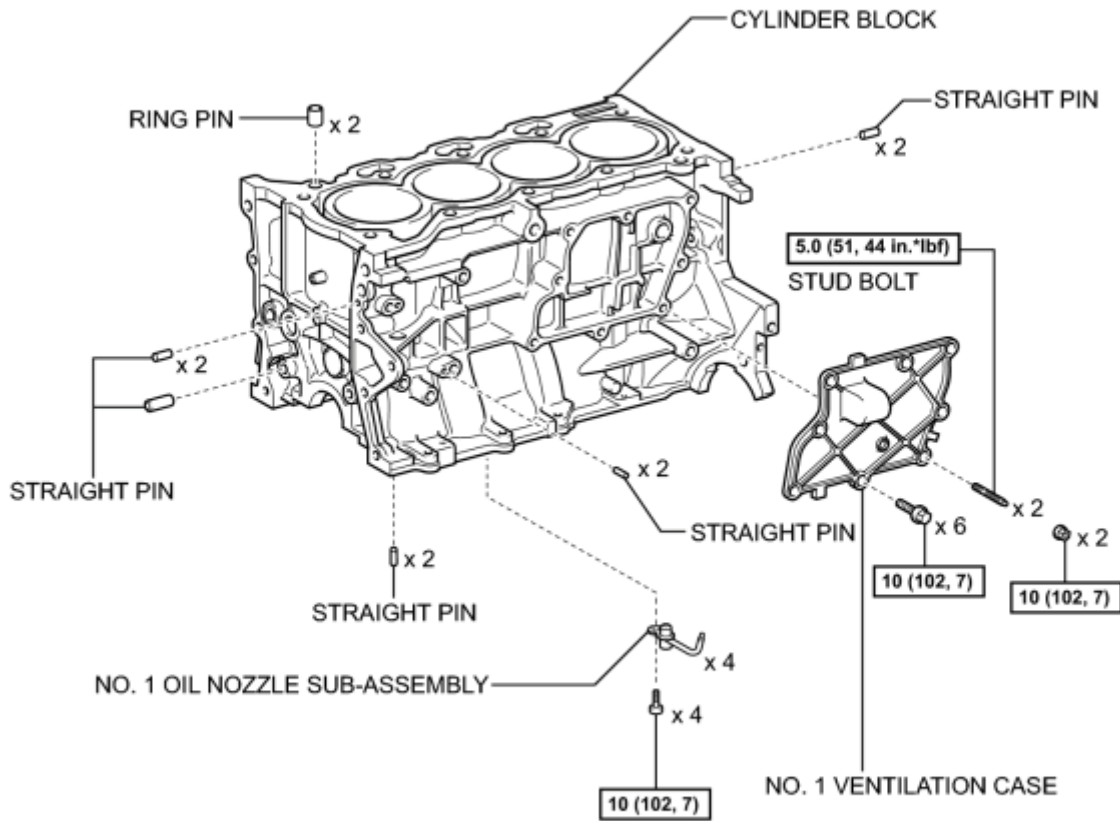


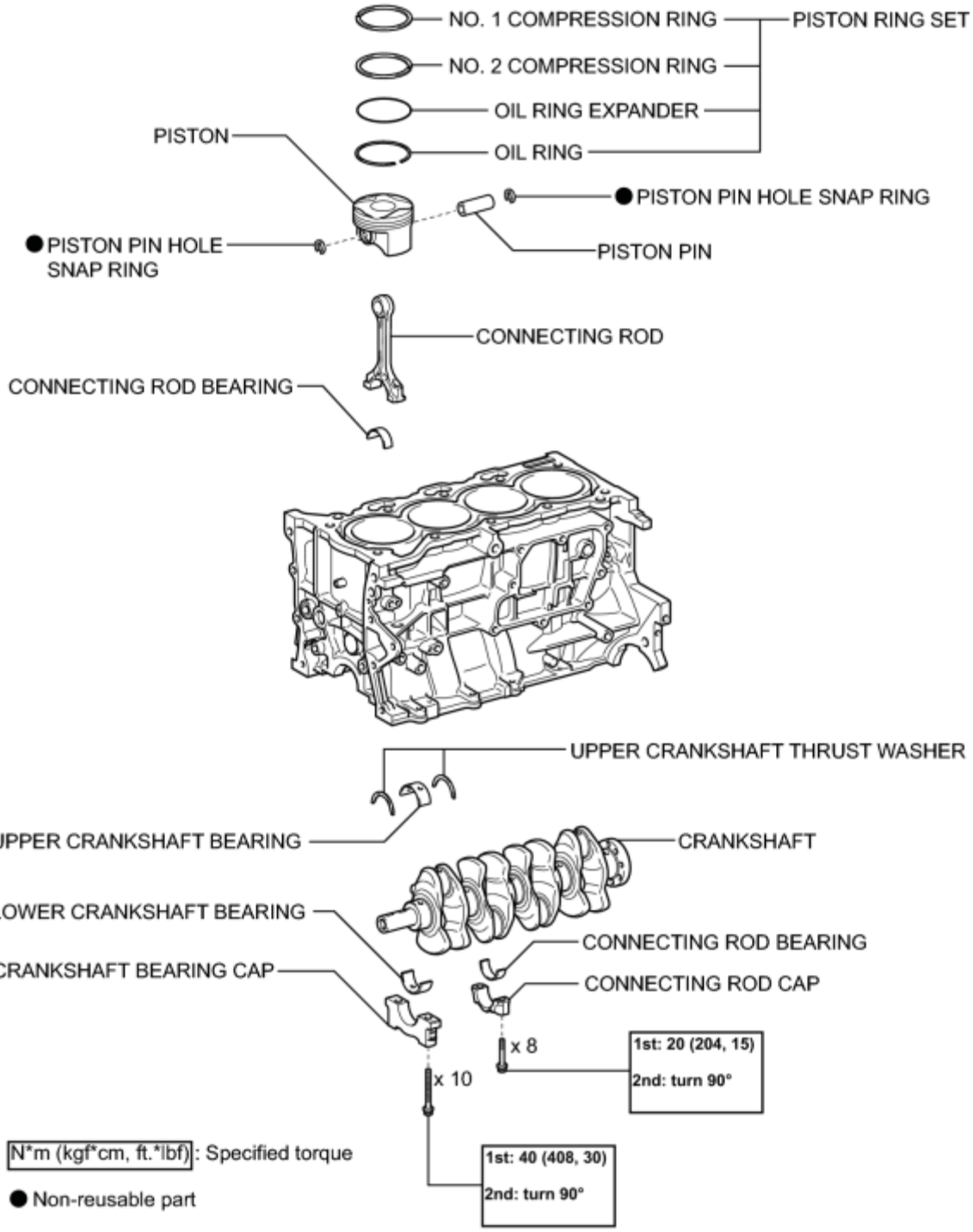
COMPONENTS

ILLUSTRATION



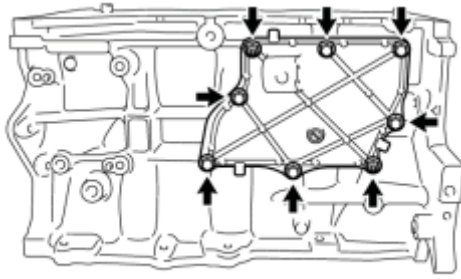
10 (102, 7): Specified torque

ILLUSTRATION



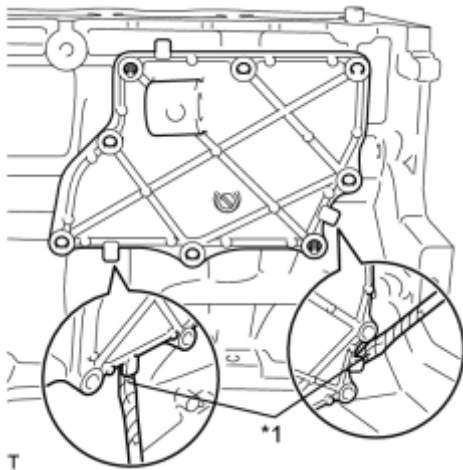
DISASSEMBLY

1. REMOVE NO. 1 VENTILATION CASE



(a) Remove the 6 bolts and 2 nuts.

(b) Remove the ventilation case by prying between the ventilation case and cylinder block with a screwdriver as shown in the illustration.



Text in Illustration

*1	Protective Tape
----	-----------------

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and No. 1 ventilation case.

HINT:

Tape the screwdriver tip before use.

2. INSPECT CONNECTING ROD THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the connecting rod cap back and forth.

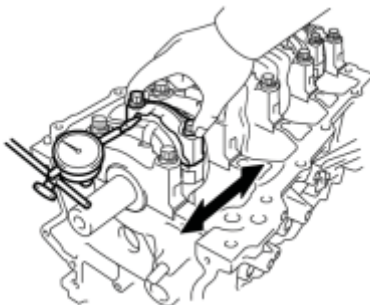
Standard thrust clearance:

0.160 to 0.342 mm (0.00630 to 0.0135 in.)

Maximum thrust clearance:

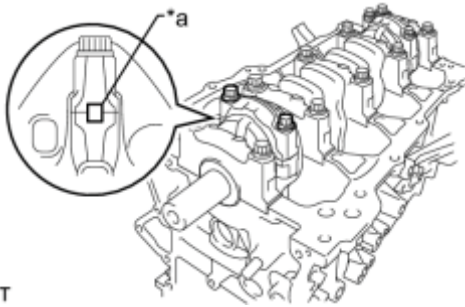
0.342 mm (0.0132 in.)

If the thrust clearance is greater than the maximum, replace the connecting rod assemblies as necessary. If necessary, replace the crankshaft.



3. INSPECT CONNECTING ROD OIL CLEARANCE

(a) Check that the matchmarks on the connecting rod and cap are aligned



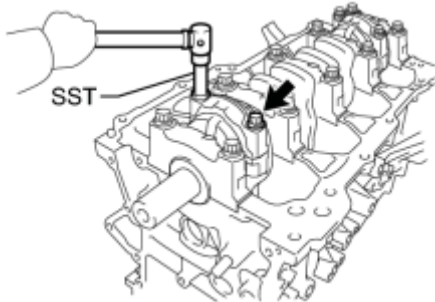
to ensure correct reassembly.

Text in Illustration

*a	Matchmark
----	-----------

HINT:

The matchmarks on the connecting rods and caps are provided to ensure correct reassembly.



(b) Using SST, uniformly loosen the 2 bolts.

SST: 09205-16011



(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

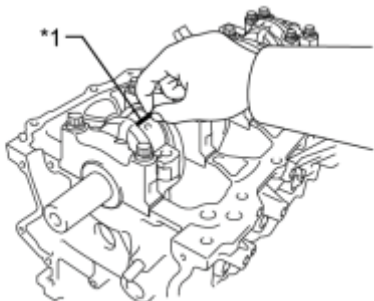
HINT:

Keep the lower bearing inserted in the connecting rod cap.

(d) Clean the crank pin and bearing.

(e) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



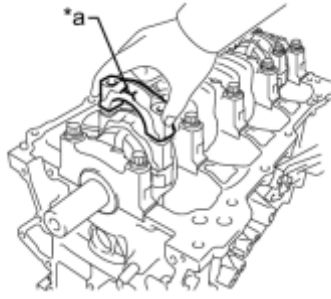
(f) Lay a strip of Plastigage on the crank pin.

Text in Illustration

*1	Plastigage
----	------------

(g) Check that the front mark of the connecting rod cap is facing forward and install the connecting rod cap.

Text in Illustration



*a	Front Mark
----	------------

T

(h) Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.

(i) Install the connecting rod cap bolts.

NOTICE:

The connecting rod cap bolts should be tightened in 2 progressive steps.

(j) Step 1:

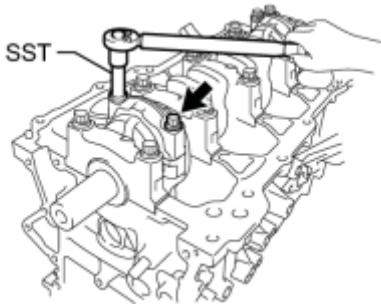
(1) Using SST, install and alternately tighten the bolts of the connecting rod cap in several steps.

SST: 09205-16011

Torque: **20 N·m (204 kgf·cm, 15ft·lbf)**

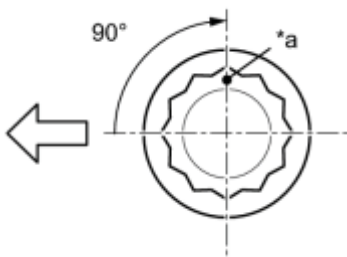
NOTICE:

Do not turn the crankshaft.



T

(k) Step 2:



P

Text in Illustration

*a	Paint Mark
→	Engine Front

(1) Mark the front of the connecting rod cap bolts with paint.

(2) Tighten the cap bolts 90° as shown in the illustration.

NOTICE:

Do not turn the crankshaft.

(l) Remove the 2 bolts and connecting rod cap.

HINT:

Keep the lower bearing inserted in the connecting rod cap.

(m) Measure the Plastigage at its widest point.

Text in Illustration

*1	Plastigage
*a	Mark 1, 2 or 3

Standard oil clearance:

0.014 to 0.038 mm (0.000551 to 0.00150 in.)

Maximum oil clearance:

0.070 mm (0.00276 in.)

If the oil clearance is more than the maximum, replace the connecting rod bearings. If necessary, inspect the crankshaft.

NOTICE:

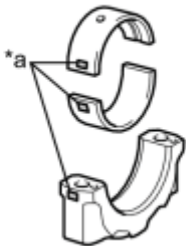
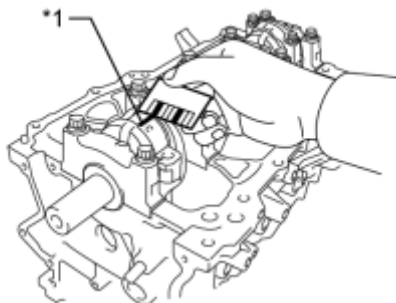
Remove the Plastigage completely after the measurement.

HINT:

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. Each bearing standard thickness is indicated by a 1, 2, or 3 mark on its surface.

Standard Connecting Rod Large End Bore Diameter:

Mark	Specified Condition
Mark 1	47.000 to 47.008 mm (1.85039 to 1.85070 in.)
Mark 2	47.009 to 47.016 mm (1.85074 to 1.85102 in.)
Mark 3	47.017 to 47.024 mm (1.85106 to 1.85133 in.)



T

Standard Connecting Rod Bearing Thickness:

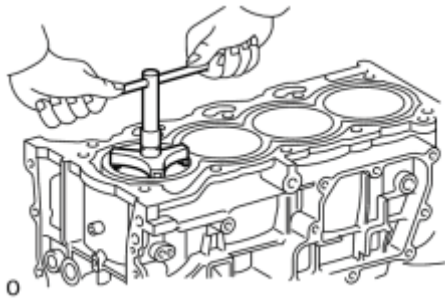
Mark	Specified Condition
Mark 1	1.489 to 1.493 mm (0.05862 to 0.05878 in.)
Mark 2	1.494 to 1.497 mm (0.05882 to 0.05894 in.)
Mark 3	1.498 to 1.501 mm (0.05898 to 0.05909 in.)

Standard crankshaft pin diameter:

43.992 to 44.000 mm (1.7320 to 1.7323 in.)

(n) Perform the inspection above for each cylinder.

4. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD



(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Push the piston, connecting rod and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearing, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.
- Be sure to arrange the removed piston and connecting rod assemblies in such a way that they can be reinstalled exactly as before.

5. REMOVE CONNECTING ROD BEARING

(a) Remove the connecting rod bearings.

HINT:

Arrange the removed parts in the correct order.

6. REMOVE PISTON RING SET

(a) Using a piston ring expander, remove the 2 compression rings.



T

(b) Remove the oil ring and oil ring expander by hand.

HINT:

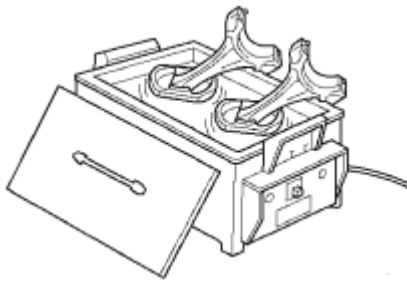
Arrange the removed parts in the correct order.

7. REMOVE PISTON



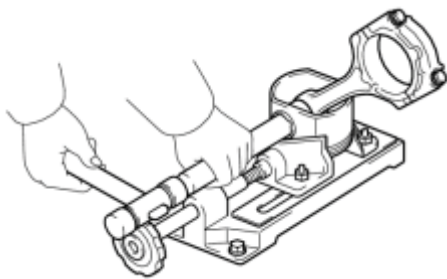
T

(a) Using a screwdriver, pry out the 2 snap rings.



Y

(b) Gradually heat each piston to approximately 80 to 90°C (176 to 194°F).



P

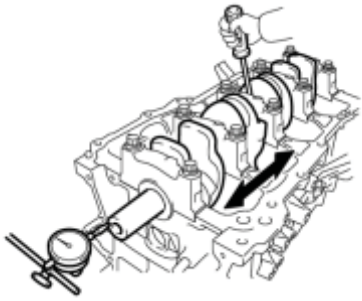
(c) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

8. INSPECT CRANKSHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while prying the

T



crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.04 to 0.14 mm (0.00157 to 0.00551 in.)

Maximum thrust clearance:

0.18 mm (0.00709 in.)

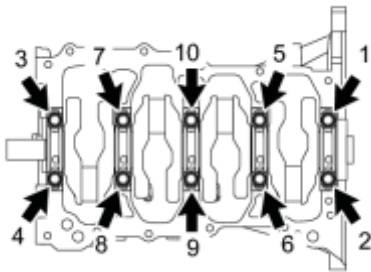
If the thrust clearance is more than the maximum, replace the thrust washers as a set. If necessary, replace the crankshaft.

HINT:

The thrust washer thickness is 2.43 to 2.48 mm (0.0957 to 0.0976 in.).

9. REMOVE CRANKSHAFT

T



(a) Uniformly loosen and remove the 10 crankshaft bearing cap bolts in the sequence shown in the illustration.

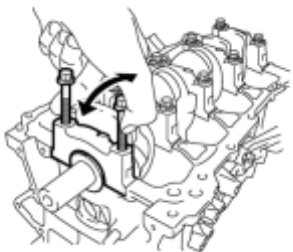
(b) Using the 2 removed crankshaft bearing cap bolts, remove the 5 crankshaft bearing caps and 5 lower bearings.

NOTICE:

Insert the bolts into the caps in turn. Ease the cap out by gently pulling up and applying force toward the front and back sides of the cylinder block, as shown in the illustration. Take care not to damage the contact surfaces of the cap and cylinder block.

- Keep the lower bearing and crankshaft bearing cap together as a set.
- Arrange the crankshaft bearing caps in the correct order.

T

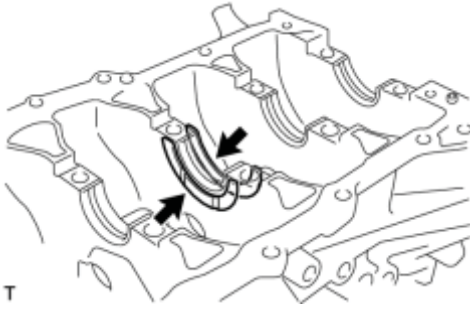


(c) Lift out the crankshaft.

(d) Check each crankshaft journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.

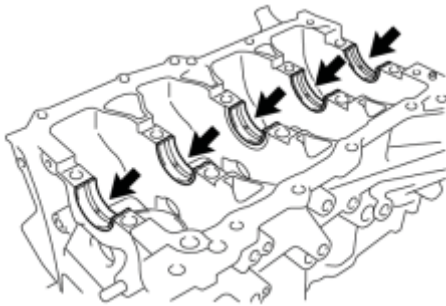
10. REMOVE UPPER CRANKSHAFT THRUST WASHER



(a) Remove the 2 upper crankshaft thrust washers from the cylinder block.

T

11. REMOVE CRANKSHAFT BEARING

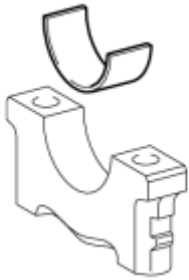


(a) Remove the 5 upper crankshaft bearings from the cylinder block.

HINT:

Arrange the bearings in the correct order.

T



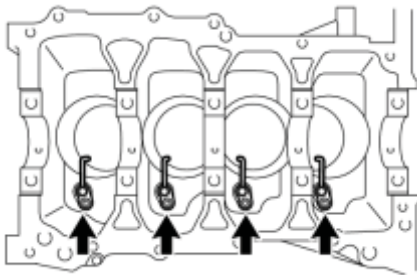
(b) Remove the 5 lower crankshaft bearings from the 5 crankshaft bearing caps.

HINT:

Arrange the bearings in the correct order.

T

12. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY



(a) Using a 5 mm socket hexagon wrench, remove the 4 bolts and 4 oil nozzles.

T

13. CLEAN CYLINDER BLOCK

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner will stick out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

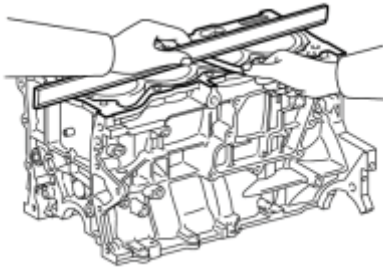
14. REMOVE STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

INSPECTION

1. INSPECT CYLINDER BLOCK FOR WARPAGE

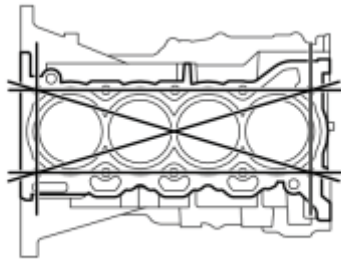


(a) Using a straightedge and feeler gauge, measure the warpage of the surface that contacts the cylinder head gasket.

Maximum warpage:

0.05 mm (0.00197 in.)

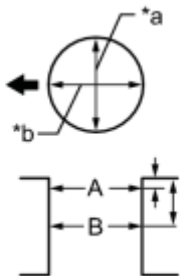
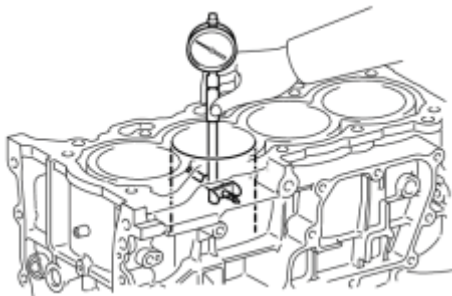
If the warpage is more than the maximum, replace the cylinder block.



T

2. INSPECT CYLINDER BORE

(a) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in both the thrust and axial directions.



T

Text in Illustration

*a	Thrust Direction
*b	Axial Direction
	Engine Front

Standard diameter:

80.500 to 80.513 mm (3.169 to 3.170 in.)

Maximum diameter:

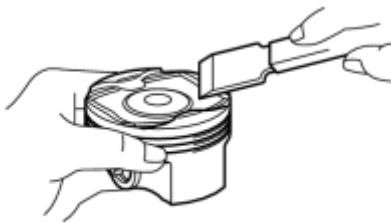
80.63 mm (3.174 in.)

Measurement Position:

Measurement Position	Cylinder Bore Position
A	10 mm (0.394 in.) from top edge
B	50 mm (1.97 in.) from top edge

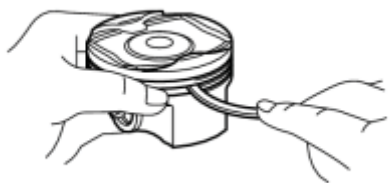
If the average diameter of the 4 positions is more than the maximum, replace the cylinder block.

3. INSPECT PISTON



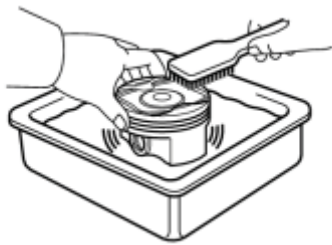
o

(a) Using a gasket scraper, remove the carbon from the piston top.



o

(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.

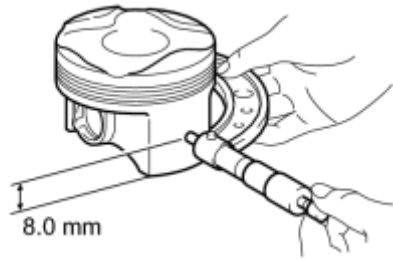


(c) Using a brush and solvent, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.

O



(d) Using a micrometer, measure the piston diameter at a position that is 8.0 mm (0.315 in.) from the bottom of the piston (refer to the illustration).

Standard piston diameter:

80.461 to 80.471 mm (3.1677 to 3.1681 in.)

If the diameter is not as specified, replace the piston with pin.

T

4. INSPECT PISTON OIL CLEARANCE

(a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.009 to 0.042 mm (0.000354 to 0.00165 in.)

Maximum oil clearance:

0.08 mm (0.00315 in.)

If the oil clearance is more than the maximum, replace all the pistons. If necessary, replace the cylinder block.

5. INSPECT RING GROOVE CLEARANCE

(a) Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

Standard Ring Groove Clearance:

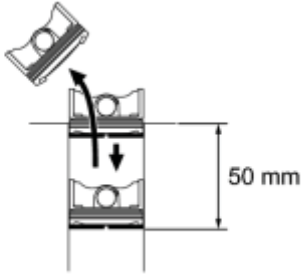


Item	Specified Condition
No. 1 Compression Ring	0.02 to 0.07 mm (0.000787 to 0.00276 in.)
No. 2 Compression Ring	0.02 to 0.055 mm (0.000787 to 0.00217 in.)
Oil Ring	0.02 to 0.06 mm (0.000787 to 0.00236 in.)

T

If the groove clearance is not as specified, replace the piston with pin.

6. INSPECT PISTON RING END GAP



(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 50 mm (1.97 in.) from the top of the cylinder block.

(b) Using a feeler gauge, measure the end gap.

Standard End Gap:

Item	Specified Condition
No. 1 Compression Ring	0.20 to 0.30 mm (0.00787 to 0.0118 in.)
No. 2 Compression Ring	0.30 to 0.45 mm (0.0118 to 0.0177 in.)
Oil Ring	0.10 to 0.35 mm (0.00394 to 0.0138 in.)



Maximum End Gap:

Item	Specified Condition
No. 1 Compression Ring	0.50 mm (0.0197 in.)
No. 2 Compression Ring	0.70 mm (0.0276 in.)
Oil Ring	0.70 mm (0.0276 in.)

If the end gap is more than the maximum, replace the piston ring. If the end gap is more than the maximum even with a new piston ring, replace the cylinder block.

7. INSPECT PISTON PIN OIL CLEARANCE

(a) Using a caliper gauge, measure the piston pin bore diameter.

Standard piston pin bore diameter:

20.006 to 20.015 mm (0.78764 to 0.78799 in.)



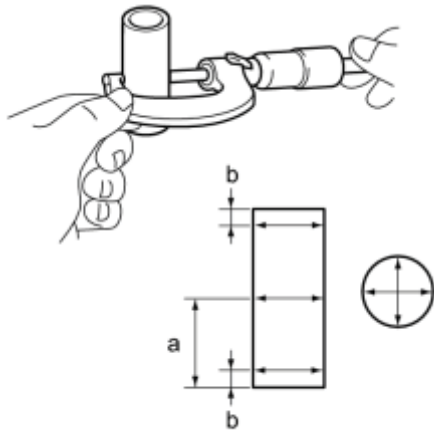
Item	Specified Condition
Mark A	20.006 to 20.009 mm (0.78764 to 0.78775 in.)
Mark B	20.010 to 20.012 mm (0.78779 to 0.78787 in.)
Mark C	20.013 to 20.015 mm (0.78791 to 0.78799 in.)

If the diameter is not as specified, replace the piston with pin.

(b) Using a micrometer, measure the piston pin diameter.

Standard piston pin diameter:

20.004 to 20.013 mm (0.78756 to 0.78791 in.)



Item	Specified Condition
Mark A	20.004 to 20.007 mm (0.78756 to 0.78768 in.)
Mark B	20.008 to 20.010 mm (0.78771 to 0.78779 in.)
Mark C	20.011 to 20.013 mm (0.78783 to 0.78791 in.)

If the diameter is not as specified, replace the piston with pin.

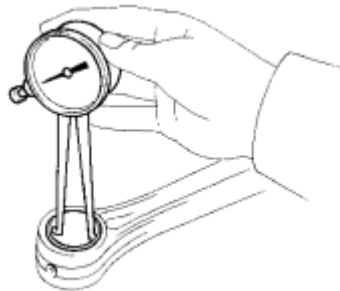
Measurement Position:

Measurement Position	Piston Pin Position
a	25 mm (0.984 in.) from side edge
b	5 mm (0.197 in.) from side edge

(c) Using a caliper gauge, measure the connecting rod small end bore diameter.

Standard connecting rod small end bore diameter:

20.012 to 20.021 mm (0.78787 to 0.78823 in.)



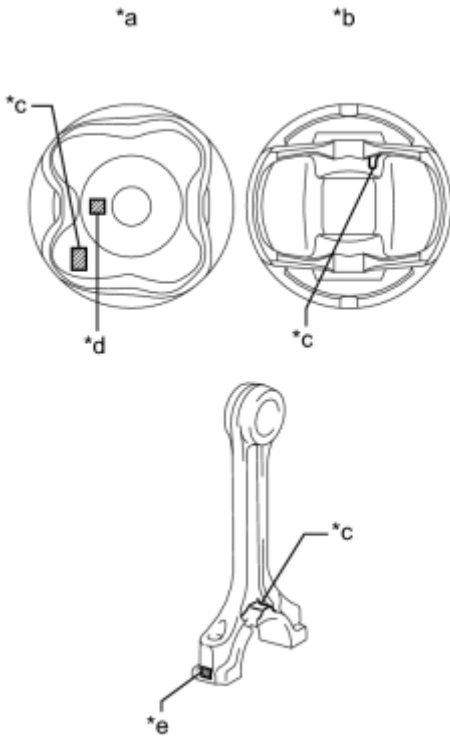
Item	Specified Condition
Mark A	20.012 to 20.015 mm (0.78787 to 0.78799 in.)
Mark B	20.016 to 20.018 mm (0.78803 to 0.78811 in.)
Mark C	20.019 to 20.021 mm (0.78815 to 0.78823 in.)

If the diameter is not as specified, replace the connecting rod.

(d) Subtract the piston pin diameter measurement from the piston pin bore diameter measurement.

Text in Illustration

*a	Upper Side:
*b	Lower Side:
*c	Front Mark
*d	Piston Pin Bore Diameter Mark
*e	Connecting Rod Small Bore Diameter Mark



Standard oil clearance:

-0.001 to 0.005 mm (-0.0000394 to 0.000197 in.)

Maximum oil clearance:

0.010 mm (0.000394 in.)

If the oil clearance is more than the maximum, replace the connecting rod.
If necessary, replace the piston and piston with pin as a set.

(e) Subtract the piston pin diameter measurement from the connecting rod small end bore diameter measurement.

Standard oil clearance:

0.005 to 0.011 mm (0.000197 to 0.000433 in.)

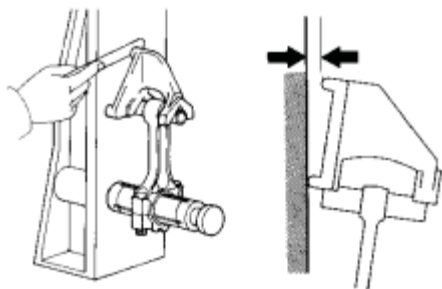
Maximum oil clearance:

0.014 mm (0.000551 in.)

If the oil clearance is more than the maximum, replace the connecting rod small end bush. If necessary, replace the piston with pin as a set.

8. INSPECT CONNECTING ROD SUB-ASSEMBLY

(a) Using a connecting rod aligner and feeler gauge, check the connecting rod alignment.

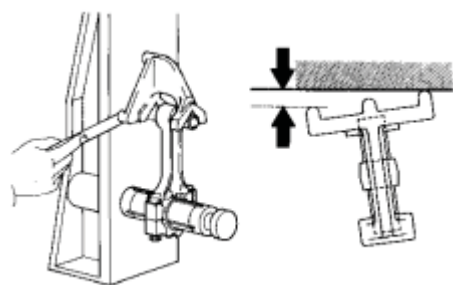


(1) Check for misalignment.

Maximum misalignment:

0.05 mm (0.00197 in.) per 100 mm (3.94 in.)

If the misalignment is more than the maximum, replace the connecting rod.



(2) Check for twist.

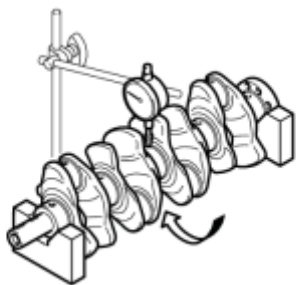
Maximum twist:

0.15 mm (0.00591 in.) per 100 mm (3.94 in.)

If the twist is more than the maximum, replace the connecting rod.

9. INSPECT CRANKSHAFT

(a) Inspect the circle runout.



(1) Using a dial indicator and V-blocks, measure the circle runout as shown in the illustration.

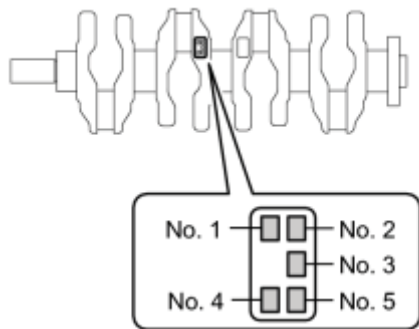
Maximum circle runout:

0.03 mm (0.00118 in.)

If the circle runout is more than the maximum, replace the crankshaft.

(b) Inspect the main journals.

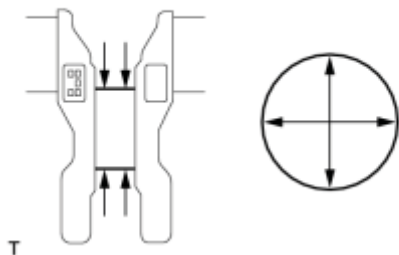
(1) Using a micrometer, measure the diameter of each main journal.



Standard diameter:

47.988 to 48.000 mm (1.8893 to 1.8898 in.)

If the diameter is not as specified, check the crankshaft oil clearance.



(2) Check each main journal for taper and distortion as shown in the illustration.

Maximum taper and distortion:

0.004 mm (0.000157 in.)

If the taper and distortion are more than the maximum, replace the crankshaft.

Standard Diameter (Reference):

Mark	Specified Condition
0	47.999 to 48.000 mm (1.88972 to 1.88976 in.)
1	47.997 to 47.998 mm (1.88964 to 1.88968 in.)
2	47.995 to 47.996 mm (1.88956 to 1.88960 in.)
3	47.993 to 47.994 mm (1.88948 to 1.88952 in.)
4	47.991 to 47.992 mm (1.88941 to 1.88945 in.)
5	47.988 to 47.990 mm (1.88929 to 1.88937 in.)

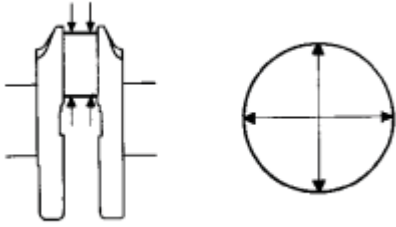
(c) Inspect the crank pin.

(1) Using a micrometer, measure the diameter of each crank pin.

Standard diameter:

43.992 to 44.000 mm (1.7320 to 1.7323 in.)

If the diameter is not as specified, check the connecting rod oil clearance.



(2) Inspect each crank pin for taper and distortion.

Maximum taper and distortion:

0.004 mm (0.000157 in.)

If the taper and distortion are more than the maximum, replace the crankshaft.

10. INSPECT CRANKSHAFT OIL CLEARANCE

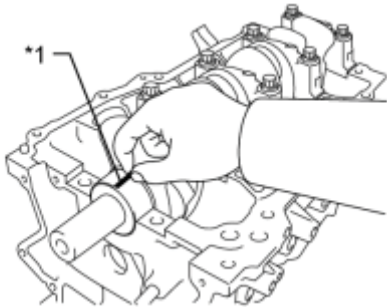
(a) Check the crankshaft journals and bearings for pitting and scratches.

(b) Install the crankshaft bearings **INFC**.

(c) Install the upper crankshaft thrust washers **INFC**.

(d) Clean each main journal and bearing.

(e) Place the crankshaft on the cylinder block.



(f) Lay a strip of Plastigage across each journal.

Text in Illustration

*1	Plastigage
----	------------

(g) Examine the front marks and numbers and place the bearing caps on the cylinder block.

HINT:

A number is marked on each crankshaft bearing cap to indicate the installation position.

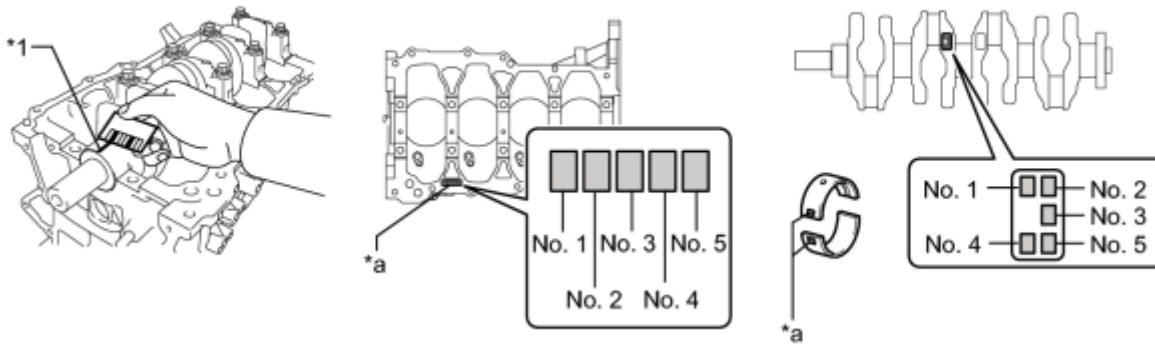
(h) Install the crankshaft bearing cap **INFC**.

NOTICE:

Do not turn the crankshaft.

(i) Remove the crankshaft bearing caps INFO.

(j) Measure the Plastigage at its widest point.



T

Text in Illustration

*1	Plastigage	*a	Number Mark
----	------------	----	-------------

Standard oil clearance:

0.016 to 0.039 mm (0.000630 to 0.00154 in.)

Maximum oil clearance:

0.050 mm (0.00197 in.)

If the oil clearance is more than the maximum, replace the crankshaft bearing. If necessary, replace the crankshaft.

NOTICE:

Remove the Plastigage completely after the measurement.

HINT:

If replacing a bearing, select a new one with the same number. If the number of the bearing cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft. Then select a new bearing with the calculated number according to the chart below. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

- Example:

Cylinder block "3" + Crankshaft "5" = Total number 8 (Use bearing "3")

Bearing Chart

Cylinder Block + Crankshaft	Bearing to be Used
0 to 2	"1"
3 to 5	"2"
6 to 8	"3"
9 to 11	"4"

Standard Cylinder Block Journal Bore Diameter:

Item	Specified Condition
Mark 0	52.000 to 52.002 mm (2.04724 to 2.04732 in.)
Mark 1	52.003 to 52.004 mm (2.04736 to 2.04740 in.)
Mark 2	52.005 to 52.006 mm (2.04744 to 2.04752 in.)
Mark 3	52.007 to 52.009 mm (2.04752 to 2.04759 in.)
Mark 4	52.010 to 52.011 mm (2.04763 to 2.04767 in.)
Mark 5	52.012 to 52.013 mm (2.04771 to 2.04775 in.)
Mark 6	52.014 to 52.016 mm (2.04779 to 2.04787 in.)

Standard Crankshaft Journal Diameter:

Item	Specified Condition
Mark 0	47.999 to 48.000 mm (1.88972 to 1.88976 in.)
Mark 1	47.997 to 47.998 mm (1.88964 to 1.88968 in.)
Mark 2	47.995 to 47.996 mm (1.88956 to 1.88961 in.)
Mark 3	47.993 to 47.994 mm (1.88948 to 1.88952 in.)
Mark 4	47.991 to 47.992 mm (1.88941 to 1.88945 in.)
Mark 5	47.988 to 47.990 mm (1.88929 to 1.88937 in.)

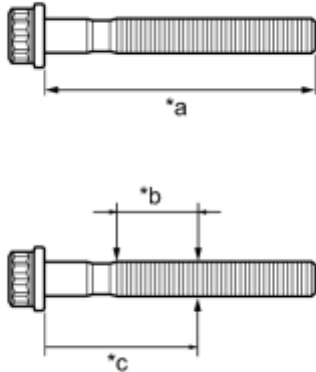
Standard Bearing Center Wall Thickness:

Item	Specified Condition
Mark 1	1.994 to 1.997 mm (0.07850 to 0.07862 in.)
Mark 2	1.998 to 2.000 mm (0.07866 to 0.07874 in.)
Mark 3	2.001 to 2.003 mm (0.07878 to 0.07886 in.)
Mark 4	2.004 to 2.006 mm (0.07890 to 0.07898 in.)

11. INSPECT CRANKSHAFT BEARING CAP SET BOLT

(a) Using a vernier caliper, measure the length of the crankshaft bearing cap set bolt from the seat to end.

Text in Illustration



*a	Measurement Length
*b	Measurement Area
*c	Distance

Standard bolt length:

84.3 to 85.7 mm (3.32 to 3.37 in.)

Maximum bolt length:

86.7 mm (3.41 in.)

If the length is more than the maximum, replace the crankshaft bearing cap set bolt.

(b) Using a vernier caliper, measure the tension portion diameter of the bolts.

Measurement point:

55.0 mm (0.197 in.)

Standard diameter:

9.77 to 9.96 mm (0.385 to 0.392 in.)

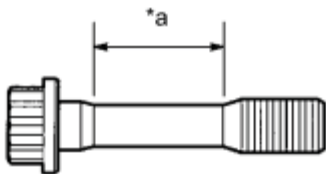
Minimum diameter:

9.1 mm (0.358 in.)

If the diameter is less than the minimum, replace the crankshaft bearing cap set bolt.

12. INSPECT CONNECTING ROD BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.



Text in Illustration

*a	Measurement Area
----	------------------

Standard diameter:

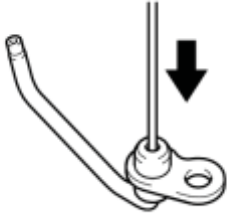
6.6 to 6.7 mm (0.260 to 0.264 in.)

Minimum diameter:

6.4 mm (0.252 in.)

If the diameter is less than the minimum, replace the connecting rod bolt.

13. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY



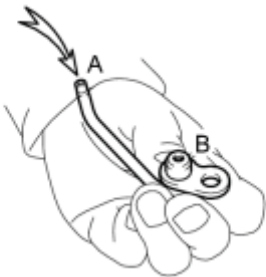
(a) Push the check valve with a pin to check if it is stuck.

If stuck, replace the No. 1 oil nozzle.

P

(b) Push the check valve with a pin to check if it moves smoothly.

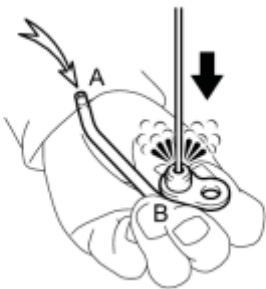
If it does not move smoothly, clean or replace the No. 1 oil nozzle.



(c) Apply air into A. Check that air does not leak through B.

If air leaks, clean or replace the No. 1 oil nozzle.

P



(d) Push the check valve while applying air into A. Check that air passes through B.

If air does not pass through B, clean or replace the No. 1 oil nozzle.

P

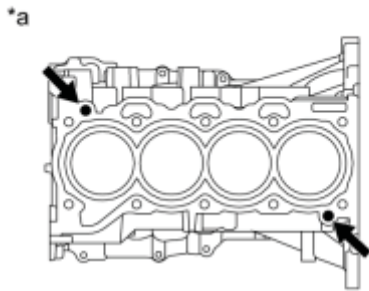
REPLACEMENT

1. REPLACE RING PIN

NOTICE:

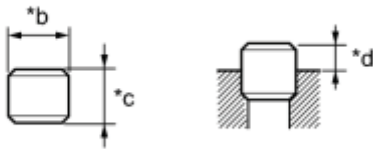
It is not necessary to remove a ring pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in the ring pins.



Text in Illustration

*a	Upper Side:
*b	Width
*c	Height
*d	Protrusion Height



Standard Ring Pin:

Item	Height	Width	Protrusion
Ring Pin	14.3 to 14.7 mm (0.563 to 0.579 in.)	12.9 to 13.0 mm (0.508 to 0.512 in.)	7.5 to 8.5 mm (0.295 to 0.335 in.)

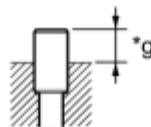
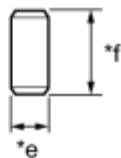
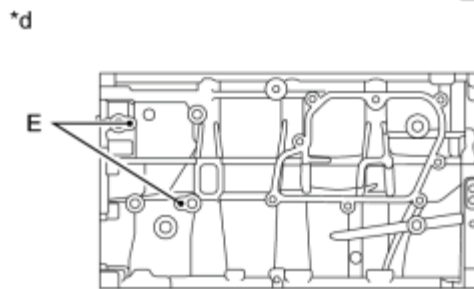
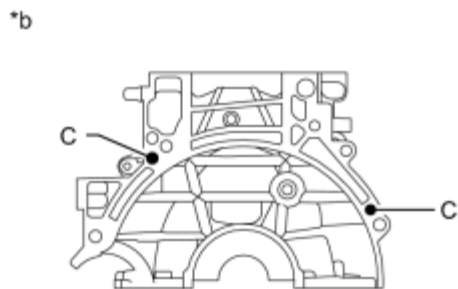
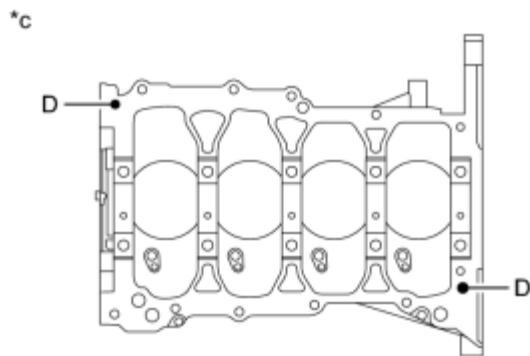
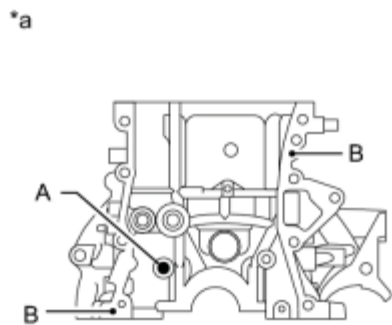
T

2. REPLACE STRAIGHT PIN

NOTICE:

It is not necessary to remove a straight pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in the straight pin.



T

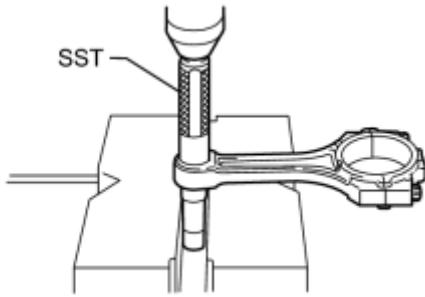
Text in Illustration

*a	Front Side:	*b	Rear Side:
*c	Lower Side:	*d	LH Side:
*e	Width	*f	Height
*g	Protrusion Height	-	-

Standard Straight Pin:

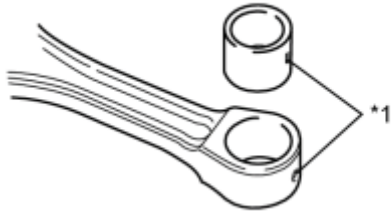
Item	Height	Width	Protrusion
Pin A	36 mm (1.42 in.)	10 mm (0.394 in.)	18.5 to 19.5 mm (0.728 to 0.768 in.)
Pin B	12 mm (0.472 in.)	4 mm (0.156 in.)	5.0 to 7.0 mm (0.197 to 0.276 in.)
Pin C	22 mm (0.866 in.)	10 mm (0.394 in.)	11 to 13 mm (0.433 to 0.512 in.)
Pin D	15 mm (0.591 in.)	8 mm (0.315 in.)	5.0 to 7.0 mm (0.197 to 0.276 in.)
Pin E	12 mm (0.472 in.)	4 mm (0.156 in.)	5.0 to 6.0 mm (0.197 to 0.236 in.)

3. REPLACE CONNECTING ROD SMALL END BUSH



(a) Using SST and a press, press out the connecting rod small end bush.

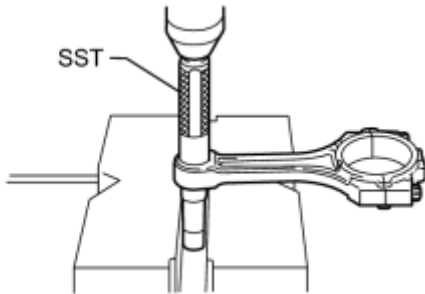
SST: 09222-30010



(b) Align the oil holes of a new connecting rod small end bush and the connecting rod.

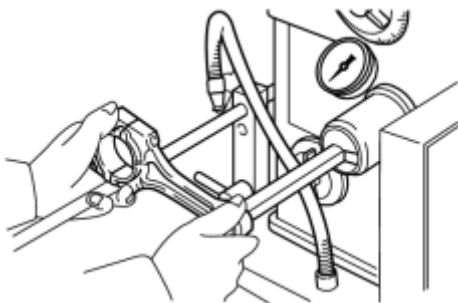
Text in Illustration

*1	Oil Hole
----	----------



(c) Using SST and a press, press in the connecting rod small end bush.

SST: 09222-30010

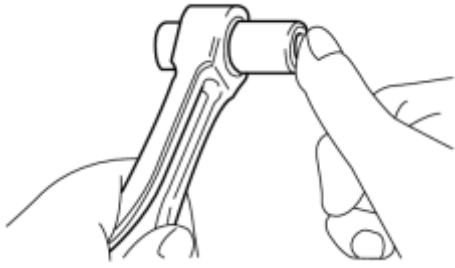


(d) Using a pin hole grinder, hone the bush to obtain the standard oil clearance between the bush and piston pin.

Standard oil clearance:

0.005 to 0.011 (0.000197 to 0.000433 in.)

(e) Coat the piston pin with engine oil. Push the piston pin into the connecting rod with your thumb to check that the piston pin fits at normal room temperature.



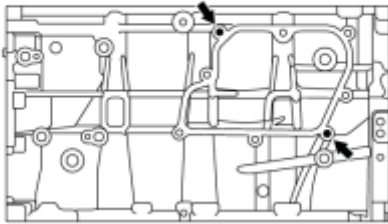
REASSEMBLY

1. INSTALL STUD BOLT

NOTICE:

If the stud bolt is deformed or the threads are damaged, replace it.

*a

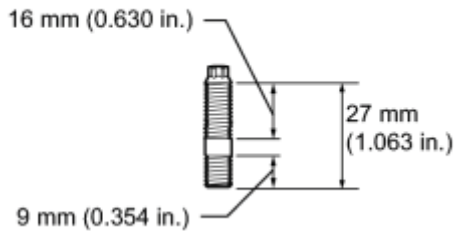


(a) Using an E6 "TORX" socket, install the stud bolts as shown in the illustration.

Text in Illustration

*a

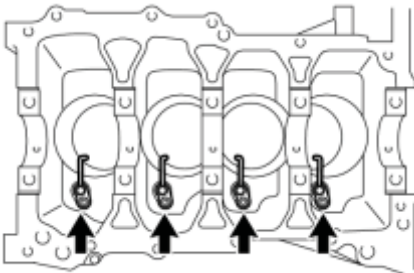
LH Side:



Torque: **5.0 N·m (51 kgf·cm, 44in·lbf)**

T

2. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY



(a) Using a 5 mm socket hexagon wrench, install the 4 oil nozzles with the 4 bolts.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

T

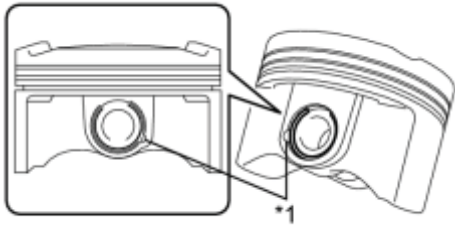
3. INSTALL PISTON

(a) Using a screwdriver, install a new snap ring at one end of the piston pin hole.

Text in Illustration

*1

Service Hole

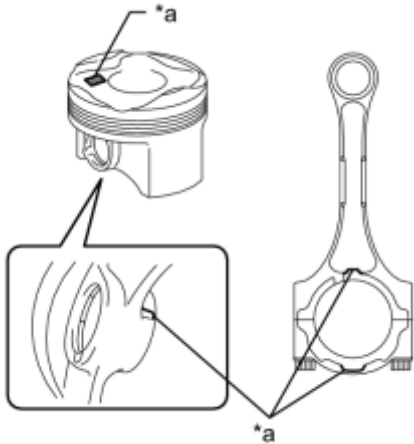


HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

T

(b) Gradually heat the piston to approximately 80 to 90°C (176 to 194°F).



(c) Align the front marks of the piston and connecting rod, insert the connecting rod into the piston, and then push in the piston pin with your thumb until the pin comes into contact with the snap ring.

Text in Illustration

*a	Front Mark
----	------------

HINT:

The piston and pin are a matched set.

T

(d) Using a screwdriver, install a new snap ring on the other end of the piston pin hole.

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



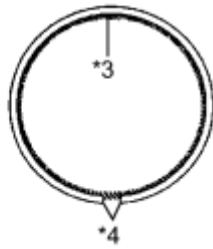
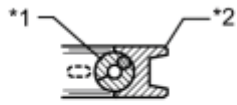
(e) Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.

T

4. INSTALL PISTON RING SET

(a) Install the oil ring expander and oil ring by hand.

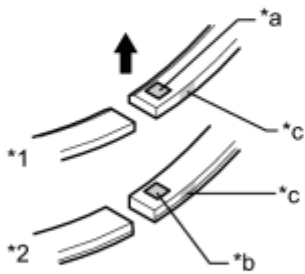
Text in Illustration



*1	Oil Ring Expander
*2	Oil Ring
*3	Coil Joint
*4	Oil Ring End

- Install the expander and oil ring so that their ring ends are at opposite sides.
- Securely install the expander to the inner groove of the oil ring.

(b) Using a piston ring expander, install the 2 compression rings so that the paint marks are positioned as shown in the illustration.



Text in Illustration

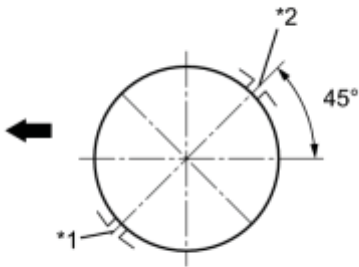
*1	No. 1 Compression Ring
----	------------------------

*2	No. 2 Compression Ring
*3	Piston Ring Expander
*a	Code Mark (1R)
*b	Code Mark (2R)
*c	Paint Mark
	Upward


NOTICE:

- Install the No. 1 compression ring with the code mark (1R) facing upward.
- Install the No. 2 compression ring with the code mark (2R) facing upward.
- Paint marks can only be checked on new piston rings. When reusing piston rings, check each piston ring profile in order to install them into the correct positions.

(c) Position the piston rings so that the ring ends are as shown in the illustration.



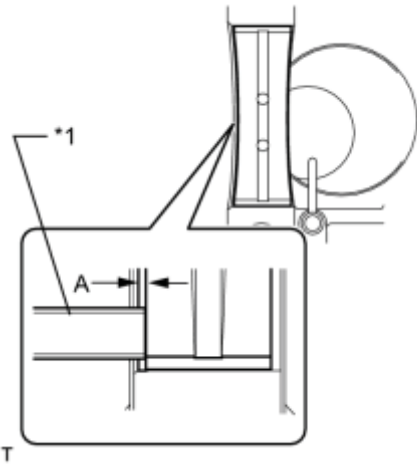
Text in Illustration

*1	No. 1 compression ring and Oil Ring
*2	No. 2 compression ring and Oil Ring Expander
	Engine Front

5. INSTALL CRANKSHAFT BEARING

(a) Install the upper bearing (except No. 3 journal).

Text in Illustration



*1	Vernier Caliper
----	-----------------

(1) Install the upper bearing to the cylinder block.

HINT:

Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.

(2) Using a vernier caliper, measure the distance between the cylinder block edge and the upper bearing edge.

Standard dimension (A):

0.5 to 1.0 mm (0.0197 to 0.0394 in.)

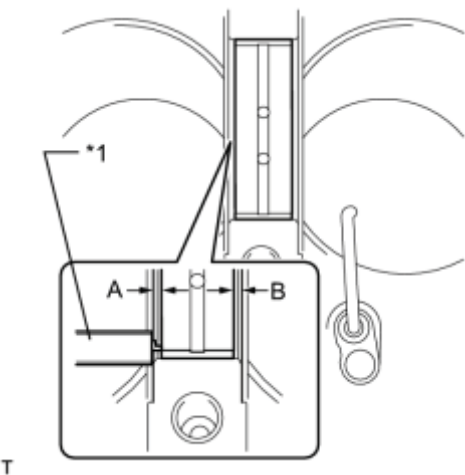
NOTICE:

Do not apply engine oil to the bearings or the contact surfaces.

(b) Install the upper bearing (for No. 3 journal).

Text in Illustration

*1	Vernier Caliper
----	-----------------



(1) Install the upper bearing to the cylinder block.

HINT:

Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.

(2) Using a vernier caliper, measure the distance between the cylinder block edge and the upper bearing edge.

Standard dimension (A - B):

0.7 mm (0.0276 in.) or less

NOTICE:

Do not apply engine oil to the bearing or the contact surfaces.

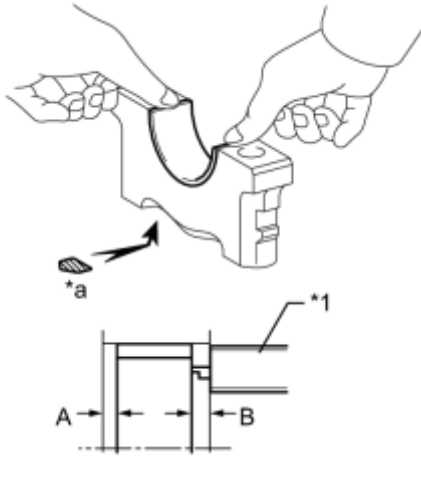
(c) Install the lower bearing.

(1) Install the upper bearing to the cylinder block.

HINT:

Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.

(2) Using a vernier caliper, measure the distance between the bearing cap edge and the lower bearing edge.



Text in Illustration

*1	Vernier Caliper
*a	Mark 1, 2, 3, 4 or 5

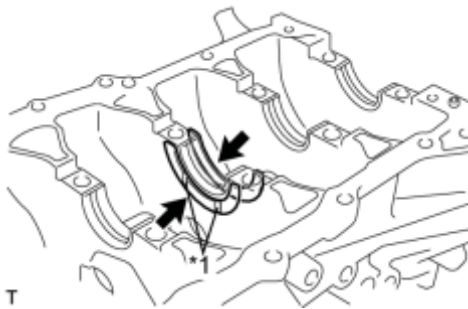
Standard dimension (A - B):

0.7 mm (0.0276 in.) or less

NOTICE:

Do not apply engine oil to the bearings or the contact surfaces.

6. INSTALL UPPER CRANKSHAFT THRUST WASHER



(a) Install the 2 thrust washers to the No. 3 journal position of the cylinder block with the oil grooves facing outward.

Text in Illustration

*1	Oil Groove
----	------------

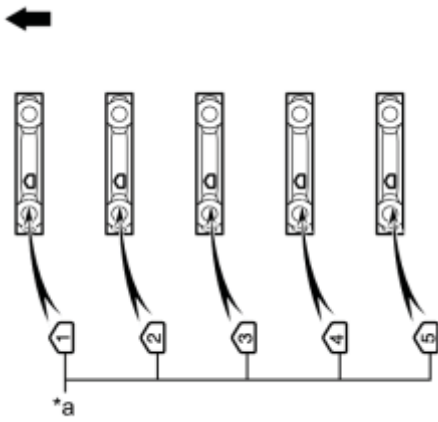
(b) Apply engine oil to the crankshaft thrust washer.

7. INSTALL CRANKSHAFT

(a) Apply engine oil to the upper bearings and install the crankshaft to the cylinder block.

(b) Apply engine oil to the lower bearings.

(c) Examine the number marks and install the bearing caps to the cylinder block.

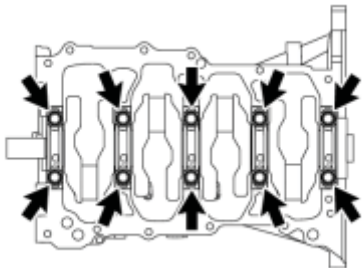


T

Text in Illustration

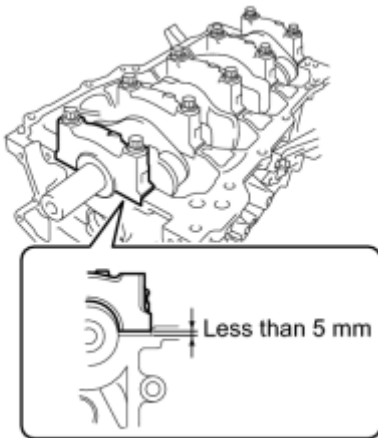
*a	Number Mark
➔	Engine Front

(d) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.



T

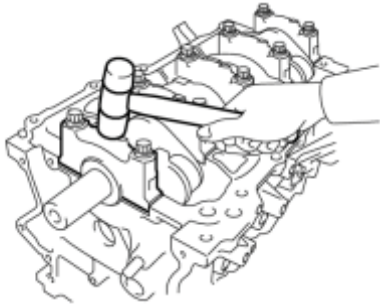
(e) Temporarily install the 10 crankshaft bearing cap bolts.



T

(f) Push on the crankshaft bearing caps with your hand until the clearance between the crankshaft bearing caps and cylinder block is less than 5 mm (0.197 in.).

(g) Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.



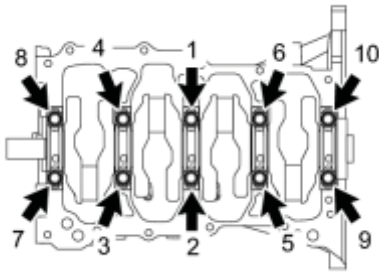
T

(h) Install the crankshaft bearing cap bolts.

NOTICE:

The crankshaft bearing cap bolts are tightened in 2 progressive steps.

(i) Step 1:



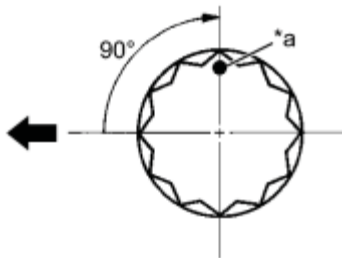
T

(1) Install and uniformly tighten the 10 crankshaft bearing cap bolts in the sequence shown in the illustration.

Torque: **40 N·m (408 kgf·cm, 30ft·lbf)**

(j) Step 2:

(1) Mark the front of the bearing cap bolts with paint.



Text in Illustration

*a	Paint Mark
➔	Engine Front

(2) Tighten the bearing cap bolts 90° in the sequence shown in step 1.

(k) Check that the paint marks are now at a 90° angle to the front.

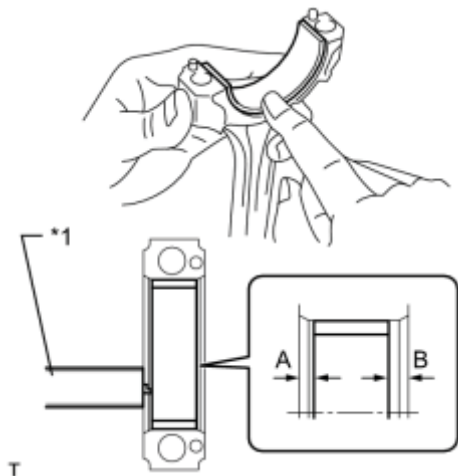
(l) Check that the crankshaft turns smoothly.

(m) Check the crankshaft thrust clearance INFO.

8. INSTALL CONNECTING ROD BEARING

(a) Install the connecting rod bearings to the connecting rods and connecting rod caps.

(b) Using a vernier caliper, measure the distance between the edges of the connecting rods and connecting cap bearings, and the connecting rod caps and the connecting rod bearings.



Text in Illustration

*1	Vernier caliper
----	-----------------

Standard dimension A - B or B - A:

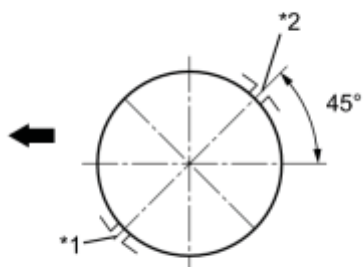
0 to 0.7 mm (0 to 0.0276 in.)

NOTICE:

Do not apply engine oil to the bearings or the contact surfaces.

9. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

(a) Apply engine oil to the cylinder walls, pistons, and the surfaces of the connecting rod bearings.



Text in Illustration

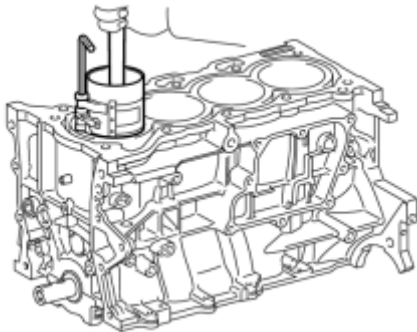
*1	No. 1 compression ring and Oil Ring
----	-------------------------------------

*2	No. 2 compression ring and Oil Ring Expander
	Engine Front

(b) Position the piston rings so that the ring ends are as shown in the illustration.

NOTICE:

Do not align the ring ends.

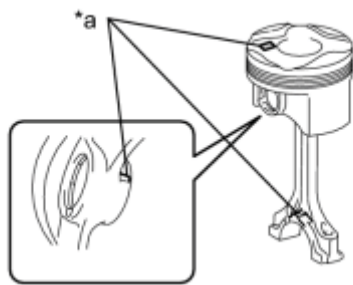


(c) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into the cylinder with the front mark of the piston facing forward.

Text in Illustration

*a	Front Mark
----	------------

- When inserting the piston with connecting rod, do not allow it to make contact with the oil nozzle.
- Match the numbered connecting rod cap with the connecting rod.



(d) Check that the front mark of the connecting rod cap is facing in the correct direction.

Text in Illustration

*a	Front Mark
----	------------

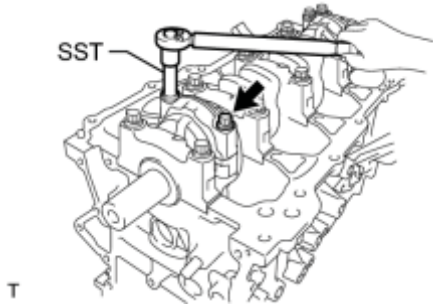
(e) Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.

(f) Install the connecting rod cap bolts.

NOTICE:

The connecting rod cap bolts should be tightened in 2 progressive steps.

(g) Step 1:



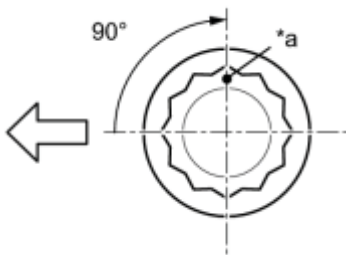
(1) Using SST, install and alternately tighten the bolts of the connecting rod cap in several steps.

SST: 09205-16011

Torque: **20 N·m (204 kgf·cm, 15ft·lbf)**

(h) Step 2:

(1) Mark the front of the connecting rod cap bolts with paint.



P

Text in Illustration

*a	Paint Mark
➔	Engine Front

(2) Tighten the cap bolts 90° as shown in the illustration.

(i) Check that the crankshaft turns smoothly.

(j) Check the connecting rod thrust clearance INFO.

10. INSTALL NO. 1 VENTILATION CASE

(a) Apply seal packing in a continuous line as shown in the illustration.

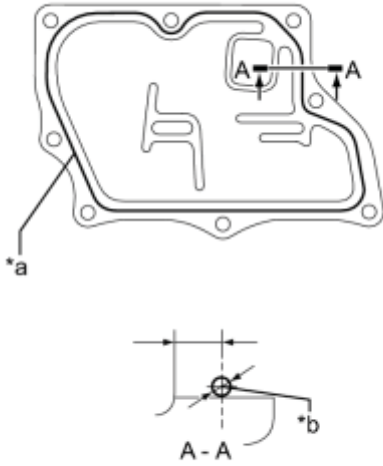
Text in Illustration

*a	Seal Packing
*b	Seal Packing Diameter

Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

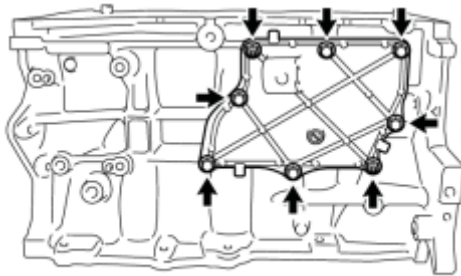
Application Specification:



Seal Packing Diameter	Distance from inside edge of cover to center of seal packing
2.0 to 3.0 mm (0.0787 to 0.118 in.)	3.0 mm (0.118 in.)

- Remove any oil from the contact surface.
- Install the ventilation case within 3 minutes and tighten the bolts and nuts within 15 minutes of applying seal packing.
- Do not start the engine for at least 2 hours after installation.

T



(b) Install the ventilation case with the 6 bolts and 2 nuts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

T