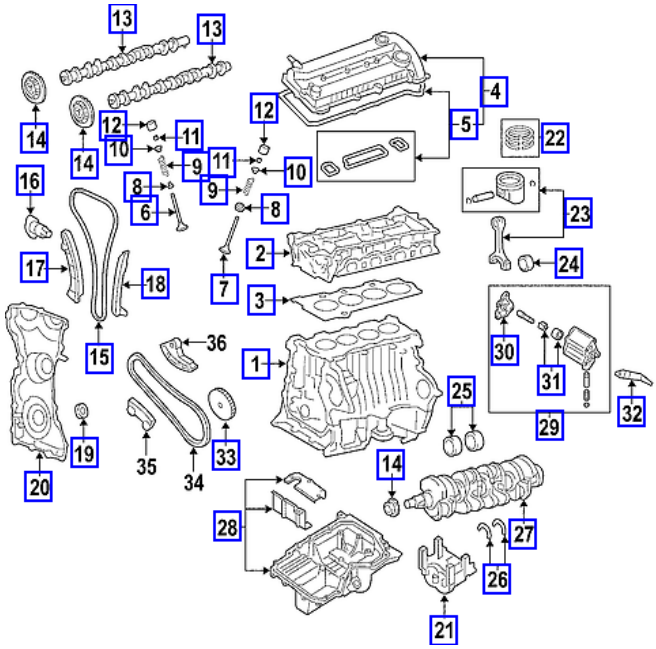
Component Procedures: Engine

Table of Contents

Component Procedures: Engine

Exploded Parts Diagram (itype_83)



Parts and Labor (itype_189)

Parts

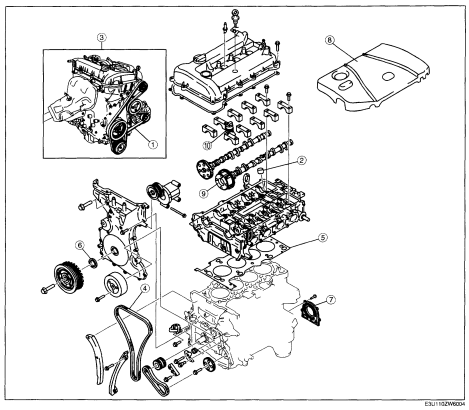
Qualifier	Part #	Name	Price	Note
Short Block > Auto Trans > F?	L3YT02200D	Short Block	3090.62	Includes: Block, Pistons, ?
Short Block > Auto Trans > C?	L3YW02200C	Short Block	3347.50	Includes: Block, Pistons, ?
Short Block > Manual Trans >?	L3YS02200D	Short Block	3090.62	Includes: Block, Pistons, ?
Short Block > Manual Trans >?	L3YV02200C	Short Block	3090.62	Includes: Block, Pistons, ?
Overhaul Gasket Set	8LA110271	Overhaul Gasket Set	0.00	

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Diagnose/Test	Oil Leak, Diagnosis	B	1.0	0.0
Replace	Complete Assembly With Transfer Of Parts	B	10.5	0.0
Replace	Complete Assembly Without Transfer Of Parts	B	8.8	0.0
Replace	Long Block	B	11.3	7.0
Replace	Short Block	A	16.5	12.3
Overhaul/Rebuild	Engine, Overhaul	A	27.5	20.0

Engine Location Index (LF, L3) (Article 1413088)

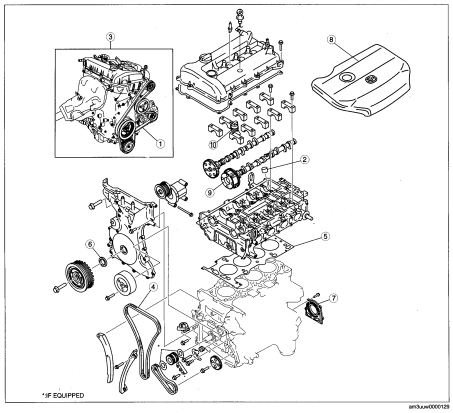
ENGINE LOCATION INDEX[LF, L3]



1	Drive belt	5	Cylinder head gasket
2	Tappet	6	Front oil seal
3	Engine	7	Rear oil seal
4	Timing chain	8	Plug hole plate
		9	Variable valve timing actuator
		10	Oil control valve (OCV)

Engine Location Index [LF, L3] (Article 1392251)

ENGINE LOCATION INDEX [LF, L3]



1	Drive belt (See DRIVE BELT INSPECTION [LF, L3].) (See DRIVE BELT AUTO TENSIONER INSPECTION [LF, L3].)	5	Cylinder head gasket
2	Tappet (See VALVE CLEARANCE INSPECTION [LF, L3].)	6	Front oil seal
3	Engine (See COMPRESSION INSPECTION [LF, L3].)	7	Rear oil seal
4	Timing chain	8	Plug hole plate
		9	Variable valve timing actuator (See VARIABLE VALVE TIMING ACTUATOR INSPECTION [LF, L3].)
		10	Oil control valve (OCV) (See OIL CONTROL VALVE (OCV) INSPECTION [LF, L3].)

Engine Disassembly/Assembly (Article 1417187)

ENGINE DISASSEMBLY/ASSEMBLY [LF, L3]
1. Disconnect the engine and transaxle.
2. Remove the following part.
(1) Intake-air system
(2) Generator
(3) Ignition coils
(4) Crankshaft position (CKP) sensor
3. Assemble in the reverse order of disassembly.

Timing Chain Disassembly (Article 1417123)

Non Standards
- Timing Chain Disassembly (1417124)
- Crankshaft Pulley Lock Bolt Disassembly Note (1417125)
- Front Oil Seal Disassembly Note (1417126)

- Chain Tensioner Disassembly Note (1417127)
- Oil Pump Sprocket Disassembly Note (1417128)

Cylinder Head Disassembly (I) (Article 1417129)

Non Standards
- Disassembly (1417130)
- Camshaft Sprocket Lock Bolt, Variable Valve Timing Actuator Lock Bolt Disassembly Note (1417131)
- Camshaft Cap Disassembly Note (1417132)
- Tappet Disassembly Note (1417133)
- Cylinder Head Bolt Disassembly Note (1417134)

Cylinder Head Disassembly (II) (Article 1417135)

Non Standards
- Disassembly (1417136)
- Valve Keeper Disassembly Note (1417137)
- Valve Seal Disassembly Note (1417138)

Cylinder Block Disassembly (I) (Article 1417139)

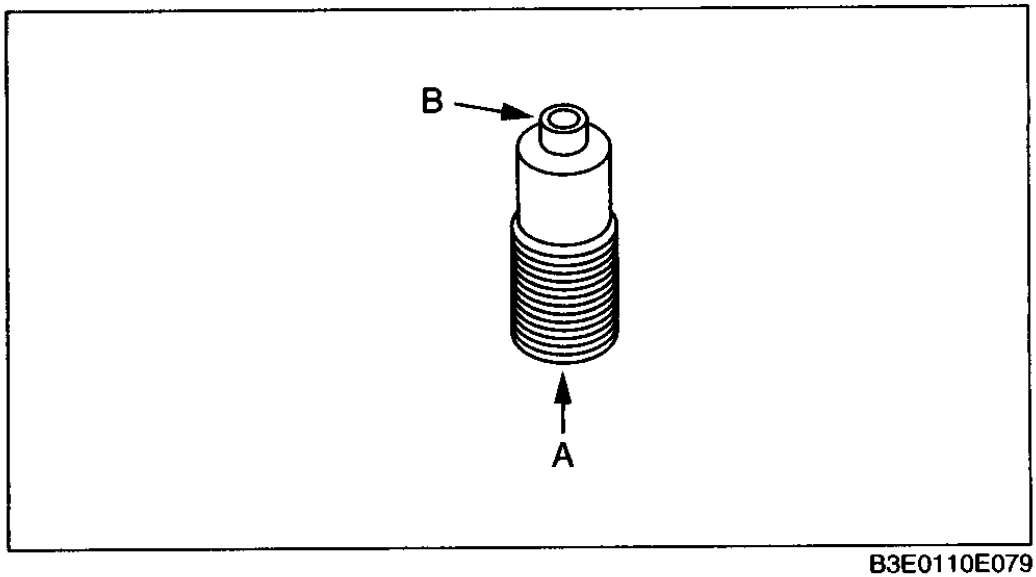
Non Standards
- Disassembly (1417140)
- Drive Plate (ATX), Flywheel (MTX) Disassembly Note (1417141)

Cylinder Block Disassembly (II) (Article 1417142)

Non Standards
- Disassembly (1417143)
- Connecting Rod Cap Disassembly Note (1417144)
- Main Bearing Cap Disassembly Note (1417145)

Oil Jet Valve Inspection (Article 1417146)

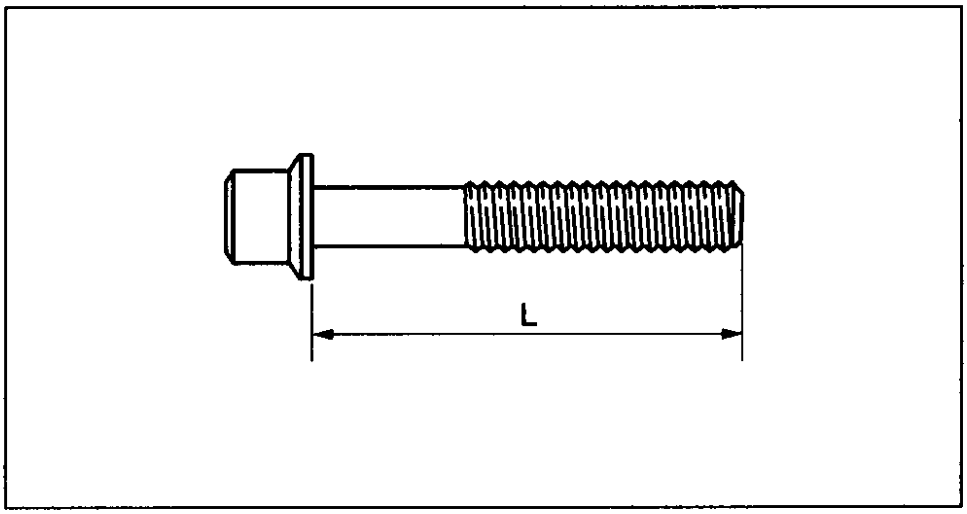
E5U011010730E01



B3E0110E079

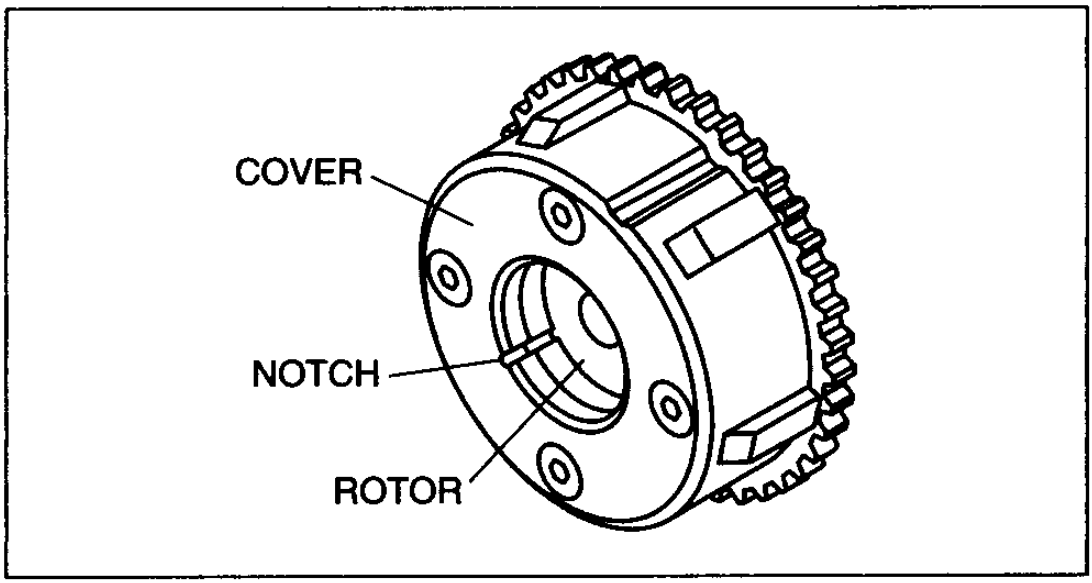
Bolt Inspection (Article 1417147)

E5U011010135E01



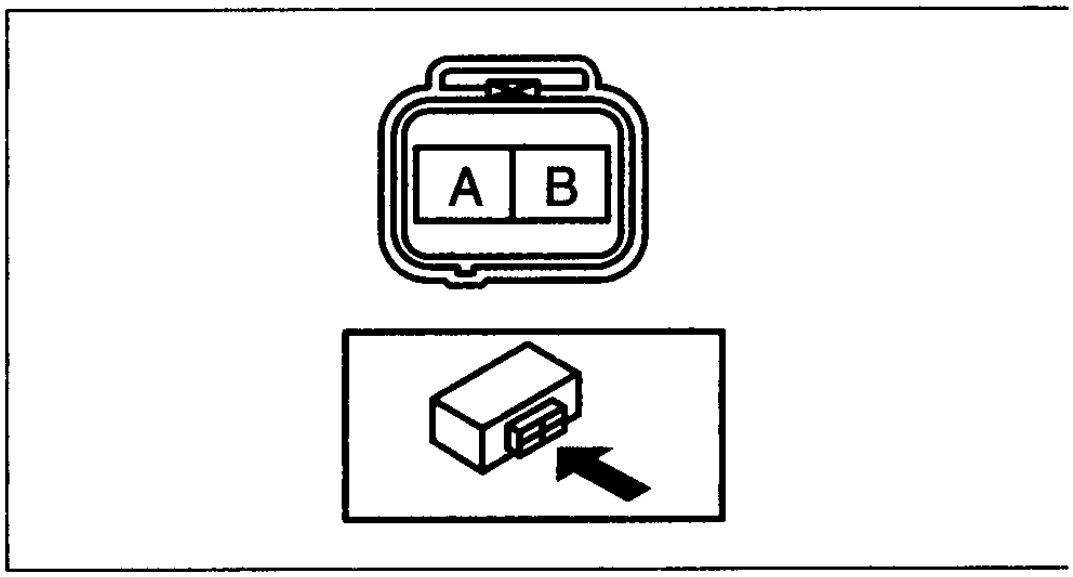
B3E0110E088

Variable Valve Timing Actuator Inspection [With Variable Valve Timing Mechanism] (Article 1417148)



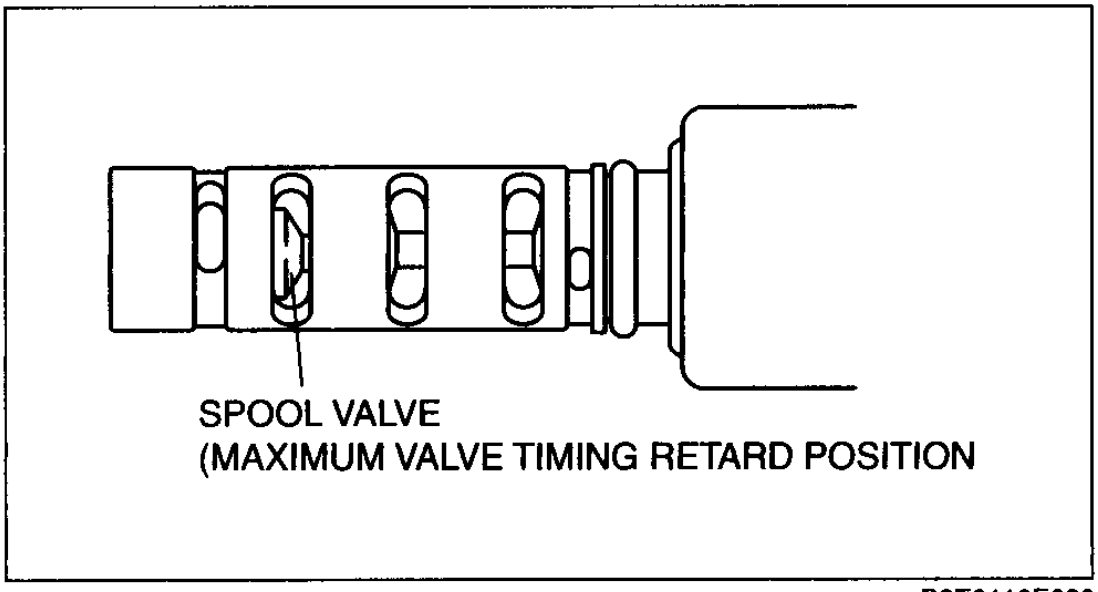
B3E0110E089

Oil Control Valve (OCV) Inspection [With Variable Valve Timing Mechanism] (Article 1417149)

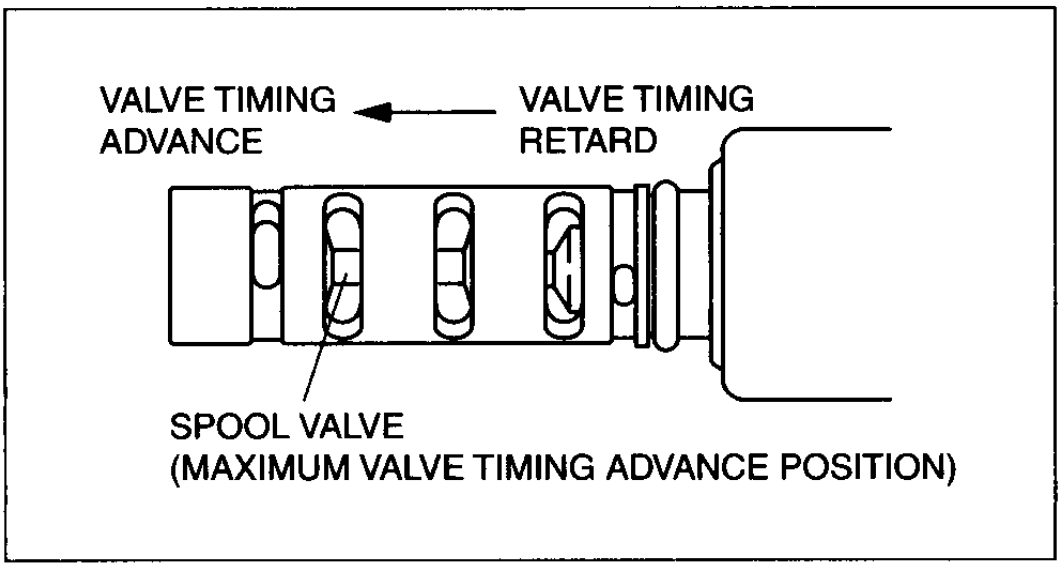


B3E0110W151

Spool Valve Operation Inspection (Article 1417150)

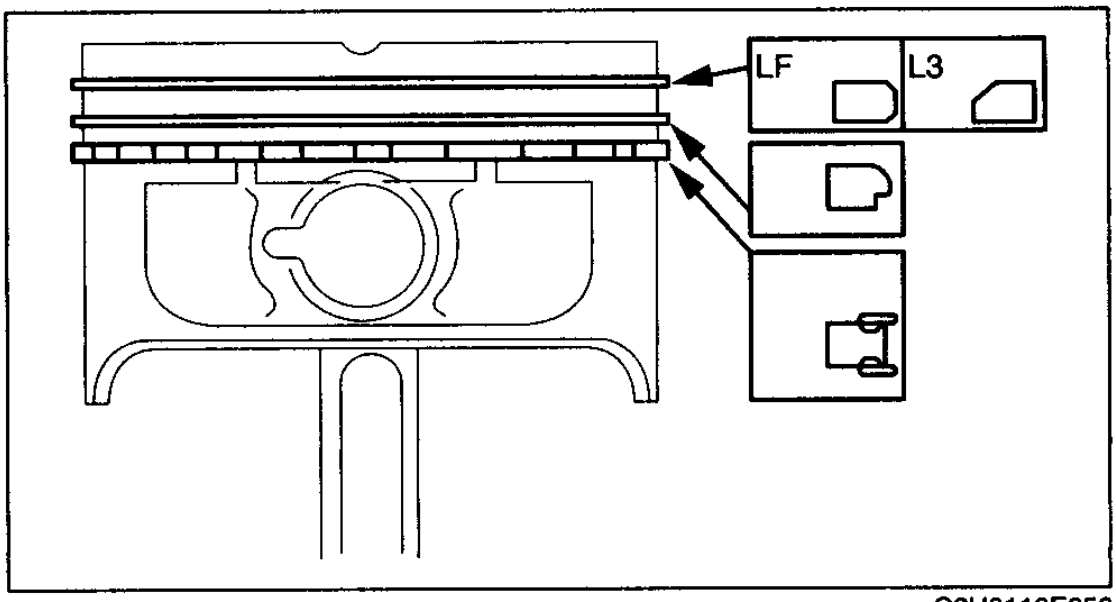


B3E0110E090



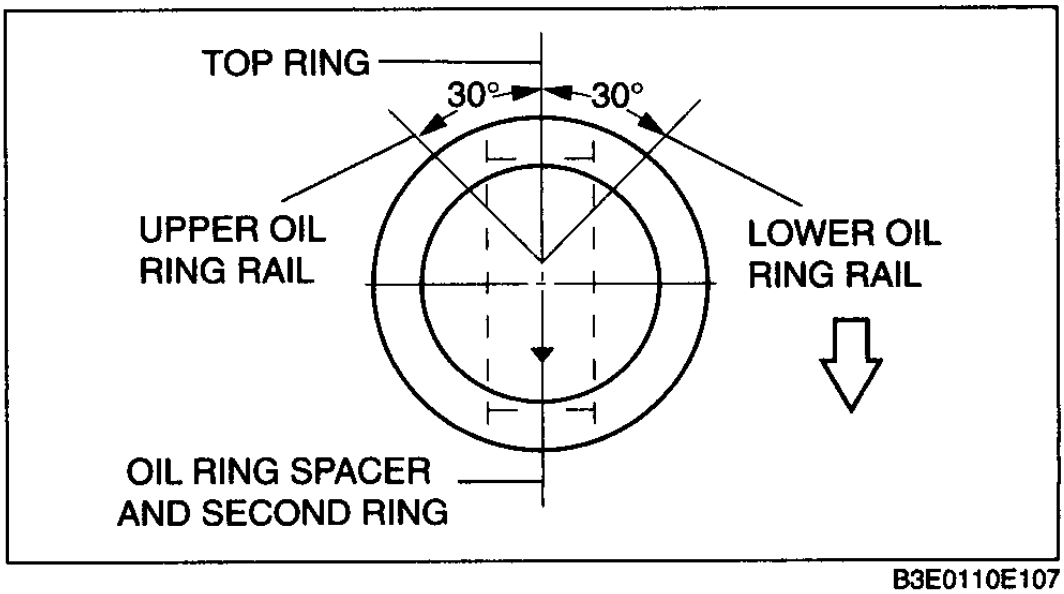
B3E0110E091

Piston Ring Assembly Note (Article 1417151)

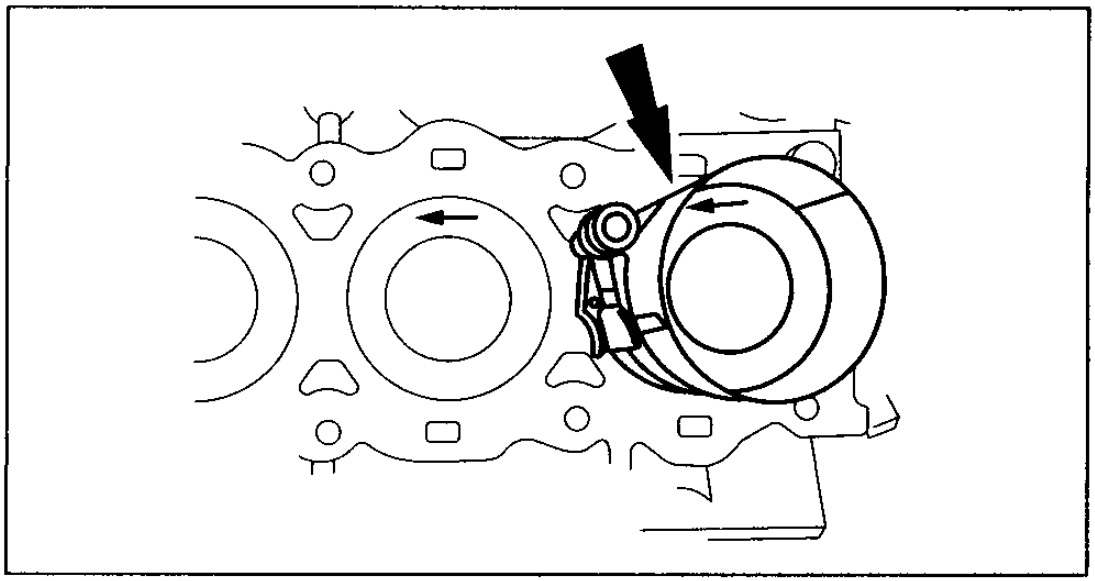


C3U0110E056

Piston Assembly Note (Article 1417152)

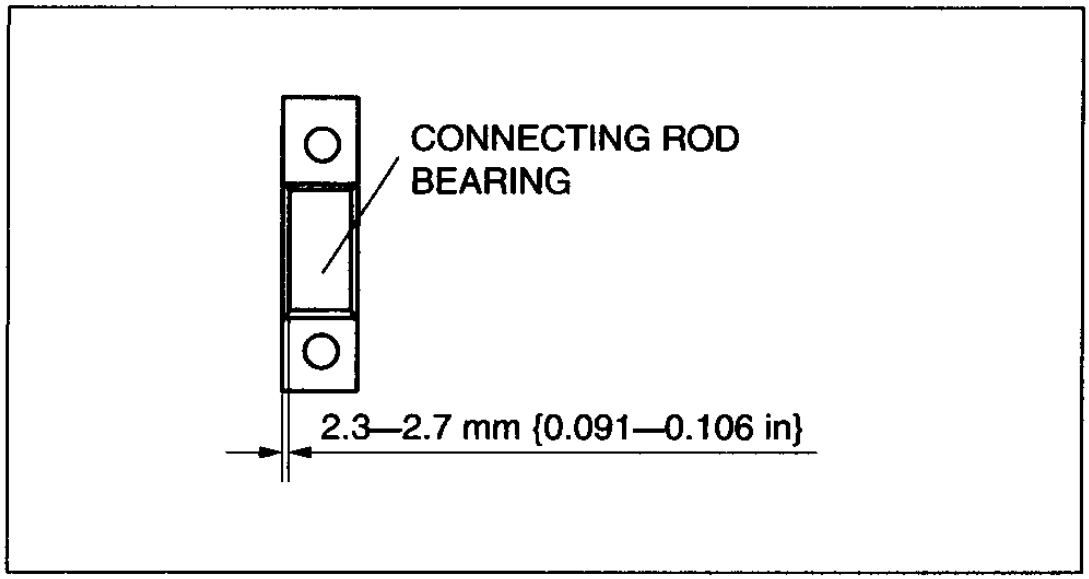


B3E0110E107



B3E0110E108

Connecting Rod Bearing Assembly Note (Article 1417153)

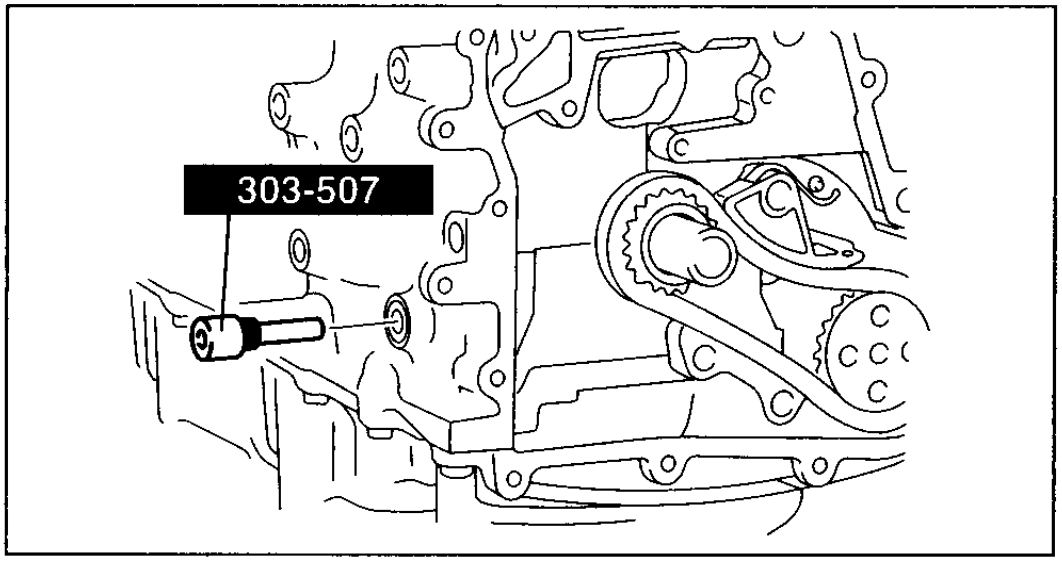


B3E0110E109

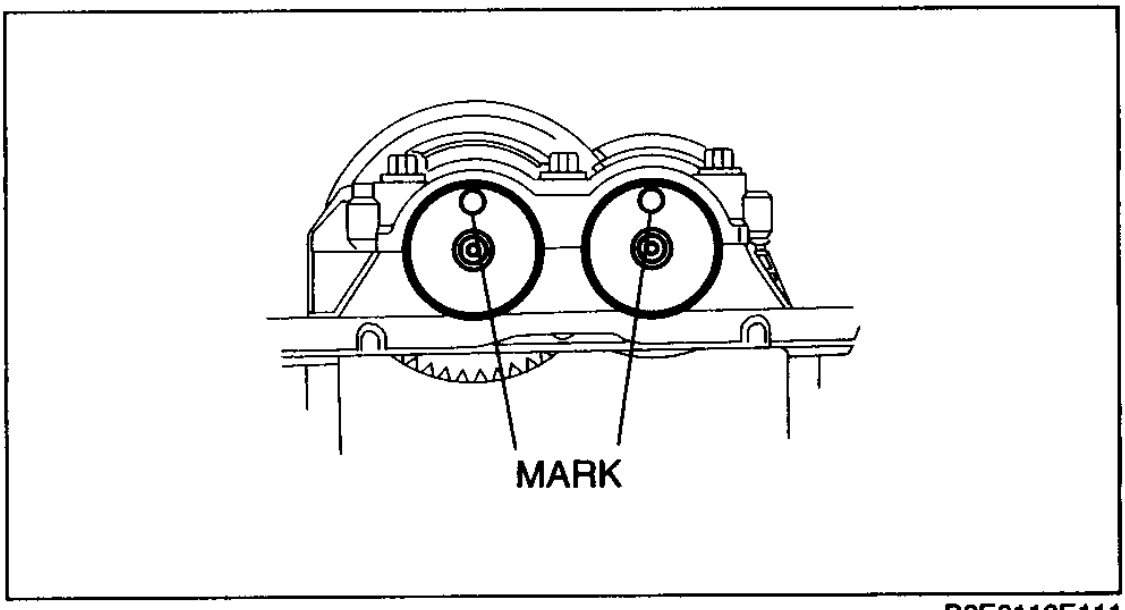
Connecting Rod Cap Assembly Note (Article 1417154)

Connecting Rod
Cap Assembly Note
Caution:
^ When assembling the connecting rod caps, align the broken, rough faces of the connecting rods and connecting rod caps.
1. Tighten the connecting rod bolts in two steps using the SST (49 D032 316).
Tightening torque
(1)
26-32 N-m (2.7-3.2 kgf-m, 19.2-23.6 ft-lbf)
(2)
80°-100°

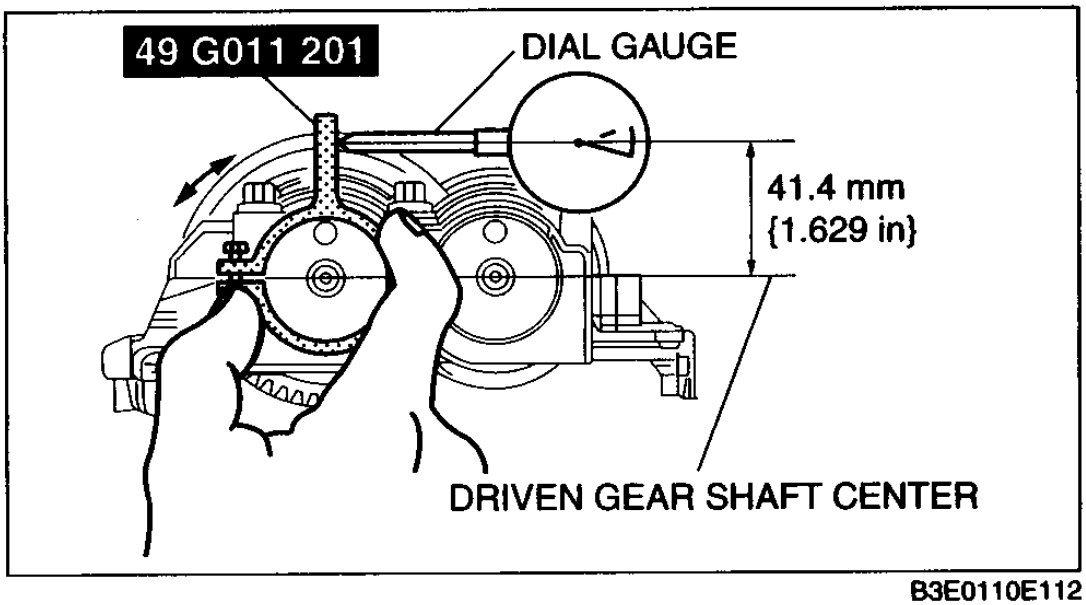
Balancer Unit Assembly Note (Article 1417155)



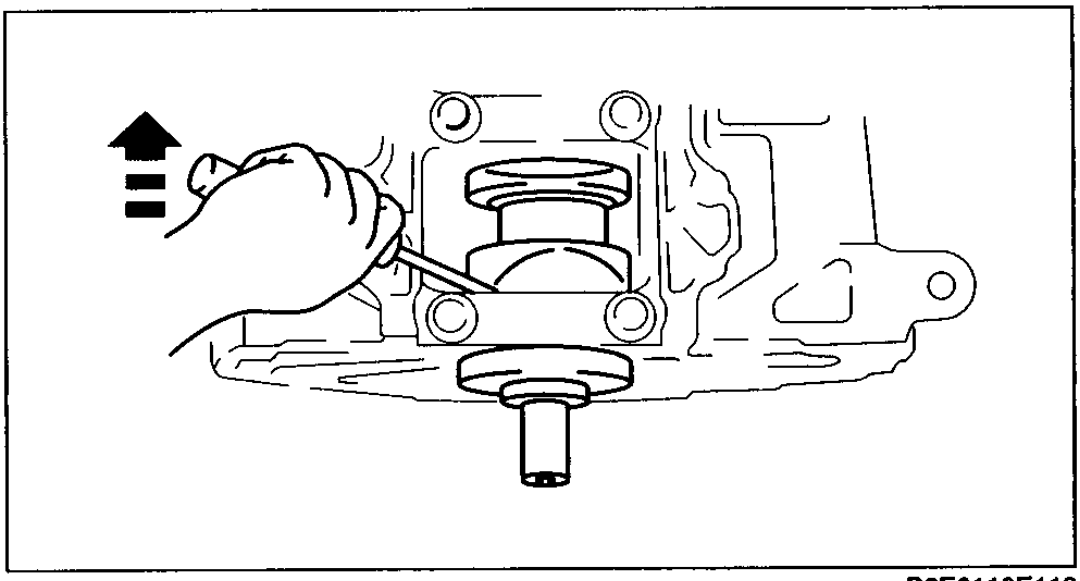
D3U110ZE4007



B3E0110E111



B3E0110E112

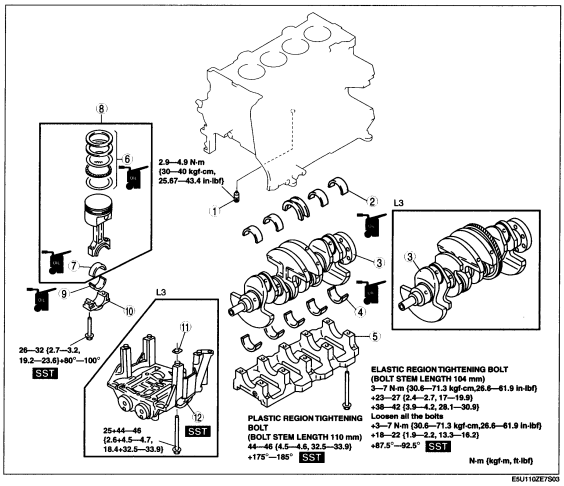


B3E0110E113

Adjustment shim selection table

Backlash mm {in}	Selection shim (No.)	Shim thickness mm {in}	Backlash mm {in}	Selection shim (No.)	Shim thickness mm {in}
0.267—0.273 {0.01051—0.01074}	15	1.15 {0.0452}	0.127—0.133 {0.00500—0.00523}	35	1.35 {0.0531}
0.260—0.266 {0.01023—0.01047}	16	1.16 {0.0456}	0.120—0.126 {0.00472—0.00496}	36	1.36 {0.0535}
0.253—0.259 {0.00996—0.01019}	17	1.17 {0.0460}	0.113—0.119 {0.00444—0.00468}	37	1.37 {0.0539}
0.246—0.252 {0.00968—0.00992}	18	1.18 {0.0464}	0.106—0.112 {0.00417—0.00440}	38	1.38{0.0543}
0.239—0.245 {0.00940—0.00964}	19	1.19 {0.0468}	0.099—0.105 {0.00389—0.00413}	39	1.39 {0.0547}
0.232—0.238 {0.00913—0.00937}	20	1.20 {0.0472}	0.092—0.098 .087 {0.00362—0.00385}	40	1.40 {0.0551}
0.225—0.231 {0.00885—0.00909}	21	1.21 {0.0476}	0.085—0.091 {0.00334—0.00358}	41	1.41 {0.0555}
0.218—0.224 {0.00858—0.00881}	22	1.22 {0.0480}	0.078—0.084 {0.00307—0.00330}	42	1.42 {0.0559}
0.211—0.217 {0.00830—0.00854}	23	1.23 {0.0484}	0.071—0.077 {0.00279—0.00303}	43	1.43 {0.0562}
0.204—0.210 {0.00803—0.00826}	24	1.24 {0.0488}	0.064—0.070 {0.00251—0.00275}	44	1.44 {0.0566}
0.197—0.203 {0.00775—0.00799}	25	1.25 {0.492}	0.057—0.063 {0.00224—0.00248}	45	1.45 {0.0570}
0.190—0.196 {0.00748—0.00771}	26	1.26 {0.496}	0.050—0.056 {0.00196—0.00220}	46	1.46 {0.0574}
0.183—0.189 {0.00720—0.00744}	27	1.27 {0.499}	0.043—0.049 {0.00169—0.00192}	47	1.47 {0.0578}
0.176—0.182 {0.00692—0.00716}	28	1.28 {0.503}	0.036—0.042 {0.00141—0.00165}	48	1.48 {0.0582}
0.169—0.175 {0.00665—0.00688}	29	1.29 {0.507}	0.029—0.035 {0.00114—0.00137}	49	1.49 {0.0586}
0.162—0.168 {0.00637—0.00661}	30	1.30 {0.511}	0.022—0.028 {0.000866—0.00110}	50 (master)	1.50 {0.0590}
0.155—0.161 {0.00610—0.00633}	31	1.31 {0.515}	0.015—0.021 {0.00059—0.000826}	51	1.51 {0.0594}
0.148—0.154 {0.00582—0.00606}	32	1.32 {0.519}	0.008—0.014 {0.000314—0.000551}	52	1.52 {0.0598}
0.141—0.147 {0.00555—0.00578}	33	1.33 {0.523}	0.001—0.007 {0.00003—0.000275}	53	1.53 {0.0602}
0.134—0.140 {0.00527—0.00551}	34	1.34 {0.527}	0.000—0.000 {0.000—0.000}	54	1.54 {0.0606}

Cylinder Block Assembly (I) (Article 1417156)



E5U1102E7S03

1	Oil jet valve
2	Upper main bearing, thrust bearing
3	Crankshaft
4	Lower main bearing, thrust bearing
5	Main bearing cap (See Main Bearing Cap Assembly Note)
6	Piston ring (See Piston Ring Assembly Note)
7	Upper connecting rod bearing (See Connecting Rod Bearing Assembly Note)

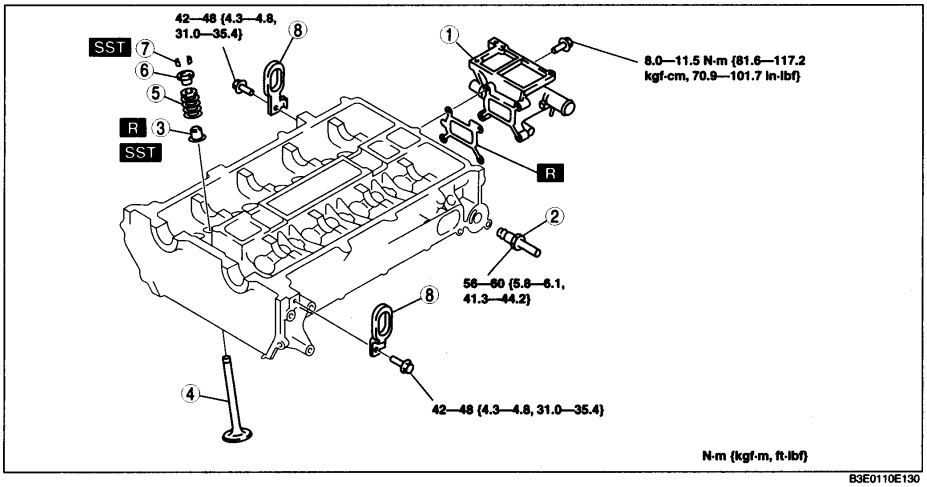
8	Connecting rod, piston assembly (See Piston Assembly Note)
9	Lower connecting rod bearing (See Connecting Rod Bearing Assembly Note)
10	Connecting rod cap (See Connecting Rod Cap Assembly Note)
11	Adjustment shim
12	Balancer unit (See Balancer Unit Assembly Note)

Cylinder Block Assembly (II) (Article 1417157)

Non Standards

- Assembly (1417158)
- Main Bearing Cap Assembly Note (1417159)
- Rear Oil Seal Assembly Note (1417160)
- Drive Plate (ATX), Flywheel (MTX) Assembly Note (1417161)
- Oil Pan Assembly Note (1417162)

Cylinder Head Assembly (I) (Article 1417163)

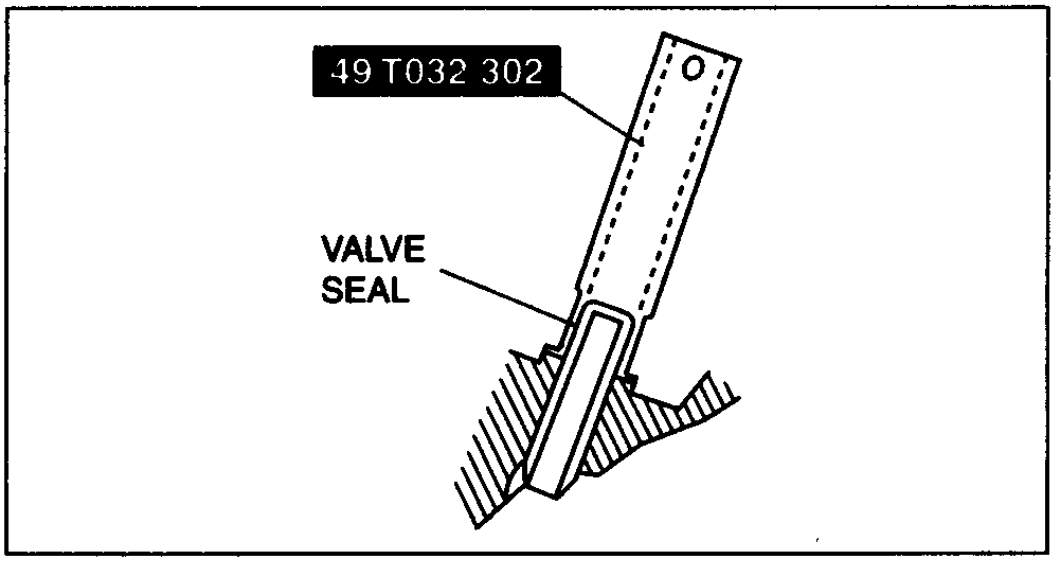


B3E0110E130

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

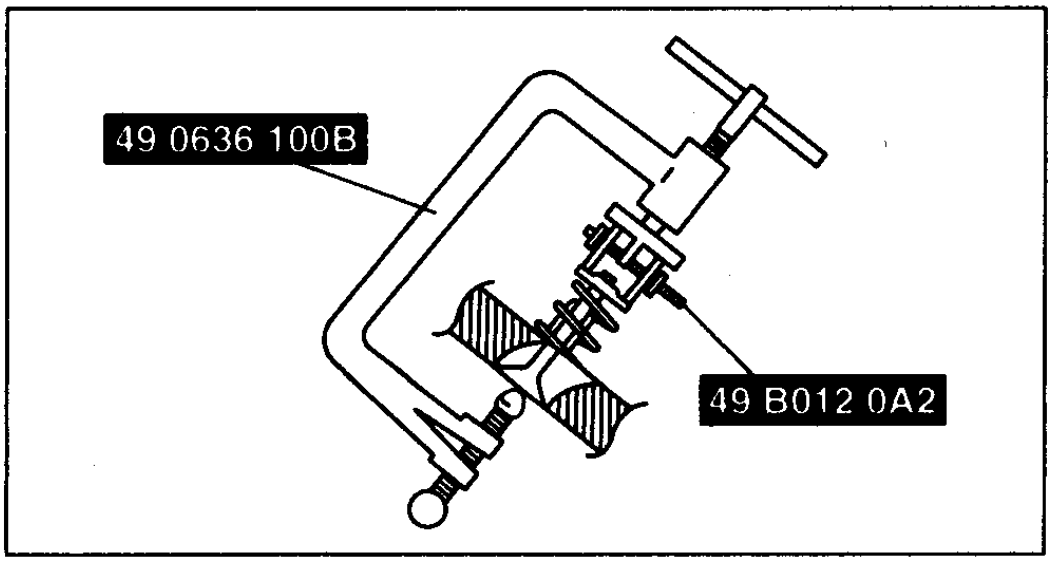
5	Valve spring
6	Upper valve spring seat
7	Valve keeper (See Valve Keeper Assembly Note)
8	Engine hanger

Valve Seal Assembly Note (Article 1417164)



B3E0110E123

Valve Keeper Assembly Note (Article 1417165)

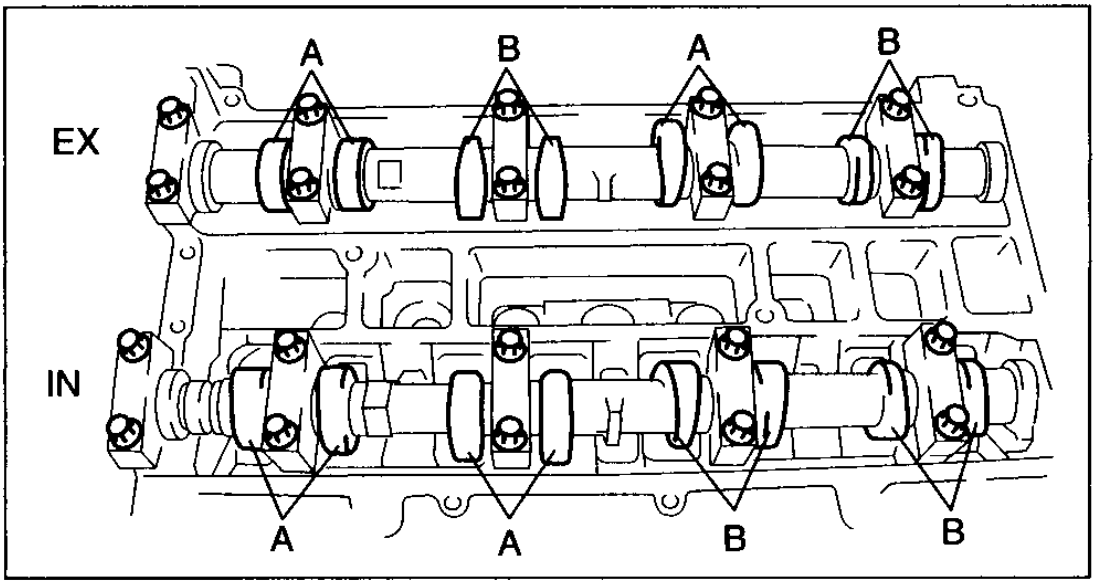


B3E0110E124

Cylinder Head Assembly (II) (Article 1417166)

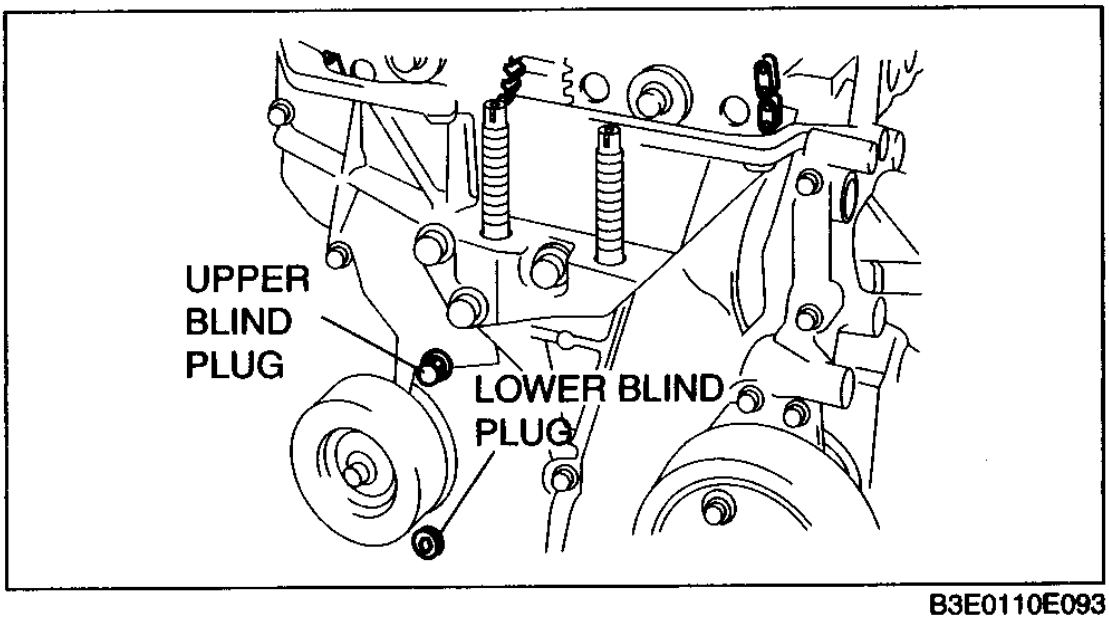
Non Standards
- Assembly (1417167)
- Cylinder Head Bolt Assembly Note (1417168)
- Camshaft Assembly Note (1417169)
- Camshaft Sprocket, Variable Valve Timing Actuator Assembly Note (1417170)

Valve Clearance Inspection (Article 1417171)

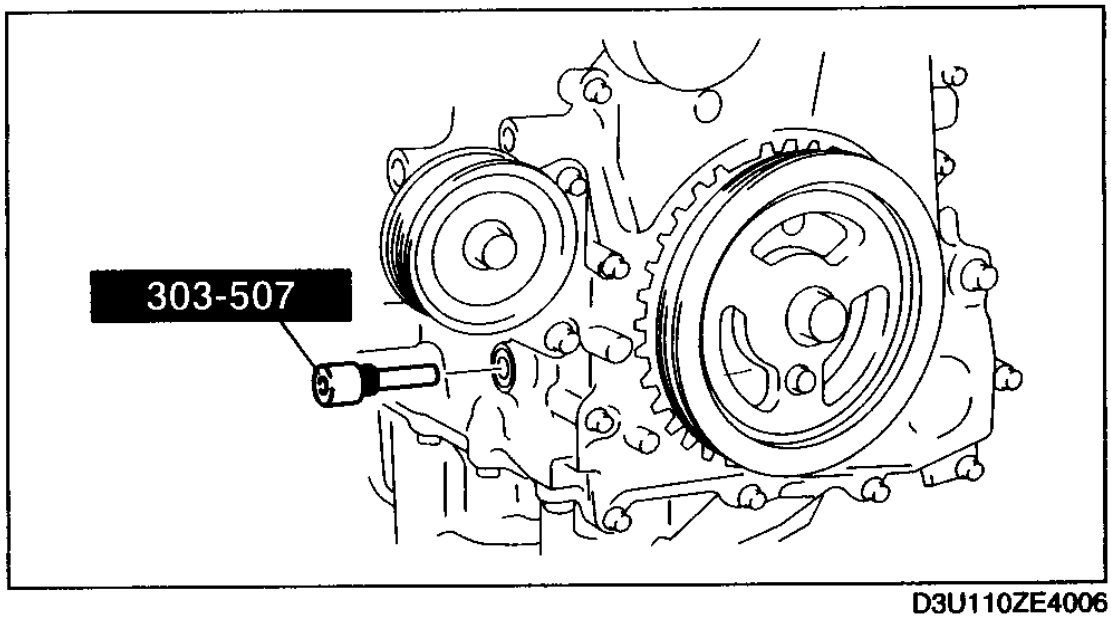


B3E0110E092

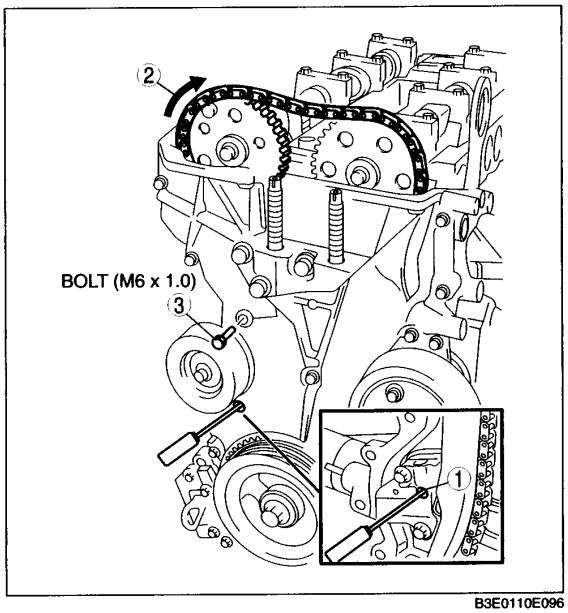
Valve Clearance Adjustment (Article 1417172)



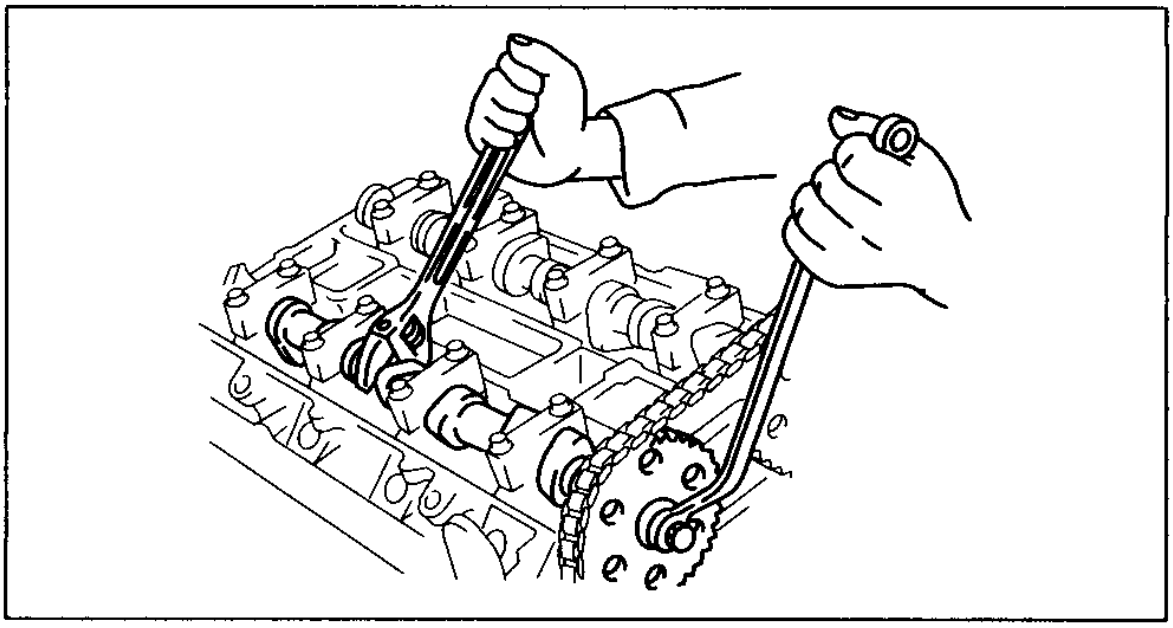
B3E0110E093

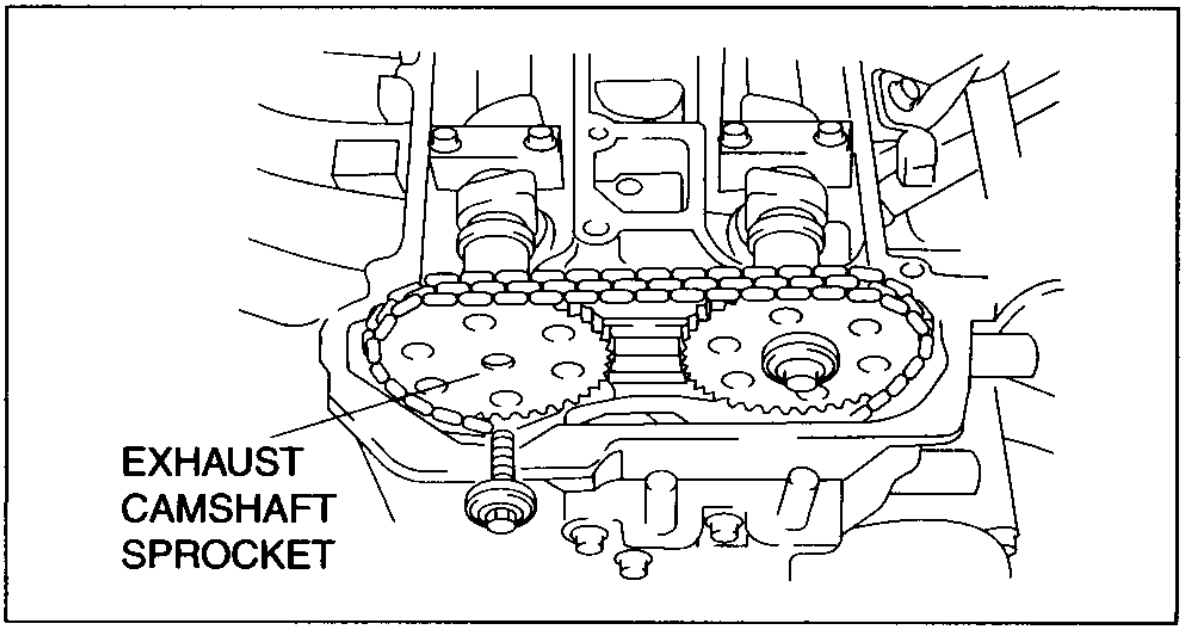


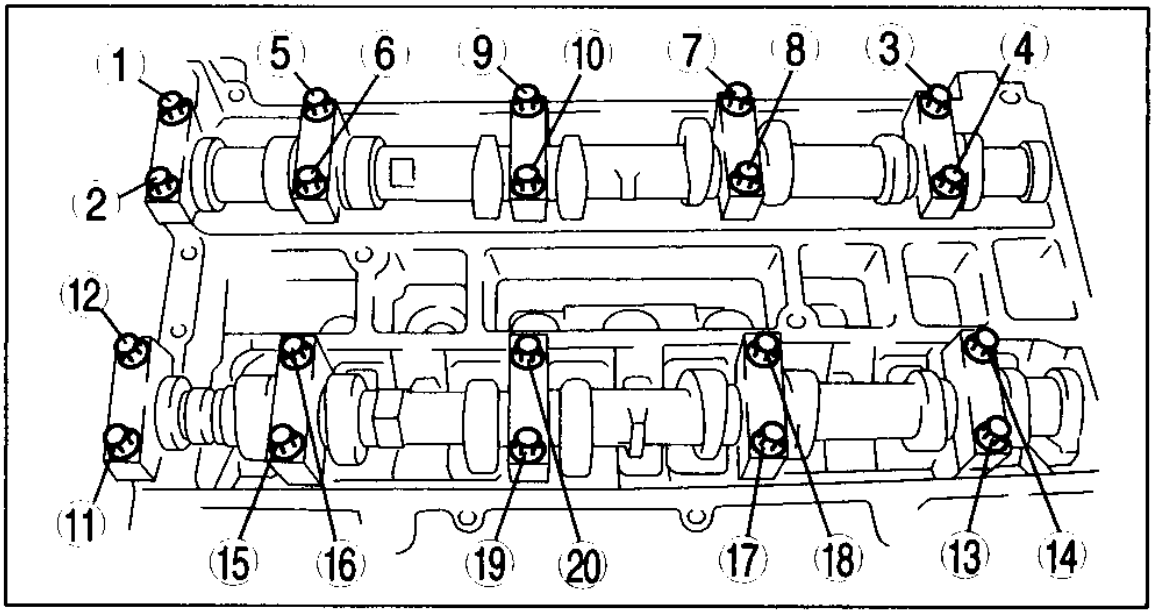
D3U110ZE4006

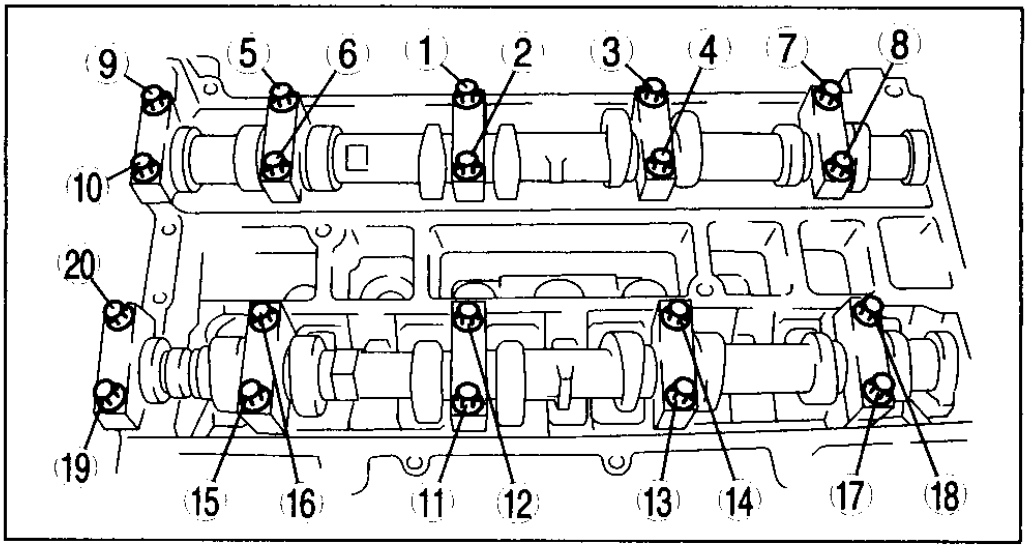


B3E0110E096

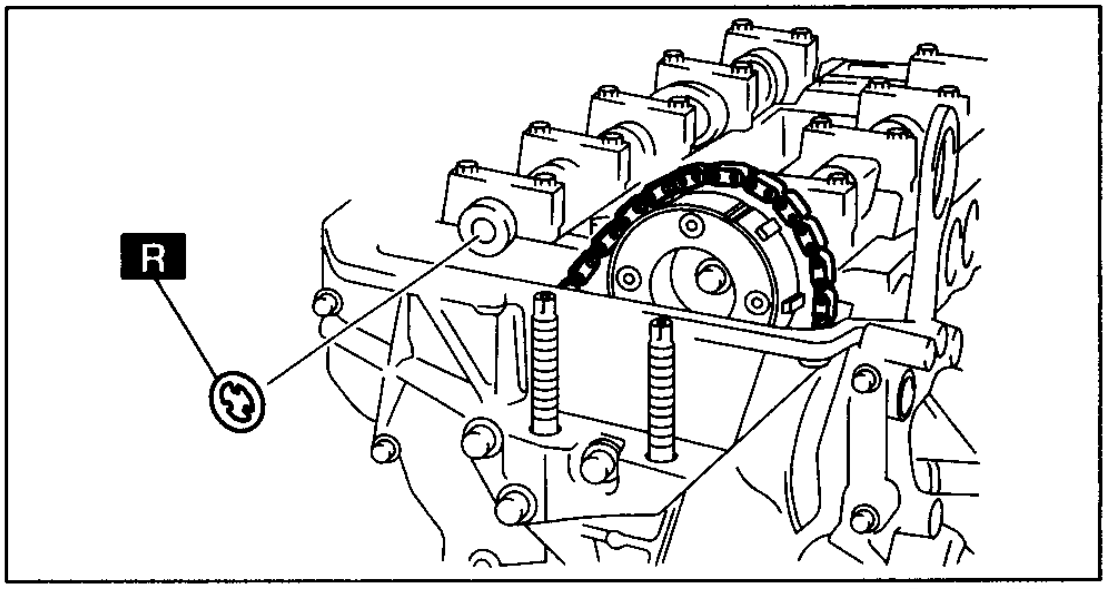



EXHAUST
CAMSHAFT
SPROCKET

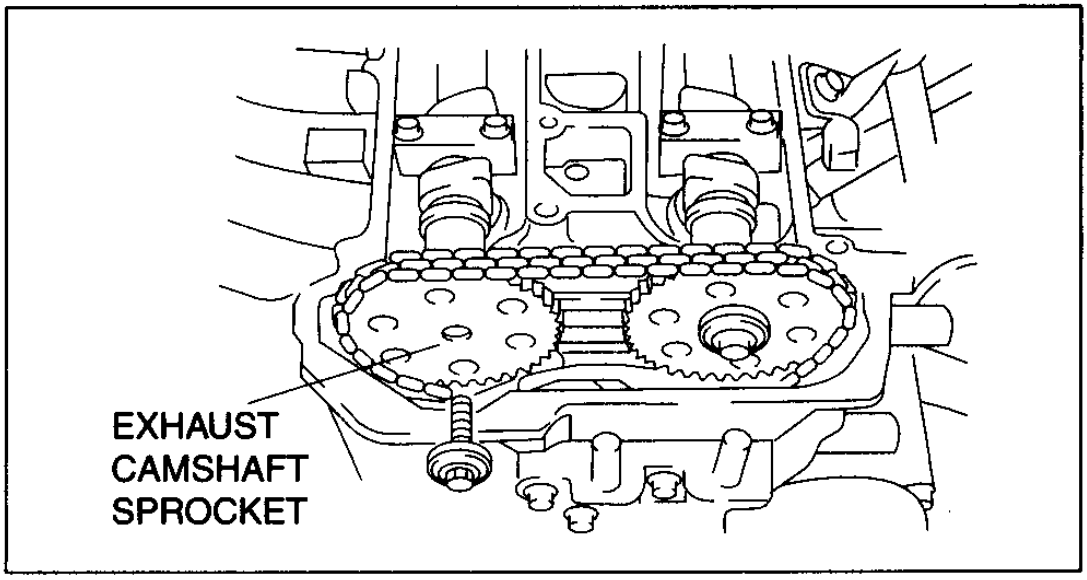




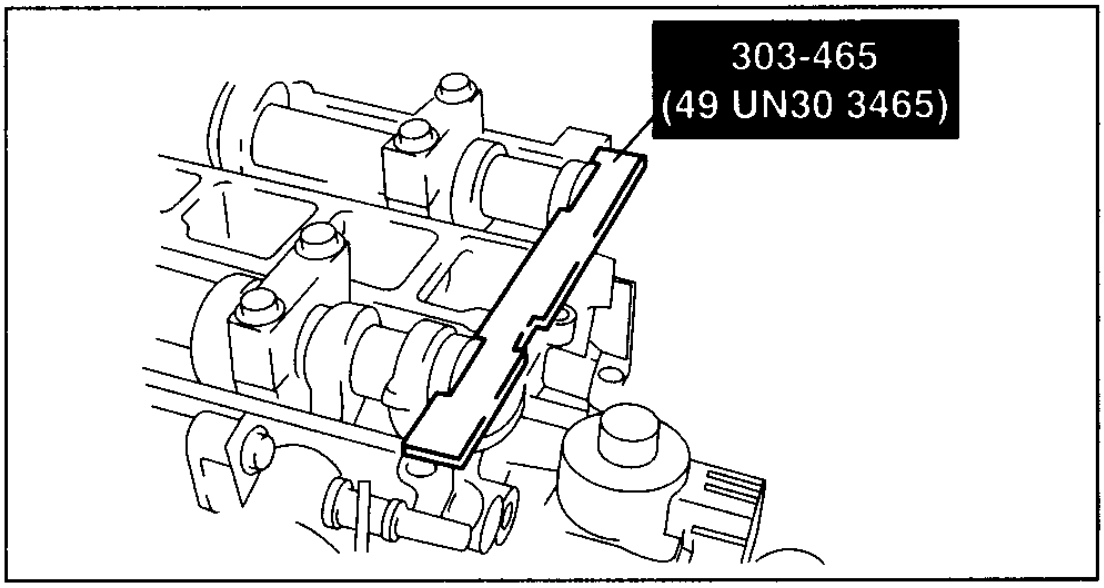
B3E0110E098



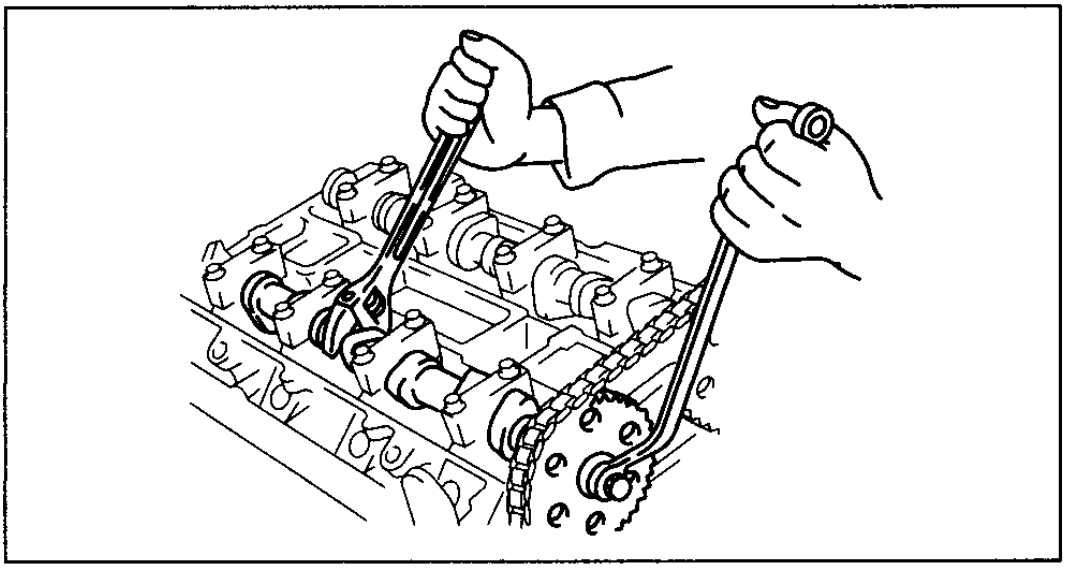
D3U110ZE4012



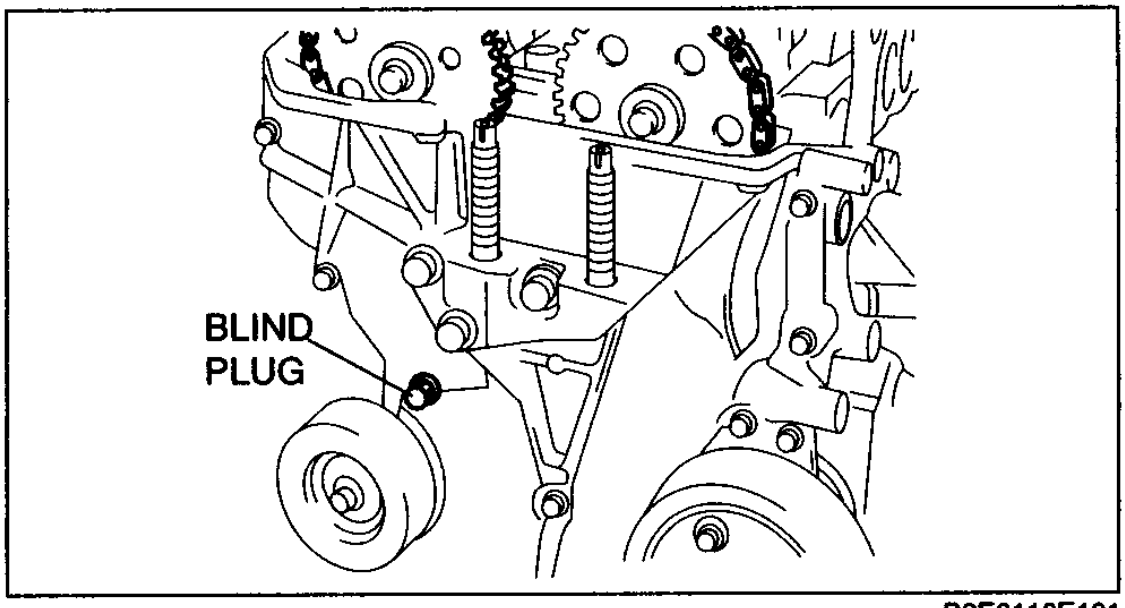
B3E0110E097



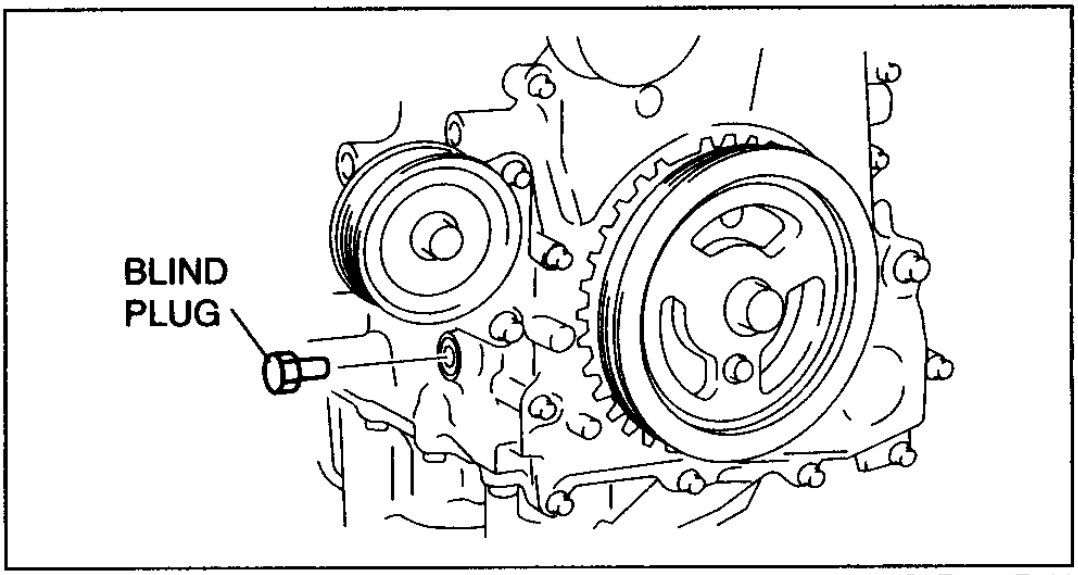
C3U0110E066



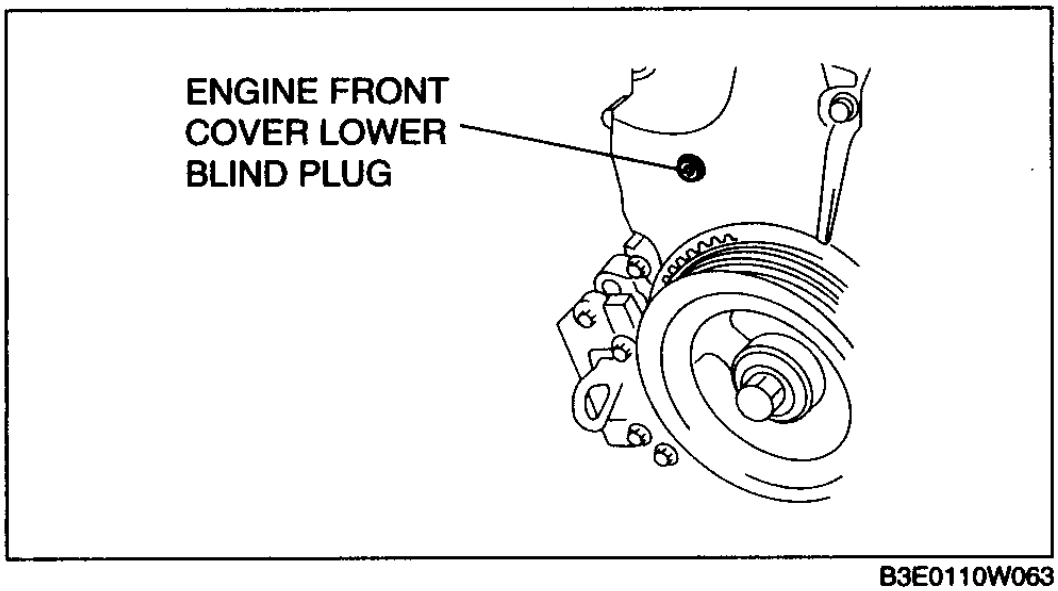
B3E0110E095



B3E0110E101



B3E0110E102



B3E0110W063

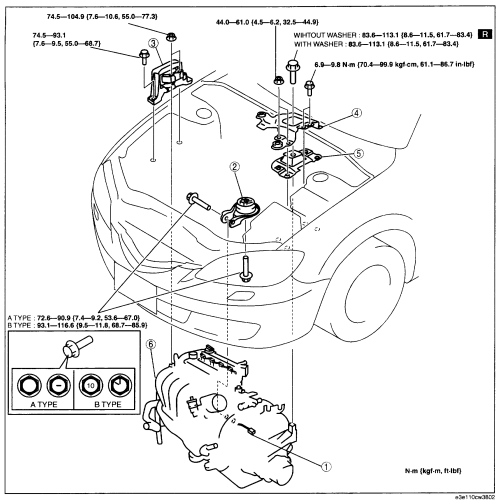
Timing Chain Assembly (Article 1417173)

Non Standards
- Assembly (1417174)
- Oil Pump Sprocket Assembly Note (1417175)
- Timing Chain Assembly Note (1417176)
- Camshaft Sprocket, Variable Valve Timing Actuator Assembly Note (1417177)
- Front Oil Seal Assembly Note (1417178)
- Engine Front Cover Assembly Note (1417179)
- Crankshaft Pulley Lock Bolt Assembly Note (1417180)
- Cylinder Head Cover Assembly Note (1417181)

Engine Overhaul (Article 1417189)

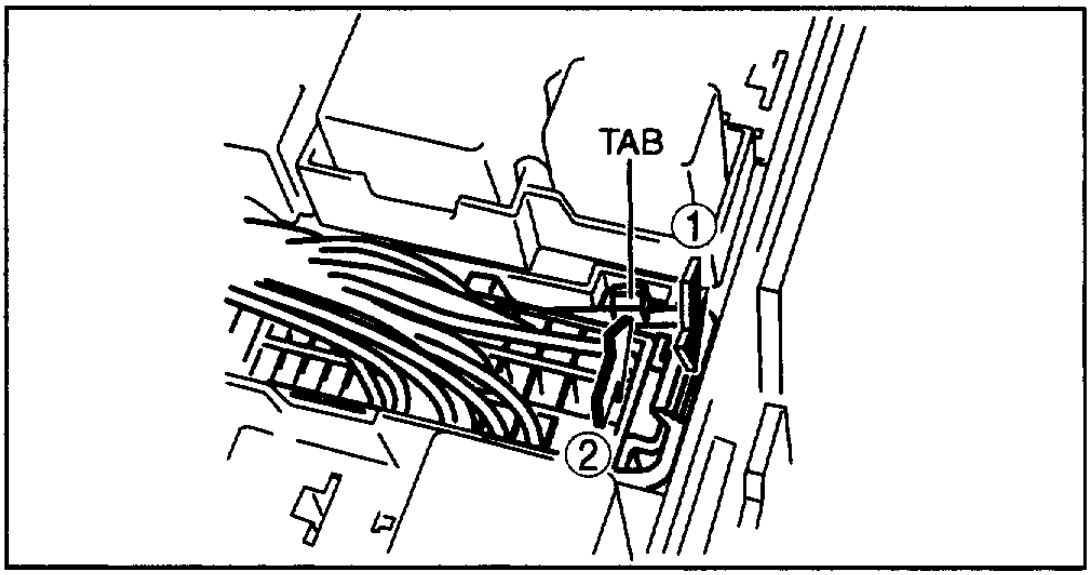
Non Standards
- Warning (1417190)
- Foreword (1417191)
- How to Use This Information (1417192)
- Units (1417197)
- Fundamental Procedures (1417202)
- Electrical System (1417215)
- Engine Overhaul Service Warning (1417218)
- Engine (1417220)
- Engine Technical Data (1417223)
- Service Tools (1417224)

Engine Removal/Installation (Article 1370209)

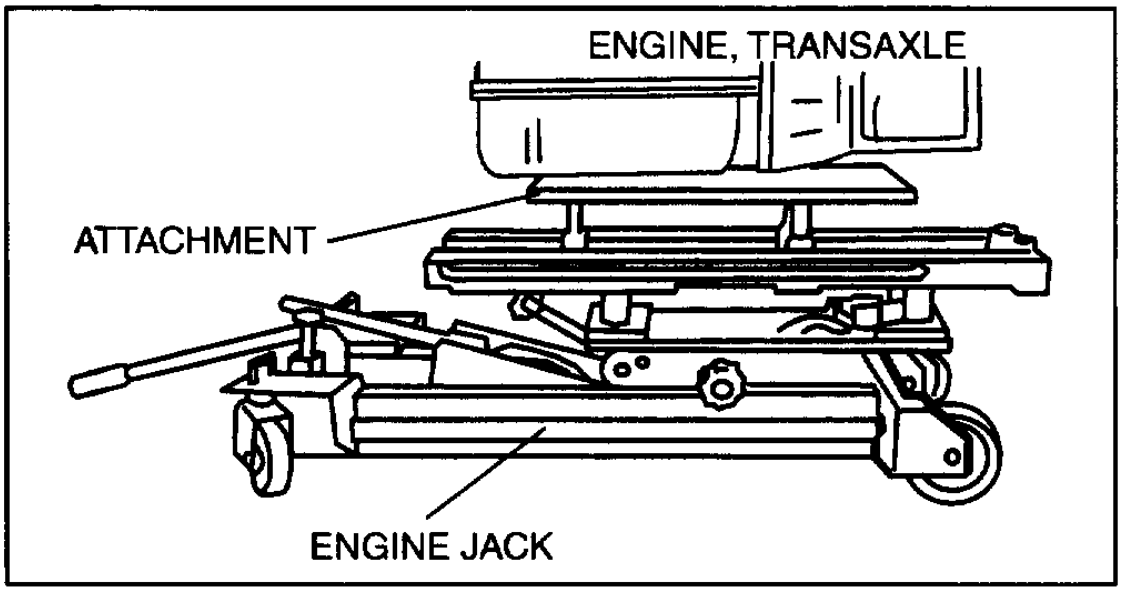


1	Main fuse block connector
2	No.1 engine mount rubber
3	No.3 Engine mount
4	Dynamic damper (if equipped)

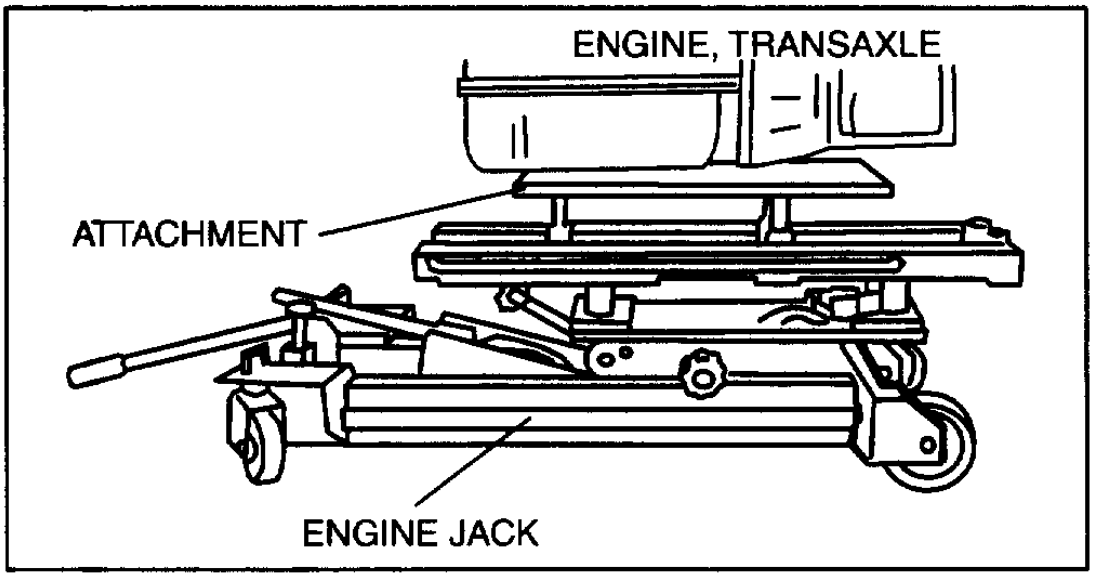
5	Battery bracket
6	No.4 Engine mount rubber
7	Engine, transaxle



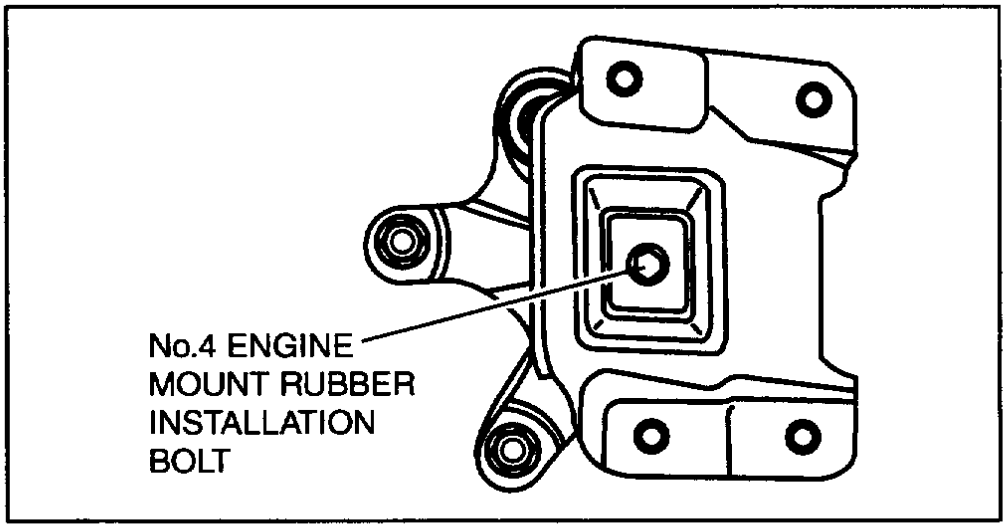
am3uuw0000104



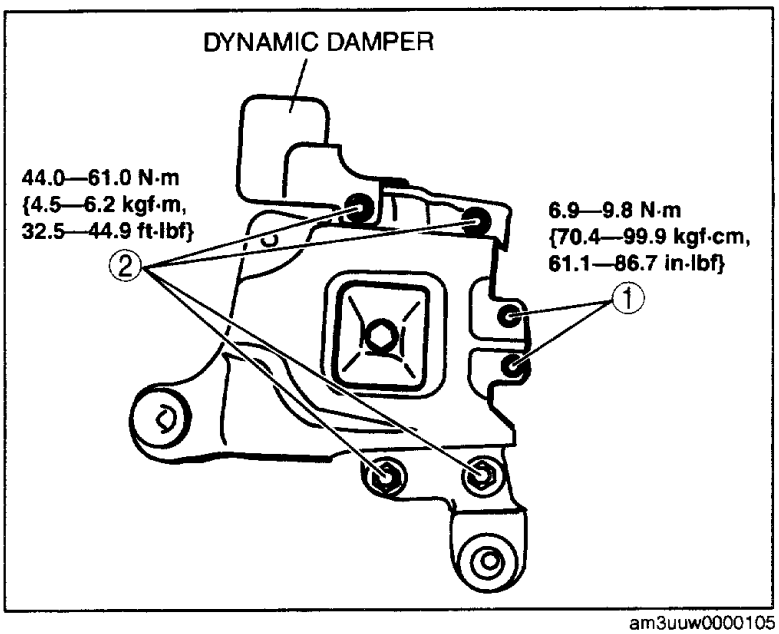
am3uuw0000105



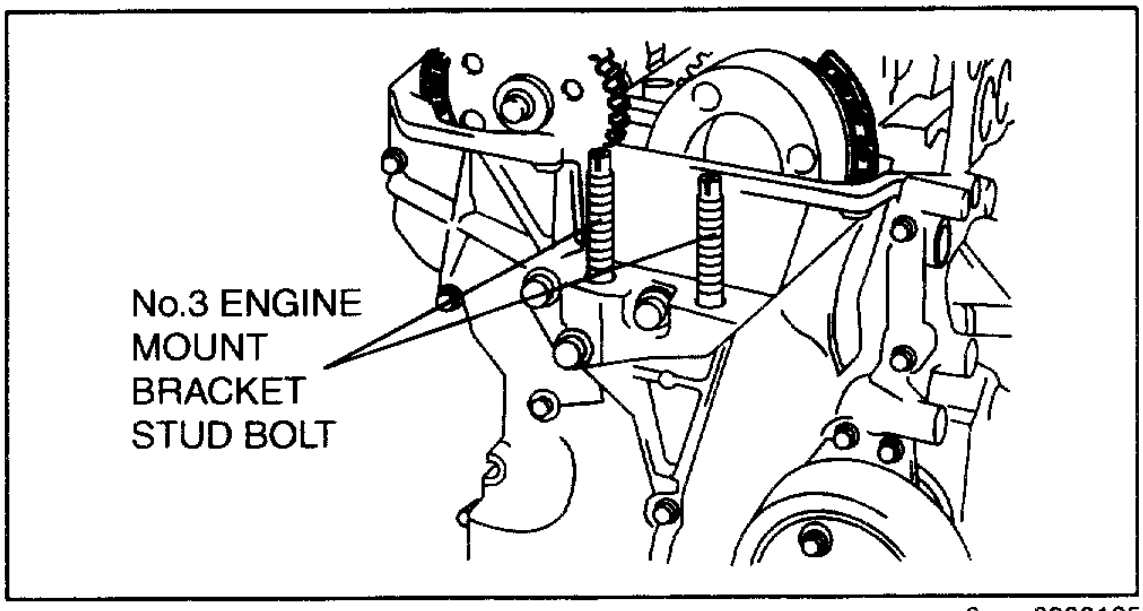
am3uuw0000105



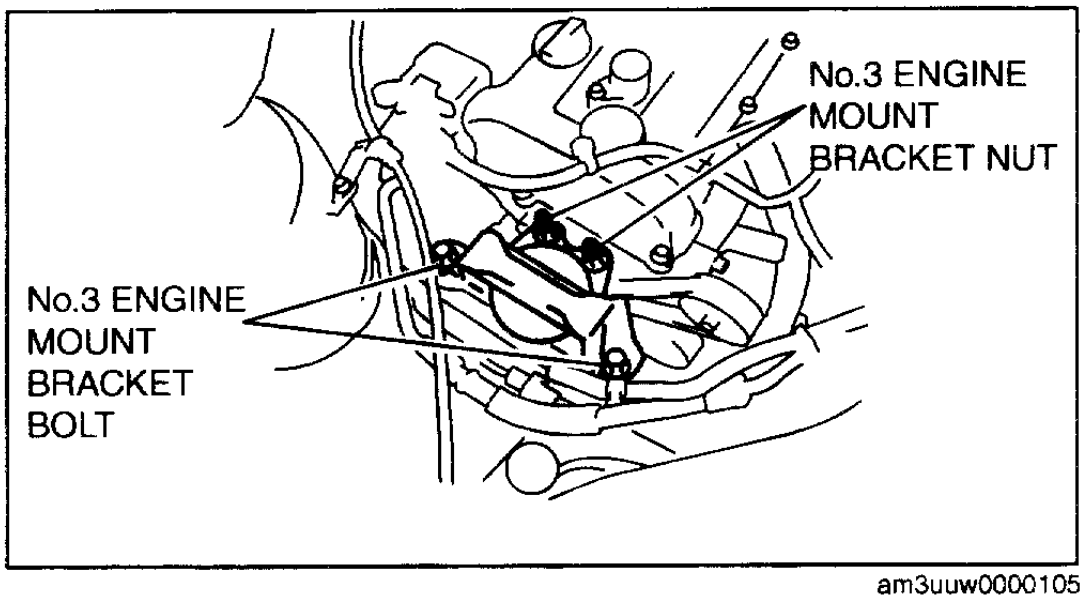
e3u110zw3n11



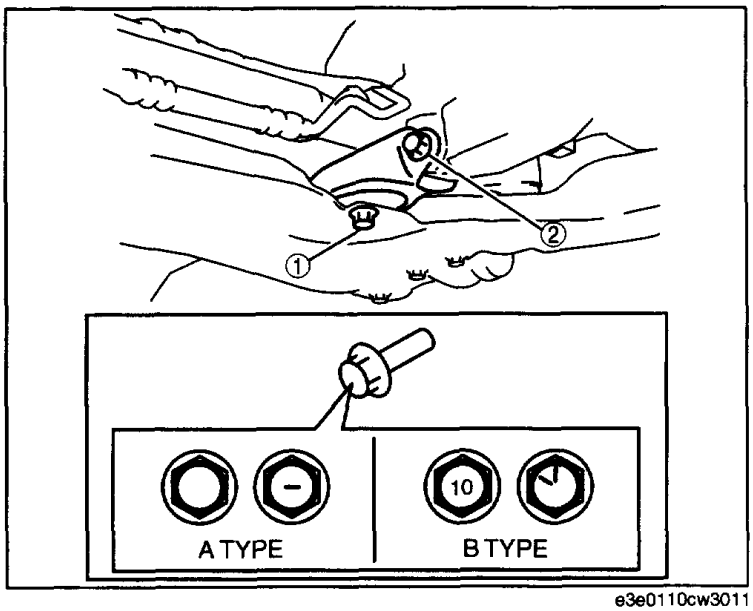
am3uuw0000105



am3uuw0000105



am3uuw0000105



e3e0110cw3011

Engine Technical Data (Article 1367337)

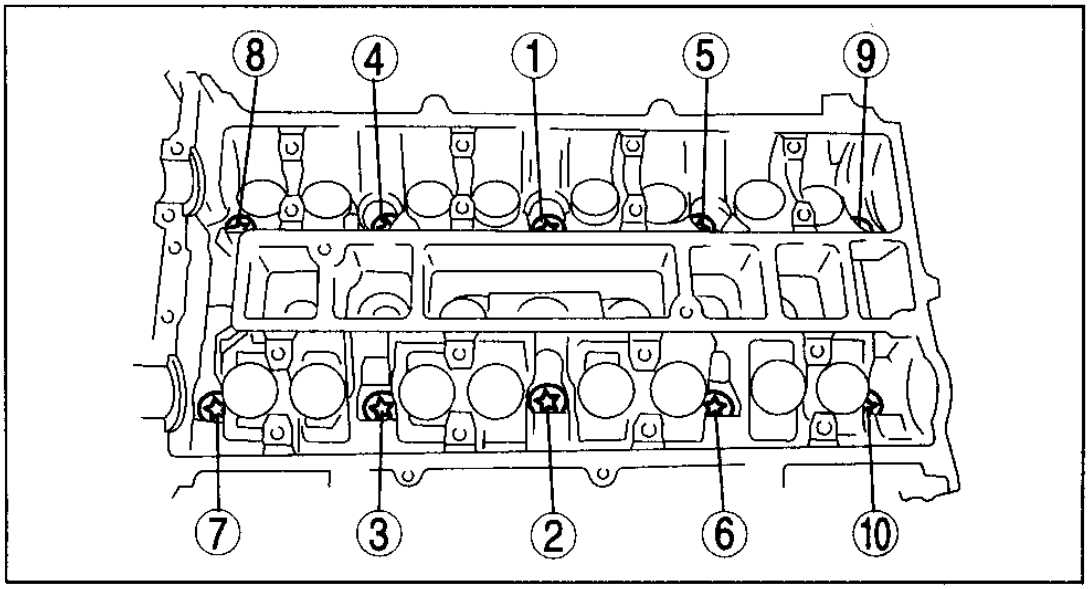
ENGINE TECHNICAL DATA

ESUD15000000E01

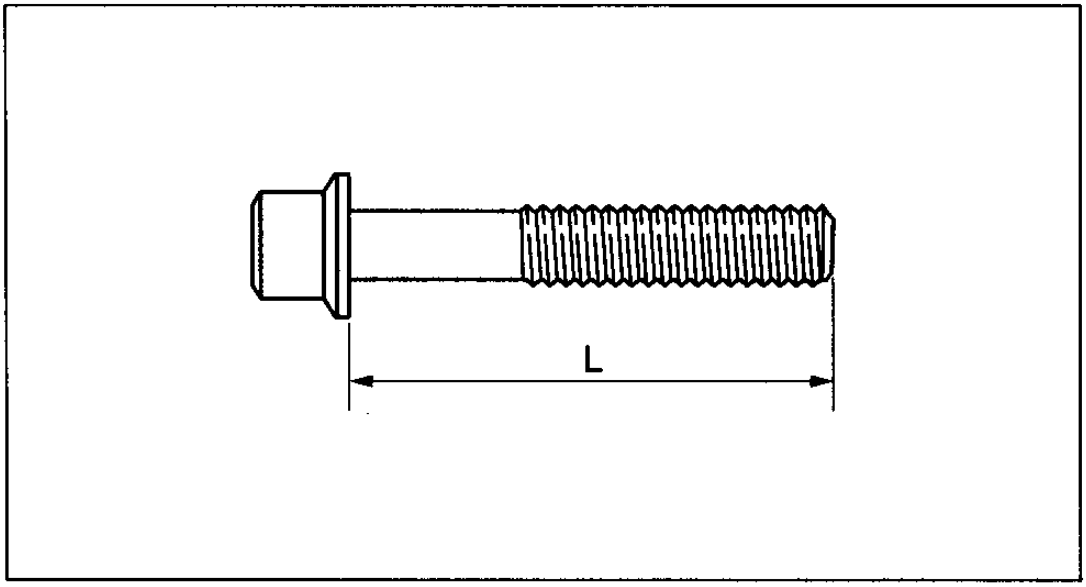
Item	Specification
Cylinder head gasket contact surface distortion (Maximum)	0.10 mm {0.004 in}
Manifold contact surfaces distortion (Maximum)	0.10 mm {0.004 in}
Manifold contact surfaces distortion (Maximum grinding)	0.15 mm {0.006 in}
Valve head margin thickness (Minimum)	IN: 1.62 mm {0.0637 in} EX: 1.82 mm {0.0716 in}
Valve length (Standard)	IN: 102.99—103.79 mm {4.055—4.086 in} EX: 104.25—105.05 mm {4.105—4.135 in}
Valve length (Minimum)	IN: 102.99 mm {4.055 in} EX: 104.25 mm {4.104 in}
Valve stem diameter (Standard)	IN: 5.470—5.485 mm {0.2154—0.2159 in} EX: 5.465—5.480 mm {0.2152—0.2157 in}
Valve stem diameter (Minimum)	IN: 5.440 mm {0.2142 in} EX: 5.435 mm {0.2140 in}
Valve guide inner diameter (Standard)	5.509—5.539 mm {0.2169—0.2180 in}
Valve stem to guide clearance (Standard)	IN: 0.024—0.069 mm {0.0009—0.0027 in} EX: 0.029—0.074 mm {0.0012—0.0029 in}
Valve stem to guide clearance (Maximum)	0.10 mm {0.004 in}
Valve guide protrusion height (standard)	12.2—12.8 mm {0.481—0.503 in}
Valve seat contact width (Standard)	1.2—1.6 mm {0.048—0.062 in}
Valve protrusion height (Standard)	IN: 40.64—42.24 mm {1.600—1.662 in} EX: 40.50—42.10 mm {1.595—1.657 in}
Valve spring pressing force	390 N {39.76 kgf, 87.67 lbf}
Valve spring standard height H	28.68 mm {1.129 in}
Valve spring out-of-square (Maximum)	1.95 mm {0.0767 in}
Maximum runout (Maximum)	0.03 mm {0.0012 in}
Camshaft standard height (mm {in})	With variable valve timing mechanism IN: 42.44 {1.671} EX: 41.18 {1.621} Without variable valve timing mechanism IN: 42.12 {1.659} EX: 41.08 {1.618}
Camshaft minimum height (mm {in})	With variable valve timing mechanism IN: 42.33 {1.666} EX: 41.06 {1.616} Without variable valve timing mechanism IN: 42.01 {1.653} EX: 40.96 {1.612}
Camshaft journal diameter (Standard)	24.96—24.98 mm {0.9827—0.9834 in}
Camshaft journal diameter (Minimum)	24.95 mm {0.982 in}
Camshaft journal oil clearance (Standard)	0.035—0.080 mm {0.0014—0.0031 in}
Camshaft journal oil clearance (Maximum)	0.09 mm {0.0035 in}
Camshaft end play (Standard)	0.09—0.24 mm {0.0035—0.0094 in}
Camshaft end play (Maximum)	0.25 mm {0.0098 in}
Tappet bore diameter (Standard)	31.000—31.030 mm {1.2205—1.2216 in}
Tappet diameter (Standard)	30.970—30.980 mm {1.2193—1.2196 in}
Tappet-to-Tappet bore oil clearance (Standard)	0.02—0.06 mm {0.0008—0.0023 in}
Tappet-to-Tappet bore oil clearance (Maximum)	0.15 mm {0.006 in}
Cylinder head gasket contact surfaces distortion (Maximum)	0.10 mm {0.004 in}
Cylinder bore diameter (Standard)	87.500—87.530 mm {3.4449—3.4460 in}

Item	Specification
Minimum / maximum bore diameter limit	87.440—87.590 mm {3.4425—3.4484 in}
Oil jet valve air pressure	216—274 kPa {2.2—2.7 kgf·cm^2 31.4—39.7 psi}
Piston diameter (Standard)	87.465—87.495 mm {3.4435—3.4446 in}
Piston-to-cylinder clearance (Standard)	0.025—0.045 mm {0.0010—0.0017 in}
Piston-to-cylinder clearance (Maximum)	0.11 mm {0.0043 in}
Piston ring-to-ring groove clearance (Standard)	Top: 0.03—0.08 mm {0.0012—0.0031 in} Second: 0.03—0.07 mm {0.0012—0.0027 in} Oil: 0.03—0.07 mm {0.0012—0.0027 in}
Piston ring-to-ring groove clearance (Maximum)	Top: 0.17 mm {0.0067 in} Second, Oil: 0.15 mm {0.0059 in}
Piston end gap (Standard)	Top: 0.16—0.31 mm {0.0063—0.0122 in} Second: 0.33—0.48 mm {0.0130—0.0189 in} Oil (rail): 0.20—0.70 mm {0.0079—0.0275 in}
Piston end gap (Maximum)	1.0 mm {0.0393 in}
Crankshaft end play (Standard)	0.22—0.45 mm {0.0087—0.0177 in}
Crankshaft end play (Maximum)	0.55 mm {0.0216 in}
Crankshaft runout (Maximum)	0.05 mm {0.0019 in}
Main journal bearing size	STD: 51.980—52.000 mm {2.0464—2.0472 in} US0.25: 51.730—51.750 mm {2.0366—2.0373 in}
Main journal out of round (Maximum)	0.05 mm {0.0019 in}
Crank pin journal diameter [LF]	STD: 46.980—47.000 mm {1.8497—1.8503 in} US0.25: 46.730—46.750 mm {1.8398—1.8405 in}
Crank pin journal diameter [L3]	STD: 49.980—50.000 mm {1.9677—1.9685 in} US0.25: 49.730—49.750 mm {1.9579—1.9586 in}
Crank pin out of round (Maximum)	0.05 mm {0.0019 in}
Main journal oil clearance (Standard)	0.019—0.035 mm {0.0007—0.0013 in}
Main journal oil clearance (Maximum)	0.10 mm {0.0039 in}
Main bearing size	STD: 2.506—2.509 mm {0.0987—0.0988 in} OS0.25: 2.628—2.634 mm {0.1034—0.1037 in}
Connecting rod side clearance (Standard)	0.14—0.36 mm {0.0056—0.0141 in}
Connecting rod side clearance (Maximum)	0.435 mm {0.0172 in}
Connecting rod bearing oil clearance (Standard)	0.026—0.052 mm {0.0011—0.0020 in}
Connecting rod bearing oil clearance (Maximum)	0.1 mm {0.0039 in}
Connecting rod bearing size [LF]	STD: 1.498—1.504 mm {0.0589—0.0592 in} OS0.25: 1.623—1.629 mm {0.0639—0.0641 in}
Connecting rod bearing size [L3]	STD: 1.496—1.502 mm {0.0589—0.0591 in} OS0.25: 1.621—1.627 mm {0.0639—0.0641 in}
Bolt length (mm {in})	Cylinder head bolt (With washer) Standard: 149.2—149.8 {5.87—5.90} Maximum: 150.5 {5.91} Cylinder head bolt (Without washer) Standard: 145.2—145.8 {5.72—5.74} Maximum: 146.5 {5.77} Connecting rod bolt Standard: 44.7—45.3 {1.75—1.78} Maximum: 46.0 {1.81} Main bearing cap bolt (Plastic region tightening bolt only) Standard: 110.0—110.6 {4.33—4.35} Maximum: 111.3 {4.38}
Valve clearance [Engine cold]	IN: 0.22—0.28 mm {0.0087—0.0110 in} EX: 0.27—0.33 mm {0.0106—0.0130 in}
Value range	0.005—0.101 mm {0.00019—0.0039 in}

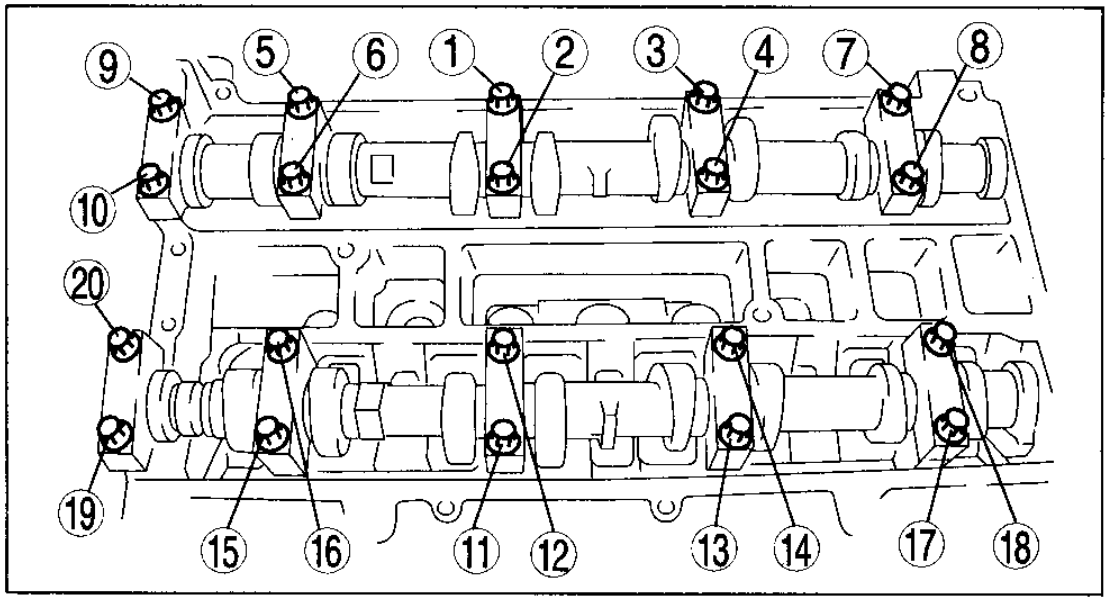
Tightening Torques (Article 1392162)



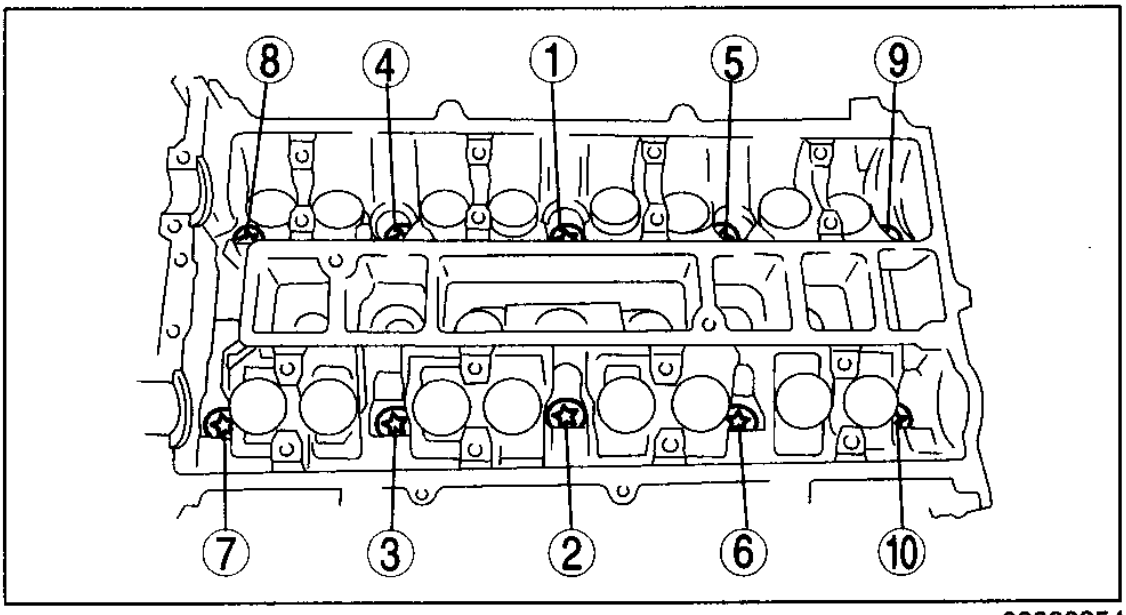
am3uuw0000129



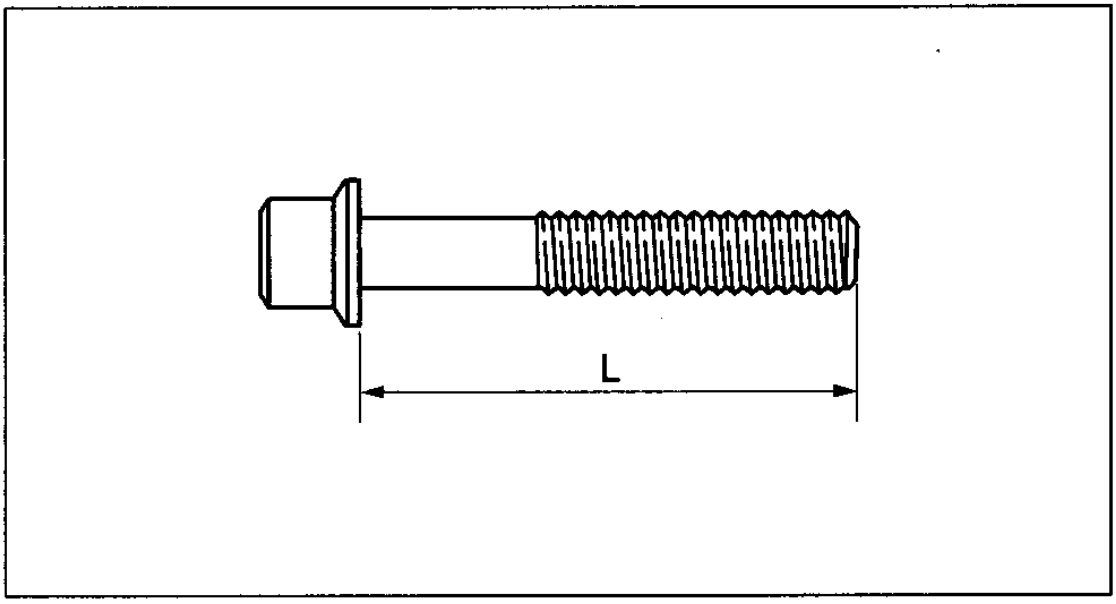
am3uuw0000129



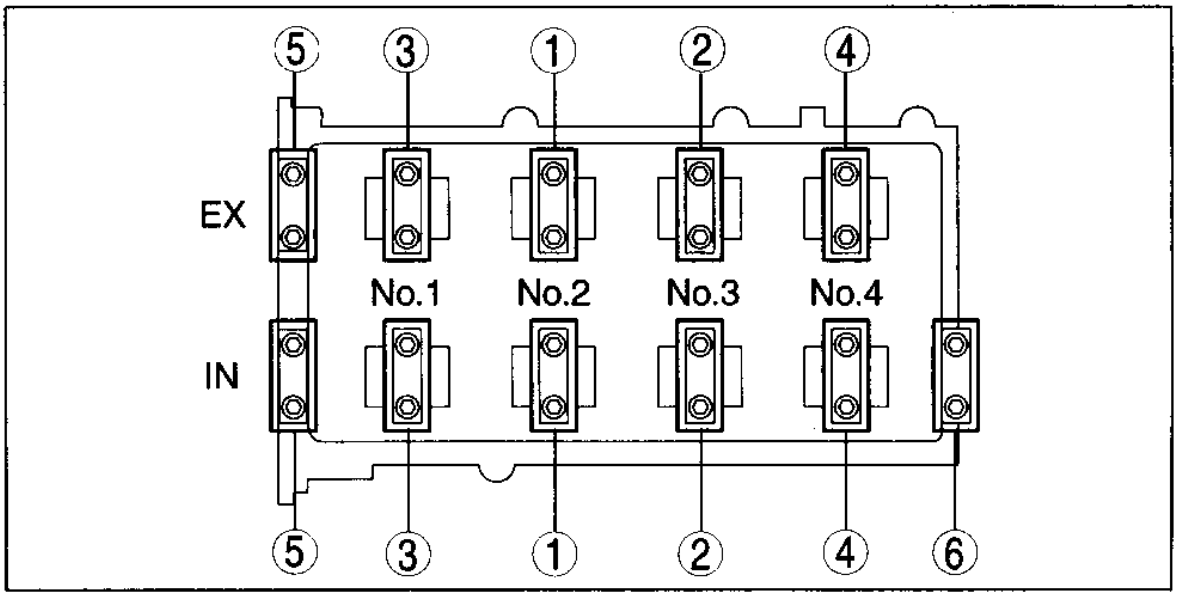
am3uuw0000129



acxuuw00000254



acxuuw00000253



acxuuw00000256

All Technical Service Bulletins (itype_100)

Tsbs
- Engine - Correct Oil Filter Wrench Applications (MTIP-08-03-3, 2008/03/01)
- Engine - Vibration At Cruising Speeds (55 MPH) (0300310, 2010/06/30)
- Engine/Body - Engine Undercover Removal Precautions (0900211, 2011/01/27)
- Engine - Camshaft Timing Information (MTIP-07-12-5, 2007/12/01)
- Engine - VVT Noise At Engine Start Up (0101011, 2011/12/21)
- Computers/Controls KAM Memory Clearing After VVT R & R (MTIP-09-01-3, 2009/01/01)
- Engine - Knocking Noise On Start Up/Shut Down (0100310, 2010/01/07)
- Engine - Noise Diagnostic Information (0105309, 2009/12/01)
- Engine - Component/Engine Replacement Guidelines (0104209, 2009/09/22)
- WATER PUMP COOLANT LEAK (01-022/19, 2019/12/13)
- Engine - Front Crankshaft Bolt Service Precautions (0104007, 2007/10/03)
- Engine - Drive Belt Squeal After Driving Through Water (MTIP-08-09-3, 2008/09/01)
- Body - Engine Compartment Shroud Appearance (0903409, 2009/07/10)
- Engine - MIL ON/DTC P2004 Set (0101209, 2009/04/09)
- Engine - Oil Filter Element Replacement Precautions (0103508, 2008/07/07)
- Engine - Revised Oil Pan Removal/Installtion (0101309, 2009/04/16)
- Engine - Engine Mount Bolt Torque Specification (0104709, 2009/10/30)

Customer Interest Bulletins (itype_109)

Tsbs
- Engine - Vibration At Cruising Speeds (55 MPH) (0300310, 2010/06/30)
- Engine - Knocking Noise On Start Up/Shut Down (0100310, 2010/01/07)
- Engine - VVT Noise At Engine Start Up (0101011, 2011/12/21)
- Engine - MIL ON/DTC P2004 Set (0101209, 2009/04/09)

Repair Tips (itype_110)

Tsbs
- Engine - Correct Oil Filter Wrench Applications (MTIP-08-03-3, 2008/03/01)
- Engine/Body - Engine Undercover Removal Precautions (0900211, 2011/01/27)
- Engine - Noise Diagnostic Information (0105309, 2009/12/01)
- Engine - Component/Engine Replacement Guidelines (0104209, 2009/09/22)
- Engine - Front Crankshaft Bolt Service Precautions (0104007, 2007/10/03)
- Engine - Drive Belt Squeal After Driving Through Water (MTIP-08-09-3, 2008/09/01)
- Engine - Camshaft Timing Information (MTIP-07-12-5, 2007/12/01)
- Body - Engine Compartment Shroud Appearance (0903409, 2009/07/10)

- Engine - Oil Filter Element Replacement Precautions (0103508, 2008/07/07)
- Computers/Controls KAM Memory Clearing After VVT R & R (MTIP-09-01-3, 2009/01/01)
- Engine - Engine Mount Bolt Torque Specification (0104709, 2009/10/30)

Component Tests and General Diagnostics (itype_383)

Intake Manifold
Vacuum Inspection
1. Verify air intake hoses are installed properly.
2. Start the engine and run it at idle.
3. Disconnect the vacuum hose between the intake manifold and purge solenoid valve from the intake manifold side.
4. Connect a vacuum gauge to the intake manifold and measure the intake manifold vacuum.
- If not as specified, inspect the following:
Specification (LF)
ATX: More than 55 kPa {413 mmHg, 16 inHg}
MTX: More than 57 kPa {428 mmHg, 17 inHg}
Specification (L3)
ATX: More than 57 kPa {428 mmHg, 17 inHg}
MTX: More than 60 kPa {451 mmHg, 18 inHg}
NOTE:
Air suction can be located by engine speed change when lubricant is sprayed on the area where suction is occurring.
- Air suction at throttle body, intake manifold and PCV valve installation points
- EGR valve (stuck open)
- Fuel injector insulator
- Engine compression (See COMPRESSION INSPECTION [LF, L3].)

Symptom Related Diagnostic Procedures (itype_381)

NO.16 HIGH OIL CONSUMPTION/LEAKAGE[LF, L3]

id0103a6802200

16	HIGH OIL CONSUMPTION/LEAKAGE
DESCRIPTION	Oil consumption is excessive.
POSSIBLE CAUSE	• PCV valve malfunction • Improper dipstick • Improper engine oil viscosity • Engine internal parts malfunction

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Remove and shake the PCV valve. Does the PCV valve rattle?	Yes	Go to the next step.
		No	Replace the PCV valve.
2	Inspect for the following: • External leakage • Proper dipstick • Proper engine oil viscosity Are all items normal?	Yes	Inspect the internal engine parts such as valves, valve guides, valve stem seals, cylinder head drain passage, and piston rings.
		No	Service if necessary. Repeat Step 2.
3	• Verify test results. — If normal, return to diagnostic index to service any additional symptoms. (See ENGINE SYMPTOM TROUBLESHOOTING[LF, L3].) — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If vehicle is repaired, troubleshooting completed. • If vehicle is not repaired or additional diagnostic information is not available, replace the PCM.		

NO.21 ENGINE NOISE[LF, L3]

id0103a6802700

21	ENGINE NOISE
DESCRIPTION	Engine noise from under hood
POSSIBLE CAUSE	**Squeal, click or chirp noise:** • Improper engine oil level • Improper drive belt tension • Generator installation (alignment) • Splash shield or under cover looseness (splashed water to drive belts) **Rattle sound noise:** • Loose parts **Hiss sound noise:** • Vacuum leakage • Loose spark plug • Air leakage from intake-air system **Rumble or grind noise:** • Improper drive belt tension • Improper P/S fluid level **Rap or roar noise:** • Dynamic dumper looseness • Exhaust system looseness • Intake-air system looseness **Other noise:** • Camshaft friction gear noise or MLA noise • Timing chain noise

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is a squealing, click or chirping sound present?	Yes	Inspect for the followings: • Engine oil level • Drive belt tension • Splash shield or under cover looseness • Generator installation (alignment)
		No	Go to the next step.
2	Is a rumbling or grinding noise present?	Yes	Inspect for the followings: • Drive belt tension • P/S fluid level
		No	Go to the next step.
3	Is a rattling noise present?	Yes	Inspect rattling location for loose parts.
		No	Go to the next step.
4	Is a hissing noise present?	Yes	Inspect for the following: • Vacuum leakage • Spark plug looseness • Intake-air system leakage
		No	Go to the next step.
5	Is a rapping or roar noise present?	Yes	Inspect looseness for followings: • Dynamic dumper • Intake-air system • Exhaust system
		No	Go to the next step.
6	Is a knocking noise present?	Yes	Go to symptom troubleshooting "No.11 Knocking/pinging". (See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE[LF, L3].)
		No	If the noise comes from the engine internal, inspect for friction gear, timing chain or MLA noise.
7	• Verify test results. — If normal, return to diagnostic index to service any additional symptoms. (See ENGINE SYMPTOM TROUBLESHOOTING[LF, L3].) — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If vehicle is repaired, troubleshooting completed. • If vehicle is not repaired or additional diagnostic information is not available, replace the PCM.		

NO.22 VIBRATION CONCERNS (ENGINE)[LF, L3]

id0103a6802800

22	VIBRATION CONCERNS (ENGINE)
DESCRIPTION	• Vibration from under hood or driveline
POSSIBLE CAUSE	• Loose attaching bolts or worn parts • Components malfunction such as worn parts

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect the following components for loose attaching bolts or worn parts: • Cooling fan • Drive belt and pulleys • Generator • Engine mounts • Exhaust system mounts All items normal?	Yes	Inspect the following systems: • Wheels • ATX • Driveline • Suspension
		No	Readjust or retighten engine mount installation position. Service if necessary for other parts.
2	• Verify test results. — If normal, return to diagnostic index to service any additional symptoms. (See ENGINE SYMPTOM TROUBLESHOOTING[LF, L3].) — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If vehicle is repaired, troubleshooting completed. • If vehicle is not repaired or additional diagnostic information is not available, replace the PCM.		

16	HIGH OIL CONSUMPTION/LEAKAGE
DESCRIPTION	Oil consumption is excessive.
POSSIBLE CAUSE	• PCV valve malfunction • Improper dipstick • Improper engine oil viscosity • Engine internal parts malfunction

Diagnostic procedure

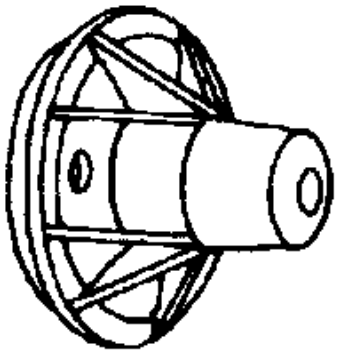
STEP	INSPECTION	RESULTS	ACTION
1	Remove and shake the PCV valve. Does the PCV valve rattle?	Yes	Go to the next step.
		No	Replace the PCV valve.
2	Inspect for the following: • External leakage • Proper dipstick • Proper engine oil viscosity Are all items normal?	Yes	Inspect the internal engine parts such as valves, valve guides, valve stem seals, cylinder head drain passage, and piston rings.
		No	Service if necessary. Repeat Step 2.
3	• Verify test results. — If normal, return to diagnostic index to service any additional symptoms. (See SYMPTOM DIAGNOSTIC INDEX [LF, L3].) — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If vehicle is repaired, troubleshooting completed. • If vehicle is not repaired or additional diagnostic information is not available, replace the PCM.		

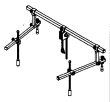
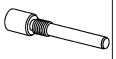
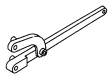
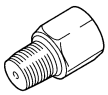
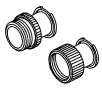
Engine SST (Article 1416891)

Example

1:49 UN30 3328
2:303–328

Rear oil seal replacer



1:49 C017 5A0 2: – Engine support set 	1:49 H010 401 2: – Oil seal installer 	1: 49 N013 103A 2:– Remover (Part of 49 N013 1A0D) 
1: – 2:303–507 Crankshaft TDC setting peg 	1:49 UN20 5072 2:205–072 Holder 	1:49 B011 105 2: – Adapter 
1:49 D032 316 2: – Protractor 	1:49 UN30 3465 2:303–465 Camshaft Alignment Timing Tool 	1:49 E042 001 2:– Remover 
1:49 0187 280A 2: – Oil pressure gauge 	1:49 E019 001 2:– Adapter 	1:49 F042 001 2: – Wrench 
1:49 B015 0A0 2:– Adapter set 	1:49 D015 001 2:– Box wrench 	1:49 L018 001 2: – HO2S wrench 
1:49 N013 1A0D 2:– Fuel pressure gauge set 	1: – 2:134-01049 Evaporative emission system tester 	1:49 UN30 3328 2:303–328 Rear oil seal replacer 

Leaks (itype_149)

Tsbs
- WATER PUMP COOLANT LEAK (01-022/19, 2019/12/13)

Noise (itype_156)

Tsbs
- Engine - Knocking Noise On Start Up/Shut Down (0100310, 2010/01/07)
- Engine - VVT Noise At Engine Start Up (0101011, 2011/12/21)

Vibration (itype_176)

Tsbs
- Engine - Vibration At Cruising Speeds (55 MPH) (0300310, 2010/06/30)

New / Updated Parts (itype_117)

Tsbs
- Engine - Vibration At Cruising Speeds (55 MPH) (0300310, 2010/06/30)
- Engine - Knocking Noise On Start Up/Shut Down (0100310, 2010/01/07)
- Engine - MIL ON/DTC P2004 Set (0101209, 2009/04/09)
- Engine - Revised Oil Pan Removal/Installtion (0101309, 2009/04/16)

Service Manual Updates (itype_115)

Tsbs
- Engine - Revised Oil Pan Removal/Installtion (0101309, 2009/04/16)

Tools and Equipment (itype_113)

Tsbs
- Engine - Correct Oil Filter Wrench Applications (MTIP-08-03-3, 2008/03/01)
- Engine - Camshaft Timing Information (MTIP-07-12-5, 2007/12/01)
- Engine - Oil Filter Element Replacement Precautions (0103508, 2008/07/07)