GROUP 11B

ENGINE OVERHAUL

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GENERAL SPECIFICATIONS

M1113000203240

Item		3A92	
Total displacement cm ³ (d	cu in)	1,193 (72.8)	
Bore × stroke mm (in)		75.0 (2.95) × 90.0 (3.54)	
Compression ratio		10.5	
Combustion chamber		Pentroof type	
Camshaft arrangement		DOHC	
Valve timing	Intake opening	BTDC 41° – ATDC 9°	
	Intake closing	ABDC 19° – ABDC 69°	
	Exhaust opening	BBDC 35°	
	Exhaust closing	ATDC 5°	
Fuel system		Electronically controlled multiport fuel injection	
Ignition system		Electronic-controlled 3-coil	

SERVICE SPECIFICATIONS

M1113000303742

Item		Standard value	Limit
Timing chain			
Valve clearance [cold engine] mm (in)	Intake	$0.22 \pm 0.04 \; (0.009 \pm 0.001)$	_
	Exhaust	$0.30 \pm 0.04 \; (0.012 \pm 0.001)$	_
Camshaft			1
Cam height mm (in)	Intake	44.81 (1.764)	44.31 (1.744)
	Exhaust	43.98 (1.731)	43.48 (1.712)
Cylinder head and valves			
Cylinder head bottom face distortion mm (in)		0.03 (0.001) or less	_
Cylinder head overall height mm (in)		112.9 – 113.1 (4.445 – 4.452)	_
Valve margin mm (in)	Intake	0.85 (0.033)	_
	Exhaust	1.50 (0.059)	_
Valve length mm (in)	Intake	87.21 (3.433)	86.71 (3.414)
	Exhaust	88.54 (3.486)	88.04 (3.466)
Valve spring free length mm (in)		49.6 (1.95)	48.6 (1.91)
Valve spring out-of-squareness		2° or less	4°
Valve stem-to-guide clearance mm (in)	Intake	0.020 - 0.047 (0.0008 - 0.0018)	0.10 (0.004)
	Exhaust	0.030 - 0.057 (0.0012 - 0.0022)	0.15 (0.006)
Valve seat contact width mm (in)		1.1 – 1.5 (0.044 – 0.059)	_
Valve guide press-fit height mm (in)		12.7 – 13.3 (0.50 – 0.52)	_

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SEALANTS AND ADHESIVES

M1113000503940

Item	Specified sealant and adhesive	Remark	
Engine coolant temperature sensor	LOCTITE 262, ThreeBond 1324N or equivalent	Anaerobic adhesive	
Cylinder block crank angle sensor mounting face	ThreeBond 1207F (MITSUBISHI MOTORS GENUINE Part No.1000A992) or equivalent	Semi-drying sealant	
Engine oil pressure switch	ThreeBond 1215, ThreeBond 1141J, ThreeBond 1212D or equivalent		
Timing chain case (matching area of the cylinder block, the cylinder head gasket and the cylinder head)	ThreeBond 1217G (MITSUBISHI MOTORS GENUINE Part No.1000A923), LOCTITE 5900, LOCTITE 5970 or equivalent		
Cylinder head cover (matching area of the cylinder head and timing chain case)			
Cylinder head gasket (matching area of the cylinder block, the cylinder head gasket and the cylinder head)			
Timing chain case (Area of the water pump)	ThreeBond 1227D, ThreeBond 1207F (MITSUBISHI MOTORS GENUINE Part No.1000A992) or equivalent		
Oil pan Oil seal case	ThreeBond 1217G (MITSUBISHI MOTORS GENUINE Part No.1000A923), ThreeBond 1227D, LOCTITE 5900, LOCTITE 5970 or equivalent		
Flywheel bolt <m t=""></m>	LOCTITE 2701 or equivalent	Anaerobic	
Drive plate bolt <cvt></cvt>	LOCTITE 2701, ThreeBond 1324 or equivalent	adhesive	

NOTE: The number in brackets shows the genuine part number.

LIQUID GASKET (FIPG)

FIPG is used for some parts in the engine. It is necessary to pay attention to an application amount, application procedure and applied surface condition for this gasket to fully achieve its purpose.

Too small application amount of FIPG or the dirty surface where the FIPG is applied might cause the water or oil leakage. Too large application amount of FIPG overflows and might clog or narrow the passage of water or oil. It is absolutely essential that the surface where the FIPG is applied must be cleaned and the appropriate amount of FIPG must be evenly applied to prevent the leakage from the connected area.

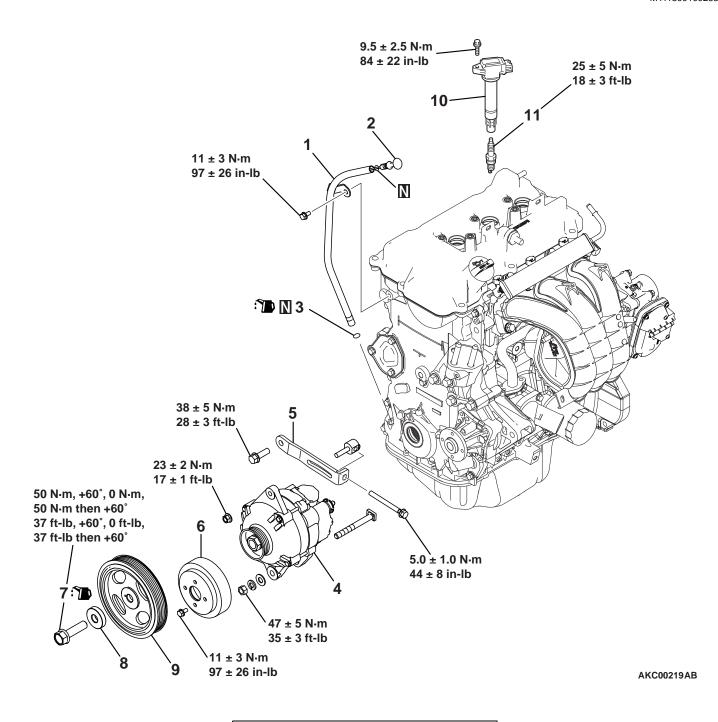
FIPG used for engine parts hardens reacting with moisture in the air, and is usually used for metal flanges.

Tool	Tool number and name	Supersession	Application
MB991614	MB991614 Angle gauge	General service tool	Tightening crankshaft bearing cap bolt

GENERATOR AND IGNITION SYSTEM

REMOVAL AND INSTALLATION

M1113001002837



REMOVAL SERVICE POINT

<<A>> FUEL RAIL AND FUEL INJECTOR ASSEMBLY REMOVAL

↑ CAUTION

Do not drop the fuel injector.

Remove the fuel rail with the fuel injectors attached to it.

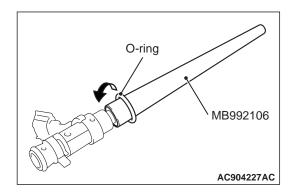
INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

- 1. Apply a small amount of new engine oil to the O-ring.
- While turning the fuel injector to the right and left, install the O-ring to the fuel injector with care not to damage the O-ring.

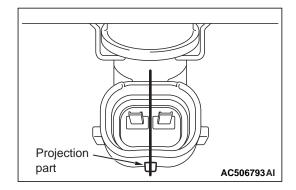
>>B<< O-RING INSTALLATION

- 1. Apply a small amount of new engine oil to the O-ring.
- 2. Using special tool O-ring installer (MB992106), install the fuel injector paying attention to avoid damage to the O-ring.



>>C<< FUEL INJECTOR ASSEMBLY INSTALLATION

- 1. Apply a small amount of new engine oil to the O-ring.
- Turning the fuel injector assembly to right and left, install it to the fuel rail with care not to damage the O-ring. After the installation, check for its smooth rotation. At this time, check that the projection part of the fuel injector assembly is in the center.
- If the rotation is not smooth, the O-ring may be caught. Remove the fuel injector assembly and check the O-ring for damage. After this, re-insert it to the fuel rail and check for its smooth rotation.



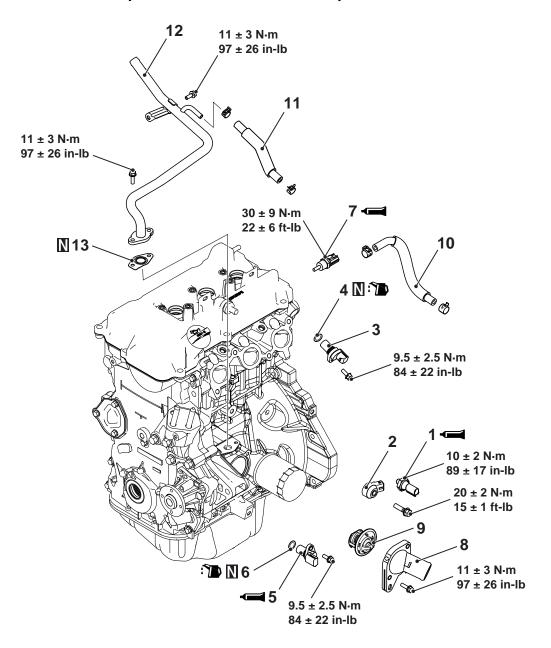
WATER HOSE AND PIPE

REMOVAL AND INSTALLATION

M1113010201018

⚠ CAUTION

- When removing or installing the camshaft position sensor or crankshaft position sensor, be careful not to apply impact to the sensor.
- Do not reuse the camshaft position sensor or crankshaft position sensor that has been dropped.



ACC06785AB

Removal steps

>>**G**<< 1. Engine oil pressure switch

>>F<< 2. Knock sensor

3. Camshaft position sensor

4. O-ring

>>**E**<< 5. Crankshaft position sensor

6. O-ring

>>**D**<< 7. Engine coolant temperature sensor

Removal steps (Continued)

8. Water inlet fitting

>>C<< 9. Thermostat

>>**B**<< 10.Water hose A

11. Water hose B

12. Water pipe

>>A<< 13.Water pipe gasket

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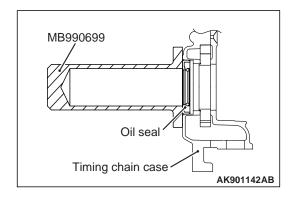
INSTALLATION SERVICE POINTS

>>A<< FRONT OIL SEAL INSTALLATION

⚠ CAUTION

When installing the front oil seal, be careful to avoid damage to the front oil seal.

- Using special tool differential oil seal installer (MB990699), drive the oil seal so that it is flush with the timing chain case.
- 2. Apply a small amount of engine oil to the entire inner circumference of the oil seal lip.

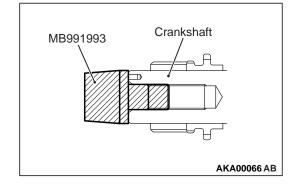


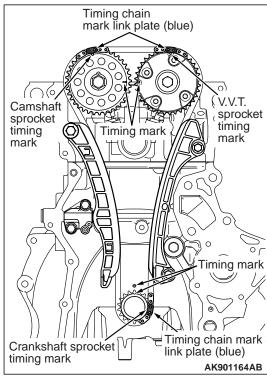
>>B<< SERVICE HOLE BOLT / TIMING CHAIN CASE INSTALLATION

↑ CAUTION

Sufficiently check that there is no residual oil on the place where degreasing is performed. If fingerprints are left, do not touch it with bare hands after the degreasing, since the oils from your fingers will harm the seal ability.

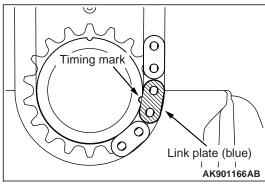
- 1. Remove any liquid gasket remaining on the timing chain case, the cylinder block, and the cylinder head.
- 2. Install special tool crankshaft front oil seal guide (MB991993) onto the crankshaft.



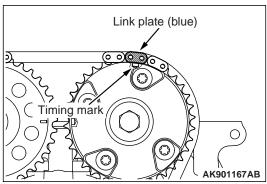


>>C<< TIMING CHAIN INSTALLATION

1. Place the timing chain such that the blue link that is away from the other two blue links of the chain is on the crankshaft side.



2. Install the timing chain onto the crankshaft sprocket, aligning the blue link with the mark on the sprocket.

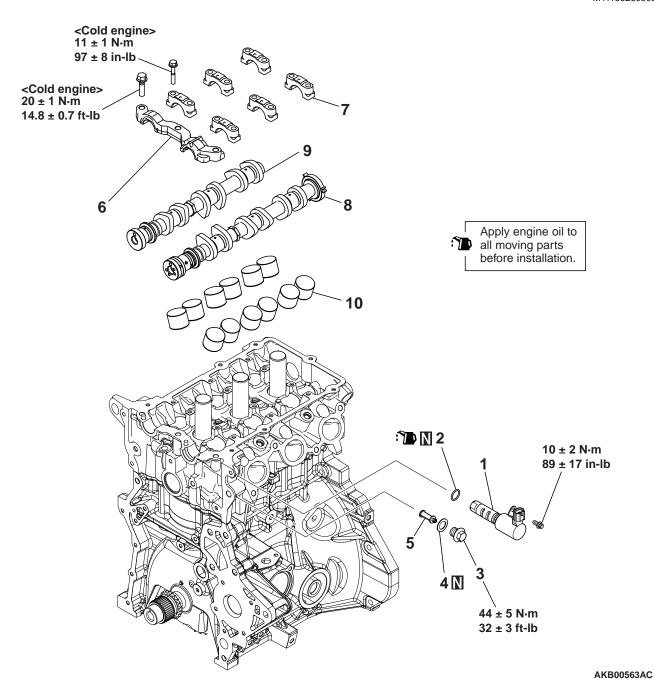


3. Install the chain onto the V.V.T. sprocket, aligning the blue link with the mark on the sprocket.

CAMSHAFT

REMOVAL AND INSTALLATION

M1113026900983



Removal steps

>>**D**<< 1. Oil feeder control valve (OCV)

>>**D**<< 2. O-ring

3. Oil feeder control valve filter bolt

4. Gasket

>>**C**<< 5. Oil feeder control valve filter

Removal steps (Continued)

<<A>>> >B<< 6. Front camshaft bearing cap

<<A>>> >B<< 7. Camshaft bearing cap

>>**B**<< 8. Intake camshaft

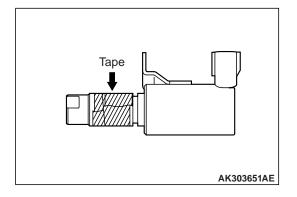
>>**B**<< 9. Exhaust camshaft

<<**B**>> >> **A**<< 10. Valve tappet

>>D<< O-RING/OIL FEEDER CONTROL VALVE INSTALLATION

⚠ CAUTION

- Do not reuse the O-ring.
- Install the O-ring after wrap a tape not having adhesion (such as a seal tape) round the notch on the oil passage of oil feeder control valve to prevent it from damage.
 The damaged O-ring may cause oil leakage.
- 1. Apply a little amount of engine oil to the O-ring of oil feeder control valve.
- 2. Install the oil feeder control valve to the cylinder head.
- 3. Tighten the oil feeder control valve to the specified torque of 10 \pm 2 N·m (89 \pm 17 in-lb).



INSPECTION

M1113027000983

CAMSHAFT

Measure the cam height. If the measured value exceeds the limit, replace the camshaft.

Standard value:

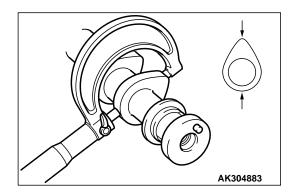
Intake: 44.81 mm (1.764 inches) Exhaust: 43.98 mm (1.731 inches)

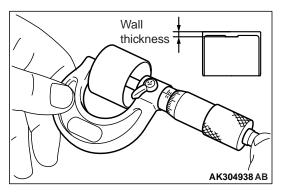
Limit:

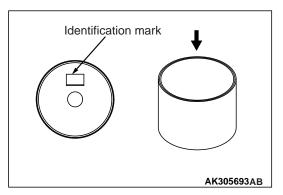
Intake: 44.31 mm (1.744 inches) Exhaust: 43.48 mm (1.712 inches)



 Measure the valve tappet at the illustrated location. If the measured valve is discord to instruction valve by identification mark and following table, replace the tappet.

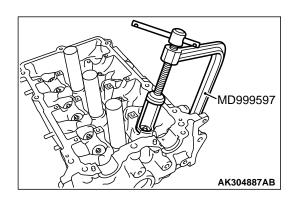






2. Every valve tappet has an identification mark stamped at the illustrated location.

Valve tappets are available in 31 sizes, at 0.02 mm (0.0008 inch) intervals in the 5.10-5.70 mm (0.2008-0.2244 inch) range, as shown in the following table.

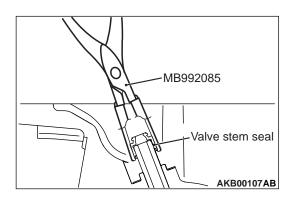


REMOVAL SERVICE POINTS

<<A>> RETAINER LOCK REMOVAL

While compressing the valve spring using special tool valve spring compressor (MD999597), remove the retainer lock.

NOTE: To facilitate reassembly, the valve, spring and other parts removed should be kept together and attached with a tag showing where it has been assembled including the cylinder number.



<> VALVE STEM SEAL REMOVAL

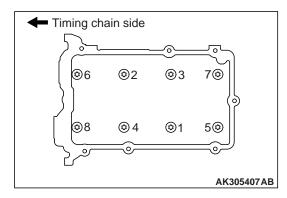
Use special tool valve stem seal pliers (MB992085) to nip the base of the stem seal (where the outside diameter is larger) securely, and remove it by twisting it to the left and right.

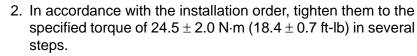
INSTALLATION SERVICE POINTS

>>A<< VALVE SPRING SEAT / VALVE STEM SEAL INSTALLATION

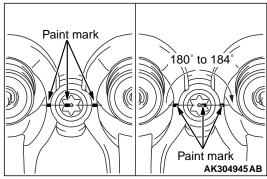
↑ CAUTION

- The valve stem seal must not be reused.
- Do not damage the tappet wall during assembly.
- Be sure to use a special tool to install the valve stem seal. Poor installation causes oil loss via valve guides.
- If oil is not applied, the valve stem seal may rise to the surface after it is press fitted.
- 1. Apply a small amount of engine oil to the press-fit part and lip part of the new valve stem seal.
- 2. Use a special tool to install the valve stem seal, obeying the following procedures.





3. Make sure all bolts reach the specified torque.



4. Put paint marks on the bolt heads and the cylinder as illustrated.

↑ CAUTION

- When the tightening angle is smaller than the specified tightening angle, the appropriate tightening capacity cannot be secured.
- When the tightening angle is larger than the specified tightening angle, remove the bolt to start from the beginning again according to the procedure.
- 5. Tighten the bolts in the correct sequence by 180 to 184 degree angle.

Ensure that the paint marks on the bolt heads and the cylinder are aligned in a straight line.

INSPECTION

M1113007003139

CYLINDER HEAD

- 1. Before cleaning, check the cylinder head for leakage of coolant or exhaust gas as well as cracks or other damage.
- 2. Remove oil, scale, sealant, carbon and other residues completely. Clean the oil passages and blow compressed air through them to verify that they are free of restriction.

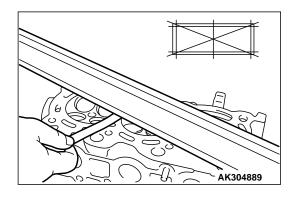
⚠ CAUTION

The grinding limit for the cylinder head and block combined is 0.2 mm (0.01 inch).

3. Using a straight edge and a thickness gauge, measure the flatness of the cylinder head bottom surface.

Bottom face distortion

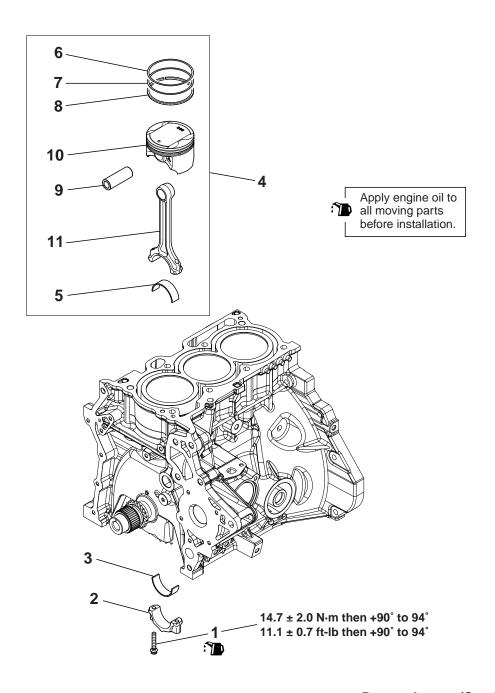
Standard value: 0.03 mm (0.001 inch) or less Cylinder head height (standard value for new part): 112.9 – 113.1 mm (4.445 – 4.452 inches)



PISTON AND CONNECTING ROD

REMOVAL AND INSTALLATION

M1113008403992



AKA00369AE

Removal steps

>>**G**<< 1. Connecting rod cap bolt

<<A>>> F<< 2. Connecting rod cap

>>**E**<< 3. Connecting rod bearing

>>**D**<< 4. Piston, connecting rod assembly

>>**E**<< 5. Connecting rod bearing

>>**C**<< 6. Piston ring, No. 1

Removal steps (Continued)

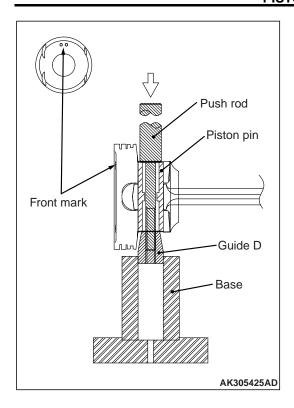
>>**C**<< 7. Piston ring, No. 2

>>**B**<< 8. Oil ring

<<**B**>> >> **A**<< 9. Piston pin

10.Piston

11. Connecting rod

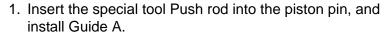


- 1. Insert the Push rod (special tool) into the piston, from the piston side with the front mark on the piston top face. Install the Guide D on the other side.
- 2. Install the piston and connecting rod assembly with the tools onto the Piston pin setting base (special tool), ensuing that the piston front mark faces upwards.
- 3. Using a press, remove the piston pin.

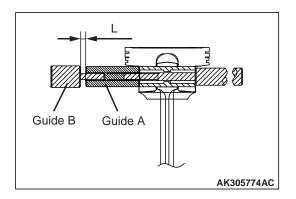
 NOTE: With the piston pin removed, keep the pin, piston and connecting rod of the same cylinder together.

INSTALLATION SERVICE POINTS

>>A<< PISTON PIN INSTALLATION



- 2. Assemble the piston and the connecting rod together, ensuring that their front marks are aligned with each other.
- 3. Apply engine oil onto the periphery of the piston pin.
- 4. Insert the piston pin assembled in step 1 above into the piston pin boss. Guide A end of the piston pin should be inserted first into the front mark end of the boss.

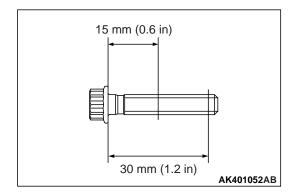


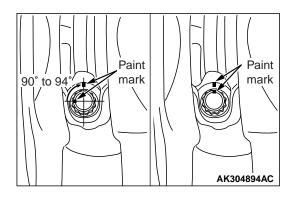
Front mark

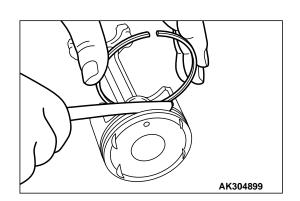
AK306099AD

5. Insert Guide B into Guide A with having 2.25 mm (0.089 inch) of the clearance "L" between Guide A and B.









>>G<< CONNECTING ROD CAP BOLT INSTALLATION

- 1. Inspect all reused connecting rod bolts according to the following procedure.
 - (1) Measure the outside diameter at 15 mm (0.6 inch) and 30 mm (1.2 inches) from the head of the connecting rod bolts shown in Figure respectively.
 - (2) When the difference between the outside diameters [measured at 15 mm (0.6 inch) and 30 mm (1.2 inches)] exceeds the standard value, replace the connecting rod bolts.

Standard value: 0 - 0.1 mm (0 - 0.003 inch)

- 2. Apply engine oil to the threaded portion and seating face of the bolt.
- 3. To correctly install the cap, loosely install the bolts with fingers.
- 4. Alternately, tighten the bolts in several steps to the specified torque of $14.7 \pm 2.0 \text{ N} \cdot \text{m}$ (11.1 \pm 0.7 ft-lb).
- 5. Put a paint mark on the bolt head as illustrated.
- 6. Put another paint mark on the bolt head at 90 to 94° in the tightening direction from the first paint mark.

⚠ CAUTION

- When the tightening angle is smaller than the specified tightening angle, the appropriate tightening capacity cannot be secured.
- When the tightening angle is larger than the specified tightening angle, remove the bolt to start from the beginning again according to the procedure.
- 7. Tighten the bolt 90° to 94°. The paint mark on the connecting rod should be aligned with the paint mark on the bolt.

INSPECTION

M1113008502725

PISTON RING

1. Measure the clearance between the piston ring and the ring groove. If the measured value exceeds the limit, replace the piston ring, or both the piston and the piston ring.

Standard value:

No. 1 ring: 0.03 - 0.07 mm (0.0012 - 0.0027 inch) No. 2 ring: 0.02 - 0.06 mm (0.0008 - 0.0023 inch)

Limit: 0.1 mm (0.004 inch)