

GROUP 11A

ENGINE MECHANICAL

<4G1>

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GENERAL INFORMATION

M1111000100390

Item		4G13	4G18
Total displacement mL		1,299	1,584
Bore × Stroke mm		71 × 82	76 × 87.3
Compression ratio		10	
Compression chamber		Pentroof	
Camshaft arrangement		SOHC	
Number of valve	Intake	8	
	Exhaust	8	
Valve timing	Intake opening	BTDC 17°	BTDC 9°
	Intake closing	ABDC 39°	ABDC 51°
	Exhaust opening	BBDC 49°	BBDC 45°
	Exhaust closing	ATDC 7°	ATDC 15°
Fuel system		Electronically controlled multipoint fuel injection	
Rocker arm		Roller type	
Auto-lash adjuster		Equipped	

SERVICE SPECIFICATIONS

M1112000300245

Item		Standard value	Limit
Alternator drive belt tension (When checked)	Vibration frequency Hz	142 – 173	–
	Tension N	392 – 588	–
	Deflection mm (Reference)	8.1 – 10.2	–
Alternator drive belt tension (When adjusted)	Vibration frequency Hz	150 – 166	–
	Tension N	441 – 539	–
	Deflection mm (Reference)	8.6 – 9.7	–
Alternator drive belt tension (When replaced)	Vibration frequency Hz	195 – 218	–
	Tension N	785 – 981	–
	Deflection mm (Reference)	5.4 – 6.6	–
Power steering oil pump drive belt tension <Vehicles without A/C>, Power steering oil pump and A/C compressor drive belt tension <Vehicles with A/C> (When checked)	Vibration frequency Hz	129 – 158	–
	Tension N	392 – 588	–
	Deflection mm (Reference)	9.6 – 12.4	–
Power steering oil pump drive belt tension <Vehicles without A/C>, Power steering oil pump and A/C compressor drive belt tension <Vehicles with A/C> (When adjusted)	Vibration frequency Hz	137 – 151	–
	Tension N	441 – 539	–
	Deflection mm (Reference)	10.2 – 11.6	–

Item		Standard value	Limit
Power steering oil pump drive belt tension <Vehicles without A/C>, Power steering oil pump and A/C compressor drive belt tension <Vehicles with A/C> (When replaced)	Vibration frequency Hz	164 – 188	–
	Tension N	637 – 833	–
	Deflection mm (Reference)	7.2 – 9.0	–
Basic ignition timing		5° BTDC ±3°	–
Ignition timing		Approximately 10° BTDC	–
Idle speed r/min		750 ± 100	–
CO contents %		0.5 or less	–
HC contents ppm		100 or less	–
Compression pressure (at engine speed of 300 r/min) kPa	4G13	1,600	Minimum 1,120
	4G18	1,720	Minimum 1,260
Compression pressure difference of all cylinders kPa		–	Maximum 98
Intake manifold vacuum kPa		–	Minimum 60
Cylinder head bolt shank length mm		–	103.2

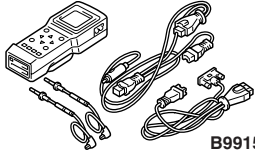
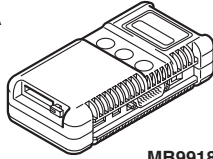
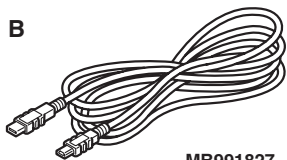

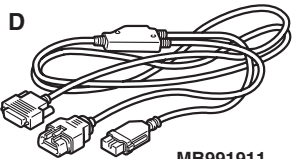
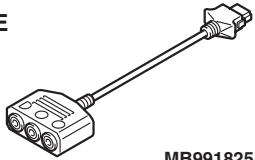
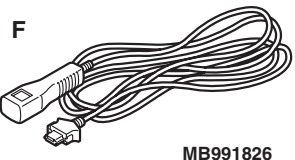
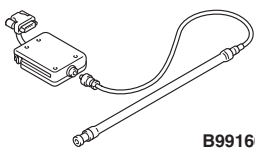
SEALANT

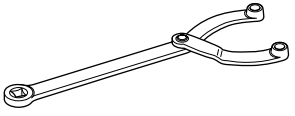
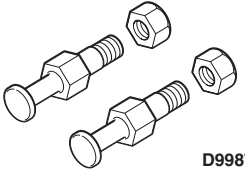
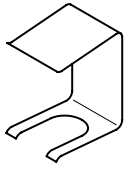
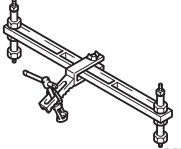
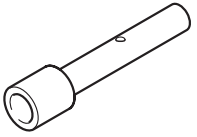
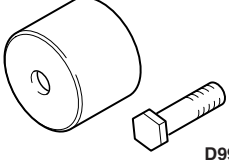
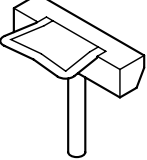
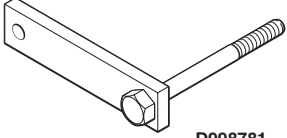
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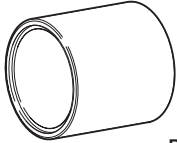
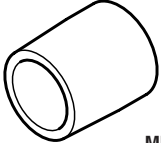

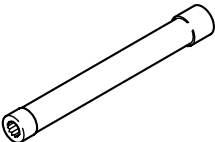
Item	Specified Sealant	Remark
Camshaft position sensor support	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant
Engine oil pan		

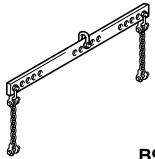
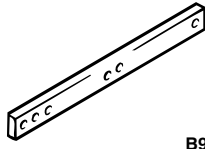
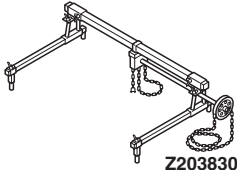
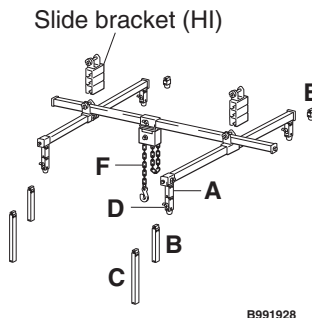
SPECIAL TOOLS

M1112000601067

Tool	Number	Name	Use
 <p>B991502</p>	MB991502	M.U.T.-II sub assembly	<ul style="list-style-type: none"> • Drive belt tension check • Checking the ignition timing • Checking the idle speed
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991825</p> <p>F</p>  <p>MB991826</p> <p>MB991955</p>	<p>MB991955</p> <p>A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826</p>	<p>M.U.T.-III sub assembly</p> <p>A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III adapter harness F: M.U.T.-III trigger harness</p>	<p>CAUTION</p> <p>If you connect M.U.T.-III main harness A to a vehicle without CAN communication system to use the M.U.T.-III, a pulse signal may interfere with the simulated vehicle speed lines, thus causing the M.U.T.-III inoperative. Therefore, use the M.U.T.-III main harness B (MB991911) instead.</p> <ul style="list-style-type: none"> • Drive belt tension check • Checking the ignition timing • Checking the idle speed
 <p>B991668</p>	MB991668	Belt tension meter set	Drive belt tension check (used together with M.U.T.-II/III)

Tool	Number	Name	Use
 <p align="center">B990767</p>	MB990767	Front hub and flange yoke holder	Holding the camshaft sprocket
 <p align="center">D998719</p>	MD998719	Crankshaft pulley holder pin	
 <p align="center">D998443</p>	MD998443	Auto-lash adjuster holder	Supporting of rocker arm lash adjuster
 <p align="center">MD998772</p>	MD998772	Valve spring compressor	Compressing valve spring
 <p align="center">B991671</p>	MB991671	Valve stem seal installer	Valve stem seal installation
 <p align="center">D998713</p>	MD998713	Camshaft oil seal installer	Camshaft oil seal installation
 <p align="center">D998727</p>	MD998727	Oil pan remover	Engine oil pan removal
 <p align="center">D998781</p>	MD998781	Flywheel stopper	Supporting the flywheel assembly <M/T> or A/T drive plate <A/T>

Tool	Number	Name	Use
 <p>B991032</p>	MB991032	Mount bush remover & installer ring	Crankshaft rear oil seal installation
 <p>B991033</p>	MB991033	Mount bush remover & installer base	
 <p>MB991962</p>	MB991962	Crankshaft front oil seal guide	Crankshaft front oil seal installation
 <p>MD998306</p>	MD998306	Camshaft oil seal installer	
	MB991653	Cylinder head bolt wrench	Removal and installation of cylinder head bolt

Tool	Number	Name	Use
 B991454	MB991454	Engine hanger balancer	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transmission assembly <i>NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.</i>
 B991527	MB991527	Hanger	
 Z203830	MB991895	Engine hanger	
 B991928	MB991928 A: MB991929 B: MB991930 C: MB991931 D: MB991932 E: MB991933 F: MB991934	Engine hanger A: Joint (50) × 2 B: Joint (90) × 2 C: Joint (140) × 2 D: Foot (standard) × 4 E: Foot (short) × 2 F: Chain and hook assembly	

ON-VEHICLE SERVICE

DRIVE BELT TENSION CHECK AND ADJUSTMENT

M1111003101262

ALTERNATOR DRIVE BELT TENSION CHECK

Check the drive belt tension in the following procedure.

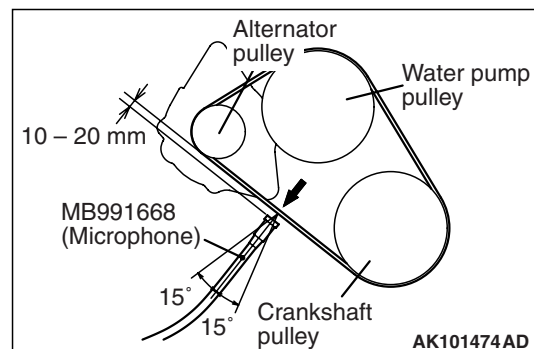
Standard value:

Vibration frequency Hz	142 – 173
Tension N	392 – 588
Deflection mm (Reference)	8.1 – 10.2

When using the M.U.T.-II

1. Connect the special tool belt tension meter set (MB991668) to the M.U.T.-II.
2. Connect the M.U.T.-II to the diagnosis connector.

3. Turn the ignition switch to the "ON" position and select "Belt Tension Measurement" from the menu screen.



4. Hold the microphone to the middle of the drive belt between the pulleys (at the place indicated by the arrow), about 10 – 20 mm away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of $\pm 15^\circ$).

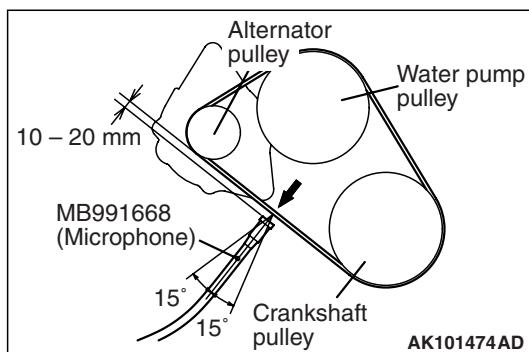
- Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

⚠ CAUTION

- The temperature of the surface of the belt should be as close as possible to normal temperature.
- Do not let any contaminants such as water or oil get onto the microphone.
- If strong gusts of wind blow against the microphone or if there is loud source of noise nearby, the values measured by the microphone may not correspond to actual values.
- If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.
- Do not take the measurement while the vehicle's engine is running.

When using the Vehicle communication interface (V.C.I.)

- Connect the special tool belt tension meter set (MB991668) to the special tool V.C.I (MB991824).
- Connect the special tool V.C.I (MB991824) to the diagnosis connector.
- Turn the ignition switch to the "ON" position and select "Belt Tension Measurement" from the menu screen.

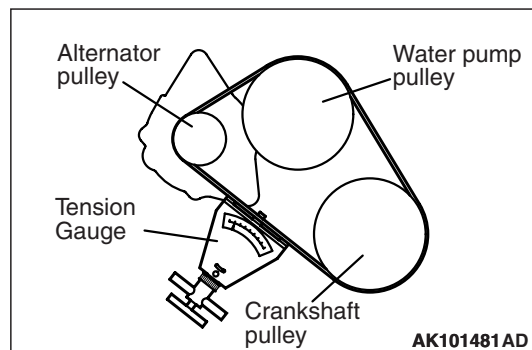


- Hold the microphone to the middle of the drive belt between the pulleys (at the place indicated by the arrow), about 10 – 20 mm away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of $\pm 15^\circ$).
- Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

⚠ CAUTION

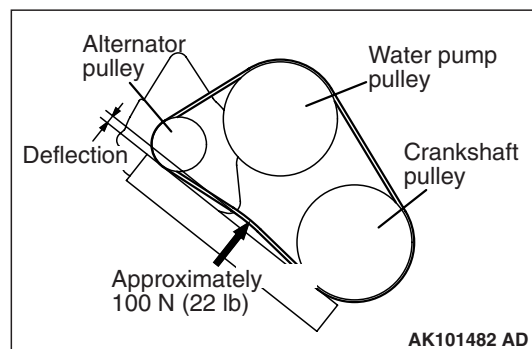
- The temperature of the surface of the belt should be as close as possible to normal temperature.
- Do not let any contaminants such as water or oil get onto the microphone.
- If strong gusts of wind blow against the microphone or if there is loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.
- If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.
- Do not take the measurement while the vehicle's engine is running.

When using the tension gauge



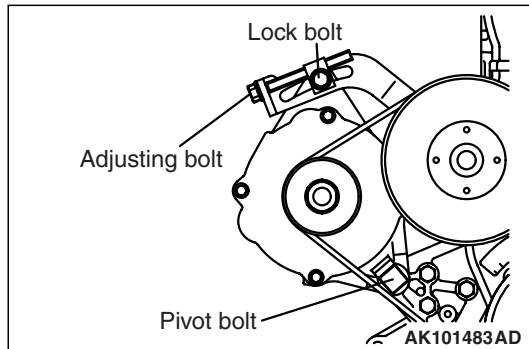
Use a belt tension gauge to check that the belt tension is within the standard value.

Belt deflection check



Apply approx. 100 N of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value.

ALTERNATOR DRIVE BELT TENSION ADJUSTMENT



1. Loosen the nut of the alternator pivot bolt.
2. Loosen the lock bolt.
3. Use the adjusting bolt to adjust the belt tension and belt deflection to the standard values.

Standard value:

Items	When adjusted	When replaced
Vibration frequency Hz	150 – 166	195 – 218
Tension N	441 – 539	785 – 981
Deflection mm (Reference)	8.6 – 9.7	5.4 – 6.6

4. Tighten the nut of the alternator pivot bolt.

Tightening torque: 44 ± 10 N·m

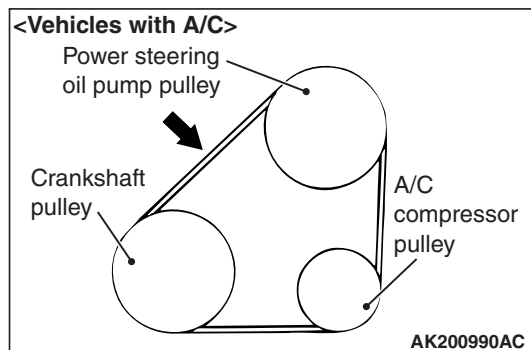
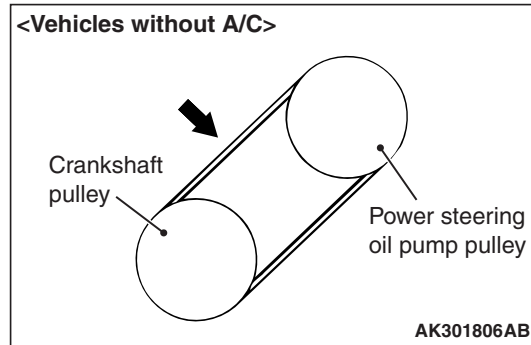
5. Tighten the lock bolt.

Tightening torque: 23 ± 2 N·m

6. Tighten the adjusting bolt.

Tightening torque: 5.0 ± 1.0 N·m

POWER STEERING OIL PUMP DRIVE BELT <Vehicles without A/C>, POWER STEERING OIL PUMP AND A/C COMPRESSOR DRIVE BELT <Vehicles with A/C> TENSION CHECK AND ADJUSTMENT



Check the drive belt tension by the following procedures.

Standard value:

Item	When checked	When adjusted	When replaced
Vibration frequency Hz	129 – 158	137 – 151	164 – 188
Tension N	392 – 588	441 – 539	637 – 833
Deflection mm (Reference)	9.6 – 12.4	10.2 – 11.6	7.2 – 9.0

When the vibration frequency is measured: Recommendation

Gently tap the centre of the belt between the pulleys (arrow), and check that the belt vibration frequency is within the standard value.

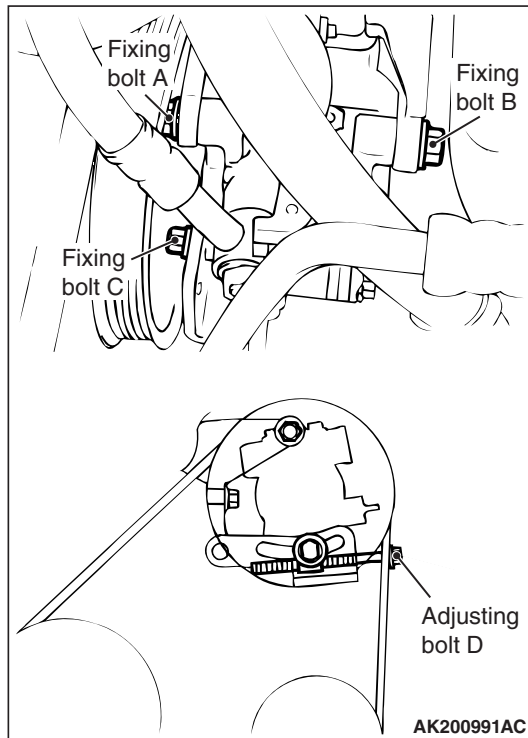
When the tension is measured

Place a belt tension gauge at the centre of the belt between the pulleys (arrow), and check that the belt tension is within the standard value.

When the deflection is measured

Apply approx. 100 N of pressure against the location between the pulleys shown by the arrow in the illustration and then measure the deflection.

If not within the standard value, adjust the belt tension by the following procedure.



1. Loosen the power steering oil pump fixing bolts A, B and C.
2. Use the adjusting bolt D to adjust the belt tension.
3. Tighten the fixing bolts at the specified torque in the order of A, B and C.

Tightening torque: 40 ± 5 N·m

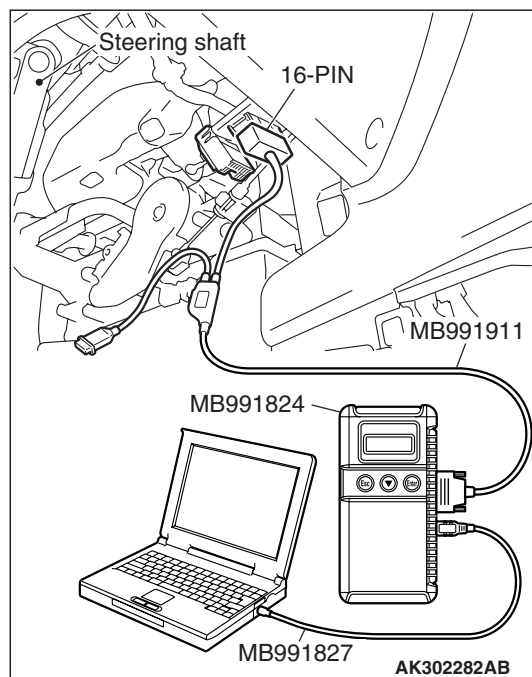
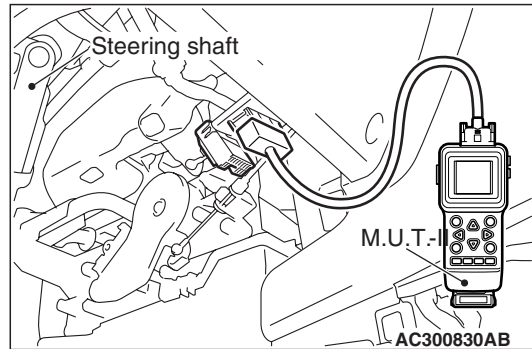
CAUTION

When checking the belt tension, turn the crankshaft clockwise one turn or more.

4. Check the belt tension, and readjust if necessary.

IGNITION TIMING CHECK

M1111001700544



1. Before inspection, set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to the "LOCK" (OFF) position and then connect the M.U.T.-II/III to the diagnosis connector.
3. Connect a timing light.
4. Start the engine and let it run at idle.
5. Use the M.U.T.-II/III to measure engine idle speed and check that it is within the standard value.

Standard value: 750 ± 100 r/min

6. Select No. 17 of the M.U.T.-II/III Actuator test.
7. Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC $\pm 3^\circ$

8. If the basic ignition timing is outside the standard value, inspect the MPI system (Refer to GROUP 13A – Troubleshooting – Inspection chart for diagnosis code [P.13A-17](#)).

CAUTION

If the test is not cancelled, a forced driving will continue for 27 minutes. Driving under this condition may damage the engine.

9. Press the M.U.T.-II/III clear key (Select a forced driving cancel mode) to release the Actuator test.
10. Check that ignition timing is at the standard value.

Standard value: approximately 10° BTDC

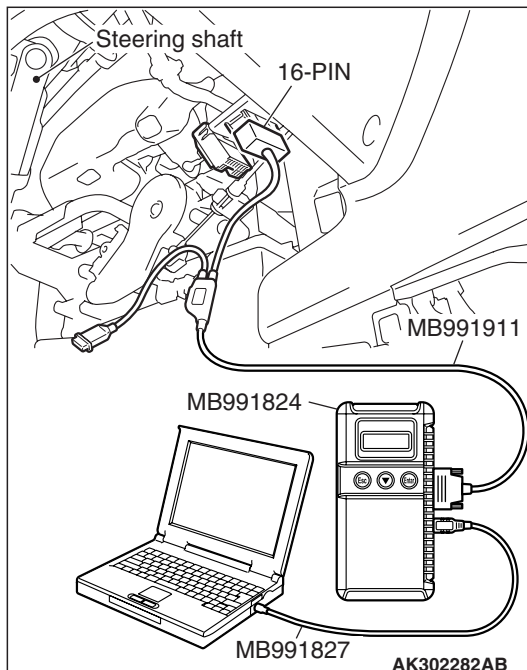
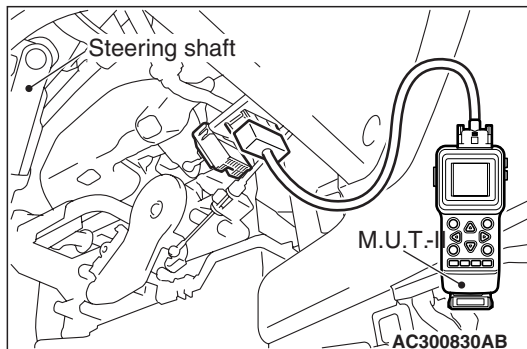
NOTE:

- The ignition timing may fluctuate within $\pm 7^\circ$ BTDC. This is normal.
- In higher altitude, the ignition timing is more advanced than the standard value by approximately 5° .

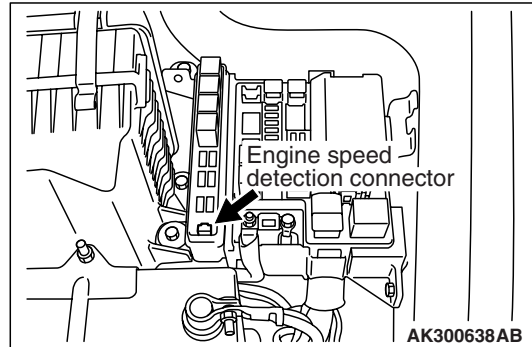
11. Remove the timing light.
12. Turn off the ignition switch and then remove the M.U.T.-II/III.

IDLE SPEED CHECK

M1111003500591



1. Before inspection, set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to "LOCK" (OFF) position.
3. Connect the M.U.T.-II/III to the diagnosis connector or connect a tachometer to the engine speed detection connector.
4. Connect a timing light.



5. Start the engine and let it run at idle.
6. Check that ignition timing is at the standard value.

Standard value: approximately 10° BTDC

7. Check the idle speed.

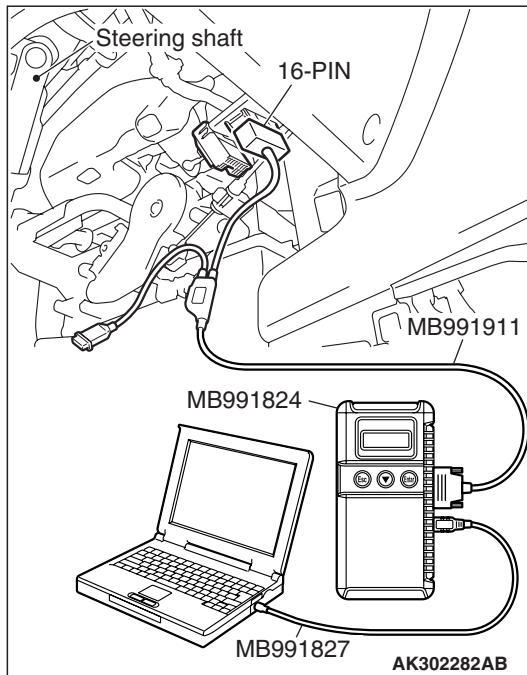
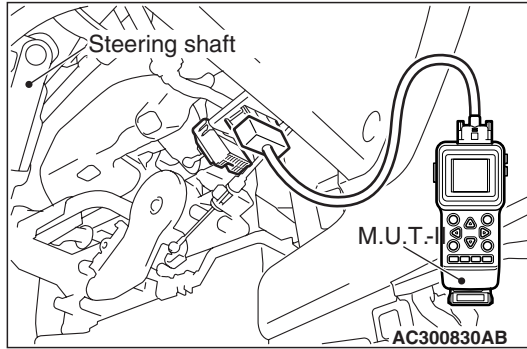
Standard value: 750 \pm 100 r/min

NOTE:

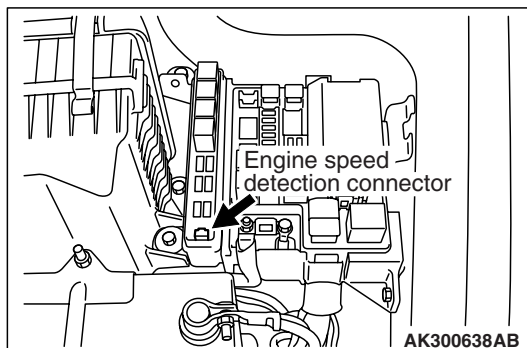
- The idle speed is controlled automatically by the idle speed control system.
 - When using the M.U.T.-II/III, select item No. 22 and take a reading of the idle speed.
8. If the idle speed is outside the standard value, inspect the MPI system (Refer to GROUP 13A – Troubleshooting – Inspection chart for diagnosis code P.13A-17).

IDLE MIXTURE CHECK

M1111002100363



1. Before inspection, set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to "LOCK" (OFF) position.
3. Connect the M.U.T.-II/III to the diagnosis connector or connect a tachometer to the engine speed detection connector.
4. Connect a timing light.



5. Start the engine and let it run at idle.

6. Check that ignition timing is at the standard value.

Standard value: approximately 10° BTDC

7. Run the engine at 2,500 r/min for 2 minutes.
8. Set the CO, HC tester.
9. Check the CO contents and the HC contents at idle.

Standard value

CO contents: 0.5 % or less

HC contents: 100 ppm or less

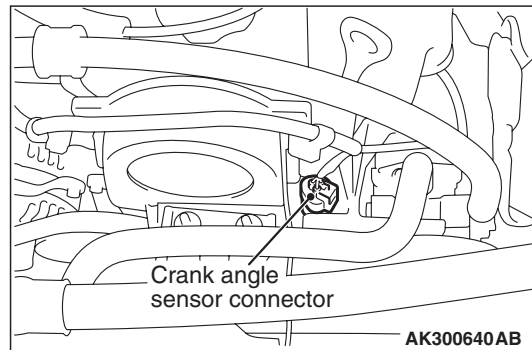
10. If there is a deviation from the standard value, check the following items:

- Diagnosis output
- Fuel pressure
- Injector
- Ignition coil, spark plug cable, spark plug
- EGR control system
- Evaporative emission control system
- Compression pressure

NOTE: Replace the three way catalyst when the CO and HC contents are not within the standard value, even though the result of the inspection is normal on all items.

COMPRESSION PRESSURE CHECK

M1111002600551

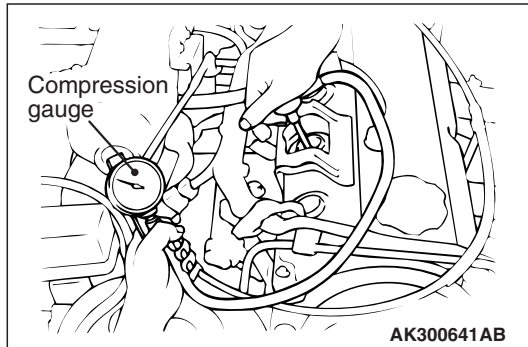


1. Before inspection, set the vehicle to the pre-inspection condition.
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the crank angle sensor connector.

NOTE: Doing this will prevent the engine-A/T-ECU from carrying out ignition and fuel injection.

CAUTION

- Keep away from the spark plug hole when cranking.
 - If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.
5. Cover the spark plug hole with a shop towel etc., and after the engine has been cranked, check that no foreign material is adhering to the shop towel.



6. Set compression gauge to one of the spark plug holes.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

Standard value (at engine speed of 300 r/min):

4G13: 1,600 kPa

4G18: 1,720 kPa

Limit (at engine speed of 300 r/min):

4G13: Minimum 1,120 kPa

4G18: Minimum 1,260 kPa

8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

Limit: Maximum 98 kPa

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps from (6) to (8).
- (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.

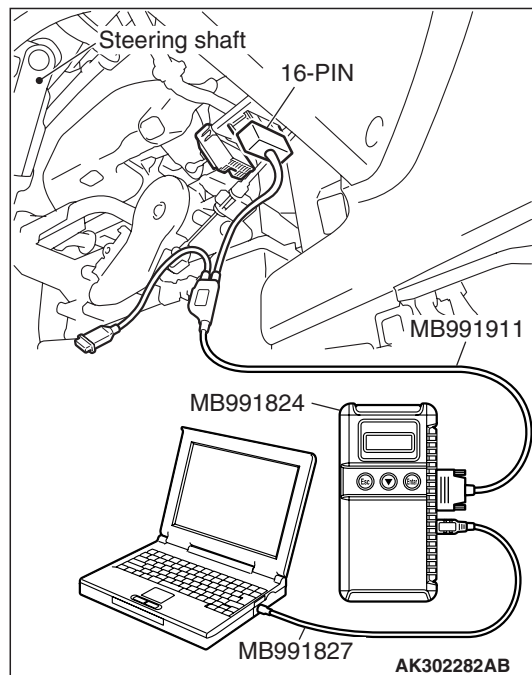
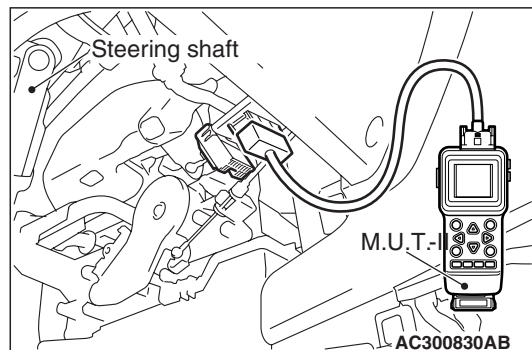
- (2) If the compression dose not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

10. Connect the crank angle sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the M.U.T.-II/III to erase the diagnosis codes.

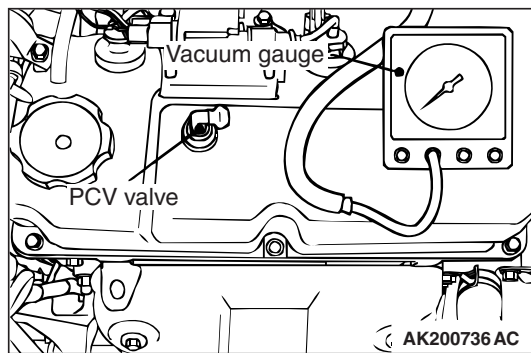
NOTE: This will erase the diagnosis code resulting from the crank angle sensor connector being disconnected.

MANIFOLD VACUUM CHECK

M1111002700503



1. Before inspection, set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to "LOCK" (OFF) position.
3. Connect a tachometer or connect the M.U.T.-II/III to the diagnosis connector.



4. Disconnect the ventilation hose from the positive crankcase ventilation (PVC) valve, and then connect a vacuum gauge to the ventilation hose. Plug the positive crankcase ventilation (PCV) valve.
5. Start the engine and check that idle speed is within the standard value.
Standard value: 750 ± 100 r/min
6. Check the intake manifold vacuum.
Limit: Minimum 60 kPa
7. Turn off the ignition switch.
8. Remove the vacuum gauge and then connect the ventilation hose to the positive crankcase ventilation (PCV) valve.
9. Remove the engine tachometer or the M.U.T.-II/III.

LASH ADJUSTER CHECK

M1111002900422

If an abnormal noise (knocking) that seems to be coming from the lash adjuster is heard after starting the engine and does not stop, carry out the following check.

NOTE:

- *The abnormal noise which is caused by a problem with the lash adjusters is generated after the engine is started, and will vary according to the engine speed. However, this noise is not related to the actual engine load. Because of this, if the noise does not occur immediately after the engine is started, if it does not change in accordance with the engine speed, or if it changes in accordance with the engine load, the source of the noise is not the lash adjusters.*
- *If there is a problem with the lash adjusters, the noise will almost never disappear, even if the engine has been run at idle to let it warm up. The only case where the noise might disappear is if the oil in the engine has not been looked after properly and oil sludge has caused the lash adjusters to stick.*

1. Start the engine.
2. Check that the noise occurs immediately after the engine is started, and that the noise changes in accordance with changes in the engine speed.

If the noise does not occur immediately after the engine is started, or if it does not change in accordance with the engine speed, the problem is not being caused by the lash adjusters, so check for some other cause of the problem. Moreover, if the noise does not change in accordance with the engine speed, the cause of the problem is probably not with the engine (In these cases, the lash adjusters are normal).

3. While the engine is idling, check that the noise level does not change when the engine load is varied (for example, by shifting from N to D).
If the noise level changes, the cause of the noise is probably parts striking because of worn crankshaft bearings or connecting rod bearings (In such cases, the lash adjusters are normal).
4. After the engine has warmed up, run it at idle and check if any noise can be heard.

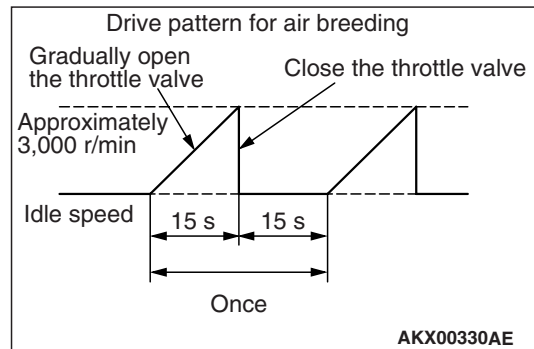
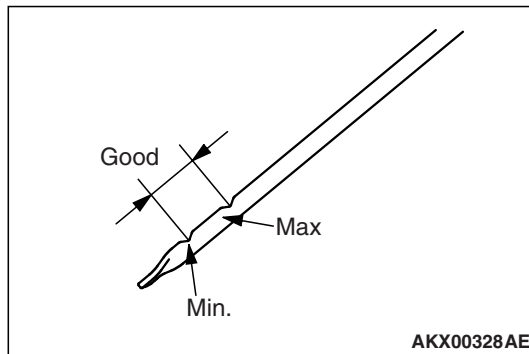
If the noise has become smaller or disappeared, oil sludge could make the lash adjusters stick. Clean the lash adjusters (Refer to GROUP 11B – Rocker Arms and Camshaft – Rocker Arms and Camshaft Inspection P.11B-25). If not improved, go to step 5.

5. Bleed air from the lash adjusters (Refer to P.11A-14).
6. If the noise has not disappeared even after the air bleeding, clean the lash adjusters (Refer to GROUP 11B – Rocker Arms and Camshaft – Rocker Arms and Camshaft Inspection P.11B-25).

<LASH ADJUSTER AIR BLEEDING>

NOTE:

- *If the vehicle is parked on a slope for a long period of time, the amount of oil inside the lash adjuster will decrease, and air may get into the high pressure chamber when starting the engine.*
- *After parking the vehicle for long periods, the oil drains out of the oil passage, and it takes time for the oil to be supplied to the lash adjuster, so air can get into the high-pressure chamber.*
- *If either of the above situations occur, the abnormal noise can be eliminated by bleeding the air from inside the lash adjusters.*

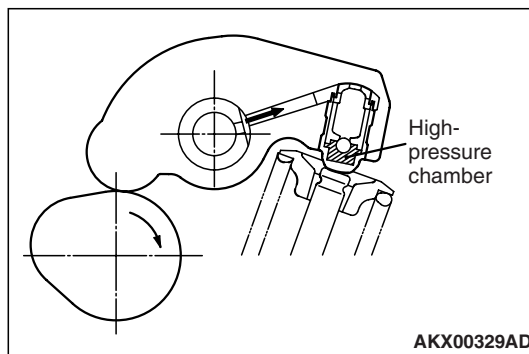


1. Check the engine oil and replenish or replace the oil if necessary.

NOTE:

- If there is an only small amount of oil, air will be drawn in through the oil screen and will get into the oil passage.
- If the amount of oil is greater than normal, then the oil will be mixed by the crankshaft and a large amount of air may get mixed into the oil.
- If the oil is degenerated, air and oil will not separate easily in oil, and the amount of air mixed into the oil will increase.

2. Run the engine at idle for 1 – 3 minutes to let it warm up.
3. With no load on the engine, repeat the drive pattern shown in the illustration above and check if the abnormal noise disappears (The noise should normally disappear after 10 – 30 repetitions, but if there is no change in the noise level after 30 repetitions or more, the problem is probably not due to air inside the lash adjusters).
4. After the noise has disappeared, repeat the drive pattern shown in the illustration above a further 5 times.
5. Run the engine at idle for 1 – 3 minutes and check that the noise has disappeared.



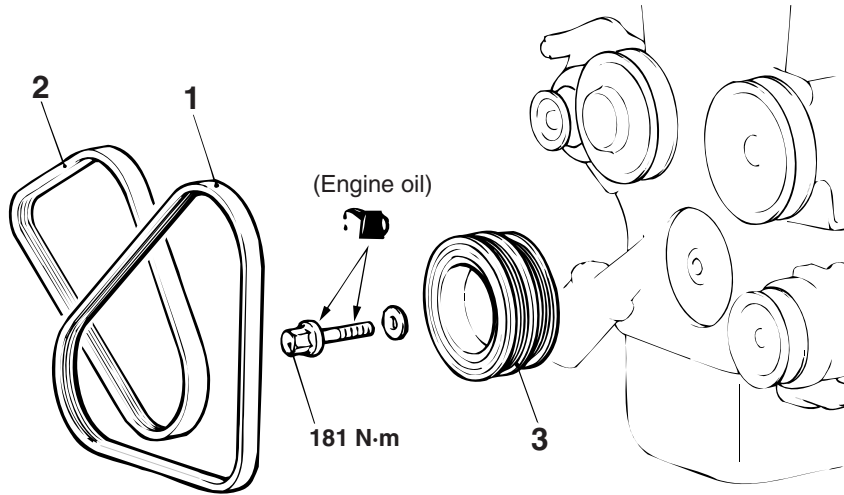
- If the air which has been mixed in with the oil due to any of the above reasons gets into the high pressure chamber of the lash adjuster, the air inside the high pressure chamber will be compressed when the valve is open and the lash adjuster will over-compress, resulting in abnormal noise when the valve close. This is the same effect as if the valve clearance is adjusted to be too large by mistake. If the air inside the lash adjusters is then released, the operation of the lash adjusters will return to normal.

CRANKSHAFT PULLEY

REMOVAL AND INSTALLATION

M1112001600421

<p>Pre-removal Operation</p> <ul style="list-style-type: none"> • Under Cover Removal 	<p>Post-installation Operation</p> <ul style="list-style-type: none"> • Drive Belt Tension Check (Refer to P.11A-7). • Under Cover Installation
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AC203471 AD

<<A>>

Removal steps

1. Power steering oil pump drive belt <Vehicles without A/C>, Power steering oil pump and A/C compressor drive belt <Vehicles with A/C>

<>

<<C>>

>>A<<

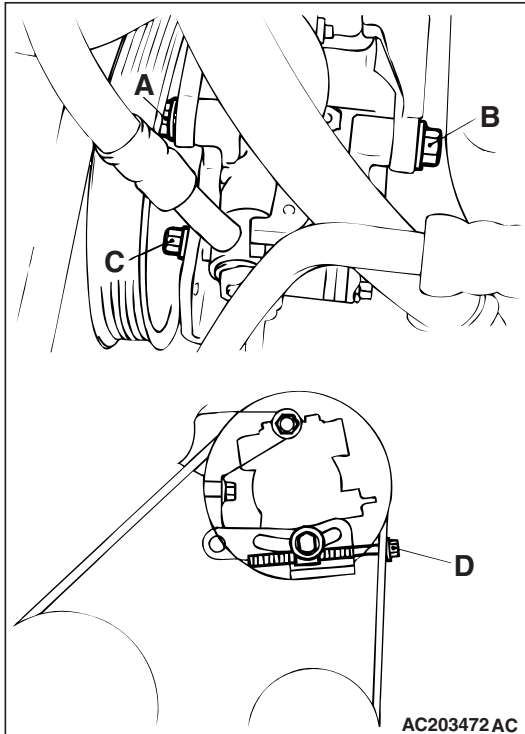
Removal steps (Continued)

2. Alternator drive belt
3. Crankshaft pulley assembly

REMOVAL SERVICE POINTS

<<A>>POWER STEERING OIL PUMP
DRIVE BELT <VEHICLES WITHOUT A/C>,
POWER STEERING OIL PUMP AND A/C
COMPRESSOR DRIVE BELT <VEHICLES
WITH A/C> REMOVAL

CAUTION

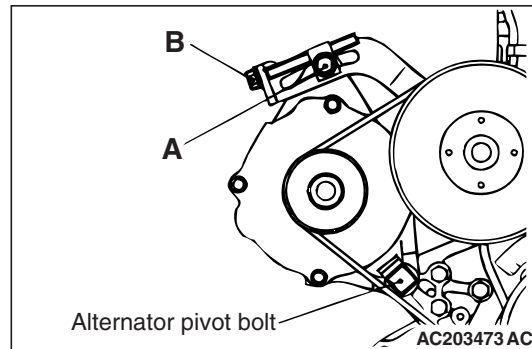


To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk.

1. Loosen the power steering oil pump fixing bolts A, B and C.
2. Turn the adjusting bolt D in the anti-clockwise direction (to the left) to remove the drive belt.

<> ALTERNATOR DRIVE BELT REMOVAL

CAUTION



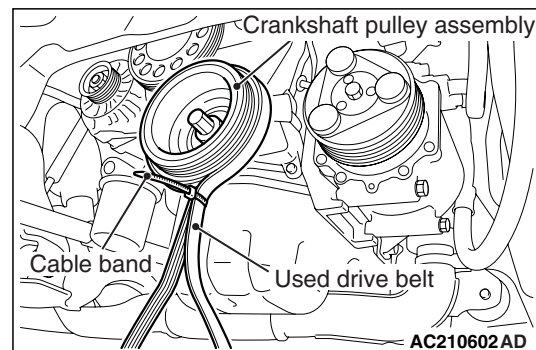
To reuse the alternator drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk.

1. Loosen the nut for alternator pivot bolt and alternator bolt A.
2. Turn the adjusting bolt B in the anti-clockwise direction (to the left) to remove the alternator drive belt.

<<C>> CRANKSHAFT PULLEY ASSEMBLY REMOVAL

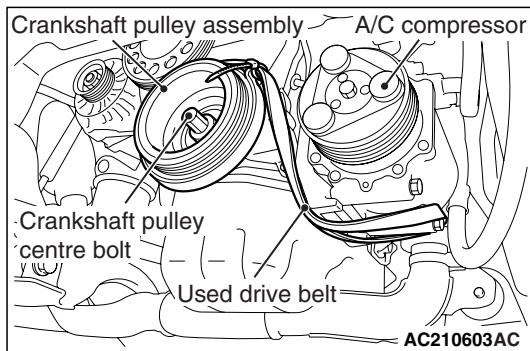
Use the used drive belt to fix the crankshaft pulley assembly, and loosen the crankshaft pulley centre bolt.

CAUTION



- Do not use the drive belt setup on the vehicles.
- Do not use a cracked or damaged drive belt.

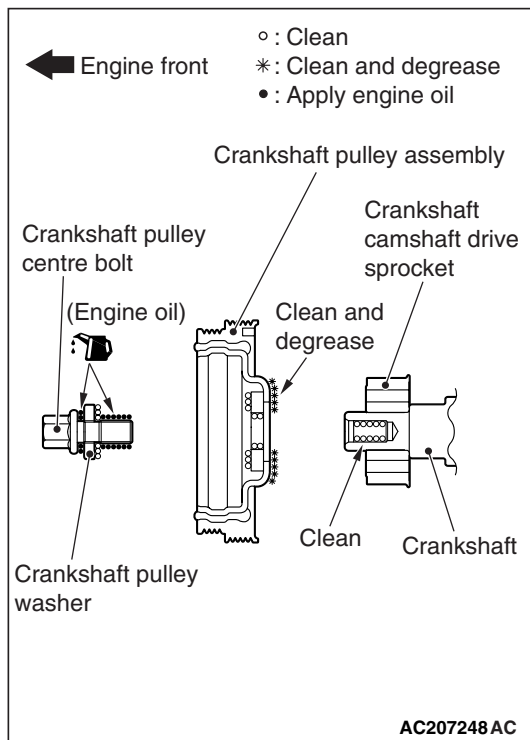
1. Set the used drive belt as shown and hold it with a cable band.



- Turning the crankshaft pulley assembly to the anti-clockwise direction (to the left), place the used drive belt to the A/C compressor, hold the crankshaft pulley assembly and remove the crankshaft pulley centre bolt.

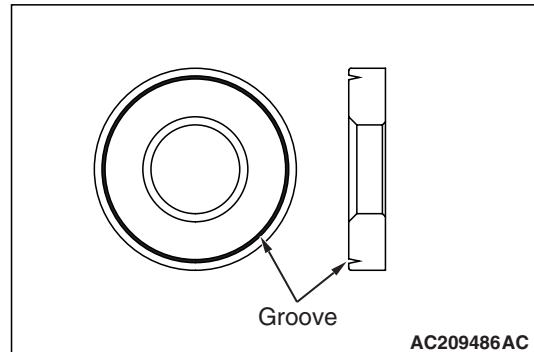
INSTALLATION SERVICE POINT

>>A<< CRANKSHAFT PULLEY ASSEMBLY INSTALLATION



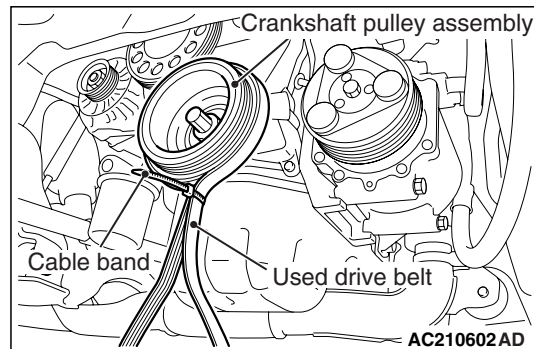
- Clean the screw hole of the crank shaft, the crankshaft pulley assembly and the crankshaft pulley washer.
- Clean and degrease the crankshaft pulley assembly installation side and install the crankshaft pulley assembly.

- Apply an appropriate quantity of new engine oil to the thread of crankshaft pulley centre bolt and the crankshaft pulley washer top face.

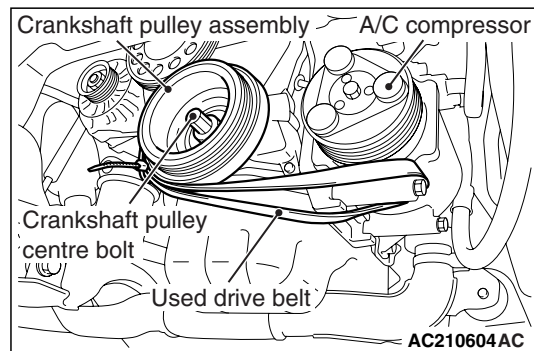


- Place the crankshaft pulley washer with the groove facing on the bolt side.

⚠ CAUTION



- Do not use the drive belt setup on the vehicles.
 - Do not use a cracked or damaged drive belt.
- Set the used drive belt and hold it with a cable band as during removal.



- Turning the crankshaft pulley assembly to the clockwise direction (to the right), place the used drive belt to the A/C compressor, hold the crankshaft pulley assembly and remove the crankshaft pulley centre bolt.

Tightening torque: 181 N·m

CAMSHAFT AND VALVE STEM SEAL

REMOVAL AND INSTALLATION

M1112006600233

CAUTION

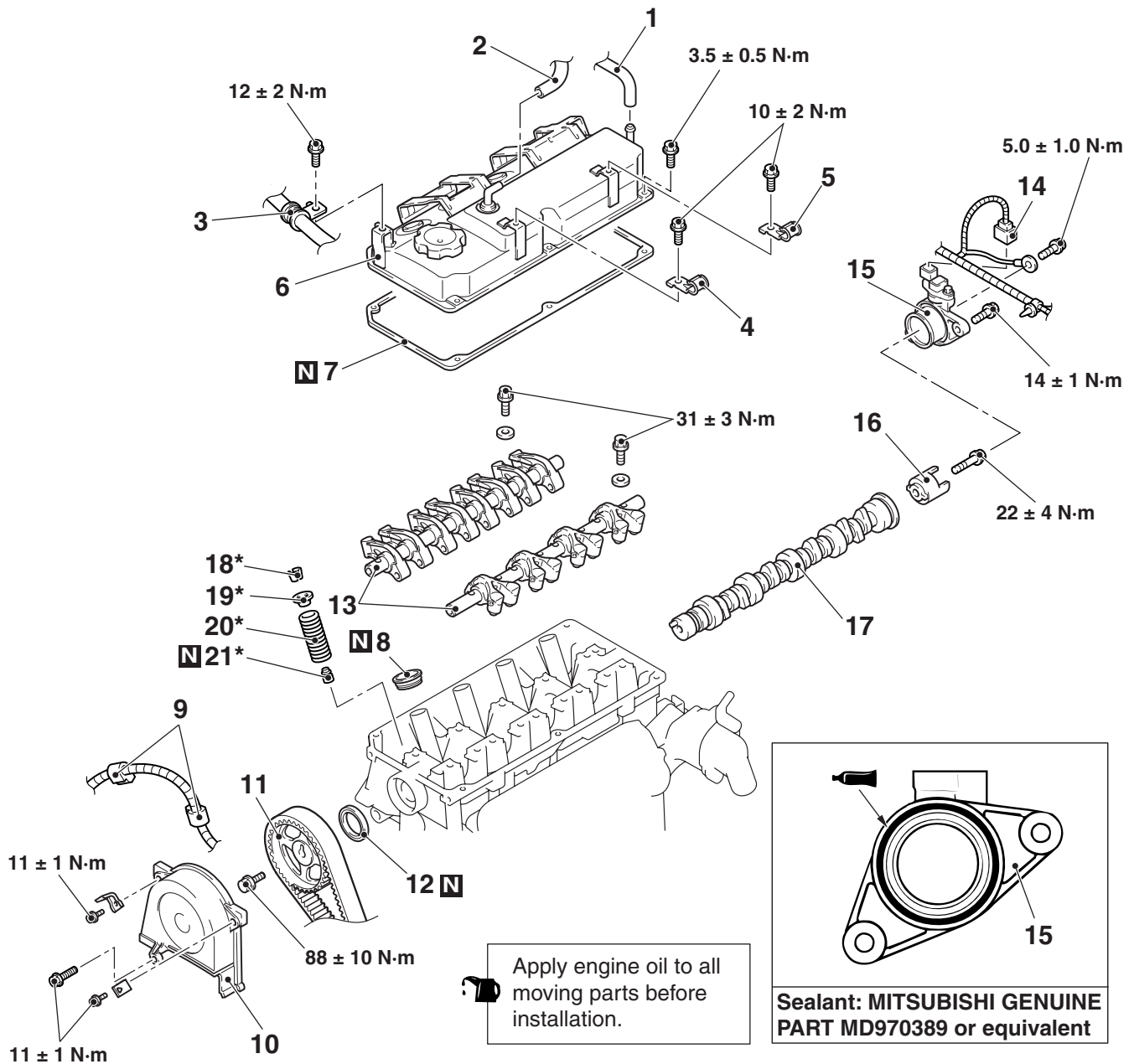
*Remove and assemble the marked parts in each cylinder unit.

Pre-removal Operation

- Air Cleaner Assembly and Air Cleaner Bracket Removal (Refer to GROUP 15 P.15-3).
- Battery and Battery Tray Removal
- Ignition Coil Removal (Refer to GROUP 16 P.16-36).

Post-installation Operation

- Ignition Coil Installation (Refer to GROUP 16 P.16-36).
- Battery and Battery Tray Installation
- Air Cleaner Assembly and Air Cleaner Bracket Installation (Refer to GROUP 15 P.15-3).



AC302524AB

Camshaft removal steps

1. Rocker cover breather hose connection
2. Rocker cover PCV hose connection

Camshaft removal steps

3. Power steering pressure hose clamp
4. Accelerator cable support clamp

Camshaft removal steps

- 5. Accelerator cable support clamp <R.H. drive vehicles>
- 6. Rocker cover assembly
- 7. Rocker cover gasket
- 8. Cylinder head spark plug guide seal
- 9. Control wiring harness clamp
- 10. Timing belt front upper cover
- <<A>> >>F<< 11. Camshaft sprocket
- >>E<< 12. Camshaft oil seal
- <> >>D<< 13. Rocker arm lash adjuster, rocker arm and shaft assembly
- 14. Camshaft position sensor connector
- 15. Camshaft position sensor and Camshaft position sensor support assembly
- 16. Camshaft position sensing cylinder
- 17. Camshaft

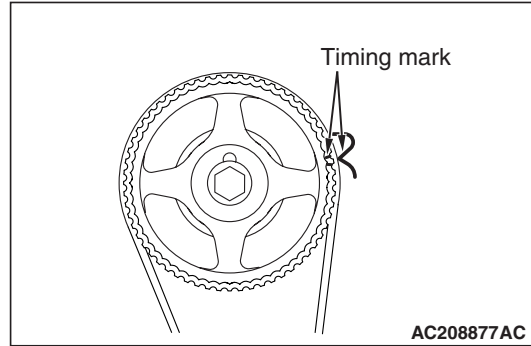
Valve stem seal removal steps

- 1. Rocker cover breather hose connection
- 2. Rocker cover PCV hose connection
- 3. Power steering pressure hose clamp
- 4. Accelerator cable support clamp
- 5. Accelerator cable support clamp <R.H. drive vehicles>
- 6. Rocker cover assembly
- 7. Rocker cover gasket
- <> >>D<< 13. Rocker arm lash adjuster, rocker arm and shaft assembly
- <<C>> >>C<< 18. Valve spring retainer lock
- >>B<< 19. Valve spring retainer
- >>A<< 20. Valve spring
- 21. Valve stem seal

REMOVAL SERVICE POINTS

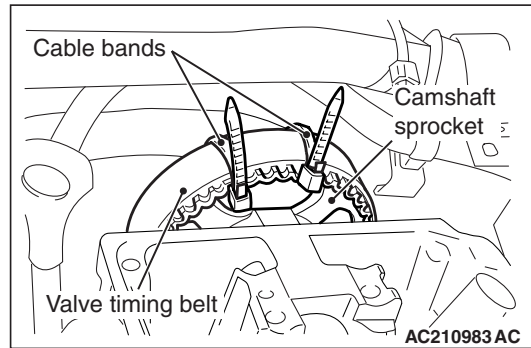
<<A>> CAMSHAFT SPROCKET REMOVAL

CAUTION

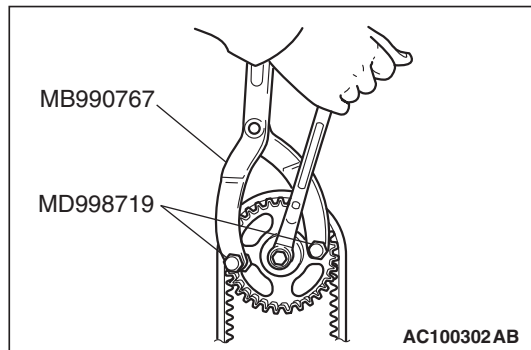


Always turn the crankshaft in the forward direction (clockwise).

1. Turn the crankshaft in the forward direction (clockwise) to align the timing mark so that No.1 cylinder is at the compression TDC (Top Dead Centre) position.



2. Secure the camshaft sprocket and the valve timing belt with cable bands to prevent deviation from the relative positions between the camshaft sprocket and the valve timing belt.



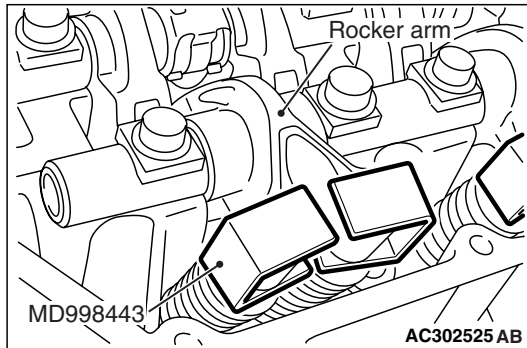
3. Use the following special tools to stop the camshaft sprocket from turning.
 - Front hub and flange yoke holder (MB990767)
 - Crankshaft pulley holder pin (MD998719)

⚠ CAUTION

Do not turn the crankshaft after the camshaft sprocket is removed.

4. Remove the camshaft sprocket with the valve timing belt attached.

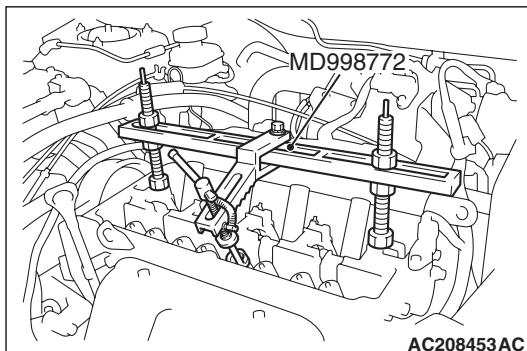
<> ROCKER ARM LASH ADJUSTER, ROCKER ARM AND SHAFT ASSEMBLY REMOVAL



Before removing the rocker arm lash adjuster, rocker arm and shaft assembly, install the special tools auto-lash adjuster holder (MD998443) as shown in the illustration so that the rocker arm lash adjusters will not fall out.

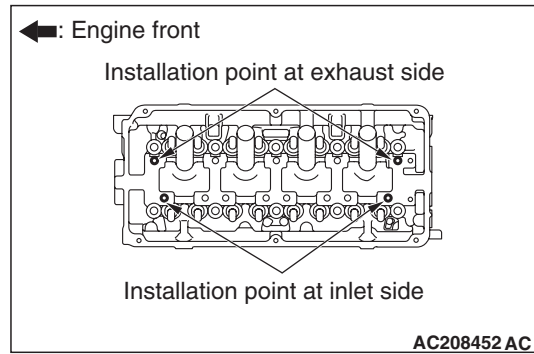
<<C>> VALVE SPRING RETAINER LOCK REMOVAL

⚠ CAUTION



When removing valve spring retainer lock, leave the piston of each cylinder in the TDC position. The valve may fall into the cylinder if the piston is not properly in the TDC position.

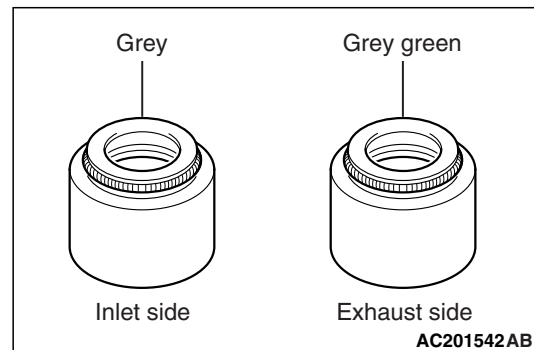
Use special tool valve spring compressor (MD998772) to compress the valve spring, remove the valve spring retainer lock.



NOTE: Installation position of the special tool is different between inlet side and exhaust side.

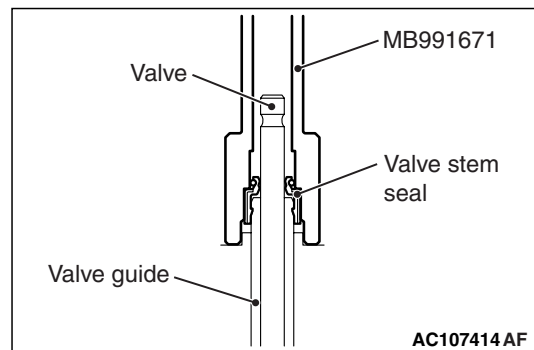
INSTALLATION SERVICE POINTS

>>A<< VALVE STEM SEAL INSTALLATION



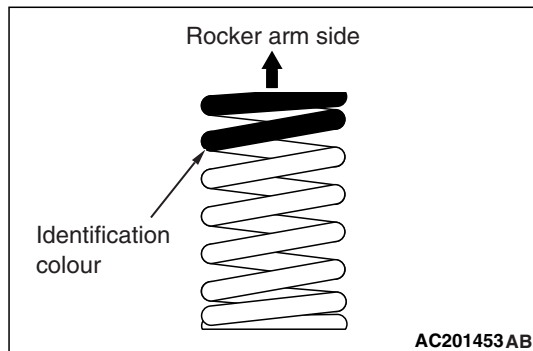
1. Check the valve stem seal colour to identify the inlet side or exhaust side.
2. Apply a small amount of engine oil to the valve stem seal.

⚠ CAUTION



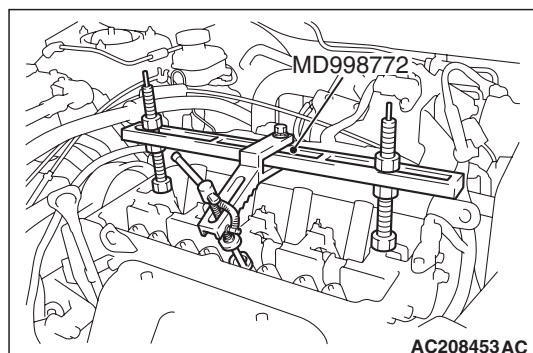
- Valve stem seal cannot be reused.
 - The special tool valve stem seal installer (MB991671) must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.
3. Use special tool valve stem seal installer (MB991671) to fill a new valve stem seal in the valve guide using the valve stem area as a guide.

>>B<< VALVE SPRING INSTALLATION



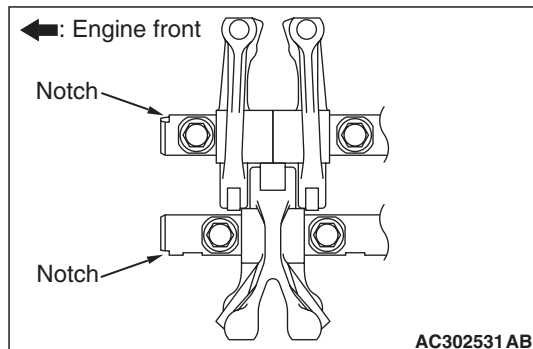
Install the valve spring with its identification colour painted end facing the locker arm.

>>C<< VALVE SPRING RETAINER LOCK INSTALLATION



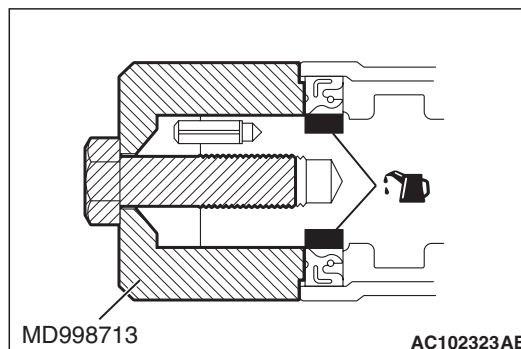
Use special tool valve spring compressor (MD998772) to compress the valve spring in the same manner as removal, and install the valve spring retainer lock.

>>D<< ROCKER ARM LASH ADJUSTER, ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION



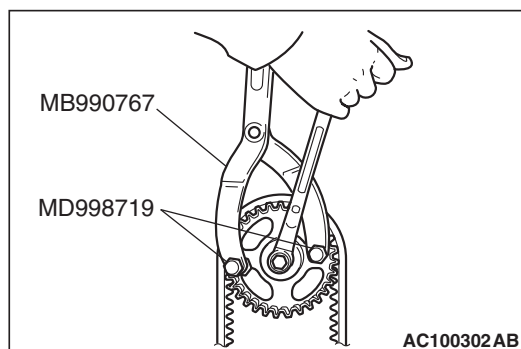
Position the rocker arm shaft so that their notches point the direction shown, and install the lash adjuster, rocker arm and shaft assembly.

>>E<< CAMSHAFT OIL SEAL INSTALLATION



1. Apply new engine oil to the camshaft oil seal lip.
2. Use special tool camshaft oil seal installer (MD998713) to press-fit the camshaft oil seal.

>>F<< CAMSHAFT SPROCKET INSTALLATION



1. Use the following special tools to stop the camshaft sprocket from turning in the same way as was done during removal.
 - Front hub and flange yoke holder (MB990767)
 - Crankshaft pulley holder pin (MD998719)
2. Tighten the timing belt train bolt to the specified torque.

Tightening torque: 88 ± 10 N·m

OIL PAN

REMOVAL AND INSTALLATION

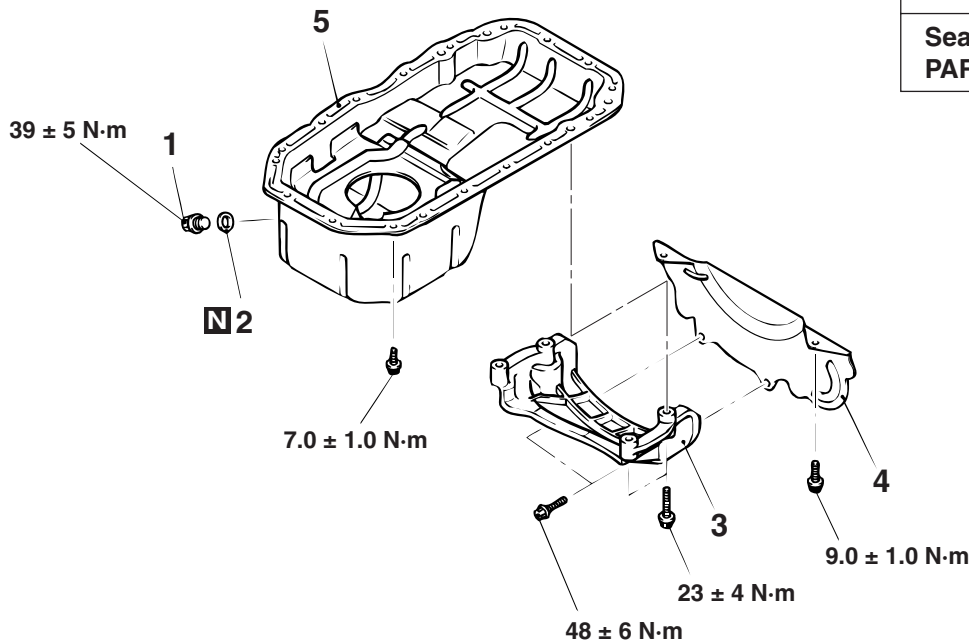
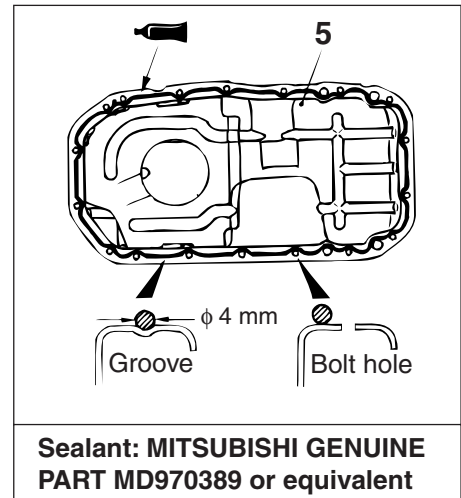
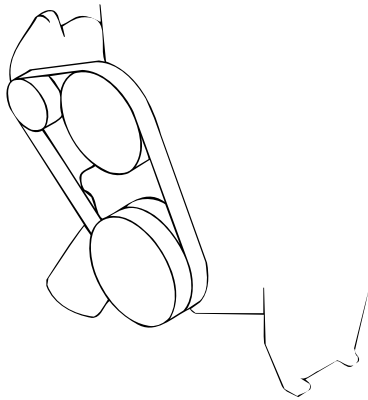
M1112002800622

Pre-removal Operation

- Under Cover Removal
- Engine Oil Draining (Refer to GROUP 12 - On-vehicle Service P.12-4).
- Front Exhaust Pipe Removal (Refer to GROUP 15 P.15-11).

Post-installation Operation

- Front Exhaust Pipe Installation (Refer to GROUP 15 P.15-11).
- Engine Oil Refilling (Refer to GROUP 12 - On-vehicle Service P.12-4).
- Under Cover Installation



AC302553AB

Removal steps

- >>B<<
1. Engine oil pan drain plug
 2. Engine oil pan drain plug gasket
 3. Transmission housing front lower cover stay

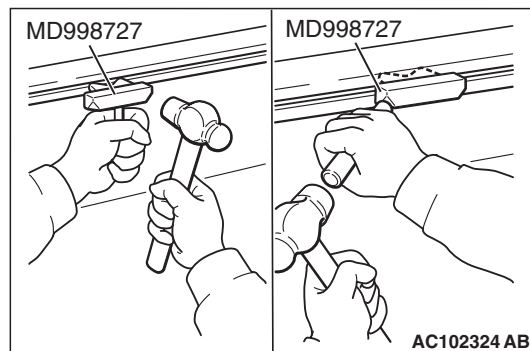
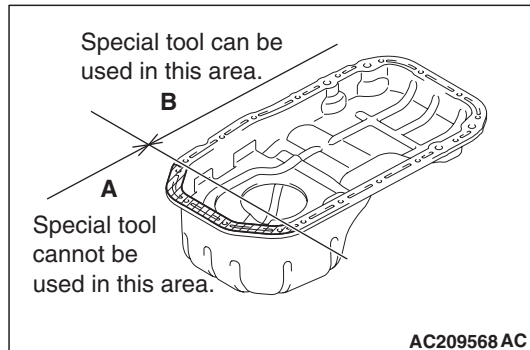
Removal steps (Continued)

- <<A>> >>A<<
4. Flywheel housing front lower cover
 5. Engine oil pan

REMOVAL SERVICE POINT

<<A>> ENGINE OIL PAN REMOVAL

1. Remove the engine oil pan bolts.

CAUTION

Do not use oil pan remover MD998727 for the area A of the engine oil pan shown in the figure. If the special tool is used for the area A, the cylinder block front case may be deformed because it is aluminium.

2. After hammering oil pan remover MD998727 between the area B of the cylinder block and the engine oil pan, slide it.

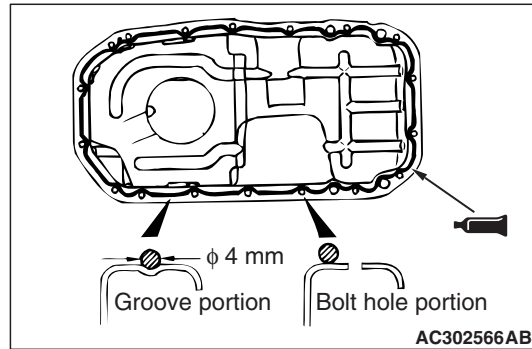
NOTE: You need not to use the special tool when the other parts interfere with it.

3. Remove the engine oil pan.

INSTALLATION SERVICE POINTS

>>A<< ENGINE OIL PAN INSTALLATION

1. Remove sealant from the engine oil pan and cylinder block surfaces.



2. Apply a bead of the sealant to the cylinder block mating surface of the engine oil pan as shown.

Specified sealant: MITSUBISHI GENUINE PART MD970389 or equivalent

NOTE: Install the engine oil pan within 15 minutes after applying sealant.

3. Assemble the engine oil pan to the cylinder block.

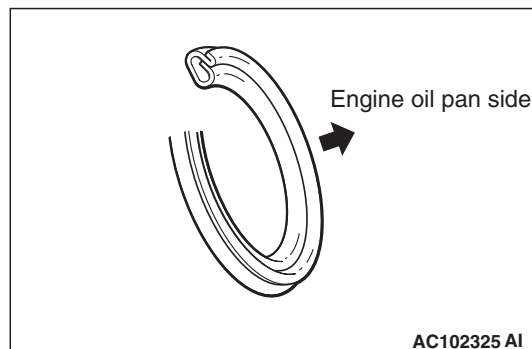
CAUTION

Then wait at least one hour. Never start the engine or let engine oil or coolant touch the sealant surface during that time.

4. Tighten the engine oil pan bolts to the specified torque.

Tightening torque: 7.0 ± 1.0 N·m

>>B<< ENGINE OIL PAN DRAIN PLUG GASKET INSTALLATION



Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.

INSPECTION

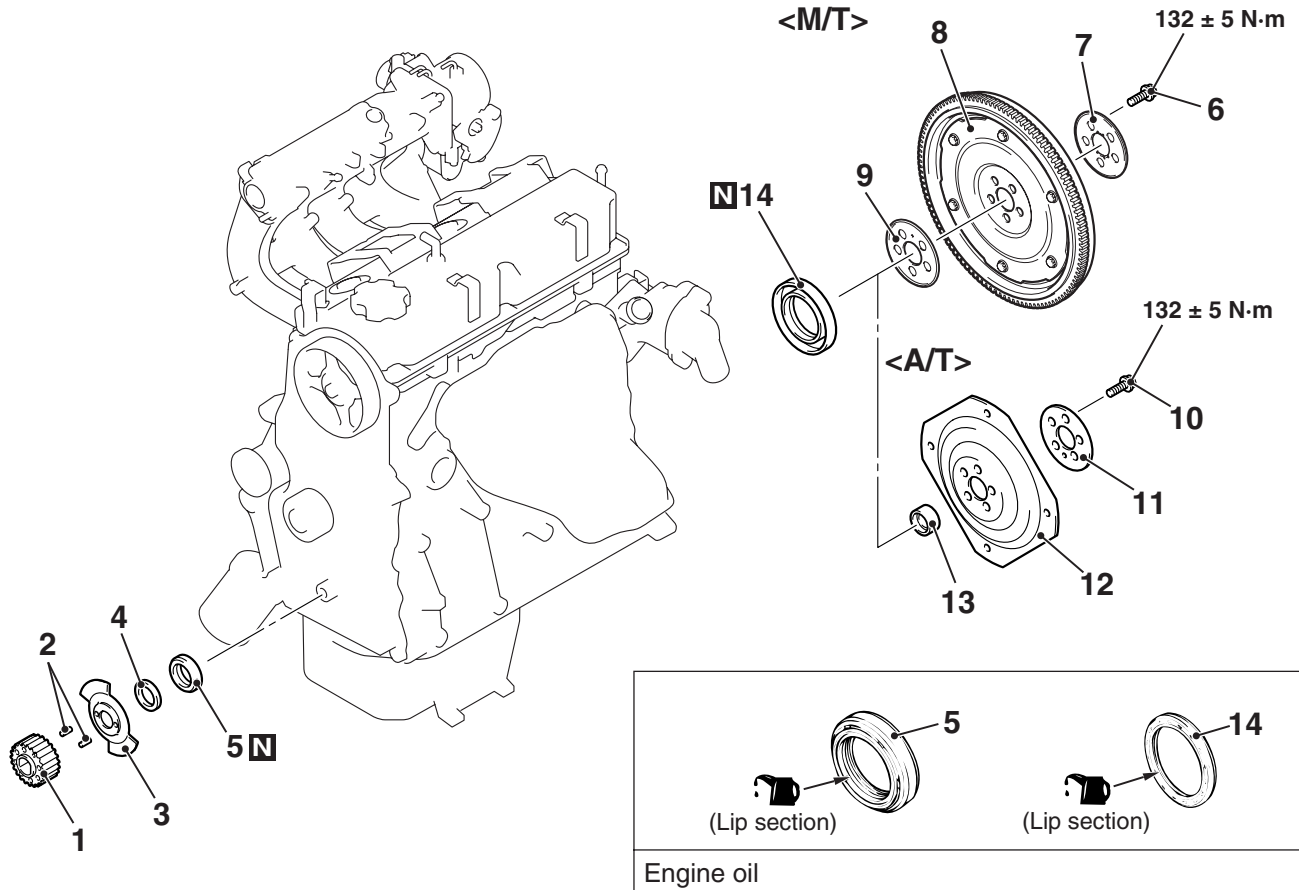
- Check the engine oil pan for cracks.
- Check the engine oil pan sealant-coated surface for damage and deformation.

M1112002900221

CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION

M1112003100295



AC302568AB

Crankshaft front oil seal removal steps

- Valve timing belt (Refer to [P.11A-33](#)).
 - Engine crank angle sensor (Refer to GROUP 16 [P.16-39](#)).
- >>D<< 1. Crankshaft camshaft drive sprocket
>>D<< 2. Timing belt train spring pin
>>D<< 3. Crankshaft angle sensing blade
>>D<< 4. Timing belt train spacer
>>C<< 5. Crankshaft front oil seal

<<A>>

<> >>B<<

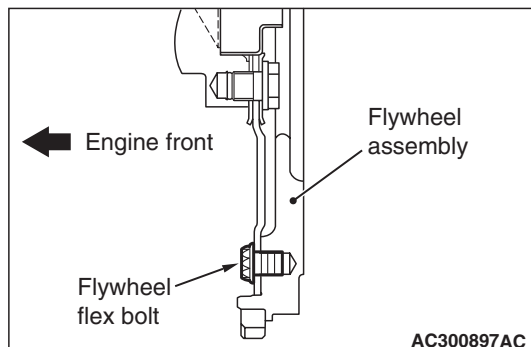
<> >>B<<

>>A<<

Crankshaft rear oil seal removal steps

- Transmission assembly
 - Clutch cover and disc
6. Flywheel bolt <M/T>
7. Flywheel adapter plate <M/T>
8. Flywheel assembly <M/T>
9. Flywheel adapter plate <M/T>
<> >>B<< 10. A/T drive plate bolt <A/T>
11. A/T drive plate adapter plate <A/T>
12. A/T drive plate <A/T>
13. Crankshaft bushing <A/T>
>>A<< 14. Crankshaft rear oil seal

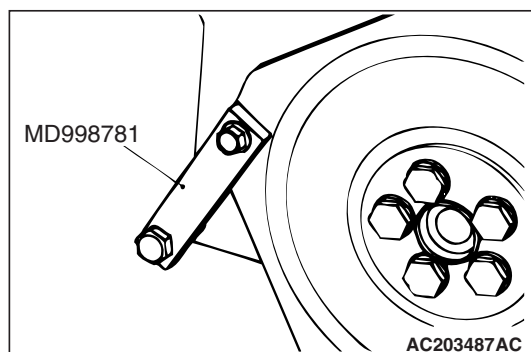
REMOVAL SERVICE POINTS

<<A>> TRANSMISSION ASSEMBLY
REMOVAL**⚠ CAUTION**

For vehicles with M/T, do not remove the flywheel flex bolt shown by the arrow. If this bolt is removed, the flywheel assembly will become out of balance and damaged.

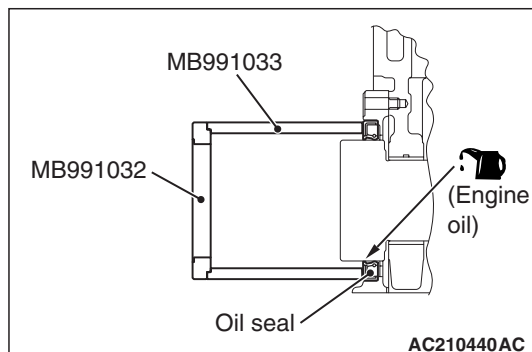
Refer to GROUP 22A - Transmission Assembly
P.22A-12. <M/T>

Refer to GROUP 23A - Transmission Assembly
P.23A-151. <A/T>

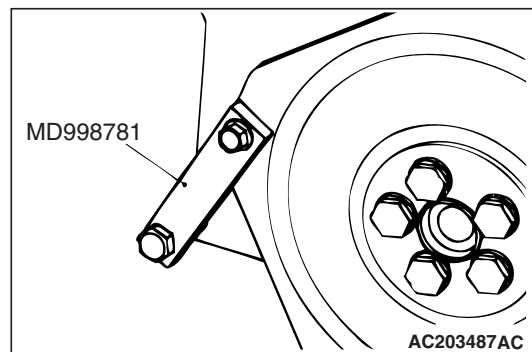
<> FLYWHEEL BOLT <M/T>/A/T
DRIVE PLATE BOLTS <A/T> REMOVAL

1. Use special tool flywheel stopper (MD998781) to secure the flywheel assembly <M/T> or A/T drive plate <A/T>.
2. Remove the flywheel bolts <M/T> or A/T drive plate bolts <A/T>.

INSTALLATION SERVICE POINTS

>>A<< CRANKSHAFT REAR OIL SEAL
INSTALLATION

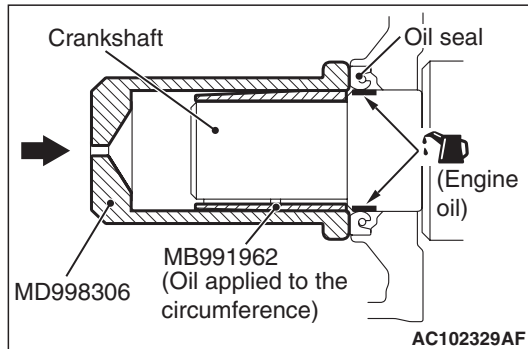
1. Apply a small amount of new engine oil to the entire inner diameter of the oil seal lip.
2. Use the following special tools to press-fit the oil seal.
 - Mount bush remover & installer ring (MB991032)
 - Mount bush remover & installer base (MB991033)

>>B<< A/T DRIVE PLATE BOLT
<A/T>/FLYWHEEL BOLT <M/T>
INSTALLATION

1. Use special tool flywheel stopper (MD998781) to secure the A/T drive plate <A/T> or flywheel assembly <M/T> in the same manner as removal.
2. Tighten the A/T drive plate bolts <A/T> or flywheel bolts <M/T> to the specified torque.

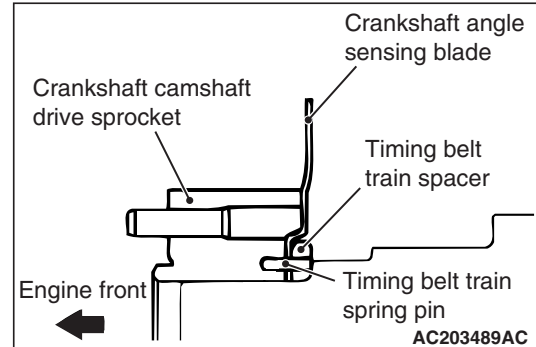
Tightening torque: 132 ± 5 N·m

>>C<< CRANKSHAFT FRONT OIL SEAL INSTALLATION



1. Apply a small amount of new engine oil to the entire inner diameter of the oil seal lip.
2. Apply a small amount of engine oil to the outer diameter of special tool crankshaft front oil seal guide (MB991962) and install it to the crankshaft.
3. Use special tool camshaft oil seal installer (MD998306) to press-fit the oil seal.

>>D<< TIMING BELT TRAIN SPACER/CRANKSHAFT ANGLE SENSING BLADE/TIMING BELT TRAIN SPRING PIN/CRANKSHAFT CAMSHAFT DRIVE SPROCKET INSTALLATION



With the timing belt train spring pins, the crankshaft angle sensing blade and the timing belt train spacer installed, install the crankshaft drive sprocket on the crankshaft.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

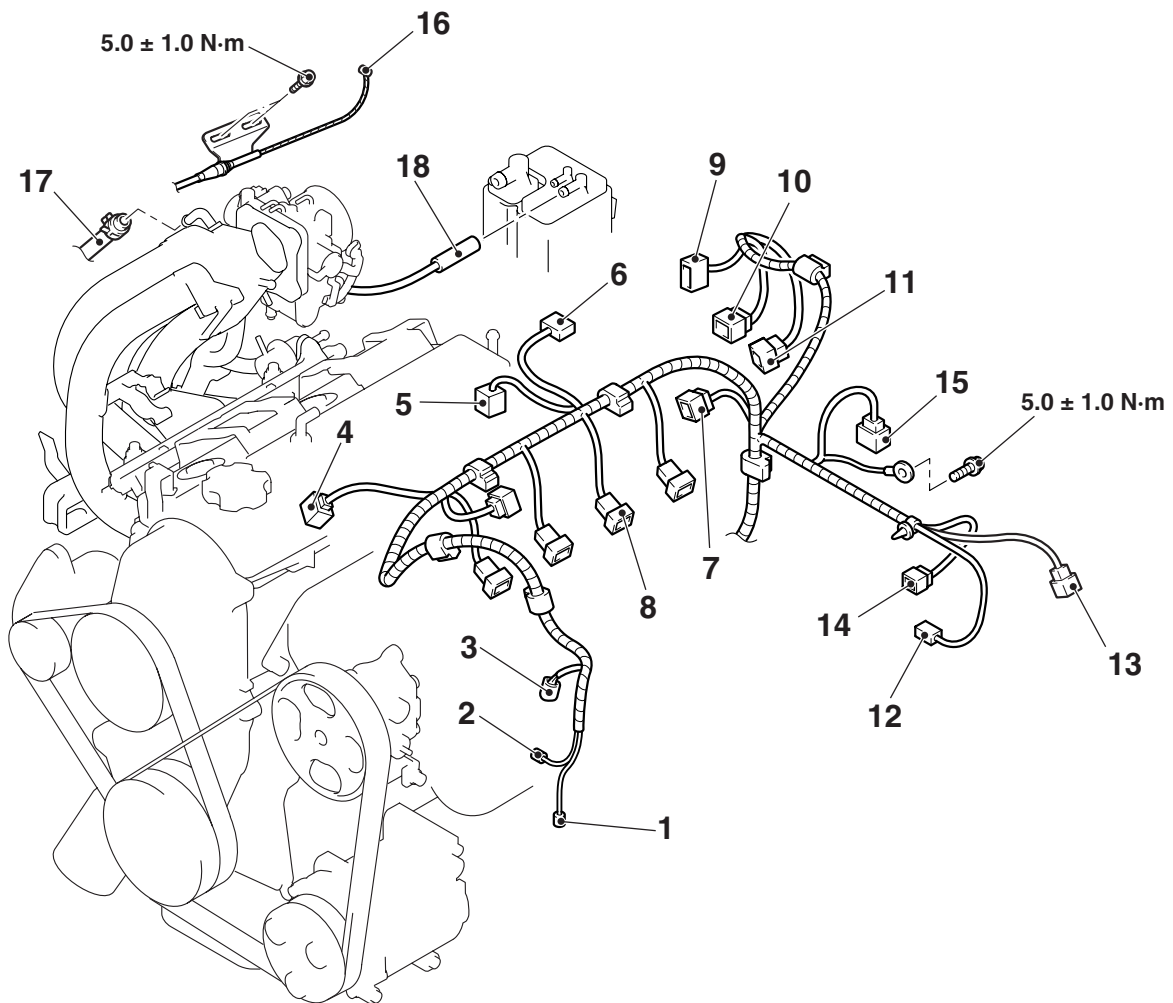
M1112004000688

Pre-removal Operation

- Fuel Line Pressure Reduction (Refer to GROUP 13A - On-vehicle Service P.13A-401).
- Under Cover Removal
- Engine Oil Draining (Refer to GROUP 12 - On-vehicle Service P.12-4).
- Engine Coolant Draining (Refer to GROUP 14 - On-vehicle Service P.14-21).
- Air Cleaner Assembly Removal (Refer to GROUP 15 P.15-3).
- Battery and Battery Tray Removal
- Strut Tower Bar Removal (Refer to GROUP 42 P.42-9).

Post-installation Operation

- Strut Tower Bar Installation (Refer to GROUP 42 P.42-9).
- Battery and Battery Tray Installation
- Air Cleaner Assembly Installation (Refer to GROUP 15 P.15-3).
- Engine Coolant Refilling (Refer to GROUP 14 - On-vehicle Service P.14-21).
- Engine Oil Refilling (Refer to GROUP 12 - On-vehicle Service P.12-4).
- Under Cover Installation
- Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service P.17-2).
- Fuel Leak Check



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Removal steps

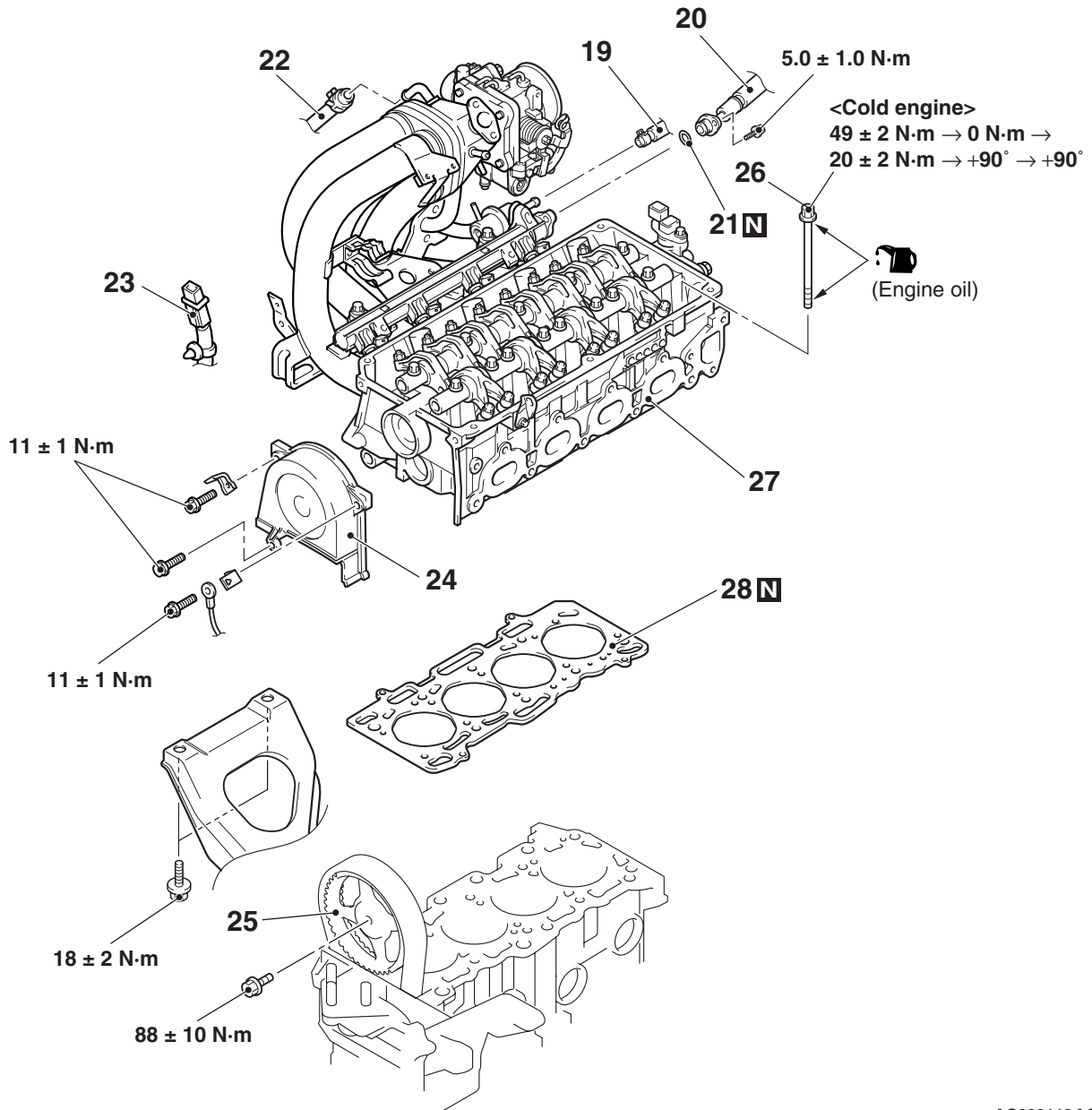
1. A/C compressor connector <Vehicles with A/C>
2. Power steering oil pressure switch connector
3. Engine crank angle sensor connector
4. Engine control detonation sensor connector

Removal steps (Continued)

5. Emission solenoid valve (EGR system)
6. Inlet manifold absolute pressure sensor connector
7. Ignition coil connector
8. Fuel injector connector
9. Throttle body throttle sensor connector

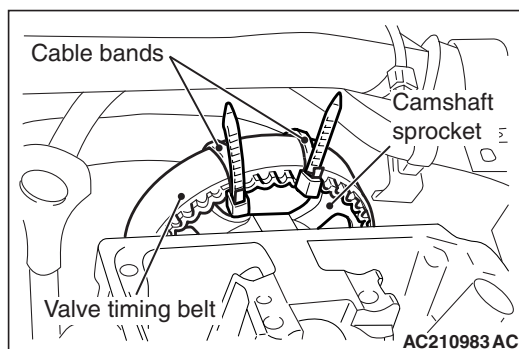
Removal steps (Continued)

10. Throttle body idle speed control servo connector
11. Emission solenoid valve (purge control system)
12. Water temperature gauge unit connector
13. Engine control oxygen sensor (front) connector
14. Water temperature sensor unit connector
15. Camshaft position sensor connector
16. Accelerator cable connection
17. Brake booster vacuum hose connection
18. Fuel vapor control hose connection

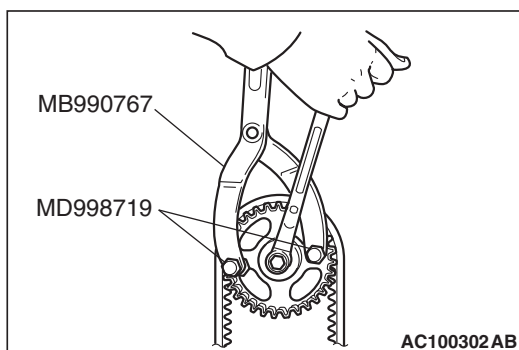


Removal steps

- Ignition coil (Refer to GROUP 16 P.16-36).
 - Rocker cover assembly (Refer to P.11A-19).
 - Exhaust manifold (Refer to GROUP 15 P.15-8).
 - Water pump inlet pipe (Refer to GROUP 14 - Water Hose and Water Pipe P.14-27).
19. Fuel return line hose connection
 - >>D<< 20. Fuel high-pressure hose connection
 - >>D<< 21. Fuel line O-ring
 22. Heater water hose connection
 23. Engine control detonation sensor connector
 24. Timing belt front upper cover
 - <<A>> >>C<< 25. Camshaft sprocket
 - <> >>B<< 26. Cylinder head bolt
 27. Engine cylinder head assembly
 - >>A<< 28. Cylinder head gasket



2. Secure the camshaft sprocket and the valve timing belt with cable bands to prevent deviation from the relative positions between the camshaft sprocket and the valve timing belt.

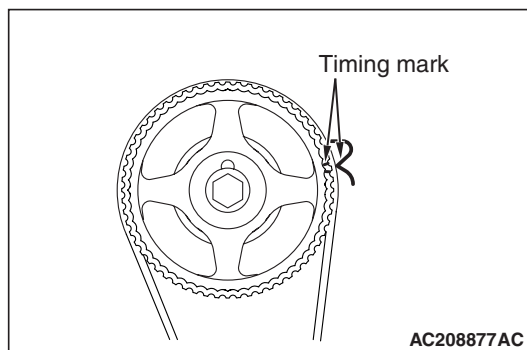


3. Use the following special tools to stop the camshaft sprocket from turning.
 - Front hub and flange yoke holder (MB990767)
 - Crankshaft pulley holder pin (MD998719)

CAUTION

Do not turn the crankshaft after the camshaft sprocket is removed.

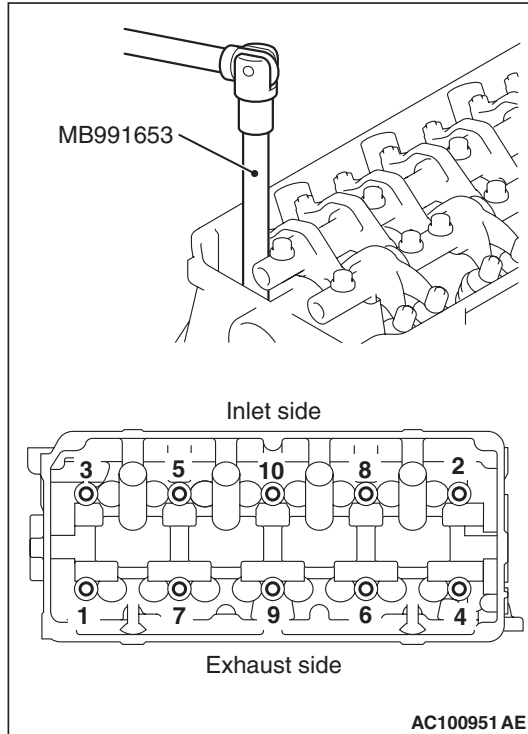
4. Remove the camshaft sprocket with the valve timing belt attached.

INSTALLATION SERVICE POINTS**<<A>> CAMSHAFT SPROCKET
REMOVAL****CAUTION**

Always turn the crankshaft in the forward direction (clockwise).

1. Turn the crankshaft in the forward direction (clockwise) to align the timing mark so that No.1 cylinder is at the compression TDC (Top Dead Centre) position.

<> CYLINDER HEAD BOLT REMOVAL



Using special tool cylinder head bolt wrench (MB991653), loosen the cylinder head bolts in two or three steps in the order of the numbers shown in the illustration.

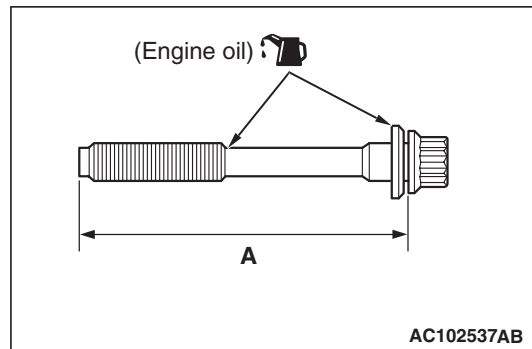
INSTALLATION SERVICE POINTS
>>A<< CYLINDER HEAD GASKET
INSTALLATION

CAUTION

Do not allow foreign materials to enter the engine coolant or oil passages and the cylinder.

1. Wipe off all oil and gasket from the gasket mounting surface.
2. Install so that the shapes of the cylinder head holes match the shapes of the respective cylinder head gasket holes.

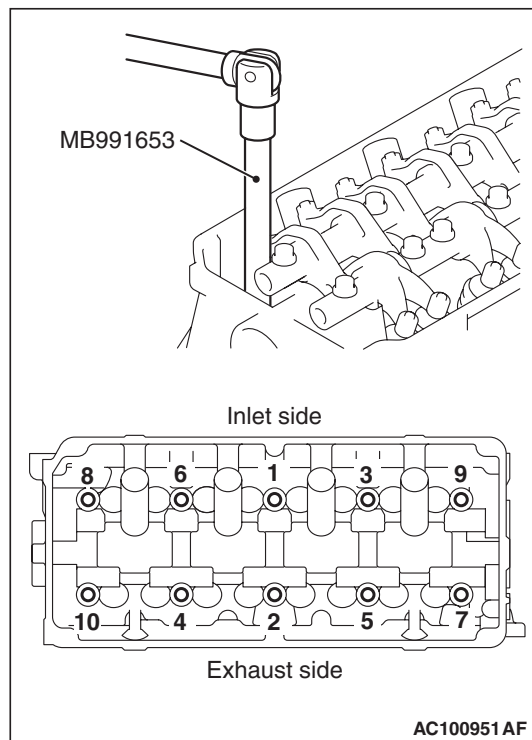
>>B<< CYLINDER HEAD BOLT
INSTALLATION



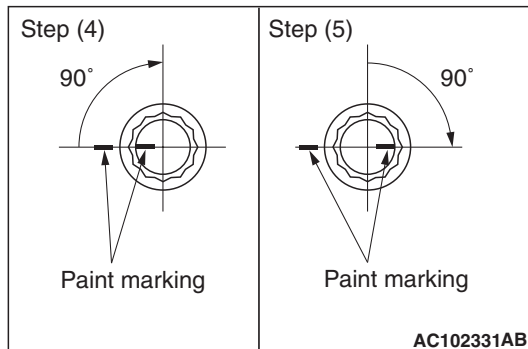
1. When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

Limit (A): 103.2 mm

2. Apply a small amount of new engine oil to the thread section and the washer of the engine cylinder head bolt.



3. Use special tool cylinder head bolt wrench (MB991653) to tighten the cylinder head bolts by the following procedure (angle-tightening procedure).
 - (1) Tighten the cylinder head bolts in the shown sequence to $49 \pm 2 \text{ N} \cdot \text{m}$.
 - (2) Loosen the cylinder head bolts completely in the reverse of the shown sequence.
 - (3) Tighten the cylinder head bolts in the shown sequence to $20 \pm 2 \text{ N} \cdot \text{m}$.



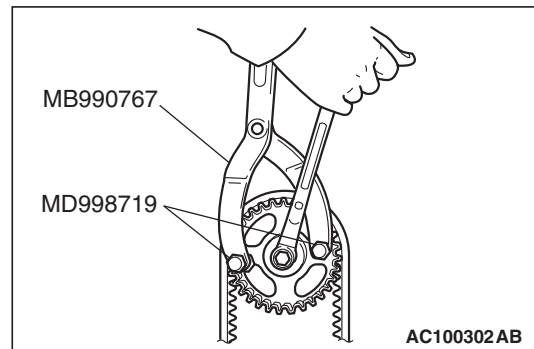
- (4) Mark the cylinder head bolts and the engine cylinder head with paint, and then tighten the bolts in the shown sequence to 90°.

CAUTION

- If the tightening angle is less than 90°, the bolt is loose.
- If the tightening angle is more than 90°, loosen the bolt and repeat the procedure from step 1.

- (5) Tighten the cylinder head bolts in the shown sequence to additional 90°, and check that the paint marks on the cylinder head bolts are flush with the paint marks on the engine cylinder head.

>>C<< CAMSHAFT SPROCKET INSTALLATION



1. Use the following special tools to stop the camshaft sprocket from turning in the same way as was done during removal.
 - Front hub and flange yoke holder (MB990767)
 - Crankshaft pulley holder pin (MD998719)
2. Tighten the bolt to the specified torque.

Tightening torque: 88 ± 10 N·m

>>D<< FUEL LINE O-RING/FUEL HIGH-PRESSURE HOSE INSTALLATION

CAUTION

Do not let any engine oil get into the fuel delivery pipe.

1. Apply a small amount of new engine oil to the fuel line O-ring.
2. While turning the fuel high-pressure hose to the right and left, install the fuel delivery pipe, while being careful not to damage the fuel line O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the fuel line O-ring is probably being clamped. Disconnect the fuel high-pressure hose and check the fuel line O-ring for damage. After this, re-insert the delivery pipe and check that the hose turns smoothly.
4. Tighten to the specified torque.

Tightening torque: 5.0 ± 1.0 N·m

TIMING BELT

REMOVAL AND INSTALLATION

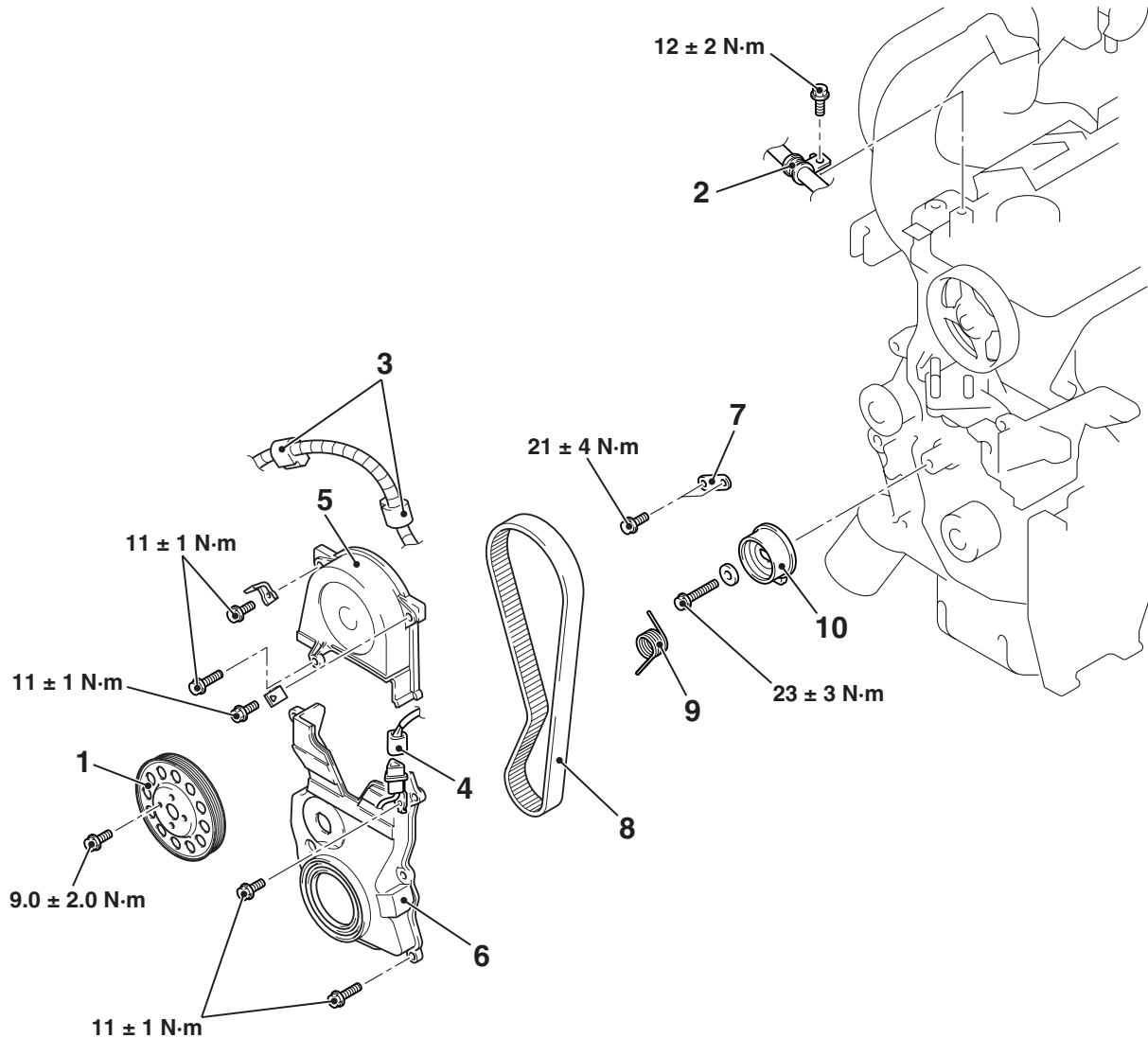
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Pre-removal Operation

- Under Cover Removal
- Crankshaft Pulley Assembly Removal (Refer to P.11A-16).
- Engine Mounting Insulator Removal (Refer to GROUP 32 P.32-4).

Post-installation Operation

- Engine Mounting Insulator Installation (Refer to GROUP 32 P.32-4).
- Crankshaft Pulley assembly Installation (Refer to P.11A-16).
- Under Cover Installation



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Removal steps

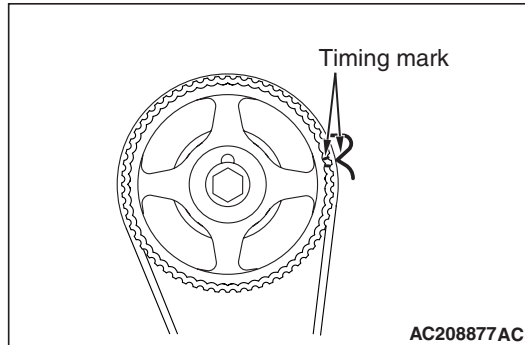
1. Water pump pulley
2. Power steering pressure hose clamp
3. Control wiring harness clamp
4. Engine crank angle sensor connector
5. Timing belt front upper cover
6. Timing belt front lower cover

Removal steps (Continued)

7. Engine mounting stay
 >>B<<
 - Valve timing belt tension adjustment
8. Valve timing belt
9. Timing belt tensioner spring
 <<A>> >>A<< >>A<<
10. Timing belt tensioner
 >>A<<

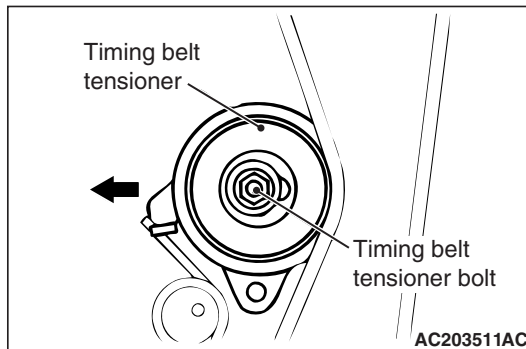
REMOVAL SERVICE POINT

<<A>> VALVE TIMING BELT REMOVAL

⚠ CAUTION

Always turn the crankshaft in the forward direction (clockwise).

1. Turn the crankshaft in the forward direction (clockwise) to align the timing mark so that No.1 cylinder is at the compression TDC (Top Dead Centre) position.



2. Loosen the timing belt tensioner bolt.
3. Move the timing belt tensioner to the water pump side and temporarily tighten the timing belt tensioner bolt so that the tensioner does not turn.

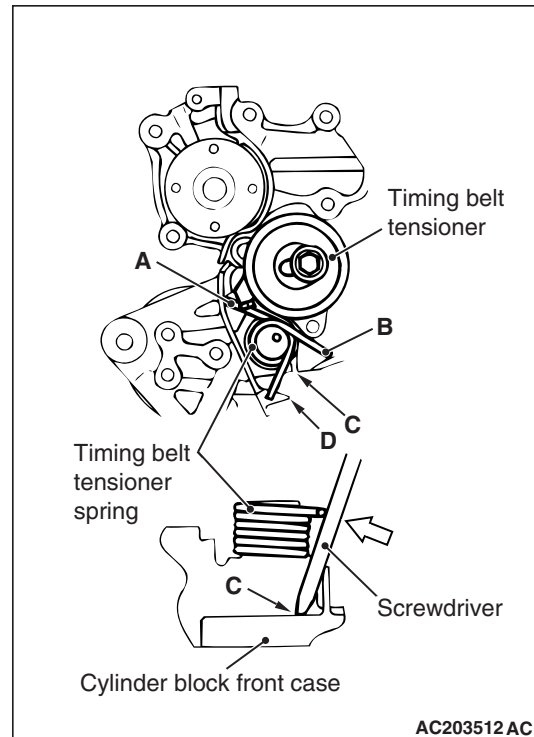
⚠ CAUTION

If the valve timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (right turn).

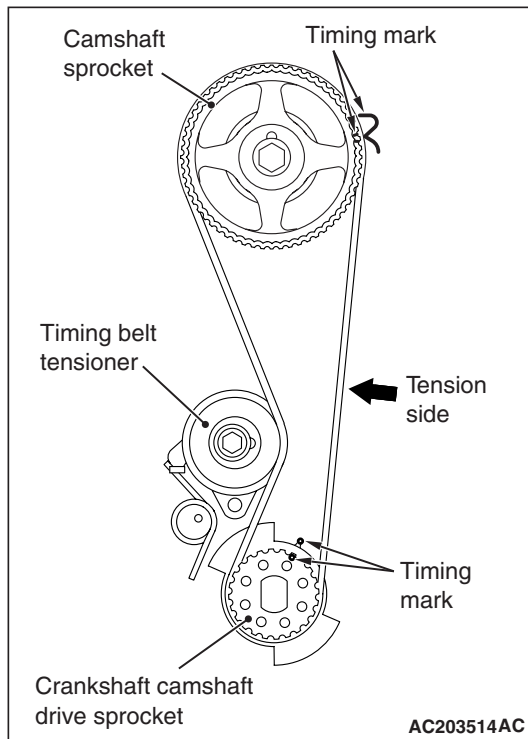
4. Remove the valve timing belt.

INSTALLATION SERVICE POINTS

>>A<< TIMING BELT TENSIONER/TIMING BELT TENSIONER SPRING/VALVE TIMING BELT INSTALLATION



1. Put the protrusion of the timing belt tensioner on the timing belt tensioner spring end (A) as shown.
2. Move the timing belt tensioner close to the water pump, and temporarily tighten the timing belt tensioner bolt.
3. Put a screwdriver in (C), and push the protrusion (B) of the timing belt tensioner spring in the shown direction and place it on the stopper (D) of the cylinder block front case.



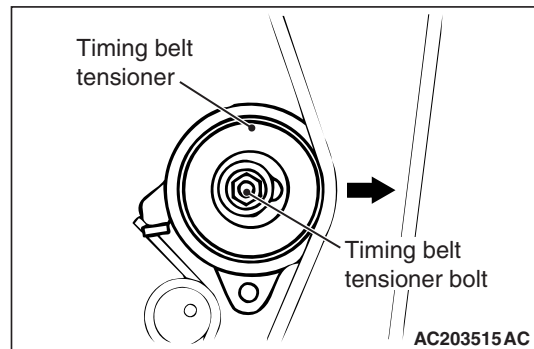
4. Align each of the camshaft sprocket and the crankshaft camshaft drive sprocket timing marks.

CAUTION

After installing the valve timing belt, apply force to turn the camshaft sprocket in the reverse direction (anti-clockwise), and recheck to be sure that the belt is fully tensioned and that each timing mark is in the proper position.

5. Install the valve timing belt in the following order, while making sure that the tension side of the valve timing belt is not slackened.
 - (1) Crankshaft camshaft drive sprocket
 - (2) Camshaft sprocket
 - (3) Timing belt tensioner

>>B<< VALVE TIMING BELT TENSION ADJUSTMENT

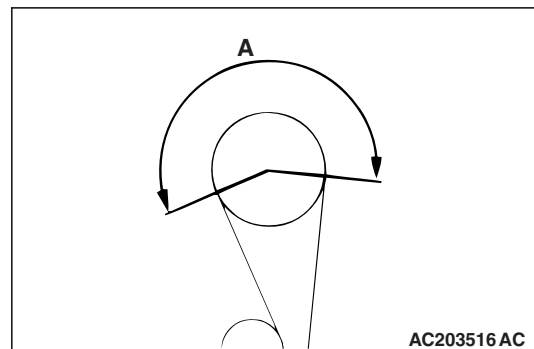


1. Initially loosen the timing belt tensioner bolt fixed to the engine mounting insulator side by 1/2 - 1/4 turn, and use a force of the timing belt tensioner spring to apply tension to the belt.

CAUTION

As the purpose of this procedure is to apply the proper amount of tension to the tension side of the valve timing belt by using the cam driving torque, turn the crankshaft only by the amount given above. Be sure not to turn the crankshaft in the reverse direction (anti-clockwise).

2. Turn the crankshaft in the forward direction (clockwise) for two rotations, and recheck to be sure that the timing marks on each sprocket are aligned.



3. After checking to be sure that no belt teeth in the section marked with (A) are lifted up and that the teeth in each sprocket are engaged, secure the timing belt tensioner.

Tightening torque: 23 ± 3 N·m

ENGINE ASSEMBLY**REMOVAL AND INSTALLATION**

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⚠ CAUTION

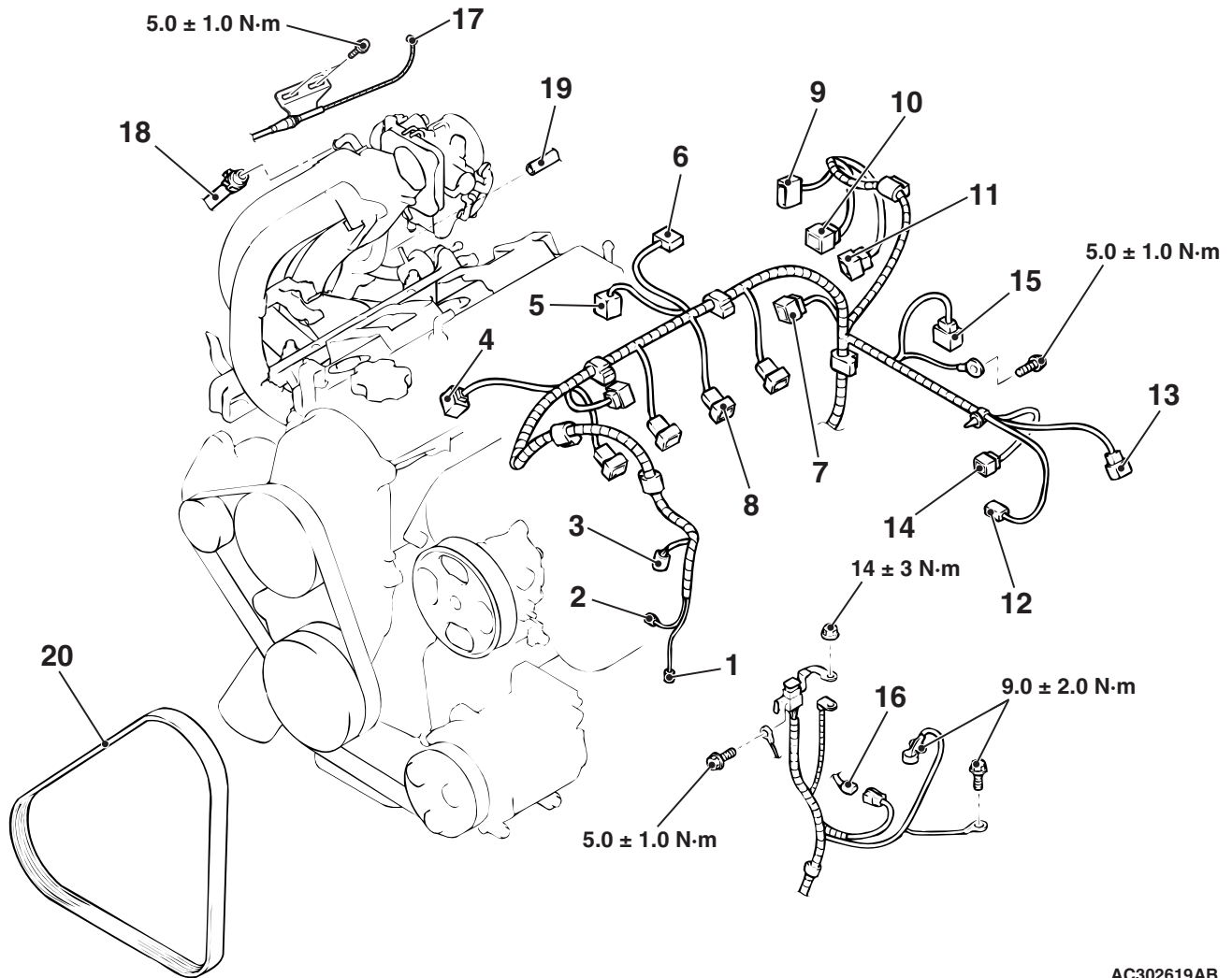
- When the engine assembly replacement is performed, use the M.U.T.-II/III to initialise the learning value (Refer to GROUP 00, Precautions Before Service – Initialisation Procedure for Learning Value in MPI Engine [P.00-19](#)).
- *: indicates parts which should be temporarily tightened, and then fully tightened with the engine weight applied on the vehicle body.

Pre-removal Operation

- Fuel Line Pressure Reduction (Refer to GROUP 13A - On-vehicle Service [P.13A-401](#)).
- Under Cover Removal
- Engine Oil Draining (Refer to GROUP 12 - On-vehicle Service [P.12-4](#)).
- Engine Coolant Draining (Refer to GROUP 14 - On-vehicle Service [P.14-21](#)).
- Hood Removal (Refer to GROUP 42 [P.42-4](#)).
- Strut Tower Bar Removal (Refer to GROUP 42 [P.42-9](#)).
- Air Cleaner Assembly Removal (Refer to GROUP 15 [P.15-3](#)).
- Battery and Battery Tray Removal
- Radiator Assembly Removal (Refer to GROUP 14 [P.14-33](#)).
- Front Exhaust Pipe Removal (Refer to GROUP 15 [P.15-11](#)).

Post-installation Operation

- Front Exhaust Pipe Installation (Refer to GROUP 15 [P.15-11](#)).
- Radiator Assembly Installation (Refer to GROUP 14 [P.14-33](#)).
- Battery and Battery Tray Installation
- Air Cleaner Assembly Installation (Refer to GROUP 15 [P.15-3](#)).
- Strut Tower Bar Installation (Refer to GROUP 42 [P.42-9](#)).
- Hood Installation (Refer to GROUP 42 [P.42-4](#)).
- Engine Coolant Refilling (Refer to GROUP 14 - On-vehicle Service [P.14-21](#)).
- Engine Oil Refilling (Refer to GROUP 12 - On-vehicle Service [P.12-4](#)).
- Under Cover Installation
- Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service [P.17-2](#)).
- Drive Belt Tension Check (Refer to [P.11A-7](#)).
- Fuel Leak Check



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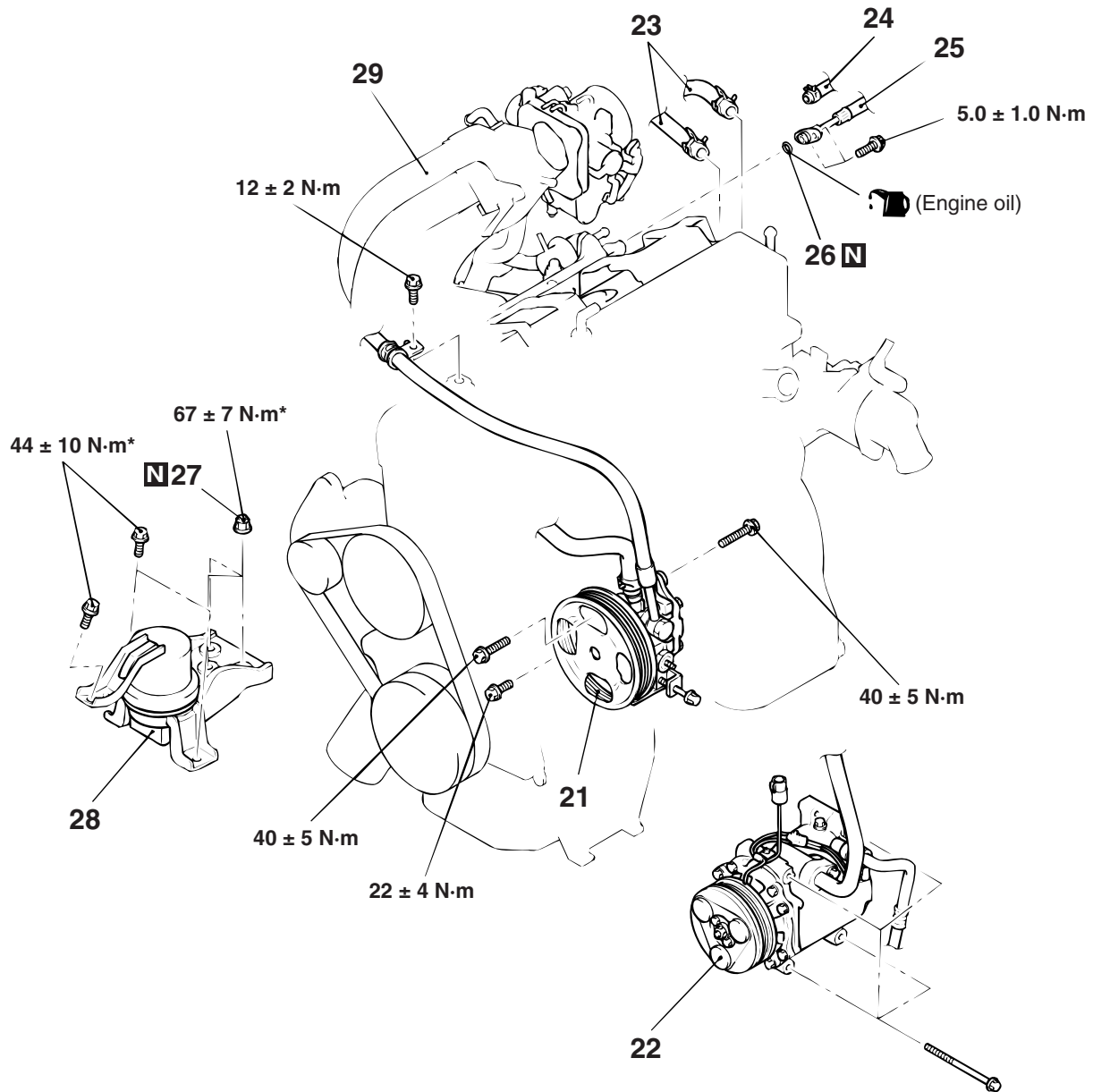
Removal steps

1. A/C compressor connector <Vehicles with A/C>
2. Power steering oil pressure switch connector
3. Engine crank angle sensor connector
4. Engine control detonation sensor connector
5. Emission solenoid valve (EGR system)
6. Inlet manifold absolute pressure sensor connector
7. Ignition coil connector
8. Fuel injector connector
9. Throttle body throttle sensor connector
10. Throttle body idle speed control servo connector
11. Emission solenoid valve (purge control system)

<<A>>

Removal steps (Continued)

12. Water temperature gauge unit connector
13. Engine control oxygen sensor (front) connector
14. Water temperature sensor unit connector
15. Camshaft position sensor connector
16. Control wiring harness and battery wiring harness combination connector
17. Accelerator cable connection
18. Brake booster vacuum hose connection
19. Fuel vapour control hose connection
20. Power steering oil pump drive belt <Vehicles without A/C>, power steering oil pump and A/C compressor drive belt <Vehicles with A/C>



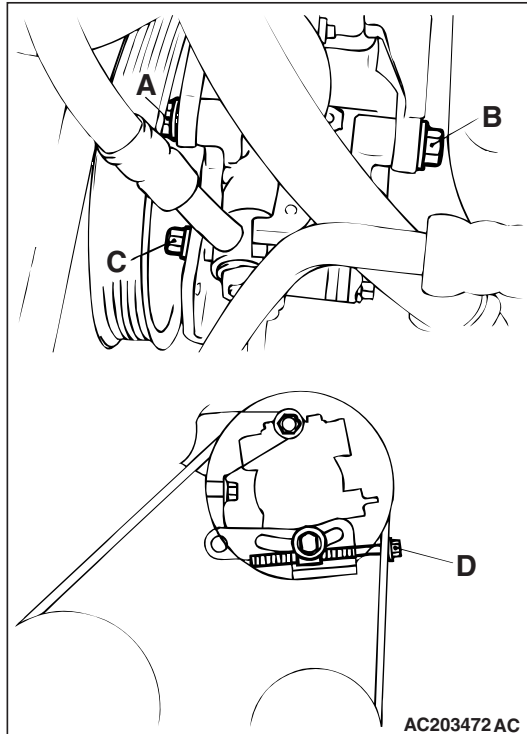
AC302620 AC

- | | | | |
|----------------------|---|----------------------------------|-------------------------------------|
| Removal steps | | Removal steps (Continued) | |
| <> | 21. Power steering oil pump and brace assembly | <<C>> | >>C<< • Transmission assembly |
| <> | 22. A/C compressor assembly <Vehicles with A/C> | <<D>> | >>B<< 27. Self-locking nut |
| | 23. Heater water hoses connection | <<E>> | >>A<< 28. Engine mounting insulator |
| | 24. Fuel return line hose connection | | 29. Engine assembly |
| >>D<< | 25. Fuel high-pressure hose connection | | |
| >>D<< | 26. Fuel line O-ring | | |

REMOVAL SERVICE POINTS

<<A>> POWER STEERING OIL PUMP DRIVE BELT <VEHICLES WITHOUT A/C>, POWER STEERING OIL PUMP AND A/C COMPRESSOR DRIVE BELT <VEHICLES WITH A/C> REMOVAL

CAUTION



To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk.

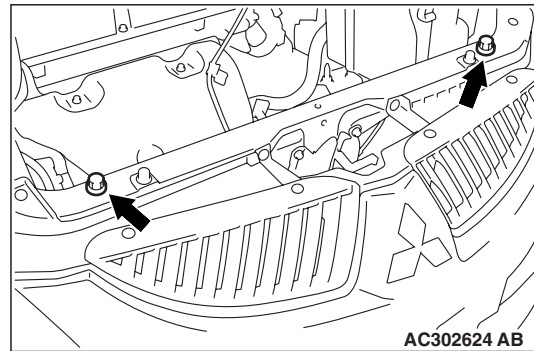
1. Loosen the power steering oil pump fixing bolts A, B and C.
2. Turn the adjusting bolt D in the anti-clockwise direction (to the left) to remove the drive belt.

<> POWER STEERING OIL PUMP AND BRACE ASSEMBLY/A/C COMPRESSOR ASSEMBLY <VEHICLES WITH A/C> REMOVAL

With the hose installed, remove the power steering oil pump and brace assembly, and A/C compressor assembly from the bracket.

NOTE: Secure the removed power steering oil pump and brace assembly, and A/C compressor assembly with cord or rope at a position where they will not interfere with the removal of the engine assembly.

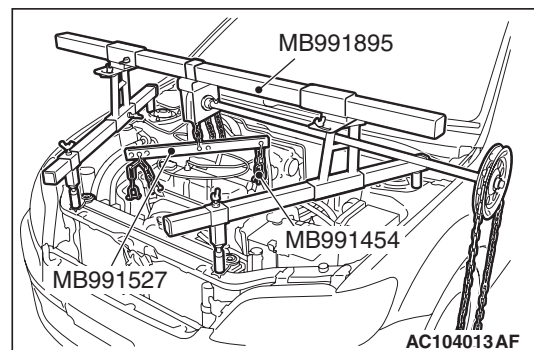
<<C>> TRANSMISSION ASSEMBLY REMOVAL



1. Pre-tighten the 2 bolts on the car to assemble the radiator support upper insulator to set the special tools engine hanger (MB991895) or engine hanger (MB991928).
2. Remove the transmission assembly. (Refer to GROUP 22A P.22A-12) <M/T>, (Refer to GROUP 23A P.23A-151) <A/T>.

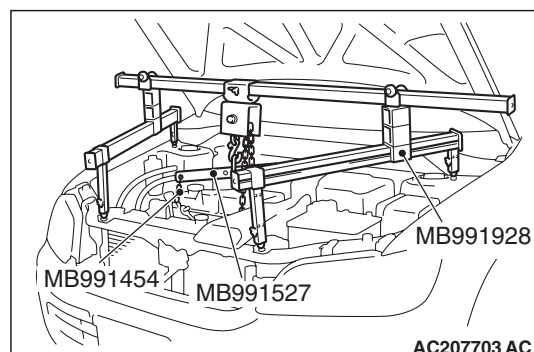
<<D>> ENGINE MOUNTING INSULATOR REMOVAL

1. Support the engine with a garage jack.
2. Remove the following special tool.



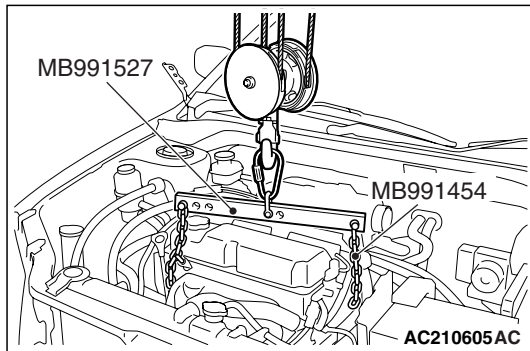
- (1) <Special tool engine hanger (MB991895) is used>

Remove special tool MB991895.



- (2) <Special tool engine hanger (MB991928) is used>

Remove special tool MB991928.



3. Hold the engine assembly with a chain block or similar tool.
4. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mounting insulator.
5. Loosen the engine mounting insulator mounting nuts and bolt, and remove the engine mounting insulator.

<<E>> ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and wiring harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

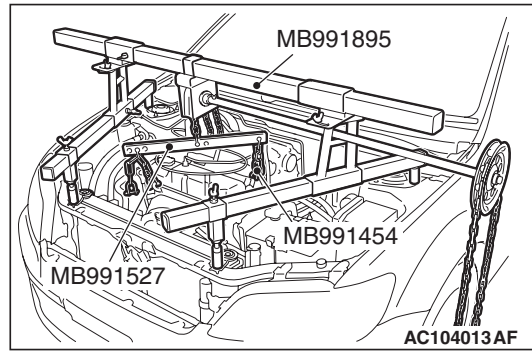
INSTALLATION SERVICE POINTS

>>A<< ENGINE ASSEMBLY INSTALLATION

Install the engine assembly, checking that the cables, hoses, and wiring harness connectors are not clamped.

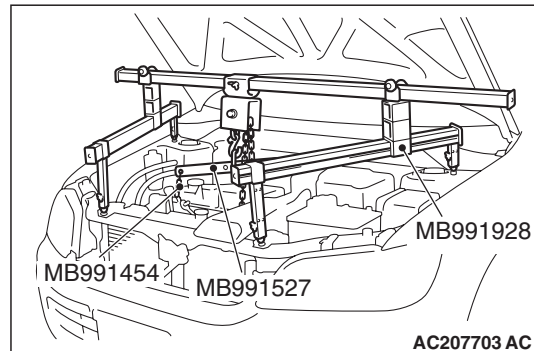
>>B<< ENGINE MOUNTING INSULATOR INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mounting insulator while adjusting the position of the engine.
2. Support the engine assembly with a garage jack.
3. Remove the chain block.
4. Use the following special tool as during removal to support the engine.



- (1) <Special tool engine hanger (MB991895) is used>

Set special tool MB991895. (Refer to GROUP 22A - Transmission Assembly P.22A-12) <M/T>, (Refer to GROUP 23A - Transmission Assembly P.23A-151) <A/T>.

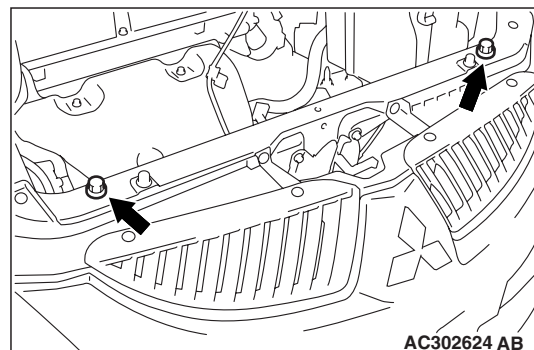


- (2) <Special tool engine hanger (MB991928) is used>

Set special tool MB991928. (Refer to GROUP 22A - Transmission Assembly P.22A-12) <M/T>, (Refer to GROUP 23A - Transmission Assembly P.23A-151) <A/T>.

>>C<< TRANSMISSION ASSEMBLY INSTALLATION

1. Install the transmission assembly. (Refer to GROUP 22A P.22A-12) <M/T>, (Refer to GROUP 23A P.23A-151) <A/T>.



2. Remove from the car the 2 bolts, to assemble the radiator support upper insulator.

>>D<< FUEL LINE O-RING/FUEL HIGH-PRESSURE HOSE INSTALLATION

 **CAUTION**

Do not let any engine oil get into the fuel delivery pipe.

1. Apply a small amount of new engine oil to the fuel line O-ring.
2. While turning the fuel high-pressure hose to the right and left, install the fuel delivery pipe, while being careful not to damage the fuel O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the fuel line O-ring is probably being clamped. Disconnect the fuel high-pressure hose and check the fuel line O-ring for damage. After this, re-insert the fuel delivery pipe and check that the hose turns smoothly.
4. Tighten to the specified torque.

Tightening torque: 5.0 ± 1.0 N·m

NOTES