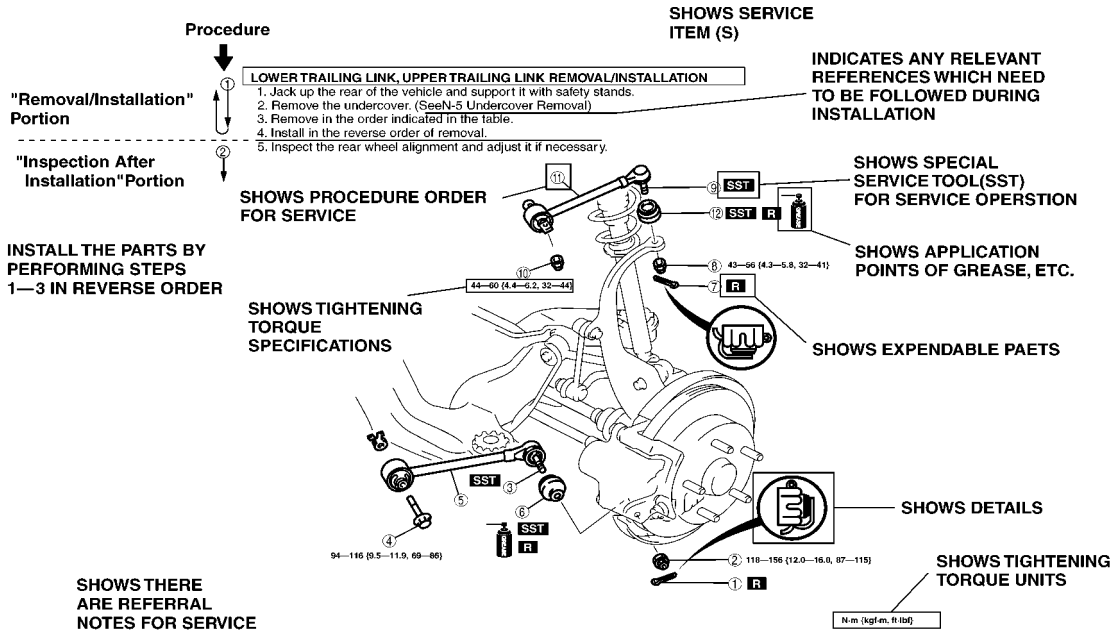


1	Split pin
2	Nut
3	Lower trailing link ball joint (See R-6 Lower Trailing Link Ball Joint Removal Note)
4	Bolt
5	Lower trailing link
6	Dust boot (lower trailing link)

7	Split pin
8	Nut
9	Upper trailing link ball joint (See R-6 Upper Trailing Link Ball Joint Removal Note)
10	Nut
11	Upper trailing link
12	Dust boot (upper trailing link)

XME2010010

SYMBOLS

A6E201000001E03

- There are eight symbols indicating oil, grease, fluids, sealant, and **SST** or equivalent use. These symbols show application points or use of these materials during service.

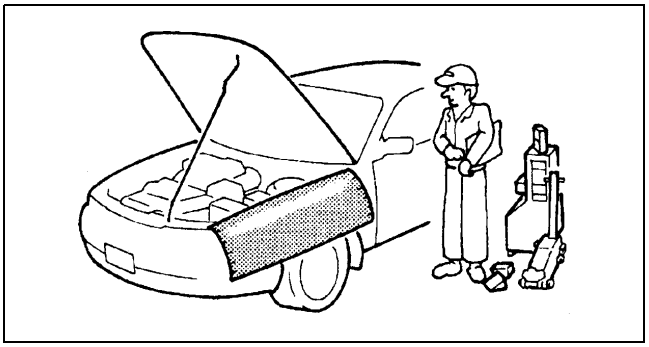
Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid

FUNDAMENTAL PROCEDURES

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

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

A6E201400004E02

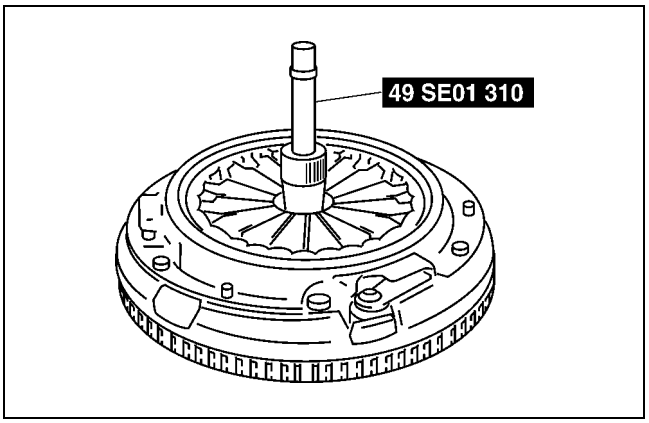


X3U000WAH

SPECIAL SERVICE TOOLS

- Use special service tools or equivalent when they are required.

A6E201400004E03

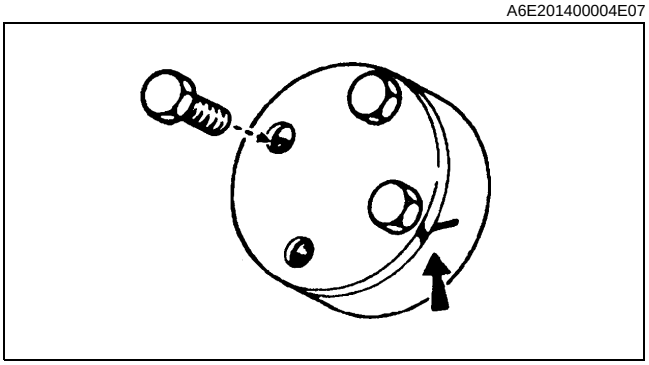


X3U000WAJ

DISASSEMBLY

- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.

A6E201400004E07



X3U000WAL

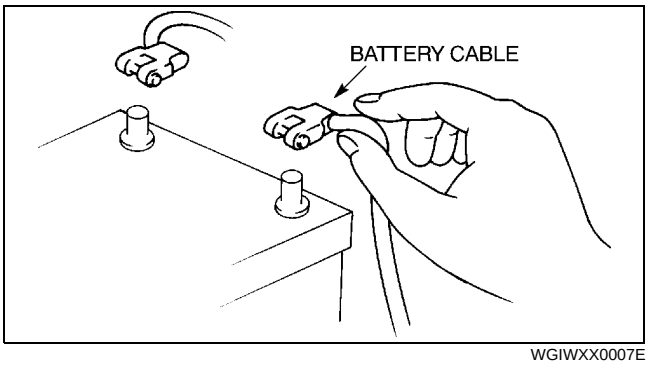
ELECTRICAL SYSTEM

ELECTRICAL PARTS

A6E201700006E01

Battery cable

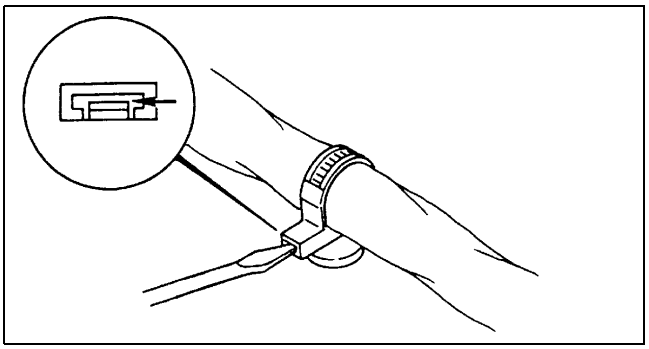
- Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.



WGIWXX0007E

Wiring Harness

- To remove the wiring harness from the clip in the engine room, pry up the hook of the clip using a flathead screwdriver.



X3U000WBU

CONNECTORS

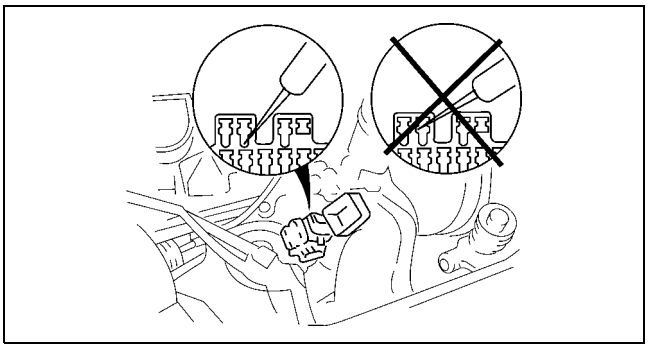
A6E201700006E02

Data link connector

- Insert the probe into the terminal when connecting a jumper wire to the data link connector.

Caution

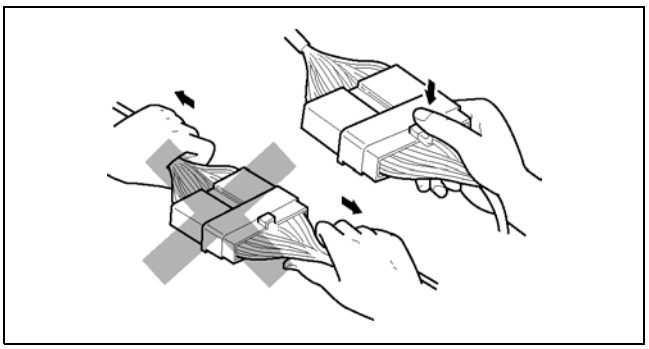
- **Inserting a jumper wire probe into the data link connector terminal may damage the terminal.**



X3U000WAY

Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



WGIWXX0041E

NEW STANDARDS

NEW STANDARDS

A6E202800020E01

- Following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	Vb	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
CPP	Clutch Pedal Position	—	Idle Switch	
CIS	Continuous Fuel Injection System	—	Clutch Position	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code(s)	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFL	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On-Board Diagnostic	—	Diagnosis/SelfDiagnosis	
OL	Open Loop	—	Open Loop	

ENGINE

ENGINE OVERHAUL SERVICE WARNING

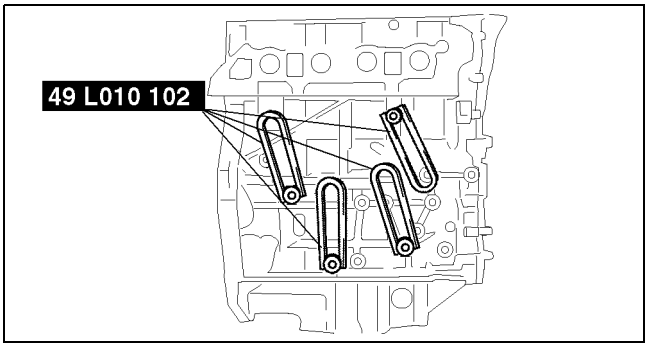
A6E242402000E01

Warning
- **Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.**

ENGINE MOUNTING/DISMOUNTING

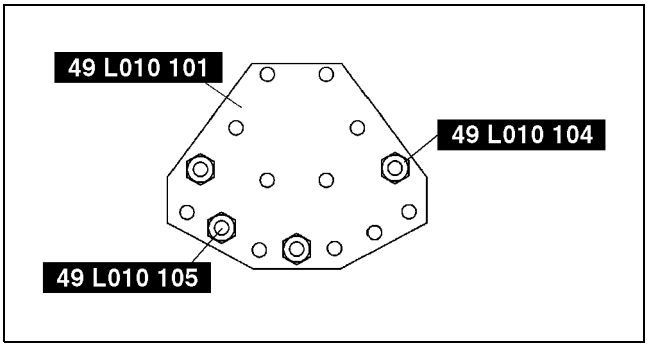
A6E242402000E02

1. Install the **SSTs** (arms) to the cylinder block holes as shown, and hand-tighten the bolts **(part No.: 9YA20-1003) or M10×1.5T length 90 mm {3.55 in}**.



AME2224E065

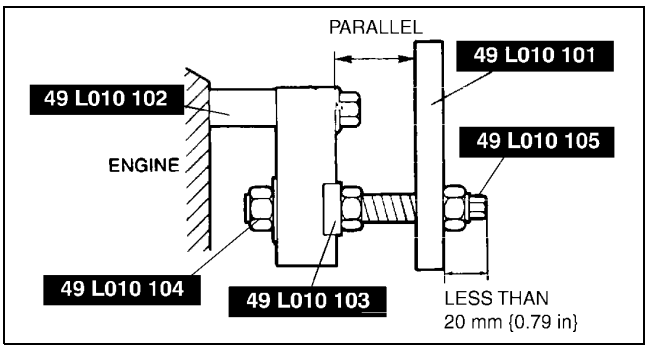
2. Assemble the **SSTs** (bolts, nuts and plate) to the specified positions.
3. Adjust the **SSTs** (bolts) so that less than **20 mm {0.79 in}** of thread is exposed.
4. Make the **SSTs** (arms and plate) parallel by adjusting the **SSTs** (bolts and nuts).



AME2224E300

5. Tighten the **SSTs** (bolts and nuts) to affix the **SSTs** firmly.

Warning
- **Self-locking brake system of the engine stand may not be effective when the engine is held in an unbalanced position. This could lead to sudden, rapid movement of the engine and mounting stand handle and cause serious injury. Never keep the engine in an unbalanced position, and always hold the rotating handle firmly when turning the engine.**



AME2224E301

6. Mount the engine on the **SST** (engine stand).
7. Drain the engine oil into a container.
8. Clean the flange surface (seal rubber) of the oil pan drain plug, then install the oil pan drain plug.

Tightening torque
20—30 N·m {2.1—3.0 kgf·m, 15—22 ft·lbf}

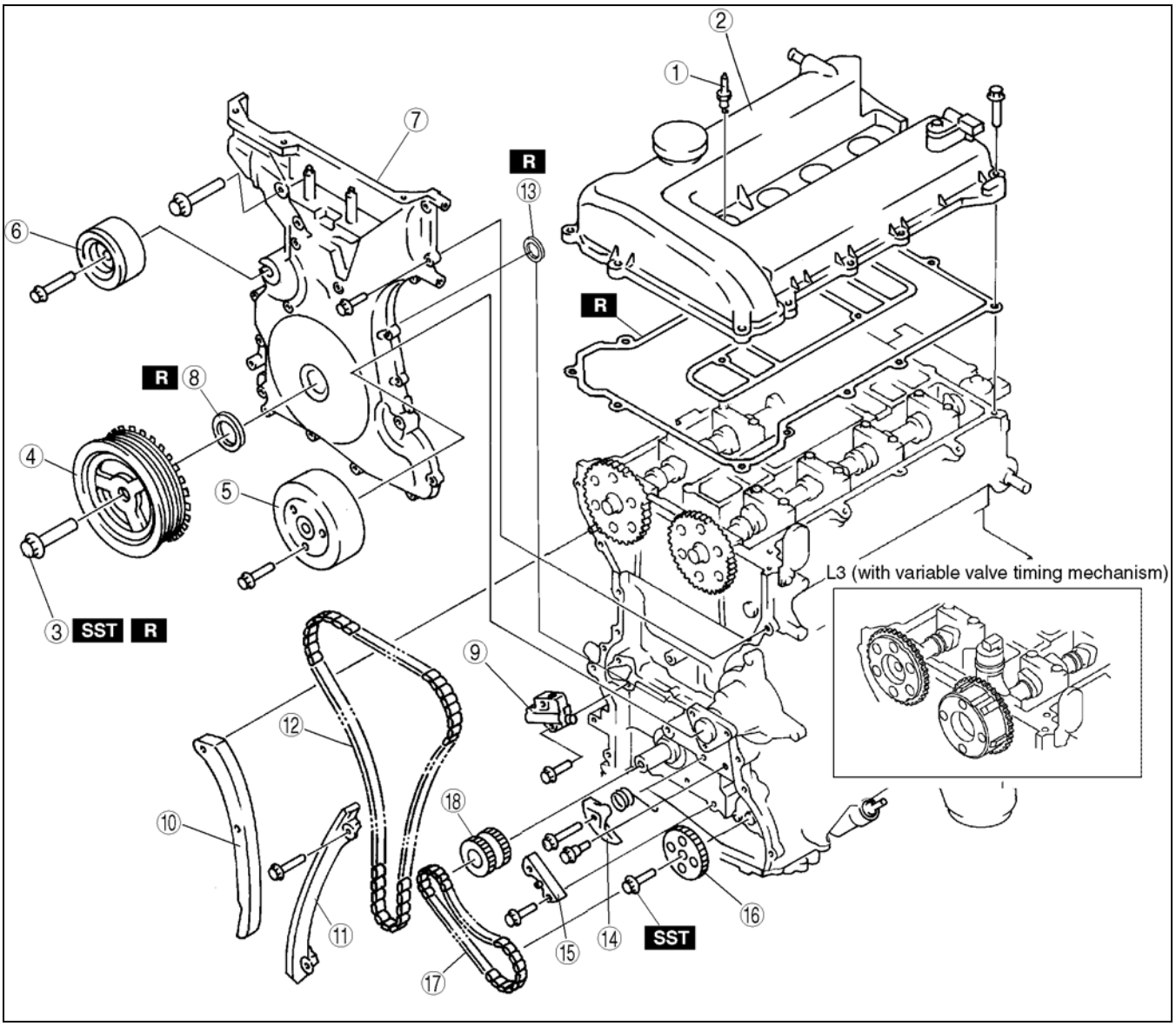
DISMOUNTING

- Dismount in the reverse order of mounting.

TIMING CHAIN DISASSEMBLY

A6E242402000E04

1. Disassemble in the order indicated in the table.



AME2224E337

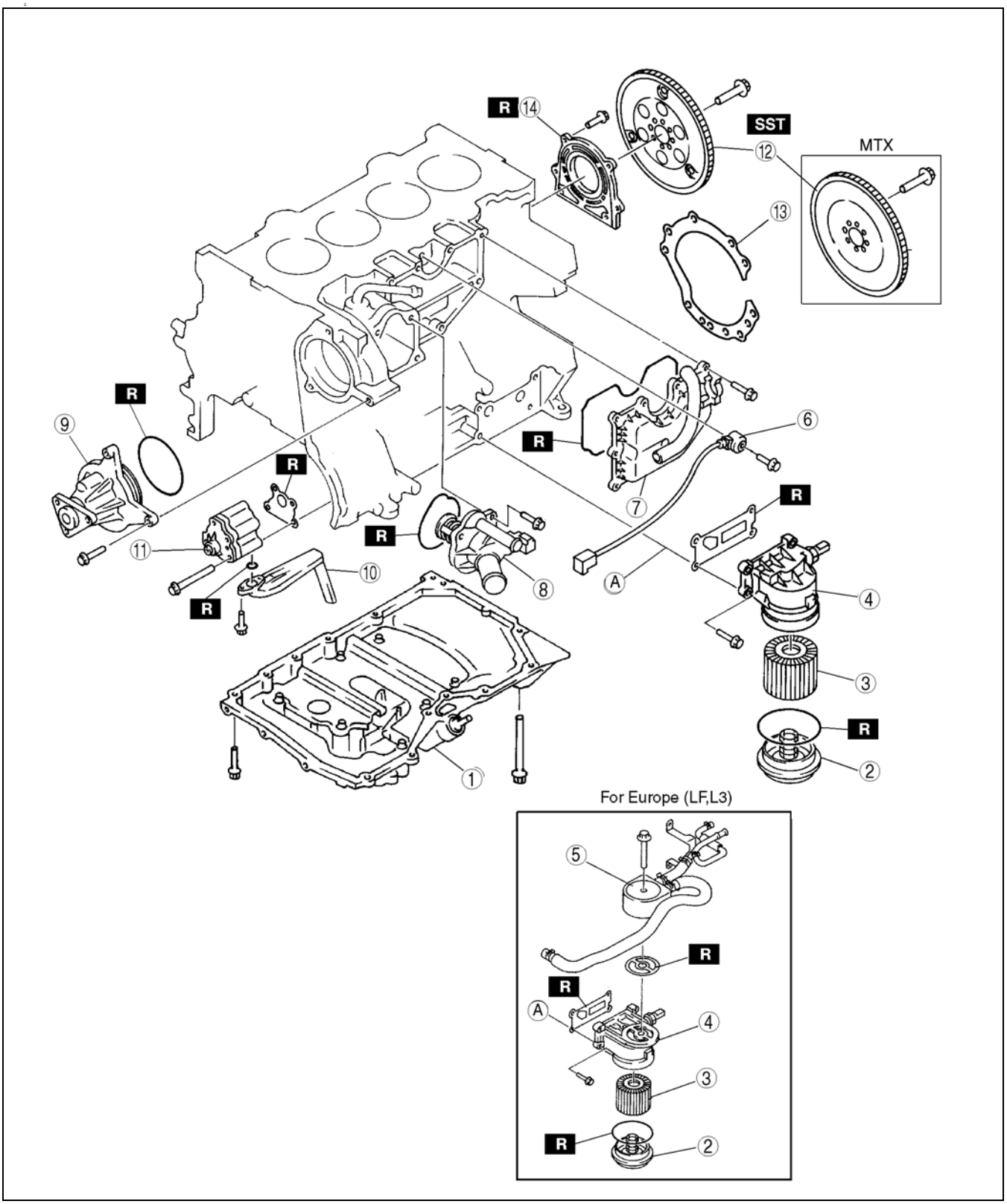
1	Spark plug
2	Cylinder head cover
3	Crankshaft pulley lock bolt (See B–4 Crankshaft Pulley Lock Bolt Disassembly Note)
4	Crankshaft pulley
5	Water pump pulley
6	Drive belt idler pulley
7	Engine front cover
8	Front oil seal (See B–4 Front Oil Seal Disassembly Note)

9	Chain tensioner (See B–4 Chain Tensioner Disassembly Note)
10	Tensioner arm
11	Chain guide
12	Timing chain
13	Seal (L3 (with variable valve timing mechanism))
14	Oil pump chain tensioner
15	Oil pump chain guide
16	Oil pump sprocket (See B–4 Oil Pump Sprocket Disassembly Note)
17	Oil pump chain
18	Crankshaft sprocket

CYLINDER BLOCK (I) DISASSEMBLY

A6E242402000E07

1. Disassemble in the order indicated in the table.



AME2224E011

1	Oil pan
2	Oil filter cover
3	Oil filter
4	Oil filter adapter
5	Oil cooler

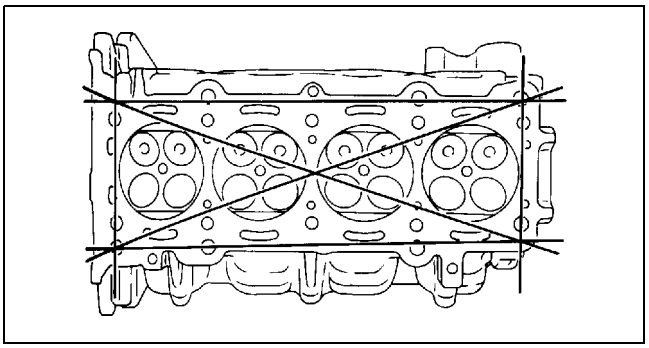
6	Knock sensor
7	Oil separator
8	Thermostat
9	Water pump
10	Oil strainer

CYLINDER HEAD INSPECTION

A6E242410100E01

1. Carry out color contrast penetrate examination on the cylinder head surface.
   - Replace the cylinder head if necessary.
2. Inspect for the following and repair or replace if necessary.
   (1) Sunken valve seats
   (2) Excessive camshaft oil clearance and end play
3. Measure the cylinder head for distortion in the six directions as shown.
   - If the distortion exceeds the maximum, replace the cylinder head.

   Maximum distortion:
   0.10 mm {0.004 in}

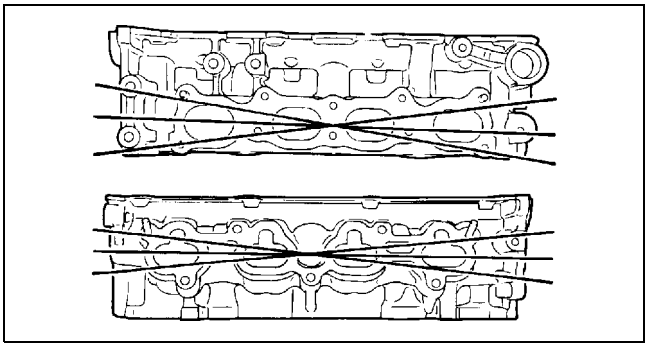


AME2224E317

4. Measure the manifold contact surface distortion as shown.
   - If the distortion exceeds the maximum, grind the surface or replace the cylinder head.

   Maximum distortion:
   0.10 mm {0.004 in}

   Maximum grinding:
   0.15 mm {0.006 in}



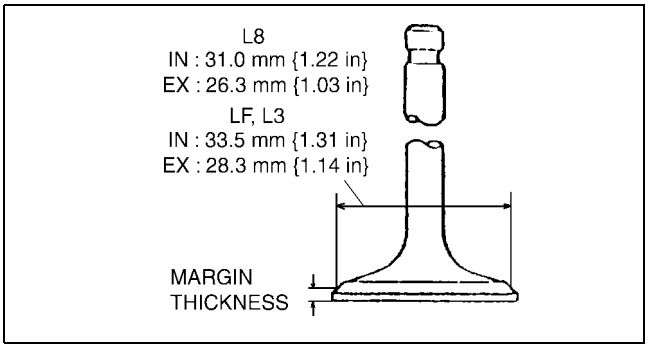
AME2224E318

VALVE, VALVE GUIDE INSPECTION

A6E242412111E01

1. Measure the valve head margin thickness of each valve.
   - If not specified, replace the valve.

   Margin thickness:
   IN: 1.62 mm {0.0637 in}
   EX: 1.82 mm {0.0716 in}

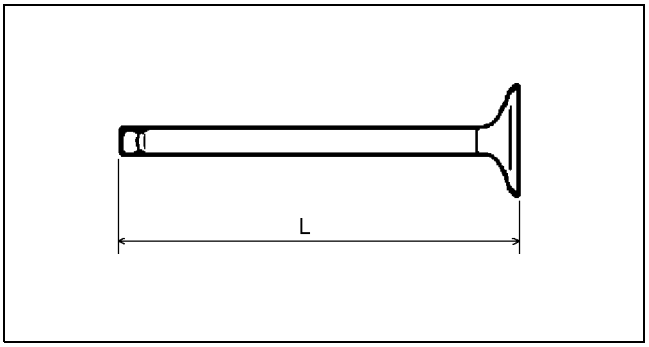


AME2224E070

2. Measure the length of each valve. Replace the valve if necessary.
   - If not specified, replace the valve.

   Standard length L:
   IN: 102.99—103.79 mm {4.055—4.086 in}
   EX: 104.25—105.05 mm {4.105—4.135 in}

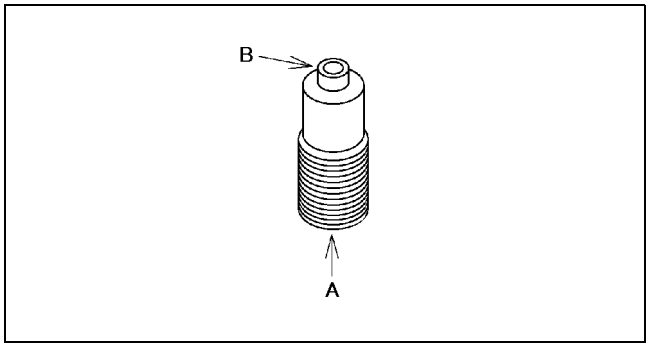
   Minimum length L:
   IN: 102.99 mm {4.055 in}
   EX: 103.79 mm {4.086 in}



AME2224E071

OIL JET VALVE INSPECTION

A6E242410730E02



AME2224E105

1. Apply compressed air to oil jet valve A and verify that air passes through oil jet valve B.
   - If not ventilation,replace the oil jet valve.

   Air pressure:
   216—274 kPa {2.2—2.7kgf•cm^2 31.4—39.7 psi}

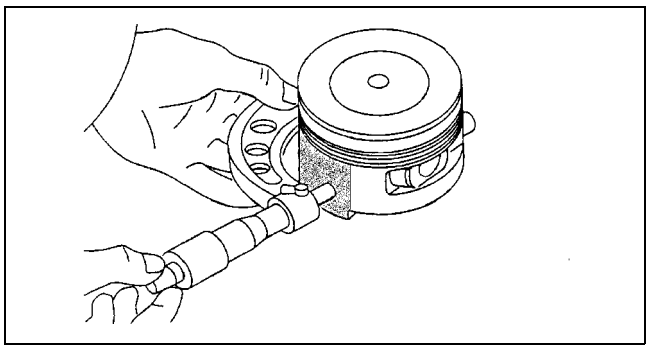
PISTON INSPECTION

A6E242411010E01

Caution
- **The piston, piston ring and connecting rod cannot be disassembled.**
- **When replacing the piston, piston pin, piston ring and connecting rod, replace them together as a single unit.**

1. Measure the outer diameter of each piston at right angle 90° to the piston pin, 10.0 mm {0.40 in} above the under of the piston.
   - If the piston diameter is below the standard diameter, replace the piston, piston pin, piston ring and connecting rod as a single unit.

   Piston diameter
   L8:
   82.965—82.995 mm {3.2664—3.2675 in}
   LF, L3, L3 (with variable valve timing mechanism):
   87.465—87.495 mm {3.4435—3.4446 in}



AME2224E030

2. Measure the piston-to-cylinder clearance.
   - If not as specified, replace the piston, piston pin, piston ring and connecting rod as a single unit.

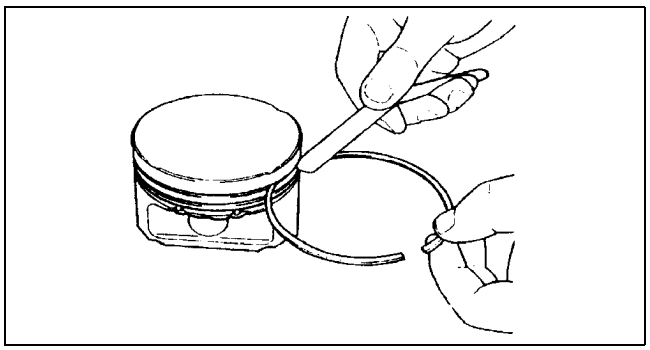
   Standard clearance:
   0.025—0.045 mm {0.0010—0.0017 in}

   Maximum clearance:
   0.11 mm {0.0043 in}

3. Measure the piston ring-to-ring groove clearance around the entire circumference.
   - If the piston ring-to-ring groove clearance exceeds the maximum clearance, replace the piston, piston pin, piston ring and connecting rod as a single unit.

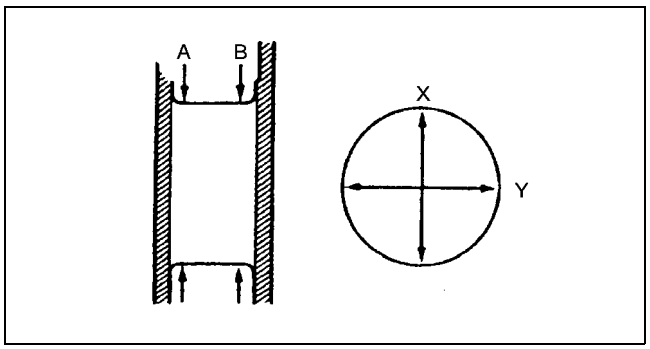
   Standard clearance:
   Top: 0.03—0.08 mm {0.0012—0.0031 in}
   Second: 0.03—0.07 mm {0.0012—0.0027in}
   Oil: 0.03—0.07 mm {0.0012—0.0027 in}

   Maximum clearance:
   Top: 0.17 mm {0.0067 in}
   Second, Oil: 0.15 mm {0.0059 in}



AME2224E029

5. Measure the journal diameter in X and Y directions at the two points (A and B) as indicated in the figure.
   - If not as specified, replace the crankshaft or grind the journal and install the undersize bearing.



AME2224E036

Main journal

mm {in}

Bearing size	Standard diameter
Standard	51.980—52.000 {2.0464—2.0472}
0.25 {0.01} undersize	51.730—51.750 {2.0366—2.0373}

Maximum out-of-round:
0.05 mm {0.0019 in}

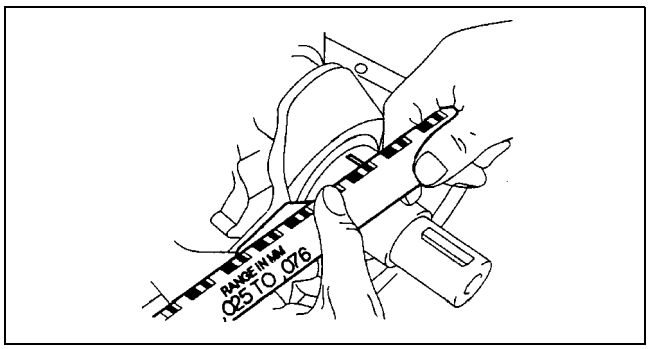
Crank pin

mm {in}

Bearing size	Standard diameter
Standard	49.980—50.000 {1.9677—1.9685}
0.25 {0.01} undersize	49.730—49.750 {1.9579—1.9586}

Maximum out-of-round:
0.05 mm {0.0019 in}

6. Install the main bearing caps and crankshaft.
7. Position a plastigage atop the journals in the axial direction.
8. Install the main bearing caps and cylinder block. (See B–30 Main Bearing Caps Assembly Note.)
9. Remove the main bearing caps. (See B–11 Main Bearing Cap Disassembly Note.)
10. Measure the main journal oil clearance.
    - If the clearance exceeds the maximum, replace the main bearing using the main bearing selection table or grind the main journal and install the oversize bearings so that the specified oil clearance is obtained.



AME2224E038

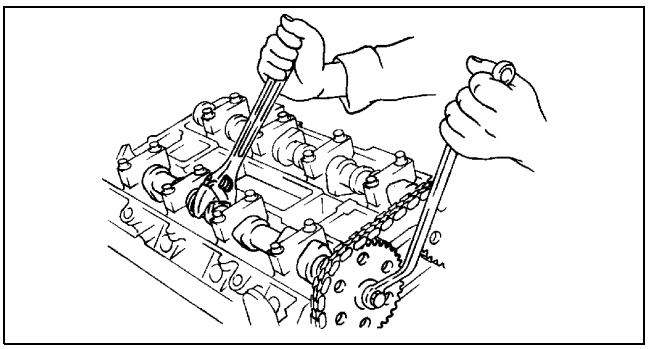
Standard clearance:
0.019—0.035 mm {0.0007—0.0013 in}

Maximum clearance:
0.10 mm {0.0039 in}

mm {in}

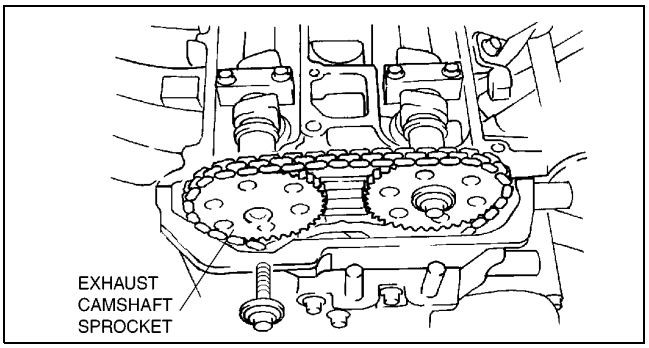
Bearing size	Color	Bearing thickness
Standard	Green	2.506—2.509 {0.0987—0.0988}
0.25 {0.01} oversize		2.628—2.634 {0.1034—0.1037}
0.50 {0.02} oversize		2.753—2.759 {0.1084—0.1086}

7. Hold the exhaust camshaft using a suitable wrench on the cast hexagon as shown.



AME2212W006

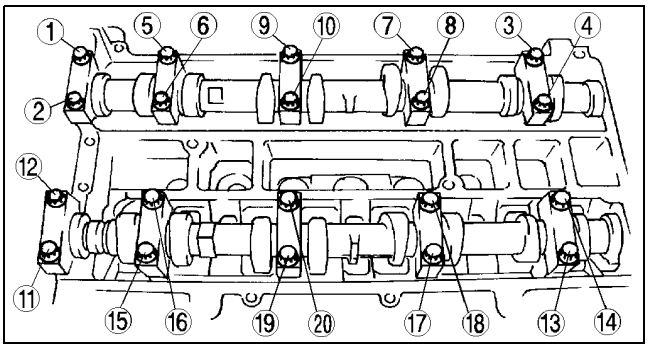
8. Remove the exhaust camshaft sprocket.



AME2212W007

9. Loosen the camshaft cap bolts in several passes in the order shown.

Note
- The cylinder head and the camshaft caps are numbered to make sure they are reassembled in their original position. When removed, keep the caps with the cylinder head they were removed from. Do not mix the caps.



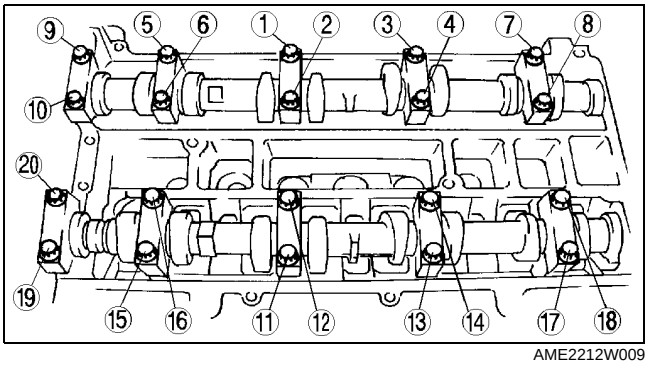
AME2212W008

10. Remove the camshaft.
11. Remove the tappet.
12. Select proper adjustment shim.

New adjustment shim
= Removed shim thickness + Measured valve clearance - Standard valve clearance (IN: 0.25 mm {0.0098 in}, EX: 0.30 mm {0.0118 in})

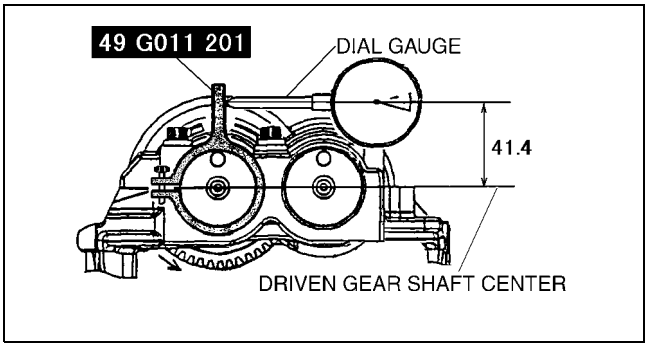
Standard [Engine cold]
IN: 0.22—0.28 mm {0.0087—0.0110 in} (0.25±0.03 mm {0.0098±0.0011 in})
EX: 0.27—0.33 mm {0.0106—0.0130 in} (0.30±0.03 mm {0.0118±0.0011 in})

13. Install the camshaft with No.1 cylinder aligned with the TDC position.
14. Tighten the camshaft cap bolt using the following two steps.
    (1) Tighten to **5.0—9.0 N·m {51.0—91.7 kgf·cm, 44.3—79.5 in·lbf}**.
    (2) Tighten to **14.0—17.0 N·m {1.5—1.7 kgf·m, 10.4—12.5 ft·lbf}.**



AME2212W009

6. Set the SST as shown, then measure the gear backlash using a dial gauge.
   - If the backlash exceeds the specified range, remeasure the backlash and, using the adjustment shim selection table, select the proper shim, according to the following procedure.



AME2224E060

Caution
- **When measuring the backlash, rotate the crankshaft one full rotation and verify that it is within the specified range at all of the following six positions: 10°, 30°, 100°, 190°, 210°, 280° ATDC.**

Value range:
0.005—0.101 mm {0.00019—0.0039 in}

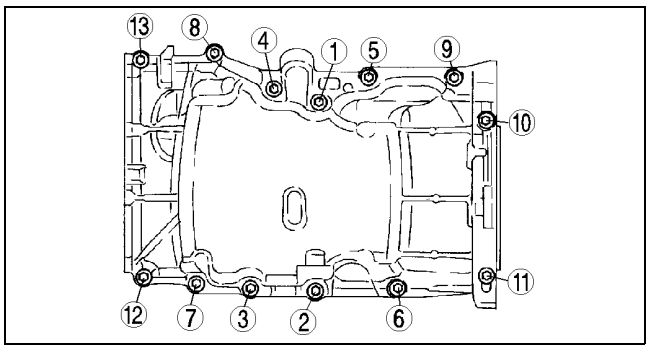
(1) Using master adjustment shim (No.50), assemble the balancer unit to the cylinder block, then measure the backlash.
(2) Select the proper adjustment shim according to the measured value.
(3) Install the selected adjustment shim to the balancer unit, then assemble the balancer unit to the cylinder block.

Adjustment shim selection table

Backlash mm {in}	Selection shim (No.)	Shim thickness mm {in}	Backlash mm {in}	Selection shim (No.)	Shim thickness mm {in}
0.256—0.262 {0.0100—0.01031}	15	1.15 {0.0452}	0.116—0.122 {0.00456—0.00480}	35	1.35 {0.0531}
0.249—0.255 {0.0098—0.010039}	16	1.16 {0.0456}	0.109—0.115 {0.00429—0.00452}	36	1.36 {0.0535}
0.242—0.248 {0.0096—0.00976}	17	1.17 {0.0460}	0.102—0.108 {0.00401—0.00425}	37	1.37 {0.0539}
0.235—0.241 {0.0093—0.0948}	18	1.18 {0.0464}	0.095—0.101 {0.00374—0.00397}	38	1.38 {0.0543}
0.228—0.234 {0.00897—0.00921}	19	1.19 {0.0468}	0.088—0.094 {0.00346—0.00370}	39	1.39 {0.0547}
0.221—0.227 {0.00870—0.00893}	20	1.20 {0.0472}	0.081—0.087 {0.00318—0.00342}	40	1.40 {0.0551}
0.214—0.220 {0.00842—0.00874}	21	1.21 {0.0476}	0.074—0.080 {0.00291—0.00314}	41	1.41 {0.0555}
0.207—0.213 {0.00814—0.00838}	22	1.22 {0.0480}	0.067—0.073 {0.00263—0.00287}	42	1.42 {0.0559}
0.200—0.206 {0.00787—0.00811}	23	1.23 {0.0484}	0.060—0.066 {0.00236—0.00259}	43	1.43 {0.0562}
0.193—0.199 {0.00759—0.00783}	24	1.24 {0.0488}	0.053—0.059 {0.00208—0.00232}	44	1.44 {0.0566}
0.186—0.192 {0.00732—0.00755}	25	1.25 {0.492}	0.046—0.052 {0.00181—0.00204}	45	1.45 {0.0570}
0.179—0.185 {0.00704—0.00728}	26	1.26 {0.496}	0.039—0.045 {0.00153—0.00177}	46	1.46 {0.0574}

3. Tighten the rear oil pan bolts in the order as shown.

Tightening torque:
20—30 N·m {2.1—3.0 kgf·m, 15.2—21.6 in·lbf}

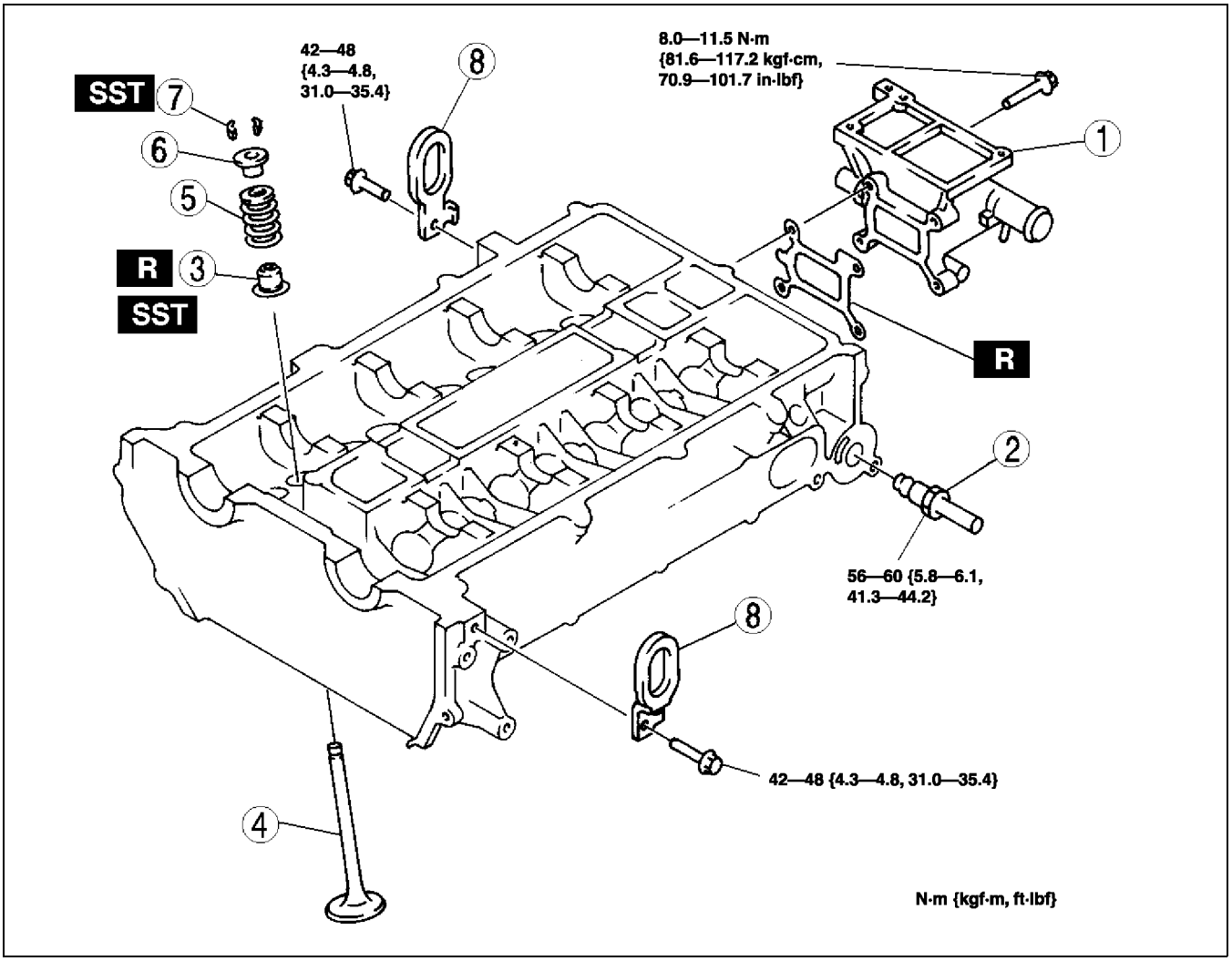


AME2224E056

CYLINDER HEAD (I) ASSEMBLY

A6E242402000E11

1. Assemble in the order indicated in the table.



AME2224E044

1	Water outlet case
2	EGR pipe
3	Valve seal (See B–38 Valve Seal Assembly Note)
4	Valve

5	Valve spring
6	Upper valve spring seat
7	Valve keeper (See B–38 Valve Keeper Assembly Note)
8	Engine hanger

TECHNICAL DATA

ENGINE TECHNICAL DATA

A6E931001001E01

Item				Engine		
				L8	LF	L3, L3 (with variable valve timing mechanism)
Cylinder head						
Cylinder head gasket contact surfaces distortion	(mm {in})	Maximum		0.10 {0.004}		
Manifold contact surfaces distortion	(mm {in})	Maximum		0.10 {0.004}		
		Maximum grinding		0.15 {0.006}		
Valve clearance [Engine cold]	(mm {in})		IN	0.22—0.28 {0.0087—0.0110}		
			EX	0.27—0.33 {0.0106—0.0130}		
Valve and valve guide						
Valve stem diameter	(mm {in})	Standard	IN	5.470—5.485 {0.2154—0.2159}		
			EX	5.465—5.480 {0.2152—0.2157}		
		Minimum	IN	5.440 {0.2142}		
			EX	5.435 {0.2140}		
Valve stem to guide clearance	(mm {in})	Standard	IN	0.024—0.069 {0.0009—0.0027}		
			EX	0.029—0.074 {0.0012—0.0029}		
		Maximum	IN	0.10 {0.004}		
			EX	0.10 {0.004}		
Valve length	(mm {in})	Standard	IN	102.99—103.79 {4.055—4.086}		
			EX	104.25—105.05 {4.105—4.135}		
		Minimum	IN	102.99 {4.055}		
			EX	103.79 {4.086}		
Valve guide inner diameter	(mm {in})	Standard	IN	5.509—5.539 {0.2169—0.2180}		
			EX	5.509—5.539 {0.2169—0.2180}		
Valve guide protrusion height	(mm {in})	IN		12.2—12.8 {0.481—0.503}		
		EX		12.2—12.8 {0.481—0.503}		
Valve head margin thickness	(mm {in})	Minimum	IN	1.62 {0.0637}		
			EX	1.82 {0.0716}		
Valve seat						
Valve seat contact width	(mm {in})	Standard	IN	1.2—1.6 {0.048—0.062}		
			EX	1.2—1.6 {0.048—0.062}		
Valve seat angle	(°)		IN	45		
			EX	45		
Valve seat sinking (Valve protrusion height)	(mm {in})	Standard	IN	40.64—42.24 {1.600—1.662}		
			EX	40.50—42.10{1.595—1.657}		
Valve spring						
Out-of-square	(mm {in})	Maximum		1% (2.10 {0.082})		
Pressing force at valve spring height H	(N {kgf, lbf})	H: 27.8 mm {1.094 in}		494.9 {50.47,111.2}		
OCV (Oil control valve)						
Coil resistance [20° C{68°F}]	(ohm)	Standard		–		6.9—7.9 *

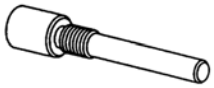
SPECIAL TOOLS

ENGINE SST

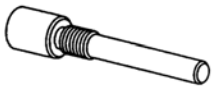
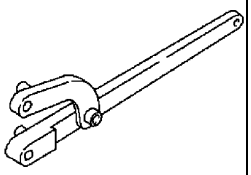
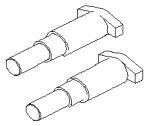
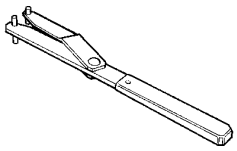
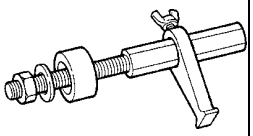
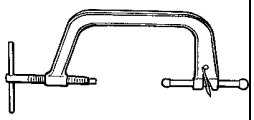
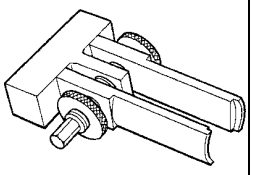
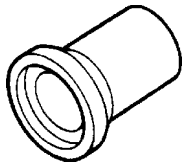
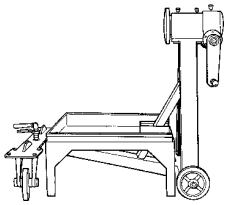
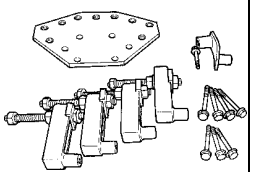
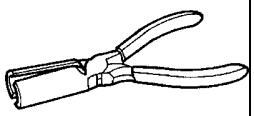
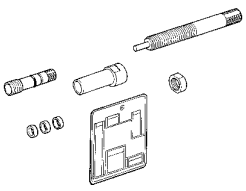
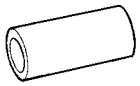
A6E941001001E01

Ford SST numbers are collated with Mazda SST numbers in the example below.
Ford SSTs are marked with Ford SST number.

Example

1:49 JE01 061 2:303-507 Peg 

1: Mazda SST number
2: Ford SST number

1:49 JE01 061 2:303–507 Peg 	1:49 UN20 5072 2:205–072 Holder 	1:49 UN20 507202 2:205–072–02 Adapter 
1:49 G032 354 2: – Adjusting wrench 	1:49 E011 1A0 2: – Ring gear brake set 	1:49 0636 100B 2: – Valve spring lifter arm 
1:49 B012 0A2 2: – Pivot 	1:49 B012 015 2: – Valve guide installer 	1:49 H010 401 2: – Oil seal installer 
1:49 0107 680A 2: – Engine stand 	1:49 L010 1A0 2: – Engine hanger set 	1:49 S120 170 2: – Valve seal remover 
1:49 L012 0A0B 2: – Valve seal and valve guide installer set 	1:49 T032 302 2: – Bearing installer 	1:49 D032 316 2: – Protractor