing and Adjusting for the correct method of inspecting the flywheel.

(3) Torque for eight bolts $300 \pm 40 \text{ N}\cdot\text{m}$
((220 ± 30 lb ft))

i02934298

i02960983

Flywheel

SMCS Code: 1156

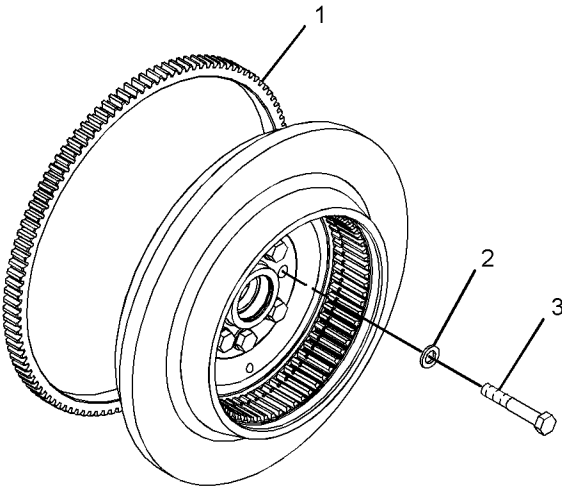


Illustration 309 g01220083

- (1) Ring gear
- (2) Washer

Note: Refer to System Operation, Testing and Adjusting for the correct method of inspecting the flywheel.

(3) Torque for eight bolts $300 \pm 40 \text{ N}\cdot\text{m}$
((220 $\pm$ 30 lb ft))

Flywheel

SMCS Code: 1156

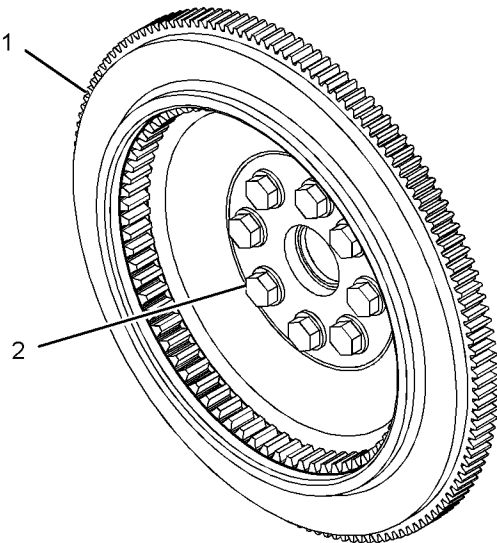


Illustration 310 g01224957

- (1) Flywheel gear

Note: Refer to System Operation, Testing and Adjusting for the correct method of inspecting the flywheel.

(2) Torque for eight locking bolts $300 \pm 40 \text{ N}\cdot\text{m}$
((220 $\pm$ 30 lb ft))

i02970260

i02993765

Flywheel

SMCS Code: 1156

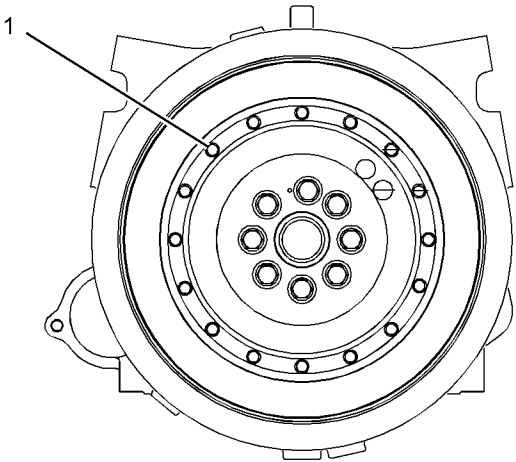


Illustration 311 g01255866

Note: Refer to System Operation, Testing and Adjusting for the correct method of inspecting the flywheel.

(1) Apply 4C-4030 Thread Lock Compound to the threads of 16 bolts.

Flywheel

SMCS Code: 1156

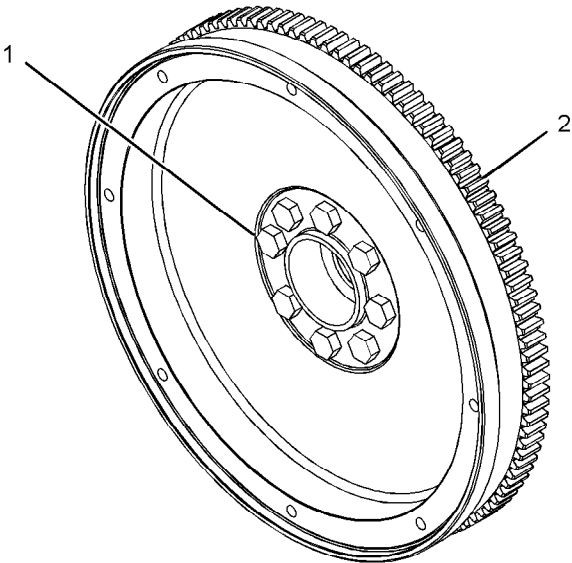


Illustration 312 g01103055

Typical example

(2) Flywheel Gear

Note: Refer to Testing and Adjusting for the correct method of inspecting the flywheel.

(1) Torque for eight bolts $300 \pm 40 \text{ N}\cdot\text{m}$
((220 ± 30 lb ft))

i04377606

Flywheel

SMCS Code: 1156

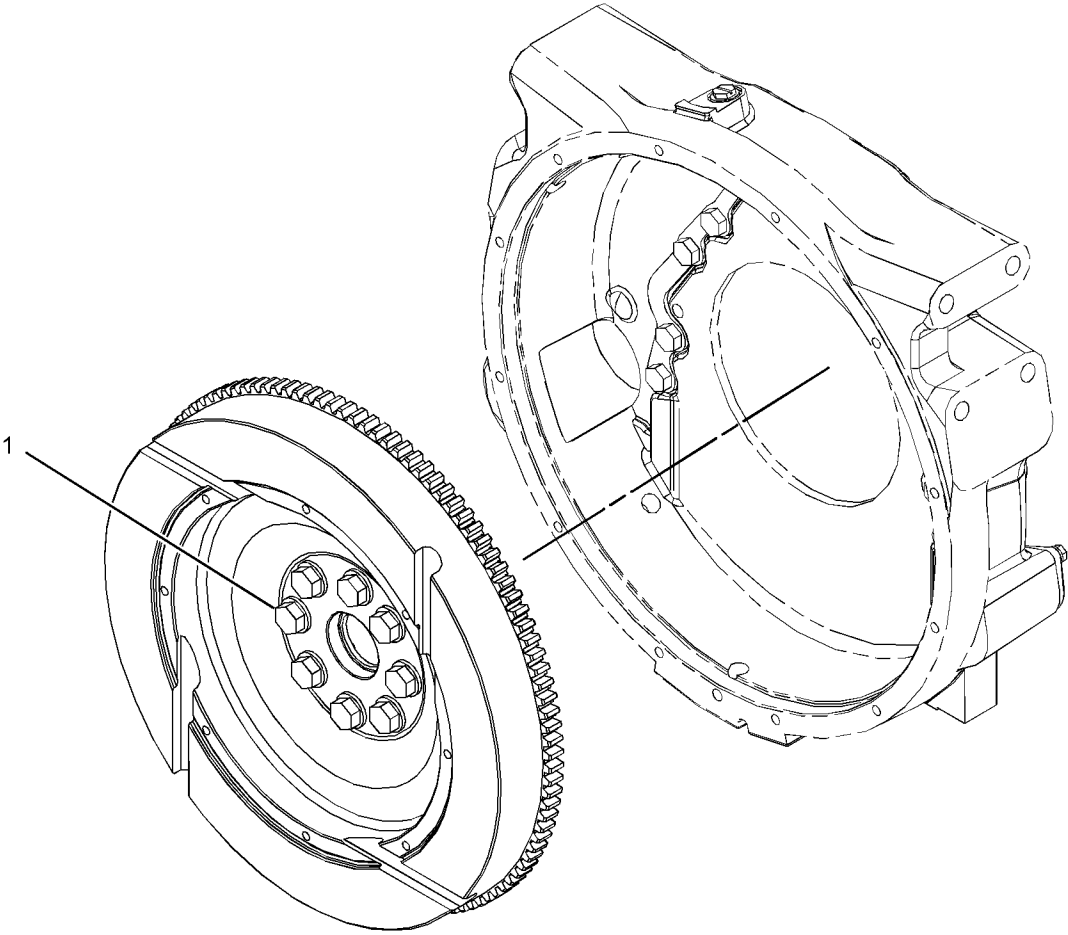


Illustration 313

g02542877

Table 126

Specification for 319-8165 Flywheel Gp			
Item	Qty	Part	Specification Description
1	8	9X - 2021 Locking Bolt	Torque to 300 ± 40 N·m (221 ± 30 lb ft).

i05198757

Flywheel

SMCS Code: 1156

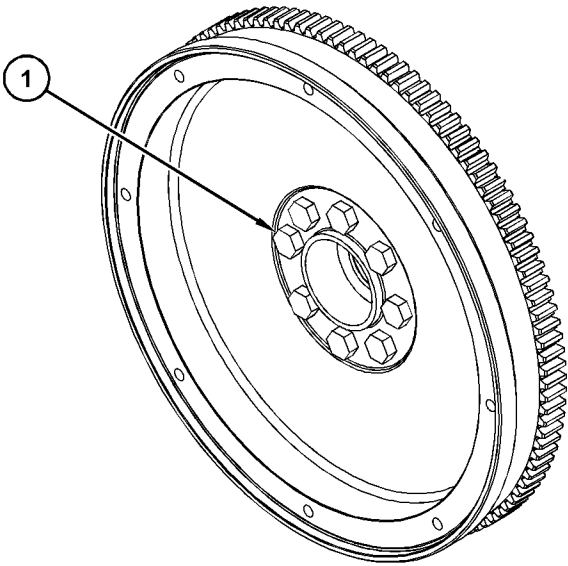


Illustration 314
Typical example

Table 127

Specification for 217-8206 Flywheel Gp ,102-3596 Flywheel Gp,145-9112 Flywheel Gp,174-1581 Flywheel Gp,220-7233 Fly-wheel Gp,155-6615 Flywheel Gp,242-8670 Flywheel Gp, 192-8815 Flywheel Gp, 351-2367 Flywheel Gp, and 252-6185 Flywheel Gp			
Item	Qty	Part	Specification Description
1	8	-	Tighten the bolts to 300 ± 40 N·m (221 ± 30 lb ft).

i02438112

Flywheel Housing

SMCS Code: 1157

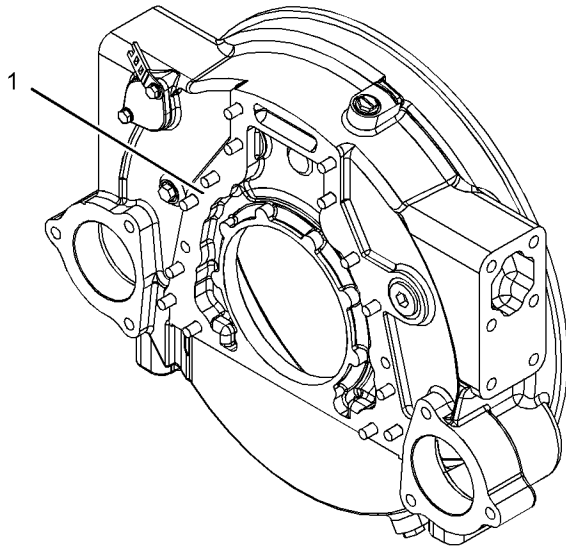


Illustration 315

g01218267

Note: Refer to Systems Operation, Testing and Adjusting for the correct method of inspecting the flywheel housing.

(1) Apply 1U-8846 Gasket Sealant on the gasket surface of the flywheel housing. Assemble the flywheel housing to the cylinder block and tighten within ten minutes of applying the sealant.

i02438114

Flywheel Housing

SMCS Code: 1157

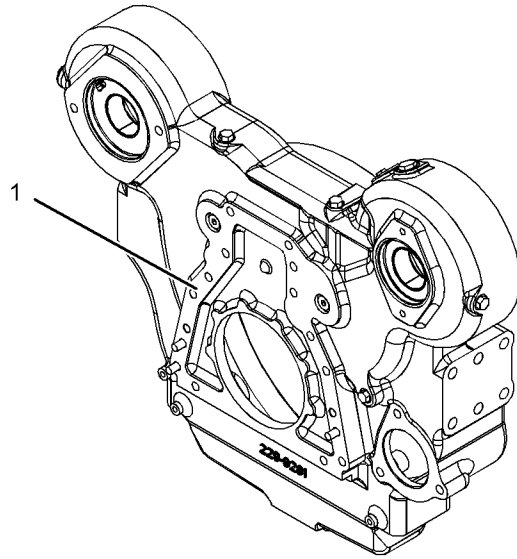


Illustration 316

g01218272

Note: Refer to Systems Operation, Testing and Adjusting for the correct method of inspecting the flywheel housing.

(1) Apply 1U-8846 Gasket Sealant on the gasket surface of the flywheel housing. Assemble the flywheel housing to the cylinder block and tighten within ten minutes of applying the sealant.

i02438126

i02489827

Flywheel Housing

SMCS Code: 1157

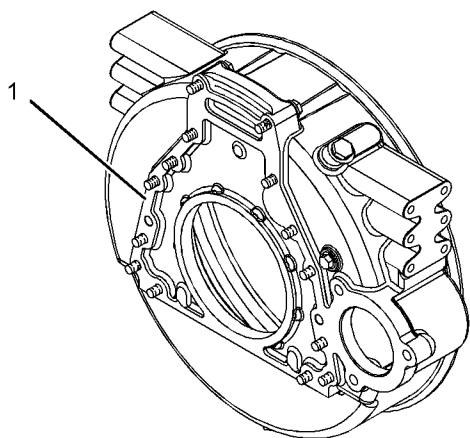


Illustration 317

g01218306

Note: Refer to Systems Operation, Testing and Adjusting for the correct method of inspecting the flywheel housing.

(1) Apply 1U-8846 Gasket Sealant on the gasket surface of the flywheel housing. Assemble the flywheel housing to the cylinder block and tighten within ten minutes of applying the sealant.

Flywheel Housing

SMCS Code: 1157

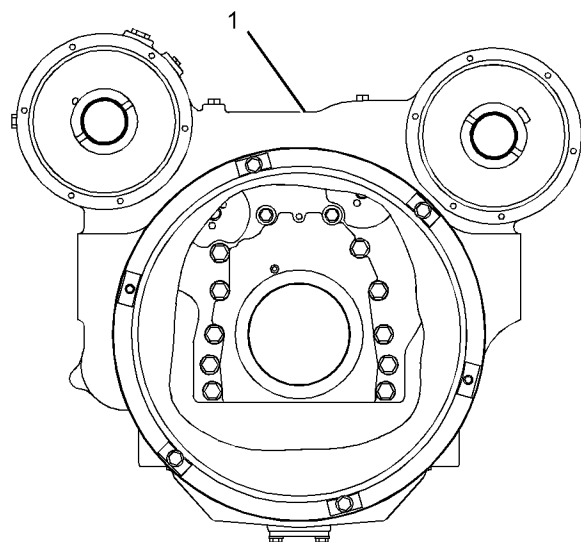


Illustration 318

g01243742

(1) Flywheel housing (rear view)

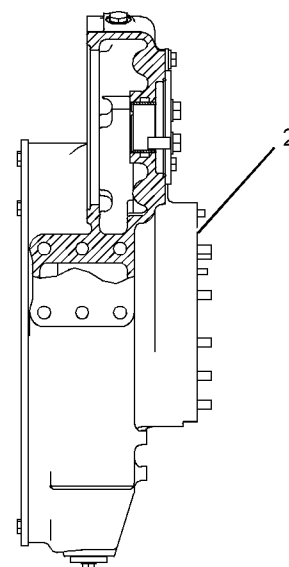


Illustration 319

g01243745

Right side view

(2) Apply 1U-8846 Gasket Sealant on the gasket surface of the flywheel housing. Assemble the flywheel housing to the cylinder block and tighten within ten minutes of applying the sealant.

i02960981

i02970361

Flywheel Housing

SMCS Code: 1157

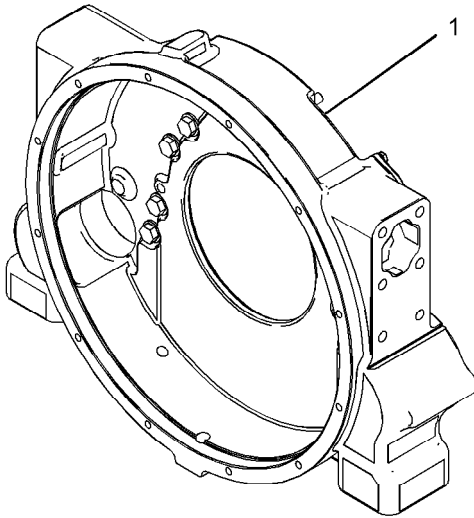


Illustration 320

g01102428

Note: Remove excessive oil, fuel and water from the front face of the flywheel housing and the rear face of the cylinder block.

(1) Apply 1U-8846 Gasket Sealant to all of the sealing surfaces of the flywheel housing. The flywheel housing must be assembled and tightened to the block within ten minutes.

Flywheel Housing

SMCS Code: 1157

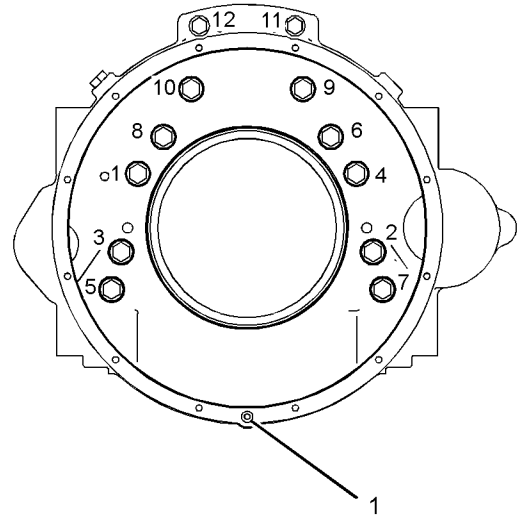


Illustration 321

g01494713

For bolt 1 through bolt 10, use M14 X 2 X 60 mm bolts.

For bolt 11 and bolt 12, use M12 X 1.75 X 100 mm bolts.

Tighten the bolt 1 through bolt 12 in the numerical sequence that is shown in Illustration 321 to standard torque.

(1) Apply 5P-3413 Pipe sealant to the pipe plug. Tighten the pipe plug barely below the front face of the flywheel housing.

i03083462

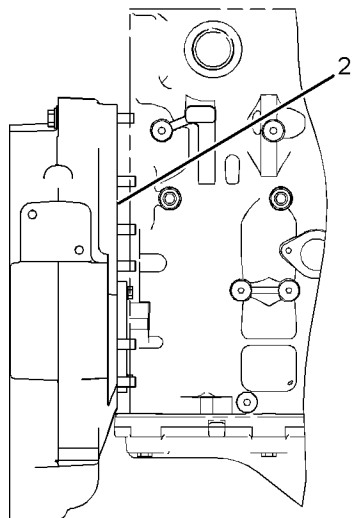


Illustration 322

g01494753

(2) Apply a continuous bead of 1U-8846 Gasket Sealant to entire joint face. The flywheel housing must be assembled and tightened to the block within ten minutes.

Flywheel Housing

SMCS Code: 1157

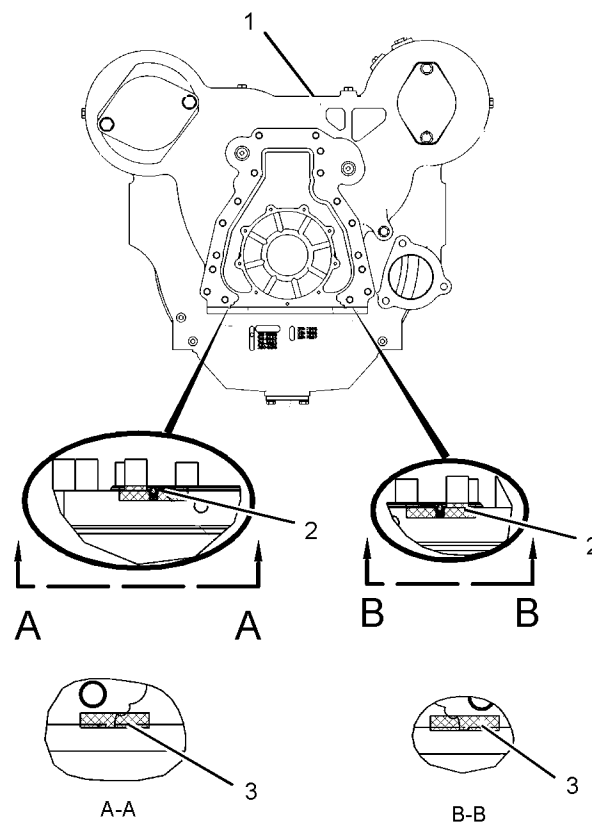


Illustration 323

g01563164

(1) The front face of flywheel housing and rear face of block must be free of oil, dirt, water, assembly compounds and other contaminants during assembly.

(2) Apply 4C-9612 Silicone Sealant immediately prior to assembling the front housing assembly.

(3) Apply 4C-9612 Silicone Sealant immediately after installation of the front housing assembly.

i04379729

Flywheel Housing

SMCS Code: 1157

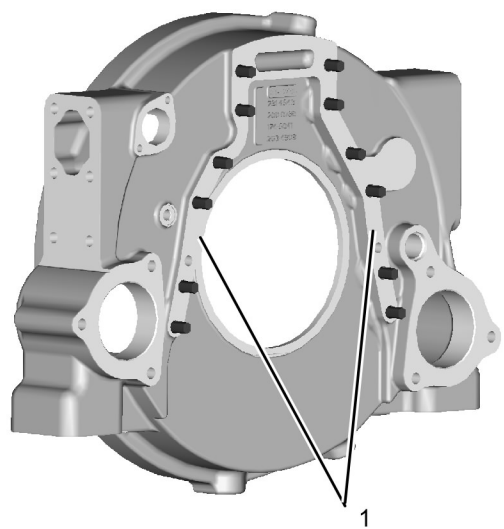


Illustration 324

g02543576

Table 128

Specification for 344 - 2905 Flywheel Housing Gp and 264 - 4643 Flywheel Housing Gp			
Item	Qty	Part	Specification Description
1	-	-	Apply 8C - 8422 Sealant continuously and evenly over the entire surface as shown in Illustration 324 . Assemble the housing to the engine within 10 minutes of sealant application.

i04522150

Flywheel Housing

SMCS Code: 1157

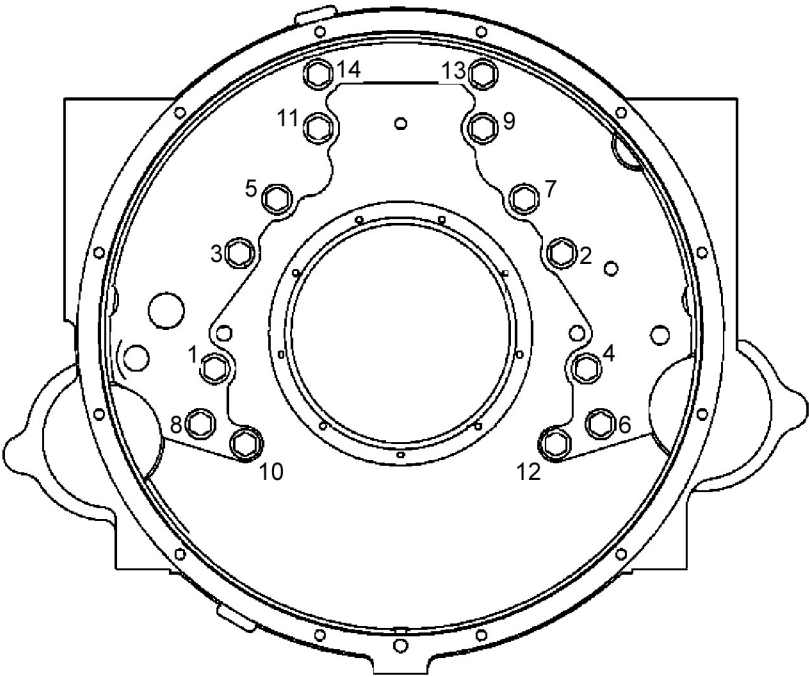


Illustration 325

g02697978

Table 129

Specification for 344 - 2902 Flywheel Housing Gp			
Item	Qty	Part	Specification Description
Apply blue Loctite high flex GM on the gasket surface of the flywheel housing. Assemble the flywheel housing to the cylinder block and tighten within 10 minutes of applying the sealant.			
-	14	6V - 8197 Bolt	Tighten the bolt 1 through bolt 14 in the numerical sequence as shown in the Illustration 325 to standard torque..

i04694689

Flywheel Housing

SMCS Code: 1157

- S/N: 3F31–Up
- S/N: 3F41–Up
- S/N: NN41–Up
- S/N: 3F51–Up
- S/N: NN51–Up

- S/N: BJ61–Up
- S/N: BS61–Up
- S/N: NN61–Up
- S/N: 2L71–Up
- S/N: 2L81–Up
- S/N: FLA1–Up
- S/N: GTA1–Up
- S/N: TBA1–Up
- S/N: JGB1–Up

Specifications Section

S/N: BYC1-Up	S/N: KLH1-Up
S/N: FPC1-Up	S/N: LFH1-Up
S/N: LCC1-Up	S/N: R9H1-Up
S/N: MDC1-Up	S/N: TAH1-Up
S/N: SPC1-Up	S/N: A6J1-Up
S/N: WEC1-Up	S/N: A7J1-Up
S/N: XAC1-Up	S/N: B9J1-Up
S/N: 9SD1-Up	S/N: R9J1-Up
S/N: A6D1-Up	S/N: RAJ1-Up
S/N: A7D1-Up	S/N: RBJ1-Up
S/N: ESD1-Up	S/N: TAJ1-Up
S/N: MGD1-Up	S/N: MLK1-Up
S/N: P5D1-Up	S/N: R5K1-Up
S/N: PFD1-Up	S/N: A3L1-Up
S/N: RGD1-Up	S/N: B1L1-Up
S/N: WTD1-Up	S/N: GCL1-Up
S/N: M3E1-Up	S/N: TAL1-Up
S/N: MTE1-Up	S/N: WTL1-Up
S/N: NPE1-Up	S/N: NLM1-Up
S/N: RAE1-Up	S/N: SDM1-Up
S/N: WDE1-Up	S/N: WTM1-Up
S/N: YAE1-Up	S/N: DKN1-Up
S/N: YEE1-Up	S/N: JKN1-Up
S/N: GKF1-Up	S/N: MEN1-Up
S/N: M3F1-Up	S/N: RAN1-Up
S/N: NNF1-Up	S/N: RFN1-Up
S/N: RYF1-Up	S/N: SCN1-Up
S/N: A6G1-Up	S/N: WTN1-Up
S/N: A7G1-Up	S/N: DHP1-Up
S/N: NEG1-Up	S/N: WTP1-Up
S/N: PZG1-Up	S/N: BWR1-Up
S/N: RGG1-Up	S/N: JAR1-Up
S/N: TDG1-Up	S/N: M2R1-Up
S/N: YAG1-Up	S/N: SBR1-Up
S/N: B9H1-Up	S/N: XBR1-Up
S/N: EEH1-Up	S/N: D3S1-Up
S/N: GPH1-Up	S/N: E9S1-Up
S/N: KFH1-Up	S/N: ELS1-Up

S/N: KHS1–Up
S/N: LRS1–Up
S/N: LYS1–Up
S/N: PBT1–Up
S/N: E9W1–Up
S/N: PJW1–Up
S/N: GAX1–Up
S/N: BWY1–Up
S/N: E9Y1–Up
S/N: LKY1–Up
S/N: NYY1–Up
S/N: SEY1–Up
S/N: SEZ1–Up
S/N: WXZ1–Up

i03085342

Flywheel Housing Cover

SMCS Code: 1157

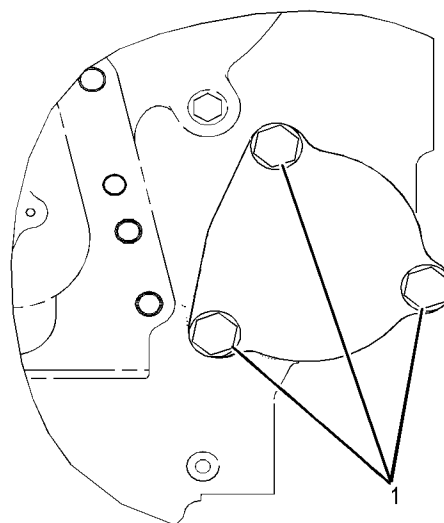


Illustration 327

g01566614

Front view

(1) Torque for three bolts . . . $49 \pm 7 \text{ N}\cdot\text{m}$ (($36 \pm 5 \text{ lb ft}$))

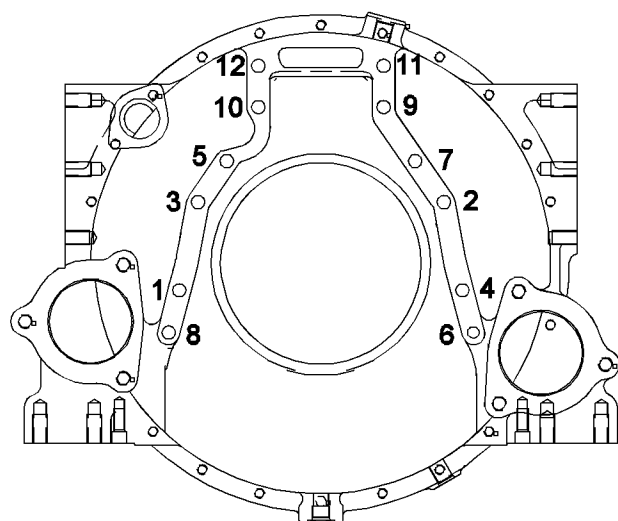


Illustration 326

g01230736

Note: During assembly, inspect the following components for any foreign materials: the front face of the flywheel housing and the rear face of the cylinder block. These components must be free of the following substances: oil, fuel, water, sealant, assembly compounds and any other foreign material. Apply 6ml of Loctite High Flex sealant as a continuous film on entire joint face.

1. Apply Loctite 7649 and then apply Loctite 620 to the threads of the bolts prior to assembly. In a numerical sequence, tighten bolt 1 through bolt 12.

Torque for the 12 bolts $100 \pm 20 \text{ N}\cdot\text{m}$
(($75 \pm 15 \text{ lb ft}$))

i03550794

Flywheel Housing Cover

SMCS Code: 1157

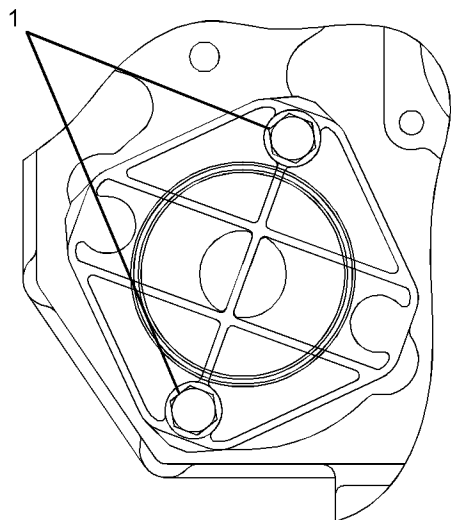


Illustration 328

g01225054

(1) Torque for two bolts $30 \pm 5 \text{ N}\cdot\text{m}$
((266 $\pm$ 44 lb in))

i04753249

Flywheel Housing Cover

SMCS Code: 1157

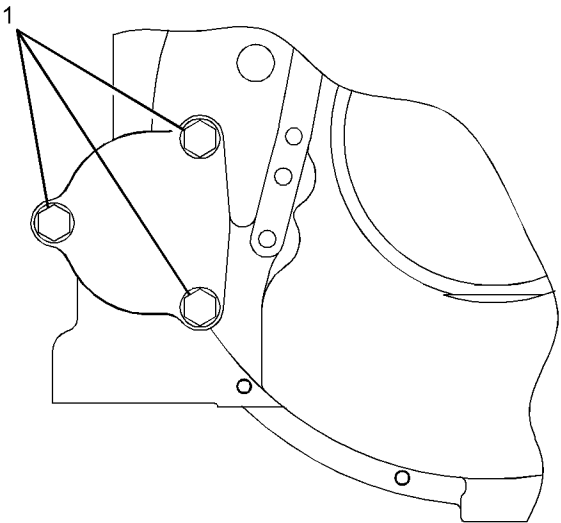


Illustration 329
Front view

g02848820

Table 130

Specification for 127 - 5728 Flywheel Housing Cover Gp			
Item	Qty	Part	Specification Description
1	3	0S - 1589 Bolt	Torque to 115 ± 7 N·m (85 ± 5 lb ft).

i04753270

Flywheel Housing Cover

SMCS Code: 1157

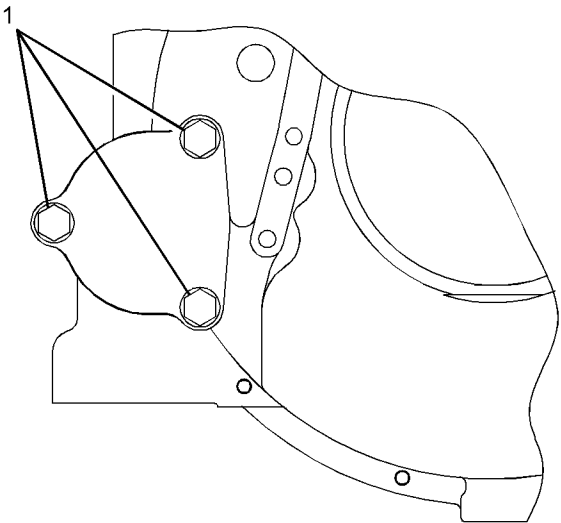


Illustration 330
Front view

g02848821

Table 131

Specification for 133 - 3089 Flywheel Housing Cover Gp			
Item	Qty	Part	Specification Description
1	3	0S - 1589 Bolt	Torque to 48 ± 7 N·m (35 ± 5 lb ft).

i04379731

Flywheel Housing Cover

SMCS Code: 1157

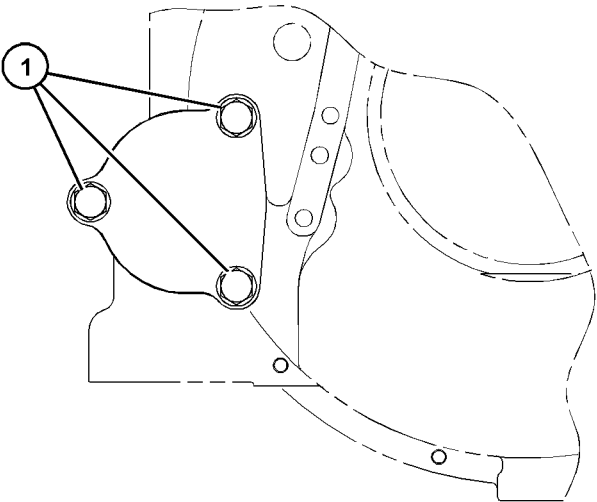


Illustration 331
Front view

g06226414

Table 132

Item	Qty	Part	Specification Description
1	3	0S-1589 Bolt	Torque to 115 ± 7 N·m (85 ± 55 lb ft).

i03569156

Belt Tensioner

SMCS Code: 1358

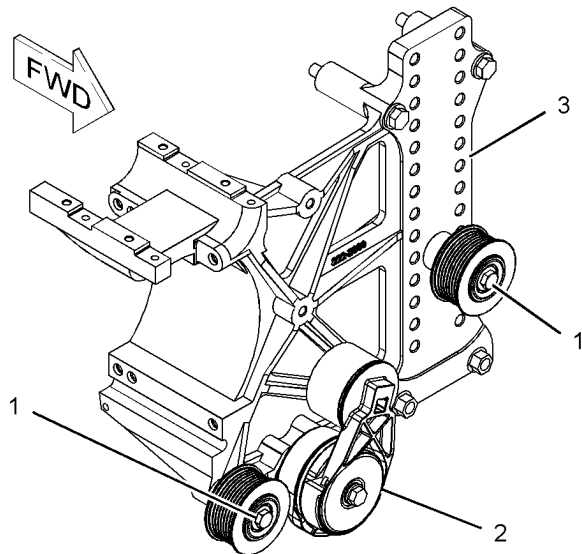


Illustration 332 g01116762

Typical example

(3) Mounting bracket

(1) Torque for bolts $50 \pm 5 \text{ N}\cdot\text{m}$ ($(37 \pm 4 \text{ lb ft})$)

(2) The tensioner is in the free position when the belt is not on the tensioner. Required torque for rotating the tensioner to a 30 degrees angle from the free position $58.8 \pm 5.9 \text{ N}\cdot\text{m}$ ($(43 \pm 4 \text{ lb ft})$)

i03920972

Belt Tensioner

SMCS Code: 1358

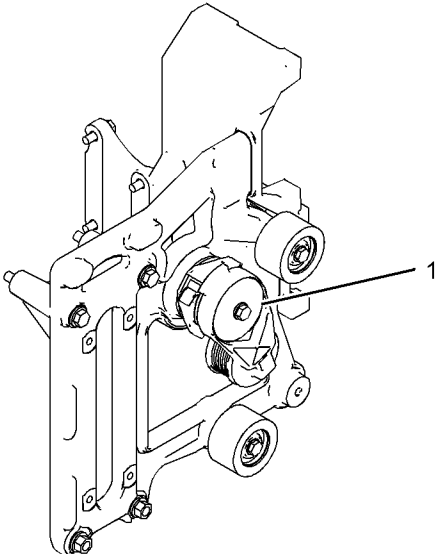


Illustration 333 g02151488

(1) Tensioner is in the free position when the belt is not on the tensioner. Required torque for rotating the tensioner to an angle of 30 degrees from the free position $50.8 \pm 5.1 \text{ N}\cdot\text{m}$ ($(37.5 \pm 3.8 \text{ lb ft})$)

i04346010

Belt Tensioner

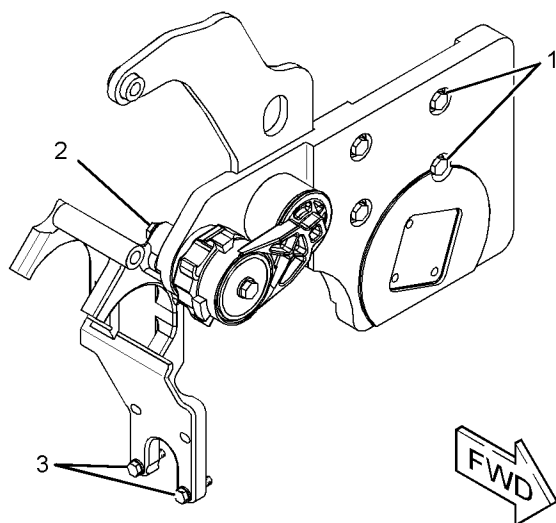
SMCS Code: 1358

Illustration 334

g02501196

Use the following sequence in order to tighten the bolts:

1. Hand tighten bolts (1), (2) and (3).
2. Tighten four bolts (1) to $55 \pm 10 \text{ N}\cdot\text{m}$ ($41 \pm 7 \text{ lb ft}$).
3. Tighten two bolts (2) to $55 \pm 10 \text{ N}\cdot\text{m}$ ($41 \pm 7 \text{ lb ft}$).
4. Tighten two bolts (3) to $28 \pm 7 \text{ N}\cdot\text{m}$ ($248 \pm 62 \text{ lb in}$).

i04375208

Belt Tensioner

SMCS Code: 1358

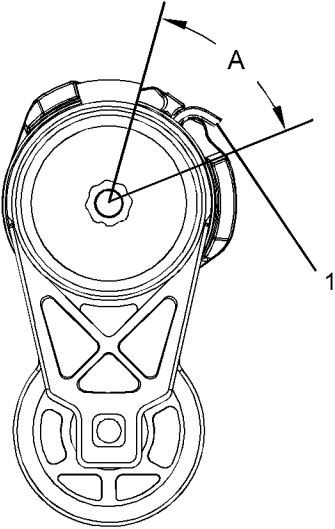


Illustration 335

g02547178

Table 133

Specifications for 220 - 1209 Belt Tensioner			
Item	Qty	Part	Specification Description
A	-	-	Minimum limited travel is 52 degrees.
1	-	-	Spring torque at assembly is 59.9 ± 6.0 N·m (44.2 ± 4.4 lb ft) at 35 degrees from the free arm position.

i04375211

Belt Tensioner

SMCS Code: 1358

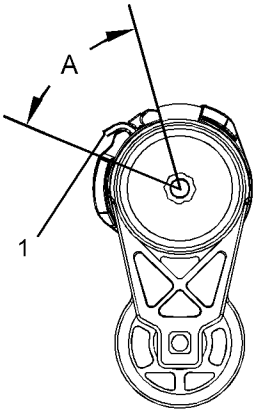


Illustration 336

g02547236

Table 134

Specifications for 222 - 2880 Belt Tensioner			
Item	Qty	Part	Specification Description
A	-	-	Minimum limited travel is 52 degrees.
1	-	-	Spring torque at assembly is 59.9 ± 6.0 N·m (44.2 ± 4.4 lb ft) at 35 degrees from the free arm position.

i04375212

Belt Tensioner

SMCS Code: 1358

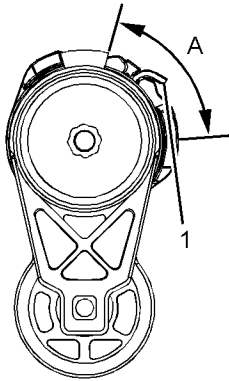


Illustration 337

g02547197

Table 135

Specification for 190-0643 Belt Tensioner Gp			
Item	Qty	Part	Specification Description
A	-	-	Minimum limited travel is 71 degrees.
1	-	-	Spring torque at assembly is 47.5 ± 4.3 N·m (35.0 ± 3.2 lb ft) at 36 degrees from the free arm position.

i04375218

Belt Tensioner

SMCS Code: 1358

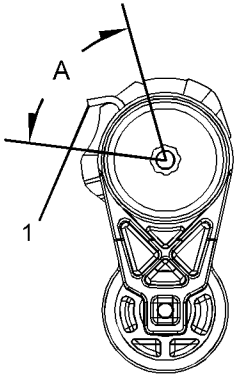


Illustration 338

g02547263

Table 136

Specifications for 190 - 0649 Belt Tensioner			
Item	Qty	Part	Specification Description
A	-	-	Minimum limited travel is 71 degrees.
1	-	-	Spring torque at assembly is 42.9 ± 4.3 N·m (31.6 ± 3.2 lb ft) at 36 degrees from the free arm position.

i04394633

Belt Tensioner (Alternator and Compressor)

SMCS Code: 1358

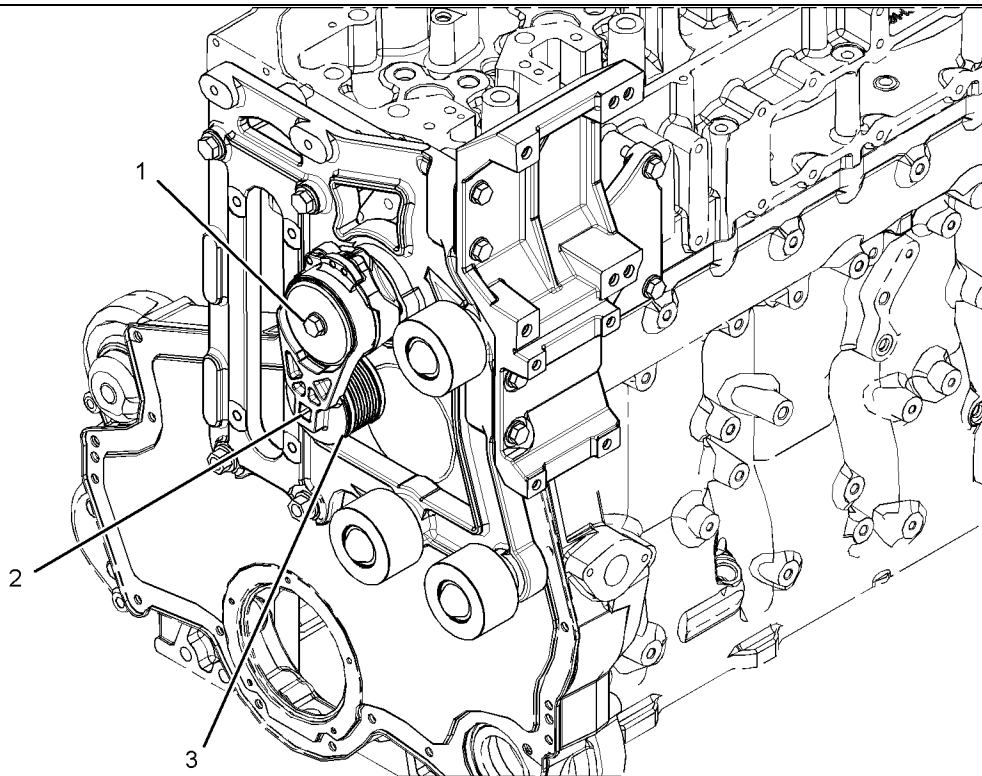


Illustration 339

g02567317

Table 137

Specification for 351 - 6636 Belt Tensioner			
Item	Qty	Part	Specification Description
1	1	8T - 4172 Bolt	Torque to 50 ± 5 N·m (37 ± 4 lb ft).
2	-	-	Torque bolt to 41 ± 8 N·m (30 ± 6 lb ft).
3	-	-	Belt tensioner is in the free position when the belt is not on the tensioner. Required torque for rotating the tensioner to a 30 degrees angle from the free position is 50.8 ± 5.1 N·m (37.5 ± 3.8 lb ft).

i04428699

Belt Tensioner

SMCS Code: 1358

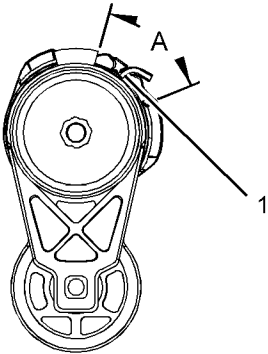


Illustration 340

g02622716

Table 138

Specifications for 217 - 8938 Belt Tensioner			
Item	Qty	Part	Specification Description
A	-	-	Minimum limited travel is 71 degrees.
1	-	-	Assembly spring torque is 14.1 ± 1.7 N·m (124.8 ± 15.1 lb in) at 25 degrees from the free arm position.

i04428712

Belt Tensioner

SMCS Code: 1358

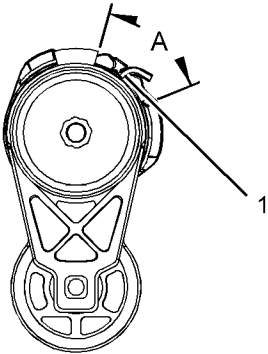


Illustration 341

g02622737

Table 139

Specifications for 200 - 2279 Belt Tensioner			
Item	Qty	Part	Specification Description
A	-	-	Minimum limited travel is 51 degrees.
1	-	-	Assembly spring torque is 56.5 ± 5.6 N·m (42 ± 4 lb ft) at 30 degrees from the free arm position.

i04428730

Belt Tensioner

SMCS Code: 1358

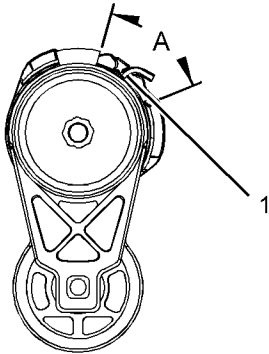


Illustration 342

g02622756

Table 140

Specifications for 236 - 2301 Belt Tensioner			
Item	Qty	Part	Specification Description
A	-	-	Minimum limited travel is 51 degrees.
1	-	-	Assembly spring torque is 62.1 ± 6.2 N·m (45.8 ± 4.6 lb ft) at 30 degrees from the free arm position.

i07887572

Belt Tensioner

SMCS Code: 1358

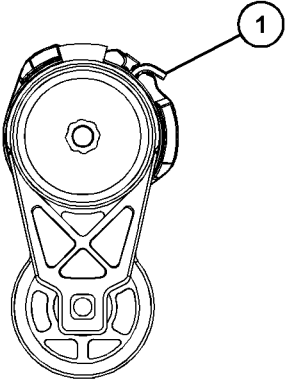


Illustration 343

g06469798

Table 141

Item	Qty	Part	Specification Description
1	-	-	Spring force at assembly is 56.5 ± 5.6 N·m (500.0 ± 50.0 lb in) at 30 degrees from the free arm position.
-	-	-	Minimum arm travel is 51 degrees.
-	-	-	Recommended mounting bolt torque is 50 ± 5 N·m (37 ± 4 lb ft)

i02837963

i02837965

Fan Drive

SMCS Code: 1359

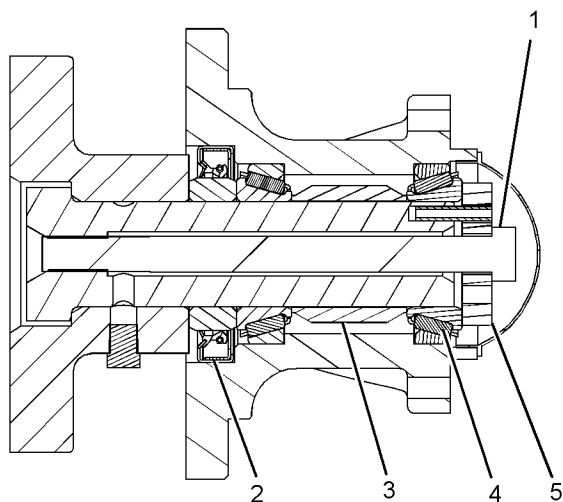


Illustration 344

g01419352

Note: Apply 4C-4030 Thread Lock Compound to the threads of the bolt (1).

(1) Torque for the bolt $115 \pm 5 \text{ N}\cdot\text{m}$ ($(85 \pm 4 \text{ lb ft})$)

Note: Lightly lubricate the sealing lip of the lip type seal with 198-0308 Lubricant.

(2) Install the lip type seal with the lip in the specified position. The lip should be facing toward the front of the engine.

(3) Fill the bearing cavity with 10 grams of 198-0308 Lubricant.

(4) Hand pack the bearing cup and the bearing cone with 5 grams of 198-0308 Lubricant prior to assembly.

(5) Fill the drive group with 30 grams of 198-0308 Lubricant.

Fan Drive

SMCS Code: 1359

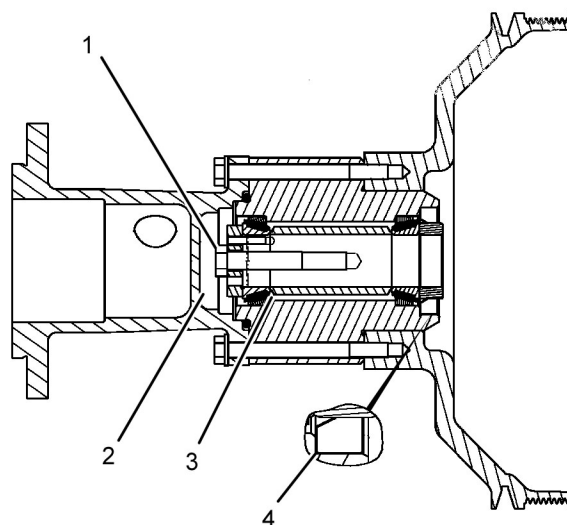


Illustration 345

g01421177

(1) Apply 4C-4030 Thread Lock Compound to the threads of the bolt.

(2) Fill the fan adapter cavity with 30 grams of 198-0308 Lubricant.

(3) Fill the bearing cavity with 25 grams of 198-0308 Lubricant.

(4) Lightly lubricate the sealing lips of the lip type seal with 198-0308 Lubricant. Install the lip type seal, as shown.

i02837969

i02935136

Fan Drive

SMCS Code: 1359

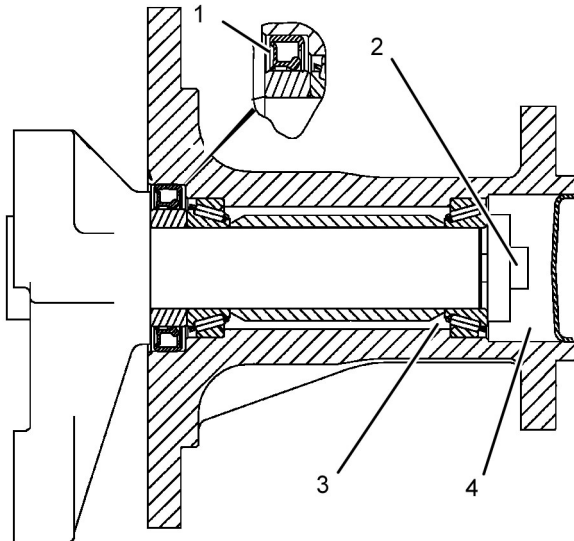


Illustration 346

g01421221

(1) Lightly lubricate the sealing lips of the lip type seal with 198-0308 Lubricant. Install the lip type seal, as shown. Fill the seal cavity with 9 grams of 198-0308 Lubricant.

(2) Apply 4C-4030 Thread Lock Compound to the threads of the bolt.

(3) Fill the bearing cavity with 23 grams of 198-0308 Lubricant.

(4) Fill the front cavity with 21 grams of 198-0308 Lubricant.

Fan Drive

SMCS Code: 1359

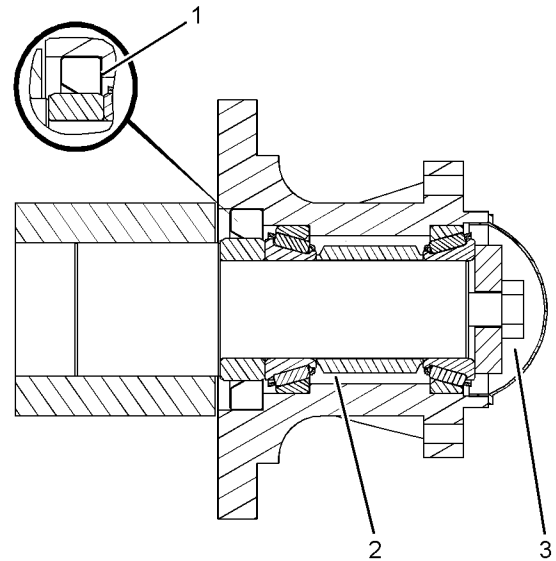


Illustration 347

g01456055

Note: Lightly lubricate the sealing lip of the lip type seal with 2S-3230 Bearing Lubricant.

(1) Install the lip of the lip type seal, as shown. Refer to Illustration 347 .

(2) Fill the bearing cavity with 30 grams of 2S-3230 Bearing Lubricant.

(3) Fill the drive group with 30 grams of 2S-3230 Bearing Lubricant.

i03928491

Fan Drive

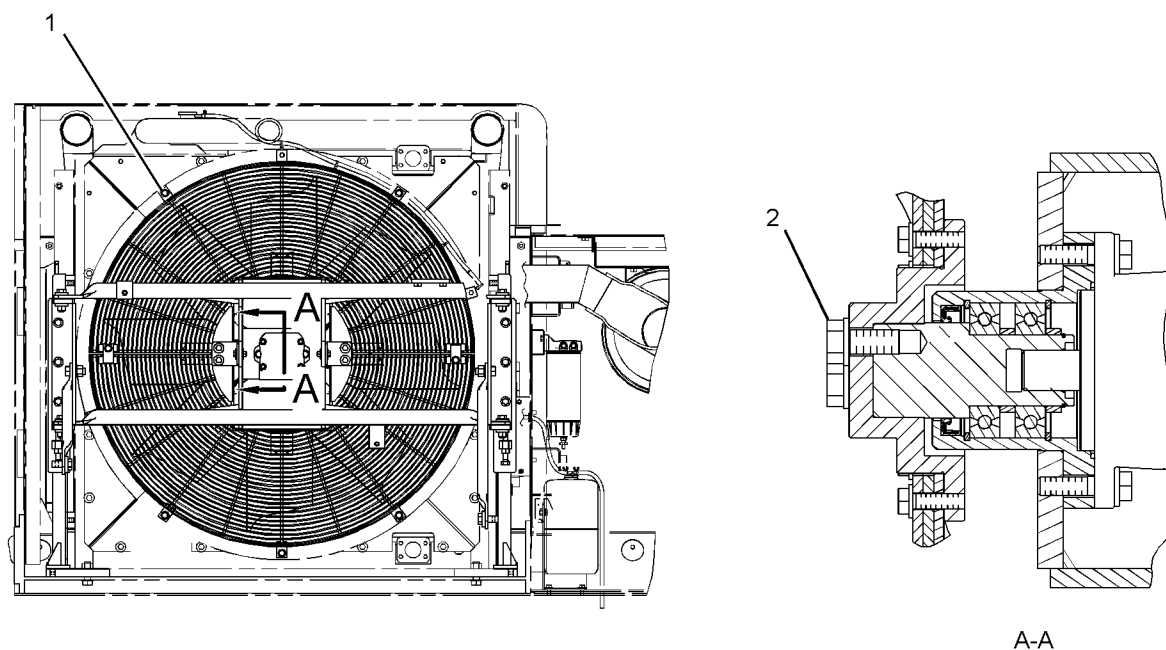
SMCS Code: 1359

Illustration 348

g02153491

Typical example

Note: Nominal clearance between the shroud and the spider assembly is 10.0 mm (0.39 inch).

(1) Torque for eight bolts $30 \pm 7 \text{ N}\cdot\text{m}$
(($266 \pm 62 \text{ lb in}$))

Note: Apply red Loctite 271 to the threads of the bolts.

(2) Torque for three bolts $105 \pm 20 \text{ N}\cdot\text{m}$
(($77 \pm 15 \text{ lb ft}$))

i05755802

Fan Drive

SMCS Code: 1359

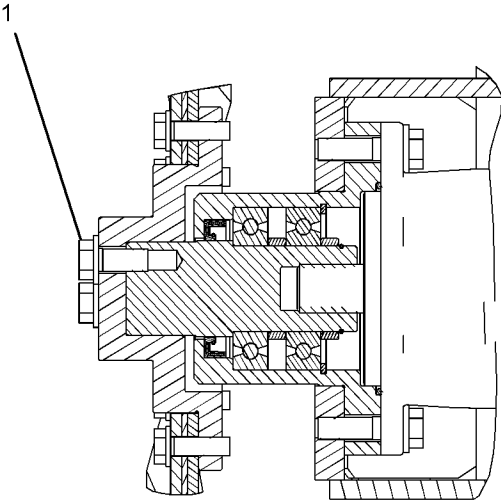


Illustration 349

g03653974

Table 142

Specification for 230 - 2899 Suction Fan Gp			
Item	Qty	Part	Specification Description
1	3	451 - 2181 Bolt	Apply red Loctite 271 to the threads. Torque to 105 ± 20 N·m (77 ± 15 lb ft).

i06801051

Fan Drive

SMCS Code: 1359

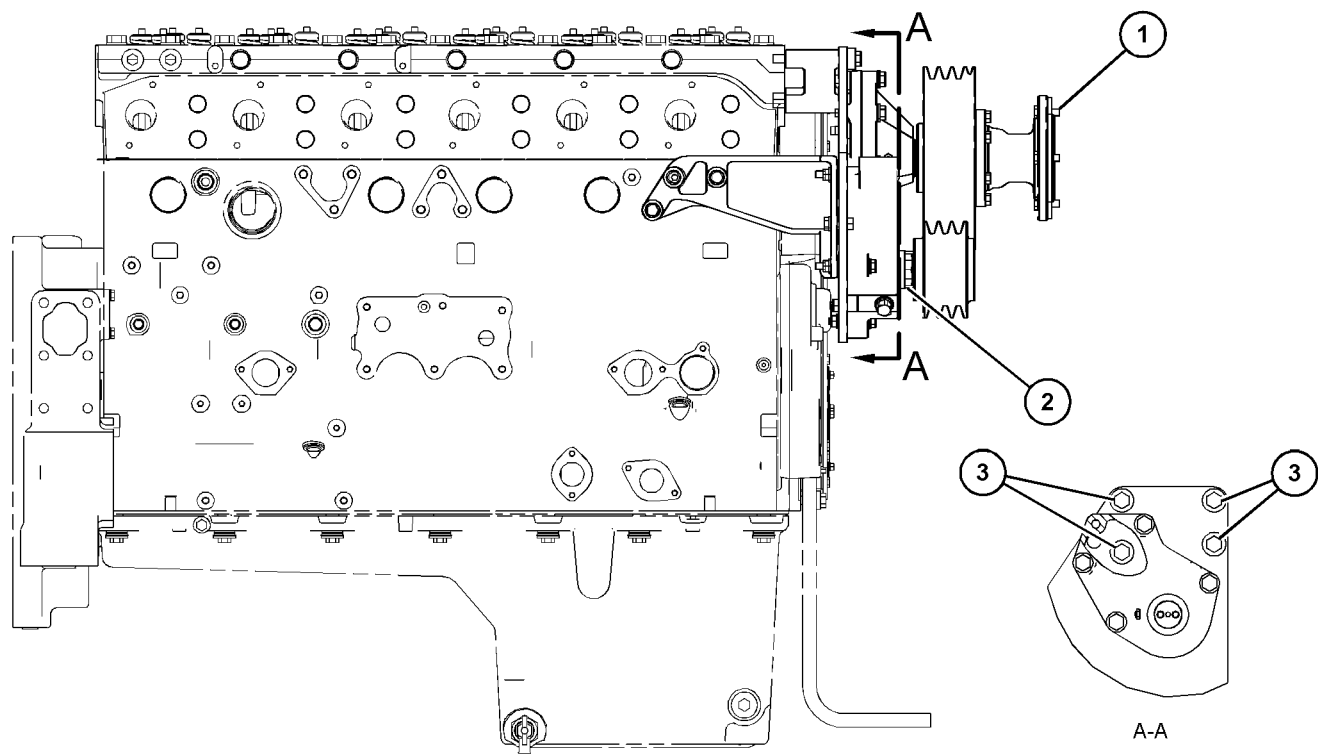


Illustration 350

g06119746

Table 143

Specification for 399 - 6040 Fan Drive Gp			
Item	Qty	Part	Specification Description
1	6	8T - 4195 Bolt	Tighten to standard torque when the fan is fitted. Tighten to 15 ± 3 N·m (133 ± 27 lb in) when no fan is fitted.
2	1	296 - 8180 Nut	After the belts are installed, tighten the nut to 200 ± 25 N·m (148 ± 18 lb ft).
3	4	6V - 8004 Bolt	Apply red Loctite Dri-Loc 204 to the threads.

i05685309

Engine Mounting

SMCS Code: 1152**S/N:** 3F31–Up**S/N:** 3F41–Up**S/N:** NN41–Up**S/N:** 3F51–Up**S/N:** MW51–Up**S/N:** NN51–Up**S/N:** BJ61–Up**S/N:** BS61–Up**S/N:** NN61–Up**S/N:** 2L71–Up**S/N:** 2L81–Up**S/N:** FLA1–Up**S/N:** GTA1–Up**S/N:** TBA1–Up**S/N:** JGB1–Up**S/N:** BYC1–Up**S/N:** FPC1–Up**S/N:** LCC1–Up**S/N:** MDC1–Up**S/N:** SPC1–Up**S/N:** WEC1–Up**S/N:** XAC1–Up**S/N:** 9SD1–Up**S/N:** A6D1–Up**S/N:** A7D1–Up**S/N:** ESD1–Up**S/N:** MGD1–Up**S/N:** P5D1–Up**S/N:** PFD1–Up**S/N:** RGD1–Up**S/N:** WTD1–Up**S/N:** M3E1–Up**S/N:** MTE1–Up**S/N:** NPE1–Up**S/N:** RAE1–Up**S/N:** WDE1–Up**S/N:** YAE1–Up**S/N:** YEE1–Up**S/N:** GKF1–Up**S/N:** M3F1–Up**S/N:** NNF1–Up**S/N:** RYF1–Up**S/N:** A6G1–Up**S/N:** A7G1–Up**S/N:** NEG1–Up**S/N:** PZG1–Up**S/N:** RGG1–Up**S/N:** TDG1–Up**Part No. :** 222 - 8358**S/N:** YAG1–Up**S/N:** B9H1–Up**S/N:** EEH1–Up**S/N:** GPH1–Up**S/N:** KFH1–Up**S/N:** KLH1–Up**S/N:** LFH1–Up**S/N:** R9H1–Up**S/N:** TAH1–Up**S/N:** A6J1–Up**S/N:** A7J1–Up**S/N:** B9J1–Up**S/N:** R9J1–Up**S/N:** RAJ1–Up**S/N:** RBJ1–Up**S/N:** TAJ1–Up**S/N:** MLK1–Up**S/N:** R5K1–Up**S/N:** A3L1–Up**S/N:** B1L1–Up

S/N: GCL1–Up
S/N: TAL1–Up
S/N: WTL1–Up
S/N: NLM1–Up
S/N: SDM1–Up
S/N: WTM1–Up
S/N: DKN1–Up
S/N: JKN1–Up
S/N: MEN1–Up
S/N: RAN1–Up
S/N: RFN1–Up
S/N: SCN1–Up
S/N: WTN1–Up
S/N: DHP1–Up
S/N: WTP1–Up
S/N: BWR1–Up
S/N: JAR1–Up
S/N: M2R1–Up
S/N: SBR1–Up
S/N: XBR1–Up
S/N: D3S1–Up
S/N: E9S1–Up
S/N: ELS1–Up
S/N: KHS1–Up
S/N: LRS1–Up
S/N: LYS1–Up
S/N: PBT1–Up
S/N: E9W1–Up
S/N: PJW1–Up
S/N: GAX1–Up
S/N: BWY1–Up
S/N: E9Y1–Up
S/N: LKY1–Up
S/N: NYY1–Up
S/N: SEY1–Up
S/N: SEZ1–Up
S/N: WXZ1–Up

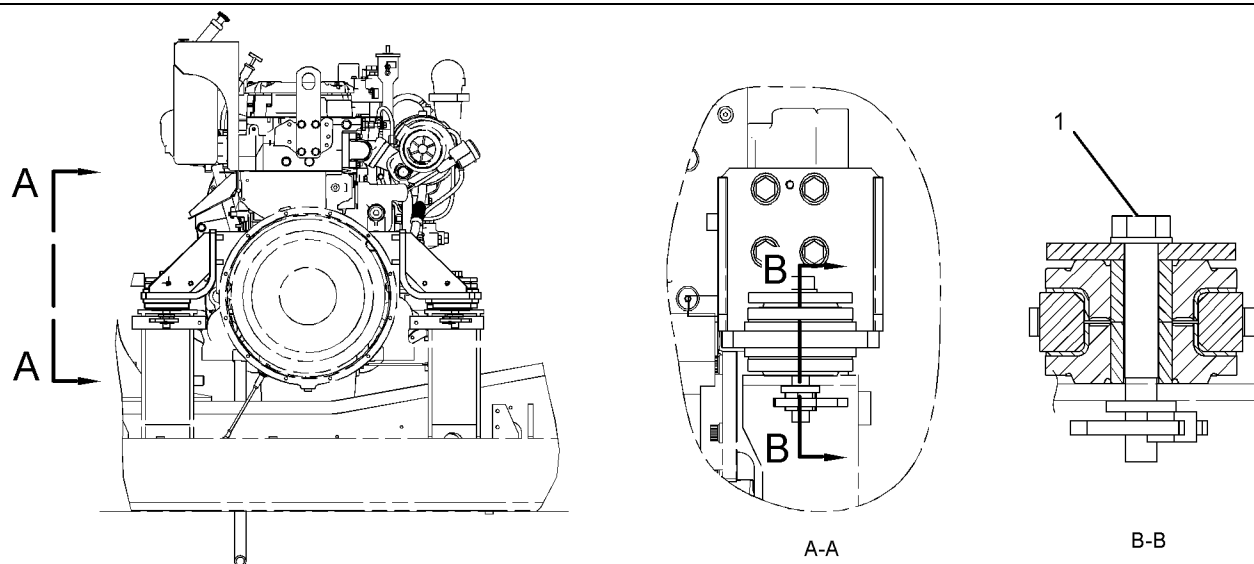


Illustration 351

g01530456

Typical example
Rear view of engine

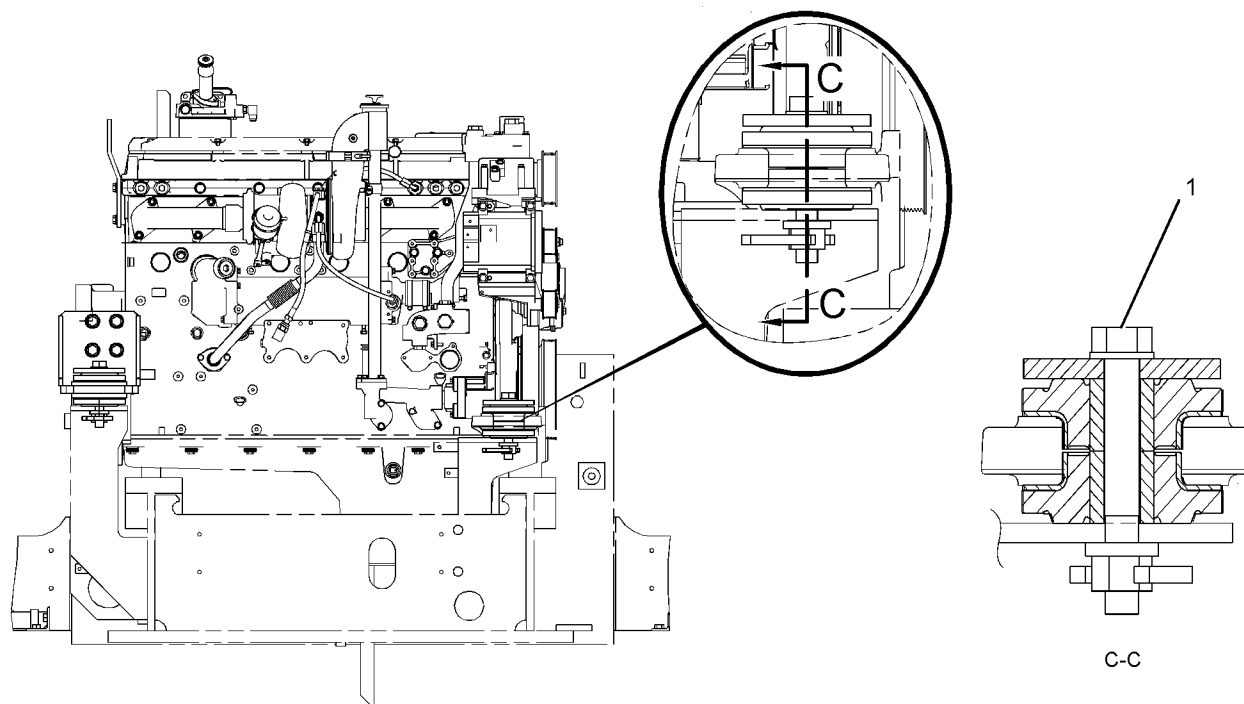


Illustration 352

g02912417

Typical example
Right side view of engine

Table 144

Specification for 324 - 4340 Engine Mounting Gp and 222 - 8358 Engine Mounting Gp			
Item	Qty	Part	Specification Description
1	4	447 - 1721 Bolt	Torque to 900 ± 100 N·m (664 ± 74 lb ft).

i06049552

Engine Mounting

SMCS Code: 1152

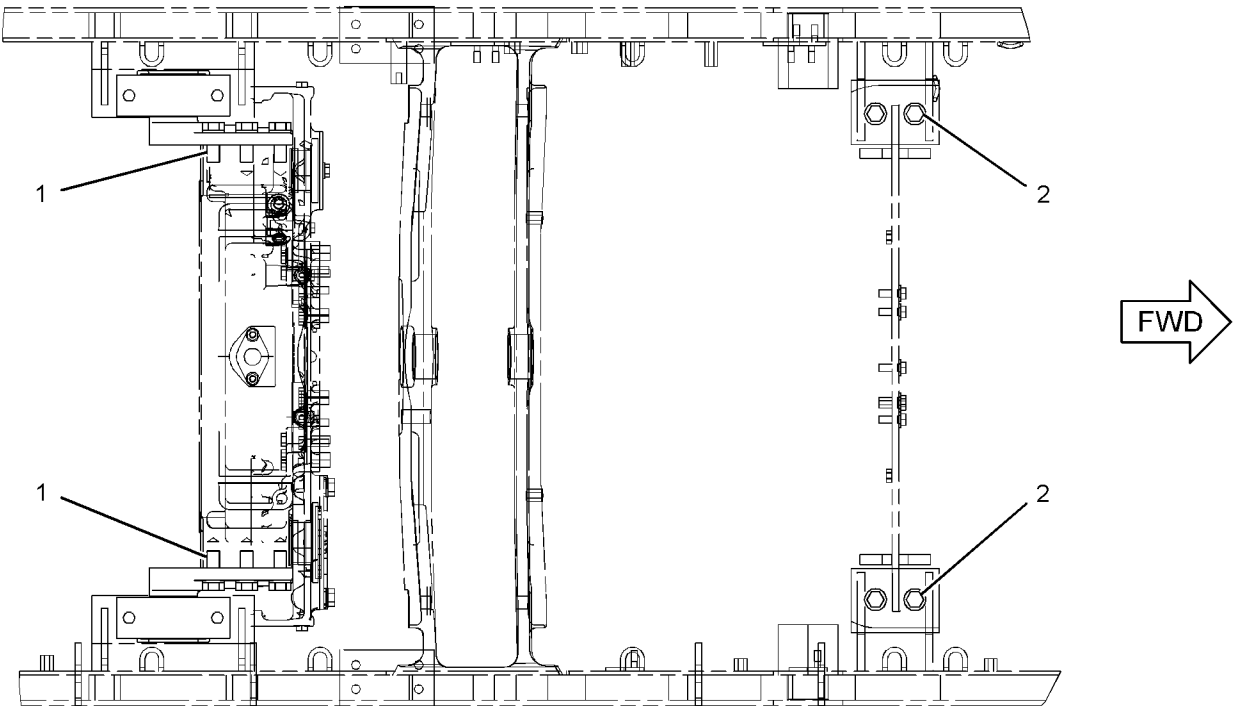


Illustration 353
Top view

g02126795

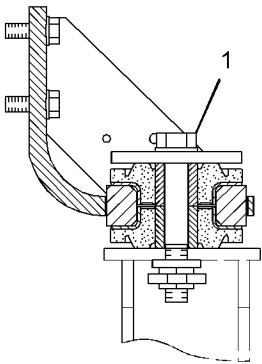
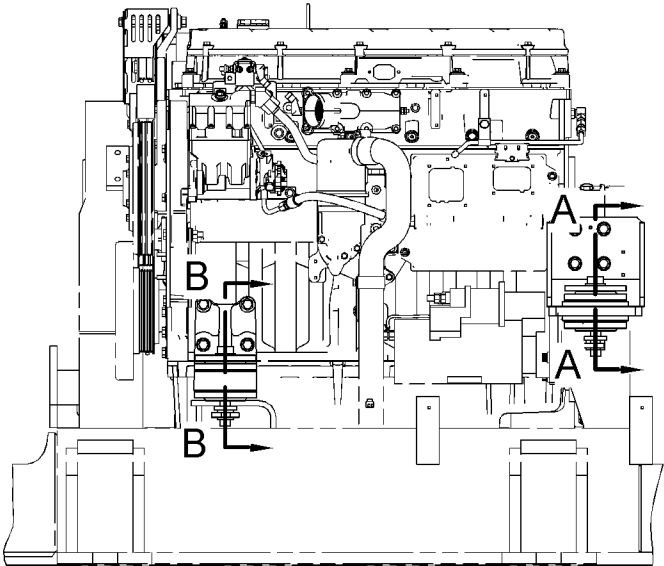
Table 145

Specification for 223 -0556 Engine Mounting Gp			
Item	Qty	Part	Specification Description
1	12	8T -6430 Bolt	Torque to 520 ± 70 N·m (384 ± 52 lb ft).
2	4	8T -4193 Bolt	Torque to 270 ± 40 N·m (199 ± 30 lb ft).

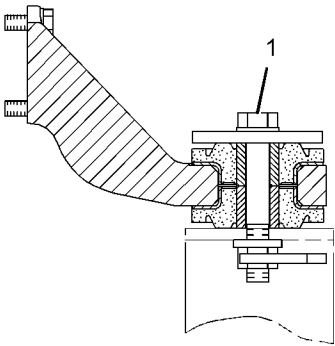
i06857190

Engine Mounting

SMCS Code: 1152



A-A



B-B

Illustration 354
Typical example

g01422941

Table 146

Specification for 222 - 8358 Engine Mounting Gp, 239 - 6474 Engine Mounting Gp and 324 - 4340 Engine Mounting Gp			
Item	Qty	Part	Specification Description
1	4	447 - 1721 Bolt	Torque to 900 ± 100 N·m (664 ± 74 lb ft).

i02959924

Engine Support (Front)

SMCS Code: 1153; 1154

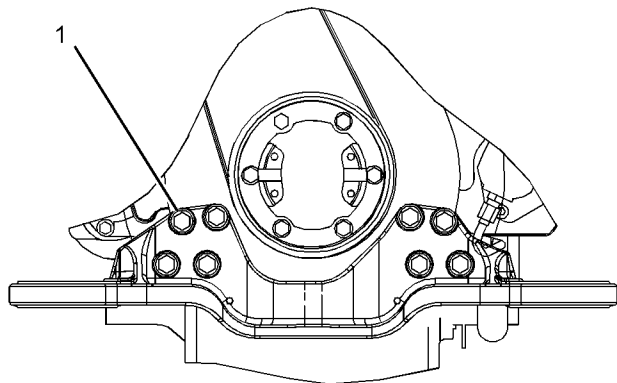


Illustration 355 g01478055

Front view of engine

(1) Torque for eight bolts $120 \pm 20 \text{ N}\cdot\text{m}$
((90 $\pm$ 15 lb ft))

i02959926

Engine Support (Front)

SMCS Code: 1153; 1154

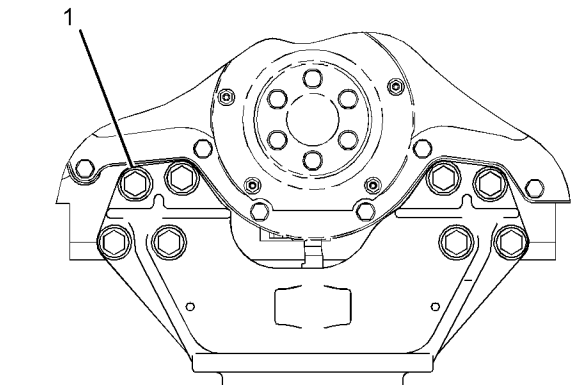


Illustration 356 g01225399

Front view of engine

(1) Torque for eight bolts $120 \pm 20 \text{ N}\cdot\text{m}$
((90 $\pm$ 15 lb ft))

i02959927

Engine Support (Front)

SMCS Code: 1153; 1154

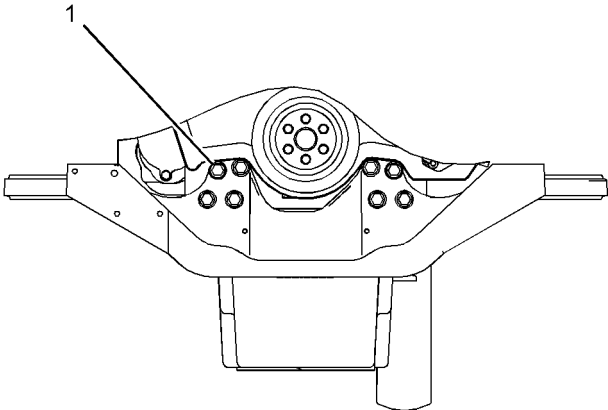


Illustration 357
Front view of engine

(1) Torque for eight bolts 120 ± 20 N·m
((90 ± 15 lb ft))

i02959929

Engine Support (Front)

SMCS Code: 1153; 1154

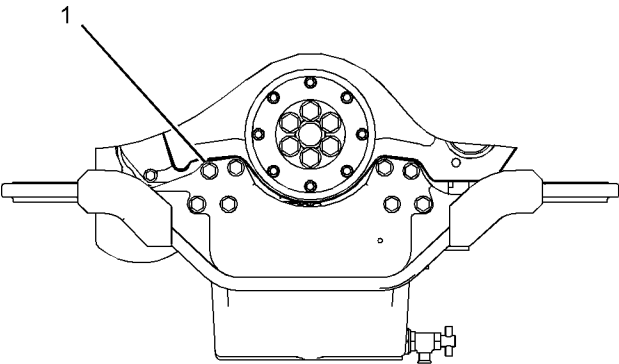


Illustration 358
Front view of engine

(1) Torque for eight bolts 120 ± 20 N·m
((90 ± 15 lb ft))

i02996013

Engine Support (Front)

SMCS Code: 1153; 1154

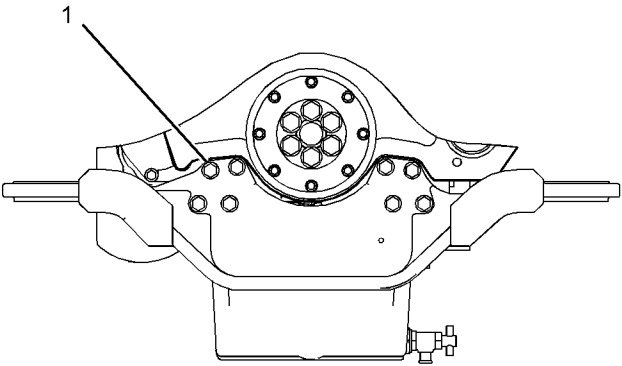


Illustration 359
Front view of engine

Note: Apply 154-9731 Thread Lock Compound to the threads of the bolts.

(1) Torque for eight bolts 120 ± 20 N·m
((90 ± 15 lb ft))

i02440572

Alternator and Regulator

SMCS Code: 1405; 1410

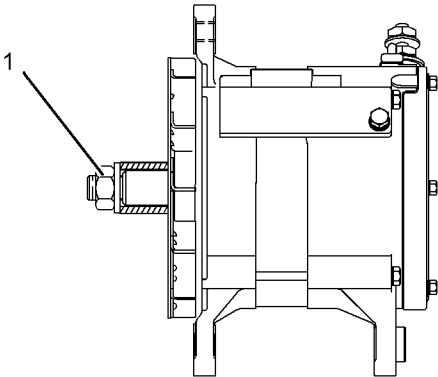


Illustration 360

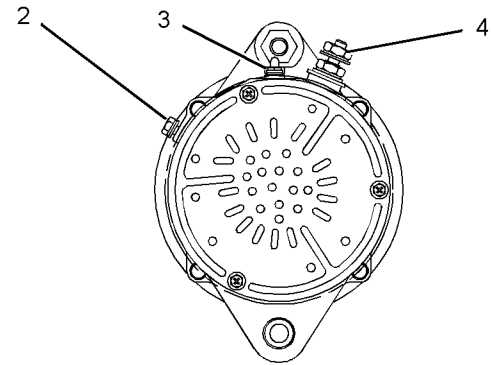


Illustration 361

Voltage 24 V

Amperage 95 Amp

Note: Load the battery with a carbon pile 4C-4911 Battery Load Tester in order to get the maximum alternator output.

Polarity Negative ground

Rotation Clockwise

The minimum full load current at 5000 rpm is the following value. 95 Amp

The minimum full load current at 2000 rpm is the following value. 28 Amp

Output voltage 28.0 ± 1.0 V

(1) Tighten the shaft nut to the following torque.
..... 127 ± 10 N·m ((95 ± 7 lb ft))

(2) (B-) terminal. Tighten the screw to the following torque. $4.4 \pm 1.0 \text{ N}\cdot\text{m}$ ($(39 \pm 9 \text{ lb in})$)

(3)(R) terminal. The peak voltage for terminal (R) must not be less than the output voltage for terminal (B+).

(4) (B+) terminal. Tighten the nut to the following torque. $18.2 \pm 2.4 \text{ N}\cdot\text{m}$ ($(13 \pm 2 \text{ lb ft})$)

i04379734

Alternator and Regulator

SMCS Code: 1405; 1410

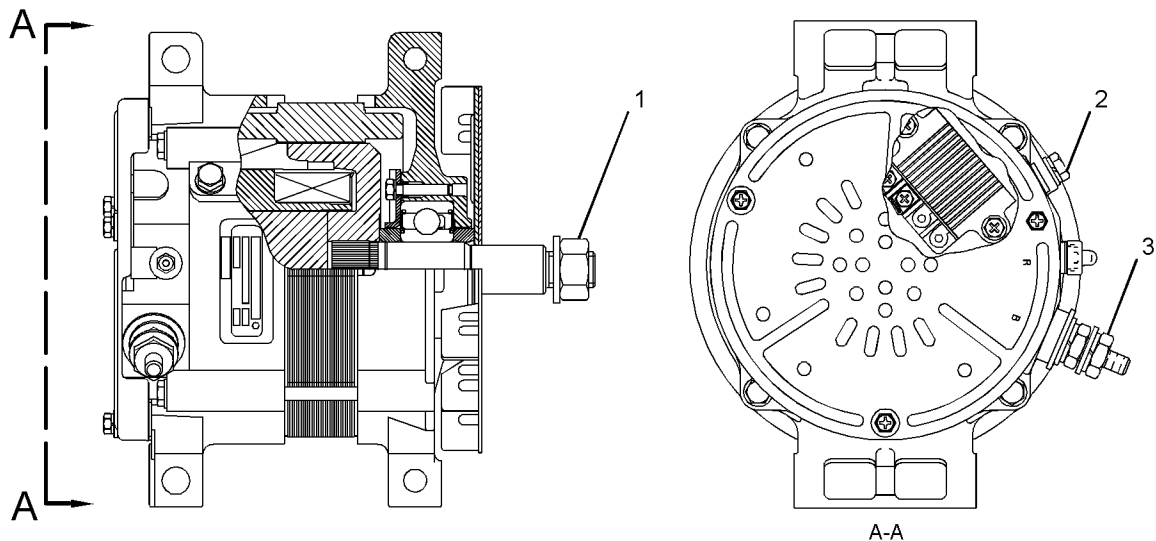


Illustration 362

g02543582

Table 147

Specification for 235 - 7133 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	1	2K - 4821 Locknut	Torque to 127 ± 10 N·m (94 ± 7 lb ft).
2	-	-	Torque nut of the (B -) terminal to 4.4 ± 1.0 N·m (38.9 ± 8.9 lb in).
3	-	-	Use a 7/16 ring terminal for (B +) terminal. Torque nut of the (B +) terminal to 18.2 ± 2.4 N·m (161.1 ± 21.2 lb in).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 80 amp.
-	-	-	Polarity is negative case grounded.
-	-	-	Rotation viewed from pulley is clockwise.
-	-	-	Minimum full load current at 5000 rpm is 85 amp.
-	-	-	Minimum full load current at 1500 rpm is 16 amp.
-	-	-	Maximum turn on speed is 2000 rpm.
-	-	-	Output voltage is 28 ± 1 V.

i04428830

Alternator and Regulator

SMCS Code: 1405; 1410

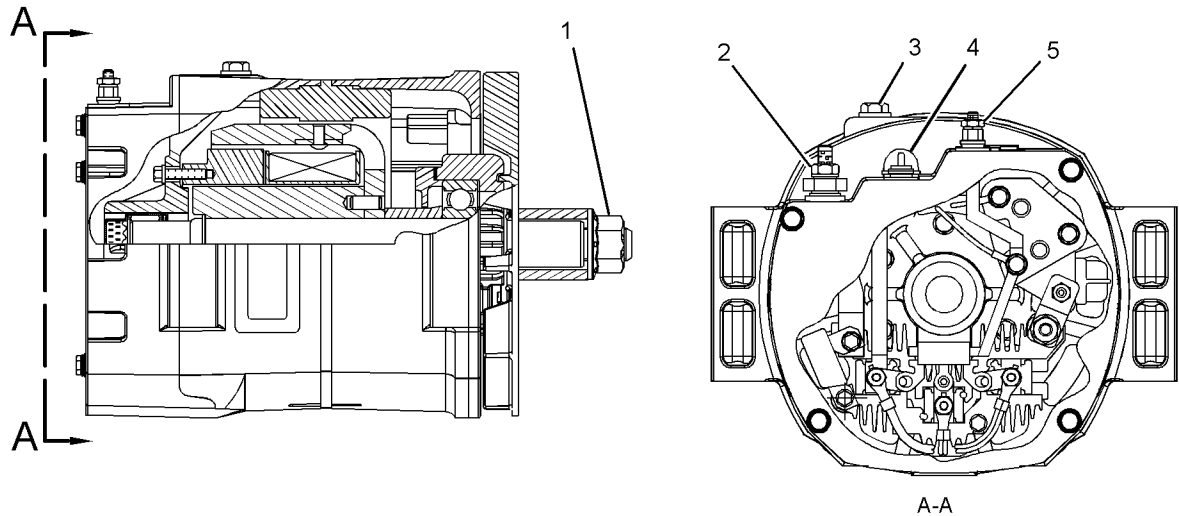


Illustration 363

g02622876

Note: Load the battery with a carbon pile 4C - 4911 Battery Load Tester in order to get the maximum alternator output.

Table 148

Specification for 200 - 2232 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	1	187 - 2034 Flange Nut	Torque to 102 ± 7 N·m (75 ± 5 lb ft).
2	1	6V - 8187 Nut	(B+) terminal. Torque to 6.2 ± 0.6 N·m (55.0 ± 5.3 lb in).
			Use a 7/16 ring terminal for (B+) terminal.
3	1	5S - 7349 Bolt	(B-) terminal. Torque to 6.2 ± 0.6 N·m (55.0 ± 5.3 lb in).
4	-	-	(R) terminal is the AC tap from stator and is not to be used for diagnostics.
5	1	4B - 2047 Nut	(D+) terminal. Torque to 2.25 ± 0.25 N·m (19.91 ± 2.21 lb in).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 75 amp.
-	-	-	Polarity is negative ground.
-	-	-	Rotation is either direction.
-	-	-	Minimum full load current at 5000 rpm and at 25 °C (77 °F) is 67.5 amp.
-	-	-	Minimum full load current at 2000 rpm and at 25 °C (77 °F) is 26 amp.
-	-	-	Output voltage is 28 ± 1 V.

i04430755

Alternator and Regulator

SMCS Code: 1405; 1410

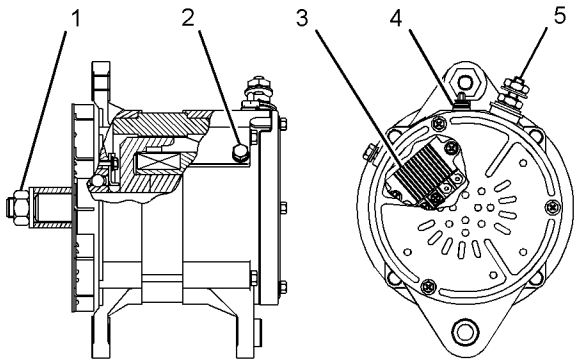


Illustration 364

g02624396

Table 149

Specification for 257 -9466 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	1	2K - 4821 Locknut	Torque to 127 ± 10 N·m (94 $\pm$ 7lb ft).
2	1	5S - 7349 Bolt	(B-) terminal. Torque to 4.4 ± 1.0 N·m (38.9 $\pm$ 8.9 lb in).
3	1	185 - 2648 Voltage Regulator As	Voltage setting requires no adjustment. Permissible voltage range is 27 to 29 V.
4	-	-	(R) terminal is the AC tap from stator and is not to be used for diagnostics.
5	1	6V - 8189 Nut	(B+) terminal. Use a 7/16 ring terminal for (B+) terminal.
			Torque to 18.2 ± 2.4 N·m (161.1 $\pm$ 21.2 lb in).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 95 amp.
-	-	-	Polarity is negative ground.
-	-	-	Rotation is clockwise.
-	-	-	Minimum full load current at 5000 rpm and at 25 °C (77 °F) is 95 amp.
-	-	-	Minimum full load current at 2000 rpm and at 25 °C (77 °F) is 28 amp.
-	-	-	Output voltage is 28 ± 1 V.

i05357672

Alternator and Regulator

SMCS Code: 1405; 1410

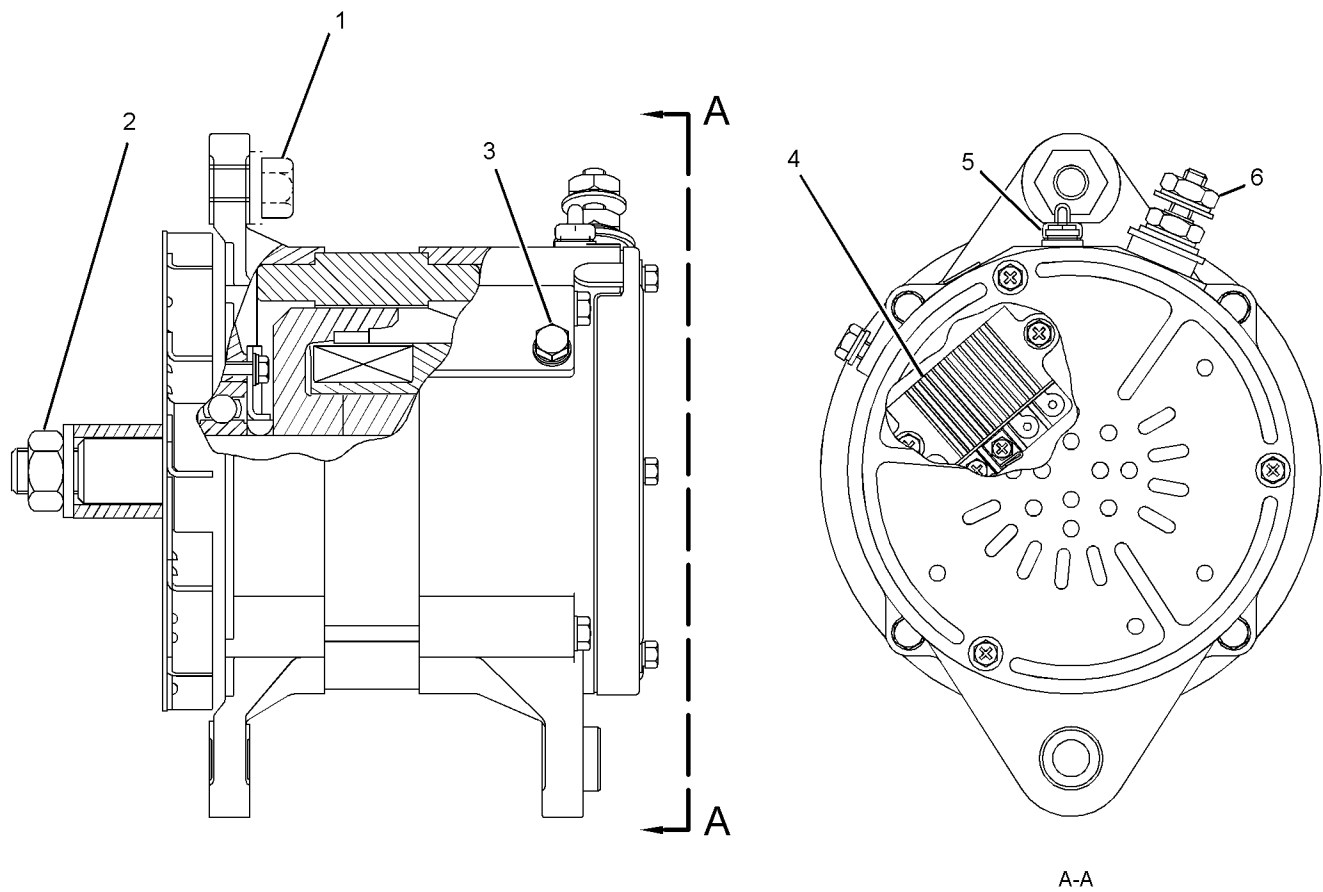


Illustration 365

g03393001

Note: Load the battery with a carbon pile 4C - 4911 Battery Load Tester in order to get the maximum alternator output.

Table 150

Specification for 177 - 9953 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	-	-	Tighten the bolt to 88.0 ± 13.5 N·m (64.9 ± 10.0 lb ft) before tightening the bolt (3).
2	1	2K - 4821 Locknut	Torque to 127 ± 10 N·m (94 ± 8 lb ft).
3	1	5S - 7349 Bolt	(B-) terminal. Torque to 4.4 ± 1.0 N·m (38.9 ± 8.9 lb in).

(continued)

Specifications Section

(Table 150, contd)

4	1	185 - 2648 Voltage Regulator As	Voltage setting requires no adjustment. Permissible voltage range is 27 to 29 V.
5	-	-	(R) terminal is the AC tap from stator and is not to be used for diagnostics.
6	1	6V - 8189 Nut	Use a 7/16 ring terminal for (B+) terminal.
			(B+) terminal. Torque to $18.2 \pm 2.4 \text{ N}\cdot\text{m}$ ($161.1 \pm 21.2 \text{ lb in}$).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 80 Amp.
-	-	-	Polarity is negative ground.
-	-	-	Rotation is clockwise.
-	-	-	Minimum full load current at 5000 rpm is 85 Amp.
-	-	-	Minimum full load current at 1500 rpm is 16 Amp.
-	-	-	Output voltage is $28 \pm 1 \text{ V}$.

i05358587

Alternator and Regulator

SMCS Code: 1405; 1410

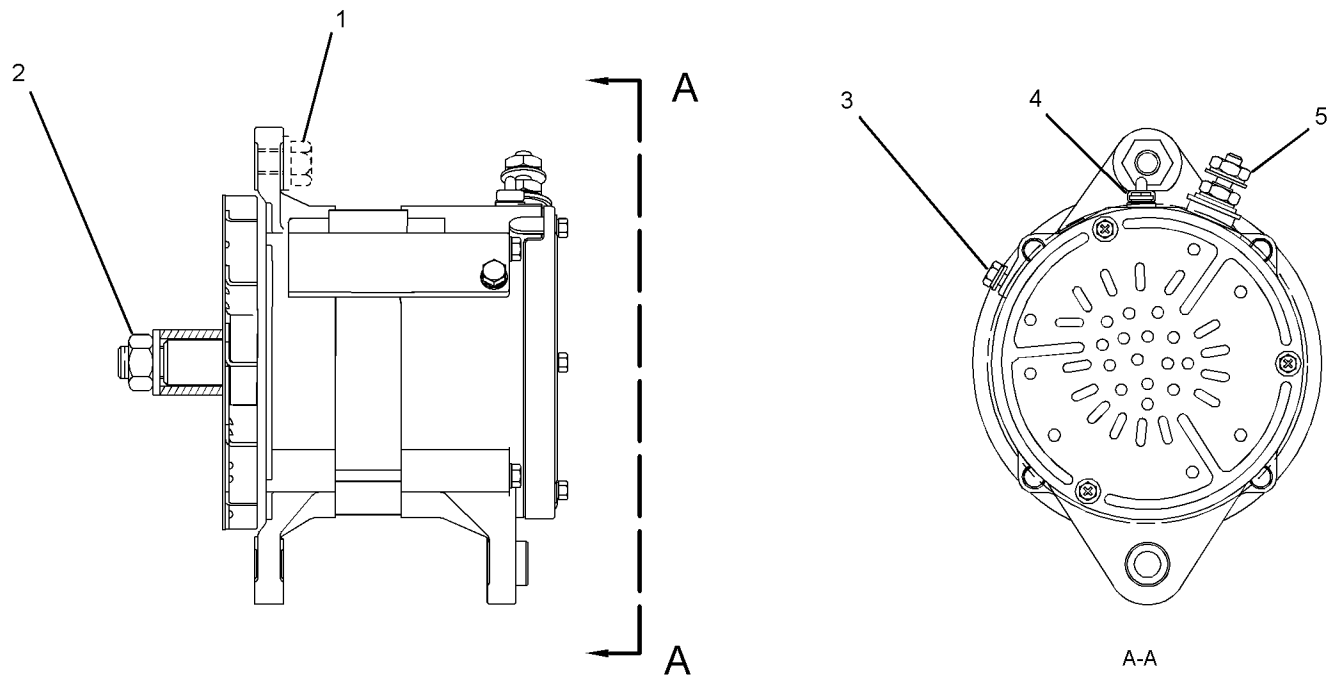


Illustration 366

g03393493

Note: Load the battery with a carbon pile 4C- 4911 Battery Load Tester in order to get the maximum alternator output.

Table 151

Specification for 197 -8820 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	-	-	Tighten the bolt to 88.0 ± 13.5 N·m (64.9 ± 10.0 lb ft) before tightening the bolt (3).
2	1	2K -4821 Locknut	Torque to 127 ± 10 N·m (94 ± 8 lb ft).
3	1	5S -7349 Bolt	(B-) terminal. Torque to 4.4 ± 1.0 N·m (38.9 ± 8.9 lb in).
4	-	-	(R) terminal is the AC tap from stator and is not to be used for diagnostics.
5	1	6V -8189 Nut	Use a 7/16 ring terminal for (B+) terminal.
			(B+) terminal. Torque to 18.2 ± 2.4 N·m (161.1 ± 21.2 lb in).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 95 Amp.

(continued)

Specifications Section

(Table 151, contd)

-	-	-	Polarity is negative ground.
-	-	-	Rotation is clockwise.
-	-	-	Minimum full load current at 5000 rpm is 95 Amp.
-	-	-	Minimum full load current at 2000 rpm is 28 Amp.
-	-	-	Output voltage is 28 ± 1 V.

i05360448

Alternator and Regulator

SMCS Code: 1405; 1410

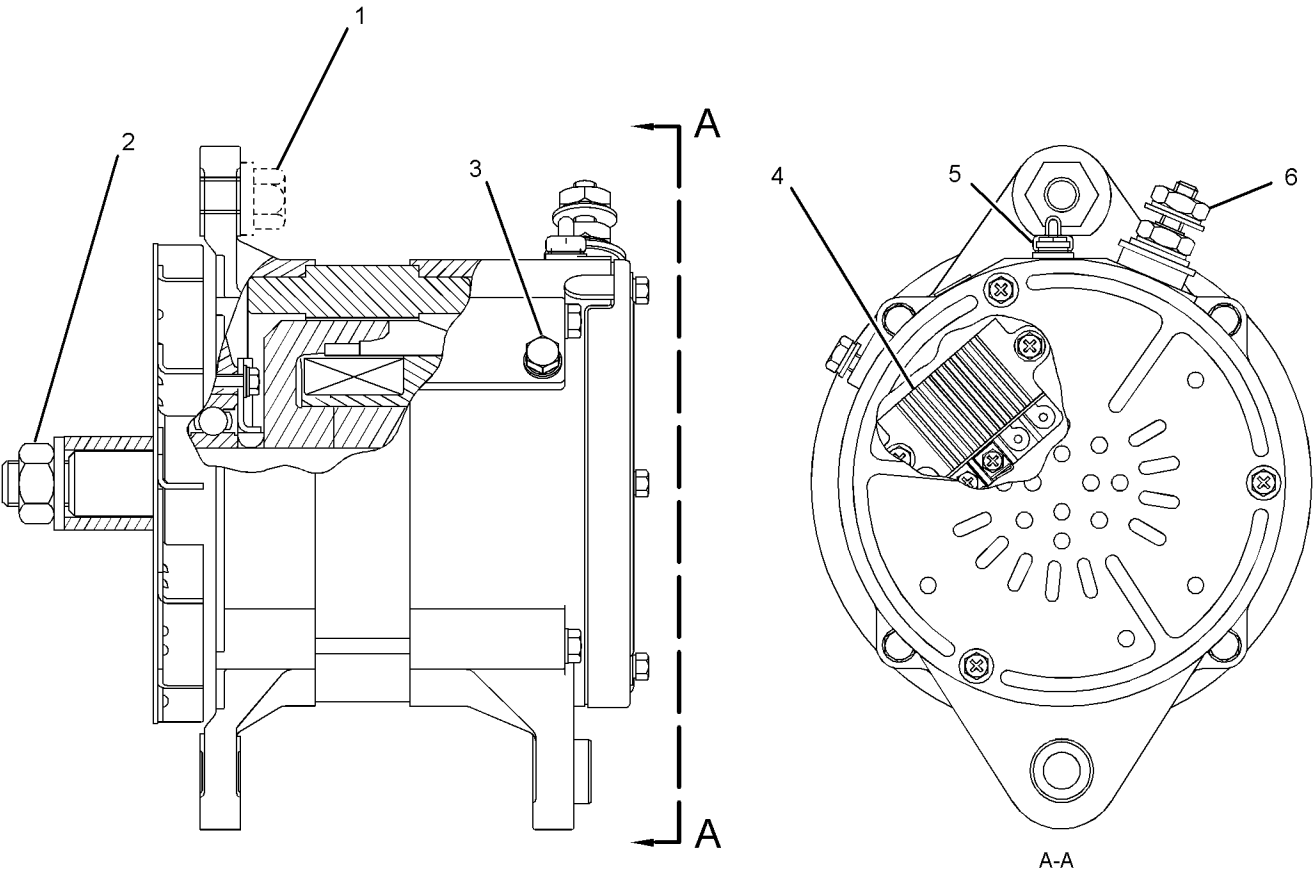


Illustration 367

g03394570

Note: Load the battery with a carbon pile 4C - 4911 Battery Load Tester in order to get the maximum alternator output.

Table 152

Specification for 185 - 5294 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	-	-	Tighten the bolt to 88.0 ± 13.5 N·m (64.9 ± 10.0 lb ft) before tightening the bolt (3).
2	1	2K - 4821 Locknut	Torque to 127 ± 10 N·m (94 ± 8 lb ft).
3	1	5S - 7349 Bolt	(B-) terminal. Torque to 4.4 ± 1.0 N·m (38.9 ± 8.9 lb in).

(continued)

Specifications Section

(Table 152, contd)

4	1	185 - 2648 Voltage Regulator As	Voltage setting requires no adjustment. Permissible voltage range is 27 to 29 V.
5	-	-	(R) terminal is the AC tap from stator and is not to be used for diagnostics.
6	1	6V - 8189 Nut	Use a 7/16 ring terminal for (B+) terminal.
			(B+) terminal. Torque to $18.2 \pm 2.4 \text{ N}\cdot\text{m}$ ($161.1 \pm 21.2 \text{ lb in}$).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 65 Amp.
-	-	-	Polarity is negative ground.
-	-	-	Rotation is clockwise.
-	-	-	Minimum full load current at 5000 rpm is 65 Amp.
-	-	-	Minimum full load current at 1500 rpm is 30 Amp.
-	-	-	Output voltage is $28 \pm 1 \text{ V}$.

i06289071

Alternator and Regulator

SMCS Code: 1405; 1410

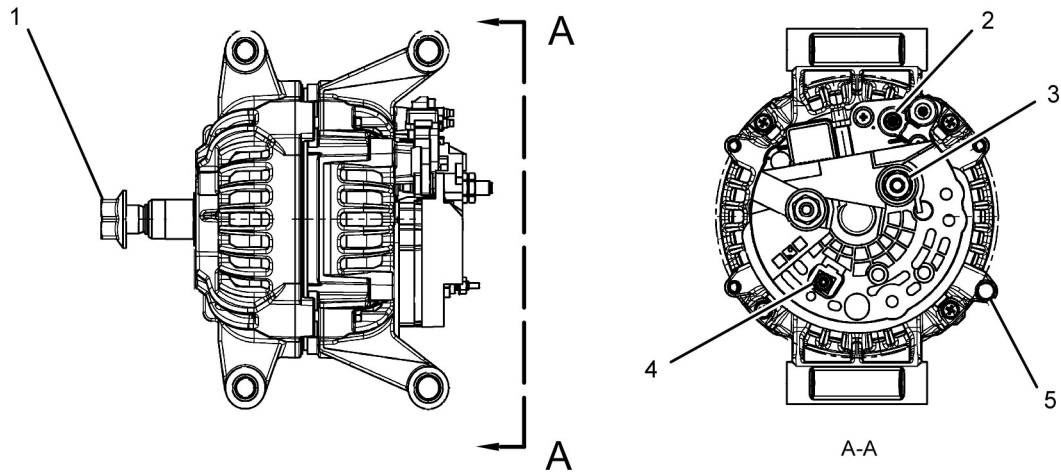


Illustration 368

g03887480

Table 153

Specification for 352-4700 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	-	-	Tighten the nut to 100 ± 5 N·m (74 ± 4 lb ft).
2	-	-	(D+) terminal. Tighten the nut to 4 ± 1 N·m (35 ± 95 lb in).
3	-	-	(B+) terminal. Tighten the nut to 15 ± 3 N·m (133 ± 27 lb in).
4	-	-	(R) terminal. Tighten the nut to 4 ± 1 N·m (35 ± 95 lb in).
			Use (M5) terminal.
			(R) terminal is tap from stator and is not to be used for diagnostics.
5	-	-	Ground terminal. Tighten the nut to 6 ± 1 N·m (53 ± 9 lb in).
-	-	-	Voltage is 24 V
-	-	-	Amperage is 145 Amp.
-	-	-	Polarity is negative ground.
-	-	-	Minimum full load current at 5000 rpm is 145 Amp.
-	-	-	Minimum full load current at 2000 rpm is 65 Amp.
-	-	-	Output voltage is 28 ± 1 V.

i06289089

Alternator and Regulator

SMCS Code: 1405; 1410

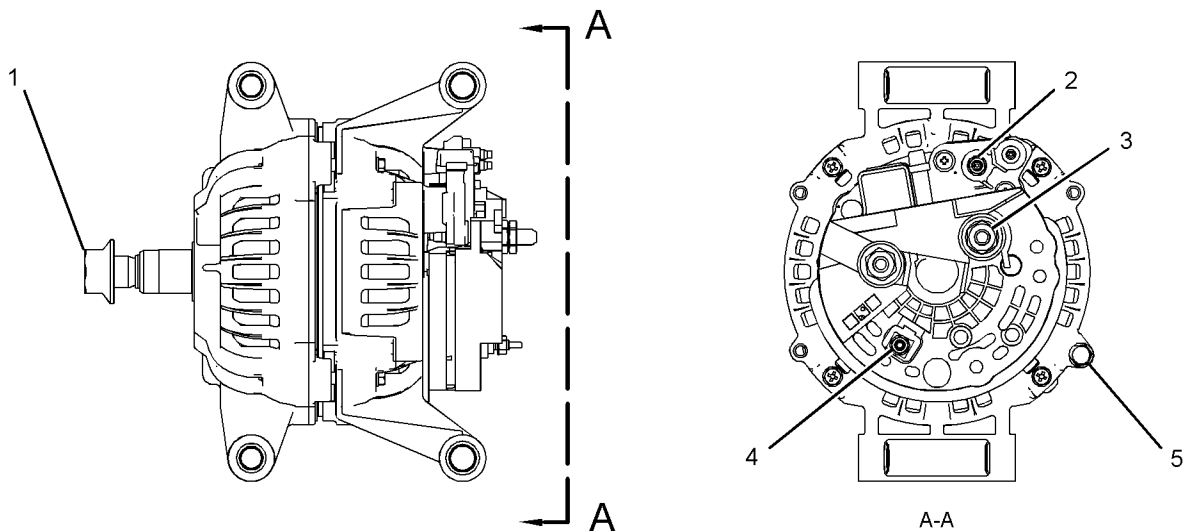


Illustration 369

g03887482

Table 154

Specification for 344-5081 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	-	-	Tighten the nut to 100 ± 5 N·m (74 ± 4 lb ft).
2	-	-	(D+) terminal. Tighten the nut to 4 ± 1 N·m (35 ± 95 lb in).
3	-	-	(B+) terminal. Tighten the nut to 15 ± 3 N·m (133 ± 27 lb in).
4	-	-	(R) terminal. Tighten the nut to 4 ± 1 N·m (35 ± 95 lb in).
			Use (M5) terminal.
			(R) terminal is tap from stator and is not to be used for diagnostics.
5	-	-	Ground terminal. Final installation torque to 6 ± 1 N·m (53 ± 9 lb in).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 115 Amp.
-	-	-	Polarity is negative ground.
-	-	-	Minimum full load current at 5000 rpm is 115 Amp.
-	-	-	Minimum full load current at 2000 rpm is 65 Amp.
-	-	-	Output voltage is 28 ± 1 V.

i06803024

Alternator and Regulator

SMCS Code: 1405; 1410

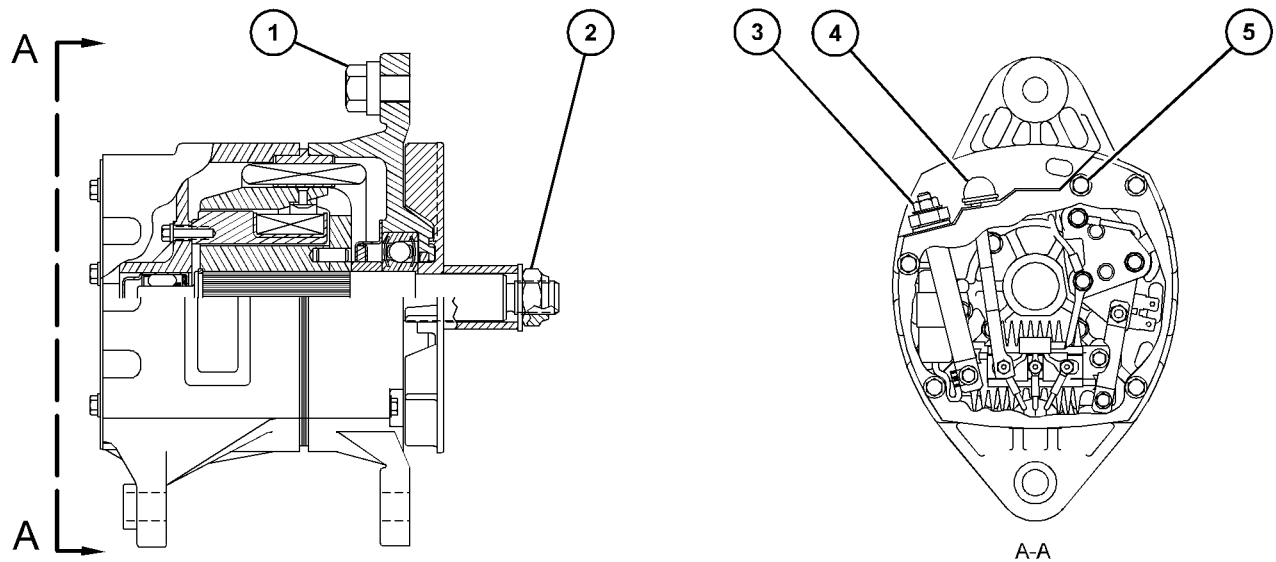


Illustration 370

g06120278

Table 155

Specification for 5N-5692 Charging Alternator Gp			
Item	Qty	Part	Specification Description
-	-	-	Load the battery with a carbon pile 4C-4911 Battery Load Tester to get the maximum alternator output
1	1	-	Tighten the bolt before you tighten the mounting bolt for the alternator.
			Torque to 88 ± 7 N·m (65 ± 5 lb ft)
2	1	187-2034 Flange Nut	Torque to 102 ± 7 N·m (75 ± 5 lb ft).
3	-	6V-8187 Nut	Use a 7/16 ring terminal for (B+) terminal.
			(B+) terminal. Torque to 7.0 ± 0.8 N·m (62.0 ± 7.1 lb in).
4	-	-	The peak voltage for (R) terminal must not be less than the output voltage for (B+) terminal.
5	-	-	(B-) terminal. Torque to 6.25 ± 0.55 N·m (55.32 ± 4.87 lb in).
-	-	-	Voltage is 24 V.
-	-	-	Amperage is 45 amp.
-	-	-	Polarity is negative ground.
-	-	-	Rotation is Either direction.
-	-	-	Maximum turn on speed is 2500 rpm
-	-	Alternator performance at 25 °C (77 °F)	

(continued)

Specifications Section

(Table 155, contd)

Specification for 5N - 5692 Charging Alternator Gp			
Item	Qty	Part	Specification Description
-	-	-	Minimum full load current at 5000 rpm is 42.3 amp.
-	-	-	Minimum full load current at 2000 rpm is 15.8 amp.
-	-	-	Output voltage is 28 ± 1 V.

i04377232

Alternator Mounting

SMCS Code: 1405

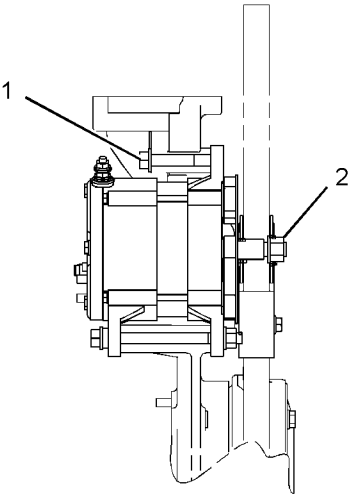


Illustration 371
Right side view of engine

g02542436

Table 156

Specification for 235 -2471 Charging Alternator Gp			
Item	Qty	Part	Specification Description
1	1	0V - 0375 Bolt	Torque to 85 ± 10 N·m (63 ± 7 lb ft).
2	1	2K - 4821 Locknut	Torque to 102 ± 7 N·m (75 ± 5 lb ft).

i04437970

Alternator Mounting

SMCS Code: 1405

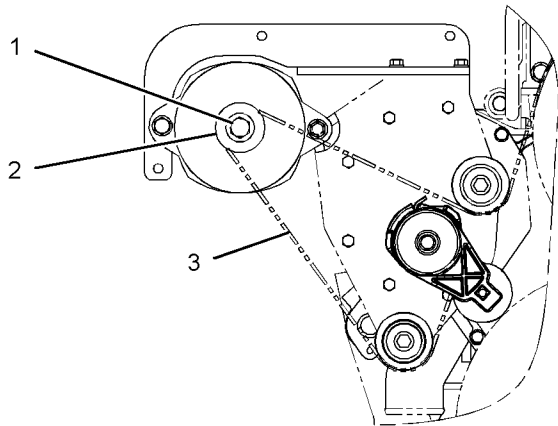


Illustration 372

g02626663

(3) Belt

Table 157

Specification for 252 - 0781 Alternator Mounting Gp			
Item	Qty	Part	Specification Description
1	1	187 - 2034 Flange Nut	Torque to 102 ± 7 N·m (75 ± 5 lb ft).
2	-	-	Misalignment between the pulleys should be less than or equal to 0.4 degrees.

i04561229

Alternator Mounting

SMCS Code: 1405

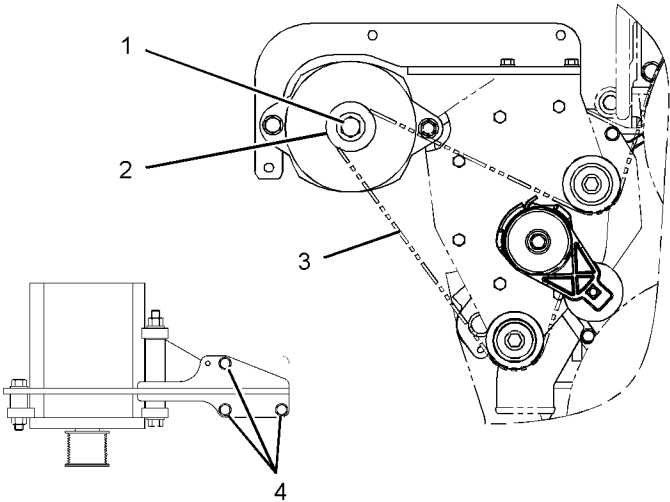


Illustration 373

g02625824

(3) Belt

Table 158

Specification for the 259 - 1511 Alternator Mounting Gp			
Item	Qty	Part	Specification Description
1	1	-	Torque to 127 ± 10 N·m (95 ± 7 lb ft).
2	-	-	The misalignment between the pulleys should be less than or equal to 0.4 degrees
4	3	8T - 4136 Bolt	Apply Loctite C5A copper anti-seize to the threads.

i02440576

Electric Starting Motor

SMCS Code: 1453

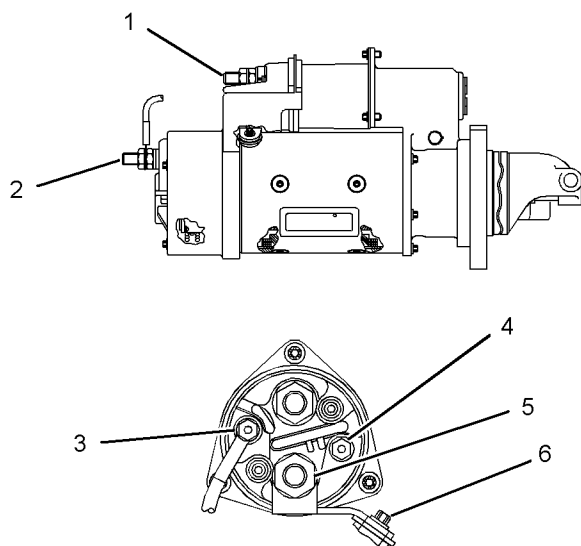


Illustration 374

g01219226

When the electric starting motor is viewed from the drive end, the motor rotates in the following direction.
..... Clockwise

No load conditions at 25 °C (77 °F)

Minimum speed with no load . . 7643 ± 1683 rpm
Maximum current with no load 76.5 ± 14.5
amp
Voltage 23 V

(1) Battery terminal

A maximum of three cable or wire terminals should be between the nuts.
Tighten the nut on the battery terminal to the following torque. . . 30.5 ± 3.5 N·m ((22 ± 3 lb ft))

(2) Ground terminal

Tighten the nut on the ground terminal to the following torque. . . 30.5 ± 3.5 N·m ((22 ± 3 lb ft))

(3) Ground terminal

Tighten the nut on the ground terminal to the following torque. 2.25 ± 0.25 N·m
((20 ± 2 lb in))

(4) Switch terminal

The wire terminal that is on the switch terminal must be insulated with heat shrink tubing. Do not use molded terminals.

Tighten the nut on the switch terminal to the following torque. 2.25 ± 0.25 N·m
((20 ± 2 lb in))

(5) Motor terminal

Tighten the nut on the motor terminal to the following torque. . . 30.5 ± 3.5 N·m ((22 ± 3 lb ft))

(6) Motor frame terminal

Tighten the nut on the motor frame terminal to the following torque. . . 8 ± 3 N·m ((70 ± 27 lb in))

Solenoid

Current draw at 20 V and 25 °C (77 °F)

Pull-in windings 57 Amp

Hold-in windings 16 Amp maximum

i02787418

Electric Starting Motor

SMCS Code: 1453

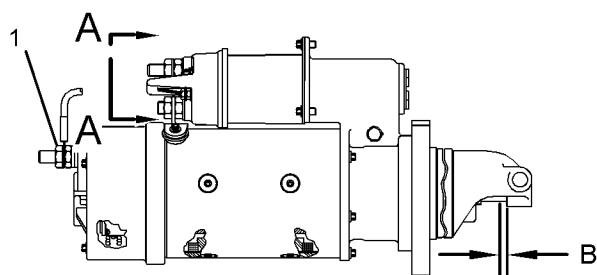


Illustration 375

g01392303

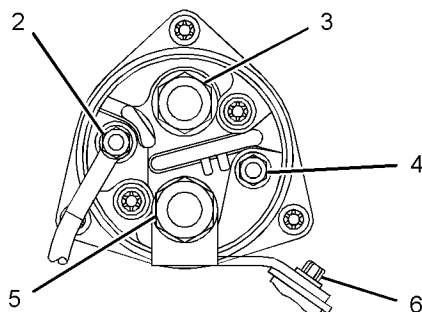


Illustration 376

g01392304

View A-A

When the electric starting motor is viewed from the pinion end, the motor rotates in the following direction. Clockwise

No load conditions at 25 °C (77 °F)

Speed 7643 ± 1683 rpm
 Current draw 76.5 ± 14.5 Amp
 Voltage 23V

(B) Clearance between the pinion and the housing
 9.1 mm ((0.36 inch))

(1) Final installation torque for the ground terminal
 nut 30.5 ± 3.5 N·m ((270 ± 30 lb in))

(2) Final installation torque for the ground terminal
 nut 2.25 ± 0.25 N·m ((20 ± 2 lb in))

Note: A maximum of three cable terminals or wire terminals may be used with the battery terminal nut (3). A maximum of two of the cable terminals may be equal to or greater than 0 AWG.

(3) Final installation torque for the battery terminal
 nut 30.5 ± 3.5 N·m ((270 ± 30 lb in))

Note: The switch terminal must be insulated with heat shrink tubing. Do not use molded terminals.

(4) Final installation torque for the switch terminal nut
 2.25 ± 0.25 N·m ((20 ± 2 lb in))

(5) Final installation torque for the motor terminal nut
 30.5 ± 3.5 N·m ((270 ± 30 lb in))

(6) Final installation torque for the motor frame
 terminal nut 8 ± 3 N·m ((70 ± 27 lb in))

Solenoid assembly

Current consumption at 20V and 25 °C (77 °F)

Pull-in windings 57 Amp
 Hold-in windings 16 Amp
 Maximum rated current 850 Amp

i02818901

Electric Starting Motor

SMCS Code: 1453

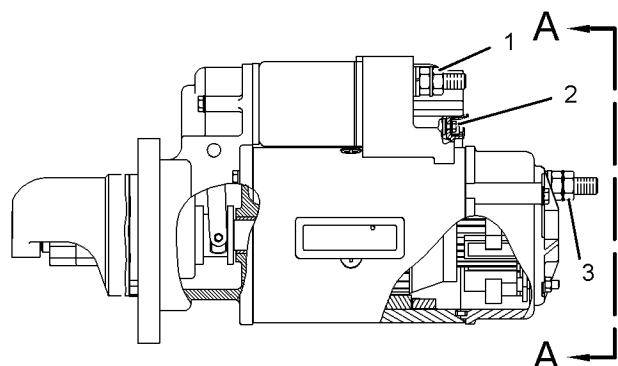


Illustration 377

g01406539

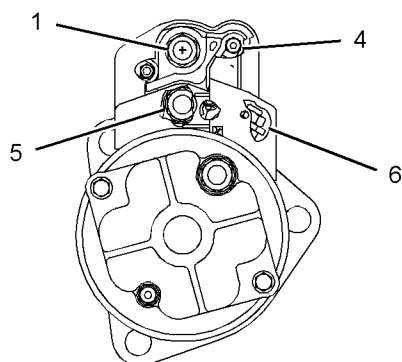


Illustration 378

g01388728

View A-A

When the electric starting motor is viewed from the drive end, the motor rotates in the following direction.
..... Clockwise

No load conditions at 25 °C (77 °F)

Minimum speed with no load 3300 rpm
Maximum current with no load 80 Amp
Voltage 23.5 VDC

Note: A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the terminals may be equal to or greater than 0 AWG.

(1) Final installation torque for the battery terminal nut $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ((22 ± 3 lb ft))

(2) Final installation torque for the ground terminal nut $1.5 \pm 0.5 \text{ N}\cdot\text{m}$ ((13 ± 4 lb in))

(3) Final installation torque for the ground terminal nut $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ((22 ± 3 lb ft))

Note: The wire terminal that is on the switch terminal must be insulated with heat shrink tubing. Do not use molded terminals.

(4) Final installation torque for the switch terminal nut $2.25 \pm 0.25 \text{ N}\cdot\text{m}$ ((20 ± 2 lb in))

(5) Final installation torque for the motor terminal nut $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ((22 ± 3 lb ft))

(6) Final installation torque for the motor frame terminal nut $17.5 \pm 2.5 \text{ N}\cdot\text{m}$ ((13 ± 2 lb ft))

Solenoid assembly

Current draw at 24 V and 25 °C (77 °F)

Pull-in windings 103 Amp

Hold-in windings 19 Amp

i02942994

Electric Starting Motor

SMCS Code: 1453

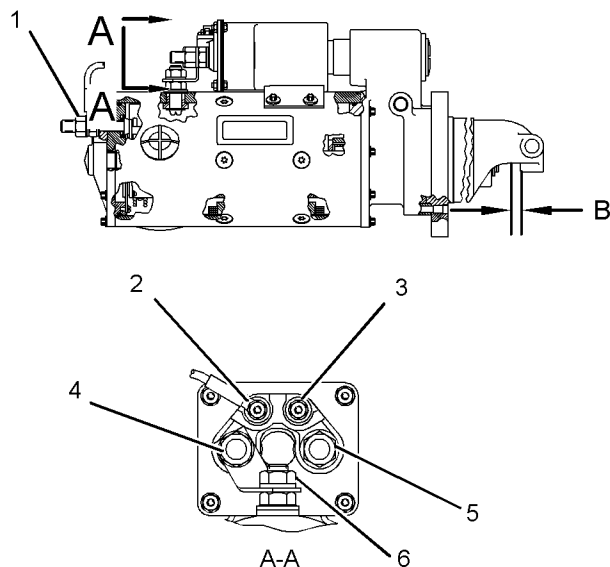


Illustration 379

g01501613

When the electric starting motor is viewed from the pinion end, the motor rotates in the following direction. Clockwise

No load conditions at 25 °C (77 °F)

Speed 6950 ± 1650 rpm
 Current draw 115 ± 25 Amp
 Voltage 23 VDC

(B) Clearance between the pinion and the housing is the following value. 9.1 mm ((0.36 inch))

(1) Final installation torque for the ground terminal nut 30.5 ± 3.5 N·m ((270 ± 30 lb in))

(2) Final installation torque for the switch terminal nut 2.25 ± 0.25 N·m ((20 ± 2 lb in))

Note: The switch terminal must be insulated with heat shrink tubing. Do not use molded terminals.

(3) Final installation torque for the switch terminal nut 2.25 ± 0.25 N·m ((20 ± 2 lb in))

(4) Final installation torque for the motor terminal nut 30.5 ± 3.5 N·m ((270 ± 30 lb in))

Note: A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the terminals may be equal to or greater than 0 AWG.

(5) Final installation torque for the battery terminal nut 30.5 ± 3.5 N·m ((270 ± 30 lb in))

(6) Final installation torque for the motor frame terminal nut 30.5 ± 3.5 N·m ((270 ± 30 lb in))

Solenoid assembly

Current consumption at 20V and 25 °C (77 °F)

Pull-in windings 49.3 ± 3.3 Amp
 Hold-in windings 6.8 Amp

i03077809

Electric Starting Motor

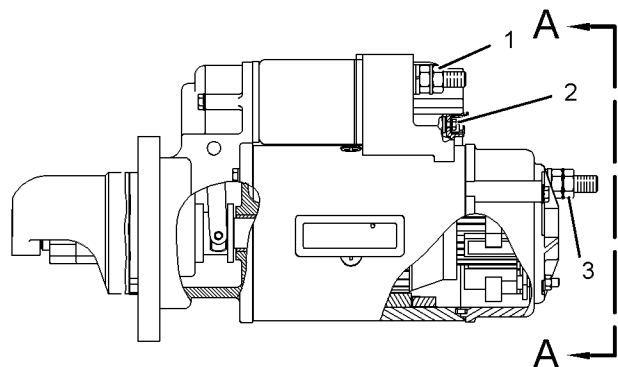
SMCS Code: 1453


Illustration 380

g01406539

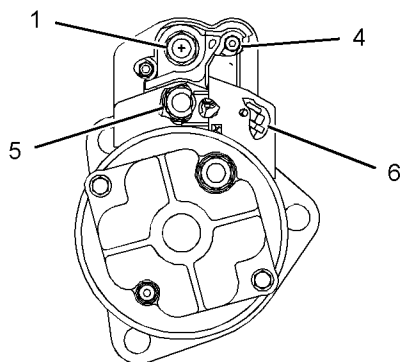


Illustration 381

g01388728

View A-A

When the electric starting motor is viewed from the drive end, the motor rotates in the following direction.
 Clockwise

No load conditions at 25 °C (77 °F)

Minimum speed 3300 rpm
 Maximum current 80 Amp
 Voltage 24 VDC

Note: A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the terminals may be equal to or greater than 0 AWG.

(1) Final installation torque for the battery terminal nut $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ((22 ± 3 lb ft))

(2) Final installation torque for the ground terminal nut $1.5 \pm 0.5 \text{ N}\cdot\text{m}$ ((13 ± 4 lb in))

(3) Final installation torque for the ground terminal nut $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ((22 ± 3 lb ft))

Note: The wire terminal that is on the switch terminal must be insulated with heat shrink tubing. Do not use molded terminals.

(4) Final installation torque for the switch terminal nut $2.25 \pm 0.25 \text{ N}\cdot\text{m}$ ((20 ± 2 lb in))

(5) Final installation torque for the motor terminal nut $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ((22 ± 3 lb ft))

(6) Final installation torque for the motor frame terminal nut $17.5 \pm 2.5 \text{ N}\cdot\text{m}$ ((13 ± 2 lb ft))

Solenoid assembly

Current draw at 24 V and 25 °C (77 °F)

Pull-in windings 103 Amp

Hold-in windings 19 Amp

i04392884

Electric Starting Motor

SMCS Code: 1453**S/N:** 3F31-Up**S/N:** 3F41-Up**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** GTA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** LCC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** A7D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** A7G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**S/N:** R9H1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** A7J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up**S/N:** GCL1-Up**S/N:** TAL1-Up**S/N:** WTL1-Up**S/N:** NLM1-Up

S/N: SDM1–Up

S/N: WTM1–Up

S/N: DKN1–Up

S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: E9S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

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S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

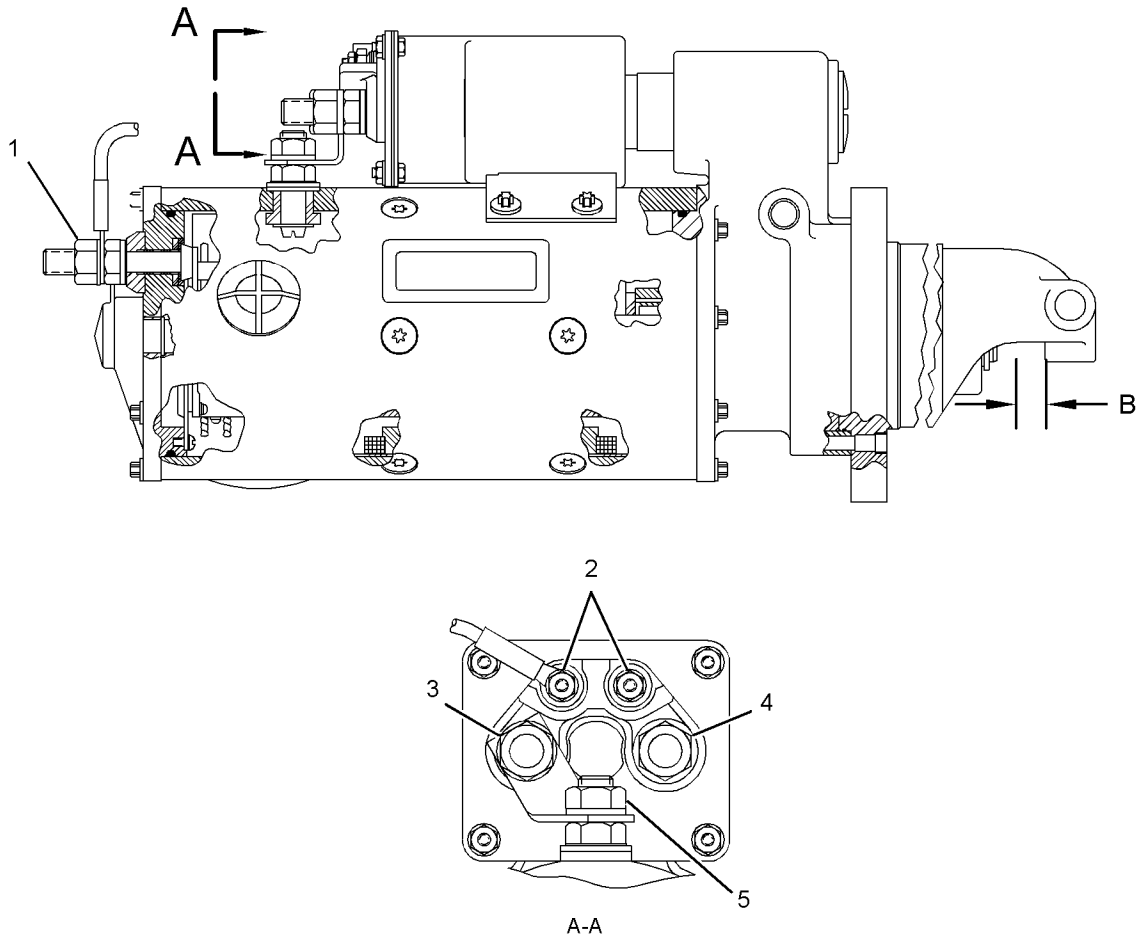


Illustration 382

g02562997

Table 159

Specification for the 237 - 1962 Electric Starting Motor Gp			
Item	Qty	Part	Specification Description
B	-	-	Clearance between the pinion and the housing is 9.1 mm (0.36 inch).
1	2	6V - 8188 Nut	Ground terminal. Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
2	2	4B - 2049 Nut	Torque to 2.25 ± 0.25 N·m (19.91 ± 2.21 lb in).
3	1	6V - 8188 Nut	Motor terminal. Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
4	1	6V - 8188 Nut	Battery terminal. A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the cable terminals may be equal to or greater than 0 AWG.
			Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
5	-	-	Motor frame terminal. Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
-	-	-	Pull-in current at 20 V and 25° C (77° F) is 49.3 ± 3.3 Amp.
			Hold-in current at 20 V and 25° C (77° F) is 6.8 Amp max.
-	-	-	When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction.

(continued)

(Table 159, contd)

-	-	-	No load conditions at 25 °C (77 °F):
			Speed is 6950 ± 1650 rpm.
			Current draw is 115 ± 25 Amp.
			Voltage is 23 VDC.

i04392953

Electric Starting Motor

SMCS Code: 1453

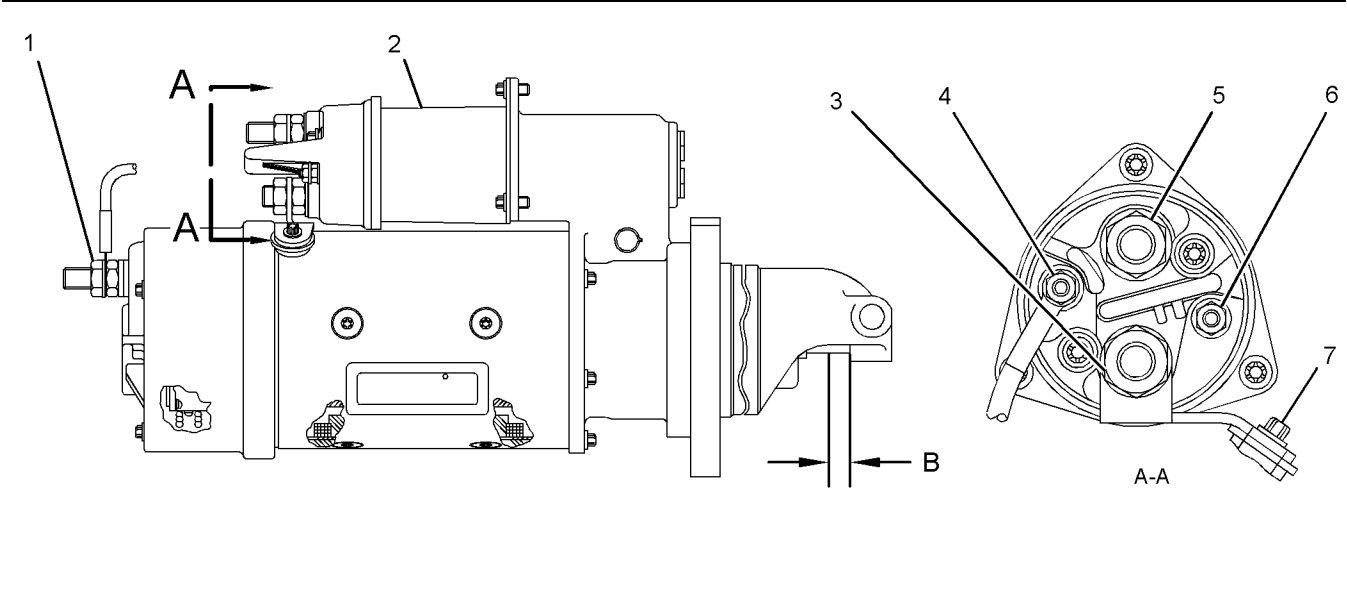


Illustration 383

g02563097

Table 160

Specification for the 207 - 1549 Electric Starting Motor Gp, 207 - 1562 Electric Starting Motor Gp, and 207 - 1557 Electric Starting Motor Gp			
Item	Qty	Part	Specification Description
B	-	-	The clearance between the pinion and the housing is 9.1 mm (0.36 inch).
1	2	6V-8188 Nut	Torque to 30.5 ± 3.5 N·m (270 ± 31 lb in).
2	1	-	Current consumption at 20V and 25 °C (77 °F): 1. For Pull-in current is 57 Amp 2. For Hold-in current is 16 Amp max
3	1	6V-8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 30.9 lb in).
4	1	6V-8378 Nut	Torque to 2.25 ± 0.25 N·m (20 ± 2 lb in).
5	1	6V-8188 Nut	A maximum of three cable terminals or wire terminals may be used with the battery terminal nut (5). A maximum of two of the terminals may be equal to or greater than 0 AWG. Torque to 30.5 ± 3.5 N·m (270 ± 30 lb in).
6	1	6V-8378 Nut	The switch terminal must be insulated with heat shrink tubing. Do not use molded terminals. Torque to 2.25 ± 0.25 N·m (20 ± 2 lb in).
7	-	-	Torque to 8 ± 3 N·m (71 ± 27 lb in).
-	-	-	When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction. No load conditions at 25 °C (77 °F) 1. Speed is 7643 ± 1683 rpm 2. Current draw is 76.5 ± 14.5 Amp 3. Voltage is 23 VDC

i04394629

Electric Starting Motor

SMCS Code: 1453

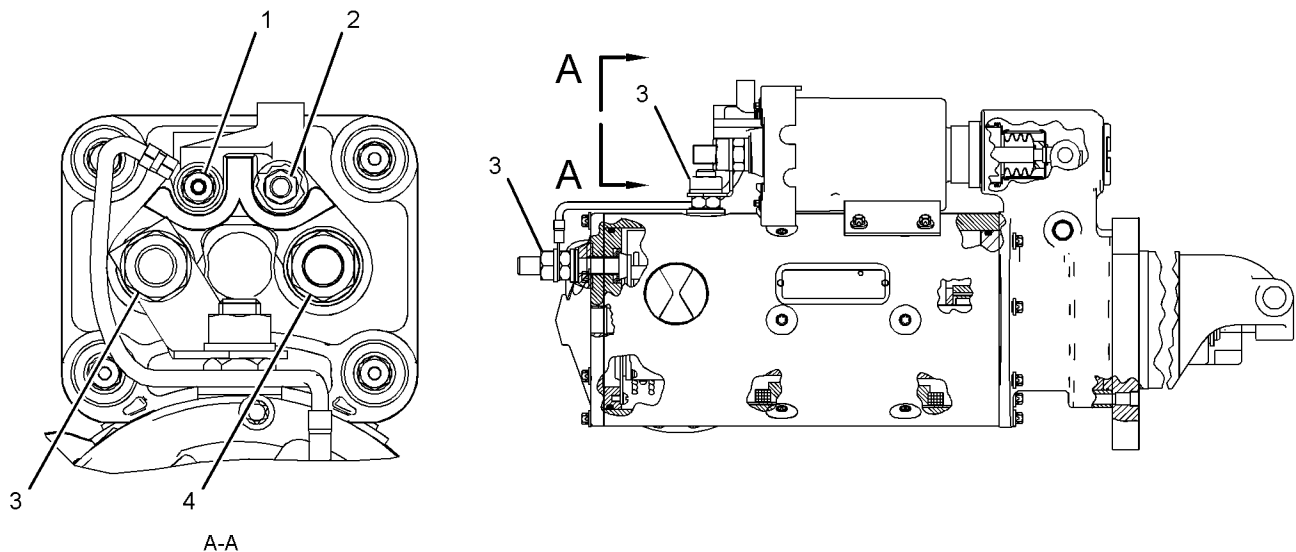


Illustration 384

g02567276

Table 161

Specification for 348 - 7651 Electric Starting Motor Gp			
Item	Qty	Part	Specification Description
1	1	4B - 2049 Nut	Torque to $3.4 \pm 1.2 \text{ N}\cdot\text{m}$ ($30.1 \pm 10.6 \text{ lb in.}$).
2	1	4B - 2049 Nut	The switch terminal must be insulated with heat shrinkable tubing. Do not use molded terminals. Torque to $3.4 \pm 1.2 \text{ N}\cdot\text{m}$ ($30.1 \pm 10.6 \text{ lb in.}$).
3	3	6V - 8188 Nut	Torque to $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ($269.9 \pm 31.0 \text{ lb in.}$).
4	1	6V - 8188 Nut	A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the terminals may be equal to or greater than 0 AWG. Torque to $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ($269.9 \pm 31.0 \text{ lb in.}$).
-	-	-	System voltage is 24 V.
-	-	-	No load performance at 25 °C (77 °F): Speed $6950 \pm 1650 \text{ rpm}$ Current $115 \pm 25 \text{ amp.}$ Voltage 23 V
Mount the electric starting motor in a position that places the solenoid assembly no less than the 15 degrees above the horizontal.			
When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction.			

i04419669

Electric Starting Motor

SMCS Code: 1453

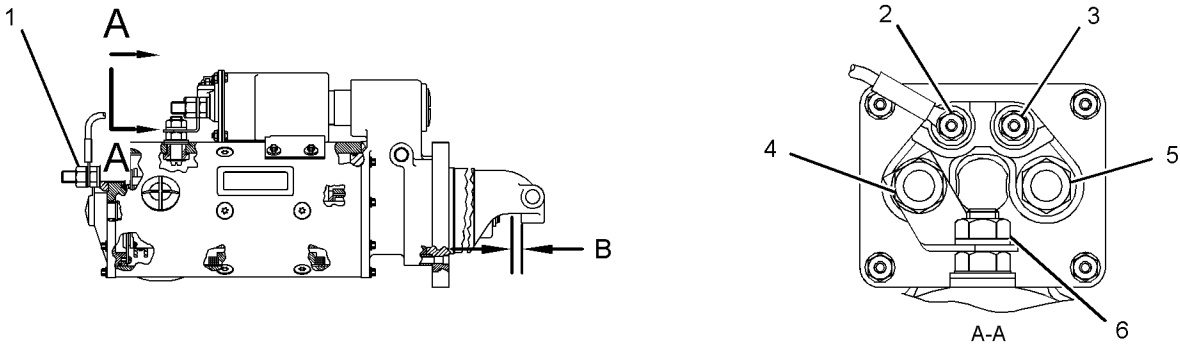


Illustration 385 g02617582

Table 162

Specification for 6V - 0889 Electric Starting Motor Gp and 6V - 0513 Electric Starting Motor Gp			
Item	Qty	Part	Specification Description
1	2	6V - 8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
2	1	4B - 2049 Nut	Torque to 2.25 ± 0.25 N·m (19.91 ± 2.21 lb in).
3	1	4B - 2049 Nut	The switch terminal must be insulated with heat shrinkable tubing. Do not use molded terminals. Torque to 2.25 ± 0.25 N·m (19.91 ± 2.21 lb in).
4	1	6V - 8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
5	1	6V - 8188 Nut	A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the cable terminals may be equal to or greater than 0 AWG. Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
6	2	6V - 8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
B	-	-	Clearance between the pinion and the housing is 9.1 mm (0.36 inch).
-	-	-	Pull-in current at 20 V and 25 °C (77 °F) is 49.3 ± 3.3 Amp.
-	-	-	Hold-in current at 20 V and 25 °C (77 °F) is 6.8 Amp max.
-	-	-	When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction.

i04432829

Electric Starting Motor

SMCS Code: 1453

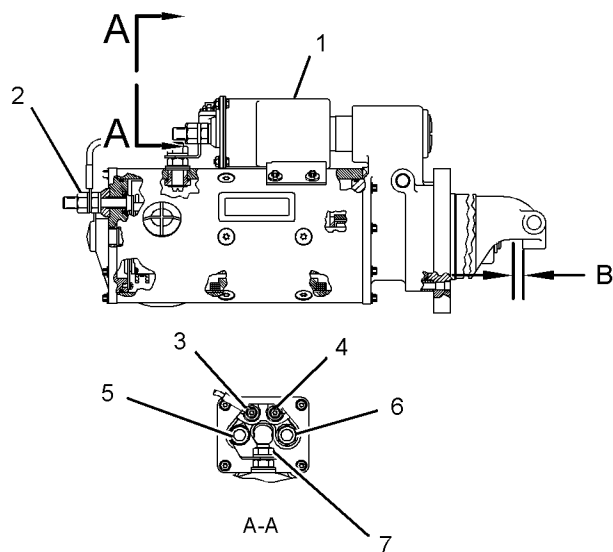


Illustration 386

g02625716

Table 163

Specification for 272 - 7123 Electric Starting Motor Gp			
Item	Qty	Part	Specification Description
B	-	-	Clearance between the pinion and the housing is 9.1 mm (0.36 inch).
1	1	338 - 3453 Starting Motor Solenoid	Current consumption at 20V and 25 °C (77 °F): 1. For pull-in windings is 49.3 ± 3.3 amp 2. For hold-in windings is 6.8 amp
2	2	6V - 8188 Nut	Ground terminal. Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
3	1	4B - 2049 Nut	Switch terminal. Torque to 2.25 ± 0.25 N·m (20.00 ± 2.00 lb in).
4	1	4B - 2049 Nut	Switch terminal. Torque to 2.25 ± 0.25 N·m (20.00 ± 2.00 lb in). Note: The switch terminal must be insulated with heat shrink tubing. Do not use molded terminals.
5	1	6V - 8188 Nut	Motor terminal. Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
6	1	6V - 8188 Nut	Battery terminal. A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the cable terminals may be equal to or greater than 0 AWG. Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
7	-	-	Motor frame terminal. Torque to 30.5 ± 3.5 N·m (270.0 ± 31.0 lb in).
-	-	-	When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction.
-	-	-	No load performance at 25 °C (77 °F): Speed is 6950 ± 1650 rpm. Current draw is 115 ± 25 amp. Voltage is 23 VDC.

i04561232

Electric Starting Motor

SMCS Code: 1453

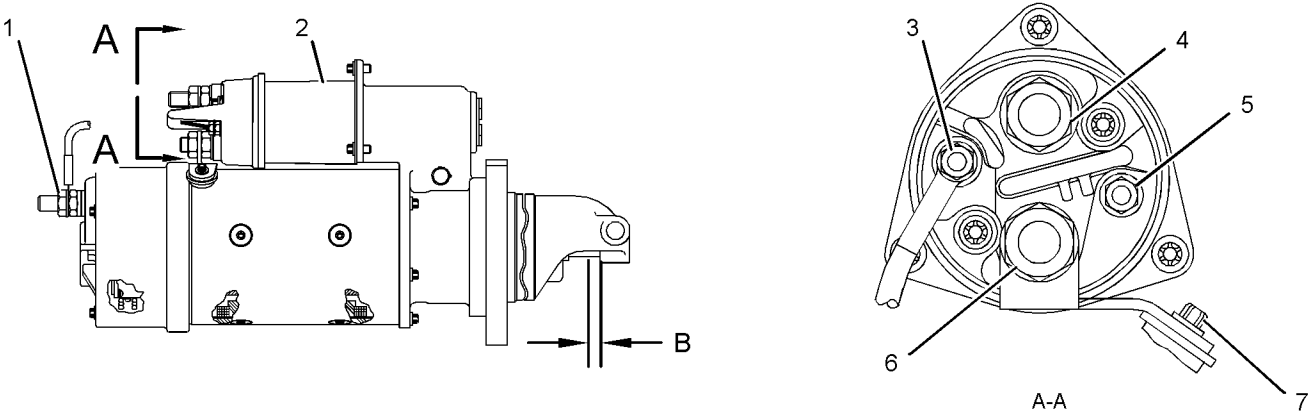


Illustration 387

g02560026

Table 164

Specification for 207 - 1548 Electric Starting Motor Gp			
Item	Qty	Part	Specification Description
1	2	6V - 8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
2	1	-	Current consumption at 20 V and 25 °C (77 °F): 1. For pull-in windings is 57 amp 2. For hold-in windings is 16 amp 3. Maximum rated current is 850 amp
B	-	-	The clearance between the pinion and the housing is 9.1 mm (0.36 inch).
3	1	6V - 8378 Nut	Torque to 20.6 ± 0.8 N·m (182.3 ± 7.1 lb in).
4	1	6V - 8188 Nut	A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the terminals may be equal to or greater than 0 AWG. Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
5	1	6V - 8378 Nut	The switch terminal must be insulated with heat shrink tubing. Do not use molded terminals. Torque to 20.6 ± 0.8 N·m (182.3 ± 7.1 lb in).
6	1	6V - 8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
7	-	-	Torque to 8 ± 3 N·m (71 ± 27 lb in).
-	-	-	When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction. No load conditions at 25 °C (77 °F) 1. Speed is 7643 ± 1683 rpm 2. Current draw is 76.5 ± 14.5 amp 3. Voltage is 23 V

i07989437

Electric Starting Motor

SMCS Code: 1453

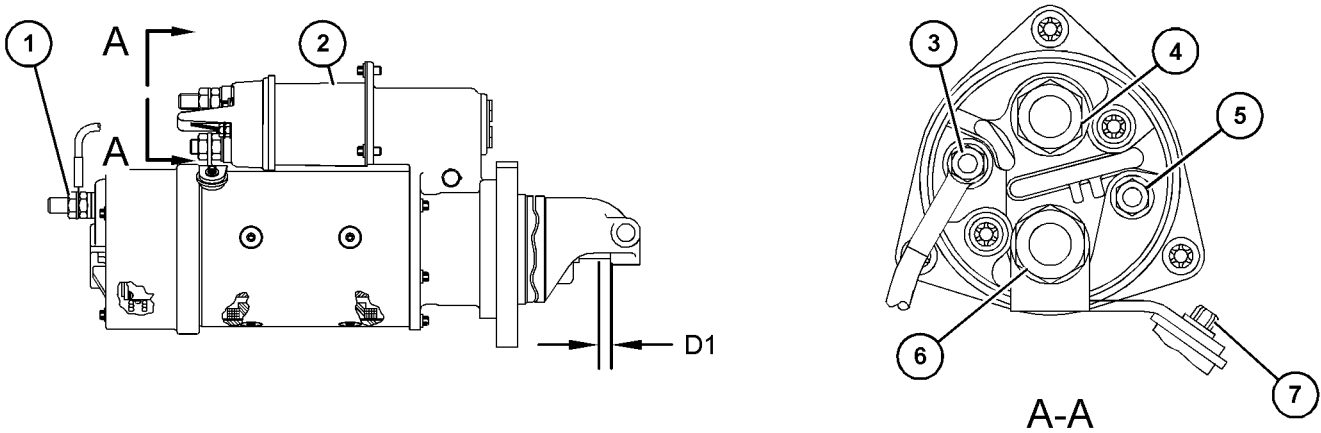


Illustration 388

g06499690

Table 165

Item	Qty	Part	Specification Description
1	2	6V-8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
2	1	548-9596 Solenoid Kit	Current consumption at 20V and 25 °C (77 °F): 1. For Pull-in windings is 57 Amp 2. For Hold-in windings is 16 Amp 3. Maximum rated current is 850 Amp
D1	-	-	The clearance between the pinion and the housing is 9.1 mm (0.36 inch).
3	1	6V-8378 Nut	Torque to 2.6 ± 0.8 N·m (23.0 ± 7.1 lb in).
4	1	6V-8188 Nut	A maximum of three cable terminals or wire terminals may be used with the battery terminal nut (3). A maximum of two of the terminals may be equal to or greater than 0 AWG. Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
5	1	6V-8378 Nut	The switch terminal must be insulated with heat shrink tubing. Do not use molded terminals. Torque to 2.6 ± 0.8 N·m (23.0 ± 7.1 lb in).
6	1	6V-8188 Nut	Torque to 30.5 ± 3.5 N·m (269.9 ± 31.0 lb in).
7	-	-	Torque to 8 ± 3 N·m (71 ± 27 lb in).
-	-	-	When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction. No load conditions at 25 °C (77 °F) 1. Speed is 7643 ± 1683 rpm 2. Current draw is 76.5 ± 14.5 Amp 3. Voltage is 23 V

i08062247

Electric Starting Motor

SMCS Code: 1453**S/N:** 3F31-Up**S/N:** 3F41-Up**S/N:** 3F51-Up**S/N:** MW51-Up**S/N:** BJ61-Up**S/N:** BS61-Up**S/N:** 2L71-Up**S/N:** 2L81-Up**S/N:** FLA1-Up**S/N:** GTA1-Up**S/N:** TBA1-Up**S/N:** JGB1-Up**S/N:** BYC1-Up**S/N:** FPC1-Up**S/N:** LCC1-Up**S/N:** MDC1-Up**S/N:** SPC1-Up**S/N:** WEC1-Up**S/N:** XAC1-Up**S/N:** 9SD1-Up**S/N:** A6D1-Up**S/N:** A7D1-Up**S/N:** ESD1-Up**S/N:** MGD1-Up**S/N:** P5D1-Up**S/N:** PFD1-Up**S/N:** RGD1-Up**S/N:** WTD1-Up**S/N:** M3E1-Up**S/N:** MTE1-Up**S/N:** NPE1-Up**S/N:** RAE1-Up**S/N:** WDE1-Up**S/N:** YAE1-Up**S/N:** YEE1-Up**S/N:** GKF1-Up**S/N:** M3F1-Up**S/N:** NNF1-Up**S/N:** RYF1-Up**S/N:** A6G1-Up**S/N:** A7G1-Up**S/N:** NEG1-Up**S/N:** PZG1-Up**S/N:** RGG1-Up**S/N:** TDG1-Up**S/N:** YAG1-Up**S/N:** B9H1-Up**S/N:** EEH1-Up**S/N:** GPH1-Up**S/N:** KFH1-Up**S/N:** KLH1-Up**S/N:** LFH1-Up**S/N:** R9H1-Up**S/N:** TAH1-Up**S/N:** A6J1-Up**S/N:** A7J1-Up**S/N:** B9J1-Up**S/N:** R9J1-Up**S/N:** RAJ1-Up**S/N:** RBJ1-Up**S/N:** TAJ1-Up**S/N:** MLK1-Up**S/N:** R5K1-Up**S/N:** A3L1-Up**S/N:** B1L1-Up**S/N:** GCL1-Up**S/N:** TAL1-Up**S/N:** WTL1-Up**S/N:** NLM1-Up

S/N: SDM1–Up

S/N: WTM1–Up

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S/N: JKN1–Up

S/N: MEN1–Up

S/N: RAN1–Up

S/N: RFN1–Up

S/N: SCN1–Up

S/N: WTN1–Up

S/N: DHP1–Up

S/N: WTP1–Up

S/N: BWR1–Up

S/N: JAR1–Up

S/N: M2R1–Up

S/N: SBR1–Up

S/N: XBR1–Up

S/N: D3S1–Up

S/N: ELS1–Up

S/N: KHS1–Up

S/N: LRS1–Up

S/N: LYS1–Up

S/N: PBT1–Up

S/N: PJW1–Up

S/N: GAX1–Up

S/N: BWY1–Up

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S/N: SEY1–Up

S/N: SEZ1–Up

S/N: WXZ1–Up

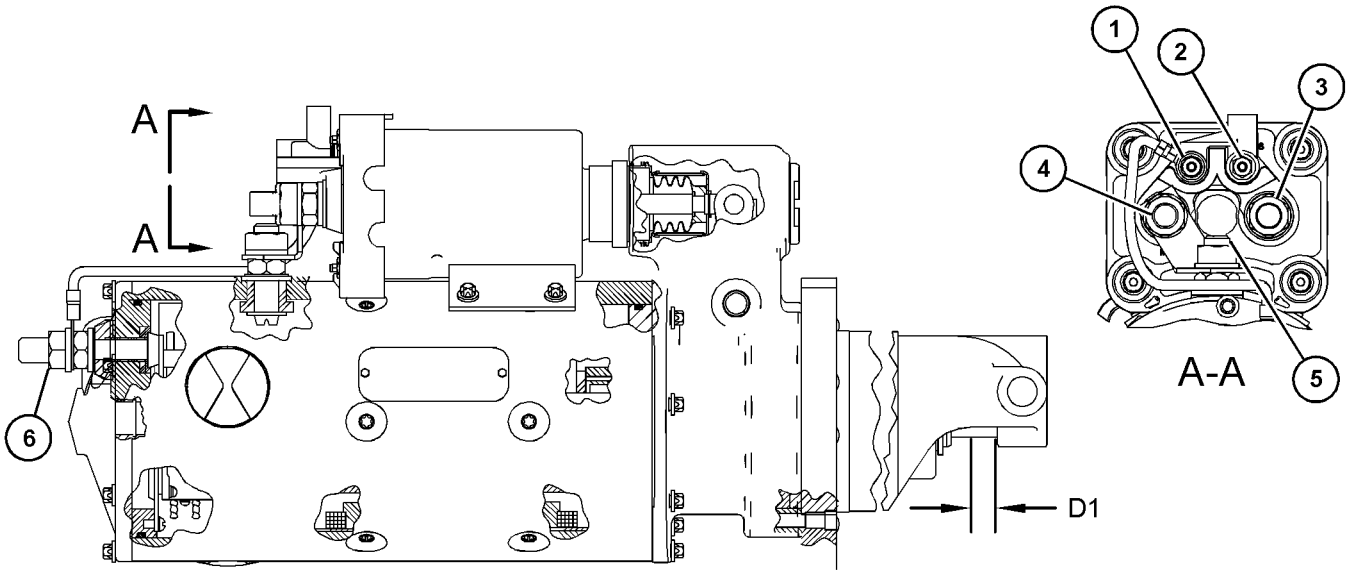


Illustration 389 g06529126

Table 166

Item	Qty	Part	Specification Description
1	1	4B-2049 Nut	Final installation torque for the ground terminal nut is $3.4 \pm 1.2 \text{ N}\cdot\text{m}$ ($30.1 \pm 10.6 \text{ lb in.}$).
2	1	4B-2049 Nut	The switch terminal must be insulated with heat shrinkable tubing. Do not use molded terminals. Final installation torque for the switch terminal nut is $3.4 \pm 1.2 \text{ N}\cdot\text{m}$ ($30.1 \pm 10.6 \text{ lb in.}$).
3	1	6V-8188 Nut	A maximum of three cable terminals or wire terminals may be used with the battery terminal nut. A maximum of two of the cable terminals may be equal to or greater than 0 AWG. Final installation torque for the battery terminal nut is $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ($269.9 \pm 31.0 \text{ lb in.}$).
4	1	6V-8188 Nut	Final installation torque for the motor terminal nut is $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ($269.9 \pm 31.0 \text{ lb in.}$).
5	1	6V-8188 Nut	Final installation torque for the motor frame terminal nut is $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ($269.9 \pm 31.0 \text{ lb in.}$).
6	2	6V-8188 Nut	Final installation torque for the ground terminal nut is $30.5 \pm 3.5 \text{ N}\cdot\text{m}$ ($269.9 \pm 31.0 \text{ lb in.}$).
D1	-	-	Clearance between the pinion and the housing is 9.1 mm (0.36 inch).
-	-	-	Pull-in current at 20 V and 25 °C (77 °F) is $49.3 \pm 3.3 \text{ Amp}$.
-	-	-	Hold-in current at 20 V and 25 °C (77 °F) is 6.8 Amp max.
-	-	-	When the electric starting motor is viewed from the pinion end, the motor rotates in the clockwise direction.
-	-	-	No load conditions at 25 °C (77 °F): Speed is $6950 \pm 1650 \text{ rpm}$. Current draw is $115 \pm 25 \text{ Amp}$. Voltage is 23 VDC.

i04405418

Coolant Temperature Sensor

SMCS Code: 1906

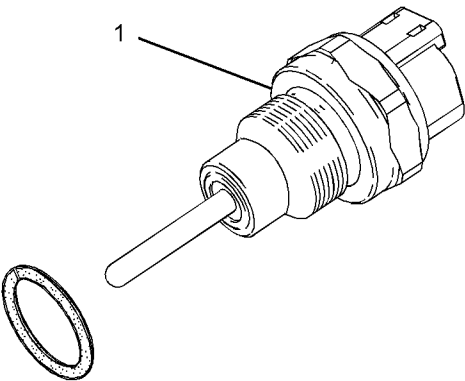


Illustration 390 g02553996

Table 167

Specification for 264 - 4297 Temperature Sensor and 256 - 6453 Temperature Sensor			
Item	Qty	Part	Specification Description
1	1	-	Torque to temperature sensor 20 ± 3 N·m (177 ± 27 lb in).
-	-	-	Output type is Passive.

i04448859

Coolant Temperature Sensor

SMCS Code: 1906

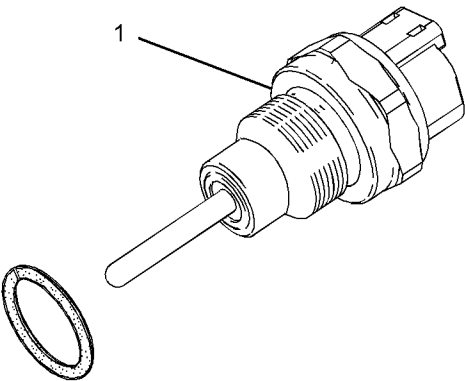


Illustration 391

g02574738

Table 168

Specification for 130-9811 Temperature Sensor Gp, 274-7396 Temperature Sensor Gp, 197-8392 Temperature Sensor Gp, and 256-6453 Temperature Sensor			
Item	Qty	Part	Specification Description
1	1	-	Torque to 20 ± 3 N·m (175 ± 25 lb in).
			Output type is passive.

i04974669

Coolant Temperature Sensor

SMCS Code: 1906

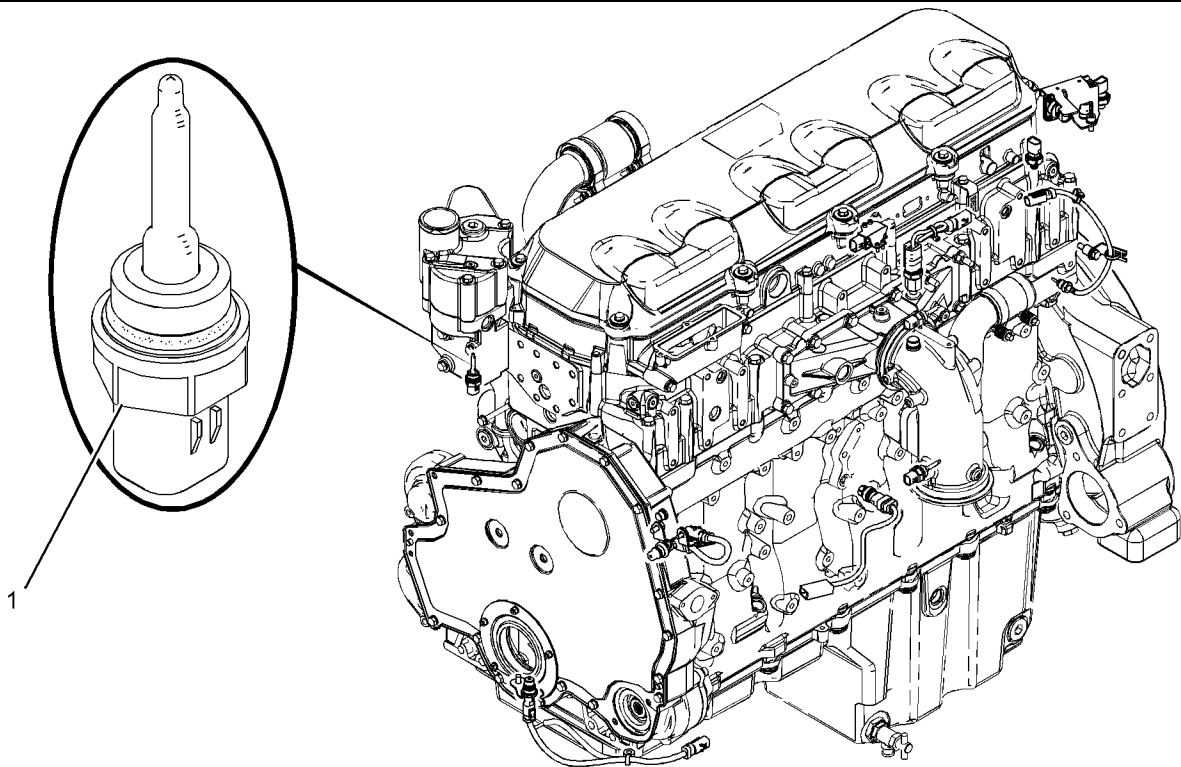


Illustration 392
Typical example

g02543656

Table 169

Specification for 234-5012 Temperature Sensor Gp and 234-5013 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	1	256-6453 Temperature Sensor	Final installation torque is 20 ± 3 N·m (177 ± 27 lb in).
-	-	-	Output type is Passive.

i07192182

Coolant Temperature Sensor

SMCS Code: 1906

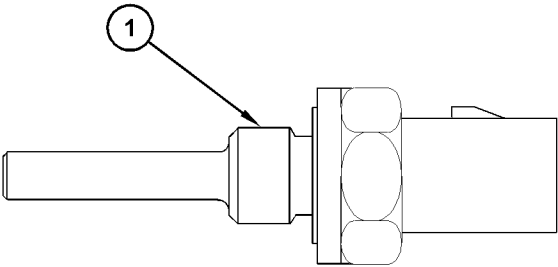


Illustration 393

g03394043

Table 170

Item	Qty	Part	Specification Description
1	1	238-0112 Temperature Sensor Gp	Final installation torque is 20 ± 3 N·m (177 ± 27 lb in)
Output type of the temperature sensor is passive.			

i02911292

Fuel Temperature Sensor

SMCS Code: 1922

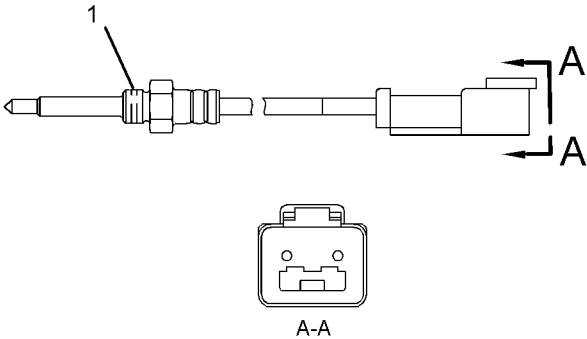


Illustration 394

g01448886

(1) Final installation torque for the temperature
sensor group 6 ± 1 N·m ((55 ± 9 lb in))

Output type Passive

Operating temperature -40 to 150 °C
((-40 to 302 °F))

i04390215

Fuel Temperature Sensor

SMCS Code: 1922

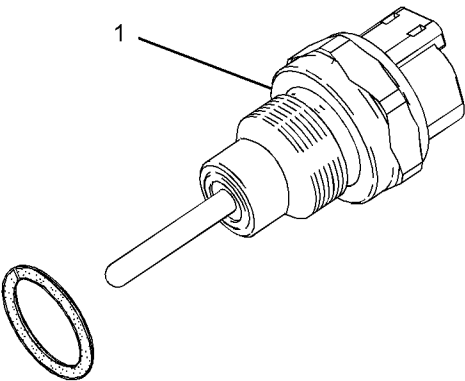


Illustration 395 g02553996

Table 171

Specification for the 264 - 4297 Temperature Sensorand 256 - 6453 Temperature Sensor			
Item	Qty	Part	Specification Description
1	-	-	Torque to 20 ± 3 N·m (15 ± 2 lb ft).
			Output type is Passive.

i04790660

Fuel Temperature Sensor

SMCS Code: 1922

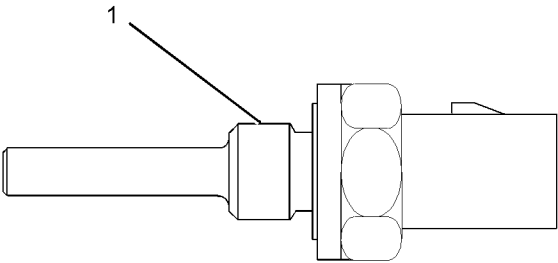


Illustration 396

g02906256

Table 172

Specification for 238 - 0112 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Final installation torque for the temperature sensor group is 20 ± 3 N·m (177 ± 27 lb in).
-	-	-	Output type is passive.

i04974693

Fuel Temperature Sensor

SMCS Code: 1922

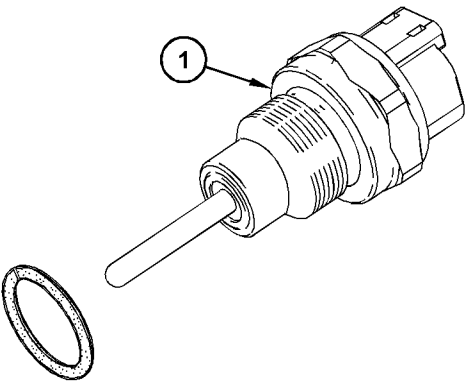


Illustration 397

g03157896

Table 173

Specification for 234 - 5013 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	1	-	Final installation torque for temperature sensor is 20 ± 3 N·m (177 ± 27 lb in).
-	-	-	Output type is Passive.

i05309676

Fuel Temperature Sensor

SMCS Code: 1922

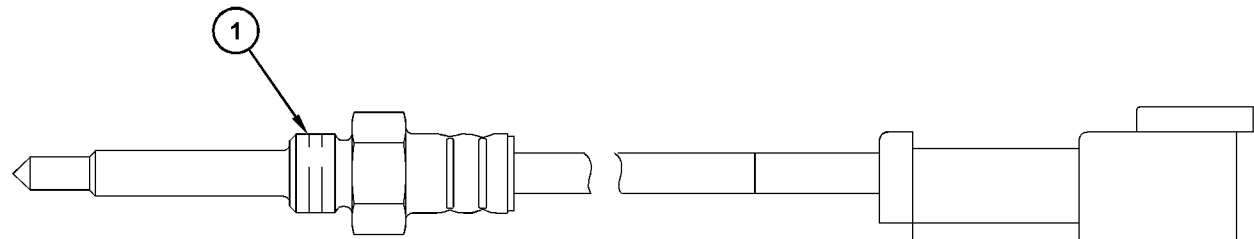


Illustration 398

g03367910

Table 174

Specifications for 145 - 7028 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	1	145 - 7028 Bolt	Final installation torque is 6 ± 1 N·m (53 ± 9 lb in).
-	-	-	Operating temperature is -40 to 150 °C (-40 to 302 °F).
-	-	-	Output type is passive.

i04358589

Fuel Pressure Sensor

SMCS Code: 1718

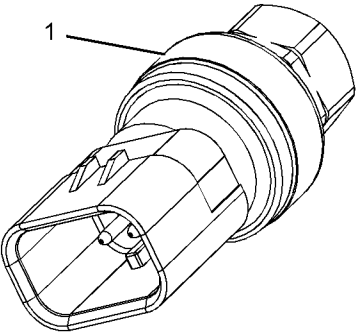


Illustration 399

g02544036

Table 175

Specification for 274 - 6719 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	1	274 - 6719 Pressure Sensor Gp	Torque to 10 ± 2 N·m (89 ± 18 lb in)
			Operating voltage is 5.0 ± 0.5 VDC

i04412912

Fuel Pressure Sensor

SMCS Code: 1718

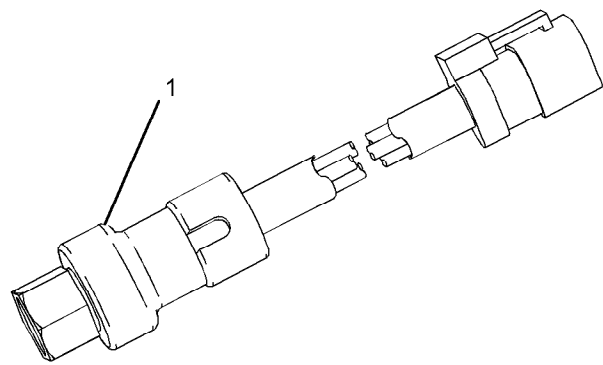


Illustration 400

g02554181

Typical example

Table 176

Specification for the 194 -6725 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Torque to 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.00 ± 0.25 VDC.

i05351643

Liquid Level Sensor (Water Separator)

SMCS Code: 7422

S/N: 3F31-Up

S/N: 3F41-Up

S/N: NN41-Up

S/N: 3F51-Up

S/N: MW51-Up

S/N: NN51-Up

S/N: BJ61-Up

S/N: BS61-Up

S/N: NN61-Up

S/N: 2L71-Up

S/N: 2L81-Up

S/N: FLA1-Up

S/N: GTA1-Up

S/N: TBA1-Up

S/N: JGB1-Up

S/N: BYC1-Up

S/N: FPC1-Up

S/N: LCC1-Up

S/N: MDC1-Up

S/N: SPC1-Up

S/N: WEC1-Up

S/N: XAC1-Up

S/N: 9SD1-Up

S/N: A6D1-Up

S/N: A7D1-Up

S/N: ESD1-Up

S/N: MGD1-Up

S/N: P5D1-Up

S/N: PFD1-Up

S/N: RGD1-Up

S/N: WTD1-Up

S/N: M3E1-Up

S/N: MTE1-Up

S/N: NPE1-Up

S/N: RAE1-Up

S/N: WDE1-Up

S/N: YAE1-Up

S/N: YEE1-Up

S/N: GKF1-Up

S/N: M3F1-Up

S/N: NNF1-Up

S/N: RYF1-Up

S/N: A6G1-Up

S/N: A7G1-Up

S/N: NEG1-Up

S/N: PZG1-Up

S/N: RGG1-Up

S/N: TDG1-Up

Part No.: 222-8367

S/N: YAG1-Up

S/N: B9H1-Up

S/N: EEH1-Up

S/N: GPH1-Up

S/N: KFH1-Up

S/N: KLH1-Up

S/N: LFH1-Up

S/N: R9H1-Up

S/N: TAH1-Up

S/N: A6J1-Up

S/N: A7J1-Up

S/N: B9J1-Up

S/N: R9J1-Up

S/N: RAJ1-Up

S/N: RBJ1-Up

S/N: TAJ1-Up

S/N: MLK1-Up

S/N: R5K1-Up

S/N: A3L1–Up**S/N:** B1L1–Up**S/N:** GCL1–Up**S/N:** TAL1–Up**S/N:** WTL1–Up**S/N:** NLM1–Up**S/N:** SDM1–Up**S/N:** WTM1–Up**S/N:** DKN1–Up**S/N:** JKN1–Up**S/N:** MEN1–Up**S/N:** RAN1–Up**S/N:** RFN1–Up**S/N:** SCN1–Up**S/N:** WTN1–Up**S/N:** DHP1–Up**S/N:** WTP1–Up**S/N:** BWR1–Up**S/N:** JAR1–Up**S/N:** M2R1–Up**S/N:** SBR1–Up**S/N:** XBR1–Up**S/N:** D3S1–Up**S/N:** E9S1–Up**S/N:** ELS1–Up**S/N:** KHS1–Up**S/N:** LRS1–Up**S/N:** LYS1–Up**S/N:** PBT1–Up**S/N:** E9W1–Up**S/N:** PJW1–Up**S/N:** GAX1–Up**S/N:** BWY1–Up**S/N:** E9Y1–Up**S/N:** LKY1–Up**S/N:** NYY1–Up**S/N:** SEY1–Up**S/N:** SEZ1–Up**S/N:** WXZ1–Up

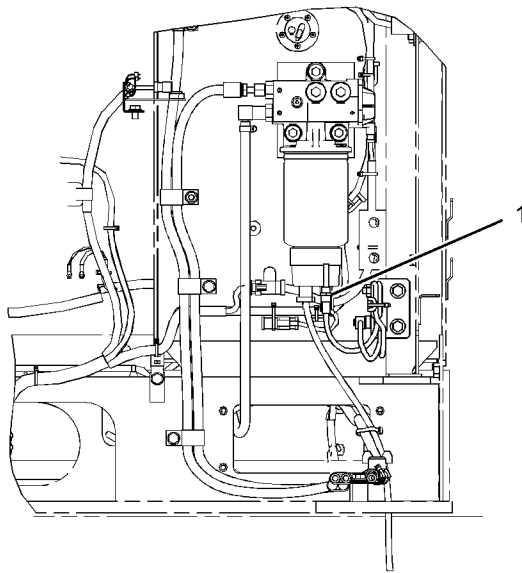


Illustration 401
Typical example

g03389923

Table 177

Specification for 222 - 8367 Liquid Level Sensor Gp, and 266 - 6290 Liquid Level Sensor Gp			
Item	Qty	Part	Specification Description
1	1	382 - 2001 Liquid Level Sensor Gp	Remove the plug that is on the water separator and install the liquid level sensor group. Torque to 2.5 ± 0.5 N·m (22.1 ± 4.4 lb in).

i05397230

Liquid Level Sensor (Water Separator)

SMCS Code: 7422

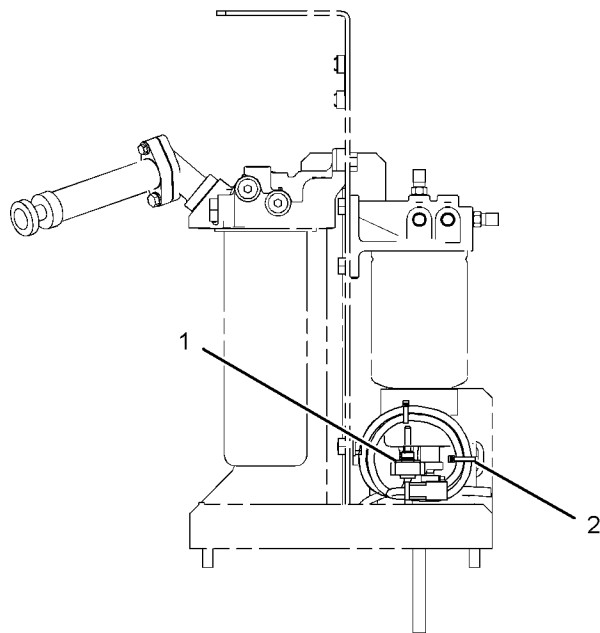


Illustration 402
Left-hand side view

g03411078

Table 178

Specification for 233 - 1124 Liquid Level Sensor Gp			
Item	Qty	Part	Specification Description
1	1	382 - 2001 Liquid Level Sensor Gp	Remove the plug that is on the water separator and install the liquid level sensor group with the O-ring seal. Torque to 2.5 ± 0.5 N·m (22.1 ± 4.4 lb in).
			Operating voltage is 7.5 to 36.0 VDC.
2	2	3S - 2093 Cable Strap	Sharp corners at each strap cutting edge shall not be allowed.

i02475387

Engine Oil Pressure Sensor

SMCS Code: 1924

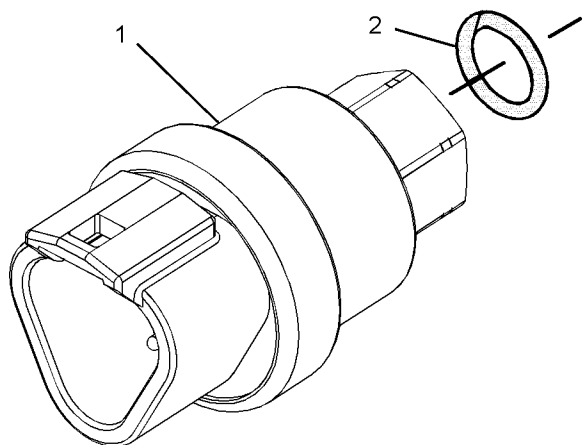


Illustration 403

g01235437

(1) Sensor

Torque $10 \pm 2 \text{ N}\cdot\text{m}$ ($90 \pm 18 \text{ lb in}$)

(2) O-ring seal

Input supply voltage $5 \pm 0.25 \text{ VDC}$

Install the sensor so that the pressure port is lower than the connector end. Mount the sensor as close to vertical as possible.

i04397599

Engine Oil Pressure Sensor

SMCS Code: 1924

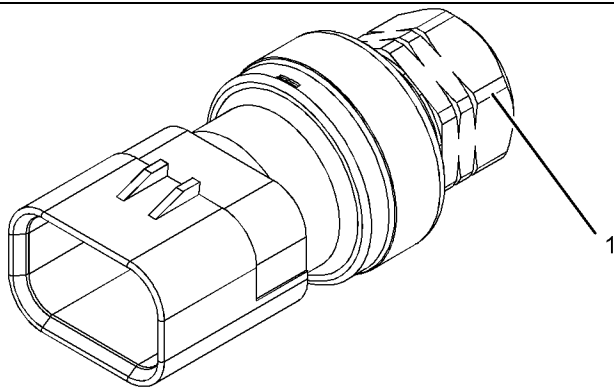


Illustration 404

g02575276

Table 179

Specification for 274-6719 Pressure Sensor Gp, 299-3222 Pressure Sensor Gp, 248-2167 Pressure Sensor Gp, 276-9067 Pressure Sensor Gp, and 293-5535 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Torque to 10 ± 2 N·m (89 ± 18 lb in).
-	-	-	Operating voltage is 5.0 ± 0.5 VDC.

i04402163

Engine Oil Pressure Sensor

SMCS Code: 1924

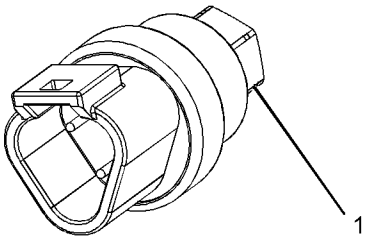


Illustration 405

g02587196

Table 180

Specification for the 161 - 1705 Engine Oil Pressure Sensor			
Item	Qty	Part	Specification Description
1	-	-	Torque the pressure sensor to 10 ± 2 N·m (90 ± 18 lb in).
			Prior to installing the pressure sensor onto the engine, apply 5P - 3413 Pipe Sealant to the first three threads of the sensor.
			Operating voltage is 5.00 ± 0.25 VDC.

i04518649

Engine Oil Pressure Sensor

SMCS Code: 1924

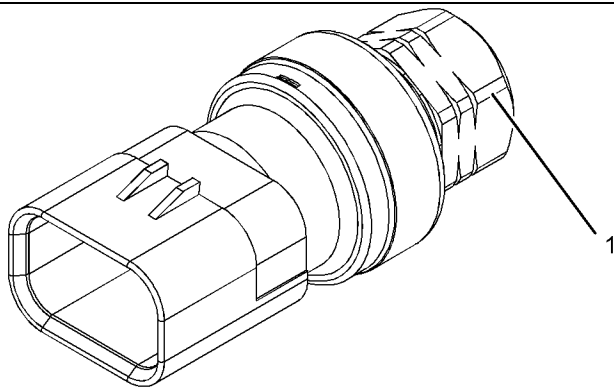


Illustration 406 g02697696

Table 181

Specification for 293-5535 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Torque to 10 ± 2 N·m (89 ± 18 lb in).
-	-	-	Operating voltage is 5.0 ± 0.5 VDC.

i05391885

Engine Oil Pressure Sensor

SMCS Code: 1924

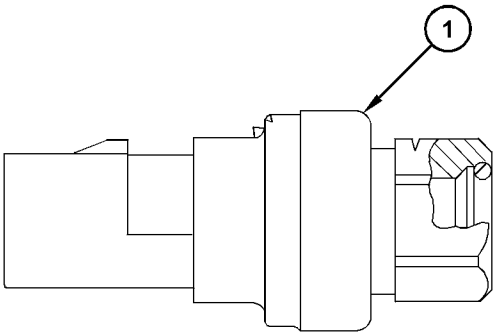


Illustration 407

g03408837

Table 182

Specification for the 276-9067 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	1	274-6719 Pressure Sensor Gp	Torque to 10 ± 2 N·m (89 ± 18 lb in).
			Operating voltage is 5.0 ± 0.5 VDC.

i07398027

Engine Oil Pressure Sensor

SMCS Code: 1924

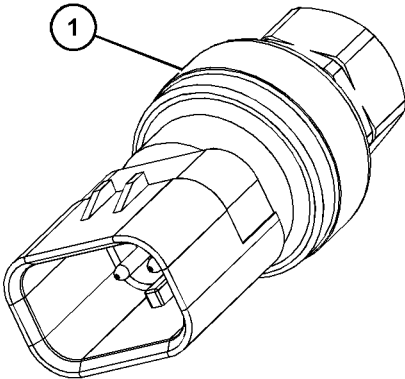


Illustration 408

g06309478

Table 183

Item	Qty	Part	Specification Description
1	1	274 - 6719 Pres- sure Sensor Gp	Torque to 10 ± 2 N·m (89 ± 18 lb in).
			Operating voltage is 5.00 ± 0.5 VDC.
			Operating temperature is -40 °C to 125 °C (-40 °F to 257 °F).

i08015889

Engine Oil Pressure Sensor

SMCS Code: 1924

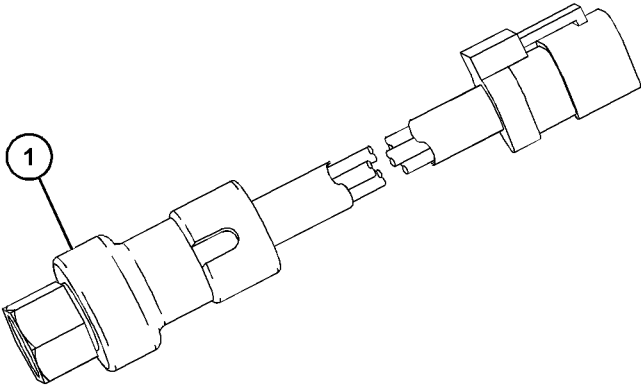


Illustration 409 g06507745

Table 184

Item	Qty	Part	Specification Description
1	-	-	Final installation torque is to 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.00 ± 0.50 VDC.

i04390278

Engine Oil Level Switch
(If Equipped)

SMCS Code: 7422

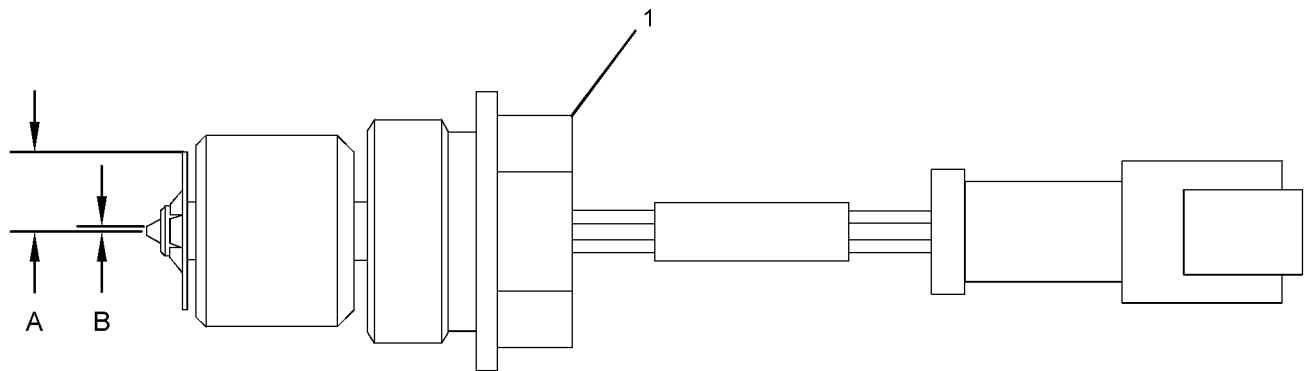


Illustration 410

g02560518

Table 185

Specification for 213-0677 Liquid Level Switch			
Item	Qty	Part	Specification Description
1	1	213-0677 Liquid Level Switch	Torque to 120 ± 27 N·m (89 ± 20 lb ft).
A	-	-	The switch must close on a rising level in the maximum range of 10.5 mm (0.41 inch).
B	-	-	The switch must open on a falling level in the minimum range of 2.0 mm (0.08 inch).
-	-	-	Contact position is closed at 10.5 mm (0.41 inch). Contact position is open at 2.0 mm (0.08 inch).

i02779332

Atmospheric Pressure Sensor

SMCS Code: 1923

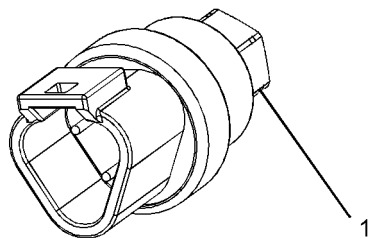


Illustration 411 g01122320

- (1) Torque for the sensor $10 \pm 2 \text{ N}\cdot\text{m}$
(($90 \pm 18 \text{ lb in}$))

i04397550

Atmospheric Pressure Sensor

SMCS Code: 1923

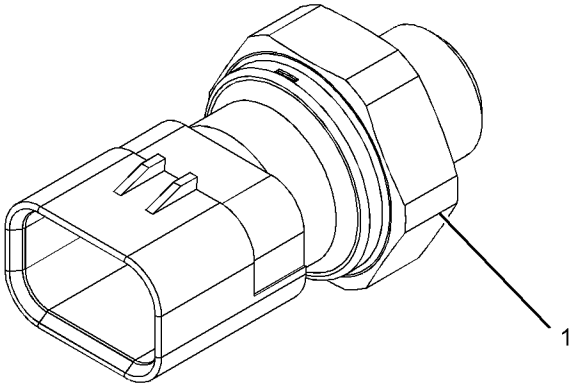


Illustration 412

g02575237

Table 186

Specification for 274 - 6717 Pressure Sensor, 248 - 2162 Pressure Sensor Gp, 276 - 6793 Pressure Sensor Gp, 306 - 6834 Pressure Sensor Gp, 296 - 8060 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Torque to 10 ± 2 N·m (89 ± 18 lb in).
-	-	-	Operating voltage is 5.0 ± 0.5 VDC.

i04402249

Atmospheric Pressure Sensor

SMCS Code: 1923

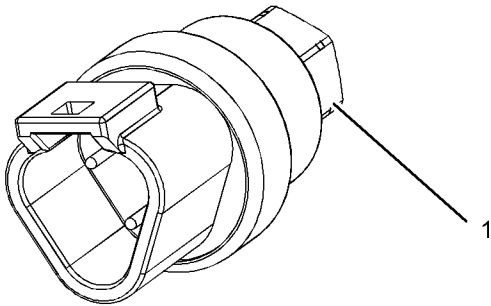


Illustration 413

g02587218

Table 187

Specification for the 161 - 1703 Atmospheric Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Torque to 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.00 ± 0.25 VDC.

i04423449

Atmospheric Pressure Sensor

SMCS Code: 1923

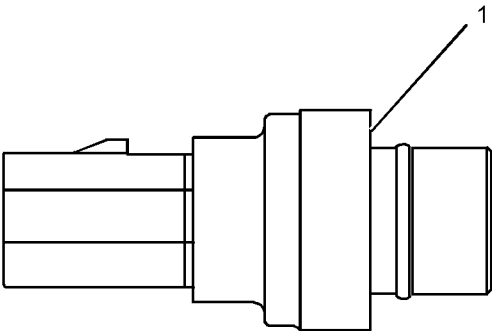


Illustration 414

g02619516

Table 188

Specification for 276 - 8548 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	1	-	Torque to 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.0 ± 0.5 VDC.

i06221385

Atmospheric Pressure Sensor

SMCS Code: 1923

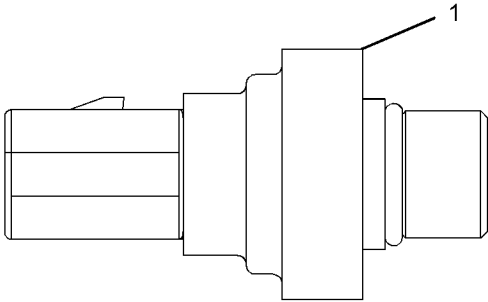


Illustration 415

g03860495

Table 189

Specification for 276-8548 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	1	274-6717 Pressure Sensor	Torque to 10 ± 2 N·m (89 ± 18 lb in) Operating voltage is 5.0 ± 0.5 VDC.

i07321090

Atmospheric Pressure Sensor

SMCS Code: 1923

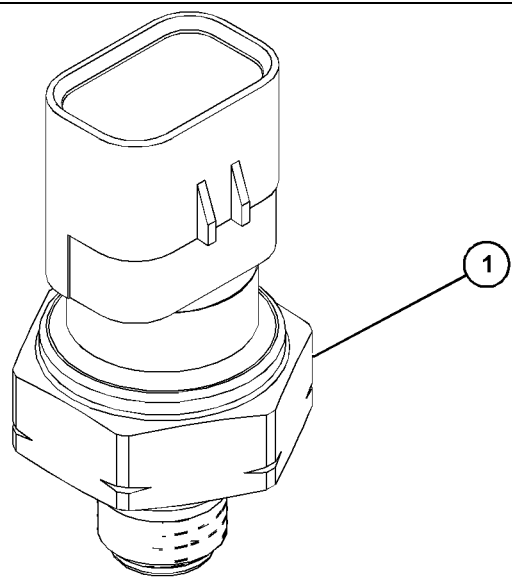


Illustration 416 g06088946

Table 190

Item	Qty	Part	Specification Description
1	1	320-3063 Pressure Sensor Gp	Torque to 13 ± 3 N·m (115 ± 27 lb in).
-	-	-	Operating voltage is 5.00 ± 0.25 VDC.
-	-	-	Operating temperature is -40 °C to 125 °C (-40 °F to 257 °F).

i08015892

Atmospheric Pressure Sensor

SMCS Code: 1923

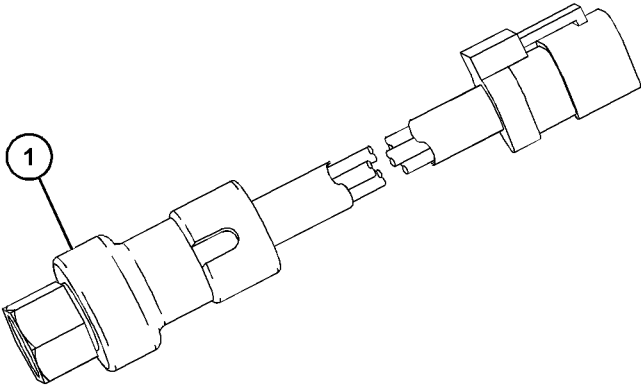


Illustration 417

g06507745

Table 191

Item	Qty	Part	Specification Description
1	-	-	Final installation torque is 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.00 ± 0.50 VDC.

i04379801

**Inlet Manifold Temperature
Sensor**
(Charge Air Cooler Outlet)

SMCS Code: 1921

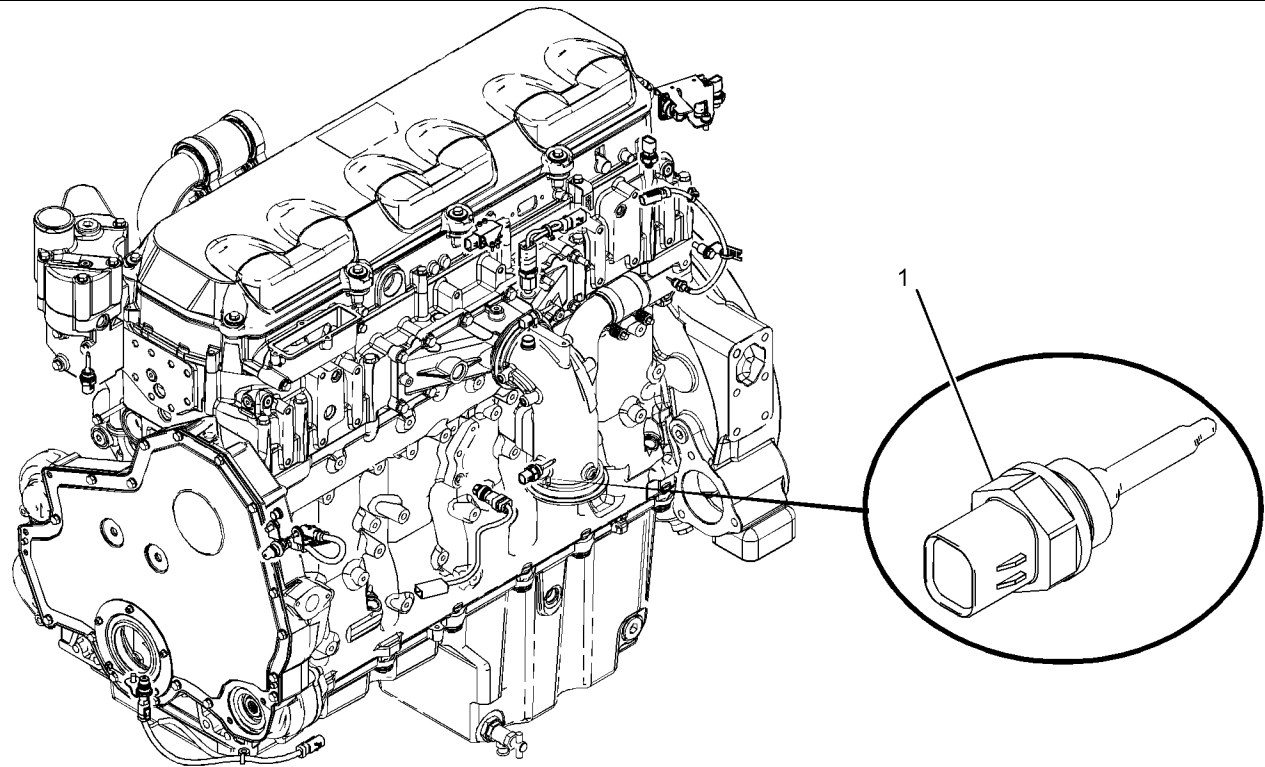


Illustration 418

g02543956

Table 192

Specification for 234 - 5013 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	1	256 - 6453 Temperature Sensor	Torque to 20 ± 3 N·m (177 ± 27 lb in).
-	-	-	Output type is Passive.
-	-	-	Operating temperature is -40 to 150 °C (-40 to 302 °F).

i04423512

Inlet Manifold Temperature Sensor

SMCS Code: 1921

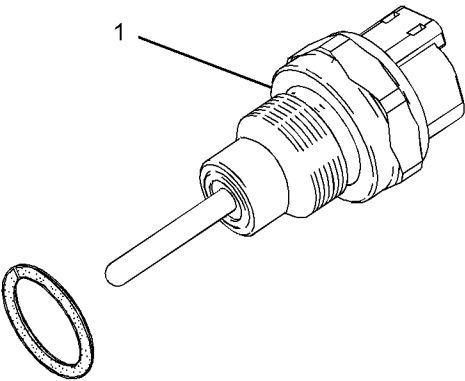


Illustration 419

g02619756

Table 193

Specification for 197 - 8391 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	1	197 - 8391 Tempera- ture Sensor Gp	Torque to 20 ± 3 N·m (177 ± 27 lb in).
			Out put type is passive.

i04561288

Inlet Manifold Temperature
Sensor

SMCS Code: 1921

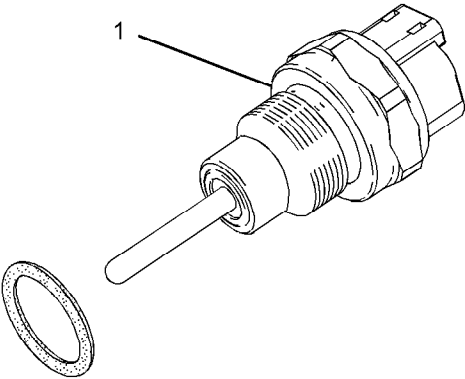


Illustration 420

g02727184

Table 194

Specification for 130-9811 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	-	130-9811 Temperature Sensor Gp	Torque to 20 ± 5 N·m (177 ± 44 lb in).
			Output type is passive.

i05198754

Inlet Manifold Temperature Sensor

SMCS Code: 1921

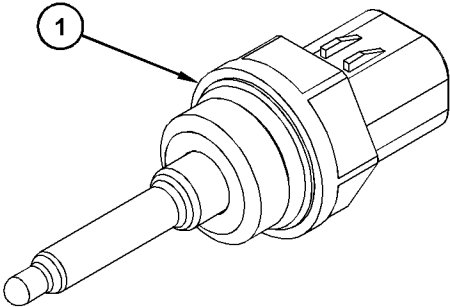


Illustration 421

g03331249

Table 195

Specification for 234 - 5013 Temperature Sensor Gp			
Item	Qty	Part	Specification Description
1	1	256 - 6453 Temperature Sensor	Torque to 20 ± 3 N·m (177 ± 27 lb in).
-	-	-	Output type is Passive.

i05331049

Inlet Manifold Temperature
Sensor

SMCS Code: 1921

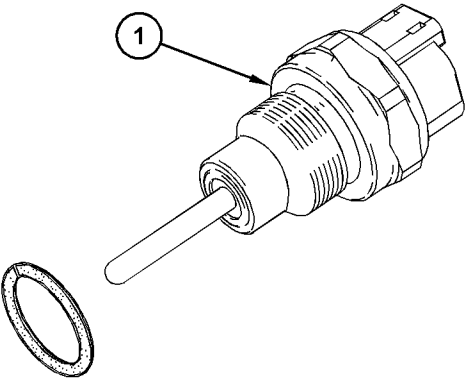


Illustration 422

g03377183

Table 196

Specification for 264 - 4297 Temperature Sensor			
Item	Qty	Part	Specification Description
1	-	-	Final installation torque for temperature sensor group is 20 ± 3 N·m (177 ± 27 lb in).
	-	-	Output type is passive.

i04385602

Inlet Manifold Air Pressure Sensor

SMCS Code: 1058; 1923

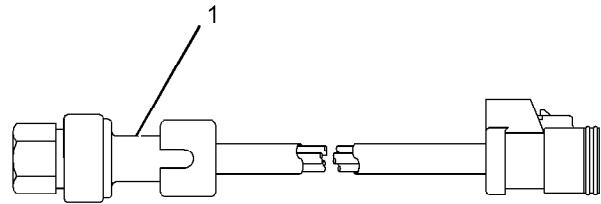


Illustration 423

g02554317

Table 197

Specification for 239-3478 Pressure Sensor Gp, 194-6724 Pressure Sensor Gp, 194-6725 Pressure Sensor Gp, 194-6722 Pressure Sensor Gp and 218-3840 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	1	-	Torque to 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.00 ± 0.25 VDC.

i04423490

**Inlet Manifold Air Pressure
Sensor**

SMCS Code: 1058; 1923

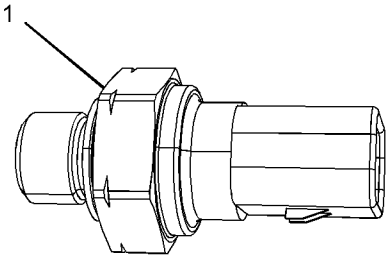


Illustration 424

g02619656

Table 198

Specification for 249 - 0096 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	1	249 - 0096 Pressure Sensor Gp	Torque to 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.0 ± 0.5 VDC.

i05275153

Inlet Manifold Air Pressure Sensor

SMCS Code: 1058; 1923

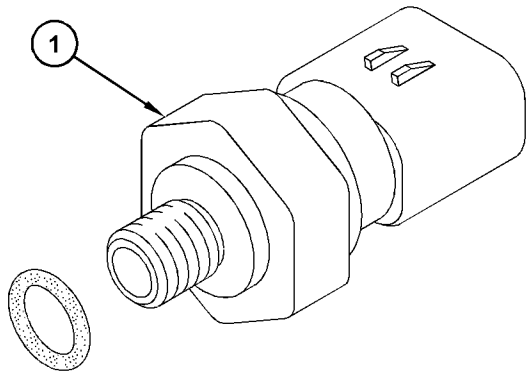


Illustration 425

g03355050

Table 199

Specification for 274 - 6718 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Final installation torque for the pressure sensor group is 10 ± 2 N·m (89 ± 18 lb in).
-	-	-	Operating voltage 5.0 ± 0.5 VDC.

i05345618

Inlet Manifold Air Pressure
Sensor

SMCS Code: 1058; 1923

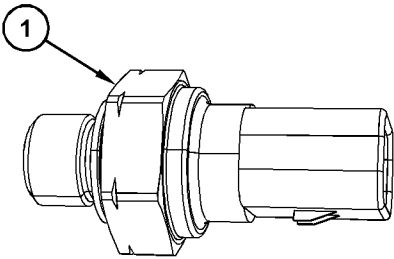


Illustration 426

g03385979

Table 200

Specification for 274 - 6721 Pressure Sensor Gp			
Item	Qty	Part	Specification Description
1	-	-	Final installation torque for the pressure sensor group is 10 ± 2 N·m (90 ± 18 lb in).
			Operating voltage is 5.0 ± 0.5 VDC.

i04372667

Speed/Timing Sensor

SMCS Code: 1907; 1912

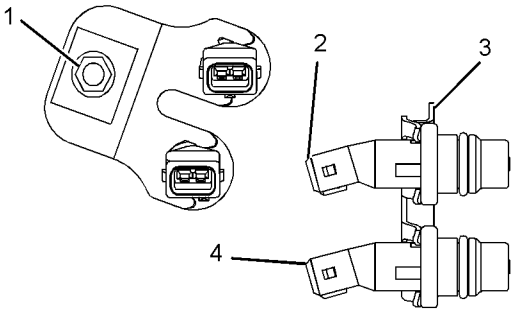


Illustration 427

g01405981

(2) Low output speed sensor group
(4) High output speed sensor group

Table 201

Specifications for 245 - 4630 Speed Sensor Gp			
Item	Qty	Parts	Specification Description
1	-	-	Locate each sensor to the sensor support before tightening the bolt. Final installation torque for the bolt (1) of the mounting bracket (3) for the speed sensor group is 28 ± 7 N·m (248 ± 62 lb in).
			The speed sensor group must be replaced as a pair. Each sensor has a different part number.
			Output type of the speed sensor group is analog.

i04389496

Speed/Timing Sensor

SMCS Code: 1907; 1912

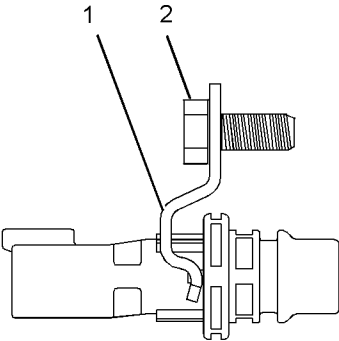


Illustration 428 g02557656

Table 202

Specification for 191 - 8303 Speed Sensor Gp			
Item	Qty	Part	Specification Description
1	1	133 - 0260 Bracket	Ensure that the bracket is installed in the correct orientation. Refer to Illustration 428 for the orientation of the bracket.
2	1	-	Torque to 28 ± 7 N·m (248 ± 62 lb in).

i04389514

Speed/Timing Sensor

SMCS Code: 1907; 1912

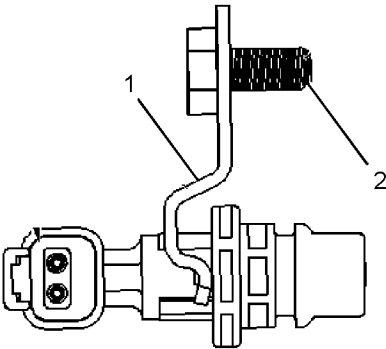


Illustration 429

g02557837

Table 203

Specification for 201 - 6617 Speed Sensor Gp			
Item	Qty	Part	Specification Description
1	1	133 - 0261 Bracket	Ensure that the bracket is installed in the correct orientation. Refer to Illustration 429 for the orientation of the bracket.
2	1	-	Torque to 28 ± 7 N·m (248 ± 62 lb in).

i04390432

Speed/Timing Sensor

SMCS Code: 1907; 1912

Primary Speed/Timing Sensor (Crankcase)

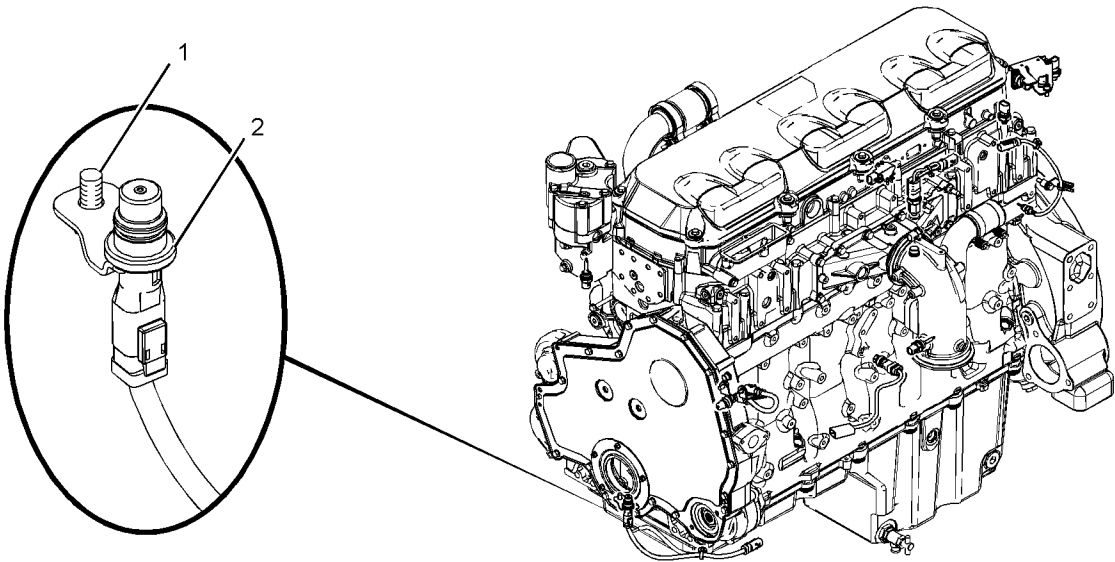


Illustration 430

g02560816

Table 204

Specification for 300 - 9805 Speed Sensor Gp (PRIMARY, TIMING)			
Item	Qty	Part	Specification Description
1	1	6V - 5215 Bolt	Torque to 28 ± 7 N·m (248 ± 62 lb in).
2	1	279 - 9828 Speed Sensor Gp	Lubricate the bore with the lubricant that is being sealed. Ensure that the sensor is seated before the bolt is tightened.

Secondary Speed/Timing Sensor
(Camshaft)

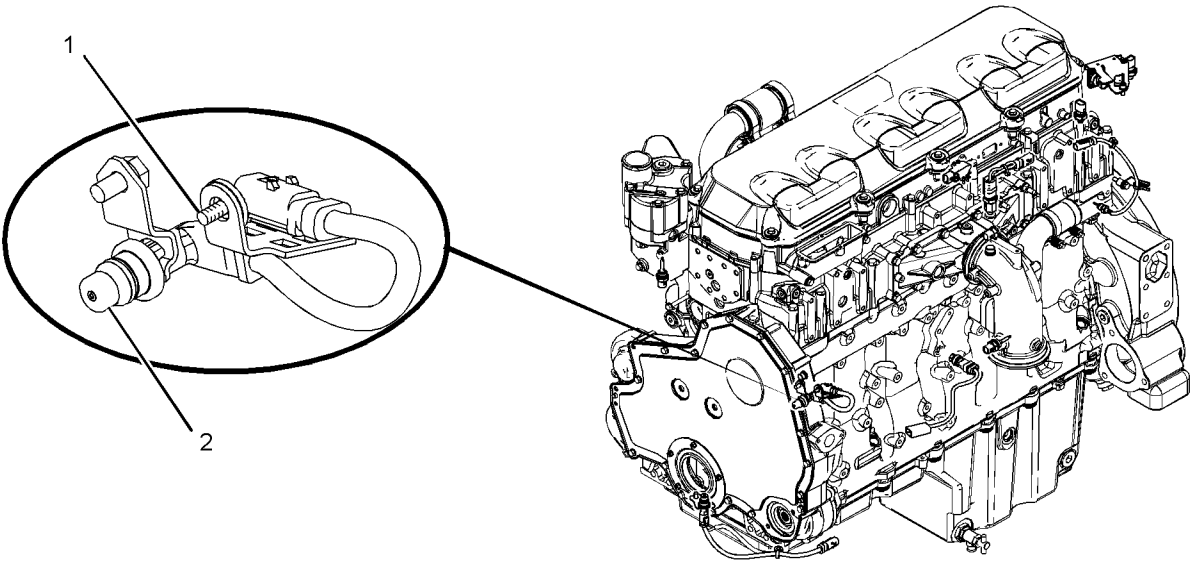


Illustration 431

g02560960

Table 205

Specification for 300-9806 Speed Sensor Gp (SECONDARY, TIMING)			
Item	Qty	Part	Specification Description
1	1	8T-4970 Bolt	Torque to 28 ± 7 N·m (248 ± 62 lb in).
2	1	279-9829 Speed Sensor Gp	Lubricate the bore with the lubricant that is being sealed. Ensure that the sensor is seated before the bolt is tightened.

i04403689

Speed/Timing Sensor

SMCS Code: 1907; 1912

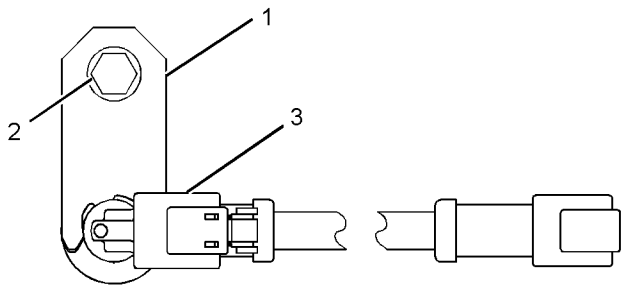


Illustration 432

g01473698

Table 206

Specification for 201 - 6616 Speed Sensor Gp			
Item	Qty	Part	Specification Description
1	2	264 - 7786 Bracket	Ensure that the bracket is installed in the orientation, as shown. Refer to Illustration 432 .
2	-	-	Torque for the bolt is 28 ± 7 N·m (21 ± 5 lb ft).
-	-	-	Output type is analog.
Lubricate the O-ring seal lightly with the lubricant that is being sealed.			
Ensure that the sensor (3) is seated before the bolt (2) is tightened.			

Note:

Note:

i04403707

Speed/Timing Sensor

SMCS Code: 1907; 1912

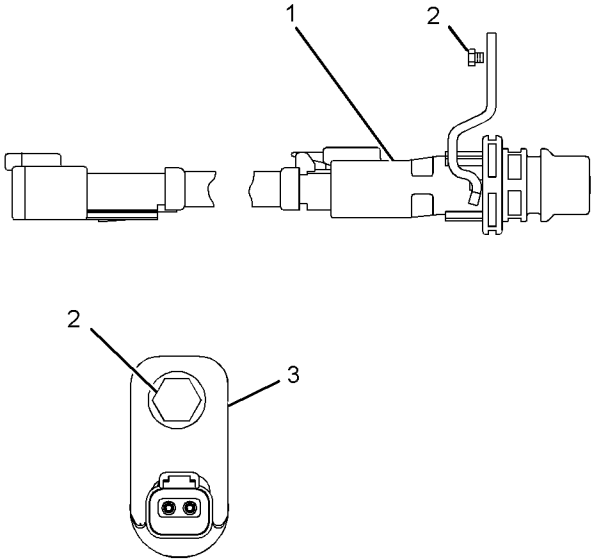


Illustration 433

g02250533

Table 207

Specification for 201 - 6615 Speed Sensor Gp			
Item	Qty	Part	Specification Description
2	-	-	Torque the bolt to 28 ± 7 N·m (248 ± 62 lb in).
3	2	133 - 0260 Bracket	Ensure that the bracket is installed in the orientation, as shown. Refer to Illustration 433 .
-	-	-	Output type is analog.
Lubricate the O-ring seal lightly with the lubricant that is being sealed.			
Ensure that the sensor (1) is seated before the bolt (2) is tightened.			

i04421189

Speed/Timing Sensor

SMCS Code: 1907; 1912

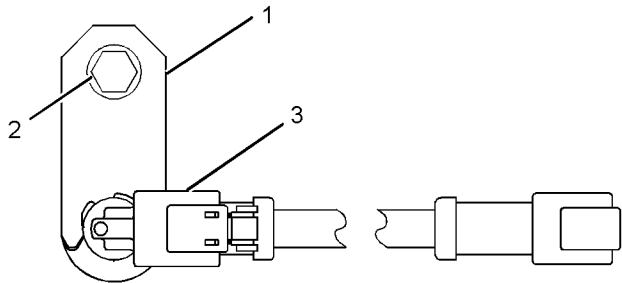


Illustration 434

g02617789

Table 208

Specification for 300-9804 Speed Sensor Gp			
Item	Qty	Part	Specification Description
-	-	-	Lubricate the O-ring seal lightly with the lubricant that is being sealed.
1	1	133-0261 Bracket	Ensure that the bracket is installed in the correct orientation. Refer to Illustration 434 for the orientation of the bracket.
2	1	-	Torque the M8 bolt to 28 ± 7 N·m (248 ± 62 lb in).
3	1	192-1562 Speed Sensor	Ensure that the sensor is seated before the bolt (2) is tightened.

i04522028

Speed/Timing Sensor

SMCS Code: 1907; 1912

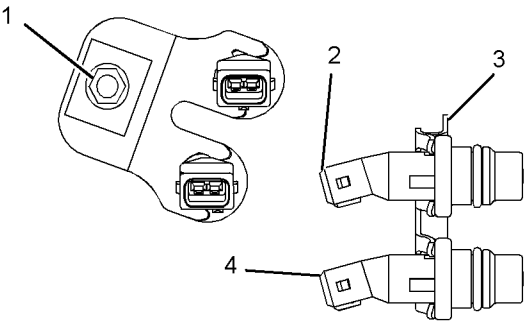


Illustration 435 g02697741

(2) Low output speed sensor group (4) High output speed sensor group

Table 209

Specifications for 236 -6221 Speed Sensor Gp			
Item	Qty	Parts	Specification Description
1	1	-	Locate each sensor to the sensor support before tightening the bolt.
			Torque the bolt for the mounting bracket (3) to 28 ± 7 N·m (248 ± 62 lb in).
-	-	-	The speed sensor group must be replaced as a pair. Each sensor has a different part number.
-	-	-	Output type of the speed sensor group is analog.

i05393010

Speed/Timing Sensor

SMCS Code: 1907; 1912

Primary Speed/Timing Sensor

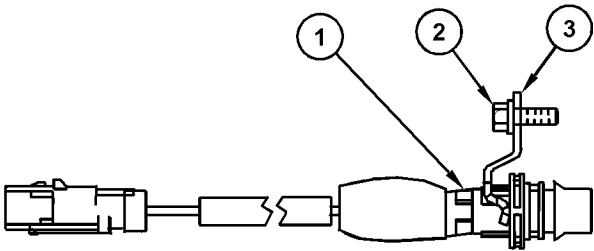


Illustration 436 g03409389

Table 210

Specification for 279-9828 Speed Sensor Gp, and 284-3163 Speed Sensor Gp			
Item	Qty	Part	Specification Description
-	-	-	Lubricate the O-ring seal lightly with the lubricant that is being sealed.
2	-	-	Torque for the bolt is 28 ± 7 N·m (248 ± 62 lb in). Ensure that the sensor (1) is seated before the bolt (2) is tightened.
3	2	133-0260 Bracket	Ensure that the bracket is installed in the orientation, as shown. Refer to Illustration 436 .

i07210932

Speed/Timing Sensor

SMCS Code: 1907; 1912

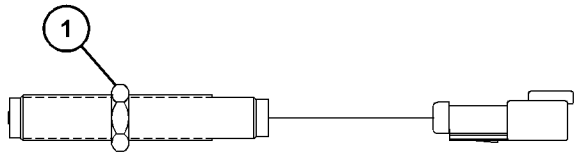


Illustration 437

g06252872

Table 211

Item	Qty	Part	Specification description
1	1	4P - 5820 Speed Sensor Gp	Torque to 37 ± 4 N.m (27 ± 3 lb ft).

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