

Maintenance Manual

Deployable Universal Combat Earthmover (DEUCE)

30/30 (Model DV100)

NSN: 2430-01-423-2819

PIN: 7RR00003-Up

Approved for public release; distribution is unlimited

Literature Information

Maintenance Manual

This manual is divided into seven units: Engine, Power Train, Hydraulic System, Machine Systems, Electrical System, Special Operation and Maintenance, and Appendices. Each unit contains individual modules.

Special attention should be given to Appendix D—Electronic Troubleshooting, to be used with the Soldier's Portable On-system Repair Tool (SPORT) and Caterpillar's Electronic Technician (ET) software.

The types of modules within the first six units include: Specifications, Systems Operation, Testing and Adjusting, and Disassembly and Assembly. The Hydraulic System and Electrical System units also contain a Schematic module.

The Specifications, Systems Operation, Testing and Adjusting modules are divided into three sections. The Specifications section contains component-specific information. Nonstandard torques, required sealants, serviceable component specifications, and other information to assist with service and repair are included. All specifications are given in metric units, with the equivalent English units parenthetically noted.

The Systems Operation section of the Specifications, Systems Operation, Testing and Adjusting module includes detailed explanations of how each machine system operates. This section provides theory of operation to assist with machine troubleshooting.

The Testing and Adjusting section of the Specifications, Systems Operation, Testing and Adjusting module includes machine troubleshooting tips and component test procedures.

SPORT with ET is the primary maintenance diagnostic tool used to troubleshoot the DEUCE. The troubleshooting procedures to be used with SPORT and ET are located in Appendix D.

The Disassembly and Assembly module illustrates disassembly and assembly procedures. The procedures are arranged in alphabetical order within the module. This module calls out all nonstandard torque specifications and the weight of components with weights greater than 23 kg (50 lb).

NOTE: Bolt torques which are not specifically identified in the Specifications section or a disassembly or assembly procedure are standard torque values. Standard torque values are given in the Appendix C of the manual. Group numbers related to the disassembly and assembly procedures are given at the beginning of each procedure.

The Schematic module contains general component location information and a complete schematic of the system.

NOTE: The Systems Operation section of the Specifications, Systems Operation, Testing and Adjusting module may contain partial schematics.

The Special Operations and Maintenance unit illustrates procedures and maintenance activities which are beyond those which the operator can perform.

The Appendices unit includes four modules: Maintenance Allocation Chart (MAC); Unit Preventative Maintenance Checks and Services (UPMCS); Standard Torque Specifications; and Electronic Troubleshooting. Military-specific information is included in the Appendices unit. The Standard Torque Specifications module should be used when a torque is not specified in a procedure in the Maintenance Manual.

Related Manuals

The Maintenance Manual should be used in conjunction with the Parts Manual and the Operator's Manual. The Parts Manual lists all serviceable components on the machine by part number. The Parts Manual divides the machine components into sections. Component groups are listed alphabetically within each section.

NOTE: The Parts Manual and the procedures in the Disassembly and Assembly modules do not follow the same structure. It may be necessary to search through different groups in the Parts Manual to find all of the parts which are called out in a particular disassembly or assembly procedure.

NOTE: The Parts Manual refers to parts by their engineering designation, while the Maintenance Manual refers to parts by their common names. Sometimes the engineering designation does not match the common name. For example, the Parts Manual may identify a component as a "Valve Group - Pressure Relief," while the Maintenance Manual may identify the same component as a "pressure relief valve." In most instances, nomenclature differences are minor.

NOTE: There is no difference between the following part numbers, except for format: 123-4567 and 1234567. A dash may be included in part numbers in the Maintenance Manual and Operator's Manual to improve readability. The part numbers in the Parts Manual do not contain dashes.

The Operator's Manual includes safety, operation, transportation, lubrication and maintenance information suitable for the Army operator.

Specifications Systems Operation Testing & Adjusting

**Deployable Universal Combat
Earthmover (DEUCE)**

3100 HEUI DEUCE Engine

Engine PIN: 4CW00222-Up
Machine PIN: 7RR00003-Up

Important Safety Information

Most accidents involving 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. 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 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 other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "WARNING" as 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, explaining the hazard, can be either written or pictorially presented.

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. If a tool, procedure, work method or operating technique not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustrations in this publication are on the basis of information available at the time it was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. Caterpillar dealers have the most current information available. For a list of the most current publication form numbers available, see the Service Manual Contents Microfiche, REG1139F.

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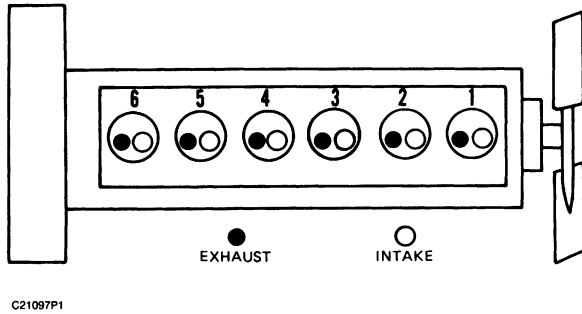
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Specifications

Basic Engine

Engine Design

4CW00222-UP



Cylinder and Valve Location.

Bore110.025 ± 0.025 mm (4.331 ± 0.0010 in)

Stroke127 mm (5.0 in)

Displacement7.2 L (439 cu in)

Number of cylinders6

Cylinder arrangementIn-line

Valves per cylinder2

Valve lash setting:

Intake0.38 mm (0.015 in)

Exhaust0.64 mm (0.25 in)

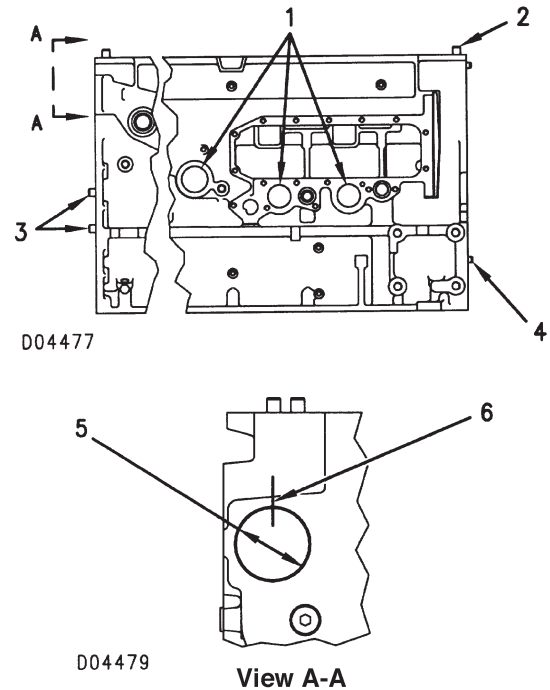
Type of combustionDirect injection

Firing order1-5-3-6-2-4

Direction of crankshaft rotation (when viewed from flywheel end)Counterclockwise

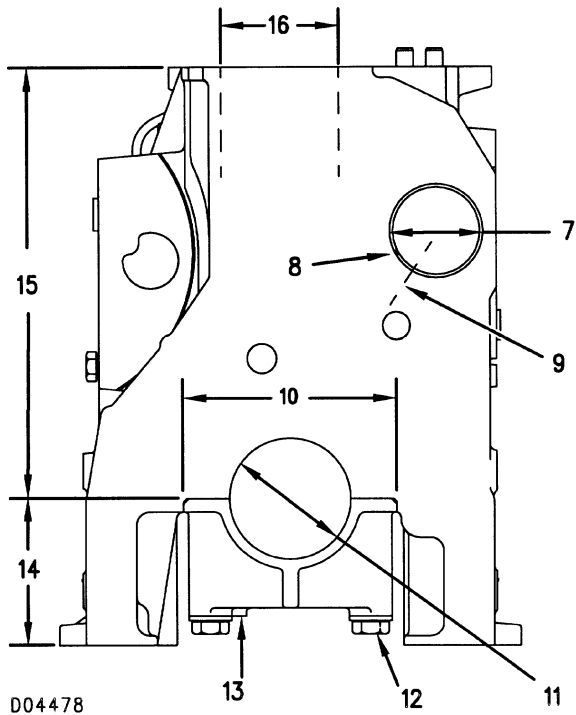
NOTE: The front end of the engine is opposite the flywheel end. The left and right sides of the engine are as viewed from the flywheel end. The number-one cylinder is the front cylinder.

Cylinder Block



Right Side. View A-A (Rear Face).

- (1) Depth plugs are installed (measure from block face to top edge of plug)1.25 ± 0.25 mm
.....(0.049 ± 0.010 in)
- (2) Distance all dowels extend from top face14 ± 2 mm (0.55 ± 0.08 in)
- (3) Distance two large dowels extend from rear face12.0 ± 0.5 mm (0.47 ± 0.02 in)
- (4) Distance all dowels extend from front face8.0 ± 0.5 mm (0.31 ± 0.02 in)
- (5) Bores in block for all camshaft bearings except front bearing69.000 ± 0.038 mm
.....(2.7165 ± 0.0015 in)
- (6) Locate bearing oil hole for all camshaft bearings (except front bearing) at top of bore.



Front Face.

(7) Bore in block for front camshaft bearing
.....70.000 ± 0.025 mm (2.7559 ± 0.0010 in)

(8) Front camshaft bearing joint location.

(9) Front camshaft bearing oil hole.

NOTE: Install the front camshaft bearing with camshaft bearing oil hole (9) aligned with the oil hole in the block, and camshaft bearing joint (8) positioned as shown.

(10) Width of main bearing cap159.995 ± 0.020 mm
.....(6.2990 ± 0.0008 in)

Width of cylinder block for main bearing cap.....
.....160.000 ± 0.018 mm (6.2992 ± 0.0007 in)

(11) Bore in block for main bearings
.....95.000 ± 0.013 mm (3.7402 ± 0.0005 in)

(12) Install main bearing cap bolts as follows:

a. Install bearing caps with the sequence number to the right, 1 through 7 (front to rear).

b. Before assembly, put 2P-2506 Thread Lubricant on threads and washer face.

c. Tighten both bolts of each bearing cap to a torque of.....54 ± 7 N•m (40 ± 5 lb ft)

d. Tighten bolts an additional
.....90 ± 5 degrees (one-quarter turn)

(13) Location of bearing cap sequence number.

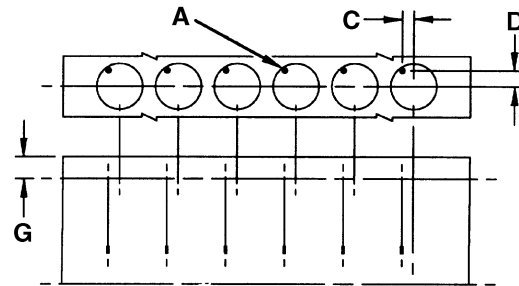
(14) Dimension from centerline of crankshaft bore to pan rail110.00 mm (4.331 in)

(15) Dimension from centerline of crankshaft bore to top of block.....322.00 mm (12.677 in)

(16) Cylinder bore size110 mm (4.331 in)

NOTE: Bore size must be checked with a 4C-4377 Cylinder Head Stress Plate (with head gasket).

Piston Cooling Jet



D11927

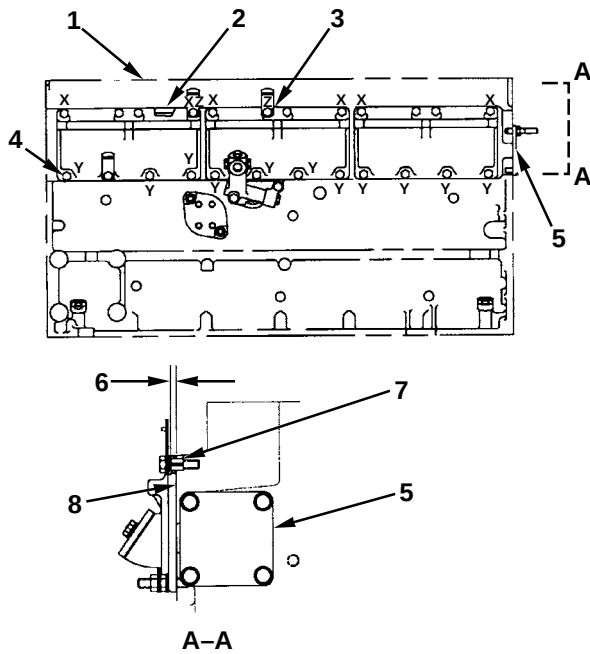
Check the piston cooling jets by inserting a 1.90 mm (0.075 in) diameter drill rod into the jet. The rods must pass through a 12.7 mm (0.50 in) diameter circle in location (A). The circle is located at depth (G), 50.0 mm (1.97 in) below the top of the cylinder block.

Dimension (C).....25.9 mm (1.02 in)

Dimension (D).....33.4 mm (1.31 in)

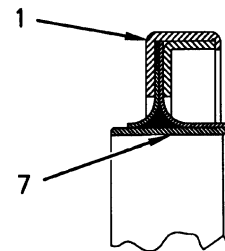
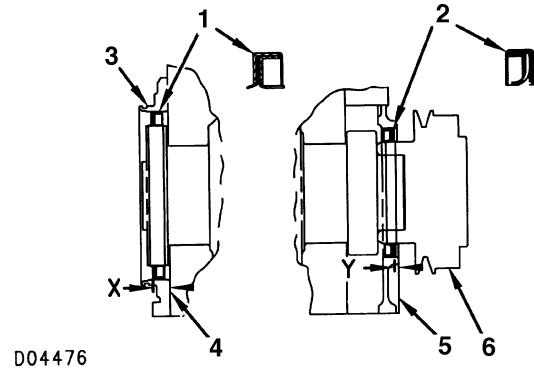
Dimension (G).....50.0 mm (1.97 in)

Cylinder Block Cover Group

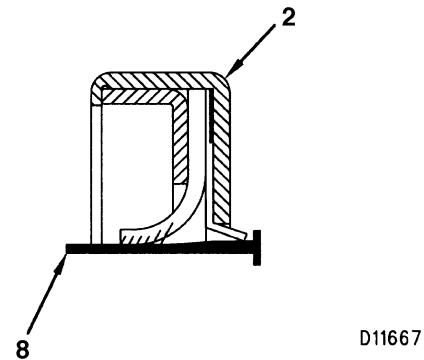


- (1) Cylinder block.
- (2) Gasket.
- (3) Length of bolt (locations marked [X and Z]).....30.0 mm (1.18 in)
- (4) Length of bolt (location marked [Y]).....20.0 mm (0.79 in)
- (5) Clean cover face with 138-8440 Solvent. Apply 1U-8846 Gasket Maker to cover. Spread uniformly on face and around the bolt holes. Cover must be installed and tightened within 10 minutes.
- (6) Length wear sleeve (7) extends from face of cylinder block..... 5.0 ± 0.5 mm (0.20 ± 0.02 in)
- (7) Sleeve (location marked [X]).
- (8) Clean cover face with 138-8440 Solvent. Apply 1U-8846 Gasket Maker to cover. Spread uniformly on face and around bolt holes. Cover must be installed and tightened within 10 minutes.

Crankshaft Seals



Rear Crankshaft Seal Group.



Front Crankshaft Seal Group.

- (1) Install rear seal with rear face of seal at dimension (X) from rear block face (4). Dimension (X)..... 16.0 ± 0.5 mm (0.63 ± 0.02 in)

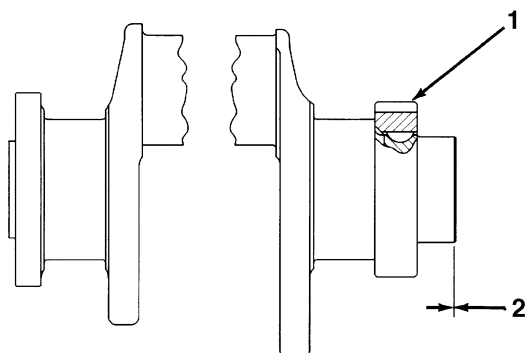
NOTE: The rear seal runs directly on the crankshaft flange as originally manufactured. The service rear seal group has wear sleeve (7) that is part of the replacement rear seal group.

- (2) Install front seal with front face of seal at dimension (Y) from front face of front housing. Dimension (Y) ... 2.5 ± 0.5 mm (0.10 ± 0.02 in)

- (3) Carrier/flywheel housing.

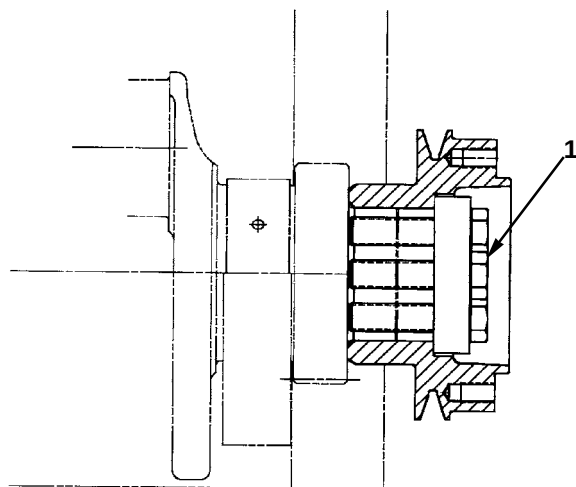
- (4) Rear face of block.
- (5) Front housing.
- (6) Pulley.
- (7) Do not remove wear sleeves from seal group.
- (8) Remove shipping sleeve for front seal after installing front seal (2) in housing and immediately before installing pulley (6).

Crankshaft (113-6087)



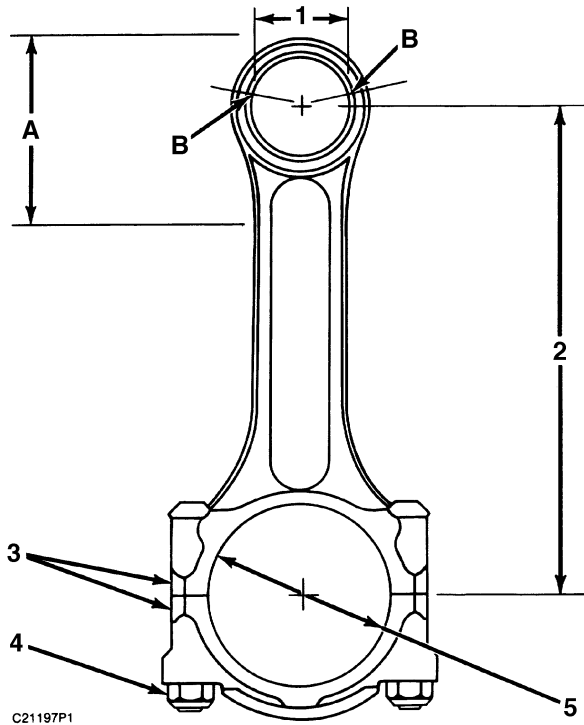
- (1) For installation, heat gear (do not use a torch) to
.....316°C (600°F)
- (2) Endplay for crankshaft assembled in engine
.....0.07 to 0.32 mm (0.003 to 0.013 in)

Crankshaft Pulley Group



- (1) Tighten bolts to a torque of190 ± 30 N•m
.....(140 ± 22 lb ft)

Connecting Rod



- (1) Bore in bearing for piston pin (new)..... 40.028 ± 0.008 mm (1.5759 ± 0.0003 in)

To install bearing, rod may be heated at length (A) (do not use a torch) to 175 to 260°C (347 to 500°F)

Length (A)..... 75 mm (3 in)

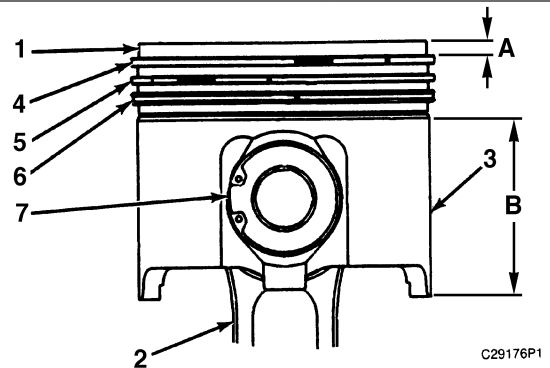
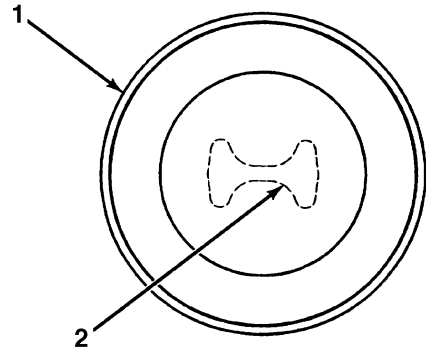
Bearing joint must be at either location (B), at an angle above bore centerline of 12.0 ± 5 degrees

- (2) Distance between center of bearings..... 200.00 mm(7.874 in)
- (3) Location for etching cylinder number on rod and cap after assembly. Etch numbers on same side of rod as bearing retainer notch.
- (4) Tighten connecting rod bolts as follows:
- Lubricate bolt threads, seating faces of cap and nut with engine oil before installing nut.
 - Tighten each nut to a torque of..... 54 ± 7 N•m (40 ± 5 lb ft)
 - Put an alignment mark on cap and nut.

- d. Tighten each nut an additional 60 ± 5 degrees(one-sixth turn)

- (5) Bore in connecting rod for bearing with bolts tightened to specification (4)..... 75.000 ± 0.013 mm(2.9528 ± 0.0005 in)

Pistons and Rings



- (1) Thoroughly lubricate piston crown assembly 360 degrees in zone (A) with clean engine oil just before inserting into block group.
- (2) Install connecting rod and piston group with rod forging part number to rear of engine (flywheel end). Thoroughly lubricate piston group with clean engine oil just before inserting into block group.
- (3) Thoroughly lubricate piston skirt 360 degrees in zone (B) with clean engine oil just before inserting into block group.

Top and Intermediate Ring

Install piston ring with "UP" side toward top of piston (green strip to right of ring gear).

Pin diameter40.000 ± 0.005 mm
.....(1.5748 ± 0.0002 in)

Pin length.....89.95 ± 0.13 mm (3.541 ± 0.005 in)

(4) Top ring marked "UP-1."

Clearance between ends of piston ring (when installed in cylinder with bore size of 110 mm [4.331 in]).....0.525 ± 0.125 mm (0.207 ± 0.0049 in)

Increase in clearance between ends of piston ring for each 0.03 mm (0.001 in) increase in cylinder bore size0.09 mm (0.004 in)

Install intermediate ring with side marked "UP-2" toward top of piston (white strip to right of ring end gap).

Thoroughly lubricate pin with clean engine oil before assembling to piston group and connecting rod.

(5) Intermediate ring marked "UP-2."

Clearance between ends of piston ring (when installed in cylinder with bore size of 110 mm [4.331 in])...0.825 ± 0.125 mm (0.0033 ± 0.0049 in)

Increase in clearance between ends of piston ring for each 0.03 mm (0.001 in) increase in cylinder bore size0.09 mm (0.004 in)

Oil Control Ring

(6) Install oil control ring with gap in spring 180 degrees away from gap in ring (light green portion of spring must be visible at ring end gap).

Width of groove in piston for piston ring (new)
.....4.041 ± 0.013 mm (0.1591 ± 0.0005 in)

Thickness of piston ring (new)3.982 ± 0.008 mm
.....(0.1568 ± 0.0003 in)

Clearance between groove and piston ring (new).....
.....0.038 ± 0.080 mm (0.0015 ± 0.0031 in)

Clearance between ends of piston ring (when installed in cylinder with bore size of 110 mm [4.331 in]).....0.45 ± 0.15 mm (0.018 ± 0.006 in)

Increase in clearance between ends of piston ring for each 0.03 mm (0.001 in) increase in cylinder bore size0.09 mm (0.004 in)

After rings have been installed, rotate so end gaps are apart120 degrees

Piston Pin Bore

(7) Pin bore diameter in piston crown bearing.....40.031 ± 0.007 mm (1.5760 ± 0.0003 in)

Pin bore diameter in piston skirt.....
.....40.020 ± 0.008 mm (1.5756 ± 0.0003 in)