ENGINE
4G1 SERIES

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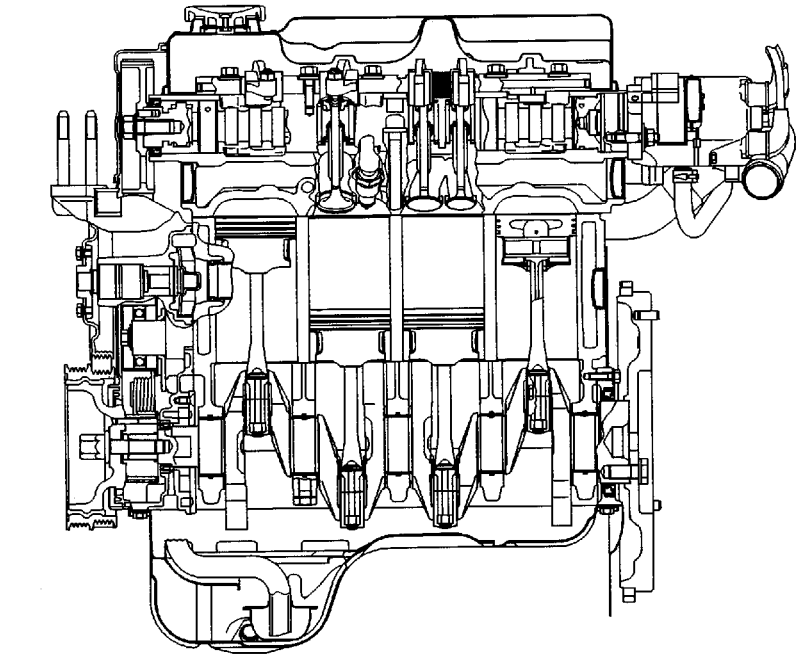
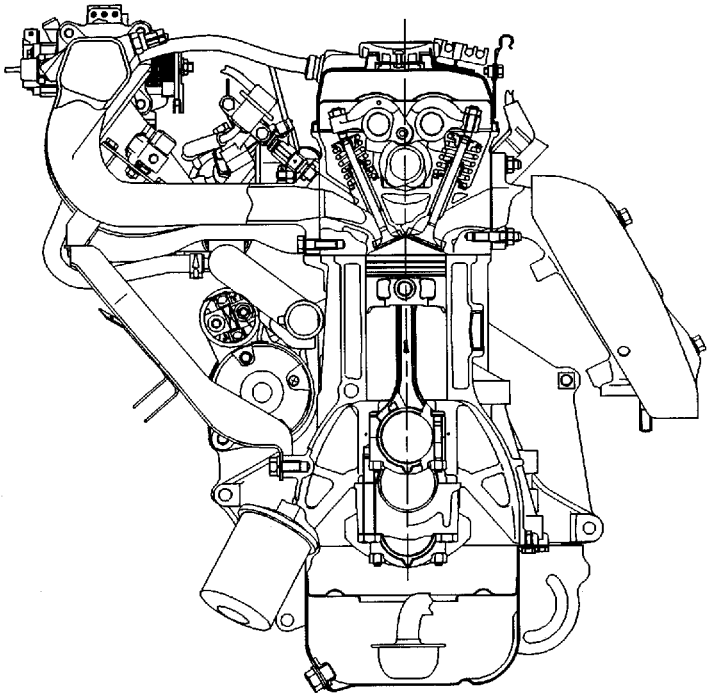
NOTES

GENERAL INFORMATION





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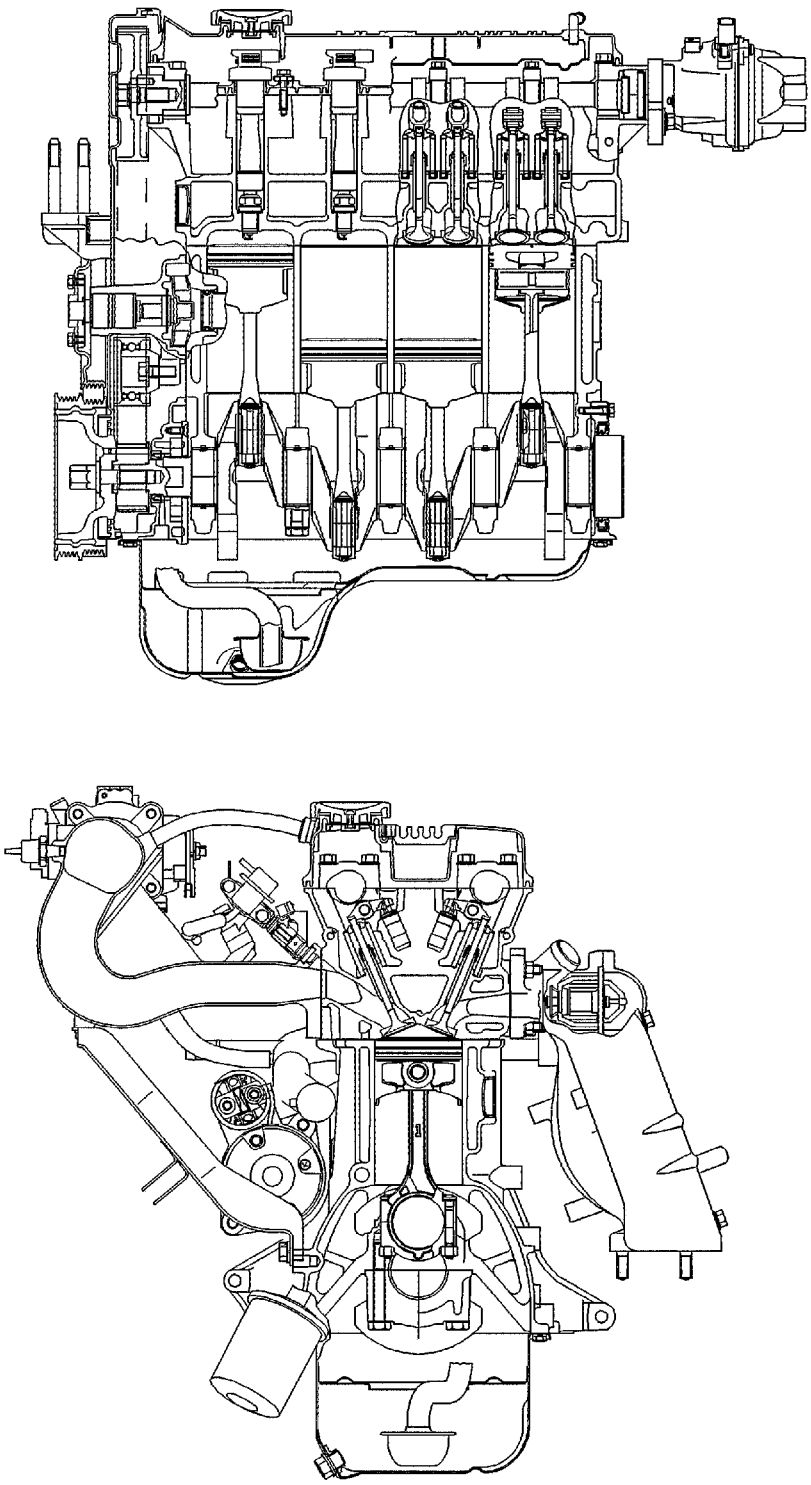

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Descriptions		4G13 12-VALVE-CARBURETOR	4G13 12-VALVE-MPI
Type		In-line OHV, SOHC	In-line OHV, SOHC
Number of cylinders		4	4
Combustion chamber		Pentroof type	Pentroof type
Total displacement dm^3		1,299	1,299
Cylinder bore mm		71.0	71.0
Piston stroke mm		82.0	82.0
Compression ratio		9.5	9.5
Number of valves	Intake	8	8
	Exhaust	4	4
Valve timing	Intake opens	BTDC 14°	BTDC 19°
	Intake closes	ABDC 48°	ABDC 43°
	Exhaust opens	BBDC 55°	BBDC 60°
	Exhaust closes	ATDC 13°	ATDC 8°
Lubrication system		Pressure feed, full-flow filtration	Pressure feed, full-flow filtration
Oil pump type		Trochoid type	Trochoid type
Cooling system		Water-cooled, forced circulation	Water-cooled, forced circulation
Water pump type		Centrifugal impeller type	Centrifugal impeller type

Descriptions		4G13 16-VALVE–CARBURETOR	4G13 16-VALVE–MPI
Type		In-line OHV, SOHC	In-line OHV, SOHC
Number of cylinders		4	4
Combustion chamber		Pentroof type	Pentroof type
Total displacement dm^3		1,299	1,299
Cylinder bore mm		71.0	71.0
Piston stroke mm		82.0	82.0
Compression ratio		9.5	10, 9.5*1
Number of valves	Intake	8	8
	Exhaust	8	8
Valve timing	Intake opens	BTDC 12°	BTDC 17°
	Intake closes	ABDC 48°	ABDC 39°
	Exhaust opens	BBDC 48°	BBDC 49°
	Exhaust closes	ATDC 12°	ATDC 7°
Lubrication system		Pressure feed, full-flow filtration	Pressure feed, full-flow filtration
Oil pump type		Trochoid type	Trochoid type
Cooling system		Water-cooled, forced circulation	Water-cooled, forced circulation
Water pump type		Centrifugal impeller type	Centrifugal impeller type

*1: LANCER for General Export

Descriptions		4G15–CARBURETTOR	4G15–MPI 12-VALVE	4G15–MPI 16-VALVE	4G15–GDI
Type		In-line OHV, SOHC	In-line OHV, SOHC	In-line OHV, DOHC	In-line OHV, DOHC
Number of cylinders		4	4	4	4
Combustion chamber		Semi spherical type	Semi spherical type	Pentroof type	Pentroof + Curved piston head
Total displacement dm^3		1,468	1,468	1,468	1,468
Cylinder bore mm		75.5	75.5	75.5	75.5
Piston stroke mm		82.0	82.0	82.0	82.0
Compression ratio		9.0	9.0	9.5	11.0
Number of valves	Intake	8	8	8	8
	Exhaust	4	4	8	8
Valve timing	Intake opens	BTDC 14°	BTDC 14° , BTDC 13°*1	BTDC 16°	BTDC 12°
	Intake closes	ABDC 48°	ABDC 48° , ABDC 47°*1	ABDC 40°	ABDC 44°
	Exhaust opens	BBDC 55°	BBDC 55° , BBDC 56°*1	BBDC 45°	BBDC 48°
	Exhaust closes	ATDC 13°	ATDC 13° , ATDC 8°*1	ATDC 15°	ATDC 12°
Lubrication system		Pressure feed, full-flow filtration	Pressure feed, full-flow filtration	Pressure feed, full-flow filtration	Pressure feed, full-flow filtration
Oil pump type		Trochoid type	Trochoid type	Trochoid type	Trochoid type
Cooling system		Water-cooled, forced circulation	Water-cooled, forced circulation	Water-cooled, forced circulation	Water-cooled, forced circulation
Water pump type		Centrifugal impeller type	Centrifugal impeller type	Centrifugal impeller type	Centrifugal impeller type

*1: Special low-emission engines on vehicles for Australia

Descriptions		4G18 16-VALVE–CARBURETOR	4G18 16-VALVE–MPI
Type		In-line OHV, SOHC	In-line OHV, SOHC
Number of cylinders		4	4
Combustion chamber		Pentroof type	Pentroof type
Total displacement dm^3		1,584	1,584
Cylinder bore mm		76.0	76.0
Piston stroke mm		87.3	87.3
Compression ratio		9.5	9.5, 10*1*2
Number of valves	Intake	8	8
	Exhaust	8	8
Valve timing	Intake opens	BTDC 12°	BTDC 17° , BTDC 9°*1 , BTDC 17°*2
	Intake closes	ABDC 48°	ABDC 39° , ABDC 51°*1 , ABDC 43°*2
	Exhaust opens	BBDC 48°	BBDC 49° , BBDC 49°*1 , BBDC 53°*2
	Exhaust closes	ATDC 12°	ATDC 7° , ATDC 15°*1 , ATDC 7°*2
Lubrication system		Pressure feed, full-flow filtration	Pressure feed, full-flow filtration
Oil pump type		Trochoid type	Trochoid type
Cooling system		Water-cooled, forced circulation	Water-cooled, forced circulation
Water pump type		Centrifugal impeller type	Centrifugal impeller type

*1: SPACE STAR for Europe
*2: LANCER for General Export

1. SPECIFICATIONS

SERVICE SPECIFICATIONS

Item			Standard	Limit
Rocker arms and camshaft				
Camshaft cam height mm	SOHC 12-VALVE	Intake (primary)	38.78	38.28
		Intake (secondary)	38.78	38.28
		Exhaust*1	39.01	38.51
		Exhaust*2	38.97	38.47
	SOHC 16-VALVE*3	Intake	36.99	36.49
		Exhaust	36.85	36.35
	SOHC 16-VALVE*4	Intake	36.86	36.36
		Exhaust	36.68	36.18
	SOHC 16-VALVE*5	Intake	37.30	36.80
		Exhaust	37.16	36.66
	SOHC 16-VALVE*6	Intake	37.17	36.67
		Exhaust	36.99	36.49
	DOHC	Intake	34.67	34.17
		Exhaust	34.26	33.76
	DOHC GDI	Intake	34.85	34.35
		Exhaust	34.59	34.09
Camshaft journal diameter mm		SOHC	45.93–45.94	–
		SOHC 16-VALVE*7	44.93–44.94	–
		DOHC	25.95–25.97	–
Cylinder head and valves				
Flatness of cylinder head gasket surface mm			0.05 or less	–
Cylinder head gasket surface grinding limit (including grinding of cylinder block gasket surface) mm			–	0.2
Cylinder head overall height mm		SOHC 12-VALVE	106.9–107.1	–
		SOHC 16-VALVE	119.9–120.1	–
		DOHC	131.9–132.1	–
Cylinder head bolt nominal length mm			–	103.2
Valve margin mm		Intake	1.0	0.5
		Exhaust	1.5	1.0
Valve stem diameter mm		SOHC 12-VALVE	6.6	–
		SOHC 16-VALVE	5.5	–
		DOHC	5.5	–

*1: With low pollution system
*2: Without low pollution system
*3: Except 2001 model front wheel drive vehicles
*4: 2001 model front wheel drive vehicles for Europe
*5: 2001 model front wheel drive vehicles for General Export
*6: 2002 model front wheel drive vehicles for Europe
*7: SOHC 16-VALVE MPI for Europe

Item			Standard	Limit
Valve stem-to-guide clearance mm	SOHC 12-VALVE	Intake	0.020–0.050	0.10
		Exhaust	0.035–0.050	0.15
	SOHC 16-VALVE	Intake	0.020 – 0.047	0.10
		Exhaust	0.030 – 0.057	0.15
	DOHC	Intake	0.020–0.047	0.10
		Exhaust	0.030–0.062	0.15
Valve face angle			45°–45.5°	–
Valve stem projection mm	SOHC 12-VALVE	Intake	43.70	44.20
		Exhaust	43.30	43.80
	SOHC 16-VALVE	Intake	53.21	53.71
		Exhaust	54.10	54.60
	DOHC	Intake	48.80	49.30
		Exhaust	48.70	49.20
Overall valve length mm	SOHC 12-VALVE	Intake	100.75	100.25
		Exhaust	101.05	105.55
	SOHC 16-VALVE	Intake	111.56	111.06
		Exhaust	114.71	114.21
	DOHC	Intake	106.35	105.85
		Exhaust	106.85	106.35
Valve spring free height mm	SOHC 12-VALVE	Intake	46.1	45.6
		Exhaust	46.8	46.3
	SOHC 16-VALVE		50.9	50.4
	DOHC		49.1	48.6
Valve spring load/ installed height N/ mm	SOHC 12-VALVE	Intake	226/40.0	–
		Exhaust	284/39.6	–
	SOHC 16-VALVE		216/44.2	–
	DOHC		177/40.0	–
Valve spring squareness			2°	4°
Valve seat contact width mm			0.9–1.3	–
Valve guide internal diameter mm		SOHC 12-VALVE	6.6	–
		SOHC 16-VALVE	5.5	–
		DOHC	5.5	–
Valve guide projection mm		SOHC 12-VALVE	17.0	–
		SOHC 16-VALVE	23.0	–
		DOHC	23.0	–
Oil pump and oil pan				
Oil pump tip clearance mm			0.03–0.08	–
Oil pump side clearance mm			0.04–0.10	–
Oil pump body clearance mm			0.10–0.18	0.35

Item			Standard	Limit
Pistons and connecting rods				
Piston outside diameter mm		4G13	71.0	–
		4G15	75.5	–
		4G18	76.0	–
Piston ring side clearance mm		No. 1 ring	0.03–0.07	–
		No. 2 ring	0.02–0.06	–
Piston ring end gap clearance	No. 1 ring	4G13, 4G18	0.20–0.35	0.8
		4G15	0.15–0.35	0.8
	No. 2 ring	4G13, 4G18	0.35–0.50	0.8
		4G15	0.35–0.55	0.8
	Oil ring	4G13, 4G15	0.20–0.50	1.0
		4G18	0.10–0.40	1.0
Piston pin O. D. mm			18.0	–
Piston pin press-in load (at room temperature) N			4,900–14,700	–
Crankshaft pin oil clearance mm			0.02–0.04	0.1
Connecting rod big end side clearance mm			0.10–0.25	0.4
Crankshaft and cylinder block				
Crankshaft end play mm			0.05–0.18	0.25
Crankshaft journal diameter mm			48.0	–
Crankshaft pin diameter mm			42.0	–
Crankshaft journal oil clearance mm			0.02–0.04	0.1
Cylinder block gasket surface flatness mm			0.05 or less	–
Cylinder block gasket surface grinding limit (including grinding of cylinder head gasket surface) mm			–	0.2
Cylinder block overall height mm			256	–
Cylinder bore cylindricity mm			0.01	–
Cylinder bore I. D. mm		4G13	71.0	–
		4G15	75.5	–
		4G18	76.0	–
Piston-to-cylinder clearance mm			0.02–0.04	–

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REWORK DIMENSIONS

Item				Standard	Limit
Cylinder head and valves					
Cylinder head oversize valve guide hole diameter mm		SOHC 12-VALVE	0.05 O. S.	12.040–12.058	–
			0.25 O. S.	12.240–12.258	–
			0.50 O. S.	12.490–12.508	–
		SOHC 16-VALVE	0.05 O. S.	10.550–10.568	–
			0.25 O. S.	10.750–10.768	–
			0.50 O. S.	11.000–11.018	–
		DOHC	0.05 O. S.	10.550–10.568	–
			0.25 O. S.	10.750–10.768	–
			0.50 O. S.	11.000–11.018	–
		DOHC GDI	0.05 O. S.	10.610–10.620	–
			0.25 O. S.	10.810–10.820	–
			0.50 O. S.	11.060–11.070	–
Oversize valve seat ring hole diameter mm	SOHC 12-VALVE	Intake (primary)	0.3 O. S.	27.300–27.325	–
			0.6 O. S.	27.600–27.625	–
		Intake (secondary)	0.3 O. S.	32.300–32.325	–
			0.6 O. S.	32.600–32.625	–
		Exhaust	0.3 O. S.	35.300–35.325	–
			0.6 O. S.	35.600–35.625	–
	SOHC 16-VALVE <4G13>	Intake	0.3 O. S.	28.300–28.321	–
			0.6 O. S.	28.600–28.621	–
		Exhaust	0.3 O. S.	26.300–26.321	–
			0.6 O. S.	26.600–26.621	–
	SOHC 16-VALVE <4G18>	Intake	0.3 O. S.	30.300–30.321	–
			0.6 O. S.	30.600–30.621	–
		Exhaust	0.3 O. S.	28.300–28.321	–
			0.6 O. S.	28.600–28.621	–
	DOHC	Intake	0.3 O. S.	31.300–31.325	–
			0.6 O. S.	31.600–31.625	–
		Exhaust	0.3 O. S.	27.800–27.825	–
			0.6 O. S.	28.100–28.125	–

TORQUE SPECIFICATIONS

Item	Nm
Alternator and ignition system	
Water pump pulley bolt	9
Alternator brace bolt (alternator side)	22
Alternator brace bolt (tightened with water pump)	23
Alternator pivot bolt	44
Oil level gauge guide bolt (Flange)	23
Oil level gauge guide bolt (Washer)	19
Crankshaft bolt (M12)	125
Crankshaft bolt (M14)	181
Spark plug	25
Distributor bolt	11
Ignition coil bolt	10
Ignition failure sensor bolt	5
Camshaft position sensor bolt	9
Camshaft position sensor support bolt	13
Camshaft position sensing cylinder bolt	21
Timing belt	
Timing belt cover bolt	11
Timing belt tensioner bolt	23
Crankshaft angle sensor bolt	9
Bracket bolt	21
Engine support bracket bolt (M8)	21
Engine support bracket bolt, nut (M10)	35
Idler pulley bolt	35
Camshaft sprocket bolt	88
Fuel and emission control system	
Vacuum pipe & hose bolt	9
Delivery pipe bolt	11
Fuel pressure regulator bolt	9
Throttle body bolt	18
Hose clamp bolt	10
Fuel pump bolt (SOHC 12-VALVE–CARBURETOR)	12
Fuel pump bolt (SOHC 16-VALVE–CARBURETOR)	19
Breather tube clamp bolt	22
Carburetor bolt	17
Air temperature sensor	13
Cover bolt (Except M8 × 16)	12

Item	Nm
Cover bolt (M8 × 16)	18
EGR valve bolt	21

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Item	Nm
Intake manifold and throttle body (GDI)	
Accelerator cable bolt	10
Throttle body bolt	19
Air intake plenum resonator bolt	10
Power plant stay right bolt	49
Intake manifold stay bolt	30
EGR valve bolt	19
EGR valve support bolt	19
EGR valve support nut	24
Intake manifold bolt, nut	20
Exhaust manifold (GDI)	
Oxygen sensor	44
Exhaust manifold cover bolt	30
Exhaust manifold bracket bolt	35
Exhaust manifold nut (M8)	18
Exhaust manifold nut (M10)	29
Power plant stay left bolt	35
Water pump and water hose	
Water inlet fitting bolt	22
Water inlet pipe bolt (M8)	12
Water inlet pipe bolt (M10)	25
Fitting bolt	23
Water outlet fitting bolt (Front wheel drive)	23
Water outlet fitting bolt (Rear wheel drive)	18
Thermostat case bolt	23
Thermo valve	27
Engine coolant temperature gauge unit	11
Engine coolant temperature sensor	29
Water pump bolt	13
Exhaust manifold and intake manifold	
Boost sensor bolt	5
Solenoid valve assembly bolt	9
Intake manifold bolt, nut	17
Intake manifold stay bolt <MPI> (M8)	17
Intake manifold stay bolt <MPI> (M10)	31
Intake manifold stay bolt <carburetor>	30
Engine hanger bolt	19
Exhaust manifold cover bolt	29

Item	Nm
Exhaust manifold nut (M8)	17
Exhaust manifold nut (M10)	29
Exhaust manifold bracket A bolt	35
Exhaust manifold bracket B bolt	35
Power plant stay right bolt	49
Power plant stay left bolt	35
Oxygen sensor	44
Fuel system (GDI)	
Fuel pipe bolt	12
Fuel pump bolt	4.9 → 17 ± 2
Flange bolt	24
Harness bracket bolt	9.8
Injector holder bolt	23
Delivery pipe and injector bolt	12
Rocker arms and camshaft	
Fuel pump cover bolt	12
Rocker cover bolt <SOHC>	3.5
Rocker cover bolt <DOHC>	4
Rocker shaft assembly bolt	31
Adjusting screw	15
Bearing cap bolt (M6)	11
Bearing cap bolt (M8)	24
Rocker arms and camshaft (GDI)	
Engine hanger bolt	19
Rocker cover bolt	3.5
Beam camshaft cap bolt (M6)	11
Beam camshaft cap bolt (M8)	25
Cylinder head and valves	
Cylinder head bolt Tighten to 49 Nm, then completely loosen and retighten as described.	20 + 90° + 90°
Oil pump and oil pan	
Transmission stay bolt	23
Oil pan bolt (M6)	7
Oil pan bolt (M8)	24
Drain plug	39
Oil screen bolt	19
Front case bolt	14
Relief plug	44

Item	Nm
Oil pump cover bolt	10
Pistons and connecting rods	
Connecting rod nut	17 → + 90° to 94°
Crankshaft and cylinder block	
Flywheel bolt	132
Drive plate bolt <Except GDI>	132
Drive plate bolt <GDI>	98
Rear plate bolt	10
Bell housing cover bolt	10
Rear oil seal case bolt	11
Bearing cap bolt	34 → + 30° to 34°
Oil pressure switch	19
Knock sensor	23

NEW TIGHTENING METHOD USING PLASTIC REGION TIGHTENING BOLTS

Parts of the engine use plastic region tightening bolts. The tightening procedure for these is different from that of conventional bolts and is described in relevant parts of this manual. Note that plastic region tightening bolts have fixed service limits. These limits are indicated in relevant parts of this manual and must be strictly observed.

- Plastic region tightening bolts are used for the following applications:
  (1) Cylinder head bolts
  (2) Connecting rod cap bolts
  (3) Bearing cap bolt
- The tightening procedure is basically as follows:
  After tightening a bolt to the specified torque, tighten it by a further 90° + 90°, 90°–100°or 30°–34°. The exact tightening procedure differs depending on the bolt and is described in relevant parts of this manual.

SEALANTS

Item	Specified sealant	Quantity
Cam position sensor support	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Water pump	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Thermo valve	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Thermostat housing	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Water outlet fitting	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Engine coolant temperature sensor	3M Nut Locking Part No. 4171 or equivalent	As required
Engine coolant temperature gauge unit	3M ATD Part No. 8660 or equivalent	As required
Camshaft bearing cap	3M ATD Part No. 8660 or equivalent	As required
Semi-circular packing	3M ATD Part No. 8660 or equivalent	As required
Rocker cover	3M ATD Part No. 8660 or equivalent	As required
Beam camshaft cap	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil pump case	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil pan	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil pressure switch	3M ATD Part No. 8660 or equivalent	As required
Rear oil seal case	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Drive plate bolt	3M Nut Locking Part No. 4171 or equivalent	As required

FORM-IN-PLACE GASKET

The engine has several areas where the form-in-place gasket (FIPG) is in use. To ensure that the gasket fully serves its purpose, it is necessary to observe some precautions when applying the gasket. Bead size, continuity and location are of paramount importance. Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of the fluid feed line. To eliminate the possibility of leaks from a joint, therefore, it is absolutely necessary to apply the gasket evenly without a break, while observing the correct bead size.
The FIPG used in the engine is a room temperature vulcanization (RTV) type and is supplied in a 100-gram tube (Part No. MD970389 or MD997110). Since the RTV hardens as it reacts with the moisture in the atomospheric air, it is normally used in the metallic flange areas. The FIPG, Part No. MD970389, can be used for sealing both engine oil and coolant, while Part No. 997110 can only be used for engine oil sealing.

Disassembly

The parts assembled with the FIPG can be easily disassembled without use of a special method. In some cases, however, the sealant between the joined surfaces may have to be broken by lightly striking with a mallet or similar tool. A flat and thin gasket scraper may be lightly hammered in between the joined surfaces. In this case, however, care must be taken to prevent damage to the joined surfaces. For removal of the oil pan, the special tool “Oil Pan Remover” (MD998727) is available. Be sure to use the special tool to remove the oil pan. <Except aluminium die-cast oil pans>

Surface Preparation

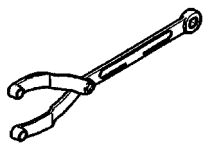
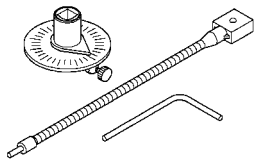
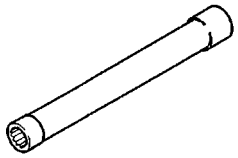
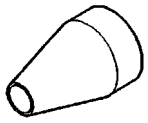
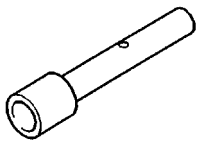
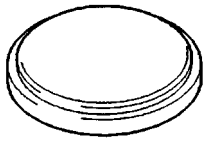
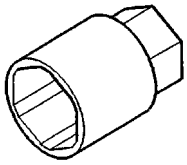
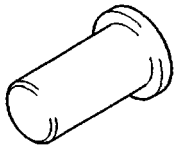
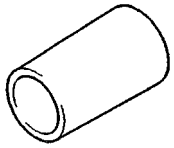
Thoroughly remove all substances deposited on the gasket application surfaces, using a gasket scraper or wire brush. Check to ensure that the surfaces to which the FIPG is to be applied is flat. Make sure that there are no oils, greases and foreign substances deposited on the application surfaces. Do not forget to remove the old sealant remained in the bolt holes.

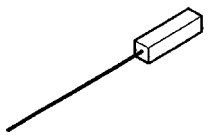
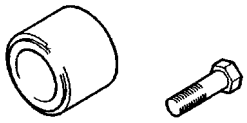
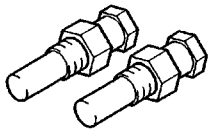
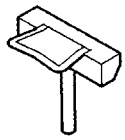
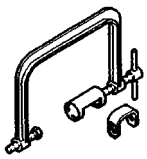
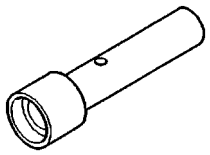
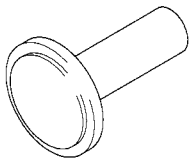
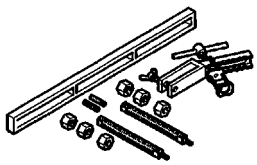
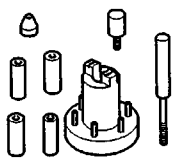
Form-In-Place Gasket Application

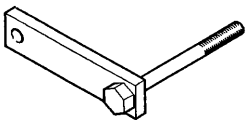
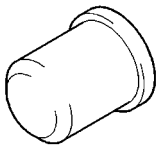
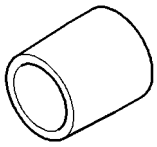
When assembling parts with the FIPG, you must observe some precautions, but the procedures is very simple as in the case of a conventional precut gasket.
Applied FIPG bead should be of the specified size and without breaks. Also be sure to encircle the bolt hole circumference with a completely continuous bead. The FIPG can be wiped away unless it is hardened. While the FIPG is still moist (in less than 15 minutes), mount the parts in position. When the parts are mounted, make sure that the gasket is applied to the required area only. In addition, do not apply any oil or water to the sealing locations or start the engine until a sufficient amount of time (about one hour) has passed after installation is completed.
The FIPG application procedure may vary on different areas. Observe the procedure described in the text when applying the FIPG.

NOTES

2. SPECIAL TOOLS

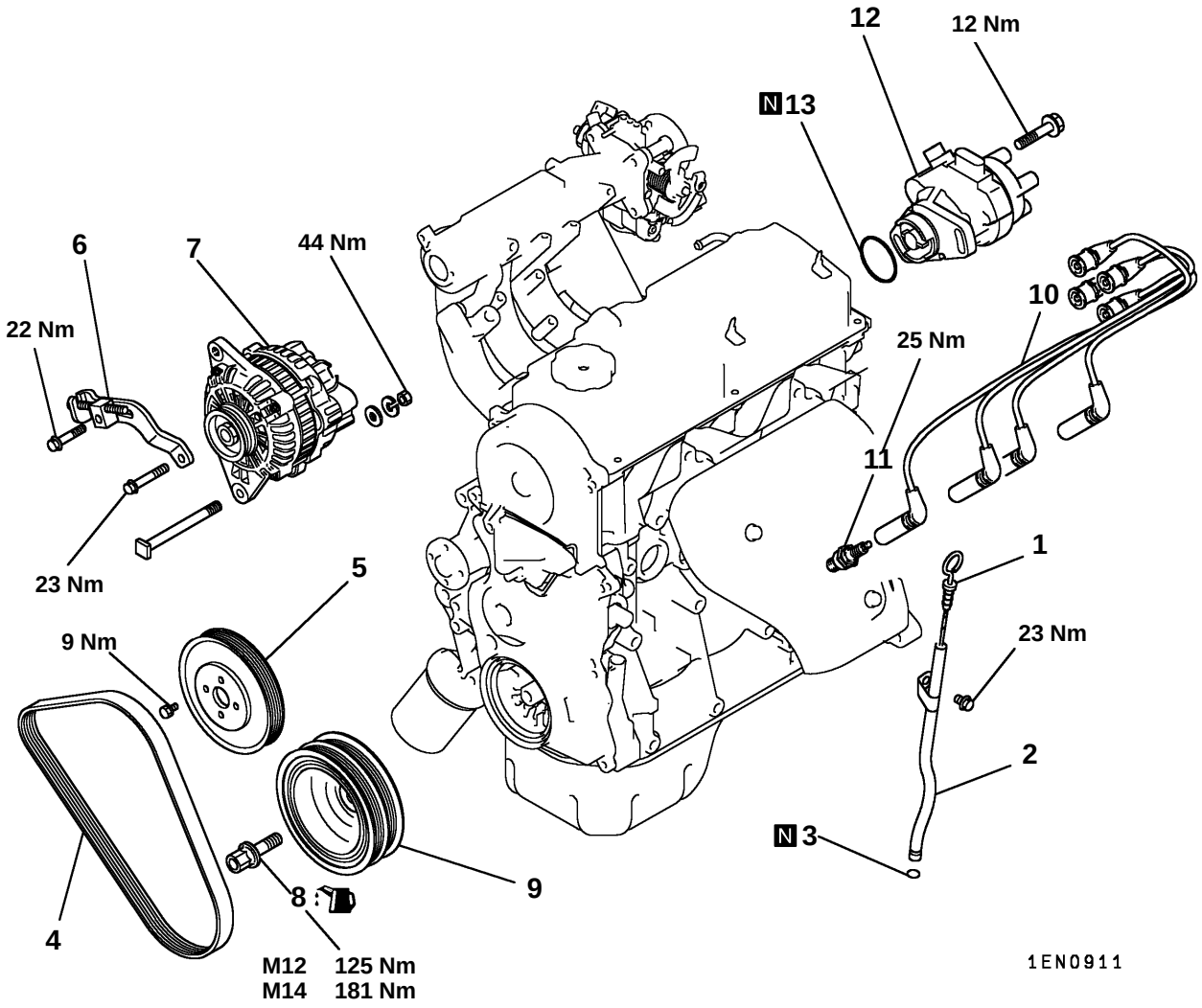
Tool	Number	Name	Use
	MB990767	End yoke holder	Holding camshaft sprocket when loosening or tightening bolt (used with MD998715)
	MB991614	Angle gauge	Installation of crankshaft bearing caps
	MB991653	Cylinder head bolt wrench (10)	Removal and installation of cylinder head bolts
	MB991659	Guide-D	Guide for removal and press-fitting of piston pins
	MB991671	Valve stem installer	Press-fitting of valve stem seals (SOHC 16-VALVE, DOHC)
	MD998011	Crankshaft rear oil seal installer	Installation of crankshaft rear oil seal
	MD998054	Oil pressure switch wrench	Removal and installation of oil pressure switch
	MD998304	Crankshaft front oil seal installer	Installation of crankshaft front oil seal
	MD998305	Crankshaft front oil seal guide	Guide for installation of crankshaft front oil seal

Tool	Number	Name	Use
	MD998442	Air bleed wire	Testing of automatic lash adjusters (DOHC)
	MD998713	Camshaft oil seal installer	Installation of camshaft oil seal
	MD998715	Pin (2-off)	Holding camshaft sprocket when loosening or tightening bolt (used with MB990767)
	MD998727	Oil pan remover	Removal of oil pan
	MD998735	Valve spring compressor	Compression of valve springs
	MD998760	Valve stem seal installer	Installation of valve stem seals (SOHC 12-VALVE)
	MD998762	Circular packing installer	Installing of circular packing
	MD998772	Valve spring compressor	Compression of valve springs
	MD998780	Piston pin setting tool	Removal and press-fitting of piston pins

Tool	Number	Name	Use
	MD998781	Flywheel stopper	Locking flywheel in fixed position
	MD998306	Crankshaft front oil seal installer	Installation of crankshaft front oil seal
	MB991962	Crankshaft front oil seal guide	Guide for installation of crankshaft oil seal

3. ALTERNATOR AND IGNITION SYSTEM

REMOVAL AND INSTALLATION <SOHC 12-VALVE>



Removal steps

1. Oil level gauge
2. Oil level gauge guide
3. O-ring
4. Drive belt*
5. Water pump pulley
6. Alternator brace
7. Alternator

◀A▶ ▶B◀ 8. Crankshaft bolt

▶B◀ 9. Crankshaft pulley

10. Spark plug cable
11. Spark plug

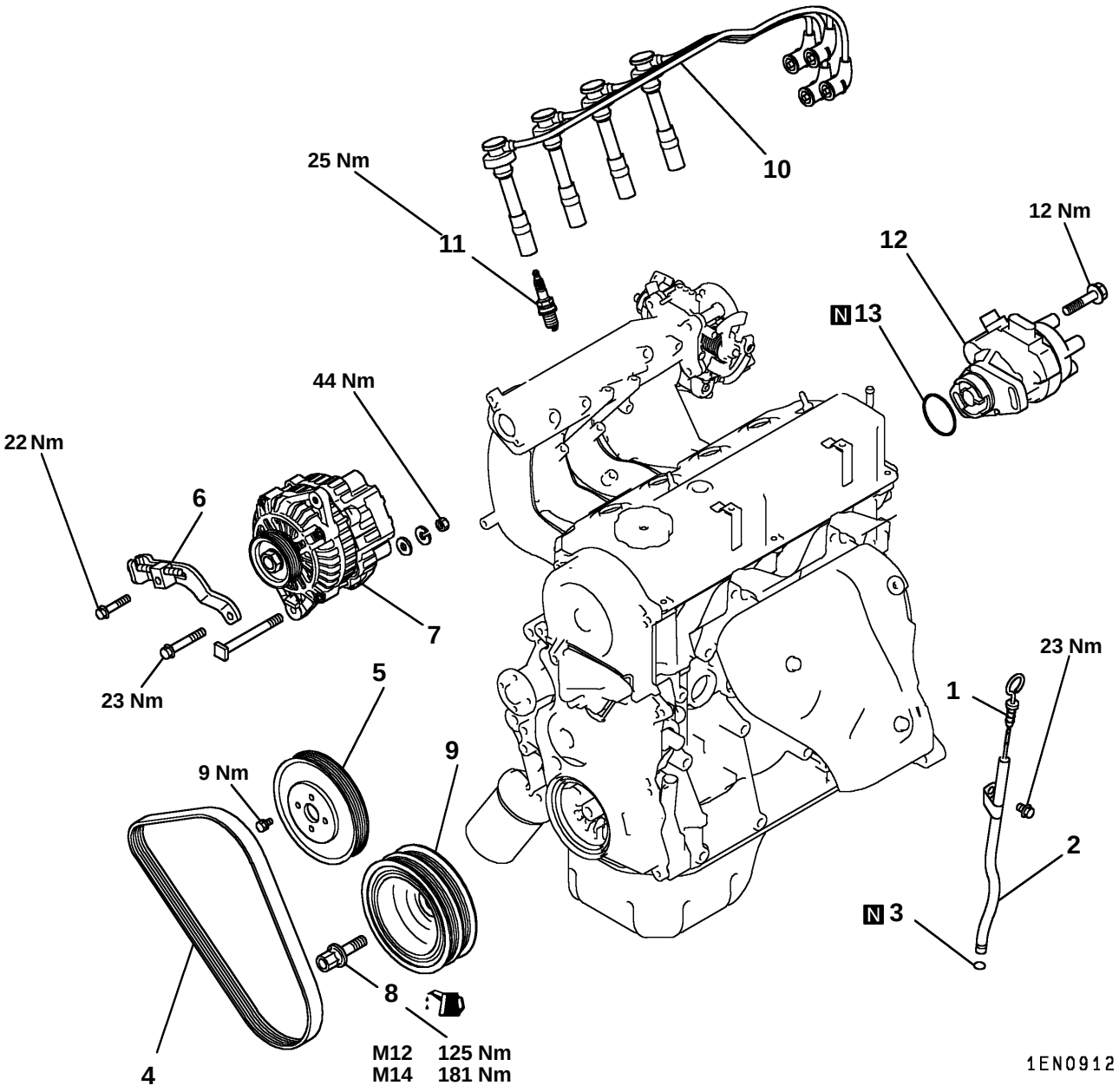
▶A◀ 12. Distributor

13. O-ring

NOTE

*: For details of adjustment, refer to the relevant model's chassis workshop manual.

REMOVAL AND INSTALLATION <SOHC 16-VALVE – FRONT WHEEL DRIVE (WITH DISTRIBUTOR)>



Removal steps

1. Oil level gauge
2. Oil level gauge guide
3. O-ring
4. Drive belt*
5. Water pump pulley
6. Alternator brace
7. Alternator

◀A▶ ▶B◀ 8. Crankshaft bolt

▶B◀ 9. Crankshaft pulley

10. Spark plug cable
11. Spark plug

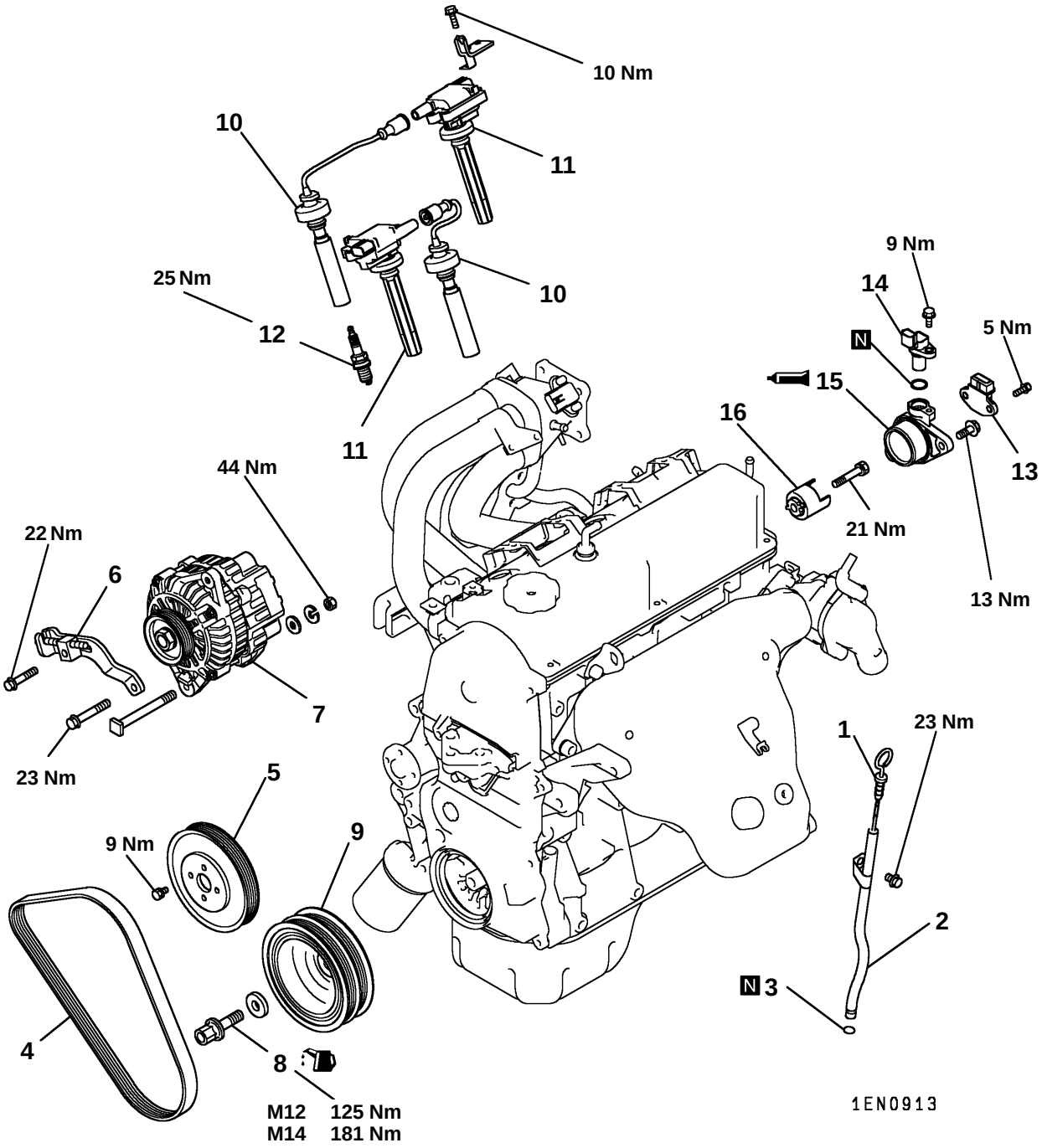
▶A◀ 12. Distributor

13. O-ring

NOTE

*: For details of adjustment, refer to the relevant model's chassis workshop manual.

REMOVAL AND INSTALLATION <SOHC 16-VALVE – FRONT WHEEL DRIVE (WITH CAM POSITION SENSOR)>



Removal steps

1. Oil level gauge
2. Oil level gauge guide
3. O-ring
4. Drive belt*
5. Water pump pulley
6. Alternator brace
7. Alternator

◀A▶ ▶B◀ 8. Crankshaft bolt

▶B◀ 9. Crankshaft pulley

10. Spark plug cable
11. Ignition coil
12. Spark plug
13. Ignition failure sensor (only vehicles for Europe)
14. Cam position sensor

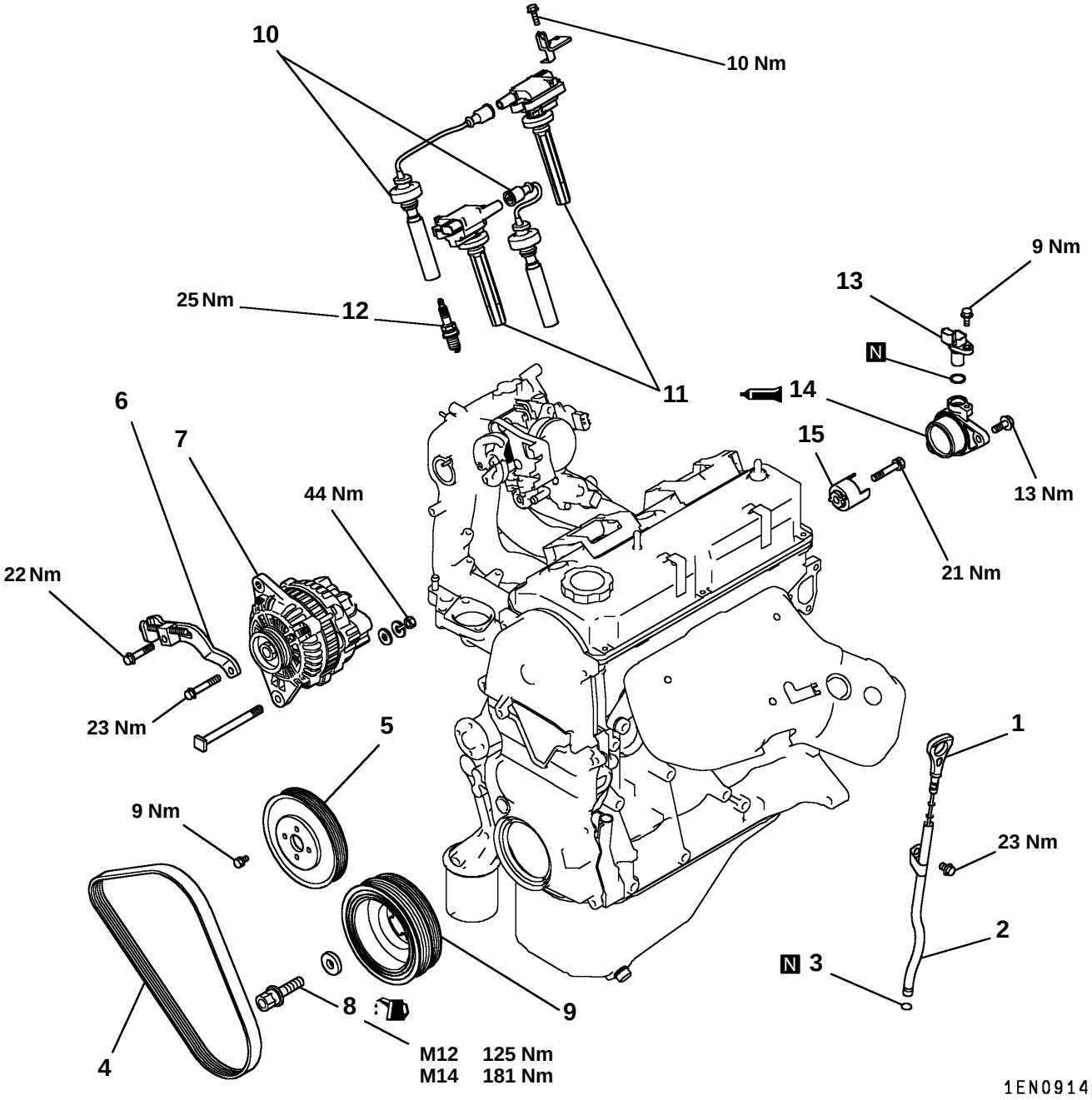
▶C◀ 15. Cam position sensor support

16. Cam position sensing cylinder

NOTE

*: For details of adjustment, refer to the relevant model's chassis workshop manual.

REMOVAL AND INSTALLATION <SOHC 16-VALVE – REAR WHEEL DRIVE>



Removal steps

1. Oil level gauge
2. Oil level gauge guide
3. O-ring
4. Drive belt*
5. Water pump pulley
6. Alternator brace
7. Alternator

◀A▶ ▶B◀ 8. Crankshaft bolt

▶B◀ 9. Crankshaft pulley

10. Spark plug cable
11. Ignition coil
12. Spark plug
13. Cam position sensor

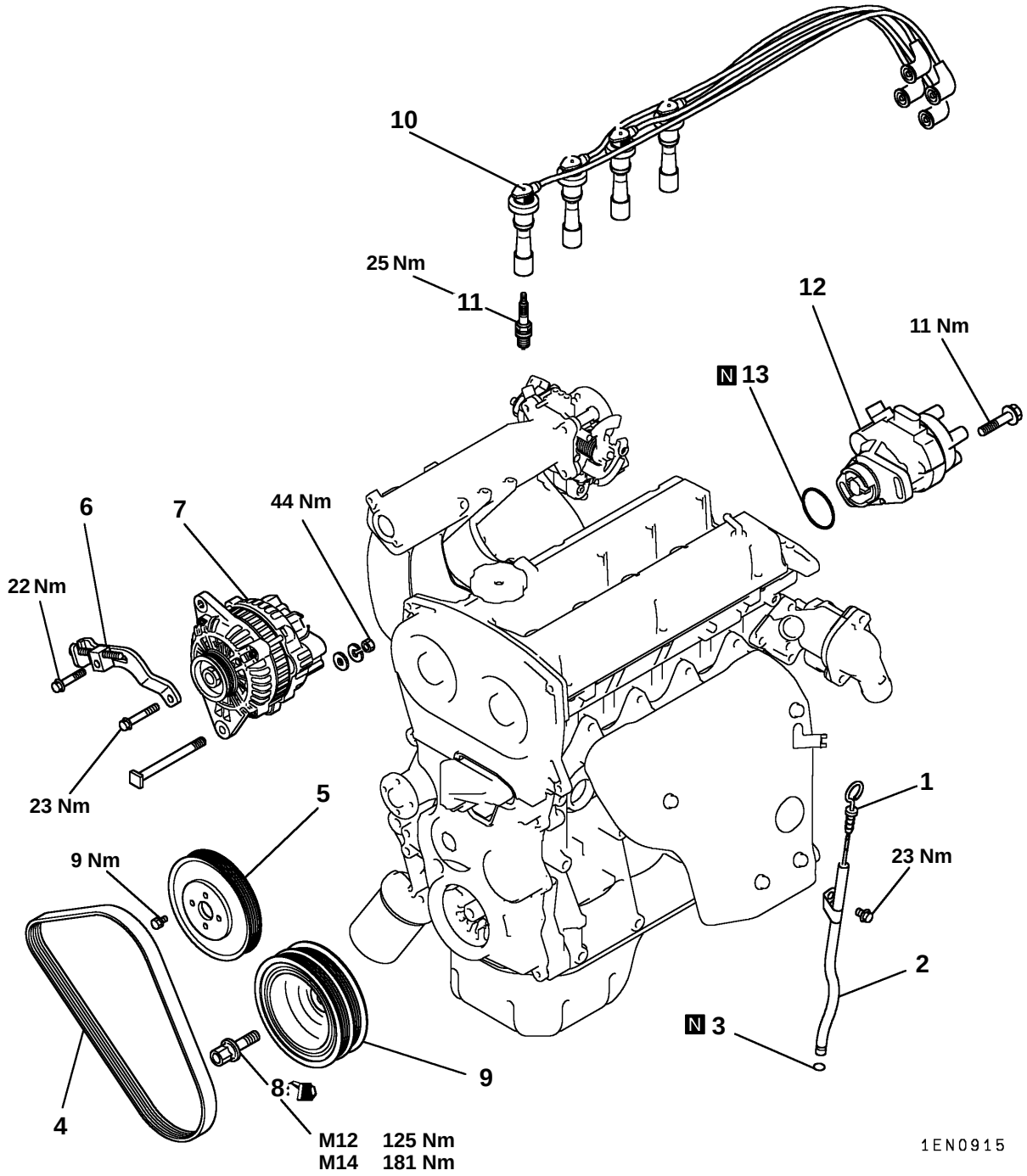
▶C◀ 14. Cam position sensor support

15. Cam position sensing cylinder

NOTE

*: For details of adjustment, refer to the relevant model's chassis workshop manual.

REMOVAL AND INSTALLATION <DOHC>



Removal steps

1. Oil level gauge
2. Oil level gauge guide
3. O-ring
4. Drive belt*
5. Water pump pulley
6. Alternator brace
7. Alternator

◀A▶ ▶B◀ 8. Crankshaft bolt

▶B◀ 9. Crankshaft pulley

10. Spark plug cable
11. Spark plug

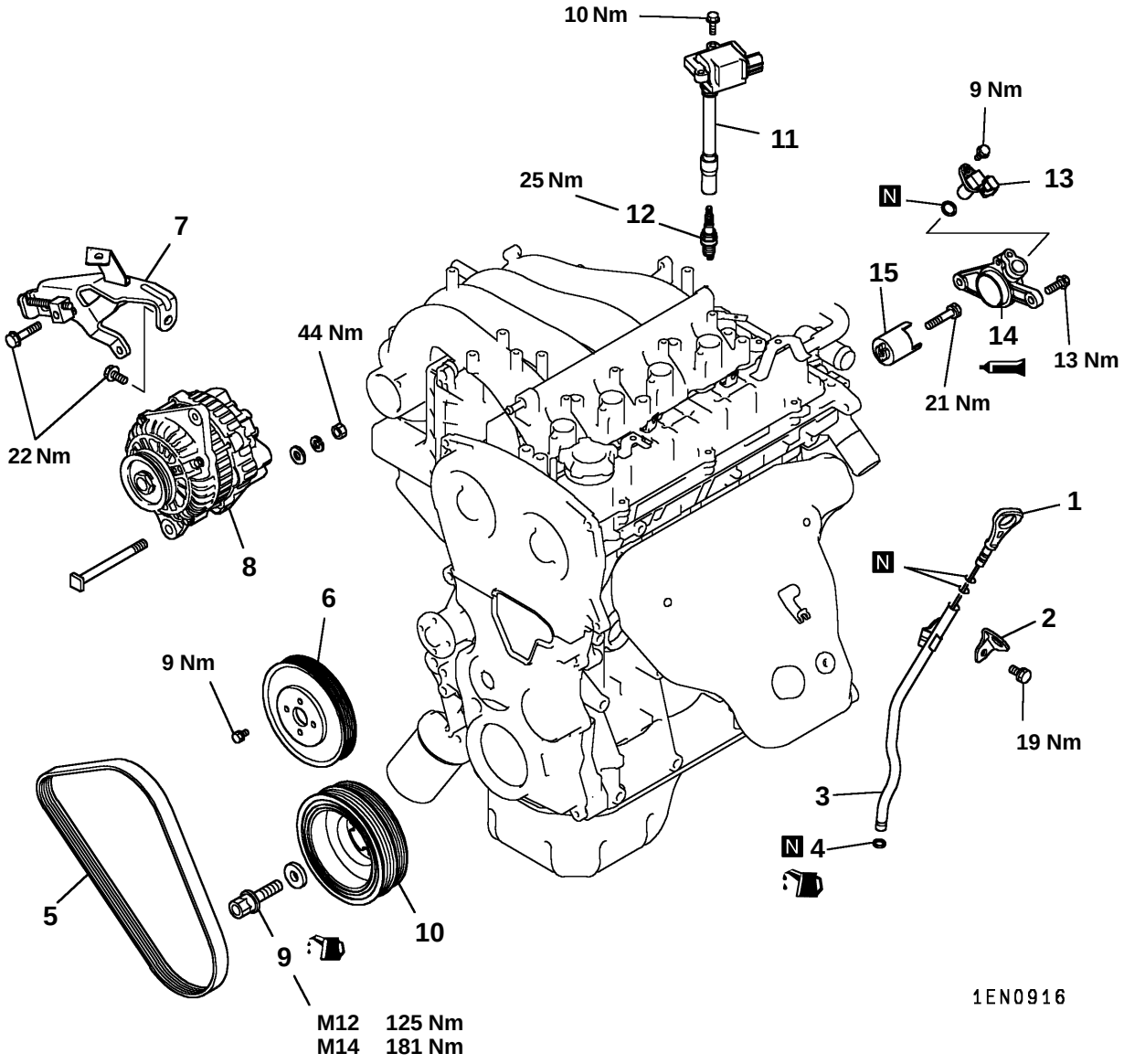
▶A◀ 12. Distributor

13. O-ring

NOTE

*: For details of adjustment, refer to the relevant model's chassis workshop manual.

REMOVAL AND INSTALLATION <DOHC–GDI>



Removal steps

1. Oil level gauge
2. Engine hanger
3. Oil level gauge guide
4. O-ring
5. Drive belt
6. Water pump pulley
7. Alternator brace
8. Alternator assembly

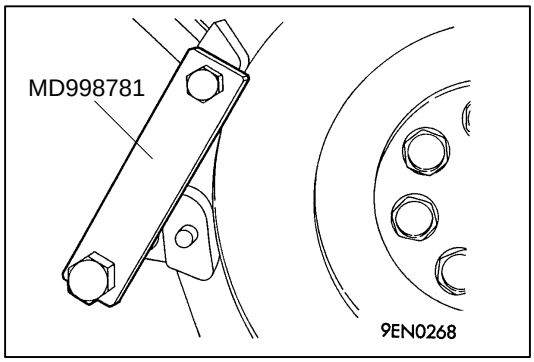
◀A▶ ▶B◀ 9. Crankshaft bolt

▶B◀ 10. Crankshaft pulley

11. Ignition coil
12. Spark plug
13. Cam position sensor

▶C◀ 14. Cam position sensor support

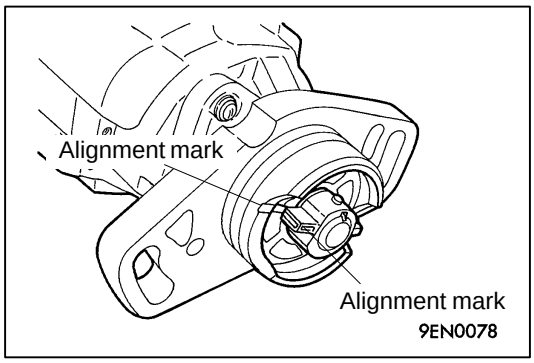
15. Cam position sensing cylinder



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT BOLT REMOVAL

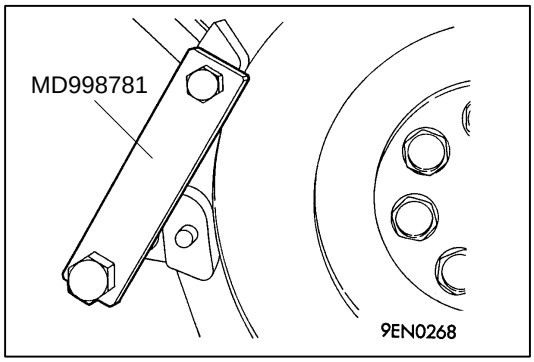
(1) Lock the flywheel or drive plate in position using the special tool shown in the illustration, then loosen the crankshaft bolts.



INSTALLATION SERVICE POINTS

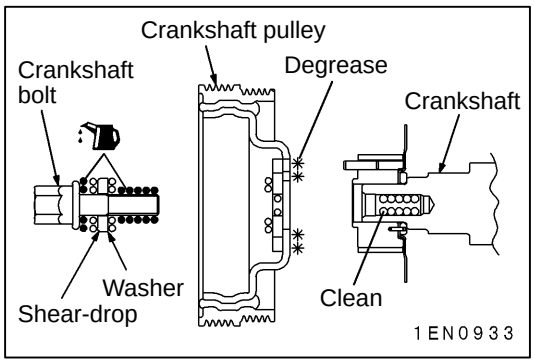
▶A◀ DISTRIBUTOR INSTALLATION

(1) Turn the crankshaft clockwise until cylinder No. 1 is at top dead center on its compression stroke.
(2) Align the alignment marks on the distributor housing and coupling.
(3) Fit the distributor onto the engine, aligning the stud bolts with the slots in the distributor mounting flange.

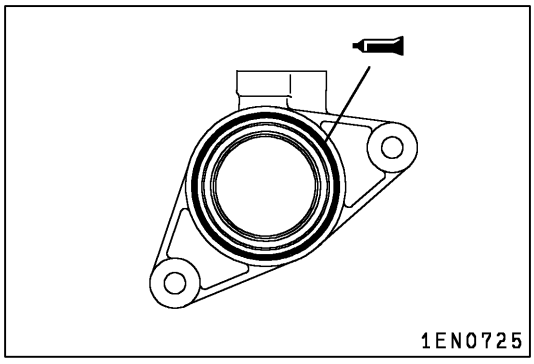


▶B◀ CRANKSHAFT PULLEY / BOLT INSTALLATION

(1) Hold the flywheel or drive plate using the special tool.



(2) Clean the bolt hole in crankshaft, crankshaft bolt and crankshaft pulley's seating surface.
(3) Degrease the cleaned seating surface of the crankshaft pulley.
(4) Install the crankshaft pulley.
(5) Apply oil to the threads of crankshaft bolt and the outer surface of washer.
(6) Tighten the crankshaft bolt to the specified torque of 125 Nm.



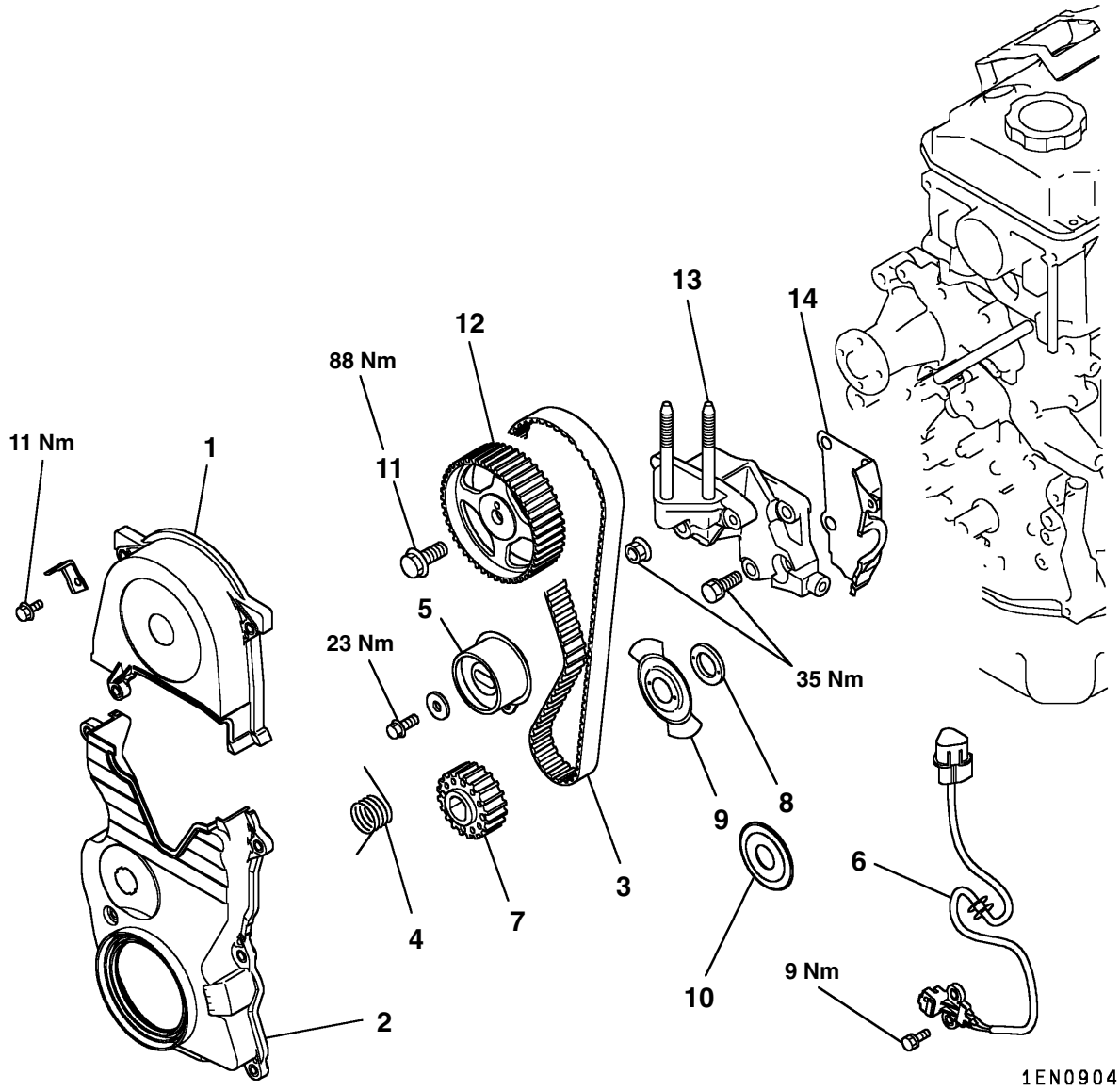
▶C◀ CAM POSITION SENSOR SUPPORT INSTALLATION

(1) Apply a 3 mm bead of form-in-place gasket (FIPG) to the area shown.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

4. TIMING BELT

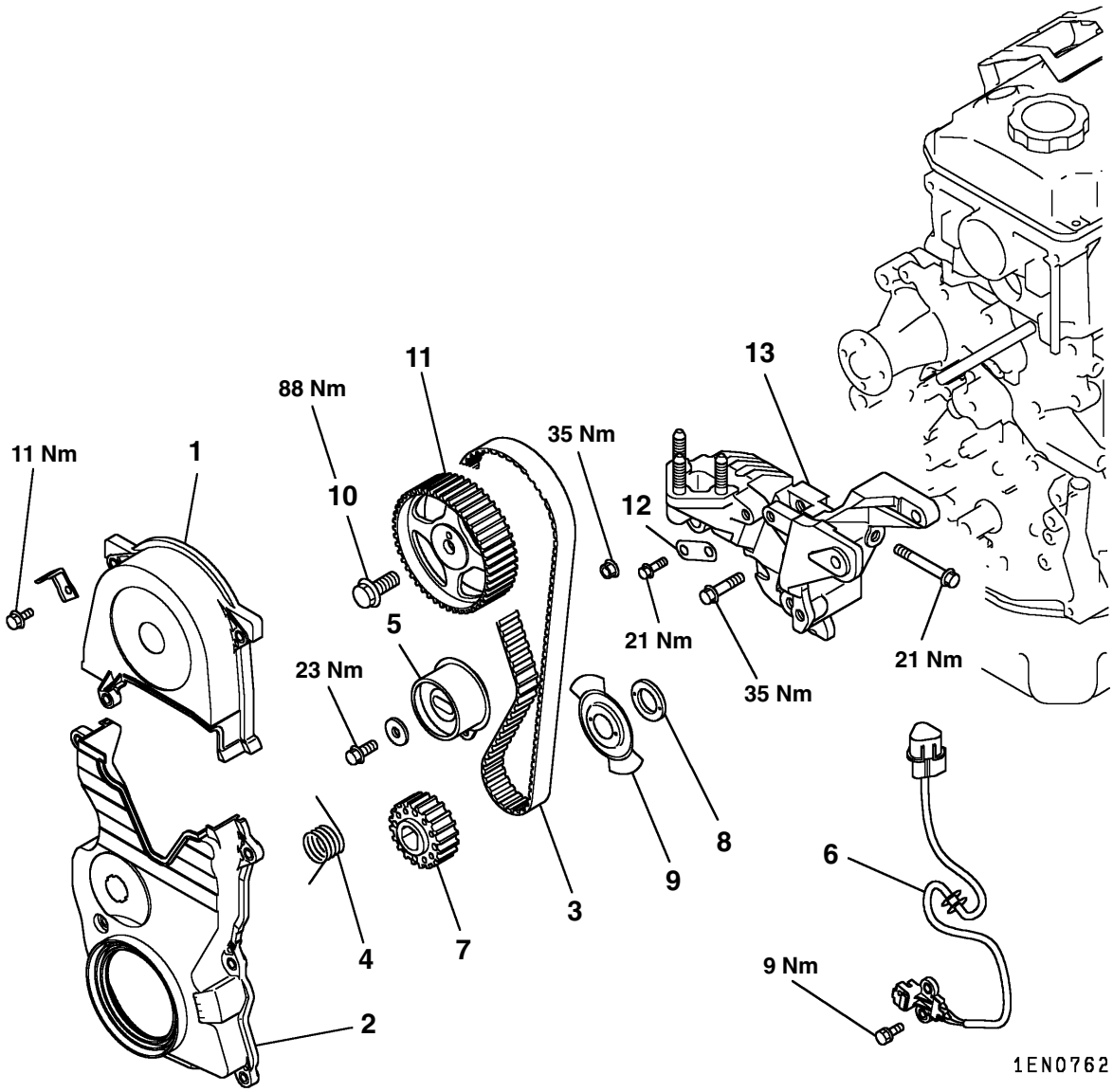
REMOVAL AND INSTALLATION <SOHC – With timing belt rear cover>



Removal steps

1. Timing belt upper cover
2. Timing belt lower cover
◀A▶ ▶D◀ 3. Timing belt
▶C◀ 4. Tensioner spring
▶C◀ 5. Timing belt tensioner
6. Crankshaft angle sensor <Without Distributor>
▶B◀ 7. Crankshaft sprocket
▶B◀ 8. Spacer <Without Distributor>
▶B◀ 9. Sensing blade <Without Distributor>
▶B◀ 10. Flange <With Distributor>
◀B▶ ▶A◀ 11. Camshaft sprocket bolt
12. Camshaft sprocket
13. Engine support bracket
14. Timing belt rear cover

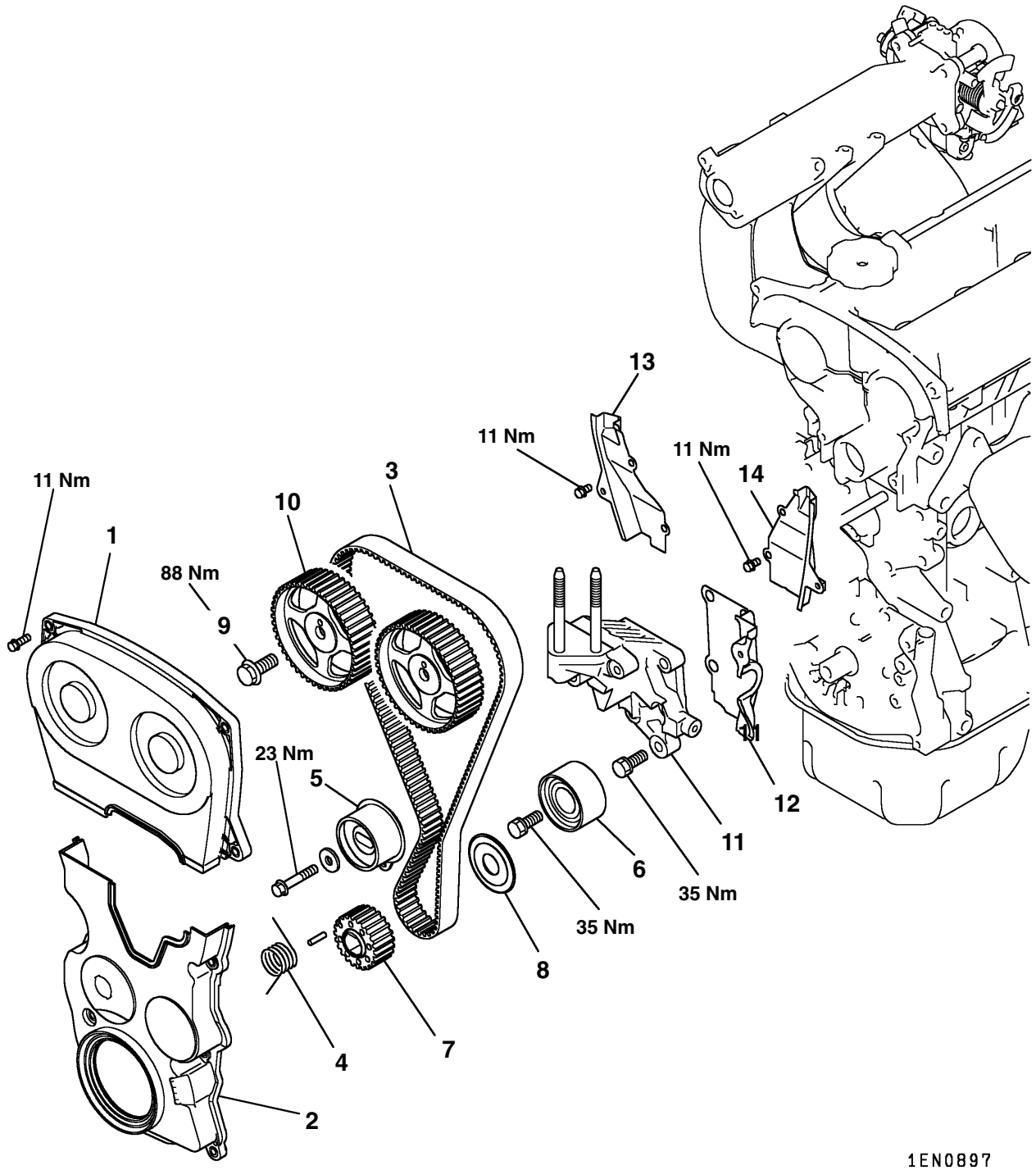
REMOVAL AND INSTALLATION <SOHC – Without timing belt rear cover>



Removal steps

1. Timing belt upper cover
2. Timing belt lower cover
◀A▶ ▶D◀ 3. Timing belt
▶C◀ 4. Tensioner spring
▶C◀ 5. Timing belt tensioner
6. Crankshaft angle sensor <Without Distributor>
▶B◀ 7. Crankshaft sprocket
▶B◀ 8. Spacer <Without Distributor>
▶B◀ 9. Sensing blade <Without Distributor>
◀B▶ ▶A◀ 10. Camshaft sprocket bolt
11. Camshaft sprocket
12. Bracket
13. Engine support bracket

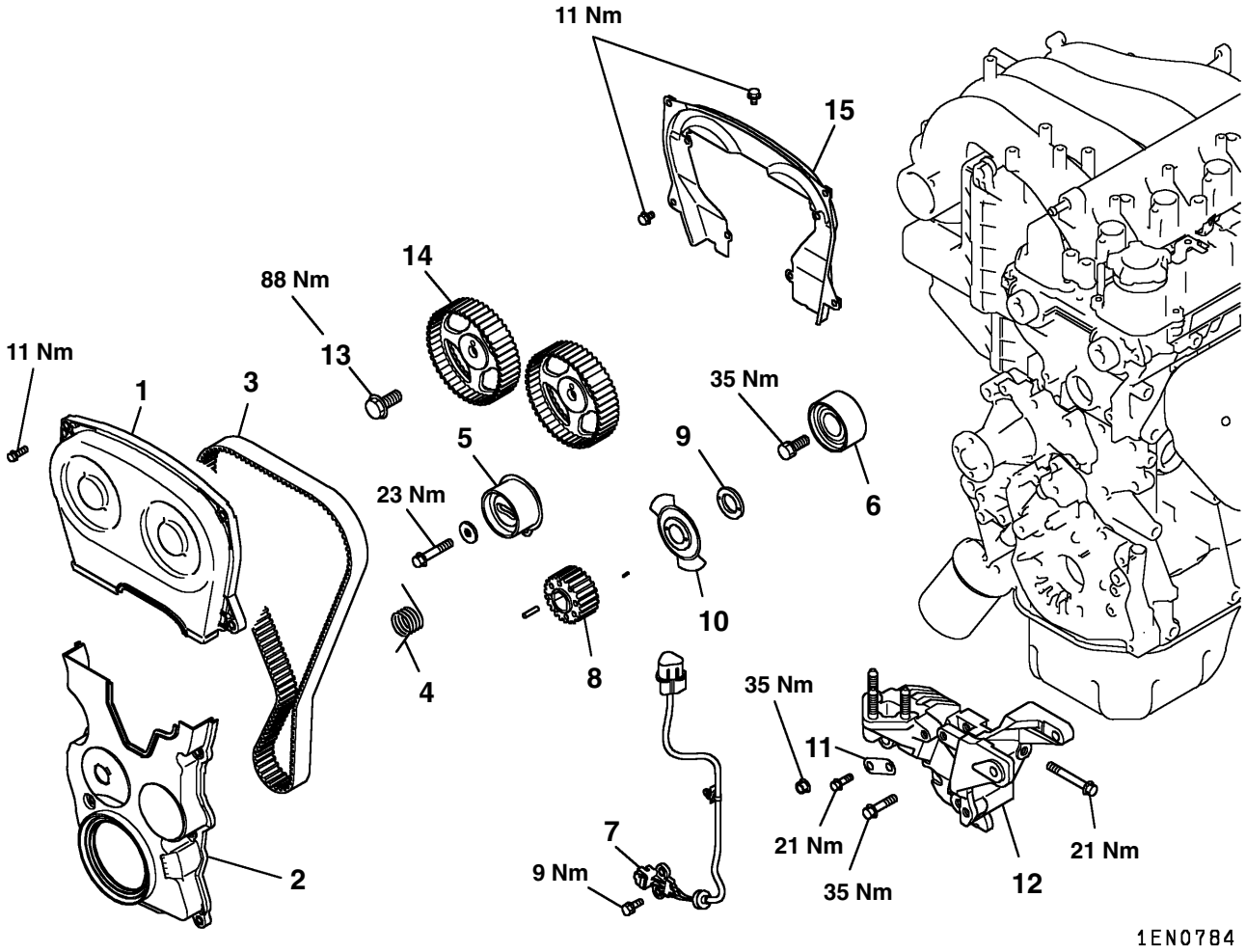
REMOVAL AND INSTALLATION <DOHC>



Removal steps

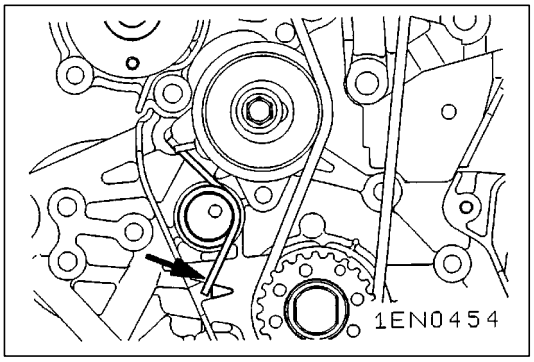
1. Timing belt upper cover
2. Timing belt lower cover
◀A▶ ▶E◀ 3. Timing belt
◀A▶ ▶C◀ 4. Tensioner spring
◀A▶ ▶C◀ 5. Timing belt tensioner
6. Idler pulley
▶B◀ 7. Crankshaft sprocket
▶B◀ 8. Flange
◀B▶ ▶A◀ 9. Camshaft sprocket bolt
10. Camshaft sprocket
11. Engine support bracket
12. Timing belt rear cover (lower)
13. Timing belt rear cover (right)
14. Timing belt rear cover (left)

REMOVAL AND INSTALLATION <GDI>



Removal steps

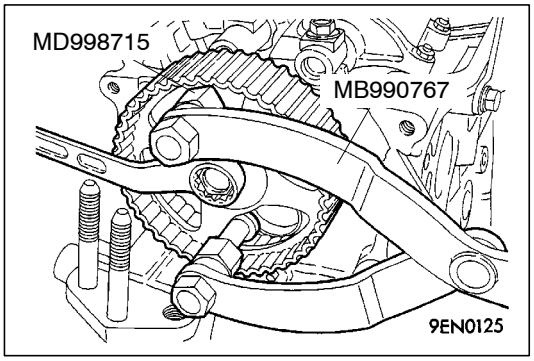
1. Timing belt front upper cover
2. Timing belt front lower cover
◀C▶ ▶G◀ 3. Timing belt
4. Tensioner spring
▶F◀ 5. Timing belt tensioner
6. Idler pulley
7. Crank angle sensor
▶B◀ 8. Crankshaft sprocket
▶B◀ 9. Spacer
▶B◀ 10. Sensing blade
11. Bracket
12. Right engine support bracket
◀B▶ ▶A◀ 13. Camshaft sprocket bolt
14. Camshaft sprocket
15. Timing belt rear upper cover



REMOVAL SERVICE POINTS

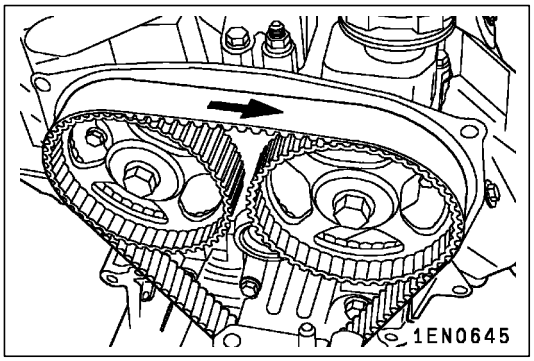
◀A▶ TIMING BELT / TENSIONER SPRING / TIMING BELT TENSIONER REMOVAL

(1) Using pliers, grip the tensioner spring projection (marked "A" in the diagram)and remove it from the oil pump case stopper. Then, remove the tensioner spring.
(2) Remove the timing belt tensioner.
(3) If the timing belt is to be reused, chalk an arrow on the belt to indicate the direction of rotation before removing it. This will ensure the timing belt is fitted correctly when reused.



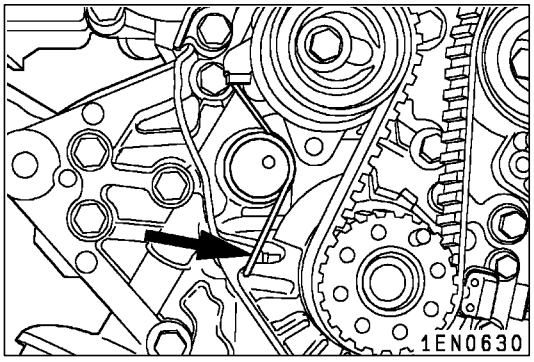
◀B▶ CAMSHAFT SPROCKET BOLT REMOVAL

(1) Using the special tools shown in the illustration, lock the camshaft sprocket in position.
(2) Loosen the camshaft sprocket bolt.



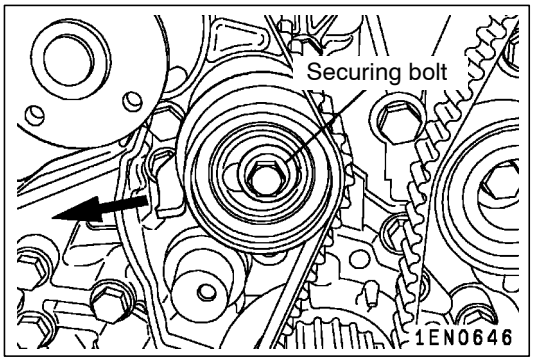
◀C▶ TIMING BELT REMOVAL

(1) If the timing belt is to be refused, it is necessary to install it in the same direction as it was before. Mark an arrow that shows the direction of rotation on the back surface of the timing belt with chalk, etc.

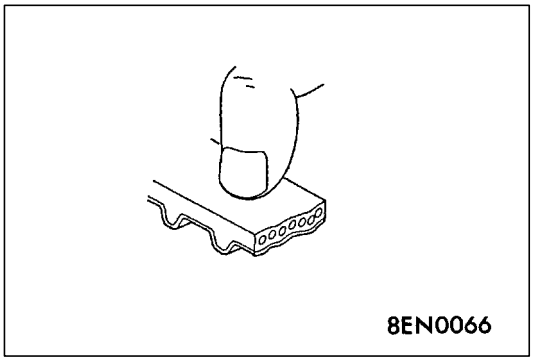


(2) Using pliers and the like, hold the tensioner spring at the illustrated position, and remove the spring.

Caution
Do not cause the end of the tensioner spring to give damage to the timing belt.



(3) Loosen the timing belt tensioner securing bolt.
(4) Move the timing belt tensioner in the direction shown to remove the timing belt.

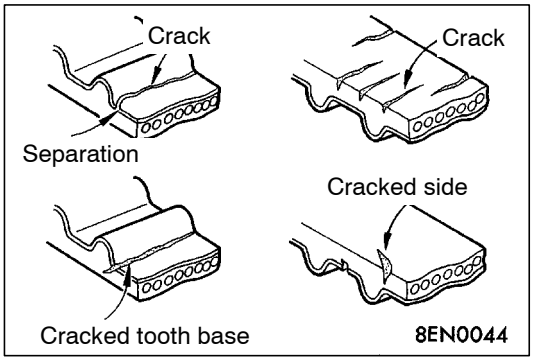

8EN0066

INSPECTION

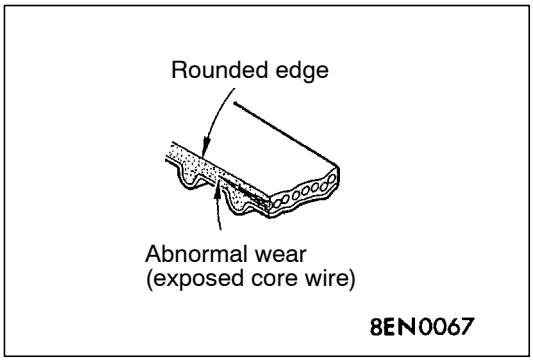
1. TIMING BELT

Check the timing belt closely. Replace the belt with a new one if any of the following defects is evident:

(1) Hardened backing rubber (the backing rubber is glossy, non-elastic, and so hard that scratching with fingernails leaves no mark)

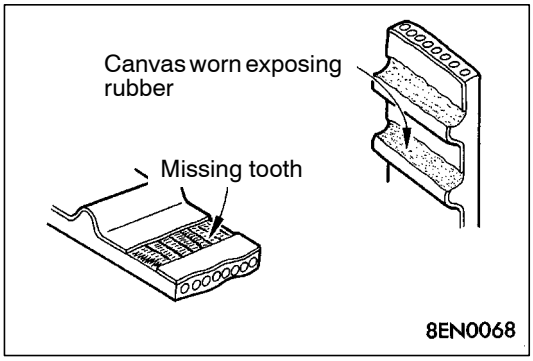


(2) Surface cracks in the backing rubber
(3) Splits in the canvas and/or separation of the canvas and rubber
(4) Cracks at the bases of teeth
(5) Cracks in the side of the belt



(6) Abnormal wear on the belt's sides

NOTE
The sides of the belt are normal if they are sharp as if cut by a knife.

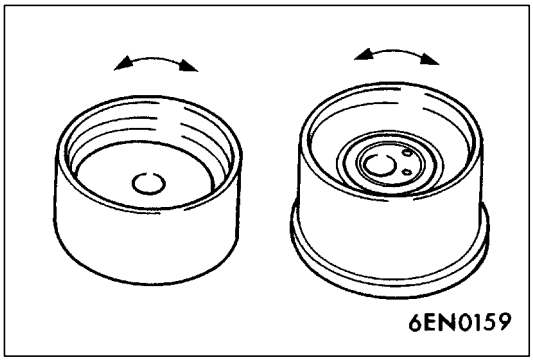


(7) Abnormal wear on teeth

Initial stage:
Canvas worn (fluffy canvas fibers, rubbery texture gone, white discoloration, canvas texture indistinct)

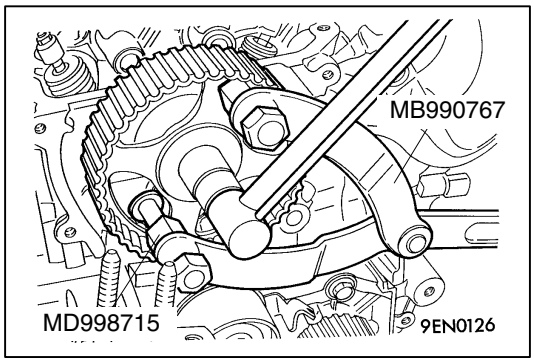
Final stage:
Canvas worn, exposing rubber (tooth width reduced)

(8) Missing teeth


6EN0159

2. TENSIONER PULLEY AND IDLER PULLEY

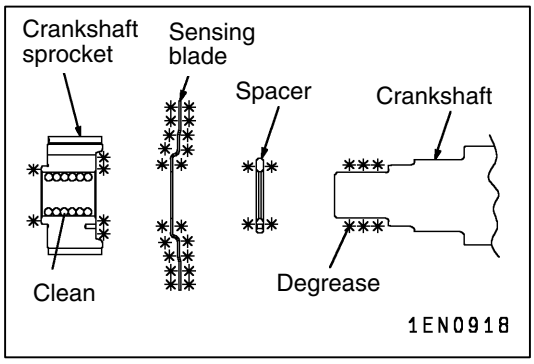
(1) Check that the pulleys turn smoothly without play and are not abnormally noisy. Replace either or both of the pulleys if necessary.



INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT SPROCKET BOLT INSTALLATION

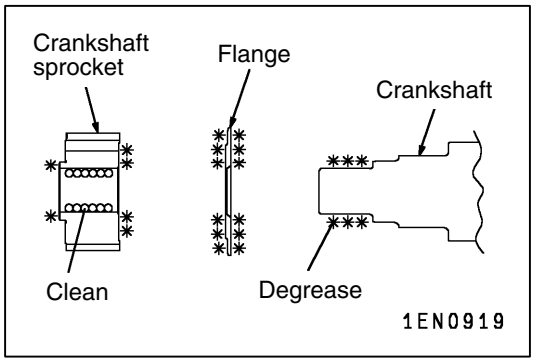
(1) Using the special tools shown in the illustration, lock the camshaft sprocket in position.
(2) Tighten the camshaft sprocket bolt to the specified torque.



▶B◀ SENSING BLADE / SPACER / FLANGE / CRANKSHAFT SPROCKET

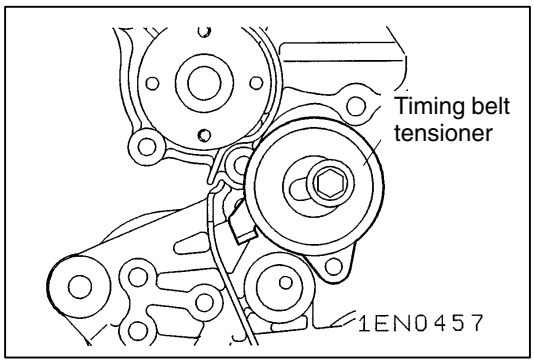
Type with crank angle sensor:
(1) Clean the hole in the crankshaft sprocket.
(2) Clean and degrease the mating surfaces of the crankshaft sprocket and crankshaft; sensing blade; and spacer.

NOTE
Degreasing is necessary to prevent decrease in friction between the mating surfaces due to presence of oil.



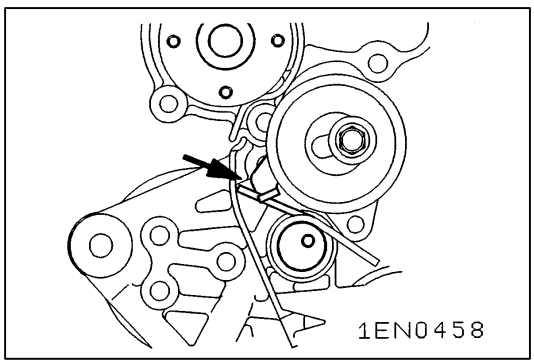
Type without crank angle sensor:
(1) Clean the hole in the crankshaft sprocket.
(2) Clean and degrease the crankshaft sprocket, flange, and sprocket fitting surface of the crankshaft.

NOTE
Degreasing is necessary to prevent decrease in friction between the mating surfaces due to presence of oil.

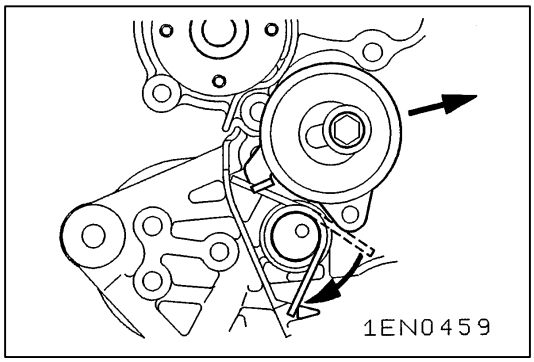


▶C◀ TIMING BELT TENSIONER / TENSIONER SPRING INSTALLATION

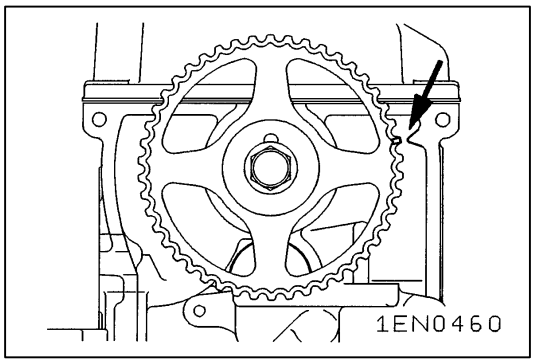
(1) Lock the timing belt tensioner in the illustrated position.



(2) Fit one of the tensioner spring projections over the hooked portion of the timing belt tensioner and fit the tensioner onto the oil pump case.

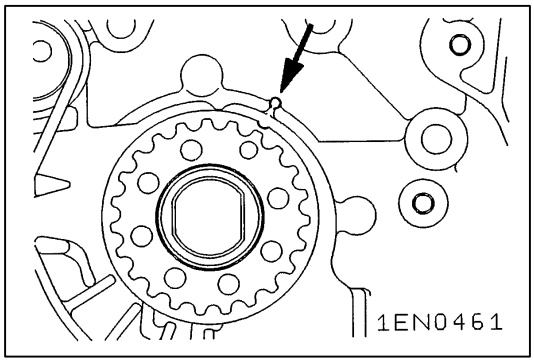


(3) Grip the other tensioner spring projection and fit it onto the oil pump case lug as shown in the illustration.
(4) Move the timing belt tensioner in the direction shown and temporarily tighten the bolt.

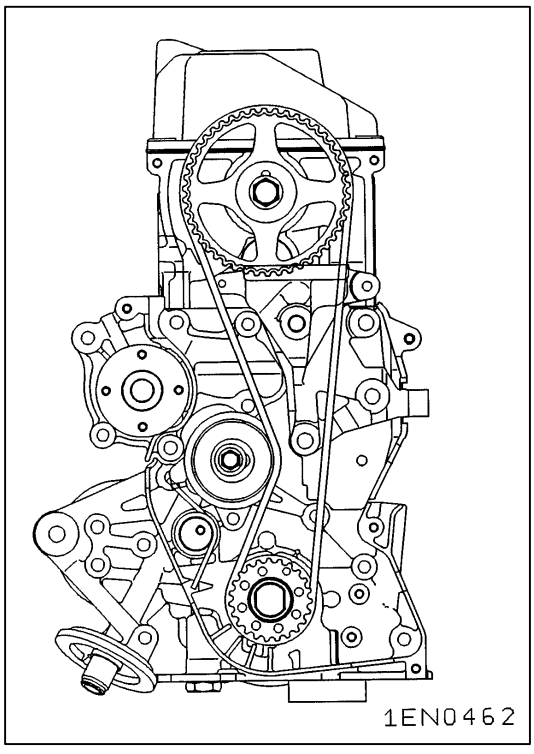


▶D◀ TIMING BELT INSTALLATION

(1) Align the camshaft timing mark with the timing mark on the cylinder head.



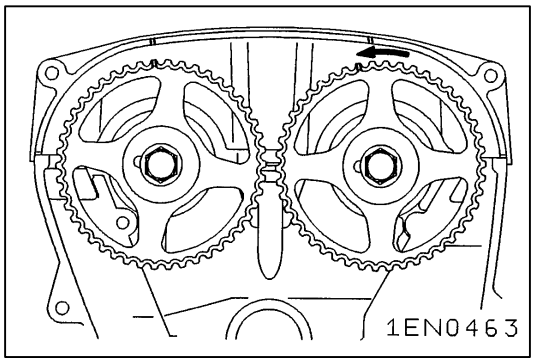
(2) Align the crankshaft timing mark with the timing mark on the front case.



(3) Keeping the tension side of the timing belt tight, fit the timing belt onto the crankshaft sprocket, camshaft sprocket, and tensioner pulley in that order.
(4) Loosen the tensioner pulley mounting bolts by 1/4 to 1/2 of a turn and allow the tensioner spring to apply tension to the timing belt.
(5) Turn the crankshaft twice in the normal rotating direction (clockwise) and check that the timing marks are correctly aligned.

Caution
This procedure utilizes the camshaft's driving torque to apply tension evenly to the timing belt. Be sure to turn the crankshaft as described above. Do not turn the crankshaft in reverse.

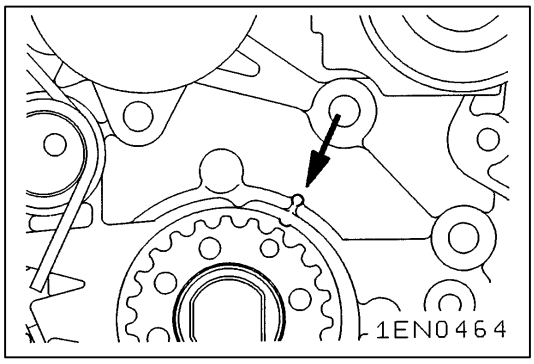
(6) Tighten the tensioner pulley mounting bolts.



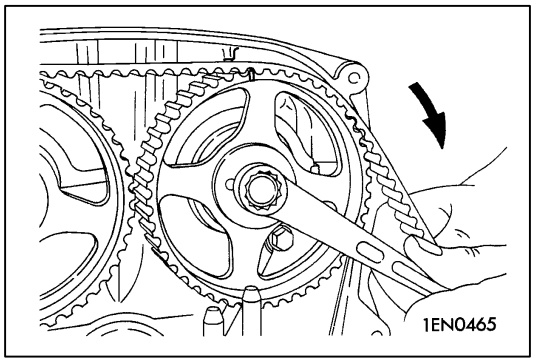
▶E◀ TIMING BELT INSTALLATION

(1) Place the camshaft sprocket timing marks at the positions shown.

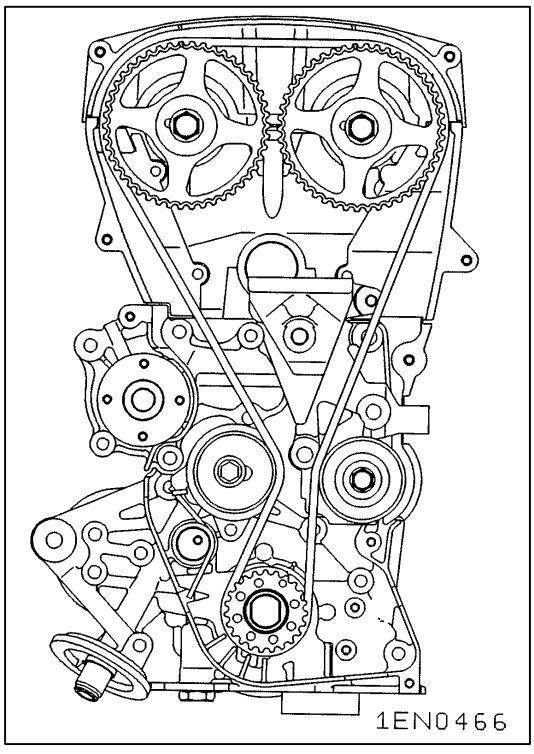
NOTE
After aligning the sprocket timing marks, let go of the sprockets. The exhaust camshaft sprocket will rotate by one tooth in the direction shown and remain stable in this position.



(2) Align the crankshaft timing mark with the timing mark on the front case.



(3) Turn the exhaust camshaft sprocket in the direction shown and fit the timing belt with the timing marks aligned.
(4) Use a bulldog clip to prevent the timing belt teeth from jumping.



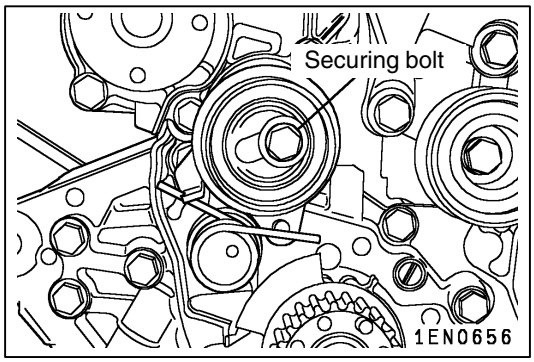
(5) Fit the timing belt onto the idler pulley, crankshaft sprocket, and tensioner pulley in that order.

NOTE
When fitting the belt, keep the camshaft sprocket timing marks correctly aligned and keep the tension side of the belt tight.

(6) Loosen the tensioner pulley mounting bolts by $^1/_4$ to $^1/_2$ of a turn and allow the tensioner spring to apply tension to the timing belt.
(7) Remove the bulldog clip.
(8) Turn the crankshaft twice in the normal rotating direction (clockwise) and check that the timing marks are correctly aligned.

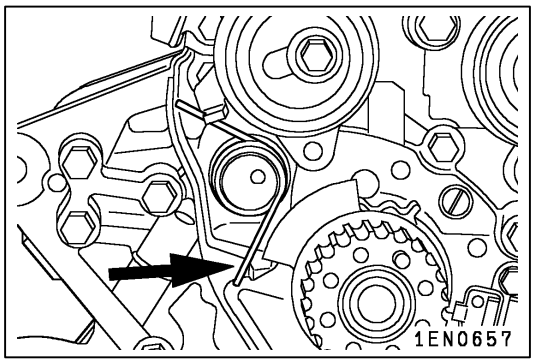
Caution
This procedure utilizes the camshaft's driving torque to apply tension evenly to the timing belt. Be sure to turn the crankshaft as described above. Do not turn the crankshaft in reverse.

(9) Tighten the tensioner pulley mounting bolts.



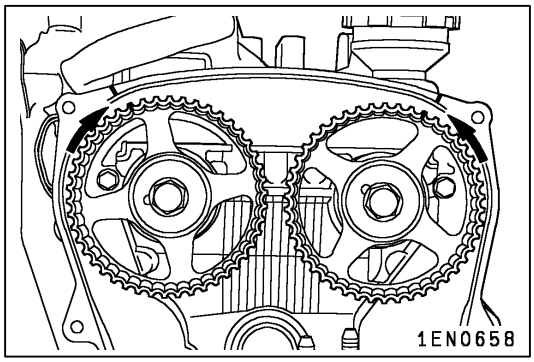
▶F◀ TIMING BELT TENSIONER AND TENSIONER SPRING INSTALLATION

(1) Install the timing belt tensioner and the tensioner spring, and temporarily tighten the timing belt tensioner securing bolt.



(2) Using pliers and the like, secure the spring at the illustrated position of the front case.

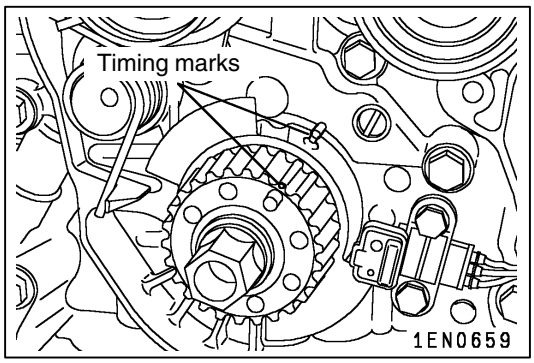
Caution
Do not cause the end of the tensioner spring to give damage to the crankshaft sprocket.



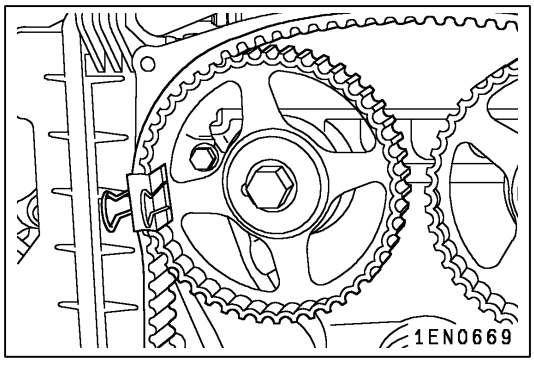
▶G◀ TIMING BELT INSTALLATION

(1) Align the timing marks on each camshaft sprocket.

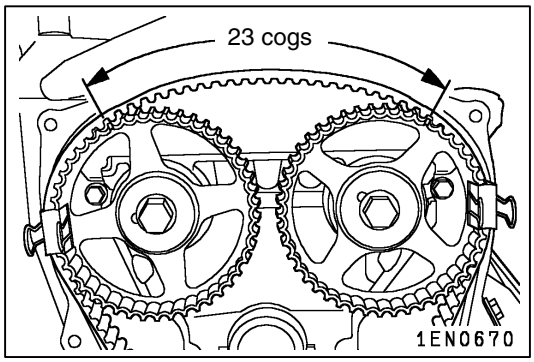
NOTE
After the timing marks on the sprockets are aligned, the sprockets can turn by about one tooth in the direction shown and remain stable in this position.



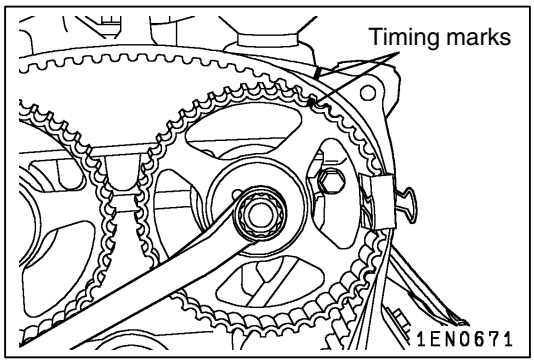
(2) Align the crankshaft sprocket timing marks.



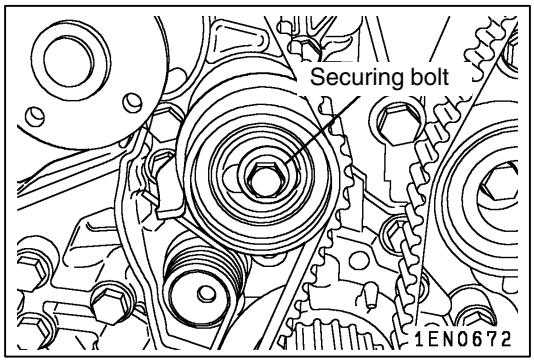
(3) While paying attention to the direction of rotation marked on the timing belt (if the timing belt is reused), put the timing belt over the inlet camshaft sprocket. After that, secure the belt at the position shown with a paper clip, etc.



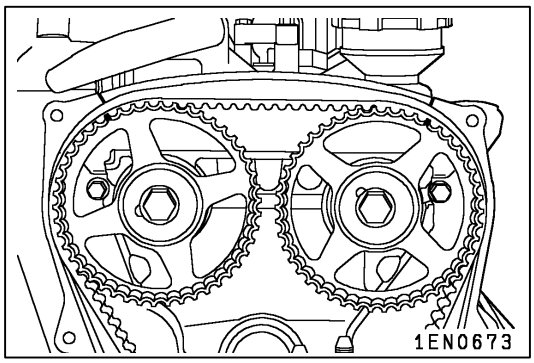
(4) Adjust the timing belt so that 23 cogs will fall within the range between the timing marks on the intake and exhaust camshaft sprockets. Secure the belt at this position with a paper clip, etc.



(5) While aligning the exhaust camshaft sprocket timing marks, install the timing belt on the idler pulley, crankshaft sprocket, and the timing belt tensioner in that order.
(6) Ensure that the timing marks on the exhaust camshaft sprocket and on the crankshaft sprocket are in alignment.

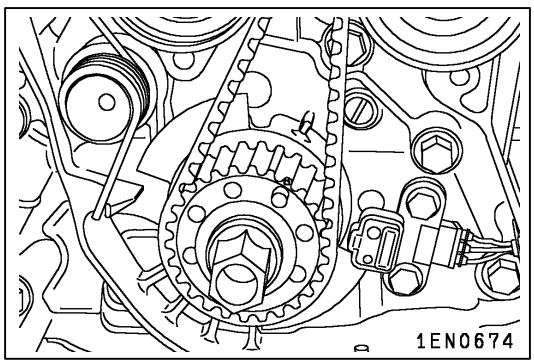


(7) Loosen the timing belt tensioner securing bolt, which has temporarily been tightened, a quarter to half turn. Utilizing tensioner spring tension, give tension to the timing belt.
(8) Remove the paper clips, etc.



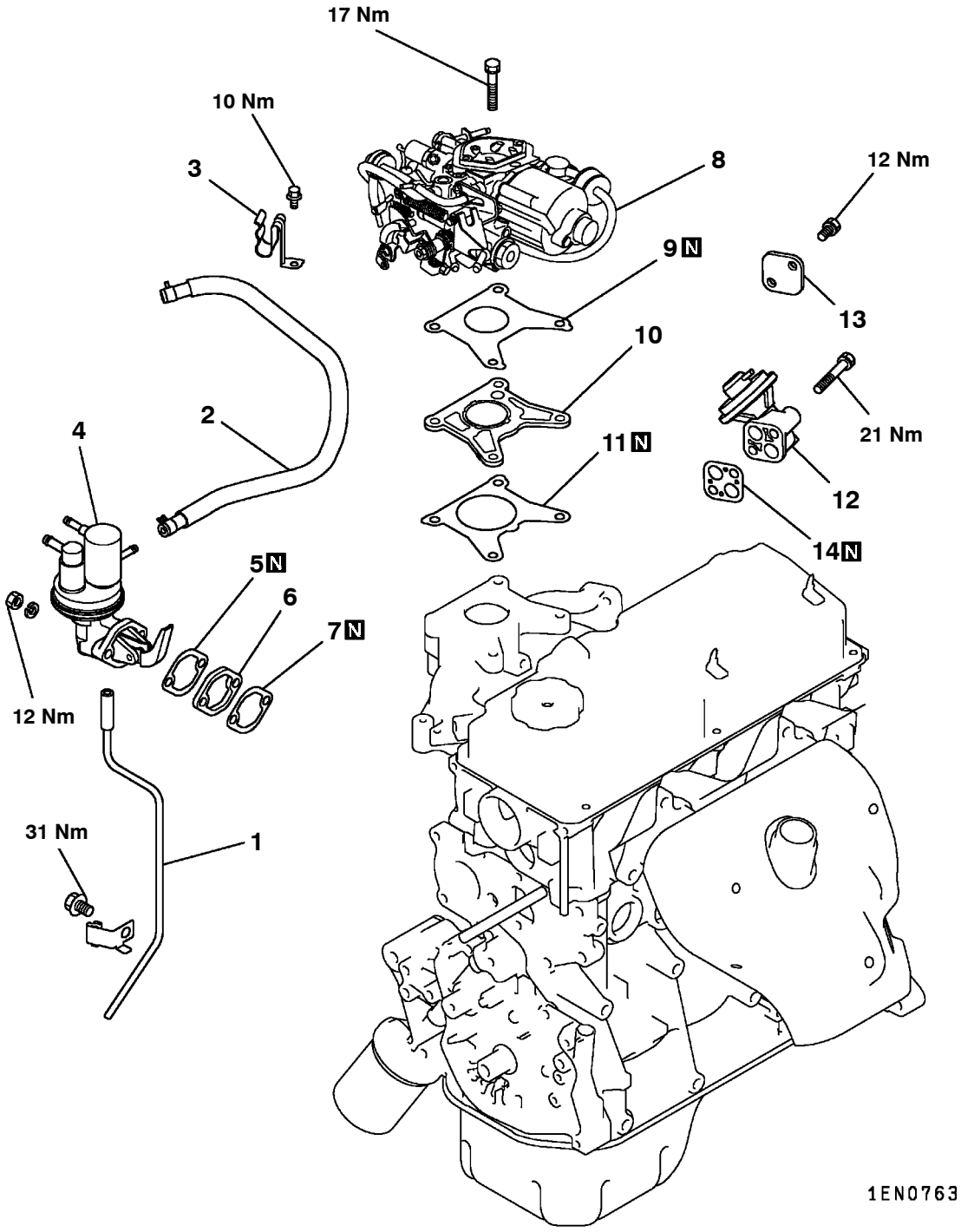
(9) Make two turns of the crankshaft sprocket in clockwise direction to ensure that the timing marks on each camshaft sprocket are in alignment.

Caution
Operation under item 9 above is performed in order to give a constant tension to the timing belt by utilizing camshaft driving torque. Observe the number of turns of the sprocket mentioned above. Do not turn the crankshaft sprocket counterclockwise direction.



5. FUEL AND EMISSION CONTROL SYSTEMS

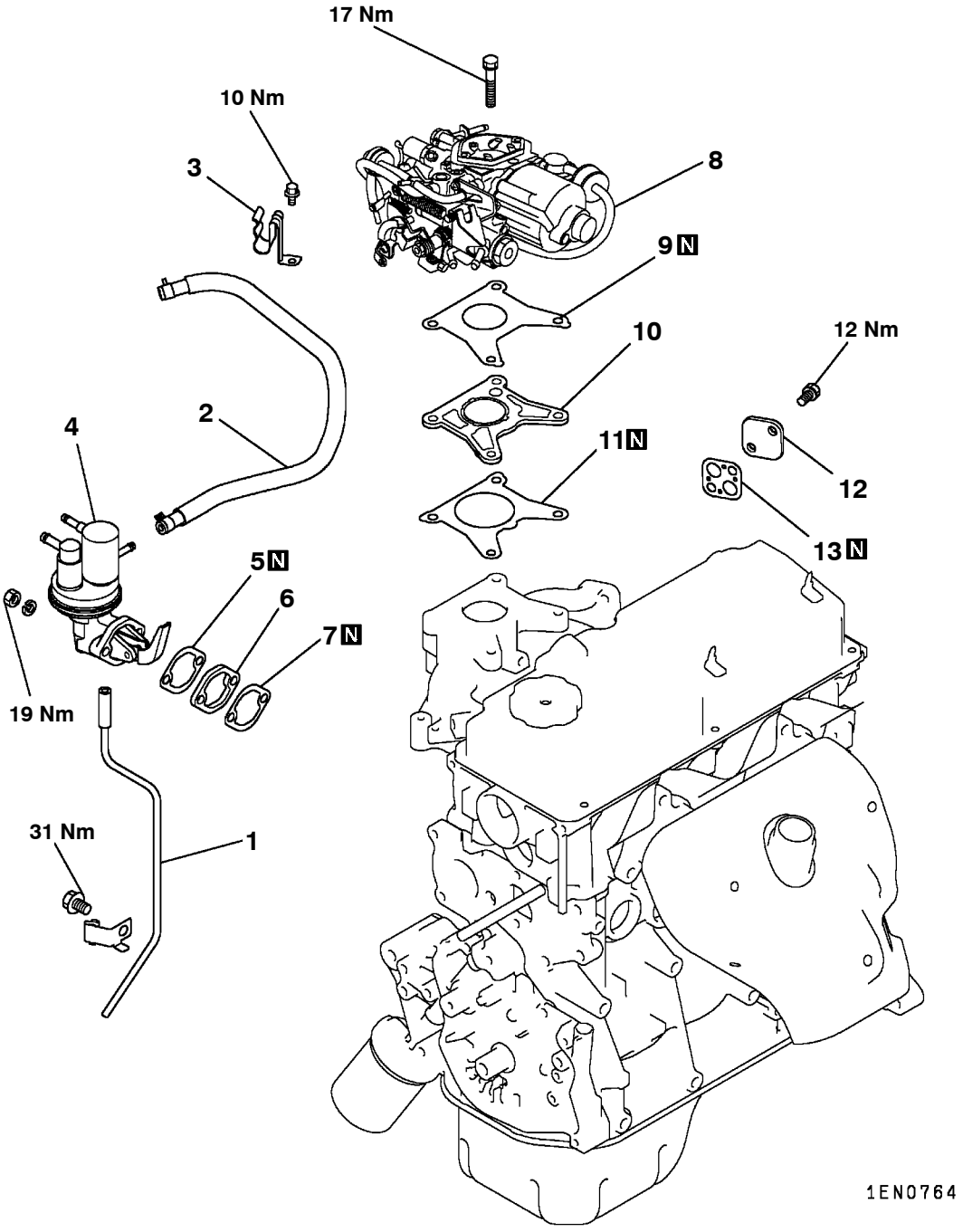
REMOVAL AND INSTALLATION <SOHC 12-VALVE-CARBURETOR>



Removal steps

1. Breather tube
2. Fuel hose
3. Hose clamp
4. Fuel pump
5. Gasket
6. Insulator
7. Gasket
8. Carburetor
9. Upper gasket
10. Spacer
11. Lower gasket
12. EGR valve <engine with EGR>
13. Cover <engine without EGR>
14. Gasket

REMOVAL AND INSTALLATION <SOHC 16-VALVE-CARBURETOR>

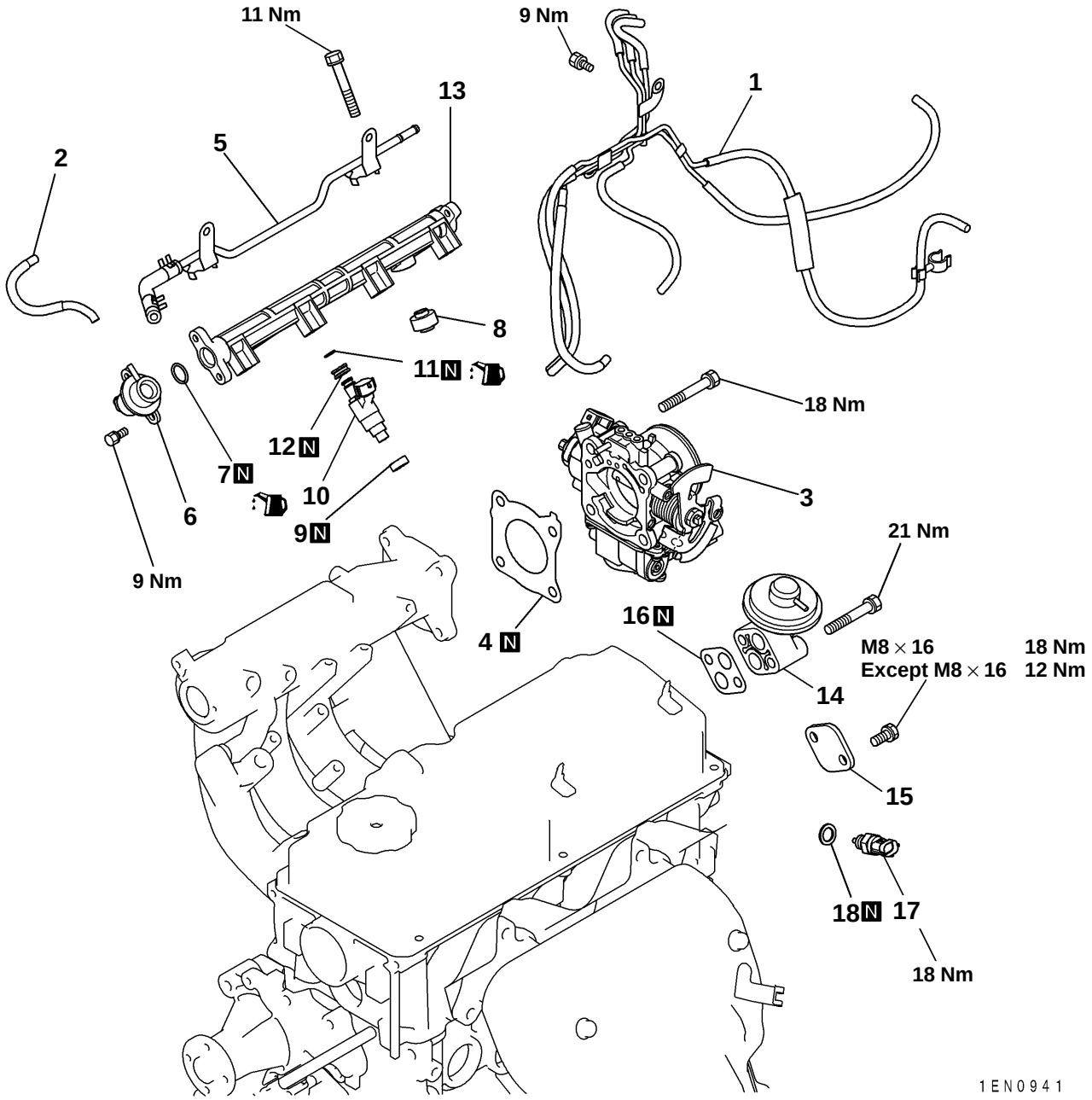


Removal steps

1. Breather tube
2. Fuel hose
3. Hose clamp
4. Fuel pump
5. Gasket
6. Insulator
7. Gasket
8. Carburetor
9. Upper gasket
10. Spacer
11. Lower gasket
12. Cover
13. Gasket

Intentionally blank

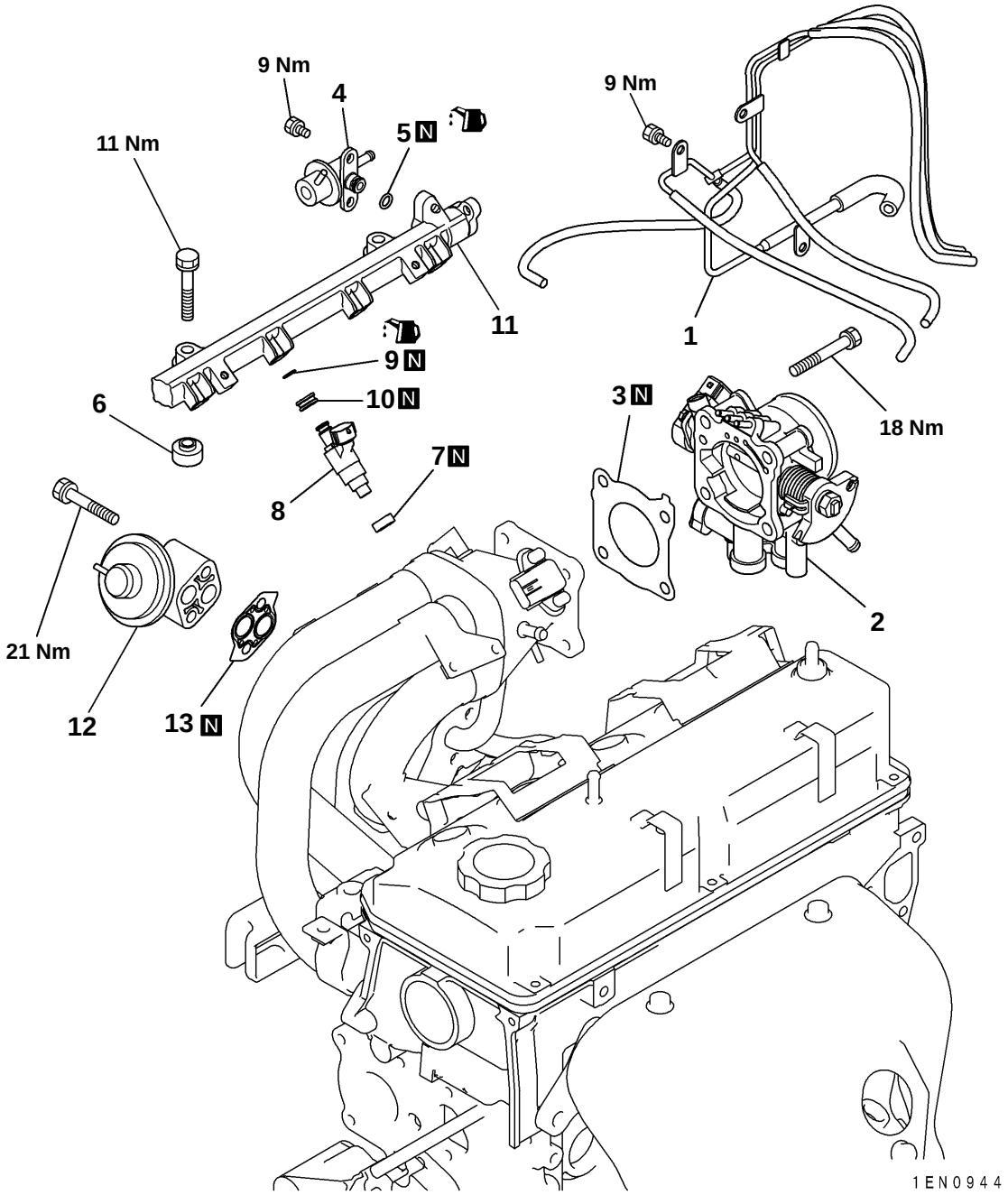
REMOVAL AND INSTALLATION <SOHC–MPI – FRONT WHEEL DRIVE (EXCEPT FROM 2001 model FOR EUROPE)>



Removal steps

1. Vacuum pipe and hose assembly
2. Vacuum hose assembly
3. Throttle body assembly
4. Gasket
5. Fuel return pipe
▶B◀ 6. Fuel pressure regulator
7. O-ring
8. Insulator
9. Insulator
▶A◀ 10. Injector
11. O-ring
12. Grommet
13. Delivery pipe
14. EGR valve (With EGR valve)
15. Cover (Without EGR valve)
16. Gasket
17. Air temperature sensor (Up to 2000 model)
18. Gasket (Up to 2000 model)

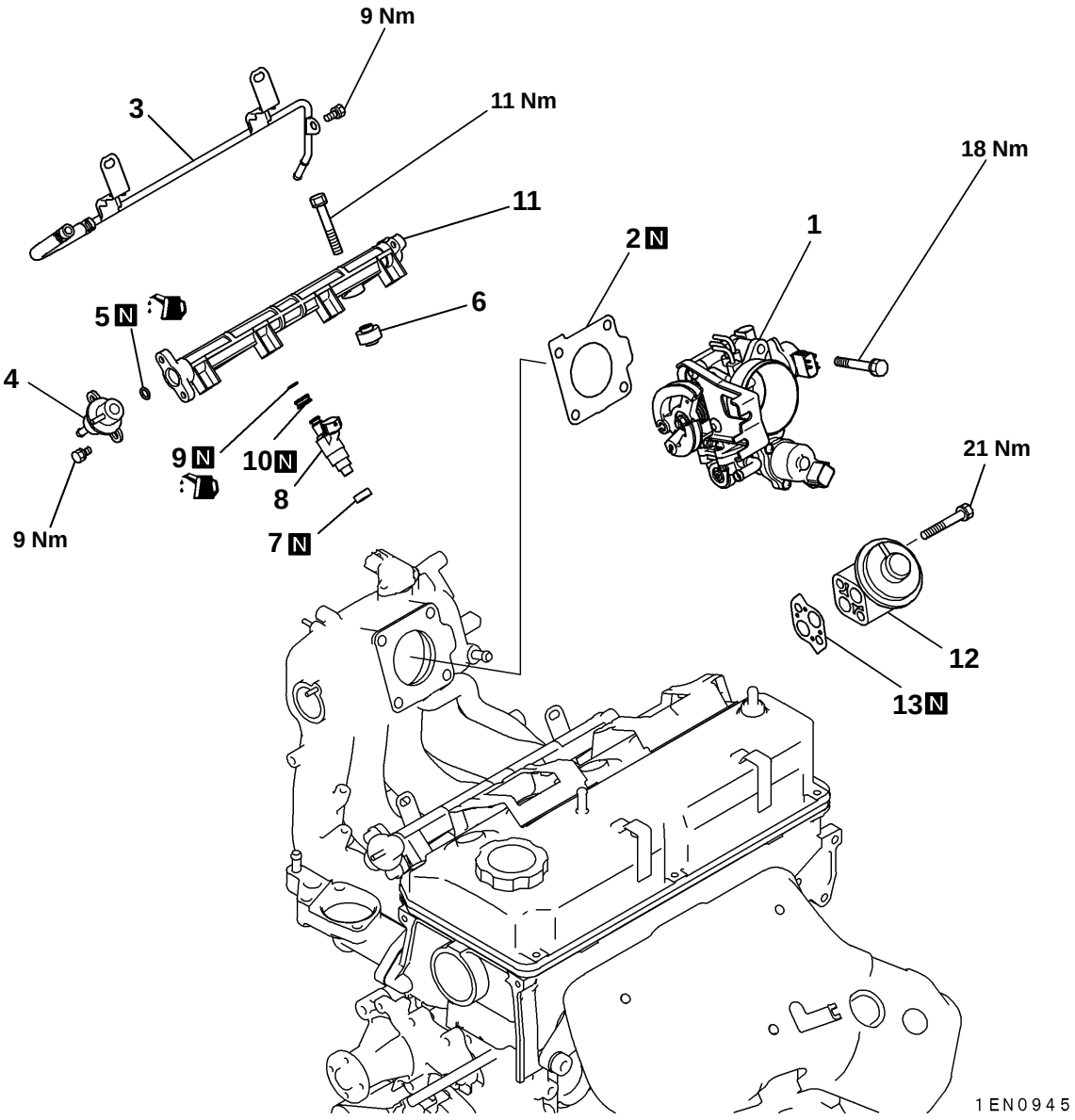
REMOVAL AND INSTALLATION <SOHC–MPI – FRONT WHEEL DRIVE (FROM 2001 model FOR EUROPE)>



Removal steps

1. Vacuum pipe and hose
2. Throttle body assembly
3. Gasket
▶B◀ 4. Fuel pressure regulator
5. O-ring
6. Insulator
7. Insulator
▶A◀ 8. Injector
9. O-ring
10. Grommet
11. Delivery pipe
12. EGR valve
13. Gasket

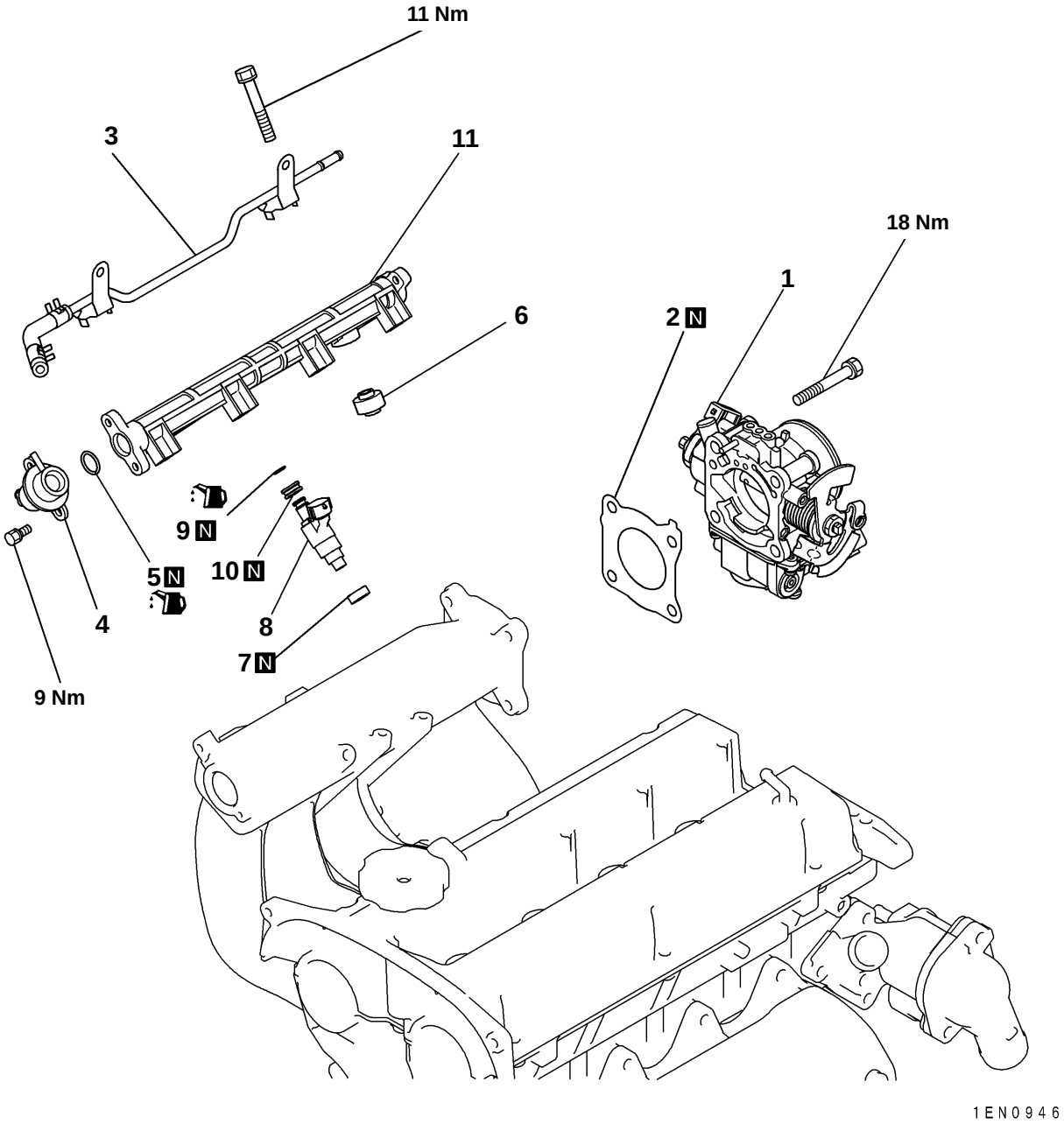
REMOVAL AND INSTALLATION <SOHC–MPI – REAR WHEEL DRIVE>



Removal steps

1. Throttle body assembly
2. Gasket
3. Fuel return pipe
▶B◀ 4. Fuel pressure regulator
5. O-ring
6. Insulator
7. Insulator
▶A◀ 8. Injector
9. O-ring
10. Grommet
11. Delivery pipe
12. EGR valve
13. Gasket

REMOVAL AND INSTALLATION <DOHC>



Removal steps

1. Throttle body assembly
2. Gasket
3. Fuel return pipe
▶B◀ 4. Fuel pressure regulator
5. O-ring
6. Insulator
7. Insulator
▶A◀ 8. Injector
9. O-ring
10. Grommet
11. Delivery pipe

INSTALLATION SERVICE POINTS

▶A◀ INJECTOR INSTALLATION

(1) Fit a new O-ring and grommet onto the injector.
(2) Apply spindle oil or gasoline to the injector O-ring.

(3) Fit the injector onto the delivery pipe, turning it to the left and right as it goes in.
(4) Check that the injector rotates smoothly.

Caution
If the injector does not rotate smoothly, its O-ring may be binding. If this occurs, remove the injector from the delivery pipe, check the O-ring, and re-insert the injector.

▶B◀ FUEL PRESSURE REGULATOR INSTALLATION

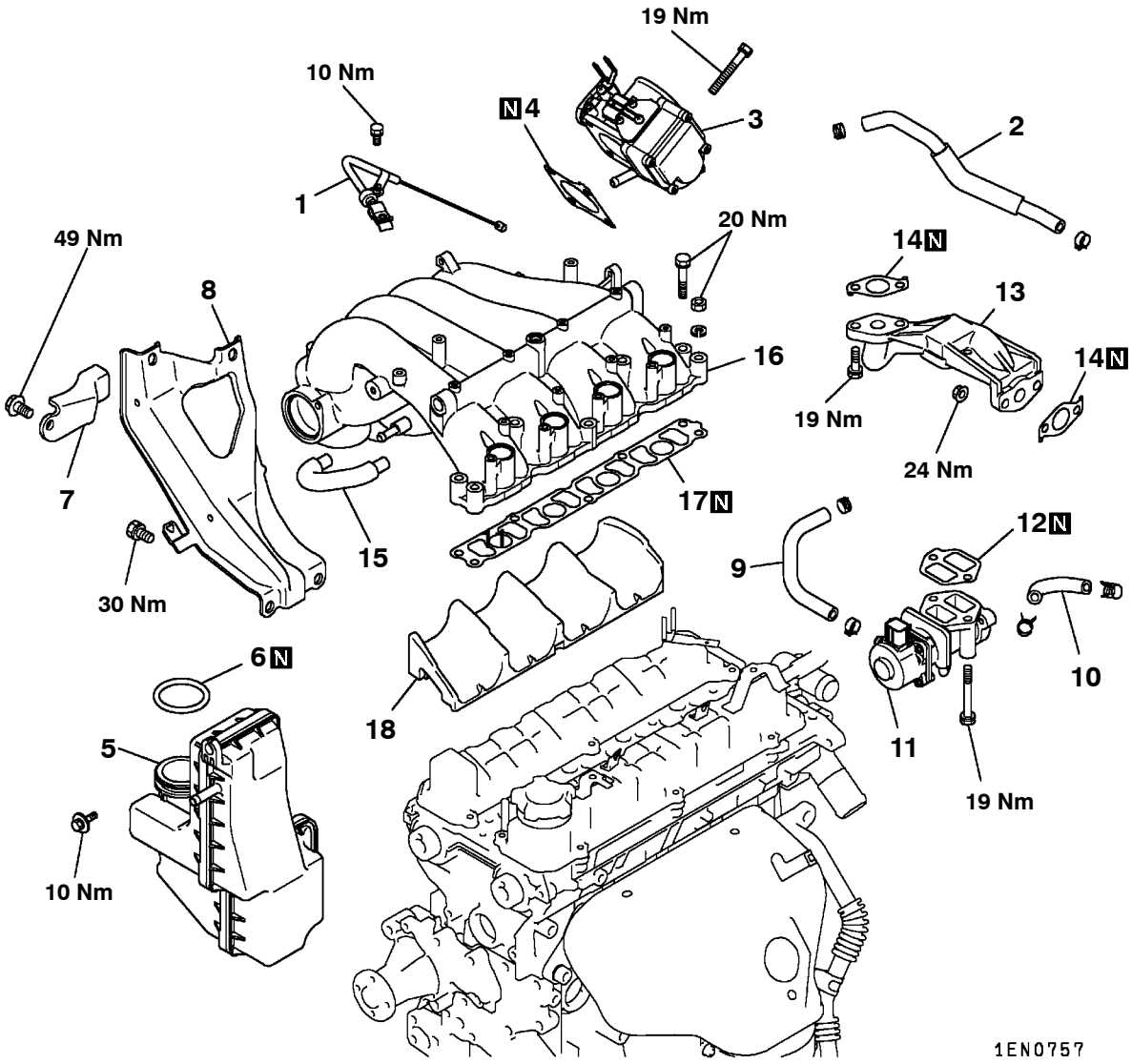
(1) Apply a little new engine oil to the O-ring, then insert the fuel pressure regulator into the delivery pipe, taking care not to damage the O-ring.

Caution
Ensure that no engine oil enters the delivery pipe.

(2) Check that the fuel pressure regulator rotates smoothly. If it does not rotate smoothly, the O-ring may be binding. If this occurs, remove the fuel pressure regulator, check the O-ring for damage, then re-insert the regulator into the delivery pipe.

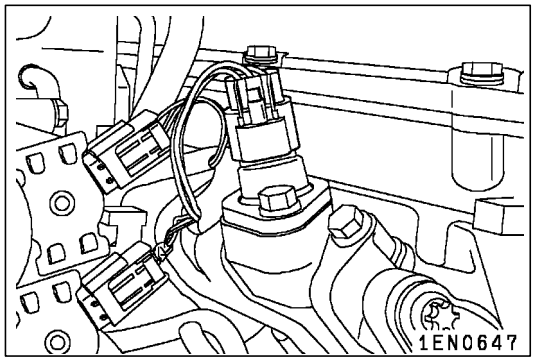
INTAKE MANIFOLD AND THROTTLE BODY (GDI)

REMOVAL AND INSTALLATION



Removal steps

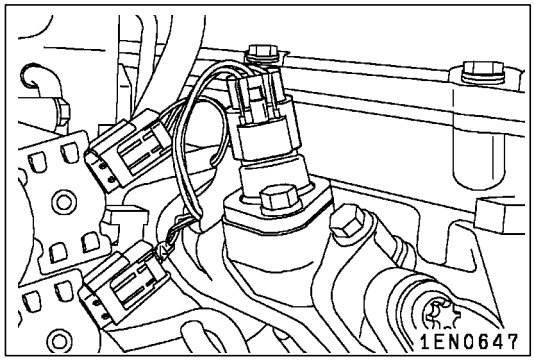
1. Accelerator cable
2. Water hose
3. Throttle body
4. Gasket
5. Air intake plenum resonator
6. O-ring
7. Power plant stay, right
▶B◀ 8. Intake manifold stay
9. Water hose
10. Water hose
11. EGR valve
12. Gasket
13. EGR valve support
14. Gasket
15. P.C.V. hose
◀A▶ ▶A◀ 16. Intake manifold
17. Gasket
18. Insulator



REMOVAL SERVICE POINT

◀A▶ INTAKE MANIFOLD REMOVAL

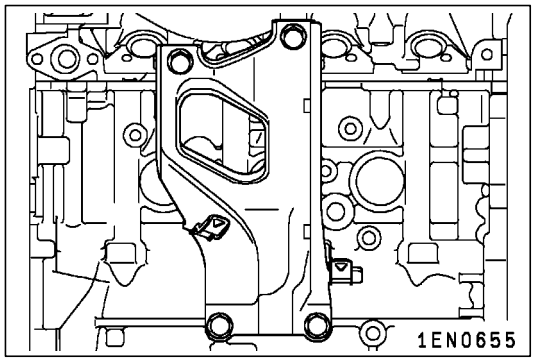
Disconnect the fuel pressure sensor connectors.



INSTALLATION SERVICE POINTS

▶A◀ INTAKE MANIFOLD INSTALLATION

After installing the intake manifold, connect the fuel pressure sensor connectors.

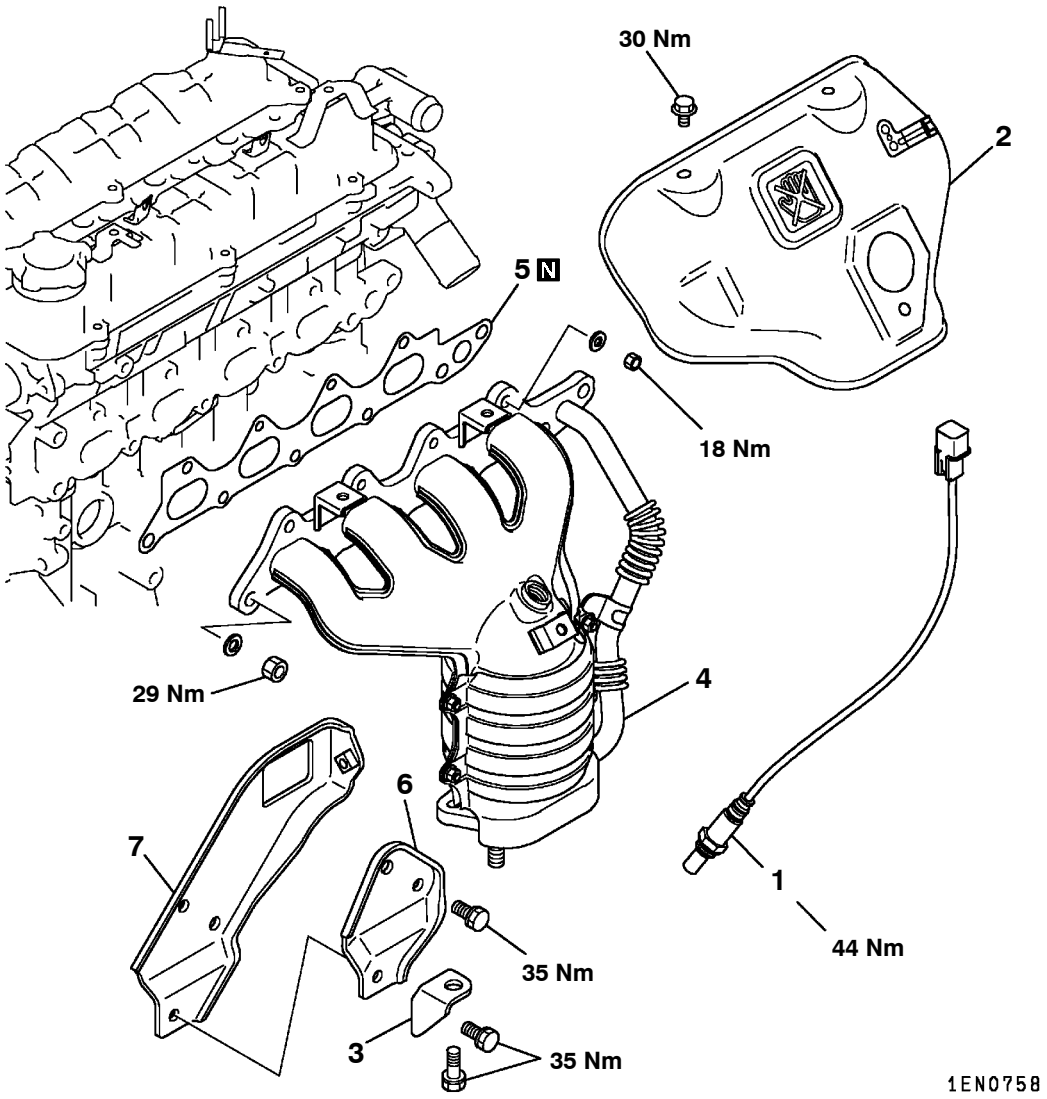


▶B◀ INTAKE MANIFOLD STAY INSTALLATION

Ensure that the intake manifold stay is in close contact with the intake manifold and the cylinder block boss. After that, tighten the bolts to the specified torque.

EXHAUST MANIFOLD (GDI)

REMOVAL AND INSTALLATION

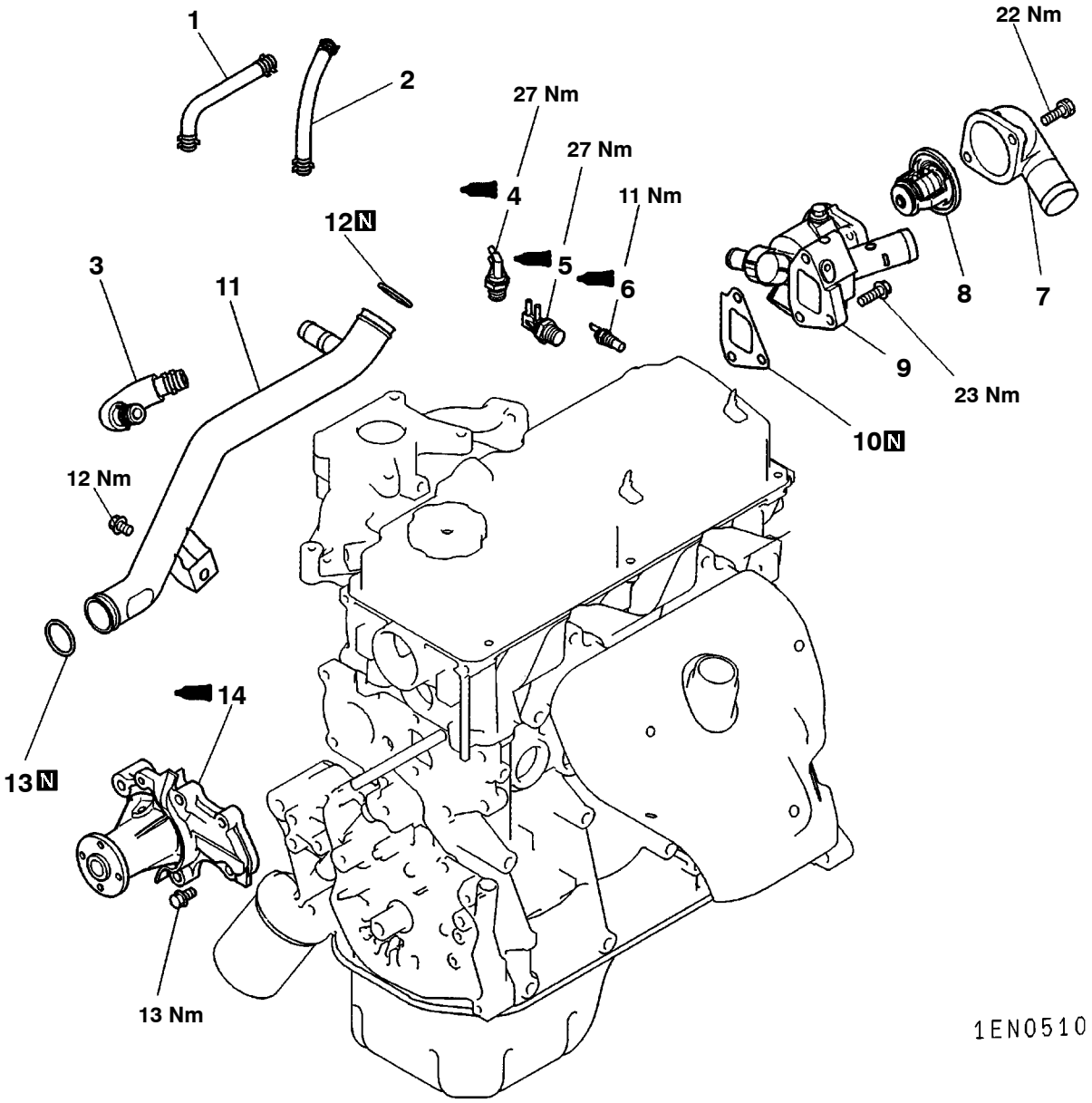


Removal steps

1. Oxygen sensor
2. Exhaust manifold cover
3. Exhaust manifold bracket B
4. Exhaust manifold
5. Exhaust manifold gasket
6. Exhaust manifold bracket A
7. Power plant stay, left

6. WATER PUMP AND WATER HOSE

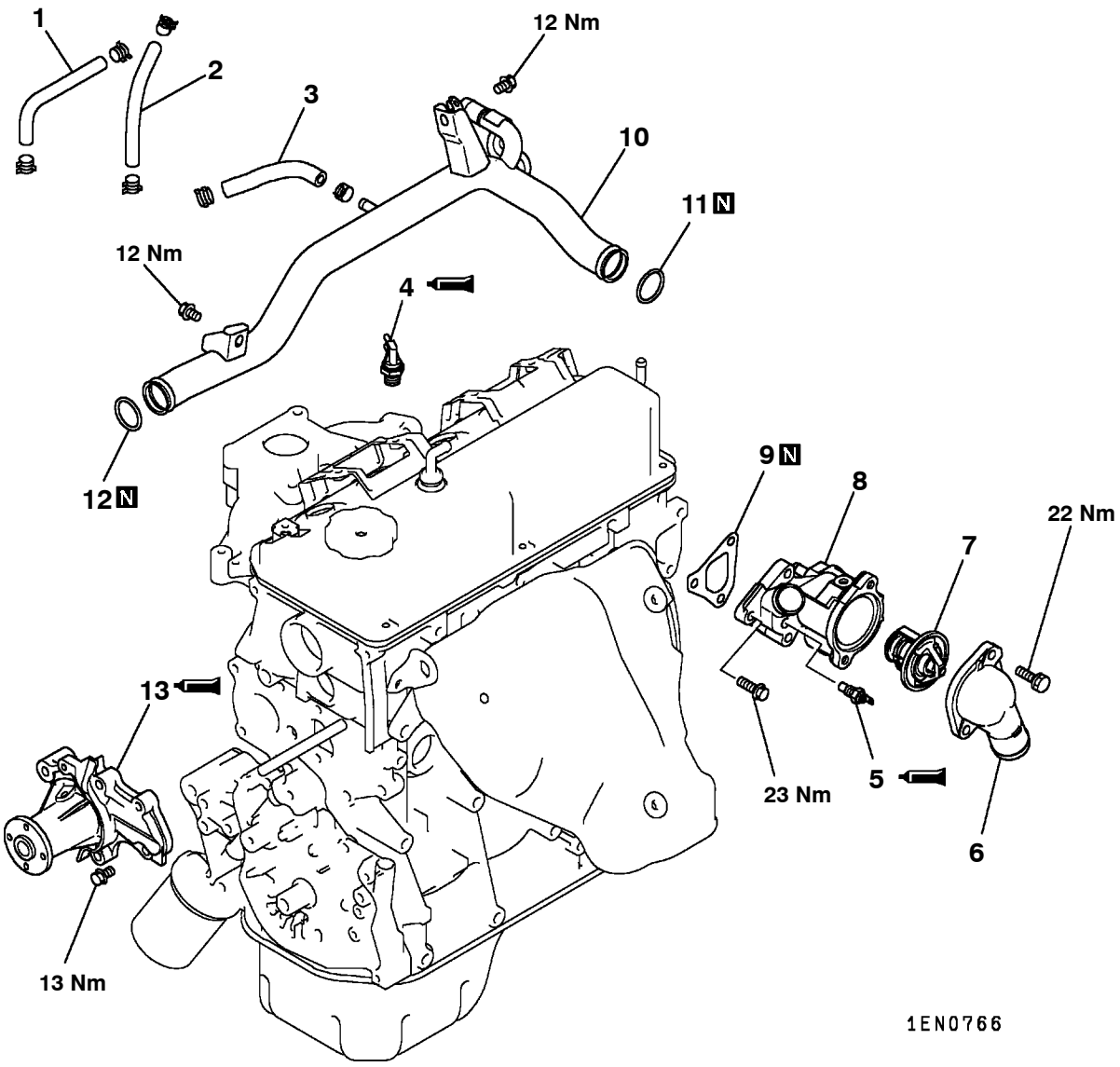
REMOVAL AND INSTALLATION <SOHC 12-VALVE-CARBURETOR>



Removal steps

1. Water hose
2. Water hose
3. Water hose
▶F◀ 4. Thermo valve <engines with EGR>
▶F◀ 5. Thermo valve
▶D◀ 6. Engine coolant temperature gauge unit
7. Water inlet fitting
▶C◀ 8. Thermostat
9. Thermostat case
10. Gasket
▶B◀ 11. Water inlet pipe
▶B◀ 12. O-ring
▶B◀ 13. O-ring
▶A◀ 14. Water pump

REMOVAL AND INSTALLATION <SOHC 16-VALVE - CARBURETOR>

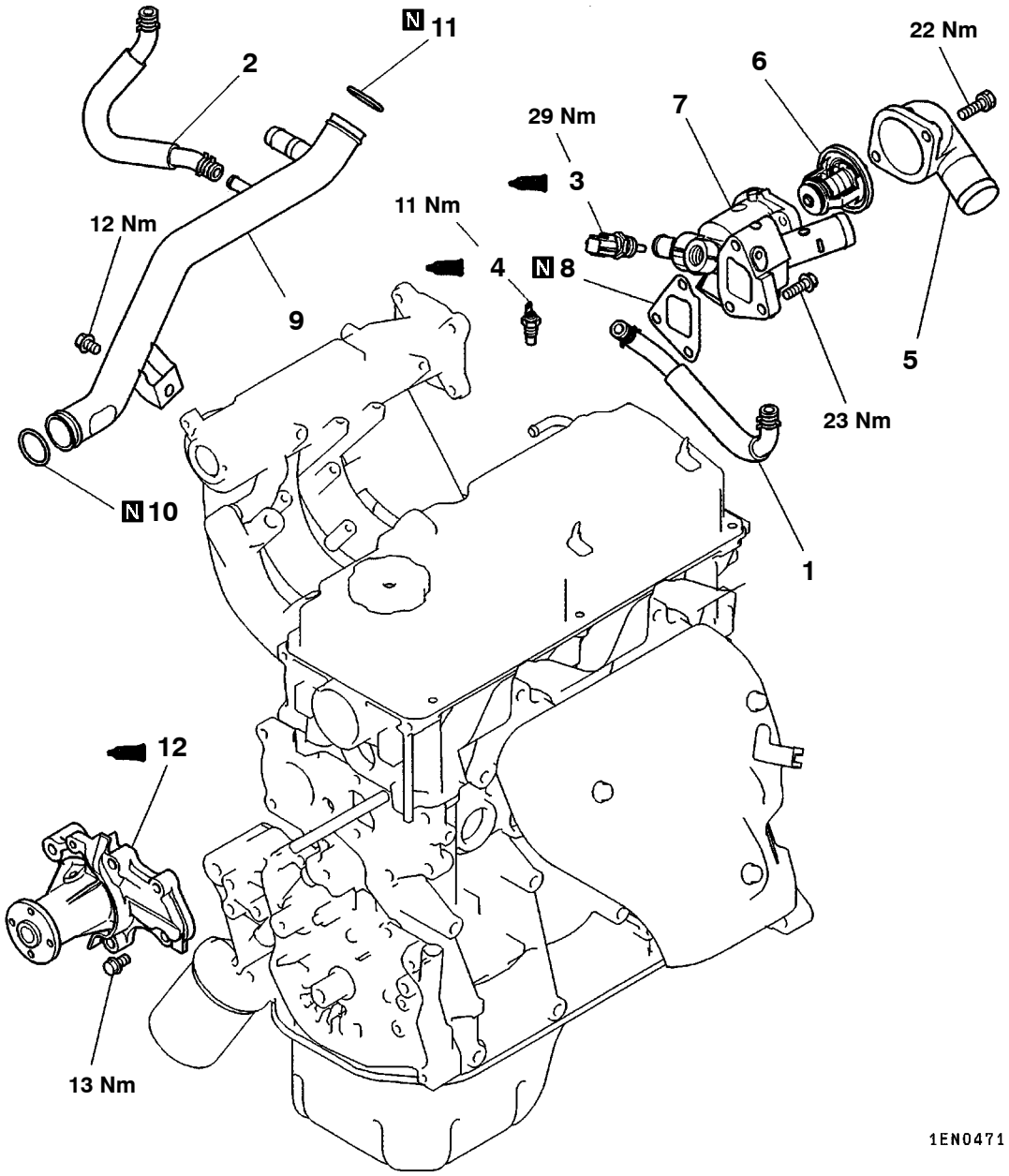


Removal steps

1. Water hose
2. Water hose
3. Water hose
- ▶F◀ 4. Thermo valve
- ▶D◀ 5. Engine coolant temperature gauge unit
6. Water inlet fitting
- ▶C◀ 7. Thermostat
8. Thermostat case
9. Gasket
- ▶B◀ 10. Water inlet pipe
- ▶B◀ 11. O-ring
- ▶B◀ 12. O-ring
- ▶A◀ 13. Water pump

Intencionalmente en blanco

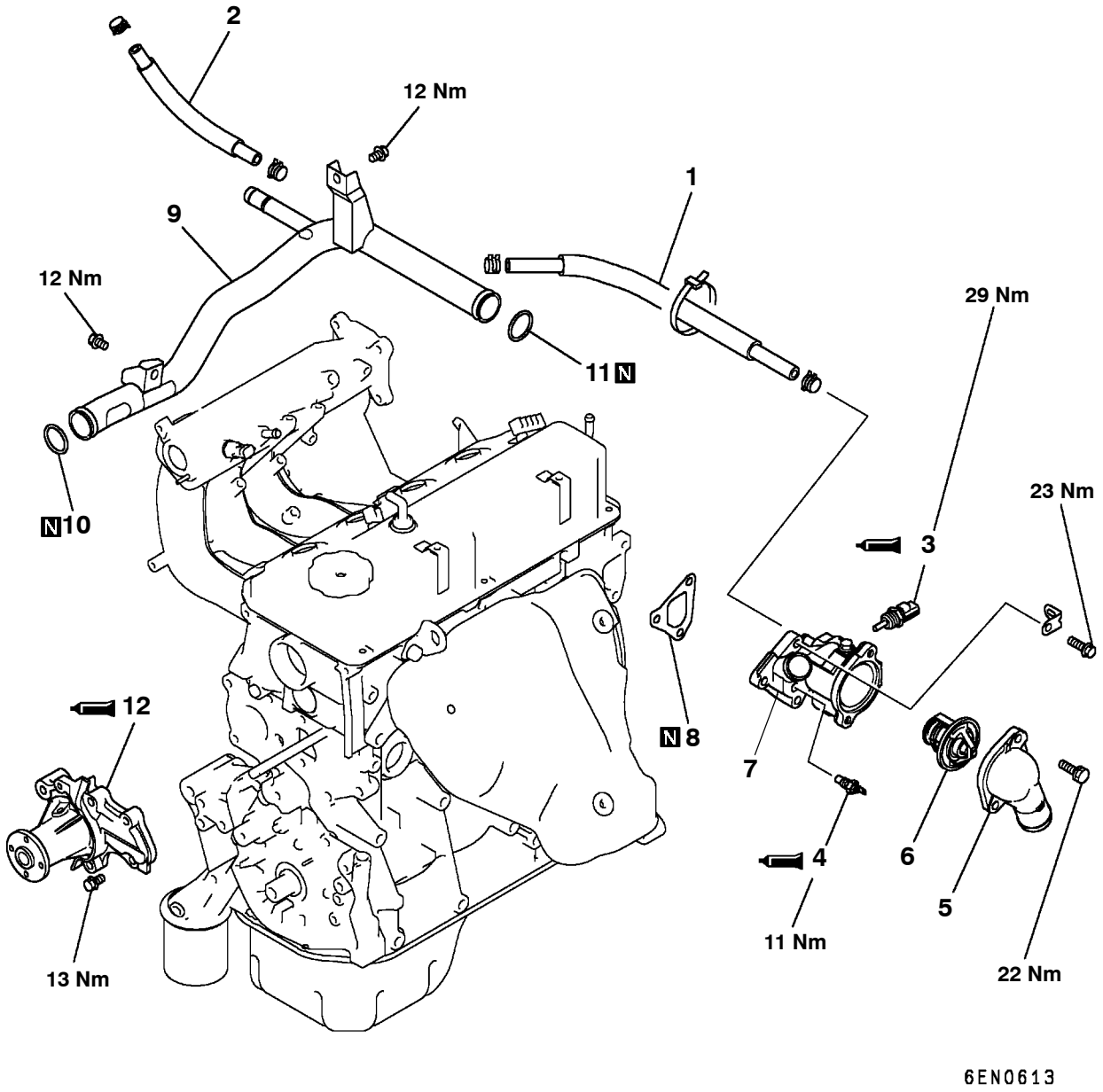
REMOVAL AND INSTALLATION <SOHC-MPI>



Removal steps

1. Water hose
2. Water hose
▶E◀ 3. Engine coolant temperature sensor
▶D◀ 4. Engine coolant temperature gauge unit
5. Water inlet fitting
▶C◀ 6. Thermostat
7. Thermostat case
8. Gasket
▶B◀ 9. Water inlet pipe
▶B◀ 10. O-ring
▶B◀ 11. O-ring
▶A◀ 12. Water pump

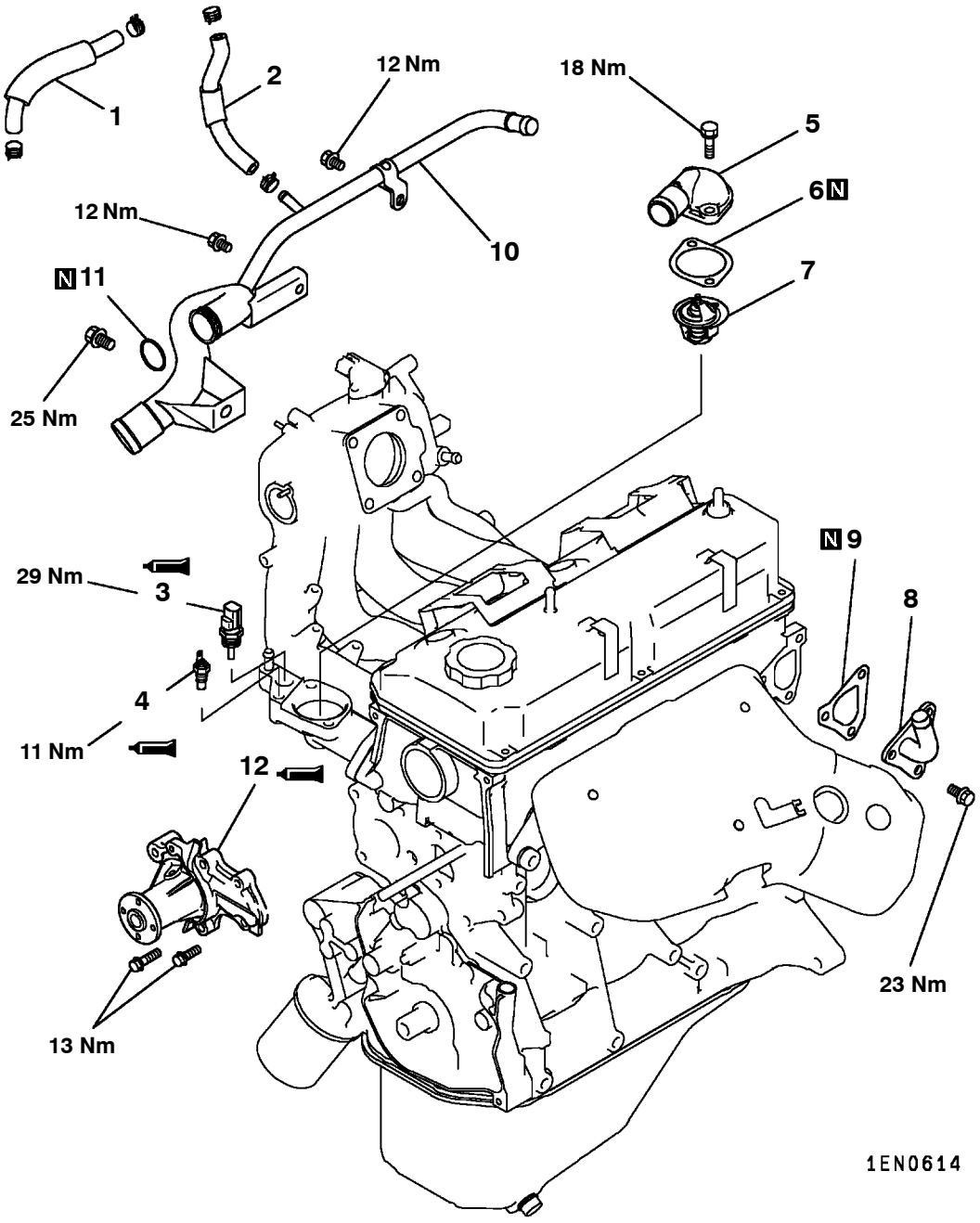
REMOVAL AND INSTALLATION <SOHC 16-VALVE-MPI - FRONT WHEEL DRIVE>



Removal steps

1. Water hose
2. Water hose
▶E◀ 3. Engine coolant temperature sensor
▶D◀ 4. Engine coolant temperature gauge unit
5. Water inlet fitting
▶C◀ 6. Thermostat
7. Thermostat case
8. Gasket
▶B◀ 9. Water inlet pipe
▶B◀ 10. O-ring
▶B◀ 11. O-ring
▶A◀ 12. Water pump

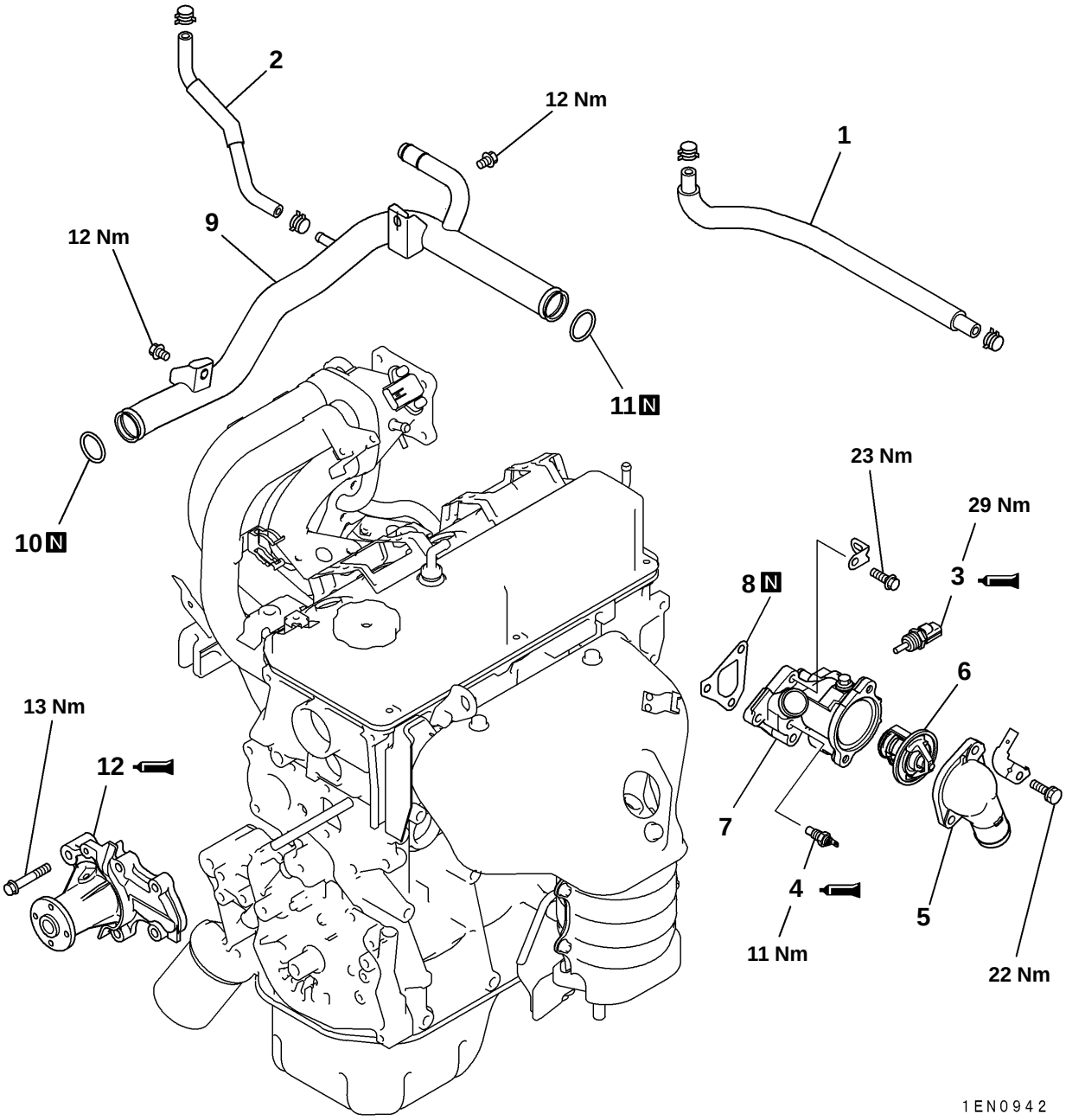
REMOVAL AND INSTALLATION <SOHC 16-VALVE-MPI - REAR WHEEL DRIVE>



Removal steps

1. Water hose
2. Water hose
▶E◀ 3. Engine coolant temperature sensor
▶D◀ 4. Engine coolant temperature gauge unit
5. Water outlet fitting
6. Gasket
▶C◀ 7. Thermostat
8. Fitting
9. Gasket
▶B◀ 10. Water inlet pipe
▶B◀ 11. O-ring
▶A◀ 12. Water pump

REMOVAL AND INSTALLATION <SOHC 16-VALVE–MPI – FRONT WHEEL DRIVE (FROM 2004 model FOR EUROPE)>

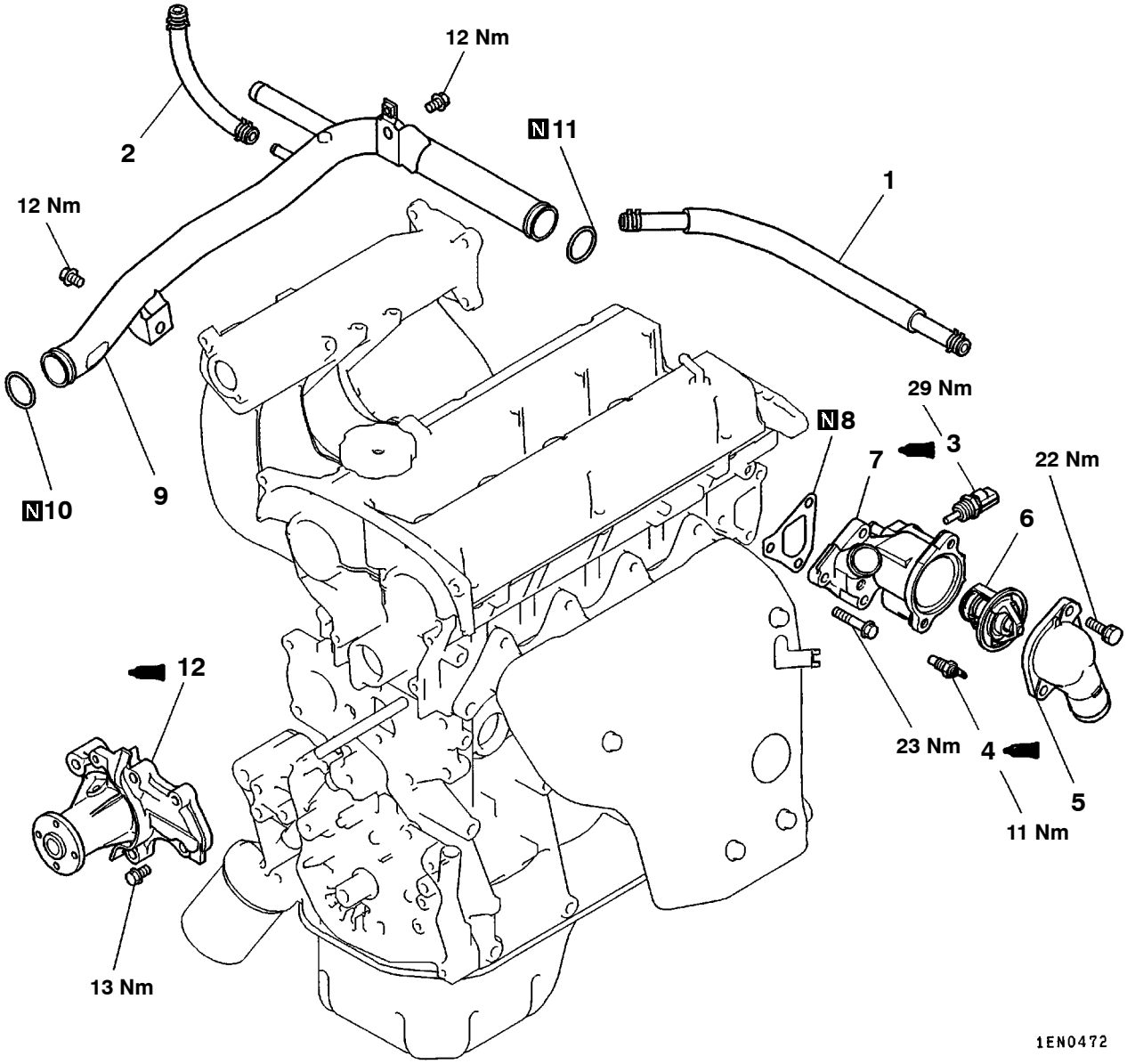


Removal steps

1. Water hose
2. Water hose
▶E◀ 3. Engine coolant temperature sensor
▶D◀ 4. Engine coolant temperature gauge unit
5. Water inlet fitting
▶C◀ 6. Thermostat
7. Thermostat case
8. Gasket
▶B◀ 9. Water inlet pipe
▶B◀ 10. O-ring
▶B◀ 11. O-ring
▶A◀ 12. Water pump

Intentionally blank

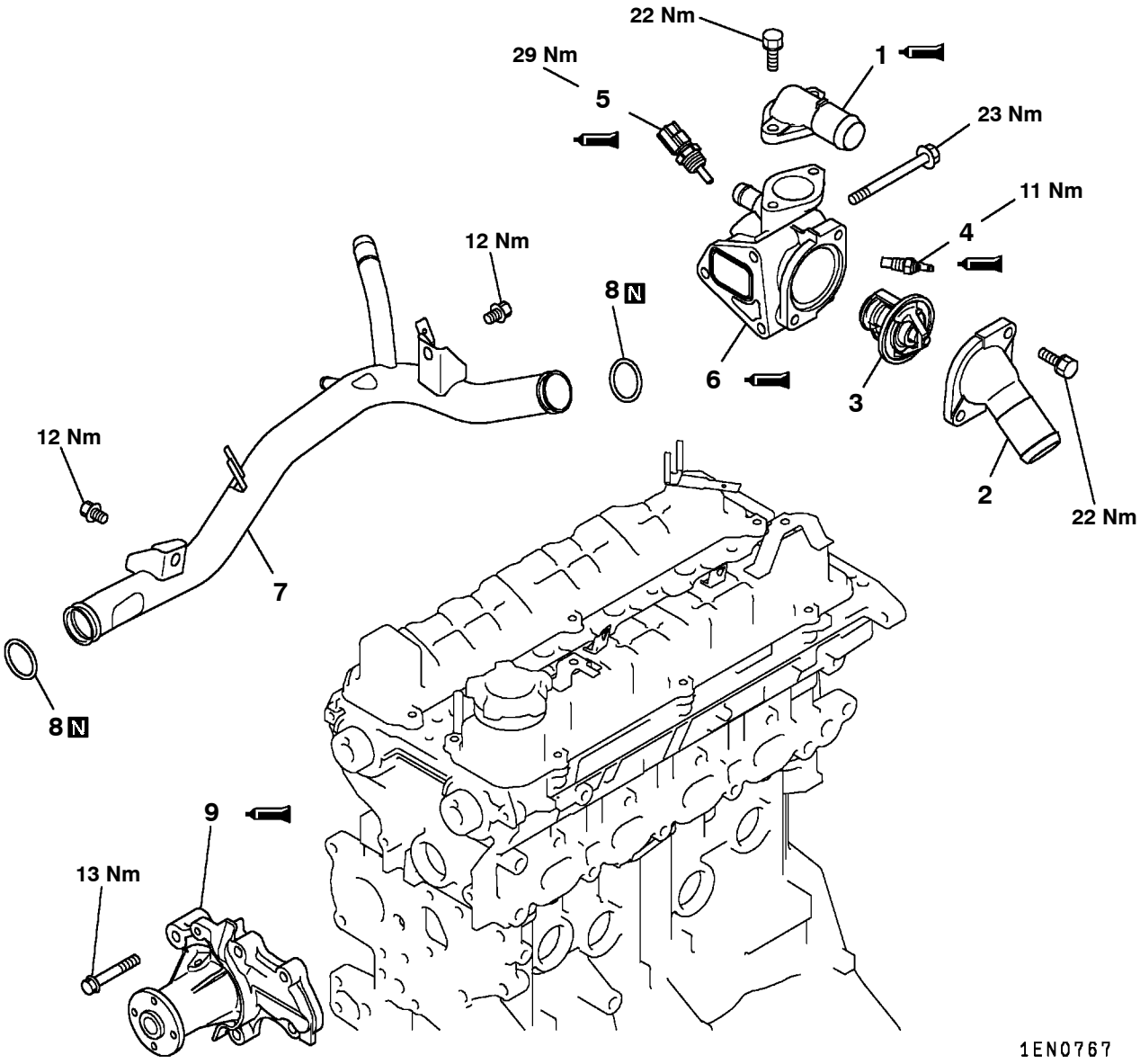
REMOVAL AND INSTALLATION <DOHC>



Removal steps

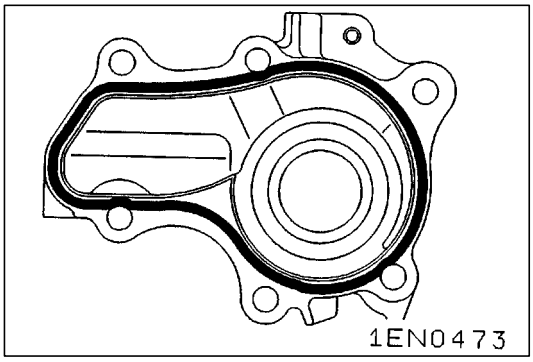
1. Water hose
2. Water hose
▶E◀ 3. Engine coolant temperature sensor
▶D◀ 4. Engine coolant temperature gauge unit
5. Water inlet fitting
▶C◀ 6. Thermostat
7. Thermostat case
8. Gasket
▶B◀ 9. Water inlet pipe
▶B◀ 10. O-ring
▶B◀ 11. O-ring
▶A◀ 12. Water pump

REMOVAL AND INSTALLATION <DOHC-GDI>



Removal steps

- ▶H◀ 1. Water outlet fitting
- 2. Water inlet fitting
- ▶C◀ 3. Thermostat
- ▶D◀ 4. Engine coolant temperature gauge unit
- ▶E◀ 5. Engine coolant temperature sensor
- ▶G◀ 6. Thermostat housing
- ▶B◀ 7. Water inlet pipe
- ▶B◀ 8. O-ring
- ▶A◀ 9. Water pump



INSTALLATION SERVICE POINTS

▶A◀ WATER PUMP INSTALLATION

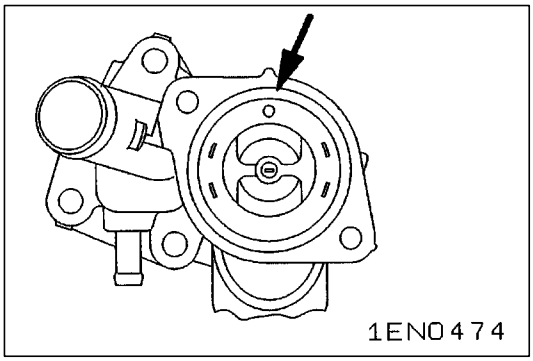
(1) Apply a 3 mm bead of form-in-place gasket (FIPG) to the mounting surface.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.

▶B◀ O-RING / WATER PIPE INSTALLATION

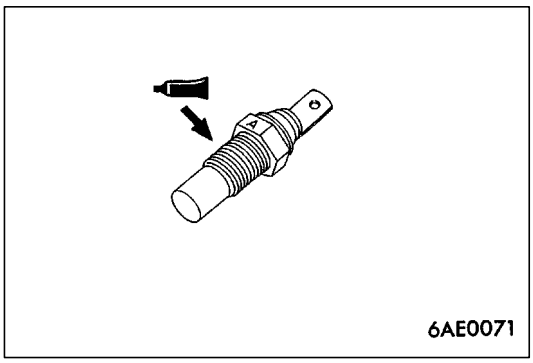
(1) Replace the water inlet pipe O-rings with new ones, then apply water to the O-rings so that they can be inserted easily into the water pump and thermostat case.

Caution
1. **Do not apply engine oil or any other oily substance to the O-rings.**
2. **Secure the water pipe after the thermostat case has been installed.**



▶C◀ THERMOSTAT INSTALLATION

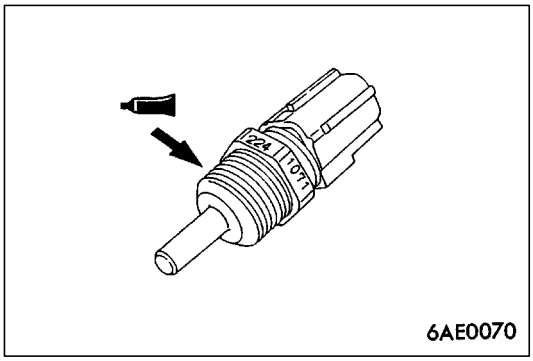
(1) Fit the thermostat such that its jiggle valve is at the top.



▶D◀ ENGINE COOLANT TEMPERATURE GAUGE UNIT INSTALLATION

(1) If the engine coolant temperature gauge unit is to be reused, apply the specified sealant to its thread.

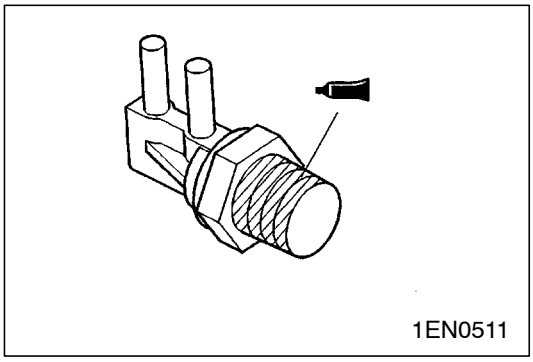
Specified sealant:
3M ATD Part No. 8660 or equivalent.



▶E◀ ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

(1) If the engine coolant temperature sensor is to be reused, apply the specified sealant to its thread.

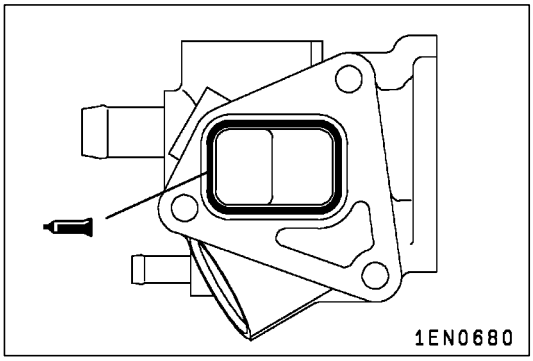
Specified sealant:
3M Nut Locking Part No. 4171 or equivalent.



▶F◀ THERMO VALVE INSTALLATION

(1) If the thermo valve is to be reused, apply the specified sealant to its thread.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.

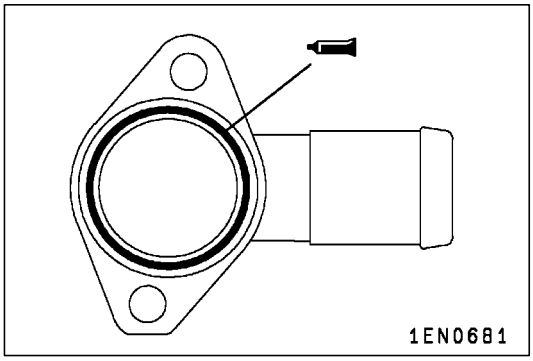


▶G◀THERMOSTAT HOUSING INSTALLATION

(1) Remove the old liquid gasket from the cylinder head (thermostat housing mounting surface) and the thermostat housing.
(2) Apply liquid gasket to the thermostat housing mounting surface by squeezing it to a thickness of 3 mm.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.

Caution
Squeeze the liquid gasket uniformly so that there is no break in the gasket nor is there too much gasket.



▶H◀ WATER OUTLET FITTING INSTALLATION

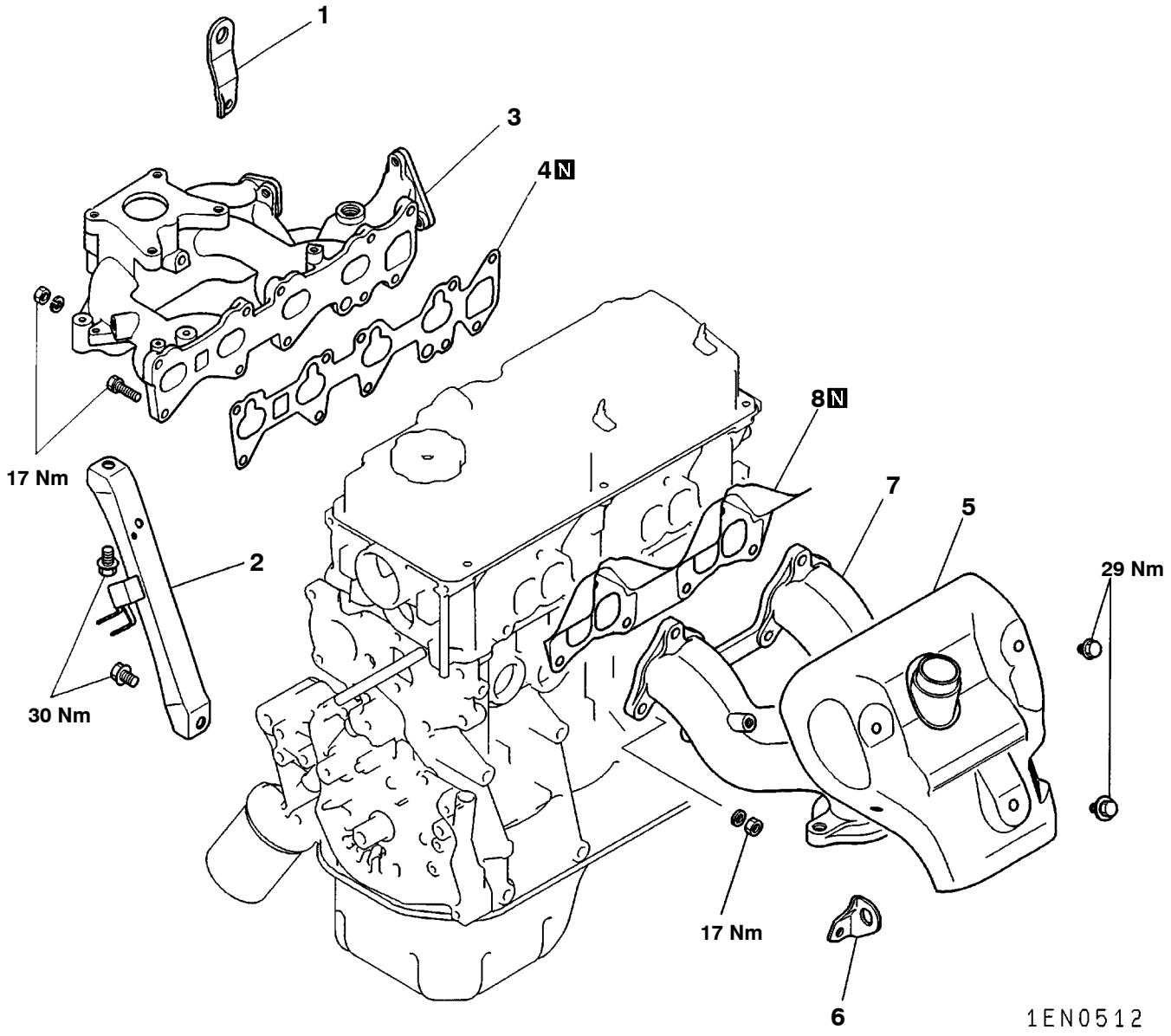
(1) Remove the old liquid gasket from the thermostat housing (water outlet fitting mounting surface) and the water outlet fitting.
(2) Apply liquid gasket to the water outlet fitting mounting surface by squeezing it to a thickness of 3 mm.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.

Caution
Squeeze the liquid gasket uniformly so that there is no break in the gasket nor is there too much gasket.

7. INTAKE AND EXHAUST MANIFOLDS

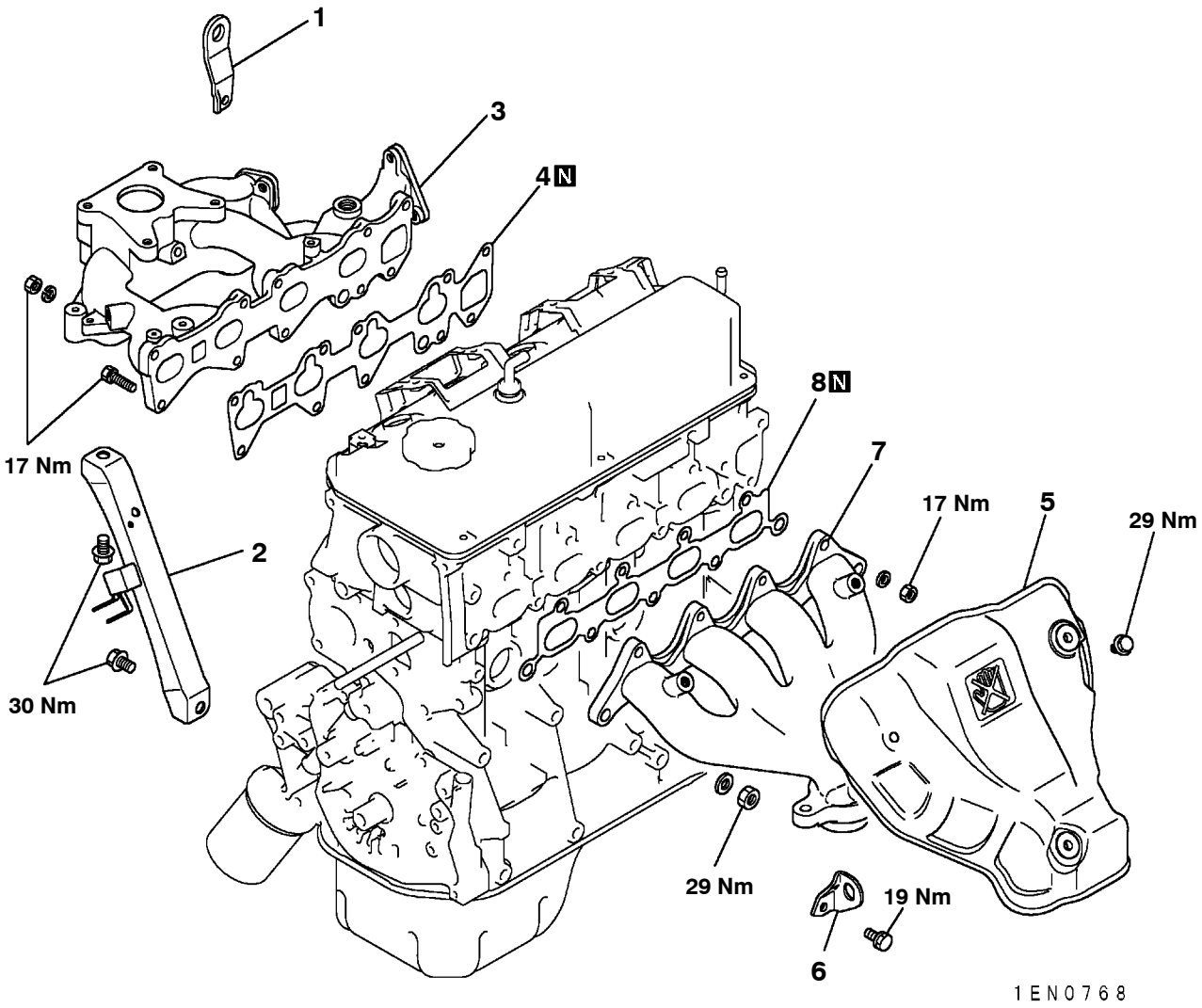
REMOVAL AND INSTALLATION <SOHC 12-VALVE-CARBURETOR>



Removal steps

1. Engine hanger
2. Intake manifold stay
3. Intake manifold
4. Intake manifold gasket
5. Exhaust manifold cover
6. Engine hanger
7. Exhaust manifold
8. Exhaust manifold gasket

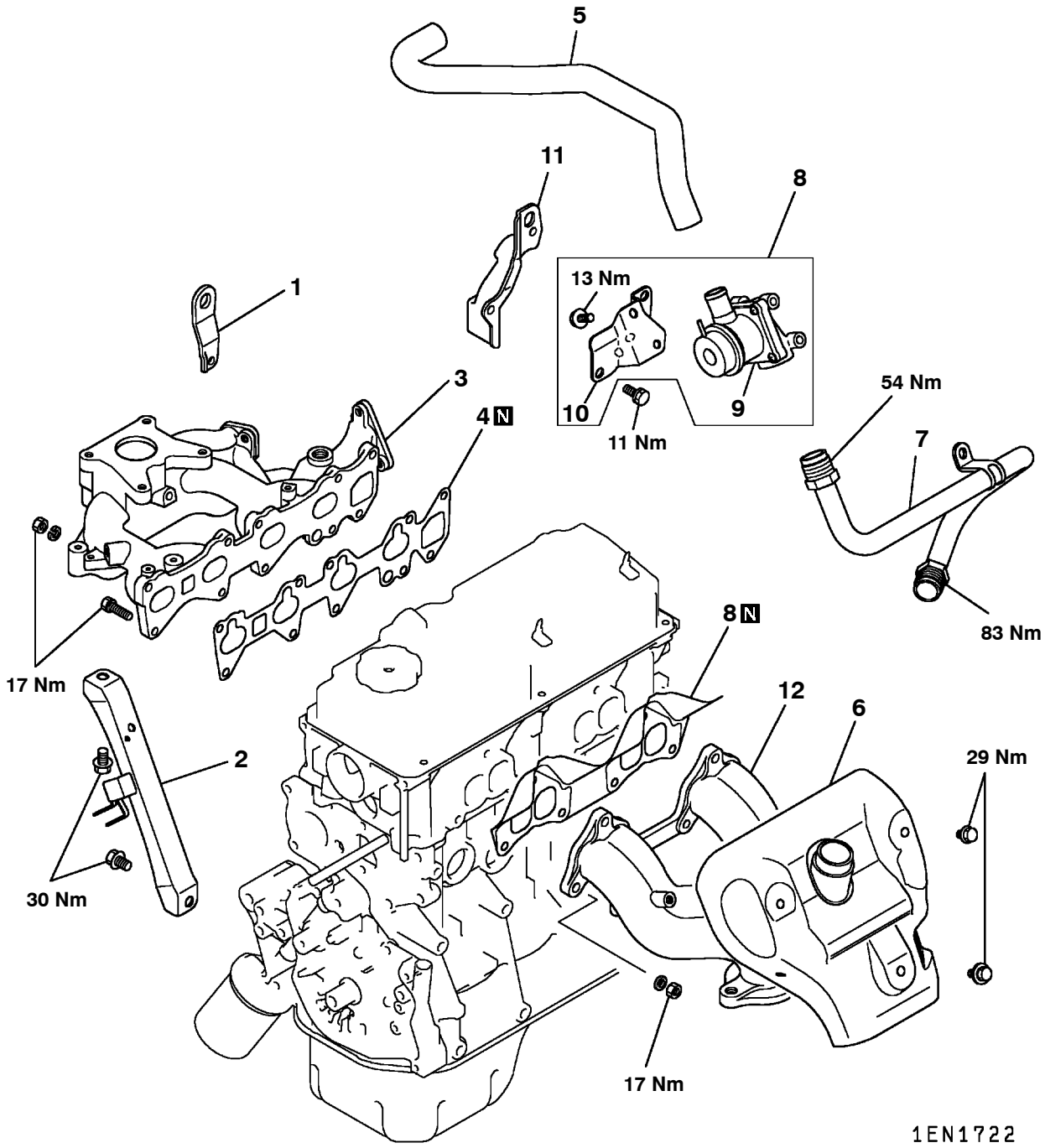
REMOVAL AND INSTALLATION <SOHC 16-VALVE-CARBURETOR>



Removal steps

1. Engine hanger
2. Intake manifold stay
3. Intake manifold
4. Intake manifold gasket
5. Exhaust manifold cover
6. Engine hanger
7. Exhaust manifold
8. Exhaust manifold gasket

REMOVAL AND INSTALLATION <SOHC-CARBURETOR FOR CENTRAL AMERICA>

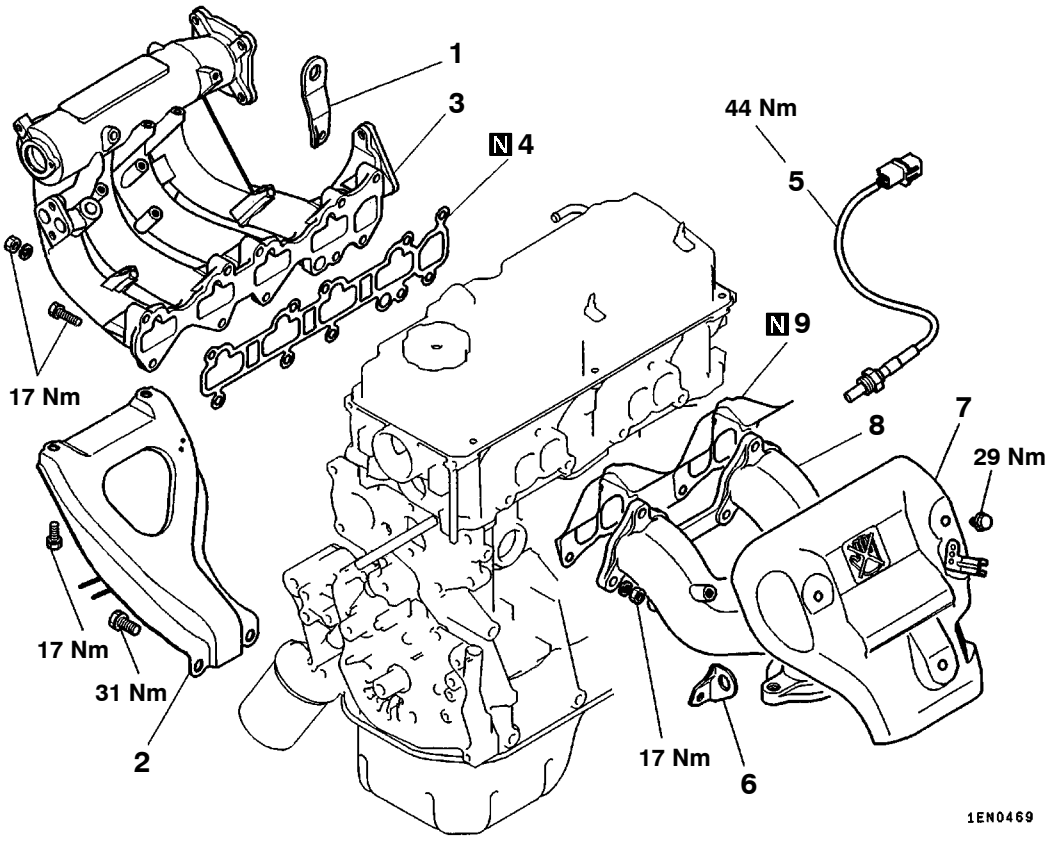


Removal steps

1. Engine hanger
2. Intake manifold stay
3. Intake manifold
4. Intake manifold gasket
5. Air hose
6. Exhaust manifold cover

▶A◀ 7. Air pipe
▶A◀ 8. Reed valve and bracket
9. Reed valve
10. Reed valve bracket “A”
11. Reed valve bracket “B”
12. Exhaust manifold

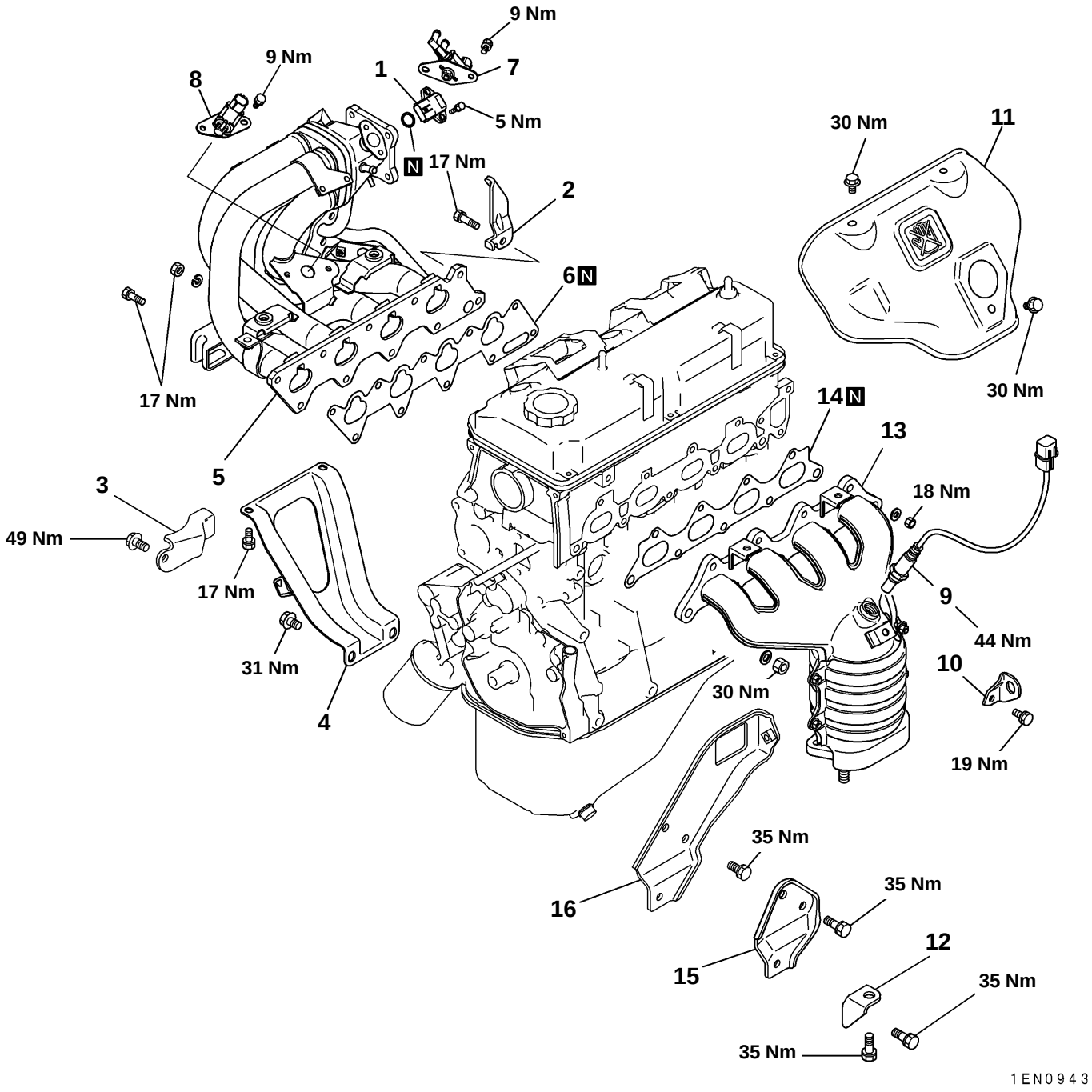
REMOVAL AND INSTALLATION <SOHC 12-VALVE-MPI>



Removal steps

1. Engine hanger
2. Intake manifold stay
3. Intake manifold
4. Intake manifold gasket
5. Oxygen sensor <vehicles for Hong Kong only>
6. Engine hanger
7. Exhaust manifold cover
8. Exhaust manifold
9. Exhaust manifold gasket

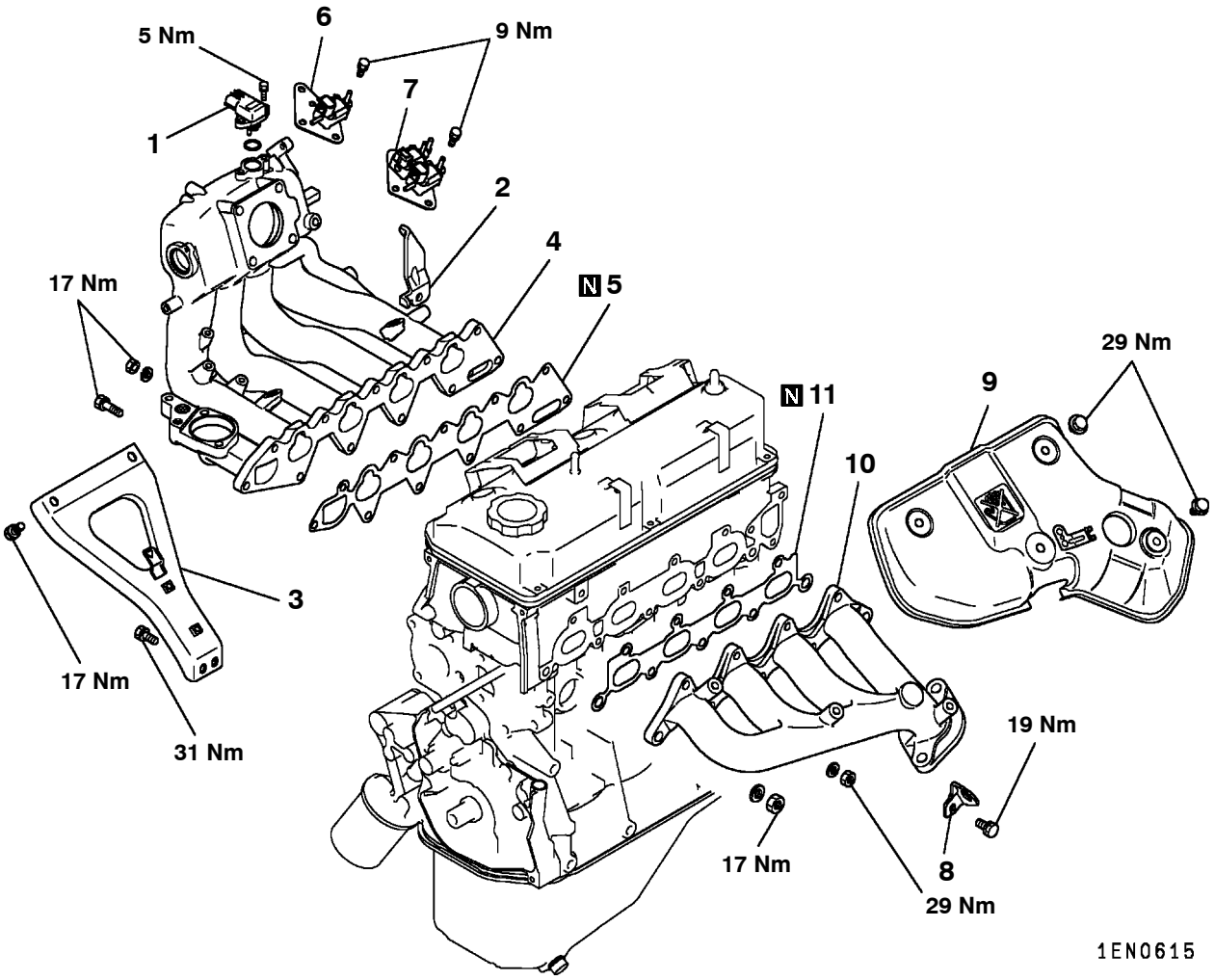
REMOVAL AND INSTALLATION <SOHC 16-VALVE–MPI – FRONT WHEEL DRIVE (FROM 2001 model for Europe)>



Removal steps

1. Boost sensor
2. Engine hanger
3. Power plant stay, right (From 2004 model)
4. Intake manifold stay
5. Intake manifold
6. Intake manifold gasket
7. Solenoid valve assembly
8. Solenoid valve assembly
9. Oxygen sensor
10. Engine hanger
11. Exhaust manifold cover
12. Exhaust monifold bracket B
13. Exhaust manifold
14. Exhaust manifold gasket
15. Exhaust manifold bracket A (Up to 2003 model)
16. Power plant stay, left (From 2004 model)

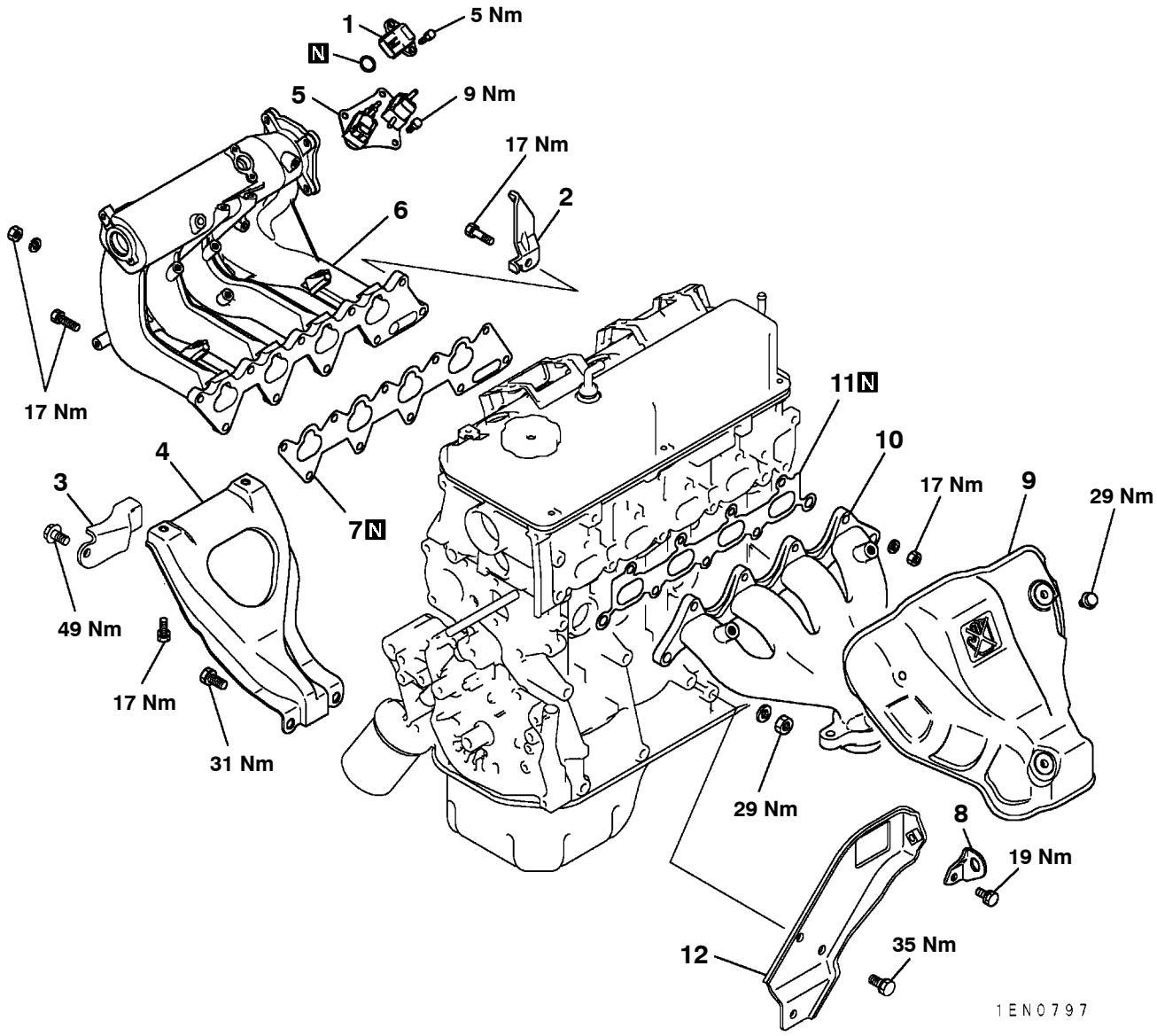
REMOVAL AND INSTALLATION <SOHC 16-VALVE-MPI - REAR WHEEL DRIVE>



Removal steps

1. Boost sensor
2. Engine hanger
3. Intake manifold stay
4. Intake manifold
5. Intake manifold gasket
6. Solenoid valve assembly <Without catalytic converter>
7. Solenoid valve assembly <With catalytic converter>
8. Engine hanger
9. Exhaust manifold cover
10. Exhaust manifold
11. Exhaust manifold gasket

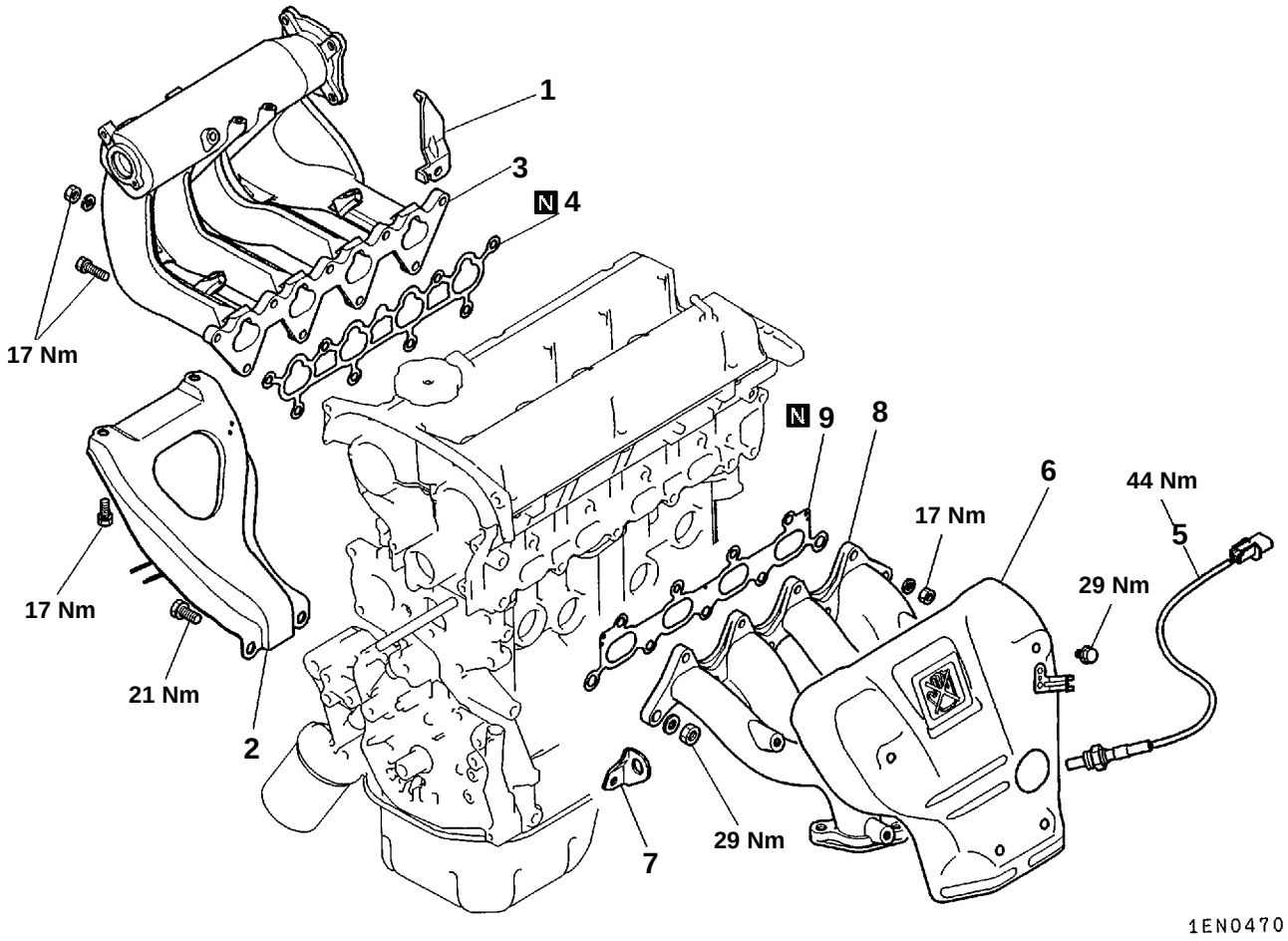
REMOVAL AND INSTALLATION <SOHC 16-VALVE-MPI - FRONT WHEEL DRIVE (EXCEPT FROM 2001 model FOR EUROPE)>



Removal steps

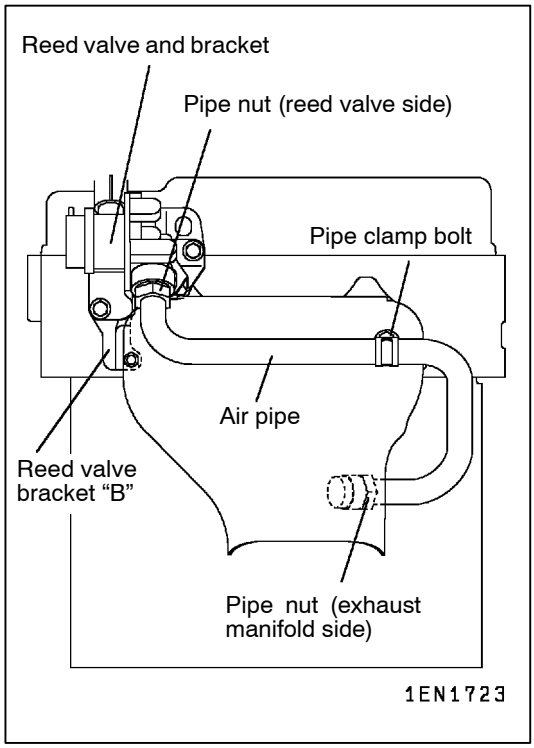
1. Boost sensor
2. Engine hanger
3. Power plant stay right <CVT>
4. Intake manifold stay
5. Solenoid valve assembly
6. Intake manifold
7. Intake manifold gasket
8. Engine hanger
9. Exhaust manifold cover
10. Exhaust manifold
11. Exhaust manifold gasket
12. Power plant stay left <CVT>

REMOVAL AND INSTALLATION <DOHC>



Removal steps

1. Engine hanger
2. Intake manifold stay
3. Intake manifold
4. Intake manifold gasket
5. Oxygen sensor
6. Exhaust manifold cover
7. Engine hanger
8. Exhaust manifold
9. Exhaust manifold gasket



INSTALLATION SERVICE POINTS

▶A◀ REED VALVE, BRACKET AND AIR PIPE INSTALLATION

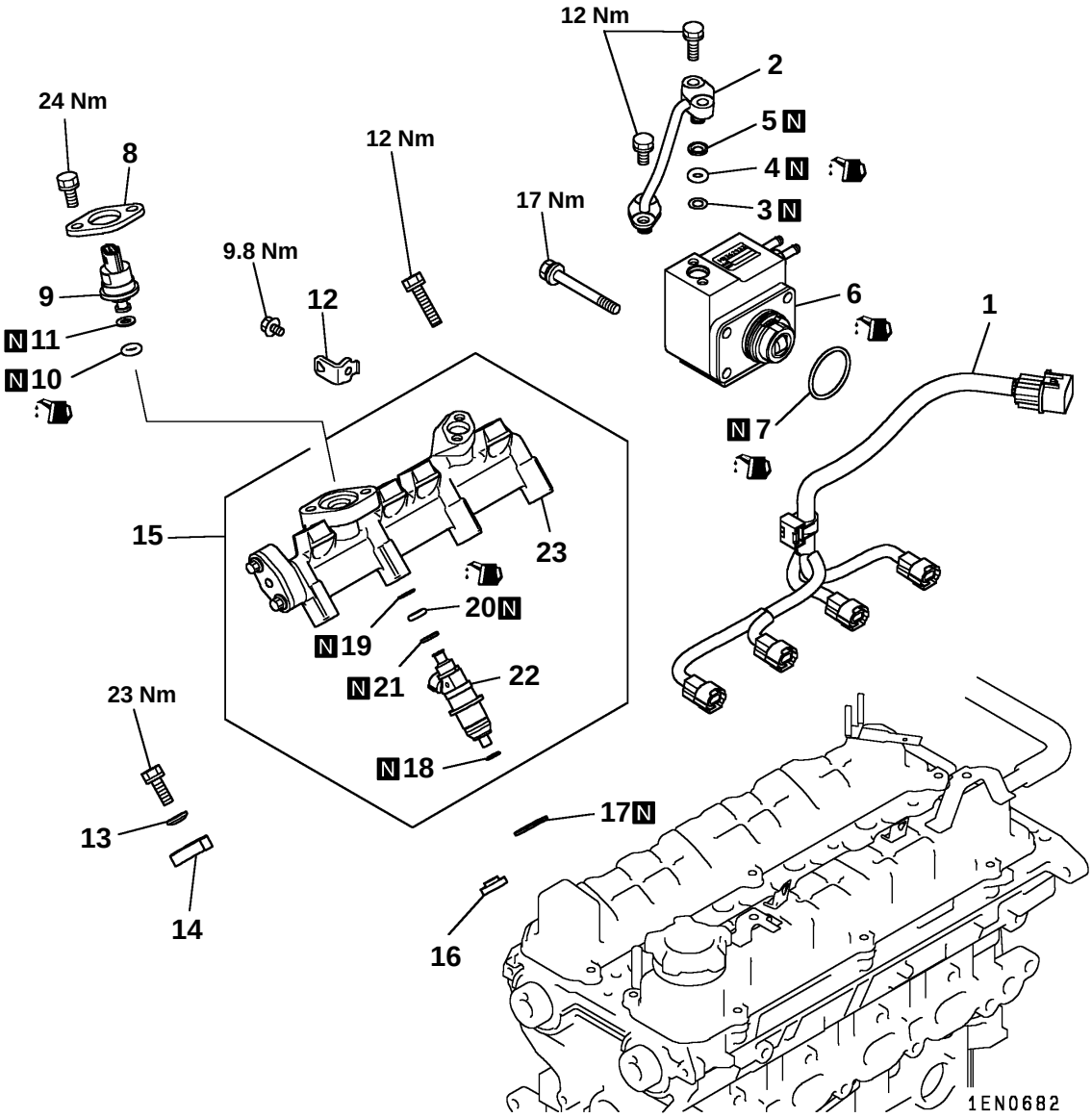
(1) Insert the lower end of the air pipe into the exhaust manifold, then tighten the pipe nut temporarily.
(2) Fit the upper end of the air pipe to the reed valve and bracket assembly, then tighten the pipe nut temporarily.
(3) Attach the reed valve and bracket assembly to the reed valve bracket "B" and tighten the mounting bolts temporarily.
(4) Tighten the nuts on both ends of the air pipe to the specified torque.

Caution
The tightening torque of the reed valve side nut and that of the exhaust manifold side nut are different from each other.
Be sure to tighten each nut correctly to the specified torque.

(5) Tighten the reed valve and bracket mounting bolts to the specified torque.
(6) Tighten the pipe clamp bolt.

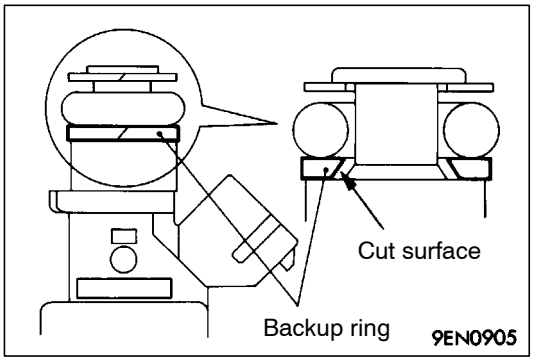
7a. FUEL SYSTEM (GDI)

REMOVAL AND INSTALLATION



Removal steps

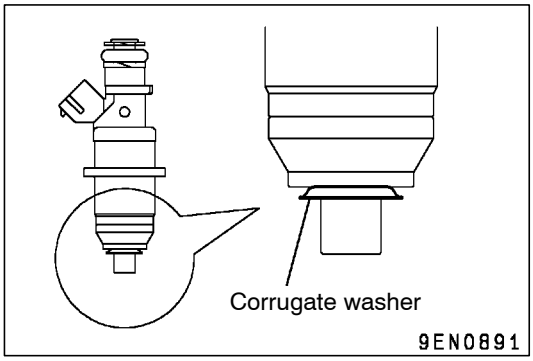
1. Injector harness
▶E◀ 2. Fuel pipe
▶E◀ 3. Backup ring
▶E◀ 4. O-ring
▶E◀ 5. Backup ring
▶E◀ 6. Fuel pump
7. O-ring
8. Flange
▶D◀ 9. Fuel pressure sensor
▶D◀ 10. O-ring
▶D◀ 11. Backup ring
12. Harness bracket
13. Washer
14. Injector holder
▶C◀ 15. Delivery pipe and injector
16. Insulator
17. Injector gasket
▶B◀ 18. Corrugate washer
▶A◀ 19. Backup ring
▶A◀ 20. O-ring
▶A◀ 21. Backup ring
▶F◀ 22. Injector
23. Delivery pipe



INSTALLATION SERVICE POINTS

▶A◀ BACKUP RING / O-RING INSTALLATION

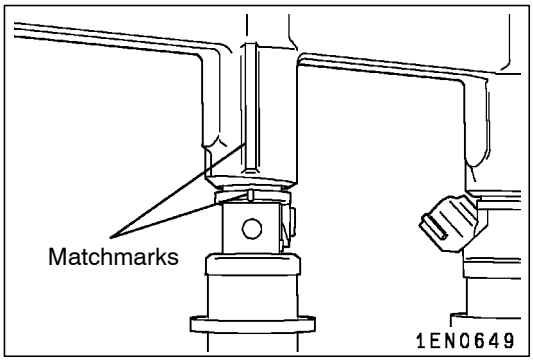
Install the backup rings and the O-rings on the injector. Install the backup ring (thicker one) on the injector with the inside cut surface facing the direction shown in the illustration.



▶B◀ CORRUGATE WASHER INSTALLATION

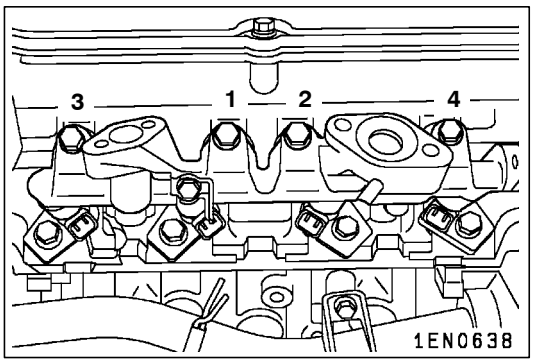
Apply white vaseline to the corrugate washer and install the washer on the injector in the direction shown.

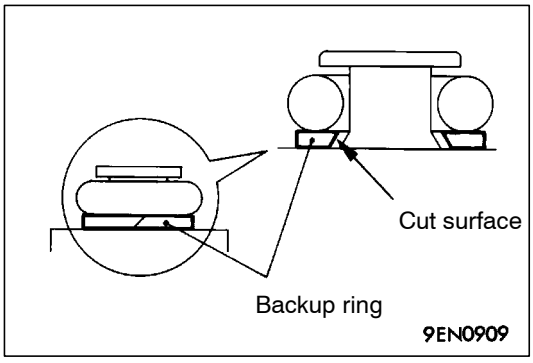
Caution
If the washer that has once been tightened is refused, it will cause fuel leakage or gas leakage. Be sure to use a new washer.



▶C◀ DELIVERY PIPE AND INJECTOR INSTALLATION

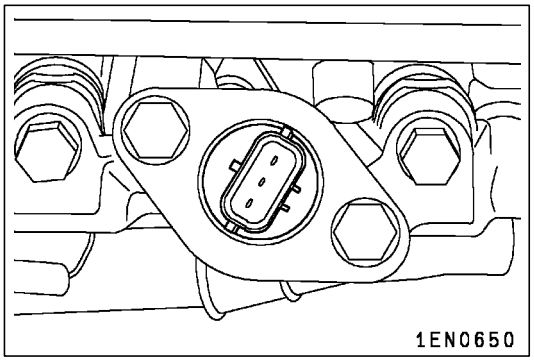
(1) Apply spindle oil or gasoline to injector O-rings.
(2) Insert the injector straight in the injector mounting hole on the delivery pipe.
(3) Try to the turn the injector. If the injector dose not turn smoothly, remove the injector and check the O-rings for damage. If damage is evident, replace the O-rings and reinstall the injector.
(4) Align the matchmark on the injector with that on the delivery pipe.
(5) Install the delivery pipe and injector on the cylinder head and tighten the bolts to the specified torque in the order shown in the illustration.



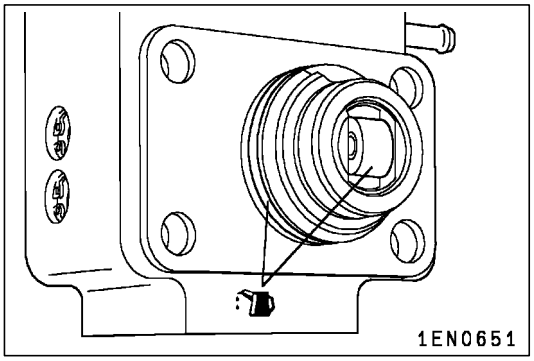


▶D◀ BACKUP RING / O-RING / FUEL PRESSURE SENSOR INSTALLATION

(1) Install the backup ring on the fuel pressure sensor with the inside cut surface facing the direction shown in the illustration.

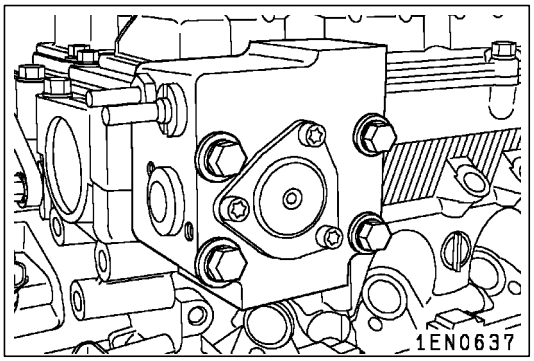


(2) Install the fuel pressure sensor in the direction shown, paying attention to the shape of connector.

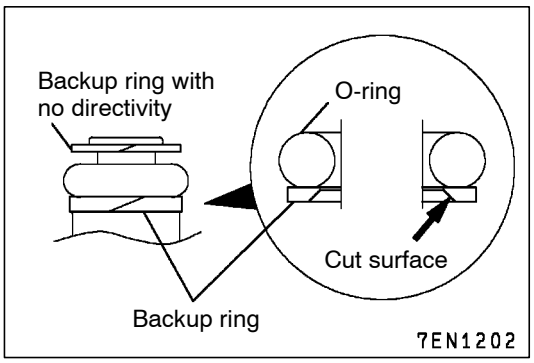


▶E◀ FUEL PUMP / BACKUP RING / O-RING / FUEL PIPE INSTALLATION

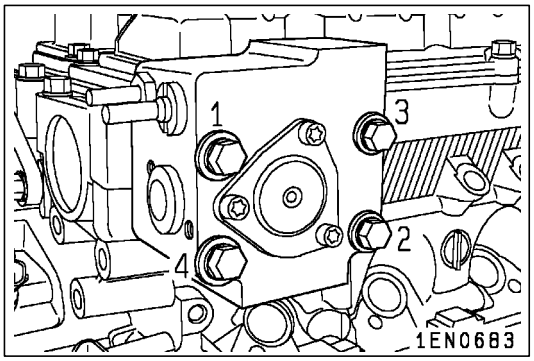
(1) Apply engine oil to the roller and the O-ring of the fuel pump.



(2) Insert the fuel pump in the mounting hole on the cylinder head, and lightly tighten four bolts (a little more strongly than you tighten them with fingers).

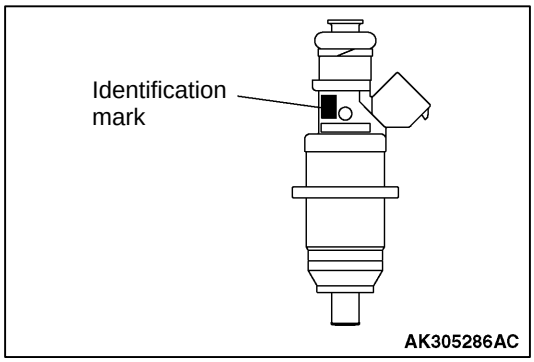


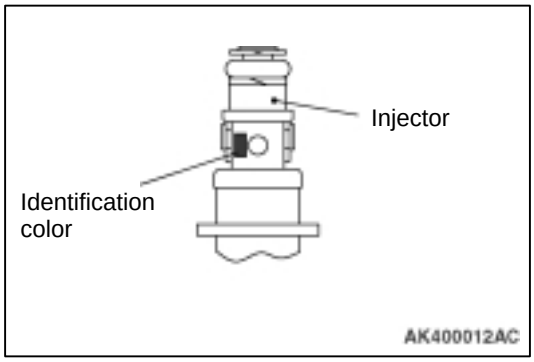
(3) Install the backup rings and the O-rings on both ends of the fuel pipe. Install the backup ring (thicker one) with the inside cut surface facing the direction shown in the illustration.
(4) Apply spindle oil or gasoline to the O-rings on both ends of the pipe.
(5) Insert the fuel pipe straight in the mounting hole on the fuel pump. When the fuel pipe is inserted, use care not to twist it and insert as far as it goes.
(6) Tighten the bolts on both ends of the pipe to the specified torque.



(7) Using the torque wrench (minimum scale 0.5 Nm), tighten the fuel pump mounting bolts by the following procedure.
   1. Tighten the bolts to 4.9 Nm in the order as shown.
   2. Tighten the bolts to 17 Nm in the order as shown. The torque variation of the four bolts should be within 2 Nm.

Caution
Observe the tightening order. Failure to observe the specified torques and tightening order will cause leakage, etc.





▶F◀ INJECTOR INSTALLATION

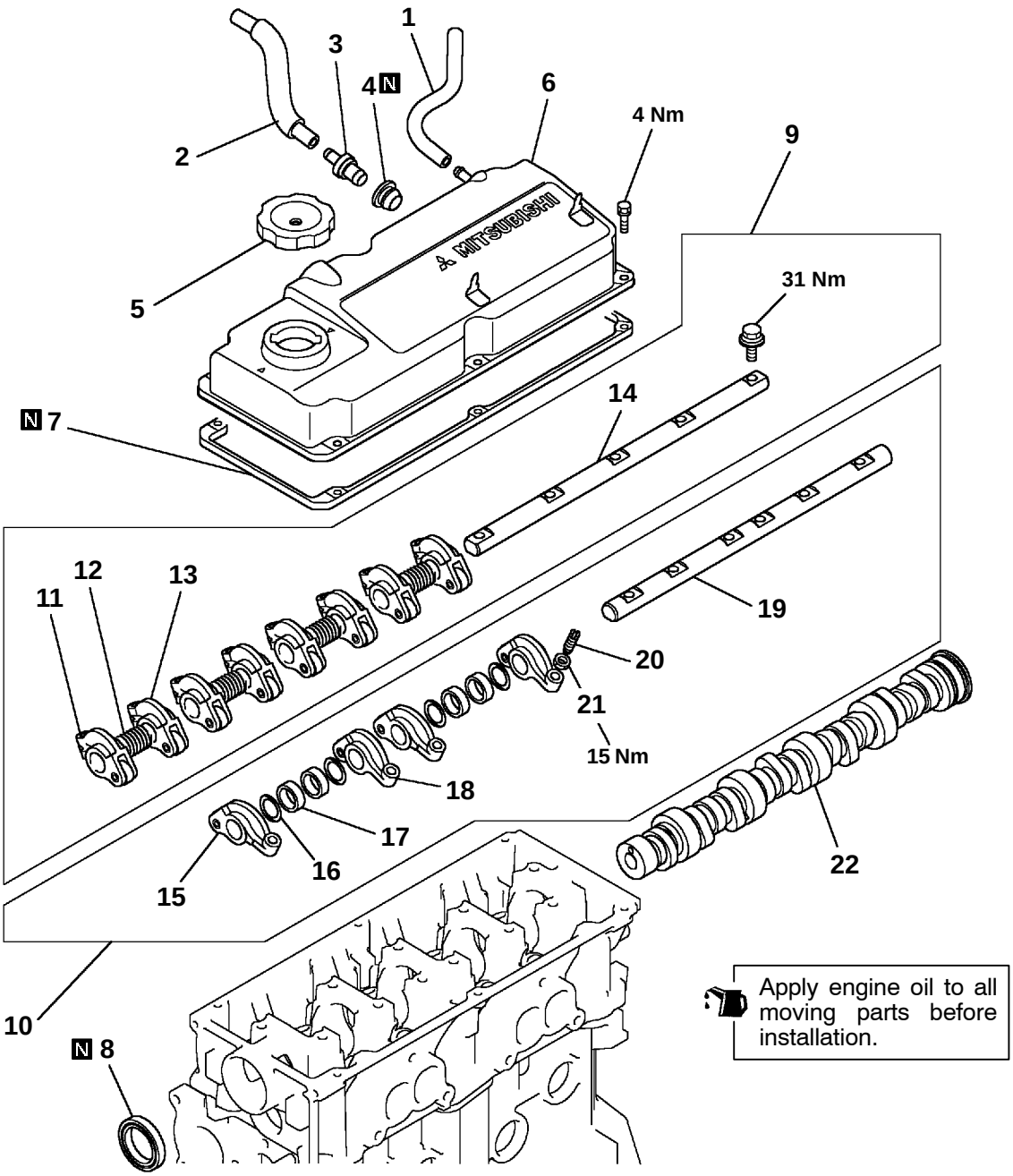
When replacing injectors, confirm the identification on replacement injectors and use the injectors with the same mark for all cylinders of the engine.

Identification marks
A
B
C

Caution
Be aware that the fuel injectors are identified by colors, not by alphabet marks, in a vehicle produced up to the beginning of December 1998. The color marks correspond to the alphabet marks as follows:
A = Yellow
B = Pink
C = Light blue

8. ROCKER ARMS AND CAMSHAFTS

REMOVAL AND INSTALLATION <SOHC 12-VALVE>

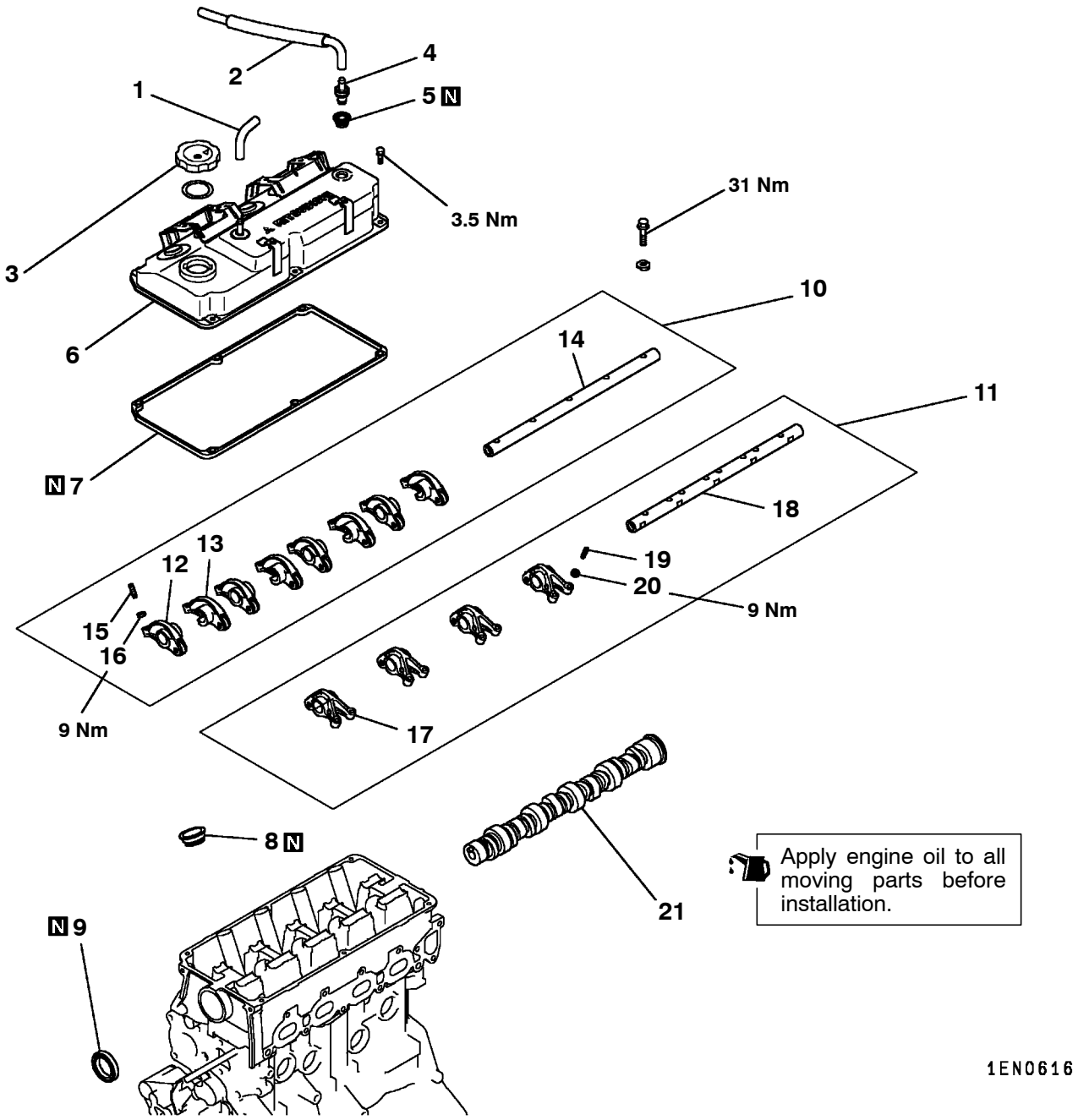


1EN0624

Removal steps

1. Breather hose
2. P.C.V. hose
3. P.C.V. valve
4. P.C.V. valve gasket
5. Oil filler cap
6. Rocker cover
7. Rocker cover gasket
▶F◀ 8. Camshaft oil seal
▶E◀ 9. Rocker arm and shaft assembly
▶E◀ 10. Rocker arm and shaft assembly
11. Rocker arm A
12. Rocker arm spring
13. Rocker arm B
14. Rocker arm shaft
15. Rocker arm C
16. Wave washer
17. Spacer
18. Rocker arm D
19. Rocker arm shaft
▶C◀ 20. Adjusting screw
21. Nut
22. Camshaft

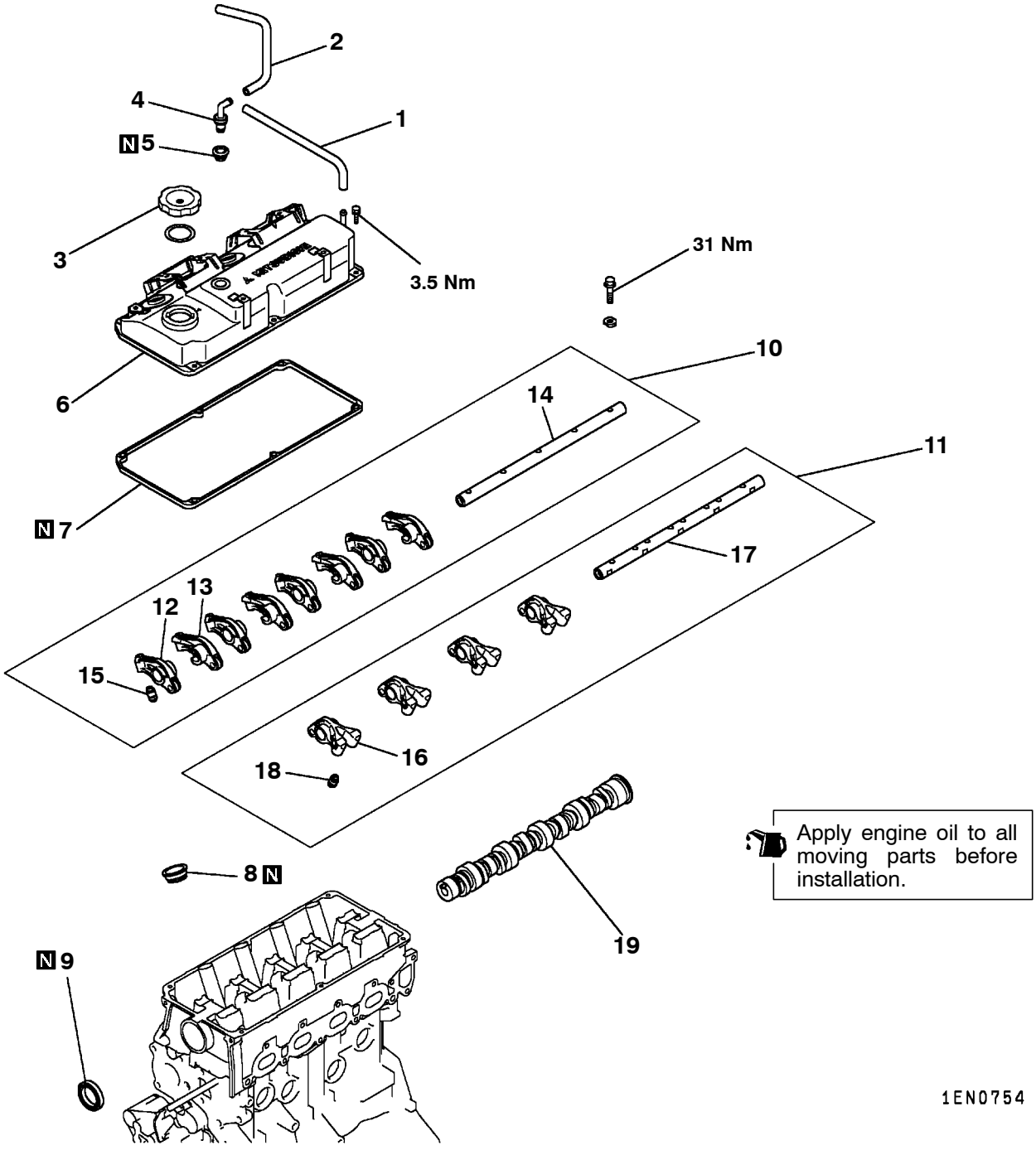
REMOVAL AND INSTALLATION <SOHC 16-VALVE (With Adjusting screw)>



Removal steps

1. Breather hose
2. P.C.V. hose
3. Oil filler cap
4. P.C.V. valve
5. P.C.V. valve gasket
6. Rocker cover
7. Rocker cover gasket
8. Oil seal
- ▶F◀ 9. Oil seal
- ▶E◀ 10. Rocker arms and rocker arm shaft, intake
- ▶E◀ 11. Rocker arms and rocker arm shaft, exhaust
12. Rocker arm A
13. Rocker arm B
- ▶D◀ 14. Rocker arm shaft
- ▶C◀ 15. Adjusting screw
16. Nut
17. Rocker arm C
- ▶D◀ 18. Rocker arm shaft
- ▶C◀ 19. Adjusting screw
20. Nut
21. Camshaft

REMOVAL AND INSTALLATION <SOHC 16-VALVE (With Lash adjuster)>

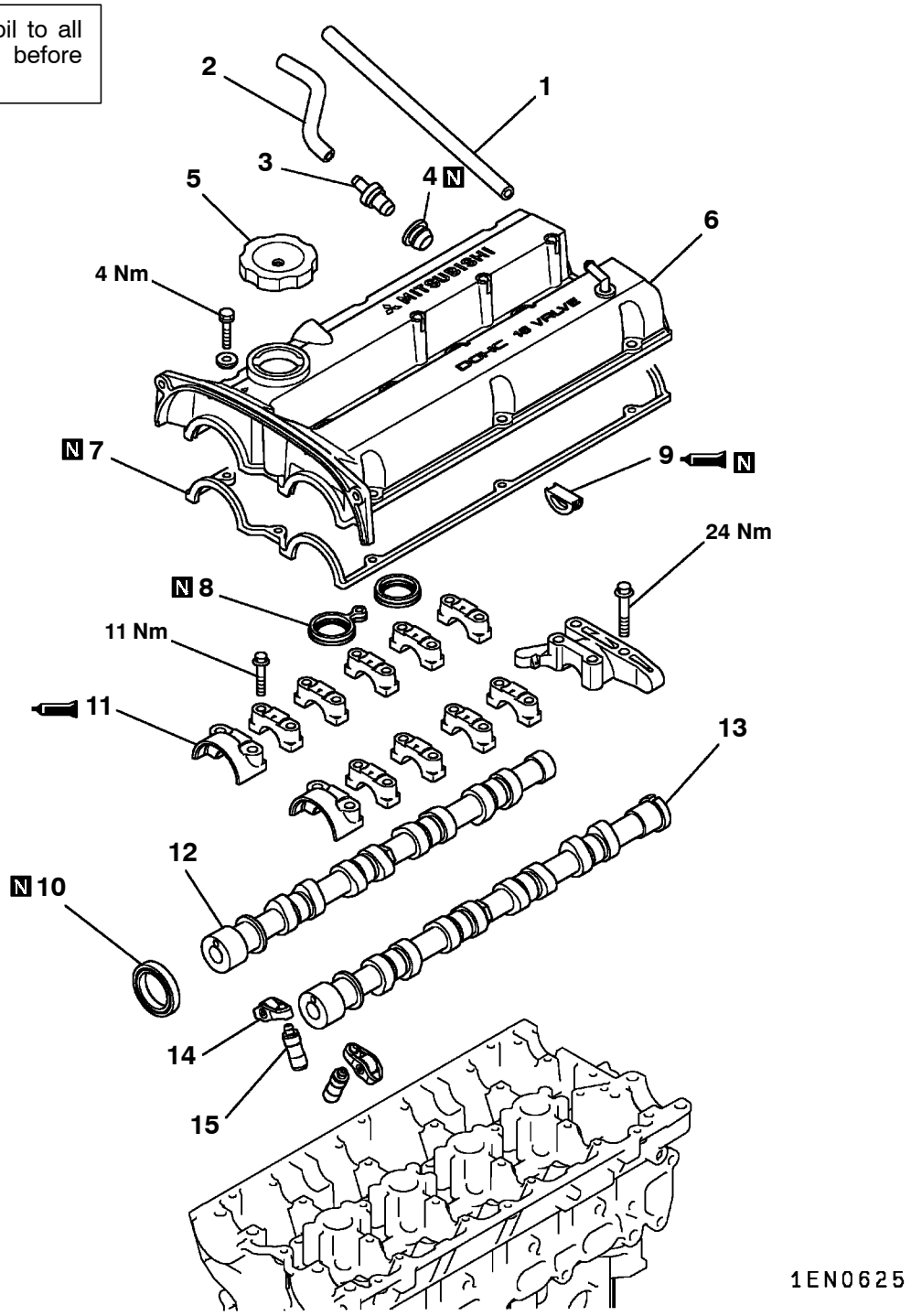


Removal steps

1. Breather hose
2. P.C.V. hose
3. Oil filler cap
4. P.C.V. valve
5. P.C.V. valve gasket
6. Rocker cover
7. Rocker cover gasket
8. Oil seal
▶F◀ 9. Oil seal
◀A▶ ▶E◀ 10. Rocker arms and rocker arm shaft, intake
◀A▶ ▶E◀ 11. Rocker arms and rocker arm shaft, exhaust
12. Rocker arm A
13. Rocker arm B
▶D◀ 14. Rocker arm shaft
▶I◀ 15. Lash adjuster
16. Rocker arm C
▶D◀ 17. Rocker arm shaft
▶I◀ 18. Lash adjuster
19. Camshaft

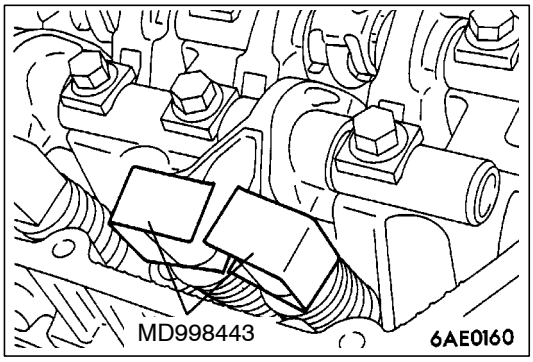
REMOVAL AND INSTALLATION <DOHC>

Apply engine oil to all moving parts before installation.



Removal steps

1. Breather hose
2. P.C.V. hose
3. P.C.V. valve
4. P.C.V. valve gasket
5. Oil filler cap
▶H◀ 6. Rocker cover
7. Rocker cover gasket A
8. Rocker cover gasket B
▶G◀ 9. Semi-circular packing
▶F◀ 10. Camshaft oil seal
▶B◀ 11. Bearing cap
▶A◀ 12. Camshaft
▶A◀ 13. Camshaft
14. Roller rocker arm
◀B▶ ▶J◀ 15. Lash adjuster



REMOVAL SERVICE POINTS

◀A▶ ROCKER ARMS AND ROCKER ARM SHAFTS REMOVAL

Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11A-8-3.)

Set special tool MD998443 to prevent the lash adjuster from coming free and falling to the floor.

◀B▶ LASH ADJUSTER REMOVAL

Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11A-8-6.)

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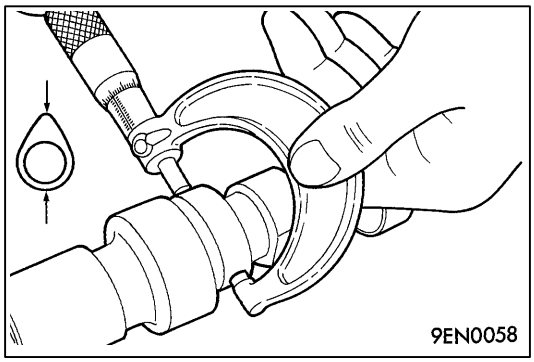


INSPECTION

1. CAMSHAFT

(1) Measure the cam heights and replace the camshaft if any height exceeds the specified limit.

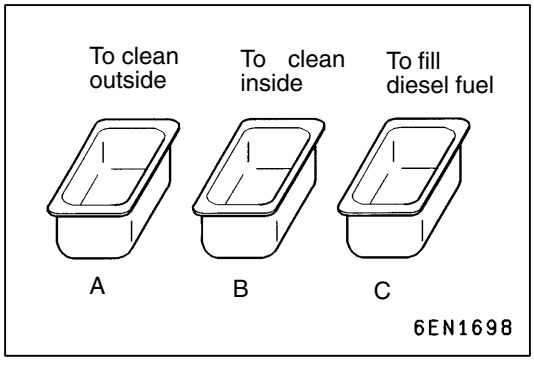
		Standard value mm	Limit mm
Intake	SOHC 12-VALVE*1	38.78	38.28
	SOHC 12-VALVE*2	38.78	38.28
	SOHC 16-VALVE*3	36.99	36.49
	SOHC 16-VALVE*4	36.86	36.36
	SOHC 16-VALVE*5	37.30	36.80
	SOHC 16-VALVE*6	37.17	36.67
	DOHC	34.67	34.17
Exhaust	SOHC 12-VALVE*1	39.01	38.51
	SOHC 12-VALVE*2	38.97	38.47
	SOHC 16-VALVE*3	36.85	36.35
	SOHC 16-VALVE*4	36.68	36.18
	SOHC 16-VALVE*5	37.16	36.66
	SOHC 16-VALVE*6	36.99	36.49
	DOHC	34.26	33.76

*1: With low pollution system
*2: Without low pollution system
*3: Except 2001 model front wheel drive vehicles
*4: 2001 model front wheel drive vehicles for Europe
*5: 2001 model front wheel drive vehicles for General Export
*6: 2002 model front wheel drive vehicles for Europe

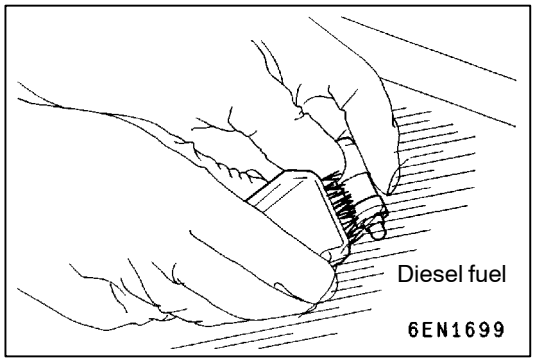
2. LASH ADJUSTERS

(SOHC)

Caution
1. **The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.**
2. **Do not attempt to disassemble the lash adjusters.**
3. **Use only fresh diesel fuel to clean the lash adjusters.**

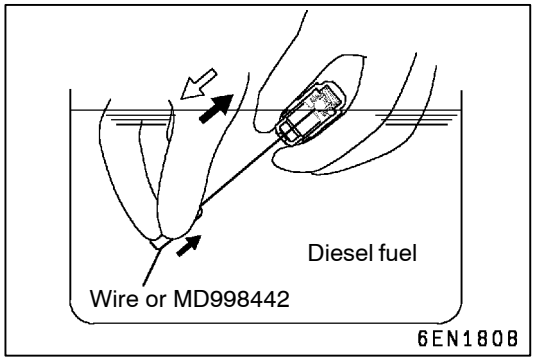


(1) Prepare three containers and approximately five liters of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.



(2) Place the lash adjuster in container A and clean its outside surface.

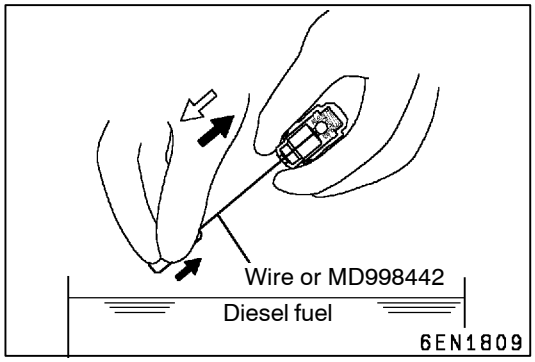
NOTE
Use a nylon brush if deposits are hard to remove.



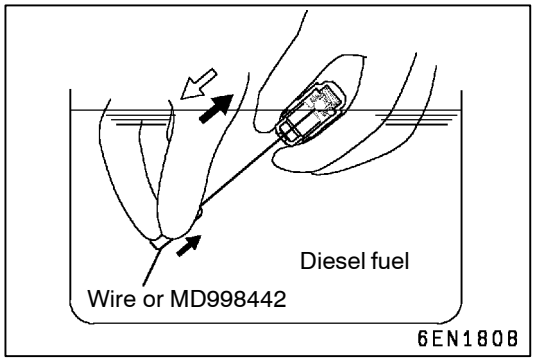
(3) While gently pushing down the internal steel ball using special tool MD998442, move the plunger through 5 to 10 strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will remove dirty oil.

Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

NOTE
If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.

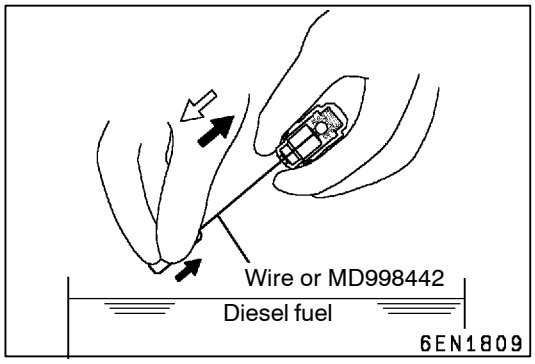


(4) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

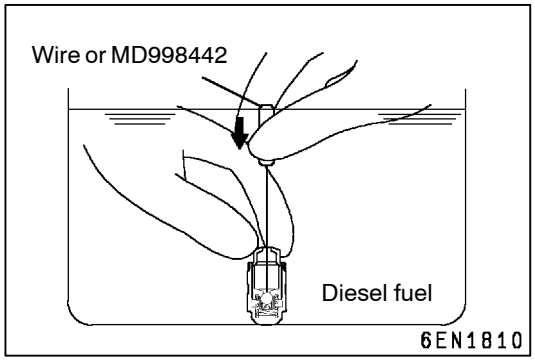


(5) Place the lash adjuster in container B. Then, gently push down the internal steel ball using special tool MD998442 and move the plunger through 5 to 10 strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.

Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

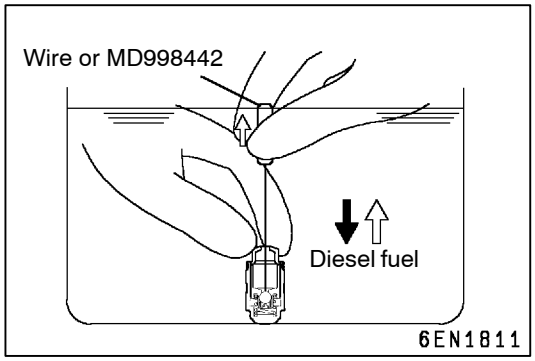


(6) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

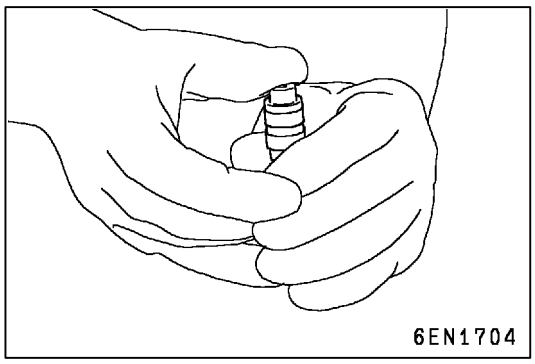


(7) Place the lash adjuster in container C. Then, gently push down the internal steel ball using special tool MD998442.

Caution
Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when chamber is filled with diesel fuel.



(8) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.



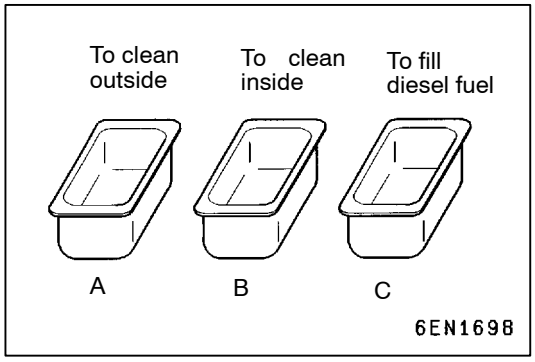
(9) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

NOTE
If lash adjuster contracts, perform the operations (7) through (9) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

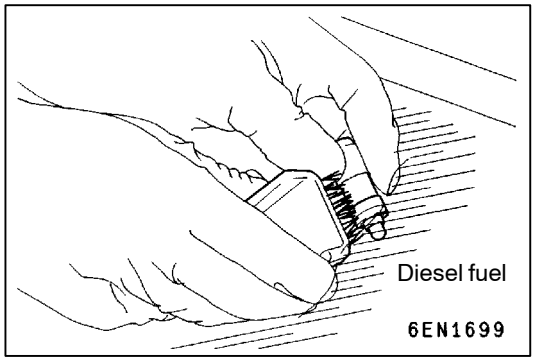
(10) Stand the lash adjuster upright to prevent diesel fuel from spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

(DOHC)

Caution
1. **The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.**
2. **Do not attempt to disassemble the lash adjusters.**
3. **Use only fresh diesel fuel to clean the lash adjusters.**

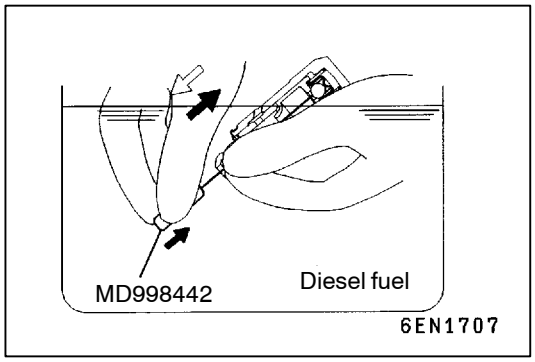


(1) Prepare three containers and approximately five liters of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.



(2) Place the lash adjuster in container A and clean its outside surface.

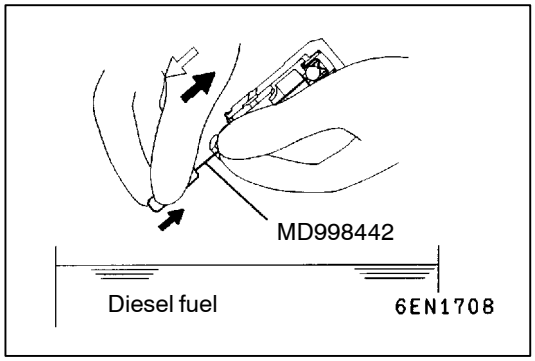
NOTE
Use a nylon brush if deposits are hard to remove.



(3) While gently pushing down the internal steel ball using special tool MD998442, move the plunger through 5 to 10 strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will remove dirty oil.

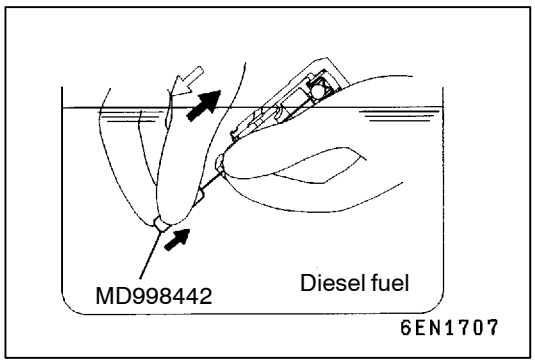
Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

NOTE
If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.



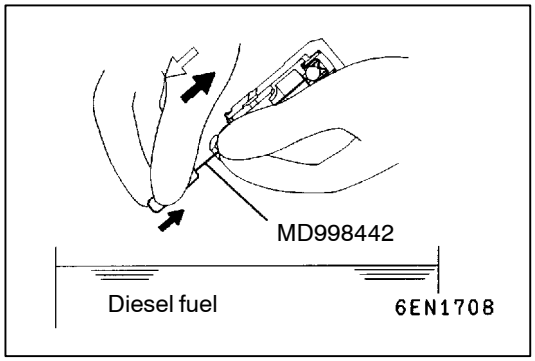
(4) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

Caution
Make sure the oil hole in the side of the body is pointing toward container A. Do not point the oil hole at yourself or other people.



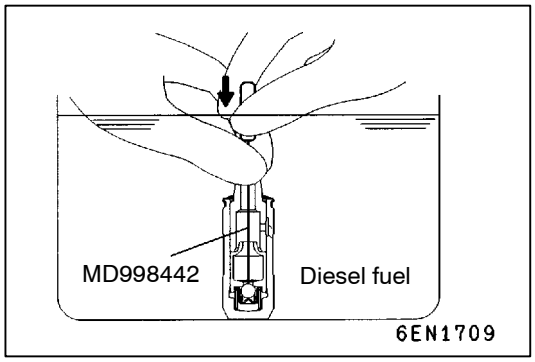
(5) Place the lash adjuster in container B. Then, gently push down the internal steel ball using special tool MD998442 and move the plunger through 5 to 10 strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.

Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.



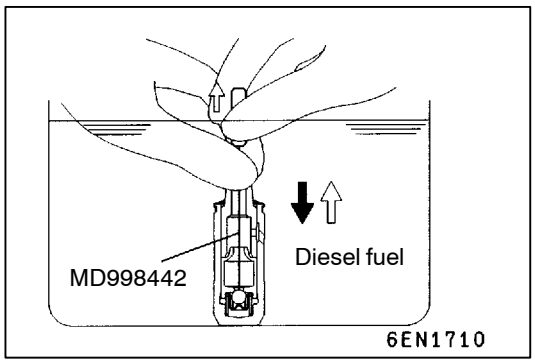
(6) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

Caution
Make sure the oil hole in the side of the body is pointing toward container B. Do not point the oil hole at yourself or other people.

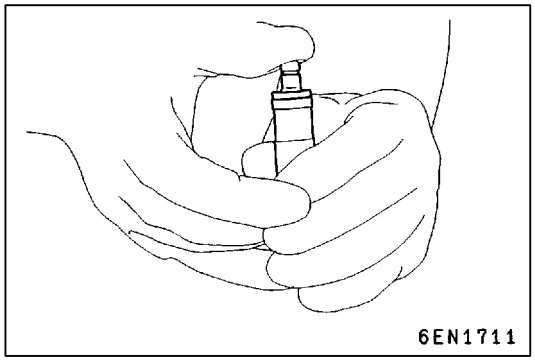


(7) Place the lash adjuster in container C. Then, gently push down the internal steel ball using special tool MD998442.

Caution
Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when chamber is filled with diesel fuel.



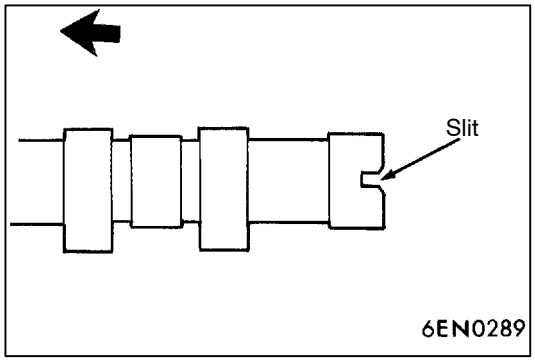
(8) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.



(9) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

NOTE
If lash adjuster contracts, perform the operations (7) through (9) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

(10) Stand the lash adjuster upright to prevent diesel fuel from spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

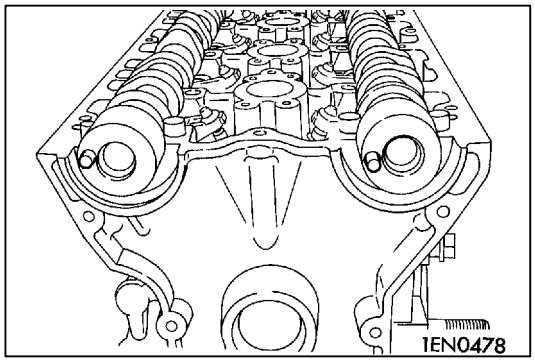


INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT INSTALLATION

(1) Apply engine oil to the camshaft journals and cams before installation. Ensure that the intake-side and exhaust-side camshafts are not reversed.

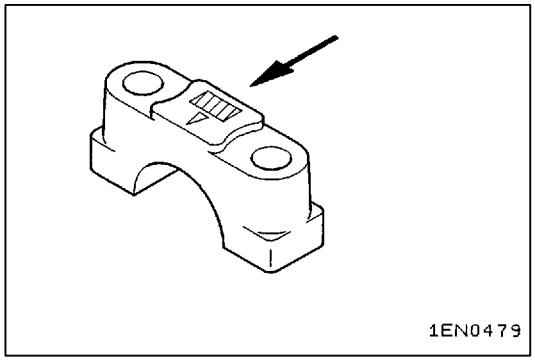
NOTE
There is a 4 mm-wide slot in the rear end of the exhaust-side camshaft.



▶B◀ BEARING CAP INSTALLATION

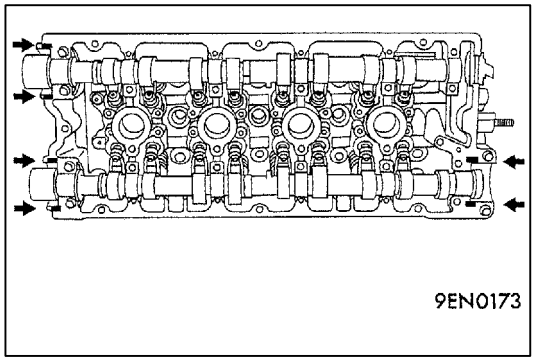
(1) Position the camshaft dowel pins as shown.

NOTE
With the camshaft dowel pins in this position, the camshaft notches for tightening cylinder head bolt are correctly positioned.



(2) Bearing caps Nos. 2 to 5 are the same shape. Be sure to install them in order of their cap numbers and check the identification marks to ensure that the intake and exhaust sides are not reversed.

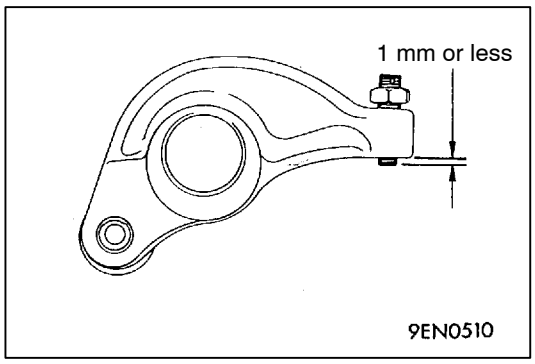
Identification marks:
I: Intake
E: Exhaust



(3) Apply the specified sealant to the surfaces that are to mate with the cylinder head. Then, tighten the bearing cap bolts - for the middle caps first, then for the outer caps, and soon. Tighten the bolts a little at a time such that each bolt is tightened to the specified torque in the final sequence.

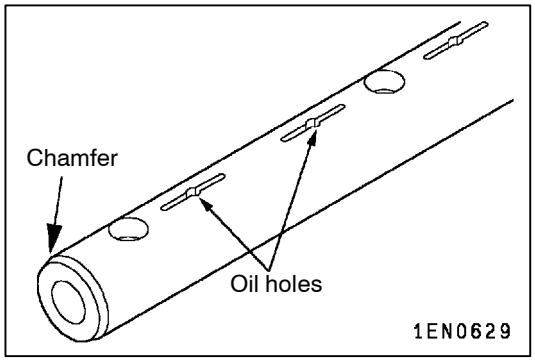
Specified sealant:
3M ATD Part No. 8660 or equivalent

(4) Check that the rocker arms are installed correctly.



▶C◀ ADJUSTING SCREW INSTALLATION

(1) Install provisionally the screw to the rocker arm. Insert it so that the end of the screw is flush with the edge of the rocker arm or projects slightly (1 mm or less).

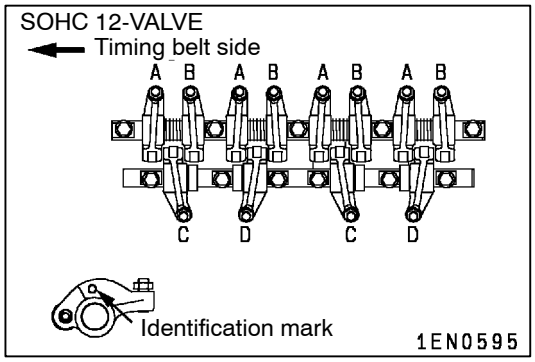


▶D◀ ROCKER ARM SHAFT INSTALLATION

(1) Place the end with the larger chamfered side toward the flywheel side. <SOHC 12-VALVE>
Place the end with the larger chamfered side toward the timing belt side. <SOHC 16-VALVE>

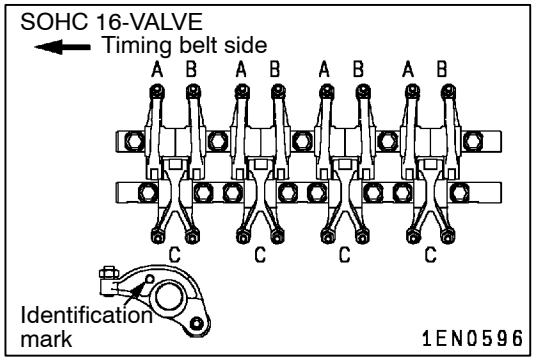
NOTE
The rocker arm shaft for intake valves have eight oil holes.

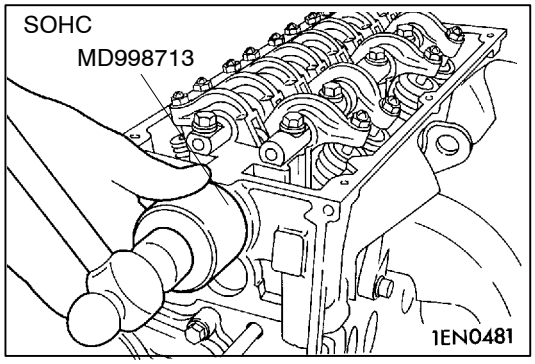
(2) Place the section of the shaft with the oil holes toward the cylinder head.



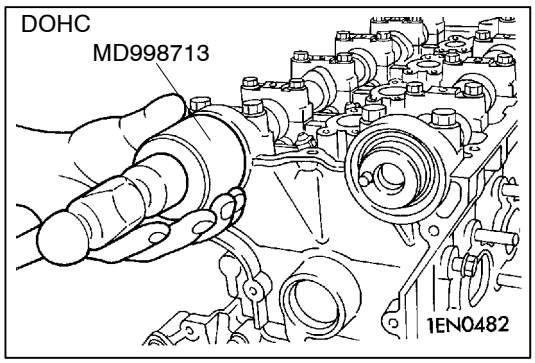
▶E◀ ROCKER ARM / ROCKER SHAFT ASSEMBLY INSTALLATION

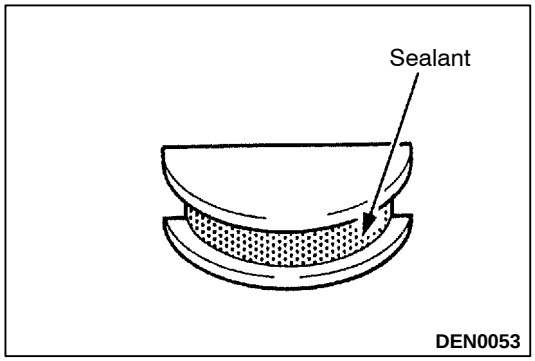
(1) Assemble the rocker arms and rocker shaft, paying attention to the identification marks. Then mount the assembly on the cylinder head.





▶F◀ CAMSHAFT OIL SEAL INSTALLATION

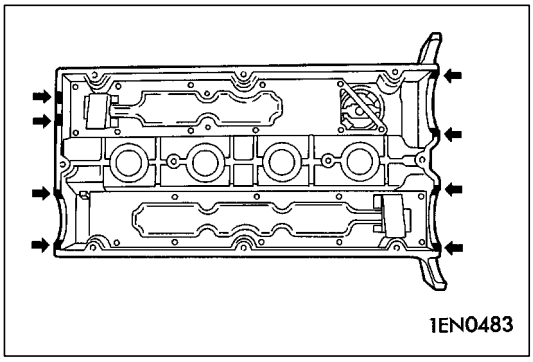




▶G◀ SEMI-CIRCULAR PACKING INSTALLATION

(1) Apply the specified sealant to the area shown.

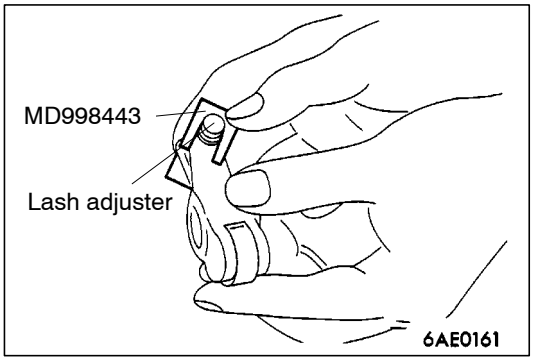
Specified sealant:
3M ATD Part No. 8660 or equivalent



▶H◀ ROCKER COVER INSTALLATION

(1) Apply the specified sealant to the area shown, then fit the rocker cover.

Specified sealant:
3M ATD part No. 8660 or equivalent



▶I◀ LASH ADJUSTER INSTALLATION

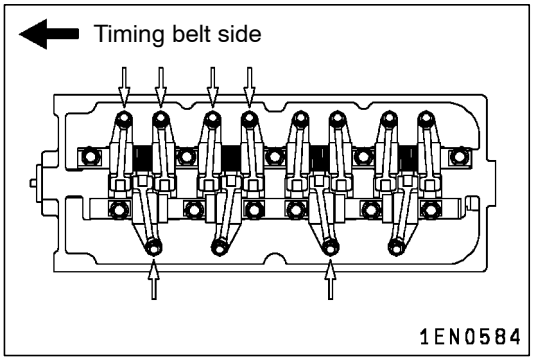
(1) Insert the lash adjuster to rocker arm, being careful not to spill diesel fuel. Use the special tool to prevent adjuster from falling while installing it.

Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11A-8-3.)

▶J◀ LASH ADJUSTER INSTALLATION

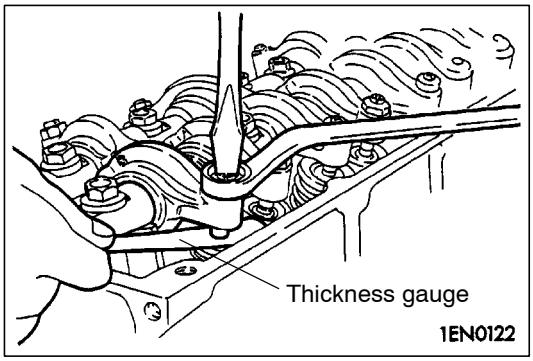
Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11A-8-6.)

Fit the lash adjuster onto the rocker arm without allowing diesel fuel to spill out.



VALVE CLEARANCE ADJUSTMENT <SOHC 12-VALVE>

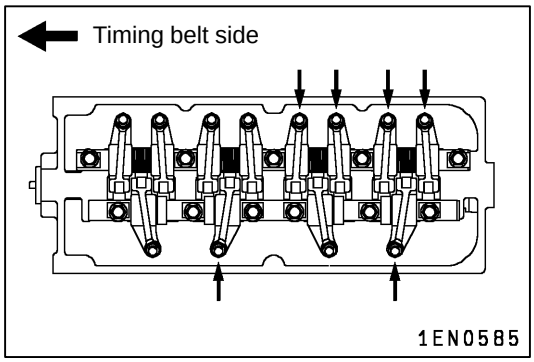
(1) Position the No. 1 cylinder at top dead center on the compression stroke.
(2) Adjust the valve clearance at the points shown in the illustration.



(3) Loosen the adjusting screw locknut.
(4) Using a feeler gauge, adjust the valve clearance by turning the adjusting screw.

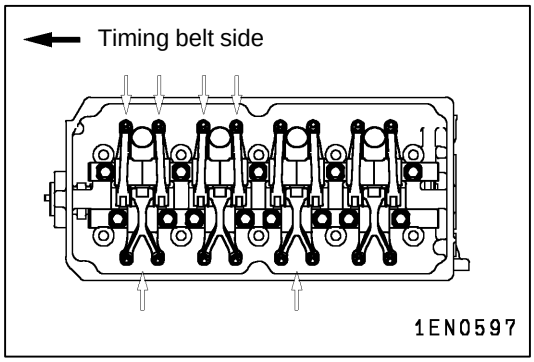
Standard value: on cold engine
Intake 0.09 mm
Exhaust 0.17 mm

(5) While holding the adjusting screw with a screwdriver, tighten the lock nut.



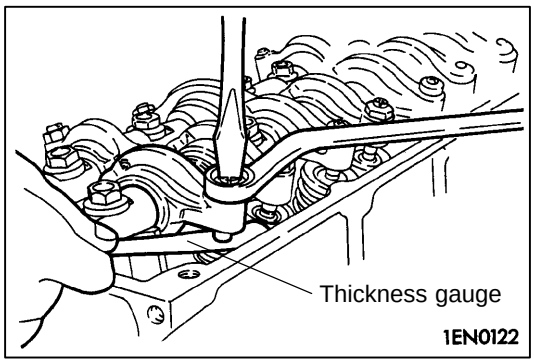
(6) Rotate clockwise the crankshaft one complete turn (360° degree).
(7) Adjust the valve clearance at points as shown in the illustration.
(8) Repeat steps (3) to (5) to adjust the valve clearance of remaining valves.
(9) With the engine mounted on vehicle, warm up the engine. Then, check for valve clearance on hot engine and adjust if necessary.

Standard value: on hot engine
Intake 0.20 mm
Exhaust 0.25 mm



<SOHC 16-VALVE>

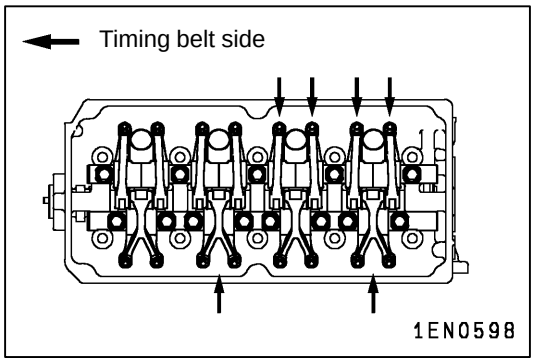
(1) Position the No. 1 cylinder at top dead center on the compression stroke.
(2) Adjust the valve clearance at the points shown in the illustration.



(3) Loosen the adjusting screw locknut.
(4) Using a feeler gauge, adjust the valve clearance by turning the adjusting screw.

Standard value: on cold engine
Intake 0.14 mm
Exhaust 0.19 mm

(5) While holding the adjusting screw with a screwdriver, tighten the lock nut.

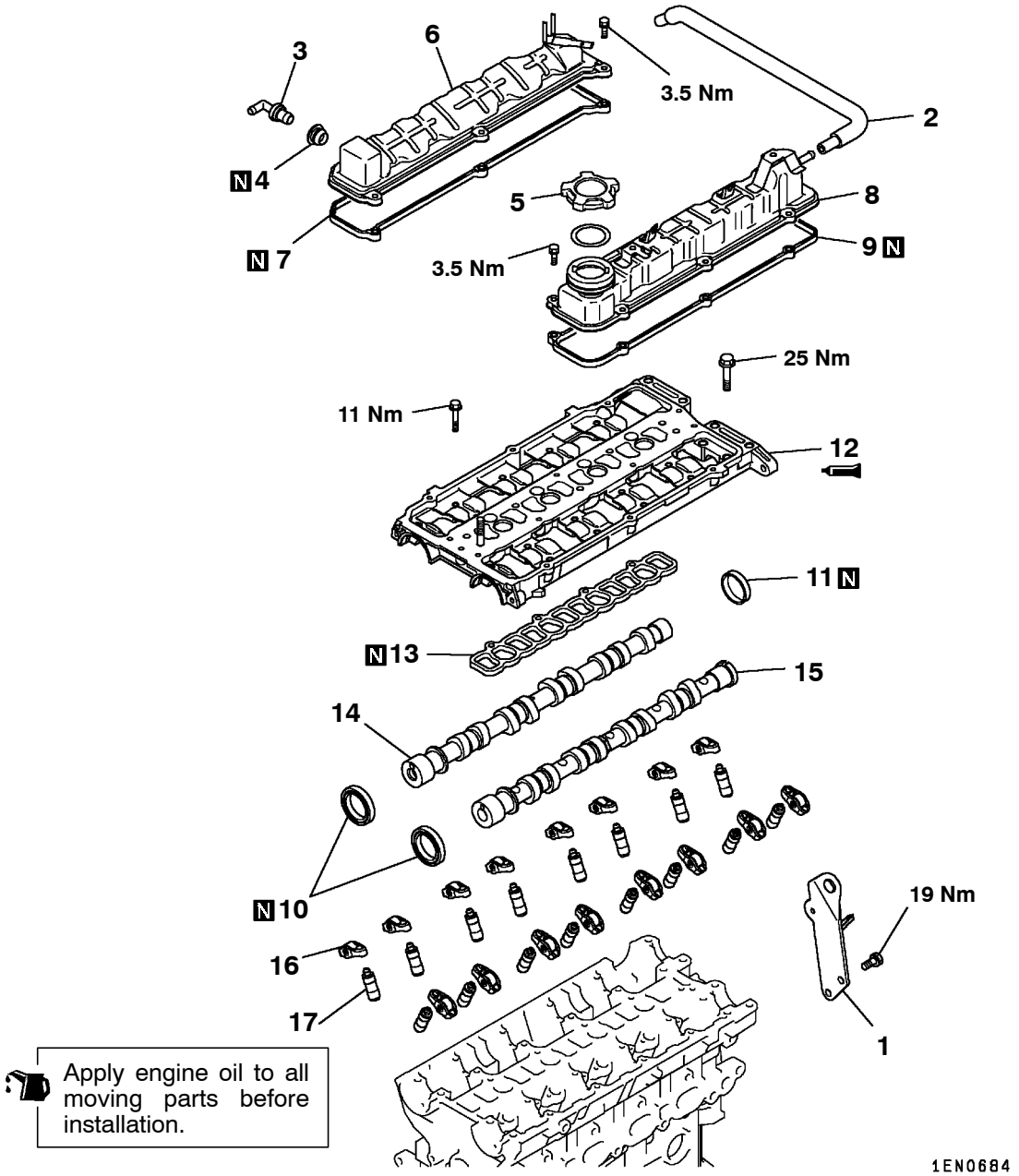


(6) Rotate clockwise the crankshaft one complete turn (360° degree).
(7) Adjust the valve clearance at points as shown in the illustration.
(8) Repeat steps (3) to (5) to adjust the valve clearance of remaining valves.
(9) With the engine mounted on vehicle, warm up the engine. Then, check for valve clearance on hot engine and adjust if necessary.

Standard value: on hot engine
Intake 0.25 mm
Exhaust 0.30 mm

ROCKER ARMS AND CAMSHAFTS (GDI)

REMOVAL AND INSTALLATION



Removal steps

1. Engine hanger
2. Breather hose
- ▶F◀ 3. P.C.V. valve
4. Gasket
5. Oil filler cap
6. Inlet rocker cover
7. Gasket
8. Exhaust rocker cover
9. Gasket
- ▶E◀ 10. Oil seal
- ▶D◀ 11. Semi-circular packing
- ▶C◀ 12. Beam camshaft cap
13. Gasket
- ▶B◀ 14. Intake camshaft
- ▶B◀ 15. Exhaust camshaft
16. Roller rocker arm
- ◀A▶ ▶A◀ 17. Lash adjuster

REMOVAL SERVICE POINT

◀A▶ LASH ADJUSTER REMOVAL

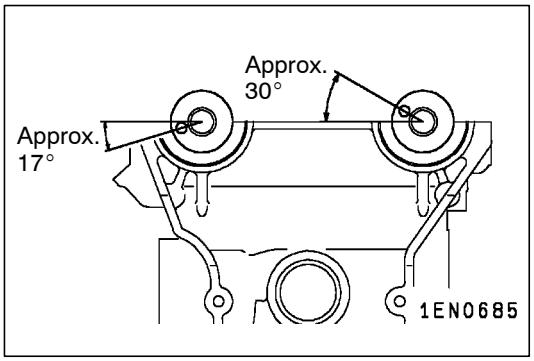
Caution
If the lash adjuster is to be reused, be sure to clean and inspect it before installation. (Refer to 11A-8a-4.)

INSTALLATION SERVICE POINTS

▶A◀ LASH ADJUSTER INSTALLATION

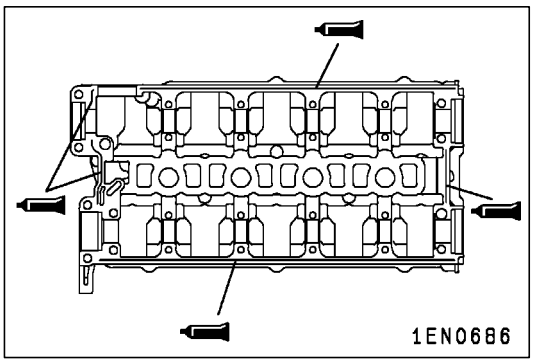
Caution
If the lash adjuster is to be reused, be sure to clean and inspect it before installation. (Refer to 11A-8a-4.)

While using care not to spill diesel fuel in the lash adjuster, install the lash adjuster on the rocker arm.



▶B◀ EXHAUST CAMSHAFT / INTAKE CAMSHAFT INSTALLATION

(1) Turn the crankshaft to place the No. 1 cylinder at top dead center.
(2) Place dowel pins of the camshafts in the positions shown in the illustration.



▶C◀ BEAM CAMSHAFT CAP INSTALLATION

(1) Remove deposits from the liquid gasket coating surfaces of the beam camshaft cap and the cylinder head.
(2) Apply liquid gasket to the five grooves on the bottom surface of the beam camshaft cap by squeezing it to a thickness of 3 mm.

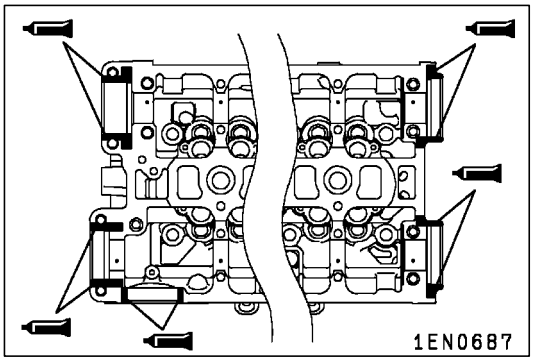
Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.

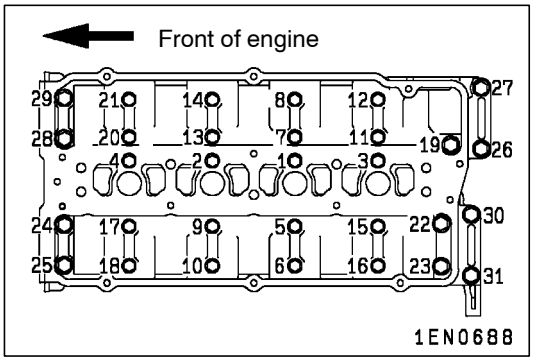
NOTE
Install the beam camshaft cap within 15 minutes of application of liquid gasket.

(3) Apply a suitable amount of liquid gasket to the ten positions as shown on the top surface of the cylinder head.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.

NOTE
Install the beam camshaft cap within 15 minutes after application of liquid gasket.

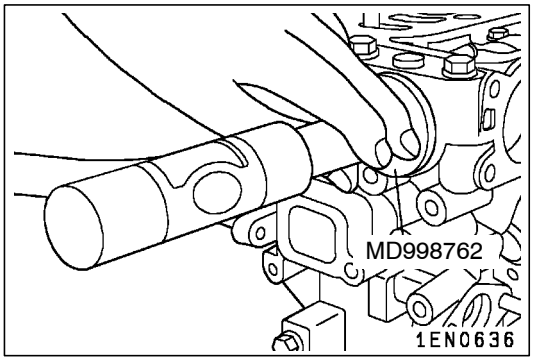




(4) Install the beam camshaft and tighten the bolts to the specified torque in the order shown in the illustration.

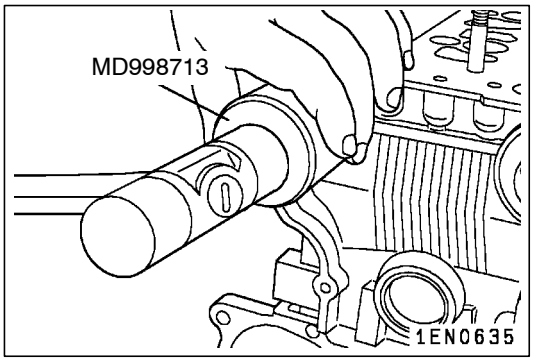
Tightening torque
11 Nm (M6)
25 Nm (M8)

(5) After tightening the bolts, completely wipe out the liquid gasket that has overflowed the intake part before the gasket is hardened (within 15 minutes after application of liquid gasket).



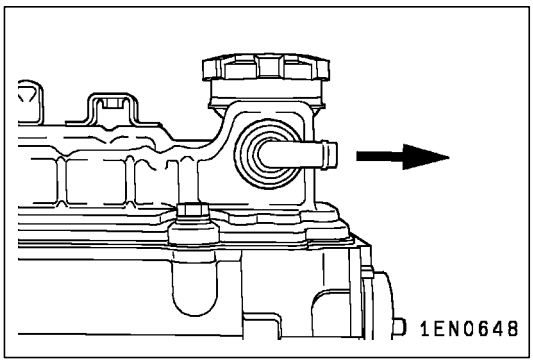
▶D◀ SEMI-CIRCULAR PACKING INSTALLATION

Using the special tool, install the semi-circular packing.



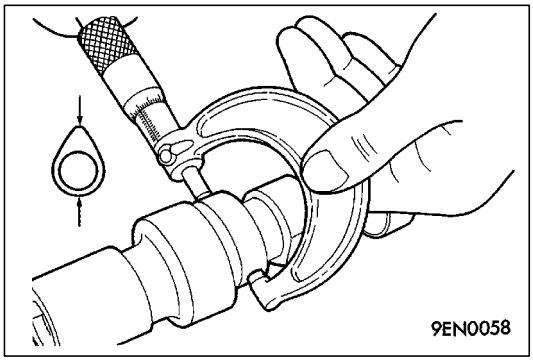
▶E◀ OIL SEAL INSTALLATION

Using the special tool, install the oil seal.



▶F◀ P.C.V. VALVE INSTALLATION

Install the P.C.V. valve with its nipple directed as shown.



INSPECTION

CAMSHAFT

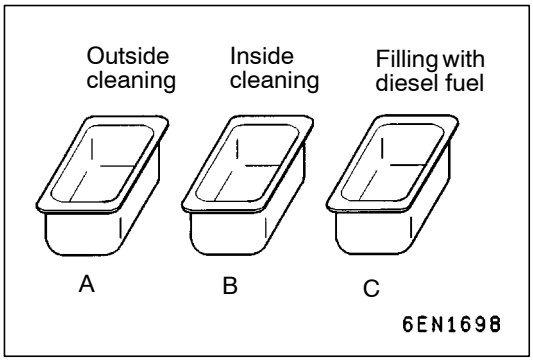
(1) Measure the cam height.

Standard value:
Intake: 34.85 mm
Exhaust: 34.59 mm

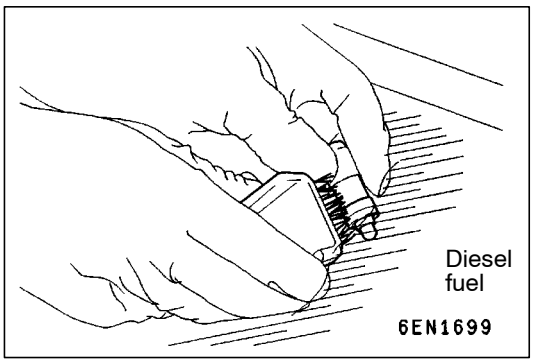
Limit:
Intake: 34.35 mm
Exhaust: 34.09 mm

LASH ADJUSTER

Caution
1. **The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign' substances.**
2. **Do not attempt to disassemble the lash adjusters.**
3. **Use only fresh diesel fuel to clean the lash adjusters.**

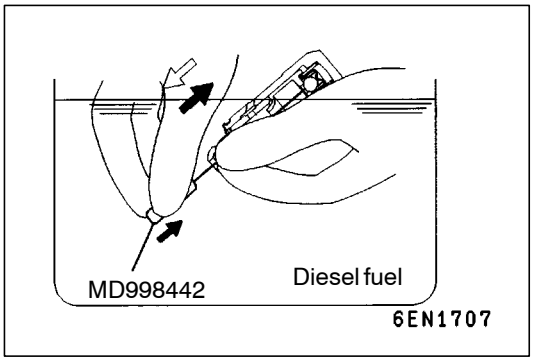


(1) Prepare three containers and approximately five liters of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.



(2) Place the lash adjuster in container A and clean its outside surface.

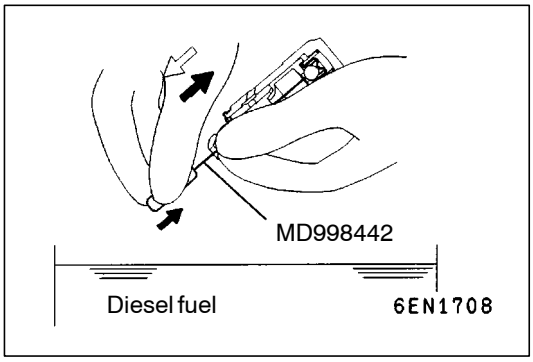
NOTE
Use a nylon brush if deposits are hard to remove.



(3) While gently pushing down the internal steel ball using special tool MD998442, move the plunger through 5 to 10 strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will remove dirty oil.

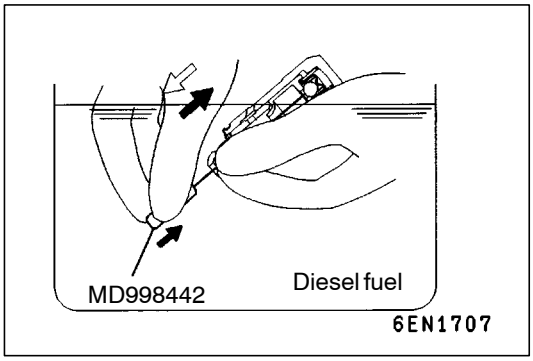
Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

NOTE
If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.



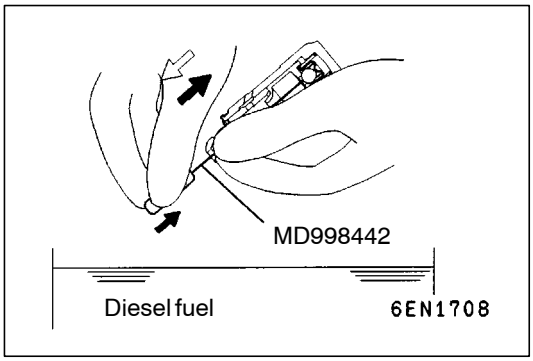
(4) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

Caution
Make sure the oil hole in the side of the body is pointing toward container A. Do not point the oil hole at yourself or other people.



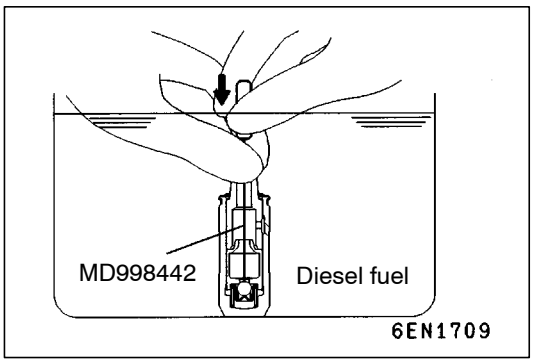
(5) Place the lash adjuster in container B. Then, gently push down the internal steel ball using special tool MD998442 and move the plunger through 5 to 10 strokes until it slide smoothly. This operation will clean the lash adjuster's pressure chamber.

Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.



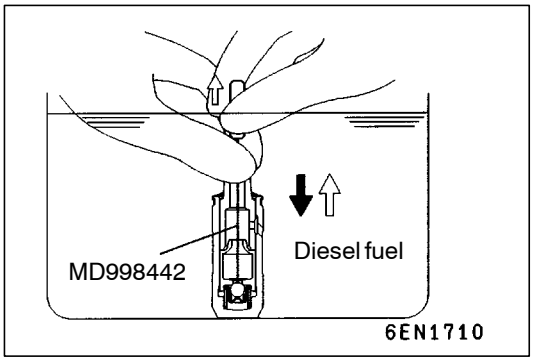
(6) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

Caution
Make sure the oil hole in the side of the body is pointing toward container A. Do not point the oil hole at yourself or other people.

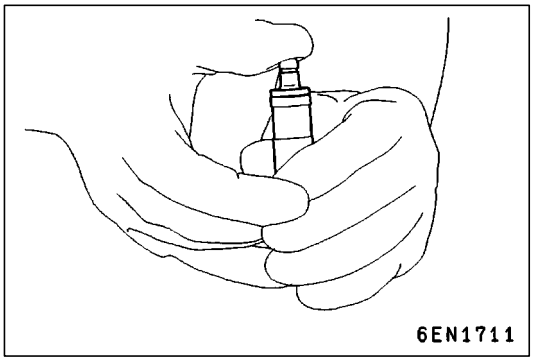


(7) Place the lash adjuster in container C. Then, gently push down the internal steel ball using special tool MD998442.

Caution
Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when chamber is filled with diesel fuel.



(8) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.



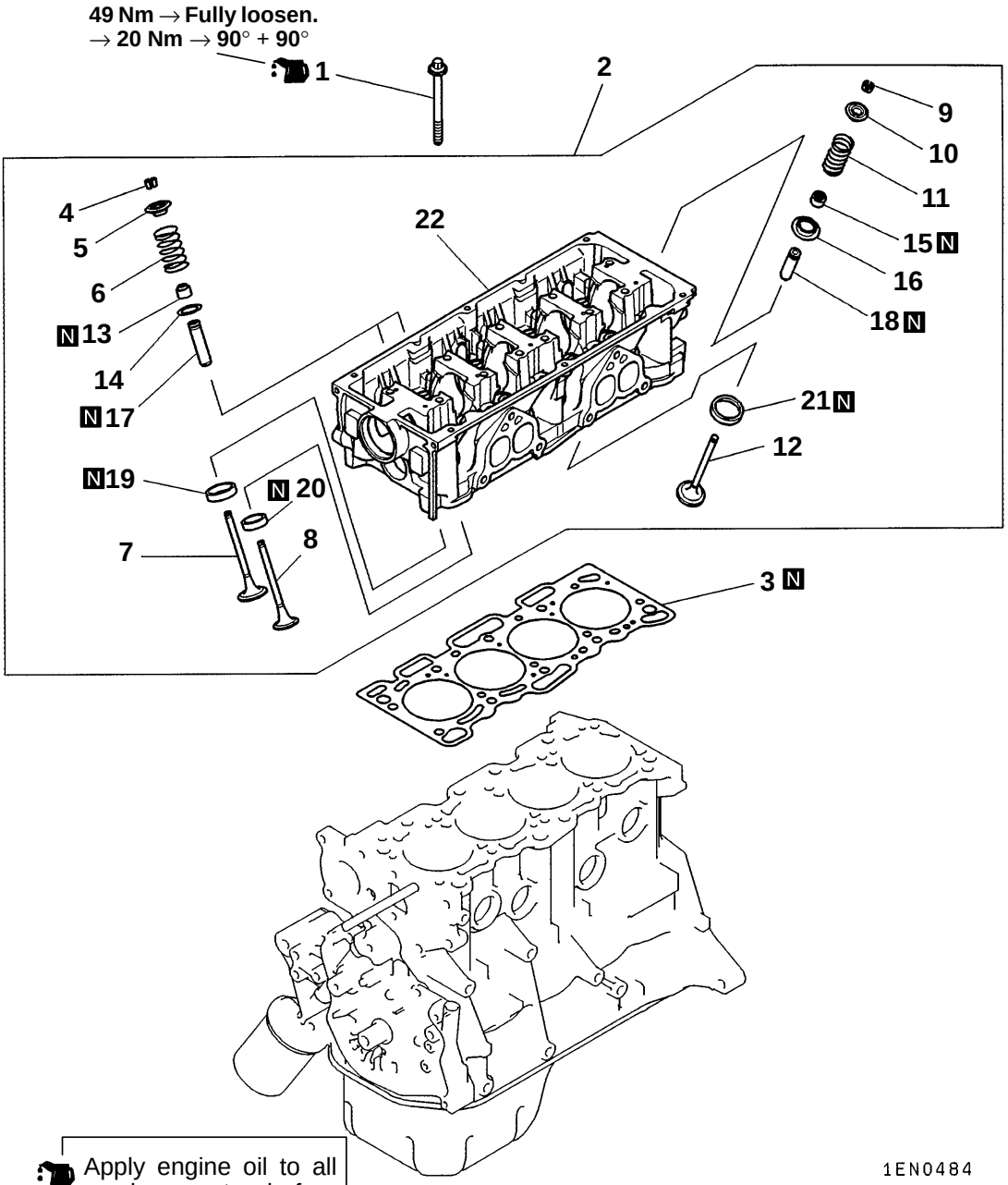
(9) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

NOTE
If lash adjuster contracts, perform the operations (7) through (9) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

(10) Stand the lash adjuster upright to prevent diesel fuel from spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

9. CYLINDER HEAD AND VALVES

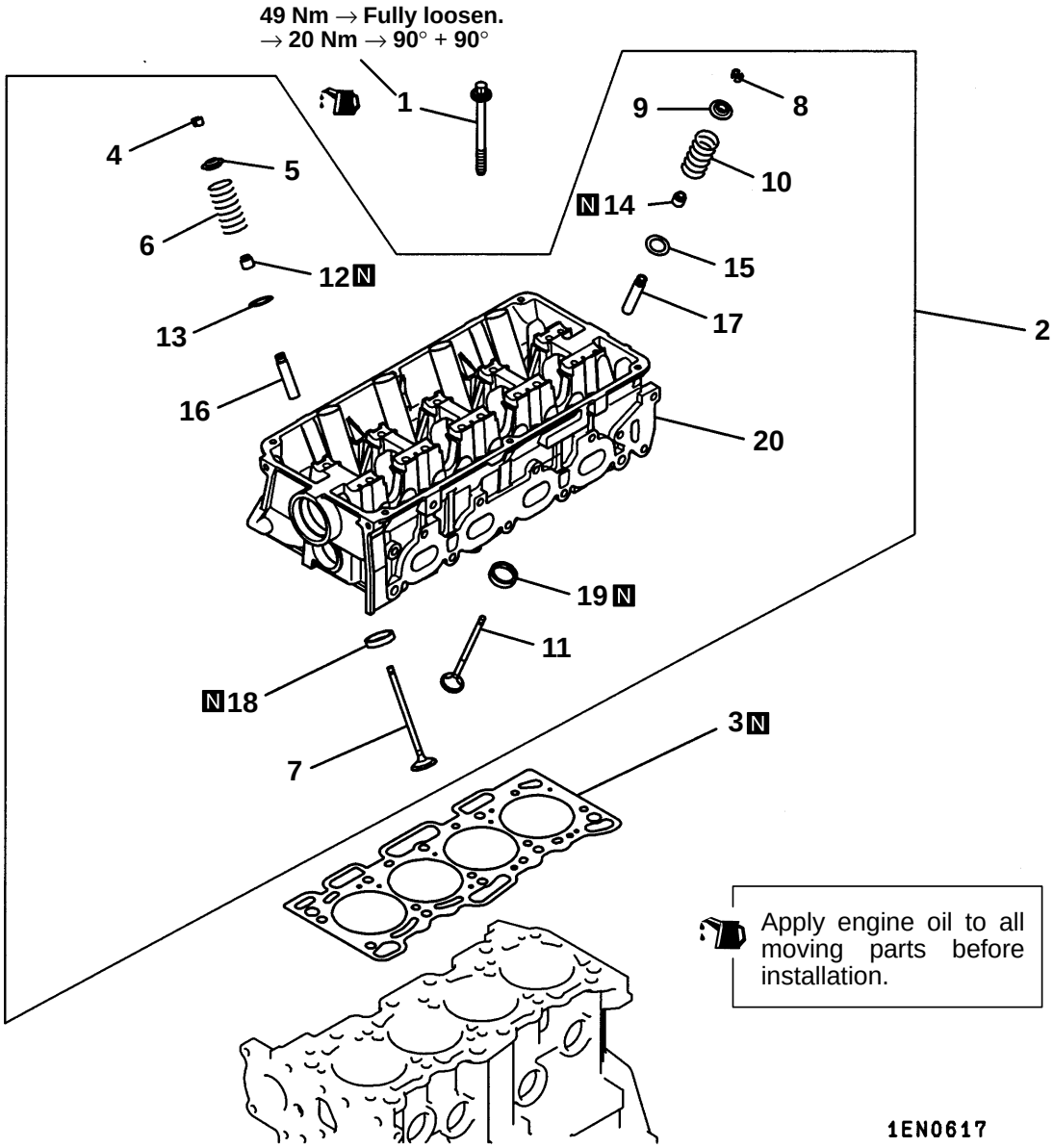
REMOVAL AND INSTALLATION <SOHC 12-VALVE>



Removal steps

◀A▶ ▶D◀ 1. Cylinder head bolt
2. Cylinder head assembly
3. Cylinder head gasket
◀B▶ ▶C◀ 4. Retainer lock
5. Valve spring retainer
▶B◀ 6. Valve spring
7. Intake valve (primary)
8. Intake valve (secondary)
◀B▶ ▶C◀ 9. Retainer lock
10. Valve spring retainer
▶B◀ 11. Valve spring
12. Exhaust valve
◀C▶ ▶A◀ 13. Valve stem seal
14. Valve spring seat
◀C▶ ▶A◀ 15. Valve stem seal
16. Valve spring seat
17. Intake valve guide
18. Exhaust valve guide
19. Intake valve seat (primary)
20. Intake valve seat (secondary)
21. Exhaust valve seat
22. Cylinder head

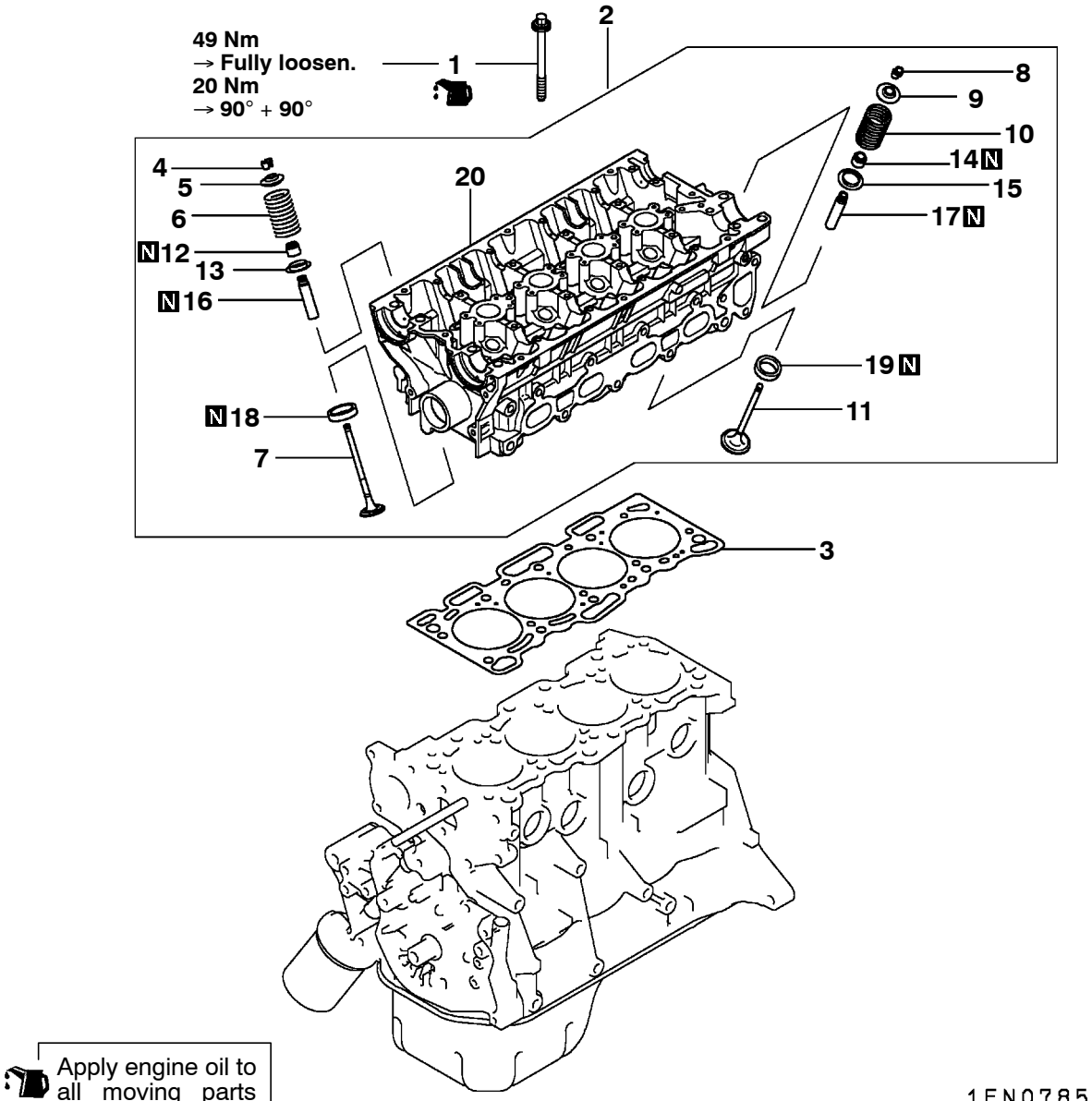
REMOVAL AND INSTALLATION <SOHC 16-VALVE>



Removal steps

◀A▶ ▶D◀ 1. Cylinder head bolt
2. Cylinder head assembly
3. Cylinder head gasket
◀B▶ ▶C◀ 4. Retainer lock
5. Valve spring retainer
▶B◀ 6. Valve spring
7. Exhaust valve
◀B▶ ▶C◀ 8. Retainer lock
9. Valve spring retainer
▶B◀ 10. Valve spring
11. Intake valve
◀C▶ ▶A◀ 12. Valve stem seal
13. Valve spring seat
◀C▶ ▶A◀ 14. Valve stem seal
15. Valve spring seat
16. Exhaust valve guide
17. Intake valve guide
18. Exhaust valve seat
19. Intake valve seat
20. Cylinder head

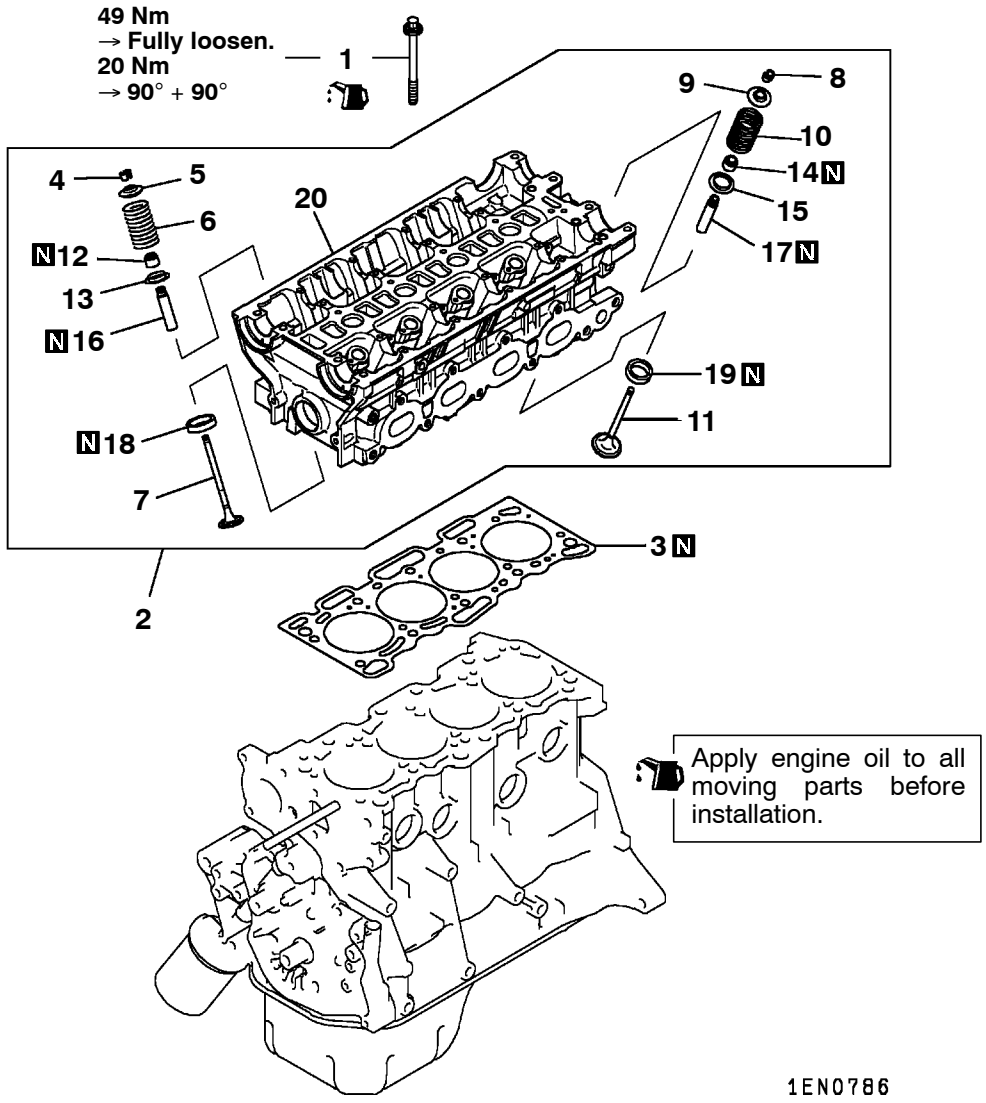
REMOVAL AND INSTALLATION <DOHC>



Removal steps

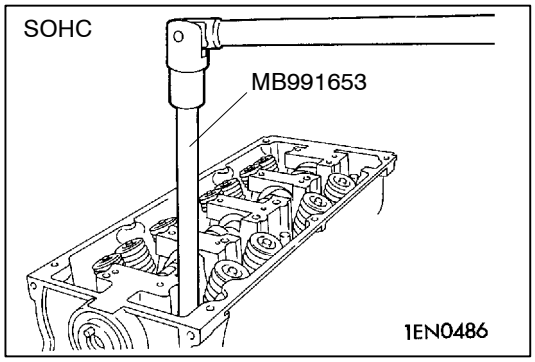
◀A▶ ▶D◀ 1. Cylinder head bolt
2. Cylinder head assembly
3. Cylinder head gasket
◀B▶ ▶C◀ 4. Retainer lock
5. Valve spring retainer
▶B◀ 6. Valve spring
7. Intake valve
◀B▶ ▶C◀ 8. Retainer lock
9. Valve spring retainer
▶B◀ 10. Valve spring
11. Exhaust valve
◀C▶ ▶A◀ 12. Valve stem seal
13. Valve spring seat
◀C▶ ▶A◀ 14. Valve stem seal
15. Valve spring seat
16. Intake valve guide
17. Exhaust valve guide
18. Intake valve seat
19. Exhaust valve seat
20. Cylinder head

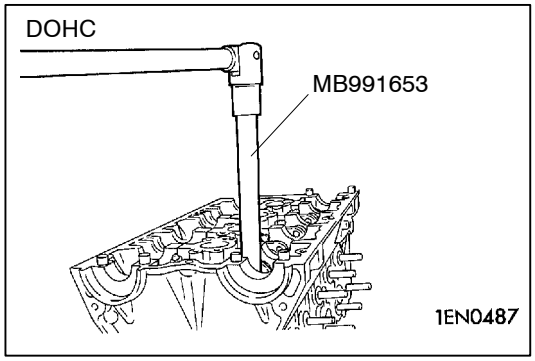
REMOVAL AND INSTALLATION <DOHC-GDI>

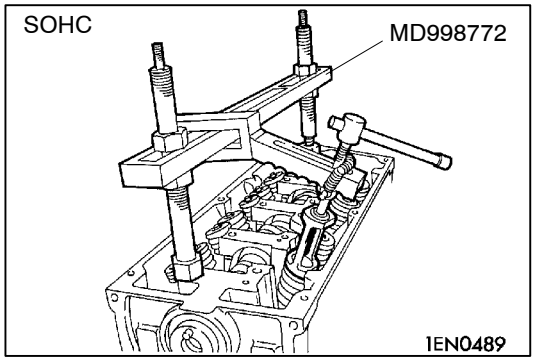


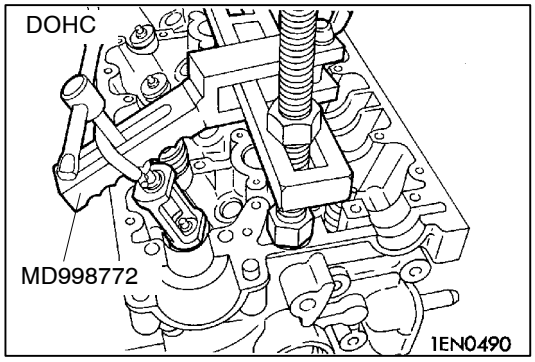
Removal steps

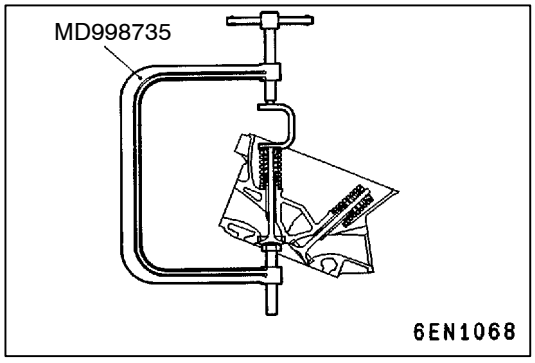
◀A▶ ▶D◀ 1. Cylinder head bolt
2. Cylinder head assembly
3. Gasket
◀B▶ ▶C◀ 4. Retainer lock
5. Valve spring retainer
▶B◀ 6. Valve spring
7. Intake valve
◀B▶ ▶C◀ 8. Retainer lock
9. Valve spring retainer
▶B◀ 10. Valve spring
11. Exhaust valve
◀C▶ ▶E◀ 12. Valve stem seal
13. Valve spring seat
◀C▶ ▶E◀ 14. Valve stem seal
15. Valve spring seat
16. Intake valve guide
17. Exhaust valve guide
18. Intake valve seat
19. Exhaust valve seat
20. Cylinder head









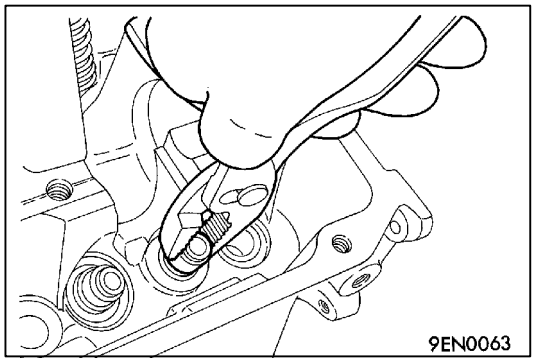


REMOVAL SERVICE POINTS

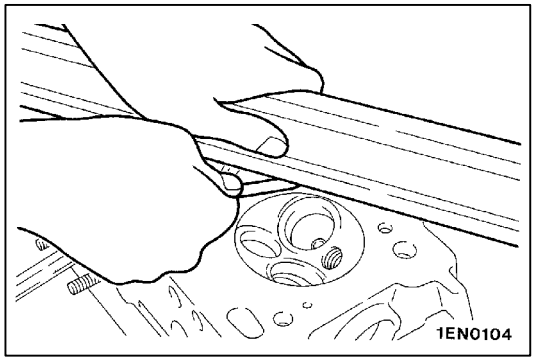
◀A▶ CYLINDER HEAD BOLT REMOVAL

◀B▶ RETAINER LOCK REMOVAL

(1) Tag removed valves, springs, and other components, noting their cylinder numbers and locations to facilitate reassembly. Store these components safely.



◀C▶ VALVE STEM SEAL REMOVAL



INSPECTION

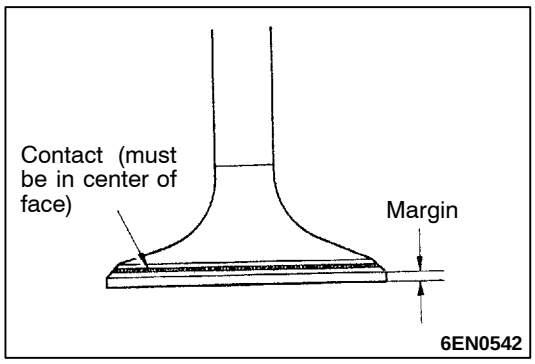
1. CYLINDER HEAD

(1) Before cleaning the cylinder head, check it for water leaks, gas leaks, cracks, and other damage.
(2) Remove all oil, water scale, sealant, and carbon. After cleaning the oil passages, blow air through them to verify that they are not blocked.
(3) Check for distortion in the cylinder head gasket surface using a straight edge and thickness gauge. If distortion exceeds the specified limit, grind the gasket surface to specification.

Gasket surface distortion

Standard value: 0.05 mm or less
Limit: 0.2 mm
Grinding limit: 0.2 mm
Cylinder head height (specification when new):
SOHC 12-VALVE: 106.9 - 107.1 mm
SOHC 16-VALVE: 119.9 - 120.1 mm
DOHC: 131.9 - 132.1 mm

Caution
No more than 0.2 mm of stock may be removed from the cylinder head and cylinder block mating surfaces in total.



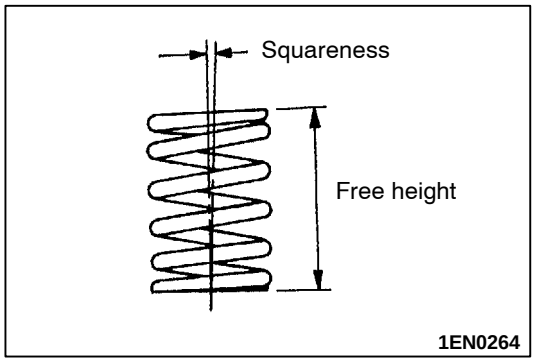
2. VALVES

(1) Check the valve face for correct contact. If contact is uneven or incomplete, reface the valve seat.
(2) If the margin is less than specified, replace the valve.

Standard value:
Intake: 1.0 mm
Exhaust: 1.5 mm
Limit:
Intake: 0.5 mm
Exhaust: 1.0 mm

(3) Measure the valve's total length. If the measurement is less than specified, replace the valve.

		Standard mm	Limit mm
Intake	SOHC 12-VALVE	100.75	100.25
	SOHC 16-VALVE	111.56	111.06
	DOHC	106.35	105.85
Exhaust	SOHC 12-VALVE	101.05	100.55
	SOHC 16-VALVE	114.71	114.21
	DOHC	106.85	106.35



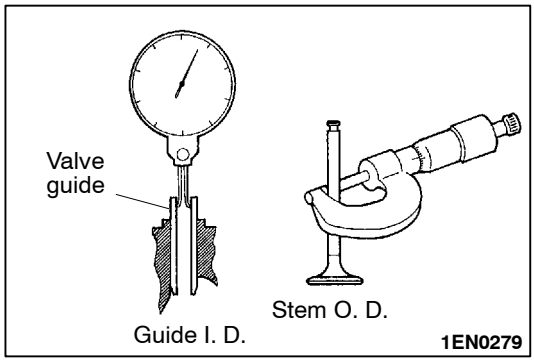
3. VALVE SPRINGS

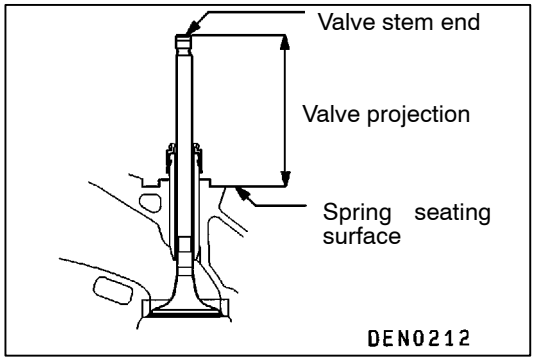
(1) Measure the valve spring's free height. If the measurement is less than specified, replace the spring.

		Standard mm	Limit mm
SOHC 12-VALVE	Intake	46.1	45.6
	Exhaust	46.8	46.3
SOHC 16-VALVE		50.9	50.4
DOHC		49.1	48.6

(2) Measure the squareness of the spring. If the measurement exceeds the specified limit, replace the spring.

Standard value: 2° or less
Limit: 4°





4. VALVE GUIDES

(1) Measure the clearance between the valve guide and valve stem. If the clearance exceeds the specified limit, replace either or both components.

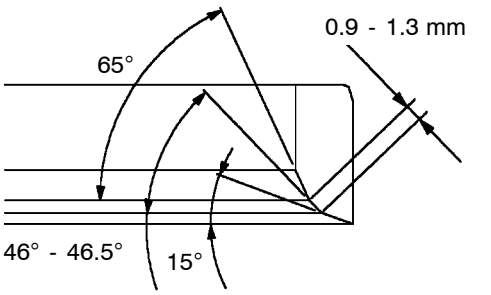
		Standard mm	Limit mm
Intake	SOHC 12-VALVE	0.020 - 0.050	0.10
	SOHC 16-VALVE	0.020 - 0.047	0.10
	DOHC	0.020 - 0.047	0.10
Exhaust	SOHC 12-VALVE	0.035 - 0.050	0.15
	SOHC 16-VALVE	0.030 - 0.057	0.15
	DOHC	0.030 - 0.062	0.15

5. VALVE SEATS

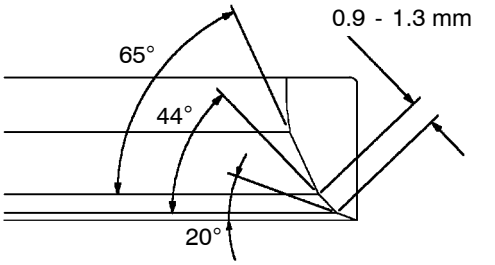
(1) Assemble the valve, then measure the valve stem projection between the end of the valve stem and the spring seating surface. If the measurement exceeds the specified limit, replace the valve seat.

		Standard mm	Limit mm
SOHC 12-VALVE	Intake	43.70	44.20
	Exhaust	43.30	43.80
SOHC 16-VALVE	Intake	53.21	53.71
	Exhaust	54.10	54.60
DOHC	Intake	48.80	49.30
	Exhaust	48.70	49.20

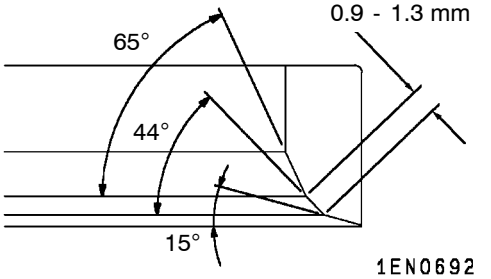
<except GDI>



<GDI - Intake side>

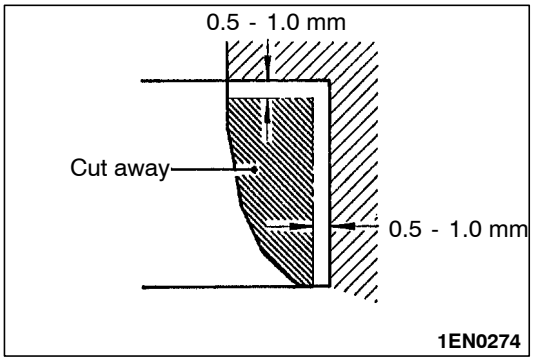


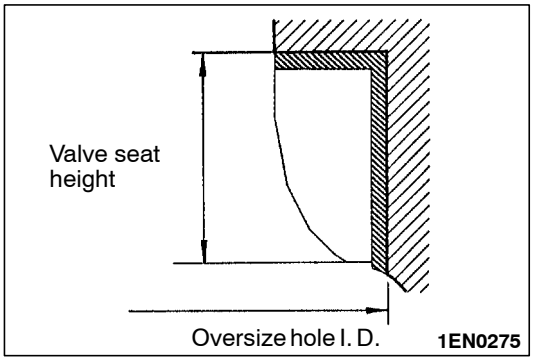
<GDI - Exhaust side>



VALVE SEAT CORRECTION SERVICE POINTS

(1) Before correcting the valve seat, check for clearance between the valve guide and valve and, if necessary, replace the valve guide.
(2) Correct to obtain the specified seat width and angle.
(3) After correction, the valve and valve seat should be lapped with a lapping compound.





VALVE SEAT REPLACEMENT SERVICE POINTS

(1) Cut the valve seat to be replaced from the inside to reduce the wall thickness. Then, remove the valve seat.
(2) Rebore the valve seat hole in the cylinder head to match the selected oversize valve seat diameter.

Valve seat hole diameters

				Standard mm
SOHC 12-VALVE	In-take	Primary	0.30 O.S.	27.300 - 27.325
			0.60 O.S.	27.600 - 27.625
		Secondary	0.30 O.S.	32.300 - 32.325
			0.60 O.S.	32.600 - 32.625
	Exhaust		0.30 O.S.	35.300 - 35.325
			0.60 O.S.	35.600 - 35.625
SOHC 16-VALVE <4G13>	Intake		0.30 O.S.	28.300 - 28.321
			0.60 O.S.	28.600 - 28.621
	Exhaust		0.30 O.S.	26.300 - 26.321
			0.60 O.S.	26.600 - 26.621
SOHC 16-VALVE <4G18>	Intake		0.30 O.S.	30.300 - 30.321
			0.60 O.S.	30.600 - 30.621
	Exhaust		0.30 O.S.	28.300 - 28.321
			0.60 O.S.	28.600 - 28.621
DOHC	Intake		0.30 O.S.	31.300 - 31.325
			0.60 O.S.	31.600 - 31.625
	Exhaust		0.30 O.S.	27.800 - 27.825
			0.60 O.S.	28.100 - 28.125

(3) Prevent galling of the cylinder head bore by cooling the valve seat with liquid nitrogen before press-fitting it.
(4) Correct the valve seat to achieve the specified width and angle (refer to VALVE SEAT CORRECTION SERVICE POINTS).

VALVE GUIDE REPLACEMENT SERVICE POINTS

(1) Using a press, push the valve guide out toward the cylinder block side.
(2) Rebore the valve guide hole in the cylinder head to match the oversize valve guide that is to be fitted.

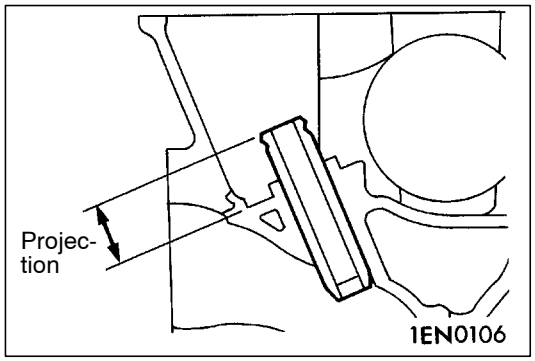
Caution
Do not install a valve guide of the same size again.

Valve guide hole diameters (SOHC 12-VALVE)
0.05 O.S.: 12.040 - 12.058 mm
0.25 O.S.: 12.240 - 12.258 mm
0.50 O.S.: 12.490 - 12.508 mm

Valve guide hole diameters (SOHC 16-VALVE, DOHC)
0.05 O.S.: 10.550 - 10.568 mm
0.25 O.S.: 10.750 - 10.768 mm
0.50 O.S.: 11.000 - 11.018 mm

Valve guide hole diameters (DOHC-GDI)
0.05 O.S.: 10.61 - 10.62 mm
0.25 O.S.: 10.81 - 10.82 mm
0.50 O.S.: 11.06 - 11.07 mm

(3) Press-fit the valve guide until it projects by the specified amount.



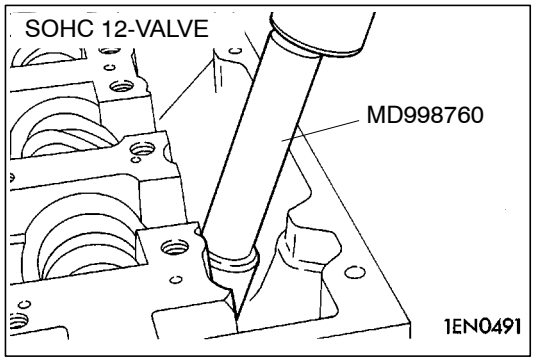
Standard value:
SOHC 12-VALVE: 17 mm
SOHC 16-VALVE, DOHC: 23 mm

Caution
1. **The valve guide must be installed from the upper side of the cylinder head.**
2. **The valve guides differ in length on the intake and exhaust sides. (48 mm for intake valve; 55 mm for exhaust valve)**
3. **After press-fitting the valve guide, insert a new valve and check that it slides smoothly.**

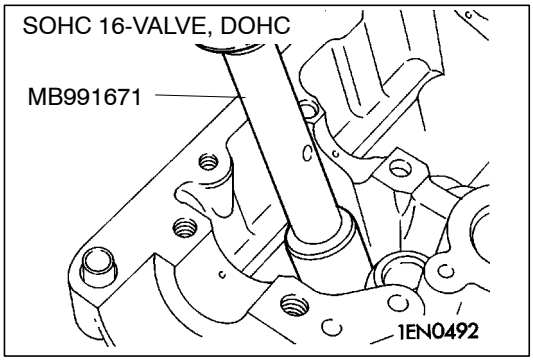
INSTALLATION SERVICE POINTS

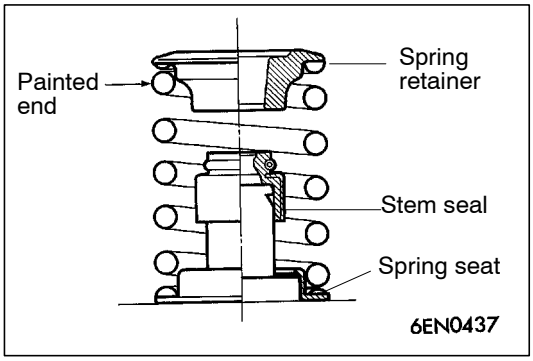
▶A◀ VALVE STEM SEAL INSTALLATION

(1) Install the valve spring seat.
(2) Install a new valve stem seal using the special tool shown in the illustration.



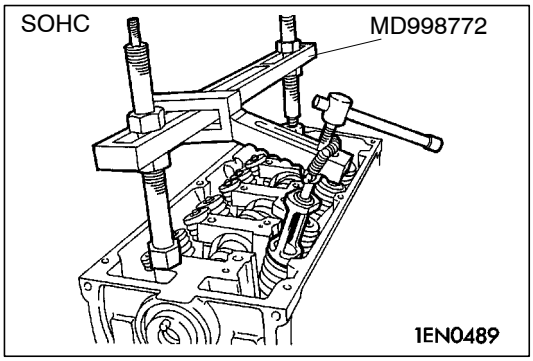
Caution
1. **Valve stem seals cannot be reused.**
2. **The valve stem seal must be installed using the correct special tool. Incorrect installation could result in oil leaking past the valve guide.**





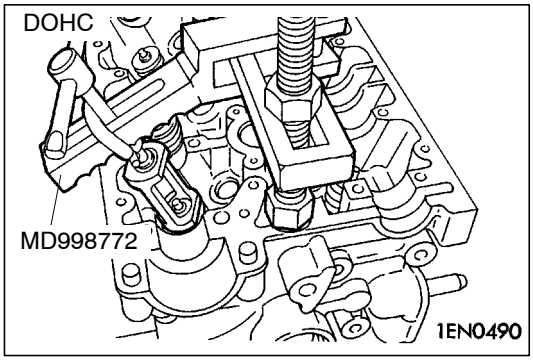
▶B◀ VALVE SPRING INSTALLATION

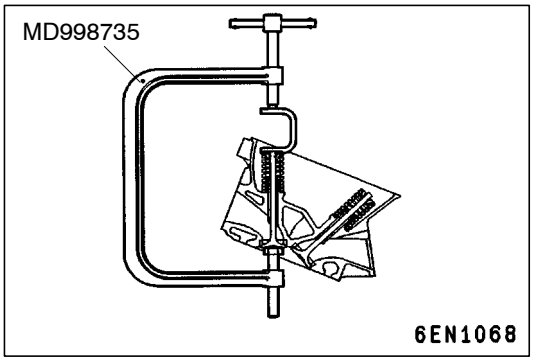
(1) Install the valve spring such that its painted end is on the rocker arm side.

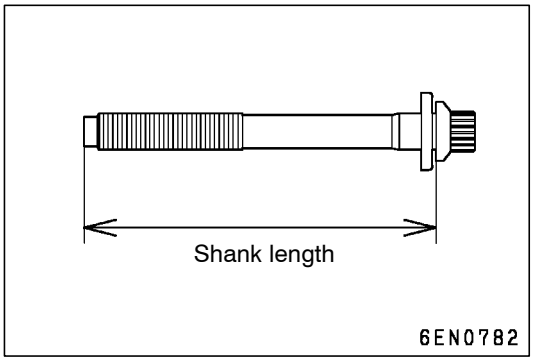


▶C◀ RETAINER LOCK INSTALLATION

(1) The valve spring, if excessively compressed, causes the bottom end of retainer to be in contact with the stem seal, and damage it.





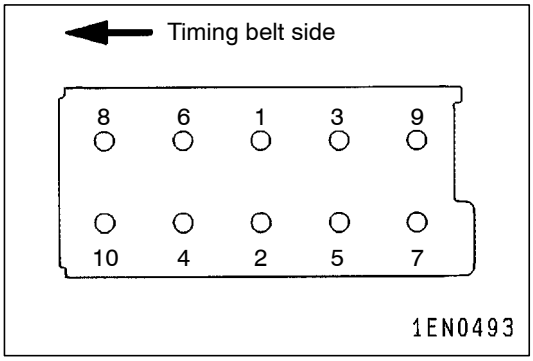


▶D◀ CYLINDER HEAD BOLT INSTALLATION

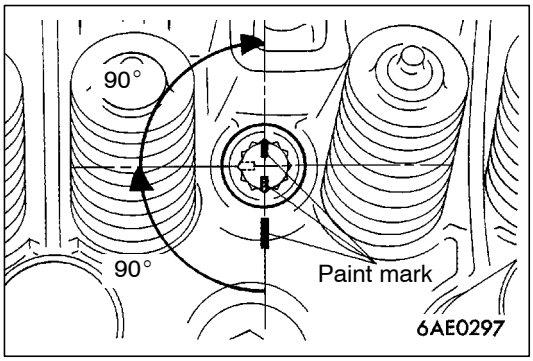
(1) Before reusing the cylinder head bolt, check that its nominal length does not exceed the specified limit. Replace the bolt if this measurement exceeds the limit.

Limit: 103.2 mm

(2) Apply engine oil to the bolt's thread and washer.

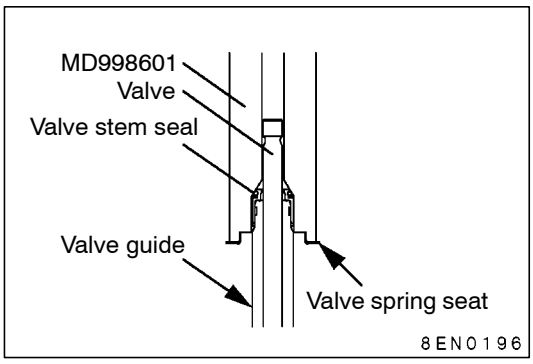


(3) Tighten the bolts in the sequence shown until each is torqued to 49 Nm.
(4) Completely loosen the bolts.
(5) Retighten the bolts in the sequence shown until each is torqued to 20 Nm.



(6) Apply paint marks to the cylinder head bolt heads and cylinder head as shown.
(7) In accordance with the tightening sequence, tighten each bolt by 90°.
(8) Tighten each bolt by a further 90° and check that the paint marks on the bolt head and cylinder head are aligned.

Caution
If the bolts are tightened by an angle of less than 90°, they may not hold the cylinder head with sufficient strength.
If the bolts are tightened by an angle exceeding 90°, completely remove them and carry out the installation procedure again.

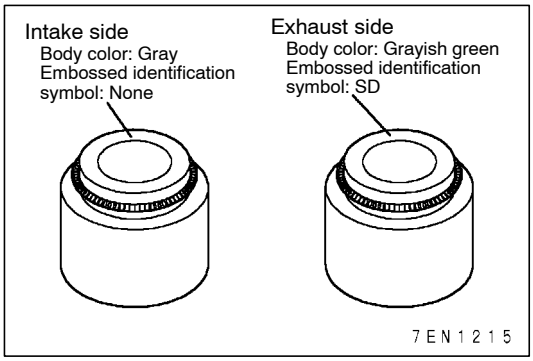


▶E◀ VALVE STEM SEAL INSTALLATION

(1) Install the valve spring seat.
(2) Install the valve.
(3) Apply a small amount of engine oil to the valve stem seal.
(4) Using the valve stem as a guide, install the valve stem seal to the valve guide with the special tool.

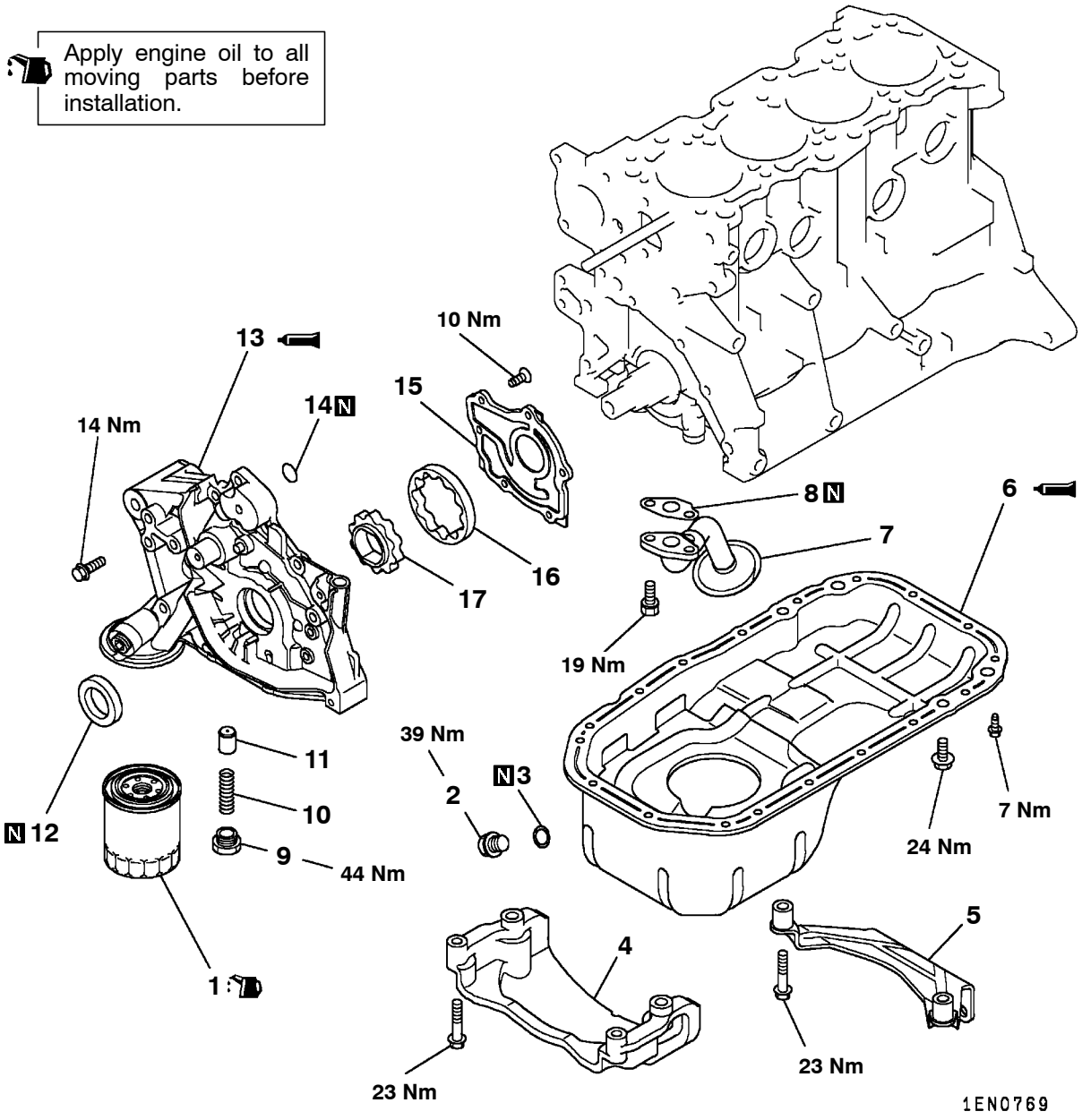
Caution
Improper installation of the valve stem seal will cause oil to work down. Use the special tool to install the valve stem seal.

NOTE
The valve stem seal differs between the intake and exhaust sides.



10. OIL PUMP AND OIL PAN

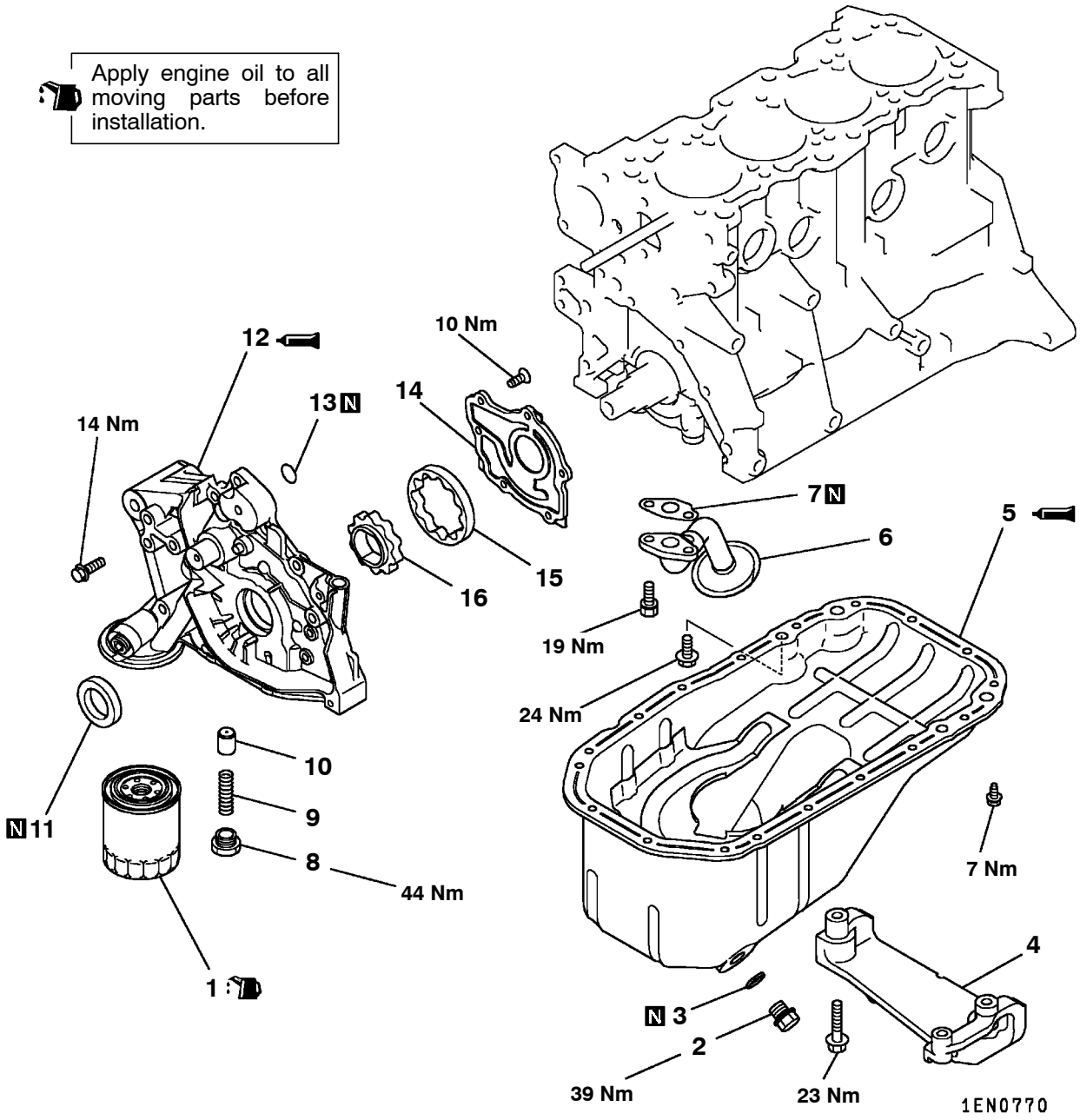
REMOVAL AND INSTALLATION <EXCEPT GDI (FRONT WHEEL DRIVE)>



Removal steps

- ▶E◀ 1. Oil filter
- 2. Drain plug
- ▶D◀ 3. Gasket
- 4. Transmission stay (cast metal)
- 5. Transmission stay (sheet metal)
- ◀A▶ ▶C◀ 6. Oil pan
- 7. Oil screen
- 8. Gasket
- 9. Relief valve
- 10. Relief valve spring
- 11. Relief plunger
- ▶B◀ 12. Front oil seal
- ▶A◀ 13. Front case
- 14. O-ring
- 15. Oil pump cover
- 16. Oil pump outer rotor
- 17. Oil pump inner rotor

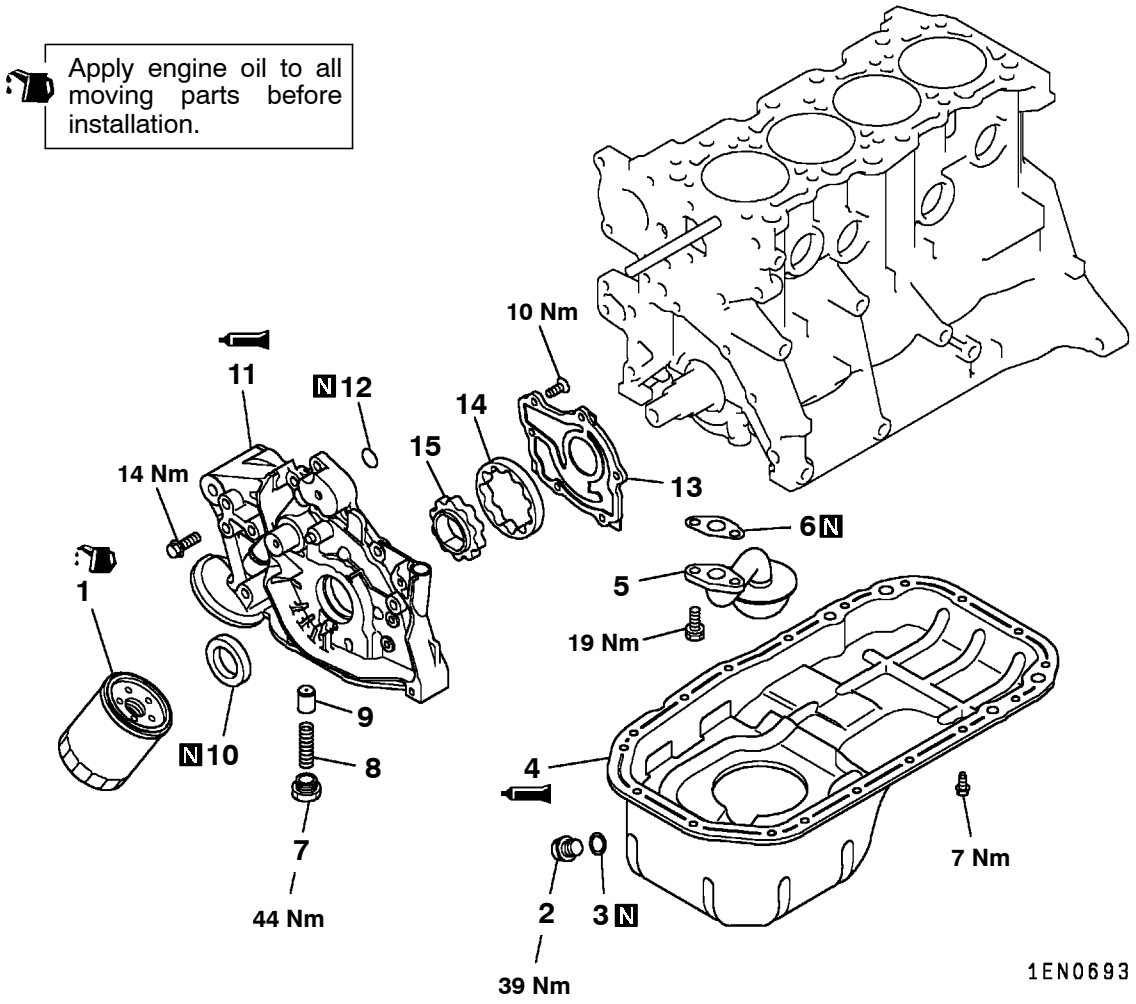
REMOVAL AND INSTALLATION <EXCEPT GDI (REAR WHEEL DRIVE)>



Removal steps

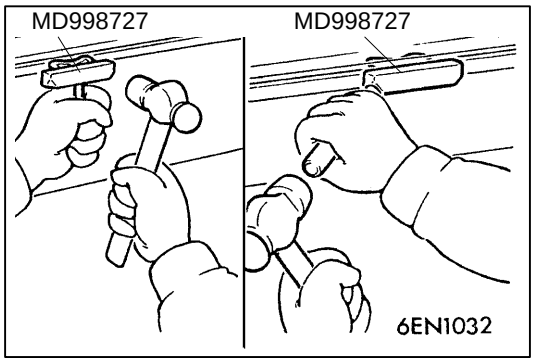
- ▶E◀ 1. Oil filter
- 2. Drain plug
- ▶D◀ 3. Gasket
- 4. Transmission stay
- ◀A▶ ▶C◀ 5. Oil pan
- 6. Oil screen
- 7. Gasket
- 8. Relief valve
- 9. Relief valve spring
- 10. Relief plunger
- ▶B◀ 11. Front oil seal
- ▶A◀ 12. Front case
- 13. O-ring
- 14. Oil pump cover
- 15. Oil pump outer rotor
- 16. Oil pump inner rotor

REMOVAL AND INSTALLATION <GDI>



Removal steps

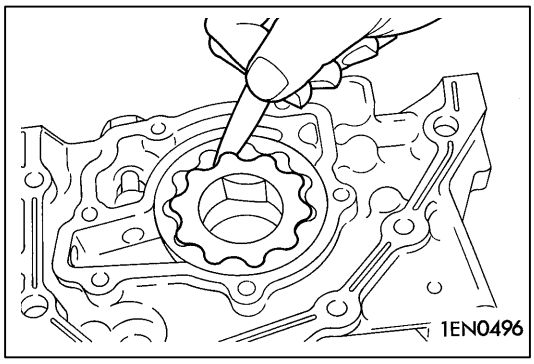
- ▶F◀ 1. Oil filter
- 2. Drain plug
- ▶D◀ 3. Gasket
- ◀A▶ ▶C◀ 4. Oil pan
- 5. Oil screen
- 6. Gasket
- 7. Relief valve
- 8. Relief valve spring
- 9. Relief plunger
- ▶B◀ 10. Oil seal
- ▶A◀ 11. Front case
- 12. O-ring
- 13. Oil pump cover
- 14. Outer rotor
- 15. Inner rotor



REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL

(1) Remove the oil pan mounting bolts.
(2) Knock the special tool between the oil pan and cylinder block as shown in the illustration.
(3) Tapping the side of the special tool, slide the tool along the oil pan/cylinder block seal and thus remove the oil pan.

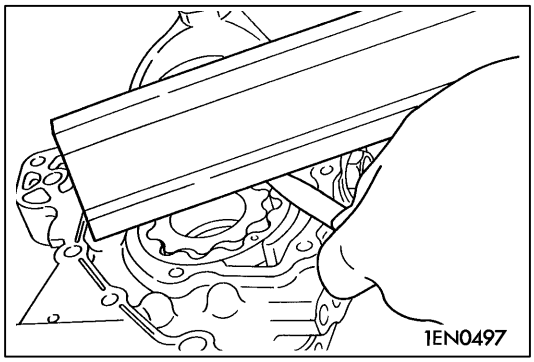


INSPECTION

1. OIL PUMP

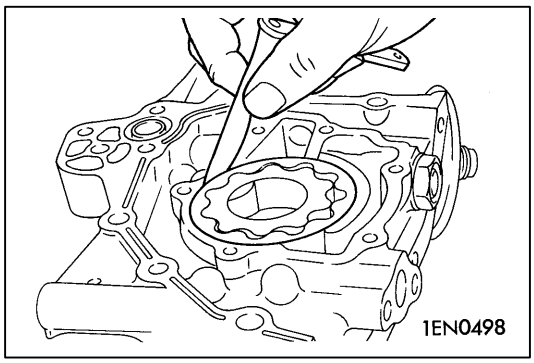
(1) Fit the rotor into the front case.
(2) Check the tip clearance using a thickness gauge.

Standard value: 0.03 – 0.08 mm



(3) Check the side clearance using a straight edge and thickness gauge.

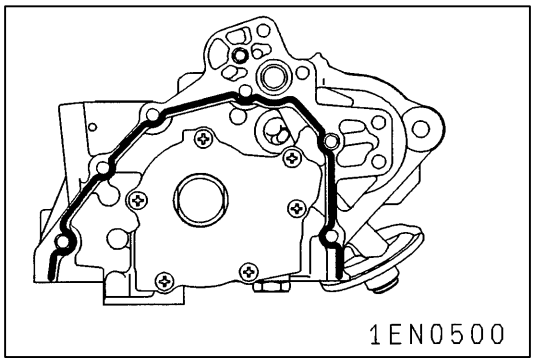
Standard value: 0.04 – 0.10 mm



(4) Check the body clearance using a thickness gauge.

Standard value: 0.10 – 0.18 mm

Limit: 0.35 mm

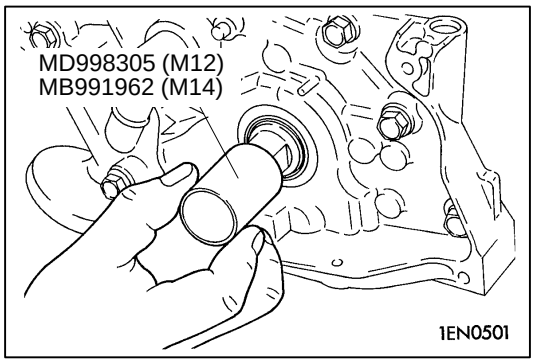


INSTALLATION SERVICE POINTS

▶A◀ FRONT OIL SEAL CASE INSTALLATION

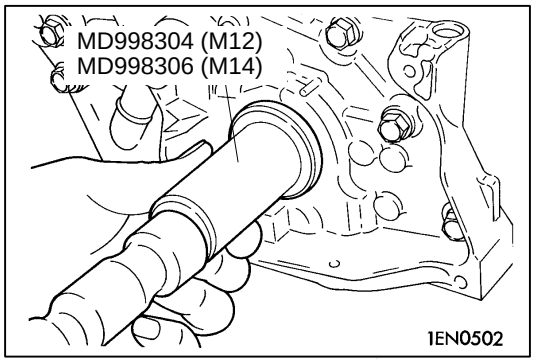
(1) Clean the sealant application surfaces on the cylinder block and front oil seal case.
(2) Apply a 3 mm bead of form-in-place gasket to the entire circumference of the oil pan flange.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.

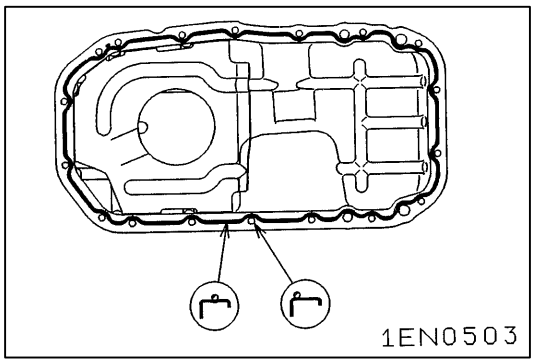


▶B◀ FRONT OIL SEAL INSTALLATION

(1) Place the special tool on the crankshaft's front end and apply engine oil to the its outer circumference.



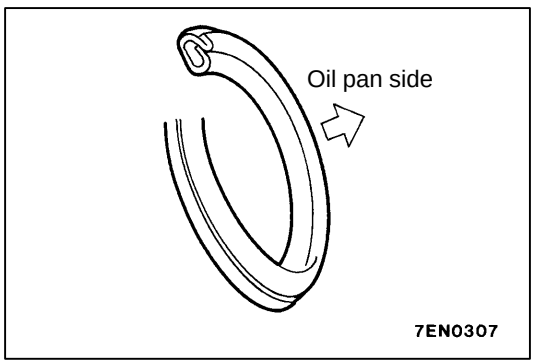
(2) Apply engine oil to the oil seal lip, then push the oil seal along the guide by hand until it touches the front case. Tap the oil seal into place using the special tool.



▶C◀ OIL PAN INSTALLATION

(1) Clean the mating surfaces of the cylinder block and oil pan.
(2) Apply a 4 mm bead of form-in-place gasket to the outer circumference of the oil pan flange.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent.



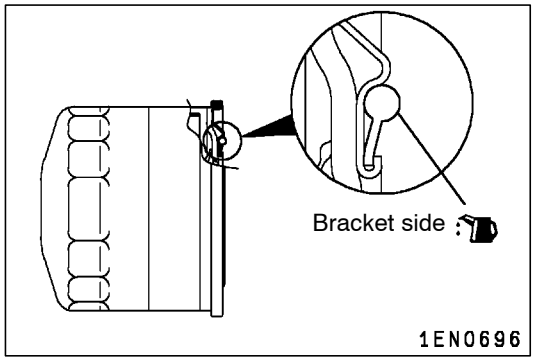
▶D◀ DRAIN PLUG GASKET INSTALLATION

(1) Replace the drain plug gasket with a new one. Fit the new gasket as shown.

▶E◀ OIL FILTER INSTALLATION

(1) Clean the filter mounting surface on the front case.
(2) Apply engine oil to the oil filter's O-ring.
(3) Screw on the oil filter until the O-ring is seated on the mounting surface. Then, give the oil filter one further turn such that it is torqued to approximately 14 Nm.

Caution
The oil filter must be tightened using a commercially available filter wrench. If the filter is tightened by hand only, it will be insufficiently torqued, resulting in oil leaks.



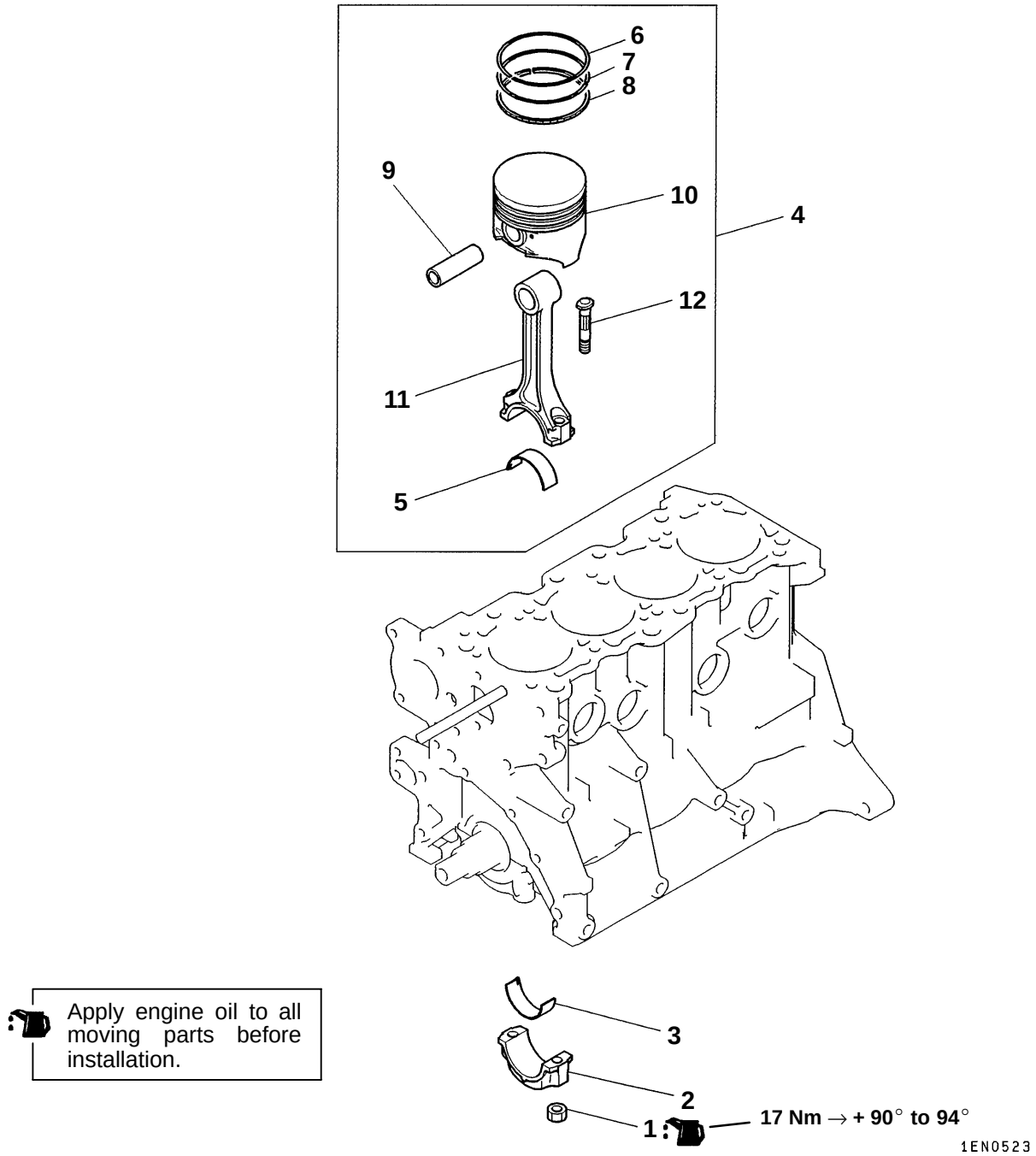
▶F◀ OIL FILTER INSTALLATION

(1) Clean the filter mounting surface on the front case.
(2) Apply engine oil to the O-ring of the oil filter.
(3) Screw the oil filter in and tighten the oil filter approximately 3/4 of a turn (approx. 16 ± 4 Nm) from where the O-ring has come into contact with the oil filter mounting surface.

Caution
The oil filter must be tightened using a commercially available filter wrench. If the filter is tightened by hand only, it will be insufficiently torqued, resulting in oil leaks.

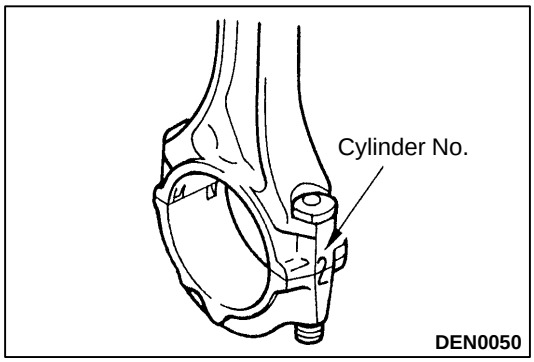
11. PISTONS AND CONNECTING RODS

REMOVAL AND INSTALLATION



Removal steps

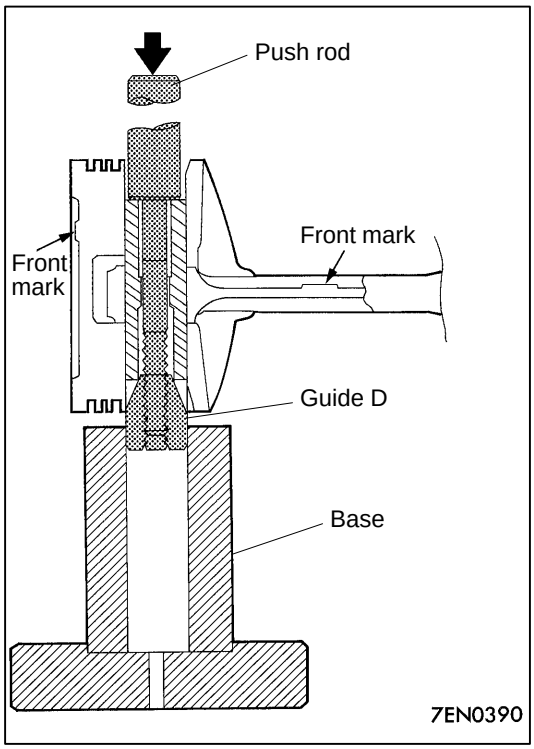
- ▶G◀ 1. Connecting rod nut
- ◀A▶ ▶F◀ 2. Connecting rod cap
- ▶E◀ 3. Connecting rod bearing
- ▶D◀ 4. Piston and connecting rod assembly
- 5. Connecting rod bearing
- ▶C◀ 6. Piston ring No. 1
- ▶C◀ 7. Piston ring No. 2
- ▶B◀ 8. Oil ring
- ◀B▶ ▶A◀ 9. Piston pin
- 10. Piston
- 11. Connecting rod
- 12. Bolt



REMOVAL SERVICE POINTS

◀A▶ CONNECTING ROD CAP REMOVAL

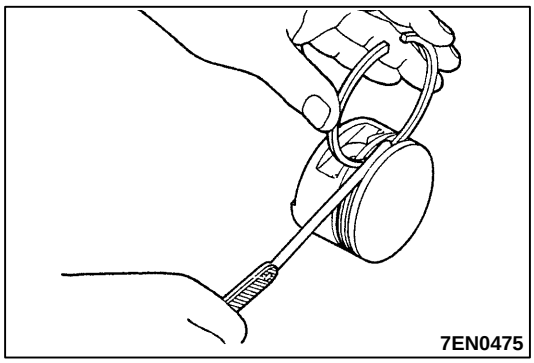
(1) Mark the cylinder number on the side of the connecting rod big end to facilitate reassembly.



◀B▶ PISTON PIN REMOVAL

(1) Insert the Push Rod (special tool) from the front arrow mark side, then fit guide D.
(2) Mount the piston and connecting rod assembly on the Piston Pin Setting Base (special tool) with the piston's front mark pointing upward.
(3) Remove the piston pin using a press.

NOTE
After removing the piston pin, keep the piston, piston pin, and connecting rod together. Do not allow pistons, piston pins, and connecting rods from different cylinders to become mixed up.



INSPECTION

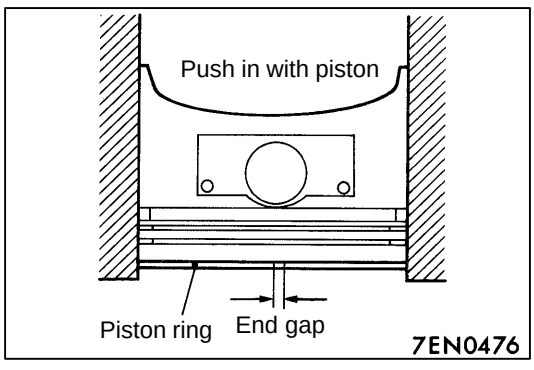
1. PISTON RINGS

(1) Check the piston ring side clearance. If the clearance exceeds the specified limit, replace the ring or piston, or both.

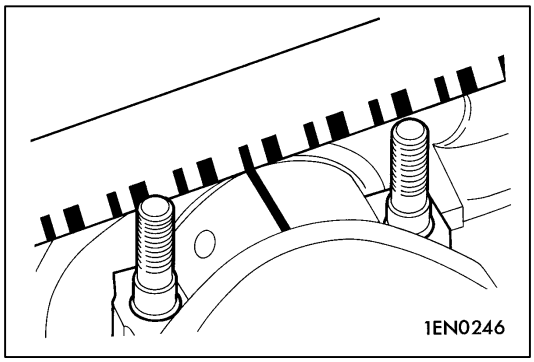
Standard values:
No. 1 ring: 0.03 – 0.07 mm
No. 2 ring: 0.02 – 0.06 mm

Limits:
No. 1 ring: 0.1 mm
No. 2 ring: 0.1 mm

(2) Insert the piston ring into the cylinder bore and push it down with a piston. Ensure that the piston's crown is in contact with the ring such that the ring is at 90° to the cylinder wall. Then, measure the end gap with a thickness gauge. If the gap is too large, replace the piston ring.



		Standard values mm	Limits mm
No. 1 ring	4G13, 4G18	0.20 – 0.35	0.8
	4G15	0.15 – 0.35	0.8
No. 2 ring	4G13, 4G18	0.35 – 0.50	0.8
	4G15	0.35 – 0.55	0.8
Oil ring	4G13 4G15	0.20 – 0.50	1.0
	4G18	0.10 – 0.40	1.0

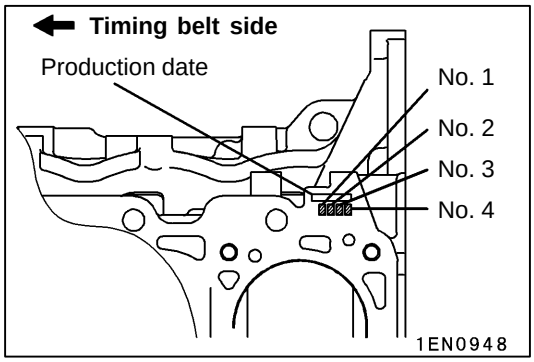


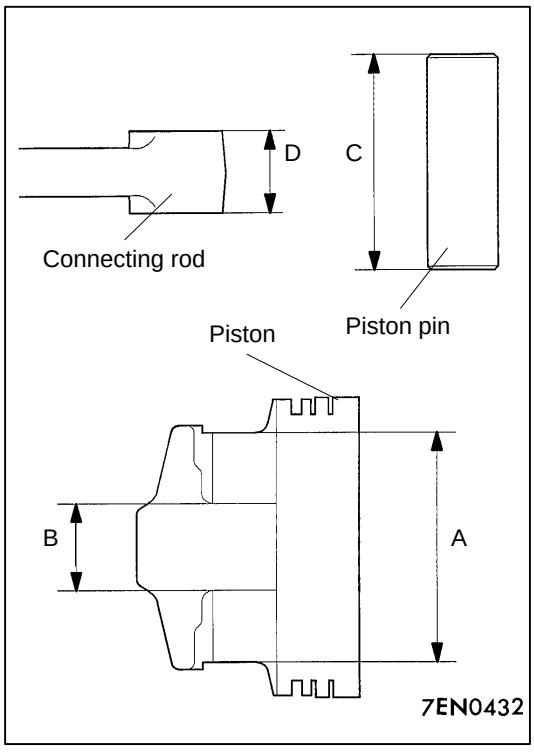
2. CRANKSHAFT PIN OIL CLEARANCE (PLASTIC GAUGE METHOD)

(1) Wipe all oil off the crankshaft pin and connecting rod bearing.
(2) On the pin, place a plastic gauge that is cut to the same length as the bearing's width. The plastic gauge must be centered on the pin in parallel with the pin's axis.
(3) Gently place the connecting rod cap in position and tighten the bolts to the specified torque.
(4) Remove the bolts and gently remove the connecting rod cap.
(5) Measure the compressed part of the plastic gauge at its widest point using the scale printed on the plastic gauge bag.

Standard value: 0.02 – 0.04 mm

Limit: 0.1 mm





INSTALLATION SERVICE POINTS

▶A◀ PISTON PIN INSTALLATION

(1) When replacing the piston, read off the cylinder bore size mark on the cylinder block as illustrated, and select a piston according to the flowing table.

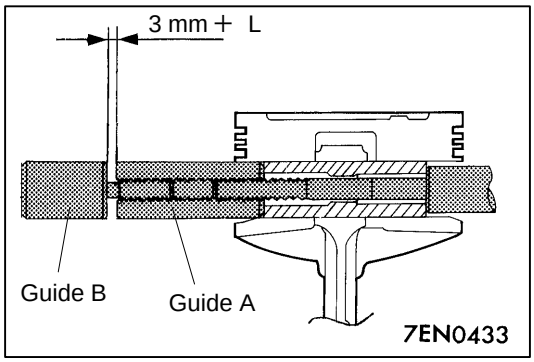
CYLINDER BORE SIZE MARK	PISTON SIZE MARK
A	A
B	None
C	C

NOTE:
The piston size mark shows on the top of the piston.

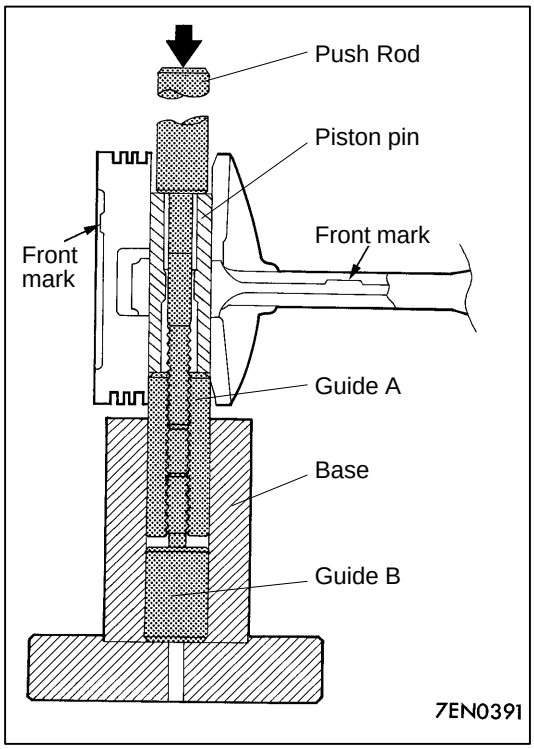
(2) Measure the following lengths (as shown):
A: Piston boss-to-piston boss outside dimension
B: Piston boss-to-piston boss inside dimension
C: Piston pin length
D: Connecting rod small end eye thickness
(3) Enter the measured values into the following formula:

$$L=\frac{(A-C)\ -\ (B-D)}{2}$$

(4) Insert the Push Rod (special tool) into the piston pin, then fit Guide A (special tool).
(5) Fit the piston and connecting rod together such that their front marks are on the same side.
(6) Apply engine oil to the outside of the piston pin.
(7) Into the front-mark side of the piston, insert the Guide A, piston pin, and Push Rod, starting with guide A.



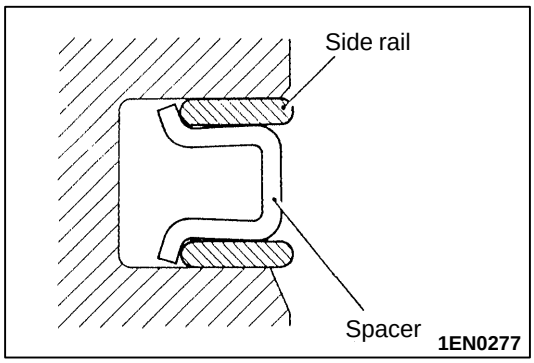
(8) Screw guide B into guide A. Leave a gap between the two guides of 3 mm plus the value (L) calculated in step (3).



(9) Mount the piston and connecting rod on the Piston Pin Setting Base (special tool) with the piston's front mark pointing upward.

(10) Install the piston pin using a press. If the press-fitting load is out of specification, replace the piston pin and piston assembly or the connecting rod, or both.

Standard value: 4,900 – 14,700 N

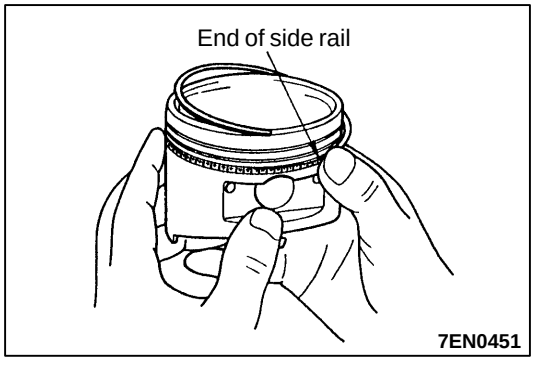


▶B◀ OIL RING INSTALLATION

(1) Fit the oil ring spacer into the piston ring groove. Then, fit the upper and lower side rails.

NOTE
(1) The spacer and side rails may be fitted in either direction. No distinction is made between top and bottom.
(2) Spacer and side rail sizes are color-coded as follows:

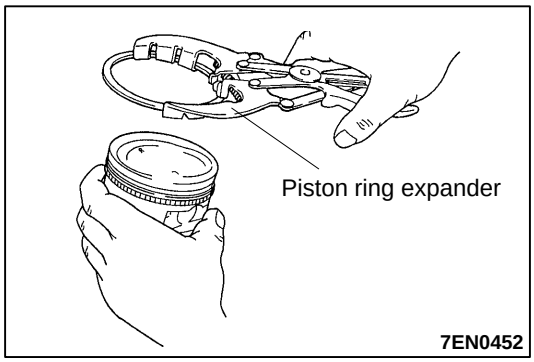
Size	Color	
STD	None	ALL
0.25 mm O. S.	White	4G18
0.50 mm O. S.	Blue	ALL
1.00 mm O. S.	Yellow	4G13, 4G15

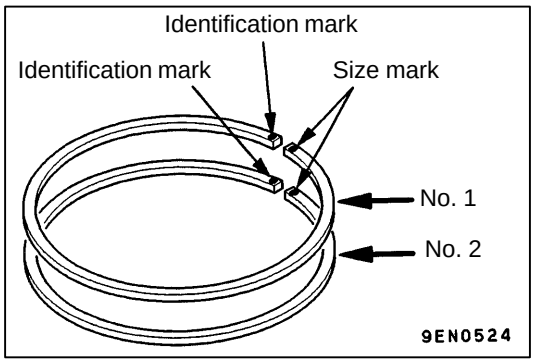


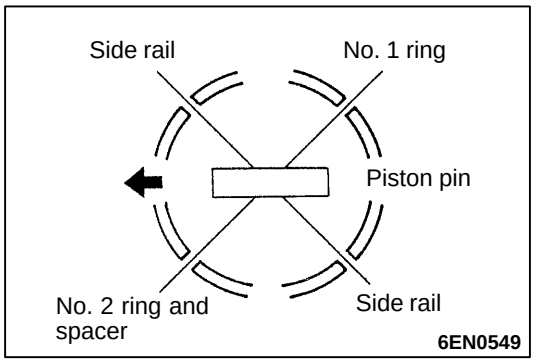
(2) To install a side rail, fit one end of the rail into the groove then press the rest of the rail into position by hand as shown.

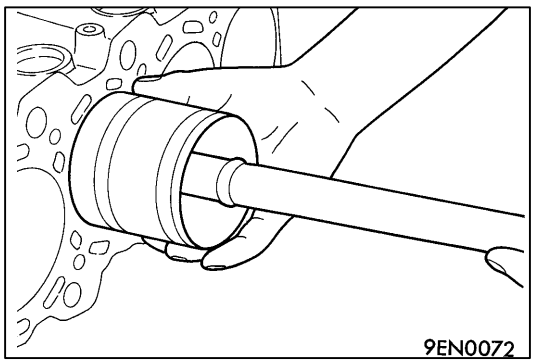
Caution
Do not fit side rails using a piston ring expander since they may break.

(3) After installing the side rails, check that they move smoothly in both directions.









▶C◀ PISTON RING No. 2 / PISTON RING No. 1 INSTALLATION

(1) Using piston ring expander, fit No. 2 and No. 1 piston ring into position.

NOTE
1. The ring end is provided with identification mark.

Item	Identification mark
No. 1 ring	1R or 1T or T
No. 2 ring	2R or 2T or T2

2. Install piston rings with identification mark facing up, to the piston crown side.
3. Size marks on piston rings are as follows.

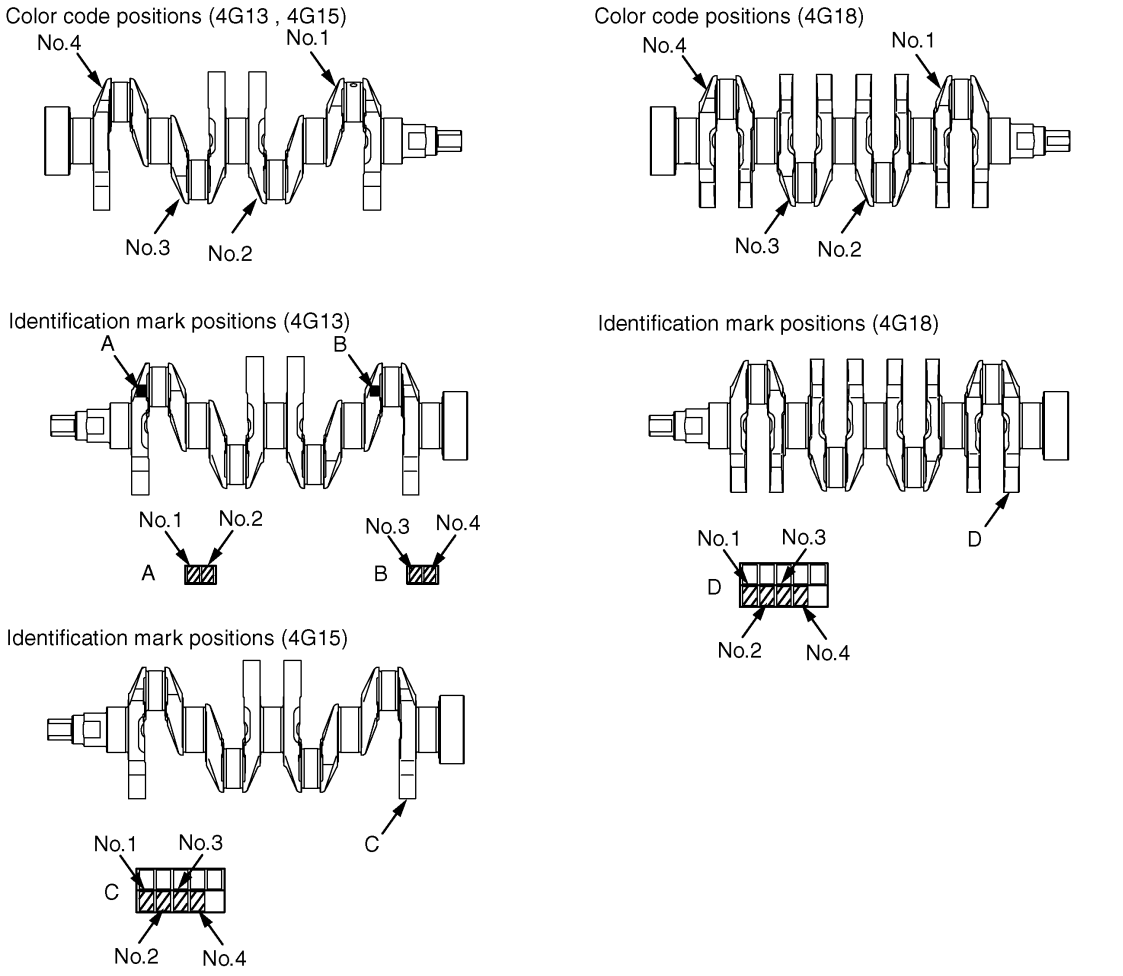
Size	Size mark	
STD	None	ALL
0.25 mm O. S.	25	4G18
0.50 mm O. S.	50	ALL
1.00 mm O. S.	100	4G13, 4G15

▶D◀ PISTON AND CONNECTING ROD ASSEMBLY INSTALLATION

(1) Apply oil to the piston, piston rings, and oil ring.
(2) Align the gaps of the piston rings and oil ring (side rails and spacer) as shown.
(3) With the piston crown's front arrow mark pointing toward the timing belt side, press the piston and connecting rod assembly into the cylinder from the top of the cylinder.

(4) Compress the piston rings tightly with a suitable ring compression tool, then press the piston and connecting rod fully into the cylinder. Do not strike the piston hard since the piston rings may break and the crank pin may be nicked.

▶E◀ CONNECTING ROD BEARING INSTALLATION



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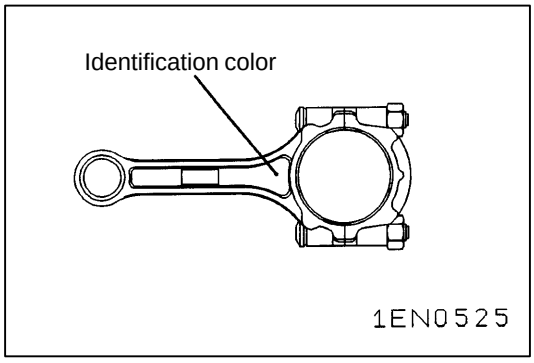
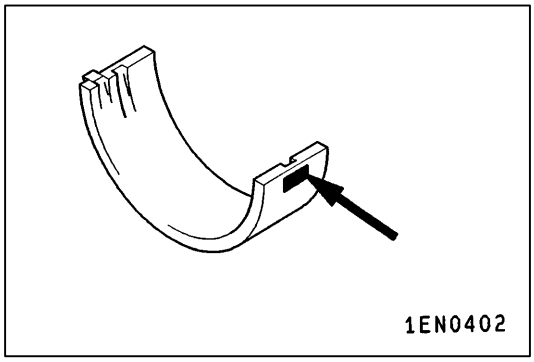
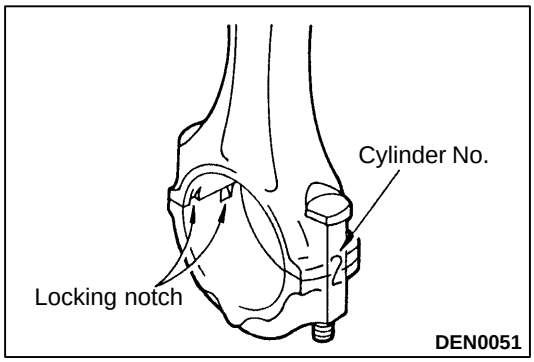




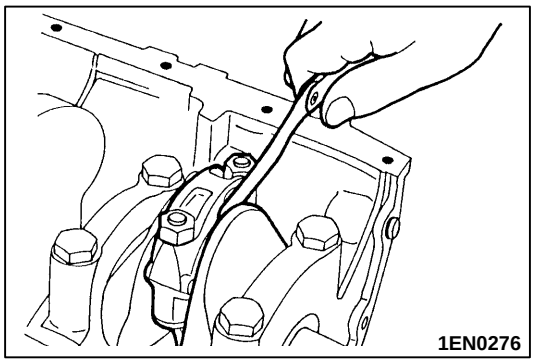
(1) Select bearings according to crankshaft and connecting rod identification marks or color codes, referring to the following table.

Crankshaft identification mark	Connecting rod identification color	Bearing identification mark
I, Yellow	White	1
	None	1
	Yellow	2
II, None	White	1
	None	2
	Yellow	3
III, White	White	2
	None	3
	Yellow	3



▶F◀ CONNECTING ROD CAP INSTALLATION

(1) Aligning the marks made during disassembly, fit the bearing cap onto the connecting rod. If the connecting rod is new and has no index mark, ensure that the bearing locking notches are both on the same side.



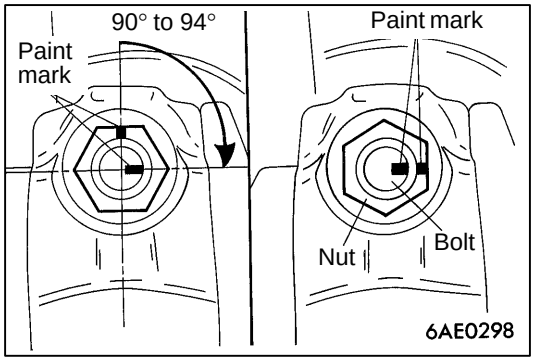
(2) Check that the connecting rod big end side clearance confirms with specifications.

Standard value: 0.10 – 0.25 mm
Limit: 0.4 mm

▶G◀CONNECTING ROD CAP NUT INSTALLATION

Caution
To fit the connecting rod cap nuts with the cylinder head in place, the spark plugs must be removed beforehand.

(1) The connecting rod bolts and nuts utilize the plastic region tightening method. The bolts must therefore be checked for stretching before reuse. To check a bolt for stretching, screw the nut down the entire length of the thread by hand. Unless the nut turns smoothly all the way, the bolt's threaded section is stretched and the bolt must be replaced.



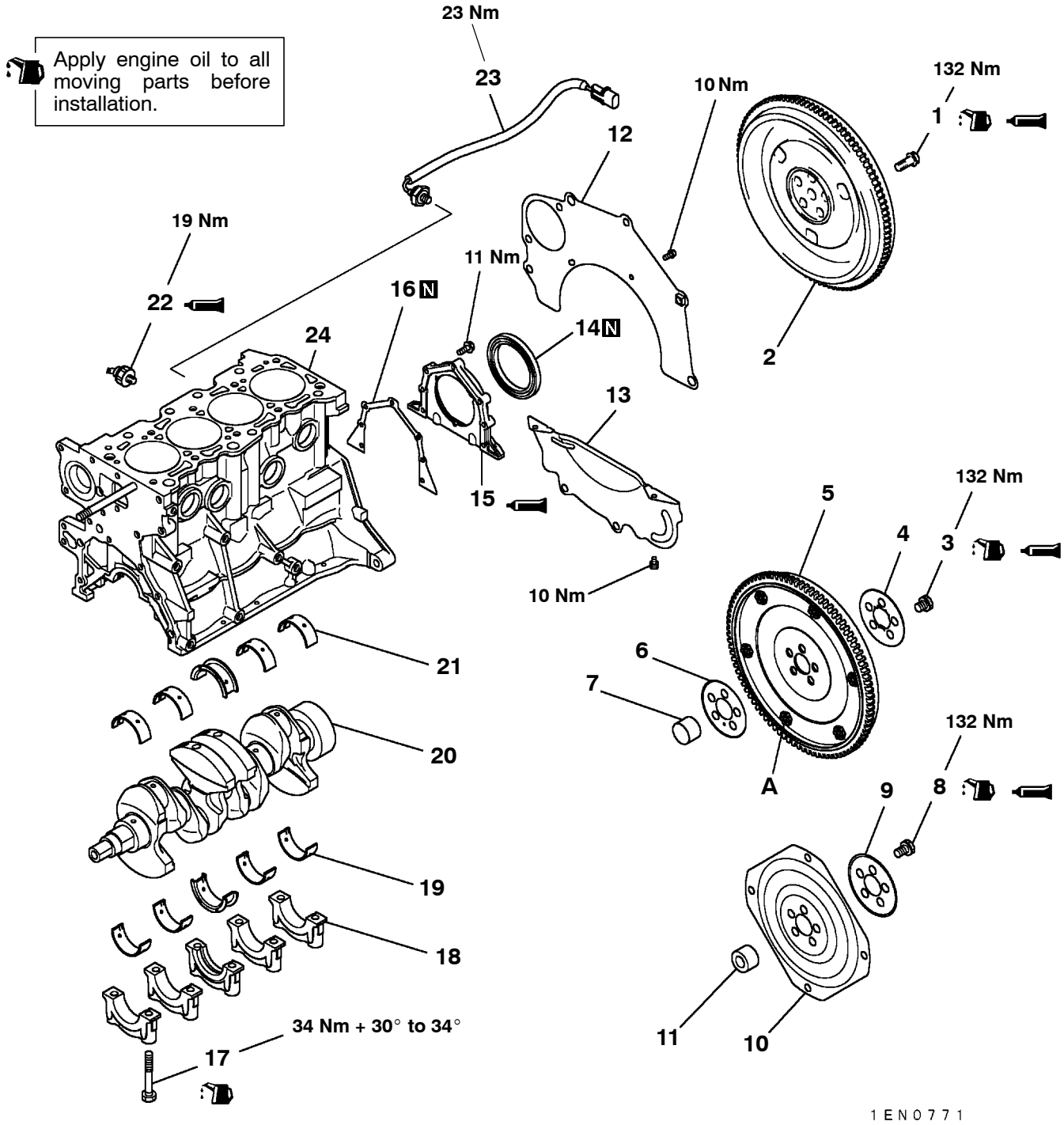
(2) Before fitting the nuts, apply engine oil to their threads and seating surfaces.
(3) Fit the nuts onto the bolts and turn them until they are finger-tight. After this, the nuts must be tightened alternately to ensure correct fitting of the cap.
(4) Tighten the nuts to a torque of 17 Nm.
(5) Make a paint mark on the top of each nut as shown.
(6) Make paint marks on the bolts 90 to 94° clockwise from the paint marks on the nuts.
(7) Turn the nuts until their paint marks are aligned with the paint marks on the bolts.

Caution

1. **If the nuts are turned by less than 90°, the cap may not be held on with sufficient strength.**
2. **If the nuts are turned by more than 94°, loosen them completely and carry out the tightening procedure again.**

12. CRANKSHAFT AND CYLINDER BLOCK

REMOVAL AND INSTALLATION <EXCEPT GDI>

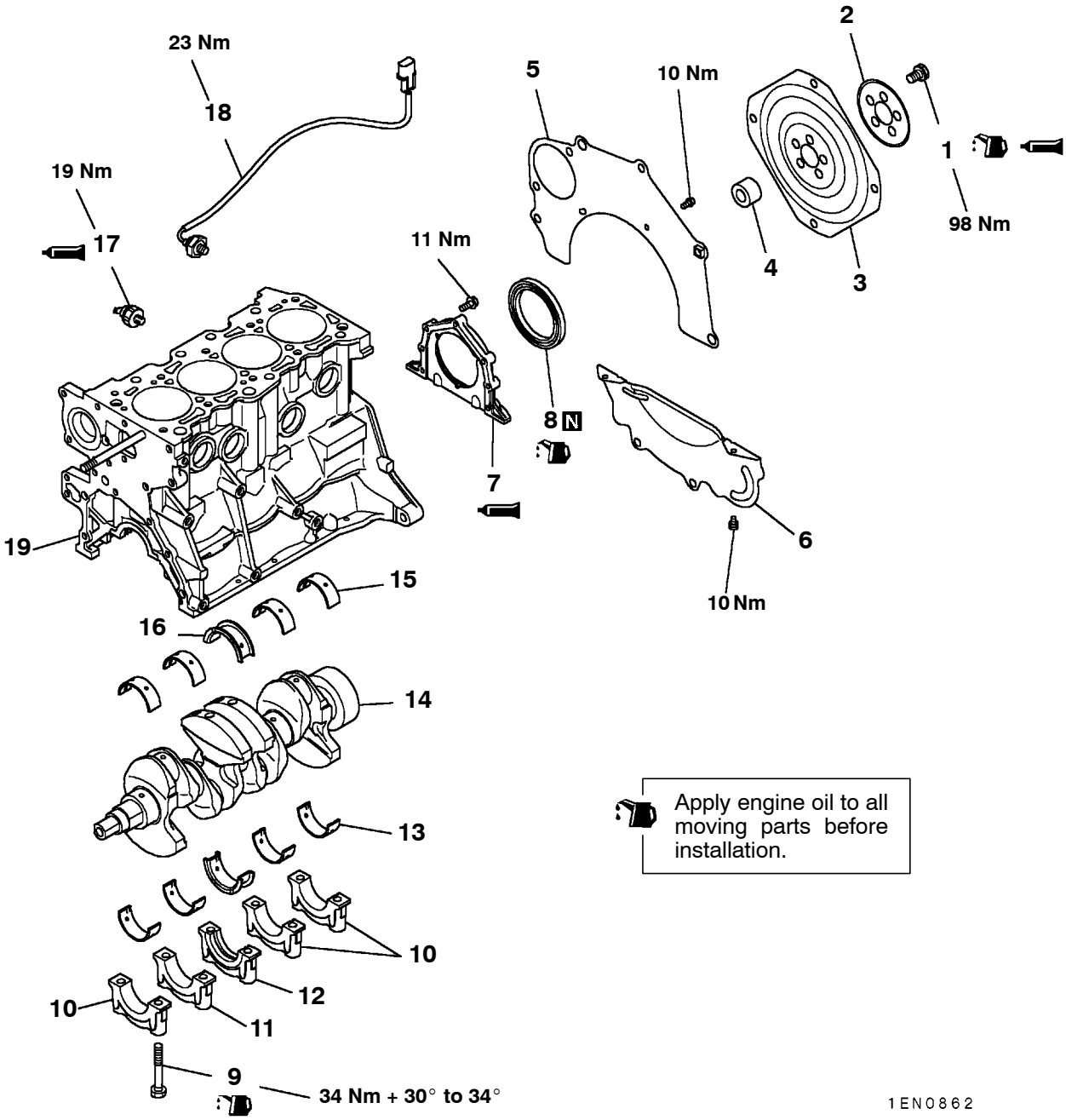


Removal steps

- ▶F◀ 1. Flywheel bolt
- 2. Flywheel
- 3. Flywheel bolt
- 4. Adapter plate
- 5. Flywheel
- 6. Adapter plate
- 7. Crankshaft bushing
- 8. Drive plate bolt
- 9. Adapter plate
- 10. Drive plate
- 11. Crankshaft bushing
- 12. Rear plate
- 13. Bell housing cover
- ▶D◀ 14. Rear oil seal
- ▶E◀ 15. Rear oil seal case
- 16. Rear oil seal case gasket
- ▶C◀ 17. Bearing cap bolt
- ▶C◀ 18. Bearing cap
- ▶B◀ 19. Crankshaft bearing (lower)
- 20. Crankshaft
- ▶B◀ 21. Crankshaft bearing (upper)
- ◀A▶ ▶A◀ 22. Oil pressure switch
- 23. Knock sensor
  <4G13 (SOHC 16-VALVE) for Europe, 4G18 for GCC and 4G18 for Europe (From 2004 model)>
- 24. Cylinder block

Caution
On the flexible flywheel equipped engines, do not remove any of the bolts “A” of the flywheel shown in the illustration.
The balance of the flexible flywheel is adjusted in the assembled condition. Removing the bolt, therefore, can cause the flexible flywheel to be out of balance, giving damage to the flywheel.

REMOVAL AND INSTALLATION <GDI>



Removal steps

- ▶F◀ 1. Drive plate bolt
- 2. Adapter plate
- 3. Drive plate
- 4. Crankshaft bushing
- 5. Rear plate
- 6. Bell housing cover
- ▶E◀ 7. Rear oil seal case
- ▶D◀ 8. Rear oil seal
- 9. Bearing cap bolt
- ▶C◀ 10. Bearing cap
- ▶C◀ 11. Bearing cap No. 4
- ▶C◀ 12. Bearing cap center
- ▶B◀ 13. Crankshaft bearing, lower
- 14. Crankshaft
- ▶B◀ 15. Crankshaft bearing, upper
- ▶B◀ 16. Crankshaft bearing, center
- ◀A▶ ▶A◀ 17. Oil pressure switch
- 18. Knock sensor
- 19. Cylinder block

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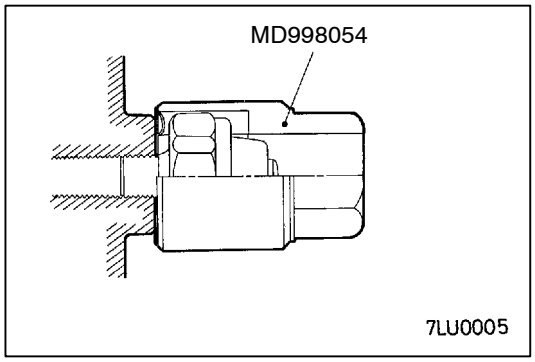
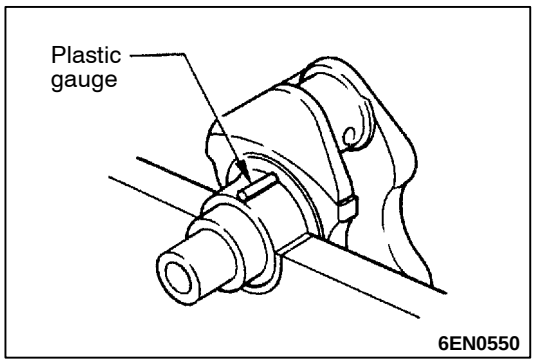


REMOVAL SERVICE POINTS

◀A▶ OIL PRESSURE SWITCH REMOVAL

(1) Disconnect the oil pressure switch terminals.
(2) Using the special tool, remove the oil pressure switch.

Caution
The thread is coated with sealant. Take care not to bend it when removing the oil pressure switch.



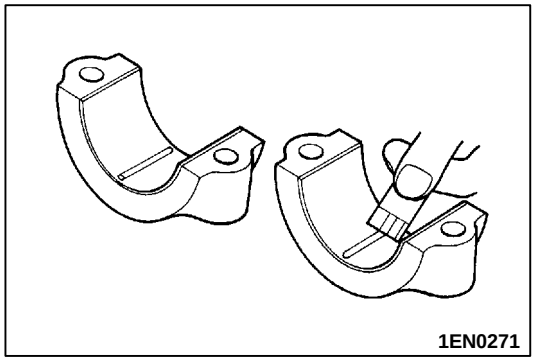
INSPECTION

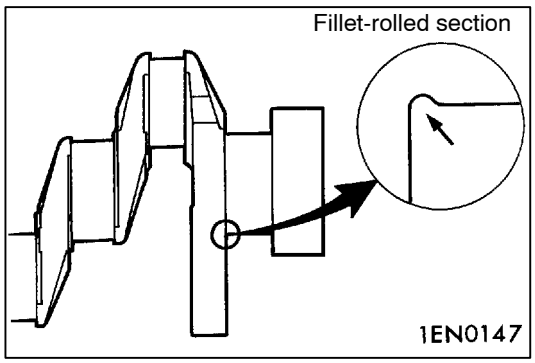
1. CRANKSHAFT OIL CLEARANCE

The crankshaft oil clearance can be measured easily using a plastic gauge.
To check the crankshaft oil clearance with a plastic gauge, carry out the following procedure:
(1) Wipe all oil off the crankshaft journal and the bearing's inside surface.
(2) Install the crankshaft.
(3) Cut the plastic gauge such that its length matches the width of the bearing, then place it on the journal along the journal's axis.
(4) Gently fit the crankshaft bearing cap and tighten the bolts to the specified torque.
(5) Remove the bolts and gently remove the crankshaft bearing cap.
(6) Using the scale printed on the plastic gauge bag, measure the plastic gauge's crushed section at its widest point.

Standard value: 0.02 - 0.04 mm

Limit: 0.1 mm





NOTE
The crankshaft pins and journals are fillet-rolled and must not be machined to undersize dimensions.

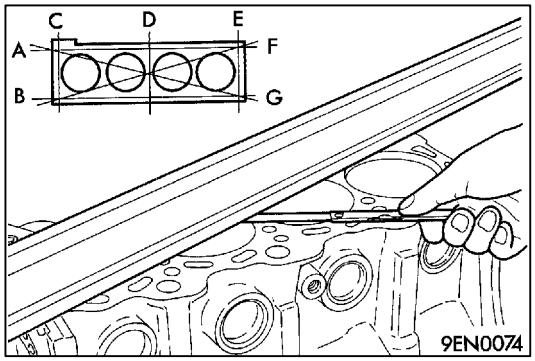
2. CYLINDER BLOCK

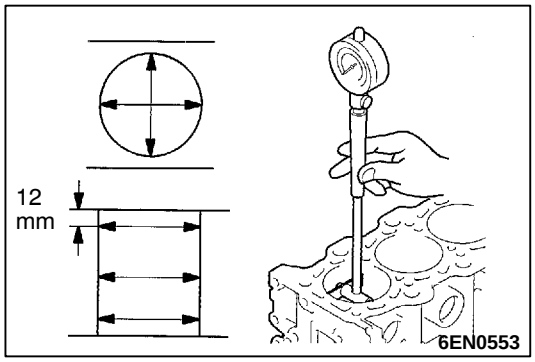
(1) Visually check for cracks, rust, and corrosion, and inspect the cylinder block using a flaw detecting agent. Rectify defects where possible or replace the cylinder block.
(2) Ensure that the top surface is free of gasket chips and other foreign material. Check the cylinder block's top surface for distortion using a straight edge and thickness gauge.

Standard value: 0.05 mm

Limit: 0.1 mm

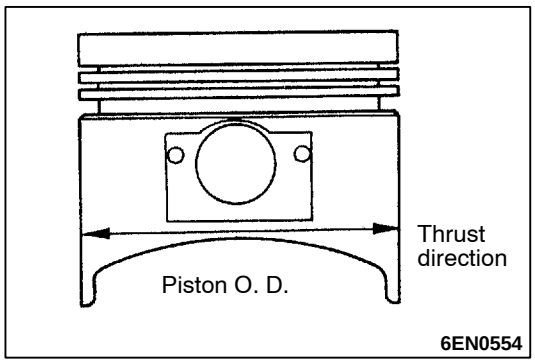
(3) Check the cylinder walls for cracks and seizure marks. If defects are evident, bore all the cylinders to oversize or replace the cylinder block.





(4) Using a cylinder gauge, measure each cylinder's bore and cylindricity. If any cylinder is severely worn, bore all the cylinders to oversize and replace the piston and piston rings accordingly. Take measurements at the points shown.

Standard value:
Cylinder bore:
4G13 engine: 71.0 mm
4G15 engine: 75.5 mm
4G18 engine: 76.0 mm
Cylindricity: 0.01 mm or less



3. BORING CYLINDERS

(1) Oversize pistons to be used should be determined on the basis of the cylinder with the largest bore.
(2) Oversize pistons are available with the following oversize dimensions: 0.25 mm, 0.50 mm, and 1.00 mm. Measure the diameter of the piston to be used. Boring must be carried out such that the piston-to-cylinder clearance complies with the standard value. The piston's diameter should be measured at the points shown.
(3) Calculate the boring finish dimension based on the piston diameter dimension.
- [Boring finish dimension] = [piston O.D.] + [piston-to-cylinder clearance (0.02 – 0.04 mm)] - [honing margin (0.02 mm)]

(4) Bore each cylinder to the calculated boring finish dimension.

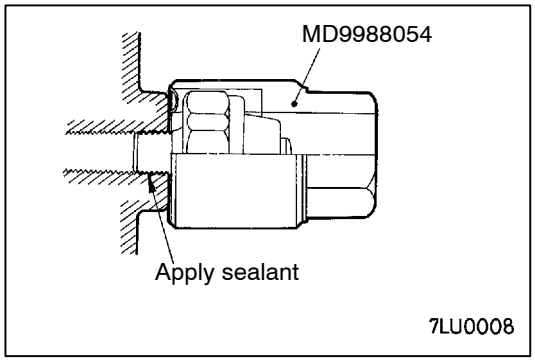
Caution
To prevent distortion caused by heat increases during boring bore the cylinders in the following order: No. 2, No. 4, No. 1, No. 3.

(5) Hone the cylinders to the final finish dimension (piston O. D. + piston-to-cylinder clearance).
(6) Check the clearance between the pistons and cylinders.

Standard value: 0.02 - 0.04 mm

INSTALLATION SERVICE POINTS

▶A◀ OIL PRESSURE SWITCH INSTALLATION



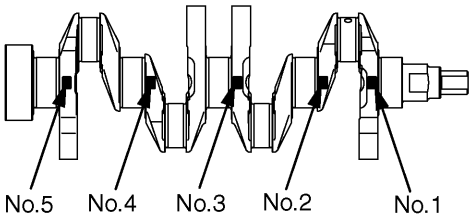
(1) Apply the specified sealant to the thread, then fit the oil pressure switch using the special tool shown in the illustration.

Specified sealant:
3M ATD Part No. 8660 or equivalent

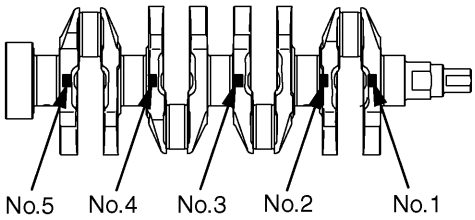
Caution
1. **Apply sealant such that none is squeezed out past end of the thread.**
2. **Do not over-tighten the oil pressure switch.**

▶B◀ CRANKSHAFT BEARING INSTALLATION

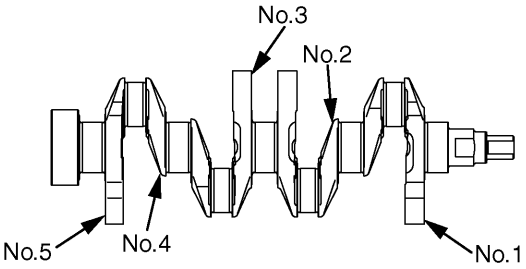
Color code positions [type1] (4G13 , 4G15)



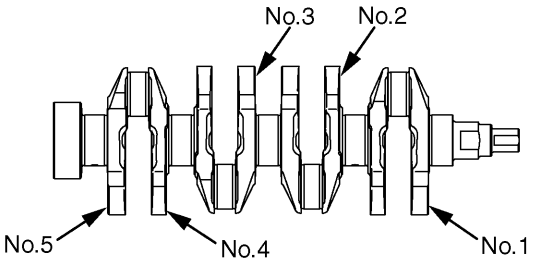
Color code positions [type1] (4G18)



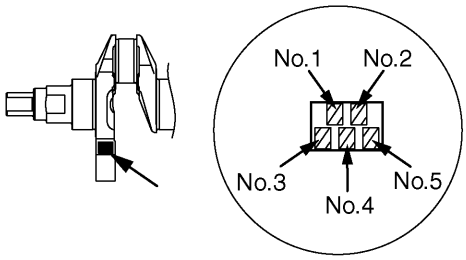
Color code positions [type2] (4G13 , 4G15)



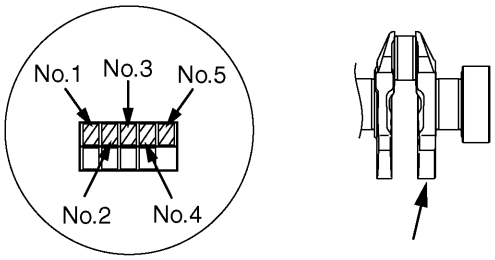
Color code positions [type2] (4G18)



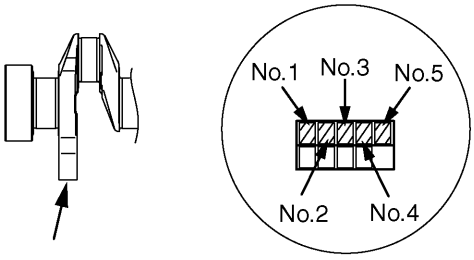
Identification mark positions (4G13)



Identification mark positions (4G18)



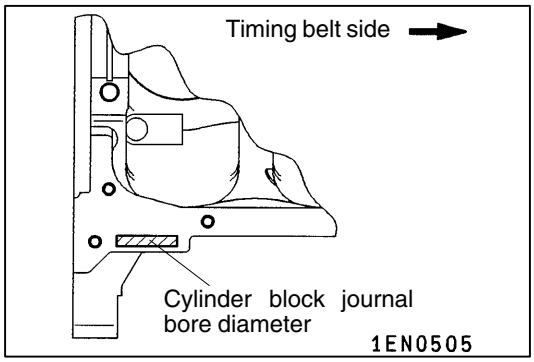
Identification mark positions (4G15)



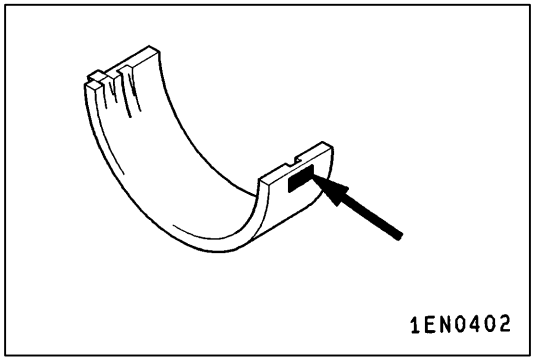
AK306151AB

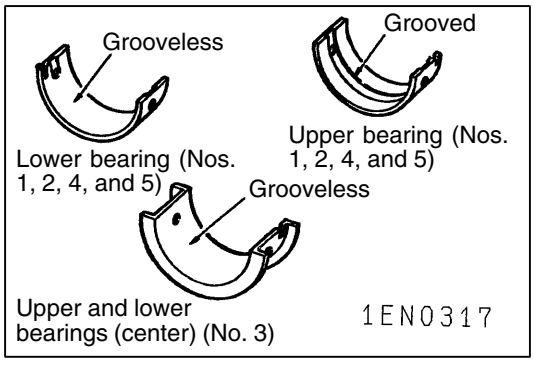
(1) Select bearings according to the crankshaft identification marks or color codes, referring to the following table. If they are not identifiable, measure the crankshaft journals and choose bearings to match the measurements.

Crankshaft journal				Cylinder block bearing diameter	Bearing
Range	Color code	Identification mark	Journal diameter mm	Identification mark	Identification mark
1	Yellow	1	47.994 – 48.000	0	1
				1	2
				2	3
2	None	2	47.988 – 47.994	0	2
				1	3
				2	4
3	White	3	47.982 – 47.988	0	3
				1	4
				2	5

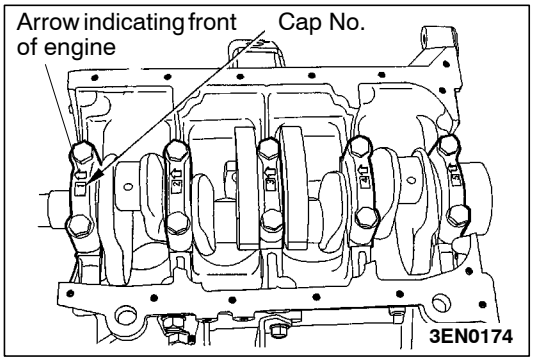


(2) Identification marks showing the cylinder block bearing bore diameter are stamped in the position shown, with No. 1 at the front of the engine. Bearings must be selected and installed in accordance with these identification marks.
(3) Based on the identification markings verified in steps (1) and (2), select bearings from table above. See the following example:
   1. If the measured crankshaft journal diameter is 48.000 mm, this corresponds to classification 1 in the above table.
   2. If the identification mark on the cylinder block bearing hole is “1”, select a bearing with an identification mark of “2”.



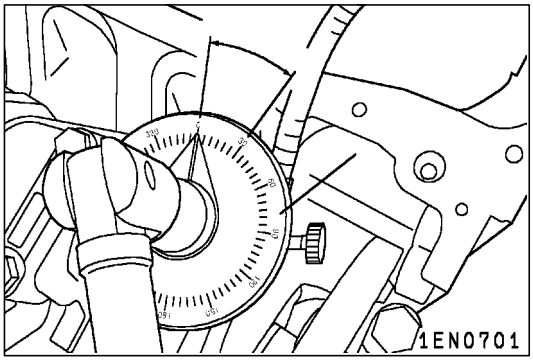


(4) Except for the center bearing, all the upper bearings are grooved. The center bearings are grooveless and have flanges. The center bearings are the same at the top and bottom.
(5) The lower bearings are all grooveless.

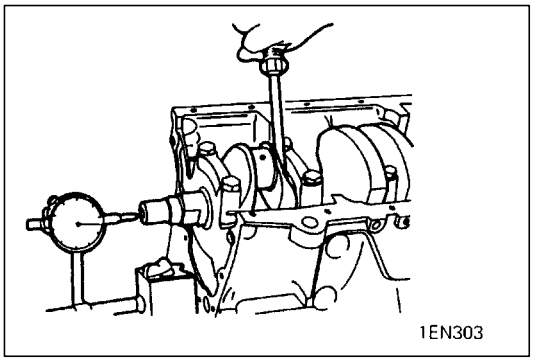


▶C◀ BEARING CAP INSTALLATION

(1) On the bottom surface of each bearing cap is the cap's number and an arrow. Starting at the timing belt side, fit the bearing caps in numerical order. Ensure that the arrows point toward the timing belt side.



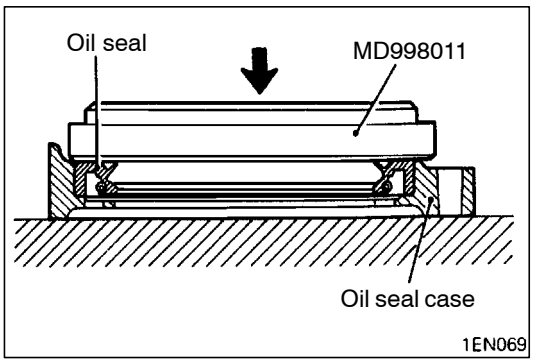
(2) Apply engine oil to the threaded portion and bearing surface of the bolt. Tighten the bolts to 34 Nm.
(3) Using the special tool, tighten the bolts to a further 30 to 34 degrees.



(4) After fitting the bearing caps, measure the end play in the crankshaft. If the measurement exceeds the specified limit, replace the crankshaft bearings.

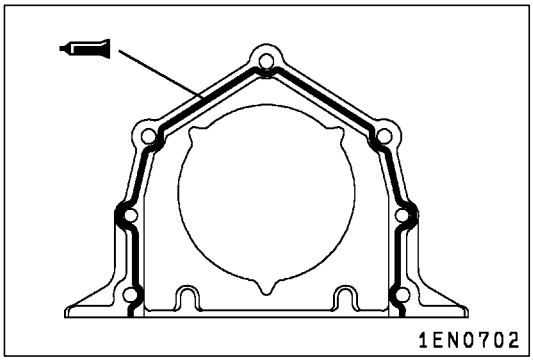
Standard value: 0.05 - 0.18 mm

Limit: 0.25 mm



▶D◀ REAR OIL SEAL INSTALLATION

Press-fit the rear oil seal using the special tool shown in the illustration.



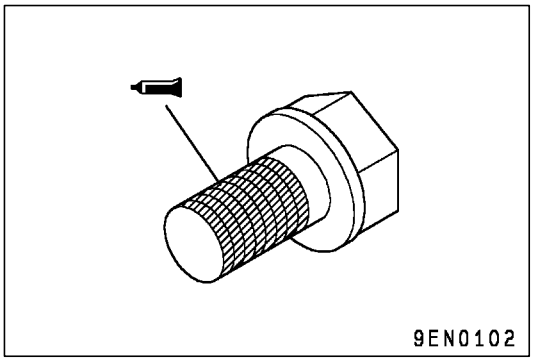
▶E◀ REAR OIL SEAL CASE INSTALLATION

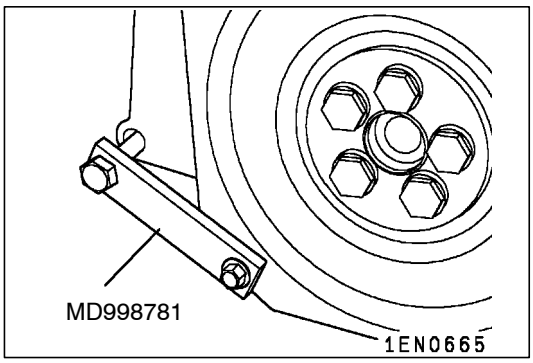
(1) Apply liquid gasket to the rear oil seal case at the illustrated position if it has no pre-formed gasket attached.

Specified sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

Caution
Squeeze the liruid gasket uniformly so that there is no break in the gasket nor is there too much gasket.

(2) Apply a suitable amount of engine to the entire periphery of the oil seal lip and install the oil seal on the cylinder block.





▶F◀ FLYWHEEL BOLT / DRIVE PLATE BOLT INSTALLATION

(1) Clean off sealant, oil and deposits from the threaded portion of the drive plate/adapter plate tightening bolts and from the threaded holes on the crankshaft.
(2) Apply engine oil to the bolt flange and to the threaded holes on the crankshaft.
(3) Apply sealant to the threaded portion of the bolt (if the bolt is reused).

Specified sealant:
3M Nut Locking Part No. 4171 or equivalent

(4) Using the special tool, secure the drive plate and tighten the bolts to the specified torque.

Service Bulletins

Click on the applicable bookmark to select the Service Bulletin.

SERVICE BULLETIN

MITSUBISHI MOTORS

QUALITY INFORMATION ANALYSIS
OVERSEAS SERVICE DEPT. MITSUBISHI MOTORS CORPORATION

SERVICE BULLETIN	**No.:** MSB-01E11-502	
	Date: 2002-02-26	**<Model>** **<M/Y>**
Subject: CORRECTION TO 4G1 ENGINE BEARING IDENTIFICATION MARKS		(EC)COLT/LANCER 95-10 (EC)SPACE STAR 95-10 (EC)PAJERO iO 95-10
Group: ENGINE	**Draft No.:** 01EN502	
CORRECTION	**INTERNATIONAL CAR ADMINISTRATION OFFICE**	T.Inoue - Manager SERVICE PUBLICATION

1. Description:

In the 4G1 engine Workshop Manuals shown below, omission of descriptions from the identification marks for the connecting rod bearing and the crankshaft bearing, has been rectified.

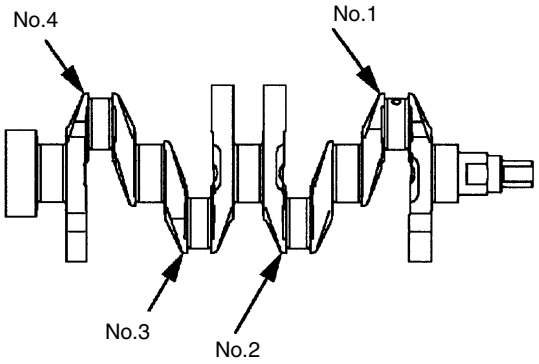
2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
ENGINE 4G1 (E-W) Workshop Manual	PWEE9520	(English)	11A-11-6, 11A-12-6
	PWES9521	(Spanish)	
	PWEF9522	(French)	
	PWEG9523	(German)	
	PWED9524	(Dutch)	
	PWEW9525	(Swedish)	

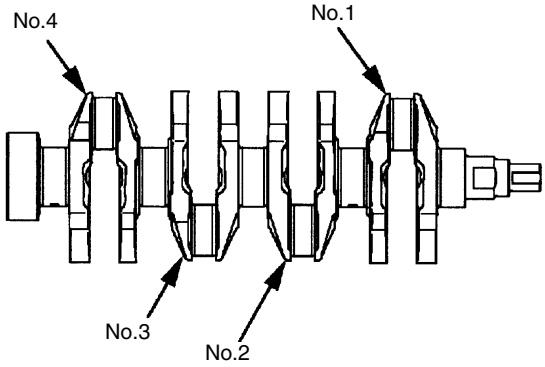
►E◄ CONNECTING ROD BEARING INSTALLATION

4G13, 4G15

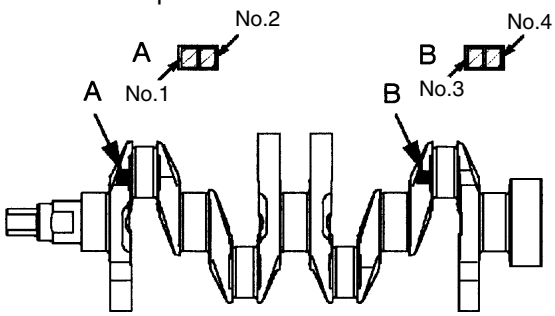
Color code positions

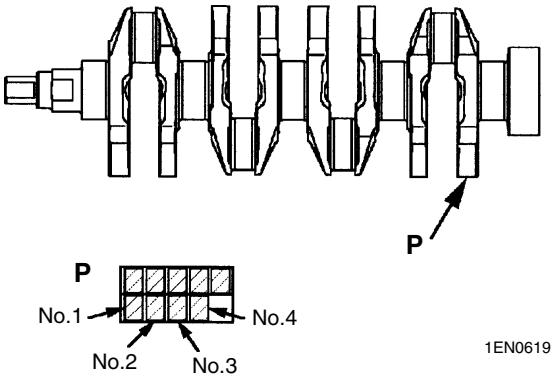


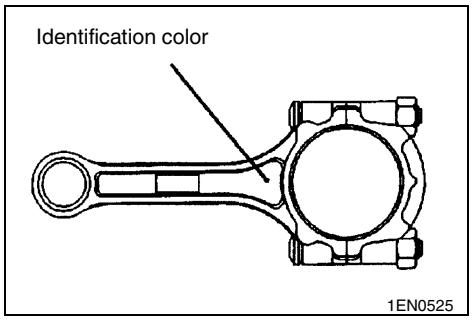
4G18



Identification mark positions



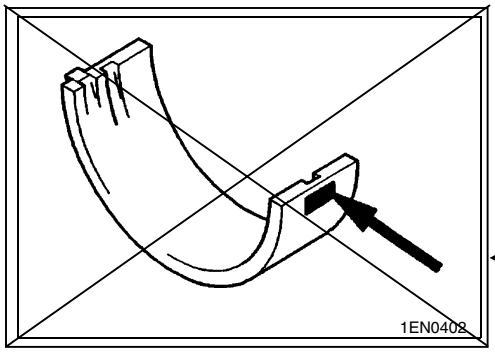




(1) Select bearings according to crankshaft and connecting rod identification marks or color codes, referring to the following table.

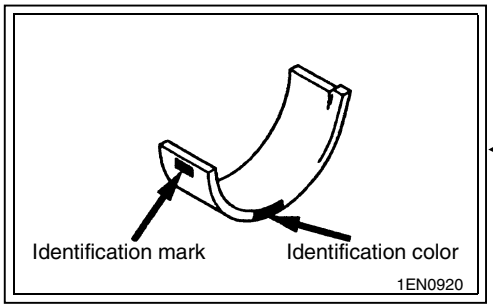
Crankshaft identification mark	Connecting rod identification color	Bearing identification mark	**or color**
I Yellow **<Incorrect>** **or** **<Correct>**	White	1	**or Yellow**
	None	1	**or Yellow**
	Yellow	2	**or None**
II None **<Incorrect>** **or** **<Correct>**	White	1	**or Yellow**
	None	2	**or None**
	Yellow	3	**or Blue**
III White **<Incorrect>** **or** **<Correct>**	White	2	**or None**
	None	3	**or Blue**
	Yellow	3	**or Blue**

<Added>



<Incorrect>

To be replaced by the one on following page.

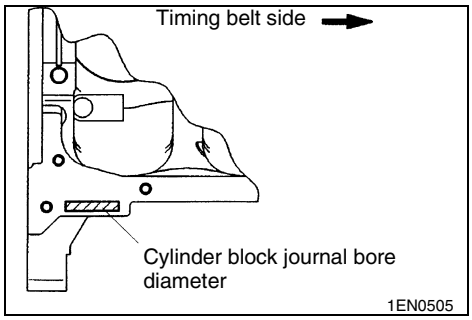


<Correct>

To replace the one on previous page.

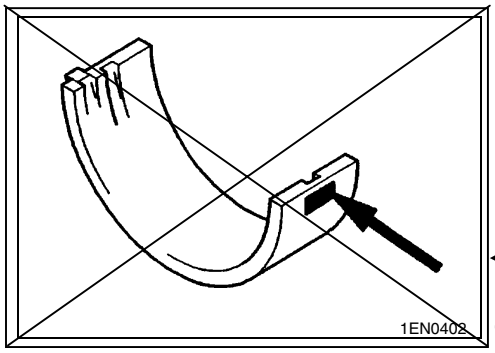
Crankshaft journal				Cylinder block bearing diameter	Bearing	
Range	Color code	Identification mark	Journal diameter mm	Identification mark	Identification mark	**or color**
1	Yellow	1	47.995 – 48.000	0	1	**or Brown**
				1	2	**or None**
				2	3	**or Blue**
2	None	2	47.985 – 49.995	0	2	**or None**
				1	3	**or Blue**
				2	4	**or Yellow**
3	White	3	47.980 – 48.985	0	3	**or Blue**
				1	4	**or Yellow**
				2	5	**or Green**

<Added>



(2) Identification marks showing the cylinder block bearing bore diameter are stamped in the position shown, with No. 1 at the front of the engine. Bearings must be selected and installed in accordance with these identification marks.

(3) Based on the identification markings verified in steps (1) and (2), select bearings from table above. See the following example:
   1. If the measured crankshaft journal diameter 48.000 mm, this corresponds to classification 1 in the above table.
   2. If the identification mark on the cylinder block bearing hole is “1”, select a bearing with an identification mark of “2”.



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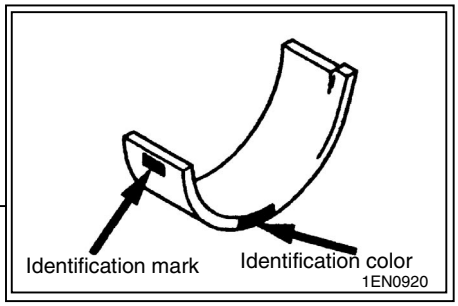
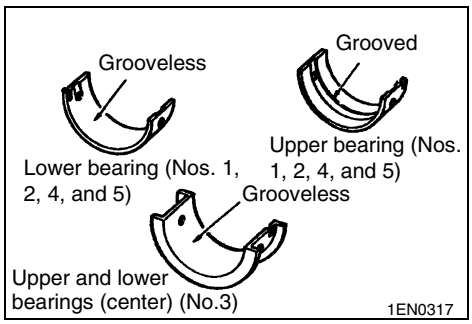




(4) Except for the center bearing, all the upper bearings are grooved. The center bearings are grooveless and have flanges. The center bearings are the same at the top and bottom.

(5) The lower bearings are all grooveless.

SERVICE BULLETIN

MITSUBISHI MOTORS

SERVICE PUBLICATION & TRAINING
INTERNATIONAL AFTER-SALES DEPARTMENT. MITSUBISHI MOTORS CORPORATION

SERVICE BULLETIN	NO. : MSB–02E11–505	
	DATE : 2002–09–20	<MODEL> <M/Y> (EC)LANCER(CK0A) 95–05 (EC)SPACE STAR(DG0A) 95–05
SUBJECT : 4G1 ENGINE CRANKSHAFT BOLT – CHANGE TO TORQUE AND TIGHTENING PROCEDURE		
GROUP : ENGINE	DRAFTNO. : 02EN510	
CORRECTION	INTERNATIONAL AFTER-SALES DEPARTMENT	T. Kobayashi – Manager SERVICE PUBLICATION & TRAINING

1. Description:

This Service Bulletin informs you of the change that has been made to the tightening torque for the 4G1 engine's M12 crankshaft bolt. The tightening procedure for the upsized M14 crankshaft bolt is also contained here in addition to the new tightening torque and procedure for the existing M12 crankshaft bolt.

2. Applicable Manuals:

Manual	Pub. No.	Page
ENGINE 4G1 (E–W) Workshop Manual	PWEE9520-F (English) PWES9521-F (Spanish) PWEF9522-F (French) PWEG9523-F (German) PWED9524-F (Dutch) PWEW9525-F (Swedish)	11A-1-4 11A-3-1, 1a, 1b, 3, 4
ENGINE Workshop Manual	PWEH9903R-E (English, Spanish, Swedish) PWEK9904R-E (French, German, Dutch)	11A-1-4 11A-3-1, 1a, 1b, 3, 4

3. Details:

M12 CRANKSHAFT BOLT

In order to prevent the crankshaft bolt from loosening and thereby improve reliability, an increased tightening torque has been established as follows:

<Tightening torque>

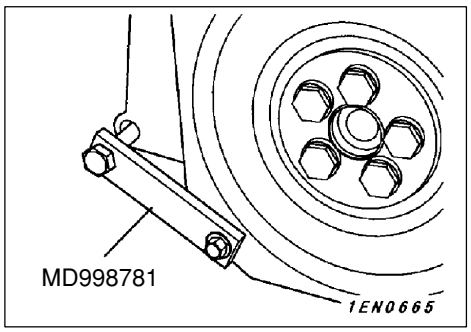
Tightening torque

Current torque	New torque	Type
125 N·m	132 N·m	3
	132 N·m + (35 to 55°) Caution: Stop tightening and never tighten the bolt any more if a torque of 206 N·m is reached during additional tightening to an angle within the specified range.	4

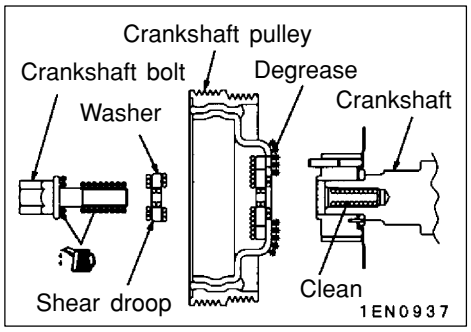
Applicable vehicle models

Vehicle model (code)	Type	Remarks
LANCER (CJ1A, CJ2A)	3	Crankshaft with casting pulley
	4	Crankshaft with steel plate pulley
LANCER (CS1A, CS2A, CS3A)	4	Crankshaft with steel plate pulley
SPACE STAR (DG1A, DG3A)	3	Crankshaft with casting pulley
	4	Crankshaft with steel plate pulley

<Tightening procedure>



1. Prevent the flywheel or drive plate from rotating using the special tool.



2. Clean the crankshaft bolt hole.
3. Clean and degrease the crankshaft pulley.

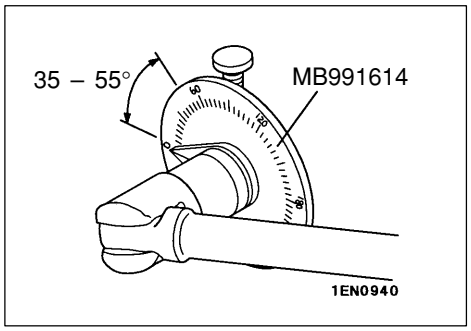
   NOTE
   Degreasing is necessary to prevent lack of frictional coefficient on the mating surfaces due to presence of oil or grease.
4. Install the crankshaft pulley.
5. Apply necessary minimum amount of engine oil to the threads and bearing surface of the crankshaft bolt flange.
6. Clean the washer.
7. Install the washer with the shear droop side toward the bolt head.
8. Tighten the crankshaft bolt in the following procedure.

   <Crankshaft with steel plate pulley>
   1. Tighten the crankshaft bolt to 132 N·m.

      Caution
      Never exceed a torque of 206 N·m during additional tightening to an angle within the specified range.

   2. Using the special tool, Angle gauge (MB991614), turn the bolt in the tightening direction to an angle within the 35 – 55° range.

   <Crankshaft with casting pulley>
   Tighten the crankshaft bolt to 132 N·m.

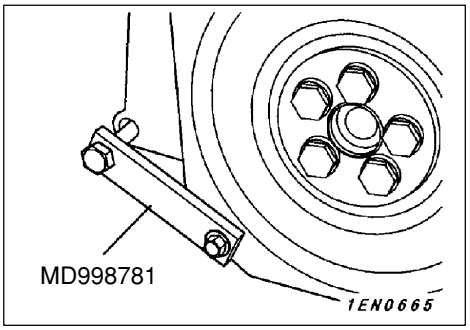


M14 CRANKSHAFT BOLT

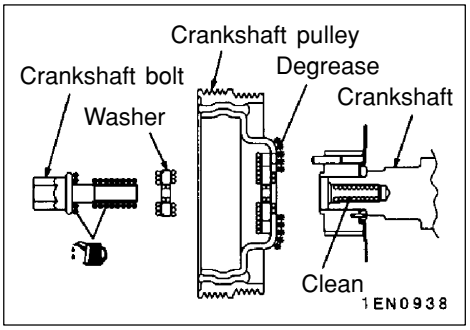
<Tightening torque>

The specified tightening torque for the crankshaft bolt is 181 N·m.

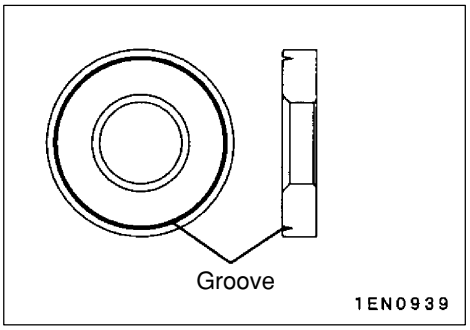
<Tightening procedure>



1. Prevent the flywheel or drive plate from rotating using the special tool.



2. Clean the crankshaft bolt hole.
3. Clean and degrease the crankshaft pulley.
   NOTE
   Degreasing is necessary to prevent lack of frictional coefficient on the mating surfaces due to presence of oil or grease.
4. Install the crankshaft pulley.
5. Apply necessary minimum amount of engine oil to the threads and bearing surface of the crankshaft bolt flange.
6. Clean the washer.



7. Install the washer with the grooved side toward the bolt head.
8. Tighten the crankshaft bolt to 181 N·m.