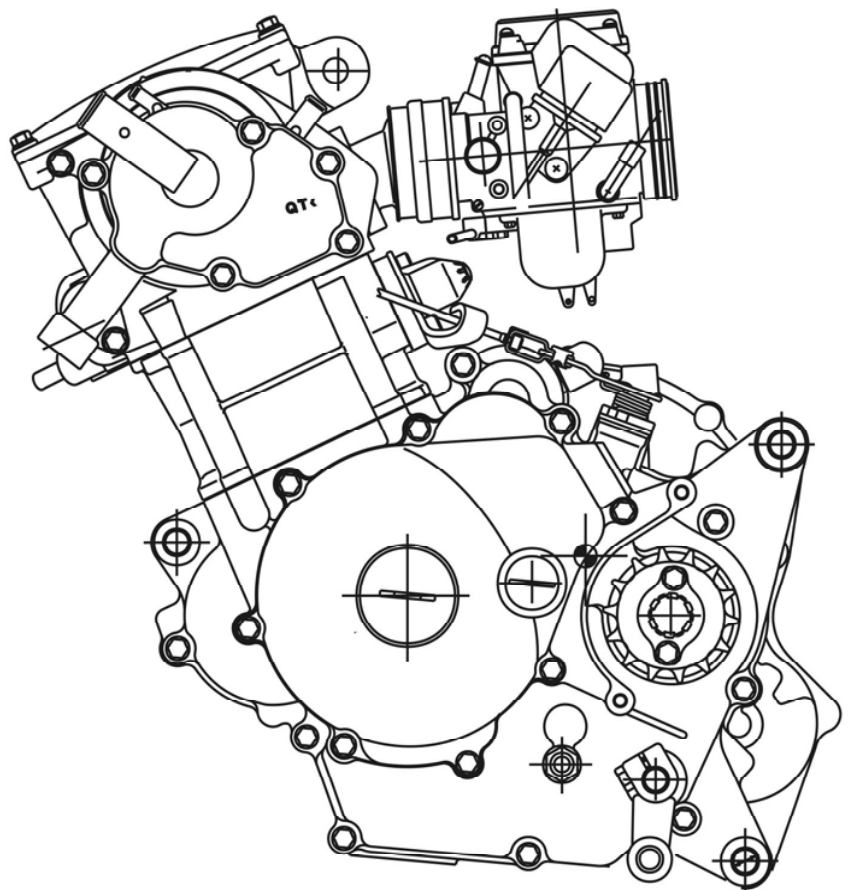


FANTIC MOTOR

CABALLERO 125 Liquid Cooled



Service manual

ENGINE SPECIFICATIONS

EAS20290

ENGINE SPECIFICATIONS

Engine

Engine type	Liquid cooled 4-stroke, SOHC
Displacement	124.7 cm ³
Cylinder arrangement	Forward-inclined single cylinder
Bore × stroke	52.0 × 58.6 mm (2.05 × 2.31 in)
Compression ratio	11.20 :1
Standard compression pressure (at sea level)	550 kPa/600 r/min (78.2 psi/600 r/min) (5.5 kgf/cm ² /600 r/min)
Minimum–maximum	480–620 kPa (68.3–88.2 psi) (4.8–6.2 kgf/cm ²)
Starting system	Electric starter

Fuel

Recommended fuel	Premium unleaded gasoline only
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Engine oil

Lubrication system	Wet sump
Type	SAE 10W-30, SAE 10W-40, SAE 15W-40, SAE 20W-40 or SAE 20W-50
Recommended engine oil grade	API service SG type or higher, JASO standard MA
Engine oil quantity	
Total amount	1.15 L (1.22 US qt) (1.01 Imp.qt)
Without oil filter element replacement	0.95 L (1.00 US qt) (0.84 Imp.qt)
With oil filter element replacement	1.00 L (1.06 US qt) (0.88 Imp.qt)

Oil filter

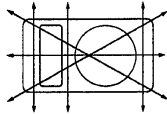
Oil filter type	Paper
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Oil pump

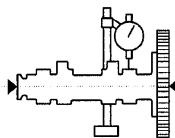
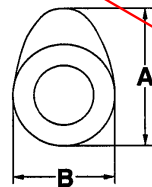
Oil pump type	Trochoid
Inner-rotor-to-outer-rotor-tip clearance	Less than 0.15 mm (0.0059 in)
Limit	0.23 mm (0.0091 in)
Outer-rotor-to-oil-pump-housing clearance	0.13–0.18 mm (0.0051–0.0071 in)
Limit	0.25 mm (0.0098 in)
Oil-pump-housing-to-inner-and-outer-rotor clearance	0.06–0.11 mm (0.0024–0.0043 in)
Limit	0.18 mm (0.0071 in)
Relief valve operating pressure	39.2–78.4 kPa (5.7–11.4 psi) (0.39–0.78 kgf/cm ²)
Pressure check location	Check bolt on cylinder head body

ENGINE SPECIFICATIONS

Thermostat	
Model/manufacturer	5YP/NIPPON THERMOSTAT
Valve opening temperature	80.5–83.5 °C (176.9–182.3 °F)
Valve full open temperature	95.0 °C (203.0 °F)
Valve lift (full open)	3.0 mm (0.12 in)
Radiator core	
Width	198.0 mm (7.80 in)
Height	128.0 mm (5.04 in)
Depth	24.0 mm (0.94 in)
Water pump	
Water pump type	Single suction centrifugal pump
Reduction ratio	19/38 (0.500)
Spark plug (s)	
Manufacturer/model	NGK/CR8E
Spark plug gap	0.7–0.8 mm (0.028–0.031 in)
Cylinder head	
Volume	9.90–10.50 cm ³ (0.60–0.64 cu.in)
Warpage limit	0.03 mm (0.0012 in)



Camshaft	
Drive system	Chain drive (left)
Camshaft lobe dimensions	
Intake A	30.225–30.325 mm (1.1900–1.1939 in)
Limit	30.125 mm (1.1860 in)
Intake B	25.127–25.227 mm (0.9893–0.9932 in)
Limit	25.027 mm (0.9853 in)
Exhaust A	30.232–30.332 mm (1.1902–1.1942 in)
Limit	30.132 mm (1.1863 in)
Exhaust B	25.065–25.165 mm (0.9868–0.9907 in)
Limit	24.965 mm (0.9829 in)
Camshaft runout limit	
0.030 mm (0.0012 in)	



Intake B	25.114 - 25.214
Limit	25.014
Exhaust A	30.261 - 30.361
Limit	30.161
Exhaust B	25.172 - 25.272
Limit	25.072

ENGINE SPECIFICATIONS

Timing chain

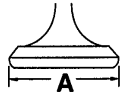
Model/number of links	DID SCR-0404SV/96
Tensioning system	Automatic

Rocker arm/rocker arm shaft

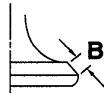
Rocker arm inside diameter	9.985–10.000 mm (0.3931–0.3937 in)
Limit	10.015 mm (0.3943 in)
Rocker arm shaft outside diameter	9.966–9.976 mm (0.3924–0.3928 in)
Limit	9.941 mm (0.3914 in)
Rocker-arm-to-rocker-arm-shaft clearance	0.009–0.034 mm (0.0004–0.0013 in)
Limit	0.074 mm (0.0029 in)

Valve, valve seat, valve guide

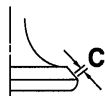
Valve clearance (cold)	
Intake	0.10–0.14 mm (0.0039–0.0055 in)
Exhaust	0.20–0.24 mm (0.0079–0.0094 in)
Valve dimensions	
Valve head diameter A (intake)	19.40–19.60 mm (0.7638–0.7717 in)
Valve head diameter A (exhaust)	16.90–17.10 mm (0.6654–0.6732 in)



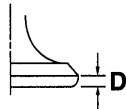
Valve face width B (intake)	1.538–2.138 mm (0.0606–0.0842 in)
Valve face width B (exhaust)	1.538–2.138 mm (0.0606–0.0842 in)



Valve seat width C (intake)	0.90–1.10 mm (0.0354–0.0433 in)
Limit	1.6 mm (0.06 in)
Valve seat width C (exhaust)	0.90–1.10 mm (0.0354–0.0433 in)



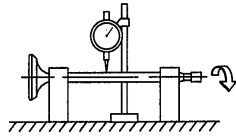
Limit	1.6 mm (0.06 in)
Valve margin thickness D (intake)	0.50–0.90 mm (0.0197–0.0354 in)
Valve margin thickness D (exhaust)	0.50–0.90 mm (0.0197–0.0354 in)



Valve stem diameter (intake)	4.475–4.490 mm (0.1762–0.1768 in)
Limit	4.445 mm (0.1750 in)
Valve stem diameter (exhaust)	4.460–4.475 mm (0.1756–0.1762 in)
Limit	4.430 mm (0.1744 in)
Valve guide inside diameter (intake)	4.500–4.512 mm (0.1772–0.1776 in)
Limit	4.550 mm (0.1791 in)
Valve guide inside diameter (exhaust)	4.500–4.512 mm (0.1772–0.1776 in)

ENGINE SPECIFICATIONS

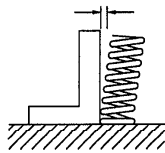
Limit	4.550 mm (0.1791 in)
Valve-stem-to-valve-guide clearance (intake)	0.010–0.037 mm (0.0004–0.0015 in)
Limit	0.080 mm (0.0032 in)
Valve-stem-to-valve-guide clearance (exhaust)	0.025–0.052 mm (0.0010–0.0020 in)
Limit	0.100 mm (0.0039 in)
Valve stem runout	0.010 mm (0.0004 in)



Cylinder head valve seat width (intake)	0.90–1.10 mm (0.0354–0.0433 in)
Limit	1.6 mm (0.06 in)
Cylinder head valve seat width (exhaust)	0.90–1.10 mm (0.0354–0.0433 in)
Limit	1.6 mm (0.06 in)

Valve spring

Free length (intake)	41.71 mm (1.64 in)
Limit	39.62 mm (1.56 in)
Free length (exhaust)	41.71 mm (1.64 in)
Limit	39.62 mm (1.56 in)
Installed length (intake)	35.30 mm (1.39 in)
Installed length (exhaust)	35.30 mm (1.39 in)
Spring rate K1 (intake)	23.54 N/mm (134.41 lb/in) (2.40 kgf/mm)
Spring rate K2 (intake)	36.58 N/mm (208.87 lb/in) (3.73 kgf/mm)
Spring rate K1 (exhaust)	23.54 N/mm (134.41 lb/in) (2.40 kgf/mm)
Spring rate K2 (exhaust)	36.58 N/mm (208.87 lb/in) (3.73 kgf/mm)
Installed compression spring force (intake)	140–162 N (31.47–36.42 lbf) (14.28–16.52 kgf)
Installed compression spring force (exhaust)	140–162 N (31.47–36.42 lbf) (14.28–16.52 kgf)
Spring tilt (intake)	2.5°/1.8 mm
Spring tilt (exhaust)	2.5°/1.8 mm



Winding direction (intake)	Clockwise
Winding direction (exhaust)	Clockwise

Cylinder

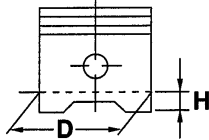
Bore	52.000–52.010 mm (2.0472–2.0476 in)
Wear limit	52.110 mm (2.0516 in)
Taper limit	0.050 mm (0.0020 in)
Out of round limit	0.005 mm (0.0002 in)

Piston

Piston-to-cylinder clearance	0.015–0.048 mm (0.0006–0.0019 in)
Limit	0.15 mm (0.0059 in)
Diameter D	51.962–51.985 mm (2.0457–2.0466 in)

ENGINE SPECIFICATIONS

Height H 5.0 mm (0.20 in)

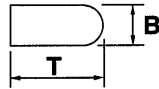


Offset	0.50 mm (0.0197 in)
Offset direction	Intake side
Piston pin bore inside diameter	14.002–14.013 mm (0.5513–0.5517 in)
Limit	14.043 mm (0.5529 in)
Piston pin outside diameter	13.995–14.000 mm (0.5510–0.5512 in)
Limit	13.975 mm (0.5502 in)
Piston-pin-to-piston-pin-bore clearance	0.002–0.018 mm (0.0001–0.0007 in)
Limit	0.068 mm (0.0027 in)

Piston ring

Top ring

Ring type	Barrel
Dimensions (B × T)	0.80 × 1.90 mm (0.03 × 0.07 in)



End gap (installed)	0.10–0.25 mm (0.0039–0.0098 in)
Limit	0.50 mm (0.0197 in)
Ring side clearance	0.030–0.065 mm (0.0012–0.0026 in)
Limit	0.100 mm (0.0039 in)

2nd ring

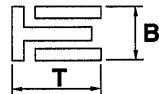
Ring type	Taper
Dimensions (B × T)	0.80 × 2.10 mm (0.03 × 0.08 in)



End gap (installed)	0.10–0.25 mm (0.0039–0.0098 in)
Limit	0.60 mm (0.0236 in)
Ring side clearance	0.020–0.055 mm (0.0008–0.0022 in)
Limit	0.100 mm (0.0039 in)

Oil ring

Dimensions (B × T)	1.50 × 1.95 mm (0.06 × 0.08 in)
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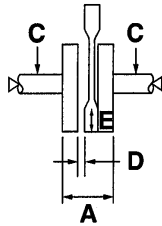
End gap (installed)	0.20–0.70 mm (0.0079–0.0276 in)
Ring side clearance	0.040–0.160 mm (0.0016–0.0063 in)

Crankshaft

Width A	47.95–48.00 mm (1.888–1.890 in)
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ENGINE SPECIFICATIONS

Runout limit C	0.030 mm (0.0012 in)
Big end side clearance D	0.110–0.410 mm (0.0043–0.0161 in)
Big end radial clearance E	0.004–0.014 mm (0.0002–0.0006 in)



Balancer

Balancer drive method	Gear
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Clutch

Clutch type	Wet, multiple-disc
Clutch release method	Inner push, cam push
Clutch lever free play	10.0–15.0 mm (0.39–0.59 in)
Friction plate 1 thickness	2.90–3.10 mm (0.114–0.122 in)
Wear limit	2.80 mm (0.1102 in)
Plate quantity	1 pc
Friction plate 3 thickness	2.90–3.10 mm (0.114–0.122 in)
Wear limit	2.80 mm (0.1102 in)
Plate quantity	3 pcs
Friction plate 2 thickness	2.90–3.10 mm (0.114–0.122 in)
Wear limit	2.80 mm (0.1102 in)
Plate quantity	1 pc
Clutch plate thickness	1.45–1.75 mm (0.057–0.069 in)
Plate quantity	4 pcs
Warping limit	0.20 mm (0.0079 in)
Clutch spring free length	38.71 mm (1.52 in)
Minimum length	36.77 mm (1.45 in)
Spring quantity	4 pcs
Push rod bending limit	0.500 mm (0.0197 in)

Transmission

Transmission type	Constant mesh 6-speed
Primary reduction system	Helical gear
Primary reduction ratio	73/24 (3.042)
Secondary reduction system	Chain drive
Secondary reduction ratio	48/14 (3.429)
Operation	Left foot operation
Gear ratio	
1st	34/12 (2.833)
2nd	30/16 (1.875)
3rd	30/22 (1.364)
4th	24/21 (1.143)
5th	22/23 (0.957)
6th	21/25 (0.840)
Main axle runout limit	0.08 mm (0.0032 in)
Drive axle runout limit	0.08 mm (0.0032 in)

ENGINE SPECIFICATIONS

Shifting mechanism

Shift mechanism type	Shift drum and guide bar
Shift fork thickness	5.76–5.89 mm (0.227–0.232 in) × 1
Shift fork thickness	4.76–4.89 mm (0.187–0.193 in) × 2

Decompression device

Device type	Auto decomp
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ELECTRICAL SPECIFICATIONS

EAS20310

ELECTRICAL SPECIFICATIONS

Voltage

System voltage 12 V

Ignition system

Ignition system TCI (digital)

Ignition timing (B.T.D.C.) 5.0°/1400 r/min

Ignition coil

Model/manufacture 2JN/YAMAHA

Primary coil resistance 1.92 - 2.88 Ω at 20°

Secondary coil resistance 6.32 - 9.48 Ω at 20°

AC magneto

Model/manufacture F39S/YAMAHA

Standard output 14.0 V, 20.8 A 5000 r/min

Standard output 14.0 V, 235 W 5000 r/min

Stator coil resistance 0.32–0.48 Ω at 20 °C (68 °F)

Rectifier/regulator

Regulator type Semi conductor-short circuit

Model/manufacture SH640EA/SHINDENGEN

Regulated voltage (DC) 14.1–14.9 V

Rectifier capacity (DC) 25.0 A

Withstand voltage 200.0 V

ELECTRICAL SPECIFICATIONS

Electric starting system

System type

Constant mesh

Starter motor

Model/manufacture	3C1/YAMAHA
Power output	0.20 kW
Armature coil resistance	0.0315–0.0385 Ω
Brush overall length	7.0 mm (0.28 in)
Limit	3.50 mm (0.14 in)
Brush spring force	3.92–5.88 N (14.11–21.17 oz) (400–600 gf)
Commutator diameter	17.6 mm (0.69 in)
Limit	16.6 mm (0.65 in)
Mica undercut (depth)	1.35 mm (0.05 in)

TIGHTENING TORQUES

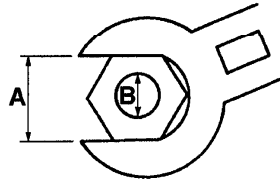
EAS20320

TIGHTENING TORQUES

EAS20330

GENERAL TIGHTENING TORQUE SPECIFICATIONS

This chart specifies tightening torques for standard fasteners with a standard ISO thread pitch. Tightening torque specifications for special components or assemblies are provided for each chapter of this manual. To avoid warpage, tighten multi-fastener assemblies in a crisscross pattern and progressive stages until the specified tightening torque is reached. Unless otherwise specified, tightening torque specifications require clean, dry threads. Components should be at room temperature.







- A. Distance between flats
- B. Outside thread diameter

A (nut)	B (bolt)	General tightening torques		
		Nm	m·kg	ft·lb
10 mm	6 mm	6	0.6	4.3
12 mm	8 mm	15	1.5	11
14 mm	10 mm	30	3.0	22
17 mm	12 mm	55	5.5	40
19 mm	14 mm	85	8.5	61
22 mm	16 mm	130	13.0	94






TIGHTENING TORQUES

EAS20340

ENGINE TIGHTENING TORQUES

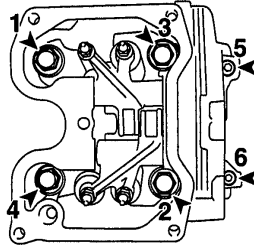
Item	Thread size	Q'ty	Tightening torque	Remarks
Cylinder head bolt	M8	4	22 Nm (2.2 m·kg, 16 ft·lb)	
Cylinder head bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Spark plug	M10	1	13 Nm (1.3 m·kg, 9.4 ft·lb)	
Cylinder head cover bolt	M6	5	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Oil check bolt	M6	1	7 Nm (0.7 m·kg, 5.1 ft·lb)	
Balancer driven gear nut	M10	1	50 Nm (5.0 m·kg, 36 ft·lb)	
Valve adjusting screw locknut	M5	4	7 Nm (0.7 m·kg, 5.1 ft·lb)	
Camshaft sprocket bolt	M8	1	30 Nm (3.0 m·kg, 22 ft·lb)	
Camshaft retainer bolt	M6	2	7 Nm (0.7 m·kg, 5.1 ft·lb)	
Timing chain guide (intake side) bolt	M6	1	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Timing chain tensioner bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	Yamaha bond No.1215 (Three Bond No.1215®)
Water pump assembly bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Water pump assembly bolt	M6	1	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Water pump housing cover bolt	M6	4	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Impeller shaft retainer bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Thermostat cover bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Oil pump assembly screw	M5	2	4 Nm (0.4 m·kg, 2.9 ft·lb)	
Engine oil drain plug	M35	1	32 Nm (3.2 m·kg, 23 ft·lb)	
Oil filter element cover bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Oil filter element cover bolt	M6	1	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Oil baffle plate bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Intake manifold bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	

TIGHTENING TORQUES

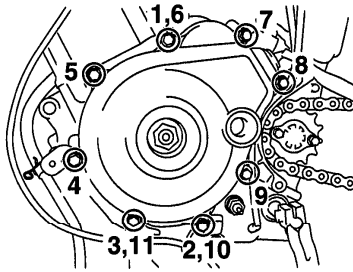
Item	Thread size	Q'ty	Tightening torque	Remarks
Crankcase bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Crankcase bolt	M6	6	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Crankcase bolt	M6	4	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Generator cover bolt	M6	7	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Clutch cover bolt	M6	4	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Clutch cover bolt	M6	6	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Drive sprocket cover bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Starter clutch bolt	M6	3	14 Nm (1.4 m·kg, 10 ft·lb)	
Primary drive gear nut	M12	1	60 Nm (6.0 m·kg, 43 ft·lb)	
Clutch spring bolt	M6	4	12 Nm (1.2 m·kg, 8.7 ft·lb)	
Short clutch push rod locknut	M6	1	8 Nm (0.8 m·kg, 5.8 ft·lb)	
Clutch boss nut	M14	1	70 Nm (7.0 m·kg, 50 ft·lb)	
Drive sprocket retainer bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Crankcase bearing retainer bolt	M6	2	7 Nm (0.7 m·kg, 5.1 ft·lb)	
Shift drum segment screw	M6	1	12 Nm (1.2 m·kg, 8.7 ft·lb)	
Stopper lever bolt	M6	1	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Stator coil bolt	M6	3	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Crankshaft position sensor bolt	M6	2	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Generator rotor nut	M12	1	70 Nm (7.0 m·kg, 50 ft·lb)	
Neutral switch	M10	1	20 Nm (2.0 m·kg, 14 ft·lb)	
Starter motor bolt	M6	1	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Starter motor bolt	M6	1	10 Nm (1.0 m·kg, 7.2 ft·lb)	
Coolant temperature sensor	M12	1	18 Nm (1.8 m·kg, 13 ft·lb)	

TIGHTENING TORQUES

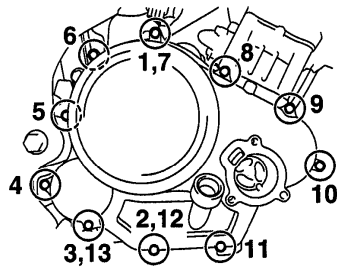
Cylinder head tightening sequence:



Generator cover tightening sequence:

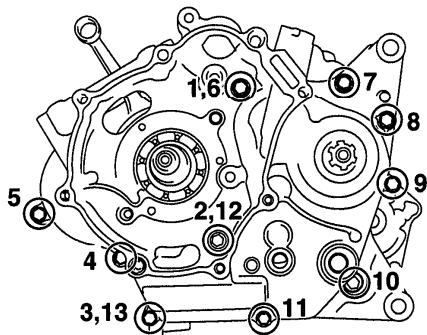


Clutch cover tightening sequence:

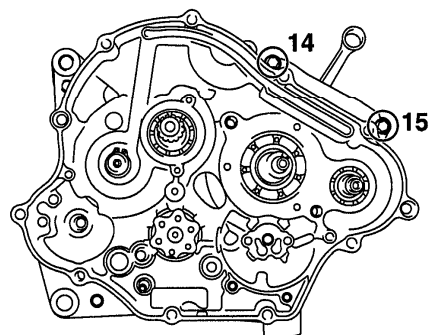


Crankcase tightening sequence:

A



B



A. Left crankcase

B. Right crankcase


































LUBRICATION POINTS AND LUBRICANT TYPES

EAS20360








LUBRICATION POINTS AND LUBRICANT TYPES

EAS20370

ENGINE

Lubrication point	Lubricant
Oil seal lips	
Bearings	
Cylinder head bolt seats, cylinder head bolt threads and washers	
Water pump assembly O-rings	
Cylinder head cover gasket	
Connecting rod big end	
Piston pin	
Cylinder inner surface, piston, ring grooves, and piston rings	
Balancer O-rings	
Camshaft lobes and rocker arm rollers	
Decompression cam	
Valve stems and valve stem seals	
Valve stem ends	
Rocker arm shafts	
Rocker arm inner surface	
Decompression arm pivoting point	
Engine oil drain plug O-ring	
Oil pump driven gear shaft	
Oil filter cover O-ring	
Intake manifold O-ring	
Fuel injector O-ring	
Timing mark accessing screw O-ring	
Crankshaft end accessing screw O-ring	
Engine oil filler cap O-ring	
Starter clutch gear thrust surfaces and washer	
Starter clutch rollers and starter clutch gear boss	
Starter motor O-ring	
Starter clutch idle gear shaft and starter clutch idle gear inner surface	
Starter clutch idle gear thrust surfaces and washer	
Clutch push lever	
Primary driven gear inner surface	
Long clutch push rod	
Short clutch push rod and ball	

LUBRICATION POINTS AND LUBRICANT TYPES

Lubrication point	Lubricant
Clutch push rod ball	
Clutch boss nut seat and clutch boss nut thread	
Main axle and pinion gears	
Drive axle and wheel gears	
Shift drum assembly	
Shift forks and shift fork guide bar	
Shift shaft	
Crankshaft position sensor/stator assembly lead grommet	Yamaha bond No.1215 (Three Bond No.1215®)
Crankcase mating surfaces	Yamaha bond No.1215 (Three Bond No.1215®)
Timing chain tensioner bolt threads	Yamaha bond No.1215 (Three Bond No.1215®)

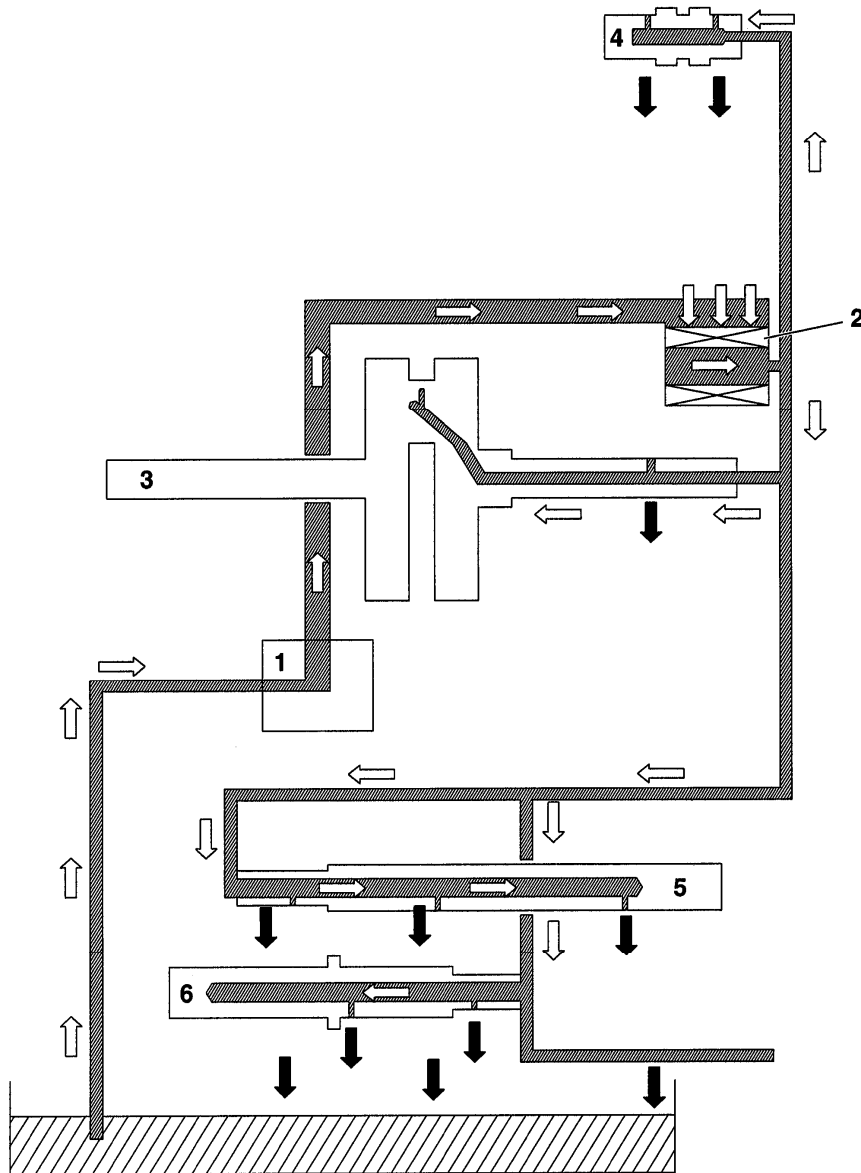
LUBRICATION SYSTEM CHART AND DIAGRAMS

EAS20390

LUBRICATION SYSTEM CHART AND DIAGRAMS

EAS20400

ENGINE OIL LUBRICATION CHART



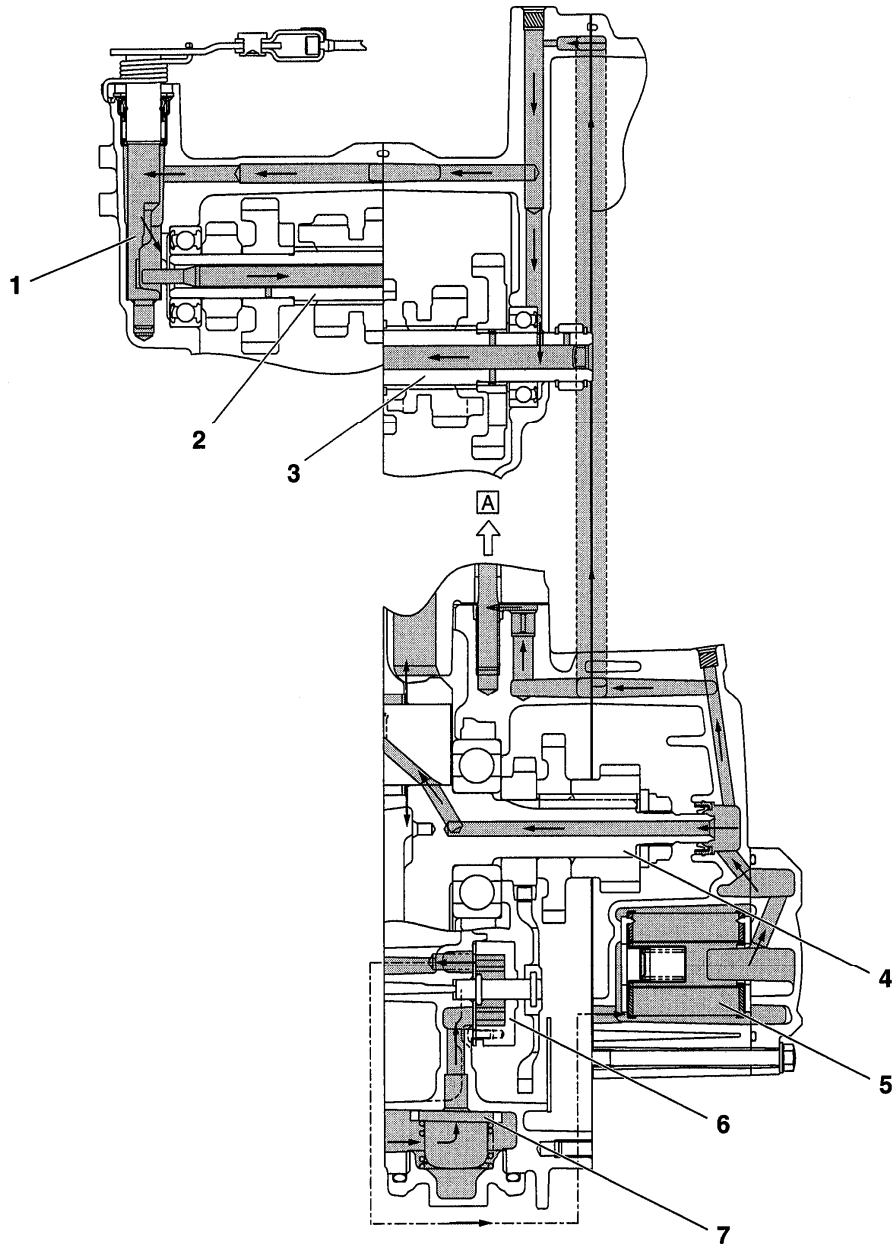
LUBRICATION SYSTEM CHART AND DIAGRAMS

1. Oil pump
2. Oil filter element
3. Crankshaft
4. Camshaft
5. Main axle
6. Drive axle

LUBRICATION SYSTEM CHART AND DIAGRAMS

EAS20410

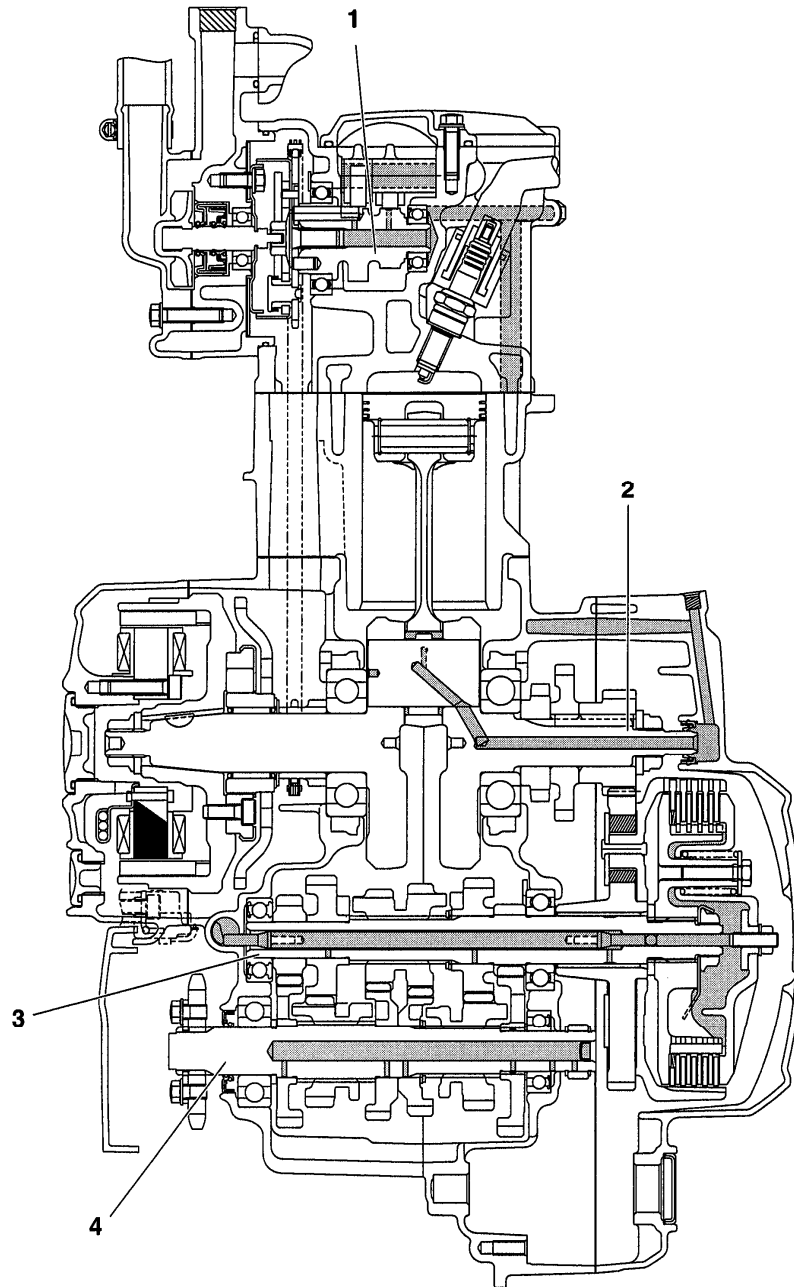
LUBRICATION DIAGRAMS



LUBRICATION SYSTEM CHART AND DIAGRAMS

1. Clutch push lever
2. Main axle
3. Drive axle
4. Crankshaft
5. Oil filter
6. Oil pump assembly
7. Oil strainer
- A. To cylinder head

LUBRICATION SYSTEM CHART AND DIAGRAMS



LUBRICATION SYSTEM CHART AND DIAGRAMS

1. Camshaft
2. Crankshaft
3. Main axle
4. Drive axle

PERIODIC MAINTENANCE

EAS20450

PERIODIC MAINTENANCE

EAS20460

INTRODUCTION

This chapter includes all information necessary to perform recommended checks and adjustments. If followed, these preventive maintenance procedures will ensure more reliable vehicle operation, a longer service life and reduce the need for costly overhaul work. This information applies to vehicles already in service as well as to new vehicles that are being prepared for sale. All service technicians should be familiar with this entire chapter.

EAU17715

PERIODIC MAINTENANCE AND LUBRICATION CHART

NOTE:

- The annual checks must be performed every year, except if a kilometer-based maintenance, or for the UK, a mileage-based maintenance, is performed instead.
- From 30000 km (17500 mi), repeat the maintenance intervals starting from 6000 km (3500 mi).
- Items marked with an asterisk should be performed by a Yamaha dealer as they require special tools, data and technical skills.

NO.	ITEM	CHECK OR MAINTENANCE JOB	ODOMETER READING					ANNUAL CHECK
			1000 km (600 mi)	6000 km (3500 mi)	12000 km (7000 mi)	18000 km (10500 mi)	24000 km (14000 mi)	
1	* Fuel line	• Check fuel hoses for cracks or damage.		√	√	√	√	√
2	Spark plug	• Check condition. • Clean and regap.		√		√		
		• Replace.			√		√	
3	* Valves	• Check valve clearance. • Adjust.		√	√	√	√	

6	Clutch	• Check operation. • Adjust.	√	√	√	√	√	
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PERIODIC MAINTENANCE

NO.	ITEM	CHECK OR MAINTENANCE JOB	ODOMETER READING					ANNUAL CHECK
			1000 km (600 mi)	6000 km (3500 mi)	12000 km (7000 mi)	18000 km (10500 mi)	24000 km (14000 mi)	
23	Engine oil	• Change.	√	2000 km (1200 mi) after the initial 1000 km (600 mi) and every 3000 km (1800 mi) thereafter				
		• Check oil level and vehicle for oil leakage.	Every 3000 km (1800 mi)					√
24	Engine oil filter element	• Replace.	√	√	√	√	√	

EAS20471

ENGINE

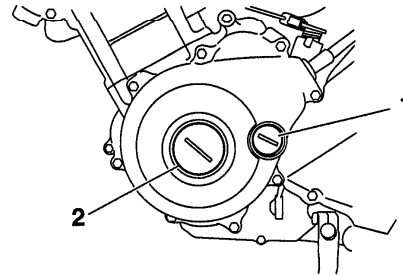
EAS20520

ADJUSTING THE VALVE CLEARANCE

The following procedure applies to all of the valves.

NOTE:

- Valve clearance adjustment should be made on a cold engine, at room temperature.
- When the valve clearance is to be measured or adjusted, the piston must be at top dead center (TDC) on the compression stroke.



6. Measure:
- Valve clearance
- Out of specification → Adjust.



Valve clearance (cold)

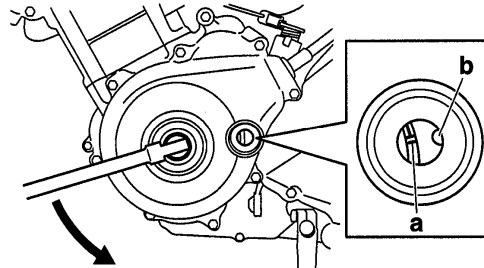
Intake

0.10–0.14 mm (0.0039–0.0055 in)

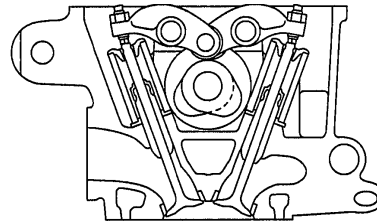
Exhaust

0.20–0.24 mm (0.0079–0.0094 in)

- a. Turn the crankshaft counterclockwise.
- b. Align the TDC mark “a” on the generator rotor with the stationary pointer “b” on the generator cover.



- c. Check that the cam lobes are positioned as shown in the illustration.



- d. Measure the valve clearance with a thickness gauge “1”.
- Out of specification → Adjust.

- Cylinder head cover gasket
- Refer to “CYLINDER HEAD” on page 5-7.

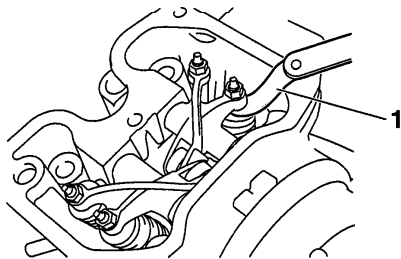
NOTE:

When removing the cylinder head cover, lift it out from between the frame tubes.

5. Remove:

- Timing mark accessing screw “1”
- Crankshaft end accessing screw “2”

ENGINE

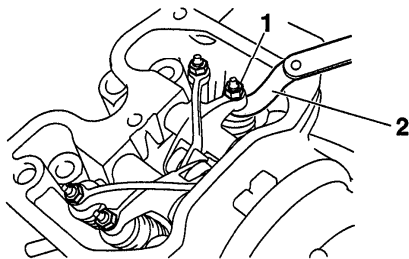


7. Adjust:

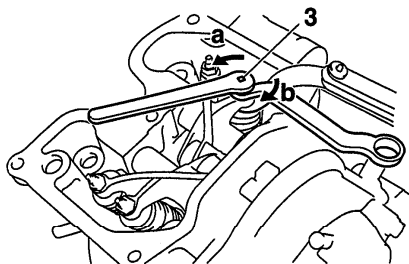
- Valve clearance

a. Loosen the locknut "1".

b. Insert a thickness gauge "2" between the end of the adjusting screw and the valve tip.



c. Turn the adjusting screw "3" in direction "a" or "b" until the specified valve clearance is obtained.



Direction "a"
Valve clearance is increased.
Direction "b"
Valve clearance is decreased.



Tappet adjusting tool
90890-01311
Six piece tappet set
YM-A5970

- Hold the adjusting screw to prevent it from moving and tighten the locknut to specification.



Valve adjusting screw locknut
7 Nm (0.7 m·kg, 5.1 ft·lb)

- d. Measure the valve clearance again.
- e. If the valve clearance is still out of specification, repeat all of the valve clearance adjustment steps until the specified clearance is obtained.

8. Install:

- Crankshaft end accessing screw
(along with the O-ring **New**)
- Timing mark accessing screw
(along with the O-ring **New**)

9. Install:

- Cylinder head cover gasket **New**
- Cylinder head cover
- Spark plug

12. Install:

- Ignition coil "4"



Ignition coil bolt
7 Nm (0.7 m·kg, 5.1 ft·lb)

- Spark plug



Spark plug
13 Nm (1.3 m·kg, 9.4 ft·lb)

4. Check:
- Spark plug type
Incorrect → Change.



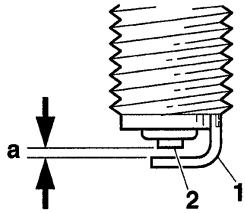
Manufacturer/model
NGK/CR8E

5. Check:
- Electrode "1"
Damage/wear → Replace the spark plug.
 - Insulator "2"
Abnormal color → Replace the spark plug.
Normal color is medium-to-light tan.
6. Clean:
- Spark plug
(with a spark plug cleaner or wire brush)
7. Measure:
- Spark plug gap "a"
(with a wire thickness gauge)
Out of specification → Regap.

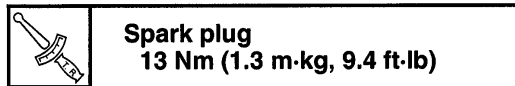


Spark plug gap
0.7–0.8 mm (0.028–0.031 in)

ENGINE



8. Install:
- Spark plug



NOTE:

Before installing the spark plug, clean the spark plug and gasket surface.

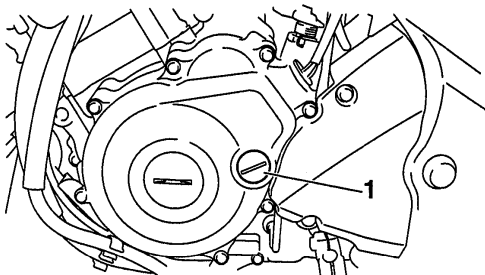
9. Connect:
- Spark plug cap

CHECKING THE IGNITION TIMING

NOTE:

Prior to checking the ignition timing, check the wiring connections of the entire ignition system. Make sure all connections are tight and free of corrosion.

2. Remove:
- Timing mark accessing screw "1"

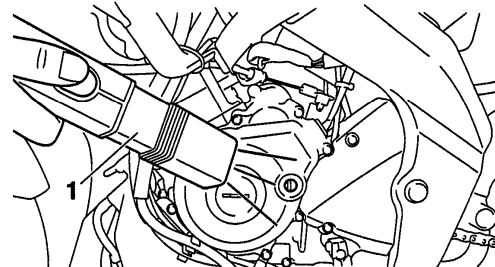


4. Connect:
- Timing light "1"

- Digital tachometer



Timing light
90890-03141
Inductive clamp timing light
YU-03141



5. Check:
- Ignition timing

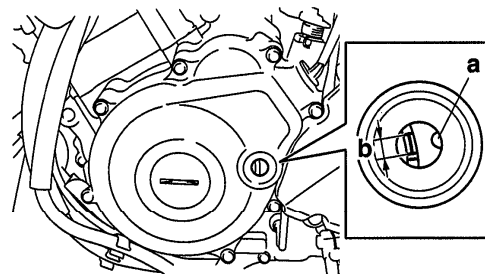
- a. Start the engine, warm it up for several minutes, and then let it run at the specified engine idling speed.



Engine idling speed

1250-1550 r/min

- b. Check that stationary pointer "a" in the generator cover is within the firing range "b" on the generator rotor.
Incorrect firing range → Check the ignition system.



NOTE:

The ignition timing is not adjustable.

6. Remove:
- Digital tachometer
 - Timing light

8. Install:
- Timing mark accessing screw (along with the O-ring **New**)

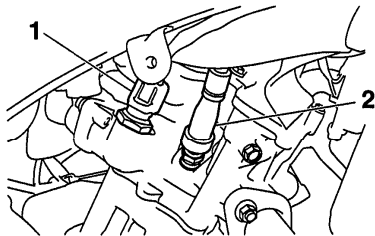
MEASURING THE COMPRESSION PRESSURE

NOTE:

Insufficient compression pressure will result in a loss of performance.

1. Measure:
 - Valve clearance
Out of specification → Adjust.
Refer to “ADJUSTING THE VALVE CLEAR-
ANCE” on page 3-3.
2. Start the engine, warm it up for several minutes, and then turn it off.

5. Disconnect:
 - Coolant temperature sensor coupler "1"
 - Spark plug cap "2"



- 6. Remove:
 - Spark plug

ECA5D71007

CAUTION:

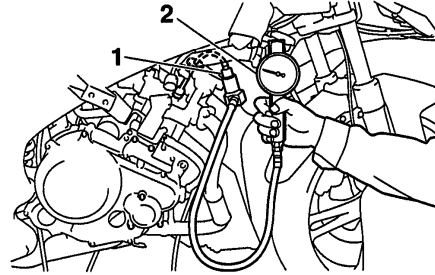
Before removing the spark plug, use compressed air to blow away any dirt accumulated in the spark plug well to prevent it from falling into the cylinder.

7. Install:
- Extension "1"

- Compression gauge “2”



Extension
90890-04082
Compression gauge
90890-03081
Engine compression tester
YU-33223



8. Measure:
- Compression pressure
Out of specification → Refer to steps (c) and (d).



**Standard compression pressure
(at sea level)**
550 kPa/600 r/min (78.2 psi/600
r/min) (5.5 kgf/cm²/600 r/min)
Minimum–maximum
480–620 kPa (68.3–88.2 psi)
(4.8–6.2 kgf/cm²)

- a. Set the main switch to “ON”.
 - b. With the throttle wide open, crank the engine until the reading on the compression gauge stabilizes.
 - c. If the compression pressure is above the maximum specification, check the cylinder head, valve surfaces and piston crown for carbon deposits.
Carbon deposits → Eliminate.
 - d. If the compression pressure is below the minimum specification, pour a teaspoonful of engine oil into the spark plug bore and measure again.
- Refer to the following table.

ENGINE

Compression pressure (with oil applied into the cylinder)	
Reading	Diagnosis
Higher than without oil	Piston ring(s) wear or damage → Repair.
Same as without oil	Piston, valves, cylinder head gasket or piston possibly defective → Repair.

9. Remove:

- Extension
- Compression gauge

10. Install:

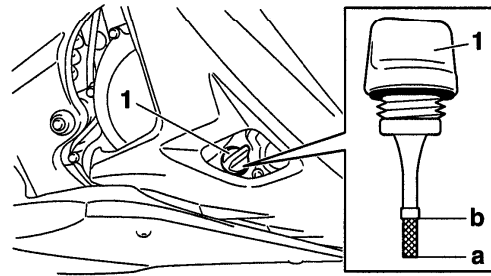
- Spark plug



Spark plug
13 Nm (1.3 m·kg, 9.4 ft·lb)

11. Connect:

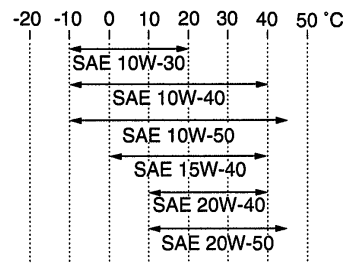
- Spark plug cap
- Coolant temperature sensor coupler



Type

SAE 10W-30, SAE 10W-40, SAE 15W-40, SAE 20W-40 or SAE 20W-50

Recommended engine oil grade
API service SG type or higher,
JASO standard MA



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CAUTION:

- Engine oil also lubricates the clutch and the wrong oil types or additives could cause clutch slippage. Therefore, do not add any chemical additives or use engine oils with a grade of "CD" "c" or higher and do not use oils labeled "ENERGY CONSERVING II" "d".
- Do not allow foreign materials to enter the crankcase.

CHECKING THE ENGINE OIL LEVEL

1. Stand the vehicle on a level surface.

NOTE:

- Place the vehicle on a suitable stand.
- Make sure the vehicle is upright.

2. Start the engine, warm it up for several minutes, and then turn it off.

3. Check:

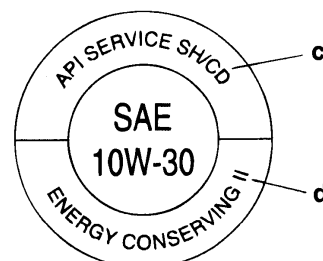
- Engine oil level

The engine oil level should be between the minimum level mark "a" and maximum level mark "b".

Below the minimum level mark → Add the recommended engine oil to the proper level.

NOTE:

- Before checking the engine oil level, wait a few minutes until the oil has settled.
- Do not screw the engine oil filler cap (dipstick) "1" in when checking the oil level.



4. Start the engine, warm it up for several minutes, and then turn it off.
5. Check the engine oil level again.

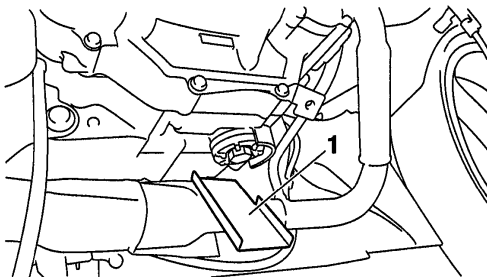
NOTE:

Before checking the engine oil level, wait a few minutes until the oil has settled.

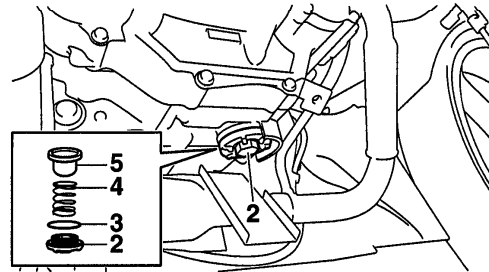
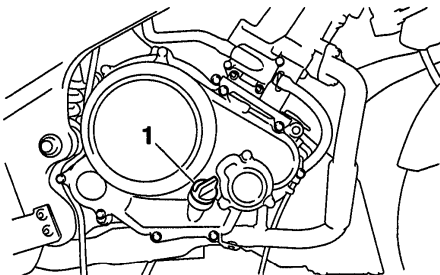
EAS20610

CHANGING THE ENGINE OIL

2. Start the engine, warm it up for several minutes, and then turn it off.
3. Place a container under the engine oil drain bolt.
4. Install:
 - Engine oil drain attachment "1" (Located under the rider seat with the owner's tool kit)

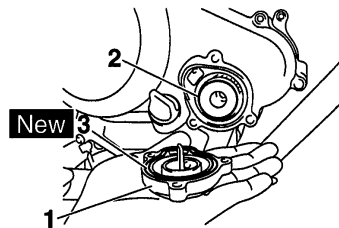


5. Remove:
 - Engine oil filler cap (dipstick) "1"
 - Engine oil drain plug "2"
 - O-ring "3"
 - Spring "4"
 - Engine oil strainer "5"



6. Drain:
 - Engine oil (completely from the crankcase)
7. If the oil filter element is also to be replaced, perform the following procedure.

- a. Remove the oil filter element cover "1" and oil filter element "2".
- b. Install the new O-ring "3".



- c. Install the new oil filter element and the oil filter element cover.



Oil filter element cover bolt
10 Nm (1.0 m·kg, 7.2 ft·lb)

8. Check:
 - Engine oil strainer
Dirt → Clean.
9. Install:
 - Engine oil strainer
 - Spring
 - O-ring **New**
 - Engine oil drain plug



Engine oil drain plug
32 Nm (3.2 m·kg, 23 ft·lb)

10. Fill:
 - Crankcase
(with the specified amount of the recommended engine oil)



Engine oil quantity

Total amount

1.15 L (1.22 US qt) (1.01 Imp.qt)

Without oil filter element replacement

0.95 L (1.00 US qt) (0.84 Imp.qt)

With oil filter element replacement

1.00 L (1.06 US qt) (0.88 Imp.qt)

ADJUSTING THE CLUTCH CABLE FREE PLAY

11. Install:

- Engine oil filler cap

12. Start the engine, warm it up for several minutes, and then turn it off.

13. Check:

- Engine
(for engine oil leaks)

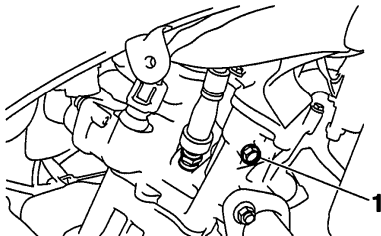
14. Check:

- Engine oil level
Refer to "CHECKING THE ENGINE OIL LEVEL" on page 3-10.

15. Check:

- Engine oil pressure

a. Slightly loosen the oil check bolt "1".



- Start the engine and keep it idling until engine oil starts to seep from the oil check bolt. If no engine oil comes out after one minute, turn the engine off so that it will not seize.
- Check the engine oil passages, the oil filter element and the oil pump for damage or leakage. Refer to "OIL PUMP" on page 5-47.
- Start the engine after solving the problem(s) and check the engine oil pressure again.
- Tighten the oil check bolt to specification.



Oil check bolt

7 Nm (0.7 m·kg, 5.1 ft·lb)



Engine end

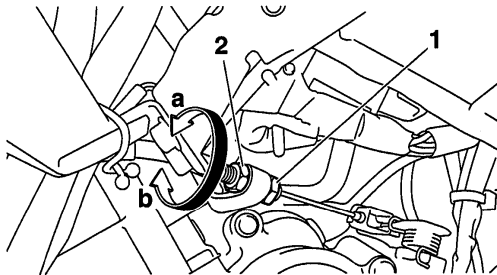
- a. Loosen the locknut "1".
- b. Turn the adjusting nut "2" in direction "a" or "b" until the specified clutch cable free play is obtained.

Direction "a"

Clutch cable free play is increased.

Direction "b"

Clutch cable free play is decreased.



- c. Tighten the locknut.

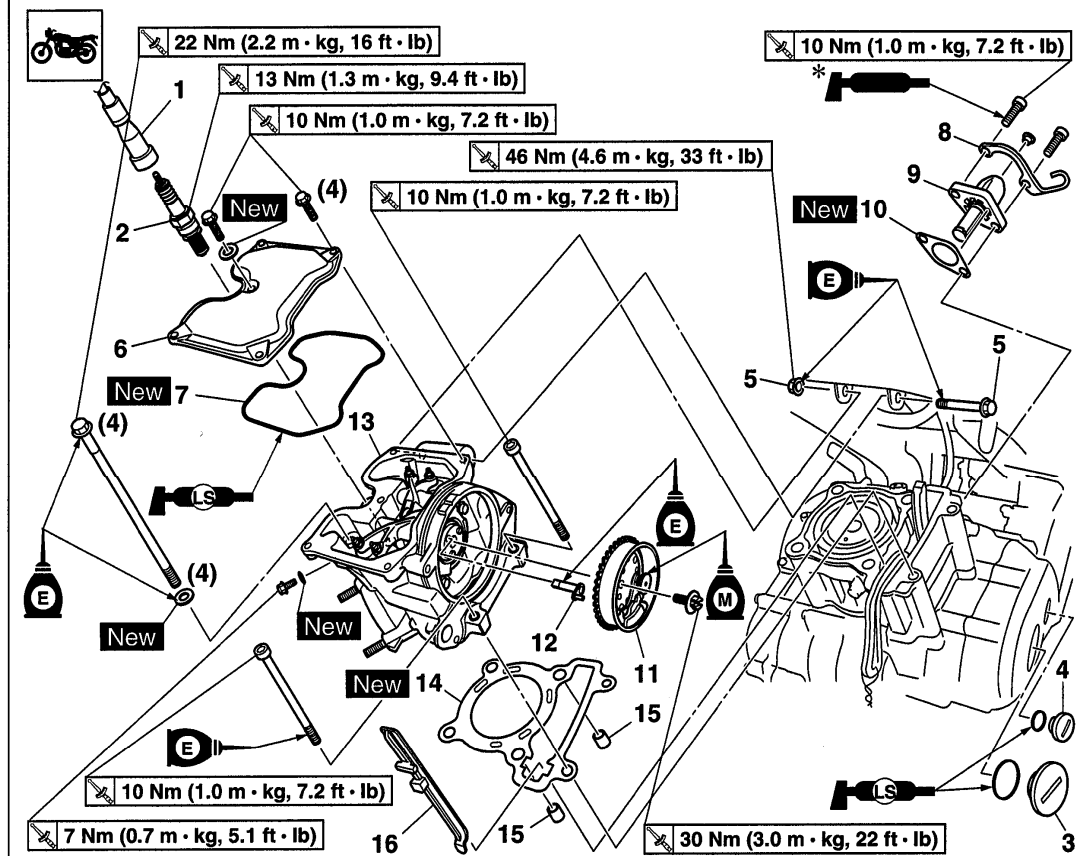


CYLINDER HEAD

EAS24100

CYLINDER HEAD

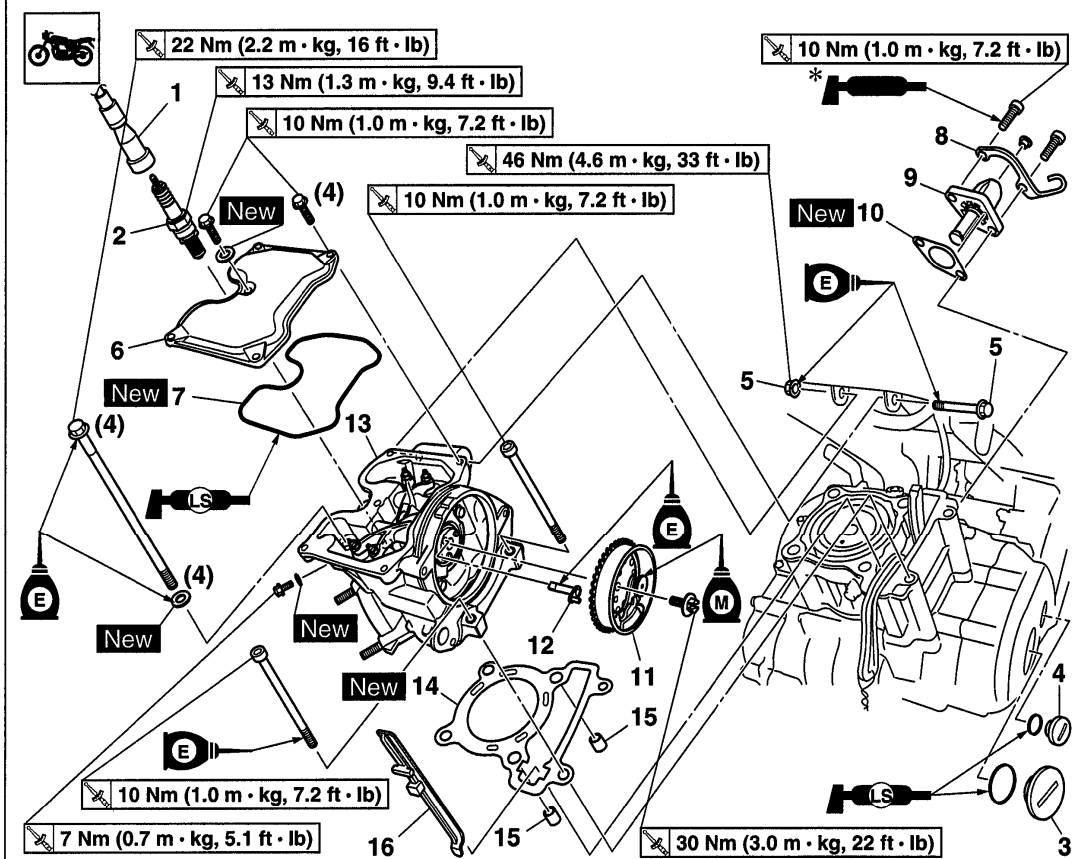
Removing the cylinder head



Order	Job/Parts to remove	Q'ty	Remarks
1	Spark plug cap	1	Disconnect.
2	Spark plug	1	
3	Crankshaft end accessing screw	1	
4	Timing mark accessing screw	1	

CYLINDER HEAD

Removing the cylinder head



Order	Job/Parts to remove	Q'ty	Remarks
5	Engine mounting bolt/nut (front side)	1/1	
6	Cylinder head cover	1	
7	Cylinder head cover gasket	1	
8	Clutch cable holder	1	
9	Timing chain tensioner	1	
10	Timing chain tensioner gasket	1	
11	Camshaft sprocket	1	
12	Decompression cam	1	
13	Cylinder head	1	
14	Cylinder head gasket	1	
15	Dowel pin	2	
16	Timing chain guide (exhaust side)	1	
			For installation, reverse the removal procedure.

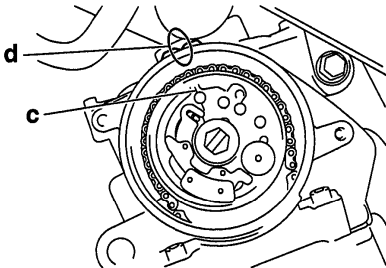
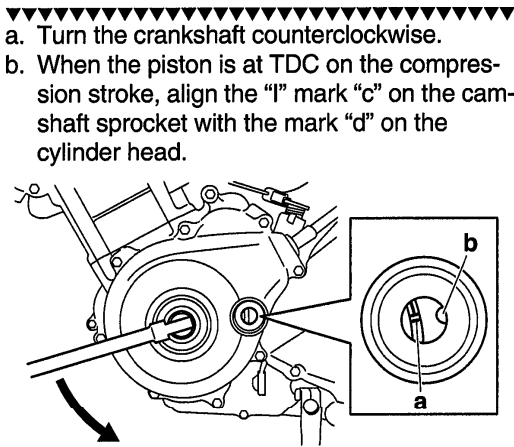
* Yamaha bond No. 1215 (Three Bond No. 1215®)

CYLINDER HEAD

EAS24130

REMOVING THE CYLINDER HEAD

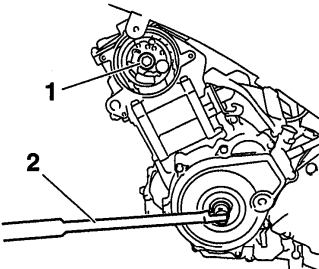
1. Align:
 - "I" mark "a" on the generator rotor (with the stationary pointer "b" on the generator cover)



2. Loosen:
- Camshaft sprocket bolt "1"

NOTE:

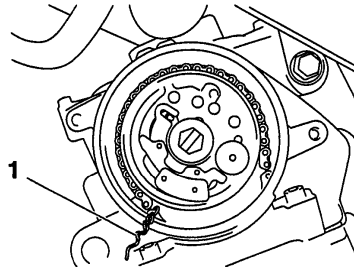
While holding the generator rotor nut with a wrench "2", loosen the camshaft sprocket bolt.



3. Remove:
- Camshaft sprocket

NOTE:

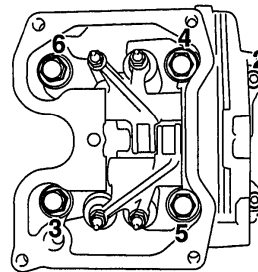
To prevent the timing chain from falling into the crankcase, fasten it with a wire "1".



4. Remove:
- Cylinder head

NOTE:

- Loosen the bolts in the proper sequence as shown.
- Loosen each bolt 1/2 of a turn at a time. After all of the bolts are fully loosened, remove bolts 1, 2, 4, and 6, and then remove the cylinder head with bolts 3 and 5 installed in the bolt heads.



EAS24160

CHECKING THE CYLINDER HEAD

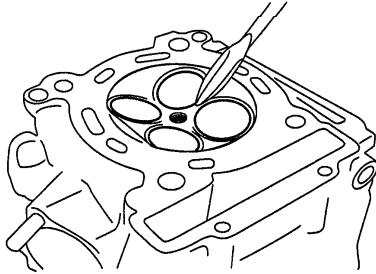
1. Eliminate:
 - Combustion chamber carbon deposits (with a rounded scraper)

NOTE:

Do not use a sharp instrument to avoid damaging or scratching:

- Spark plug bore threads
- Valve seats

CYLINDER HEAD

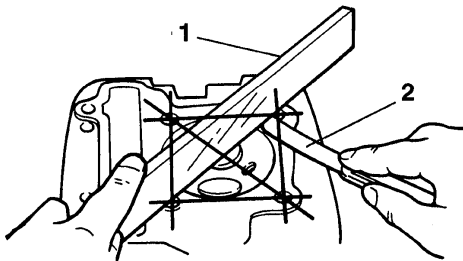


2. Check:
 - Cylinder head
Damage/scratches → Replace.
 - Cylinder head water jacket
Mineral deposits/rust → Eliminate.
3. Measure:
 - Cylinder head warpage
Out of specification → Resurface the cylinder head.



Warpage limit
0.03 mm (0.0012 in)

- a. Place a straightedge "1" and a thickness gauge "2" across the cylinder head.



- b. Measure the warpage.
- c. If the limit is exceeded, resurface the cylinder head as follows.
- d. Place a 400–600 grit wet sandpaper on the surface plate and resurface the cylinder head using a figure-eight sanding pattern.

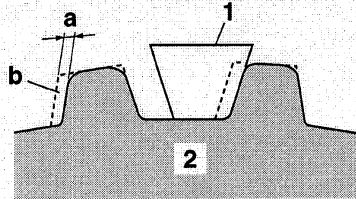
NOTE:

To ensure an even surface, rotate the cylinder head several times.

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CHECKING THE CAMSHAFT SPROCKET AND TIMING CHAIN GUIDE

1. Check:
 - Camshaft sprocket
More than 1/4 tooth wear "a" → Replace the camshaft sprocket, timing chain and crankshaft as a set.



- a. 1/4 tooth
- b. Correct
1. Timing chain roller
2. Camshaft sprocket

2. Check:
 - Timing chain guide (exhaust side)
Damage/wear → Replace.

EAS24200

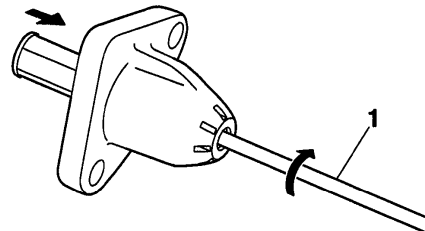
CHECKING THE TIMING CHAIN TENSIONER

1. Check:
 - Timing chain tensioner
Cracks/damage/rough movement → Replace.

- a. Lightly press the timing chain tensioner rod into the timing chain tensioner housing by hand.

NOTE:

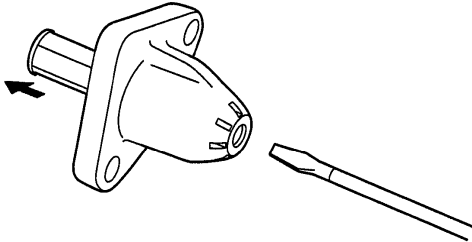
While pressing the timing chain tensioner rod, wind it clockwise with a thin screwdriver "1" until it stops.



- b. Remove the screwdriver and slowly release the timing chain tensioner rod.

CYLINDER HEAD

- c. Make sure that the timing chain tensioner rod comes out of the timing chain tensioner housing smoothly. If there is rough movement, replace the timing chain tensioner.



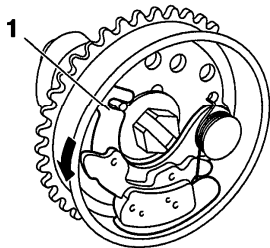
EAS5D71009

CHECKING THE DECOMPRESSION SYSTEM

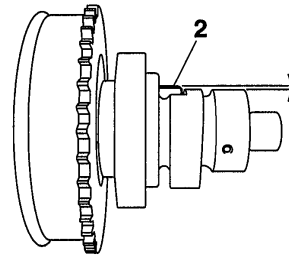
1. Check:

- Decompression system

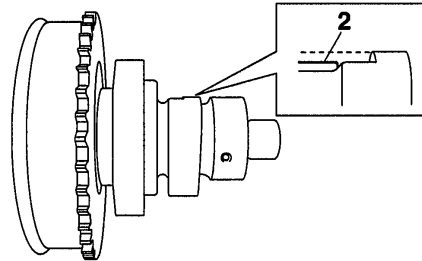
- a. Check the decompression system with the camshaft sprocket and the decompression cam installed to the camshaft.
- b. Check that the decompression lever "1" moves smoothly.
- c. Without operating the decompression lever, check that the decompression cam "2" projects from the camshaft (exhaust cam) as shown in the illustration "A".
- d. Move the decompression lever "1" in the direction of the arrow shown and check that the decompression cam does not project from the camshaft (exhaust cam) as shown in the illustration "B".



A



B



EAS24230

INSTALLING THE CYLINDER HEAD

1. Install:

- Cylinder head

NOTE:

Pass the timing chain through the timing chain cavity.

2. Tighten:

- Cylinder head bolts "1"



Cylinder head bolt
22 Nm (2.2 m·kg, 16 ft·lb)

- Cylinder head bolts "2"

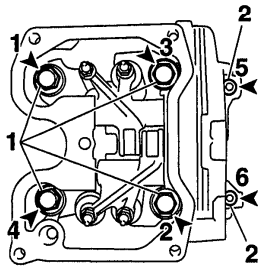


Cylinder head bolt
10 Nm (1.0 m·kg, 7.2 ft·lb)

NOTE:

- Lubricate the cylinder head bolts and washers with engine oil.
- Tighten the cylinder head bolts in the proper tightening sequence as shown and torque them in two stages.

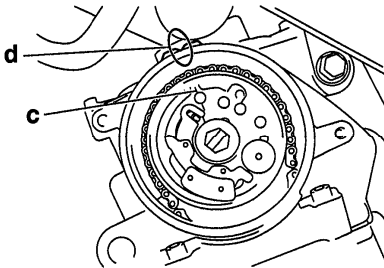
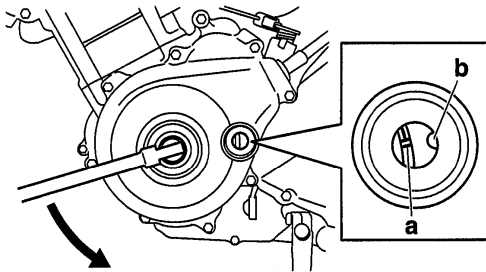
CYLINDER HEAD



3. Install:

- Camshaft sprocket

- Turn the crankshaft counterclockwise.
- Align the "I" mark "a" on the generator rotor with the stationary pointer "b" on the generator cover.
- Align the "I" mark "c" on the camshaft sprocket with the stationary pointer "d" on the cylinder head.
- Install the timing chain onto the camshaft sprocket, and then install the camshaft sprocket onto the camshaft.



NOTE:

When installing the camshaft sprocket, be sure to keep the timing chain as tight as possible on the exhaust side.

ECA5D71012

CAUTION:

Do not turn the crankshaft when installing the camshaft(s) to avoid damage or improper valve timing.

- While holding the camshaft, temporarily tighten the camshaft sprocket bolt.
- Remove the wire from the timing chain.

4. Install:

- Timing chain tensioner gasket **New**
- Timing chain tensioner

- Apply sealant to the timing chain tensioner bolt threads.

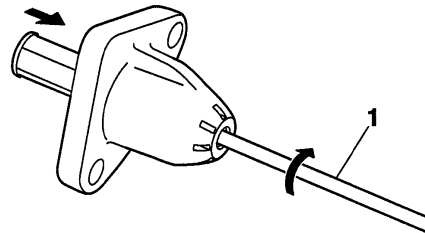


Yamaha bond No. 1215
90890-85505
(Three Bond No.1215®)

- While lightly pressing the timing chain tensioner rod by hand, turn the tensioner rod fully clockwise with a thin screwdriver "1".
- With the timing chain tensioner rod turned all the way into the timing chain tensioner housing (with the thin screwdriver still installed), install the gasket and the timing chain tensioner "2" onto the cylinder block.
- Tighten the timing chain tensioner bolts "3" to the specified torque.



Timing chain tensioner bolt
10 Nm (1.0 m·kg, 7.2 ft·lb)



- Remove the screwdriver, make sure the timing chain tensioner rod releases.

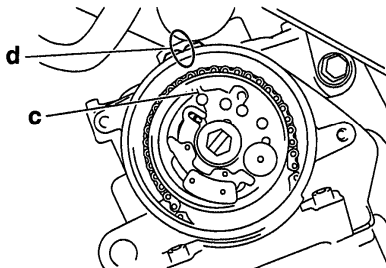
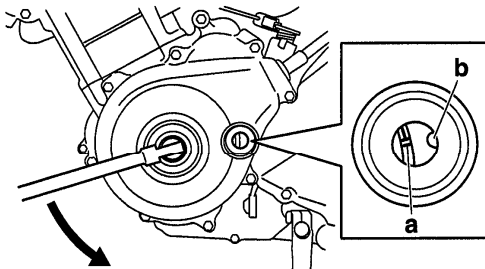
CYLINDER HEAD

5. Turn:

- Crankshaft
(several turns counterclockwise)

6. Check:

- "I" mark "a"
Align the "I" mark on the generator rotor with the stationary pointer "b" on the generator cover.
- "I" mark "c"
Align the "I" mark on the camshaft sprocket with the stationary pointer "d" on the cylinder head.
Out of alignment → Correct.
Refer to the installation steps above.



7. Tighten:

- Camshaft sprocket bolt



Camshaft sprocket bolt
30 Nm (3.0 m·kg, 22 ft·lb)

ECA5D71013

CAUTION:

Be sure to tighten the camshaft sprocket bolt to the specified torque to avoid the possibility of the bolt coming loose and damaging the engine.

8. Measure:

- Valve clearance
Out of specification → Adjust.
Refer to "ADJUSTING THE VALVE CLEARANCE" on page 3-3.

CAMSHAFT

EAS23730
CAMSHAFT

Removing the rocker arms and camshaft

7 Nm (0.7 m · kg, 5.1 ft · lb)

7 Nm (0.7 m · kg, 5.1 ft · lb)

7 Nm (0.7 m · kg, 5.1 ft · lb)

DELETE


Order	Job/Parts to remove	Q'ty	Remarks
	Cylinder head		Refer to "CYLINDER HEAD" on page 5-7.
1	Locknut	4	
2	Adjusting screw	4	
3	Camshaft retainer	1	
4	Rocker arm shaft	2	
5	Intake rocker arm	1	
6	Exhaust rocker arm	1	
7	Camshaft	1	
			For installation, reverse the removal procedure.

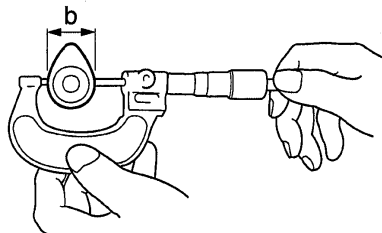
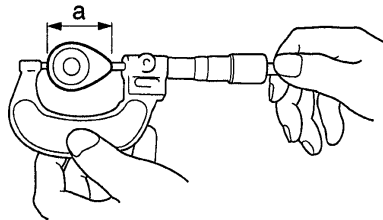
CAMSHAFT

EAS23840

CHECKING THE CAMSHAFT

1. Check:
 - Camshaft lobes
Blue discoloration/pitting/scratches → Replace the camshaft.
2. Measure:
 - Camshaft lobe dimensions "a" and "b"
Out of specification → Replace the camshaft.

OK		Camshaft lobe dimensions	
		Intake A	30.225–30.325 mm (1.1900–1.1939 in)
		Limit	30.125 mm (1.1860 in)
		Intake B	25.127–25.227 mm (0.9893–0.9932 in)
		Limit	25.027 mm (0.9853 in)
		Exhaust A	30.232–30.332 mm (1.1902–1.1942 in)
		Limit	30.132 mm (1.1863 in)
		Exhaust B	25.065–25.165 mm (0.9868–0.9907 in)
		Limit	24.965 mm (0.9829 in)




3. Check:
 - Camshaft oil passage
Obstruction → Blow out with compressed air.

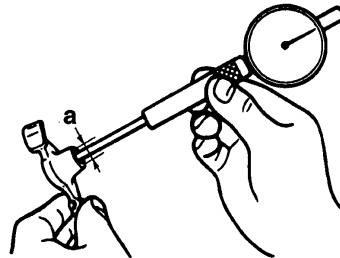
EAS23880

CHECKING THE ROCKER ARMS AND ROCKER ARM SHAFTS


The following procedure applies to all of the rocker arms and rocker arm shafts.

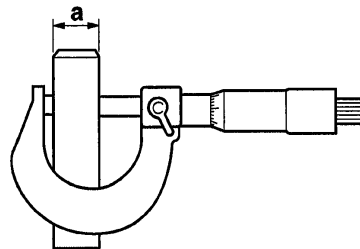
1. Check:
 - Rocker arm
Damage/wear → Replace.
2. Check:
 - Rocker arm shaft
Blue discoloration/excessive wear/pitting/scratches → Replace or check the lubrication system.
3. Measure:
 - Rocker arm inside diameter "a"
Out of specification → Replace.

	Rocker arm inside diameter	
	9.985–10.000 mm (0.3931–0.3937 in)	
	Limit	
	10.015 mm (0.3943 in)	



4. Measure:
 - Rocker arm shaft outside diameter "a"
Out of specification → Replace.

	Rocker arm shaft outside diameter	
	9.966–9.976 mm (0.3924–0.3928 in)	
	Limit	
	9.941 mm (0.3914 in)	



CAMSHAFT


5. Calculate:

- Rocker-arm-to-rocker-arm-shaft clearance

NOTE:

Calculate the clearance by subtracting the rocker arm shaft outside diameter from the rocker arm inside diameter.

Out of specification → Replace the defective part(s).


	Rocker-arm-to-rocker-arm-shaft clearance 0.009–0.034 mm (0.0004–0.0013 in) Limit 0.074 mm (0.0029 in)
---	--

EAS24040

INSTALLING THE CAMSHAFT AND ROCKER ARMS


1. Lubricate:

- Rocker arms
- Rocker arm shafts

	Recommended lubricant Rocker arm inner surface Molybdenum disulfide oil Rocker arm shaft Engine oil
---	--

2. Lubricate:

- Camshaft

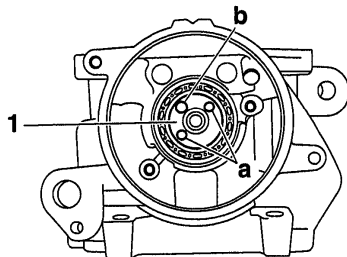
	Recommended lubricant Camshaft Molybdenum disulfide oil Camshaft bearing Engine oil
---	--

3. Install:

- Camshaft “1”

NOTE:

Make sure that the camshaft projections “a” and hole “b” are positioned as shown in the illustration.

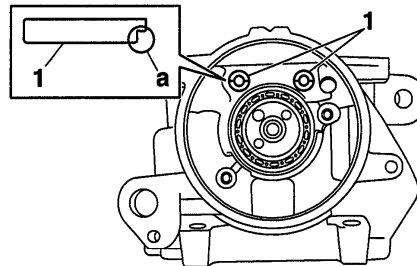


4. Install:

- Rocker arms
- Rocker arm shafts “1”

NOTE:

- Make sure that the cutout “a” in each rocker arm shaft is facing downward as shown in the illustration.
- Make sure the rocker arm shafts (intake and exhaust) are completely pushed into the cylinder head.

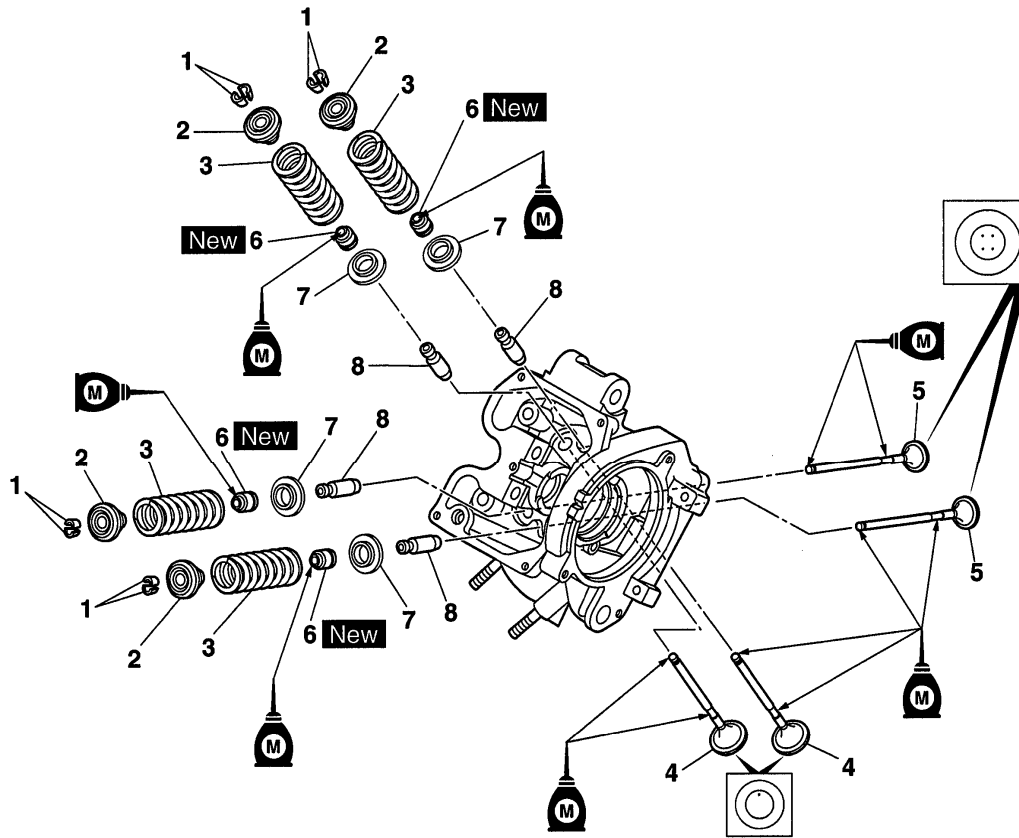


VALVES AND VALVE SPRINGS

EAS24270

VALVES AND VALVE SPRINGS

Removing the valves and valve springs



Order	Job/Parts to remove	Q'ty	Remarks
	Cylinder head		
	Rocker arms/Camshaft		
1	Valve cotter	8	
2	Upper spring seat	4	
3	Valve spring	4	
4	Intake valve	2	
5	Exhaust valve	2	
6	Valve stem seal	4	
7	Lower spring seat	4	
8	Valve guide	4	
			For installation, reverse the removal procedure.

VALVES AND VALVE SPRINGS

REMOVING THE VALVES

The following procedure applies to all of the valves and related components.

NOTE:

Before removing the internal parts of the cylinder head (e.g., valves, valve springs, valve seats), make sure the valves properly seal.

1. Check:

- Valve sealing

Leakage at the valve seat → Check the valve face, valve seat, and valve seat width.

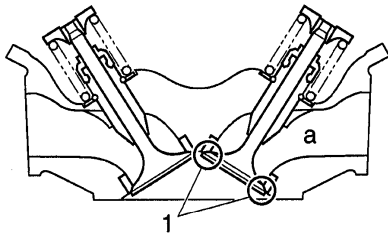
Refer to "CHECKING THE VALVE SEATS"
on page 5-20.

- a. Pour a clean solvent “a” into the intake and exhaust ports.

- b. Check that the valves properly seal.

NOTE:

There should be no leakage at the valve seat “1”.



- ## 2. Remove:

- Valve cotters “1”

NOTE:

Remove the valve cotters by compressing the valve spring with the valve spring compressor and the valve spring compressor attachment "2".



Valve spring compressor

90890-04019

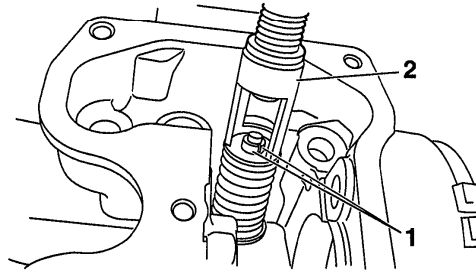
YM-04019

Valve spring compressor attachment

90890-04108

Valve spring compressor adapter 22 mm

YM-04108

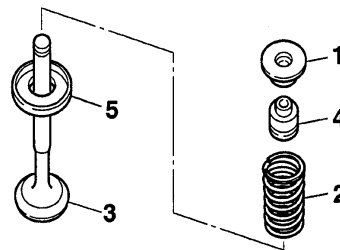


- ### 3. Remove:

- Upper spring seat “1”
- Valve spring “2”
- Valve “3”
- Valve stem seal “4”
- Lower spring seat “5”

NOTE:

Identify the position of each part very carefully so that it can be reinstalled in its original place.



EAS24290

CHECKING THE VALVES AND VALVE GUIDES

The following procedure applies to all of the valves and valve guides.

1. Measure:

- Valve-stem-to-valve-guide clearance
Out of specification → Replace the valve guide.

- Valve-stem-to-valve-guide clearance = Valve guide inside diameter "a" - Valve stem diameter "b"

VALVES AND VALVE SPRINGS



Valve-stem-to-valve-guide clearance (intake)

0.010–0.037 mm (0.0004–0.0015 in)

Limit

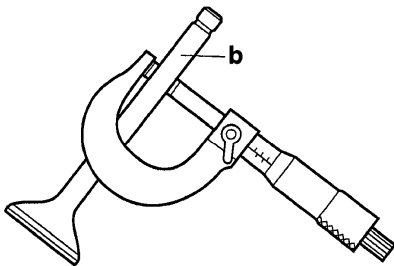
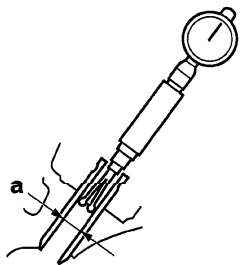
0.080 mm (0.0032 in)

Valve-stem-to-valve-guide clearance (exhaust)

0.025–0.052 mm (0.0010–0.0020 in)

Limit

0.100 mm (0.0039 in)

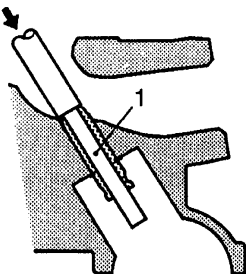


2. Replace:
- Valve guide

NOTE:

To ease valve guide removal and installation, and to maintain the correct fit, heat the cylinder head to 100 °C (212 °F) in an oven.

- a. Remove the valve guide with the valve guide remover "1".



- b. Install the new valve guide with the valve guide installer "2" and valve guide remover "1".

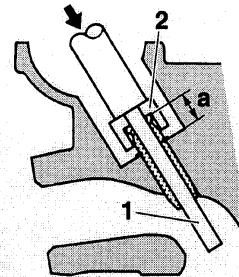


Valve guide position (intake)

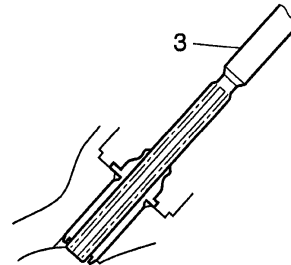
17.0–17.4 mm (0.669–0.685 in)

Valve guide position (exhaust)

14.0–14.4 mm (0.551–0.567 in)



- a. Valve guide position
- c. After installing the valve guide, bore the valve guide with the valve guide reamer "3" to obtain the proper valve-stem-to-valve-guide clearance.



NOTE:

After replacing the valve guide, reface the valve seat.



Valve guide remover (ø4.5)

90890-04116

Valve guide remover (4.5 mm)

YM-04116

Valve guide installer (ø4.5)

90890-04117

Valve guide installer (4.5 mm)

YM-04117

Valve guide reamer (ø4.5)

90890-04118

Valve guide reamer (4.5 mm)

YM-04118

VALVES AND VALVE SPRINGS

3. Eliminate:

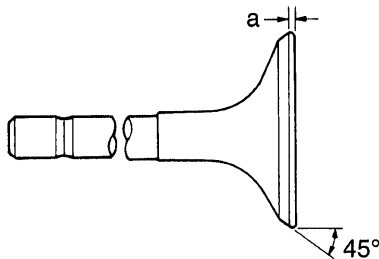
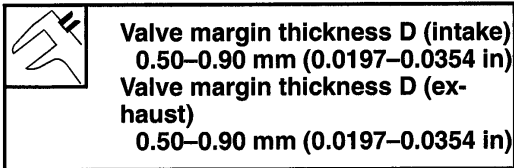
- Carbon deposits
(from the valve face and valve seat)

4. Check:

- Valve face
Pitting/wear → Grind the valve face.
- Valve stem end
Mushroom shape or diameter larger than the body of the valve stem → Replace the valve.

5. Measure:

- Valve margin thickness D "a"
Out of specification → Replace the valve.

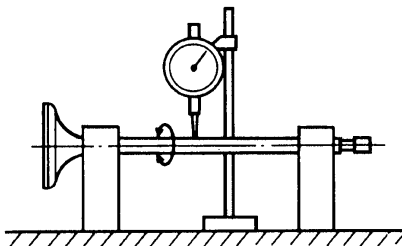
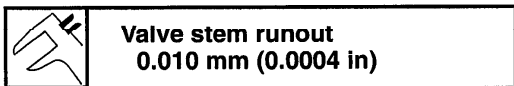


6. Measure:

- Valve stem runout
Out of specification → Replace the valve.

NOTE:

- When installing a new valve, always replace the valve guide.
- If the valve is removed or replaced, always replace the valve stem seal.



EAS24300

CHECKING THE VALVE SEATS

The following procedure applies to all of the valves and valve seats.

1. Eliminate:

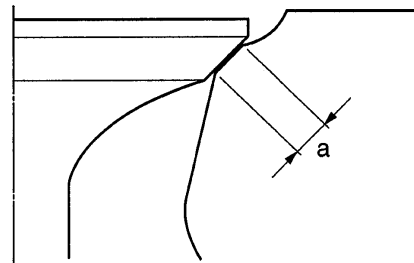
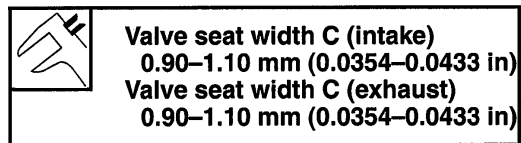
- Carbon deposits
(from the valve face and valve seat)

2. Check:

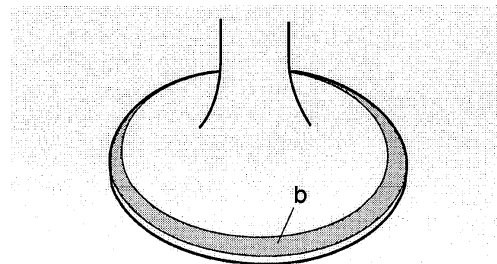
- Valve seat
Pitting/wear → Replace the cylinder head.

3. Measure:

- Valve seat width C "a"
Out of specification → Replace the cylinder head.



- a. Apply Mechanic's blueing dye (Dykem) "b" onto the valve face.



- b. Install the valve into the cylinder head.
c. Press the valve through the valve guide and onto the valve seat to make a clear impression.
d. Measure the valve seat width.

NOTE:

Where the valve seat and valve face contacted one another, the blueing will have been removed.

VALVES AND VALVE SPRINGS

- 4. Lap:
 - Valve face
 - Valve seat

NOTE:

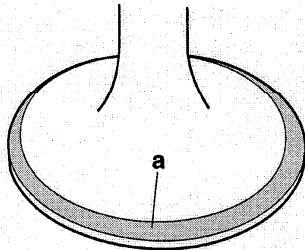
After replacing the cylinder head or replacing the valve and valve guide, the valve seat and valve face should be lapped.

- a. Apply a coarse lapping compound "a" to the valve face.

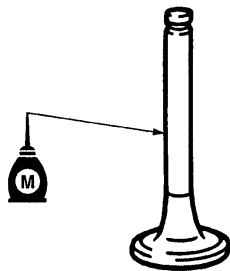
ECA13790

CAUTION:

Do not let the lapping compound enter the gap between the valve stem and the valve guide.



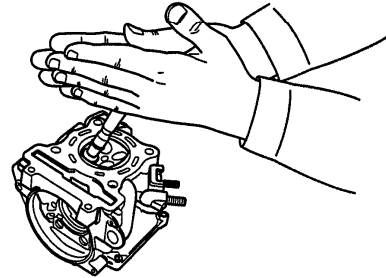
- b. Apply molybdenum disulfide oil onto the valve stem.



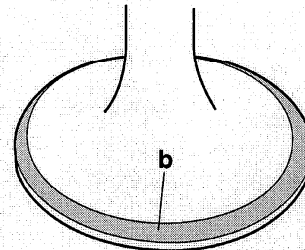
- c. Install the valve into the cylinder head.
- d. Turn the valve until the valve face and valve seat are evenly polished, then clean off all of the lapping compound.

NOTE:

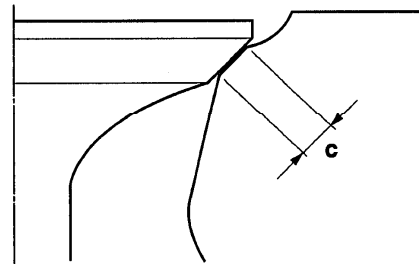
For the best lapping results, lightly tap the valve seat while rotating the valve back and forth between your hands.



- e. Apply a fine lapping compound to the valve face and repeat the above steps.
- f. After every lapping procedure, be sure to clean off all of the lapping compound from the valve face and valve seat.
- g. Apply Mechanic's blueing dye (Dykem) "b" onto the valve face.



- h. Install the valve into the cylinder head.
- i. Press the valve through the valve guide and onto the valve seat to make a clear impression.
- j. Measure the valve seat width “c” again. If the valve seat width is out of specification, reface and lap the valve seat.



EAS24310

CHECKING THE VALVE SPRINGS

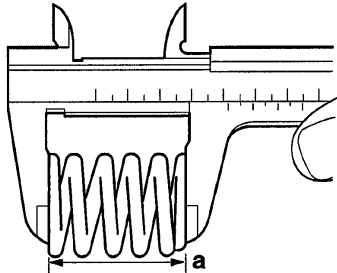
The following procedure applies to all of the valve springs.

1. Measure:
- Valve spring free length "a"
Out of specification → Replace the valve spring.

VALVES AND VALVE SPRINGS



Free length (intake)
41.71 mm (1.64 in)
Limit
39.62 mm (1.56 in)
Free length (exhaust)
41.71 mm (1.64 in)
Limit
39.62 mm (1.56 in)

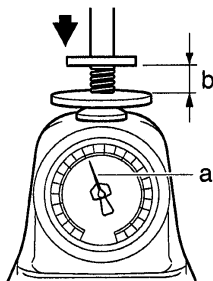


2. Measure:

- Compressed valve spring force "a"
Out of specification → Replace the valve spring.



Installed compression spring force (intake)
140–162 N (31.47–36.42 lbf)
(14.28–16.52 kgf)
Installed compression spring force (exhaust)
140–162 N (31.47–36.42 lbf)
(14.28–16.52 kgf)
Installed length (intake)
35.30 mm (1.39 in)
Installed length (exhaust)
35.30 mm (1.39 in)



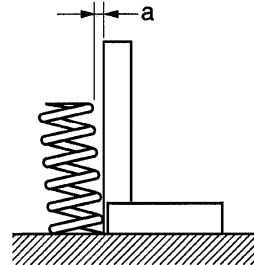
b. Installed length

3. Measure:

- Valve spring tilt "a"
Out of specification → Replace the valve spring.



Spring tilt (Intake)
2.5°/1.8 mm
Spring tilt (exhaust)
2.5°/1.8 mm



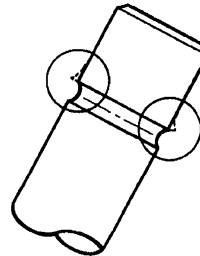
EAS24340

INSTALLING THE VALVES

The following procedure applies to all of the valves and related components.

1. Deburr:

- Valve stem end
(with an oil stone)

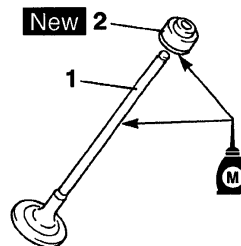


2. Lubricate:

- Valve stem "1"
- Valve stem seal "2" **New**
(with the recommended lubricant)



Recommended lubricant
Molybdenum disulfide oil



3. Install:

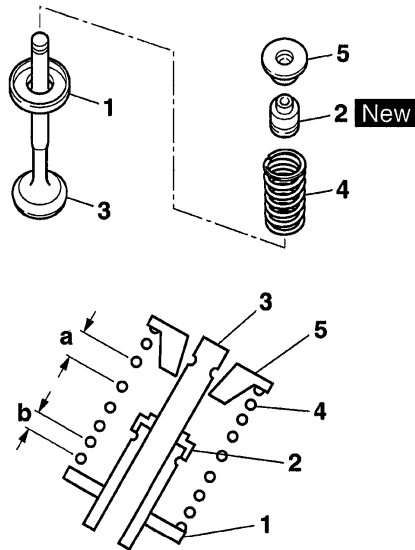
- Lower spring seat "1"
- Valve stem seal "2" **New**

VALVES AND VALVE SPRINGS

- Valve "3"
- Valve spring "4"
- Upper spring seat "5"
(into the cylinder head)

NOTE:

- Make sure each valve is installed in its original place.
- Install the valve springs with the larger pitch "a" facing up.



b. Smaller pitch

4. Install:

- Valve cotters "1"

NOTE:

Install the valve cotters by compressing the valve spring with the valve spring compressor and the valve spring compressor attachment "2".



Valve spring compressor

90890-04019

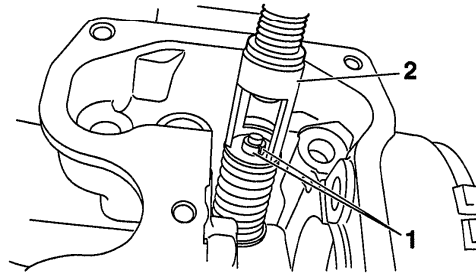
YM-04019

Valve spring compressor attachment

90890-04108

Valve spring compressor adapter 22 mm

YM-04108

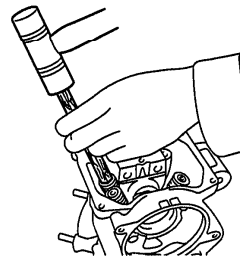


5. To secure the valve cotters onto the valve stem, lightly tap the valve tip with a soft-face hammer.

ECA13800

CAUTION:

Hitting the valve tip with excessive force could damage the valve.

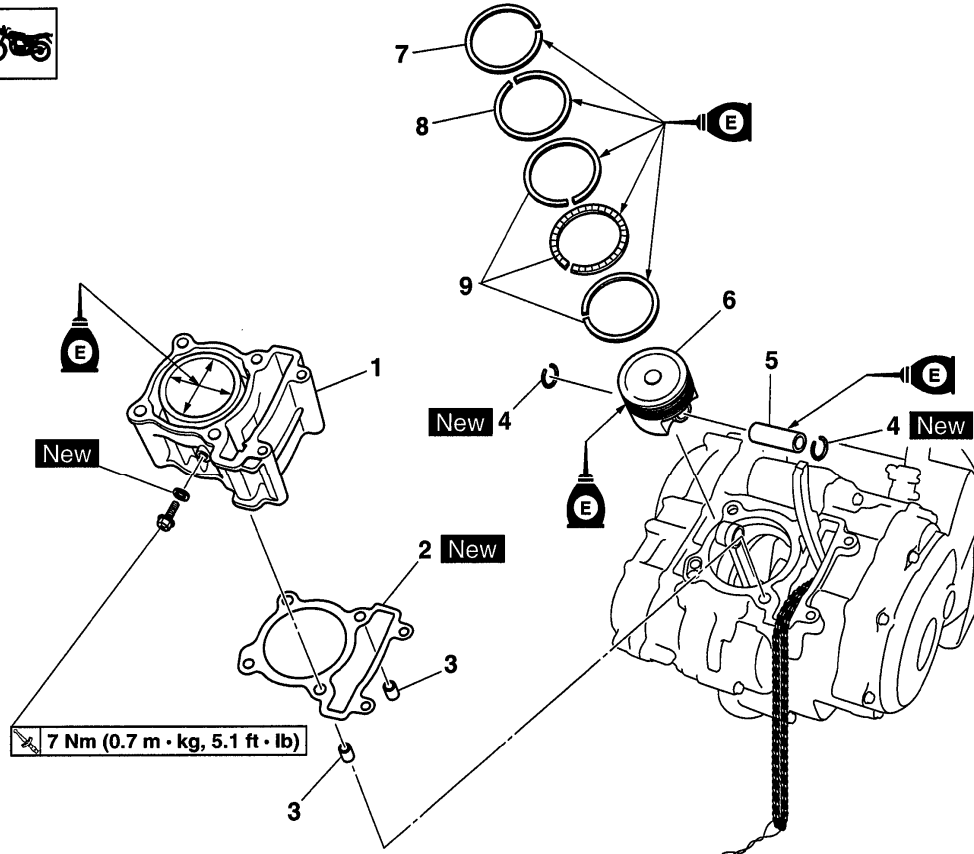


CYLINDER AND PISTON

EAS24350

CYLINDER AND PISTON

Removing the cylinder and piston



Order	Job/Parts to remove	Q'ty	Remarks
	Cylinder head		
1	Cylinder	1	
2	Cylinder gasket	1	
3	Dowel pin	2	
4	Piston pin clip	2	
5	Piston pin	1	
6	Piston	1	
7	Top ring	1	
8	2nd ring	1	
9	Oil ring	1	
			For installation, reverse the removal procedure.

CYLINDER AND PISTON

EAS24380

REMOVING THE PISTON

1. Remove:

- Piston pin clips "1"
- Piston pin "2"
- Piston "3"

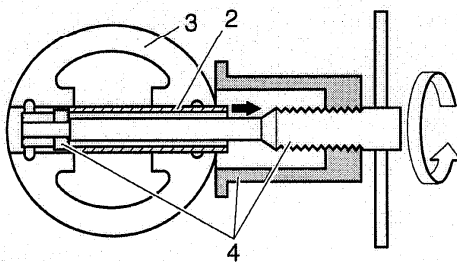
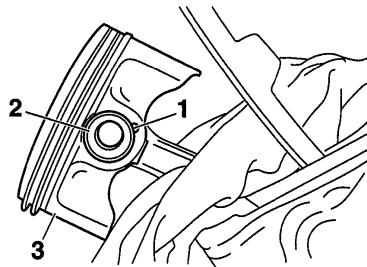
ECA13810

CAUTION:

Do not use a hammer to drive the piston pin out.

NOTE:

- Before removing the piston pin clip, cover the crankcase opening with a clean rag to prevent the piston pin clip from falling into the crankcase.
- Before removing the piston pin, deburr the piston pin clip groove and the piston pin bore area. If both areas are deburred and the piston pin is still difficult to remove, remove it with the piston pin puller set "4".

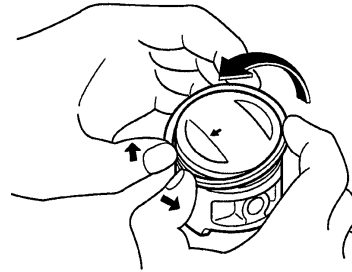


2. Remove:

- Top ring
- 2nd ring
- Oil ring

NOTE:

When removing a piston ring, open the end gap with your fingers and lift the other side of the ring over the piston crown.



EAS24390

CHECKING THE CYLINDER AND PISTON

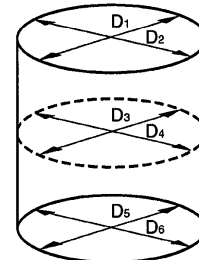
1. Check:

- Piston wall
 - Cylinder wall
- Vertical scratches → Replace the cylinder, and replace the piston and piston rings as a set.

2. Measure:

- Piston-to-cylinder clearance

- a. Measure cylinder bore "C" with the cylinder bore gauge.



NOTE:

Measure cylinder bore "C" by taking side-to-side and front-to-back measurements of the cylinder. Then, find the average of the measurements.



Bore

52.000–52.010 mm (2.0472–2.0476 in)

Taper limit

0.050 mm (0.0020 in)

Out of round limit

0.005 mm (0.0002 in)

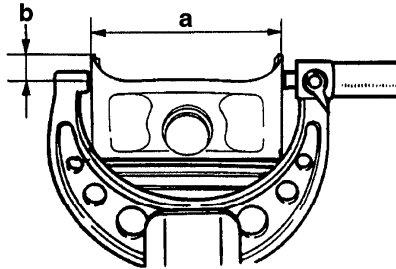
CYLINDER AND PISTON

"C" = maximum of $D_1 - D_2$

"T" = maximum of D_1 or D_2 - maximum of D_5 or D_6

"R" = maximum of D_1, D_3 or D_5 - minimum of D_2, D_4 or D_6

- If out of specification, replace the cylinder, and replace the piston and piston rings as a set.
- Measure piston skirt diameter D "a" with the micrometer.



- 5.0 mm (0.20 in) from the bottom edge of the piston



Piston Diameter D
51.962–51.985 mm (2.0457–2.0466 in)

- If out of specification, replace the piston and piston rings as a set.
- Calculate the piston-to-cylinder clearance with the following formula.

• Piston-to-cylinder clearance =
Cylinder bore "C" -
Piston skirt diameter "D"



Piston-to-cylinder clearance
0.015–0.048 mm (0.0006–0.0019 in)
Limit
0.15 mm (0.0059 in)

- If out of specification, replace the cylinder, and replace the piston and piston rings as a set.



EAS24430

CHECKING THE PISTON RINGS

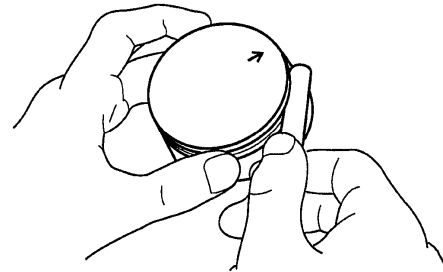
- Measure:
 - Piston ring side clearance
 Out of specification → Replace the piston and piston rings as a set.

NOTE:

Before measuring the piston ring side clearance, eliminate any carbon deposits from the piston ring grooves and piston rings.



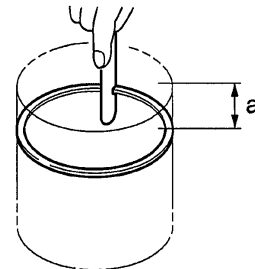
Piston ring
Top ring
Ring side clearance
0.030–0.065 mm (0.0012–0.0026 in)
Limit
0.100 mm (0.0039 in)
2nd ring
Ring side clearance
0.020–0.055 mm (0.0008–0.0022 in)
Limit
0.100 mm (0.0039 in)



- Install:
 - Piston ring (into the cylinder)

NOTE:

Level the piston ring into the cylinder with the piston crown.



- 40 mm (1.57 in)


CYLINDER AND PISTON

3. Measure:

- Piston ring end gap
Out of specification → Replace the piston ring.

NOTE:

The oil ring expander spacer end gap cannot be measured. If the oil ring rail gap is excessive, replace all three piston rings.

	Piston ring
	Top ring
	End gap (installed)
	0.10–0.25 mm (0.0039–0.0098 in)
	Limit
	0.50 mm (0.0197 in)
	2nd ring
	End gap (installed)
	0.10–0.25 mm (0.0039–0.0098 in)
	Limit
	0.60 mm (0.0236 in)
	Oil ring
	End gap (installed)
	0.20–0.70 mm (0.0079–0.0276 in)

EAS24440


CHECKING THE PISTON PIN

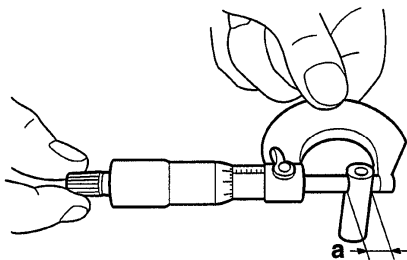
1. Check:

- Piston pin
Blue discoloration/grooves → Replace the piston pin and then check the lubrication system.

2. Measure:

- Piston pin outside diameter “a”
Out of specification → Replace the piston pin.

	Piston pin outside diameter
	13.995–14.000 mm (0.5510–0.5512 in)
	Limit
	13.975 mm (0.5502 in)

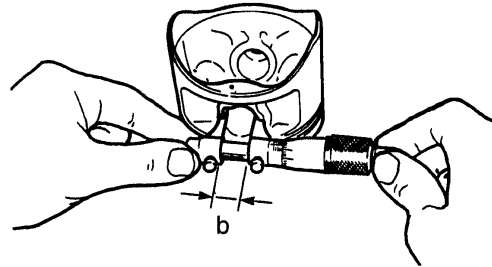


3. Measure:

- Piston pin bore diameter “b”
Out of specification → Replace the piston.



Piston pin bore inside diameter
14.002–14.013 mm (0.5513–0.5517 in)
Limit
14.043 mm (0.5529 in)



4. Calculate:

- Piston-pin-to-piston-pin-bore clearance
Out of specification → Replace the piston pin and piston as a set.

Piston-pin-to-piston-pin-bore clearance =
Piston pin bore diameter “b” -
Piston pin outside diameter “a”



Piston-pin-to-piston-pin-bore clearance
0.002–0.018 mm (0.0001–0.0007 in)
Limit
0.068 mm (0.0027 in)

EAS24450

INSTALLING THE PISTON AND CYLINDER

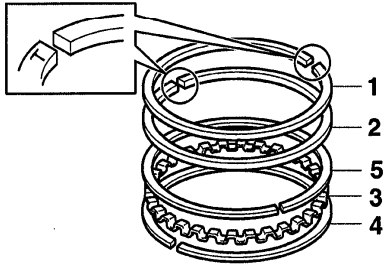
1. Install:

- Top ring “1”
- 2nd ring “2”
- Oil ring expander “3”
- Lower oil ring rail “4”
- Upper oil ring rail “5”

NOTE:

Be sure to install the piston rings so that the manufacturer marks or numbers face up.

CYLINDER AND PISTON

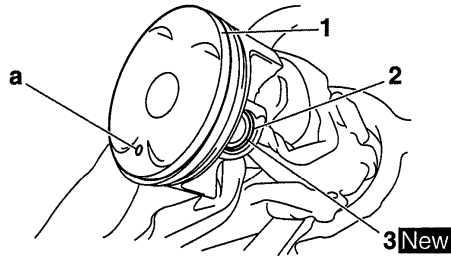


2. Install:

- Piston "1"
- Piston pin "2"
- Piston pin clips "3" **New**

NOTE:

- Apply engine oil to the piston pin.
- Make sure the arrow mark "a" on the piston points towards the exhaust side of the cylinder.
- Before installing the piston pin clips, cover the crankcase opening with a clean rag to prevent the clips from falling into the crankcase.



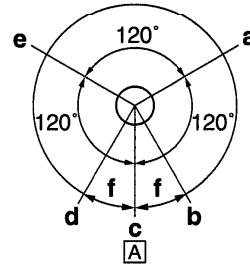
3. Lubricate:

- Piston
- Piston rings
- Cylinder (with the recommended lubricant)



4. Offset:

- Piston ring end gaps



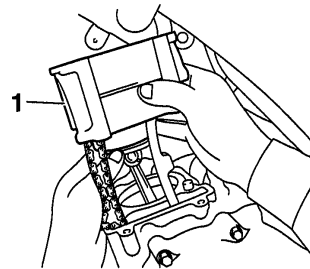
- a. Top ring
- b. Upper oil ring rail
- c. Oil ring expander
- d. Lower oil ring rail
- e. 2nd ring
- f. 20 mm (0.79 in)
- A. Intake side

5. Install:

- Dowel pins
- Cylinder head gasket **New**
- Cylinder "1"

NOTE:

- While compressing the piston rings with one hand, install the cylinder with the other hand.
- Pass the timing chain and timing chain guide (intake side) through the timing chain cavity.

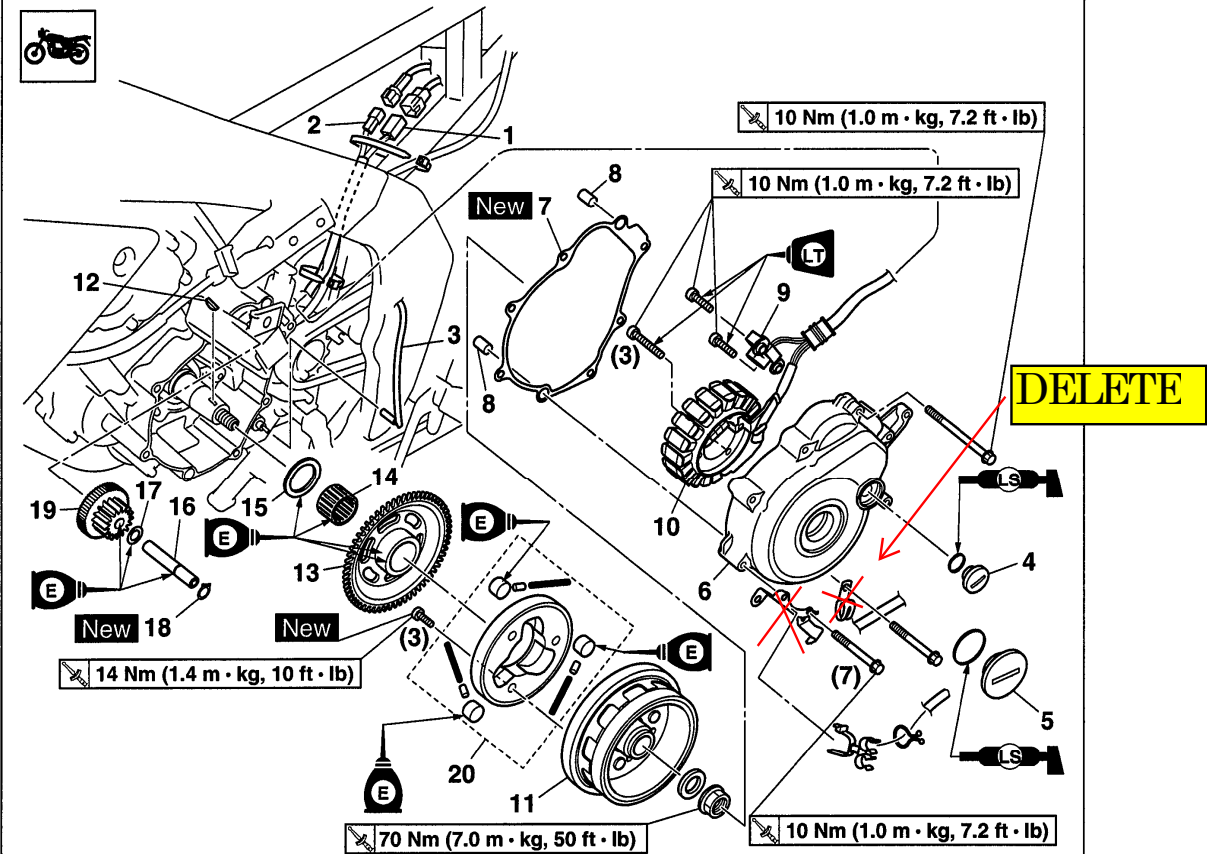


GENERATOR AND STARTER CLUTCH

EAS5D71010

GENERATOR AND STARTER CLUTCH

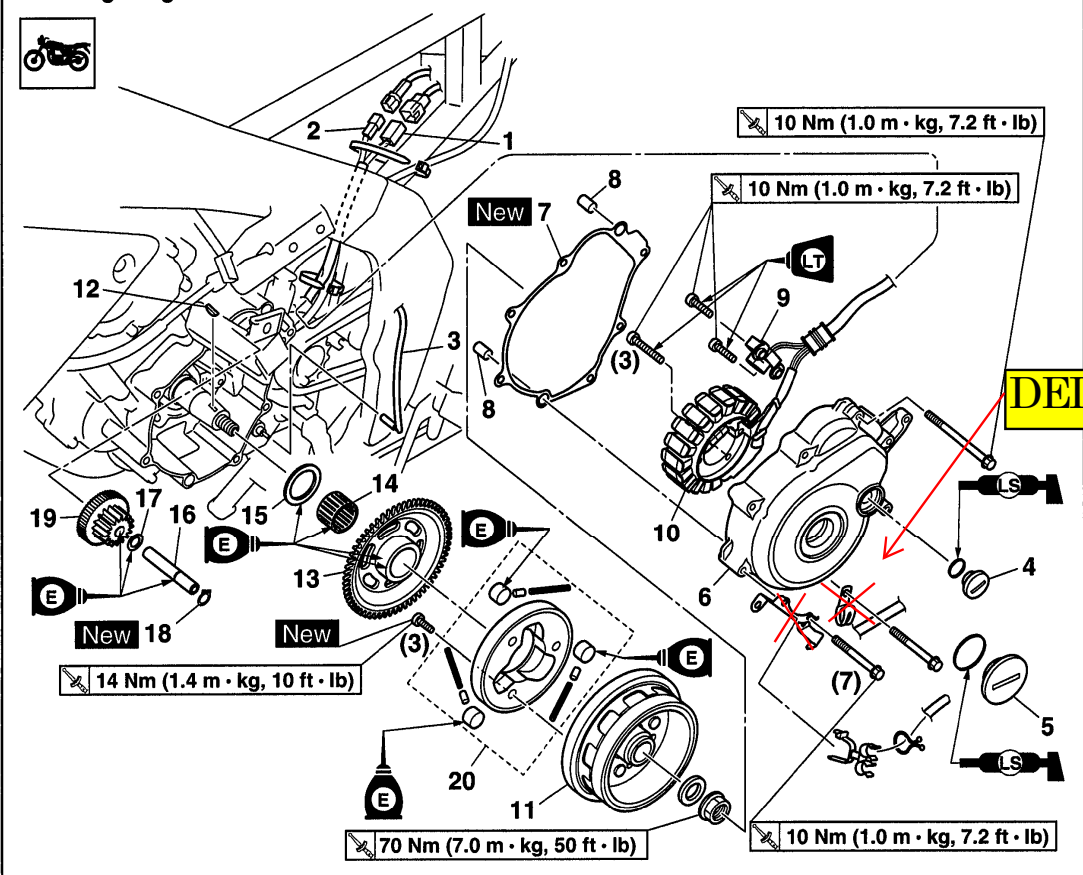
Removing the generator and starter clutch



Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" on page 3-11.
	Left lower side cowl		Refer to "GENERAL CHASSIS" on page 4-1.
	Drive sprocket cover		Refer to "CHAIN DRIVE" on page 4-63.
1	Stator coil coupler	1	Disconnect.
2	Crankshaft position sensor coupler	1	Disconnect.
3	Neutral switch lead connector	1	Disconnect.
4	Timing mark accessing screw	1	
5	Crankshaft end accessing screw	1	
6	Generator cover	1	
7	Generator cover gasket	1	
8	Dowel pin	2	
9	Crankshaft position sensor	1	
10	Stator coil	1	
11	Generator rotor	1	

GENERATOR AND STARTER CLUTCH

Removing the generator and starter clutch



Order	Job/Parts to remove	Q'ty	Remarks
12	Woodruff key	1	
13	Starter clutch gear	1	
14	Bearing	1	
15	Washer	1	
16	Starter clutch idle gear shaft	1	
17	Washer	1	
18	Circlip	1	
19	Starter clutch idle gear	1	
20	Starter clutch assembly	1	
			For installation, reverse the removal procedure.

GENERATOR AND STARTER CLUTCH

EAS24490

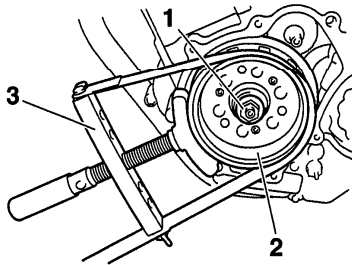
REMOVING THE GENERATOR

1. Remove:

- Generator rotor nut "1"
- Washer

NOTE:

- While holding the generator rotor "2" with the sheave holder "3", loosen the generator rotor nut.
- Do not allow the sheave holder to touch the projection on the generator rotor.



2. Remove:

- Generator rotor "1"
- (with the flywheel puller "2")
- Woodruff key

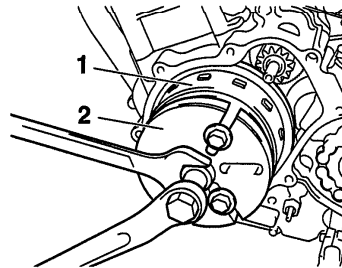
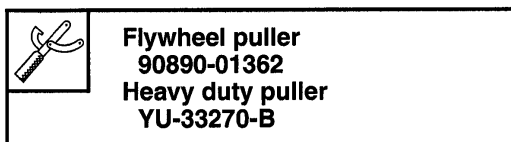
ECA13680

CAUTION:

To protect the end of the crankshaft, place an appropriate sized socket between the flywheel puller set center bolt and the crankshaft.

NOTE:

Make sure the flywheel puller is centered over the generator rotor.



EAS24560

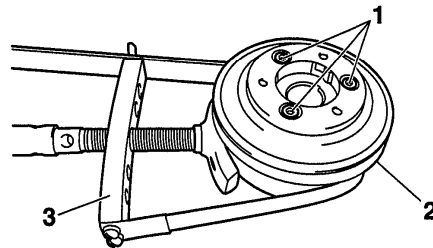
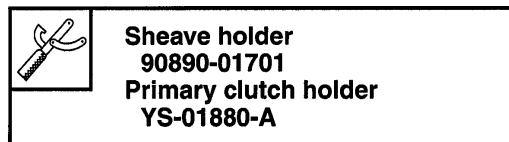
REMOVING THE STARTER CLUTCH

1. Remove:

- Starter clutch bolts "1"

NOTE:

- While holding the generator rotor "2" with the sheave holder "3", remove the starter clutch bolts.
- Do not allow the sheave holder to touch the projection on the generator rotor.



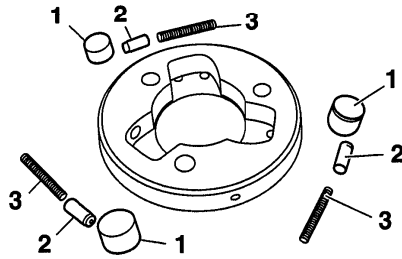
EAS24570

CHECKING THE STARTER CLUTCH

1. Check:

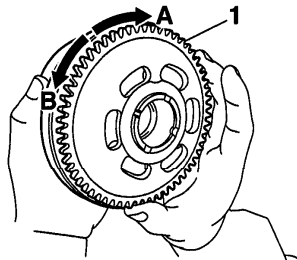
- Starter clutch rollers "1"
 - Starter clutch spring caps "2"
 - Starter clutch springs "3"
- Damage/wear → Replace the starter clutch assembly.

GENERATOR AND STARTER CLUTCH



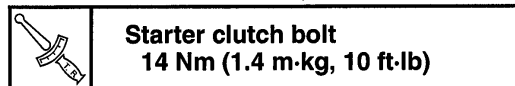
2. Check:
 - Starter clutch idle gear
 - Starter clutch gear
 - Burrs/chips/roughness/wear → Replace the defective part(s).
3. Check:
 - Starter clutch gear contacting surfaces
 - Damage/pitting/wear → Replace the starter clutch gear.
4. Check:
 - Starter clutch operation

- a. Install the starter clutch gear "1" onto the starter clutch and hold the generator rotor.
- b. When turning the starter clutch gear clockwise "A", the starter clutch and the starter clutch gear should engage, otherwise the starter clutch is faulty and must be replaced.
- c. When turning the starter clutch gear counter-clockwise "B", it should turn freely, otherwise the starter clutch is faulty and must be replaced.



INSTALLING THE STARTER CLUTCH

1. Install:
 - Starter clutch assembly
 - Starter clutch bolts "1" **New**

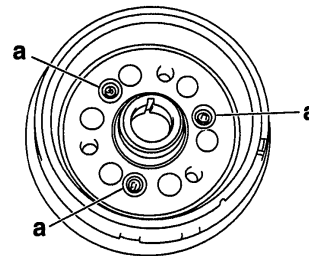
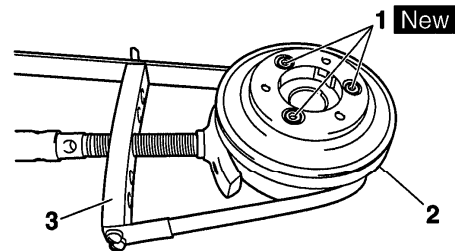


NOTE:

- While holding the generator rotor "2" with the sheave holder "3", tighten the starter clutch bolts.
- Do not allow the sheave holder to touch the projection on the generator rotor.
- Stake the end "a" of each starter clutch bolt.



Sheave holder
90890-01701
Primary clutch holder
YS-01880-A



EAS24500

INSTALLING THE GENERATOR

1. Install:
 - Woodruff key
 - Generator rotor
 - Washer
 - Generator rotor nut

NOTE:

- Clean the tapered portion of the crankshaft and the generator rotor hub.
- When installing the generator rotor, make sure the woodruff key is properly sealed in the key-way of the crankshaft.

2. Tighten:
 - Generator rotor nut "1"



Generator rotor nut
70 Nm (7.0 m·kg, 50 ft·lb)

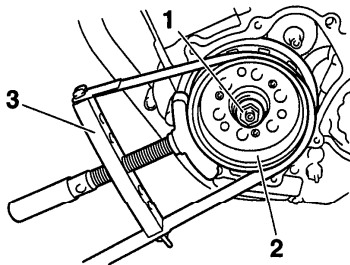
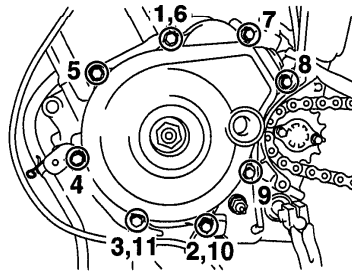
GENERATOR AND STARTER CLUTCH

NOTE:

- While holding the generator rotor "2" with the sheave holder "3", tighten the generator rotor nut.
- Do not allow the sheave holder to touch the projection on the generator rotor.



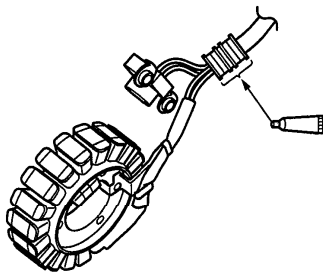
Sheave holder
90890-01701
Primary clutch holder
YS-01880-A



3. Apply:
- Sealant
(onto the crankshaft position sensor/stator assembly lead grommet)



Yamaha bond No. 1215
90890-85505
(Three Bond No.1215®)



4. Install:
- Generator cover



Generator cover bolt
10 Nm (1.0 m·kg, 7.2 ft·lb)

NOTE:

Tighten the generator cover bolts in the proper tightening sequence as shown.

ELECTRIC STARTER

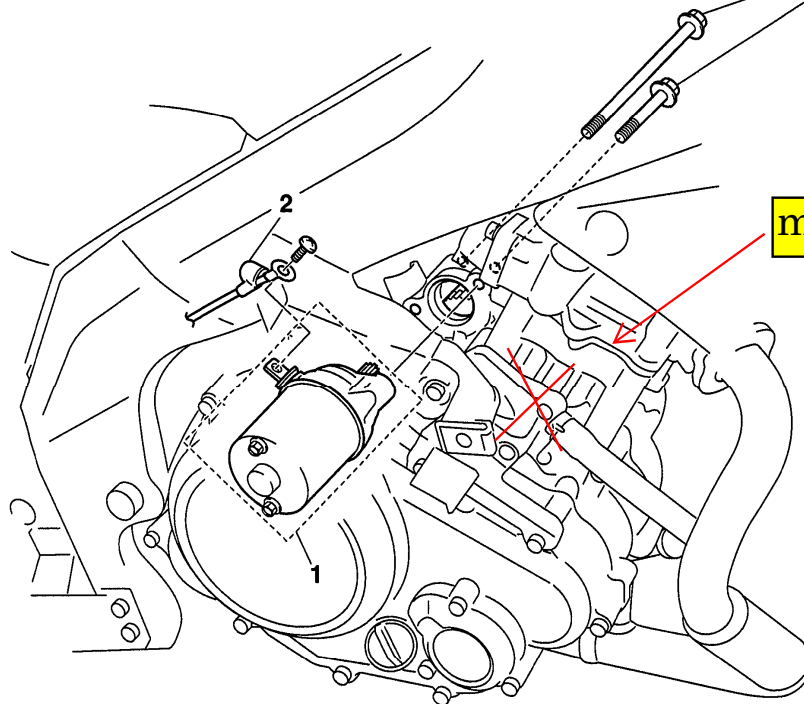
EAS24780

ELECTRIC STARTER

Removing the starter motor



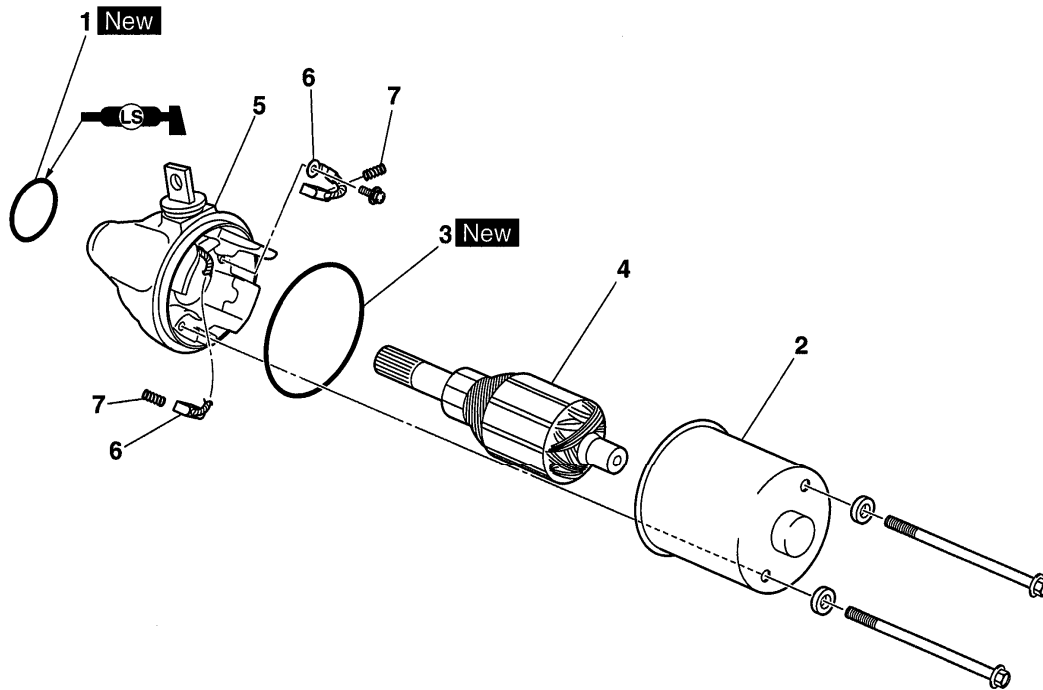
10 Nm (1.0 m · kg, 7.2 ft · lb)



Order	Job/Parts to remove	Q'ty	Remarks
1	Starter motor	1	
2	Starter motor lead	1	Disconnect.
			For installation, reverse the removal procedure.

ELECTRIC STARTER

Disassembling the starter motor



Order	Job/Parts to remove	Q'ty	Remarks
1	O-ring	1	
2	Starter motor yoke	1	
3	O-ring	1	
4	Commutator	1	
5	Starter motor front cover/brush holder set	1	
6	Brush	2	
7	Brush spring	2	
			For assembly, reverse the disassembly procedure.

ELECTRIC STARTER

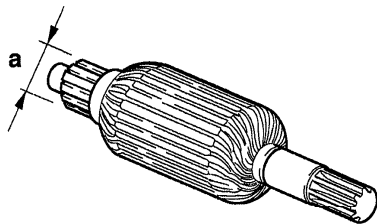
EAS24790

CHECKING THE STARTER MOTOR

1. Check:
 - Commutator
Dirt → Clean with 600 grit sandpaper.
2. Measure:
 - Commutator diameter "a"
Out of specification → Replace the starter motor.



Limit
16.6 mm (0.65 in)



3. Measure:
 - Mica undercut "a"
Out of specification → Scrape the mica to the proper measurement with a hacksaw blade that has been grounded to fit the commutator.



Mica undercut (depth)
1.35 mm (0.05 in)

NOTE:

The mica of the commutator must be undercut to ensure proper operation of the commutator.



4. Measure:
 - Armature assembly resistances (commutator and insulation)
Out of specification → Replace the starter motor.

- a. Measure the armature assembly resistances with the pocket tester.

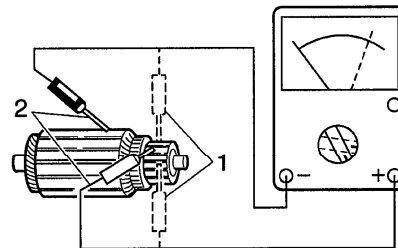


Pocket tester
90890-03112
Analog pocket tester
YU-03112-C



Armature coil
Commutator resistance "1"
0.0315–0.0385 Ω
Insulation resistance "2"
Above 1 M Ω

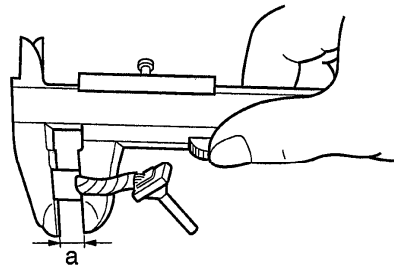
- b. If any resistance is out of specification, replace the starter motor.



5. Measure:
 - Brush length "a"
Out of specification → Replace the starter motor front cover/brush holder set.



Limit
3.50 mm (0.14 in)



6. Measure:
 - Brush spring force
Out of specification → Replace the brush springs as a set.



Brush spring force
3.92–5.88 N (14.11–21.17 oz)
(400–600 gf)

ELECTRIC STARTER

7. Check:

- Gear teeth

Damage/wear → Replace the gear.

8. Check:

- Bearing
- Oil seal

Damage/wear → Replace the starter motor front cover/brush holder set.

EAS24800

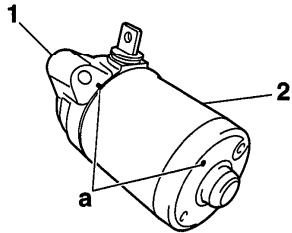
ASSEMBLING THE STARTER MOTOR

1. Install:

- Starter motor front cover/brush holder set "1"
- Starter motor yoke "2"

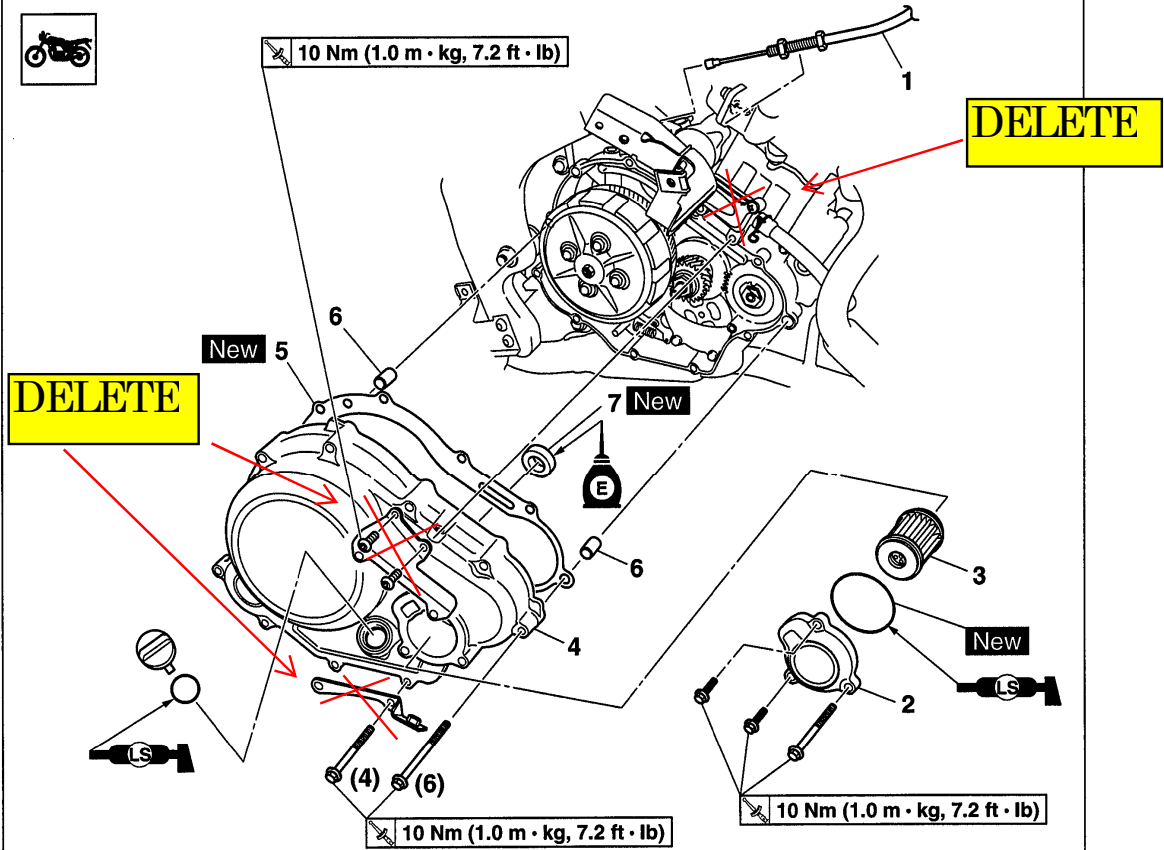
NOTE: _____

Align the marks "a" on the starter motor yoke and starter motor front cover/brush holder set.



EAS25061
CLUTCH

Removing the clutch cover

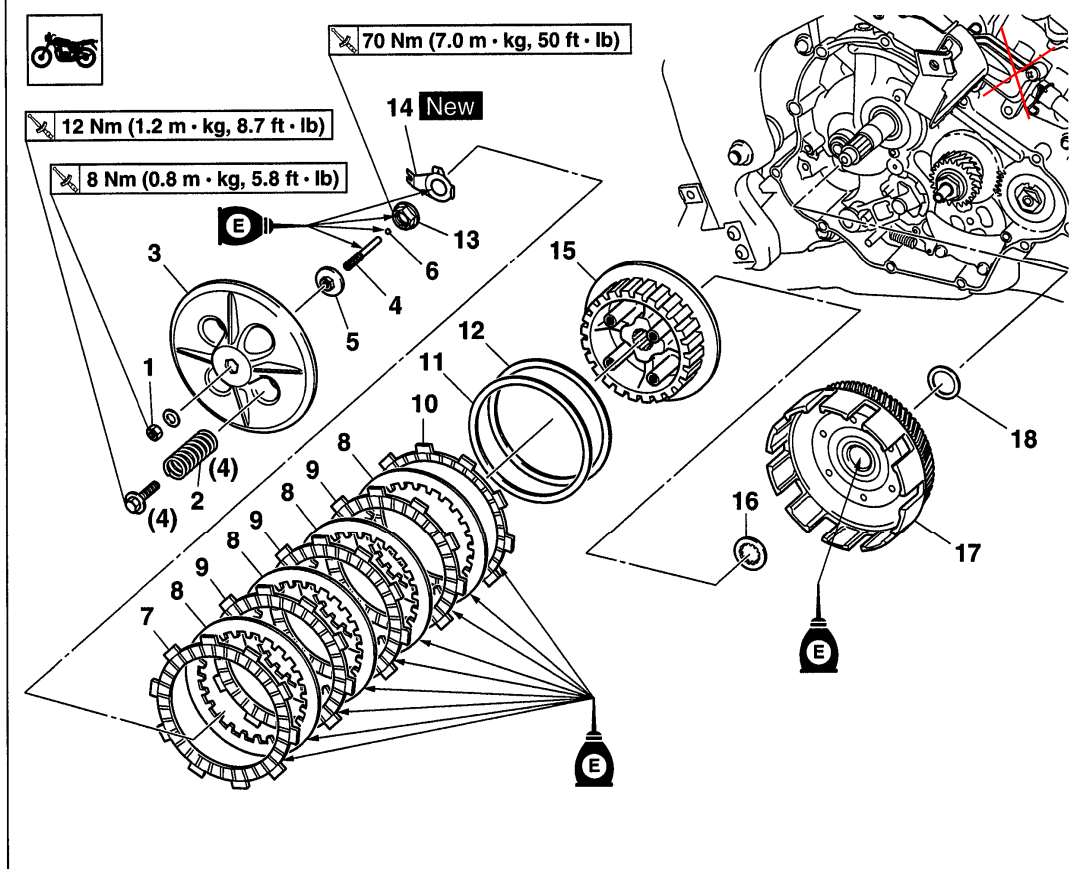


Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Drain.
	Right lower side cowling		
1	Clutch cable	1	Disconnect.
2	Oil filter element cover	1	
3	Oil filter element	1	
4	Clutch cover	1	
5	Clutch cover gasket	1	
6	Dowel pin	2	
7	Oil seal	1	
			For installation, reverse the removal procedure.

DELETE

CLUTCH

Removing the clutch



Order	Job/Parts to remove	Q'ty	Remarks
1	Locknut	1	
2	Clutch spring	4	
3	Pressure plate	1	
4	Short clutch push rod	1	
5	Clutch push rod holder	1	
6	Ball	1	
7	Friction plate 1	1	
8	Clutch plate	4	
9	Friction plate 3 (Green)	3	
10	Friction plate 2	1	
11	Clutch damper spring	1	
12	Clutch damper spring seat	1	
13	Clutch boss nut	1	
14	Lock washer	1	
15	Clutch boss	1	
16	Thrust washer	1	
17	Clutch housing	1	

DELETE

CLUTCH

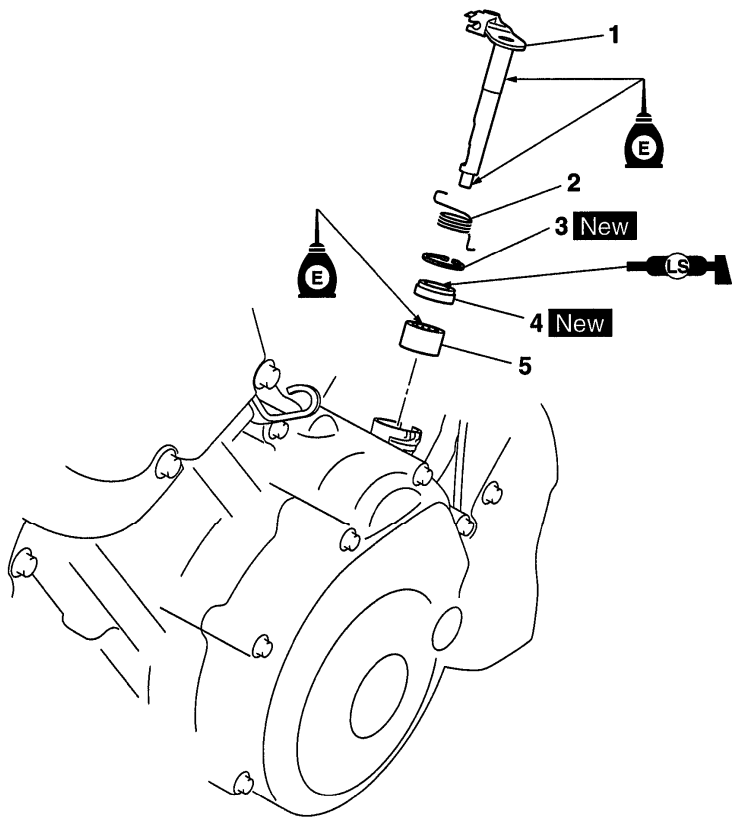
Removing the clutch

The diagram shows the removal of a motorcycle clutch assembly. It includes an exploded view of the components, numbered 1 through 18. Torque specifications are provided for several steps: 12 Nm (1.2 m · kg, 8.7 ft · lb) for step 1, 8 Nm (0.8 m · kg, 5.8 ft · lb) for step 2, and 70 Nm (7.0 m · kg, 50 ft · lb) for step 14. A 'New' label is next to part 14. A red arrow points from the 'CLUTCH' label to the assembly area. A table at the bottom lists the parts to be removed.

Order	Job/Parts to remove	Q'ty	Remarks
18	Conical spring washer	1	
			For installation, reverse the removal procedure.

CLUTCH

Removing the push lever



Order	Job/Parts to remove	Q'ty	Remarks
1	Clutch push lever	1	
2	Clutch push lever spring	1	
3	Circlip	1	
4	Oil seal	1	
5	Bearing	1	
			For installation, reverse the removal procedure.

CLUTCH

EAS25070

REMOVING THE CLUTCH

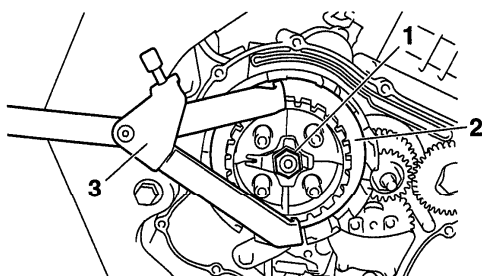
1. Straighten the lock washer tab.
2. Loosen:
 - Clutch boss nut "1"

NOTE:

While holding the clutch boss "2" with the universal clutch holder "3", loosen the clutch boss nut.



Universal clutch holder
90890-04086
YM-91042



EAS25100

CHECKING THE FRICTION PLATES

The following procedure applies to all of the friction plates.

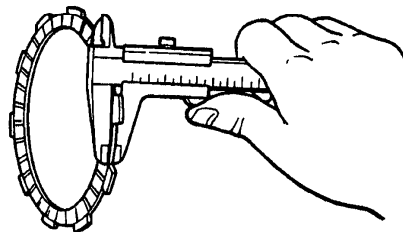
1. Check:
 - Friction plate
Damage/wear → Replace the friction plates as a set.
2. Measure:
 - Friction plate thickness
Out of specification → Replace the friction plates as a set.

NOTE:

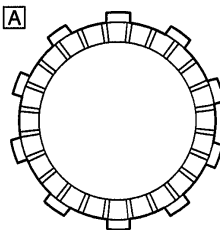
Measure the friction plate at four places.



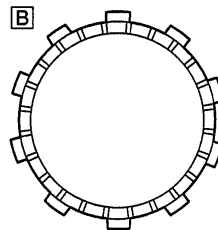
Friction plate 1 thickness
2.90–3.10 mm (0.114–0.122 in)
Wear limit
2.80 mm (0.110 in)
Friction plate 2 thickness
2.90–3.10 mm (0.114–0.122 in)
Wear limit
2.80 mm (0.1102 in)
Friction plate 3 thickness
2.90–3.10 mm (0.114–0.122 in)
Wear limit
2.80 mm (0.1102 in)



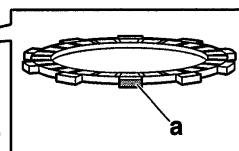
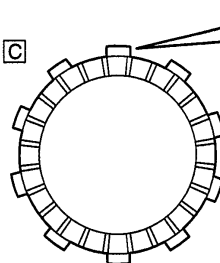
A



B



C



- A. Friction plate 1
- B. Friction plate 2
- C. Friction plate 3 (Green)
- a. Green paint

EAS25110

CHECKING THE CLUTCH PLATES

The following procedure applies to all of the clutch plates.

1. Check:
 - Clutch plate
Damage → Replace the clutch plates as a set.
2. Measure:
 - Clutch plate warpage
(with a surface plate and thickness gauge "1")
Out of specification → Replace the clutch plates as a set.

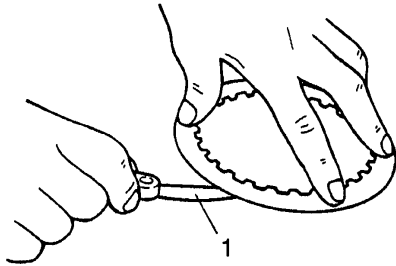


Thickness gauge
90890-03180
Feeler gauge set
YU-26900-9

CLUTCH



Clutch plate thickness
1.45–1.75 mm (0.057–0.069 in)
Warpage limit
0.20 mm (0.0079 in)



EAS25140

CHECKING THE CLUTCH SPRINGS

The following procedure applies to all of the clutch springs.

1. Check:

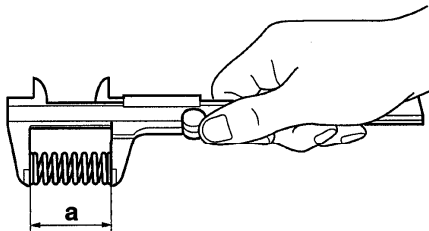
- Clutch spring
Damage → Replace the clutch springs as a set.

2. Measure:

- Clutch spring free length "a"
Out of specification → Replace the clutch springs as a set.



Clutch spring free length
38.71 mm (1.52 in)
Minimum length
36.77 mm (1.45 in)



EAS25150

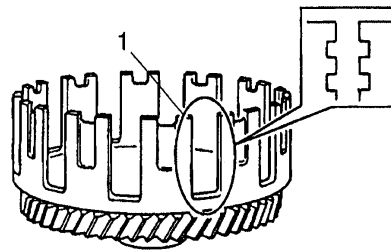
CHECKING THE CLUTCH HOUSING

1. Check:

- Clutch housing dogs "1"
Damage/pitting/wear → Deburr the clutch housing dogs or replace the clutch housing.

NOTE:

Pitting on the clutch housing dogs will cause erratic clutch operation.



2. Check:

- Bearing
Damage/wear → Replace the bearing and clutch housing.

EAS25160

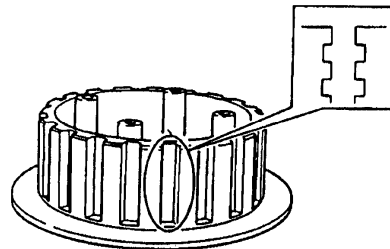
CHECKING THE CLUTCH BOSS

1. Check:

- Clutch boss splines
Damage/pitting/wear → Replace the clutch boss.

NOTE:

Pitting on the clutch boss splines will cause erratic clutch operation.



EAS25170

CHECKING THE PRESSURE PLATE

1. Check:

- Pressure plate
Cracks/damage → Replace.

EAS5071013

CHECKING THE CLUTCH PUSH LEVER AND SHORT CLUTCH PUSH ROD

1. Check:

- Clutch push lever
- Short clutch push rod
Damage/wear → Replace the defective part(s).

EAS25200

CHECKING THE PRIMARY DRIVE GEAR

1. Remove:

- Primary drive gear
Refer to "BALANCER GEAR" on page 5-53.

CLUTCH

2. Check:

- Primary drive gear
Damage/wear → Replace the primary drive gear and clutch housing as a set.
Excessive noise during operation → Replace the primary drive gear and clutch housing as a set.

3. Install:

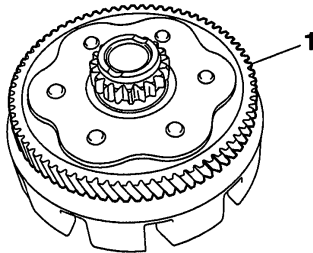
- Primary drive gear
Refer to "BALANCER GEAR" on page 5-53.

EAS25210

CHECKING THE PRIMARY DRIVEN GEAR

1. Check:

- Primary driven gear "1"
Damage/wear → Replace the primary drive gear and clutch housing as a set.
Excessive noise during operation → Replace the primary drive gear and clutch housing as a set.



EAS25240

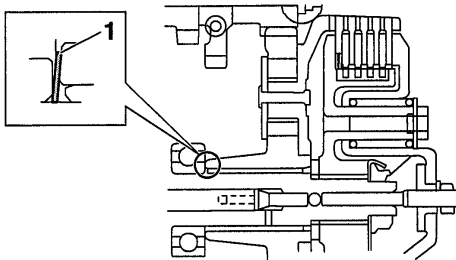
INSTALLING THE CLUTCH

1. Install:

- Conical spring washer "1"

NOTE:

Install the conical spring washer as shown in the illustration.

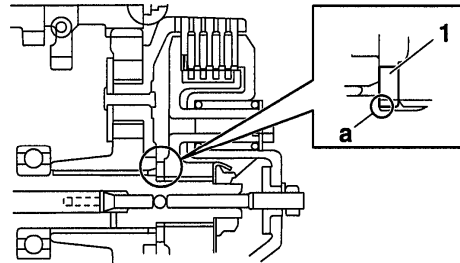


2. Install:

- Clutch housing
- Thrust washer "1"

NOTE:

Be sure to install the thrust washer so that its sharp edge "a" is facing away from the clutch boss.

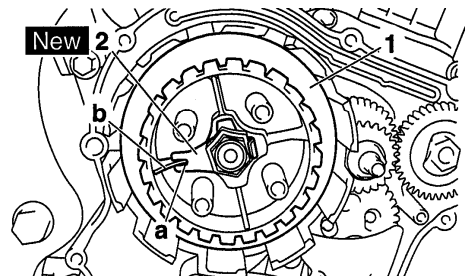


3. Install:

- Clutch boss "1"
- Lock washer "2" **New**
- Clutch boss nut

NOTE:

- Lubricate the clutch boss nut threads and lock washer mating surfaces with engine oil.
- Align the notch "a" in the lock washer with a rib "b" on the clutch boss.



4. Tighten:

- Clutch boss nut "1"



Clutch boss nut
70 Nm (7.0 m·kg, 50 ft·lb)

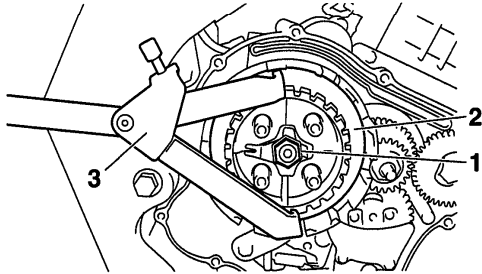
NOTE:

While holding the clutch boss "2" with the universal clutch holder "3", tighten the clutch boss nut.

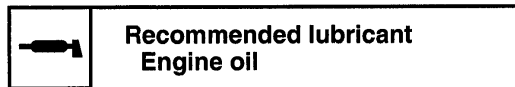


Universal clutch holder
90890-04086
YM-91042

CLUTCH



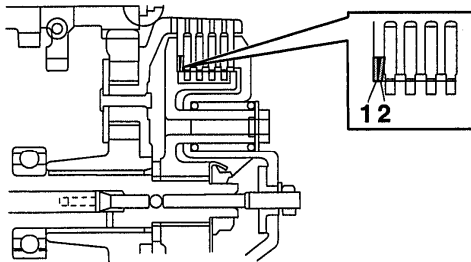
5. Bend the lock washer tab along a flat side of the nut.
6. Lubricate:
 - Friction plates
 - Clutch plates
 - (with the recommended lubricant)



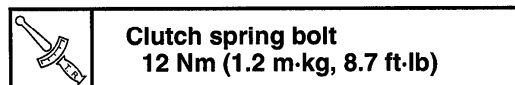
7. Install:
 - Clutch damper spring seat "1"
 - Clutch damper spring "2"
 - Friction plate 2
 - Clutch plates
 - Friction plates 3
 - Friction plate 1

NOTE:

- Install the clutch damper spring seat and clutch damper spring as shown in the illustration.
- First, install a friction plate and then alternate between a clutch plate and a friction plate.

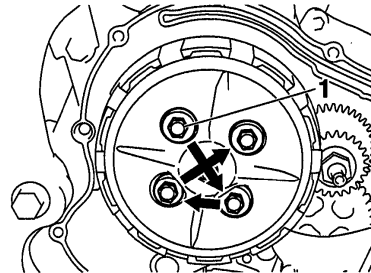


8. Install:
 - Pressure plate
 - Clutch springs
 - Clutch spring bolts "1"



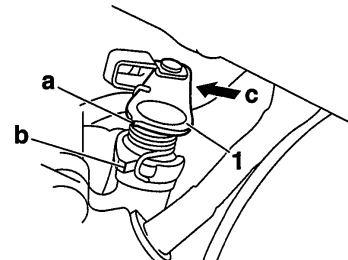
NOTE:

Tighten the clutch spring bolts in stages and in a crisscross pattern.

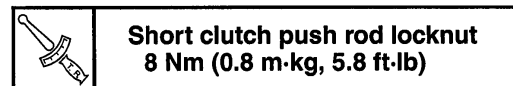


9. Adjust:
 - Clutch mechanism free play

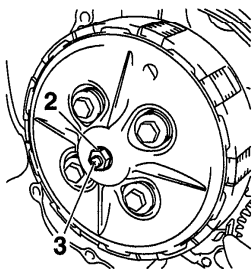
- a. Check that projection "a" on the clutch push lever "1" aligns with mark "b" shown on the crankcase in the illustration by pushing the clutch push lever manually in direction "c" until it stops.



- b. If projection "a" is not aligned with mark "b", align them as follows:
 - Loosen the locknut "2".
 - With the clutch push lever fully pushed in direction "c", turn the short clutch push rod "3" in or out until projection "a" aligns with mark "b".
 - Hold the short clutch push rod to prevent it from moving and then tighten the locknut to specification.



CLUTCH

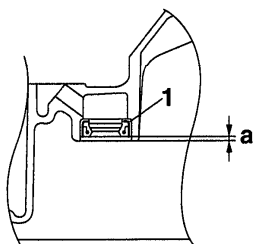


10. Install:

- Oil seal "1"



Installed depth of oil seal "a"
1.4–1.9 mm (0.055–0.075 in)



11. Install:

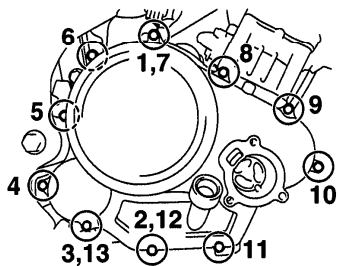
- Clutch cover



Clutch cover bolt
10 Nm (1.0 m·kg, 7.2 ft·lb)

NOTE:

Tighten the clutch cover bolts in the proper tightening sequence as shown.



12. Adjust:

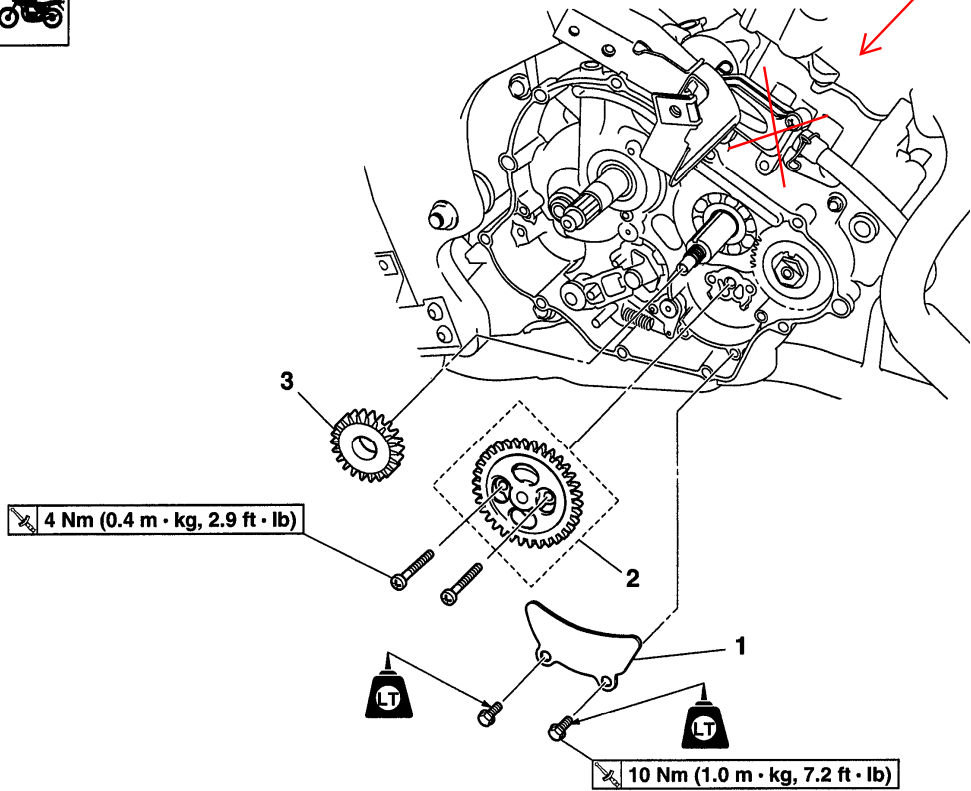
- Clutch cable free play
Refer to "ADJUSTING THE CLUTCH CABLE
FREE PLAY" on page 3-12.

EAS24911

OIL PUMP

DELETE

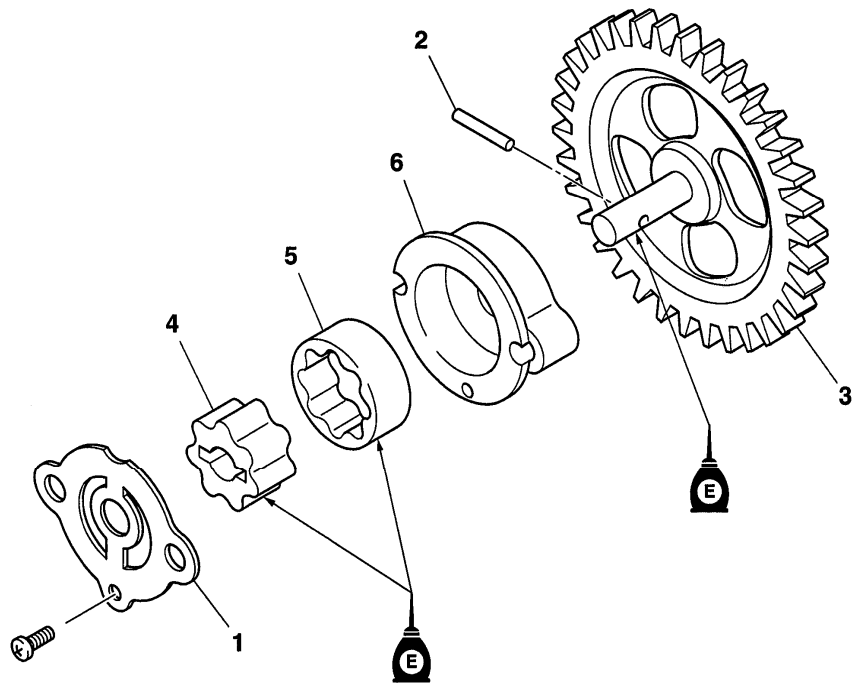
Removing the oil pump



Order	Job/Parts to remove	Q'ty	Remarks
	Clutch housing		
	Balancer drive gear		
1	Oil baffle plate	1	
2	Oil pump assembly	1	
3	Oil pump drive gear	1	
			For installation, reverse the removal procedure.

OIL PUMP

Disassembling the oil pump



Order	Job/Parts to remove	Q'ty	Remarks
1	Oil pump housing cover	1	
2	Pin	1	
3	Oil pump driven gear	1	
4	Oil pump inner rotor	1	
5	Oil pump outer rotor	1	
6	Oil pump housing	1	
			For assembly, reverse the disassembly procedure.

OIL PUMP

EAS24960

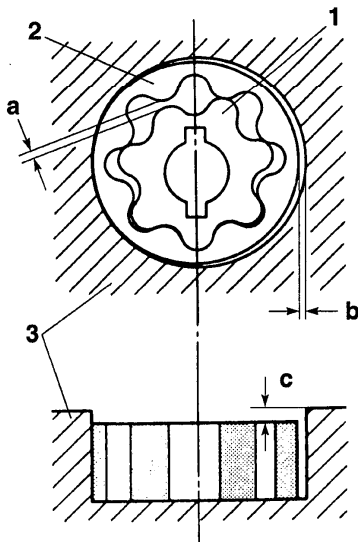
CHECKING THE OIL PUMP

1. Check:

- Oil pump drive gear
 - Oil pump driven gear
 - Oil pump housing
 - Oil pump housing cover
- Cracks/damage/wear → Replace the defective part(s).

2. Measure:

- Inner-rotor-to-outer-rotor-tip clearance "a"
 - Outer-rotor-to-oil-pump-housing clearance "b"
 - Oil-pump-housing-to-inner-rotor-and-outer-rotor clearance "c"
- Out of specification → Replace the oil pump.



- 1. Inner rotor
- 2. Outer rotor
- 3. Oil pump housing



Inner-rotor-to-outer-rotor-tip clearance

Less than 0.15 mm (0.0059 in)

Limit

0.23 mm (0.0091 in)

Outer-rotor-to-oil-pump-housing clearance

0.13–0.18 mm (0.0051–0.0071 in)

Limit

0.25 mm (0.0098 in)

Oil-pump-housing-to-inner-and-outer-rotor clearance

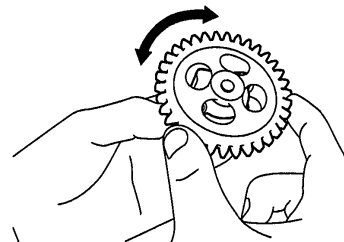
0.06–0.11 mm (0.0024–0.0043 in)

Limit

0.18 mm (0.0071 in)

3. Check:

- Oil pump operation
- Rough movement → Repeat steps (1) and (2) or replace the defective part(s).



EAS25000

ASSEMBLING THE OIL PUMP

1. Lubricate:

- Oil pump inner rotor
 - Oil pump outer rotor
 - Oil pump driven gear
- (with the recommended lubricant)



Recommended lubricant
Engine oil

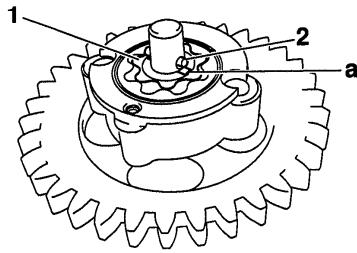
2. Install:

- Oil pump outer rotor
- Oil pump inner rotor "1"
- Oil pump driven gear
- Pin "2"

NOTE:

When installing the inner rotor, align the pin "2" in the oil pump shaft with the groove "a" in the inner rotor "1".

OIL PUMP



3. Check:

- Oil pump operation
Refer to "CHECKING THE OIL PUMP" on page 5-49.

EAS25020

INSTALLING THE OIL PUMP

1. Install:

- Oil pump assembly



Oil pump assembly screw
4 Nm (0.4 m·kg, 2.9 ft·lb)

ECA5D71021

CAUTION:

After tightening the screws, make sure the oil pump turns smoothly.

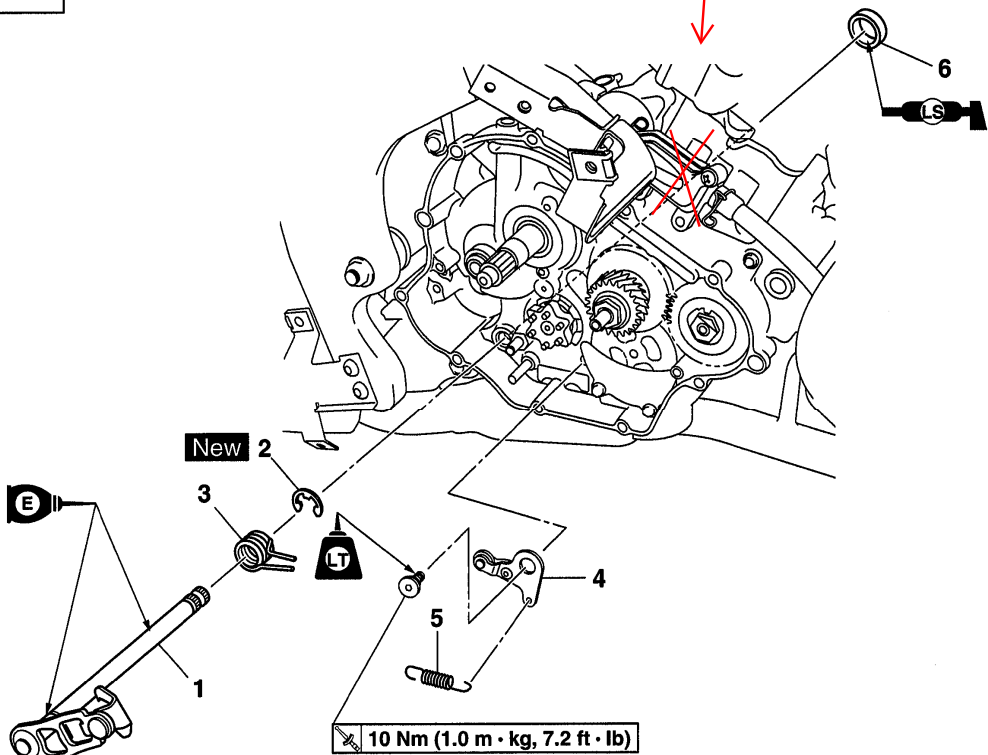
SHIFT SHAFT

EAS25410
SHIFT SHAFT

Removing the shift shaft and stopper lever



DELETE



Order	Job/Parts to remove	Q'ty	Remarks
	Clutch housing		
	Shift arm		
1	Shift shaft	1	
2	Circlip	1	
3	Shift shaft spring	1	
4	Stopper lever	1	
5	Stopper lever spring	1	
6	Oil seal	1	
			For installation, reverse the removal procedure.

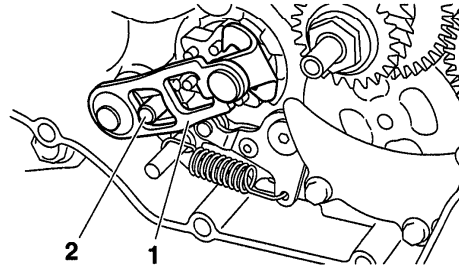
SHIFT SHAFT

EAS25420

CHECKING THE SHIFT SHAFT

1. Check:

- Shift shaft
Bends/damage/wear → Replace.
- Shift shaft spring
Damage/wear → Replace.



EAS25430

CHECKING THE STOPPER LEVER

1. Check:

- Stopper lever
Bends/damage → Replace.
Roller turns roughly → Replace the stopper lever.
- Stopper lever spring
Damage/wear → Replace.

EAS25450

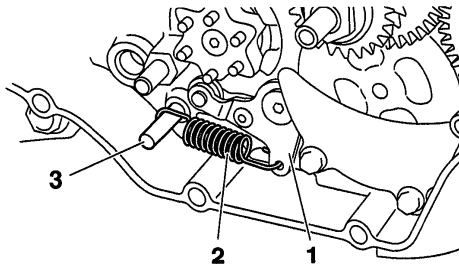
INSTALLING THE SHIFT SHAFT

1. Install:

- Stopper lever "1"
- Stopper lever spring "2"

NOTE:

- Install the stopper lever spring as shown in the illustration.
- Hook the ends of the stopper lever spring onto the stopper lever and the crankcase boss "3".
- Mesh the stopper lever with the shift drum segment assembly.



2. Install:

- Shift shaft "1"

NOTE:

Hook the end of the shift shaft spring onto the shift shaft spring stopper "2".

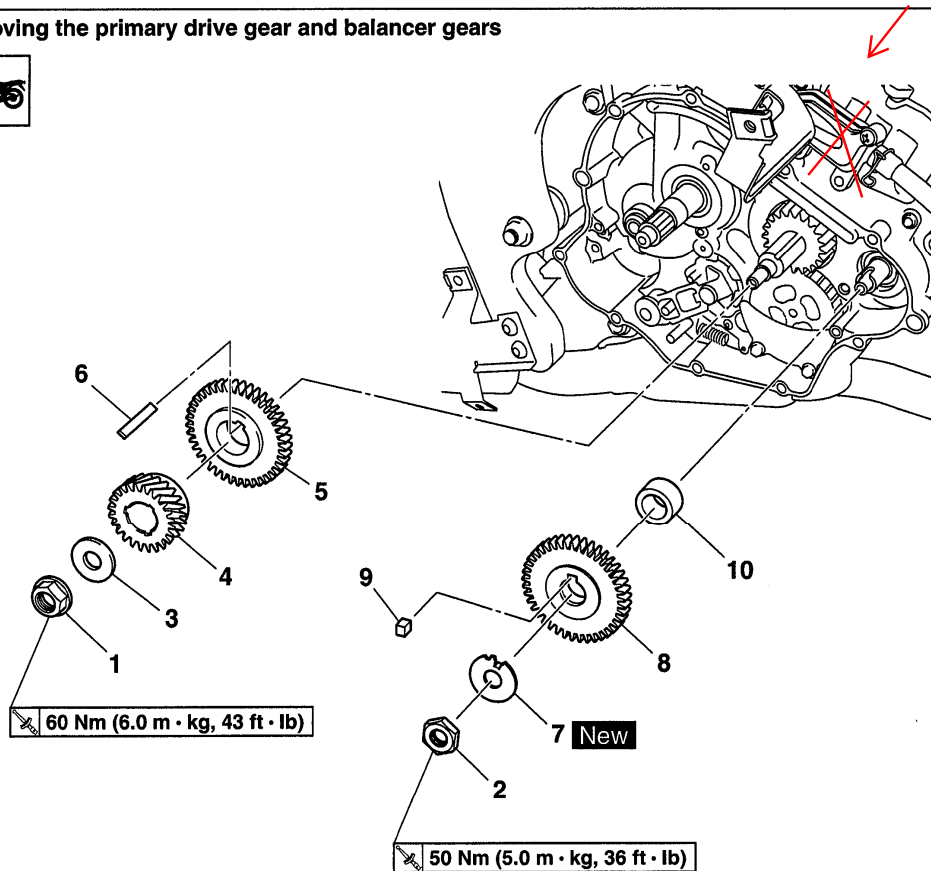
BALANCER GEAR

EAS5D71017

BALANCER GEAR

mod. AIS

Removing the primary drive gear and balancer gears



Order	Job/Parts to remove	Q'ty	Remarks
	Clutch housing		
1	Primary drive gear nut	1	
2	Balancer driven gear nut	1	
3	Washer	1	
4	Primary drive gear	1	
5	Balancer drive gear	1	
6	Straight key	1	
7	Lock washer	1	
8	Balancer driven gear	1	
9	Straight key	1	
10	Spacer	1	
			For installation, reverse the removal procedure.

BALANCER GEAR

EAS5D71018

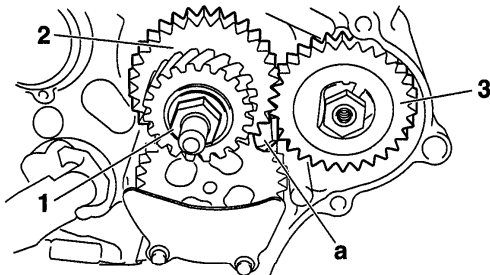
REMOVING THE PRIMARY DRIVE GEAR AND BALANCER GEARS

1. Loosen:

- Primary drive gear nut "1"

NOTE:

Place the aluminum plate "a" between the balancer drive gear "2" and the balancer driven gear "3", and then loosen the primary drive gear nut.



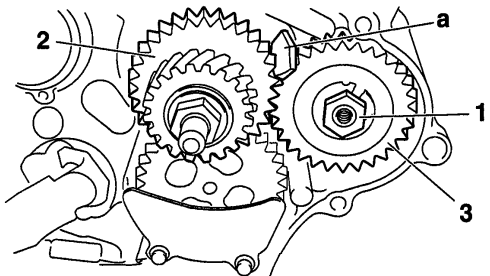
2. Straighten the lock washer tab.

3. Loosen:

- Balancer driven gear nut "1"

NOTE:

Place the aluminum plate "a" between the balancer drive gear "2" and the balancer driven gear "3", and then loosen the balancer driven gear nut.



EAS5D71019

CHECKING THE BALANCER GEARS AND PRIMARY DRIVE GEAR

1. Check:

- Balancer drive gear
- Balancer driven gear
- Cracks/damage/wear → Replace.

2. Check:

- Primary drive gear

EAS5D71021

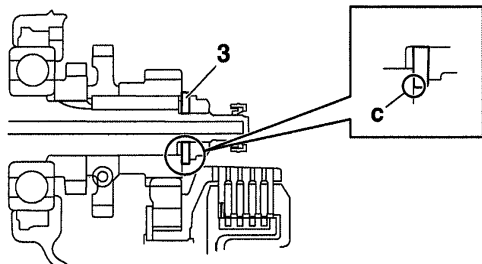
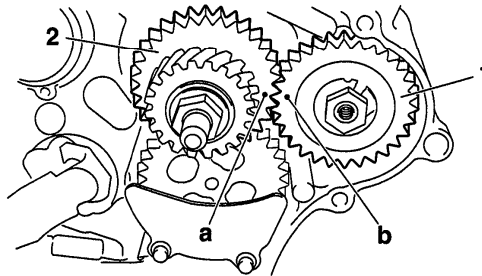
INSTALLING THE PRIMARY DRIVE GEAR AND BALANCER GEARS

1. Install:

- Balancer driven gear "1"
- Lock washer **New**
- Balancer drive gear "2"
- Primary drive gear
- Washer "3"
- Balancer driven gear nut
- Primary drive gear nut

NOTE:

- Align the punch mark "a" in the balancer drive gear "2" with the punch mark "b" in the balancer driven gear "1".
- Be sure to install the washer so that its sharp edge "c" is facing the primary drive gear.



2. Tighten:

- Balancer driven gear nut "1"
- Primary drive gear nut "2"



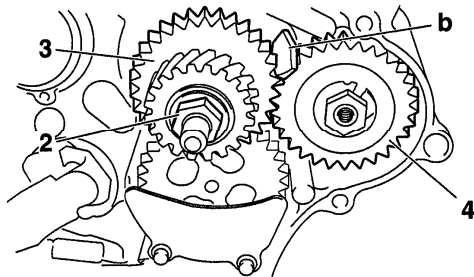
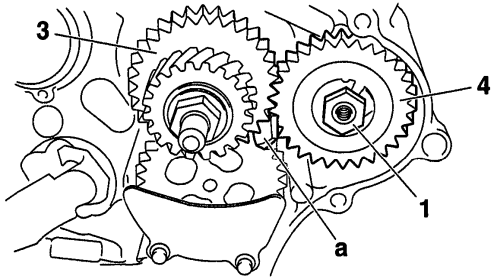
Balancer driven gear nut
50 Nm (5.0 m·kg, 36 ft·lb)
Primary drive gear nut
60 Nm (6.0 m·kg, 43 ft·lb)

NOTE:

- Place the aluminum plate "a" between the balancer drive gear "3" and the balancer driven gear "4", and then tighten the balancer driven gear nut.

BALANCER GEAR

- Place the aluminum plate "b" between the balancer drive gear "3" and the balancer driven gear "4", and then tighten the primary drive gear "4", and then tighten the primary drive gear nut.



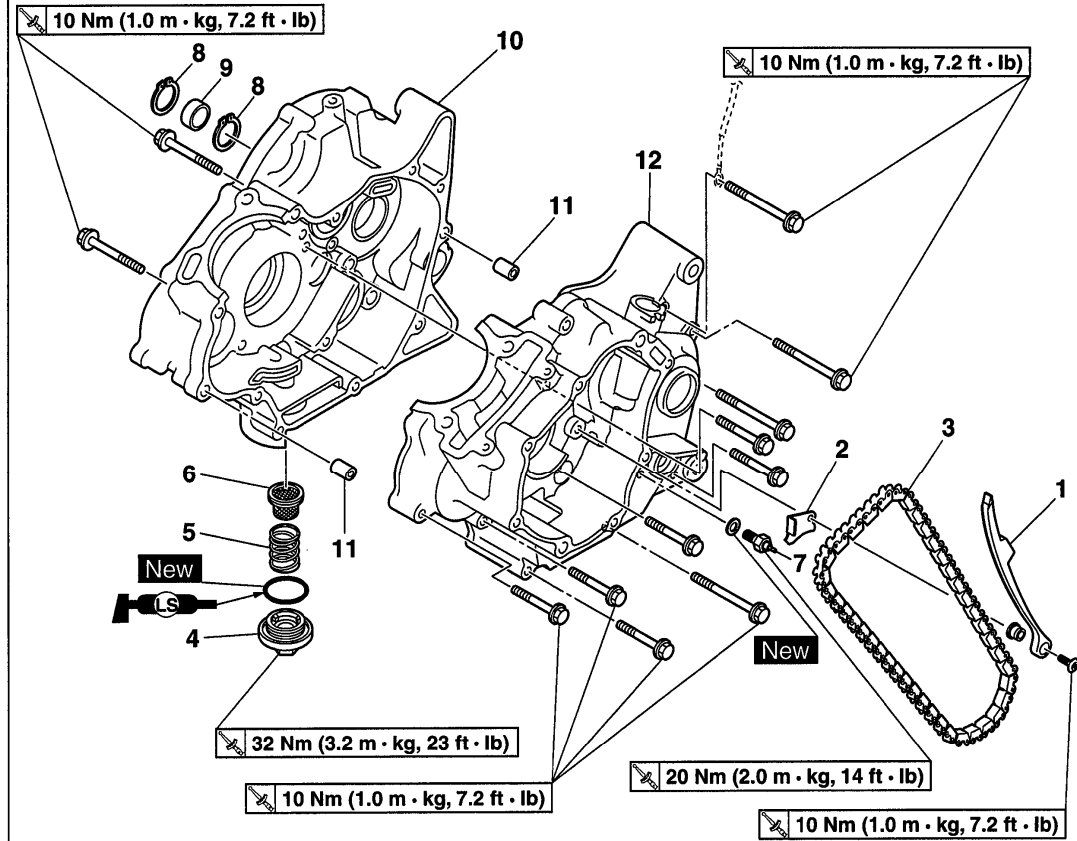
3. Bend the lock washer tab along a flat side of the nut.

CRANKCASE

EAS25540

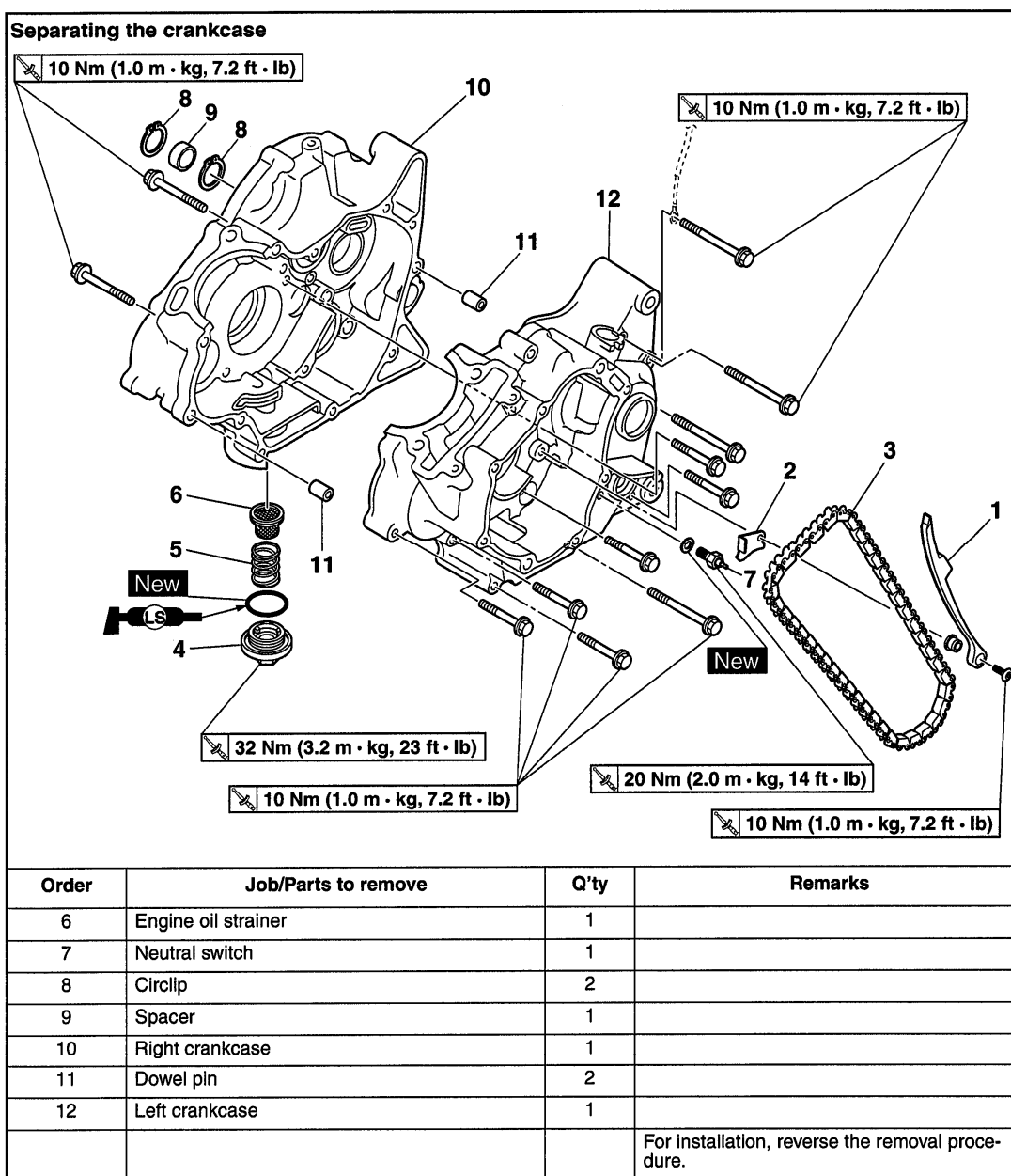
CRANKCASE

Separating the crankcase



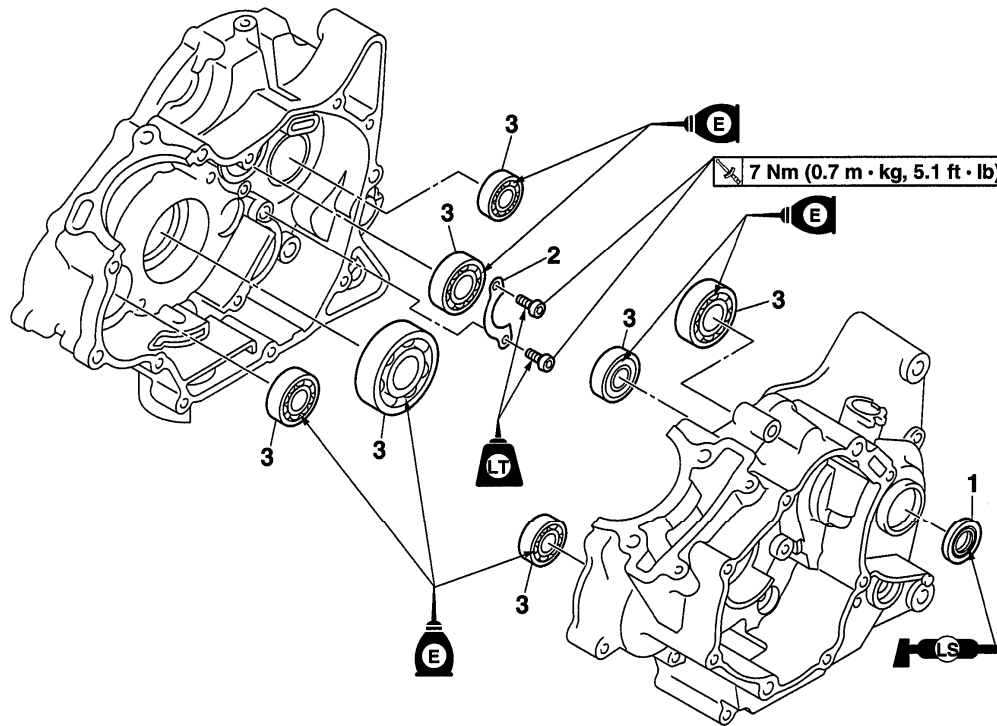
Order	Job/Parts to remove	Q'ty	Remarks
	Engine		
	Cylinder head		
	Cylinder/Piston		
	Clutch housing		
	Oil pump assembly		
	Shift shaft		
	Starter motor		
	Balancer gears		
	Generator rotor		
1	Timing chain guide (intake side)	1	
2	Chain cover	1	
3	Timing chain	1	
4	Engine oil drain plug	1	
5	Spring	1	

CRANKCASE



CRANKCASE

Removing the oil seal and bearings



Order	Job/Parts to remove	Q'ty	Remarks
	Crankshaft/Balancer		
	Transmission		
1	Oil seal	1	
2	Bearing retainer	1	
3	Bearing	7	
			For installation, reverse the removal procedure.

CRANKCASE

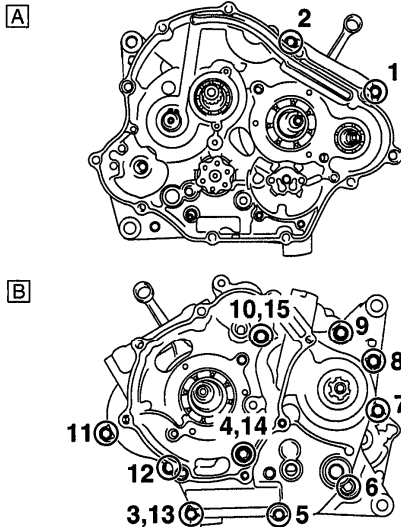
EAS5D71032

SEPARATING THE CRANKCASE

1. Remove:
 - Crankcase bolts

NOTE:

Loosen each bolt 1/4 of a turn at a time, in stages and in the proper sequence as shown.

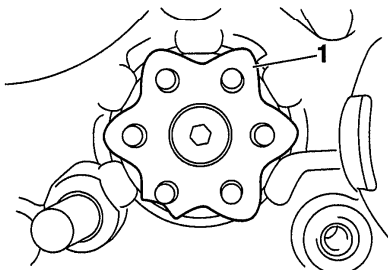


- A. Right crankcase
B. Left crankcase

2. Turn:
 - Shift drum segment

NOTE:

Turn the shift drum segment "1" to the position shown in the illustration. In this position, the shift drum segment teeth will not contact the crankcase during crankcase separation.



3. Remove:
 - Right crankcase

ECA13900

CAUTION:

Tap on one side of the crankcase with a soft-face hammer. Tap only on reinforced portions of the crankcase, not on the crankcase mating surfaces. Work slowly and carefully and make sure the crankcase halves separate evenly.

EAS25580

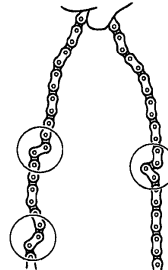
CHECKING THE CRANKCASE

1. Thoroughly wash the crankcase halves in a mild solvent.
2. Thoroughly clean all the gasket surfaces and crankcase mating surfaces.
3. Check:
 - Crankcase
 - Cracks/damage → Replace.
 - Oil delivery passages
 - Obstruction → Blow out with compressed air.

EAS5D71033

CHECKING THE TIMING CHAIN AND TIMING CHAIN GUIDE

1. Check:
 - Timing chain
 - Damage/stiffness → Replace the timing chain and camshaft sprocket as a set.



2. Check:
 - Timing chain guide (intake side)
 - Damage/wear → Replace.

EAS5D71034

CHECKING THE OIL STRAINER

1. Check:
 - Oil strainer
 - Damage → Replace.
 - Contaminants → Clean with solvent.

EAS5D71014

CHECKING THE BEARINGS AND OIL SEAL

1. Check:
 - Bearings
 - Clean and lubricate the bearings, and then rotate the inner race with your finger.
 - Rough movement → Replace.

CRANKCASE

- Oil seal
Damage/wear → Replace.

EAS5D71015

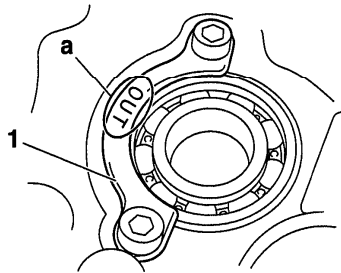
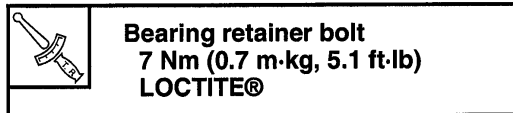
INSTALLING THE BEARING RETAINER

1. Install:

- Bearing retainer "1"

NOTE:

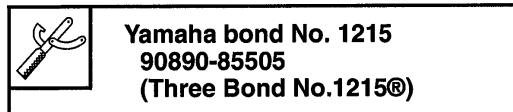
- Install the bearing retainer "1" with its "OUT" mark "a" facing outward.
- Apply locking agent (LOCTITE®) to the threads of the bearing retainer bolt.



EAS25700

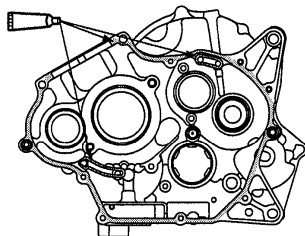
ASSEMBLING THE CRANKCASE

1. Thoroughly clean all the gasket mating surfaces and crankcase mating surfaces.
2. Apply:
 - Sealant
(onto the crankcase mating surfaces)



NOTE:

Do not allow any sealant to come into contact with the oil gallery.

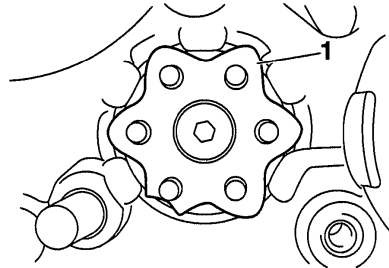


3. Install:

- Right crankcase

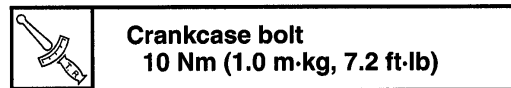
NOTE:

Turn the shift drum segment "1" to the position shown in the illustration. In this position, the shift drum segment teeth will not contact the crankcase during crankcase installation.



4. Install:

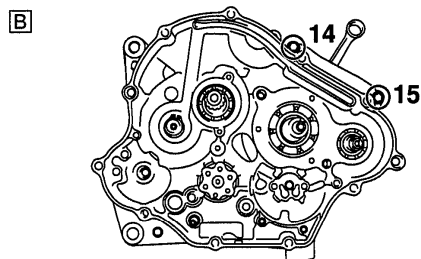
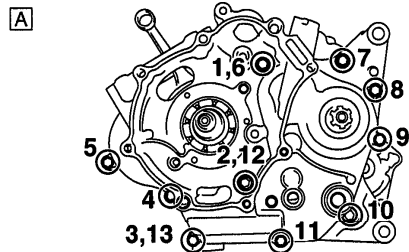
- Crankcase bolts



NOTE:

Tighten each bolt 1/4 of a turn at a time, in stages and in the proper sequence as shown.

- M6 × 70 mm : "7-9", "11"
- M6 × 55 mm : "14", "15"
- M6 × 45 mm : "1-5", "10"



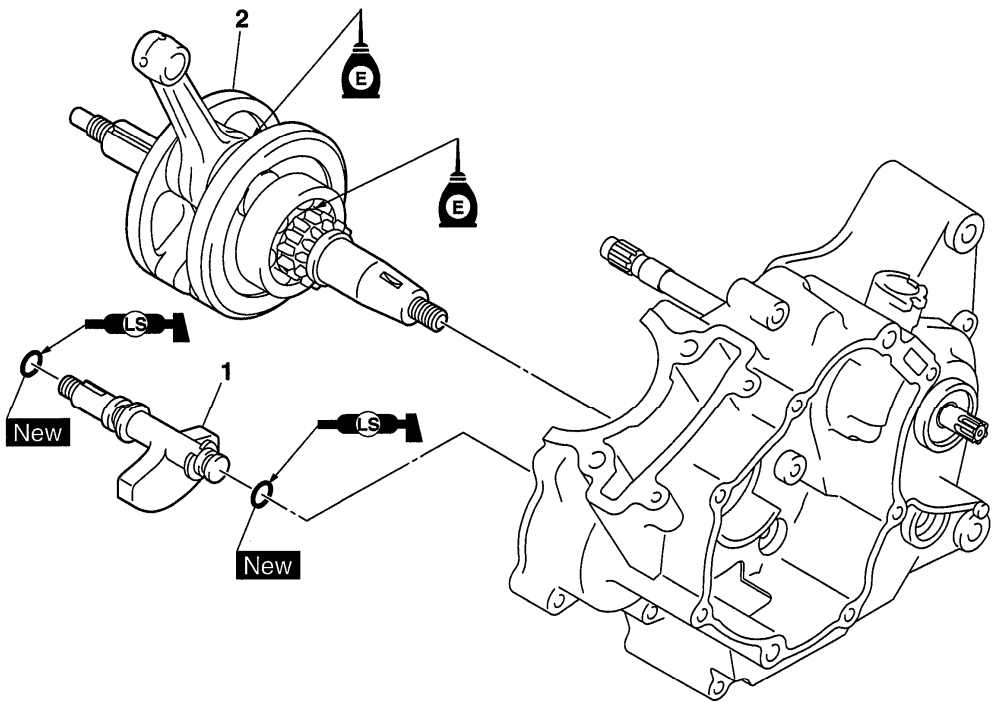
- A. Left crankcase
B. Right crankcase

CRANKSHAFT

EAS25960

CRANKSHAFT

Removing the crankshaft and balancer



Order	Job/Parts to remove	Q'ty	Remarks
	Crankcase		
1	Balancer	1	
2	Crankshaft	1	
			For installation, reverse the removal procedure.

CRANKSHAFT

EAS5D71016

REMOVING THE CRANKSHAFT

1. Remove:

- Crankshaft "1"

NOTE:

- Remove the crankshaft with the crankcase separating tool "2".
- Make sure the crankcase separating tool is centered over the crankshaft.

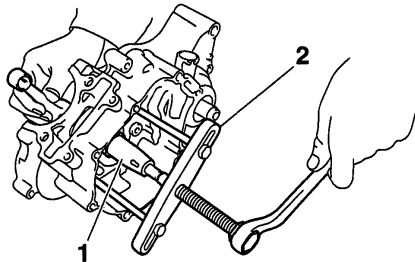
ECA5D71022

CAUTION:

- To protect the end of the crankshaft, place an appropriate sized socket between the crankcase separating tool bolt and the crankshaft.
- Do not tap on the crankshaft.



**Crankcase separating tool
90890-01135
Crankcase separator
YU-01135-B**



EAS5D71035

CHECKING THE CRANKSHAFT

1. Measure:

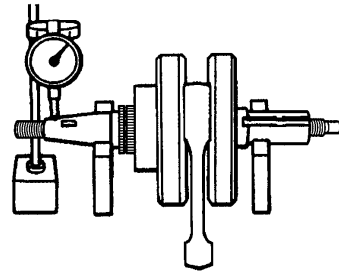
- Crankshaft runout
Out of specification → Replace the crankshaft, bearing or both.

NOTE:

Turn the crankshaft slowly.



**Runout limit C
0.030 mm (0.0012 in)**



2. Measure:

- Big end side clearance
Out of specification → Replace the crankshaft.



**Big end side clearance D
0.110–0.410 mm (0.0043–0.0161 in)**

3. Measure:

- Crankshaft width
Out of specification → Replace the crankshaft.



**Width A
47.95–48.00 mm (1.888–1.890 in)**

4. Check:

- Crankshaft sprocket
Damage/wear → Replace the crankshaft.
- Bearing
Cracks/damage/wear → Replace the crankshaft.

5. Check:

- Crankshaft journal
Scratches/wear → Replace the crankshaft.
- Crankshaft journal oil passage
Obstruction → Blow out with compressed air.

EAS5D71036

INSTALLING THE CRANKSHAFT

1. Install:

- Crankshaft "1"

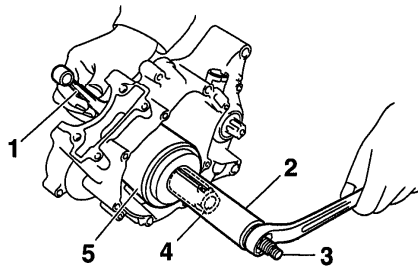
NOTE:

Install the crankshaft with the crankshaft installer pot "2", crankshaft installer bolt "3", adapter (M12) "4" and spacer (crankshaft installer) "5".

CRANKSHAFT



Crankshaft installer pot
90890-01274
Installing pot
YU-90058
Crankshaft installer bolt
90890-01275
Bolt
YU-90060
Adapter (M12)
90890-01278
Adapter #3
YU-90063
Spacer (crankshaft installer)
90890-04081
Pot spacer
YM-91044



ECA13970

CAUTION:

To avoid scratching the crankshaft and to ease the installation procedure, lubricate the oil seal lips with lithium-soap-based grease and each bearing with engine oil.

NOTE:

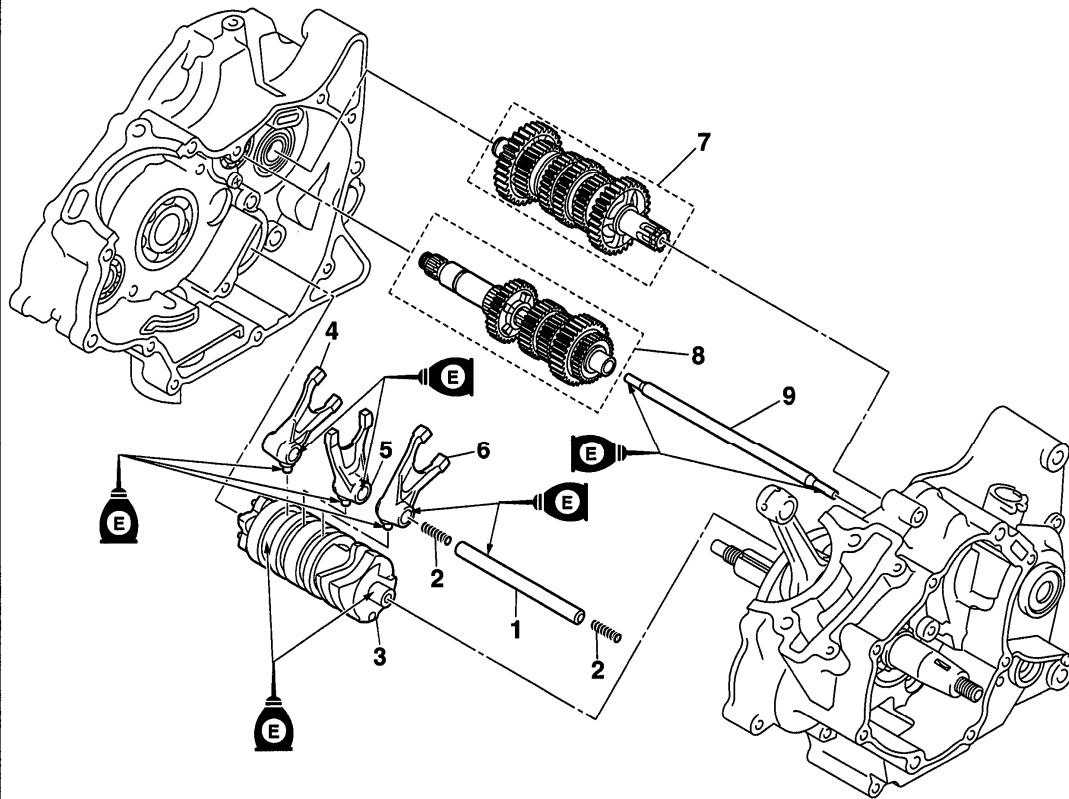
Hold the connecting rod at top dead center (TDC) with one hand while turning the nut of the crankshaft installer bolt with the other. Turn the crankshaft installer bolt until the crankshaft bottoms against the bearing.

TRANSMISSION

EAS26241

TRANSMISSION

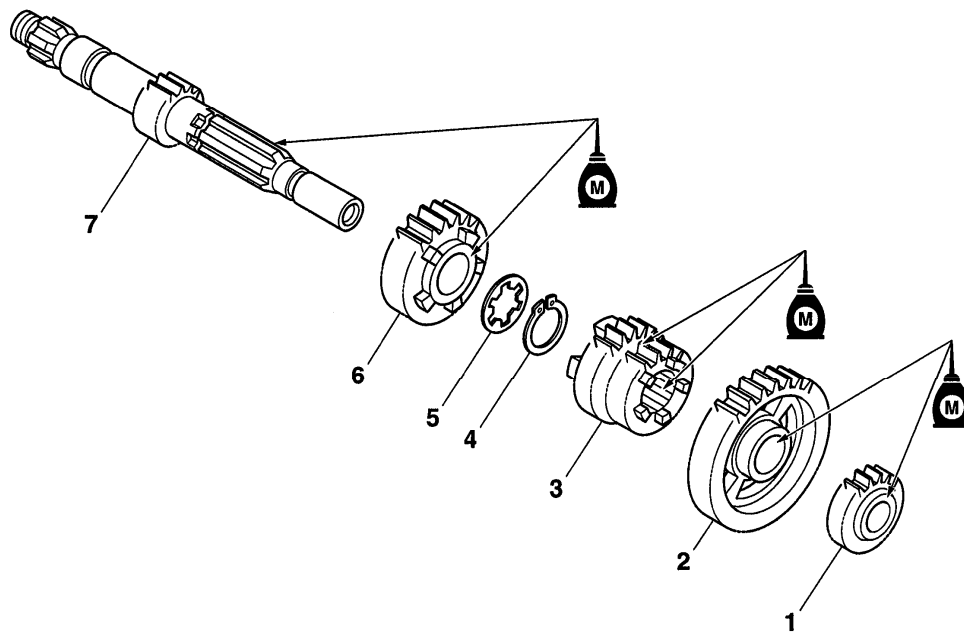
Removing the transmission, shift drum assembly, and shift forks



Order	Job/Parts to remove	Q'ty	Remarks
	Crankcase		
1	Shift fork guide bar	1	
2	Spring	2	
3	Shift drum assembly	1	
4	Shift fork-R	1	
5	Shift fork-C	1	
6	Shift fork-L	1	
7	Drive axle assembly	1	
8	Main axle assembly	1	
9	Long clutch push rod	1	
			For installation, reverse the removal procedure.

TRANSMISSION

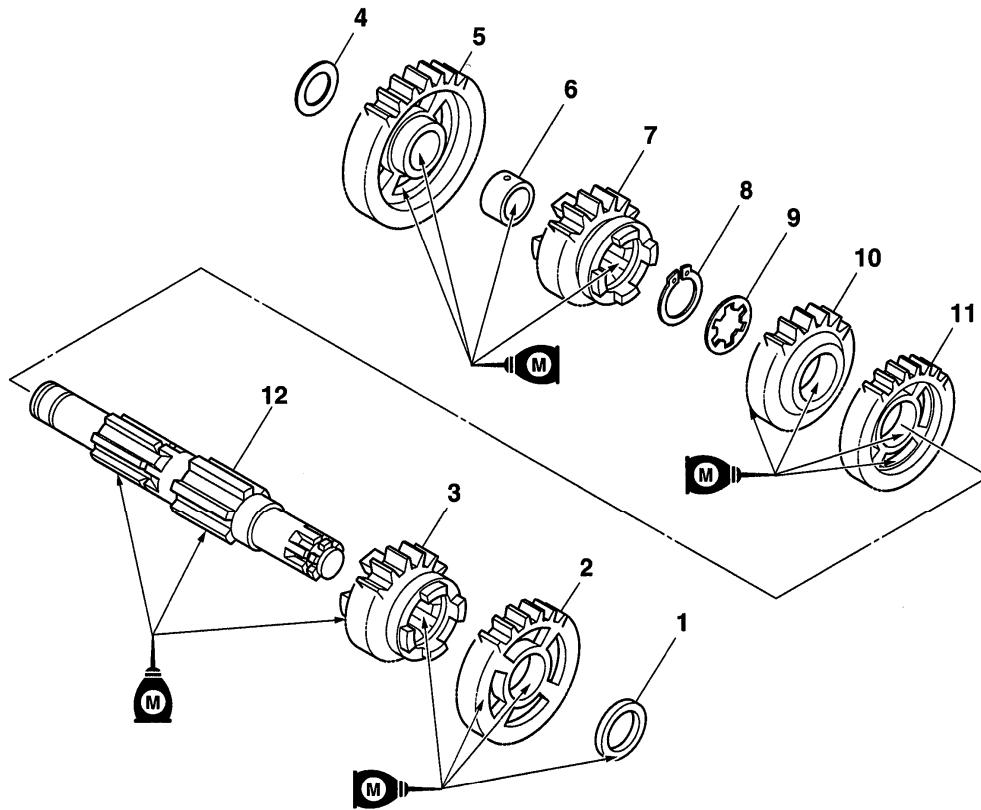
Disassembling the main axle



Order	Job/Parts to remove	Q'ty	Remarks
1	2nd pinion gear	1	
2	6th pinion gear	1	
3	3rd/4th pinion gear	1	
4	Circlip	1	
5	Toothed washer	1	
6	5th pinion gear	1	
7	Main axle/1st pinion gear	1	
			For assembly, reverse the disassembly procedure.

TRANSMISSION

Disassembling the drive axle



Order	Job/Parts to remove	Q'ty	Remarks
1	Washer	1	
2	2nd wheel gear	1	
3	6th wheel gear	1	
4	Washer	1	
5	1st wheel gear	1	
6	Spacer	1	
7	5th wheel gear	1	
8	Circlip	1	
9	Toothed washer	1	
10	4th wheel gear	1	
11	3rd wheel gear	1	
12	Drive axle	1	
			For assembly, reverse the disassembly procedure.

TRANSMISSION

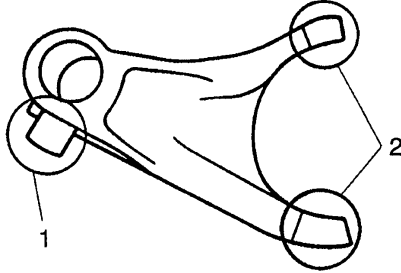
EAS26260

CHECKING THE SHIFT FORKS

The following procedure applies to all of the shift forks.

1. Check:

- Shift fork cam follower "1"
- Shift fork pawl "2"
Bends/damage/scoring/wear → Replace the shift fork.



2. Check:

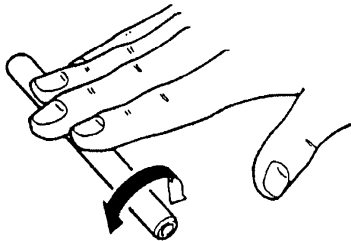
- Shift fork guide bar
Roll the shift fork guide bar on a flat surface.
Bends → Replace.

EWA12840



WARNING

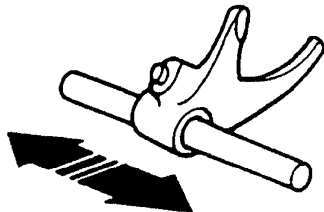
Do not attempt to straighten a bent shift fork guide bar.



319-010

3. Check:

- Shift fork movement
(along the shift fork guide bar)
Rough movement → Replace the shift forks and shift fork guide bar as a set.



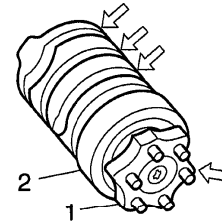
319-011

EAS26270

CHECKING THE SHIFT DRUM ASSEMBLY

1. Check:

- Shift drum groove
Damage/scratches/wear → Replace the shift drum assembly.
- Shift drum segment "1"
Damage/wear → Replace the shift drum assembly.
- Shift drum bearing "2"
Damage/pitting → Replace the shift drum assembly.



EAS26290

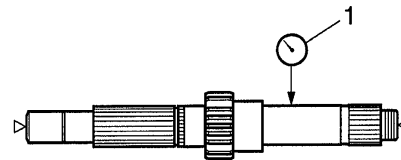
CHECKING THE TRANSMISSION

1. Measure:

- Main axle runout
(with a centering device and dial gauge "1")
Out of specification → Replace the main axle.



**Main axle runout limit
0.08 mm (0.0032 in)**



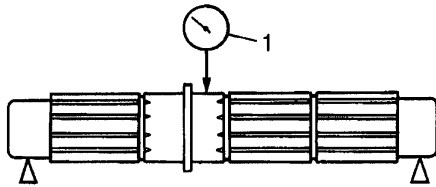
2. Measure:

- Drive axle runout
(with a centering device and dial gauge "1")
Out of specification → Replace the drive axle.



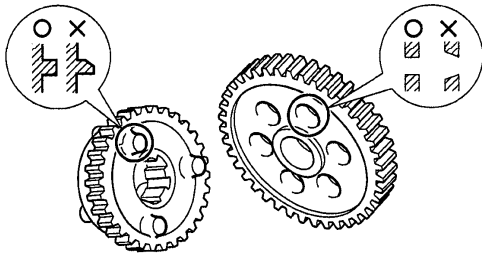
**Drive axle runout limit
0.08 mm (0.0032 in)**

TRANSMISSION



3. Check:

- Transmission gears
Blue discoloration/pitting/wear → Replace the defective gear(s).
- Transmission gear dogs
Cracks/damage/rounded edges → Replace the defective gear(s).



4. Check:

- Transmission gear engagement (each pinion gear to its respective wheel gear)
Incorrect → Reassemble the transmission axle assemblies.

5. Check:

- Transmission gear movement
Rough movement → Replace the defective part(s).

EAS26190

CHECKING THE CLUTCH PUSH RODS

1. Check:

- Long clutch push rod
Cracks/damage/wear → Replace the long clutch push rod.

2. Measure:

- Push rod bending limit
Out of specification → Replace the long clutch push rod.



Push rod bending limit
0.500 mm (0.0197 in)

EAS29020

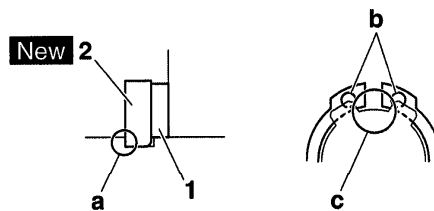
ASSEMBLING THE MAIN AXLE AND DRIVE AXLE

1. Install:

- Toothed washer "1"
- Circlip "2" **New**

NOTE:

- Be sure to install the circlip so that its sharp edge "a" is facing away from the toothed washer and gear.
- Be sure the circlip ends "b" are positioned at the axle spline groove "c".



2. Install:

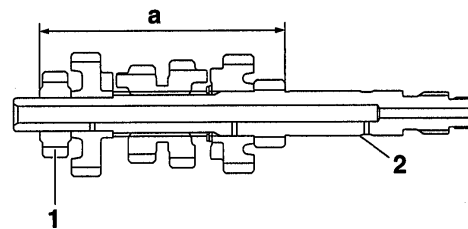
- 2nd pinion gear "1"

NOTE:

Press the 2nd pinion gear into the main axle "2", as shown in the illustration.



Installed depth "a"
106.85–107.05 mm (4.207–4.215 in)



EAS26320

INSTALLING THE SHIFT FORKS AND SHIFT DRUM ASSEMBLY

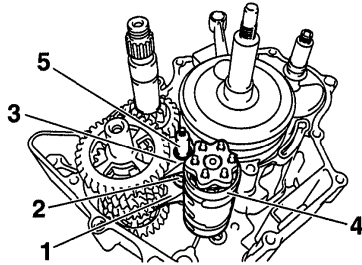
1. Install:

- Shift fork-L "1"
- Shift fork-C "2"
- Shift fork-R "3"
- Shift drum assembly "4"
- Springs
- Shift fork guide bar "5"

TRANSMISSION

NOTE:

The embossed marks on the shift forks should face towards the right side of the engine and be in the following sequence: "R", "C", "L".

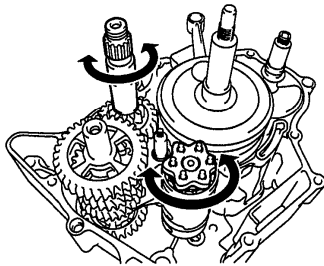


2. Check:

- Transmission
Rough movement → Repair.

NOTE:

- Apply engine oil to each gear and bearing thoroughly.
 - Before assembling the crankcase, make sure that the transmission is in neutral and that the gears turn freely.
-

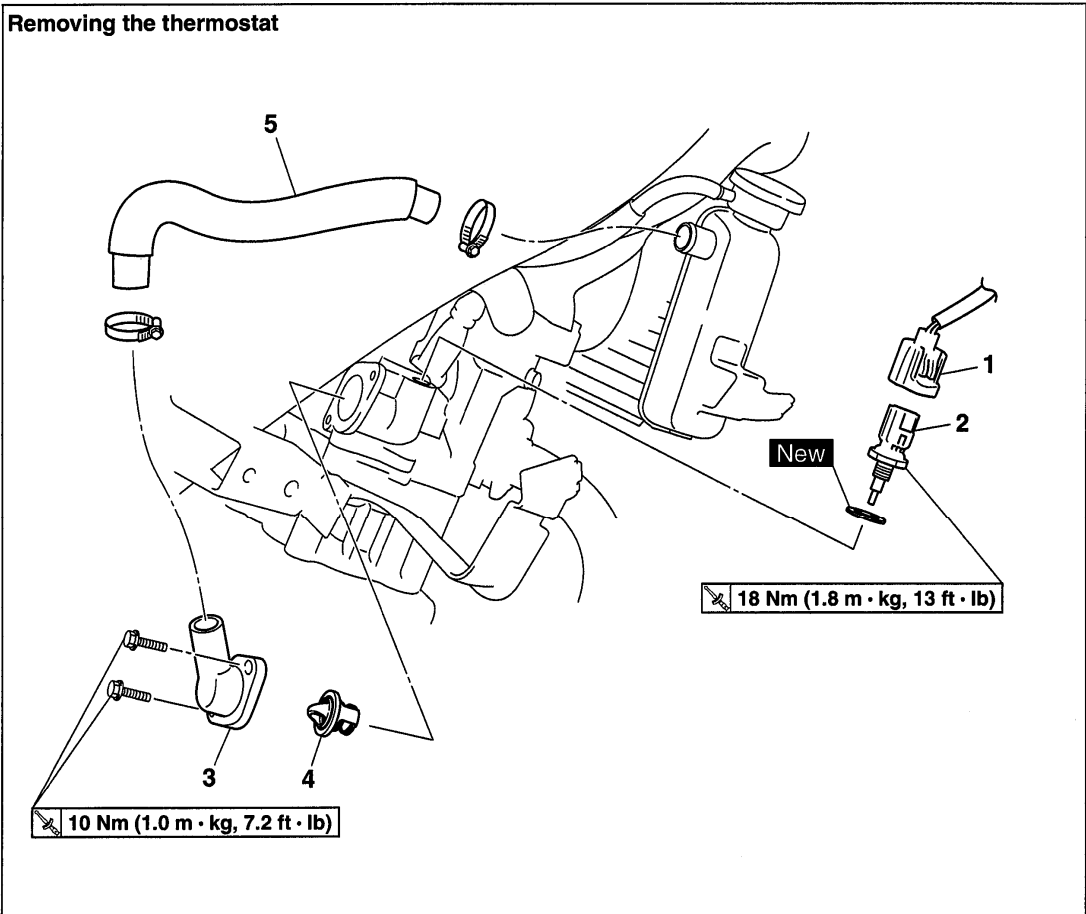


THERMOSTAT

EAS26440

THERMOSTAT

Removing the thermostat



Order	Job/Parts to remove	Q'ty	Remarks
1	Coolant temperature sensor coupler	1	Disconnect.
2	Coolant temperature sensor	1	
3	Thermostat cover	1	
4	Thermostat	1	
5	Radiator inlet hose	1	
			For installation, reverse the removal procedure.

THERMOSTAT

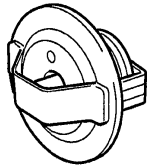
EAS26450

CHECKING THE THERMOSTAT

1. Check:

- Thermostat

Does not open at 80.5–83.5 °C (176.9–182.3 °F) → Replace.



2. Check:

- Thermostat cover
Cracks/damage → Replace.

3. Check:

- Radiator inlet hose
Cracks/damage → Replace.

EAS26450

INSTALLING THE THERMOSTAT

1. Install:

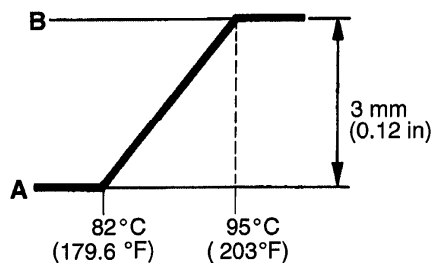
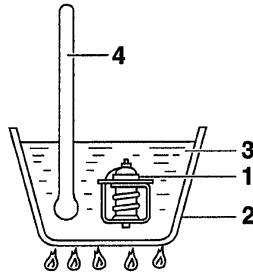
- Thermostat

NOTE:

Install the thermostat with its breather hole "a" facing up.



- Suspend the thermostat "1" in a container "2" filled with water.
- Slowly heat the water "3".
- Place a thermometer "4" in the water.
- While stirring the water, observe the thermostat and thermometer's indicated temperature.



A. Fully closed

B. Fully open

NOTE:

If the accuracy of the thermostat is in doubt, replace it. A faulty thermostat could cause serious overheating or overcooling.

2. Install:

- Copper washer **New**
- Coolant temperature sensor



Coolant temperature sensor
18 Nm (1.8 m·kg, 13 ft·lb)

ECA5D71004

CAUTION:

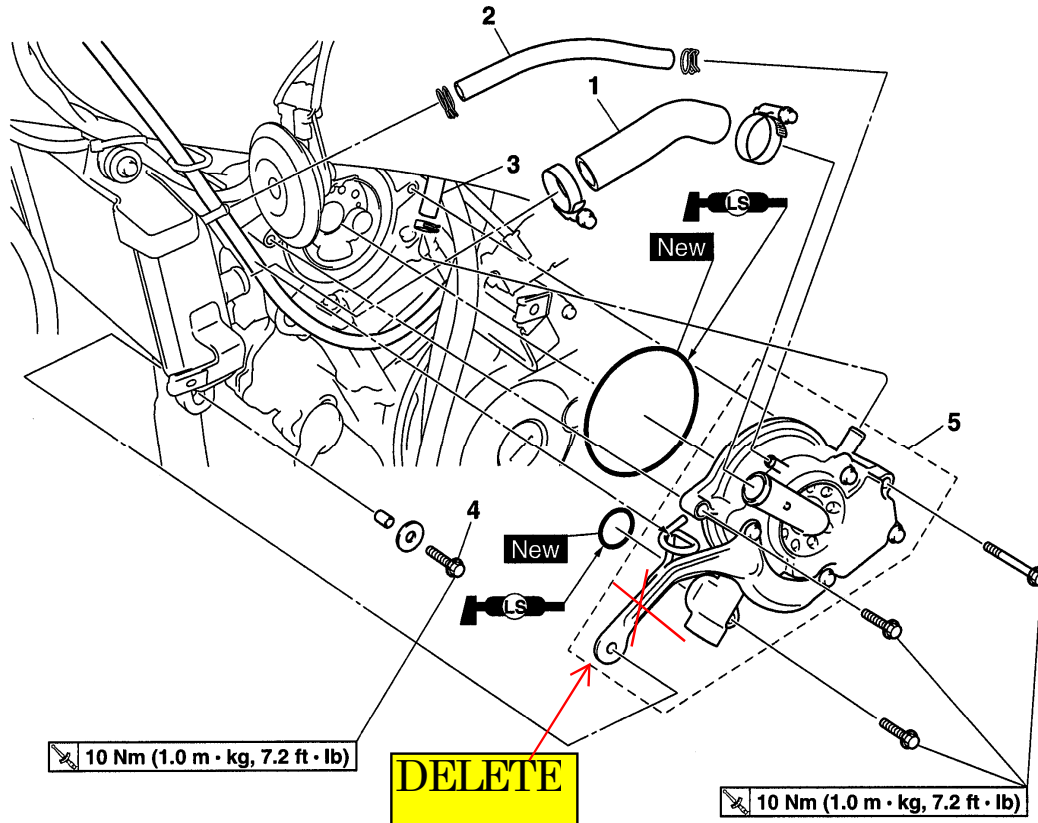
Use extreme care when handling the coolant temperature sensor. Replace any part that was dropped or subjected to a strong impact.

WATER PUMP

EAS26500

WATER PUMP

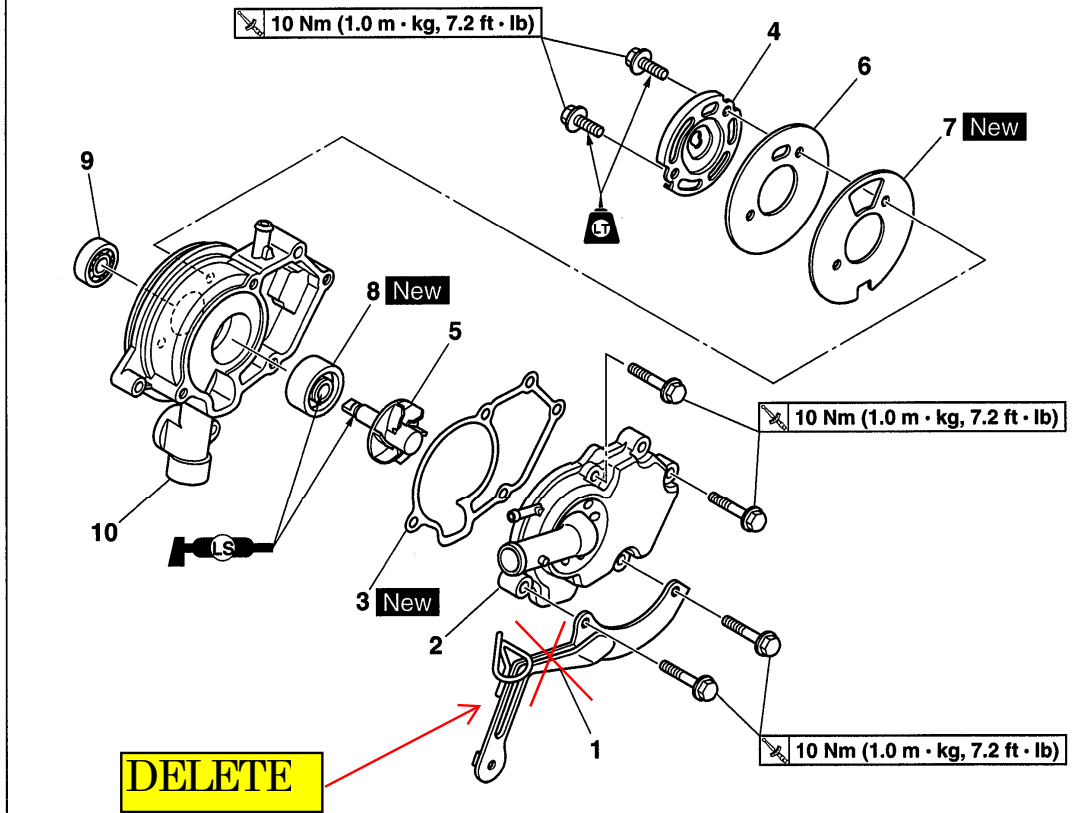
Removing the water pump



Order	Job/Parts to remove	Q'ty	Remarks
			It is not necessary to remove the water pump unless the coolant level is extremely low or the coolant contains engine oil.
1	Radiator outlet hose	1	
2	Water pump breather hose	1	
3	Cylinder head breather hose	1	Disconnect.
4	Radiator bolt	1	
5	Water pump assembly	1	
			For installation, reverse the removal procedure.

WATER PUMP

Disassembling the water pump



Order	Job/Parts to remove	Q'ty	Remarks
2	Water pump housing cover	1	
3	Water pump housing cover gasket	1	
4	Impeller shaft retainer	1	
5	Impeller shaft	1	
6	Water pump housing plate	1	
7	Water pump housing gasket	1	
8	Water pump seal	1	
9	Bearing	1	
10	Water pump housing	1	
			For assembly, reverse the disassembly procedure.

WATER PUMP

EAS26510

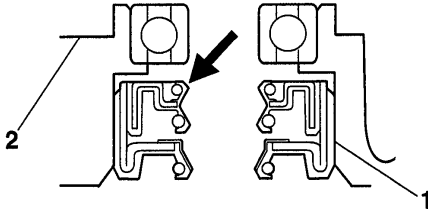
DISASSEMBLING THE WATER PUMP

1. Remove:

- Water pump seal "1"

NOTE:

Remove the water pump seal from the inside of the water pump housing "2".

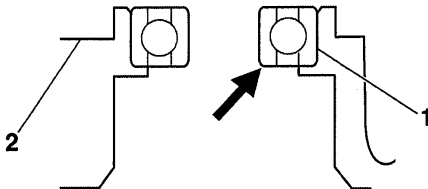


2. Remove:

- Bearing "1"

NOTE:

Remove the bearing from the outside of the water pump housing "2".



ECA14080

CAUTION:

Never lubricate the water pump seal surface with oil or grease.

NOTE:

- Install the water pump seal with the special tools.
- Install the water pump seal with the special tools to the specified depth as shown in the illustration.



Mechanical seal installer

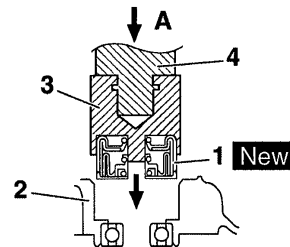
90890-04145

Middle driven shaft bearing driver

90890-04058

Bearing driver 40 mm

YM-04058



A. Push down

3. Mechanical seal installer

4. Middle driven shaft bearing driver

EAS26530

CHECKING THE WATER PUMP

1. Check:

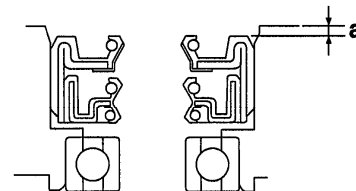
- Water pump housing cover
- Water pump housing
Cracks/damage → Replace.
- Impeller shaft
Cracks/damage/wear → Replace.
- Bearing
Rough movement → Replace.
- Radiator outlet hose
Cracks/damage → Replace.

EAS26560

ASSEMBLING THE WATER PUMP

1. Install:

- Water pump seal "1" **New**
(into the water pump housing "2")



a. 0–0.5 mm (0–0.02 in)

2. Lubricate:

- Water pump seal lip



Recommended lubricant

Lithium-soap-based grease

3. Install:

- Water pump housing gasket "1" **New**

WATER PUMP

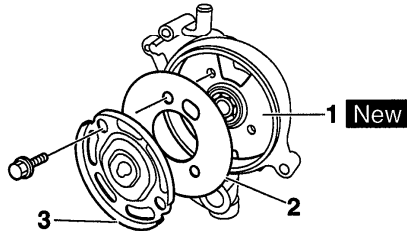
- Water pump housing plate “2”
- Impeller shaft
- Impeller shaft retainer “3”



Impeller shaft retainer bolt
10 Nm (1.0 m·kg, 7.2 ft·lb)
LOCTITE®

NOTE:

- Before installing the impeller shaft retainer, lubricate the slit on the impeller shaft end with a thin coat of lithium-soap-based grease.
- Install the water pump housing gasket, water pump housing plate, and impeller shaft retainer as shown in the illustration.
- After installation, check that the impeller shaft rotates smoothly.



EAS26580

INSTALLING THE WATER PUMP

1. Install:

- Water pump assembly “1”
- O-rings “2” **New**

NOTE:

- Align the projection “a” on the impeller shaft with the slit “b” on the camshaft sprocket bolt.
- Lubricate the O-rings with a thin coat of lithium-soap-based grease.

