



Workshop Manual





ENGINE COOLANT REFILLING AND BLEEDING

WARNING

Never remove the radiator cap when the engine is hot. Serious scalding could be caused by hot fluid under high pressure escaping from the radiator.

CAUTION

When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on the electrical parts or the paint. If any coolant spills, rinse it off immediately.

- 1. Slide the heater temperature control lever to maximum heat. Make sure the engine and radiator are cool to the touch.
- 2. Remove radiator cap.
- 3. Loosen the drain plug, and drain the coolant.



- 4. Tighten the radiator drain plug(A) securely.
- 5. Remove, drain and reinstall the reservoir. Fill the tank halfway to the MAX mark with water, then up to the MAX mark with antifreeze.
- 6. Fill fluid mixture with coolant and water slowly through the radiator cap. Gently squeeze the upper/lower hoses of the radiator so as to bleed air easily.

NOTE

- •Use only genuine antifreeze/coolant.
- •For best corrosion protection, the coolant concentration must be maintained year-round at 50% minimum. Coolant Coolant concentrations less than 50% may not provide sufficient protection against corrosion or freezing.
- Coolant concentrations greater then 60% will impair cooling efficiency and are not recommended.

CAUTION

- •Do not mix different brands of antifreeze/coolants.
- •Do not use additional rust inhibitors or anti-rust products; they may not be compatible with the coolant.

7. Start tart the engine and allow coolant to circula

When the cooling fan operates and coolant circulates, refill coolant through the radiator cap.

- 8. Repeat 7 until the cooling fan 3 ~ 5times and bleed air sufficiently out of the cooling system.
- 9. Install the radiator cap and fill the reservoir tank to the "MAX" line with coolant.
- 10. Run the vehicle under idle until the cooling fan operates $2 \sim 3$ times.
- 11. Stop the engine and allow coolant to cool.
- 12. Repeat steps 6 to 11 until the coolant level stays constant and all air is bleed out of the cooling system.

NOTE

Recheck the coolant level in the reservoir tank for 2 ~ 3 days after replacing coolant.

Coolant capacity : 6.0 liters (6.34 US qt, 5.28 lmp qt)

RADIATOR CAP TESTING

1. Remove the radiator cap, wet its seal with engine coolant, then install it on pressure tester.



- 2. Apply a pressure of 93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm², 13.51 ~ 17.78psi).
- 3. Check for a drop in pressure.
- 4. If the pressure drops, replace the cap.

RADIATOR LEAKAGE TEST

- 1. Wait until engine is cool, then carefully remove the radiator cap and fill the radiator with engine coolant, then install it on the pressure tester.
- Apply a pressure tester to the radiator and apply a pressure of 93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm², 13.51 ~ 17.78psi).



- 3. Inspect for engine coolant leaks and a drop in pressure.
- 4. Remove the tester and reinstall the radiator cap.

NOTE

Check for engine oil in the coolant and/or coolant in the engine oil.

REMOVAL

WATER PUMP

1. Drain the engine coolant.

WARNING

System is under high pressure when the engine is hot. To avoid danger of releasing scalding engine coolant, remove the cap only when the engine is cool.

- 2. Remove the drive belts.
- 3. Remove the timing belt. (Refer to EMA-27)
- 4. Remove the timing belt idler.
- 5. Remove the power steering pump and use a wire to secure the pump to the vehicle so that it is out of the way.
- 6. Remove the bolts(B, C) and power steering pump bracket(A).



- 7. Remove the alternator. (See EE group alternator)
- 8. Remove the water pump.
 - (1) Remove the 2 bolts(D) and alternator brace(A).
 - (2) Remove the 3 bolts(C) and remove the water pump(B) and gasket.



THERMOSTAT

NOTE

Disassembly of the thermostat would have an adverse effect, causing a lowering of cooling efficiency.

- 1. Drain the engine coolant so its level is below thermostat.
- 2. Remove the water inlet fitting(A), gasket and thermostat.



RADIATOR

1. Remove the under cover(A).



2. Drain the engine coolant. Remove the radiator cap to speed draining.



3. Remove the air duct(A).



4. Remove the battery and tray.



- 5. Remove the coolant reservoir tank(A).
- 6. Remove the radiator upper hose(B).



7. Remove the radiator lower hose(A).

8. Remove the ATF oil cooler hose(B).



- 9. Remove the cooling fan motor connector(A).
- 10. Remove the cooling fan motor assembly mounting bolt(B).
- 11. Remove the ATF oil cooler pipe(C).



- 12. Remove the cooling fan motor assembly with pulling it from the radiator.
- 13. Remove the radiator bracket(A, B).





- 14. Remove the condenser mounting bolt(A).
- 15. Remove the condenser bracket(B) with pulling the condenser from the radiator.



16. Remove the radiator from engine room.

INSTALLATION

WATER PUMP

- 1. Install the water pump.
 - (1) Install the water pump(B) and a new gasket with the 3 bolts(C).

Tightening torque :

11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lbf.ft)



(2) Install the alternator brace(A) with the 2 bolts(D).

Tightening torque :

19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lbf.ft)

2. Install the power steering pump bracket(A) and bolts(B, C).

Tightening torque : Bolts(B) : 34.3 ~ 49.0N.m (3.5 ~ 5.0kgf.m, 25.3 ~ 36.2lbf.ft) Bolts(C) : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.5lbf.ft)



- 3. Install the alternator. (See EE group alternator)
- 4. Install the power steering pump. (See ST group power steering pump)
- 5. Install the timing belt idler.
- 6. Install the timing belt. (Refer to EMA-32)
- 7. Install the water pump pulley.
- 8. Install the drive belts.
- 9. Tighten the water pump pulley bolts.

Tightening torque :

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)

10. Fill with engine coolant.

- 11. Start engine and check for leaks.
- 12. Recheck engine coolant level.

THERMOSTAT

- 1. Place the thermostat in thermostat housing.
 - (1) Install the thermostat(B) with the jiggle valve upward.
 - (2) Install a new gasket(A) to the thermostat(B).



2. Install the water inlet fitting(A).

Tightening torque :

14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.5lbf.ft)



- 3. Fill with engine coolant.
- 4. Start engine and check for leaks.

RADIATOR

- 1. Install the cooling fan onto the radiator.
- 2. Install the radiator onto the air conditioner condenser on the vehicle. The next installation procedures are in the reverse order of radiator removal.
- 3. Connect the fan motor connector.
- 4. Install the upper and lower radiator hoses, and ATF cooler hoses.
- 5. Fill with engine coolant.
- 6. Start engine and check for leaks.

INSPECTION

WATER PUMP

- 1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
- 2. Check the bearing for damage, abnormal noise and sluggish rotation, and replace the coolant pump assembly if necessary.



3. Check for coolant leakage. If coolant leaks from hole, the seal is defective. Replace the coolant pump assembly.

NOTE

A small amount of "weeping" from the bleed hole is normal.

THERMOSTAT

1. Immerse the thermostat in water and gradually heat the water.



2. Check the valve opening temperature.

Valve opening temperature : 82±1.5°C (179.6±2.7°F) Full opening temperature : 95°C (203°F)

If the valve opening temperature is not as specified, replace the thermostat.

3. Check the valve lift.

Valve lift : 8mm(0.3in) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

COMPONENT



- 7. Gasket
- 8. Oil screen
- Drain plug
- 10. Gasket

- 18. Washer
- 19. Rear plate

17. Drive plate



DISASSEMBLY

- 1. M/T : Remove the fly wheel.
- 2. A/T : Remove the drive plate.
- 3. Install the engine block onto an engine stand for disassembly.
- 4. Remove the timing belt. (Refer to EMA-27)
- 5. Remove the cylinder head. (Refer to EMA-40)
- 6. Remove the oil level gauge tube(A).



7. Remove the knock sensor(A).



8. Remove the oil pressure switch(A).



- 9. Remove the water pump. (Refer to EMA-92)
- 10. Remove the oil pan(A).



11. Remove the oil screen.

Remove the 2bolts(C), oil screen(A) and gasket(B).



- 12. Check the connecting rod end play. (Refer to EMA-74, step 1)
- 13. Remove the connecting rod caps and check oil clearance. (Refer to EMA-74, step 2)
- 14. Remove the piston and connecting rod assemblies.
 - (1) Using a ridge reamer, remove all the carbon from the top of the cylinder.
 - (2) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

NOTE

- •Keep the bearings, connecting rod and cap together.
- •Arrange the piston and connecting rod assemblies in the correct order.
- 15. Remove the front case. (Refer to EMA-104, step 8 ~ 9)

16. Remove the rear oil seal case.

Remove the 5bolts(B) and rear oil seal case(A).



- 17. Remove the crankshaft bearing cap and check oil clearance. (Refer to EMA-76, step 4)
- 18. Check the crankshaft end play. (Refer to EMA-78, step 5)
- 19. Lift the crankshaft(A) out of the engine, being careful not to damage journals.

NOTE

Arrange the main bearings and thrust bearings in the correct order.



20. Check fit between piston and piston pin.

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.

- 21. Remove the piston rings.
 - (1) Using a piston ring expender, remove the 2 compression rings.
 - (2) Remove the 2 side rails and oil ring by hand.

NOTE

Arrange the piston rings in the correct order only.

22. Remove the connecting rod from the piston.Using a press, remove the piston pin from piston.(Press-in load : 350 ~ 1,350kg(772~2,976lb))

INSPECTION

CONNECTING ROD AND CRANKSHAFT

Check the connecting rod end play.
 Using feeler gauge, measure the end play while moving the connecting rod back and forth.

End play Standard : 0.1 ~ 0.25mm (0.0039 ~ 0.0098in) Maximum : 0.4mm (0.0157in)



A. If out-of-tolerance, install a new connecting rod.

B. If still out-of-tolerance, replace the crankshaft.

- 2. Check the connecting rod bearing oil clearance.
 - (1) Check the match marks on the connecting rod and cap are aligned to ensure correct reassembly.
 - (2) Remove the 2 connecting rod cap nuts.
 - (3) Remove the connecting rod cap and lower bearing.
 - (4) Clean the crankshaft pin journal and bearing.
 - (5) Place a plastigage across the crankshaft pin journal.
 - (6) Reinstall the lower bearing and cap, and tighten the nuts.

Tightening torque :

49.0 ~ 52.0N.m (5.0 ~ 5.3kgf.m, 36.2 ~ 38.3lbf.ft)

NOTE

Do not turn the crankshaft.

(7) Remove the 2nuts, connecting rod cap and lower bearing.

(8) Measure the plastigage at its widest point.

Standard oil clearance 0.024 ~ 0.044mm (0.0009 ~ 0.0017in)



(9) If the plastigage measures too wide or too narrow, remove the upper and lower bearing and then install a new bearings with the same color mark. (Refer to connecting rod bearing selection table) Recheck the oil clearance.

CAUTION

Do not file, shim, of scrape the bearings or the caps to adjust clearance.

(10) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing. (Refer to connecting rod bearing selection table) Recheck the oil clearance.

NOTE

If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION

If the alignment marks are unreadable because of an accumulation of grease or grime, don't clean with a wire or abrasive cleaner. Clean only with correct cleaning solvent or detergent.

Connecting rod mark location



Discrimination of connecting rod

| Mark | Connecting rod big-end inner diameter |
|------|--|
| А | 48.000 ~ 48.006mm (1.8898 ~ 1.8900in) |
| В | 48.006 ~ 48.012mm (1.8900 ~ 1.8902in) |
| С | 48.012 ~ 48.018mm (1.8902 ~ 1.8905in) |

Crankshaft pin journal mark location



Discrimination of crankshaft pin journal

| Mark | Crankshaft pin journalouter diameter | |
|------|--|--|
| 1 | 44.960 ~ 44.966mm (1.7701 ~ 1.7703in) | |
| 2 | 44.952 ~ 44.960mm (1.7698 ~ 1.7701in) | |

| 3 | 44.946 ~ 44.952mm |
|---|---------------------|
| | (1.7695 ~ 1.7698in) |

Connecting rod bearing mark location



Discrimination of connecting rod bearing

| Mark | Color | Connecting rod bearing thickness |
|------|--------|--|
| AA | Blue | 1.514 ~ 1.517mm (0.0596 ~ 0.0597in) |
| A | Black | 1.511 ~ 1.514mm (0.0595 ~ 0.0596in) |
| В | None | 1.508 ~ 1.511mm (0.0594 ~ 0.0595in) |
| С | Green | 1.505 ~ 1.508mm (0.0593 ~ 0.0594in) |
| D | Yellow | 1.502 ~ 1.505mm (0.0591 ~ 0.0593in) |

(11) Select the bearing by using selection table.

Connecting rod bearing selection table

| | | Connecting rod mark | | |
|---------------------------------|---------------|---------------------|--------------|---------------|
| | | A (White) | B (None) | C (Yellow) |
| | 1 (Yellow) | D (Yellow) | C (Green) | B (None) |
| Crank shaft pin journal mark | 2 (None) | C (Green) | B (None) | A (Black) |
| | | | | |

| 3 | В | A | AA |
|---------|--------|---------|--------|
| (White) | (None) | (Black) | (Blue) |

- 3. Check the connecting rods.
 - (1) When reinstalling, make sure that cylinder numbers put on the connecting rod and cap at disassembly match. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
 - (2) Replace the connecting rod if it is damaged on the thrust faces at either end. Also if step wear or a severely rough surface of the inside diameter of the small end is apparent, the rod must be replaced as well.
 - (3) Using a connecting rod aligning tool, check the rod for bend and twist. If the measured value is close to the repair limit, correct the rod by a press. Any connecting rod that has been severely bent or distorted should be replaced.

Allowable bend of connecting rod :

0.05mm / 100mm (0.0020in / 3.94in) or less

Allowable twist of connecting rod :

0.1mm / 100mm (0.0039in / 3.94in) or less

- 4. Check the crankshaft bearing oil clearance.
 - (1) To check main bearing-to-journal oil clearance, remove the main bearing caps and lower bearings.
 - (2) Clean each main journal and lower bearing with a clean shop towel.
 - (3) Place one strip of plastigage across each main journal.
 - (4) Reinstall the lower bearings and caps, then tighten the bolts.

Tightening torque : 27.5 ~ 31.4N.m (2.8 ~3.2kgf.m, 20.3 ~ 23.1lbf.ft)+60°~ 64°

NOTE

Do not turn the crankshaft.

(5) Remove the cap and lower bearing again, and measure the widest part of the plastigage.

Standard oil clearance : 0.028 ~ 0.048mm (0.0011 ~ 0.0019in)



(6) If the plastigage measures too wide or too narrow, remove the upper and lower bearing and then install a new bearings with the same color mark. (Refer to EMA-78, step 8)) Recheck the oil clearance.

CAUTION

Do not file, shim, or scrape the bearings or the cap to adjust clearance.

(7) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing. (Refer to EMA-78, step 8))Recheck the oil clearance.

NOTE

If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION

If the alignment marks are unreadable because of accumulation of grease or grime, don't clean with a wire or abrasive cleaner. Clean only with correct cleaning solvent or detergent.

Cylinder block crankshaft journal bore mark location

Letters have been stamped on the end of the block as a mark for the size of each of the 5 main journal bores. Use them, and the numbers or letters stamped on the crank (marks for main journal size), to choose the correct bearings.



Discrimination of cylinder block crankshaft journal bore

| Mark | Cylinder block crankshaft journal boreinner diameter | |
|------|--|--|
| A | 61.000 ~ 61.006mm (2.4016 ~ 2.4018in) | |
| В | 61.006 ~ 61.012mm (2.4018 ~ 2.4020in) | |
| С | 61.012 ~ 61.018mm (2.4020 ~ 2.4023in) | |

Crankshaft main journal mark location



Discrimination of crankshaft main journal

| Mark | Color | Crankshaft main journal outer diameter |
|------|--------|---|
| 1 | Yellow | 56.956 ~ 56.962mm (2.2424 ~ 2.2426in) |
| 2 | None | 56.948 ~ 56.956mm (2.2420 ~ 2.2424in) |
| 3 | White | 56.942 ~ 56.948mm (2.2418 ~ 2.2420in) |

Crankshaft main bearing mark location



Discrimination of crankshaft main bearing

| Mark | Color | Crankshaft main bearing thickness |
|------|--------|--|
| AA | Blue | 2.014 ~ 2.017mm (0.0793 ~ 0.0794in) |
| А | Black | 2.011 ~ 2.014mm (0.0792 ~ 0.0793in) |
| В | None | 2.008 ~ 2.011mm (0.0791 ~ 0.0792in) |
| С | Green | 2.005 ~ 2.008mm (0.0789 ~ 0.0791in) |
| D | Yellow | 2.002 ~ 2.005mm (0.0788 ~ 0.0789in) |

(8) Select the bearing by using selection table.

Crankshaft main bearing selection table

| | | Cylinder bl | ock crankshaft journal | bore mark |
|------------------|----------|-------------|------------------------|-----------|
| | | A | В | С |
| | 1 | D | C | B |
| | (Yellow) | (Yellow) | (Green) | (None) |
| Crank shaft main | 2 | C | B | A |
| journal mark | (None) | (Green) | (None) | (Black) |
| | 3 | B | A | AA |
| | (White) | (None) | (Black) | (Blue) |

5. Check the crankshaft end play.

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

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End play
Standard: 0.06 ~ 0.26mm (0.0024 ~ 0.0102in)
Limit : 0.30mm (0.0118in)
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If the end play is greater than maximum, replace the thrust bearings as a set.

Thrust bearing thickness : 2.44 ~ 2.77mm (0.0961 ~ 0.0972in)

6. Inspect the crankshaft main journals and pin journals. Using a micrometer, measure the diameter of each main journal and pin journal.

Main journal diameter : 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) Pin journal diameter : 44.946 ~ 44.966mm (1.7695 ~ 1.7703in)



CYLINDER BLOCK

1. Remove the gasket material.

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

2. Clean the cylinder block.

Using a soft brush and solvent, thoroughly clean the cylinder block.

3. Inspect the top surface of cylinder block for flatness.

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Flatness of cylinder block gasket surface Total : Less than 0.05mm (0.0020in) Bore to bore : Less than 0.03mm (0.0012in)



4. Inspect the cylinder bore. Visually check the cylinder for vertical scratchs.

If deep scratchs are present, replace the cylinder block.

5. Inspect the cylinder bore diameter.

Using a cylinder bore gauge, measure the cylinder bore diameter at position in the thrust and axial direction.

Standard diameter :

82.00 ~ 82.03mm (3.2283 ~ 3.2295in)



6. Check the cylinder bore size code on the cylinder block bottom face.



Discrimination of cylinder bore size

| Mark | Cylinder bore inner diameter |
|------|--|
| А | 82.00 ~ 82.01mm (3.2283 ~ 3.2287in) |
| В | 82.01 ~ 82.02mm (3.2287 ~ 3.2291in) |
| С | 82.02 ~ 82.03mm (3.2291 ~ 3.2295in) |

7. Check the piston size mark(A) on the piston top



Discrimination of piston outer diameter

| Mark | Piston outer diameter |
|------|--|
| A | 81.97 ~ 81.98mm (3.2272 ~ 3.2276in) |
| None | 81.98 ~ 81.99mm (3.2276 ~ 3.2279in) |
| С | 81.99 ~ 82.00mm (3.2279 ~ 3.2283in) |

8. Select the piston related to cylinder bore class.

Piston-to-cylinder clearance : 0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

Boring cylinder

1. Oversize pistons should be selected according to the largest bore cylinder.

NOTE

The size of piston is stamped on top of the piston.

- 2. Measure the outside diameter of the piston to be used.
- 3. According to the measured O.D(Outer Diameter), calculate the new bore size.

New bore size = piston O.D + 0.02 to 0.04mm (0.0008 to 0.0016in) (clearance between piston and cylinder) - 0.01mm (0.0004in) (honing margin.)

4. Bore each of the cylinders to the calculated size.

CAUTION

To prevent distortion that may result from temperature rise during honing, bore the cylinder holes in the firing order.

- 5. Hone the cylinders, finishing them to the proper
- 6. Check the clearance between the piston and cylinder.

Standard : 0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

NOTE

When boring the cylinders, finish all of the cylinders to the same oversize. Do not bore only one cylinder to the oversize.

PISTON AND PISTON RINGS

- 1. Clean the piston.
 - (1) Using a gasket scraper, remove the carbon from the piston top.
 - (2) Using a groove cleaning tool or broken ring, clean the piston ring grooves.
 - (3) Using solvent and a brush, thoroughly clean the piston.

NOTE

Do not use a wire brush.

2. The standard measurement of the piston outside diameter is taken 47mm (1.85in) from top land of the piston.

Standard diameter :

81.97 ~ 82.00mm (3.2272 ~ 3.2283in)



3. Calculate the difference between the cylinder bore inner diameter and the piston outer diameter.

Piston-to-cylinder clearance : 0.02 ~ 0.04mm (0.0008 ~ 0.0016in) 4. Inspect the piston ring side clearance.

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

```
Piston ring side clearance
No.1 : 0.04 ~ 0.08mm (0.0016 ~ 0.0031in)
No. 2 : 0.03 ~ 0.07mm (0.0012 ~ 0.0028in)
Oil ring : 0.06 ~ 0.15mm (0.0024 ~ 0.0059in)
Limit
No.1 : 0.1mm (0.0039in)
No.2 : 0.1mm ( 0.0039in)
Oil ring : 0.2mm (0.0079in)
```



If the clearance is greater than maximum, replace the piston.

5. Inspect the piston ring end gap.

To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston rings. If the gap is too large, recheck the cylinder bore inner diameter. If the bore is over the service limit, the cylinder block must be rebored. (Refer to EMA-80)

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Piston ring end gap
Standard
No.1 : 0.23 ~ 0.38mm (0.0091 ~ 0.0150in)
No.2 : 0.33 ~ 0.48mm (0.0130 ~ 0.0189in)
Oil ring : 0.20 ~ 0.60mm(0.0079 ~ 0.0236in)
Limit
No.1, 2, oil ring : 1.0mm(0.039in)
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PISTON PINS

1. Measure the outer diameter of piston pin.

Piston pin diameter : 20.001 ~ 20.006mm (0.7874 ~ 0.7876in)



2. Measure the piston pin-to-piston clearance.

Piston pin-to-piston clearance : 0.01 ~ 0.02mm (0.0004 ~ 0.0008in)

3. Check the difference between the piston pin outer diameter and the connecting rod small end inner diameter.

Piston pin-to-connecting rod interference : -0.032 ~ -0.016mm (-0.0013 ~ -0.0006in)

OIL PRESSURE SWITCH

1. Check the continuity between the terminal and oil pressure switch.

ohmmeter. If there is no continuity, replace the



2. Check the continuity between the terminal and the body when the fine wire is pushed. If there is continuity even when the fine wire is pushed, replace the switch.



3. If there is no continuity when a 49.0kpa (0.5kg/cm², 7.1psi) vacuum is applied through the oil hole, the switch is operating properly.

Check for air leakage. If air leaks, the diaphragm is broken. Replace it.

REASSEMBLY

NOTE

- •Thoroughly clean all parts to assembled.
- •Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- •Replace all gaskets, O-rings and oil seals with new parts.
- 1. Assemble the piston and connecting rod.
 - (1) Use a hydraulic press for installation
 - (2) The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



- 2. Install the piston rings.
 - (1) Install the oil ring spacer and 2 side rails by hand.
 - (2) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
 - (3) Position the piston rings so that the ring ends are as shown.



- 3. Install the connecting rod bearings.
 - (1) Align the bearing claw with the groove of the connecting rod or connecting rod cap.
 - (2) Install the bearings(A) in the connecting rod and connecting rod cap(B).



4. Install the crankshaft main bearings.

NOTE

Upper 1, 2, 4, 5 bearings have an oil groove of oil holes ; Lower bearings do not.

(1) Align the bearing claw with the claw groove of the cylinder block, push in the 5 upper bearings(A).



(2) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

5. Install the thrust bearings.

Install the 2 thrust bearings(A) under the No.3 journal position of the cylinder block with the oil grooves facing outward.



- 6. Place the crankshaft on the cylinder block.
- 7. Place the main bearing caps on the cylinder block.
- 8. Install the main bearing cap bolts.

NOTE

- •The main bearing cap bolts are tightened in 2 progressive steps.
- •If any of the bearing cap bolts in broken or deformed, replace it.
- (1) Apply a light coat of engine oil on the threads and under the bearing cap bolts.

Tightening torque : 27.5 ~ 31.4N.m (2.8 ~ 3.2kgf.m, 20.3 ~ 23.1lbf.ft) + 60°~ 64°



(3) Check that the crankshaft turns smoothly.

- 9. Check the crankshaft end play. (Refer to EMA-78, step 5)
- 10. Install the piston and connecting rod assemblies.

NOTE

Before installing the piston, apply a coat of engine oil to the ring grooves and cylinder bores.

- (1) Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts
- (2) Install the ring compressor, check that the rings are securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.
- (3) Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
- (4) Apply engine oil to the bolt threads. install the rod caps with bearings, and tighten the nuts.

Tightening torque : 49.0 ~ 52.0N.m (5.0 ~ 5.3kgf.m, 36.2 ~ 38.3lbf.ft)

NOTE

Maintain downward force on the ring compressor to prevent the rings from expending before entering the cylinder bore.



11. Install a new gasket and rear oil seal case(A) with 5 bolts(B).

```
Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lbf.ft)
```



NOTE

Check that the mating surfaces are clean and dry.

- 12. Install the rear oil seal.
 - (1) Apply engine oil to a new oil seal lip.
 - (2) Using the SST(09231-21000) and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.



- 13. Install the front case. (Refer to EMA-106, step $1 \sim 5$)
- 14. Install the oil screen.

Install a new gasket(B) and oil screen(A) with 2 bolts(C).

Tightening torque : 14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lbf.ft)



15. Install the oil pan.

(1) Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

NOTE

Check that the mating surfaces are clean and dry before applying liquid gasket.

(2) Apply liquid gasket as an even bead, centered between the edges of the mating surface.

Liquid gasket : MS 721-40A or equivalent

NOTE

- •To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- •Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- •After assembly, wait at least 30 minutes before filling the engine with oil.

(3) Install the oil pan(A) with the bolts.

Uniformly tighten the bolts in several passes.

Tightening torque :

9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lbf.ft)



- 16. Install the water pump. (Refer to EMA-96)
- 17. Install the oil pressure switch.
 - (1) Apply adhesive to 2 or 3 threads.

Adhesive : MS 721-39(B) or equivalent.

(2) Install the oil pressure switch(A).

Tightening torque :

14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lbf.ft)



Tightening torque : 16.7 ~ 26.5N.m (1.7 ~ 2.7kgf.m, 12.3 ~ 19.5lbf.ft)



- 19. Install the oil level gauge tube(A).
 - (1) Install a new O-ring on the oil level gauge tube.
 - (2) Apply engine oil on the O-ring.
 - (3) Install the oil level gauge tube(A) with the bolt.

Tightening torque :

11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lbf.ft)



- 20. Install the cylinder head. (Refer to EMA-54)
- 21. Install the timing belt. (Refer to EMA-32)
- 22. Remove the engine stand.

23. A/T : install the drive plate(A) and washer(B).

Tightening torque :

117.7 ~ 127.5N.m (12.0 ~ 13.0kgf.m, 86.8 ~ 94.0lbf.ft)



Tightening torque :

117.7 ~ 127.5N.m (12.0 ~ 13.0kgf.m, 86.8 ~ 94.0lbf.ft)

COMPONENT





10. Key

Thank-you for purchasing this CD from Ebay user marjos42

Feel free to email me at marjose42@gmail.com

REMOVAL

Engine removal is not required for this procedure.

CAUTION

- •Use Fender cover to avoid damaging painted surfaces.
- •To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.
- •When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.
- •To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE

- •Mark all wiring and hoses to avoid misconnection.
- •Inspect the timing belt before removing the cylinder head.
- •Turn the crankshaft pulley so that the No. 1 piston is at top dead center.
- 1. Remove the air duct(A).



2. Disconnect the terminals(A) from battery.



3. Remove the engine cover.



4. Drain the engine coolant. (Refer to EMA-90) Remove the radiator cap to speed draining.



- 5. Remove the intake air hose and air cleaner assembly.
 - (1) Disconnect the AFS(Air Flow Sensor) connector(A).
 - (2) Disconnect the breather hose(B) from intake air hose.
 - (3) Remove the intake air hose and air cleaner assembly(C).



6. Remove the upper radiator hose(A) and lower $\ensuremath{\mathsf{I}}$



7. Remove the heater hoses(A).



8. Remove the accelerator cable(A) by loosening the lock-nut, then slip the cable end out of the throttle linkage.



9. Remove the engine wire harness connectors a manifold.

- lamps from cylinder head and the intake
- (1) Disconnect the OCV (Oil Control Valve) connector(A).
- (2) Disconnect the oil temperature sensor connector(B).
- (3) Disconnect the ECT (Engine Coolant Temperature) sensor connector(C).
- (4) Disconnect the ignition coil connector(D).



- (5) Disconnect the TPS (Throttle Position Sensor) connector(A).
- (6) Disconnect the ISA (Idle Speed Actuator) connector(B).



- (7) Disconnect the CMP (Camshaft Position Sensor) connector(A).
- (8) Disconnect the four injector connectors(B).
- (9) Disconnect the knock sensor connector(C).
- (10) Disconnect the ground cables (D) from the intake manifold.

(11) Disconnect the air conditioner compressor

(E).



- (12) Disconnect the front heated oxygen sensor connector(A).
- (13) Disconnect the CKP(Crankshaft Position Sensor) connector(B).
- (14) Disconnect the oil pressure switch connector(C).



(15) Disconnect the PCSV (Purge Control Solenoid Valve) connector(A).



10. Disconnect the fuel inlet hose(A) of the deliver



11. Disconnect the hose(A) of the PCSV (Purge Control Solenoid Valve) side.



12. Remove the brake booster vacuum hose(A).



- 13. Remove the power steering pump drive belt.
- 14. Remove the power steering pump and use a wire to secure the pump to the vehicle so that it is out of the way.

15. Remove the bolts(B, C) and power steering pu



16. Remove the spark plug cables.



- 17. Remove the exhaust manifold. (Refer to EMA-113)
- 18. Remove the intake manifold. (Refer to EMA-110)
- 19. Remove the timing belt. (Refer to EMA-27 ~ 29, step 2 ~ 15)
- 20. Remove the PCV(Positive Crankcase Ventilation) hose.
- 21. Remove the cylinder head cover. (Refer to EMA-30, step 18)
- 22. Remove the camshaft sprocket. (Refer to EMA-31, step 19)
- 23. Insert a stopper pin or other device into timing chain auto tensioner and remove the auto tensioner.



24. Remove the camshaft bearing caps(A) and camshafts(B).



25. Remove the OCV(Oil Control Valve)(A).



26. Remove the OCV(Oil Control Valve) filter(A).



27. Remove the water hose(A) from water pipe(B).



- 28. Remove the cylinder head bolts, then remove the cylinder head.
 - (1) Using 8mm and 10mm hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown.

Remove the 10 cylinder head bolts and plate washers.



CAUTION

Head warpage or cracking could result from removing bolts in an incorrect order.

(2) Lift the cylinder head from the dowels on the on a bench.

and replace the cylinder head on wooden blocks

CAUTION

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

REPLACEMENT

VALVE GUIDE

1. Using the SST(09221 - 3F100A), withdraw the old valve guide toward the bottom of cylinder head.



- 2. Recondition the valve guide hole of cylinder head so that it can match the newly press-fitted oversize valve guide.
- 3. Using the SST (09221 3F100 A/B), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head. Keep in mind that the intake and exhaust valve guides are different in length.

Valve guide length Intake : 45.8 ~ 46.2mm (1.8031 ~ 1.8189in) Exhaust : 54.3 ~ 54.7mm (2.1378 ~ 2.1535in)



- 4. After the valve guide is press-fitted, insert a new valve and check for proper stem-to-guide clearance.
- 5. After the valve guide is replaced, check that the valve is seated properly. Recondition the valve seats as necessary.

| | - | |
|-------|-------|-----------------|
| VALVE | GUIDE | OVERSIZE |

| ltem | Oversize [mm (in)] | Size mark | Valve guide hole inner diameter [mm (in)] | Valve guide outer diameter [mm (in)] | Valve guide protrusion height [mm (in)] |
|----------------|-----------------------|--------------|--|---|---|
| Valve guide | STD | - | 11.000 ~ 11.018 (0.4331 ~ 0.4338) | 11.040 ~ 11.050 (0.4346 ~ 0.4350) | 14.000 (0.5512) |
| | 0.05 (0.002) OS | 5 | 11.050 ~ 11.068 (0.4350 ~ 0.4357) | 11.090 ~ 11.100 (0.4366 ~ 0.4370) | |
| | 0.25 (0.010) OS | 25 | 11.250 ~ 11.268 (0.4429 ~ 0.4436) | 11.290 ~ 11.300 (0.4445 ~ 0.4449) | |
| | 0.50 (0.020) OS | 50 | 11.500 ~ 11.518 (0.4528 ~ 0.4535) | 11.540 ~ 11.550 (0.4543 ~ 0.4547) | |

VALVE SEAT RING

1. Cut away the inner face of the valve seat to rea

ness.



- 2. Enlarge the seat ring hole of cylinder head so that matches the specified cylinder head hole inner diameter of new valve seat ring.
- 3. Heat the cylinder head to about 250°C(480°F) and press-fit an oversize seat ring for the cylinder head hole size.
- 4. Using lapping compound, lap the valve to the new seat.

| ltem | Over size mm (in.) | Size mark | Seat ring hole inner diameter [mm(in)] | Seat ring outer diameter [mm(in)] | Seat ring height [mm(in)] |
|----------------------------------|-----------------------|--------------|---|--------------------------------------|------------------------------------|
| Intake valve seat ring | STD | - | 33.000 ~ 33.025 (1.2992 ~ 1.3002) | 33.090 ~ 33.105 (1.3028 ~ 1.3033) | 7.200 ~ 7.400 (0.2835 ~ 0.2913) |
| | 0.3(0.012) OS | 30 | 33.300 ~ 33.325 (1.3110 ~ 1.3120) | 33.390 ~ 33.405 (1.3146 ~ 1.3152) | 7.500 ~ 7.700 (0.2953 ~ 0.3031) |
| | 0.6(0.024) OS | 60 | 33.600 ~ 33.625 (1.3228 ~ 1.3238) | 33.690 ~ 33.705 (1.3264 ~ 1.3270) | 7.800 ~ 8.000 (0.3071 ~ 0.3150) |
| Exhaust valve seat ring | STD | - | 28.500 ~ 28.521 (1.1220 ~ 1.1229) | 28.590 ~ 28.605 (1.1256 ~ 1.1262) | 7.600 ~ 7.800 (0.3110 ~ 0.3189) |
| | 0.3(0.012) OS | 30 | 28.800 ~ 28.821 (1.1339 ~ 1.1347) | 28.890 ~ 28.905 (1.1374 ~ 1.1380) | 7.900 ~ 8.100 (0.3110 ~ 0.3189) |
| | 0.6(0.024) OS | 60 | 29.100 ~ 29.121 (1.1457 ~ 1.1465) | 29.190 ~ 29.205 (1.1492 ~ 1.1498) | 8.200 ~ 8.400 (0.3228 ~ 0.3307) |

VALVE SEAT RING OVERSIZE

INSTALLATION

NOTE

- •Thoroughly clean all parts to be assembled.
- Always use a new cylinder head and manifold gasket.
- •The cylinder head gasket is a metal gasket. Take care not to bend it.
- •Rotate the crankshaft, set the No. 1 piston at TDC.

1. Install the cylinder head gasket(A) on the cylind

NOTE

Be careful of the installation direction.



- 2. Place the cylinder head onto the block carefully in order to prevent damaging the gasket. If the gasket is damaged, fluid leakage could occur.
- 3. Install the cylinder head bolts.
 - (1) Apply a light coat if engine oil on the threads and under the heads of the cylinder head bolts.
 - (2) Using 8mm and 10mm hexagon wrench, install and tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

Tightening torque : M10: 22.6~26.5N.m (2.3~2.7kgf.m, 16.6~19.5lbf.ft)+60°~65° + 60°~65° M12: 27.5~31.4N.m (2.8~3.2kgf.m, 20.3~23.1lbf.ft)+60°~65° + 60°~65°



4. Install the OCV(Oil Control Valve) filter(A).

Tightening torque :

40.2 ~ 50.0N.m (4.1 ~ 5.1kgf.m, 29.7 ~ 36.9lbf.ft)



NOTE

- •Always use a new OCV(Oil Control Valve) filter gasket.
- •Keep the OCV filter clean.
- 5. Install the OCV(Oil Control Valve)(A).

Tightening torque :

9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lbf.ft)



CAUTION

- •Do not reuse the OCV(Oil Control Valve) when dropped.
- •Keep the OCV clean.
- •Do not hold the OCV(Oil Control Valve) sleeve during servicing.
- •When the OCV is installed on the engine, be careful not to rotate the engine while holding the yoke.

- 6. Install the camshafts.
 - (1) Align the camshaft timing chain with the intake timing chain sprocket and exhaust timing chain sprocket as shown.



(2) Install the camshaft(A) and bearing caps(B).

Tightening torque :

13.7 ~ 14.7N.m (1.4 ~ 1.5kgf.m, 10.1 ~ 10.8lbf.ft)



(3) Install the timing chain auto tentioner(A).

Tightening torque : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)



- (4) Remove the auto tentioner stopper pin(B).
- 7. Check and adjust valve clearance. (Refer to EMA-14 \sim 19)
- 8. Using the SST (09221 21000), install the camshaft bearing oil seal.



- 9. Install the camshaft sprocket. (Refer to EMA-32, step 1)
- 10. Install the cylinder head cover.
 - (1) Install the cylinder head cover gasket(A) in the groove of the cylinder head cover(B).



NOTE

- •Before installing the cylinder head cover gasket, thoroughly clean the cylinder head cover and the groove.
- •When installing, make sure the cylinder head cover gasket is seated securely in the corners of the recesses with no gap.
- (2) Apply liquid gasket to the head cover gasket at the corners of the recess.



NOTE

- •Use liquid gasket, loctite No. 5999.
- •Check that the mating surfaces are clean and dry before applying liquid gasket.
- •After assembly, wait at least 30 minutes before filling the engine with oil.
- (3) Install the cylinder head cover(A) with the 12 bolts(B). Uniformly tighten the bolts in several passes.

Tightening torque :

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)



- 11. Install the PCV(Positive Crankcase Ventilation) hose. (Refer to EMA-33, step 2))
- 12. Install the timing belt. (Refer to EMA-33 ~ 37, step 4 ~ 21)
- 13. Install the intake manifold. (Refer to EMA-110)
- 14. Install the exhaust manifold. (Refer to EMA-113)

15. Install the spark plug cables.



16. Install the power steering pump bracket(A) and bolts(B, C).

Tightening torque : Bolt (B) : 34.3 ~ 49.0N.m (3.5~ 5.0kgf.m, 25.3 ~ 36.2lbf.ft) Bolt (C) : 11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lbf.ft)



- 17. Install the power steering pump. (See ST group power steering pump)
- 18. Install the accelerator cable.
- 19. Install the brake booster hose(A).



20. Connect the hose(A) of the PCSV (Purge Con

e) side.



21. Connect the fuel inlet hose(A) of the delivery pipe side.



- 22. Install the engine wire harness connectors and wire harness clamps to the cylinder head and the intake manifold.
 - (1) Connect the PCSV(Purge Control Solenoid Valve) connector(A).



- (2) Connect the front heated oxygen sensor connector (A).
- (3) Connect the CKP(Crankshaft Position Sensor) connector(B).

(4) Connect the oil pressure switch connector(



- (5) Connect the air conditioner compressor switch connector(E).
- (6) Connect the ground cables(D) to intake manifold.
- (7) Connect the knock sensor connector(C).
- (8) Connect the fuel injector connectors(B).
- (9) Connect the CMP(Camshaft position sensor) connector(A).



- (10) Connect the ISA(Idle Speed Actuator) connector(B).
- (11) Connect the TPS (Throttle Position Sensor) connector (A).



- (12) Connect the ignition coil connector(D).
- (13) Connect the ECT (Engine Coolant Temperature) connector(C).
- (14) Connect the oil temperature sensor connector(B).

(15) Connect the OCV(Oil Control Valve) conr



23. Install the heater hose(A).



24. Install the upper radiator hose(A) and lower radiator hose(B).



- 25. Install the intake air hose and air cleaner asse
 - (1) Install the intake air hose, air cleaner assembly(C) and bolts.

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Tightening torque :
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7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)

- (2) Install the breather hose(B) to intake air hose.
- (3) Connect the AFS(Air Flow Sensor) connector(A).



26. Install the engine cover.

Tightening torque : 3.9 ~ 5.9N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lbf.ft)



27. Reconnect the battery terminals(A).



28. Install the air duct(A).



- 29. Fill with engine coolant.
- 30. Start the engine and check for leaks.
- 31. Recheck engine coolant level and oil level.

DISASSEMBLY

NOTE

Identify MLA(Mechanical Lash Adjuster), valves, valve springs as they are removed so that each item can be reinstalled in its original position.

1. Remove the MLAs(A).



2. Remove the valves.

(1) Using the SST (09222 - 28000, 09222 - 28100), compress the valve spring and remove the retainer lock.



- (2) Remove the spring retainer.
- (3) Remove the valve spring.
- (4) Remove the valve.
- (5) Using a needle-nose pliers, remove the oil seal.
- (6) Using a magnetic finger, remove the spring seat.

INSPECTION

CYLINDER HEAD

1. Inspect for flatness.

Using a precision straight edge and feeler gauge, measure the surface the contacting the cylinder block and the manifolds for warpage.

Flatness of cylinder head gasket surface Standard : Less than 0.03mm (0.0012in) Limit : 0.05mm (0.0020in) Flatness of manifold mating surface Standard : Less than 0.15mm (0.0059in) Limit : 0.30mm (0.0118in)



2. Inspect for cracks.

Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

VALVE AND VALVE SPRING

- 1. Inspect the valve stems and valve guides.
 - (1) Using a caliper gauge, measure the innner diameter of valve guide.

Valve guide inner diameter : 6.000 ~ 6.015mm (0.2362 ~ 0.2368in)


(2) Using a micrometer, measure the outer diam

m.

Valve stem outer diameter Intake : 5.965 ~ 5.980mm (0.2348 ~ 0.2354in) Exhaust : 5.950 ~ 5.965mm (0.2343 ~ 0.2348in)



(3) Subtract the valve stem outer diameter measurement from the valve guide innner diameter measurement.

Valve stem- to-guide clearance Standard Intake : 0.020 ~ 0.050mm (0.0008 ~ 0.0020in) Exhaust : 0.035 ~ 0.065mm (0.0014 ~ 0.0026in) Limit Intake : 0.10mm (0.0039in) Exhaust : 0.13mm (0.0051in)

If the clearance is greater than maximum, replace the valve and valve guide.

2. Inspect the valves.

(1) Check the valve is ground to the correct valve face angle.

(2) Check the surface of the valve face for damage or wear.

If the valve face is damaged or worn, replace the valve.

(3) Check the valve head margin thickness.

If the margin thickness is less than minimum, replace the valve.

Margin Standard Intake : 1.15mm (0.0453in) Exhaust : 1.35mm (0.0531in) Limit Intake : 0.8mm (0.0315in) Exhaust : 1.0mm (0.0394in)



- (4) Check the surface of valve stem tip for wear. If the valve stem tip is worn, replace the valve.
- 3. Inspect the valve seats.
 - (1) Check the valve seat for evidence of overheating and improper contact with the valve face. Replace the seat if necessary.
 - (2) Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it, then recondition the seat.
 - (3) Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should be within specifications and centered on the valve face.



- 4. Inspect the valve springs.
 - (1) Using a steel square, measure the out-of-square of valve spring.
 - (2) Using vernier calipers, measure the free length of valve spring.

Valve spring Standard Free height : 48.86mm (1.9236in) Load : 18.8±0.9kg/39.0mm (41.4±2.0lb/1.5354in) 41.0±1.5kg/30.5mm (90.4±3.3lb/1.2008in) Out of square : Less than 1.5° Limit Out of square : 3°



If the loads is not as specified, replace the valve spring.

CAMSHAFT

1. Inspect the cam lobes.

Using a micrometer, measure the cam lobe height.

Cam height Intake : 44.518 ~ 44.718mm (1.7527 ~ 1.7605in) Exhaust : 44.418 ~ 44.618mm (1.7487 ~ 1.7566in)



If the cam lobe height is less than minimum, re

- 2. Inspect the camshaft journal clearance.
 - (1) Clean the bearing caps and camshaft journals.
 - (2) Place the camshafts on the cylinder head.
 - (3) Lay a strip of plastigage across each of the camshaft journal.



(4) Install the bearing caps and tighten the bolts with specified torque. (Refer to EMA-55, step 6)

ft.

CAUTION

Do not turn the camshaft.

- (5) Remove the bearing caps.
- (6) Measure the plastigage at its widest point.

Bearing oil clearance Standard : 0.020 ~ 0.061mm (0.0008 ~ 0.0024in) Limit : 0.1mm (0.0039in)



If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(7) Completely remove the plastigage.

(8) Remove the camshafts.

- 3. Inspect the camshaft end play.
 - (1) Install the camshafts. (Refer to EMA-55, step 6)
 - (2) Using a dial indicator, measure the end play while moving the camshaft back and forth.

Camshaft end play Standard : 0.1 ~ 0.2mm (0.0039 ~ 0.0079in)



If the end play is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(3) Remove the camshafts.

CVVT(Continuous Variable Valve Timing) ASSEMBLY

- 1. Inspect the CVVT (Continuous Variable Valve Timing) assembly.
 - (1) Check that the CVVT (Continuous Variable Valve Timing) assembly will not turn.
 - (2) Apply vinyl tape to all the parts except the one indicated by the arrow in the illustration.



(3) To release the CVVT lock pin, wrap some tape around the tip of an air pressure adapter and apply low air pressure(about 14 psi) to the exposed camshaft port.

NOTE

Wrap a shop towel or rag around the CVVT because residual oil may leak out of the unit when applying air pressure.

(4) With low air pressure applied, turn the CVV

- E direction as indicated in the illustration.
- A. With the low air pressure applied, the CVVT should turn to the ADVANCE side.
- B. If too much air leaks when applying the low air pressure, the CVVT lock pin may not release and the CVVT may not turn.



(5) Allow the CVVT assembly to move in the ADVANCE and DELAY directions to ensure there is no binding and that it moves freely.

Standard : Movable smoothly in the range about 20°

(6) Turn the CVVT by hand and make sure it locks in the maximum delay angle position.

REASSEMBLY

NOTE

•Thoroughly clean all parts to be assembled.

- •Before installing the parts, apply fresh engine oil to all sliding and rotating surface.
- •Replace oil seals with new ones.
- 1. Install the valves.
 - (1) Install the spring seats.
 - (2) Using the SST (09222 22001), push in a new oil seal.

NOTE

Do not reuse old valve stem oil seals.

Incorrect installation of the seal could result in oil leakage past the valve guides.



(3) Install the valve, valve spring and spring retainer.

NOTE

Place the valve springs so that the side coated with enamel faces toward the valve spring retainer and then installs the retainer.

(4) Using the SST(09222 - 28000, 09222 - 28100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.



(5) Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of the valve and retainer lock.



2. Install the MLA(Mechanical Lash Adjuster)s. Check that the MLA rotates smoothly by hand.



REMOVAL

CAUTION

- •Use fender covers to avoid damaging painted surfaces.
- •To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE

- •Mark all wiring and hoses to avoid misconnection.
- 1. Remove the air duct(A).



2. Disconnect the battery terminals(A) and remove the battery.



3. Remove the engine cover.



- 4. Drain the engine coolant. (Refer to EMA-90) Remove the radiator cap to speed draining.
- 5. Remove the intake air hose and air cleaner assembly.
 - (1) Disconnect the AFS(Air Flow Sensor) connector(A).
 - (2) Disconnect the breather hose(B) from intake air hose.
 - (3) Remove the intake air hose and air cleaner assembly(C).



6. Remove the upper radiator hose(A) and lower radiator hose(B).



7. Remove the heater hose(A).



8. Remove the accelerator cable(A).



- 9. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 - (1) Disconnect the OCV(Oil Control Valve) connector(A).
 - (2) Disconnect the oil temperature sensor connector(B).
 - (3) Disconnect the ECT(Engine Coolant Temperature) sensor connector(C).
 - (4) Disconnect the ignition coil connector(D).



(5) Disconnect the TPS(Throttle Position Sensor) Connector(A).

(6) Disconnect the ISA(Idle Speed Actuator) co



- (7) Disconnect the CMP(Camshaft Position Sensor) connector(A).
- (8) Disconnect the four fuel injector connectors(B).
- (9) Disconnect the knock sensor connector(C).
- (10) Disconnect the ground cables(D) from the intake manifold and vehicle's body.
- (11) Disconnect the air conditioner compressor switch(E).



- (12) Disconnect the front heated oxygen sensor connector(A).
- (13) Disconnect the CKP(Crankshaft Position Sensor) connector(B).
- (14) Disconnect the oil pressure switch connector(C).



(15) Disconnect the PCSV (Purge Control Sole

ector(A).



10. Disconnect the fuel inlet hose(A) of the delivery pipe side.



11. Disconnect the hose(A) of the PCSV (Purge Control Solenoid Valve) side.



12. Remove the brake booster vacuum hose(A).



13. Remove the power steering oil hose(A) from the power steering pump.



14. Remove the power steering lower oil hose(A).



15. Remove the battery tray bracket.



- 16. Remove the transaxle wire harness connectors and control cable from transaxle(A/T).
 - (1) Disconnect the solenoid valve connector(A).
 - (2) Disconnect the transaxle range switch connector(B).
 - (3) Disconnect the input shaft speed sensor connector(C).



(4) Disconnect the output shaft speed sensor connector(A).

(5) Disconnect the vehicle speed sensor conn



(6) Remove the control cable(A).



17. Remove the transaxle oil cooler hose(A) (A/T).



18. Remove the under cover(A).



19. Remove the front exhaust pipe(A).



20. Disconnect the ABS wheel speed sensor(A) from both front knuckle. (See DS group - front axle)



21. Remove the front strut lower mounting bolts a (See SS griup - front strut)



22. Remove the caliper and hang the caliper assembly(A).



23. Remove the steering u-joint mounting bolt(A). (See ST group - steering)



24. Install the jack for supporting engine and transaxle assembly.

25. Remove the engine mounting bracket(A).

Tightening torque Nut(D) : 58.8 ~ 78.5N.m (6.0 ~ 8.0 kgf.m, 43.4 ~ 57.9lbf.ft) Bolt(B), Nut(C) : 49.0 ~ 63.7N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0lbf.ft)



26. Remove the transaxle mounting bracket(A).

Tightening torque

Bolt(B) : 88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.61lbf.ft)



27. Remove the sub frame mounting bolts and nuts.

Tightening torque Bolt(A) : 156.9 ~ 176.5N.m (16.0 ~ 18.0 kgf.m, 115.7 ~ 130.2 lbf.ft) Bolt, Nut(B) : 68.6 ~ 88.3N.m (7.0 ~ 9.0 kgf.m, 50.6 ~ 65.1lbf.ft)



28. Remove the engine and transaxle assembly by lifting vehicle.

CAUTION

When remove the engine and transaxle assembly, be careful not to damage any surrounding parts or body components.

INSTALLATION

Installation is in the reverse order of removal.

Perform the following :

- •Adjust the shift cable.
- •Adjust the throttle cable.

- •Refill the engine with engine oil.
- •Refill the transaxle with fluid.
- •Refill the radiator and reservoir tank with engine coolant.
- •Place the heater control knob on "HOT" positon.
- •Bleed air from the cooling system
- -Start engine and let it run until it warms up. (until the radiator fan operates 3 or 4 times.)
- -Turn Off the engine. Check the level in the radiator, add coolant if needed. This will allow trapped air to be removed from the cooling system.
- -Put the radiator cap on tightly, then run the engine again and check for leaks.
- •Clean the battery posts and cable terminals with sandpaper assemble them, then apply grease to prevent corrosion.
- Inspect for fuel leakage.
- -After assemble the fuel line, turn on the ignition switch (do not operate the starter) so that the fuel pump runs for approximately two seconds and fuel line pressurizes.
- -Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.

COMPONENT



COMPRESSION PRESSURE INSPECTION

NOTE

If the there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

- 1. Start the engine and allow to warm up to operating temperature (about five minutes). Stop the engine.
- 2. Disconnect the ignition coil connectors and the spark plug cables.



- 3. Remove the four spark plugs using a 16mm spark plug wrench.
- 4. Check the cylinder compression pressure.
 - (1) Insert a compression gauge into the spark plug hole.



- (2) Fully open the throttle.
- (3) While cranking the engine, measure the compression pressure.

NOTE

Always use a fully charged battery to obtain engine speed of 250rpm or more.

(4) Repeat step (1) through (3) for each cylinder.

NOTE

This measurement must be done in as short a time as possible.

3

Compression pressure : 1,422kPa (14.5kg/cm², 206psi) (250~400 rpm) Minimum pressure : 1,275kPa (13.0kg/cm², 185psi) Difference between each cylinder : 98kPa (1.0kg/cm², 14psi) or less

(5) If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat step (1) through (3) for cylinders with low compression.

A. If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.

B. If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

- 5. Reinstall the spark plugs.
- 6. Connect the ignition coil connectors and the spark plug cables.

TIMING BELT TENSION ADJUSTMENT

1. Remove the engine cover.



- 2. Remove the RH front wheel.
- 3. Remove the bolts(B) and RH side cover(A).



4. Loosen the water pump pulley bolts.



- 5. Remove the alternator drive belt. (See EE group alternator)
- 6. Remove the air conditioner compressor drive belt. (See HA group air conditioner compressor)
- 7. Remove the power steering pump drive belt. (See ST group power steering pump)
- 8. Remove the water pump pulley.
- 9. Remove the 4 bolts(B) and timing belt upper cover (A).



10. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover. Check that the timing mark of camshaft sprocket is aligned with the timing mark of cylinder head cover. (No.1 cylinder compression TDC position)





11. Remove the crankshaft pulley bolt(B) and crankshaft pulley(A).



12. Remove the 5 bolts(B) and timing belt lower cover(A).



13. Temporarily loosen the tensioner pulley(A) by center bolt.



14. Adjust the timing belt tension.

(1) Rotate the crankshaft clockwise (view from the front) through angle equivalent to two teeth (18°) of camshaft sprocket(A).



(2) Using a hex-wrench, apply tension to the timing belt in the clockwise direction so that there is no slack in the belt on the tension side.



(3) Tighten the tensioner bolt.

Tightening torque : 42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lbf.ft) (4) Recheck the belt tension. When applying about mm).



- 15. Turn the crankshaft two turns in the operating direction (clockwise) and realign the crankshaft sprocket and camshaft sprocket timing mark.
- 16. Install the timing belt lower cover(A) with bolts(B).

Tightening torque :

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)



17. Install the crankshaft pulley(A) with bolt(B).

Tightening torque :

166.7 ~ 176.5N.m (17.0 ~ 18.0kgf.m, 123.0 ~ 130.2lbf.ft)



18. Install the timing belt upper cover(A) with bolts(B).

Tightening torque :

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)



- 19. Install the water pump pulley.
- 20. Install the power steering pump drive belt. (See ST group power steering pump)
- 21. Install the air conditioner compressor drive belt. (See HA group air conditioner compressor)
- 22. Install the alternator drive belt. (See EE group alternator)
- 23. Install the RH side cover(A) with bolts(B)



24. Install the RH front wheel.

Tightening torque : 88.3 ~ 107.9N.m (9 ~ 11kgf.m, 65.1 ~ 79.6lbf.ft)

Tightening torque :

3.9 ~ 5.9N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lbf.ft)



VALVE CLEARANCE INSPECTION AND ADJUSTMENT

MLA(MECHNICAL LASH ADJUSTER)

NOTE

Inspect and adjust the valve clearance when the engine is cold (Engine coolant temperature : (20°C ± 5°C [68°F ± 9°F]) and cylinder head is installed on cylinder block.

1. Remove the engine cover.



2. Remove the bolts(B) and timing belt upper cover(A).



- 3. Remove the cylinder head cover.
 - (1) Disconnect the spark plug cables and do not pull on the cable by force.

NOTE

Pulling on or bending the cables may damage the conductor inside.



(2) Remove the PCV (Positive Crankcase Ventilation) hose(A) and the breather hose(B) from the cylinder head cover.



(3) Remove the accelerator cable(A) from the cylinder head cover.



(4) Loosen the cylinder head cover bolts(B) and then

,A) and gasket.



- 4. Set No. 1 cylinder to TDC/compression.
 - (1) Turn the crankshaft pulley and align its groove with the timing mark "T" of the lower timing belt cover.



(2) Check that the hole of the camshaft timing pulley(A) is aligned with the timing mark of the bearing cap. If not, turn the crankshaft one revolution (360°).



5. Inspect the valve clearance.

(1) Check only the valve indicated as shown. [No. 1 cylinder : TDC/compression]. Measure the valve clearance.



- A. Using a thickness gauge, measure the clearance between the tappet shim and the base circle of camshaft.
- B.Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance [Specification] Engine coolant temperature : $(20^{\circ}C \pm 5^{\circ}C[68^{\circ}F \pm 9^{\circ}F])$ Intake : 0.20mm (0.0079in) Exhaust : 0.28mm (0.0110in) [Limit] Intake : 0.12 ~ 0.28mm (0.0047 ~ 0.0110in) Exhaust : 0.20 ~ 0.38mm (0.0079 ~ 0.0150in)

- (2) Turn the crankshaft pulley one revolution (360°) and align the groove with the timing mark "T" of lower timing belt cover.
- (3) Check only valves indicated as shown. [No. 4 cylinder : TDC/compression]. Measure the valve clearance. (See procedure step (1))



- 6. Adjust the intake and exhaust valve clearance.
 - (1) Turn the crankshaft so that the cam lobe of the camshaft on the adjusting valve is upward.
 - (2) Using the SST(09220 2D000), press down the valve lifter and place the stopper between the camshaft and valve lifter and remove the special tool.



(3) Remove the adjusting shim with a small screw driver(A) and magnet(B).



(4) Measure the thickness of the removed shim using a micrometer.



(5) Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

Valve clearance (Engine coolant temperature : $20^{\circ}C \pm 5^{\circ}C[68^{\circ}F \pm 9^{\circ}F]$) T : Thickness of removed shim A : Measured valve clearance N : Thickness of new shim Intake : N = T + [A - 0.20mm(0.0079in)] Exhaust : N = T + [A - 0.28mm(0.0110in)] (6) Select a new shim with a thickness as close as p chart)

ated value. (Refer to the Adjusting shim selection

NOTE

Shims are available in 20 size increments of 0.04mm (0.0016in) from 2.00mm (0.0787in) to 2.76mm (0.1087in)

(7) Place a new adjusting shim on the valve lifter.

- (8) Using the SST(09220 2D000), press down the valve lifter and remove the stopper.
- (9) Recheck the valve clearance.

Valve clearance (Engine coolant temperature : $20^{\circ}C \pm 5^{\circ}C[68^{\circ}F \pm 9^{\circ}F]$) [Specification] Intake : 0.20mm (0.0079in) Exhaust : 0.28mm (0.0110in) [Limit] (After adjusting valve clearance) Intake : 0.17 ~ 0.23mm (0.0067 ~ 0.0091in) Exhaust : 0.25 ~ 0.31mm (0.0098 ~ 0.0122in)

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| | Installed shim thickness mm (in) 2 215(0.0631) 2 215(0.0641) 2 215(0.064 | 0.000-0.020 (0.0000-0.0008) 0.021-0.040 (0.0008-0.0016) | 0.041-0.050 (0.0016-0.0024) | 0.051-0.090 (0.0024-0.0031) | 0.061-0.100 (0.0032-0.0039) 0 1 1 1 0 0.0040-0.0040-0.0047) 1 1 1 | 0.121-0.140 (0.0048-0.0055) 1 1 1 1 | 0.141-0.160 (0.0066-0.0063) 11 1 2 2 | 0.161-0.159 (0.0007-0.0078) 1 1 1 1 2 2 2 3 | 0.200-0.350 (0.0079-0.0142) | 0.361-0.360 (0.0142-0.0150) 3 4 4 5 5 6 6 6 7 7 7 7 0 5 6 6 6 7 7 7 7 0 6 0 381-0.400 (0.0142-0.0157) 4 4 6 6 6 7 7 7 7 8 6 | 0.401-0.420 (0.0158-0.0165) 4 5 5 6 6 7 7 7 8 8 5 | 0.421-0.440 (0.0166-0.0173) 5 5 5 6 6 7 7 8 8 8 8 5 | 0.441-0.460 (0.0174-0.0181) 5 6 6 7 7 8 8 8 9 9 9 | 0.481-0.480 (0.0181-0.0189) 5 5 7 7 8 8 9 9 9 9 1 | 0.501-0.520 (0.0197-0.0205) 7 7 8 8 9 9 1010 10 10 10 10 | 0.521-0.540 (0.0205-0.0213) 7 8 8 9 9 10 10 10 11 11 1 | 0.541-0.560 (0.0213-0.0220) 8 8 9 9 10 10 11 11 11 11 | 0.561-0.560 (0.0229-0.0236) 9 9 10 10 11 11 12 12 12 12 12 12 12 | 0.601-0.620 (0.0237-0.0244) 9 10 10 11 11 12 12 12 13 13 1. 0.601-0.640 //0.0644-0.0680 40 40 40 44 44 40 40 40 40 40 40 40 40 | 0.641-0.690 (0.0252-0.0260) 10 11 11 12 12 13 13 13 14 14 14 14 | 0.661-0.680 (0.0260-0.0268) 11 11 12 12 13 13 14 14 14 14 15 15 | 0.701-0.720 (0.0276-0.0283) 12 12 12 13 13 14 14 15 15 15 15 16 16 16 16 16 16 16 16 16 16 16 16 16 | 0.721-0.740 (0.0284-0.0291) 12 13 13 14 14 15 15 15 16 16 16 16 16 1 | 0.761-0.780 (0.0300-0.0307) 13 13 14 14 15 15 15 15 15 15 17 17 17 17 17 17 17 17 17 17 17 17 17 | 0.781-0.800 (0.0907-0.0915) 14 14 15 15 16 16 17 17 17 17 18 16 0.801-0.800 (0.09375-0.0523) 14 15 15 16 16 17 17 17 17 14 14 14 14 | 0.621-0.840 (0.0023-0.0031) 15 15 15 16 16 17 17 18 18 18 19 19 19 | 0.641-0.690 (0.0039-0.0346) 16 16 16 17 17 18 18 19 19 19 19 20 20 | 0.881-0.500 (0.0347-0.0354) 16 17 17 18 18 19 19 19 20 20 20 20 | 0.901-0.920 (0.0655-0.0362) 17 17 18 18 19 19 20 20 20 20 | 0.921-0.940 (0.0363-0.0370) 17 18 18 18 19 19 20 20 20 20 0.041-0.960 (0.0570-0.0378) 18 18 19 19 20 20 20 | 0.961-0.980 (0.0378-0.0386) 18 19 19 20 20 | 0.581-1.000 (0.0386-0.0394) 19 19 20 20 1.001-1.020 (0.0394-0.0402) 19 20 20 1.021-1.040 (0.0462-0.0403) 20 20 | 1.041-1.060 (0.0410-0.0417) 20 |
|---|---|---|---|-----------------------------|---|--|--------------------------------------|---|---|---|--|---|--|---|--|--|---|--|---|---|--|---|--|---|--|--|--|---|---|--|---|--|--------------------------------|
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| | (2901.0) | 99.2 99.2 | 12 12 13 | 13 14 | 2 3 | 1 1 1 | | 8 5 | R R 8 | | | | | | | | 858 | line se | 2 = | | 2 | ₽ ₽ | 14 | £ | 9 10 | 4 | 8 | 1 | 8 | 8 | 1, | | |
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| | (0.0996) | 5.53 | 8 9 9 9 | 2 E | = : | 2 2 | | 5 5 | 18 18 | 8 | 19 19 | 2 8 | 20 20 | _ | | | New 8 | Ē | 00 | 3 | 5 | 5.08 | 2.12 | 2.16 | 52 | 2.24 | 2.28 | ī | 2.32 | 2.36 | News | in ad on | |
| | (2860°0) (8860°0) | 5'85 5'21 | 8 9 9 9 | 9 | = : | 1 | | 2 2 | 12 12 | 8 | 18 18 | 61 65 | 8 | 8 | _ | | _ | m r | į - | | ~ | ~ | 4 | 10 | | ~ | | ,† | 8 | 9 | Î | mprint | |
| Adjusting Shim Selection Chart (Intake) | (beer0) (2,2600) (2,2600) (2,0000) (9,9600) (9,9600) (9,9600) (1,0000) (1,0 | X-100 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - | 1 1 1 1 1 1 1 2 2 2 3 3 3 3 4 4 4 4 5 <td></td> <td></td> <td>1 1 1 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 9 9 9 9 10 10 10 10 10 11 11 11 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 10 10 10 10 10 11 11</td> <td></td> <td></td> <td>2 5 6 6 7 7 7 7 8 8 8 8 8 9 9 9 10 10 10 10 10 11 11 12 12 12 12 12 13 13 14 14 14 14 15 16 16 16 16 16 16 16 16 16 16 16 16 16</td> <td>3 B 7 7 8 B 8 B 8 9 9 9 10 10 10 10 11 11 11 11 12 12 12 12 13 13 13 13 14 14 14 15 15 15 15 16 16 16 16 16 17 17 17 17 17</td> <td>2 7 8 8 8 8 9 9 9 9 10 10 10 10 11 11 11 11 12 12 12 12 13 13 13 14 14 14 14 15 15 15 15 15 16 18 16 18 17 17 17 18 7 8 8 8 9 9 9 9 10 10 10 10 11 11 11 11 12 12 12 12 13 13 13 14 14 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15</td> <td></td> <td>9 9 9 10 10 10 10 11 11 11 11 11 12 12 12 12 13 13 13 13 13 14 14 14 14 14 15 15 15 15 15 16 16 16 17 17 17 17 17 18 16 18 19 19 19 19</td> <td>8 9 10 10 10 11 11 11 12 12 12 12 13 13 13 13 13 14 14 14 14 15 15 15 15 15 19 16 16 17 17 17 17 17 18 18 18 18 19 19 19 20</td> <td>8 10 10 11 11 11 12 12 12 12 12 13 13 13 14 14 14 14 15 15 15 15 15 15 17 17 17 17 18 19 18 19 19 19 19 20 20 20 20 20 20 20 20 20 10 11 11 11 12 12 12 13 13 13 13 14 14 14 14 14 15 15 15 15 15 15 15 17 13 18 18 18 18 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20</td> <td></td> <td>0 11 12 12 13 13 13 13 14 14 14 14 15 15 15 15 15 16 16 16 17 17 17 17 18 18 18 18 18 19 19 19 20 20 20 20 20</td> <td>1 12 12 12 13 13 14 14 14 14 14 15 15 15 15 15 15 15 15 17 17 17 17 17 17 18 18 18 18 19 19 19 20 20 20 20 20 20 1 1 12 13 13 13 14 14 14 14 15 15 15 15 15 15 15 15 17 17 17 17 17 18 18 18 18 19 19 19 19 20 20 20 20 20 20</td> <td>2 13 13 14 14 14 15 15 15 15 16 18 16 18 17 17 17 17 18 18 18 18 18 19 18 18 19 19 20 20 20 20</td> <td>2 10 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15</td> <td>3 14 14 15 15 15 16 16 16 17 17 17 17 17 18 18 18 18 19 19 19 19 19 20 20 20 20 20</td> <td>4 14 15 15 16 16 16 17 17 17 17 18 18 18 18 18 18 18 19 19 19 20 20 20 20 20 4 15 15 15 15 15 17 17 18 18 14 18 14 16 10 20 20 20 20 20 20 20 20 20 20 20 20 20</td> <td>5 15 16 16 17 17 17 18 18 18 18 18 19 19 19 19 19 20 20 20 20 20 20</td> <td>6 16 16 17 17 18 18 18 18 18 18 19 19 19 19 20 20 20 20 20 20 20 20 6 16 17 17 18 18 19 19 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20</td> <td>8 17 17 18 18 19 19 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20</td> <td>7 17 18 18 19 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20</td> <td>8 18 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20</td> <td>al ray ray and ray ray ray</td> <td>9 (20 (20)</td> <td>0 20 0.20 mm. (Spec.), 0.12-0.28 mm. (Limit)</td> <td>Example: 1 fre 2.44 mm is maximus, and une maximus and the same same same same same same same sam</td> <td>Replace the 2.24 mm shim with a new No.13 shim.</td> <td></td> | | | 1 1 1 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 9 9 9 9 10 10 10 10 10 11 11 11 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 10 10 10 10 10 11 11 | | | 2 5 6 6 7 7 7 7 8 8 8 8 8 9 9 9 10 10 10 10 10 11 11 12 12 12 12 12 13 13 14 14 14 14 15 16 16 16 16 16 16 16 16 16 16 16 16 16 | 3 B 7 7 8 B 8 B 8 9 9 9 10 10 10 10 11 11 11 11 12 12 12 12 13 13 13 13 14 14 14 15 15 15 15 16 16 16 16 16 17 17 17 17 17 | 2 7 8 8 8 8 9 9 9 9 10 10 10 10 11 11 11 11 12 12 12 12 13 13 13 14 14 14 14 15 15 15 15 15 16 18 16 18 17 17 17 18 7 8 8 8 9 9 9 9 10 10 10 10 11 11 11 11 12 12 12 12 13 13 13 14 14 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15 | | 9 9 9 10 10 10 10 11 11 11 11 11 12 12 12 12 13 13 13 13 13 14 14 14 14 14 15 15 15 15 15 16 16 16 17 17 17 17 17 18 16 18 19 19 19 19 | 8 9 10 10 10 11 11 11 12 12 12 12 13 13 13 13 13 14 14 14 14 15 15 15 15 15 19 16 16 17 17 17 17 17 18 18 18 18 19 19 19 20 | 8 10 10 11 11 11 12 12 12 12 12 13 13 13 14 14 14 14 15 15 15 15 15 15 17 17 17 17 18 19 18 19 19 19 19 20 20 20 20 20 20 20 20 20 10 11 11 11 12 12 12 13 13 13 13 14 14 14 14 14 15 15 15 15 15 15 15 17 13 18 18 18 18 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20 | | 0 11 12 12 13 13 13 13 14 14 14 14 15 15 15 15 15 16 16 16 17 17 17 17 18 18 18 18 18 19 19 19 20 20 20 20 20 | 1 12 12 12 13 13 14 14 14 14 14 15 15 15 15 15 15 15 15 17 17 17 17 17 17 18 18 18 18 19 19 19 20 20 20 20 20 20 1 1 12 13 13 13 14 14 14 14 15 15 15 15 15 15 15 15 17 17 17 17 17 18 18 18 18 19 19 19 19 20 20 20 20 20 20 | 2 13 13 14 14 14 15 15 15 15 16 18 16 18 17 17 17 17 18 18 18 18 18 19 18 18 19 19 20 20 20 20 | 2 10 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15 | 3 14 14 15 15 15 16 16 16 17 17 17 17 17 18 18 18 18 19 19 19 19 19 20 20 20 20 20 | 4 14 15 15 16 16 16 17 17 17 17 18 18 18 18 18 18 18 19 19 19 20 20 20 20 20 4 15 15 15 15 15 17 17 18 18 14 18 14 16 10 20 20 20 20 20 20 20 20 20 20 20 20 20 | 5 15 16 16 17 17 17 18 18 18 18 18 19 19 19 19 19 20 20 20 20 20 20 | 6 16 16 17 17 18 18 18 18 18 18 19 19 19 19 20 20 20 20 20 20 20 20 6 16 17 17 18 18 19 19 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20 | 8 17 17 18 18 19 19 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20 | 7 17 18 18 19 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20 | 8 18 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20 | al ray ray and ray ray ray | 9 (20 (20) | 0 20 0.20 mm. (Spec.), 0.12-0.28 mm. (Limit) | Example: 1 fre 2.44 mm is maximus, and une maximus and the same same same same same same same sam | Replace the 2.24 mm shim with a new No.13 shim. | |
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SPECIAL SERVICE TOOLS

| Tool (Number and name) | Illustration | Use |
|--|-------------------|---|
| Crankshaft front oil seal installer (09214-32000) | | Installation of the front oil seal |
| Crankshaft front oil seal guide (09214-32100) | | Installation of the front oil seal |
| Valve clearance adjust tool set (09220-2D000) | Plier | Removal and installation of the tappet shim |
| Camshaft oil seal installer (09221-21000) | | Installation of the camshaft oil seal |
| Valve guide remover (09221-3F100 (A)) Valve guide installer (09221-3F100 (B)) | (A) (B) (B) | Removal and installation of the valve guide |
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| Valve stem oil seal installer (09222-22001) | Installation of the valve stem oil seal |
|---|---|
| Valve spring compressor (09222-28000) Valve spring compressor adaptor (09222-28100) | Removal and installation of the intake or exhaust valve |
| Crankshaft rear oil seal installer (09231-21000) | Installation of the crankshaft rear oil seal |

GENERAL

SPECIFICATIONS

| De | escription | Specifications (2.0 DOHC) | Limit |
|----------------------|---------------|--|-------------------|
| General | | | |
| Туре | | In-line, DOHC | |
| Number of cylinders | | 4 | |
| Bore | | 82mm (3.2283in) | |
| Stroke | | 93.5mm (3.6811in) | |
| Total displacement | | 1,975 cc (120.5 cu.in) | |
| Compression ratio | | 10.1 : 1 | |
| Firing order | | 1-3-4-2 | |
| Valve timing | | | |
| Intake valve | Opens (ATDC) | 11° | |
| | Closes (ABDC) | 59° | |
| Exhaustivalve | Opens (BBDC) | 42° | |
| | Closes (ATDC) | 6° | |
| Cylinder head | | | |
| Flatness of gasket s | urface | Less than 0.03mm (0.0012in) | 0.06mm (0.0024in) |
| Flatness of manifold | Intake | Less than 0.15mm (0.0059in) | 0.30mm (0.0118in) |
| mounting surface | Exhaust | Less than 0.15mm (0.0059in) | 0.30mm (0.0118in) |
| | STD | 11.000 ~ 11.018mm (0.4331 ~ 0.4338in) | |
| Valve guide hole | 0.05 OS | 11.050 ~ 11.068mm (0.4350 ~ 0.4357in) | |
| (Intake, Exhaut) | 0.25 OS | 11.250 ~ 11.268mm (0.4429 ~ 0.4436in) | |
| | 0.50 OS | 11.500 ~ 11.518mm (0.4528 ~ 0.4535in) | |
| | STD | 33.000 ~ 33.025mm (1.2992 ~ 1.3002in) | |

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| ring hole diameter | 0.3 OS | 33.300 ~ 33.325mm (1.3110 ~ 1.3120in) | |
|---|----------------------|--|------------------|
| | 0.6 OS | 33.600 ~ 33.625mm (1.3228 ~ 1.3238in) | |
| | STD | 28.500 ~ 28.521mm (1.1220 ~ 1.1229in) | |
| Exhaust valve seat ring hole diameter | 0.3 OS | 28.800 ~ 28.821mm (1.1339 ~ 1.1347in) | |
| | 0.6 OS | 29.100 ~ 29.121mm (1.1457 ~ 1.1465in) | |
| Camshaft | ° | | |
| Cam height | Intake | 44.518 ~ 44.718mm (1.7527 ~ 1.7605in) | |
| (With CVVT) | Exhaust | 44.418 ~ 44.618mm (1.7487 ~ 1.7566in) | 8 |
| Cam height | Intake | 44.720mm ~ 44.920mm (1.7606 ~ 1.7685in) | |
| (Without CVVT) Exhaust | | 44.620mm ~ 44.820mm (1.7567 ~ 1.7646in) | |
| Journal outer Diamet | er (Intake, Exhaust) | 27.964 ~ 27.980mm (1.1009 ~ 1.1016in) | |
| Bearing oil clearance | | 0.02 ~ 0.061mm (0.0008 ~ 0.0024in) | 0.1mm (0.0039in) |
| End play | | 0.10 ~ 0.20mm (0.0039 ~ 0.0079in) | C |
| Valve | | | |
| Valve length | Intake | 114.34mm (4.5016in) | |
| valve length | Exhaust | 116.8mm (4.5984in) | |
| Stem outer | Intake | 5.965 ~ 5.980mm (0.2348 ~ 0.2354in) | |
| diameter | Exhaust | 5.950 ~ 5.965mm (0.2343 ~ 0.2348in) | |
| Face angle | <u>~</u> | 45° ~ 45° 30' | |
| Thickness of | Intake | 1.15mm (0.0453in) | 0.8mm (0.0315in) |
| Valve head (margin) | Exhaust | 1.35mm (0.0531in) | 1.0mm (0.0394in) |
| | | | |

| Valve stem to | Intake | 0.020 ~ 0.050mm (0.0008 ~ 0.0020in) | 0.10mm (0.0039in) | |
|----------------------|---------|--|----------------------------------|--|
| clearance Exhaust | | 0.035 ~ 0.065mm (0.0014 ~ 0.0026in) | 0.13mm (0.0051in) | |
| Valve guide | | | · | |
| Longth | Intake | 45.8 ~ 46.2mm (1.8031 ~ 1.8189in) | | |
| Length | Exhaust | 54.3 ~ 54.6mm (2.1378 ~ 2.1496in) | 1 | |
| Valve seat | | · | - | |
| Width of seat | Intake | 1.1 ~ 1.5mm (0.0433 ~ 0.0591in) | | |
| contact | Exhaust | 1.3 ~ 1.7mm (0.0512 ~ 0.0669in) | 1 | |
| Saatangla | Intake | 45° ~ 45° 30' | 1 | |
| Seat angle | Exhaust | 45° ~ 45° 30' | | |
| Valve spring | | · | 4 | |
| Free length | | 48.86mm (1.9236in) | | |
| Load | | 18.8±0.9kg/39.0mm(41.4±2.0 lb/1.5354in) | | |
| | | 41.0±1.5kg/30.5mm(90.4±3.3 lb/1.2008in) | | |
| Out of squareness | | Less than 1.5° | 3° | |
| Valve clearance | | · | | |
| Cold (20°C ± 5°C) | Intake | 0.20mm (0.0079in) | 0.12~0.28mm (0.0047~0.0110in) | |
| (68°F ± 9°F) | Exhaust | 0.28mm (0.0110in) | 0.20~0.38mm (0.0079~0.0150in) | |
| Cylinder block | | | - | |
| Cylinder bore | | 82.00 ~ 82.03mm (3.2283 ~ 3.2295in) | | |
| Flatness of gasket s | urface | Total : Less than 0.05mm (0.0020in) Bore to bore : Less than 0.03mm (0.0012in) | | |
| Piston | | | | |
| Piston outer diamete | er | 81.970 ~ 82.000mm (3.2272 ~ 3.2283in) | | |

| Piston to cylinder cle | earance | 0.020 ~ 0.040mm (0.0008 ~ 0.0016in) | |
|--|-----------------|---|------------------|
| No. 1 ring groove | | 1.23 ~ 1.25mm (0.0484 ~ 0.0492in) | 1 |
| Ring groove width No. 2 ring groove | | 1.22 ~ 1.24mm (0.0480 ~ 0.0488in) | 1 |
| | Oil ring groove | 2.51 ~ 2.53mm (0.0988 ~ 0.0996in) | 1 |
| Piston ring | | | 2 |
| | No. 1 ring | 0.04 ~ 0.08mm (0.0016 ~ 0.0031in) | 0.1mm (0.0039in) |
| Side clearance | No. 2 ring | 0.03 ~ 0.07mm (0.0012 ~ 0.0028in) | 0.1mm (0.0039in) |
| | Oil ring | 0.06 ~ 0.15mm (0.0024 ~ 0.0059in) | 0.2mm (0.0079in) |
| | No. 1 ring | 023 ~ 0.38mm (0.0091 ~ 0.0150in) | 1.0mm (0.0394in) |
| End gap | No. 2 ring | 0.33 ~ 0.48mm (0.0130 ~ 0.0189in) | 1.0mm (0.0394in) |
| | Oil ring | 0.20 ~ 0.60mm (0.0079 ~ 0.0236in) | 1.0mm (0.0394in) |
| Piston pin | | · | • |
| Piston pin outer diar | neter | 20.001 ~ 20.006mm (0.7874 ~ 0.7876in) | |
| Piston pin hole inner diameter | | 20.016 ~ 20.021mm (0.7880 ~ 0.7882in) | |
| Piston pin hole clearance | | 0.010 ~ 0.020mm (0.0004 ~ 0.0008in) | - |
| Connecting rod small end hole inner diameter | | 19.974 ~ 19.985mm (0.7864 ~ 0.7868in) | |
| Connecting rod small end hole clearance | | -0.032 ~ -0.016mm (-0.0013 ~ - 0.0006in) | |
| Piston pin press-in le | oad | 350~1,350 kg (772~2,976 lb) | 1 |
| Connecting rod | | | |
| Connecting rod big end inner diameter | | 48.000 ~ 48.018mm (1.8898 ~ 1.8905in) | |
| Connecting rod bearing oil clearance | | 0.024 ~ 0.044mm (0.0009 ~ 0.0017in) | |
| Side clearance | | 0.10 ~ 0.25mm (0.0039 ~ 0.0098in) | 0.4mm (0.0157in) |
| Crankshaft | | | |
| Main journal outer diameter | | 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) | |

| Pin journal outer diameter | | 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) | |
|----------------------------|---------------------|---|-------------------|
| Main bearing oil clearance | | 0.028 ~ 0.048mm (0.0011 ~ 0.0019in) | 0.1mm (0.0039in) |
| End play | | 0.06 ~ 0.260mm (0.0024 ~ 0.0102in) | 0.3mm (0.0118in) |
| Flywheel | | | |
| Runout | | 0.1mm (0.0039in) | 0.13mm (0.0051in) |
| Oil pump | | - | |
| Side electroped | Inner rotor | 0.040 ~ 0.085mm (0.0016 ~ 0.0033in) | |
| | Outer rotor | 0.040 ~ 0.090mm (0.0016 ~ 0.0035in) | |
| Body clearance | * | 0.120 ~ 0.185mm (0.0047 ~ 0.0073in) | |
| Relief valve opening | pressure | 490±49.0kpa (5±0.5kg/cm², 71 ±7.1psi) | |
| Relief spring | | 43.8mm (1.7244in) | |
| | | 3.7±0.4kg/40.1mm (8.2±0.9 lb/1.5787in) 9.7±0.4kg/34.3mm (21.4±0.9 lb/1.3504in) | |
| Engine oil | | | |
| Oil quantity (Total) | | 4.0 L (4.23 US qt, 3.52 lmp qt) | |
| Oil quantity (Oil pan) | | 3.7 L (3.91 US qt, 3.26 lmp qt) | |
| Oil quantity (Oil filter) |) | 0.3 L (0.32 US qt, 0.26 lmp qt) | |
| Oil quality | | Above SL, SJ | |
| Oil pressure (Idle) | | 156.9kpa (1.6kg/cm², 22.8psi) | |
| Cooling system | | | |
| Cooling method | | Forced circulation with cooling fan | |
| Coolant quantity | | 6.0 L (6.34 US qt, 5.28 lmp qt) |] |
| | Туре | Wax pellet type |] |
| Thermostat | Opening temperature | 82±1.5°C(179.6±2.7°F) | |
| Pull opening temperature | | 95°C (203°F) | |

| Radiator cap | Main valve opening pressure | 93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm², 13.51 ~ 17.78psi) | |
|-------------------|--------------------------------|---|--|
| | Vacuum valve opening pressure | 0.98 ~ 4.90 kpa (0.01 ~ 0.05kg/cm², 0.14 ~ 0.71 psi) | |
| Water temperature | sensor | | |
| Туре | | Thermister type | |
| Resistance | 20°C (68°F) | 2.45±0.14 k | |
| Resistance | 80°C (176°F) | 0.3222 k | |

TIGHTENING TORQUE

| Itom | Quan- | Tightening torque | | | |
|---|-------|-------------------|-----------|--------------|--|
| item | tity | N.m | kgf.m | lbf.ft | |
| Cylinder block | | | | | |
| Engine support (front) bracket bolt | 3 | 34.3 ~ 49.0 | 3.5 ~ 5.0 | 25.3 ~ 36.2 | |
| Engine support (rear) bracket bolt | 2 | 34.3 ~ 49.0 | 3.5 ~ 5.0 | 25.3 ~ 36.2 | |
| Engine support bracket stay plate bolt | 1 | 42.2 ~ 53.9 | 4.3 ~ 5.5 | 31.1 ~ 39.8 | |
| Engine mounting | | | | | |
| Engine mounting bracket and body fixing bolt | 3 | 49.0 ~63.7 | 5.0 ~6.5 | 36.2.9 ~47.0 | |
| Engine mounting insulator and engine mounting support bracket fixing nut | 1 | 58.8 ~78.5 | 6.0 ~8.0 | 43.4 ~57.9 | |
| Engine mounting support bracket and engine support bracket fixing bolt | 1 | 49.0 ~63.7 | 5.0 ~6.5 | 36.2 ~47.0 | |
| Engine mounting support bracket and engine support bracket fixing nut | 2 | 49.0 ~63.7 | 5.0 ~6.5 | 36.2 ~47.0 | |
| Transaxle mounting bracket and body fixing bolt | 4 | 49.0 ~63.7 | 5.0 ~6.5 | 36.2 ~47.0 | |
| Transaxle mounting insulator and transaxle support bracket fixing bolt | 1 | 88.3 ~107.9 | 9.0 ~11.0 | 65.1 ~79.6 | |
| Front roll stopper bracket and sub frame fixing bolt | 3 | 49.0 ~63.7 | 5.0 ~6.5 | 36.2 ~47.0 | |
| Front roll stopper insulator and front roll stopper support bracket fixing bolt,nut | 1 | 49.0 ~63.7 | 5.0 ~6.5 | 36.2 ~47.0 | |
| Rear roll stopper bracket and sub frame fixing bolt | 3 | 49.0 ~63.7 | 5.0 ~6.5 | 36.2 ~47.0 | |

| ~47.0 ~38.3 3.1+60° 4° ~94.0 ~94.0 ~7.2 ~7.2 ~7.2 ~8.7 ~130.2 ~86.8 |
|--|
| -38.3 3.1+60° 4° -94.0 -94.0 -7.2 -7.2 -7.2 -8.7 -130.2 -86.8 |
| ~38.3 3.1+60° 4° ~94.0 ~94.0 ~7.2 ~7.2 ~8.7 ~130.2 ~86.8 |
| 3.1+60° 4° ~94.0 ~94.0 ~7.2 ~7.2 ~7.2 ~8.7 ~130.2 ~86.8 |
| ~94.0 ~94.0 ~7.2 ~7.2 ~8.7 ~130.2 ~86.8 |
| ~94.0 ~7.2 ~7.2 ~8.7 ~130.2 ~86.8 |
| ~7.2 ~7.2 ~8.7 ~130.2 ~86.8 |
| ~7.2 ~7.2 ~8.7 ~130.2 ~86.8 |
| ~7.2 ~8.7 ~130.2 ~86.8 |
| ~8.7 ~130.2 ~86.8 |
| ~130.2 ~86.8 |
| -86.8 |
| (|
| ~39.8 |
| ~39.8 |
| |
| -4.3 |
| ~7.2 |
| ~10.8 |
| ~56.4 |
| ~7.2 |
| ~8.7 |
| - 36.9 |
|).5+60° 0°~65° |
| 3.1+60° 0°~65° |
| |
| -72 |
| • • • |
| |

| Water pump bolt (8 X 35) | 2 | 11.8 ~ 14.7 | 1.2 ~ 1.5 | 8.7 ~ 10.8 |
|--|----|-------------|-----------|-------------|
| Water pump and alternator brace fixing bolt (8 X 45) | 2 | 19.6 ~ 26.5 | 2.0 ~ 2.7 | 14.5 ~ 19.5 |
| Alternator brace and cylinder block fixing bolt | 2 | 11.8 ~ 14.7 | 1.2 ~ 1.5 | 8.7 ~ 10.8 |
| Thermostat housing bolt | 1 | 14.7 ~ 19.6 | 1.5 ~ 2.0 | 10.8 ~ 14.5 |
| Thermostat housing nut | 1 | 14.7 ~ 19.6 | 1.5 ~ 2.0 | 10.8 ~ 14.5 |
| Water temperature sensor | 1 | 19.6 ~ 39.2 | 2.0 ~ 4.0 | 14.5 ~ 28.9 |
| Water inlet fitting nut | 2 | 14.7 ~ 19.6 | 1.5 ~ 2.0 | 10.8 ~ 14.5 |
| Lubrication system | • | - | - | |
| Oil filter | 1 | 11.8 ~ 15.7 | 1.2 ~ 1.6 | 8.7 ~ 11.6 |
| Front case bolt (8 X 20) | 4 | 19.6 ~ 26.5 | 2.0 ~ 2.7 | 14.5 ~ 19.5 |
| Front case bolt (8 X 25) | 1 | 19.6 ~ 26.5 | 2.0 ~ 2.7 | 14.5 ~ 19.5 |
| Front case bolt (8 X 38) | 1 | 19.6 ~ 26.5 | 2.0 ~ 2.7 | 14.5 ~ 19.5 |
| Front case bolt (8 X 45) | 2 | 19.6 ~ 26.5 | 2.0 ~ 2.7 | 14.5 ~ 19.5 |
| Oil pan bolt (6 X 16) | 15 | 9.8 ~ 11.8 | 1.0 ~ 1.2 | 7.2 ~ 8.7 |
| Oil pan bolt (6 X 50) | 2 | 9.8 ~ 11.8 | 1.0 ~ 1.2 | 7.2 ~ 8.7 |
| Oil pan bolt (6 X 118) | 2 | 9.8 ~ 11.8 | 1.0 ~ 1.2 | 7.2 ~ 8.7 |
| Oil pan and transaxle fixing bolt | 3 | 29.4 ~ 41.2 | 3.0 ~ 4.2 | 21.7 ~ 30.4 |
| Oil pan drain bolt | 1 | 39.2 ~ 44.1 | 4.0 ~ 4.5 | 28.9 ~ 32.5 |
| Oil screen bolt | 2 | 14.7 ~ 21.6 | 1.5 ~ 2.2 | 10.8 ~ 15.9 |
| Oil pressure switch | 1 | 14.7 ~ 21.6 | 1.5 ~ 2.2 | 10.8 ~ 15.9 |
| Intake and exhaust system | ~ | | ~ | |
| Intake manifold and cylinder head fixing nut | 9 | 15.7 ~ 22.6 | 1.6 ~ 2.3 | 11.6 ~ 16.6 |
| Intake manifold stay bolt | 4 | 17.7 ~ 24.5 | 1.8 ~ 2.5 | 13.0 ~ 18.1 |
| Exhaust manifold and cylinder head fixing nut | 9 | 42.2 ~ 53.9 | 4.3 ~ 5.5 | 31.1 ~ 39.8 |
| O2 sensor to exhaust manifold | 1 | 49.0 ~ 58.8 | 5.0 ~ 6.0 | 36.2 ~ 43.4 |
| Exhaust manifold heat cover and exhaust manifold fixing bolt | 4 | 16.7 ~ 21.6 | 1.7 ~ 2.2 | 12.3 ~ 15.9 |
| Air cleaner assembly fixing bolt | 3 | 7.8 ~ 9.8 | 0.8 ~ 1.0 | 5.8 ~ 7.2 |
| Throttle body and surge tank fixing bolt | 4 | 18.6 ~ 27.5 | 1.9 ~ 2.8 | 13.7 ~ 20.3 |

| Exhaust manifold and front muffler fixing bolt | 2 | 39.2 ~ 58.8 | 4.0 ~ 6.0 | 28.9 ~ 43.4 |
|--|---|-------------|-----------|-------------|
| Front muffler fixing clip bolt | 1 | 29.4 ~ 39.2 | 3.0 ~ 4.0 | 21.7 ~ 28.9 |
| Front muffler and center muffler fixing nut | 2 | 39.2 ~ 58.8 | 4.0 ~ 6.0 | 28.9 ~ 43.4 |
| Center muffler and main muffler fixing nut | 2 | 39.2 ~ 58.8 | 4.0 ~ 6.0 | 28.9 ~ 43.4 |

| TROUBLESHOOTING | | | |
|--|---|--|--|
| Symptom | Suspect area | Remedy | |
| Engine misfire with abnormal internal lower engine noises. | Loose or improperly installed engine flywheel. | Repair or replace the flywheel as required. | |
| | Worn piston rings. (Oil consumption may or may not cause the engine to misfire.) | Inspect the cylinder for a loss of compression. Repair or replace as required. | |
| | Worn crankshaft thrust bearings. | Replace the crankshaft and bearings as required. | |
| Engine misfire with abnormal valve train noise. | Stuck valves. (Carbon buildup on the valve stem can cause the valve not to close properly.) | Repair or replace as required. | |
| | Excessive worn or mis-aligned timing chain. | Replace the timing chain and sprocket as required. | |
| | Worn camshaft lobes. | Replace the camshaft and valve lifers. | |
| Engine misfire with coolant consumption | Faulty cylinder head gasket and/or cracking or other damage to the cylinder head and engine block cooling system. Coolant consumption may or may not cause the engine to overheat. | Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket. Repair or replace as required. | |
| Engine misfire with excessive oil | Worn valves, valve guides and/or valve stem oil seals. | Repair or replace as required. | |
| consumption | Worn piston rings. (Oil consumption may or may not cause the engine to misfire) | Inspect the cylinder for a loss of compression Repair or replace as required. | |
| Engine noise on start-up, but only lasting a few seconds. | Incorrect oil viscosity. | Drain the oil. Refill with the correct viscosity oil. | |
| | Worn crankshaft thrust bearing. | Inspect the thrust bearing and crankshaft. Repair or replace as required. | |
| Upper engine noise, regardless of engine speed. | Low oil pressure. | Repair or replace as required. | |
| | Broken valve spring. | Replace the valve spring. | |
| | Worn or dirty valve lifters. | Replace the valve lifters. | |

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| | Stretched or broken timing chain and/or damaged sprocket teeth. | Replace the timing chain and sprockets. | |
|---|--|--|---|
| | Worn timing chain tensioner, if applicable. | Replace the timing chain tensioner as required. | |
| | Worn camshaft lobes. | Inspect the camshaft lobes. Replace the camshaft and valve lifters as required. | |
| | Worn valve guides or valve stems. | Inspect the valves and valve guides, then repair as required. | |
| | Stuck valves. (Carbon on the valve stem or valve seat may cause the valve to stay open.) | Inspect the valves and valve guides, then repair as required. | |
| Lower engine noise, regardless of engine | Low oil pressure. | Repair or replace damaged components as required. | |
| speed. | Loose or damaged flywheel. | Repair or replace the flywheel. | |
| | Damaged oil pan, contacting the oil pump screen. | Inspect the oil pan. Inspect the oil pump screen. Repair or replace as required. | |
| | Oil pump screen loose, damaged or restricted. | Inspect the oil pump screen. Repair or replace as required. | |
| | Excessive piston-to-cylinder bore clearance. | Inspect the piston and cylinder bore. Repair as required. | Ţ |
| | Excessive piston pin-to-bore clearance. | Inspect the piston, piston pin and the connecting rod. Repair or replace as required. | |
| | Excessive connecting rod bearing clearance. | Inspect the following components and repair as required. The connecting rod bearings. The connecting rods. The crankshaft. The crankshaft journal. | |
| | Excessive crankshaft bearing clearance. | Inspect the following components and repair as required. •The crankshaft bearings. •The crankshaft journals. | |
| | Incorrect piston, piston pin and connecting rod installation. | Verify the piston pins and connecting rods are installed correctly. Repair as required. | |

| Engine noise under | Low oil pressure. | Repair or replace as required. |
|---|---|---|
| load. | Excessive connecting rod bearing clearance. | Inspect the following components and repair as required. The connecting rod bearings. The connecting rods. The crankshaft. |
| | Excessive crankshaft bearing clearance. | Inspect the following components and repair as required. The crankshaft bearings. The crankshaft journals. The cylinder block crankshaft bearing bore. |
| Engine will not crank. (crankshaft will not rotate) | Hydraulically locked cylinder. •Coolant/antifreeze in cylinder. •Oil in cylinder. •Fuel in cylinder. | Remove spark plugs and check for fluid. Inspect for broken head gasket. Inspect for cracked engine block or cylinder head. Inspect for a sticking fuel injector and/ or leaking fuel regulator. |
| | Broken timing chain and/or timing chain gears. | Inspect timing chain and gears. Repair as required. |
| | Foreign material in cylinder. •Broken valve. •Piston material. •Foreign material. | Inspect cylinder for damaged components and/or foreign materials. Repair or replace as required. |
| | Seized crankshaft or connecting rod bearings. | Inspect crankshaft and connecting rod bearing. Repair or replace as required. |
| | Bent or broken connecting rod. | Inspect connecting rods. Repair or replace as required. |
| | Broken crankshaft. | Inspect crankshaft. Repair or replace as required. |



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REMOVAL

1. Remove the engine cover.



- 2. Disconnect the front oxygen sensor connector.
- 3. Remove the front muffler(A).

Tightening torque :

Nut (B) : 39.2 ~ 58.8N.m (4.0 ~ 6.0kgf.m, 28.9 ~ 43.4lbf.ft) Bolt (C) : 29.4 ~ 39.2N.m (3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lbf.ft)



4. Remove the heat protector.

Tightening torque : 16.7 ~ 21.6N.m (1.7 ~ 2.2kgf.m, 12.3 ~ 15.9lbf.ft) 

5. Remove the exhaust manifold and catalytic converter assembly.

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Tightening torque :
42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lbf.ft)
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IDENTIFICATION NUMBER LOCATIONS





IDENTIFICATION NUMBER DESCRIPTION

VEHICLE IDENTIFICATION NUMBER



- Check digit
- 10 : Model year
- 4 = 2004, 5 = 2005
- 11 : Plant location
- K = Kwang-ju plant

12 - 17 : Sequential number

- 000001 ~ 999999

PAINT CODE

| CODE | COLOR |
|------|-----------------|
| UD | Clear White |
| S4 | Grayish Silver |
| S6 | Satin Silver |
| ¥3 | Greenish Gold |
| 9L | Natural Oliv |
| 1L | Vert Jade Pearl |
| K6 | Smart Blue |
| 3P | Volcanic Red |
| 6D | Smokey Brown |
| 9D | Black Cherry |

ENGINE IDENTIFICATION NUMBER



1. Engine fuel

- G : Gasoline

- 2. Engine range
 - 4 : 4 cycle 4 cylinder

- 6 : 4 cycle 6 cylinder

- 3. Engine development order
 - B : DELTA Engine
 - G : BETA Engine
- 4. Engine capacity
 - A : 2656cc (Gosoline)
 - C : 1975 cc (Gasoline)
- 5. Production year
 - 4 : 2004, 5 : 2005, 6 : 2006
- 6. Engine production sequence number
 - 000001 ~ 999999

TRANSMISSION IDENTIFICATION NUMBER

MANUAL



- 4. Transaxle production sequence number
 - 000001 ~ 999999

AUTOMATIC





AIR BAG WARNING / CAUTION LABEL



DRIVE MODULE CAUTION

Caution

Don't open, remove or transfer to another vehicle. Risk of malfunction and bodily injury!

This unit is to be installed and/or dismantled by trained personnel only. This item contains





WARNING / CAUTION LABEL (cont'd)

A : WARNING

SEE OWNER'S MANUAL.

This car is equipped a side airbag for each front seat.

- •Do not use any accessory seat covers.
- •Use of other seat covers could reduce the effect of the system.
- •Do not install any accessories on the side or near the side airbag.
- •Do not use excessive force on the side of the seat.
- •For further information, see the owner's manual.

B : CAUTION

AIRBAG ESPE UNIT

Detach connector before unmounting. Assemble strictly according to manual instructions.

C : PASSENGER MODULE CAUTION

CAUTION

Don't open, remove or transfer to another vehicle. Risk of malfunction and bodily injury!

This unit is to be installed and/or dismantled by trained personnel only. This item contains an explosive to be installed igniter.

•The airbag is a Supplement Restraint System (SRS).

You must always wear the seat belts.

- •The airbag system condition is normal when the "SRS" lamp in the cluster flashes approximately 6 times after the ignition key is turned on and then goes off.
- •If any of the following condition occur, the system must be serviced.
- •"SRS" lamp does not light up when the key is turned on.
- •"SRS" lamp stays lit or flashes continuously.
- •The airbag has inflated.
- •The airbag system must be inspected by an authorized dealer ten years after the vehicle manufacture date shown on the certification label, located on left front door opening area.

WARNING

Failure to the above instructions may result in injury to you or other occupants in the vehicle

•See the "SRS" section in Owner's Manual for more information about airbags.

BATTERY CAUTION LABEL DESCRIBTION

| or the ignition switched on. |
|------------------------------|
|------------------------------|



LIFT AND SUPPORT POINTS

WARNING

When heavy rear components such as suspension, fuel tank, spare tire, tailgate and trunk lid are to be removed, place additional weight in the luggage area before hoisting. When substatial weight is removed from the rear of the vehicle, the center of gravity may change and cam cause the vehicle to tip forward on the hoist.

NOTE

•Since each tire/wheel assembly weights approximately 30lbs (14kg), placing the front wheels in the luggage area can assist with the weight distribution.

•Use the same support points to support the vehicle on safety stands.

- 1. Place the lift blocks under the support points as shown in the il
- 2. Raise the hoist a few inches (centimeters) and rock the vehicle to be sure it is firmly supported.
- 3. Raise the hoist to full height to inspect the lift points for secure support.



1.



Fuel tank cauld be damaged or broken when using the lift in the illustration above. So, install the rubber or wooden block on the position supporting the lift and then lift up the vehicle. Minimum height of the block is 8cm.



TOWING

If the vehicle needs to be towed, call a professional towing service. Never tow vehicle with just a rope or chain. It is very dangerous. If the vehicle cannot be transported by flat-bed, if should be towed with the front wheels off the ground. If due to damage, the vehicle must be

toward with the front wheels on the ground, do not following :

Manual Transmission

- •Release the parking brake.
- •Shift the transmission to neutral
- Automatic Transmission
 - •Release the parking brake.
 - •Start the engine.
 - $\mbox{-}Shift$ to [D] position, then [N] position.
 - •Turn off the engine.

CAUTION

- •Improper towing preparation will damage the transmission. Follow the above procedure exactly. If you cannot shift the transmission or start the engine(automatic transmission), your vehicle must be transported on a flatbed.
- •It is the best to tow vehicle no farther than 19miles (30km), and keep the speed below 30mph (50km/h).
- •Trying to lift or tow your vehicle by the bumpers will cause serious damage. The bumpers are not designed to support the vehicle's weight.

Front :



Rear :





TIGHTENING TORQUE TABLE OF STANDARD PARTS

| Bolt nominal diameter (mm) | Pitch (mm) | Torque Nm (kg.cm, lb.ft) | | |
|----------------------------|------------|--------------------------|----------------------------|--|
| | | Head Mark 4 | Head Mark 7 | |
| | | | | |
| M5 | 0.8 | 4 (30 ~ 40, 2.2 ~ 2.9) | 5 ~ 6 (50 ~ 60, 3.6 ~ 4.3) | |
| M6 | 1.0 | ~ 6 (50 ~ 50, 3.6 ~ 4.3) | 9 ~ 11 (90 ~ 110, 6.5 ~ 8.0) |
|-----|------|---|---|
| M8 | 1.25 | 12 ~ 15 (120 ~ 150, 9 ~ 11) | 20 ~ 25 (200 ~ 250, 14.5 ~ 18.0) |
| M10 | 1.25 | 25 ~ 30 (250 ~ 300, 18 ~ 22) | 30 ~ 50 (300 ~ 500, 22 ~ 36) |
| M12 | 1.25 | 35 ~ 45 (350 ~ 450, 25 ~ 33) | 60 ~ 80 (600 ~ 800, 43 ~ 58) |
| M14 | 1.5 | 75 ~ 85 (750 ~ 850, 54 ~ 61) | 120 ~ 140 (1,200 ~ 1,400, 85 ~ 100) |
| M16 | 1.5 | 110 ~ 130 (1,100 ~ 1,300, 80 ~ 94) | 180 ~ 210 (1,800 ~ 2,100, 130 ~ 150) |
| M18 | 1.5 | 160 ~ 180 (1,600 ~ 1,800, 116 ~ 130) | 260 ~ 300 (2,600 ~ 3,000, 190 ~ 215) |
| M20 | 1.5 | 220 ~ 250 (2,200 ~ 2,500, 160 ~ 180) | 360 ~ 420 (3,600 ~ 4,200, 260 ~ 300) |
| M22 | 1.5 | 290 ~ 330 (2,900 ~ 3,300, 210 ~ 240) | 480 ~ 550 (4,800 ~ 5,500, 350 ~ 400) |
| M24 | 1.5 | 360 ~ 420 (3,600 ~ 4,200, 260 ~ 300) | 610 ~ 700 (6,100 ~ 7,000, 440 ~ 505) |

NOTE

- 1. The torques shown in the table are standard values under the following conditions :
- •Nuts and bolts are made of galvanized steel bar.
- •Galvanized plain steel washers are inserted.
- •All nuts, bolts and plain washers are dry.
- 2. The torques shown in the table are not applicable :
- •When spring washers, toothed washers and the like are inserted.
- If plastic parts are fastened.
- If self-tapping screws or self-locking nuts are used.
- If threads and surfaces are coated with oil.
- 3. If you reduce the torques in the table to the percentage indicated below, under the following conditions, if will be the standard value.

- If spring washers are used : 85%
- If threads and bearing sufaces are stained with oil : 85%

LUBRICANTS RECOMMENDED LUBRICANTS

| Pa | arts | OIL & GREASE STANDARD |
|---|---|--|
| Engine Oil | Gasoline | API SL(SJ) or ABOVE, ILSAS GF-3 and ABOVE |
| | Disesl | API CF -4 or ABOVE, ACEA B4 OR ABOVE |
| Transaxle | Manual | GENUINE PART MTF 75W/90 (API GL - 4) |
| | Auto | DIAMOND ATF SP-III, SK ATF SP-III |
| Power Steering | | PSF -3 |
| Brake Steering | | DOT 3, DOT 4 or equivalent |
| Coolant | | Ethlyene glycol base for aluminum radiator |
| Transaxle linkage, parking breake c seat adjuster, tailgate latch, door hir | able mechanism, hood, door latch, nges, tailgate hinge | Multipurpose grease NIGL grade #2 |

WARNING

Always use Genuine Kia motors parts and recommedended fluid.

Using any other type of parts and fluid can cause serious damage to vehicle.

LUBRICANTS CAPACITIES

| Des | cription | 2.7 | 2.0 |
|------------------|------------|------------------|------------------|
| Engine oil | Oil pan | 4.2 (4.44, 3.70) | 3.7 (3.90, 3.26) |
| | Oil filter | 0.3 (0.32, 0.26) | 0.3 (0.32, 0.26) |
| | Total | 4.5 (4.75, 3.96) | 4.0 (4.23, 3.52) |
| Cooling system | | 7.8 (8.2, 6.8) | 6.0 (6.4, 5.31) |
| Manual transaxle | | .86) | 2.15 (2.3, 1.86) |

| Automatic transaxle | , 6.8) | 7.8 (8.2, 6.8) |
|---------------------|------------------|------------------|
| Power steering | 0.9 (0.95, 0.79) | 0.9 (0.95, 0.79) |

Capacities : [liter (U.S.qts, Imp.qts)]

SELECTION OF ENGINE OIL (Gasoline)

RECOMMENDED ILSAC classification : GF-3 OR ABOVE RECOMMENDED API classification : SL(SJ) OR ABOVE

RECOMMENDED SAE viscosity grades :



NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which :

1. Satisfy the requirements of the API classification.

2. Have the proper SAE grade number for expected ambient temperature range.

3. Lubricants that do not have both an SAE grade number and API service classification on the container should not be used.

GENERAL SERVICE INFORMATION

PROTECTION OF THE VEHICLE

Always be sure to cover fenders, seats, and floor areas before starting work.

CAUTION

The support rod must be inserted into the hole near the edge of the hood whenever you inspect the engine compartment to prevent the hood from falling and causing possible injury.

Make sure that the support rod has been released prior to closing the hood. Always check to be sure the hood is firmly latched before driving the vehicle.

PREPARATION OF TOOLS AND MESURING EQUIPMENT

Be sure that all necessary tools and measuring equipment are available starting work.

SPECIAL TOOLS

Use special tools when they are required.



REMOVAL OF PARTS

First find the cause of the problem and then determine whether removal or disassembly before starting the job.



DISASSEMBLY

If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not aggect their performance or external appearance.

1. Inspection of parts

Each part, when removed, should be carefulley on spected for malfunction, deformation, damage, and other problems.



2. Arrangement of parts

All disassembled parts should be carefully arranged for effective reassembly.

Be sure to separate and correctly identify the parts to be repllaced from those that will be used again.



3. Cleaning parts for reuse

All parts to be used again should be carefully and thoroughly cleaned by an appropriate method.



PARTS

When replacing parts, use KIA MOTORS genuine parts.



REPLACEMENT

Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts. If removed, the following parts should always be replaced with new ones.

- 1.Oil seals
- 2.Gaskets
- 3.O-rings
- 4.Lock washers
- 5. Cotter pins (split pins)

6. Plastic nuts



Depending on their location.

- 7. Selalant should be applied to gaskets.
- 8. Oil should be applied to the moving components of parts.

9. Specified oil or grease should be applied to the prescribed locations (oil seals, etc) before assembly.



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Use gauges and testers to adjust correcity the parts to standard

ELECTRICAL SYSTEM

- 1. Be sure to disconnect the battery cable from the negative (-) terminal of the battery.
- 2. Never pull on the wires when disconnecting connectors.
- 3. Locking connectors will click when the connector is secure.
- 4. Handle sensors and relays carefully. Be careful not to drop them against other parts.



RUBBER PARTS AND TUBES

Always prevent gasoline or from touching rubber parts or tubing.



MEASURING BODY DIMENSIONGS

- 1. Basically, all measurements in this manual are taken with a tracking gauge.
- 2. When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- 3. For measuring dimensions, both projected dimensioners and actual measurement dimensions are used in this manual.

DIMENSIONS PROJECTED

- 1. These are the dimensions measured when the measurement points are projected from the vehicle's surface, and are the reference dimensions used for used for body alterations.
- 2. If the length of the tracking gauge probes is adjustable, measure it by lengthening one of two probes as long as the different value in height of the two surface.



MEASURING ACTUAL DIMENSIONS

- 1. These dimensions indicate the actual linear distance between mesaurement points, and are used as the reference dimensions when a tracking gauge is used for measurement.
- 2. First adjust both probes to the same length (A=A') before measurement.

NOTE

Check the probes and gauge itself to make sure there is no free play.



MEASUREMENT POINT

Measurements should be taken at the center fo the hole.



CHECKING CABLES AND WIRES

- 1. Check the terminal for tightness.
- 2. Check terminals and wires for corrosion from battery electrolyte, etc.
- 3. Check terminals and wires for open corcuits.

- 4. Check wire insulation and coating for damage, cracks and deg
- 5. Check the conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
- 6. Check grounded parts to verify that there is complete continuity between thier attaching bolt(s) and the vehicle's body.
- 7. Check for incorrect wiring.
- 8. Check that the wiring is so clamped to the prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, etc.)
- 9. Check that the wiring is clamped firmy to provide enough clearance from the fan pulley, fan belt and other rotating or moving parts.
- 10. Check that the wiring has a little space so that it can vibrate between fixed and moving parts such as the vehicle body and the engine.



CHECK FUSES

A blade type fuse test taps provided to allow checking the fuse itself without removing if from the fuse box. The fuse is good if the test lamp lights up when one lead is connected to the test taps (one at a time) and the other lead is grounded. (Turn the ignition switch so that the fuse circuit becomes operative)



SERIVICING THE ELECTRICAL SYSTEM

1. Prior to servicing the electrical system, be sure to turn off the ignition switch and disconnect the battery ground cable.

NOTE

In the course of MFI or ELC system diagnosis, when the battery cable is removed, any diagnostic trouble code retained by the computer will be cleared. There fore, if necessary, read the diagnostic before removing the battery cable.



2. Attach the wiring harnesses with clamps so that there is no slack. However, for any harness which passes the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surronding parts and then secure the harness by using a clamp.



3. If any section of a wiring harness interferes with the edge of a parts, or a corner, wrap the section of the harness with tape or something similar in order to protect if from damage.



4. When installing any parts, be careful not to pinch or damage any of the wiring harness.



5. Never throw relays, sensors or electrical parts, or expose them to strong shock.



6. The electronlic parts used in the computer, relays, etc. are readily damaged by heat. If there is a need for service operations that may cause the temperature to exceed 80°C (176°F), remove the electronic parts before hand.



7. Loose connectors cause problems. Make sure that the connectors are always securely fastened.



8. When disconnecting a connector, be sure to grip only the connector, not the wires.



9. Disconnect connector which have catches by pressing in the direction of the arrows shown the illustration.



10. Connect connectors which have catches by inserting the connectors until they make a clicking sound.



11. When using a circuit tester to check continuity or voltage on connector terminals, insert the test probe into the harness side. If the connector is a sealed connector, insert the test probe through the hole in the rubber cap until contacts the terminal, being careful not to damage the insulation of the wires.



12. To avoid overloading the wiring, take the electrical current loa wire size.

quipment into consideration, and determine the appropartate

| Noominal sizo | | Permissik | ble current |
|---------------|---------------|-----------------------|-------------|
| Noeminal Size | OAL gauge No. | In engine compartment | Other areas |
| 0.3mm² | AWG 22 | - | 5A |
| 0.5mm² | AWG 20 | 7A | 13A |
| 0.85mm² | AWG 18 | 9A | 17A |
| 1.25mm² | AWG 16 | 12A | 22A |
| 2.0mm² | AWG 14 | 16A | 30A |
| 3.0mm² | AWG 12 | 21A | 40A |
| 5.0mm² | AWG 10 | 31A | 54A |

PRECAUTIONS FOR CATALYTIC CONVERTER

CAUTION

If a large amount of unburned gasolined gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this observe the following precations and explain them to your customer.

- 1. Use only unleaded gasoline.
- 2. Do not run the engine while the car is at rest for a long time. Avoid running the engine at fast idle for more than 10minutes and idle speed for more than 20 minutes.
- 3. Avoid start-jump tests. Do start-jumps only when absolutely necessary. Perform this test as rapidly as possible and, while testing, never race the engine.
- 4. Do not measure engine compression for and extended time. Engine compression tests must be made as rapidly as possible.
- 5. Avoid coasting with the ignition turned and during prolonged braking.
- 6. Do not dispose of used catalytic converter together with parts contaminated with gasoline or oil.

BODY - DIMENSION







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Unit : mm

MAINTENANCE SCHEDULE

SCHEDULE 1 - NORMAL MAINTENANCE

| MAINTENANCE | E Number of months or Miles (kilometers), whichever comes first | | | | | | | | | | | | | | |
|--|---|------|------------|----------|------------|----------|---------|----------|----------------|----------|----------|----------|----------|--|----------|
| INTERVALS | Monhs | 7.5 | 15 | 22.5 | 30 | 37.5 | 45 | 52.5 | 60 | 67.5 | 75 | 82.5 | 90 | 97.5 | 105 |
| MAINTENANCE | miles x 1,000 | 7.5 | 15 | 22.5 | 30 | 37.5 | 45 | 52.5 | 60 | 67.5 | 75 | 82.5 | 90 | 97.5 | 105 |
| ITEM | (km x 1,000) | (12) | (24) | (36) | (48) | (60) | (72) | (84) | (96) | (108) | (120) | (132) | (144) | (156) | (168) |
| Drive belts " | 2.0L | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 2.7L | | | | 1 | | | | 1 | | | | 1 | | |
| Engine oil and engine oil filter | | | | | Re | place | every | 7,500 |) miles | or 12 | mont | hs | | | |
| Manual transaxle fluid | | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | I |
| Auto transaxle fluid | | | 1 | | 1 | | I | | 1 | | 1 | | 1 | | Ι |
| Transfer case fluid (4WD) ² | | | | Inspe | ect eve | ery 25, | ,000 m | niles a | nd rep | place e | every 6 | 50,000 |) miles | 5 | |
| Rear differential fluid (4WD) *2 | | | | | | | Inspet | every | 25,00 |)0 mile | s | | | | |
| Propellar shaft clean, bolt retigh | ten(4WD) | | 1 | | | | 1 | | | | 1 | | | | 1 |
| Engine timing belt | | | | | | | | | R | | | | | | |
| Air cleaner element | | 1 | <u> </u> | R | | <u> </u> | R | 1 | | R | 1 | 1 | R | <u> </u> | 1 |
| Spark plugs 2.0L (F | Platinum coated) | | | | | | | | R | | | | | | |
| 2.7L (li | ridium coated) | | | | Rep | lace e | every 1 | 100,00 | 0 mile | es or 1 | 0 yea | rs | | | |
| Valve clearance | 2.0L | | | | Insp | pect ev | very 6 | 0,000 | miles | or 48 | month | IS | | | |
| Water pump | | | | Ins | spect | when I | replac | ing the | e drive | e belt o | or timir | ng beli | t | | |
| Engine coolant 3 | | | | | At first | , repla | ice at | 60,00 | 0 mile | s or 60 | 0 mon | ths; | | | |
| | | | | aft | er that | t, repla | ace ev | ery 30 |),000 i | miles o | or 24 r | nonthe | 5 | | |
| Fuel filter | | | <u> </u> | <u> </u> | <u> </u> | R | | <u> </u> | <u> </u> | <u> </u> | R | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| Fuel tank, cap, lines and hoses | | 1 | | | <u> </u> | | | | <u> </u> | <u> </u> | | | | | |
| Vaccum and crankcase ventilati | on hoses | | | | <u> </u> | | | | | | | | | | |
| Air filter for EVAP canister | | | | 1 | Ins | spect e | every : | 30,000 |) miles | s or 24 | mon | ins | | | |
| Battery condition | | | | | ⊢ <u>⊦</u> | <u> </u> | | | <u>⊢</u> ¦ - | <u> </u> | | <u> </u> | <u> </u> | <u> </u> | |
| Brake lines, hoses and connecti | ons | | | | <u> </u> | - | | | | | | 141 | | | |
| Brake pedal | | | | | Inspe | ct freq | uentiy | aepe | naing | on the | cona | ition | | | |
| Parking brake | | | <u> </u> | | H | <u> </u> | | - | ⊢¦- | <u> </u> | | <u> </u> | ⊢¦- | <u> </u> | |
| Disc brakes and pads | | + | <u> </u> | <u> </u> | ⊢¦ | ++ | | | ⊢ ¦ | ⊢¦ | | | +÷ | <u>+ </u> | |
| Exhaust size and muffler | | ' | <u> </u> | · · | H | <u>'</u> | | - ' | ⊢¦- | <u> </u> | | <u> </u> | ⊢¦ | <u>'</u> | |
| Throttle body cleaning (with rom | oving corbon) 4 | - | | | H | - | | - | H | <u> </u> | | | +÷ | <u> </u> | |
| Brake/clutch fluid | ioving carbon) | - | | - | H | - | | - | \vdash | <u> </u> | | <u> </u> | +- | | |
| Power steering fluid | | 1 | | 1 | | 1 | 1 | 1 | | 1 | | 1 | | 1 | 1 |
| Steering operation linkage and | hoeee | - | | | +'- | | | | - <u>+</u> - | + - | | | + - | | |
| Steering operation, initiage and | 10363 | | - | | <u> </u> | | - | - | <u> </u> | · · | - | - | <u> </u> | <u> </u> | - |

| Tioni suspension ball joints | | | | | <u> </u> | | | | <u> </u> | | | | <u> </u> | | |
|-------------------------------|------------|---|---|---|----------|--------|----------|---------|----------|--------|--------|----|----------|---|---|
| Driveshaft and boots | | | | | Ins | pect e | very 1 | 5,000 | miles | or 12 | mont | hs | | | |
| Driveshaft u-joints | | | | | 1 | | Ι | | 1 | | Ι | | 1 | | I |
| Tire | Pressure | | | | | | Pleas | e refe | r to S | S Gr. | | | | | |
| | Tread wear | Ι | | I | 1 | 1 | I | I | 1 | 1 | I | 1 | 1 | 1 | I |
| Chassis/body nuts and bolts | | | | | 1 | | | | 1 | | | | 1 | | |
| All locks and hinges | | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Air conditioner refrigerant * | | | | | | Inspe | ct refri | igeran | t amo | unt an | nually | , | | | |
| Air conditioner compressor * | | | | | | l | nspect | t opera | ation a | innual | ly | | | | |
| Air conditioner air filter * | | | | | | R | eplace | ever, | y 10,0 | 00 mil | es | | | | |
| | | | | | | | | | | | | | | | |

I : Inspect and, if necessary, adjust, correct, clean or replace.

R : Replace or change.

L : Lubricate.

* If equipped

-1 : The drive belt should be replaced when cracks occur or tension is reduced excessively.

-2 : Transfer case fluid and rear differential fluid should be changed anytime they have been submerged in water.

->: Coolant level adjustment and leak : Inspect regularly.

SCHEDULE 2 - SEVERE MAINTENANCE

| MAINTENANCE | | Number of months or Miles (kilometers), whichever comes first | | | | | | | | | | | | | |
|---|---------------|---|---------------------------------------|--------|-----------|---------|--------|---------|---------|--------|--------|---------|--------|---------|-------|
| INTERVALS | Monhs | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| MAINTENANCE | miles x 1,000 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| ІТЕМ | (km x 1,000) | (8) | (16) | (24) | (32) | (40) | (48) | (56) | (64) | (72) | (80) | (88) | (96) | (104) | (112) |
| Drive belts " | 2.0L | Ι | 1 | Ι | 1 | Ι | Ι | Ι | 1 | Ι | I | Ι | 1 | 1 | Ι |
| | 2.7L | | | | | | | | | | | | | | |
| Engine oil and engine oil filter | | | Replace every 3,000 miles or 3 months | | | | | | | | | | | | |
| Manual transaxle fluid | | | 1 | | 1 | | 1 | | 1 | | 1 | | R | | 1 |
| Auto transaxle fluid | | | | 1 | | | R | | | 1 | | | R | | |
| Transfer case fluid (4WD) ¹² | | | | | | R | | | | | R | | | | |
| Rear differential fluid (4WD) "2 | | | | | | | | | | | R | | | | |
| Propellar shaft clean, bolt retight | ten(4WD) | | | 1 | | | 1 | | | 1 | | | 1 | | |
| Engine timing belt | | | | | | | | | R | | | | 1 | | |
| Air cleaner element | | Ins | spect r | nore f | requer | ntly de | pendi | ng on | the co | nditio | n and | if nece | essary | , repla | ice |
| Spark plugs | | Ins | spect r | nore f | requer | ntly de | pendi | ng on | the co | nditio | n and | if nece | essary | , repla | ace |
| Valve clearance | 2.0L | | | | In | spect | every | 60,00 | 0 mile | s or 4 | 8 mon | nth | | | |
| Water pump | | | | I | nspect | when | repla | cing th | ne driv | e belt | or tim | ing be | elt | | |
| Engine coolant ⁻³ | | At first, replace at 60,000 miles or 60 months ; | | | | | | | | | | | | | |
| | | | | a | fter that | at, rep | lace e | very 3 | 0,000 | miles | or 24 | month | าร | | |
| Fuel filter | | | | | | R | eplace | every | / 37,5 | 00 mil | es | | | | |
| Fuel tank, cap, lines and hoses | | I | 1 | I | 1 | 1 | Ι | I | 1 | 1 | I | 1 | 1 | 1 | I |
| Vaccum and crankcase ventilation | on hoses | Т | 1 | I | | | I | 1 | | | 1 | 1 | 1 | | 1 |
| Air filter for EVAP canister | | | | | Re | place | everv | 30.00 | 0 mile | s or 2 | 4 mon | ths | | | |
| Battery condition | | | 1 | | 1 | | | | | | 1 | | 1 | | 1 |

| Brake lines, hoses and connections | | | I | | | | | | | | | | | | | |
|---|-----------|------|---------------------------------------|---------|--------|---------|----------|--------|--------|---------|----------|--------|----------|------|-----|--|
| Brake pedal | | | | | Inspe | ect fre | quentl | y depe | ending | on th | e con | dition | | | | |
| Parking brake | | | Ι | I | | | I | Ι | | | I | | | | I | |
| Disc brakes and pads | | | Ι | I | 1 | 1 | Ι | Ι | Ι | 1 | Ι | Ι | 1 | | I | |
| Drum brakes and linings | | | I | 1 | 1 | 1 | I | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Exhaust pipe and muffler | | | I | | 1 | | I | | 1 | | I | | 1 | | 1 | |
| Throttle body cleaning (with removing carbon) * | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Brake/clutch fluid | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Power steering fluid | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Steering operation, linkage and hoses | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - 1 | |
| Front suspension ball joints | | | | | 1 | | | | 1 | | | | 1 | | | |
| Driveshaft and boots | | | Inspect every 7,500 miles or 6 months | | | | | | | | | | | | | |
| Driveshaft u-joints | | | | | 1 | | Ι | | Ι | | I | | 1 | | Ι | |
| Tire Pressure | | | | | | _ | Pleas | e refe | r to S | S Gr. | | | | _ | | |
| Tread wea | ır I | | | I | | | Ι | Ι | Ι | | I | | I | | Ι | |
| Chassis/body nuts and bolts | | | | | | | | | Ι | | | | 1 | | | |
| All locks and hinges | L | | L | L | L | L | L | L | L | L | L | L | L | L | L | |
| Air conditioner refrigerant * | | | | | | Inspe | ct refri | gerani | t amou | unt an | nually | | | | | |
| Air conditioner compressor * | | | | | | Ir | nspect | opera | tion a | nnuall | у | | | | | |
| Air conditioner air filter * | | | | | | Re | eplace | every | 10,00 | 00 mile | es | | | | | |
| I : Inspect and, if necessary, adjust, co | orrect. | cle | ean o | r repla | ace. | | | | | | | | | | | |
| R : Replace or change. | L : Lu | brid | cate. | | | | * If e | quipp | ed | | | | | | | |
| - : The drive belt should be replaced v | when c | rac | cks o | ccur d | or ten | sion is | s redu | iced (| exces | sively | <i>.</i> | | | | | |
| -2 : Transfer case fluid and rear differe | ntial flu | id | shou | ld be | chan | ged a | nytim | e the | y hav | e bee | n sub | mera | ed in | wate | r. | |
| -3 : Coolant level adjustment and leak | : Inspe | ct | regul | arly. | | | | | | | | 0 | | | | |
| .4 : Be careful not to damage to the en | nission | co | ontrol | syste | em wh | en cl | eanin | a the | thrott | le bo | dv. | | | | | |



REMOVAL

1. Remove the engine cover.



2. Disconnect the TPS(Throttle Position Sensor) connector(A) and ISA(Idle Speed Actuator) connector(B).



3. Disconnect the PCV(Positive Crankcase Ventilation) hose(A) and breather hose(B).



4. Remove the accelerator cable.

5. Remove the delivery pipe(A).

Tightening torque :

18.6 ~ 27.5N.m (1.9 ~ 2.8kgf.m, 13.7 ~ 20.3lbf.ft)



6. Remove the heater hose(A), PCSV(Purge Control Solenoid Valve)(B) and the brake vacuum hose(C) from throttle body and intake manifold.



- 7. Remove the air conditioner compressor. (Refer to HA Gr.)
- 8. Remove the intake manifold stay(A).

Tightening torque :

17.7 ~ 24.5N-m (1.8 ~ 2.5kg-m, 13.0 ~ 18.1lb-ft)



9. Remove the intake manifold.

Tightening torque :





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OIL AND FILTER REPLACEMENT

CAUTION

- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- •Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.
- 1. Drain the engine oil.
 - (1) Remove the oil filler cap.
 - (2) Remove the oil drain plug, and drain the oil into a container.
- 2. Replace the oil filter.
 - (1) Remove the oil filter.
 - (2) Check and clean the oil filter installation surface.
 - (3) Check the part number of the new oil filter is as same as old one.
 - (4) Apply clean engine oil to the gasket of a new oil filter.
 - (5) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
 - (6) Tighten it an additional 3/4 turn.
- 3. Refill with engine oil.
 - (1) Clean and install the oil drain plug with a new gasket.

Tightening torque :

39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lbf.ft)

(2) Fill with fresh engine oil.

Oil Capacity Total : 4.0 L (4.23 US qt, 3.52 lmp qt) Oil pan : 3.7 L (3.91 US qt, 3.26 lmp qt) Oil filter : 0.3 L (0.32 US qt, 0.26 lmp qt)

(3) Install the oil filler cap.

- 4. Start engine and check for oil leaks.
- 5. Recheck the engine oil level.

INSPECTION

1. Check the engine oil quality.

Check for oil deterioration, entry of water, discoloring of thinning. If the quality is visibly poor, replace the oil. 2. Check the engine oil level.

After warming up the engine for five minutes, stop the engine and check the oil leverl. The level should be between the "L" and "F" marks on the dipstick.

If low, check for oil leakage and add oil up to the "F" mark on the dipstick.

NOTE

Do not fill with engine oil above the "F" mark.

SELECTION OF ENGINE OIL

Recommended ILSAC classification : GF-3 OR ABOVE Recommended API classification : SL(SJ) OR ABOVE Recommended SAE viscosity grades :



NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which :

1. Satisfy the requirement of the API classification.

2. Have proper SAE grade number for expected ambient temperature range.

3.Lubricants that do not have both an SAE grade number and API service classification on the container should not be used.

REMOVAL

OIL PAN

- 1. Drain the engine oil.
- 2. Disconnect the rear oxygen sensor connector.
- 3. Remove the front muffler(A).



- 4. Remove the exhaust manifold. (Refer to EMA-113)
- 5. Remove the front muffler bracket(A).



6. Remove the oil pan.


OIL PUMP

- 1. Drain the engine oil.
- 2. Remove the drive belts.
- 3. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover.
- 4. Remove the timing belt. (Refer to EMA-27)
- 5. Remove the bolt(B) and timing belt idler(A).



- 6. Remove the oil pan and oil screen.
- 7. Remove the alternator. (Sed EE group alternator)
- 8. Remove the air conditioner compressor tensioner bracket(A).



9. Remove the bolts(A, B, C, D) and front case.



(1) Remove the screw(B) from the pump housin

the housing and cover(A).



(2) Remove the inner rotor(A) and outer rotor(B).



INSTALLATION

OIL PUMP

1. Install the oil pump.

- (1) Place the inner and outer rotors into front case with the marks facing the oil pump cover side.
- (2) Install the oil pump cover(A) to front case with the 7 screws(B).

Tightening torque :

5.9 ~ 8.8N.m (0.6 ~ 0.9kgf.m, 4.3 ~ 6.5lbf.ft)



- 2. Check that the oil pump turns freely.
- 3. Install the oil pump on the cylinder block.
 - (1) Place a new front case gasket on the cylinder block.
 - (2) Apply engine oil to the lip of the oil pump seal. Then, install the oil pump onto the crankshaft.
 - (3) When the pump is in place, clean any excess grease off the crankshaft and check that the oil seal lip is not distorted.



Bolt length

(A) : 25mm (0.984in), (B) : 30mm (1.181in)
(C) : 38mm (1.496in), (D) : 45mm (1.772in)
Tightening torque :
19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lbf.ft)

4. Apply a light coat of oil to the front case oil seal lip.

5. Using the SST(09214-32000), install the front c



6. Install the air conditioner compressor tensioner bracket (A).



- 7. Install the alternator. (See EE group alternator)
- 8. Install the oil screen.

Tightening torque : 14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lbf.ft)

9. Install the oil pan.

Tightening torque : 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lbf.ft)

NOTE

Clean the oil pan gasket mating surfaces.

10. Install the timing belt idler.

Tightening torque :

42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lbf.ft)

- 11. Install the timing belt (Refer to EMA-32)
- 12. Install the drive belts.

13. Fill with engine oil.

OIL PAN

- 1. Install the oil pan.
 - (1) Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

NOTE

Check that the mating surfaces are clean and dry before applying liquid gasket.

(2) Apply liquid gasket as an even bead, centered between the edges of the mating surface.

Liquid gasket : MS 721-40A or equivalent

NOTE

- •To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- •Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- •After assembly, wait at least 30 minutes before filling the engine with oil.
- (3) Install the oil pan with the bolts.

Uniformly tighten the bolts in several passes.

Tightening torque :

9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lbf.ft)



2. Install the front muffler bracket(A).



- 3. Install the exhaust manifold. (Refer to EMA-113)
- 4. Install the front muffler(A).



- 5. Connect the rear oxygen sensor connector.
- 6. Fill with engine oil

DISASSEMBLY

RELIEF PLUNGER

1. Remove the relief plunger.

Remove the plug(A), spring(B) and relief plunger(C).



INSPECTION

1. Inspect the relief plunger.

Coat the plunger with engine oil and check that it falls smoothly into the plunger hole by its own weight. If it does not, replace the relief plunger. If necessary, replace the front case.

2. Inspect the relief valve spring.

Inspect for distorted or broken relief valve spring.

Standard value Free height : 43.8mm (1.724in) Load : 3.7±0.4kg/40.1mm (8.2±0.9 lb/1.579in) 9.7±0.4kg/34.3mm (21.4±0.9 lb/1.350in)

3. Inspect the rotor side clearance.

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

| Side clearance | Outer rotor | 0.04 ~ 0.09mm (0.0016 ~ 0.0035in) |
|----------------|-------------|---------------------------------------|
| | Inner rotor | 0.04 ~ 0.085mm (0.0016 ~ 0.0033in) |



If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.

4. Inspect the rotor tip clearance.

Using a feeler gauge, measure the tip clearance between the inner and outer rotor tips.

Tip clearance 0.025 ~ 0.069mm (0.0010 ~ 0.0027in)





If the tip clearance is greater than maximum, replace the rotors as a set.

5. Inspect the rotor body clearance.

Using a feeler gauge, measure the clearance between the outer rotor and body.

Body clearance 0.120 ~ 0.185mm (0.0047 ~ 0.0073in)



If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.

REASSEMBLY

RELIEF PLUNGER

1. Install the relief plunger.

Install relief plunger(C) and spring(B) into the front case hole, and install the plug(A).

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Tightening torque :
39.2 ~ 49.0N.m (4.0 ~ 5.0kgf.m, 28.9 ~ 36.2lbf.ft)
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REMOVAL

Engine removal is not required for this procedure.

1. Remove the engine cover.



- 2. Remove the RH front wheel.
- 3. Remove the 2 bolts(B) and RH side cover(A).



4. Remove the engine mounting support bracket.(1) Set the jack to the engine oil pan.



4

(2) Remove the bolt(B), nuts(C,D) and engine

bracket(A).



(3) Remove the bolt(B) and engine support bracket stay plate(A).



5. Temporarily loosen the water pump pulley bolts.



- 6. Remove the alternator drive belt. (See EE group alternator)
- 7. Remove the air conditioner compressor drive belt. (See HA group air conditioner compressor)
- 8. Remove the power steering pump drive belt. (See ST group power steering pump)
- 9. Remove the 4 bolts and water pump pulley.

10. Remove the 4 bolts(B) and timing belt upper c



11. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover. Check that the timing mark of camshaft sprocket is aligned with the timing mark of cylinder head cover. (No.1 cylinder compression TDC position)



12. Remove the crankshaft pulley bolt(B) and crarı



13. Remove the crankshaft flange(A).



14. Remove the 5 bolts(B) and timing belt lower cover(A)



15. Remove the timing belt tensioner(A) and timin



NOTE

If the timing belt is going to be reused, make an arrow indicating the turning direction to make sure that the belt is reinstalled in the same direction as before.

16. Remove the bolt(B) and timing belt idler(A).



17. Remove the crankshaft sprocket(A).



- 18. Remove the cylinder head cover.
 - (1) Disconnect the spark plug cables and do not pull on the cable by force.

NOTE

Pulling on or bending the cables may damage the conductor inside.



(2) Remove the PCV (Positive Crankcase Ventilation) hose(A) and the breather hose(B) from the cylinder head cover.



(3) Remove the accelerator cable(A) from the



(4) Loosen the cylinder head cover bolts(B) and then remove the cover(A) and gasket.



- 19. Remove the camshaft sprocket.
 - (1) Hold the portion(A) of the camshaft with a hexagonal wrench, and remove the bolt(C) with a wrench(B) and remove the camshaft sprocket.



CAUTION

Be careful not to damage the cylinder head and valve lifter with the wrench.

INSTALLATION

er.

1. Install the camshaft sprocket and tighten the bo

torque.

- (1) Temporarily install the camshaft sprocket bolt(C).
- (2) Hold the portion(A) of the camshaft with a hexagonal wrench, and tighten the bolt(C) with a wrench(B).

Tightening torque : 98.1 ~ 117.7N.m (10 ~ 12kgf.m, 72.3 ~ 86.8lbf.ft)



- 2. Install the cylinder head cover.
 - (1) Install the cylinder head cover(A) and bolts(B).

Tightening torque :

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)



(2) Install the PCV(Positive Crankcase Ventilati

preather hose(B) to the cylinder head cover.



(3) Install the accelerator cable(A) to the cylinder head cover.



(4) Install the spark plug cables.



3. Install the crankshaft sprocket(A).



4. Align the timing marks of the camshaft sprocket(A) and crankshaft sprocket(B) with the No. 1 piston placed at top dead center and its compression stroke.



5. Install the idler pulley(A) and tighten the bolt(B)

orque.

Tightening torque : 42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lbf.ft)



6. Temporarily install the timing belt tensioner(A) with plain washer(B).



Install the belt so as not give slack at each center of shaft. Do as following procedures when installing timing belt.
 Crankshaft sprocket(A) →idler pulley(B) →camshaft sprocket(C) →timing belt tensioner(D).



8. Temporarily install tensioner pulley using cente

on force to the belt.

- 9. Adjust the timing belt tension.
 - (1) Rotate the crankshaft clockwise(view from front) through angle equivalent to two teeth(18°) of camshaft sprocket(A).



(2) Using a hex-wrench, apply tension to the timing belt in the clockwise direction so that there is no slack in the belt on the tension side.



(3) Tighten the tensioner bolt.

Tightening torque : 42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lbf.ft)

(4) Recheck the belt tension. When the tension side of timing belt is pushed horizontally with a moderate force [approx. 2kg (20N, 5lb)], the timing belt cog end sags in approx. 4 ~ 6mm (0.16 ~ 0.24in).



- 10. Turn the crankshaft two turns in the operating direction (clockwise) and realign crankshaft sprocket and camshaft sprocket timing mark.
- 11. Install the timing belt lower cover(A) with 5bolts(B).

Tightening torque :

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)



12. Install the flange and crankshaft pulley(A), and then tighten crankshaft pulley bolt(B). Make sure that the crankshaft sprocket pin fits into the small hole in the pulley.

Tightening torque : 166.7 ~ 176.5N.m (17 ~ 18kgf.m, 123.0 ~ 130.2lbf.ft)



13. Install the timing belt upper cover(A) with 4 bolts(B).

Tightening torque :

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lbf.ft)



- 14. Install the water pump pulley and 4 bolts.
- 15. Install the power steering pump drive belt. (See ST group power steering pump)
- 16. Install the air conditioner compressor drive belt. (See HA group air conditioner compressor)
- 17. Install the alternator drive belt. (See EE group alternator)
- 18. Tighten the bolts of water pump pulley.
- 19. Install the engine mounting support bracket.
 - (1) Install the engine mounting support bracket stay plate(A) with bolt(B).

Tightening torque :

42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lbf.ft)



(2) Install the engine mounting support bracket(A) with nuts(C,D) and bolt(B).

Tightening torque : Nut(D) : 58.8 ~ 78.5N.m (6.0 ~ 8.0kgf.m, 43.4 ~ 57.9lbf.ft) Nut(C) and bolt(B) : 49.0 ~ 63.7N.m (5.0 ~ 6.5kgf.m, 36.2 ~ 47.0lbf.ft)



20. Install the RH side cover(A) with 2 bolts(B).



21. Install the RH front wheel.

Tightening torque : 88.3 ~ 98.N.m (9.0 ~ 10.0kgf.m, 65.1 ~ 72.3lbf.ft)

22. Install the engine cover with bolts.

Tightening torque : 3.9 ~ 5.9N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lbf.ft)



INSPECTION

SPROCKETS, TENSIONER, IDLER

- 1. Check the camshaft sprocket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear, cracks, or damage. Replace as necessary.
- 2. Inspect the tensioner pulley and the idler pulley for easy and smooth rotation and check for play or noise. Replace as necessary.



3. Replace the pulley if there is a grease leak from its bearing.

TIMING BELT

1. Check the belt for oil or dust deposits.

Replace, if necessary.

Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.

2. When the engine is overhauled or belt tension belt.

NOTE

- •Do not bend, twist or turn the timing belt inside out.
- •Do not allow timing belt to come into contact with oil, water and steam.