Doc.Title :PARTS-BREAKDOWN CATALOGUE FOR W150 ENGING

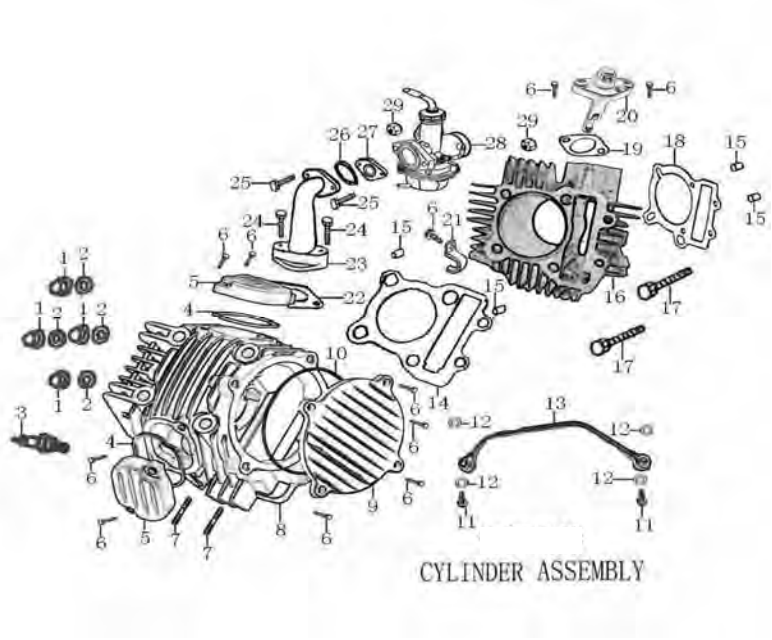
Doc.no(Model code):W150

Brand Name :ZONGSHEN

Revision Number:

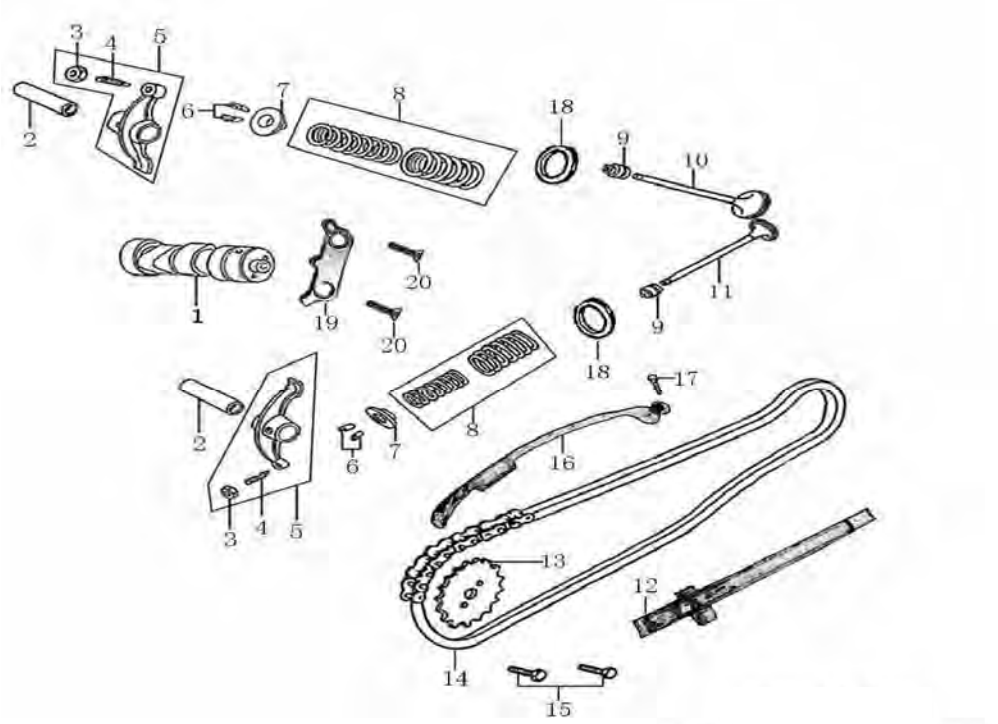
Date of Release:3.7.2009

CYLINDER ASSY



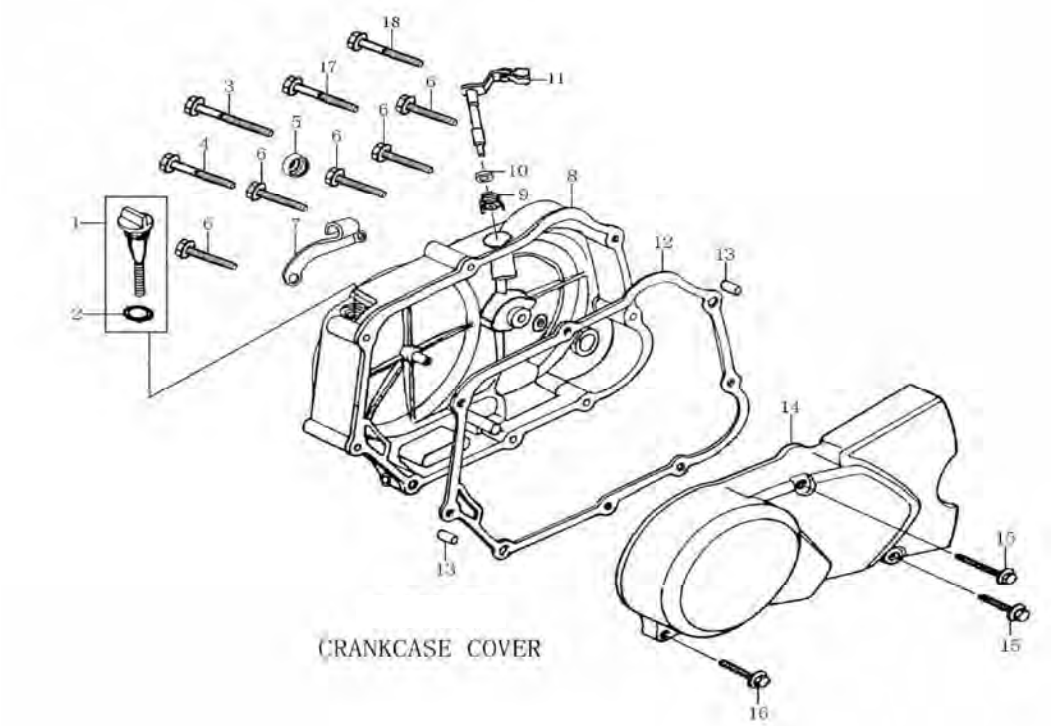
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	91201-I006-00000X	NUT M8	4
2	93301-80852218000	WASHER 8.5×2.2×18	4
3	81300-G011-0000	SPARK PLUG (A7TC)	1
4	90104-JE15-0000	LIFTER ASSY	2
5	11230-JE15-00000W	CYLINDER HEAD COMP	2
6	B166740A06001870X	BOLT M6×18	11
7	91138-MA21-00000X	STUD M8×45	2
8	1122B-JE15-00000W	CYLINDER HEAD ASSEMBLY	1
9	11227-JE15-00000W	L.COVER	1
10	90122-JE15-0000	GASKET, L.COVER	1
11	91107-PE03-00000X	BOLT M8×23	2
12	93301-80821014000	WASHER 8.2×1×14	4
13	19305-JE15-0000	VITTA	1
14	9022B-JE15-0000	GASKET ASSEMBLY, CYLINDER HEAD	1
15	91521-10001400000	PIN 10×14	4
16	1110B-JE15-000182	ASSEMBLY, CYLINDER BLOCK	1
17	B166740A06010570X	BOLT M6×105	2
18	90205-JE15-0000	GASKET,CYLINDER BLOCK	1
19	90211-JE15-0000	INLET PIPE (JQ-9L)	1
20	1554B-JE15-0000	GASKET, INLET PIPE	1
21	11003-D002-00000X	CLIP, HIGH VOLTAGE WIRE	1
22	15810-I096-0000	GASKET, INLET PIPE	1
23	15800-JE15-0100	ASSEMBLY, INLET PIPE(JQ-9L)	1
24	B057830006002570X	BOLT M6×25	2
25	B057830006003070X	BOLT M6×30	2
26	90101-10290000240	O-RING 29×2.4	1
27	90214-I096-0000	GASKET, CARBURETOR	1
28	17100-0000-0078	CARBURETOR	1
29	B061700006000090X	NUT M6	2

VALVE MECHANISM



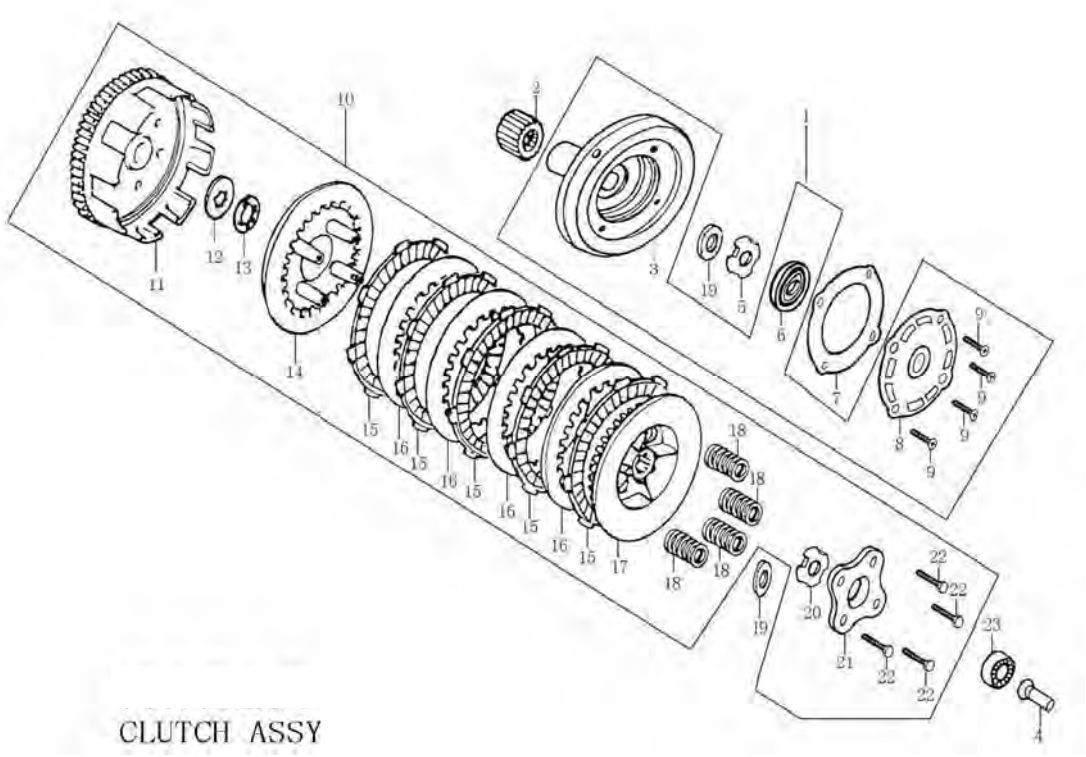
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	15100-JE15-0000	CAMSHAFT PARTS	1
2	15402-JE15-0000	SHAFT, VALVE ROCKER ARM	2
3	15403-D002-0000	ADJUSTING NUT, VALVE CLEARANCE	2
4	15404-D002-0000	ADJUSTING SCREW, VALVE CLEARANCE	2
5	1540A-D002-0000	ASSEMBLY, VALVE ROCKER ARM	2
6	15707-JE15-0000	VALVE COTTER	4
7	15705-JE15-0000	RETAINER, VALVE SPRING	2
8	15710-JE15-0000	VALVE INNER SPRING	2
9	1572B-I008-0000	VALVE STEM SEAL ASSEMBLY	2
10	15701-JE15-0000	INLET VALVE	1
11	15702-JE15-0000	EXHAUST VALVE	1
12	1553A-JE15-0000	GUIDE PLATE CHAIN	1
13	15301-JE15-0000	TIMING DRIVEN SPROCKET (32)	1
14	1532B-JE15-0000	ASSEMBLY, TIMING CHAIN (90)	1
15	B057830006001270X	BOLT M6×12	2
16	1552A-JE15-0000	WASHER 8.5×1.5×14 (ALUMINIUM)	1
17	91109-JE15-00000N	PIN SHAFT, GUIDE ROLLER(M8×27.5)	1
18	15706-D002-0000	RETAINER, VALVE SPRING	2
19	15108-JE15-0000	BAFFLE	1
20	B008190106001220B	BLOT M6×12	2

CRANKCASE COVER



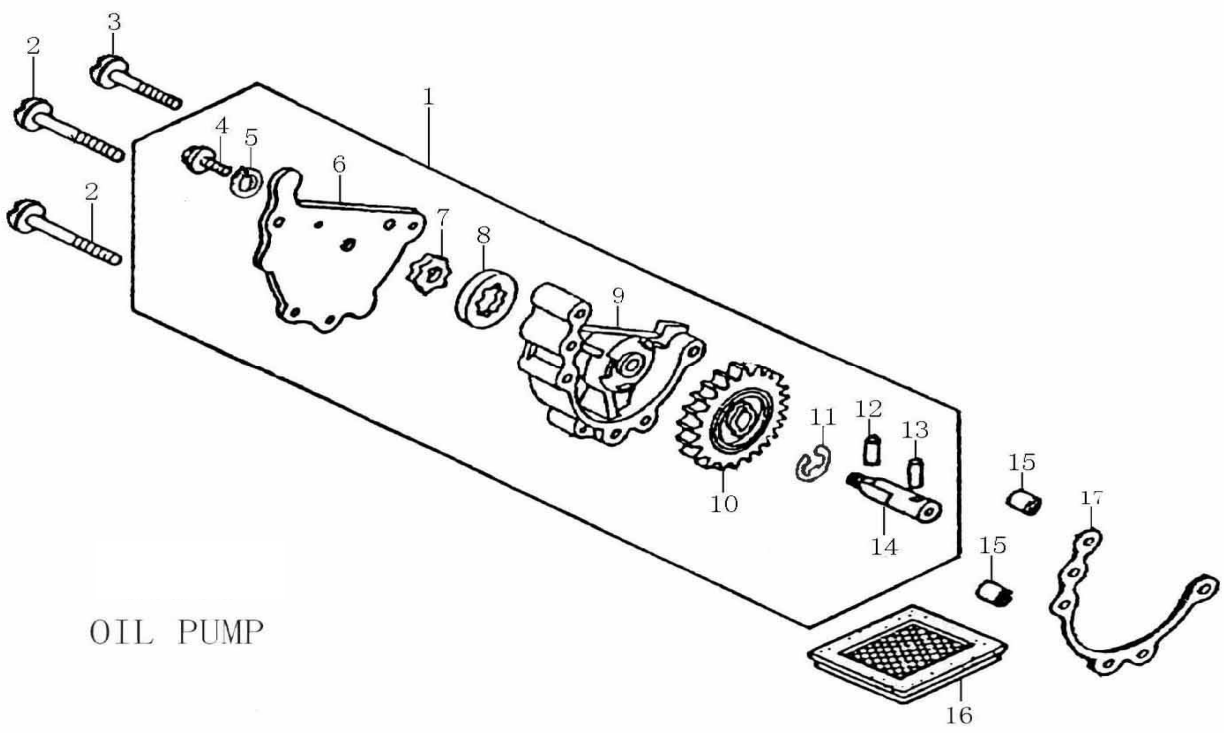
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	14301-G011-0000	DIPSTICK	1
2	90101-10180000300	O-RING 18×3	1
3	B166740A06008070X	BOLT M6×80	1
4	B166740A06006570X	BOLT M6×65	1
5	90304-D002-0000	OIL SEAL 13.7×24×5	1
6	B166740A06004070X	BOLT M6×40	5
7	22422-JA16-00000X	STEEL BRACKET, CLUTCH	1
8	12421-JE15-000089	ASSEMBLY, RIGHT CRANKCASE COVER	1
9	22427-I016-0000	SPRING, CONTROLLING ARM, CLUTCH	1
10	90306-I016-0000	OIL SEAL 12×18×5	1
11	2242A-JA16-00000X	CONTROLLING ARM ASSEMBLY, CLUTCH	1
12	90206-JE15-0000	GASKET, RIGHT CRAMKCASE COVER	1
13	91521-08001200063	DOWEL PIN 8×12×6.3	2
14	12306-G007-000089	SIDE COVER, LEFT CRANKCASE	1
15	B166740A06003570X	BOLT M6×35	2
16	B166740A06002870X	BOLT M6×28	1
17	B166740A06004570X	BOLT M6×45	1
18	B166740A06008570X	BOLT M6×85	1

CLUTCH ASSY



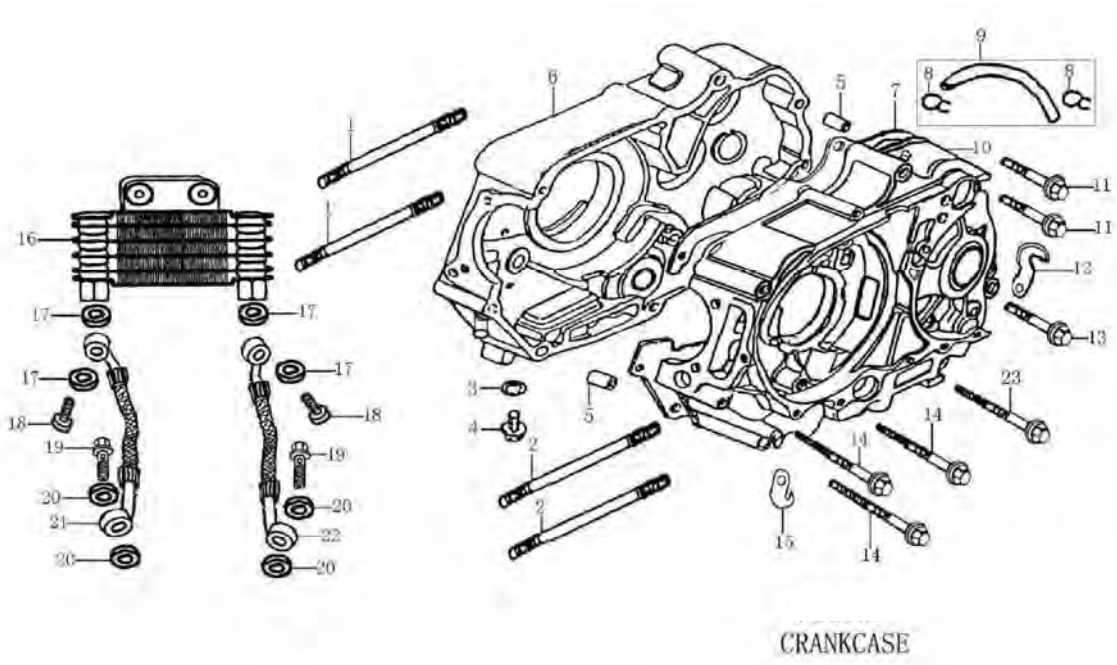
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	14200-JA16-0100	ASSEMBLY, OIL FILTER	1
2	23101-IZ27-0000	DRIVE GEAR	1
3	14203-JA16-0100	ROTOR ASSEMBLY, OIL FILTER	1
4	22403-G007-0000	PUSH ROD, CLUCTH	1
5	91208-G011-0000	NUT	1
6	90337-G007-0000	OIL SEAL 6×25×6	1
7	90209-G007-0000	GASKET, OIL FILTER END COVER	1
8	14207-G007-0000	COVER PLATE, OIL FILTER	1
9	B008190005001220B	SCREW M5×12	4
10	22000-JE15-0000	CLUTCH ASSEMBLY	1
11	22150-IZ02-0000	OUT CASE ASSEMBLY, CLUTCH	1
12	22002-G011-0000	SPRINE WASHER, CLUTCH（φ28×2.6）	1
13	22103-G011-0000	FIXING RING, CLUTCH	1
14	22122-JA16-0000	PRESSURE PLATE, CLUTCH	1
15	22214-I006-0000	FRICTION PLATE, DRIVE, CLUTCH	5
16	22215-JA16-0000	FRICTION PLATE, DRIVEN, CLUTCH	4
17	22105-JA16-0000	CENTER SLEEVE, CLUTCH	1
18	22142-JE15-0000	SPRING, CLUTCH	4
19	22004-G011-0000	THRUST WASHER	2
20	91202-G011-0000	NUT M14×1	1
21	22121-G011-0000	END COVER, CLUTCH	1
22	B166740A06002270B	BOLT M6×22	4
23	92102-00000006000	BEARING (6000)	1

OIL PUMP PARTS



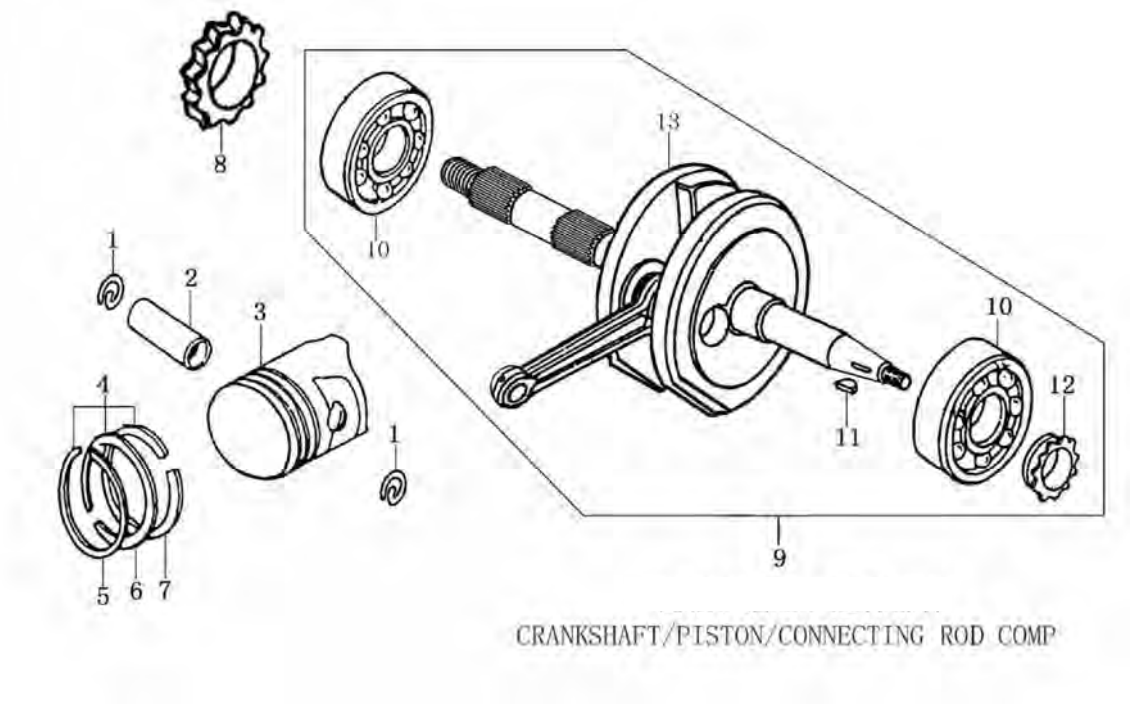
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	14100-JE15-0000	OIL PUMP	1
2	B008230006003520B	SCREW M6×35	1
3	B008230006004020B	SCREW M6×40	2
4	B057820005001270B	BOLT M5×12	1
5	B0009300060000000	WASHER 6	1
6	14108-JE15-0000	COVER, OIL PUMP	1
7	14111-JE15-0000	INNER ROTOR, OIL PUMP	1
8	14112-JE15-0000	OUTER ROTOR, OIL PUMP	1
9	14110-JE15-0000	CASE, OIL PUMP	1
10	1410B-JE15-0000	GEAR, OIL PUMP	1
11	B0089600060000000	WASHER 5	1
12	B0011902025100000	PIN 2.5×10	1
13	91522-03001600000	PIN3.0×16	1
14	14107-JE15-0000	SHAFT, OIL PUMP	1
15	91521-08001200063	DOWEL PIN 8×12×6.3	2
16	1431B-D002-0000	ASSEMBLY, OIL FILTER SCREEN	1
17	90210-HZ31-0000	GASKET, OIL PUMP	1

CRANKCASE



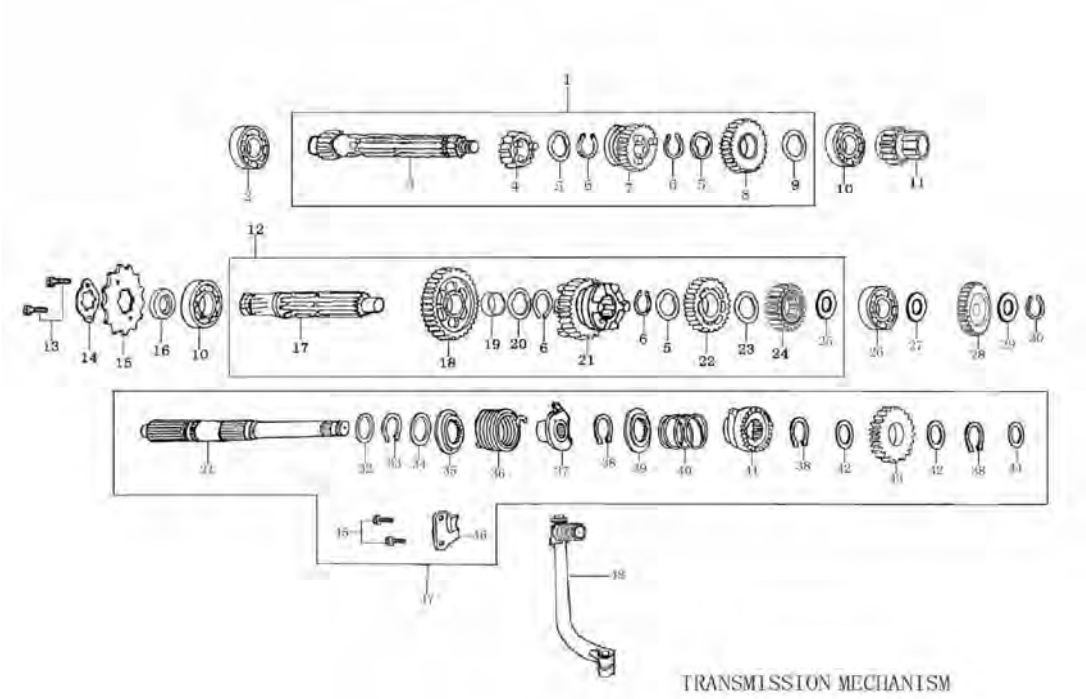
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	91102-JE15-0000	CYLINDER STUD BOLT B	2
2	91101-JE15-0000	CYLINDER STUD BOLT A	2
3	93301-71242020000	WASHER 12.5×1.5×20 (ALUMINIUM)	1
4	91103-I008-00000X	OIL DRAIN PLUG	1
5	91521-10001400000	DOWEL PIN 10×14	2
6	1222B-JE15-000089	ASSEMBLY, RIGHT CRANKCASE	1
7	90208-JE15-0000	GASKET, CRANKCASE	1
8	91405-D002-00000C	CLIP, BREATHER TUBE φ10	2
9	12130-G011-0102	BREATHER PIPE (1#)	1
10	1212B-JE15-000089	ASSEMBLY, LEFT CRANKCASE	1
11	B166740A06006070X	BOLT M6×60	2
12	11003-D002-00000X	CLIP, HIGH VOLTAGE WIRE	1
13	B166740A06005070X	BOLT M6×50	1
14	B166740A06006570X	BOLT M6×65	3
15	12108-D002-00000X	CLIP, OVERFLOW PIPE	1
16	19300-I038-0000	OIL COOLER COMP	1
17	93301-81251419000	WASHER 12.5×1.4×19	4
18	91107-I038-00010X	BLOT M12×1.25	2
19	91107-PE03-00000X	BLOT M8×23	2
20	93301-80821014000	WASHER 10×1×14	4
21	19303-JE15-0100	RETURN OF VITTA	1
22	19303-JE15-0200	ENTER OF VITTA	1
23	B166740A06008070X	BOLT M6×80	1

CRANKSHAFT/PISTON/CONNECTING ROD COMP



NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	91401-D002-0000	CIRCLIP, PISTON PIN	2
2	13102-JE15-0000	PIN, PISTON	1
3	13101-JE15-0000	PISTON	1
4	1310A-JE15-0000	ASSEMBLY, PISTON RING	1
5	13103-JE15-0000	PISTON RING (1ST)	1
6	13104-JE15-0000	PISTON RING (2ND)	1
7	13120-JE15-0000	ASSEMBLY, OIL RING	1
8	14101-IZ02-0000	DRIVE GEAR, OIL PUMP	1
9	1320B-JE15-0000	ASSEMBLY, CRANK SHAFT CONNECTING ROD	1
10	92102-00000562215	BEARING (TM-SC04A86/P5CS12 56×22×15)	2
11	91601-D002-0000	SEMICIRCULAR KEY 4×12.5	1
12	13222-JE15-0000	TIMING DRIVE SPROCKETT	1
13	13220-JE15-0000	CRANK SHAFT CONNECTING ROD	1

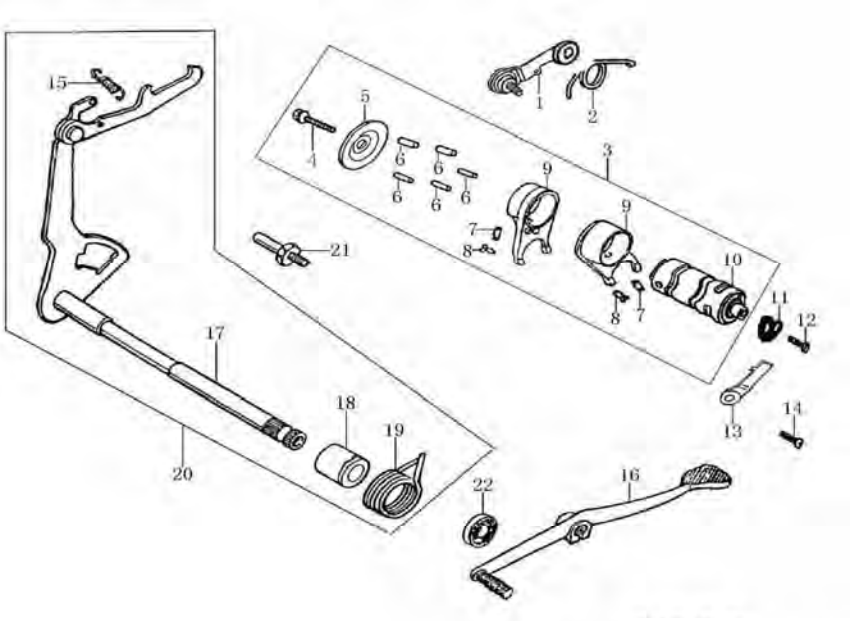
TRANSMISSION MECHANISM



NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	23220-JA16-0000	MAINSHAFT ASSEMBLY	1
2	92102-00000006001	BEARING (6001)	1
3	23221-JA16-0000	PIVOT, MAINSHAFT	1
4	23222-JA16-0002	MAINSHAFT 2ND SPEED GEAR	1
5	23223-D002-0000	SPLINE WASHER 15.5(17.2)×1.2×21	3
6	23226-D002-0000	CIRCLIP, MAINSHAFT GEAR	4
7	23222-JA16-0003	MAINSHAFT 3RD SPEED GEAR	1
8	23222-JA16-0004	MAINSHAFT 4TH SPEED GEAR	1
9	93301-61710526000	WASHER 17.1×0.5×26	1
10	92102-00000006203	BEARING (6203)	2
11	23233-IZ02-0000	STARTING GEAR	1
12	23240-JA16-0000	ASSEMBLY, COUNTERSHAFT	1
13	B057830006001070B	BOLT M6×10	2
14	23402-D002-0000	LOCATING PLATE	1
15	23401-G011-0008	DRIVE SPROCKET (428.15)	1
16	90303-D002-0000	OIL SEAL 17×29×5	1
17	23241-JA16-0000	PIVOT, COUNTERSHAFT	1
18	23242-D002-0001	COUNTERSHAFT 1ST SPEED GEAR	1
19	23247-D002-0000	SLEEVE, COUNTERSHAFT GEAR 20×19	1
20	23223-D002-0002	SPLINE WASHER15.5(17.2)×1.2×23	1
21	23242-D002-0002	COUNTERSHAFT 2ND SPEED GEAR	1
22	23242-JA16-0003	COUNTERSHAFT 3RD SPEED GEAR	1
23	93301-51721026000	CIRCLIP 17.2×1.0×26	1

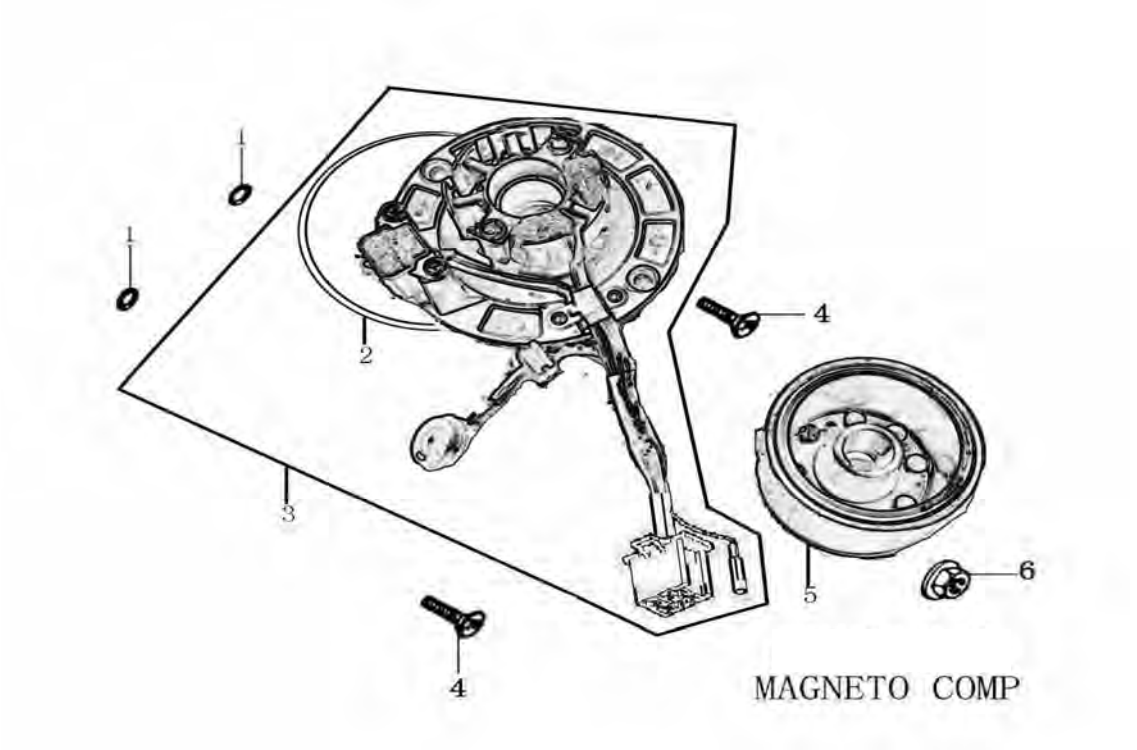
24	23242-JA16-0004	COUNTERSHAFT 4TH SPEED GEAR	1
25	93301-5152052300C	WASHER 15.2×0.5×23	1
26	92102-00000006002	BEARING (6002)(SKF)	1
27	93301-5152152500N	WASHER 15.2×1.5×25	1
28	23248-IZ02-0000	IDLE GEAR, COUNTERSHAFT STARTING	1
29	93301-61521025000	WASHER 15.2×1×25	1
30	B0089401150000000	CIRCLIP 15	1
31	21107-IZ02-0000	PIVOT, KICK STARTING SHAFT	1
32	93301-61410522000	WASHER 14.1×0.5×22	1
33	91402-D002-0000	CHECK RING φ15.5×1.2×φ19	1
34	93301-61721024000	WASHER 17.2×1×24	1
35	21104-IZ02-0000	SEAT, SPRING, KICK STARTING SHAFT	1
36	21106-IZ02-0000	RETURN SPRING, KICK STARTING SHAFT	1
37	21104-D002-0000	ASSEMBLY, COUNTERSHAFT	1
38	91402-D002-0100	CIRCLIP φ18.5×1.2×φ22.1	3
39	21122-D002-0000	SEAT, RATCHET WHEEL	1
40	21119-D002-0000	SPRING, KICK STARTING RATCHET WHEEL	1
41	21118-IZ02-0000	RATCHET WHEEL, KICK STARTER	1
42	93301-62011027000	WASHER 20.1×1×27	2
43	21117-IZ02-0000	GEAR, KICK STARTER	1
44	93301-61411022000	WASHER 14.1×1×22	1
45	B057830006001870B	BOLT M6×18	2
46	21123-IZ02-0000	GUIDE PLATE, RATCHET WHEEL	1
47	21100-IZ02-0000	KICK STARTING SHAFT ASSEMBLY	1
48	21200-F004-0001	KICK STARTING SHAFT	1

GEARSHIFT MECHANISM



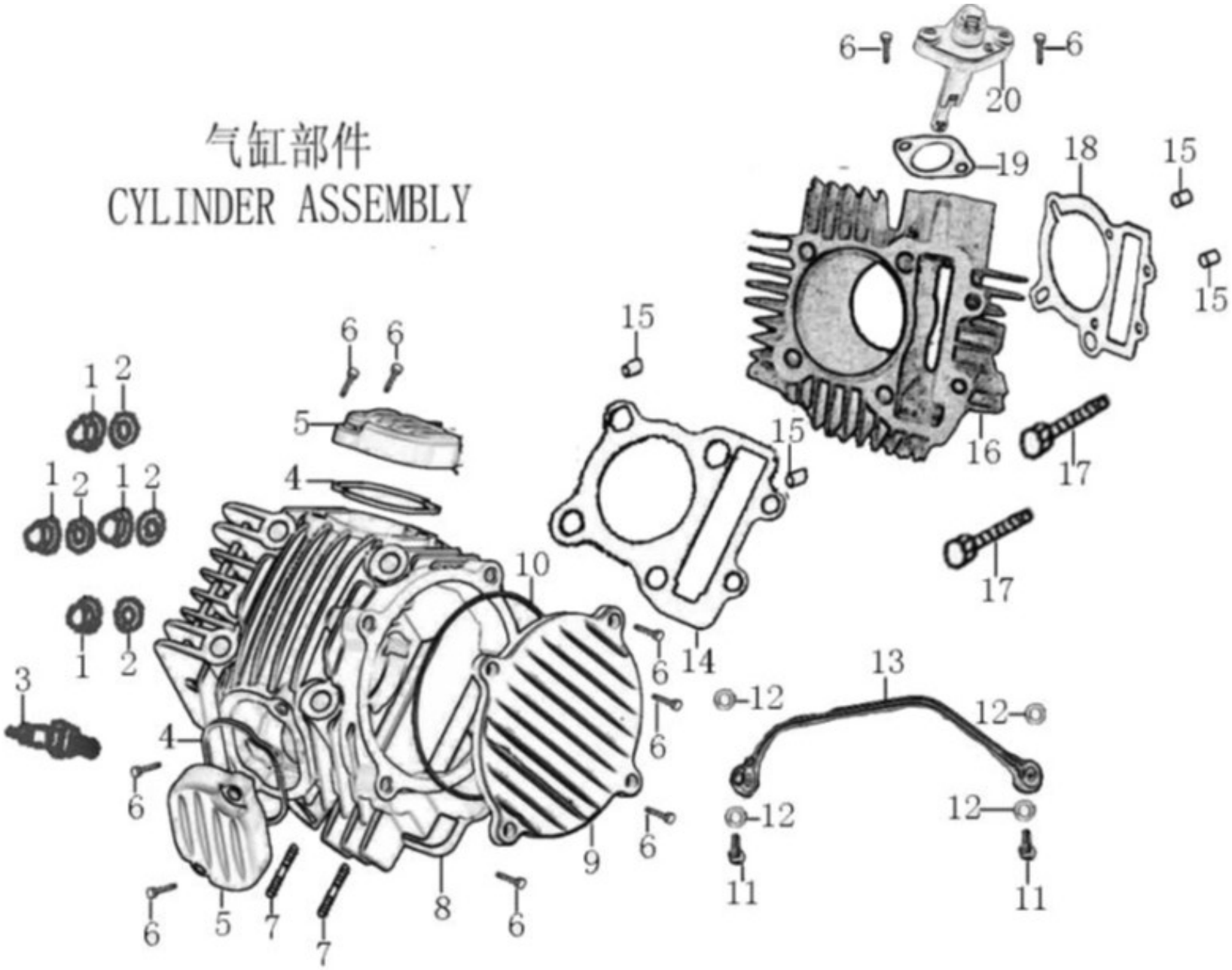
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	2434A-H032-0000	LOCATING PLATE UNIT	1
2	24304-G011-0000	SPRING, LOCATING PLATE	1
3	24200-JE15-0000	ASSEMBLY, GEARSHIFT DRUM	1
4	B008200006002020B	BOLT M6×20	1
5	24212-D002-0000	STOPPING PLATE	1
6	91522-04001300000	PIN, GEARSHIFT DRUM 4×13	5
7	24102-D002-0000	GUIDE PIN	2
8	24103-D002-0000	CLIP, SPRING	2
9	24101-D002-0000	GEARSHIFT FORK	2
10	24213-JE15-0000	GEARSHIFT DRUM	1
11	88004-G011-0000	CONTACT, GEAR INDICATION	1
12	91149-G011-00000C	SCREW	1
13	88002-G011-0001	GEARSHIFT SWITCH PRESSING PLATE	1
14	B008230006001220B	SCREW M6×12	1
15	24318-D002-0000	SPRING, GEARSHIFT LEVER TENSION	1
16	24400-F004-0004	ASSEMBLY, GEARSHIFT PEDAL (BT-4)	1
17	24301-D002-0100	GEARSHIFT SHAFT	1
18	24320-D002-0000	BUSH	1
19	24302-D002-0000	RETURN SPRING, GEARSHIFT LEVER	1
20	24300-D002-0100	ASSEMBLY, GEARSHIFT LEVER	1
21	91117-D002-0000	BOLT M8×11	1
22	90301-D002-0000	OIL SEAL 11.6×24×10	1

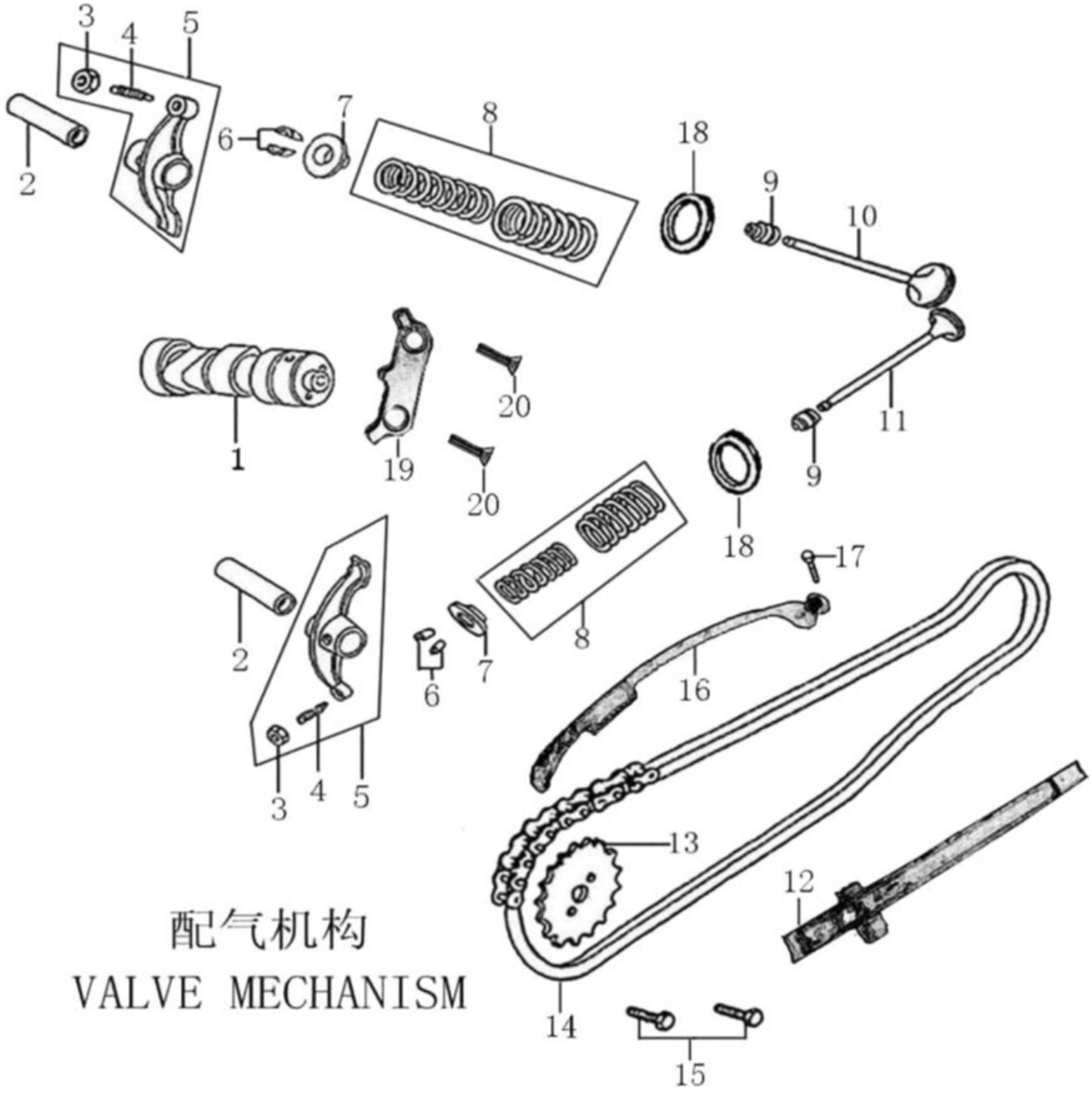
MAGNETO COMP



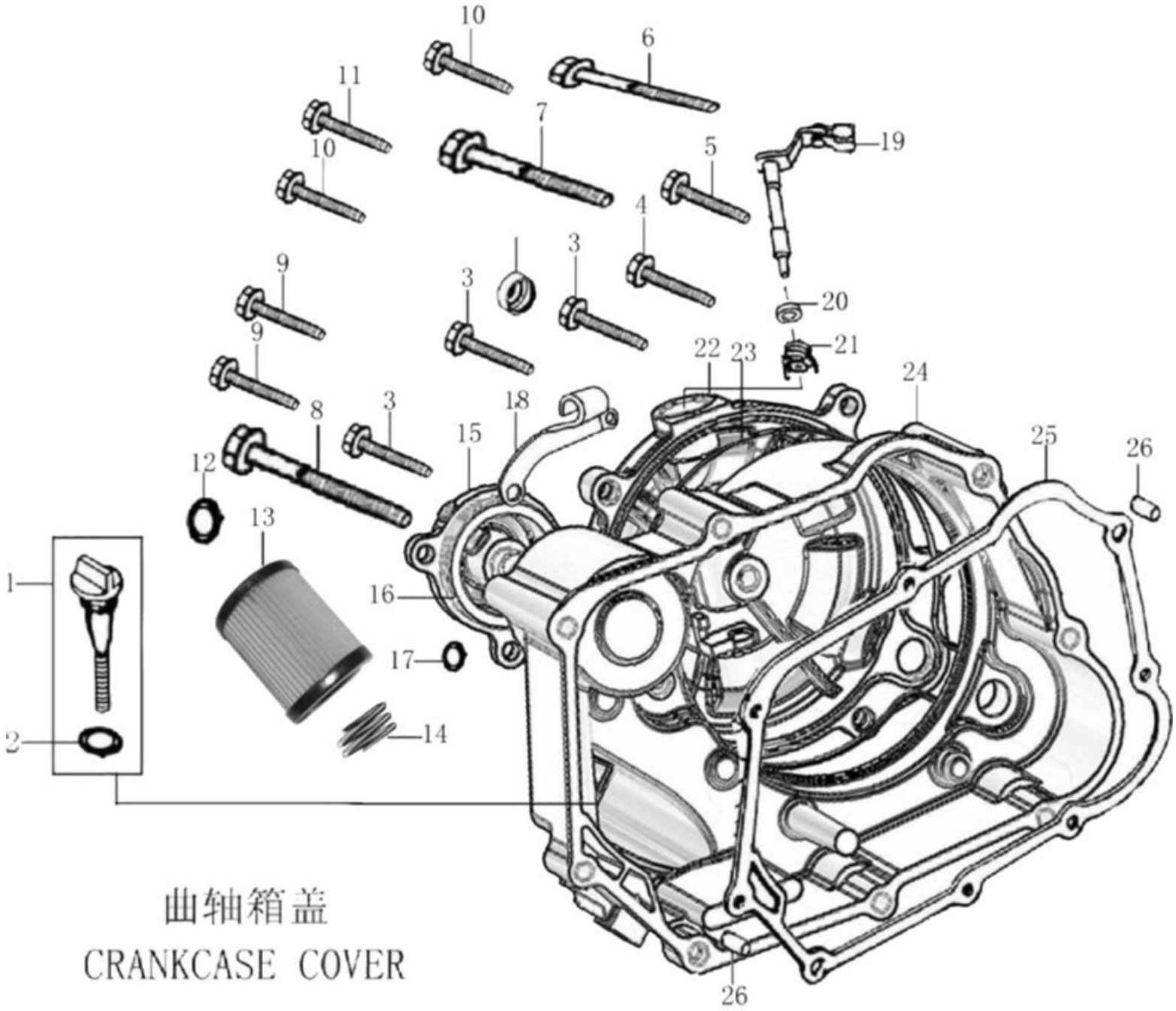
NO.	PART CODE	ENGLISH DESCRIPTION	QTY
1	90101-10065000180	O-RING 6.5×1.8	2
2	90101-21068000200	O-RING 106.8×2	1
3	82120-IZ27-000145	STATOR ASSEMBLY, MAGNETO	1
4	B008190106001620B	SCREW M6×16	2
5	82130-IZ27-0100	ROTOR ASSEMBLY, MAGNETO	1
6	91213-D002-00000X	NUT	1

气缸部件
CYLINDER ASSEMBLY



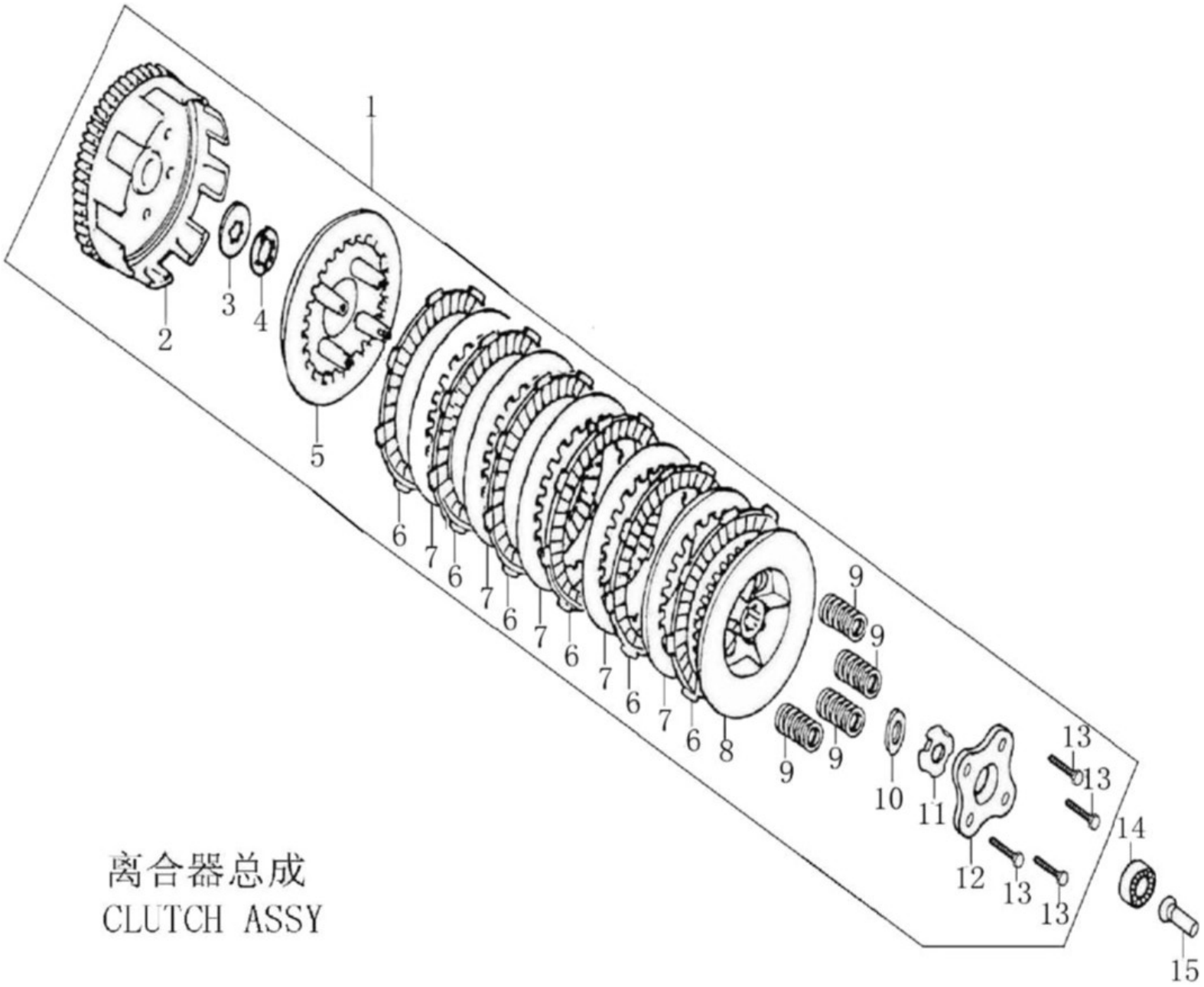


配气机构
VALVE MECHANISM



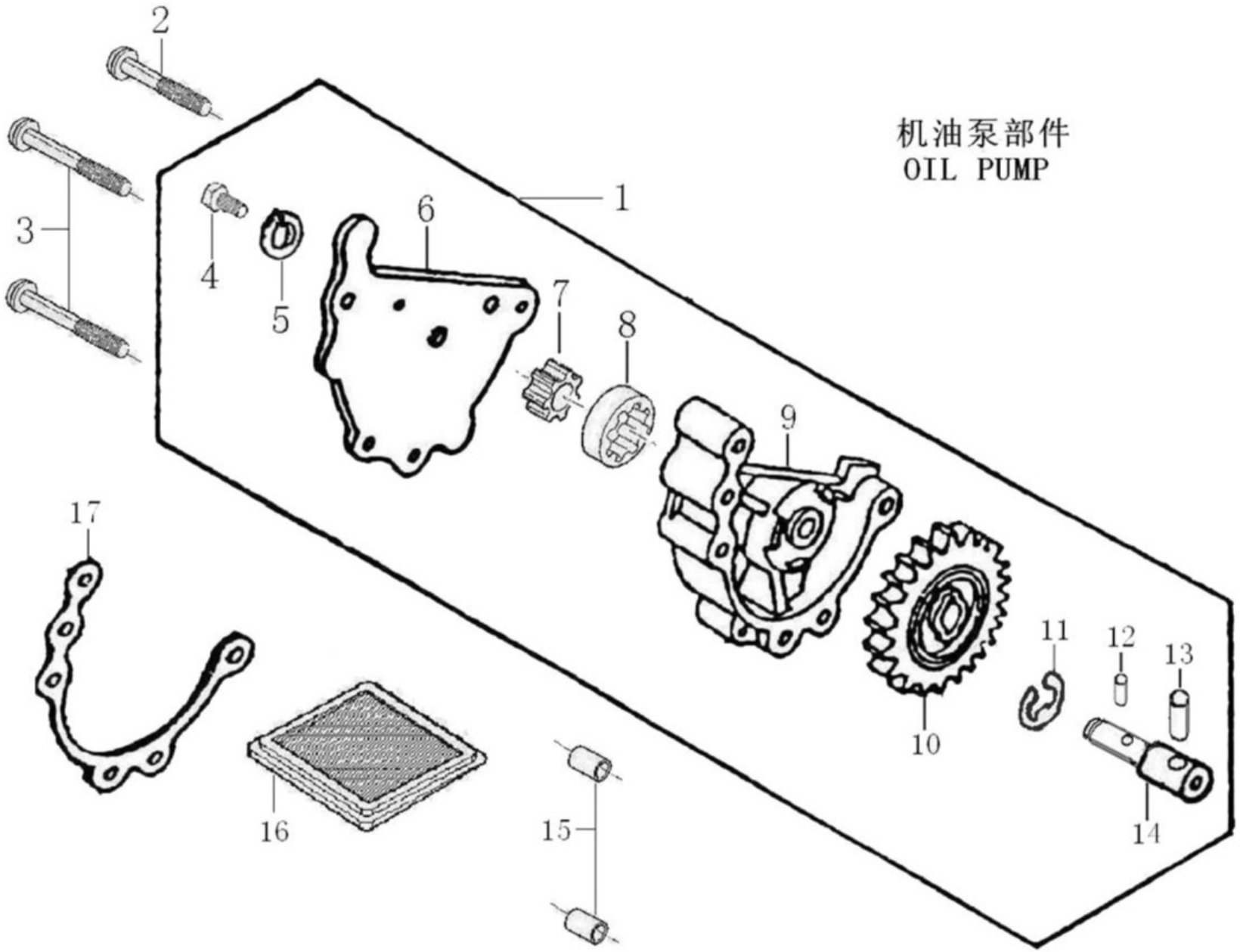
曲轴箱盖

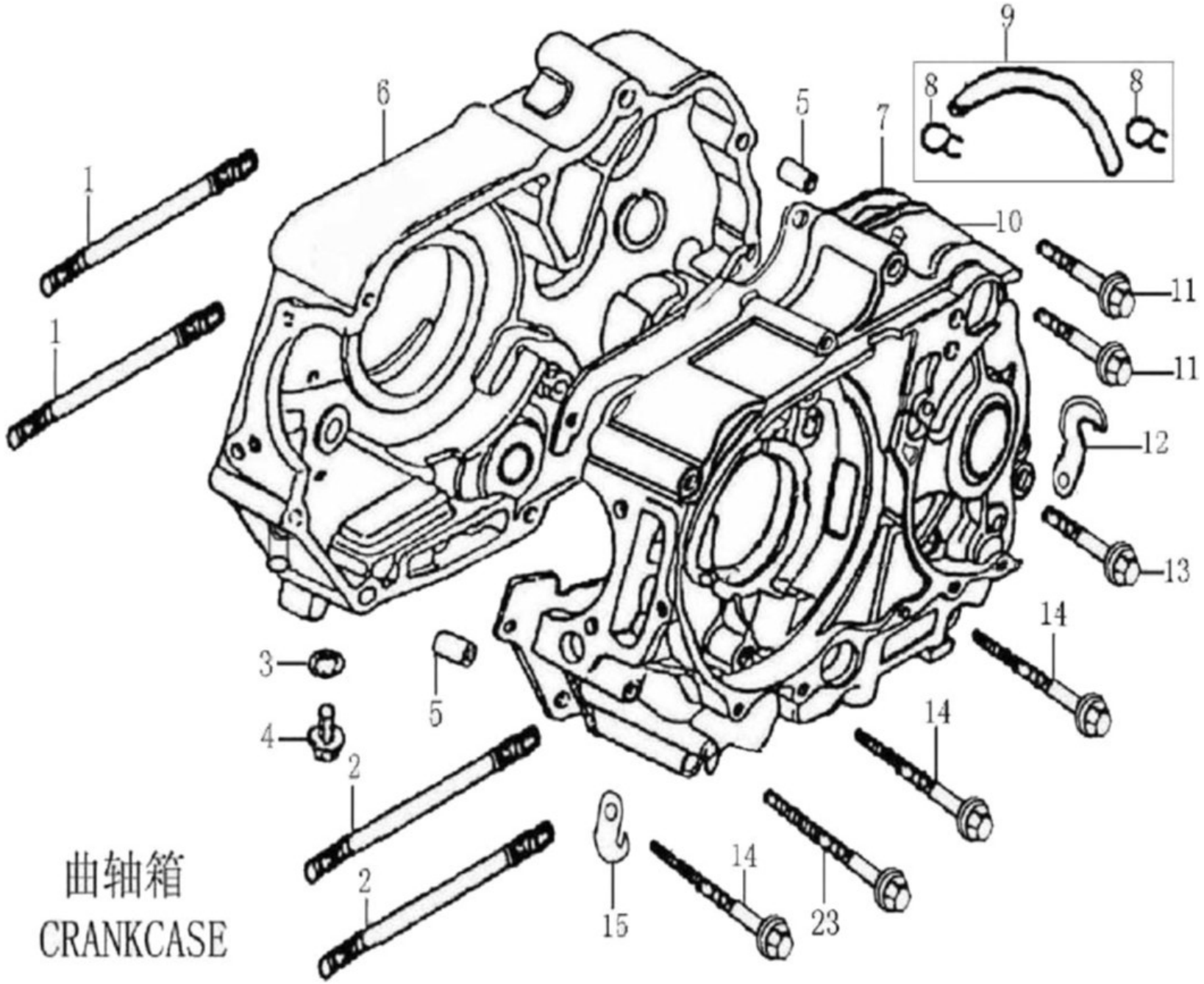
CRANKCASE COVER



离合器总成
CLUTCH ASSY

机油泵部件
OIL PUMP

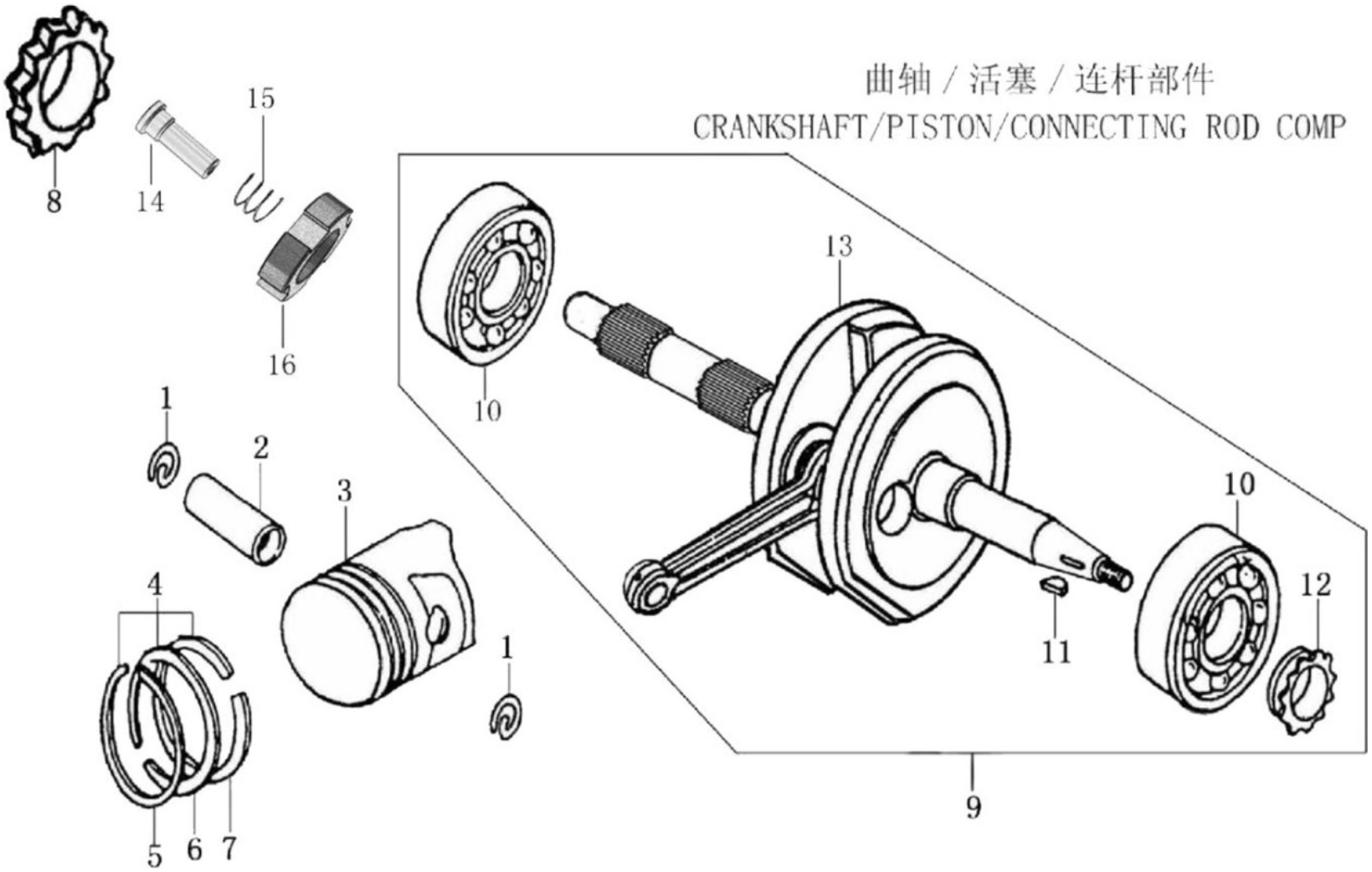


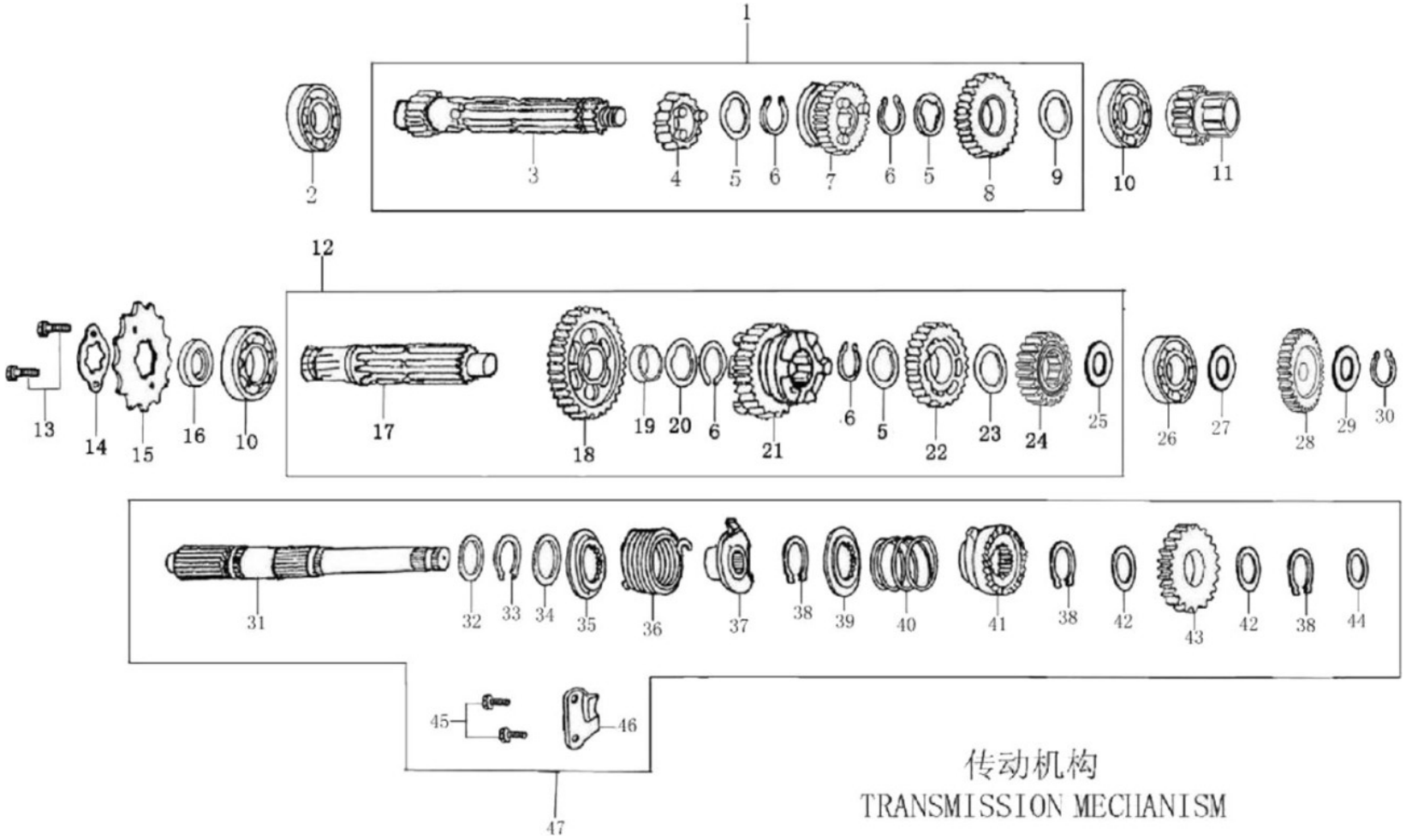


曲轴箱
CRANKCASE

曲轴 / 活塞 / 连杆部件

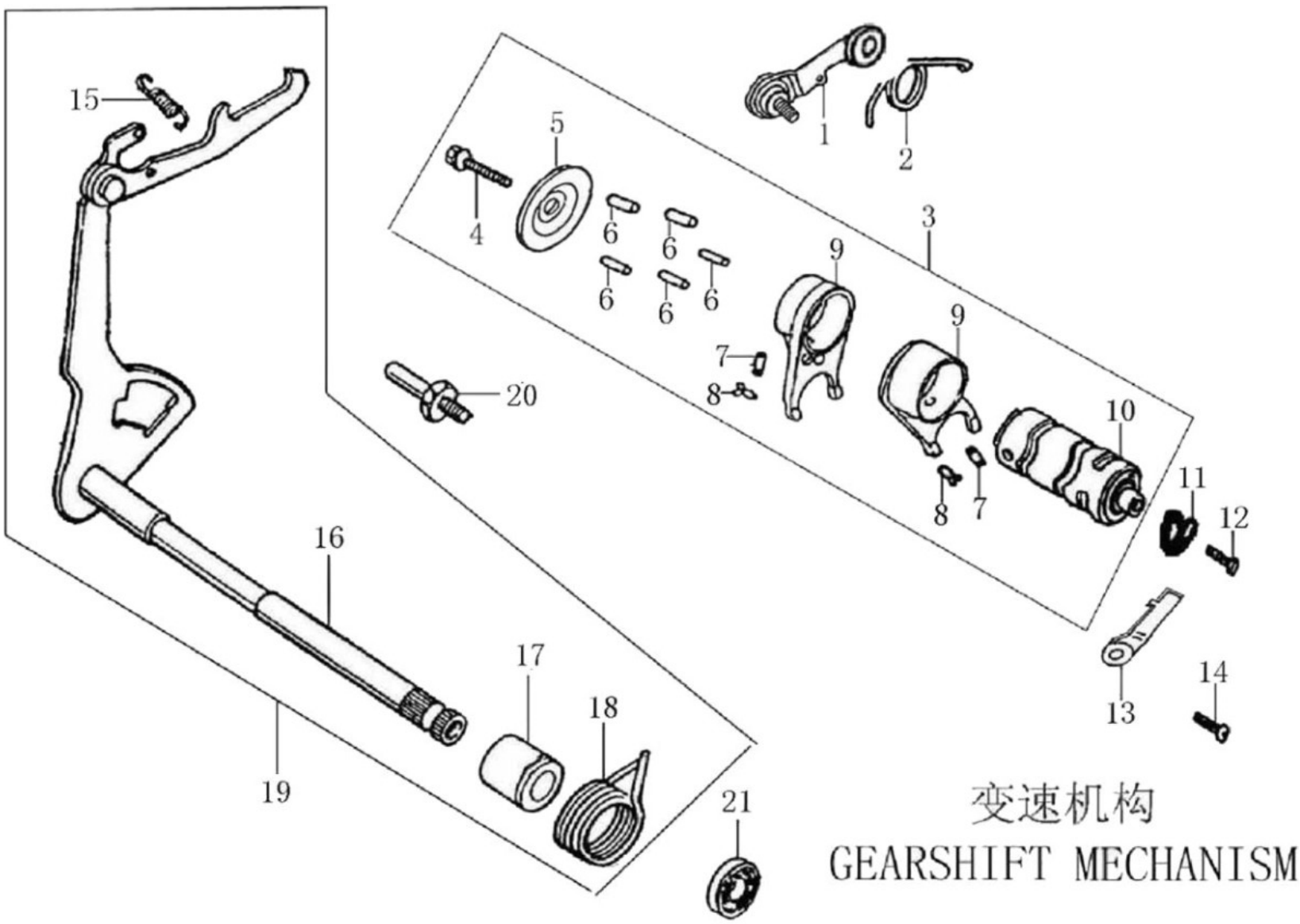
CRANKSHAFT/PISTON/CONNECTING ROD COMP



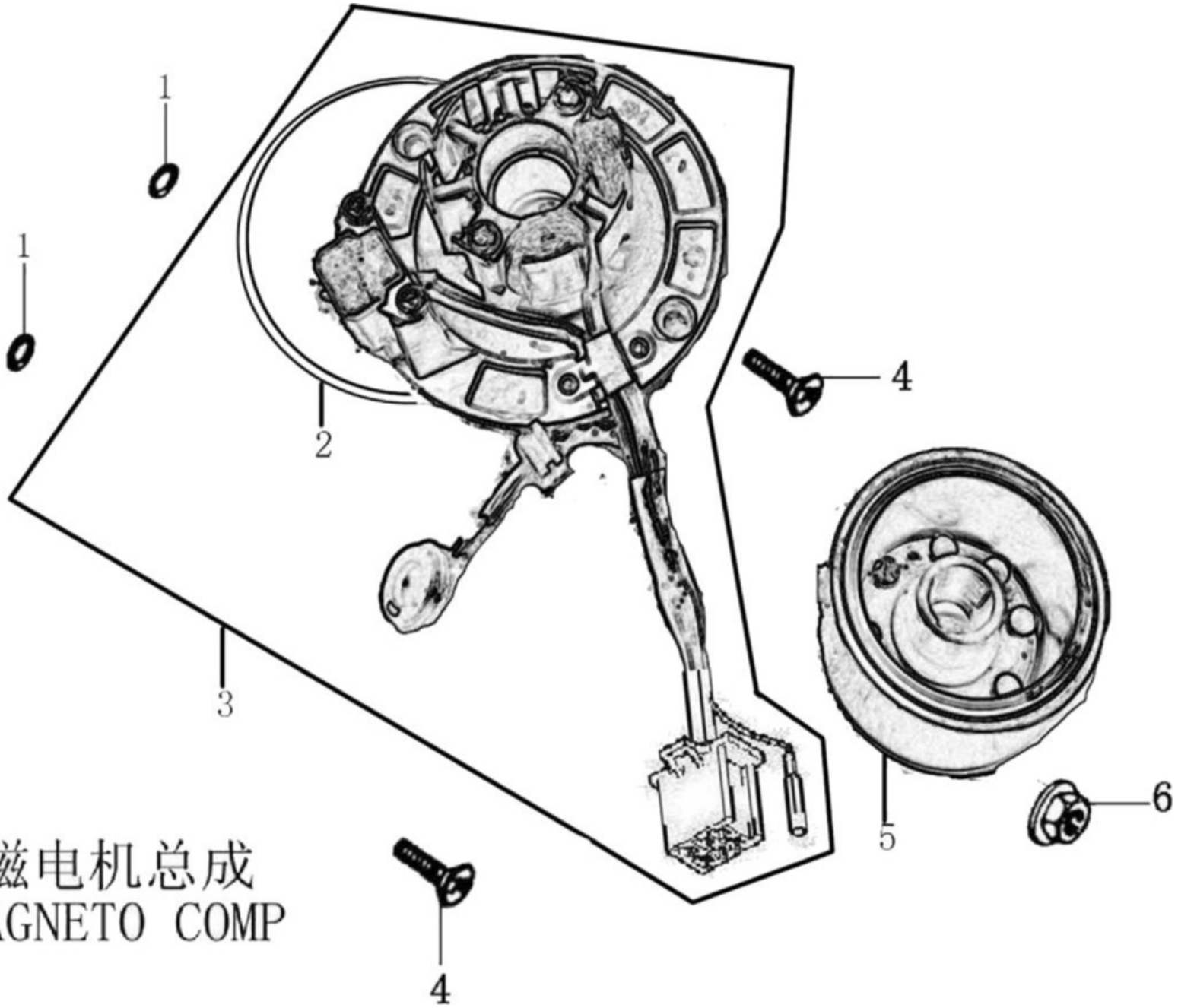


传动机构

TRANSMISSION MECHANISM



变速机构
GEARSHIFT MECHANISM



磁电机总成
MAGNETO COMP

General Specifications

Items		KLX110-A1
Dimensions:		
Overall length		1 555 mm
Overall width		660 mm
Overall height		955 mm
Wheelbase		1 065 mm
Road clearance		190 mm
Seat height		650 mm
Dry mass		64 kg
Curb mass:	Front	31 kg
	Rear	37 kg
Fuel tank capacity		3.8 L
Performance:		
Minimum turning radius		1.6 m
Engine:		
Type		4-stroke, SOHC, single cylinder
Cooling system		Air-cooled
Bore and stroke		53.0 × 50.6 mm
Displacement		111 mL
Compression ratio		9.5 : 1
Maximum horsepower		4.6 kW (6.3 PS) @7 000 r/min (rpm)
Maximum torque		6.9 N·m (0.70 kgf·m, 61 in·lb)
		@4 500 r/min (rpm)
Carburetion system		Carburetor, KEIHIN PB18
Starting system		Kick
Ignition system		Magneto CDI
Ignition timing		10° BTDC @1 300 r/min (rpm) /31°
		BTDC @4 000 r/min (rpm)
Spark plug		NGK CR6HSA
Valve timing:		
Inlet:	Open	0° BTDC
	Close	80° ABDC
	Duration	260°
Exhaust:	Open	35° BBDC
	Close	45° ATDC
	Duration	260°
Lubrication system		Forced lubrication (wet sump)
Engine oil:		
Type		API SE, SF or SG
		API SH or SJ with JASO MA
Viscosity		SAE10W-40
Capacity		1.1 L (when engine is completely dry)

General Specifications

Items		KLX110-A1
Drive Train:		
Primary reduction system:		
Type		Gear, centrifugal
Reduction ratio		3.048 (64/21)
Clutch type		Centrifugal & wet, multi disc
Transmission:		
Type		3-speed, constant mesh, return shift
Gear ratios:	1st	3.273 (36/11)
	2nd	1.938 (31/16)
	3rd	1.350 (27/20)
Final drive system:		
Type		Chain drive
Reduction ratio		2.642 (37/14)
Overall drive ratio		10.873 @Top gear
Frame:		
Type		Backbone
Caster (rake angle)		25.5°
Trail		54 mm
Front tire:	Type	C803
	Size	2.50 - 14 4PR
Rear tire:	Type	C803
	Size	3.00 - 12 4PR
Front suspension:	Type	Telescopic fork
	Wheel travel	110 mm
Rear suspension:	Type	Swingarm
	Wheel travel	107 mm
Brake type:	Front	Drum
	Rear	Drum

Specifications are subject to change without notice, and may not apply to every country.

Torque and Locking Agent

The following tables lists the tightening torque for the major fasteners requiring use of a non-permanent locking agent or liquid gasket.

Letters used in the "Remarks" column mean:

L : Apply a non-permanent locking agent to the threads.

S : Tighten the fasteners following the specified sequence.

The table below, relating tightening torque to thread diameter, lists the basic torque for the bolts and nuts. Use this table for only the bolts and nuts which do not require a specific torque value. All of the values are for use with dry solvent-cleaned threads.

Basic Torque for General Fasteners

Threads dia. (mm)	Torque		
	N·m	kgf·m	ft·lb
5	3.4 ∼ 4.9	0.35 ∼ 0.50	30 ∼ 43 in·lb
6	5.9 ∼ 7.8	0.60 ∼ 0.80	52 ∼ 69 in·lb
8	14 ∼ 19	1.4 ∼ 1.9	10.0 ∼ 13.5
10	25 ∼ 34	2.6 ∼ 3.5	19.0 ∼ 25
12	44 ∼ 61	4.5 ∼ 6.2	33 ∼ 45
14	73 ∼ 98	7.4 ∼ 10.0	54 ∼ 72
16	115 ∼ 155	11.5 ∼ 16.0	83 ∼ 115
18	165 ∼ 225	17.0 ∼ 23.0	125 ∼ 165
20	225 ∼ 325	23 ∼ 33	165 ∼ 240

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Engine Top End:				
Rocker arm shaft stopper mounting screws	5.2	0.53	46 in·lb	
Valve adjusting screw locknuts	8.8	0.9	78 in·lb	
Camshaft sprocket bolt	12	1.2	8.9	L
Cylinder head nuts	22	2.2	16	S
Cylinder head bolts	12	1.2	8.9	L,S
Spark plug	13	1.3	9.6	
Chain tensioner mounting bolts	5.2	0.53	46 in·lb	
Tensioner cap bolt	5.2	0.53	46 in·lb	
Camshaft sprocket cover bolts	5.2	0.53	46 in·lb	
Camshaft chain guide bolt	5.2	0.53	46 in·lb	
Camshaft chain holder bolts	5.2	0.53	46 in·lb	
Valve adjusting cap bolts	5.2	0.53	46 in·lb	
Clutch:				
Clutch cover screws	5.2	0.53	46 in·lb	S
Clutch cover damper screws	2.9	0.3	26 in·lb	
Crankshaft hold bearing screw	2.9	0.3	26 in·lb	
Clutch hub nut (primary)	72	7.3	53	
Clutch hub nut (secondary)	72	7.3	53	
Clutch spring bolts	3.4	0.35	30 in·lb	
Clutch adjusting screw locknut	19	1.9	14	
Shift drum position plate screw	5.2	0.53	46 in·lb	
Shift drum positioning lever pivot bolt	5.2	0.53	46 in·lb	L
Kick guide screw	5.2	0.53	46 in·lb	
Return spring pin	22	2.2	16	
Engine Lubrication System:				
Oil pipe banjo bolts	15	1.5	11	
Oil pipe clamp screw	5.2	0.53	46 in·lb	
Oil pump mounting screw	5.2	0.53	46 in·lb	
Oil filter cap bolts	5.2	0.53	46 in·lb	
Engine oil drain plug	29	3.0	21	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Engine Removal/Installation:				
Engine mounting nuts	54	5.5	40	
Side stand mounting nut	23	2.3	17	
Crankshaft/Transmission:				
Crankcase screws	5.2	0.53	46 in·lb	S
Bearing retainer screw 5 mm	2.9	0.3	26 in·lb	
Bearing retainer screw 6 mm	5.2	0.53	46 in·lb	
Shift return spring pin	22	2.2	16	L
Shift drum Allen bolt	5.2	0.53	46 in·lb	L
Cam chain guide stopper screw	5.2	0.53	46 in·lb	
Wheels/Tires:				
Spoke nipples	1.2	0.12	10 in·lb	
Front axle nut	44	4.5	32	
Rear axle nut	64	6.5	47	
Torque link nut	25	2.5	18	
Final Drive:				
Rear sprocket nuts	34	3.5	25	
Brakes:				
Brake pedal bolt	8.8	0.9	79 in·lb	
Suspension:				
Front fork clamp bolts:				
Upper	20	2.0	15	
Lower	29	3.0	22	
Front fork bottom Allen bolts	20	2.0	15	
Torque link nuts:				
Front	25	2.5	18	
Rear	25	2.5	18	
Swingarm pivot shaft nut	78	8.0	58	
Rear shock absorber mounting nuts:				
Upper	39	4.0	29	
Lower	39	4.0	29	
Steering:				
Steering stem head nut	44	4.5	32	
Handlebar clamp bolt	25	2.5	18	
Steering stem nut	4.9	0.5	43 in·lb	
Electrical System:				
Gear position switch screw	2.9	0.3	26 in·lb	
Spark plug	13	1.3	9.6	
Magneto flywheel nut	41.5	4.25	30.6	
Exciter coil mounting screws	5.2	0.53	46 in·lb	
Pickup coil mounting screw	2.9	0.30	26 in·lb	
Magneto cover mounting screw	5.2	0.53	46 in·lb	S
Exciter coil plate screw	2.9	0.3	26 in·lb	
Pickup coil plate screw	2.9	0.3	26 in·lb	
Magneto cover damper	2.9	0.3	26 in·lb	

Specifications

Item	Standard	Service Limit
Fuel System:		
Throttle grip free play	2 ~ 3 mm	– – –
Idle speed	1250 ∼ 1350 r/min (rpm)	– – –
Air cleaner element oil	High quality foam air filter oil	– – –
Engine Top End:		
Valve clearance:		
Exhaust	0.04 ∼ 0.08 mm	– – –
Inlet	0.04 ∼ 0.08 mm	– – –
Clutch:		
Clutch adjusting screw	1/4 turn out	– – –
Engine Lubrication System:		
Engine oil:		
Type	API SE, SF or SG	
	API SH or SJ with JASO MA	
Viscosity	SAE 10W-40	
Capacity	1.1 L (when engine is completely dry)	– – –
	1.0 L (when filter is removed)	– – –
	0.9 L (when filter is not removed)	– – –
Level	Between upper and lower level lines	– – –
Tires:		
Rim runout:		
Axial	0.5 mm or less	2 mm
Radial	0.8 mm or less	2 mm
Final Drive:		
Drive chain slack	0 ∼ 5 mm	– – –
Drive chain 20-link length	254.0 ∼ 254.6 mm	259 mm
Brakes:		
Brake lever free play	4 ∼ 5 mm	– – –
Brake pedal free play	20 ∼ 30 mm	– – –
Brake cam lever angle: Front	$80^\circ \sim 90^\circ$	– – –
Rear	$80^\circ \sim 90^\circ$	– – –
Suspension:		
Fork oil viscosity	SHOWA SS-8 (SAE 10W-20)	– – –
Fork oil level (fully compressed, without spring)	89 ± 2 mm	– – –
Electrical System:		
Standard plug	NGK CR6HSA	– – –
Spark plug gap	06. ∼ 0.7 mm	– – –

Special Tools - Valve Adjusting Screw Holder: 57001–1217
Jack: 57001–1238
Fork Oil Level Gauge: 57001–1290
Steering Stem Nut Wrench: 57001–1100

Periodic Maintenance Procedures

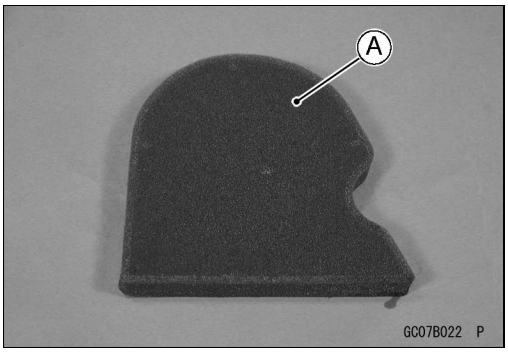
Air Cleaner Element Cleaning and Inspection

NOTE

- *In dusty areas, the element should be cleaned more frequently than recommended interval.*
- *After riding through rain or on muddy roads, the element should be cleaned immediately.*
- *Since repeated cleaning opens the pores of the element, replace it with a new one. Also, if there is a break in the element material or any other damage to the element, replace the element with a new one.*

⚠ WARNING

Clean the element in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or a low flash-point solvent to clean the element.



- Remove the air cleaner element [A] (see Fuel System chapter).

- Clean the element in a bath of a high flash-point solvent using a soft bristle brush. Squeeze it dry in a clean towel. Do not wring the element or blow it dry; the element can be damaged.
- Check all the parts of the element for visible damage.

★ If any of the parts of the element are damaged, replace them.

- After cleaning, saturate the element with a high-quality foam-air-filter oil, squeeze out the excess, then wrap it in a clean rag and squeeze it as dry as possible. Be careful not to tear the sponge filter.
- Remove the towel from the carburetor.
- Install the element.

Engine Top End

Valve Clearance Inspection

CAUTION

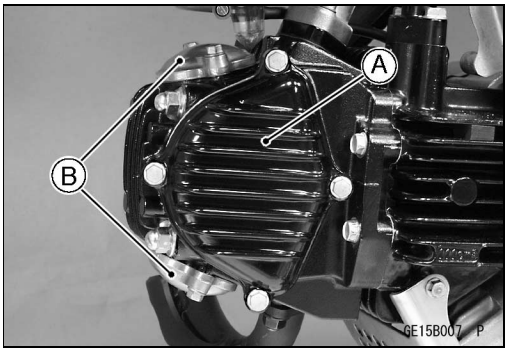
If valve clearance is left unadjusted, wear will eventually cause the valves to remain partly open, which lowers performance, burns the valves and the valve seats, and may cause serious engine damage.

NOTE

- *Valve clearance must be checked when the engine is cold (at room temperature).*

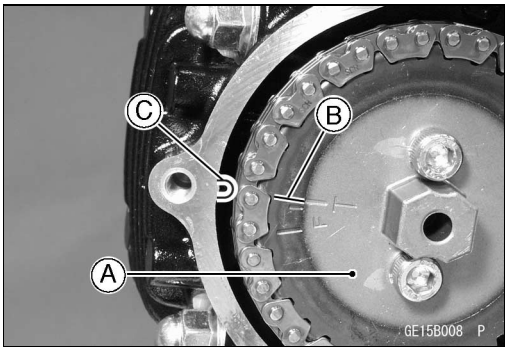
Valve Clearance (when engine cold)
Inlet and Exhaust: 0.04 ∼ 0.08 mm

- Remove:
  Left Shroud
  Spark Plug (see Electrical System chapter)
  Camshaft Sprocket Cover [A] (see Camshaft Sprocket Removal in the Engine Top End chapter.)
  Valve Adjusting Covers [B] (see Rocker Arm Removal in the Engine Top End chapter.)

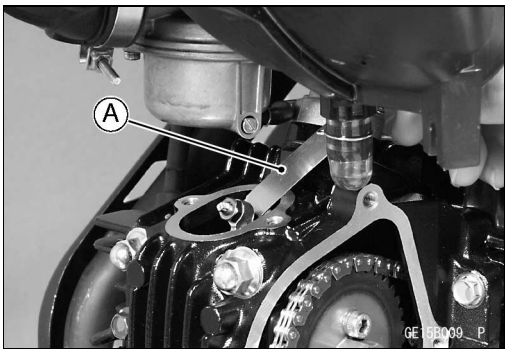


Periodic Maintenance Procedures

● Turn the camshaft sprocket plate [A] counterclockwise and align the line [B] on the camshaft sprocket with the projection [C] on the mating surface of the cylinder head.



● Measure the clearance of each valve by inserting a thickness gauge [A] between the adjusting screw and the valve stem.
★If a valve clearance is incorrect, adjust it.
● Install the other removed parts.



Valve Clearance Adjustment

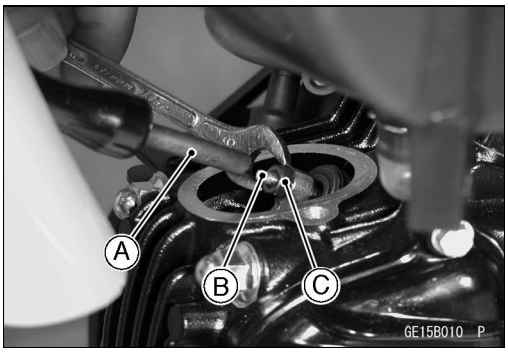
● Use a valve adjusting screw holder [A] to holding the valve adjusting screw [B], loosen the adjusting screw locknut [C] and insert the 0.05 mm thickness gauge between valve and adjusting screw and turn the adjusting screw until the adjusting screw stops.

Special Tools - Valve Adjusting Screw Holder: 57001–1217

● Tighten the locknut.

Torque - Adjusting Screw Locknut: 8.8 N·m (0.9 kgf·m, 78 in·lb)

● Remove the thickness gauge.

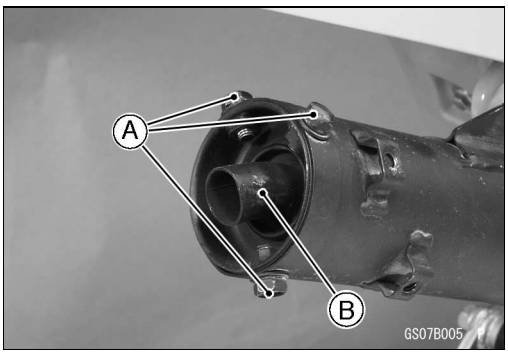


Spark Arrester Cleaning

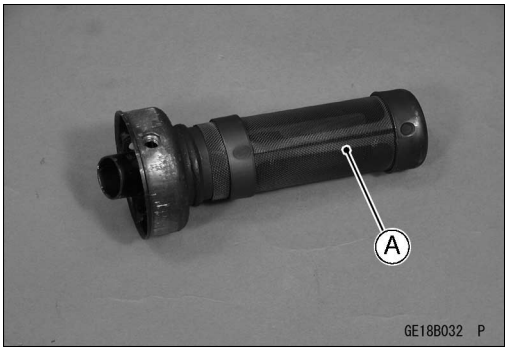
⚠WARNING

To avoid burns, be sure the exhaust system is cold before cleaning the spark arrester. The exhaust system becomes very hot soon after the engine is started.

● Remove the muffler cover.
● Unscrew the mounting bolts [A] and pull out the spark arrester [B].



● Scrape carbon deposits off the spark arrester [A].



Engine Top End

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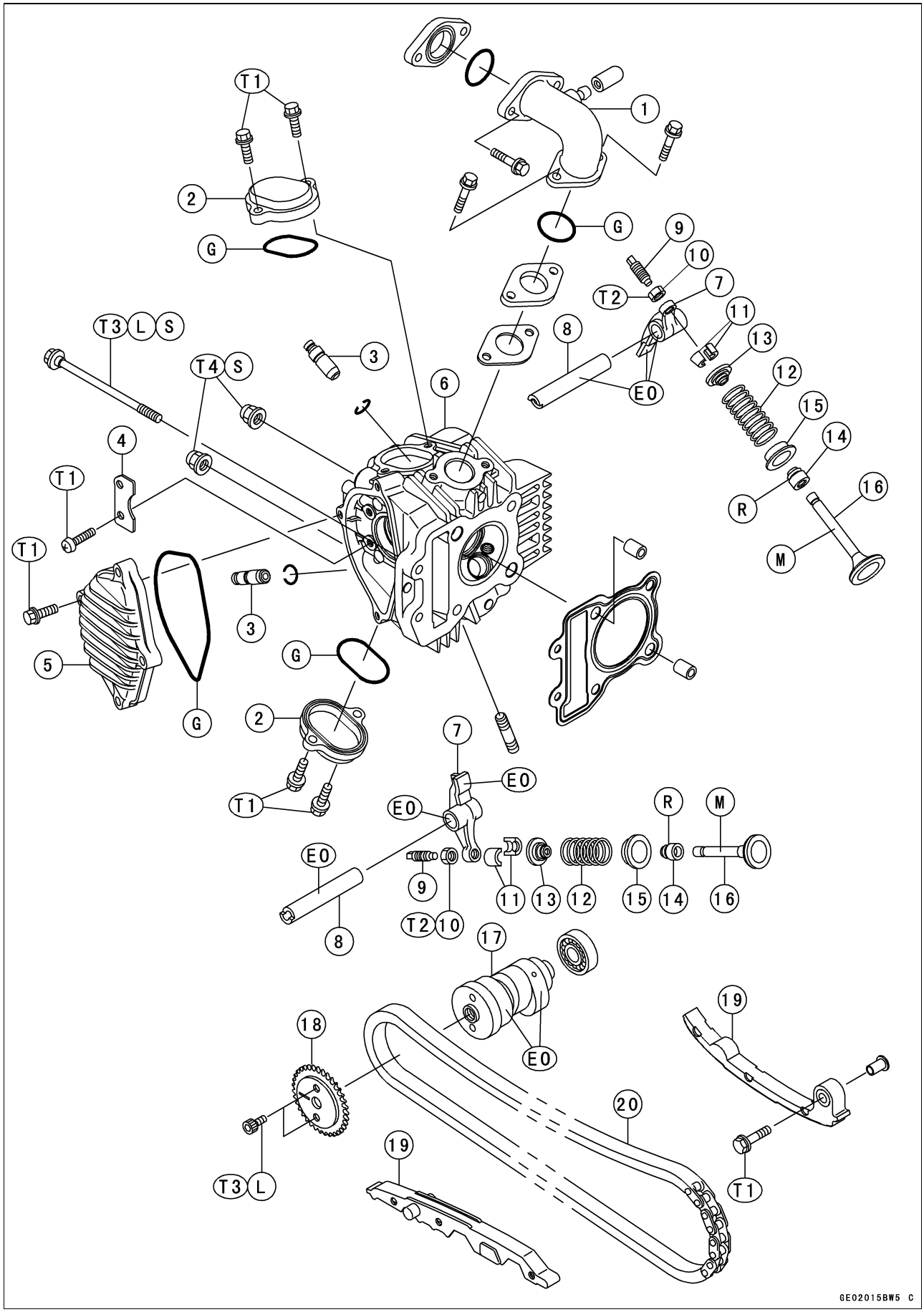
4-2 ENGINE TOP END

Exploded View

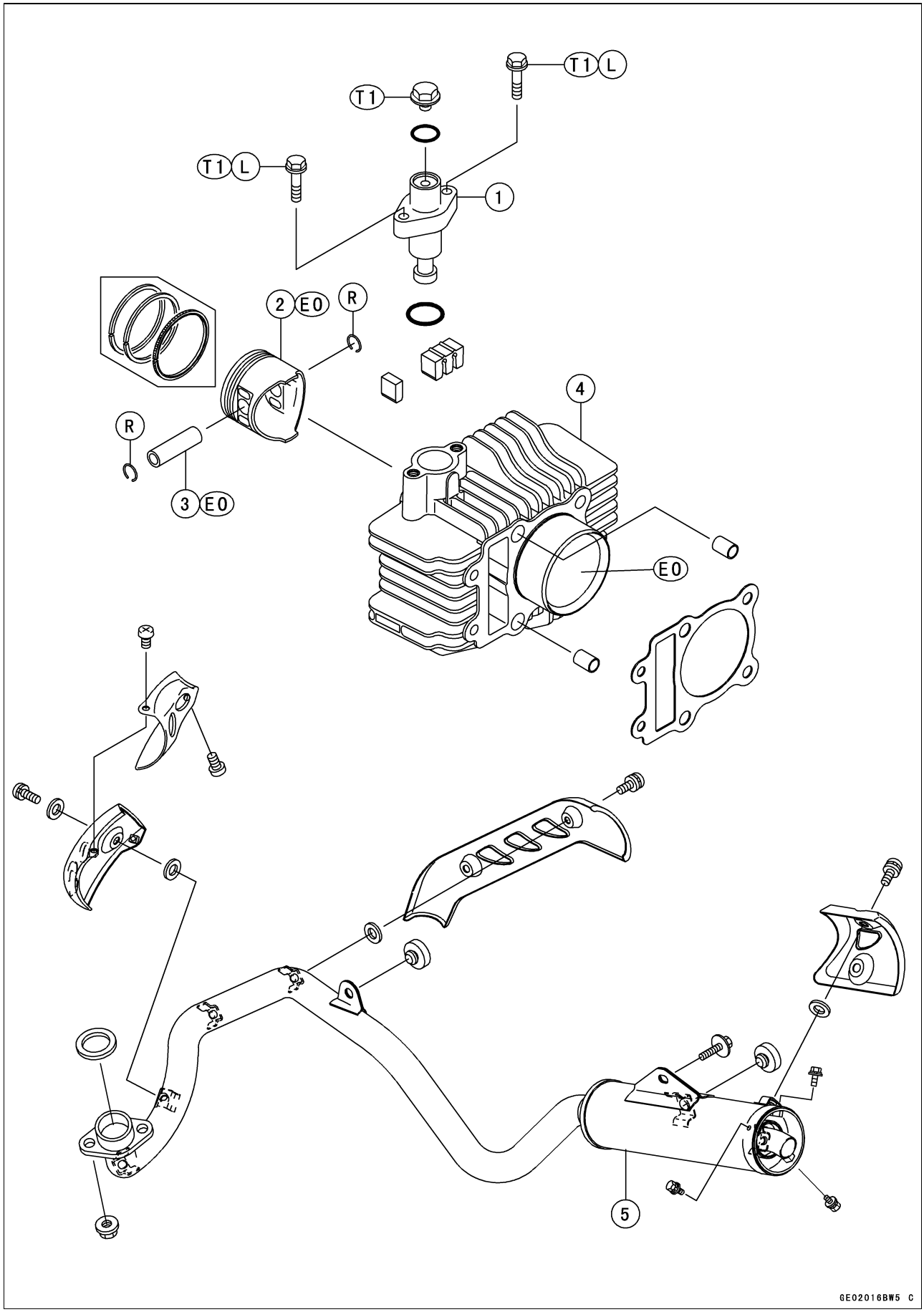


Exploded View

1. Intake Pipe
2. Valve Adjusting Cover
3. Valve Guide
4. Rocker Arm Shaft Stopper
5. Camshaft Sprocket Cover
6. Cylinder Head
7. Rocker Arm
8. Rocker Arm Shaft
9. Valve Adjusting Screw
10. Valve Adjusting Screw Locknut
11. Split Keepers
12. Valve Spring
13. Valve Spring Retainer
14. Stem Oil Seal
15. Valve Seat
16. Valve Stem
17. Camshaft
18. Camshaft Sprocket
19. Chain Guide
20. Camshaft Chain

S: Follow the specific tightening sequence.
EO: Apply engine oil.
M: Apply molybdenum disulfide grease.
R: Replacement parts
G: Apply grease.
L: Apply a non-permanent locking agent.
T1: 5.2 N·m (0.53 kgf·m, 46 in·lb)
T2: 8.8 N·m (0.9 kgf·m, 78 in·lb)
T3: 12 N·m (1.2 kgf·m, 8.9 ft·lb)
T4: 22 N·m (2.2 kgf·m, 16 ft·lb)

Exploded View



Exploded View

1. Camshaft Chain Tensioner
2. Piston
3. Piston Pin
4. Cylinder
5. Muffler

L: Apply non-permanent locking agent.
EO: Apply engine oil.
R: Replacement parts
T1: 5.2 N·m (0.53 kgf·m, 46 in·lb)

4-6 ENGINE TOP END

Specifications

Item		Standard	Service Limit
Camshaft:			
Camshaft:			
Cam height	Exhaust	29.021 mm ~ 29.201 mm	28.92 mm
	Inlet	28.984 mm ~ 29.164 mm	28.88 mm
Camshaft chain 20-link length		127.00 ~ 127.48 mm	128.9 mm
Rocker Arms, Shaft			
Rocker arm inside diameter		10.000 ~ 10.015 mm	10.05 mm
Rocker arm shaft diameter		9.980 ~ 9.995 mm	9.95 mm
Cylinder Head:			
Cylinder Compression			
		Usable range	
		865 ~ 1320 kPa (8.8 ~ 13.5 kgf/cm^2, 125 ~ 192 psi) @5 kicks	- - -
Cylinder head warp			0.05 mm
Valve:			
Valve Clearance:	Exhaust	0.04 ~ 0.08 mm	- - -
	Inlet	0.04 ~ 0.08 mm	- - -
Valve head thickness:			
	Exhaust	1.15 ~ 1.45 mm	0.5 mm
	Inlet	0.85 ~ 1.15 mm	0.5 mm
Valve stem bend		TIR 0.01 mm or less	TIR 0.05 mm
Valve stem diameter:			
	Exhaust	4.462 ~ 4.472 mm	4.44 mm
	Inlet	4.475 ~ 4.490 mm	4.46 mm
Valve guide inside diameter:			
	Exhaust	4.500 ~ 4.512 mm	4.55 mm
	Inlet	4.500 ~ 4.512 mm	4.55 mm
Valve/valve guide clearance:			
(wobble method):	Exhaust	0.06 ~ 0.11 mm	0.19 mm
	Inlet	0.02 ~ 0.07 mm	0.12 mm
Valve seat cutting angle		45°, 32°, 60°, 67.5°	
Valve seat surface:			
Width:	Exhaust	0.80 ~ 1.15 mm	- - -
	Inlet	0.80 ~ 1.15 mm	- - -
Outside diameter:	Exhaust	19.9 ~ 20.1 mm	- - -
	Inlet	22.9 ~ 23.1 mm	- - -
Valve spring free lengh:		36.75 mm	35.5 mm

Specifications

Item		Standard	Service Limit
Cylinder, Piston:			
Cylinder inside diameter		52.997 ∼ 53.009 mm	53.10 mm
Piston outside diameter		52.981 ∼ 52.993 mm	52.83 mm
Piston/cylinder clearance		0.010 ∼ 0.022 mm	- - -
Oversize piston and rings		+ 0.25 mm, +0.50 mm, 0.75 mm, and +1.0 mm	- - -
Piston ring/groove clearance:			
	Top	0.02 ∼ 0.06 mm	0.16 mm
	Second	0.01 ∼ 0.05 mm	0.15 mm
Piston ring groove width:			
	Top	0.81 ∼ 0.83 mm	0.90 mm
	Second	0.80 ∼ 0.82 mm	0.90 mm
Piston ring thickness:			
	Top	0.77 ∼ 0.79 mm	0.7 mm
	Second	0.77 ∼ 0.79 mm	0.7 mm
Piston ring end gap:			
	Top	0.15 ∼ 0.30 mm	0.6 mm
	Second	0.30 ∼ 0.45 mm	0.8 mm
	Oil	0.10 ∼ 0.60 mm	0.9 mm
Piston pin diameter		12.995 ∼ 13.000 mm	12.96 mm
Piston pin hole inside diameter		13.001 ∼ 13.007 mm	13.07 mm
Connecting rod small end inside diameter		13.003 ∼ 13.014 mm	13.05 mm

Special Tools - Compression Gauge: 57001–221
Piston Pin Puller Assembly : 57001–910
Compression Gauge Adapter, M10 X 1.0 : 57001–1317
Valve Guide Arbor, ϕ5.5 : 57001–1021
Valve Guide Reamer, ϕ5.5 : 57001–1020
Valve Seat Cutter Holder, ϕ5.5 : 57001–1125
Valve Seat Cutter Holder Bar : 57001–1128
Valve Seat Cutter, 45° – ϕ27.5 : 57001–1114
Valve Seat Cutter, 32° – ϕ25 : 57001–1118
Valve Seat Cutter, 60° – ϕ30 : 57001–1123
Valve Seat Cutter, 32° – ϕ22 : 57001–1206
Valve Seat Cutter, 45° – ϕ22 : 57001–1205
Valve Seat Cutter, 67.5° – ϕ22 : 57001–1207
Valve Spring Compressor Assembly: 57001–241
Valve Spring Compressor Adapter, ϕ20: 57001–1154
Valve Adjusting Screw Holder: 57001–1217

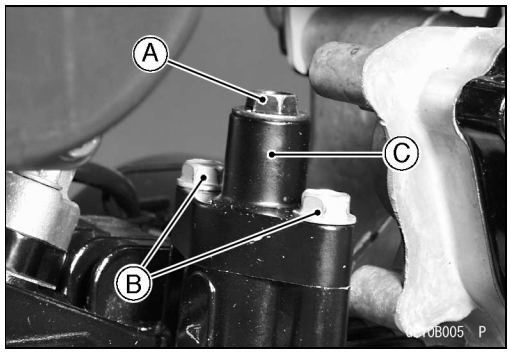
Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

CAUTION

This is a non-return type cam chain tensioner. The push rod does not return to its original position once it moves out to take up cam chain slack. Observe all the rules listed below: When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Chain Tensioner Installation". Do not turn over the crankshaft while the tensioner is removed. This could upset the cam chain timing, and damage the valves.

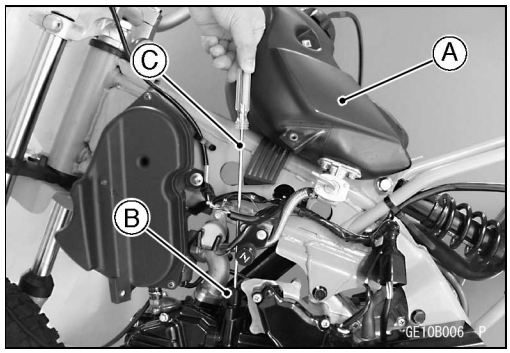
- Remove the left side cover.
- Loosen the cap bolt [A] before tensioner removal for later disassembly convenience.
- Unscrew the mounting bolts [B] and remove the camshaft chain tensioner [C].

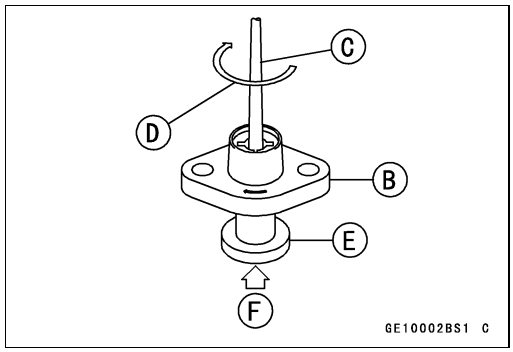


CAUTION

Do not turn over the crankshaft while the tensioner is removed. This could upset the cam chain timing, and damaging the valves.

- Remove the fuel tank mounting bolt and band, and move the fuel tank [A] backward.
- Remove the camshaft chain tensioner [B] while the push rod [E] clockwise [D] and compressing [F] it with a suitable screwdriver [C].

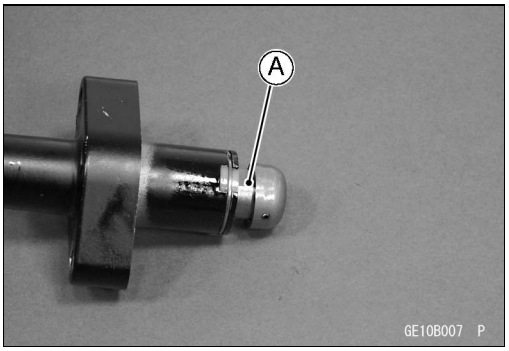




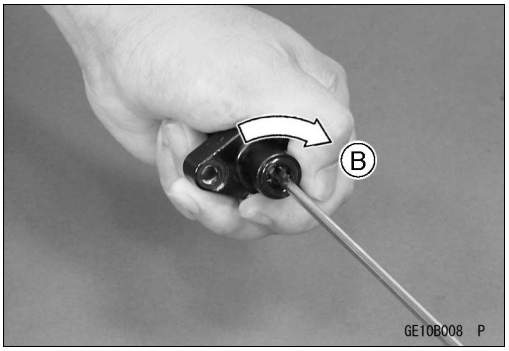
Camshaft Chain Tensioner

Camshaft Chain Tensioner Installation

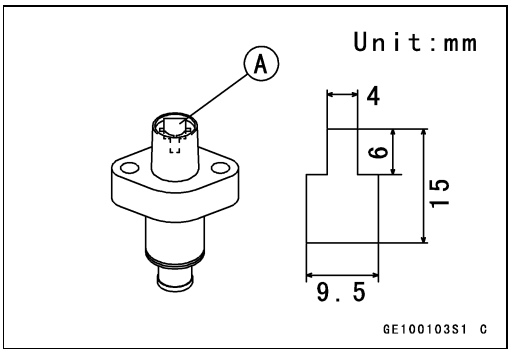
- Remove the tensioner cap bolt and O-ring.
- While compressing the push rod [A], turn it clockwise [B] with a suitable screwdriver until the rod protrusion comes to about 10 mm from the tensioner body.



CAUTION
Do not turn the rod counterclockwise at installation. This could detach the rod and the tensioner cannot be reinstalled.



- While holding the rod in position with a suitable push rod holder plate [A] install the tensioner on the cylinder block.



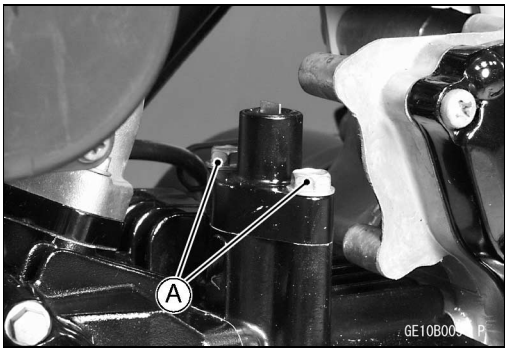
- Tighten the mounting bolts [A].

  Torque - Chain Tensioner Mounting Bolts: 5.2 N·m (0.53 kgf·m, 46 in·lb)

- Take out the holder plate.
- Install the O-ring and tighten the cap bolt.

  Torque - Tensioner Cap Bolt: 5.2 N·m (0.53 kgf·m, 46 in·lb)

- Install the left side cover.



Camshaft Chain Tensioner

Replacement Chain Tensioner Installation

○ A replacement chain tensioner (spare parts) has a push rod holder plate.

● Install the tensioner on the cylinder block, and tighten the mounting bolts.

Torque - Chain Tensioner Mounting Bolts: 5.2 N·m (0.53 kgf·m, 46 in·lb)

● Remove the plate to release the push rod.

● Install the O-ring and tighten the cap bolt.

Torque - Tensioner Cap Bolt: 5.2 N·m (0.53 kgf·m, 46 in·lb)

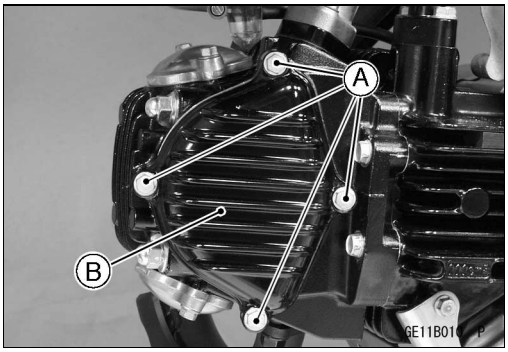
CAUTION
Do not pull the rod holder plate while the tensioner is removed. This could detach the rod and the tensioner cannot be installed easily.

Camshaft Sprocket

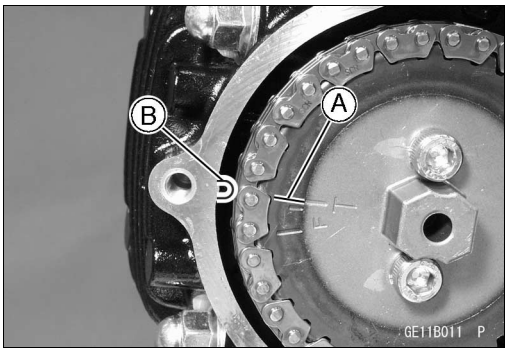
Camshaft Sprocket Removal

- Remove:
  Left Shroud
  Engine Sprocket Cover (see Final Drive chapter)
  Magneto Cover (see Electrical System chapter)

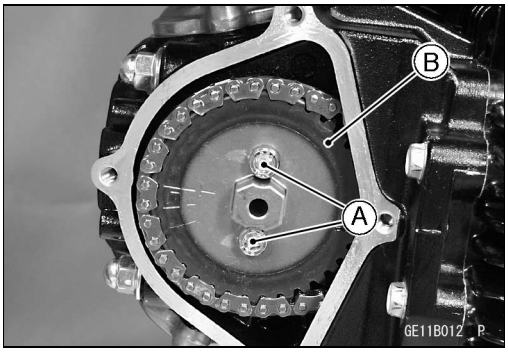
- Remove the camshaft sprocket cover bolts [A] and take off the cover [B].



- Turn the crankshaft counterclockwise until the line adjoining the line mark on the camshaft sprocket [A] aligns of the sprocket cover mating surface projection [B].
- Remove the camshaft chain tensioner.



- With a wrench on the magneto flywheel bolt to keep the crankshaft from turning, remove the camshaft sprocket bolts [A].
- Remove camshaft sprocket [B].



- Using a screwdriver [A] or wire to keep the chain [B] from falling down into the cylinder clock.

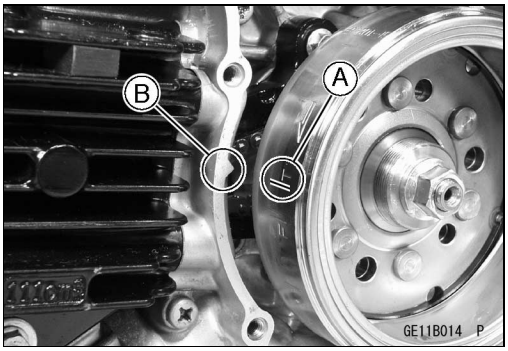
CAUTION

Always pull the camshaft chain taut while turning the crankshaft when the camshaft chain is loose.
This avoids kinking the chain on the lower (crankshaft) sprocket. A kicked chain could damage both the chain and the sprocket.

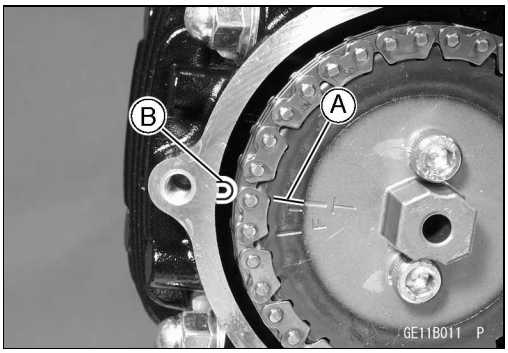
Camshaft Sprocket

Camshaft Sprocket Installation

- Check crankshaft position to see that the "T" mark [A] on the magneto flywheel aligns with the index mark [B] on the crankcase.
- Remember to pull the camshaft chain taut before rotating the crankshaft.

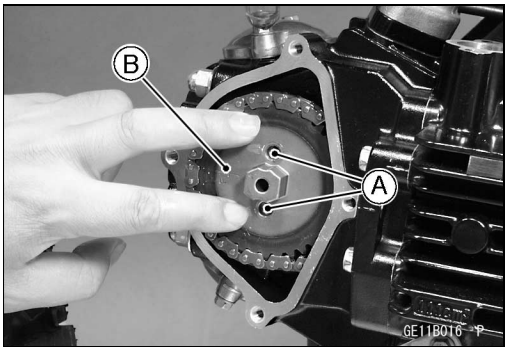


- Pull the lower side of the chain taut and fit it onto the sprocket so that the line [A] on the sprocket aligns with the make on the sprocket cover mating surface projection [B].



- Fit the sprocket up into place.
- ○ Turn the camshaft so that the cam lobes point downward, while holding the sprocket steady to align the bolt holes [A].
- Install the sprocket [B].
- Apply a non-permanent locking agent to the camshaft sprocket bolts.
- Keep the crankshaft from turning by holding a wrench on the magneto flywheel bolt.
- Tighten the sprocket bolts.

Torque - Camshaft Sprocket Bolts: 12 N·m (1.2 kgf·m, 8.9 ft·b)



- Install the camshaft chain tensioner.
- Check the camshaft chain timing.
- ○ Turn the crankshaft two turns in the counterclockwise, the crankshaft is at TDC, and re-check the camshaft chain timing.

★ If the timing mark is aligned, the camshaft chain timing is correct.

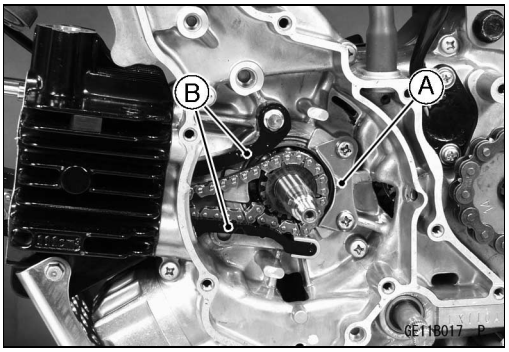
CAUTION

Rotation of the crankshaft with improper camshaft timing could cause the valve to contact each other or the piston, and bend.
If any resistance is felt when turning the crankshaft, stop immediately, and check the camshaft chain timing.

Camshaft Sprocket

Camshaft Chain Removal

- Drain the engine oil.
- Remove:
  Left Shroud
  Camshaft Chain Tensioner
  Camshaft Sprocket
  Cylinder Head
  Magneto Cover (see Electrical System chapter)
  Magneto Flywheel (see Electrical System chapter)
  Woodruff Key (see Electrical System chapter)
- Remove the camshaft chain holder [A] and chain guides [B].
- Take off the camshaft chain.

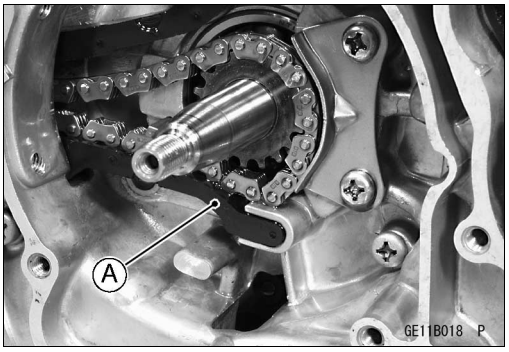


Camshaft Chain Installation

- Check to see that the crankshaft position is it TDC and re-adjust if necessary.
- Install the camshaft chain to the crankshaft and it is pulled up to the camshaft sprocket pass through camshaft chain hole in the cylinder.
- Keep the chain.
- Install the upper chain guide and camshaft chain holder.

Torque - Camshaft Chain Guide Bolt: 5.2 N·m (0.53 kgf·m, 46 in·lb)
Camshaft Chain Holder Bolts: 5.2N·m (0.53 kgf·m, 46 in·lb)

- Insert the lower chain guide [A] securely as shown.
- Install the other removed parts.



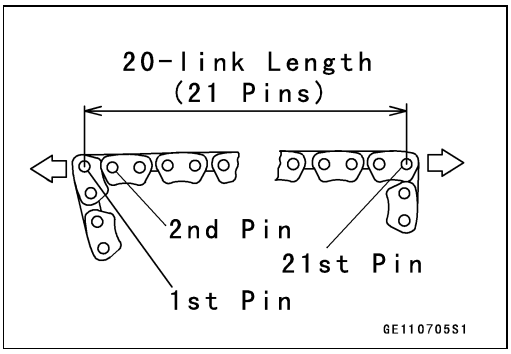
Camshaft Chain Wear

○ Hold the chain taut with a force of about 49 N (5 kg, 11 lb) in some manner and measure a 20-link length. Since the chain may wear unevenly, take measurement at several place.

Camshaft Chain 20 Link Length

Standard:	**127.00 ~ 127.48 mm**
Service Limit:	**128.9 mm**

★If the measurement of the camshaft chain exceeds the service limit, replace the chain.



Camshaft Chain Guide Wear

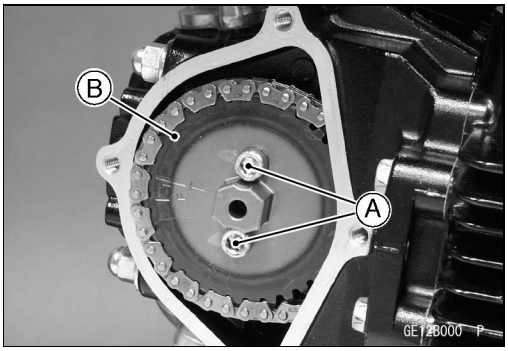
- Visually inspect the rubber on the guides.

★If the rubber is damaged or is missing places, replace the guide.

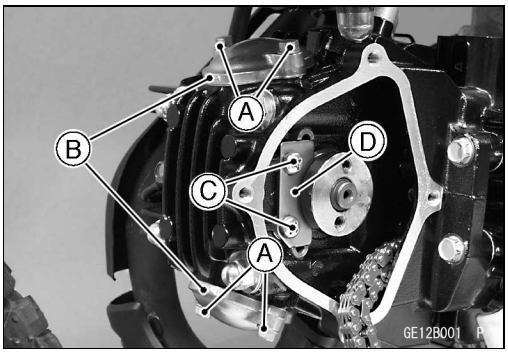
Rocker Arm, Rocker Arm Shaft

Rocker Arm Removal

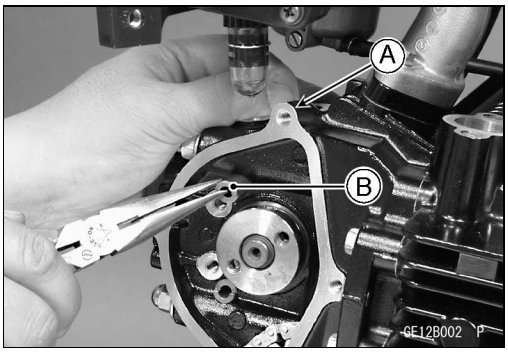
● Remove
Left Shroud
Camshaft Sprocket Cover
Camshaft Chain Tensioner
Camshaft Sprocket Bolts [A]
Camshaft Sprocket [B]



Valve Adjusting Cover Bolts [A]
Valve Adjusting Covers [B]
Rocker Arm Shaft Stopper Screws [C]
Rocker Arm Shaft Stopper [D]



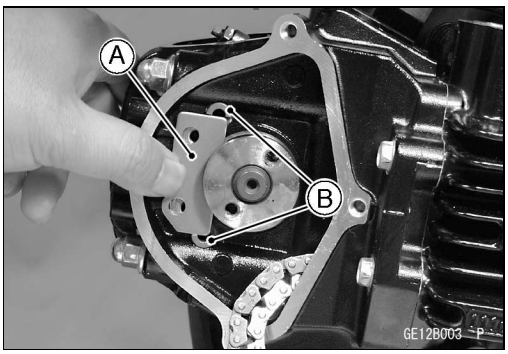
● While holding the rocker arm [A] with hand, pull out the rocker arm shaft [B] and take off the rocker arms.
○ Mark and record the rocker arm locations so that the rocker arm can be reinstalled in their original positions.



Rocker Arm Installation

● Clean the rocker arms and rocker arm shafts with a high-flash-point solvent.
● Apply a clean engine oil to the rocker arm shaft outside and rocker arm cam parts.
● Turn the camshaft so that the cam lobes point downward.
● Install the each rocker arm shaft, running it through each rocker arm.
● Install the rocker arm shaft stopper [A] so that the each rocker arm shaft protrusion [B] face to face.
● Tighten the rocker arm shaft stopper screws.

Torque - Rocker Arm Shaft Stopper Screws: 5.2 N·m (0.53 kgf·m, 46 in·lb)



● Install the camshaft sprocket.
○ Check and adjust the valve clearance.

CAUTION

When install the valve adjusting covers, be careful not to drop of protrude the O-rings from the cover grooves. If the O-ring is installed improperly, oil will leak.

Rocker Arm, Rocker Arm Shaft

Rocker Arm & Arm Shaft Wear

● Visually inspect where the cam and valve stem wear on each arm.

★If there is any damage or uneven wear, replace the arm.

○ Measure the inside diameter [A] of each rocker arm with a cylinder gauge.

Rocker Arm Inside Diameter

Standard:	**10.000 ∼ 10.015 mm**
Service Limit:	**10.05 mm**

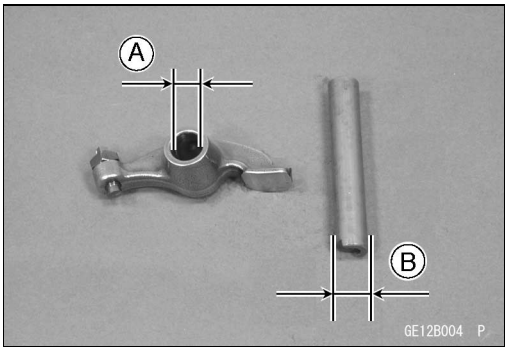
★If it exceeds the service limit, replace the arm.

○ Measure the diameter [B] of each rocker arm shaft where the rocker arm fits.

Rocker Arm Shaft Diameter

Standard:	**9.980 ∼ 9.995 mm**
Service Limit:	**9.95 mm**

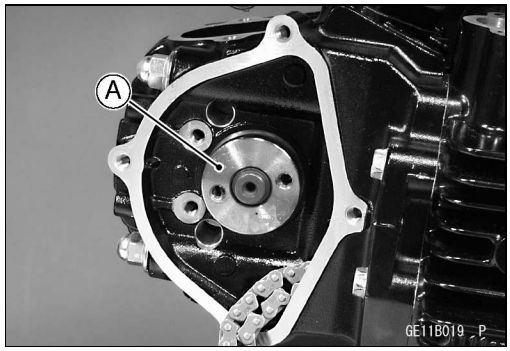
★If the diameter is less than the service limit, replace the rocker arm shaft.



Camshaft

Camshaft Removal

- Remove:
  Left Shroud
  Camshaft Chain Tensioner
  Camshaft Sprocket
  Rocker Arms
- Pull out the camshaft [A].



Camshaft Installation

- Clean the camshaft with a high-flash-point solvent.
- Apply clean engine oil to all cam parts.
- Install the camshaft in the cylinder head.
- Install the rocker arm.
- Install the other removed parts.
- ○ Check and adjust the valve clearance.

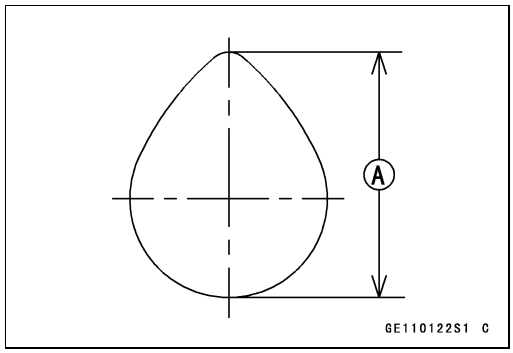
Camshaft Inspection

- Visually inspect the cam for wear or damage.
- ★ If there is any damage or wear, replace the camshaft.
- Measure the height [A] of each cam.

Cam Height

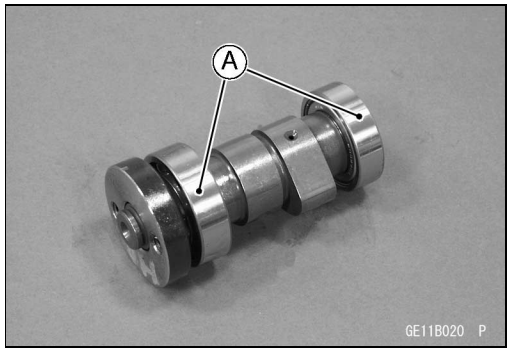
	Exhaust	Inlet
Standard:	**29.021 ∼ 29.201 mm**	**28.984 ∼ 29.164 mm**
Service Limit:	**28.92 mm**	**28.88 mm**

★ If any cam is worn down past service limit, replace the camshaft.



Camshaft Bearing Inspection

- Visually inspect each camshaft bearing [A].
- ★ If there is any damage replace the camshaft.
- Turn the bearing back and forth while checking for roughness or binding.
- ★ If roughness or binding is found, replace the camshaft.
- ★ If it is noisy, does not spin smoothly, or has any rough spots, replace the camshaft.



Cylinder Head

Compression Measurement

- Warm up the engine thoroughly
- Stop the engine.
- Remove the spark plug and attach compression gauge and adapter firmly into the spark plug hole.

Special Tools - Compression Gauge: 57001–221 [A]
Compression Gauge Adapter, M10X1.0: 57001–1317 [B]

- With the throttle fully open, turn the engine over sharply with the kick starter several times until the compression gauge stops rising; the compression is the highest reading obtainable.

Cylinder Compression
Usable Range: 865 ∼ 1320 kPa
(8.8 ∼ 13.5 kgf/cm^2, 125 ∼ 192 psi) @5 kicks

The following table should be consulted if the obtainable compression reading is not within the usable range.

Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged position oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket, cylinder base gasket thickness.	Replace to gasket with a standard part.
Cylinder compression is lower than usable range	Gas leakage around cylinder head.	Replace damaged gasket and check cylinder head warp.
	Bad condition of valve seating.	Repair if necessary.
	Incorrect valve clearance.	Adjust the valve clearance.
	Incorrect piston/cylinder clearance.	Replace the piston and/or cylinder
	Piston seizure.	Inspect the cylinder (and liner) and replace/repair the cylinder and/or piston as necessary.
	Bad condition of piston ring and/or piston ring grooves.	Replace the piston and/or the piston rings.

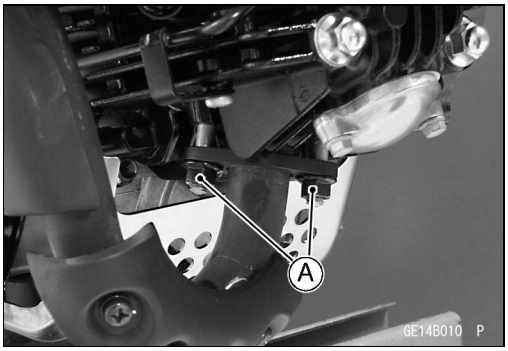
- Remove the compression gauge, adapter and install the spark plug.

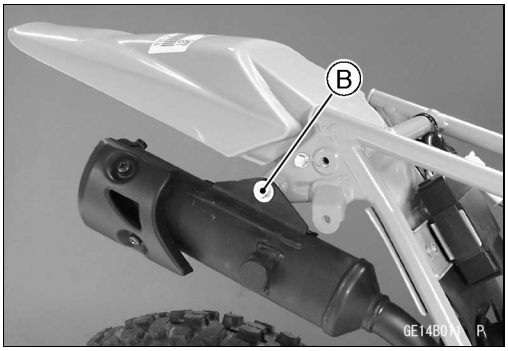
Torque - Spark Plug: 13 N·m (1.3 kgf·m, 9.6 ft·lb)

Cylinder Head

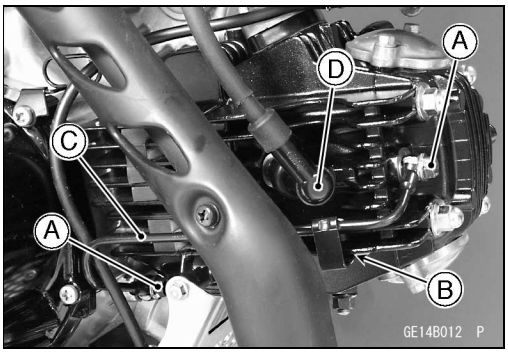
Cylinder Head Removal

- Remove the right and left shrouds.
- Remove the exhaust pipe holder nuts [A], and muffler mounting bolt [B] and then the muffler with the exhaust pipe holder.

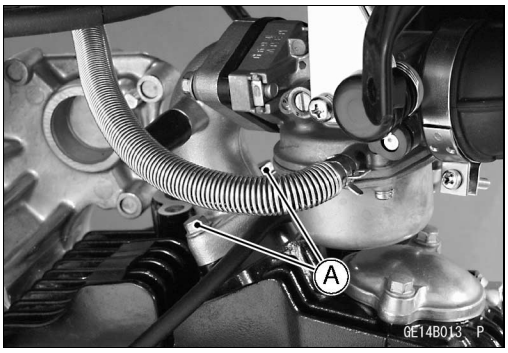




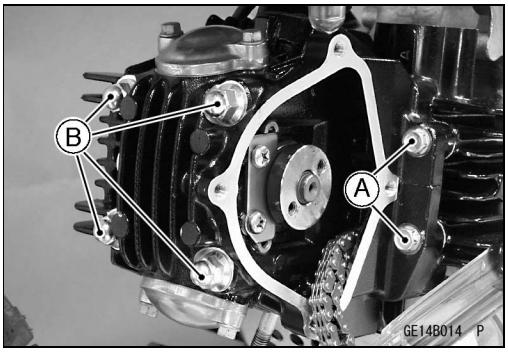
- Remove the oil pipe banjo bolts [A], screws [B], and take of the oil pipe [C].
- Remove the spark plug cap [D].



- Unscrew the intake pipe bolts [A].
- Remove:
  Camshaft Sprocket Cover
  Camshaft Chain Tensioner
  Camshaft Sprocket



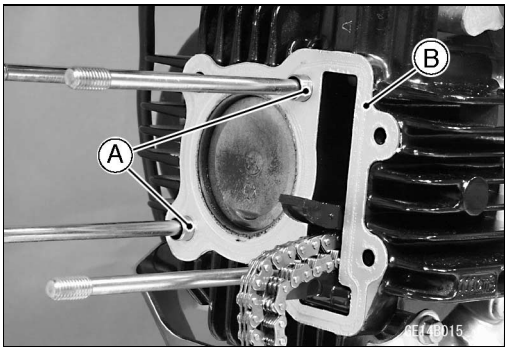
- Remove the cylinder head bolts [A], nuts [B], and take off the cylinder head.



Cylinder Head

Cylinder Head Installation

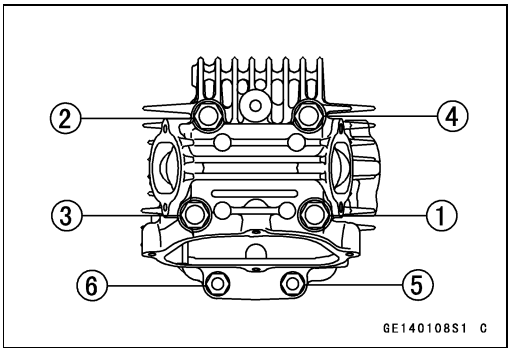
- Check to see that the two dowel pins [A] are in place on the cylinder.
- Install a new cylinder head gasket [B].



- Fit the cylinder head onto the cylinder block using a screwdriver or wire to keep the chain from falling down into the cylinder block.
- Apply a non-permanent locking agent to the cylinder head bolts.
- Tighten the cylinder head nuts and bolts following the tightening sequence as shown.

First Torque - Cylinder Head Bolts: 5.9 N·m (0.6 kgf·m, 52 in·lb)
Cylinder Head Nuts: 13 N·m (1.3 kgf·m, 9.6 ft·lb)

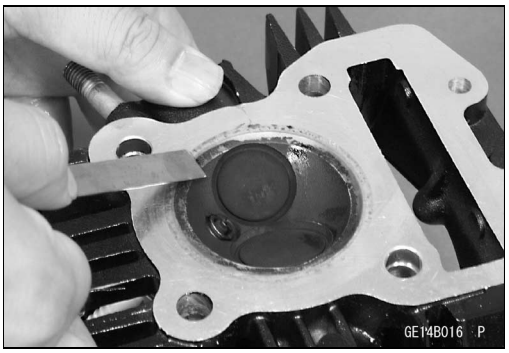
Final Torque - Cylinder Head Bolts: 12 N·m (1.2 kgf·m, 8.9 in·lb)
Cylinder Head Nuts: 22 N·m (2.2 kgf·m, 16 ft·lb)



- Install the camshaft sprocket.
- Install the other removed parts.

Cylinder Head Cleaning

- Scrape out any carbon, and wash the head with a high-flash-point solvent.

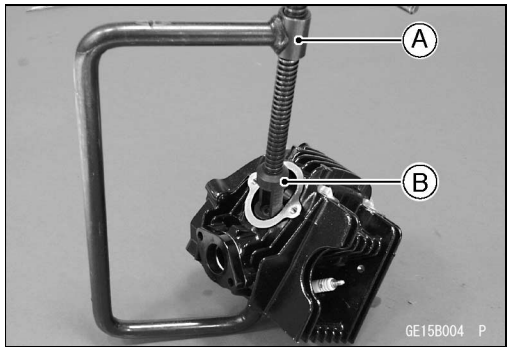


Valve/Valve Guide

Valve Removal

- Remove:
  Cylinder Head
  Rocker Arm & Rocker Arm Shaft
  Camshaft
- Using the valve spring compressor assembly to press down the valve spring retainer, remove the split keeper.

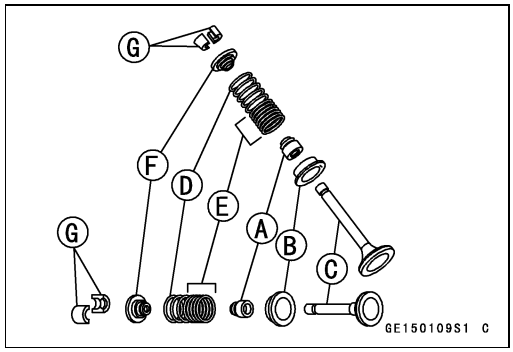
Special Tools - Valve Spring Compressor Assembly: 57001–241 [A]
Valve Spring Compressor Adapter, ϕ20: 57001–1154 [B]



- Remove the tool and then remove the spring retainer, spring, and spring seat.
- Push out the valve.
- Pull off the valve stem oil seal.

Valve Installation

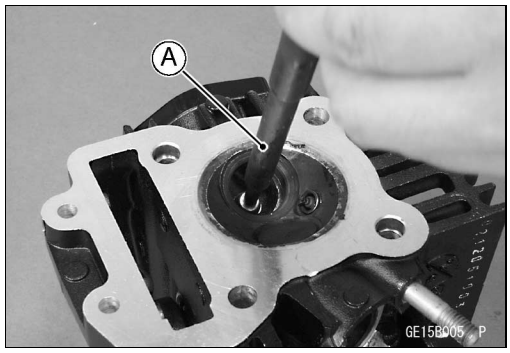
- Replace the valve stem oil seal [A].
- Push a new valve stem oil seal into place.
★ If a new valve is to be used, check the valve to guide clearance.
★ If there is too much clearance, install a new valve guide.
- Check the valve seat [B].
- Apply a thin coat of molybdenum disulfide grease to the valve stem [C].
- Install spring [D] so that the closed coil end [E] faces downwards, white paint faces upward.
- Install the spring retainer [F] press it down with the valve spring compressor assembly, and put on the split keepers [G].
- After making sure that the split keepers and valve stem are all properly fitted, remove the tool.
- Install:
  Camshaft
  Rocker Arm & Arm Shaft
  Cylinder Head
○ Check the valve clearance, and adjust if necessary.



Valve Guide Removal

- Remove:
  Cylinder Head
  Valve
  Valve Stem Oil Seal
- Heat the area around the guide to about 120° ~ 150°C (250° ~ 302°F) and hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

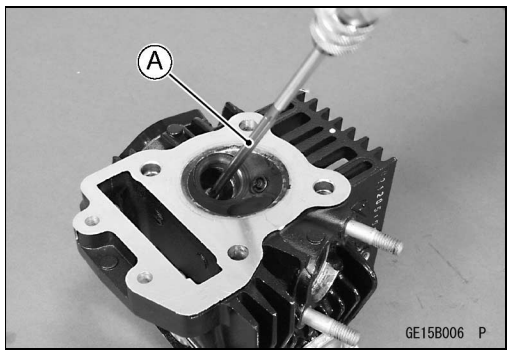
Special Tool - Valve Guide Arbor, ϕ5.5: 57001–1021



Valve Guide Installation

○ Valve guide are identical.
- Lightly oil the valve guide outer surface.
- Heat the cylinder head around the valve guide hole to about 120° ~ 150°C (250° ~ 302°F).
- Drive the valve guide in from the top of the cylinder head until the circlip stops the guide from going in too far.
- Allow the cylinder head to cool.
- Ream the valve guide with the valve guide reamer [A] even if the old guide is reused.

Special Tool - Valve Guide Reamer ϕ5.5: 57001–1020



Valve/Valve Guide

Valve Clearance Inspection

○ Refer to Valve Clearance Inspection in the Periodic Maintanance Chapter.

Valve Clearance Adjustment

○ Refer to Valve Clearance Adjustment in the Periodic Maintanance Chapter.

Valve Seat Inspection

● Remove the valve.
● Check the valve seat surface [A] between the valve [B] and valve seat [C].
○ Coat valve seat with machinists dye.
○ Push the valve into the guide.
○ Rotate the valve against the seat with a lapping tool.
○ Pull the valve out, and check the seating pattern on the valve head. It must be the correct width and even all the way around.
● Measure the outside diameter [D] of the seating pattern on the valve seat.
★ If the outside diameter is too large or too small, repair the seat (see Seat Repair).

Valve Seating Surface Outside Diameter

Standard:	**Inlet**	**22.9 ∼ 23.1 mm**
	Exhaust	**19.9 ∼ 20.1 mm**

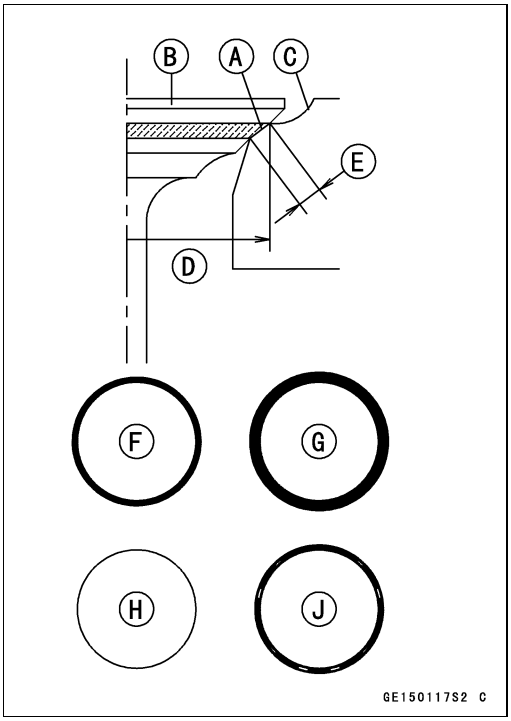
NOTE

○ *The valve stem and guide must be in good condition or this check will not be valid.*

★ If the valve seating pattern is not correct, repair the seat.
● Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.
Good [F]
★ If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Seat Repair).

Valve Seat Width

Standard:	**Inlet**	**0.80 ∼ 1.15 mm**
	Exhaust	**0.80 ∼ 1.15 mm**



Valve/Valve Guide

Valve Seat Repair

● Repair the valve seat with the valve seat cutters.

Special Tools - Valve Seat Cutter Holder, φ5.5: 57001–1125
Valve Seat Cutter Holder Bar: 57001–1128

Inlet

Special Tools - Valve Seat Cutter, 45° – φ27.5: 57001–1114
Valve Seat Cutter, 32° – φ25: 57001–1118
Valve Seat Cutter, 60° – φ30: 57001–1123

Exhaust

Special Tools - Valve Seat Cutter, 32° – φ22: 57001–1206
Valve Seat Cutter, 45° – φ22: 57001–1205
Valve Seat Cutter, 67.5° – φ22: 57001–1207

★If the manufacturer's instructions are not available, use the following procedure.

Seat Cutter Operating Care:

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purpose than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

NOTE

○ *Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.*

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond position.

NOTE

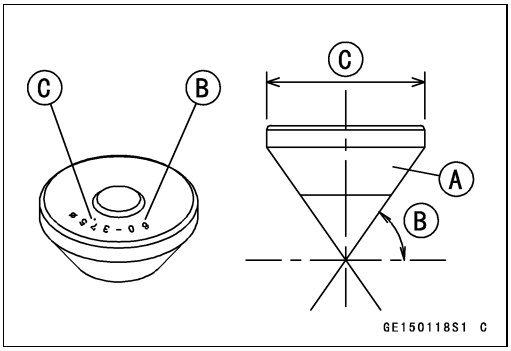
○ *Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.*

5. After use, wash the cutter with washing oil and apply a thin layer of engine oil before storing.

Marks Stamped on the cutter:

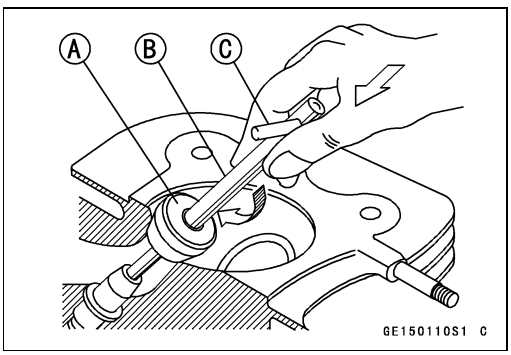
The marks stamped on the back of the cutter [A] represent the following.

60°..... Cutter angle [B]
30φ..... Outer diameter of cutter [C]



Operating Procedures:

● Clean the seat area carefully.
● Coat the seat with machinist's dye.
● Fit a 45° cutter [A] to the holder [B] and slide it into the valve guide.
● Press down lightly on the handle [C] and turn it right or left. Grind the seating surface only until it is smooth.



CAUTION

Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.

Valve/Valve Guide

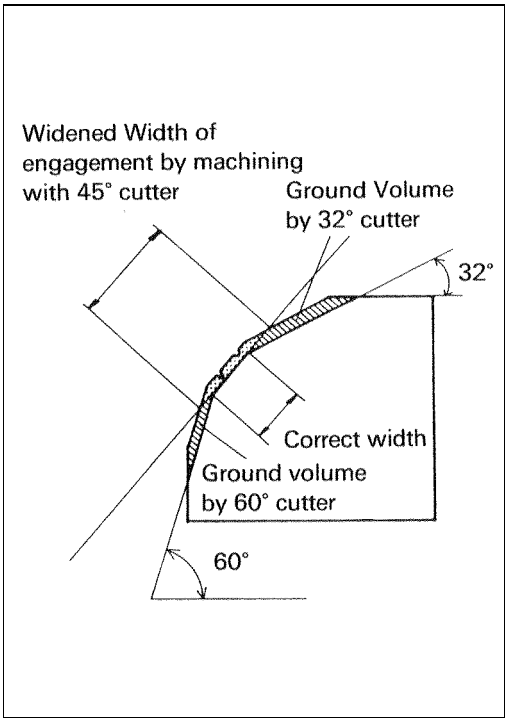
● Measure the outside diameter of the seating surface with a vernier calipers.
★ If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.
★ If the outside diameter of the seating surface is too large, make the 32° grind described below.
★ If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.
● Grind the seat at a 32° angle until the seat O.D. is within the specified range.

○ To make the 32° grind, fit a 32° cutter to the holder, and slide it into the valve guide.
○ Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

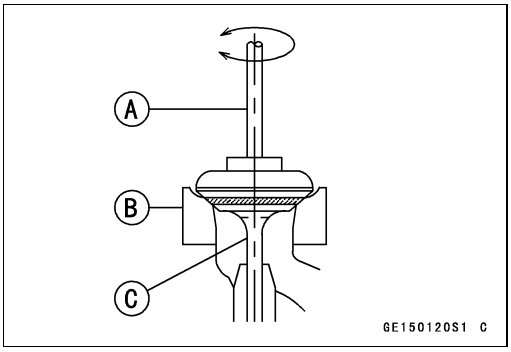
CAUTION

The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.

○ After making the 32° grind, return to the seat O.D. measurement step above.
● To measure the seat width, use a vernier calipers to measure the width of the 45° angle portion of the seat at several places around the seat.
★ If the seat width is too narrow, repeat the 45° grind until the seat is slightly too width, and then return to the seat O.D. measurement step above.
★ If the seat width is too wide, make the 60° grind described below.
★ If the seat width is within the specified range, lap the valve to the seat as described below.
● Grind the seat at a 60° angle until the seat width is within the specified range.
○ To make the 60° grind, fit 60° cutter to the holder, and slide it into the valve guide.
○ Turn the holder, while pressing down lightly.
○ After making the 60° grind, return to the seat width measurement step above.



● Lap the valve to the seat using a lapper, once the seat width and O.D. are within the ranges specified above.
○ Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
○ Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
○ Repeat the process with fine grinding compound.
[A] Lapper
[B] Valve Seat
[C] Valve
● The seating area should be marked about in the middle of the valve face.
★ If the seat area is incorrect place on the valve, be sure to check the valve is the correct part. If it is, it may have been refaced too much replace the valve.
● Be sure to remove all grinding compound before assembly.
● When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment).



Valve/Valve Guide

Valve Head Thickness Inspection

● Measure the thickness of valve head.

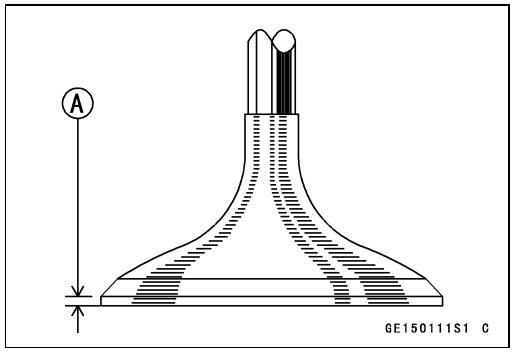
Valve Head Thickness [A]
Inlet valve:

Standard:	**0.85 ~ 1.15 mm**
Service Limit:	**0.5 mm**

Exhaust valve:

Standard:	**1.15 ~ 1.45 mm**
Service Limit:	**0.5 mm**

★If it is under the service limit, replace the valve.



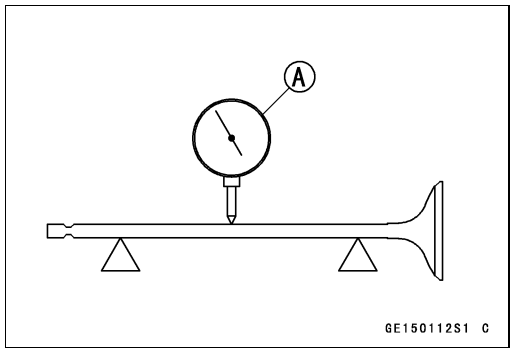
Valve Stem Bend Inspection

● Support the valve at both ends of the straight stem portion, and set a dial gauge against the center of the stem.
● Turn the valve and read the variation in the dial gauge [A].

Valve Stem Bend

Standard:	**TIR 0.01 mm or less**
Service Limit:	**TIR 0.05 mm**

★If it is bent over the service limit, replace the valve.



Valve Stem Diameter Inspection

● Measure the diameter of the valve stem.

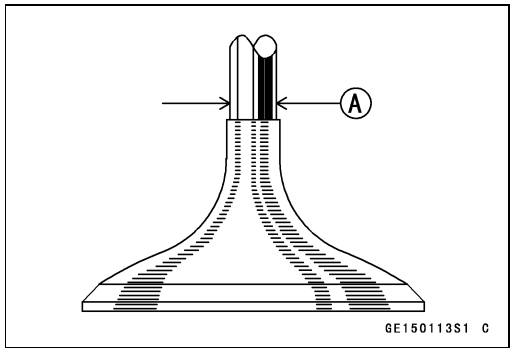
Valve Stem Diameter [A]
Inlet valve:

Standard:	**4.475 ~ 4.490 mm**
Service Limit:	**4.46 mm**

Exhaust valve:

Standard:	**4.462 ~ 4.472 mm**
Service Limit:	**4.44 mm**

★Replace the valve if the stem is worn to less than the service limit.



Valve Guide Inside Diameter Inspection

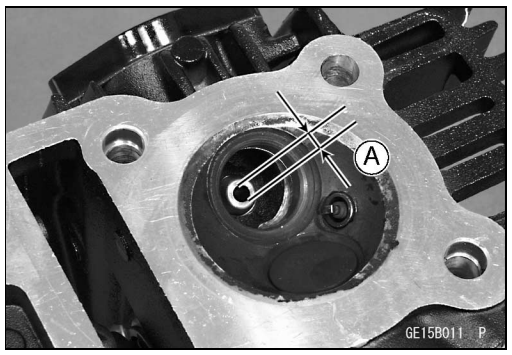
If a small bore gauge and micrometer are available, measure the valve guide as follows.

● Measure the inside diameter [A] of the valve guide. Since the guide wears unevenly, measure the diameter at four place up and down the guide.

Valve Guide Inside Diameter (Inlet and Exhaust)

Standard:	**4.500 ~ 4.512 mm**
Service Limit:	**4.55 mm**

★If any measurement exceeds the service limit, replace the valve guide.

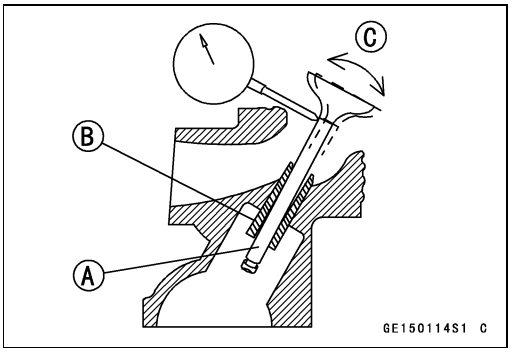


Valve/Valve Guide

Valve to Guide Clearance Measurement

If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method as indicated below.

- Insert a new valve [A] into the valve guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
- Move the stem back and forth [C] to measure valve/valve guide clearance.



Valve/Valve Guide Clearance (Woble Method)

	Standard	Service Limit
Exhaust	**0.06 ~ 0.11 mm**	**0.19 mm**
Inlet	**0.02 ~ 0.07 mm**	**0.12 mm**

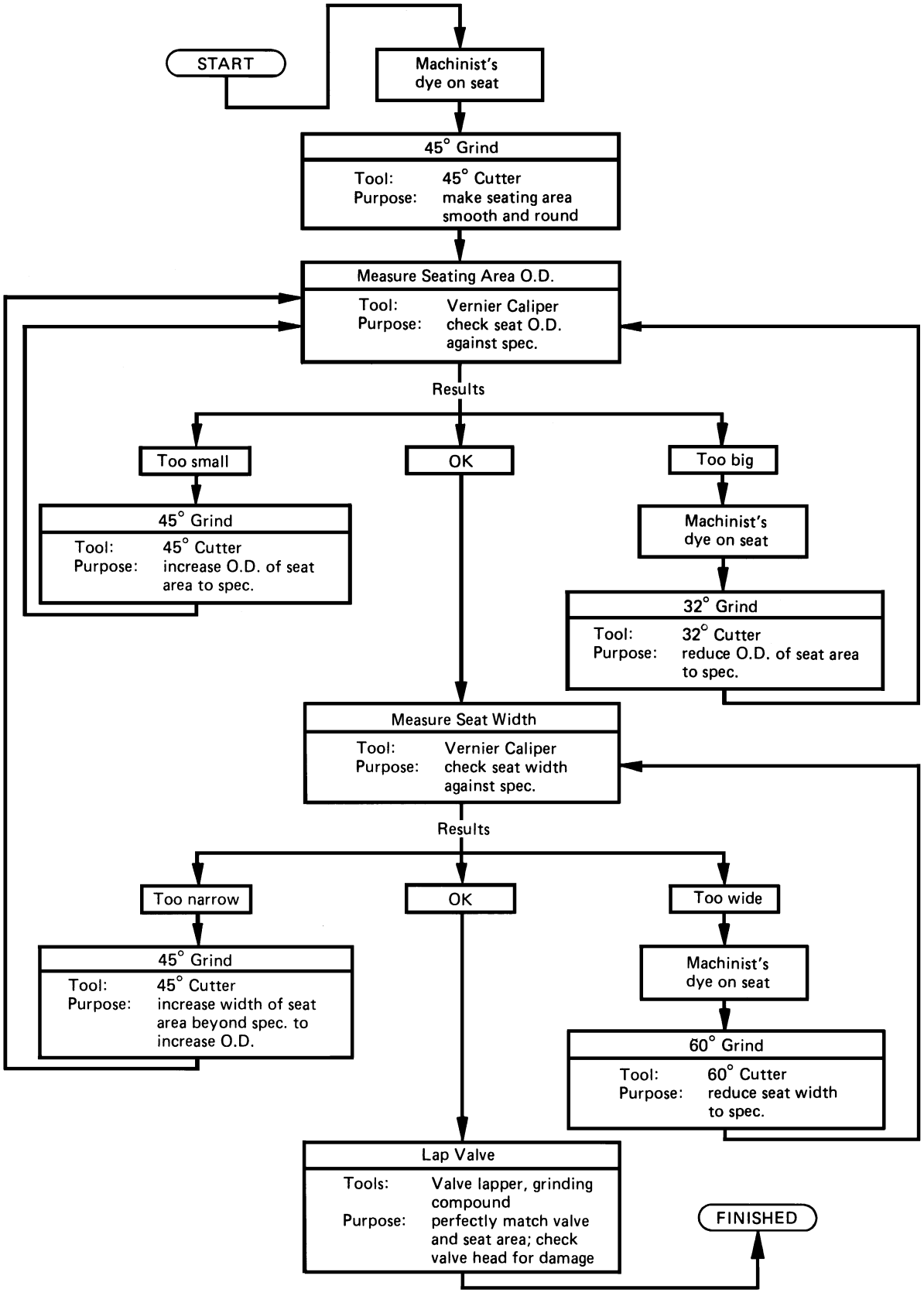
- Repeat the measurement in a direction at a right angle to the first.

★If the reading exceeds the service limit, replace the guide.

NOTE

○ *The reading is not actual valve/valve guide clearance because the measuring point is above the guide.*

Valve Seat Repair

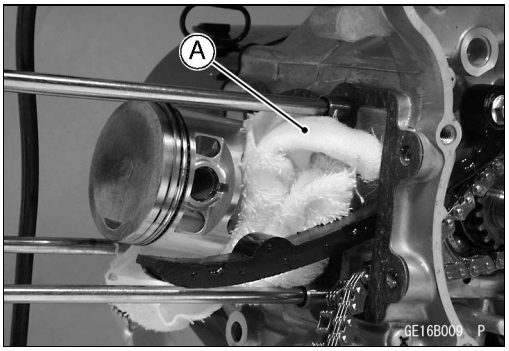


GE150308 S

Cylinder, Piston

Cylinder Removal

- Removed the cylinder head.
- Take out the cylinder block with lower camshaft chain guide, and remove the gasket. There are knock pins on the cylinder base.
- Wrap a clean cloth [A] around the base of the piston so that no parts or dirt will fall into the crankcase.

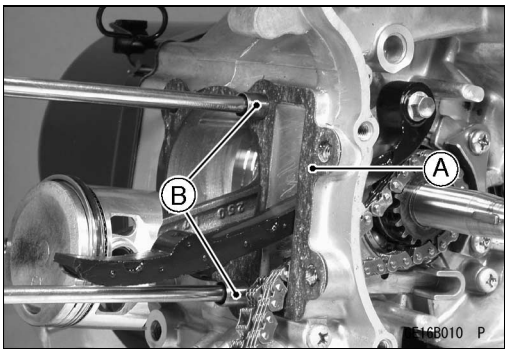


Cylinder Installation

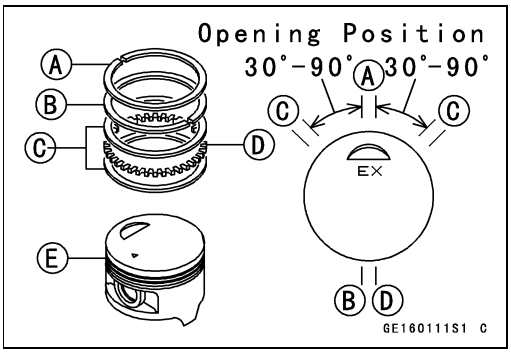
NOTE

○ *If the cylinder block is replaced with a new one, piston to cylinder clearance must be checked against the specified value.*

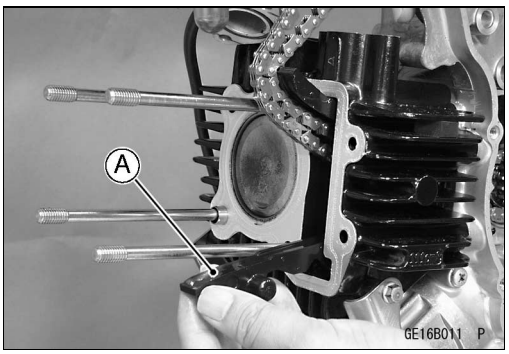
- Install a new cylinder base gasket [A] and be sure that two knock pins [B] are properly fitted in the crankcase.



- Pull the camshaft chain taut top avoid kicking it and use a wrench on the crankshaft to set the piston at BDC.
- Position the piston ring opening as follows.
  Top Ring – Front [A]
  Second Ring – Rear [B]
  Upper Steel Rail – About 30° ~ 90° of angle to the right [C]
  Expander – Rear [D]
  Lower Steel Rail – About 30° ~ 90° of angle to the left [C]
  Piston [E]

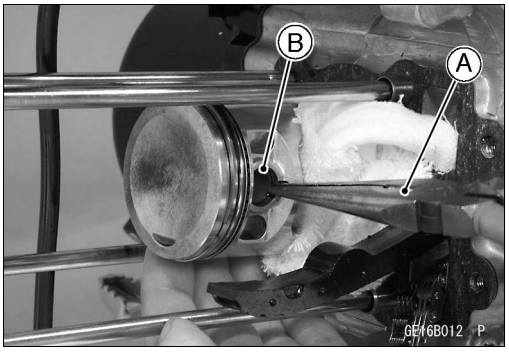


- Apply engine oil to the piston rings and the cylinder inside surface.
- Pull the camshaft chain up through the cylinder and insert a screwdriver to keep the chain from falling back into the engine.
- Place the upper camshaft chain guide inside the cylinder blocks.
- Fit the bottom of the cylinder over the piston rings, pressing in on opposite sides of the rings as necessary. Take care that the rings do not slip out of their proper positions.
- Insert the lower camshaft chain guide [A] all the way down.
- Install the cylinder head.



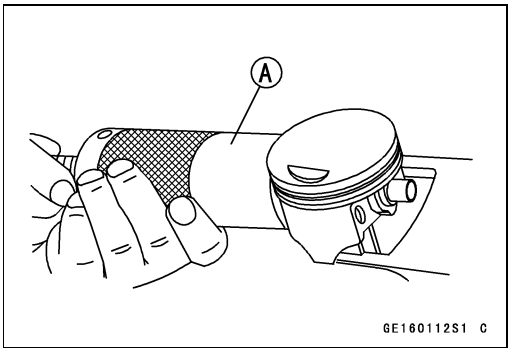
Piston Removal

- Remove the cylinder.
- Remove:
  Pliers [A]
  Snap Ring [B]

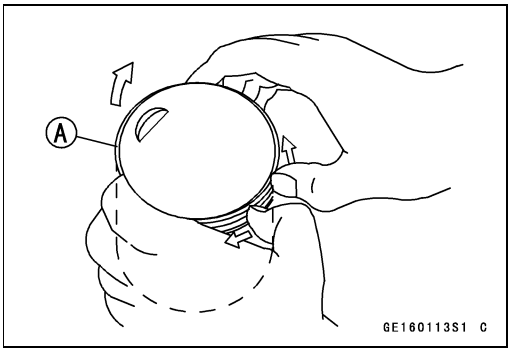


● Remove the piston by pushing its pin pull out the side that the snap ring was removed. Use the piston pin puller assembly [A] if the pin is tight.

Special Tools - Piston Pin Puller Assembly: 57001–910



● Remove the piston rings [A]. Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring to remove it.

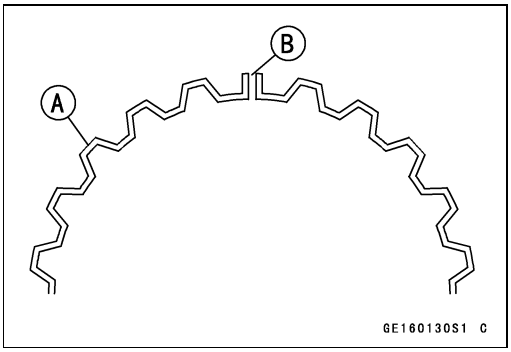


Piston Installation

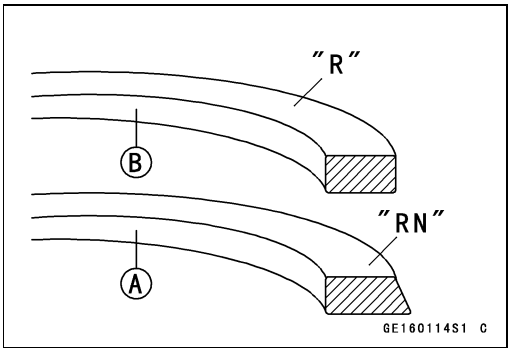
NOTE

○ *The oil ring rails have no "top" or "bottom".*

● Install the oil ring expander [A] in the bottom piston ring groove so that the ends [B] but together, never overlap.
● Install the oil ring steel rails, one above the expander and one below it.
○ Spread the rail with your thumbs, but only enough to fit the rail over the piston.
○ Release the rail into the bottom piston ring groove.



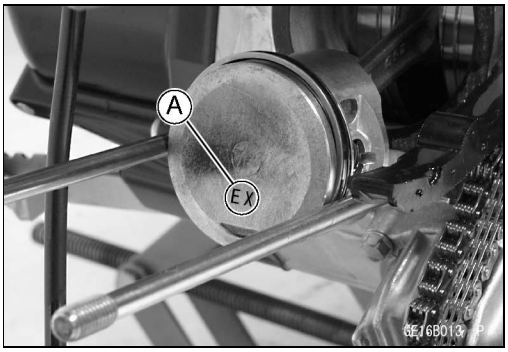
● With the marked side facing up, install the second ring [A] and top ring [B] in that order.



NOTE

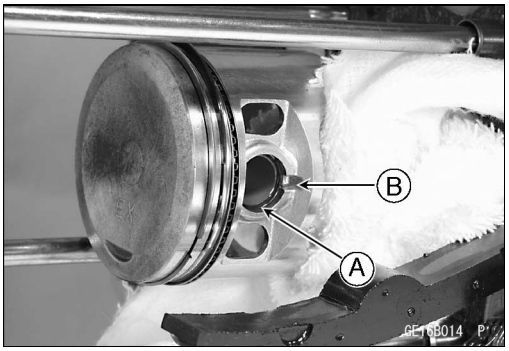
○ *If a new piston is used, check piston to cylinder clearance (see Piston/Cylinder Clearance), and use new piston rings.*

● Install the piston so that the EX mark [A] on the piston toward exhaust side.



Cylinder, Piston

● Fit a new piston snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
○ When installing a piston pin snap ring, compress it only enough to install it no more.

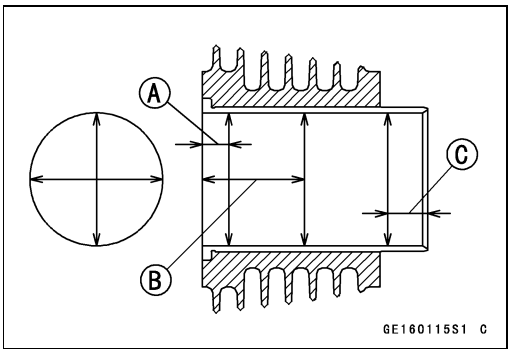


CAUTION

Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.

Cylinder Inside Diameter Measurement

● Since there is a difference in cylinder wear in different directions, take a side to side and a front to back measurement at each of the 3 locations (total of 6 measurements) shown in the figure.
★If any of the cylinder inside diameter measurements exceeds the service limit, the cylinder will have to bored to oversize and then honed.



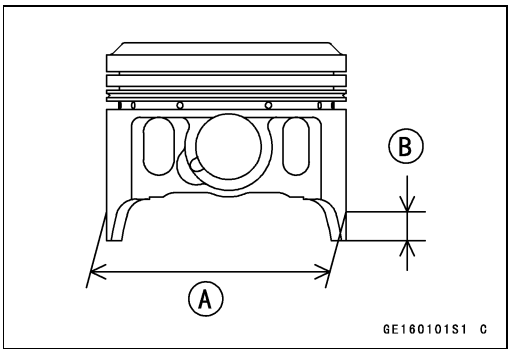
Cylinder Inside Diameter

Standard:	**52.997 ∼ 53.009 mm and less than 0.01 mm difference between any two measurements**
Service Limit:	**53.10 mm or 0.05 mm diffeence between any two measurements**

10 mm [A]
60 mm [B]
20 mm [C]

Piston Outside Diameter Measurement

● Measure the outside diameter [A] of the piston **7.8 mm** [B] up from the bottom of the piston at a right angle to the direction of the piston pin.



Piston Outside Diameter

Standard:	**52.981 ∼ 52.993 mm**
Servie Limit:	**52.83 mm**

NOTE

○ *Abnormal wear such as a marked diagonal pattern across the piston skirt may mean a bent connecting rod or crankshaft.*

Piston/Cylinder Clearance

The most accurate way to find the piston clearance is by making separate piston and cylinder diameter measurements and then computing the difference between the two values. Measure the piston diameter as just described, and measure the cylinder diameter at the very bottom of the cylinder.

Piston/Cylinder Clearance

Standard:	**0.010 ∼ 0.022 mm**

NOTE

○ *Whenever the piston or cylinder has been replaced with a new one, the motorcycle must be broken in the same as with a new machine.*

Cylinder, Piston

Boring, Honing

When boring and honing a cylinder, note the following:

○ There are two sizes of oversize pistons available. Oversize pistons require oversize rings.

Oversize Pistons and Rings

0.25 mm	Oversize
0.5 mm	Oversize
0.75 mm	Oversize
1.0 mm	Oversize

○ Before boring a cylinder, first measure the exact diameter of the service data section, oversize piston, and then, according to the standard clearance in the determine the rebore diameter. However, if the amount of boring necessary would make the inside diameter greater than 1.0 mm oversize, the cylinder block must be replaced.

○ Cylinder inside diameter must not vary more than 0.01 mm at any point.

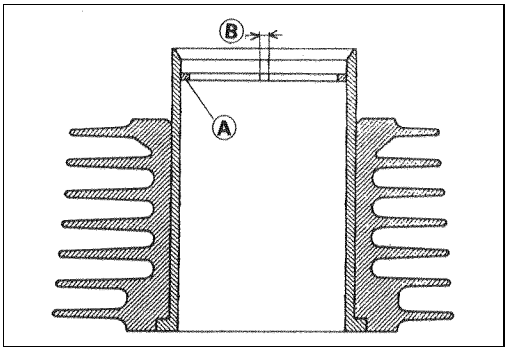
○ Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.

○ In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus 0.1 mm and the service limit for the piston is the oversize piston original diameter minus 0.20 mm. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

Piston Ring End Gap

● Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.

● Measure the gap [B] between the ends of the ring with a thickness gauge.



Piston Ring End Gap

	Standard:	Service Limit:
Top	**0.15 ~ 0.30 mm**	**0.6 mm**
Second	**0.30 ~ 0.45 mm**	**0.8 mm**
Oil	**0.10 ~ 0.60 mm**	**0.9 mm**

Piston Ring, Piston Ring Groove Inspection

● Visually inspects the piston rings and the piston ring grooves.

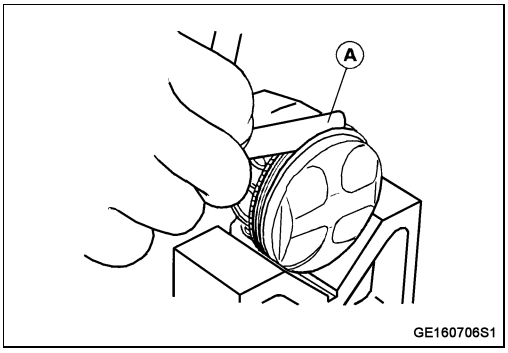
★ If the rings are worn unevenly or damaged, they must be replaced.

★ If the piston ring grooves are worn unevenly or damaged, the piston must be replaced and fitted with new rings.

● Check for uneven groove wear by inspecting the ring seating.

★ The rings should fit perfectly parallel to the groove surfaces. If not, the piston must be replaced.

● With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring groove clearance.



Piston Ring/Groove Clearance

	Standard:	Service Limit:
Top	**0.02 ~ 0.06 mm**	**0.16 mm**
Second	**0.01 ~ 0.05 mm**	**0.15 mm**

Piston Ring Thickness

	Standard:	Service Limit:
Top	**0.77 ~ 0.79 mm**	**0.7 mm**
Second	**0.77 ~ 0.79 mm**	**0.7 mm**

Piston Ring Groove Width

	Standard:	Service Limit:
Top	**0.81 ~ 0.83 mm**	**0.90 mm**
Second	**0.80 ~ 0.82 mm**	**0.90 mm**

Cylinder, Piston

★If the clearance exceeds the service limit, remove the piston rings, and measure the thickness of the piston rings and the width of the ring grooves. If the ring has worn down to less than the service limit, replace the ring, if the groove width exceeds the service limit replace the piston.

NOTE

○ *These tables apply to oversize pistons and rings as well as standard and pistons and rings.*

Piston, Piston Pin, Connecting Rod Wear Inspection

● Visually inspect the snap rings [A] are fitted in place.

★If the ring shows weakness or deformation, replace the ring. Also if the pin hole groove shows excessive wear, replace the piston.

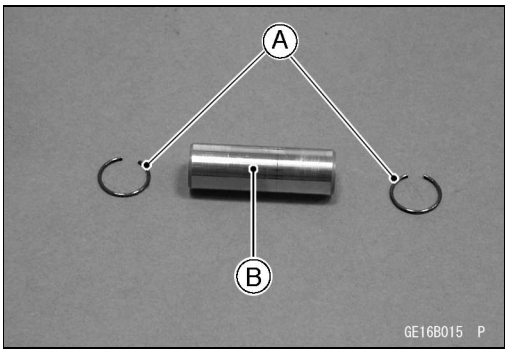
● Visually inspect the piston pin hole and connecting rod small end hole.

★If the piston pin hole shows uneven wear, replace the piston.

★If the rod small end hole shows uneven wear, replace the rod, or crankshaft assembly.

● Visually inspect the outer surface of the piston pin [B].

★If the pin shows color change or stepped wear, replace the pin and needle bearing.

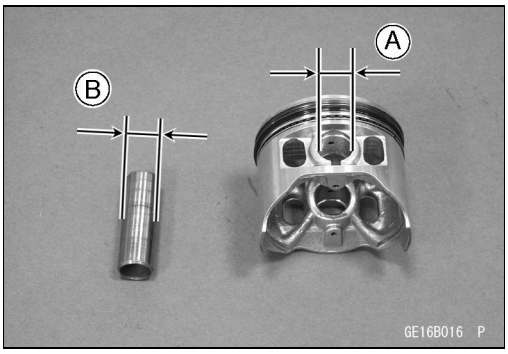


Piston, Piston Pin, Connecting Rod Inspection

● Measure the inside diameter of both piston pin holes in the piston.

Piston Pin Hole Inside Diameter [A]

Standard:	**13.001 ∼ 13.007 mm**
Service Limit:	**13.07 mm**



★If either piston pin hole inside diameter exceeds the service limit, replace the piston.

● Measure the diameter of the piston pin.

Piston Pin Diameter [B]

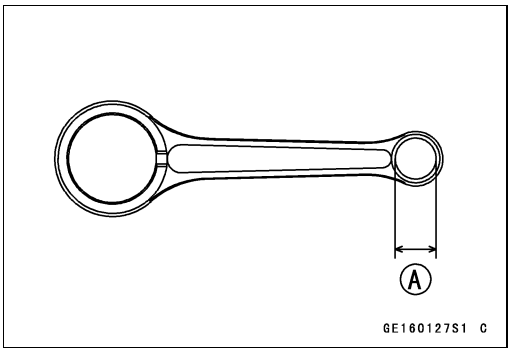
Standard:	**12.995 ∼ 13.000 mm**
Service Limit:	**12.96 mm**

★If the piston pin diameter is less than the service limit at any point, replace the piston pin.

★Measure the inside diameter[A] of the connecting rod small end.

Connecting Rod Small End Inside Diameter

Standard:	**13.003 ∼ 13014 mm**
Service limit	**13.05 mm**

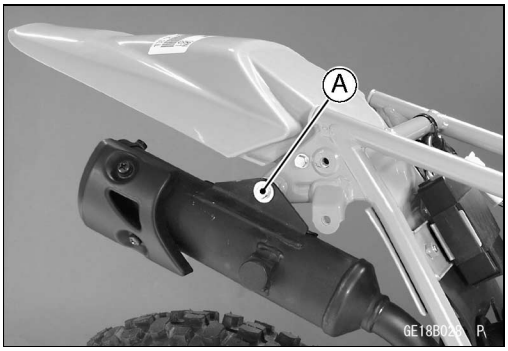


★If the inside diameter exceeds the service limit, replace the connecting rod.

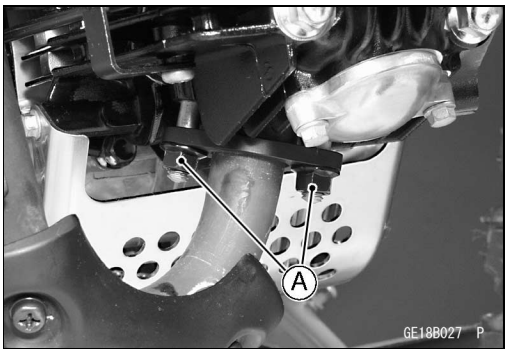
Muffler

Muffler Removal

● Unscrew the muffler mounting bolt [A].



● Remove the exhaust pipe holder nuts [A].



★ Pull out the muffler mounting bolt and remove the muffler assembly.

Muffler Installation

● Check the gasket and replace it if damaged.
● After tightening the mounting bolt and nuts securely, thoroughly warm up the engine, wait until the engine cools down and tighten all mounting bolt and nuts.

Spark Arrester Cleaning

○ Refer to Spark Arrester Cleaning in the Periodic Maintanance Chapter.

Clutch

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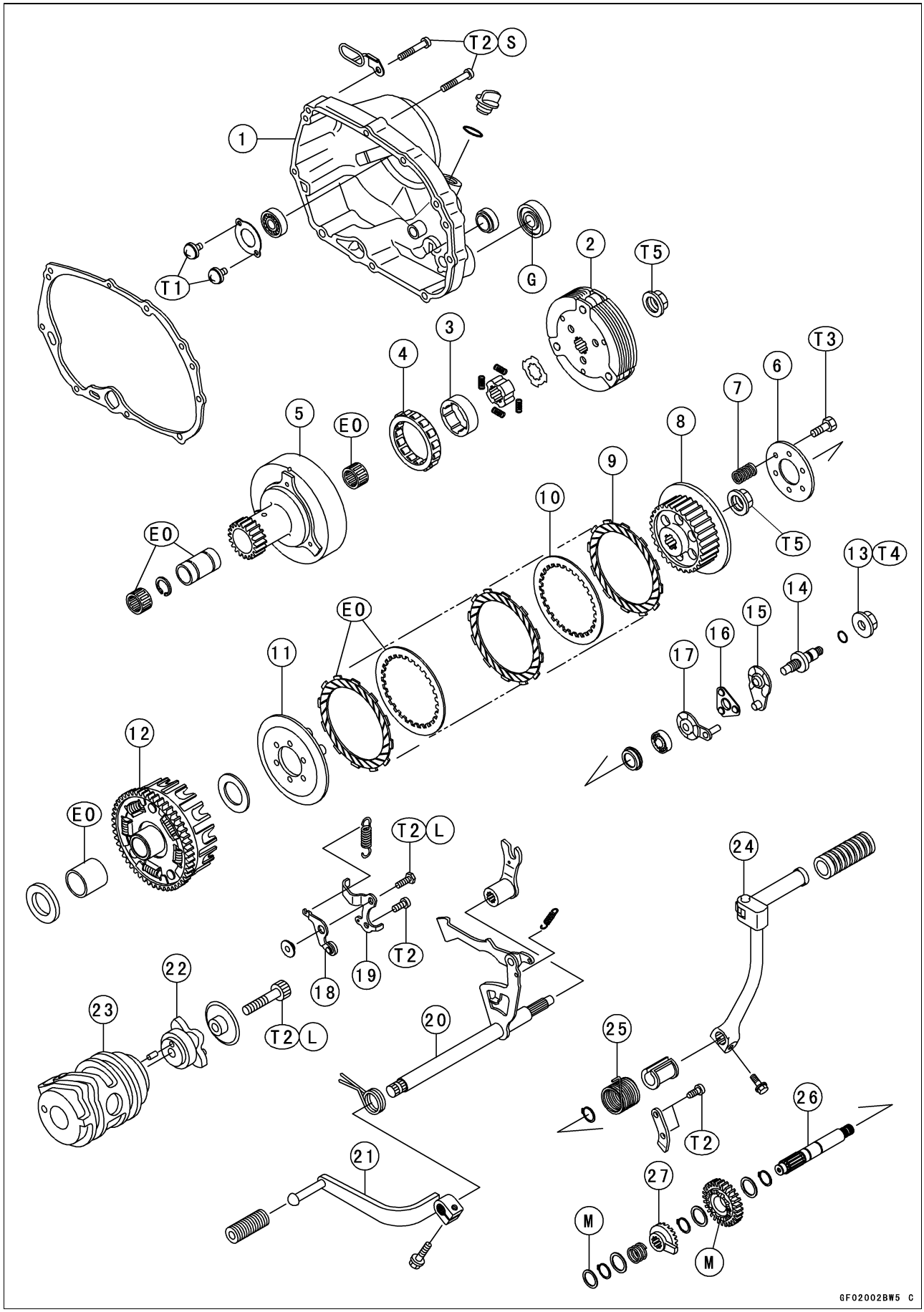
Exploded View



Exploded View

G: Apply grease.
L: Apply a non-permanent locking agent
M: Apply molybdenum disulfide grease.
EO: Apply engine oil.
S: Follow the specific tightening sequence.
T1: 2.9 N·m (0.3 kgf·m, 26 in·lb)
T2: 5.2 N·m (0.53 kgf·m, 46 in·lb)
T3: 3.4 N·m (0.35 kgf·m, 30 in·lb)
T4: 19 N·m (1.9 kgf·m, 14 ft·lb)
T5: 72 N·m (7.3 kgf·m, 53 ft·lb)
1. Clutch Cover
2. Primary Clutch Shoe Linings
3. Outer Race
4. One-way Clutch
5. Primary Clutch Housing
6. Clutch Spring Plate
7. Clutch Spring
8. Secondary Clutch Hub
9. Friction Plate
10. Steel Plate
11. Clutch Wheel
12. Clutch Housing
13. Clutch Adjusting Screw Locknut
14. Release Shaft (Adjusting Screw)
15. Release Plate
16. Release Ball Assembly
17. Release Cam
18. Gear Positioning Lever
19. Gear Positioning Plate
20. Shift Shaft
21. Shift Pedal
22. Shift Drum Can
23. Shift Drum
24. Kick Pedal
25. Return Spring
26. Kick Shaft
27. Rachet

5-4 CLUTCH

Specifications

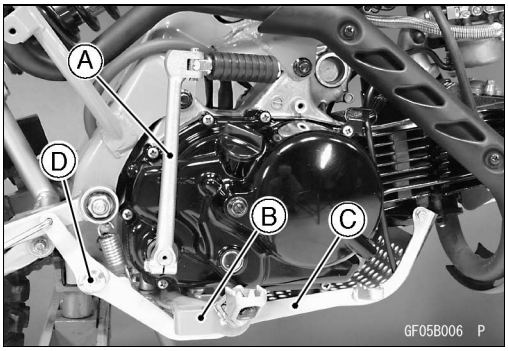
Item	Standard	Service Limit
Primary Clutch:		
Primary clutch housing inside diameter	104.0 ∼ 104.2 mm	104.5 mm
Primary clutch shoe groove depth	1.0 mm	0.5 mm
Secondary Clutch:		
Friction plate thickness	3.1 ∼ 3.3 mm	2.9 mm
Friction plate warp	0.2 mm or less	0.3 mm
Steel plate warp	0.15 mm or less	0.3 mm
Clutch spring free length	24.0 mm	23.0 mm
Kick Shaft:		
Kick shaft diameter	15.957 ∼ 15.984 mm	15.93 mm
Kick gear inside diameter	16.000 ∼ 16.018 mm	16.04 mm

Special Tools - Primary Clutch Holder: 57001–1507
Clutch Holder: 57001–1508

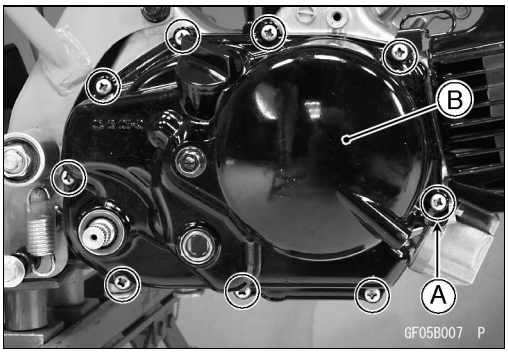
Clutch Cover

Clutch Cover and Oil Screen Removal

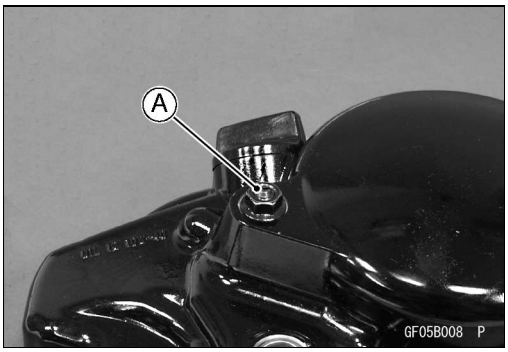
- Drain the engine oil (see Engine Lubrication System).
- Remove:
  Kick Pedal [A]
  Footpeg [B]
  Engine Guard [C]
  Brake Pedal (hanging) [D]

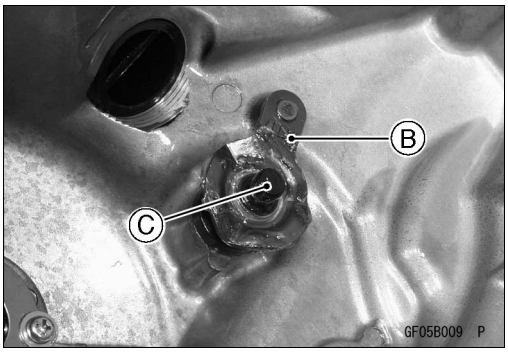


  Clutch Cover Screws [A]
- Pull out the clutch cover [B].

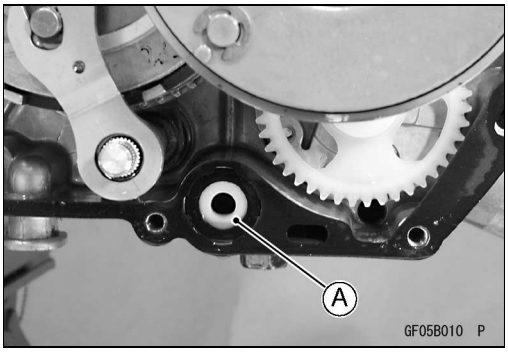


- Unscrew the clutch adjusting screw locknut [A].
- The release plate [B] and the release shaft (adjusting screw) [C] come out with the cover.





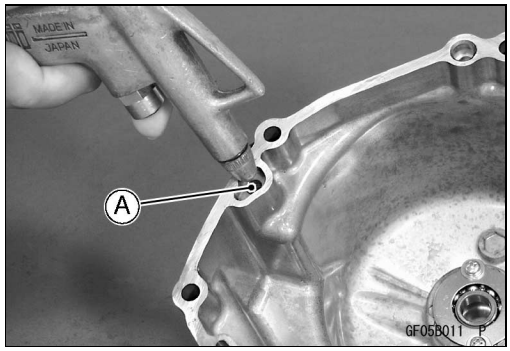
- Pull out the oil screen [A].



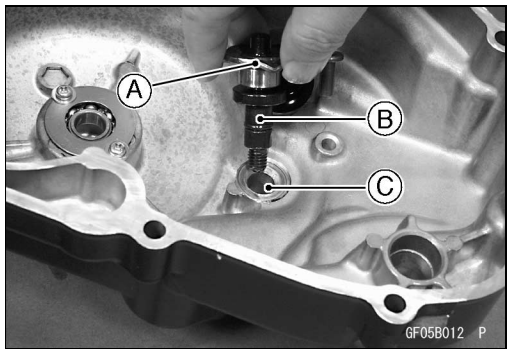
Clutch Cover

Clutch Cover and Oil Screen Installation

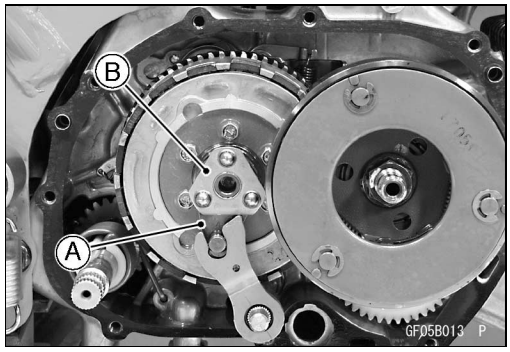
- Clean any metal particles and other dirt out of the oil screen.
- Using compressed air, blow out any particles which may obstruct the oil passage [A] in the clutch cover.



- Check that the ball bearing is in place. The shield side of the bearing must be faced to the clutch cover.
- Apply grease to the O-ring and install it.
- Turn in the release plate [A] into the release shaft [B] fully but no tightly and then back it out the three turns, and insert it into the hole [C] of clutch cover securely.
- Tighten the locknut into the release shaft from the opposite side.



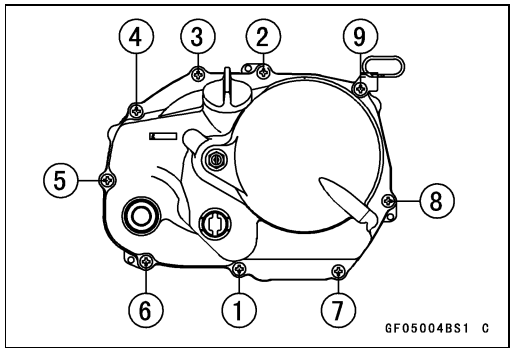
- Apply grease to the kick shaft oil seal lips.
- Check that the two dowel pins are in place on the crankcase.
- Install the clutch cover. Be sure that the release cam [A], and release ball assembly [B] are not falling down.



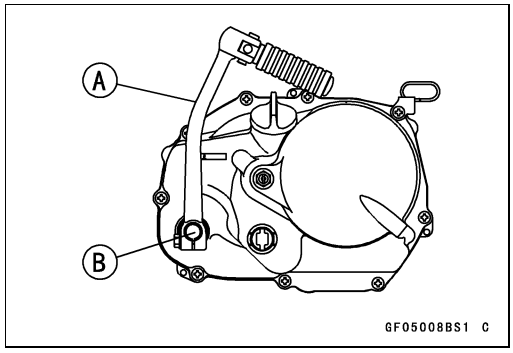
- Tighten the clutch cover screws following the tightening sequence.

  Torque - Clutch Cover Screw: 5.2 N·m (0.53 kgf·m, 46 in·lb)

- Adjust the clutch.



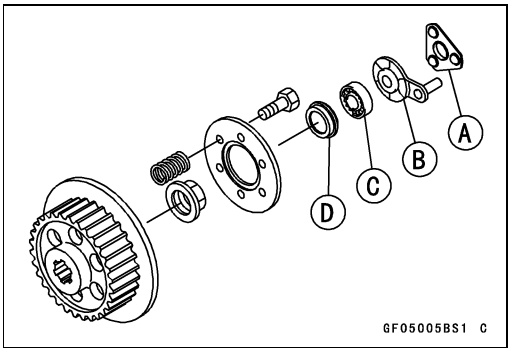
- Install the kick pedal [A] to the kick shaft [B], as shown.



Clutches

Clutch Removal

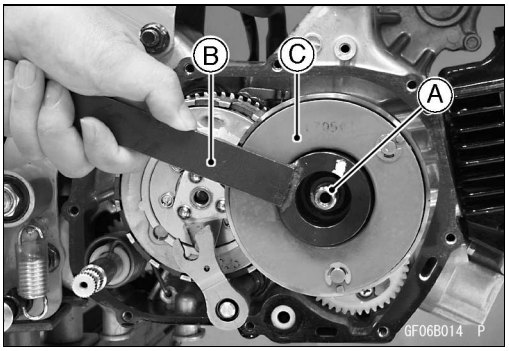
- Remove the clutch cover (see this chapter).
- Remove:
  Release Ball Assembly [A]
  Release Cam [B]
  Ball Bearing [C]
  Ball Bearing Holder [D]



- Remove the primary clutch hub nut [A], while holding the primary clutch steady with the primary clutch holder [B].

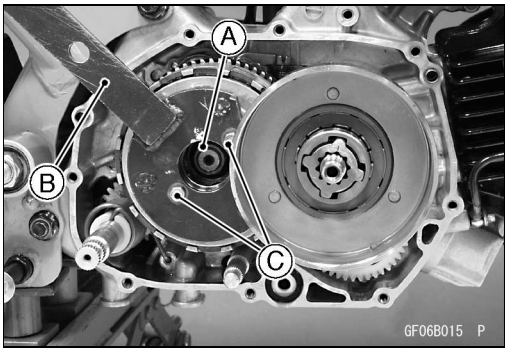
  Special Tools - Primary Clutch Holder: 57001–1507

- Pull out the primary clutch hub [C].

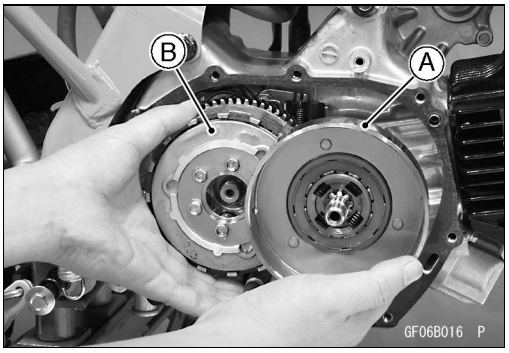


- Remove the secondary clutch hub nut [A], while holding the secondary clutch steady with the clutch holder [B].
- ○ Search the positions of three notches of clutch holder, which can be aligned.
- ○ Remove two clutch spring bolts [C] inserted into the two holes of clutch holder when searching.
- ○ Set a clutch holder.

  Special Tools - Clutch Holder: 57001–1508



- Remove the primary clutch [A] and secondary clutch [B] together.
- ○ Do not remove the one-way clutch from the primary clutch.
- Remove the spacer from the drive shaft.

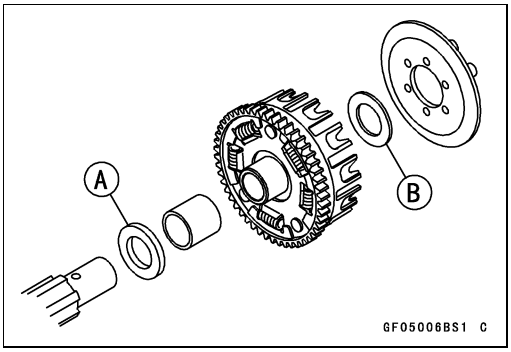


Clutch Installation

- Apply engine oil to the clutch sleeves, drive shaft, and crankshaft.
- Install the spacer [A] to the drive shaft.
- Insert the secondary clutch.
- ○ Be sure to install the spacer [B] between secondary clutch housing and clutch wheel.
- ○ Hard to install the secondary clutch, turn the drive shaft while pushing the clutch.
- Tighten the secondary clutch nut, while holding the secondary clutch holder.

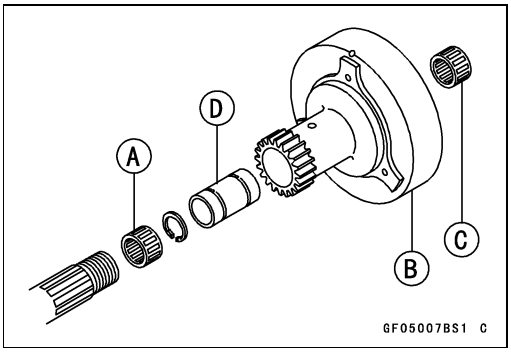
  Torque - Secondary Clutch Hub Nut: 72 N·m (7.3 kgf·m, 53 ft·lb)

  Special Tools - Clutch Holder: 57001–1508

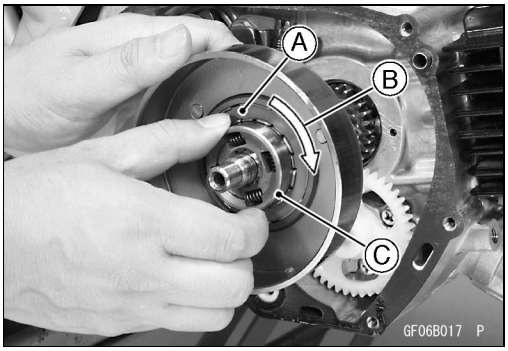


Clutches

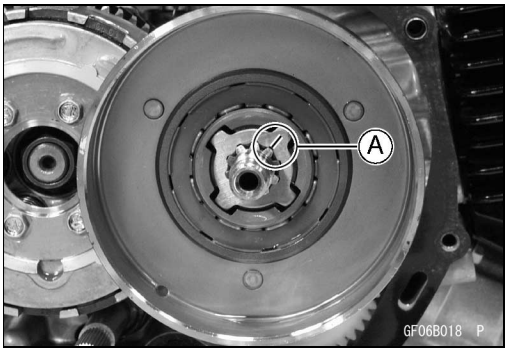
● Install:
Needle Bearing [A]
Primary Clutch Housing [B]
Needle Bearing [C]
Primary Clutch Sleeve [D]



★If the one-way clutch and race dropped from the primary clutch housing, install it as follows.
○ Put the one-way clutch [A] in the clutch housing halfway with the rotation mark [B] facing out.
○ Fit the race [C] into the one-way clutch and push them together in the clutch housing.



● Install the plate with the line mark [A] facing out, nothing the proper position.

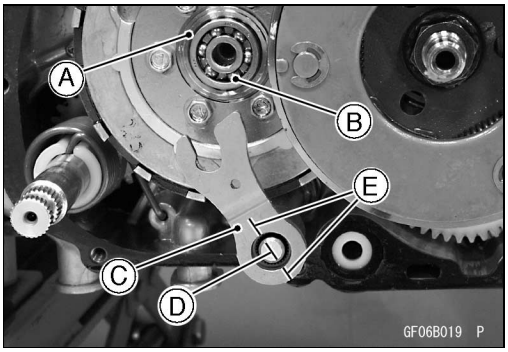


● Install the clutch hub.
● Tighten the primary clutch nut while holding the primary clutch steady with the primary clutch holder.

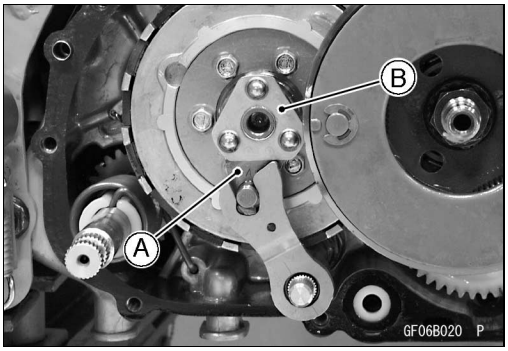
Special Tools - Primary Clutch Holder: 57001–1507

Torque - Primary Clutch Hub Nut: 72 N·m (7.3 kgf·m, 53 ft·lb)

● Install the ball bearing holder [A] and ball bearing [B].
● Install the release lever [C] to the shift shaft, with shift shaft line [D] aligning to release lever line [E].



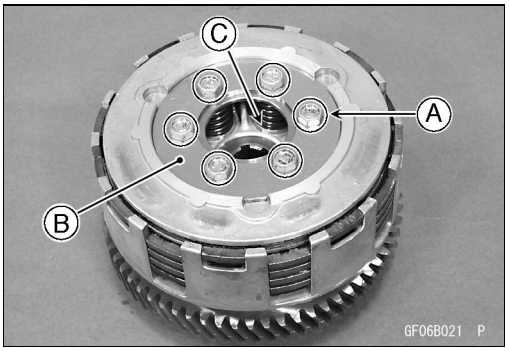
● Apply grease to the release cam and release ball assembly.
● Install the release cam [A] and release ball assembly [B].
● Install the clutch cover.
● Adjust the clutch.



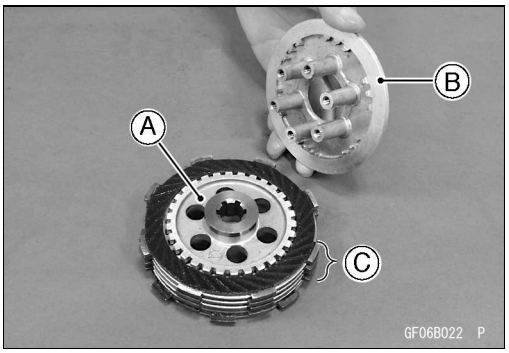
Clutches

Secondary Clutch Disassembly

- Remove the secondary clutch.
- Unscrew the clutch spring bolts [A] and take off the spring plate [B] and springs [C].

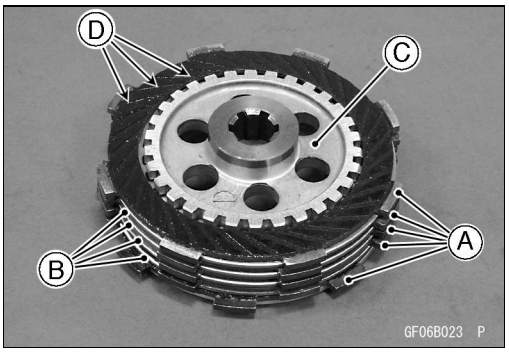


- Remove the clutch hub [A] and clutch wheel [B].
- Remove the secondary clutch plate [C].



Secondary Clutch Assembly

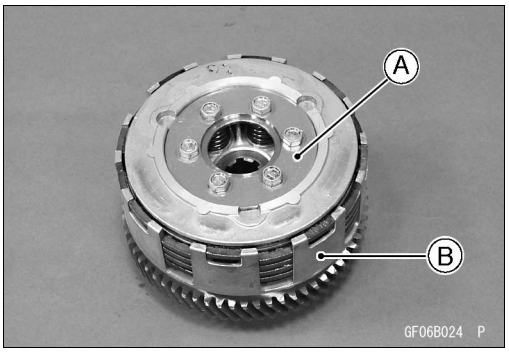
- Install the friction plates [A] and steel plates [B] on the secondary clutch hub [C], starting with a friction plate and alternating them.
- ○ The grooves [D] on the friction plate surfaces are cut tangentially and radially. Install the friction plates so that the grooves run toward the center in the direction of the clutch housing rotation (counterclockwise viewed from the engine right side).



CAUTION

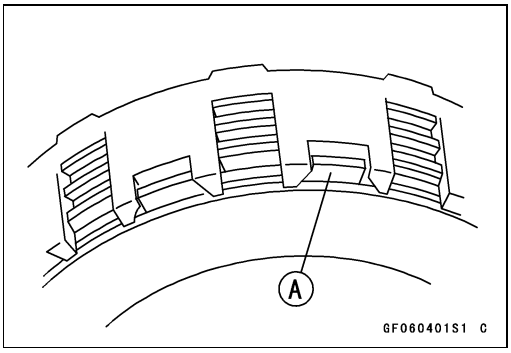
If new dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.

- Install the clutch wheel on the clutch hub.
- Install the clutch spring plate [A] with the springs and spring bolts temporarily and fit the clutch hub and plate assembly into the clutch housing [B].



- Install the last friction plate [A] fitting the tangs in the grooves on the housing as shown.
- Tighten the clutch spring bolts.

Torque - Secondary Clutch Spring Bolts: 3.4 N·m (0.35 kgf·m, 30 in·lb)



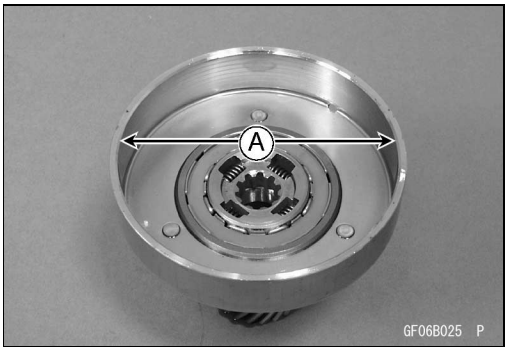
Clutches

Primary Clutch Housing Wear

● Measure the inside diameter [A] of the clutch housing sliding surface.
○ Use a vernier calipers and measure at several points as shown.
★ If any measurement is greater than the service limit, replace the primary clutch housing.

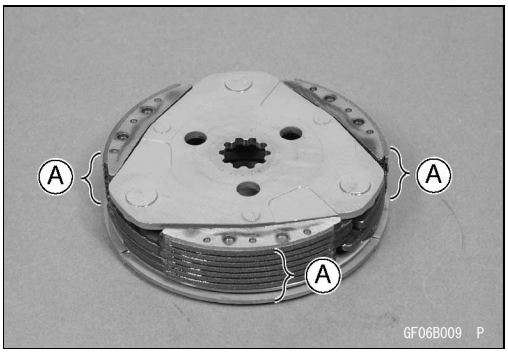
Primary Clutch Housing Inside Diameterr

Standard:	**104.0 ∼ 104.2 mm**
Serice Limit:	**104.5 mm**



Primary Clutch Shoe Lining Wear

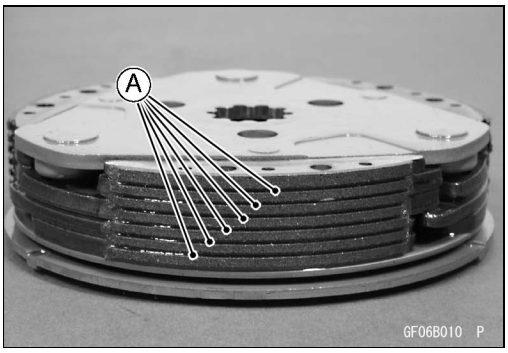
● Remove the primary clutch hub (see Clutch Removal).
● Visually inspect the primary clutch shoe linings [A] for uneven wear, discoloration, missing friction material, cracks or other damage.
★ If any of the linings are damaged, replace the primary clutch hub.



● Measure the groove depth [A].
○ Use a depth gauge, and measure at several points as shown.
★ If any measurement is less than the service limit, replace the primary clutch hub.

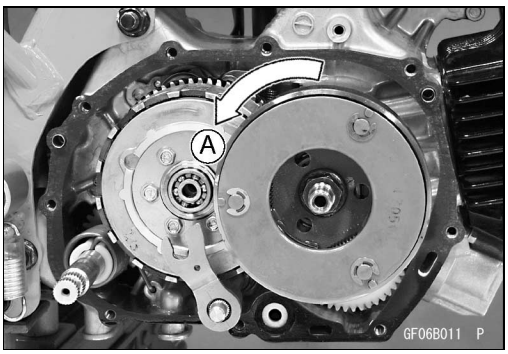
Primary Clutch Shoe Groove Depth

Standard:	**1.0 mm**
Service Limit:	**0.5 mm**

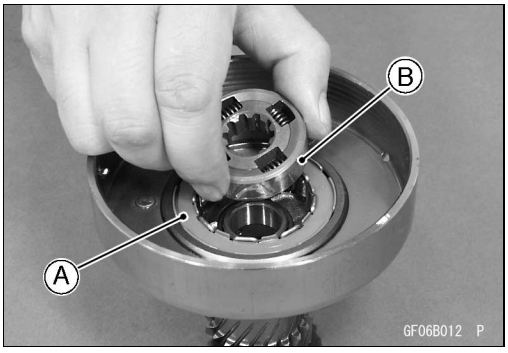


One-Way Clutch Inspection

● Remove the clutch cover.
● Turn the primary clutch housing by hand. When view from the right side of the engine, the primary clutch housing should turn counter-clockwise freely [A] but should not turn clockwise.

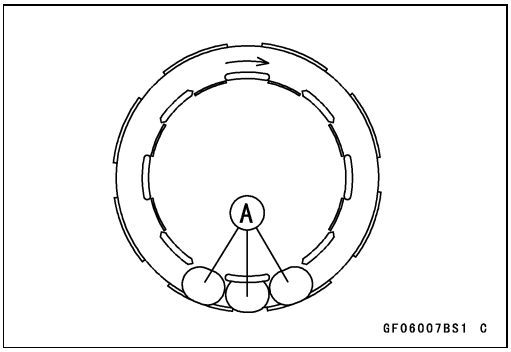


★ If the one-way clutch does not operate as it should or if it makes noise, go to the next steps.
○ Remove the primary clutch.
○ Check that the one-way clutch is installed so that the rotation mark faces out.
○ Visually inspect the one-way clutch [A] and the outer race [B] in the primary clutch housing.
★ If there is any worn or damaged part, replace it.



Clutches

○ Check that the rollers [A] in the one-way clutch is installed as shown when viewed from the right side of the engine.



Clutch Plate Wear and Damage

- Visually inspect the friction and steel plates for uneven wear, discoloration, missing friction material, cracks, or other damage.

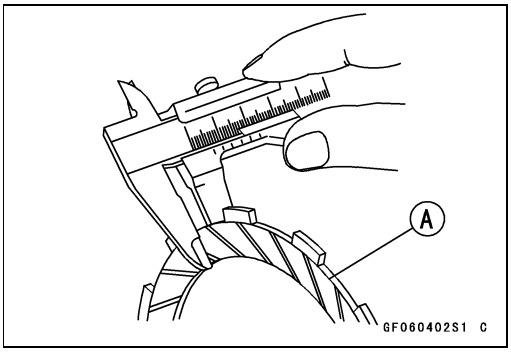
★If any plates show signs of damaged, replace the friction and steel plates as a set.

- Measure the thickness of the friction plates [A] at several points.

Friction Plate Thickness

Standard:	**3.1 ∼ 3.3 mm**
Service Limit:	**2.9 mm**

★If any of the measurement is less than the service limit, replace the plates as a set.



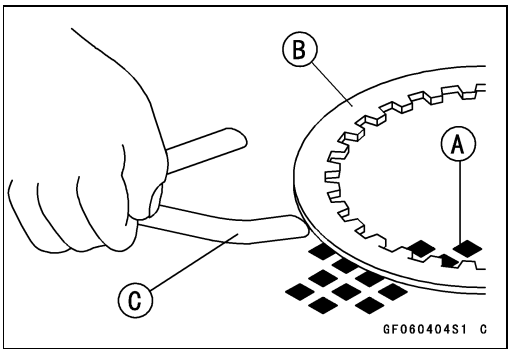
Clutch Plate Warp

- Place each friction plate or steel plate [B] on a surface plate [A] and measure the gap between the surface plate and each plate with a thickness gauge [C]. The gap is the amount of friction and steel plate warp.

★If any of the clutch plate is warped beyond the service limit, replace the plate with a new one.

Friction Plate and steel Plate Warp

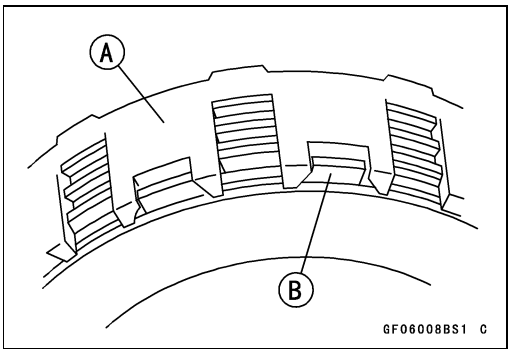
Standard:	**0.15 mm or less (Steel Plate)**
	0.2 mm or less (Friction Plate)
Service Limit:	**0.3 mm**



Secondary Clutch Housing Finger Damage

- Visually inspect the clutch housing finger [A] where the friction plate tangs [B] hit them.

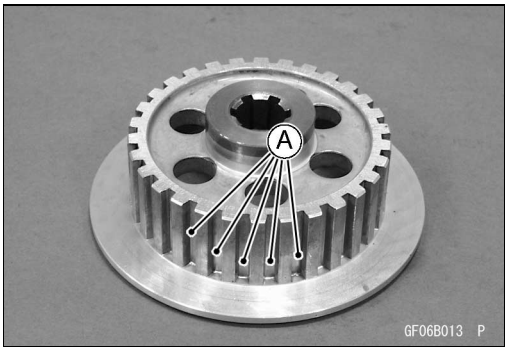
★If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.



Secondary Clutch Hub Spline Damage

- Visually inspect where the teeth on the steel plates wear against the clutch hub splines.

★If there are notches worn into the clutch hub splines [A], replace the clutch hub. Also, replace the steel plates if their teeth are damaged.



Clutches

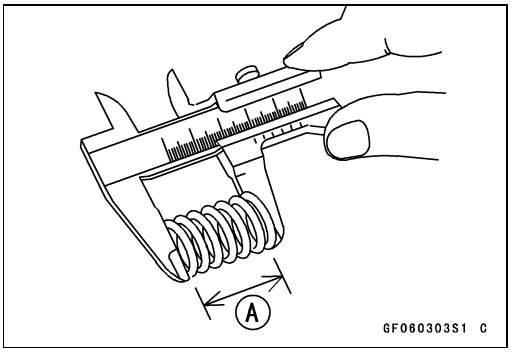
Secondary Clutch Spring Free Length Measurement

● Measure the spring free length [A].

★ If measurement is less than the service limit, replace it.

Clutch Spring Free Length

Standard:	**24.0 mm**
Service Limit:	**23.0 mm**



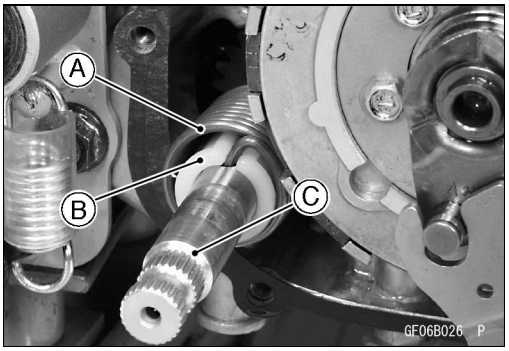
Clutch Adjustment

○ Refer to Clutch Adjustment in the Periodic Maintenance Chapter.

Kickstarter

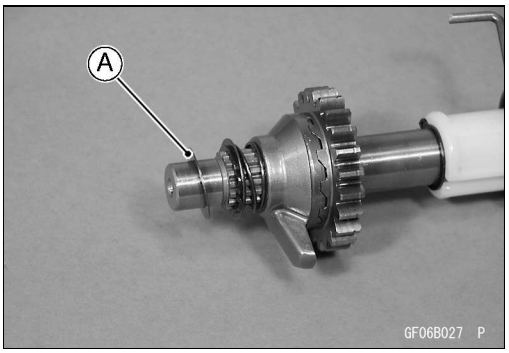
Kickstarter Removal

- Remove the clutch cover.
- Remove the return spring [A] with pliers.
- Remove:
  Spring Guide [B]
- Remove the kick shaft assembly [C], twisting it counterclockwise.
- There is a thrust washer between the kick shaft end and the crankcase.



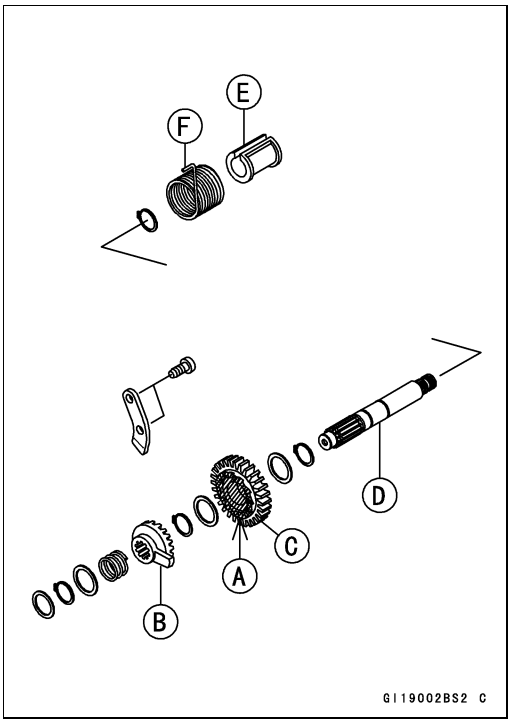
Kickstarter Installation

- Apply molybdenum disulfide grease to the thrust washer.
- Put the thrust washer [A] on the kick shaft end, and fit the kick shaft assembly in the crankcase.
- Fit the return spring end into the kick shaft, turn the spring clockwise and insert the other end of the spring into the crankcase.
- Install the plastic spring guide.
- Install the clutch cover.



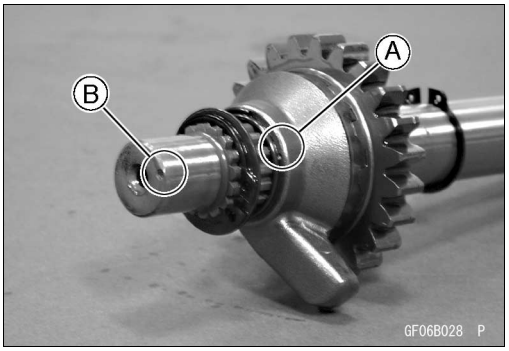
Kickstarter Assembly

- Apply a thin coat of molybdenum disulfide grease [A] to the ratchet teeth and the kick gear inside.
  Ratchet [B]
  Kick Gear [C]
  Kick Shaft [D]
  Spring Guide [E]
  Return Spring [F]



Replace the circlips that were removed with new ones.

- Align the ratchet punch mark [A] with the punch mark [B] on the kick shaft.



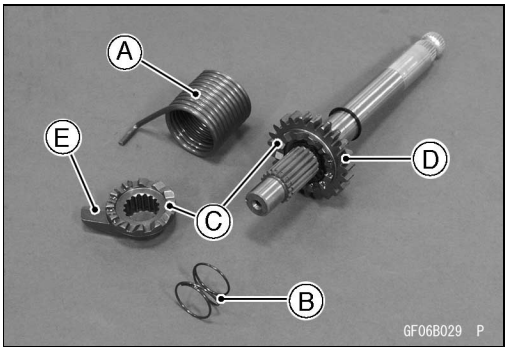
CAUTION
Misalignment of the ratchet changes the kick spring preload. Light preload could cause mechanism noise and heavy preload could weaken or break the spring.

Kickstarter

Kickstarter Inspection

- Visually inspect the parts and portion listed below.
  Kick shaft return spring [A]
  Ratchet gear spring [B]
  Ratchet portion [C] of the kick gear [D] and ratchet gear [E]

★If there is any kind of damage, replace the damaged part.

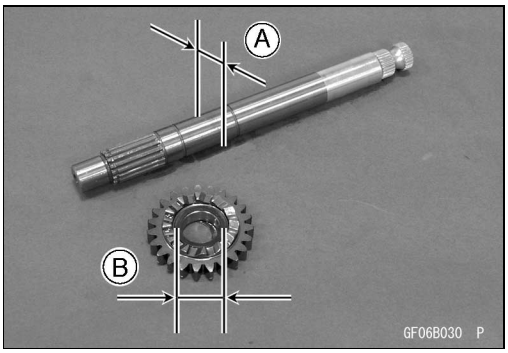


- Measure the kick shaft diameter [A] where the kick gear fits.

★If it is under the service limit, replace the shaft.

- Measure the inside diameter [B] of the kick gear.

★If it exceeds the service limit, replace the gear.



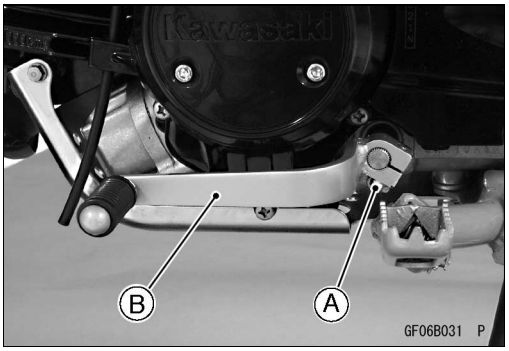
Kick Shaft, Kick Gear Diameter

Kick Shaft	**Standard:**	**15.957 ∼ 15.984 mm**
	Service Limit:	**15.93 mm**
Kick Gear	**Standard:**	**16.000 ∼ 16.018 mm**
	Service Limit:	**16.04 mm**

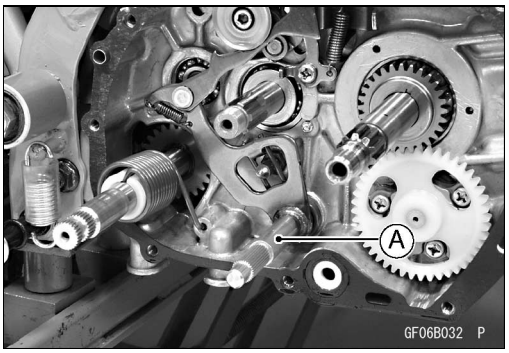
External Shift Mechanism

External Shift Mechanism Removal

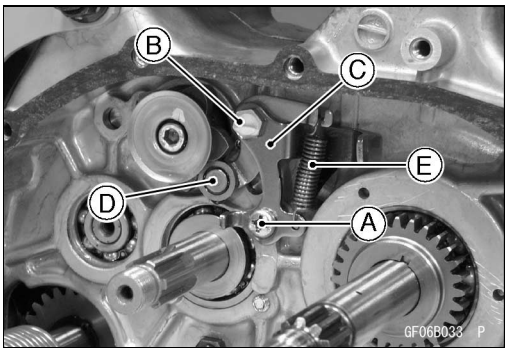
- Remove:
  Clutch Cover
  Primary Clutch
  Secondary Clutch
  Shift Pedal Clamp Bolt [A]
  Shift Pedal [B]



- Move the shift mechanism arm out of its position on the end of the shift drum and pull out the shift shaft [A].



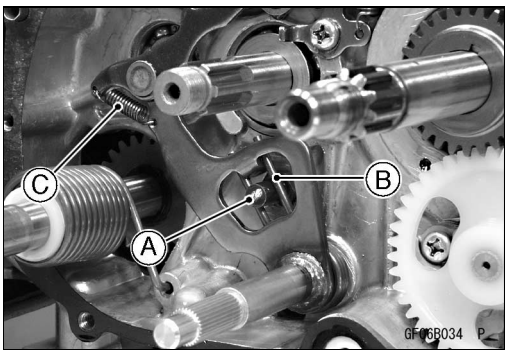
- Remove the screw [A] and pivot bolt [B].
- Remove the gear positioning plate [C], gear positioning lever [D] and its spring [E] as a set.



External Shift Mechanism Installation

- Apply non-locking agent to the lever pivot bolt.
- Install the gear positioning lever, plate and spring.
- ○ Check that the return spring pin [A] is not loose.
- ○ Check that the return spring [B] and shift arm spring [C] are properly fitted on the mechanism.

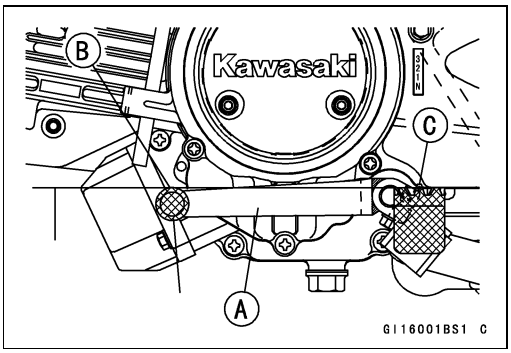
Torque - Shift Drum Positioning Lever Pivot Bolt: 5.2 N·m (0.53 kgf·m, 46 in·lb)
Shift Drum Position Plate Screw: 5.2 N·m (0.53 kgf·m, 46 in·lb)



- Apply high-temperature grease to the oil seal lips.
- Install the shift shaft.
- Install the removed parts.

Torque - Return Spring Pin: 22 N·m (2.2 kgf·m, 16 ft·lb)

- Install the shift pedal [A] to the shift shaft so that the pedal upper surface [B] is level with the step upper surface [C].



Engine Lubrication System

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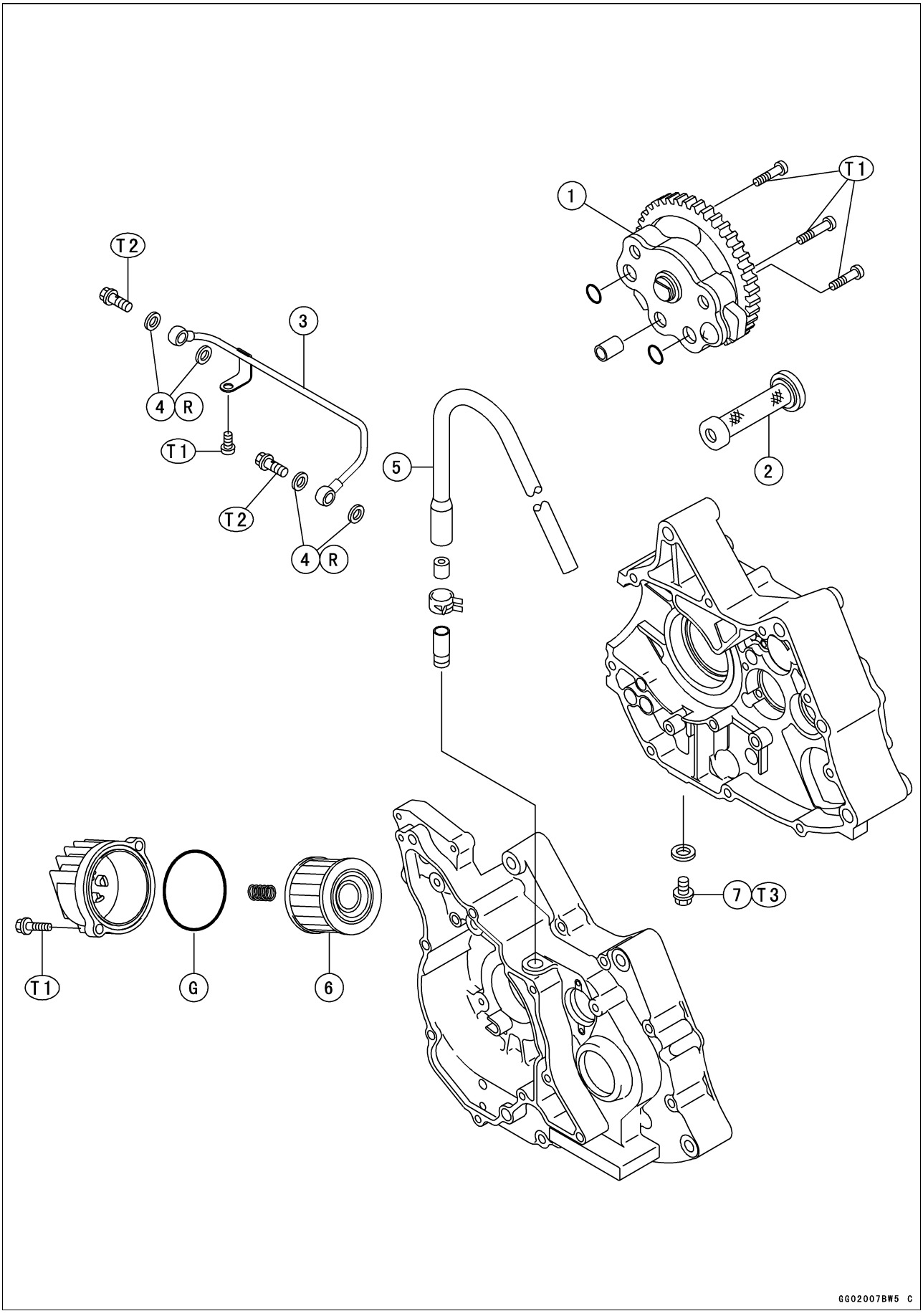
Exploded View



Exploded View

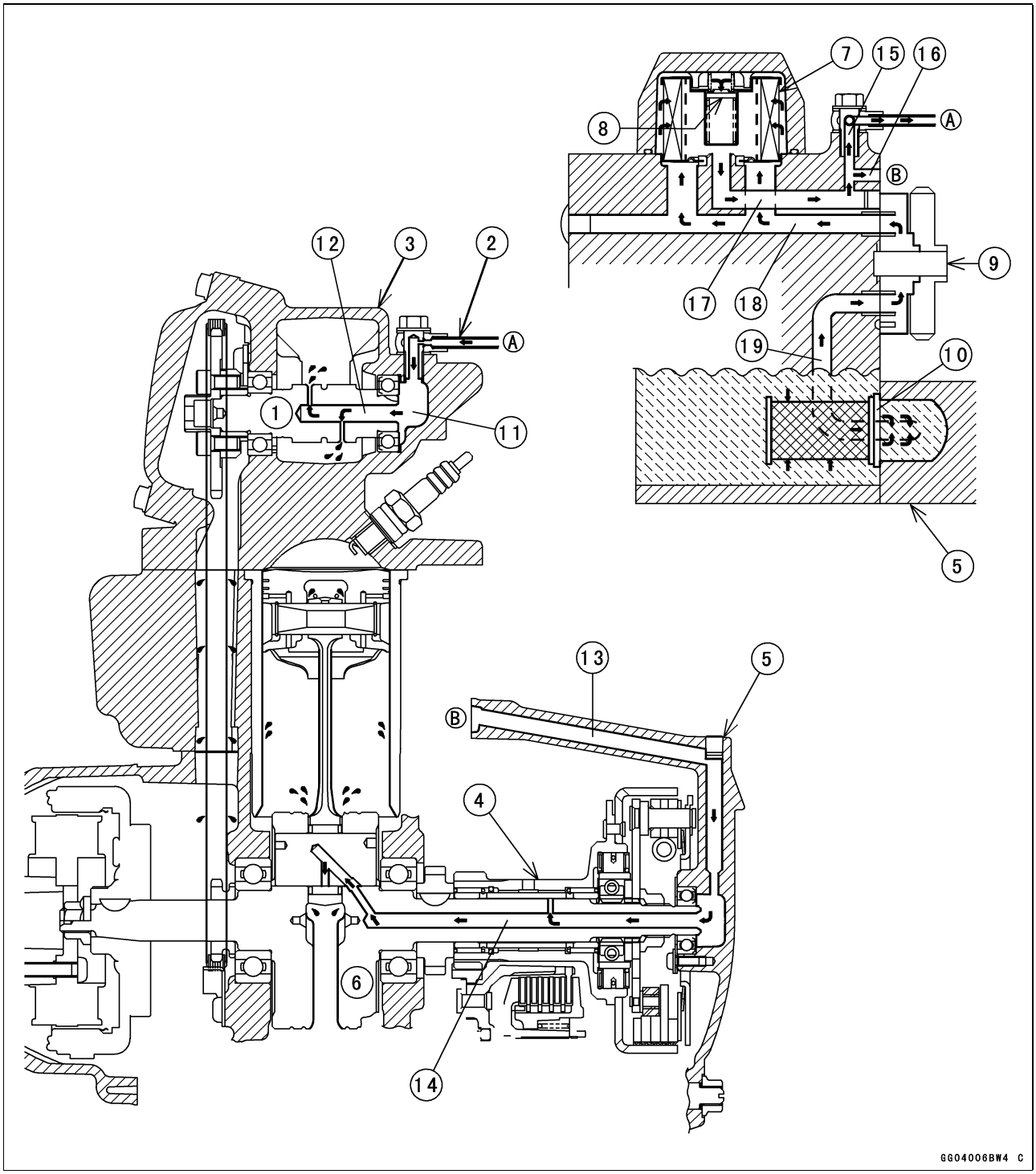
T1: 5.2 N·m (0.53 kgf·m, 46 in·lb)
T2: 15 N·m (1.5 kgf·m, 11 ft·lb)
T3: 29 N·m (3.0 kgf·m, 21 ft·lb)
G: Apply grease.
R: Replacement parts
1. Oil Pump
2. Oil Screen
3. Oil Pipe
4. Copper Washer
5. Crankcase Breather Tube
6. Oil Filter
7. Drain Plug

6-4 ENGINE LUBRICATION SYSTEM

Specifications

Item	Standard	Service Limit
Engine Oil:		
Type:	API SE, SF or SG	- - -
	API SH or SJ with JASO MA	
Viscosity:	SAE 10W-40	- - -
Capacity:		
(When engine is completely dry)	1.1 L	- - -
(When filter is removed)	1.0 L	- - -
(When filter is not removed)	0.9 L	- - -
Level	Between upper and lower level lines	- - -

Engine Oil Flow Chart



1. Camshaft
2. Oil Pipe
3. Cylinder Head
4. Primary Clutch Housing
5. Clutch Cover
6. Crankshaft
7. Oil Filter
8. Bypass Valve
9. Oil Pump
10. Oil Screen
11. Oil Passage (Cylinder Head)
12. Oil Passage (Camshaft)
13. Oil Passage (Right Engine Cover)
14. Oil Passage (Crankshaft)
15. Oil Passage to Cylinder Head
16. Oil Passage to Crankshaft
17. Oil Passage from Oil Filter
18. Oil Passage to Oil Filter
19. Oil Passage to Oil Pump

6-6 ENGINE LUBRICATION SYSTEM

Engine Oil

Oil Level Inspection

○ Refer to Oil Level Inspection in the Periodic Maintenance Chapter.

Oil Changing

○ Refer to Oil Changing in the Periodic Maintenance Chapter.

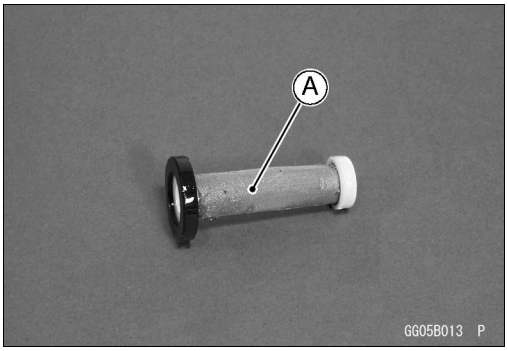
Oil Filter Element/Oil Screen

Oil Filter Element Change

○ Refer to Oil Filter Element Change in the Periodic Maintenance Chapter.

Oil Screen Cleaning

● Drain the engine oil.
● Remove the clutch cover (see Clutch chapter).
● Pull out the oil screen [A].
○ Clean the screen with high-flash-point solvent, and then dry it.
○ Clean the screen thoroughly whenever the engine oil is changed.



NOTE

○ *While cleaning the screen, check for any metal particles that engine indicate internal damage.*

⚠ WARNING

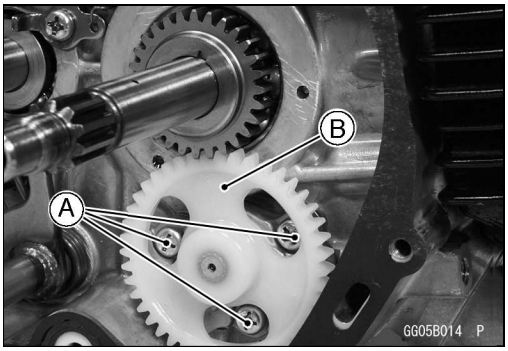
Clean the oil screen in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area, this includes any appliance with a pilot light.
Do not use gasoline or a low-flash-point solvent to clean the oil screen. A fire or explosion could result.

★ Replace the screen with a new one if it is damaged.
● Install:
Oil Screen
Clutch Cover

Engine Oil Pump

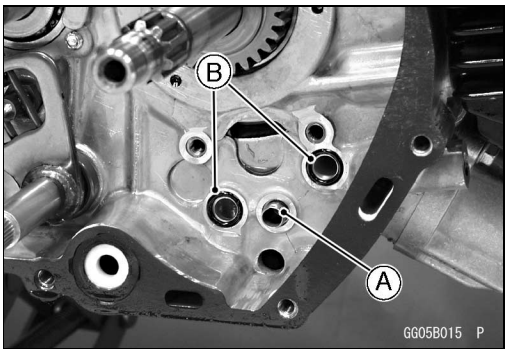
Engine Oil Pump Removal

- Remove the clutch cover (see Clutch chapter).
- Remove the primary and secondary clutch assemblies (see Clutch chapter).
- Turn the crankshaft so that the engine oil pump screws [A] can be removed through the pump gear holes, and remove the screws and oil pump [B].



Engine Oil Pump Installation

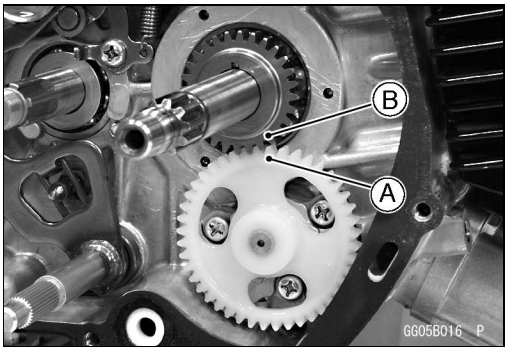
- Replace the O-rings with new ones if they are damaged.
- Check to see that the knock pin [A] and O-rings [B] are in place.



- Install the oil pump and screws.

○ When installing the oil pump, be sure the oil pump gear [A] and pump drive gear [B] on the crankshaft mesh properly.

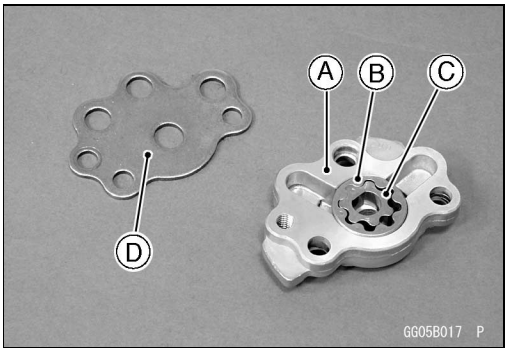
Torque - Oil Pump Mounting Screw: 5.2 N·m (0.53 kgf·m, 46 in·lb)



Engine Oil Pump Inspection

- Visually inspect the oil pump body [A], outer rotor [B], inner rotor [C] and cover [D].

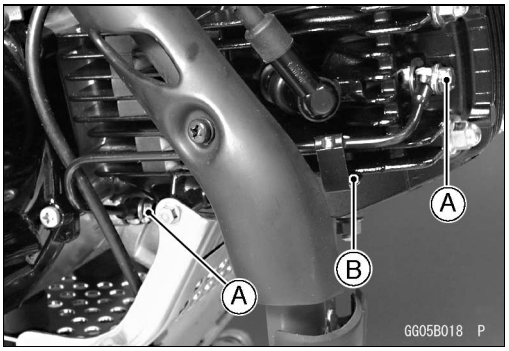
★ If there is any damage or uneven wear, replace the rotors or oil pump assembly.



Oil Pipe

Oil Pipe Removal

- Remove the banjo bolts [A] and oil pipe clamp screw [B].



Oil Pipe Installation

- Before installation, flush out the pipe with a high-flash-point solvent.
- Discard the used copper washers and install new washers on each side of the pipe fittings.
- Lightly tighten the banjo bolts and oil pipe clamp screw to a snug fit, and tighten them to the specified torque.

Torque - Oil Pipe Banjo Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)
Oil Pipe Clamp Screw: 5.2 N·m (0.53 kgf·m, 46 in·lb)

Engine Removal/Installation

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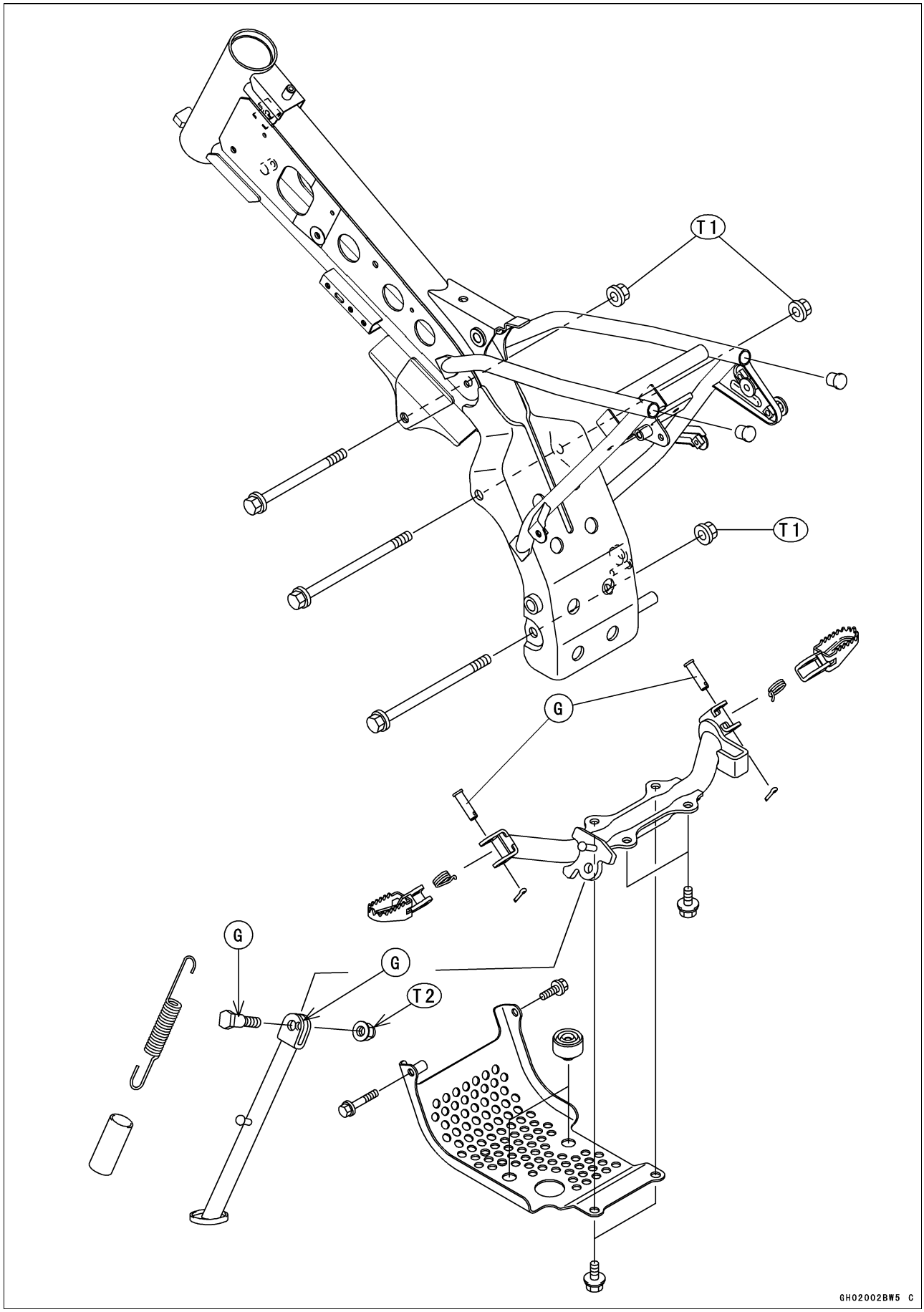
Exploded View



Exploded View

T1: 54 N·m (5.5 kgf·m, 40 ft·lb)
T2: 23 N·m (2.3 kgf·m, 17 ft·lb)
G. Apply grease.

7-4 ENGINE REMOVAL/INSTALLATION

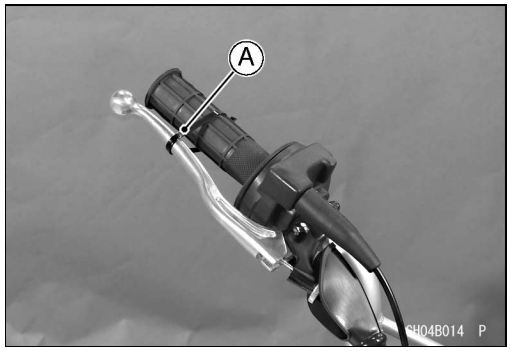
Engine Removal/Installation

Engine Removal

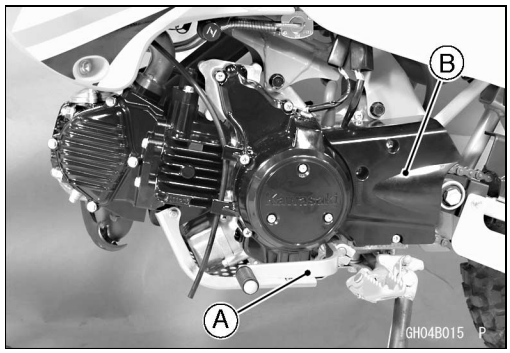
- Drain the engine oil (see Engine Lubrication chapter).
- Squeeze the brake lever slowly and hold it with a band [A].

⚠ WARNING

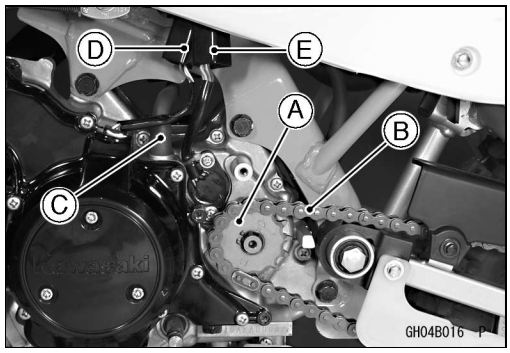
Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. It could cause an accident and injury.



- Remove
  Shift Pedal [A]
  Engine Sprocket Cover [B]

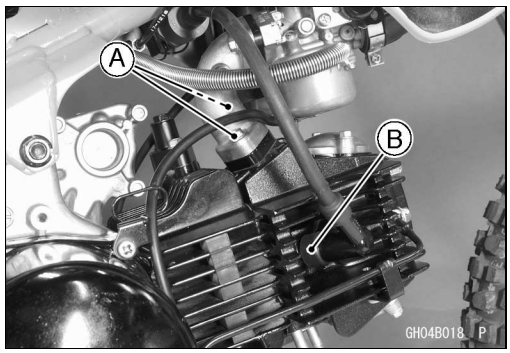


Engine Sprocket [A]
Drive Chain [B]
Breather Tube Lower End [C]
Magneto Lead Connectors [D]
Gear Position Switch Lead Connector [E]



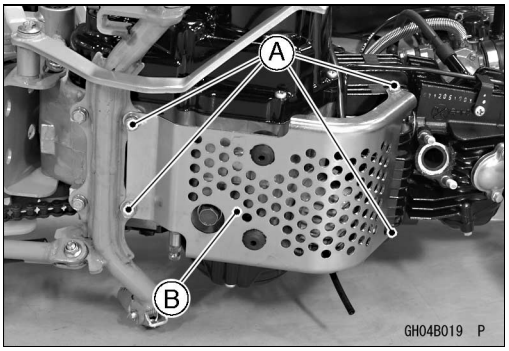
Right and Left Side Cover
Muffler [A]

Intake Pipe Bolts [A]
Spark Plug Cap [B]

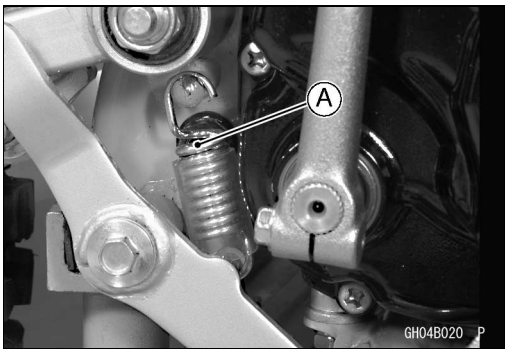


Engine Removal/Installation

- Remove the bolts [A] and the engine guard [B].

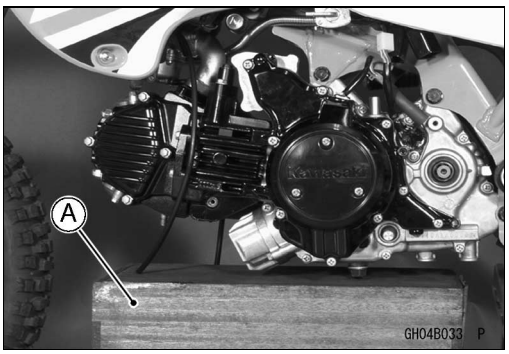


- Remove the brake pedal return spring [A].

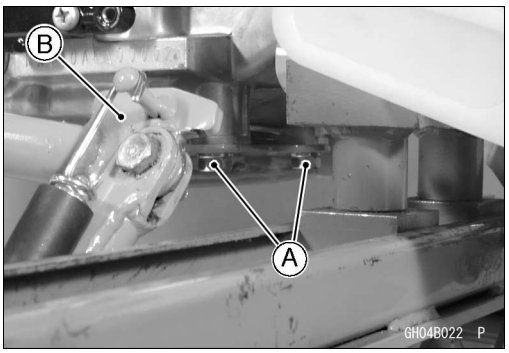


- Support the rear part of the frame on the jack [A].

- Support the engine with a suitable stand [A].

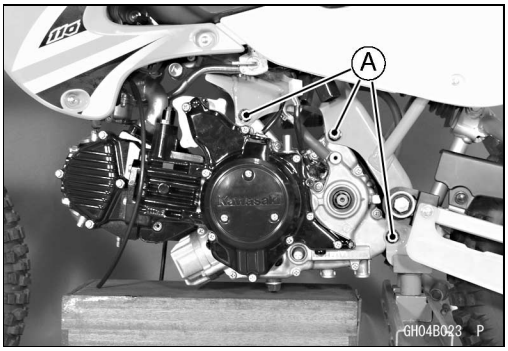


- Remove the bolts [A] and take off the front footpeg bracket [B] with side stand.



Engine Removal/Installation

- Remove the three engine mounting bolts [A] and dismount the engine.

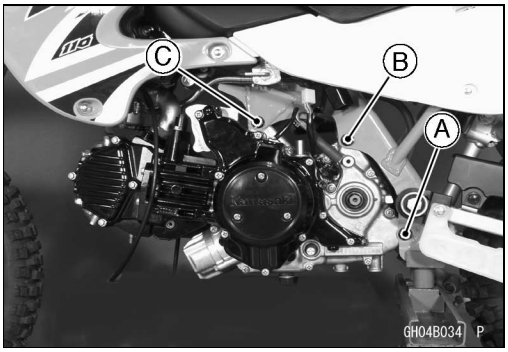


Engine Installation

- Support the engine with a suitable stand and set it at the correct position.
- Install the lower [A], middle [B] and upper [C] engine mounting bolts from left side of the engine.
- Tighten the engine mounting nuts.

Torque - Engine Mounting Nuts: 54 N·m (5.5 kgf·m, 40 ft·lb).

- Install the removed parts.
- Adjust the drive chain (see Final Drive chapter).



Crankshaft / Transmission

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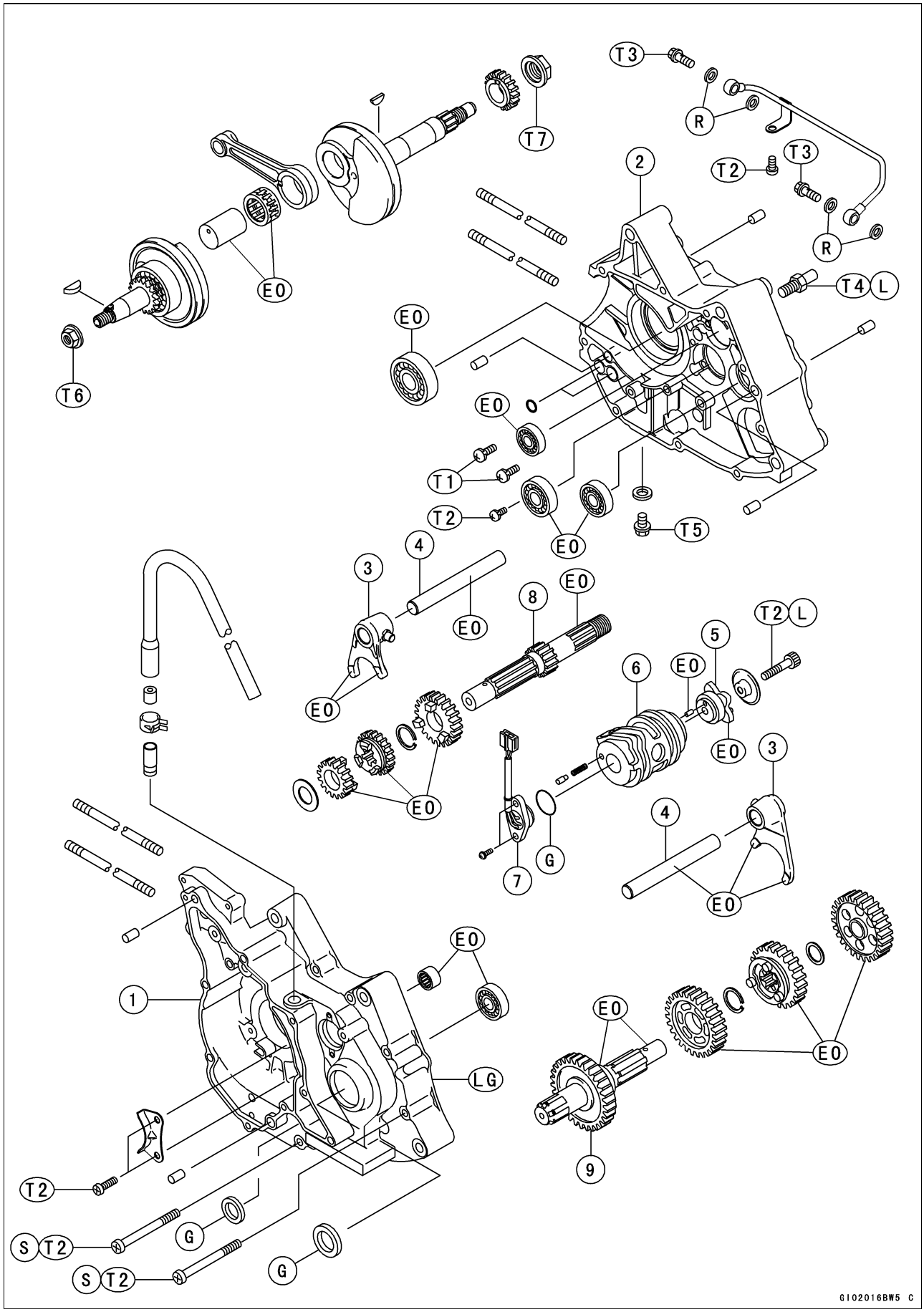
Exploded View



Exploded View

1. Left Crankcase Half
2. Right Crankcase Half
3. Shift Fork
4. Shift Rod
5. Shift Drum Cam
6. Shift Drum
7. Gear Position Switch
8. Drive Shaft
9. Output Shaft

EO: Apply engine oil.
G: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
R: Replacement Parts.
S: Follow the specific tightening sequence.
T1: 2.9 N·m (0.3 kgf·m, 26 in·lb)
T2: 5.2 N·m (0.53 kgf·m, 46 in·lb)
T3: 15 N·m (1.5 kgf·m, 11 ft·lb)
T4: 22 N·m (2.2 kgf·m, 16 ft·lb)
T5: 29 N·m (3.0 kgf·m, 22 ft·lb)
T6: 41.5 N·m (4.25 kgf·m, 30.6 ft·lb)
T7: 72 N·m (7.3 kgf·m, 53 in·lb)

8-4 CRANKSHAFT / TRANSMISSION

Specifications

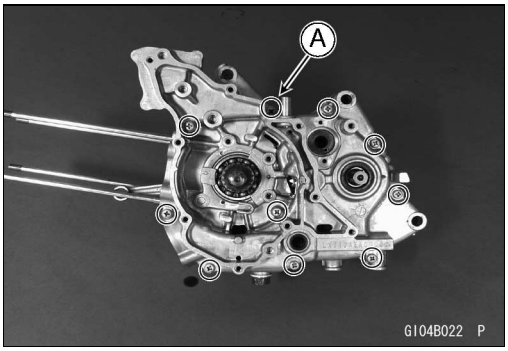
Item	Standard	Service Limit
Crankshaft, Connecting Rods:		
Connecting rod:		
Big end radial clearance	0.009 ∼ 0.023 mm	0.07 mm
Big end side clearance	0.1 ∼ 0.2 mm	0.4 mm
Crankshaft runout	Less than 0.03 mm TIR	0.08 mm
Transmission:		
Shift fork ear thickness	3.9 ∼ 4.0 mm	3.8 mm
Gear shift fork groove width	4.05 ∼ 4.15 mm	4.3 mm
Shift fork guide pin diameter	4.9 ∼ 5.0 mm	4.8 mm
Shift drum groove width	5.05 ∼ 5.20 mm	5.3 mm

Special Tools - Outside Circlip Pullers : 57001–144
Bearing Puller : 57001–158
Crankcase Splitting Tool Assembly : 57001–1098
Bearing Driver Set : 57001–1129
Crankshaft Jig : 57001–1174

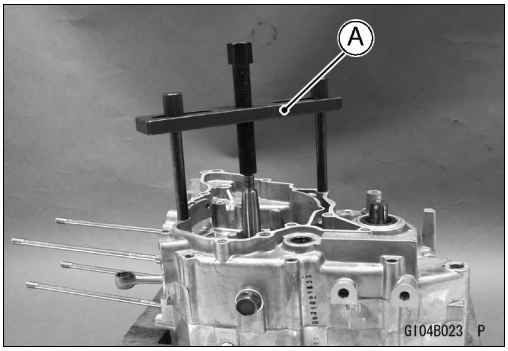
Sealant - Kawasaki Bond (Silicone Sealant): 56019–120
Kawasaki Bond (Liquid Gasket-Black): 92104–1003

Crankcase Splitting

Crankcase Splitting



- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:
  Cylinder Head (see Engine Top End chapter)
  Cylinder (see Engine Top End chapter)
  Piston (see Engine Top End chapter)
  Clutch Cover (see Clutch chapter)
  Primary Clutch, Secondary Clutch (see Clutch chapter)
  Kick Shaft (see Clutch chapter)
  Oil Filter & Oil Pump (see Engine Lubrication System chapter)
  External Shift Mechanism (see Clutch chapter)
  Magneto Cover (see Electrical System chapter)
  Magneto Flywheel (see Electrical System chapter)
  Gear Position Switch
  Crankcase Screws [A]



- Using the crankcase splitting tool assembly [A], split the crankcase.

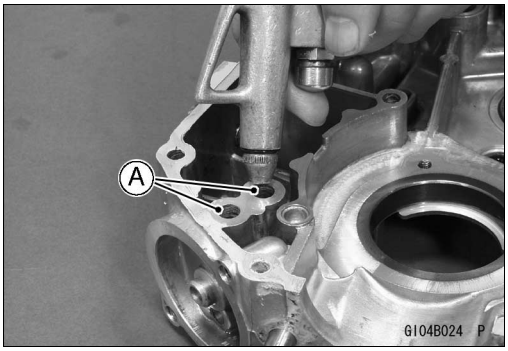
  Special Tool - Crankcase Splitting Tool Assembly: 57001–1098
- Once the crankcase is split, remove the crankcase splitting tool and separate the crankcase halves.
- Remove the crankshaft from the crankcase half using a press.

CAUTION

Do not remove the ball, needle bearings and the oil seals unless it is necessary. Removal may damage them.

- Press the remaining bearing out of the crankcase half if the bearing remains on the crankcase half.

Crankcase Assembly



CAUTION

Right and left crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

- Chip off the old gasket from the mating surfaces of the crankcase halves.
- Using compressed air, blow out the oil passages [A] in the crankcase halves and the crankshaft.
- With a high-flash-point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.

⚠ WARNING

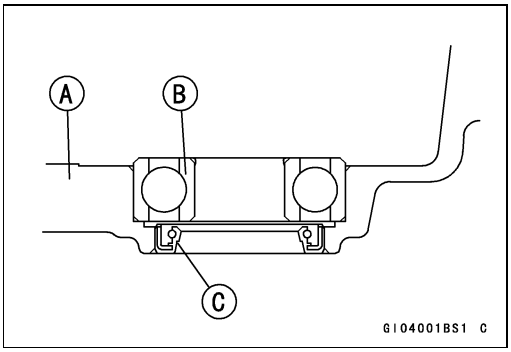
Clean the engine parts in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low-flash-point solvent to clean parts. A fire or explosion could result.

Crankcase Splitting

- Using a press and the bearing driver set, install new bearings until they bottoms out.
- ○ Press the output shaft bearing [B] in the left crankcase half [A].

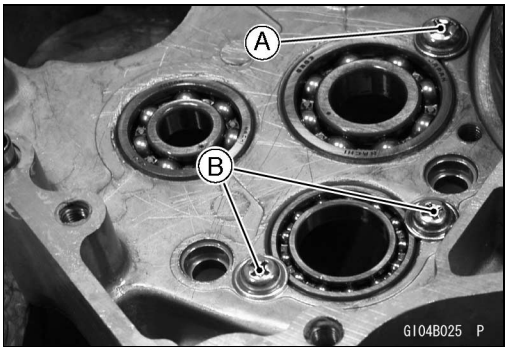
Special Tool - Bearing Driver Set: 57001–1129

- Apply high-temperature grease to the lips of the oil seals.
- Press in the oil seals [C] of the left crankcase half so that the seal surface is flush with the end of the hole.



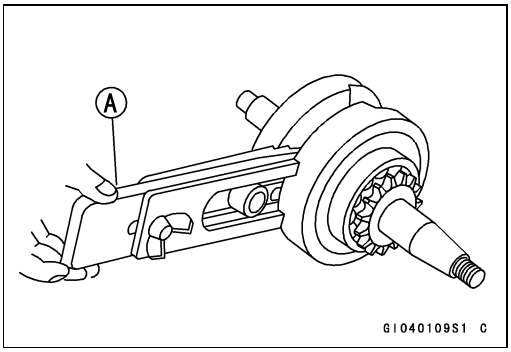
- Tighten the shift drum and drive shaft bearing retainer screws to the right crankcase.

Torque - Shift Drum Bearing Retainer Screws [B]: 2.9 N·m (0.3 kgf·m, 26 in·lb)
Drive Shaft Bearing Retainer Screw [A]: 5.2 N·m (0.53 kgf·m, 46 in·lb)

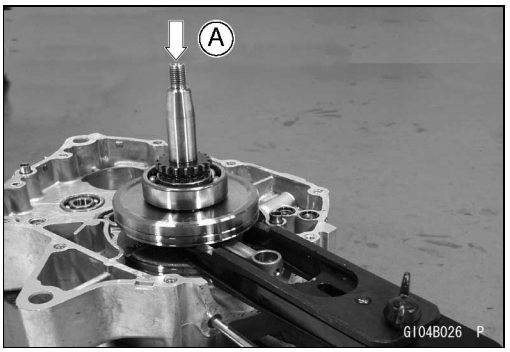


- Insert the crankshaft jig [A] between the crankshaft flywheels opposite the connecting rod big end to protect flywheel alignment. This tool is easily adjustable to fit in any gap between the flywheel.

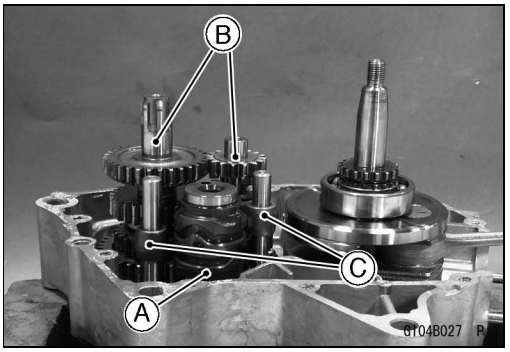
Special Tool - Crankshaft Jig: 57001–1174



- Fit the crankshaft into the right crankcase half using a press [A].

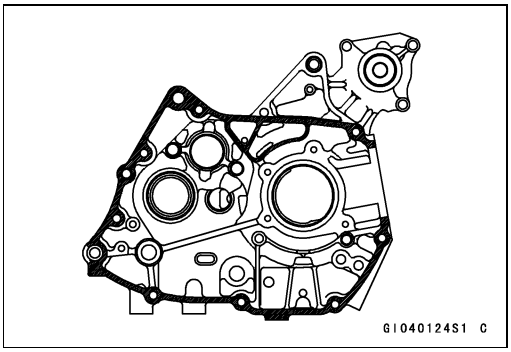


- Install:
  Shift Drum [A]
  Transmission Shaft Assemblies [B]
  Shift Forks [C]
- Check that the shift drum is in neutral position.

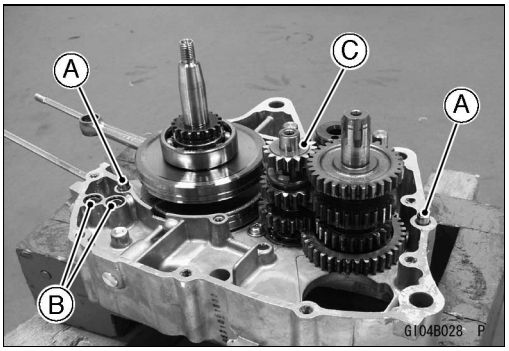


Crankcase Splitting

- Make sure that the mating surfaces of the crankcase halves are completely free of oil or contamination.
- Apply liquid gasket to the mating surface of the left crankcase half as shown.



- Check that two dowel pins [A], O-rings [B] and drive shaft spacer [C] in place.
- Fit the crankcase halves together hitting with a plastic hammer on the left crankcase side.



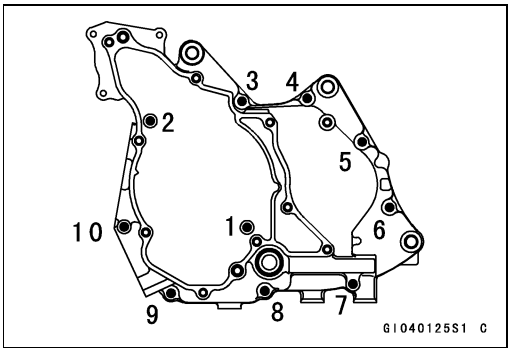
- Tighten the crankcase screws in that order shown.

NOTE

○ *Apply a non-permanent locking agent to the No.10 (tightening order) screw.*

Tightening Torque - Crankcase Screws: 5.2 N·m (0.53 kgf·m, 46 in·lb)

- Remove the crankcase installing jig.

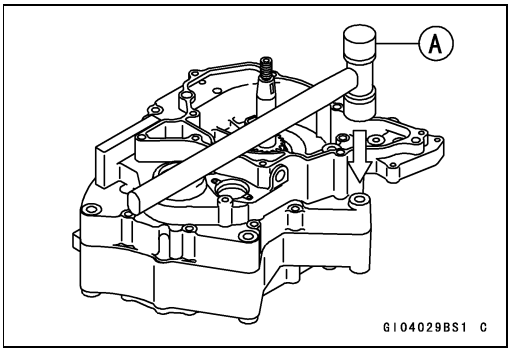


○ Check to see that the crankshaft, and output shaft all turn freely.

★If the crankshaft will not turn, it is probably not centered. Tap the mount portion of the crankcase with a plastic hammer [A] to reposition it. If it does not free up, split the crankcase again and find the cause.

★Spinning the output shaft, shift the transmission through all the gears to make certain there is not binding and that all the gears shift properly.

- Clean the cylinder and oil filter cap of the mating surface and wipe off the liquid gasket forced out.
- Install the removed parts.



Crankshaft, Connecting Rod

Crankshaft Disassembly and Assembly

CAUTION

Since assembly of the crankshaft demands exacting tolerance, the disassembly and reassembly of the crankshaft should only be performed by experienced mechanics with the necessary tools and equipment. The crankpin, connecting rod, and light crankshaft are available separately as spare parts, however it is recommended that the crankshaft assembly be replaced rather than attempting to replace the components.

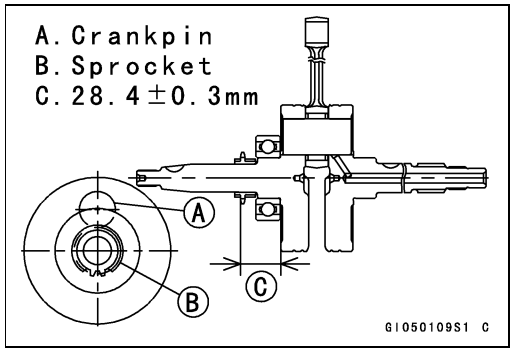
Disassembly

- If it should be necessary to disassemble the crankshaft.
- Remove the camshaft chain drive sprockets and bearing, using the bearing puller if the drive sprocket and bearing remains on the crankshaft.
- Use a press to remove the crankpin.
- Removal of the crankpin separates the flywheels, connecting rod, big end needle bearing, and crankpin.

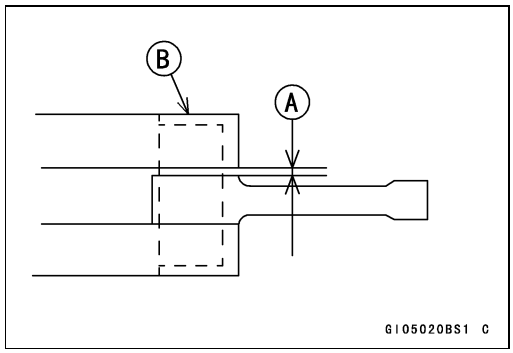
Special Tool - Bearing Puller: 57001–158

Assembly

- Press the bearing until it bottoms out.
- Press the camshaft chain drive sprocket on to the left flywheel as shown.



- Apply engine oil to the big end bearing.
- Press the crank halves onto the crankpin, noting the crankpin direction until connecting rod side clearance is within specification as shown.
  Side Clearance 0.1 ~ 0.2 mm [A]
  Crankpin Depth 0.8 ~ 1.2 mm [B]
- Check the following items after the crankshaft assembly.
  Connecting Rod Radial Clearance
  Connecting Rod Side Clearance
  Crankshaft Runout



Connecting Rod Big End Seizure

★ In the case of serious seizure with damaged flywheels, the crankshaft must be replaced.

★ In the case of less serious damage, disassemble the crankshaft and replace the crankpin, needle bearing, side washers, and connecting rod.

Crankshaft, Connecting Rod

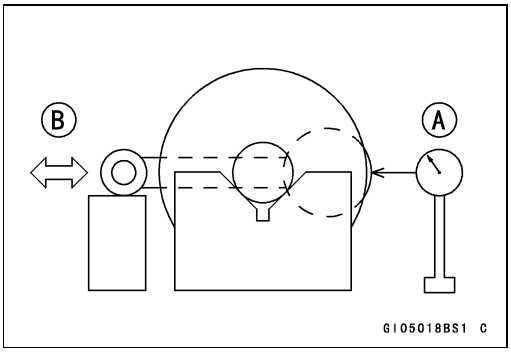
Connecting Rod Big End Radial Clearance

- Set the crankshaft in flywheel alignment jig or on V blocks, and place a dial gauge [A] against the big end of the connecting rod.
- Push [B] the connecting rod first towards the gauge and then in the opposite direction. The difference between the two gauge readings is the radial clearance.

★If the radial clearance exceeds the service limit, the crankshaft should be either replaced or disassembled and the crankpin, needle bearing, and connecting rod big end examined for wear.

Connecting Rod Big End Radial Clearance

Standard:	**0.009 ∼ 0.023 mm**
Service Limit:	**0.07 mm**



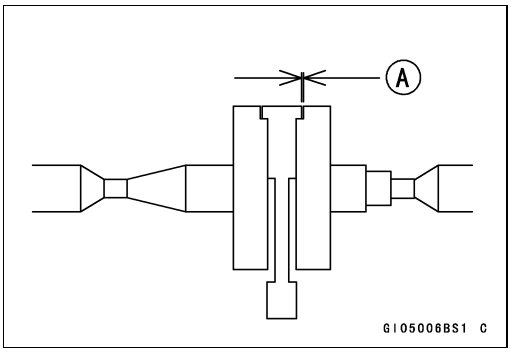
Connecting Rod Big End Side Clearance

- Measure the side clearance [A] of the connecting rod with a thickness gauge.

★If the clearance exceeds the service limit, replace the crankshaft.

Connecting Rod Big End Side Clearance

Standard:	**0.1 ∼ 0.2 mm**
Service Limit:	**0.4 mm**

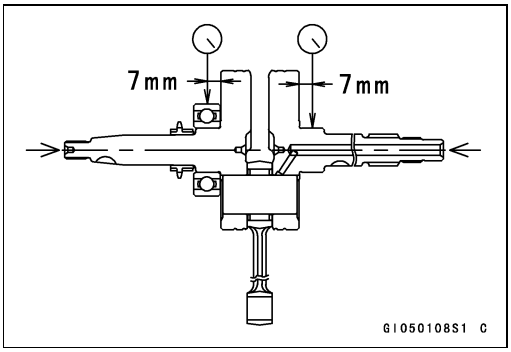


Crankshaft Runout

- Set the crankshaft in a flywheel alignment jig or on V blocks, and place a dial gauge against the points indicated.
- Turn the crankshaft slowly. The maximum difference in gauge readings is the crankshaft runout.

Crankshaft Runout

Standard:	**Less than 0.03 mm TIR**
Service Limit:	**0.08 mm**

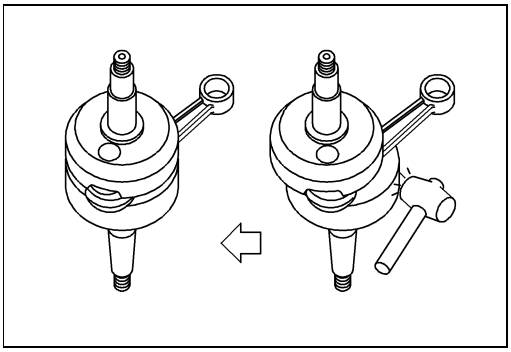


Crankshaft Alignment

★If the runout at either point exceeds the service limit, align the flywheels so that the runout falls within the service limit.

- In the case of horizontal misalignment, which is the most common, strike the projecting rim of the flywheel with a plastic, soft lead, or brass hammer as indicated in the figure.
- Recheck the runout with a dial gauge, repeating the process until the runout falls within the service limit.

○ Vertical misalignment is corrected either by driving a wedge in between the flywheels, or by squeezing the flywheel rims in a vise, depending on the nature of the misalignment.



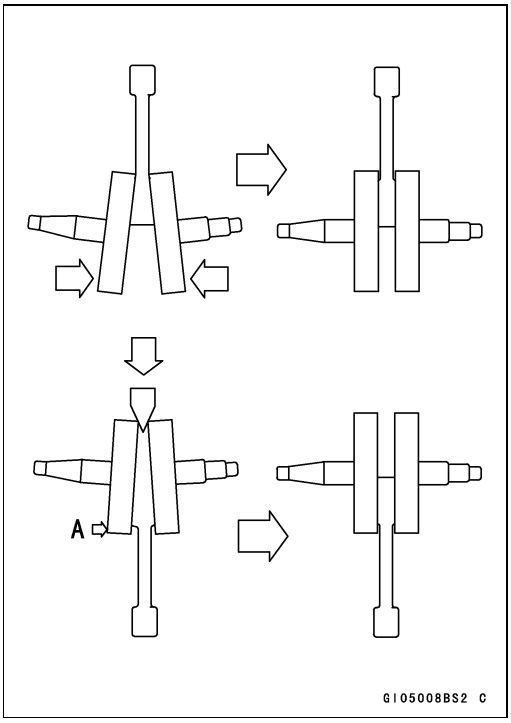
Crankshaft, Connecting Rod

- In the case of both horizontal and vertical misalignment, correct the horizontal misalignment first.
- Recheck big end side clearance after aligning crankshaft (see Connecting Rod Big End Side Clearance).

NOTE

○ *If crankshaft alignment cannot be corrected by the above method, replace the crankpin or crank halves as required. Recheck the runout and repeat the process until the runout is within service limit.*

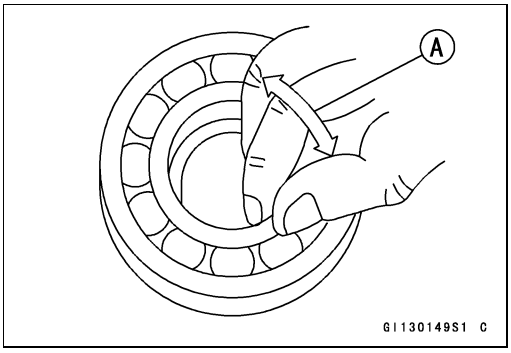
CAUTION
Don't hammer the flywheel at the point [A].



Crankshaft Main Bearing Wear

- Wash the bearings in high-flash-point solvent, blow them dry (DO NOT SPIN THEM), and lubricate them with engine oil.
- Turn each bearing [A] over by hand and see that it makes no noise, turns smoothly and has no rough spots.

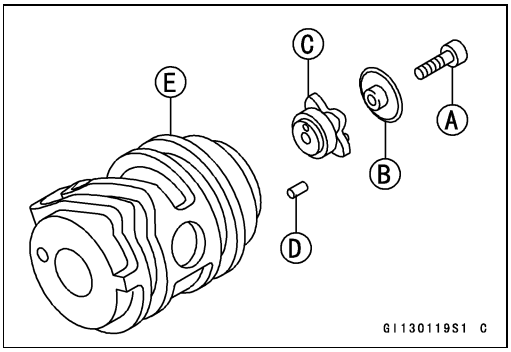
★If any of the bearings are defective, replace them.



Transmission

Transmission and Shift Mechanism Removal

- Split the crankcase.
- Pull out the shift rods and take out the shift forks.
- Remove the drive and output shaft assemblies as a set.
- Holding the shift drum with suitable bar, unscrew the shift drum Allen bolt [A].
- Remove the cam holder [B], shift drum cam [C] and dowel pin [D].
- Remove the shift drum [E].



Transmission Disassembly

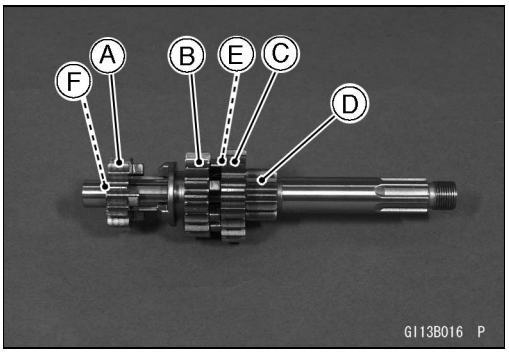
- Remove the transmission shafts.
- Using the circlip pliers to remove the circlip, disassemble the transmission shaft.

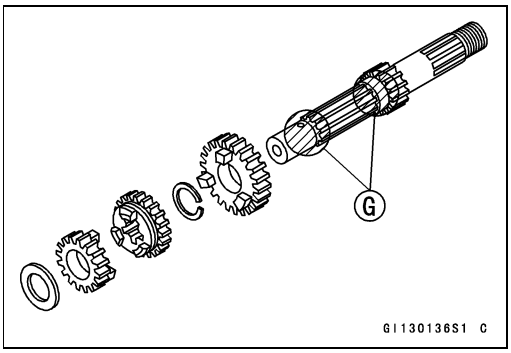
Special Tool - Outside Circlip Pliers: 57001–144

Transmission Assembly

- Assemble the transmission gears as shown.
- ○ Replace the old circlip with a new one if it is removed.
- ○ The drive shaft gears can be identified by size; the smallest diameter gear is 1st gear, and the largest it 4th (not working). Be sure that all parts are put back in the correct sequence, facing the proper direction, and that the circlip and the washer are properly in place.

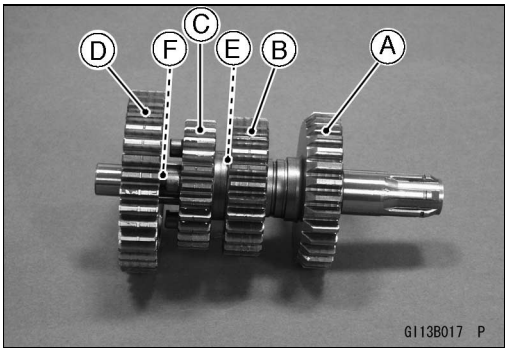
  2nd Gear [A]
  3rd Gear [B]
  4th Gear (not working) [C]
  1st Gear [D]
  Circlip [E]
  Shim [F]
  Apply Engine Oil [G]





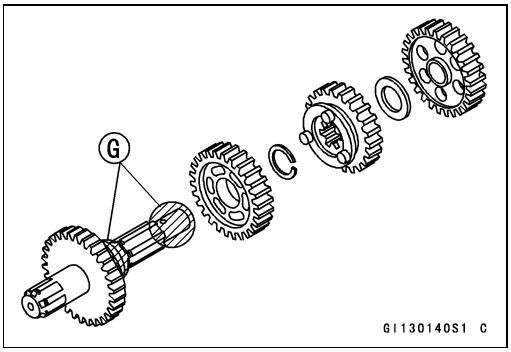
- ○ The output shaft gears can be identified by size; the largest diameter gear is 1st gear, and the smallest is 4th (not working). Be sure that all parts are put back in the correct sequence and facing the proper direction, and that the circlip is properly in place.

  2nd Gear [A]
  3rd Gear [B]
  4th Gear (not working) [C]
  1st Gear [D]
  Circlip [E]
  Spacer [F]

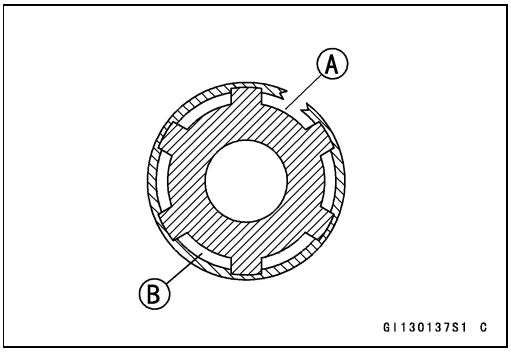


Transmission

Apply Engine Oil [G]



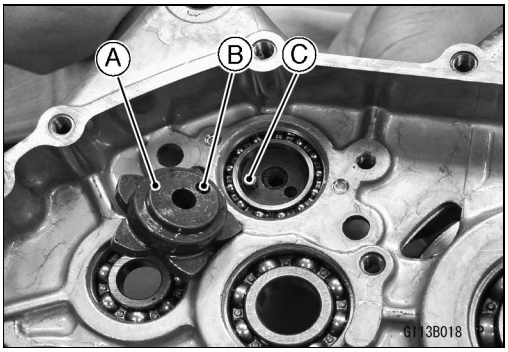
○ Always install circlips so that the opening is aligned with a spline groove. To install a circlip without damage, first fit the circlip onto the shaft expanding it just enough to install it, and then use a suatable gear to push the circlip into place.
[A] Opening of Circlip
[B] Groove of Shaft Spline



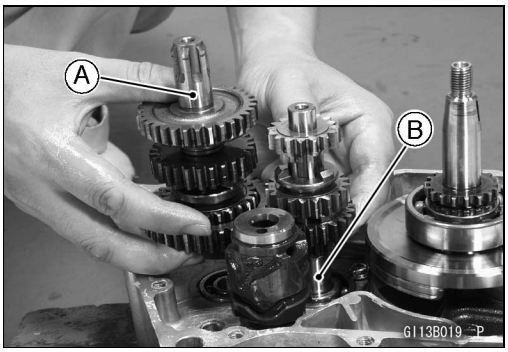
Transmission and Shift Mechanism Installation

- Fit the shift drum to the right crankcase half.
- Install the shift drum cam [A] aligning its hole [B] with the dowel pin [C].
- Install the holder and tighten the Allen bolt.

Torque - Shift Drum Allen Bolt: 5.2 N·m (0.53 kgf·m, 46 in·lb)



- Apply a clean engine oil to the transmission gears, bearings, and shaft journal, and fit the output [A] and drive shaft [B] assemblies as a set into the right crankcase half.
- Set the shift drum in neutral position.

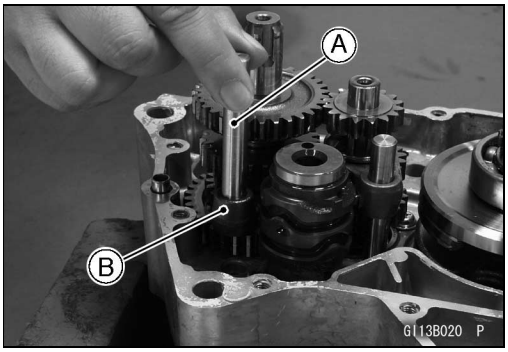


- Apply a clean engine oil to the shift fork fingers, and fit each shift fork into its gear-groove so that the shift fork guide pin is in the proper shift drum-groove.

NOTE

○ *Fingers of the 1st/3rd shift fork are longer than the fingers of the 2nd/4th shift fork.*

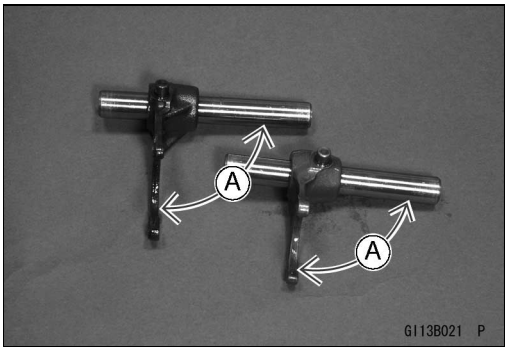
- Apply a clean engine oil to the shift rods [A], and insert each rod running it through each shift fork [B].
- Set the shift drum in neutral position, that is, drive and output shaft turn freely.
- Assemble the crankcase.



Transmission

Shift Fork Bending

● Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.
[A] 90°



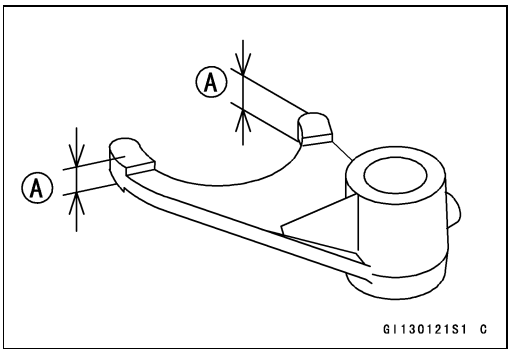
Shift Fork Ear/Gear Shift Fork Groove Wear

● Measure the thickness [A] of the shift fork ears.

★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

Shift Fork Ear Thickness

Standard:	**3.9 ∼ 4.0 mm**
Service Limit:	**3.8 mm**

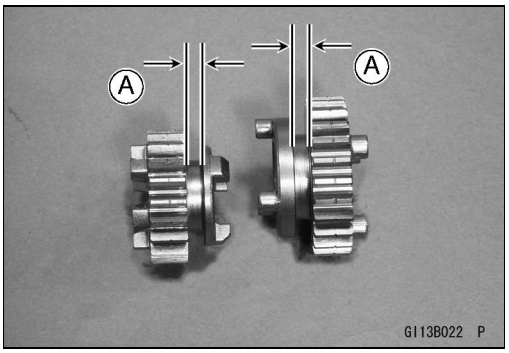


● Measure the width [A] of the gear shift fork grooves in the transmission gears.

★If a gear shift fork groove is worn over the service limit, the gear must be replaced.

Gear Shift Fork Groove Width

Standard:	**4.05 ∼ 4.15 mm**
Service Limit:	**4.3 mm**



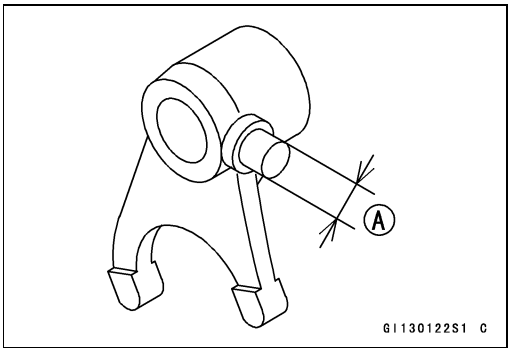
Shift Fork Guide Pin/Shift Drum Groove Wear

● Measure the diameter [A] of each shift fork guide pin, and measure the width [B] of each shift drum groove.

★If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

Shift Fork Guide Pin Diameter

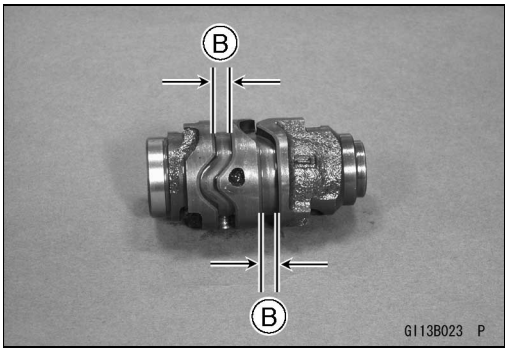
Standard:	**4.9 ∼ 5.0 mm**
Service Limit:	**4.8 mm**



★If any shift drum groove is worn over the service limit, the drum must be replaced.

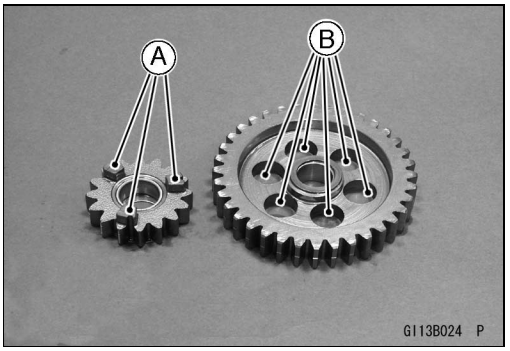
Shift Drum Groove Width

Standard:	**5.05 ∼ 5.20 mm**
Service Limit:	**5.3 mm**



Transmission

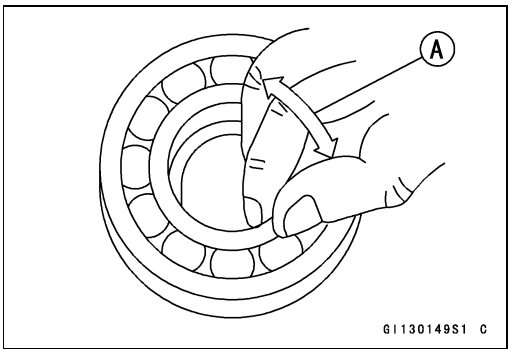
Gear Dog/Gear Dog Hole Damage



- Visually inspect the gear dogs [A] and gear dog holes [B].

★Replace any damaged gears or gears with excessively worn dogs or dog holes.

Ball and Needle Bearing Wear



CAUTION

Do not remove the bearings for inspection. Remove may damage them.

- Check the ball bearings.

○ Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.

○ Spin [A] a bearings by hand to check its condition.

★If the bearings are noisy, do not spin smoothly, or have any rough spots, replace them.

- Check the needle bearing.

○ The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

★If it is any doubt as to the condition of a needle bearing, replace it.

Oil Seal Inspection

- Inspect the oil seals.

★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.