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TROUBLESHOOTING

The following charts are provided to help in diagnosing the probable source of troubles. It should be used as a guideline. This section pertains to engine mechanical components only. Some related problems can come from other systems such as ignition system, fuel system etc. and have an impact on the engine. Ensure to check the other systems prior to concluding that the engine is in fault.


COOLING SYSTEM

SYMPTOM	HIGH ENGINE OPERATING TEMPERATURE.
CONDITION	NORMAL USE.
	1. Check coolant level. a. Coolant less than recommended level. <i>Refill.</i>
	2. Check temperature sensor for electrical/mechanical failure. a. Temperature sensor defective. <i>Replace.</i>
	3. Check thermostat (located on cylinder head). a. Thermostat defective (does not open when engine gets hot). <i>Replace thermostat.</i>
	4. Check weep hole (oil pressure switch area MAG side) if coolant leaks. a. Coolant leaking from weep hole means a damaged oil seal and/or O-ring on water pump housing. <i>Replace both oil seals and O-rings (refer to COOLING SYSTEM and MAGNETO COVER).</i>
	5. Check coolant bleeding screw on thermostat housing. a. Screw looses and/or gasket ring is missing. <i>Retighten screw and/or place gasket ring.</i>
	6. Check condition of hoses and hose clamps fixation. a. Hoses are brittle and/or hard. <i>Replace.</i> b. Hose clamps are loose. <i>Retighten clamps.</i>
	7. Check condition of impeller located on the water pump shaft. a. Impeller wings broken and/or impeller thread is damaged. <i>Replace.</i>
	8. Check coolant drain screw on crankcase PTO (marked with Coolant Drain). a. Gasket ring on drain screw leaks. <i>Retighten screw and/or replace gasket.</i>
	9. Check cylinder head and/or cylinder base gasket. a. Worn out gasket(s) is (are) causing waterleakage. <i>Replace.</i>


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MAGNETO SYSTEM


SYMPTOM	NO SPARK.
CONDITION	NORMAL USE.
	1. Check spark plug electrode condition. a. Gap is too big. <i>Readjust gap (refer to TECHNICAL DATA).</i>
	2. Check ignition coil for damage and/or electrical failure. a. Ignition coil damaged. <i>Replace ignition coil.</i> b. Connector is corroded or ignition coil shows electrical failure. <i>Clean connector area and/or replace ignition coil.</i> c. Wire harness is brittle or hard (no connection). <i>Replace.</i>
	3. Check wire harness for cracks or other damages. a. Harness shows electrical failure and/or other damages. <i>Replace wire harness.</i>
	4. Check magneto for damage and/or electrical failure. a. Radial position of rotor wrong due to a broken woodruff key. <i>Replace woodruff key.</i> b. Connector on magneto is damaged and/or has electrical failure. <i>Repair and clean contacts of connector.</i>
	5. Check electronic module. a. Module shows electrical failure or violent damages. <i>Replace electronic module.</i> b. Connectors are corroded. <i>Clean and reconnect.</i> c. Electronic module has bad ground to the vehicle frame. <i>Clean metal surface for good ground.</i>


LUBRICATION

SYMPTOM	LOW OR NO OIL PRESSURE/HIGH OIL CONSUMPTION.
CONDITION	NORMAL USE.
	1. Check oil level and search for leakage on crankcase and/or defective sealing ports. a. Crankcase is leaking due to damage. <i>Rebuild engine with new crankcase and gasket parts. Use a high quality oil (refer to TECHNICAL DATA).</i> b. Crankcase is leaking due to loose screws. <i>Retighten screws with recommended torque.</i> c. Sealing rings, O-rings and/or gaskets are brittle and/or hard or damaged. <i>Replace damaged parts.</i> d. Piston rings worn out (blue coloured engine exhaust emission). <i>Replace piston rings (refer to CYLINDER AND HEAD).</i> e. Piston rings are broken (low compression and blue coloured engine exhaust emission). <i>Replace piston rings (refer to CYLINDER AND HEAD).</i> f. Valve stem seal damaged and/or sealing lip is hard and/or brittle. <i>Replace all valve stem seals.</i>
	2. Check oil filter for contamination. a. Oil filter clogged. <i>Replace oil filter and oil at the same time. Use a high quality oil (refer to TECHNICAL DATA).</i>
	3. Check oil pressure regulator valve (spring) function. a. Valve spring damaged (valve always open). <i>Replace spring.</i> b. Valve stays open in crankcase PTO due to contamination (metallic particles). <i>Clean and/or repair valve piston.</i>
	4. Check oil drain plug on engine bottom. a. Plug is loosed and/or gasket ring is missing. <i>Retighten the plug and/or place gasket ring.</i>
	5. Check oil strainer screw on engine bottom. a. Screw is loose and/or gasket is damaged, brittle or hard. <i>Retighten screw and/or replace gasket.</i>
	6. Check weep hole if oil leaks (oil pressure switch area MAG side). a. Oil leaking from weep hole means a damaged oil seal and/or O-ring on water pump housing. <i>Replace both oil seals and O-rings (refer to COOLING SYSTEM and MAGNETO COVER).</i>
	7. Check oil pressure switch function. a. Oil pressure switch damaged. <i>Replace oil pressure switch.</i>


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SYMPTOM	LOW OR NO OIL PRESSURE/HIGH OIL CONSUMPTION.
CONDITION	NORMAL USE.
	8. Check oil orifice(s) on the oil pump suction side. a. Oil orifice(s) is (are) clogged. <i>Clean from contamination. Replace oil and oil filter if necessary (refer to MAINTENANCE or LUBRICATION).</i>
	9. Check oil pump function. a. Oil pump rotor is out of wear limit. <i>Replace oil pump shaft (refer to LUBRICATION).</i> b. Oil pump seized due to oil leakage and/or air inclusion. <i>Replace oil pump (refer to LUBRICATION).</i> c. Gears driving oil pump are broken or otherwise damaged. <i>Replace gears.</i> d. Incorrect oil being used. <i>Use a high quality oil (refer to TECHNICAL DATA).</i>
	10. Check plain bearings in crankcase for heavy wear. a. Plain bearings out of specification (increased clearance). <i>Replace all plain bearings at the same time (refer to CRANKSHAFT).</i>

SYMPTOM	OIL CONTAMINATION (WHITE APPEARANCE).
CONDITION	NORMAL USE.
	1. Check weep hole (oil pressure switch area MAG side) if water and oil leaks. a. Leakage of oil/water mixture from weep hole means damaged oil seals and/or O-rings on water pump housing. <i>Replace sealing rings, O-rings and refill with recommended oil and/or coolant (refer to COOLING SYSTEM and MAGNETO COVER).</i>
	2. Check cylinder head and/or cylinder base gasket. a. Gasket damaged or leaking. <i>Retighten cylinder head with recommended torque and/or replace gasket.</i>
	3. Check screws for torque. a. Screws not fixed. <i>Retighten screws with recommended torque and/or replace oil.</i>
	4. Check oil for particles (may indicate possible damages inside the engine). a. Oil contamination due to metal or plastic particles. <i>Replace possibly damaged parts. Use a high quality oil (refer to TECHNICAL DATA).</i>

CYLINDER AND HEAD

SYMPTOM	UNUSUAL ENGINE NOISE AND/OR VIBRATION IN IDLE SPEED.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check oil pressure regulator valve (spring) function. <ol style="list-style-type: none"> Valve fixed due contamination and/or spring damaged (valve remains open). <i>Clean and/or replace spring and/or mechanism.</i> Faulty chain tensioner. <i>Replace spring and/or mechanism.</i>


SYMPTOM	UNUSUAL ENGINE NOISE AND/OR VIBRATION WHILE OPERATING.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check items 1 of UNUSUAL ENGINE NOISE AND/OR VIBRATION IN IDLE SPEED. 2. Check noise coming from cylinder head area. <ol style="list-style-type: none"> Check valve timing. <i>Readjust valve timing and/or replace failure part(s).</i> Chain guide worn out. <i>Replace chain guide.</i> Stretched chain and/or worn out sprocket. <i>Replace chain and sprocket at the same time.</i> Sprocket screw got loose. <i>Retighten screw with recommended torque.</i> Rocker arm(s) is (are) worn out (valve adjustment). <i>Readjust valve clearance and/or replace rocker arm(s).</i> Thrust washer(s) on rocker arm shaft is(are) missing. <i>Fit thrust washer(s) (refer to CYLINDER AND HEAD).</i>

SYMPTOM	OIL CONTAMINATION ON CYLINDER AND/OR HEAD.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check screws for torque. <ol style="list-style-type: none"> Loose screws. <i>Retighten screws with recommended torque.</i> Gaskets are brittle, hard, worn out or otherwise damaged. <i>Replace damaged gaskets, O-rings or the V-ring on breather.</i>

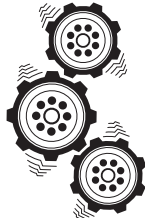
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CRANKSHAFT

SYMPTOM	UNUSUAL ENGINE NOISE AND/OR VIBRATIONS.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check thrust washer(s) on crankshaft MAG/PTO side. a. Thrust washer(s) is (are) missing on MAG and/or PTO side. <i>Fit thrust washer(s).</i>

GEARBOX

SYMPTOM	UNUSUAL ENGINE NOISE AND/OR VIBRATIONS.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check bearings in the gearbox for free movement. a. Bearing(s) do(es) not move freely. <i>Replace bearing(s).</i>
	2. Check oil level in gearbox. a. Oil leakage through plug cover area (near speed sensor support). <i>Replace O-ring and retighten screw with recommended torque.</i> b. Oil leakage in gearbox cover gasket area. <i>Replace gasket and do the torque procedure (refer to GEARBOX).</i>
	3. Check chain condition. a. Reverse gear chain shows heavy wear (rolles, chain links). <i>Replace chain.</i>
	4. Check for whistling noise inside gearbox. a. Countershaft and intermediate shaft are noisy. <i>Replace countershaft and intermediate shaft the same time.</i>
	5. Check for knocking noise. a. Tooth of gears are damaged and/or worn. <i>Replace respective gears.</i>


SYMPTOM	GEAR INDICATION FAILS.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check contact screws on PTO side (gearbox area) for damage and/or wear. <ol style="list-style-type: none"> Shifting indicator switch(es) pin(s) is (are) worn and/or otherwise damaged. <i>Replace shifting indicator switch(es).</i> Contact(s) is (are) corroded and/or contact screw for wire harness got loose. <i>Clean contact surface and retighten contact screw(s) with recommended torque.</i> Wire harness has broken cables. <i>Replace wire harness.</i>
	2. Check connector condition and/or electrical system. <ol style="list-style-type: none"> Connector contact(s) is (are) corroded and/or otherwise damaged. <i>Clean connector(s) and/or replace wire harness if damaged.</i> Electrical system failed and/or otherwise damaged. <i>Repair and/or replace damaged part(s).</i>
	3. Check index spring placed on gearbox cover. <ol style="list-style-type: none"> Indexation fails due to broken and/or damaged index spring. <i>Clean gearbox from metal particles, replace index spring and/or damaged part(s).</i>


SYMPTOM	GEAR(S) IS (ARE) HARD TO SHIFT.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check shift plate and/or shift forks for wear and/or damages. <ol style="list-style-type: none"> Shift plate has worn out and/or damaged tracks. <i>Replace shift plate.</i> Shift fork(s) is (are) worn out and/or engagement pins are damaged. <i>Replace shift fork(s).</i> Shift fork(s) is (are) worn out and/or fork(s) is (are) damaged. <i>Replace shift fork(s).</i> Shift gear(s) is (are) worn out. <i>Replace shift gear(s).</i> High gear worn and/or otherwise damaged. <i>Replace high gear.</i> Index spring worn in front area (stops intermediate gear in idle). <i>Replace index spring.</i>
	2. Check engine idle speed (choke in use). <ol style="list-style-type: none"> Idle speed is to high (CVT starts to work). <i>Adjust idle speed.</i> Choke is in use and increases the engine RPM. <i>Release choke.</i>


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CVT

SYMPTOM	THE ATV ACCELERATES SLOWLY, ESPECIALLY WHEN IT IS STOPPED.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check drive belt condition. a. Belt is too narrow (drive belt engagement is higher in drive pulley). <i>Replace belt if width is less than specified (refer to CVT or TECHNICAL DATA).</i>
	2. Check centrifugal clutch on driven pulley. a. Liners of centrifugal clutch are out of specification (refer to CVT). <i>Replace centrifugal clutch assembly.</i>
	3. Check roller on drive pulley inner half. a. Rollers are worn and/or wrong installed and/or otherwise damaged (refer to CVT). <i>Replace all rollers at the same time (roller kit).</i>
	4. Check function of sprag clutch on driven pulley. a. Sprag clutch is clogged and/or worn out (refer to CVT). <i>Replace sprag clutch together with ball bearing and oil seal (refer to CVT).</i>

SYMPTOM	ENGINE MAXIMUM RPM IS TOO HIGH AND TOP SPEED IS NOT REACHED.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check items 1 to 3 of THE ATV ACCELERATES SLOWLY, ESPECIALLY WHEN IT IS STOPPED.
	2. Check driven pulley spring tension. a. Spring tension is too stiff. <i>Replace spring (recommended Bombardier spring).</i>


SYMPTOM	DRIVE PULLEY NOISE IN IDLE SPEED.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check slide pieces (drive pulley). a. Worn slide pieces (increased clearance to drive pulley inner half). <i>Replace all slide pieces at the same time (slide piece kit).</i>
	2. Check driven pulley sliding mechanism (between driven pulley outer and inner half). a. Mechanism is stucked and/or damaged. <i>Replace driven pulley assembly.</i>
	3. Check rollers for wear (located on inner half of drive pulley). a. Roller(s) worn out. <i>Replace all rollers at the same time (roller kit).</i>
	4. Check drive pulley nut for torque. a. Loose nut. <i>Retighten nut with recommended torque.</i>
	5. Check driven pulley bearing(s) for free movement. a. Bearing(s) do(es) not move freely. <i>Replace bearing(s) and oil seal inside driven pulley at the same time.</i>


SYMPTOM	DRIVE PULLEY NOISE WHEN ACCELERATING/DECELERATING.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check items 1 to 5 of DRIVE PULLEY NOISE IN IDLE SPEED.
	2. Check if belt runs in dry conditions. a. Drive pulley area is wet/contaminated due to water/dirt intrusion. <i>Clean driven pulley area and/or drain water out of CVT cover.</i>
	3. Check driven pulley nut/bearing in CVT cover for free movement. a. Bearing does not move freely. <i>Replace bearing.</i> b. Bearing seat on driven pulley nut is worn and/or otherwise damaged. <i>Replace driven pulley nut.</i>

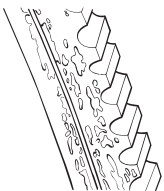
SYMPTOM	VIBRATIONS ORIGINATING FROM DRIVE PULLEY.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check tightening torque of drive pulley nut. a. Moving outer half. <i>Retighten nut.</i>
	2. Check inner half bushings. a. Excessive gap between bushings and inner half shaft, thus restraining sliding half movements. <i>Replace inner half assembly.</i>

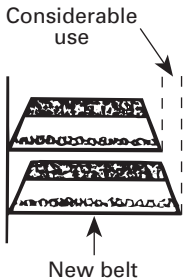
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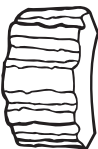
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SYMPTOM	VIBRATIONS ORIGINATING FROM DRIVEN PULLEY.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check centrifugal clutch on driven pulley. a. Centrifugal clutch out of round after replacement. <i>Reinstall centrifugal clutch turned by 180°.</i>

SYMPTOM	PULLEYS DO NOT DOWN SHIFT PROPERLY.
CONDITION	NORMAL USE.
Test/Inspection 	1. Refer to VIBRATIONS COMING FROM DRIVEN PULLEY and check items listed. 2. Check drive pulley bushings (cleanliness, wear, etc.). a. Bushings stick to fixed half pulley shaft. <i>Clean or replace.</i> 3. Check driven pulley spring tension. a. Spring tension is too weak. <i>Replace.</i>

SYMPTOM	BELT GLAZED EXCESSIVELY OR HAVING BAKED APPEARANCE.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check if drive pulley air intake is clogged. a. Drive pulley area heats up due to contamination. <i>Clean air intake from contamination.</i> 2. Check if pulley halves are clean. a. Oil on pulley surfaces. <i>Clean pulley halves and replace belt.</i>

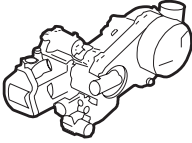
SYMPTOM	BELT WORN EXCESSIVELY IN TOP WIDTH.
CONDITION	NORMAL USE.
Test/Inspection  A00D0BY	1. Check drive pulley. a. Excessive slippage due to irregular outward actuation movement of drive pulley. <i>Carry out drive pulley inspection.</i> 2. Check drive belt identification number. a. Improper belt angle (wrong type of belt). <i>Replace belt with an appropriate drive belt.</i> 3. Check drive belt width. a. Considerable wear. <i>Replace belt if less than specified (refer to CVT or TECHNICAL DATA).</i>

SYMPTOM	BELT SIDES WORN CONCAVE.
CONDITION	NORMAL USE.
Test/Inspection  A00D0DY	<p>1. Check pulley half surfaces.</p> <p>a. Rough or scratched pulley half surfaces. <i>Repair or replace.</i></p> <p>2. Check drive belt identification number.</p> <p>a. Unspecified type of belt. <i>Replace belt with an appropriate drive belt (refer to TECHNICAL DATA).</i></p>
SYMPTOM	BELT DISINTEGRATION.
CONDITION	NORMAL USE.
Test/Inspection  A00D0EY	<p>1. Check drive belt identification number.</p> <p>a. Excessive belt speed. <i>Using unspecified type of belt. Replace belt with proper type of belt (refer to TECHNICAL DATA).</i></p> <p>2. Check if pulley halves are clean.</p> <p>a. Oil on pulley surfaces. <i>Clean pulley surfaces with fine emery cloth and wipe clean using Pulley Flange Cleaner (P/N 413 711 809) and a cloth.</i></p>
SYMPTOM	FLEX CRACKS BETWEEN COGS.
CONDITION	NORMAL USE.
Test/Inspection  A00D0GY	<p>1. Check drive belt condition.</p> <p>a. Considerable use, belt wearing out. <i>Replace.</i></p>

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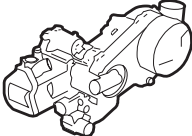
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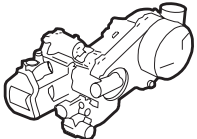
ENGINE GENERAL

SYMPTOM	ENGINE BACKFIRES.
CONDITION	NORMAL USE.
 Test/Inspection	1. Check spark plug and/or electrical system. a. Carbon accumulation caused by defective spark plug. <i>Clean carbon accumulation and replace spark plug.</i> b. Electrical system has failure. <i>Replace defective part(s).</i>
	2. Check leakage on intake manifold. a. Air leak on intake system. <i>Retighten screws and/or replace intake manifold.</i>
	3. Check exhaust air leaking. a. Exhaust gasket is leaking. <i>Retighten screws and/or replace exhaust gasket.</i>
	4. Check intake valve(s) for leaking. a. Intake valve(s) is (are) leaking. <i>Repair or replace valve(s).</i>
	5. Check if fuel supply is to less at high RPM. a. Fuel line is contaminated and/or bent (engine gets lean). <i>Clean and/or replace defective part(s).</i>

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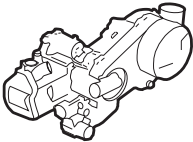
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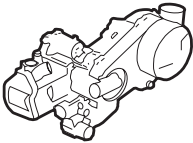
SYMPTOM	ENGINE SUDDENLY TURNS OFF.
CONDITION	NORMAL USE.
Test/Inspection 	6. Cracked or broken piston. a. Cracked or broken piston due to excessive piston/cylinder clearance or engine overrevving. <i>Replace piston. Check piston/cylinder clearance (refer to CYLINDER AND HEAD).</i>
	7. Check piston rings and cylinder surface for grooves. a. Poor oil quality. <i>Use a high quality oil.</i> b. Contamination (like sand) through engine intake. <i>Replace defective part(s) and use new air filter.</i>
	8. Check connecting rod, crankshaft, rocker arm rollers movement. a. Connecting rod failure due to leak of oil. <i>Repair and replace defective parts and use a high quality oil.</i> b. Crankshaft failure due to leak of oil. <i>Repair and replace defective parts and use a high quality oil.</i> c. Oil contamination due to clogged oil filter. <i>Replace oil filter and oil at the same time, replace defective part(s) (refer to MAINTENANCE CHART).</i>
	9. Check valve springs exhaust/inlet. a. Broken valve spring damages the cylinder head, valve(s), rocker arm(s)/piston. <i>Replace defective part(s) and do the valve adjustment.</i>

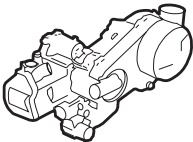
SYMPTOM	ENGINE DOES NOT OFFER MAXIMUM POWER AND/OR DOES NOT REACH MAXIMUM OPERATING RPM.
CONDITION	NORMAL USE.
	1. Check items 1 and 2 of ENGINE SUDDENLY TURNS OFF.
	2. Check air intake system. a. Air filter is clogged due to contamination. <i>Replace air filter.</i>
	3. Check spark plug condition and/or gap. a. Fouled spark plug or wrong spark plug gap. <i>Readjust gap and clean spark plug or replace.</i>
	4. Check spark plug type. a. Improper spark plug heat range. <i>Install recommended spark plug (refer to TECHNICAL DATA).</i>
	5. Perform engine leak test. Refer to ENGINE LEAK TEST procedure. Check for possible piston seizure. a. Damaged head gasket and/or seal and/or leaking inlet/exhaust valve(s). <i>Replace and/or repair defective parts.</i>
	6. Check for water in fuel (wrong fuel). a. There is water in fuel or wrong fuel. <i>Drain fuel system, search for leakage and refill it with appropriate fuel.</i>
	7. Check drive belt. a. Worn belt. <i>Replace belt if width is less than specified (refer to CVT).</i>
	8. Check engine compression. a. Worn piston and/or piston ring(s). <i>Replace (refer to CYLINDER AND HEAD).</i>

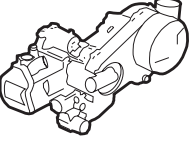
Section 03 ENGINE

Subsection 02 (TROUBLESHOOTING)

SYMPTOM	ENGINE TURNS OVER BUT FAILS TO START.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check items of ENGINE DOES NOT START — NO SPARK AT SPARK PLUG.
	2. Check spark plug. a. Define spark plug (no spark) or wrong spark plug gap. <i>Readjust gap and clean spark plug or replace.</i>
	3. Check for fuel on spark plug. a. Flooded engine (spark plug wet when removed). <i>Do not overchoke. Remove wet spark plug, turn ignition switch to OFF and crank engine several times. Install clean dry spark plug. Start engine following usual starting procedure.</i>
	4. Check engine compression. a. Insufficient engine compression. <i>Replace defective part(s) (ex.: piston, ring(s), etc.).</i> b. Valve seat worn and/or otherwise damaged. <i>Repair by performing valve guide procedure (refer to CYLINDER AND HEAD). Readjust valve clearance.</i>

SYMPTOM	HIGH ENGINE OPERATING TEMPERATURE.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check if cooling system shows any failure (see COOLING SYSTEM). a. System is leaking. <i>Repair and/or replace damaged part(s).</i>
	2. Check condition and heat range of spark plug. a. Melted spark plug tip or inadequate heat range. <i>Install recommended spark plug (refer to TECHNICAL DATA).</i>
	3. Check air inlet and outlet of the CVT cover. a. Air circulation is clogged (overheating). <i>Clean air circulation from contamination.</i> b. Drive belt worn and/or otherwise damaged. <i>Replace belt with an appropriate drive belt (refer to TECHNICAL DATA).</i>

SYMPTOM	STARTER TURNS, BUT ENGINE DOES NOT CRANK.
CONDITION	NORMAL USE.
Test/Inspection 	1. Check sprag clutch on magneto. a. Spring damaged. <i>Clean and/or replace sprag clutch.</i> b. Sprag clutch bodies worn and/or otherwise damaged. <i>Replace sprag clutch and ring gear at the same time.</i> c. Contact surface on ring gear and/or sprag clutch housing is worn or damaged. <i>Replace ring gear, sprag clutch and sprag clutch housing at the same time.</i>

SYMPTOM	ENGINE DOES NOT START — NO SPARK AT SPARK PLUG (SEE MAGNETO SYSTEM).
CONDITION	AT ENGINE CRANKING.
Test/Inspection 	1. Verify spark plug condition. a. Defective, improperly set, worn out, fouled. <i>Identify source of problem and correct. Replace spark plug.</i>
	2. Verify ignition coil resistance with an ohmmeter. a. Defective part. <i>Replace ignition coil.</i>
	3. Verify trigger coil resistance with an ohmmeter and connector condition. a. Defective trigger coil. Corroded connector terminal. <i>Replace trigger coil. Clean terminals and apply silicone dielectric grease.</i>
	4. Verify condition of ignition coil. a. Mechanically damaged part. Vibration problem. Electrically damaged part. <i>Replace ignition coil.</i>
	5. Verify condition of trigger coil. a. Mechanically damaged part. Vibration problem. Electrically damaged part. <i>Replace trigger coil and/or tighten mounting screw(s).</i> b. Metallic particles caused a short circuit between the soldered connections. <i>Clean trigger coil from metallic dust.</i>
	6. Check magneto for damage and/or electrical failure. a. Windings of stator have electrical failure (no charging causes an empty battery). <i>Replace magneto.</i>

LEAK TEST

VERIFICATION

Before performing the cylinder leak test, verify the following:

- intake port/air filter contaminated (glogged) with dirt, sand, etc. (leads to worn valves, piston rings and finally to leak of power)

CAUTION: In case of piston ring and/or valve replacement always clean the whole engine and replace oil and oil filter.

- blue exhaust gas means damaged/worn piston rings
- clamp(s) tightness
- radiator and hoses
- oily contamination on leak indicator hole (oil pressure switch area) means a damaged oil seal on water pump shaft
- coolant out of leak indicator hole means a damaged oil seal on water pump shaft (refer to **COOLING SYSTEM**).

NOTE: For all the checkpoints mentioned above see the appropriate engine section to diagnose and repair the engine.

LEAK TEST PROCEDURE

Preparation

NOTE: The following procedures should be done with a cold engine.

Disconnect battery.

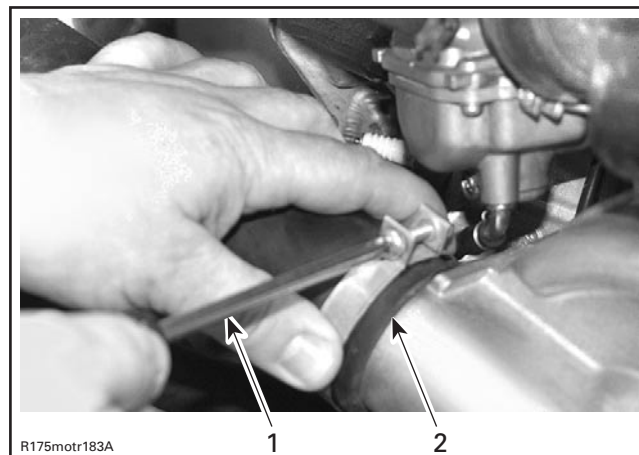
WARNING

Always respect this order for disassembly; disconnect BLACK (-) cable first. Electrolyte or fuel vapors can be present in engine compartment and a spark may ignite them and possibly cause personal injuries.

Remove:

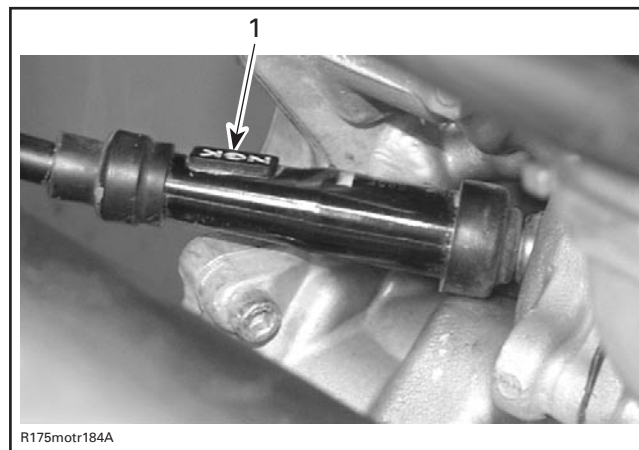
- radiator cap
- CVT hose inlet.

NOTE: To ease reaching cylinder head area it is recommended to disconnect CVT hose inlet.



1. Screwdriver
2. CVT hose inlet

Unplug spark plug cable.



1. Spark plug connector

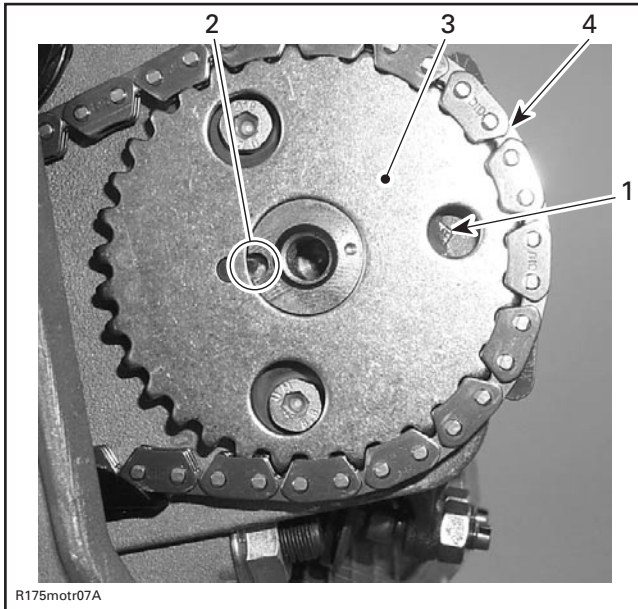
Remove spark plug from cylinder head.

Remove valve cover (refer to **CYLINDER AND HEAD**).

Section 03 ENGINE

Subsection 03 (LEAK TEST)

Rotate crankshaft until piston is at TDC.



1. Cylinder bore axle (arrow middle of the timing gear bore)
2. Groove in the camshaft
3. Chain timing gear
4. Timing chain

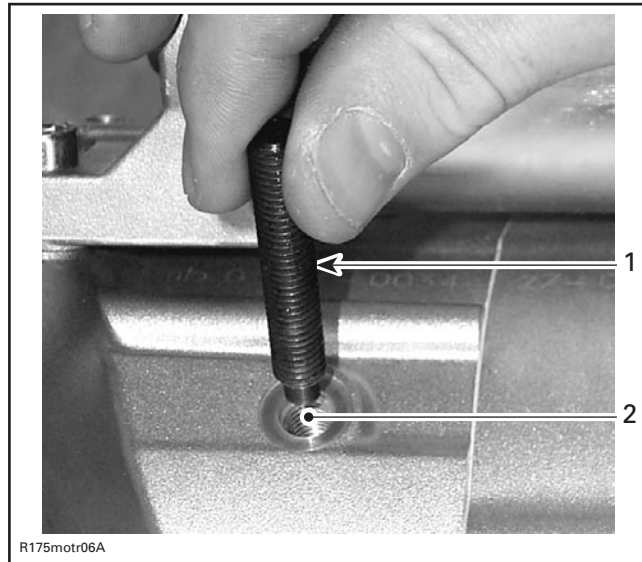
To place piston at TDC, it is possible to use two procedures.

First procedure:

- Remove CVT cover (refer to **CVT**).
- Turn the drive pulley until piston is at TDC.
- Install crankshaft locking bolt (P/N 529 035 617) (refer to **CRANKSHAFT**).

Second procedure:

- Remove the RH engine side panel.
- Remove magneto cover and the rotor on crankshaft until piston is at TDC.
- Install crankshaft locking bolt (P/N 529 035 617) (refer to **CRANKSHAFT**).



1. Crankshaft locking bolt
2. Thread in the area of electrical starter

Test

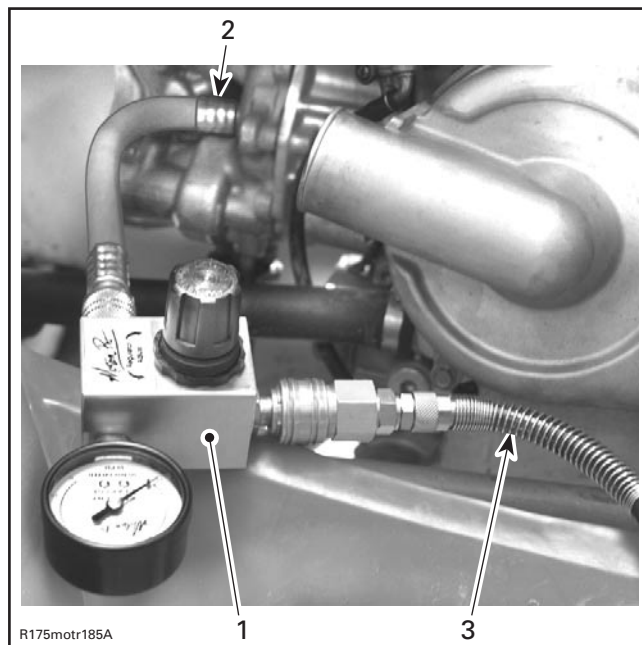
Connect leak tester (P/N 529 035 661) to adequate air supply.

Set needle of measuring gauge to zero.

NOTE: Each tester will have specific instruction on the gauge operation and required pressure.

Install gauge adapter into previously cleaned spark plug hole.

Supply combustion chamber with air pressure.



1. Leak tester
2. Adequate adapter for spark plug hole
3. Air supply hose

Note the amount of leaking or percentage (depending on tester).

LEAKAGE PERCENTAGE	ENGINE CONDITION
0% to 7%	Excellent condition.
8% to 15%	Fair condition; proceed with tuned up or adjustment.
16% to 30%	Poor condition; engine will run and performance might be down in some cases.
30% and higher	Very poor condition, diagnose and repair engine.

Diagnose

Listen for air leaks.

- air escaping on intake port/carburetor means leaking intake valve(s)
- air escaping on exhaust port means leaking exhaust valve(s)
- air bubbles out of radiator means leaking cylinder head gasket
- air/oil escaping from crankcase means damaged gasket and/or loosened screws (refer to **GEARBOX**)
- air/coolant escaping from cylinder/head means damaged gasket(s) and/or loosened screws (refer to **CYLINDER AND HEAD**)
- air escaping into crankcase area means excessively worn cylinder and/or broken piston rings.

NOTE: For all the checkpoints mentioned above see the appropriate engine section to diagnose and repair the engine.

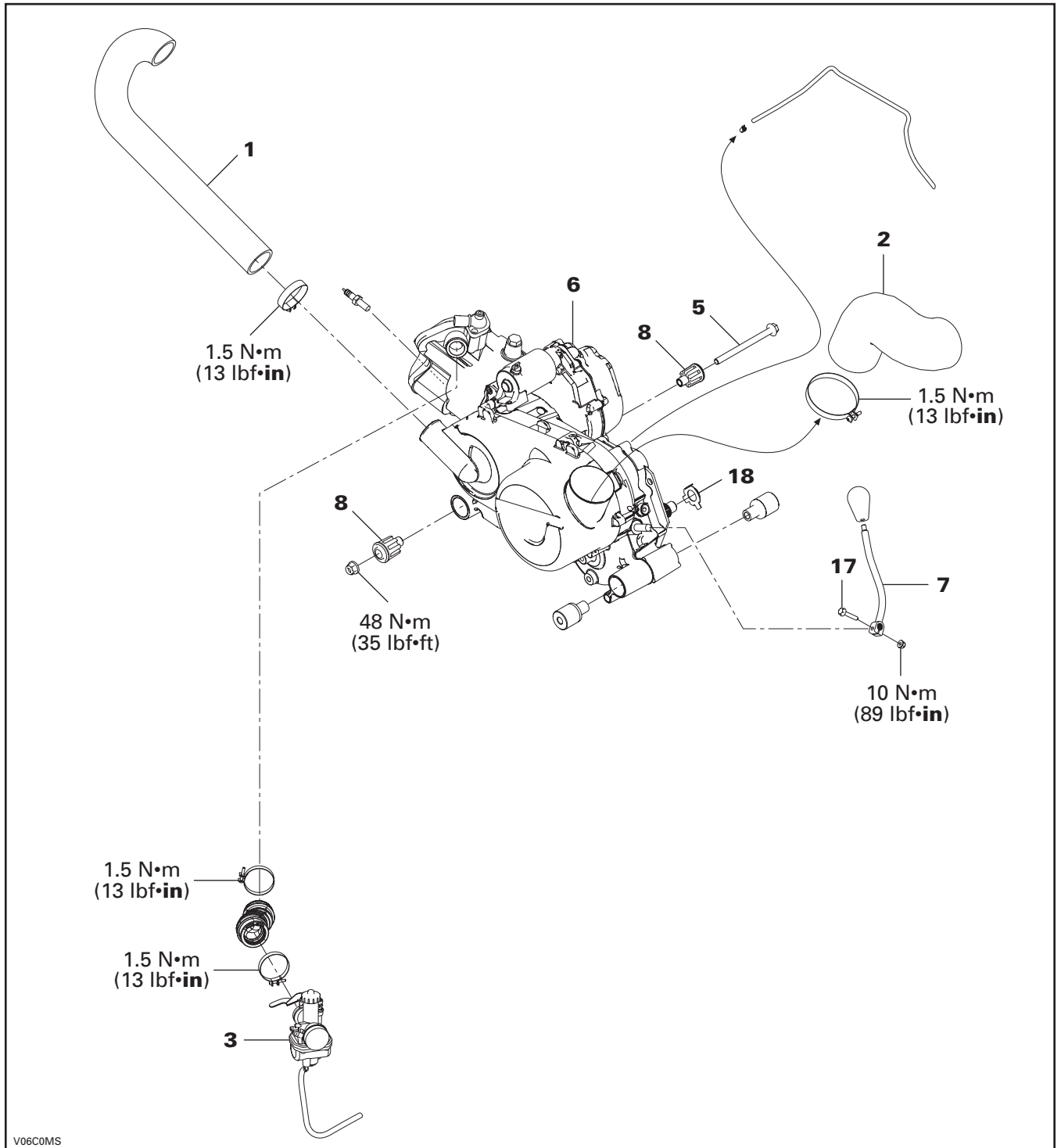
Installation

NOTE: At reassembly, use the torque values and Loctite products from the exploded views (refer to particular engine sections).

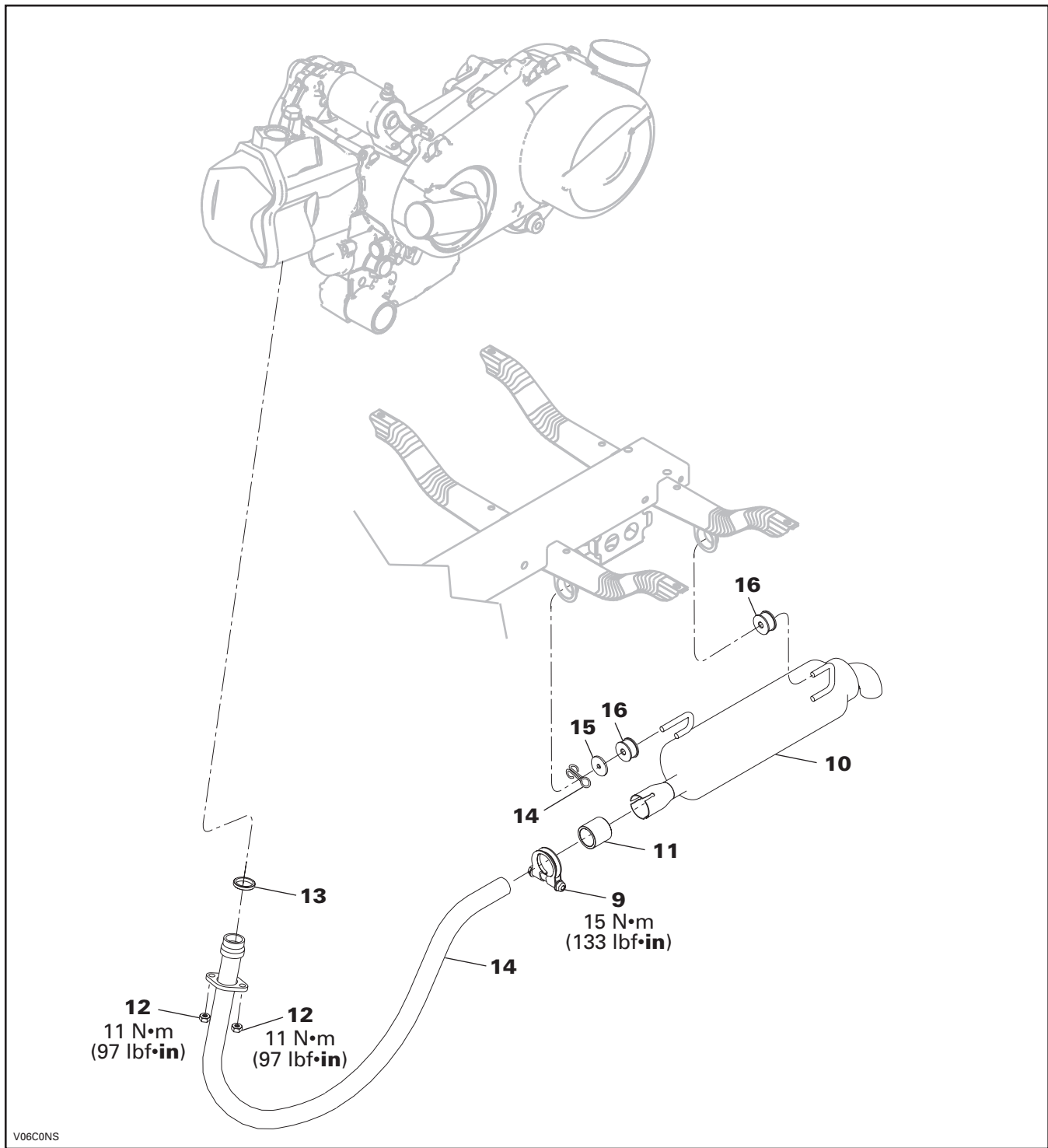
For installation, reverse the preparation procedure.

REMOVAL AND INSTALLATION

ENGINE SYSTEM



EXHAUST SYSTEM



GENERAL

Always disconnect battery.

WARNING

Always disconnect battery or starter cables exactly in the specified order, **BLACK (-)** cable first.

At installation, use torque values and Loctite products from the exploded view. Clean threads before using Loctite products when installing screws.

WARNING

Torque wrench tightening specifications must strictly be adhered to.

Locking devices (ex.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

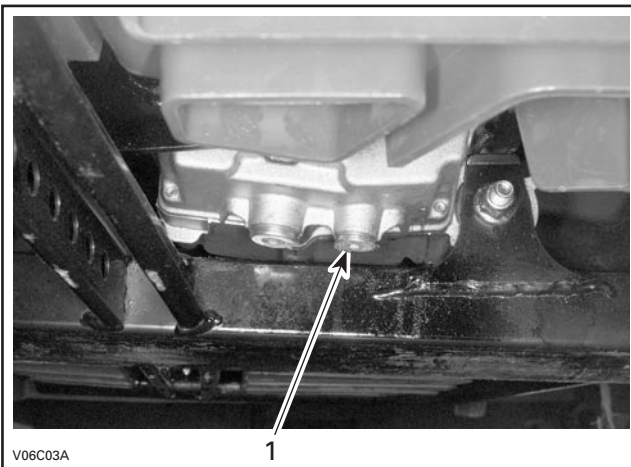
ENGINE

Removal

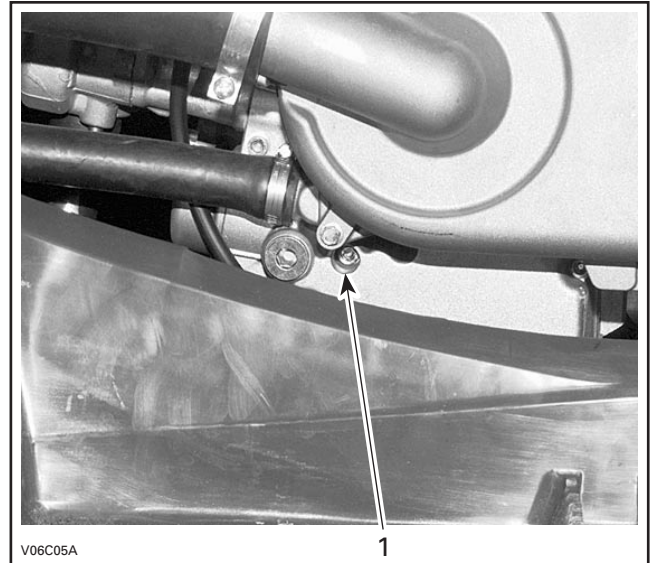
Place vehicle at workstation that will have access to an engine-lifting hoist. Then start with initial preparation of vehicle by doing the following.

Turn fuel valve on OFF position.

Drain engine oil and engine coolant.



1. Oil drain plug

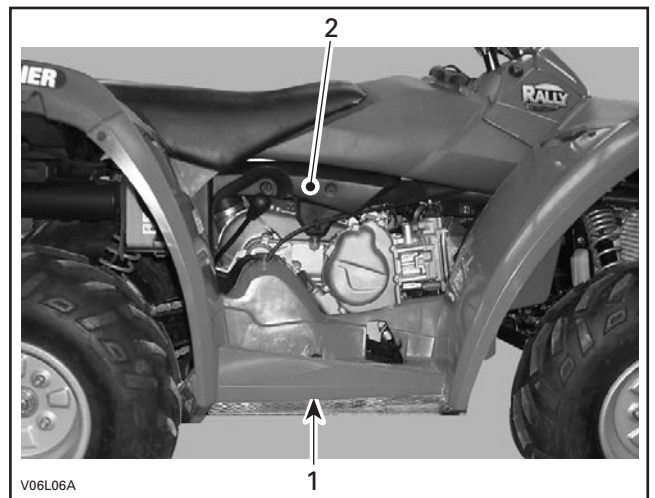


1. Cooling drain plug

On right side of vehicle, do the following:

Remove:

- RH footwell and RH cover (refer to **BODY**)

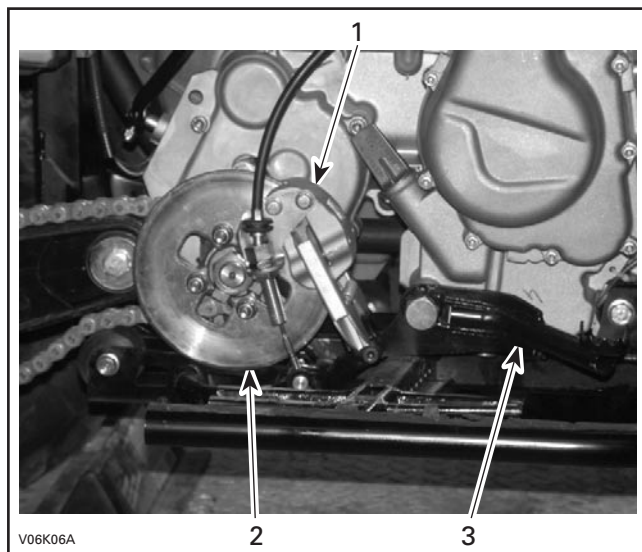


- 1. Footwell
- 2. RH cover

Section 03 ENGINE

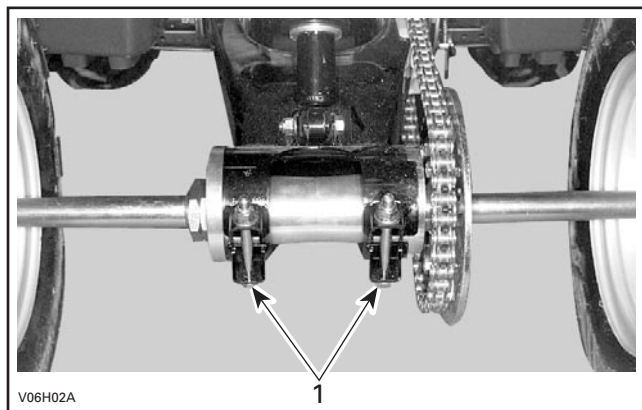
Subsection 04 (REMOVAL AND INSTALLATION)

– rear brake caliper/disc/pedal (refer to **BRAKES**)



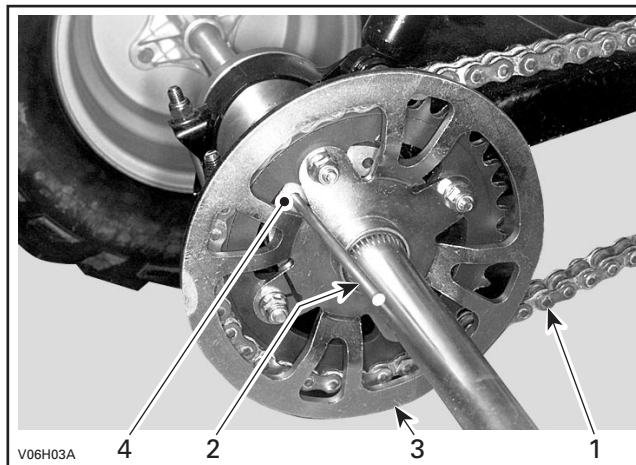
1. Rear brake caliper
2. Rear brake disc
3. Rear brake pedal

Loosen chain tensioner lock bolts.



1. Chain tensioner lock bolts

Insert adjuster lock through sprocket hub and into chain tensioner.



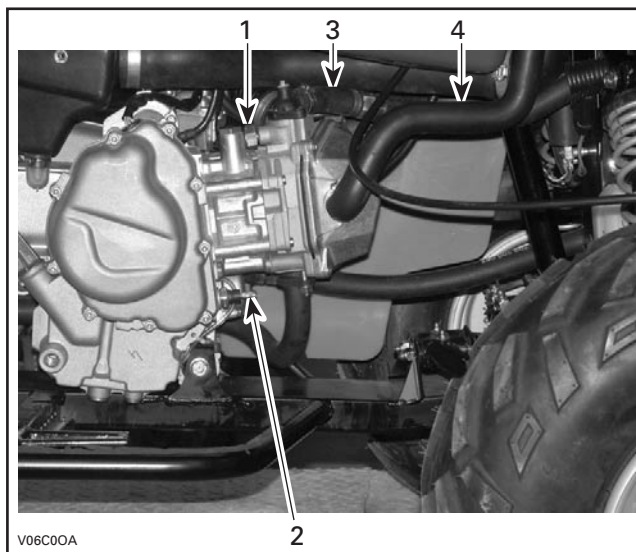
1. Drive chain
2. Adjuster lock
3. Sprocket hub
4. Chain tensioner

Slacken drive chain tightness.

Disconnect:

- water temperature sensor
- oil pressure sensor
- breather hose on valve cover
- coolant engine outlet hose

NOTE: Catch any coolant spillage.

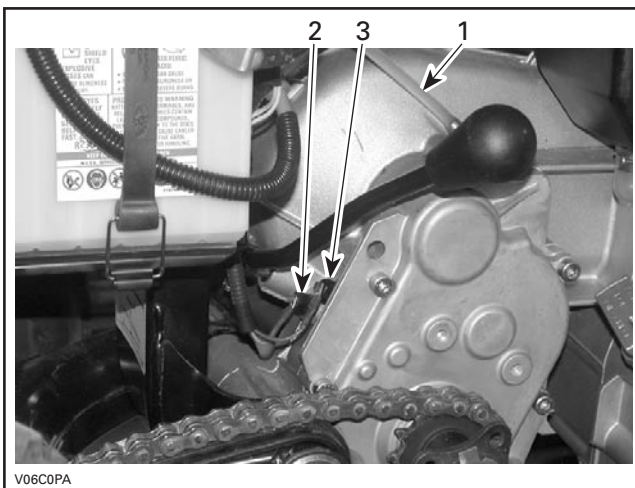


1. Water temperature sensor
2. Oil pressure sensor
3. Coolant engine outlet hose
4. Breather hose

Section 03 ENGINE

Subsection 04 (REMOVAL AND INSTALLATION)

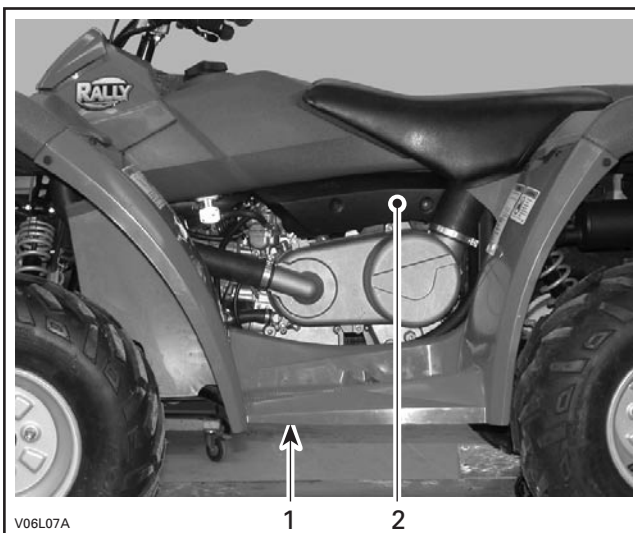
- gearbox vent tube
- neutral and reverse switches.



1. Gearbox vent tube
2. Neutral switch
3. Reverse switch

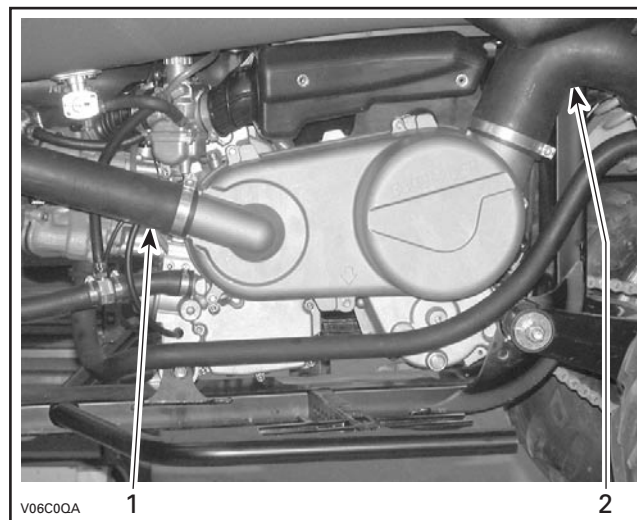
On left side of vehicle, remove the following:

- LH footwell and LH cover (refer to **BODY**)



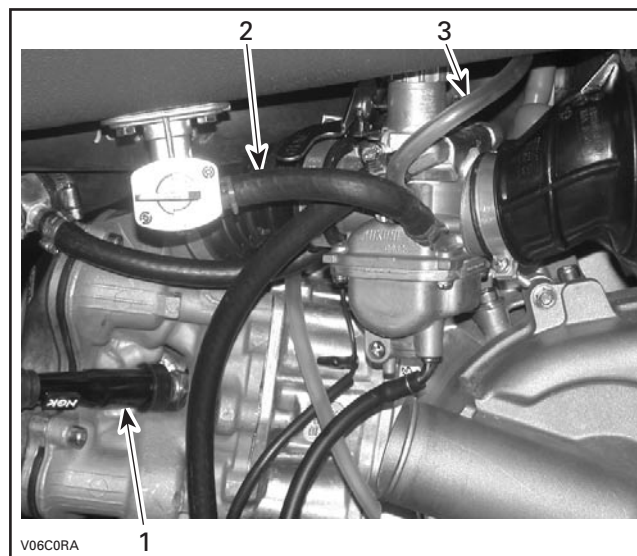
1. Footwell
2. LH cover

- CVT inlet no. 1 and outlet no. 2 hoses



1. CVT inlet hose
2. CVT outlet hose

- spark plug cable
- fuel line
- carburetor vent hose

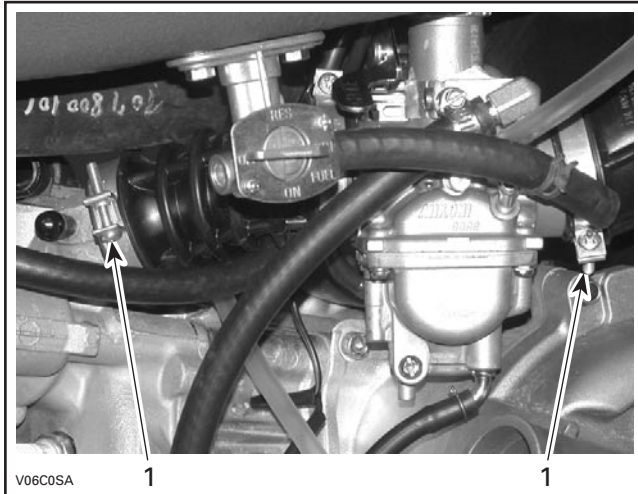


1. Spark plug cable
2. Fuel line
3. Carburetor vent hose

Section 03 ENGINE

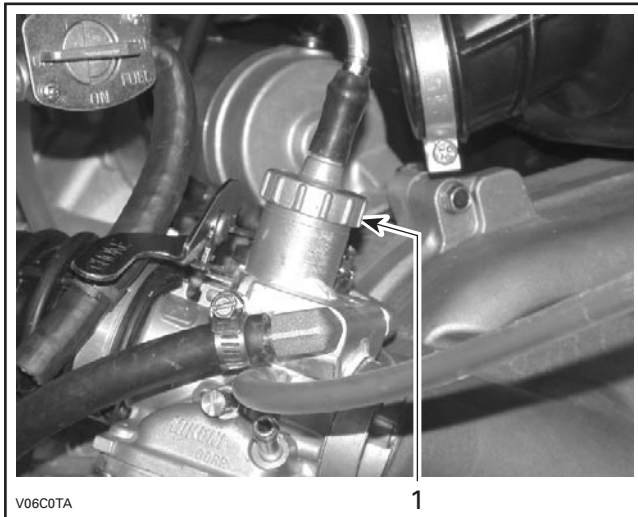
Subsection 04 (REMOVAL AND INSTALLATION)

- clamps retaining the carburetor to the engine and to the air box



1. Unscrew these clamps

- coolant engine inlet hose
- carburetor no. 3 (place it off to one side)
- carburetor cap



1. Carburetor cap

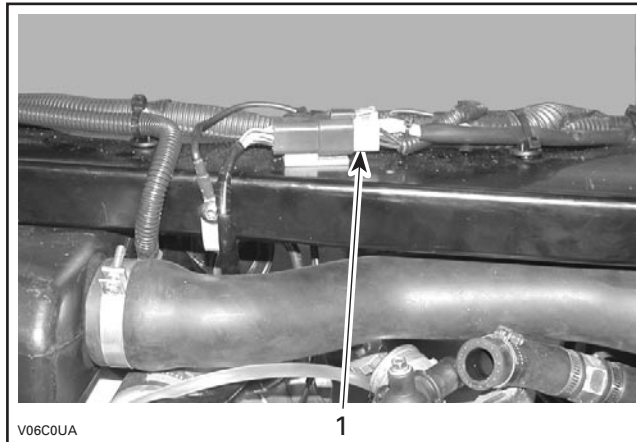
- exhaust pipe no. 4 (see EXHAUST PIPE further in this section).

From the top side, do the following:

Remove:

- seat (refer to **BODY**)
- fuel tank (refer to **FUEL CIRCUIT**).

Unplug the magneto connector.



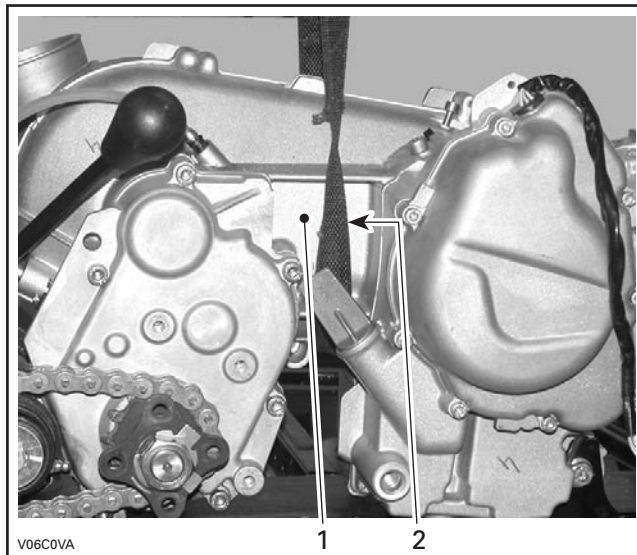
1. Magneto connector

Remove air box and the air intake hose.

Remove starter.

From bottom side, do the following:

Install engine lifting strap under CVT housing.



1. CVT housing
2. Engine lifting strap

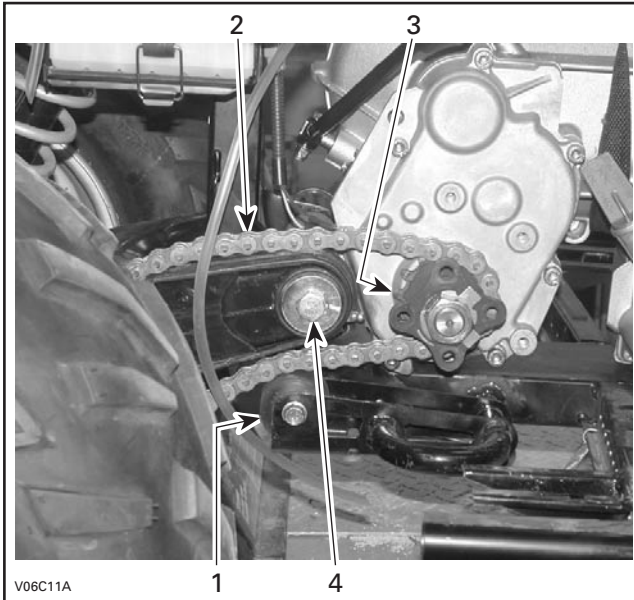
NOTE: Check local specialized supplier to buy an engine lifting strap.

Section 03 ENGINE

Subsection 04 (REMOVAL AND INSTALLATION)

Remove:

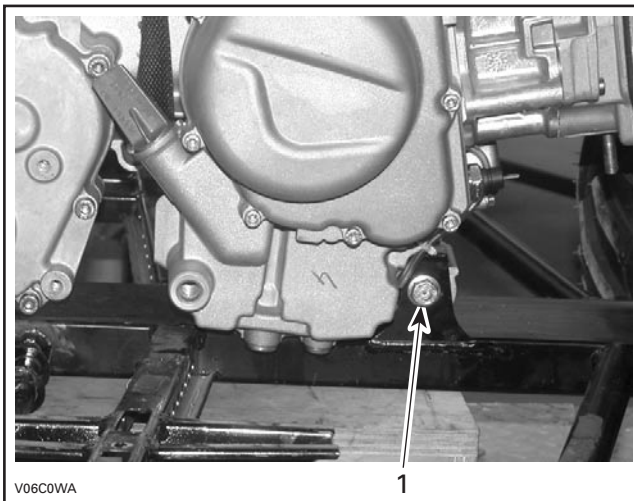
- chain roller
- drive chain from engine sprocket
- swing arm bolt



1. Chain roller
2. Drive chain
3. Engine sprocket
4. Swing arm bolt

NOTE: Move the swing arm back. Take care do not lose the O-rings (4).

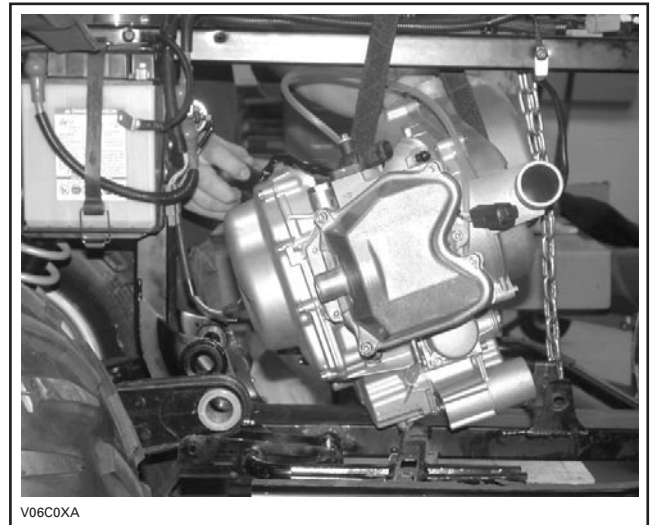
- front engine mounting bolt **no. 5**.



1. Front engine mounting bolt

Lift engine **no. 6** approximately 25 mm (1 in) to clear front mounting brackets.

Turn engine 90°, cylinder head towards right side of vehicle.



Rest engine onto frame and relocate engine lifting strap.

Relift engine and move away from vehicle.

Installation

Lift engine and move towards vehicle.

Rest engine onto frame and relocate lifting strap to opposite side of frame.

Start lifting engine up, turn engine 90°, cylinder head towards front of vehicle, until complete engine has entered frame area.

Lower engine into its place.

Install the front engine mounting bolt **no. 5**. Do not torque yet.

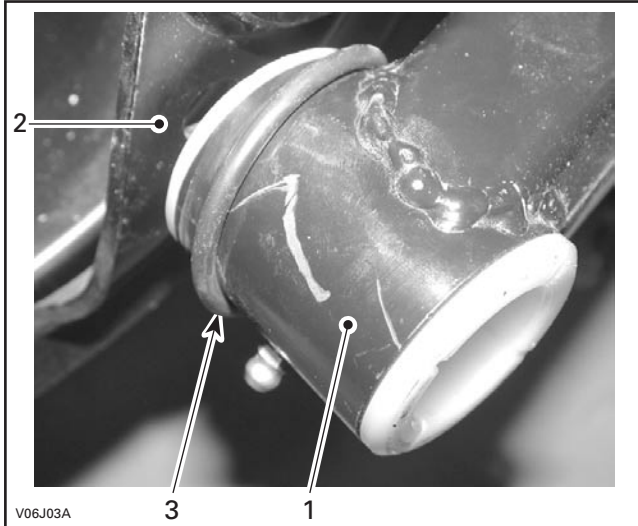
Section 03 ENGINE

Subsection 04 (REMOVAL AND INSTALLATION)

From bottom side, do the following:

Install inner bushings into swing arm. Apply Loc-tite anti-seize lubricant on bushing tapers.

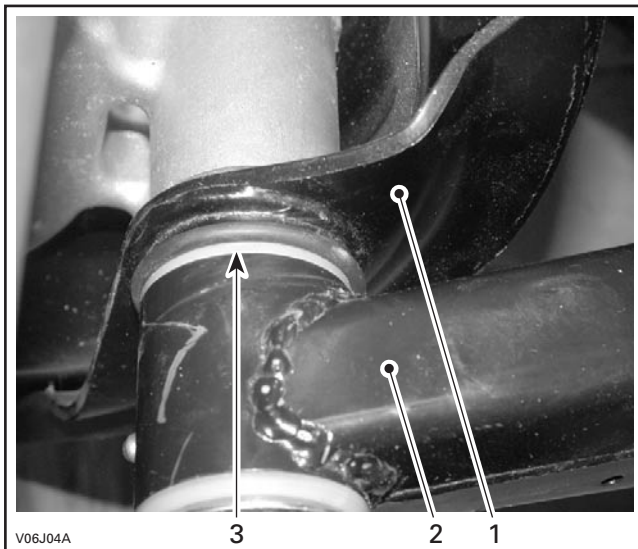
Position the swing arm at its place then install the swing arm bolt. Before installing the swing arm, place an O-ring on each inner side of swing arm.



1. Swing arm
2. Frame
3. O-ring

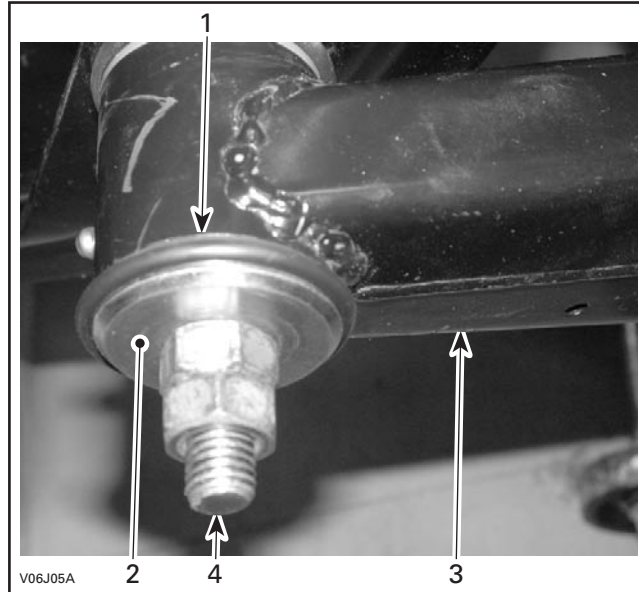
Install both nuts with washers at the end of swing arm bolt and torque them to 100 N•m (74 lbf•ft).

Install O-rings between frame and swing arm bushings on both side.



1. Frame
2. Swing arm
3. O-ring

Install O-rings between swing arm bushing and washers. One on each side.



SWING ARM BOLT SIDE SHOWN

1. O-ring
2. Washer
3. Swing arm
4. Swing arm bolt

Torque the front engine mounting bolt **no. 5**.

Remove lifting strap.

Install drive chain on engine sprocket.

From the top side, do the following:

Connect the magneto connector.

Install:

- starter
- air box and air intake hose
- fuel tank (refer to **FUEL CIRCUIT**)
- seat.

On left side of vehicle, install the following:

- exhaust pipe **no. 4**
(refer to EXHAUST PIPE further in this section)
- coolant engine inlet hose
- carburetor **no. 3**
- carburetor vent hose
- fuel line
- CVT hoses (inlet **no. 1** and outlet **no. 2**).

On right side of vehicle, do the following:

Connect:

- neutral and reverse switches
(the neutral switch wire is YELLOW/GREY)
- gearbox vent tube
- breather hose on valve cover
- coolant engine outlet hose
- oil pressure sensor
- water temperature sensor.

Install drive chain on rear axle sprocket.

Final Assembly Procedure

Confirm coolant and oil drain plugs are reinstalled and tight.

Fill cooling system. Refer to **COOLING SYSTEM**.

Fill engine with appropriate amount of oil and recommended viscosity.

Reconnect battery.

WARNING

Connect RED (+) cable then BLACK (-) cable.
Always connect RED (+) cable in first.

Before starting the engine, remove spark plug and ground it on engine or frame. Run starter about thirty seconds. This operation will activate the oil pump. Reinstall spark plug.

Place transmission lever **no. 7** on NEUTRAL position.

Start vehicle.

Set carburetor.

Stop engine and reverify coolant and oil levels are correct.

Adjust drive chain (refer to **REAR AXLE**).

Test drive to confirm all is working well.

ENGINE SPROCKET

Removal

Remove:

- RH footwell (refer to **BODY**)
- caliper and disc (refer to **BRAKES**).

Unhook the tab washer **no. 18**.

Unscrew the sprocket nut then remove the tab washer.

Slack the drive chain.

Remove the chain roller then remove the drive chain from engine sprocket.

Remove sprocket.

Inspection

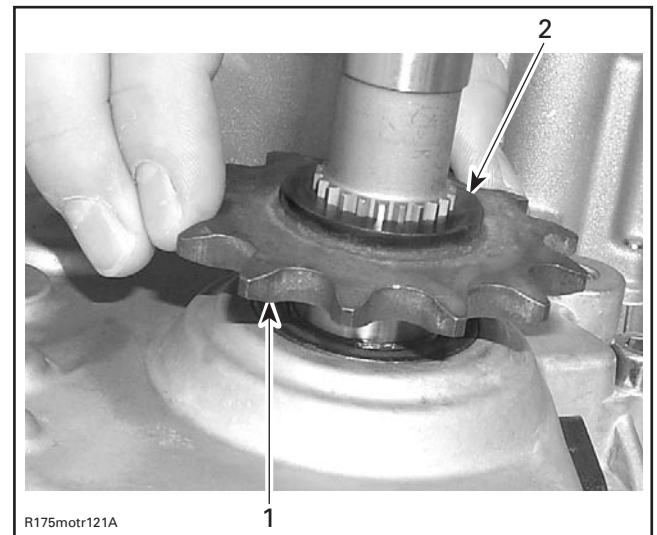
Check sprocket teeth for wear or other damages. Change sprocket if necessary.

CAUTION: Replace drive chain, engine sprocket and rear sprocket together to prevent rapid chain and sprockets wear. Install a new tab washer retaining ring each time the engine sprocket is removed.

Installation

The installation is the reverse of removal procedure.

CAUTION: Always install engine sprocket **no. 9** as per following illustration.



1. Engine sprocket
2. Flange mounted visible to the outside

Section 03 ENGINE

Subsection 04 (REMOVAL AND INSTALLATION)

FRONT ANTI-VIBRATION SYSTEM

Removal

NOTE: To remove the front anti-vibration bushings **no. 8**, the engine removal is necessary.

Insert a punch through a bushing **no. 8** and push the other bushing out of engine support.



Use punch to remove the other bushing.

CAUTION: Do not use a screwdriver when removing anti-vibration bushing.

Installation

Insert the anti-vibration bushings in engine support, one on each side.

EXHAUST PIPE

WARNING

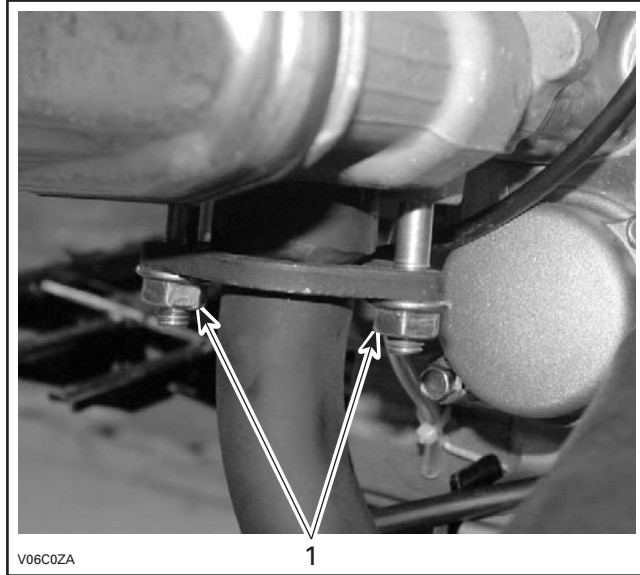
Never touch exhaust system components immediately after the engine has been run because these components are very hot.

Removal

Remove the LH footwell. Refer to **BODY**.

Remove clamp **no. 9** retaining exhaust pipe **no. 4** to muffler **no. 10**.

Unscrew exhaust pipe nuts **no. 12**.



1. Exhaust pipe nuts

Pull exhaust pipe forward then remove it from vehicle.

Remove the gasket **no. 13** in the exhaust port and the muffler gasket **no. 11**.

Installation

For installation, reverse the removal procedure, pay attention to the following details.

Using a new exhaust pipe gasket **no. 11**, install the exhaust pipe into muffler.

NOTE: Do not forget the exhaust pipe clamp **no. 9**.

On cylinder head side, install a new gasket **no. 13** on the exhaust pipe end then tighten the exhaust pipe on cylinder head.

Tighten exhaust pipe clamp **no. 9**.

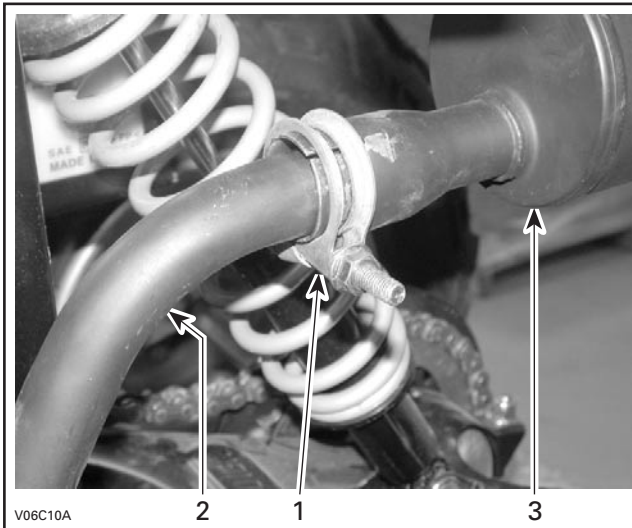
MUFFLER

Removal

Remove cotter pin **no. 14** and washer **no. 15**.

Unscrew the clamp **no. 9**.

Remove muffler **no. 10**.



- 1. Clamp
- 2. Exhaust pipe
- 3. Muffler

Inspection

Check muffler for cracks or other damages. Replace if necessary.

Check if rubber bushings **no. 16** are brittle, hard, cracked or otherwise damaged, change them if necessary.

Installation

For the installation, reverse the removal procedure.

TRANSMISSION LEVER

Removal

Unscrew transmission lever retaining bolt **no. 17** and remove lever **no. 7**.

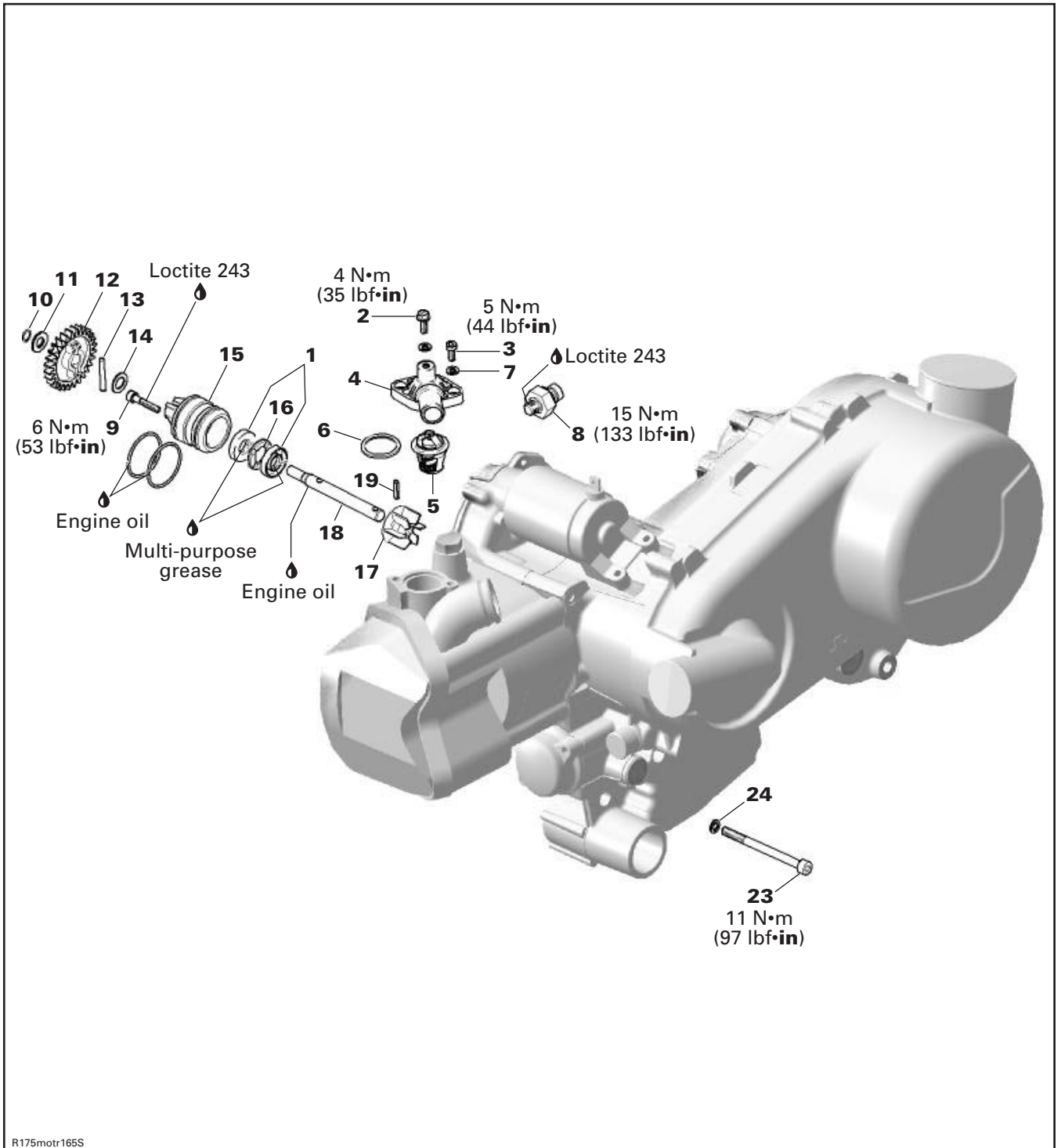
NOTE: Mark the lever position for easier installation.

Installation

For installation, reverse the removal procedure.

COOLING SYSTEM

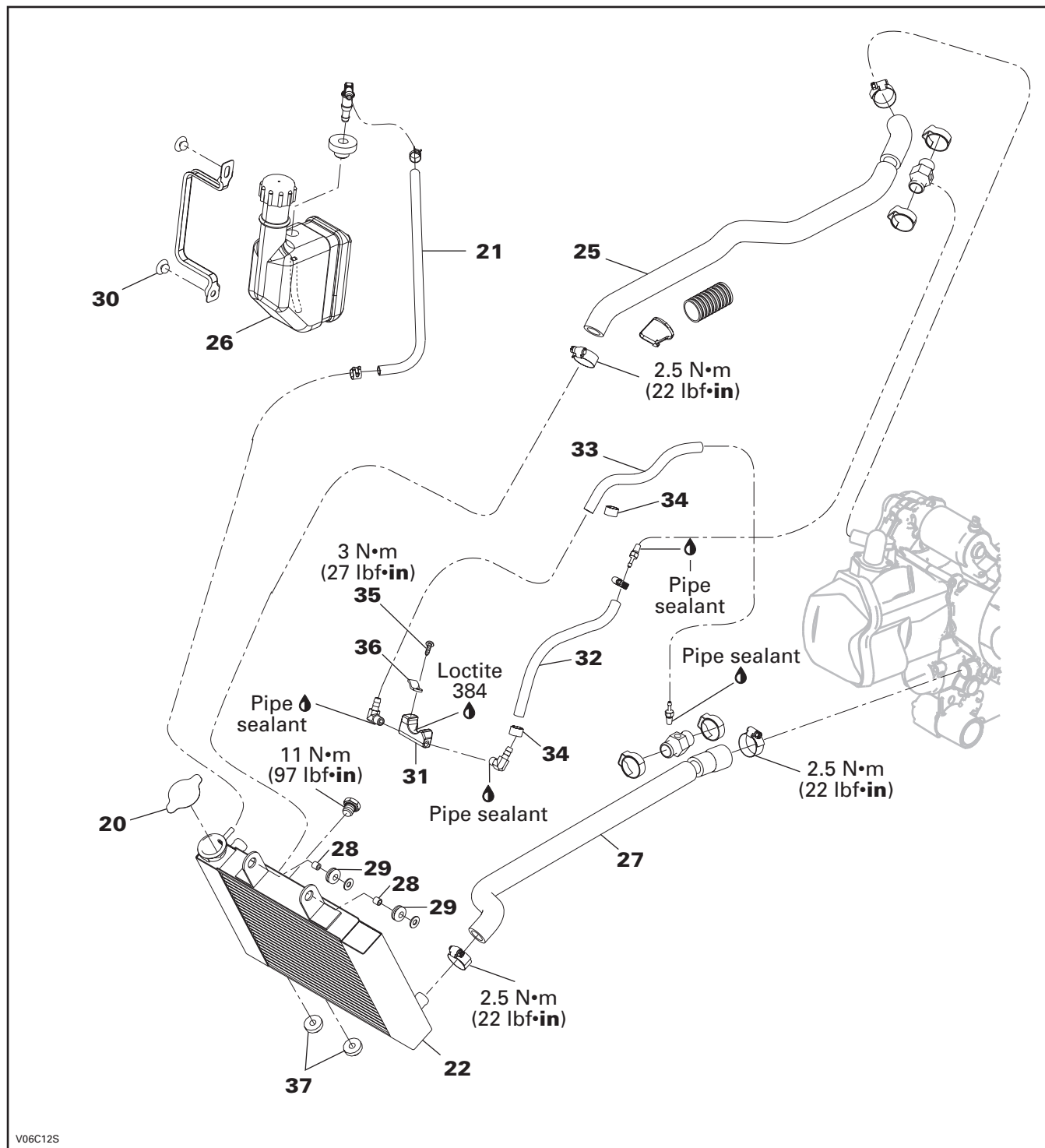
WATER PUMP



Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

COOLING SYSTEM



V06C12S

GENERAL

The engine removal is not necessary when working on water pump, thermostat or temperature switch.

WARNING

To prevent burning yourself, do not remove the radiator cap or loosen the engine drain plug if the engine is hot.

For installation, use the torque values and Loctite products from the exploded views. Clean threads before using Loctite when installing the screws.

WARNING

Torque wrench tightening specifications must strictly be adhered to.

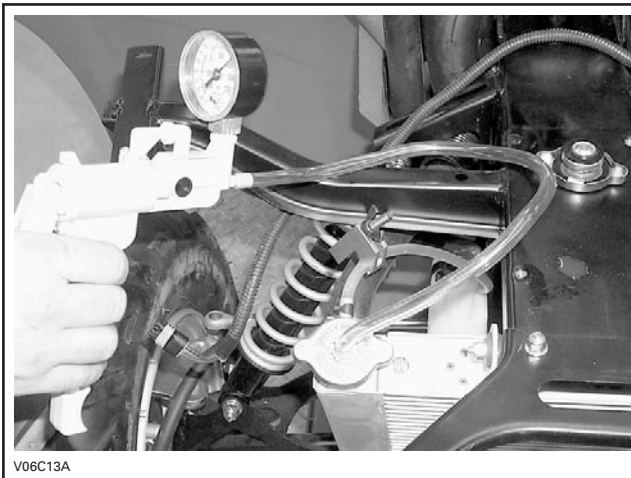
Locking devices (ex.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

COOLING SYSTEM LEAK TEST

Remove the front luggage rack. Refer to **BODY**.

Remove the radiator cap **no. 20**.

Install special plug (radiator cap) (P/N 529 021 400) and hose pincher (P/N 295 000 076) on overflow hose **no. 21**. Pressurize all system through coolant reservoir to 103 kPa (15 PSI).



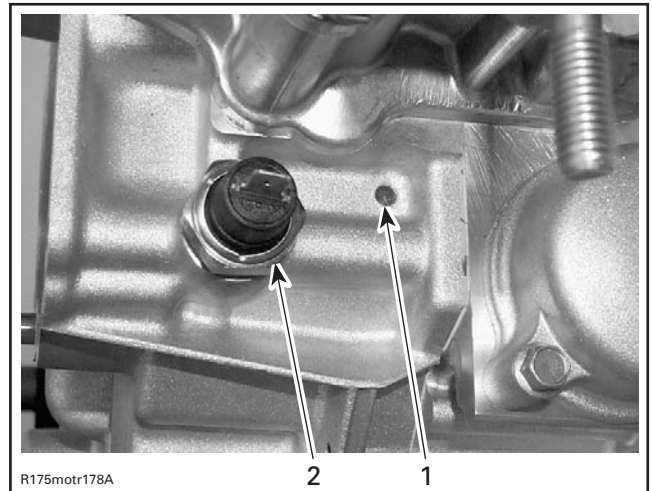
Check all hoses, radiator **no. 22** and cylinder/base for coolant leaks. Spray a soap/water solution and look for air bubbles.

INSPECTION

Check general condition of hoses and clamp tightness.

Check the weep hole if there is oil and/or water and replace oil seals in water pump housing if necessary (refer to WATER PUMP HOUSING further).

NOTE: Flowing water and/or oil out of the weep hole indicates non working oil seal(s) **no. 1**.



1. Weep hole
2. Oil pressure switch area

DRAINING THE SYSTEM

WARNING

Never drain or refill cooling system when engine is hot.

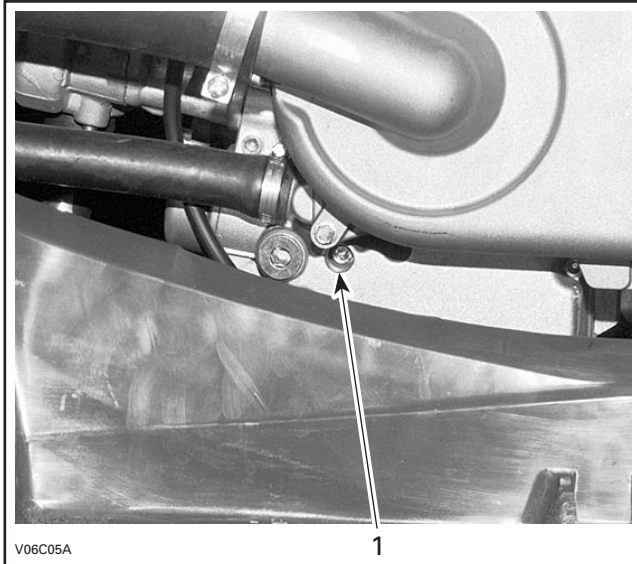
Remove the front luggage rack. Refer to **BODY**.

Remove the radiator cap.

Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

To drain cooling system, partially unscrew cooling drain plug **no. 23** on the left side of engine and drain the coolant into a suitable container.



1. Cooling drain plug

CAUTION: If the drain plug is removed completely, pay attention to the gasket ring **no. 24**.

When cooling system is drained completely, screw the cooling drain plug.

COOLANT REPLACEMENT

Recommended Coolant

Use a blend of 50% antifreeze with 50% water. Do not reinstall pressure cap.

CAUTION: To prevent rust formation or freezing condition, always replenish the system with 50% antifreeze and 50% water. Pure antifreeze without water freezes. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

System Capacity

Refer to **TECHNICAL DATA**.

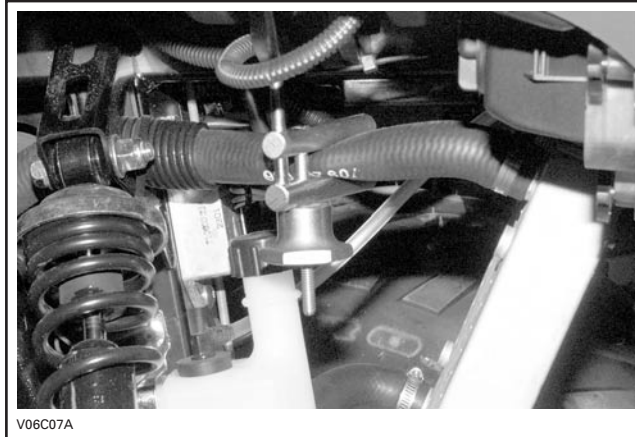
Coolant Replacement Procedure

WARNING

To prevent burning yourself do not remove the radiator cap or loosen the engine drain plug if the engine is hot.

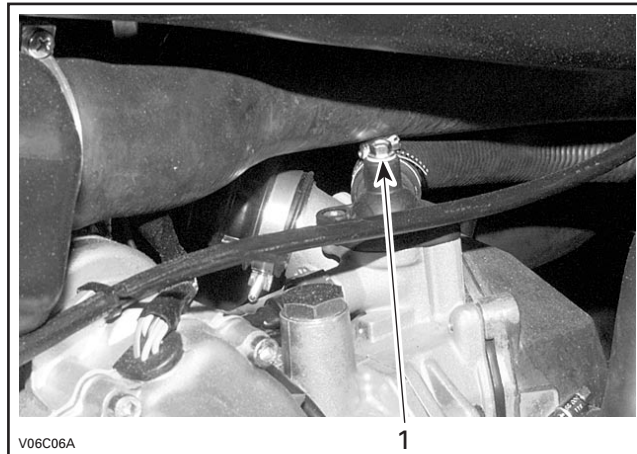
Drain the system completely (see procedure above).

Pinch engine outlet hose **no. 25** between radiator and thermostat housing with a large hose pincher (P/N 529 032 500).



Unscrew bleeding screw on top of thermostat housing.

NOTE: Do not remove the bleeding screw completely.



1. Bleeding screw

With vehicle on a flat surface, engine cold, refill radiator **no. 22**. When the coolant comes out by the thermostat housing hole, install the bleeding screw and remove the hose pincher.

NOTE: If the bleeding screw has been removed completely, do not forget gasket ring when bleeding screw is installed. Gently install screw in the same threads. If the bleeding screw is not removed completely, unscrew the bleeding screw a half turn before screw on.

Refill coolant tank **no. 26** up to MIN. level mark.

Run engine at idle with the radiator cap off. Slowly add coolant if necessary.

At this point, wait until engine reaches normal operating temperature. Depress the throttle lever two or three times; then add coolant if required.

Install the radiator cap. Inspect all connections for leaks and recheck coolant in the reservoir.

Once year, check coolant concentration (freezing point) with proper tester.

THERMOSTAT

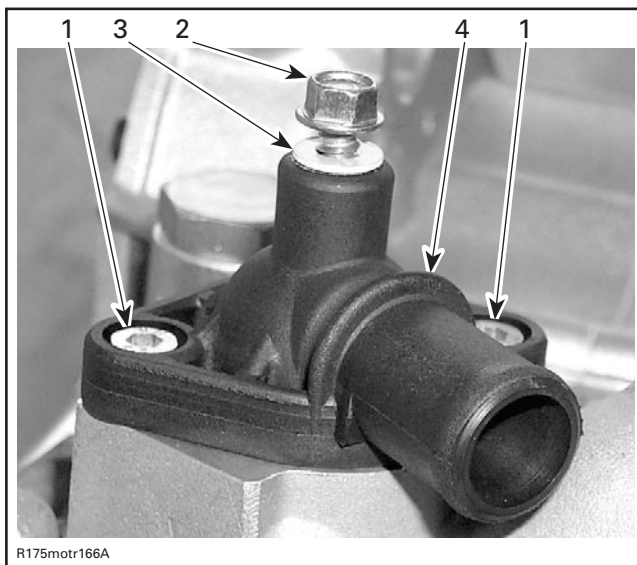
The thermostat is a single action type.

Removal

NOTE: The thermostat is located on the top of cylinder head, on intake side.

Remove:

- bleeding screw **no. 2** on thermostat cover (**only turn loose**)
- thermostat housing screws **no. 3** and pull thermostat cover **no. 4**



1. 2 screws
2. Bleeding screw
3. Gasket
4. Thermostat housing

- thermostat with gasket out of the hole.



1. Thermostat with gasket

Test

To check thermostat, put in water and heat water. Thermostat should open when water temperature reaches 65°C (149°F).

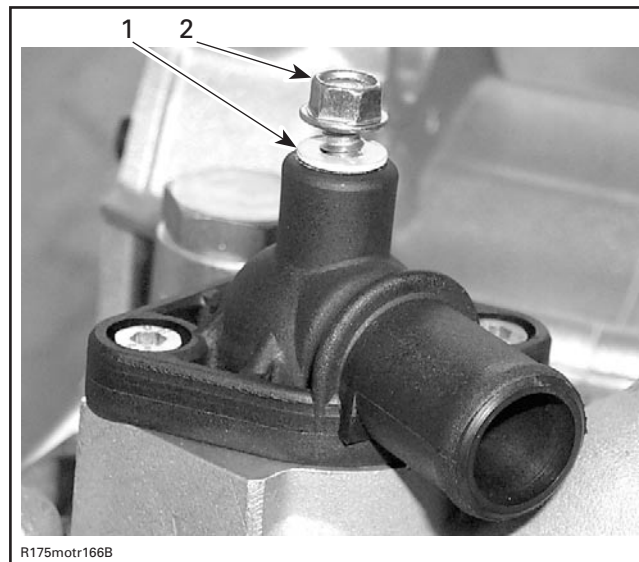
Check if the gasket is not brittle, hard or damaged. If so, replace thermostat and gasket.

Installation

For installation, reverse the removal procedure, pay attention to the following details.

NOTE: Replace gasket **no. 6** if necessary.

Place bleeding screw then torque to 4 N•m (35 lbf•in).



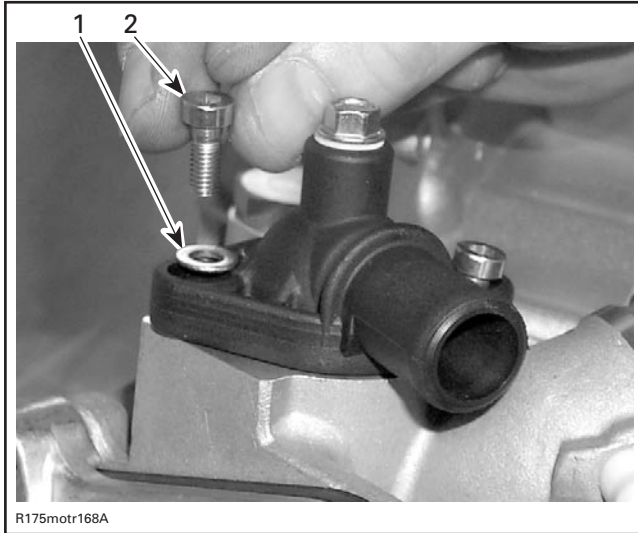
1. Gasket
2. Bleeding screw

Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

Install the thermostat cover then torque screws to 5 N•m (44 lbf•in).

NOTE: Do not forget to place shim no. 7.



- 1. 2 shims
- 2. 2 screws

Check coolant level in radiator and coolant tank and top up if necessary.

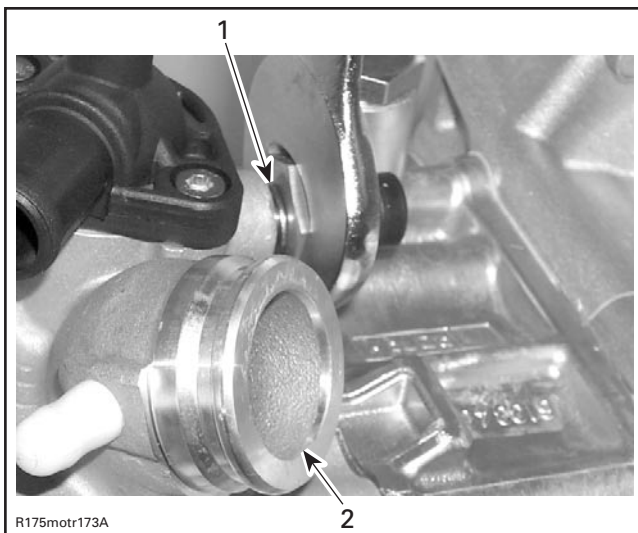
WATER TEMPERATURE SWITCH

Removal

NOTE: The temperature switch is located on the top of cylinder head, on intake side.

Remove:

- wire from temperature switch
- water temperature switch **no. 8**.



- 1. Water temperature switch
- 2. Intake port

NOTE: Cylinder head has a taper thread.

Test

To check temperature switch, put in water and heat water.

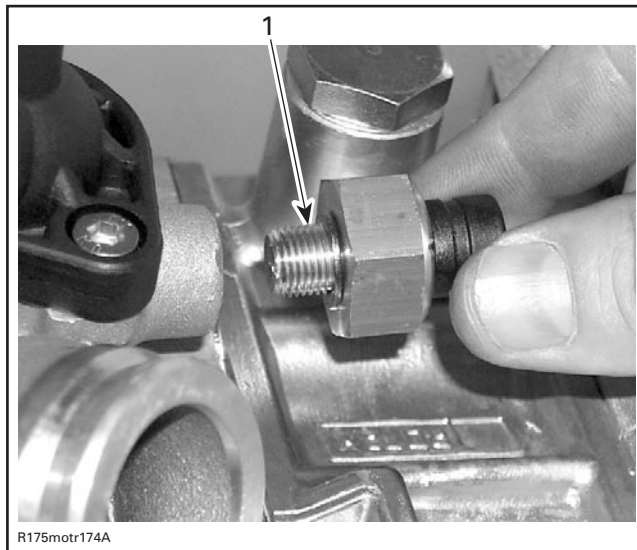
Temperature switch should operate when water temperature reaches 115°C (239°F).

Replace temperature switch if necessary.

Installation

For installation, reverse the removal procedure, pay attention to the following detail.

Do not apply Loctite 243 in the front area of the switch.



- 1. Loctite area

WATER PUMP HOUSING

It is located on the engine MAG side. Not necessary to remove rotor from crankshaft.

Removal

Drain cooling system and engine oil (refer to **LUBRICATION SYSTEM**).

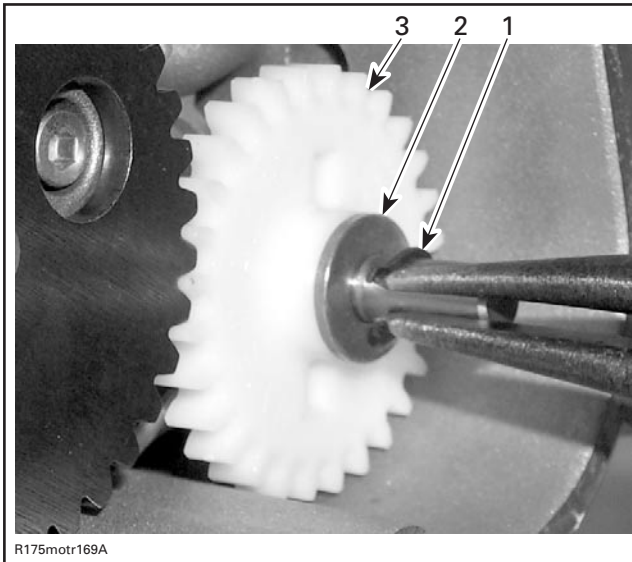
Remove:

- RH footwell (refer to **BODY**)
- drain screw
(refer to **DRAINING THE SYSTEM** above)
- magneto cover (refer to **MAGNETO SYSTEM**)

Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

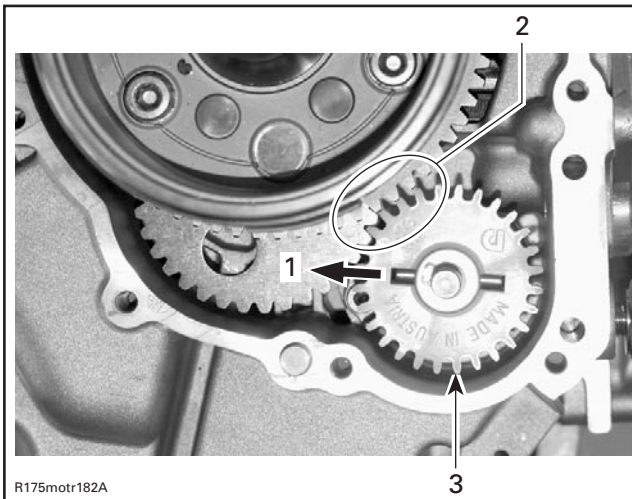
- retaining ring no. 10 (discard), shim no. 11 and water pump gear no. 12



1. Retaining ring
2. Shim
3. Water pump gear

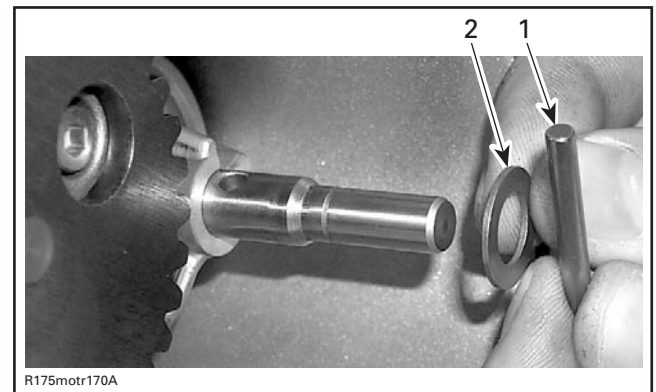
CAUTION: To lift water pump gear turn shaft no. 18 that needle pin points to oil pump shaft.

NOTE: Do not collide splines of water pump gear no. 12 with splines of sprag clutch gear.



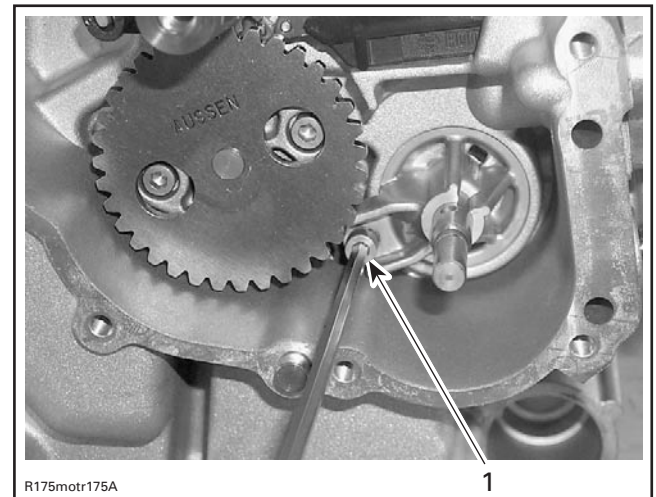
1. Direction of needle pin
2. Possible collision of water pump gear and sprag clutch gear
3. Place to lift water pump gear

- needle pin no. 13 and thrust washer no. 14



1. Needle pin
2. Thrust washer

- screw no. 9 retaining water pump housing no. 15



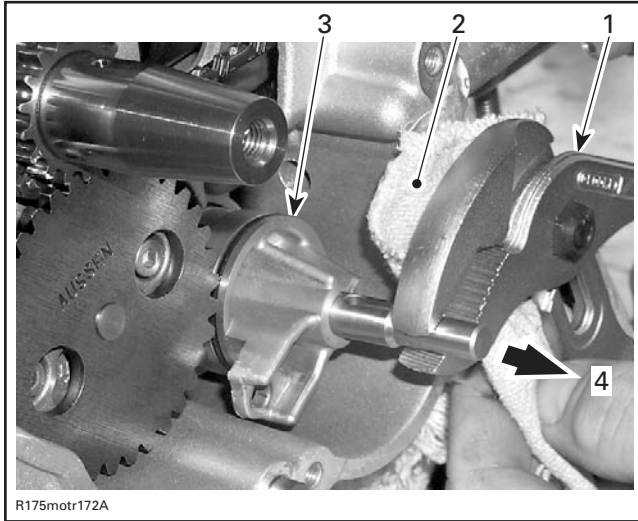
1. Allen socket screw

- water pump housing no. 15

Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

NOTE: Using pliers, pull the water pump housing out of crankcase. See the following illustration.



1. Pliers
2. Rag to protect split surface
3. Water pump housing
4. Lifting direction

– water pump shaft
(refer to WATER PUMP SHAFT below).

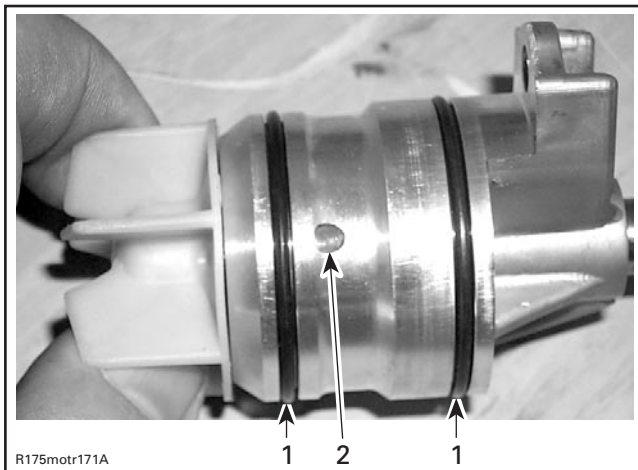
Replace oil seal in water pump housing if necessary.

Extract oil seal **no. 1** from inside of water pump housing with a screwdriver.

CAUTION: Be careful not to damage the surface of the seal bore in water pump housing.

Inspection

Check if O-rings are brittle, hard or damaged and replace if necessary.



1. 2 O-rings
2. Weep hole

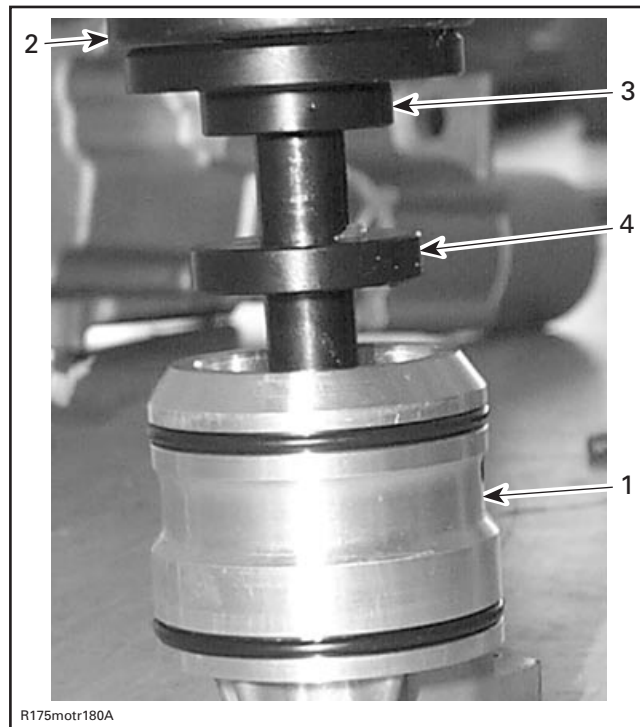
Inspect water pump gear for wear and damage on the snap mechanism to the needle pin. Replace if necessary.

Installation

The installation is the opposite of the removal procedure.

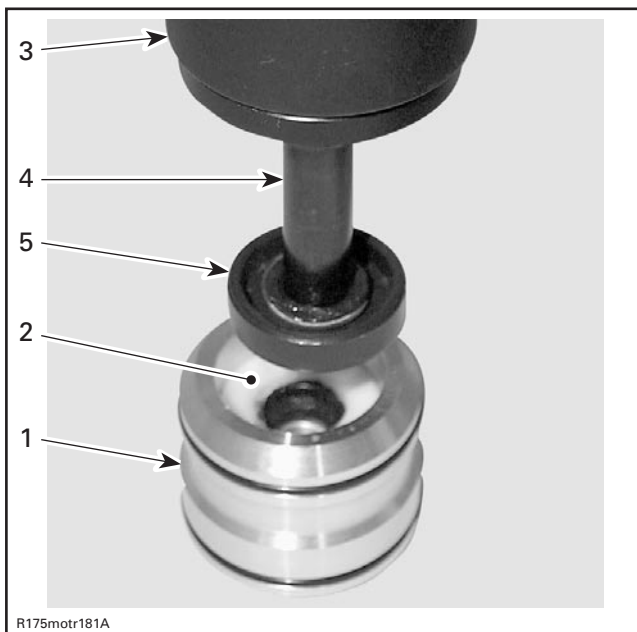
Push oil seals **no. 1** in place by using the handle for insertion jig (P/N 420 877 650) and the oil seal pusher (P/N 529 035 849) as per following procedure:

- Install inner oil seal **no. 1** by using spacer on the oil seal pusher. The sealing lip has to point towards water pump gear.



1. Water pump housing
2. Handle for insertion jig
3. Oil seal pusher
4. Spacer

- Place distance ring no. 16.
- Push outer oil seal no. 1. Sealing lip has to point towards the impeller.



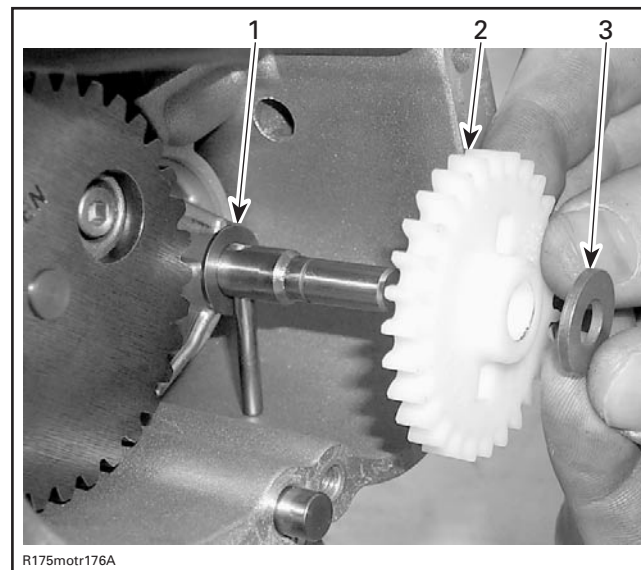
1. Water pump housing
2. Distance ring
3. Handle for insertion jig
4. Oil seal pusher without spacer
5. Oil seal with sealing lip to the outside

NOTE: Apply multi-purpose grease in water pump shaft bore.

CAUTION: To prevent leaking, take care that the O-rings are exactly in grooves when you reinstall the water pump housing.

Install water pump gear.

CAUTION: Do not forget to place shims no. 11 and no. 14.



1. Shim
2. Water pump gear
3. Shim

Install a new retaining ring.

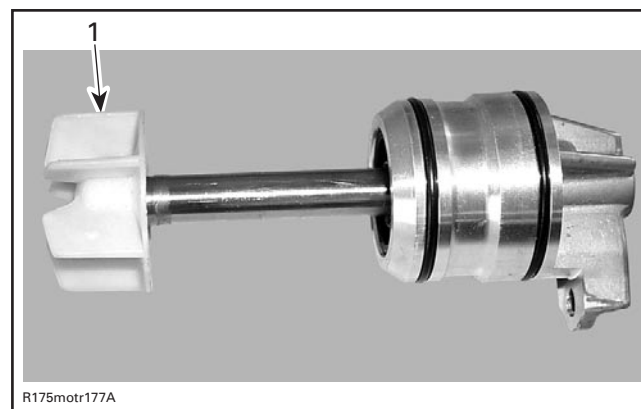
CAUTION: Never use the retaining ring a second time.

WATER PUMP IMPELLER

Removal

Remove:

- water pump housing no. 15 (refer to WATER PUMP HOUSING above)
- impeller no. 17 together with water pump shaft no. 18.



1. Impeller with water pump shaft

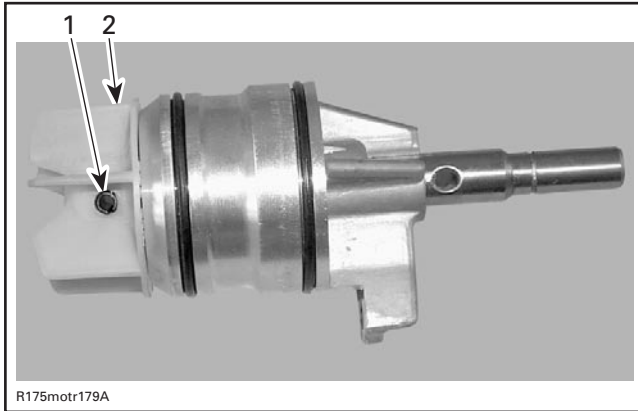
Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

Inspection

Check impeller for cracks, fitting on water pump shaft or other damage. Replace impeller if damaged.

NOTE: Use appropriate punch to remove spring pin no. 19.



- 1. Spring pin
- 2. Impeller

Installation

The installation is the opposite of the removal procedure. Pay attention to the following details.

CAUTION: Be careful not to damage impeller wings during installation.

NOTE: Fix water pump shaft in a vise and use the vise jaw protectors to avoid damaging the water pump shaft no. 18.

WATER PUMP SHAFT

Removal

Remove:

- water pump housing no. 15 (refer to WATER PUMP HOUSING above)
- impeller no. 17 together with water pump shaft no. 18.

Inspection

Water pump shaft must rotate freely. Otherwise, replace it.

NOTE: When removing water pump shaft, always replace together retaining ring, oil seals, water pump shaft with new parts.

Installation

For installation, reverse the removal procedure.

PRESSURE CAP

Check if radiator cap no. 20 pressurizes the system. If not, install a new 110 kPa (16 PSI) cap (do not exceed this pressure).

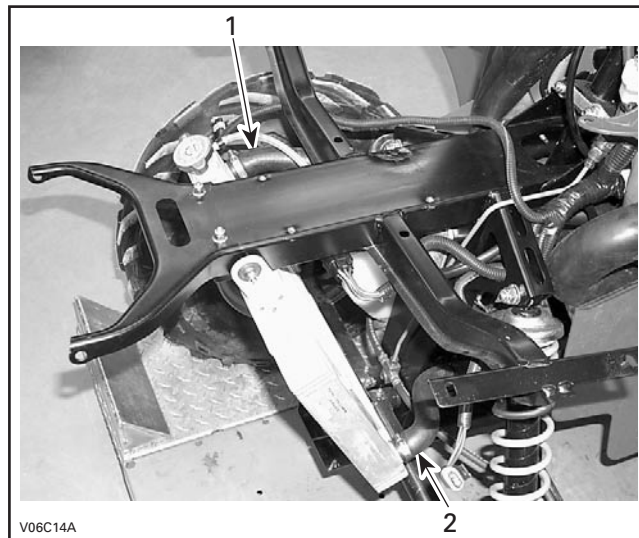
RADIATOR

Removal

Drain cooling system.

Remove:

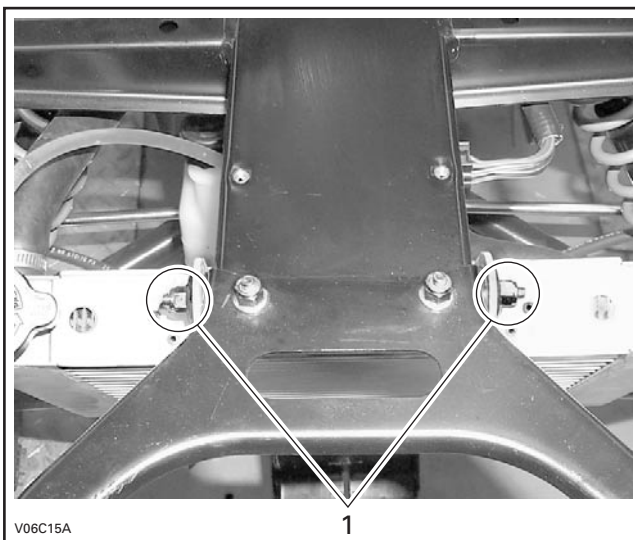
- front luggage rack (refer to BODY)
- engine inlet no. 27 and engine outlet no. 25 hoses



- 1. Engine outlet hose
- 2. Engine inlet hose

- overflow hose no. 21

- mounting bolts on the top of radiator.



1. Radiator mounting bolts

NOTE: Take care do not lose the bushings **no. 28** located in the grommets **no. 29**.

Inspection

Check radiator air passage for clogging or damage. Remove insects, mud or other obstructions with compressed air or low pressure water. Check for any coolant leakage from radiator and hoses.

Installation

For installation, reverse the removal procedure. Pay attention to the following detail.

Install the both grommets **no. 37** under radiator.

Fill up the radiator. Refer, at the beginning of this section, to the COOLANT REPLACEMENT PROCEDURE.

COOLANT TANK

Overflow Coolant Tank

The coolant expands as the temperature (up to 100 - 110°C (212 - 230°F)) and pressure rise in the system. If the limiting system working pressure cap is reached 110 kPa (16 PSI), the pressure relief valve in the pressure cap is lifted from its seat and allows coolant to flow through the overflow hose into the overflow coolant tank.

Removal

Remove overflow hose **no. 21**.

Using a 3/16 drill, remove the rivets retaining the coolant tank support **no. 30** to the frame.

Remove the coolant tank **no. 26**.

Empty coolant tank.

Installation

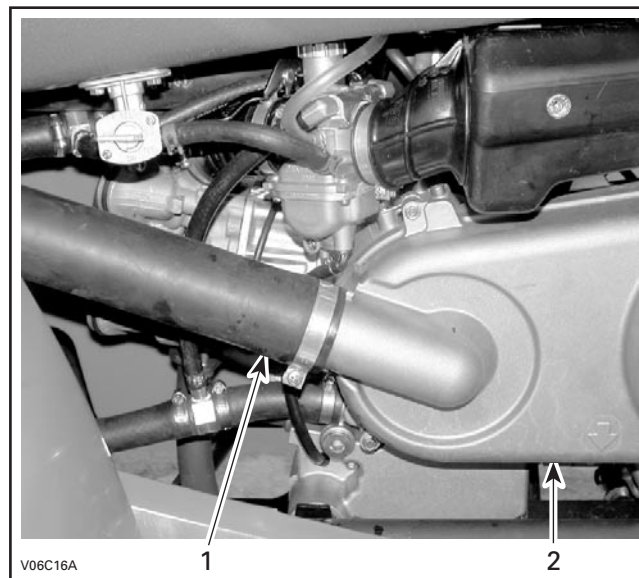
The installation is the reverse of the removal procedure.

BLOCK HEATER

The block heater **no. 31** is located on the carburetor body.

Removal

Remove the CVT air intake hose.

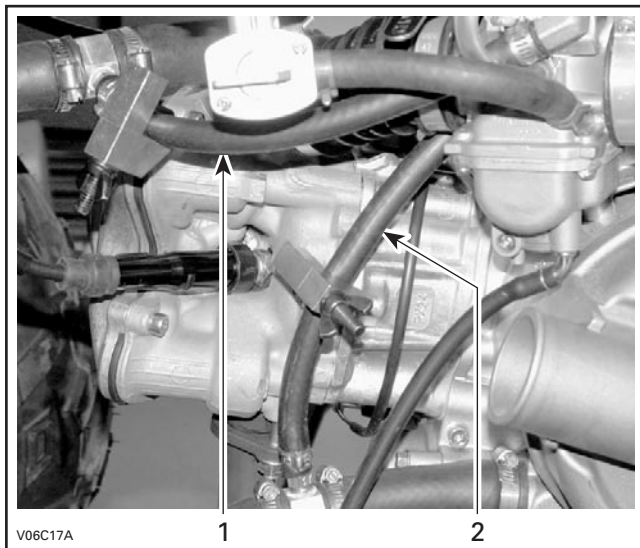


1. CVT air intake hose
2. CVT cover

Section 03 ENGINE

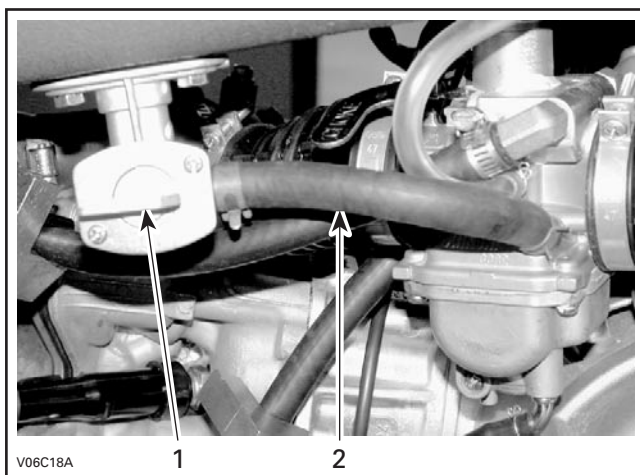
Subsection 05 (COOLING SYSTEM)

Install hose pinchers (P/N 295 000 076) on inlet hose no. 32 and outlet hose no. 33 of block heater.



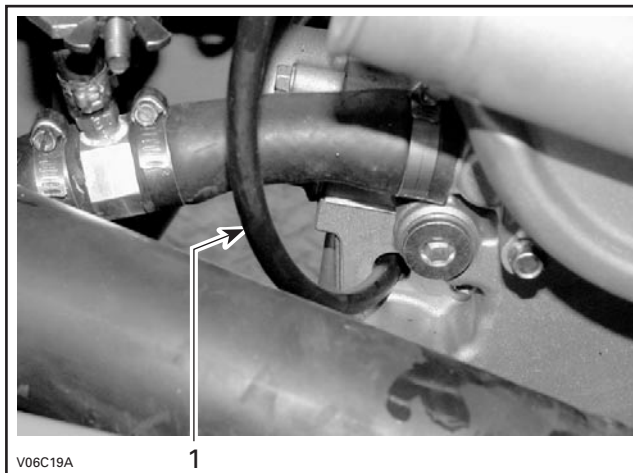
1. Inlet hose
2. Outlet hose

Turn fuel valve OFF then unplug the fuel line.



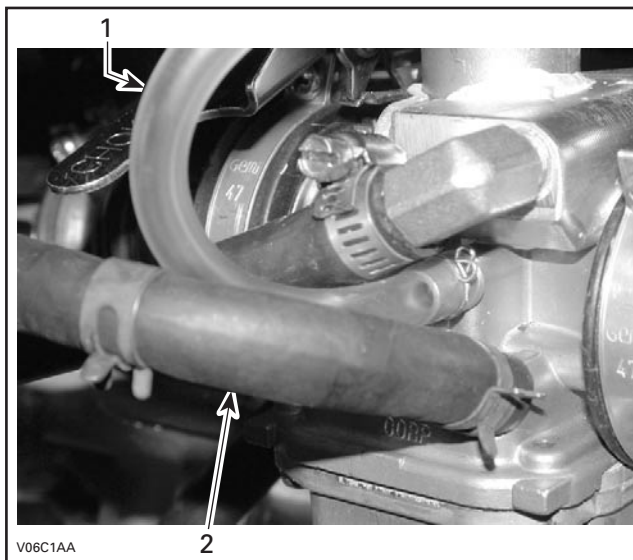
1. Fuel valve on OFF position
2. Fuel line

Come out the carburetor overflow drain hose from its location.



1. Carburetor overflow drain hose

Unplug the carburetor vent hose.

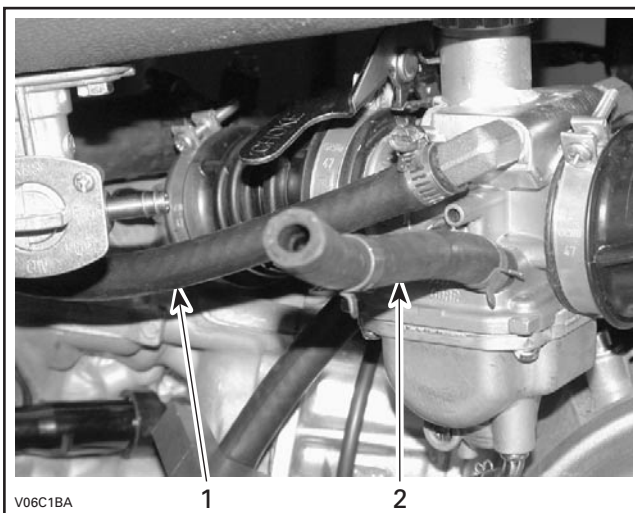


1. Carburetor vent hose
2. Fuel line

Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

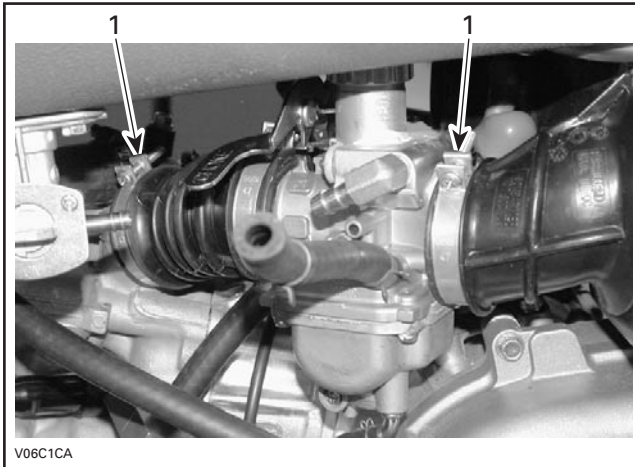
Remove the block heater outlet hose no. 33.



1. Block heater outlet hose
2. Fuel line

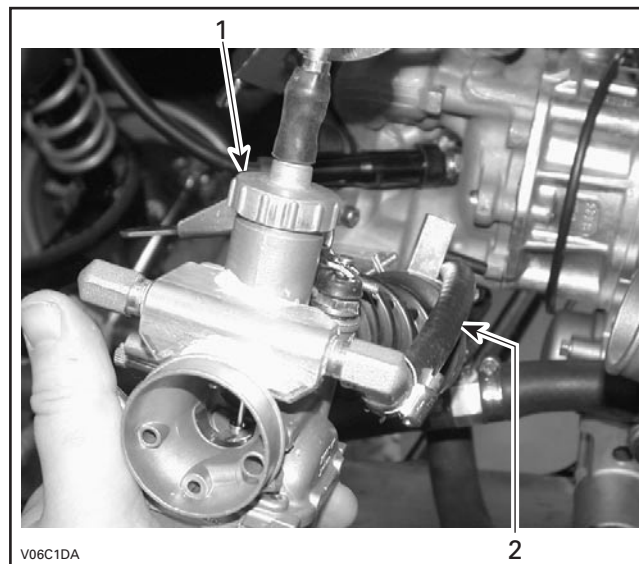
NOTE: Catch any coolant spillage.

Unscrew the clamps retaining the carburetor to the engine and to the air box. Free carburetor from the intake adaptor.



1. Unscrew these clamps

Unscrew the valve piston assembly then remove the block heater inlet hose no. 32.



1. Valve piston assembly
2. Block heater inlet hose

Use the following procedure if the block heater and carburetor separation is necessary (ex: block heater or carburetor replacement).

With the carburetor removed, unscrew the screw no. 35 then remove the block heater lock no. 36.



Section 03 ENGINE

Subsection 05 (COOLING SYSTEM)

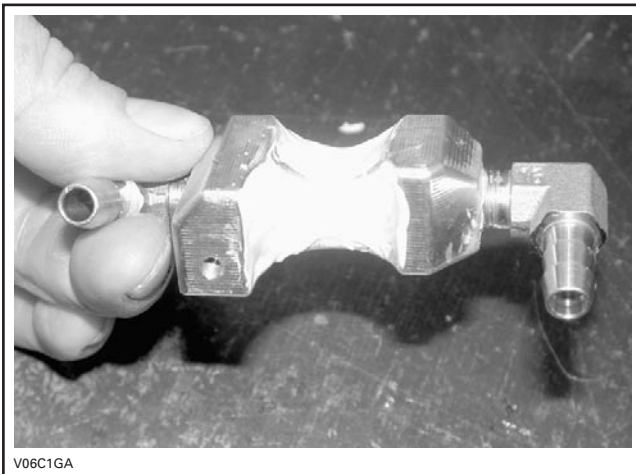
Using a flat screwdriver, gently pry the block heater until the glue is braked. Only use the location showed in the following illustration.



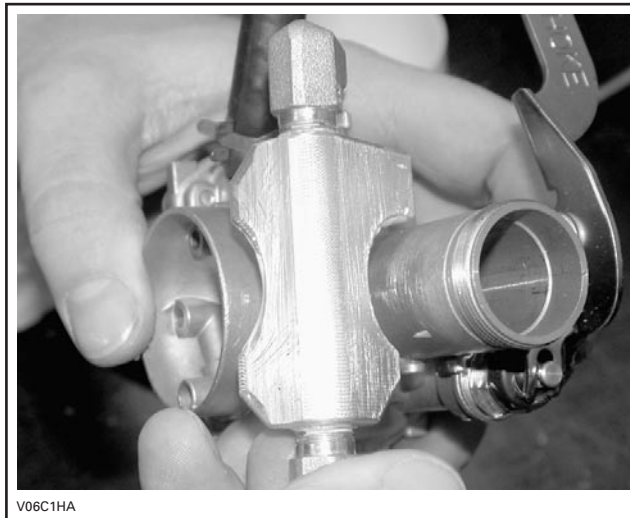
Installation

Remove all residue of glue on the block heater or on the carburetor body.

Apply 2 ml (.06 oz) of Loctite 384 (P/N 293 800 099) on the block heater. Spread the Loctite 384 everywhere on the contact surface of the block heater.



Install the block heater in accordance with the following illustration.



Install the block heater lock and torque screw.

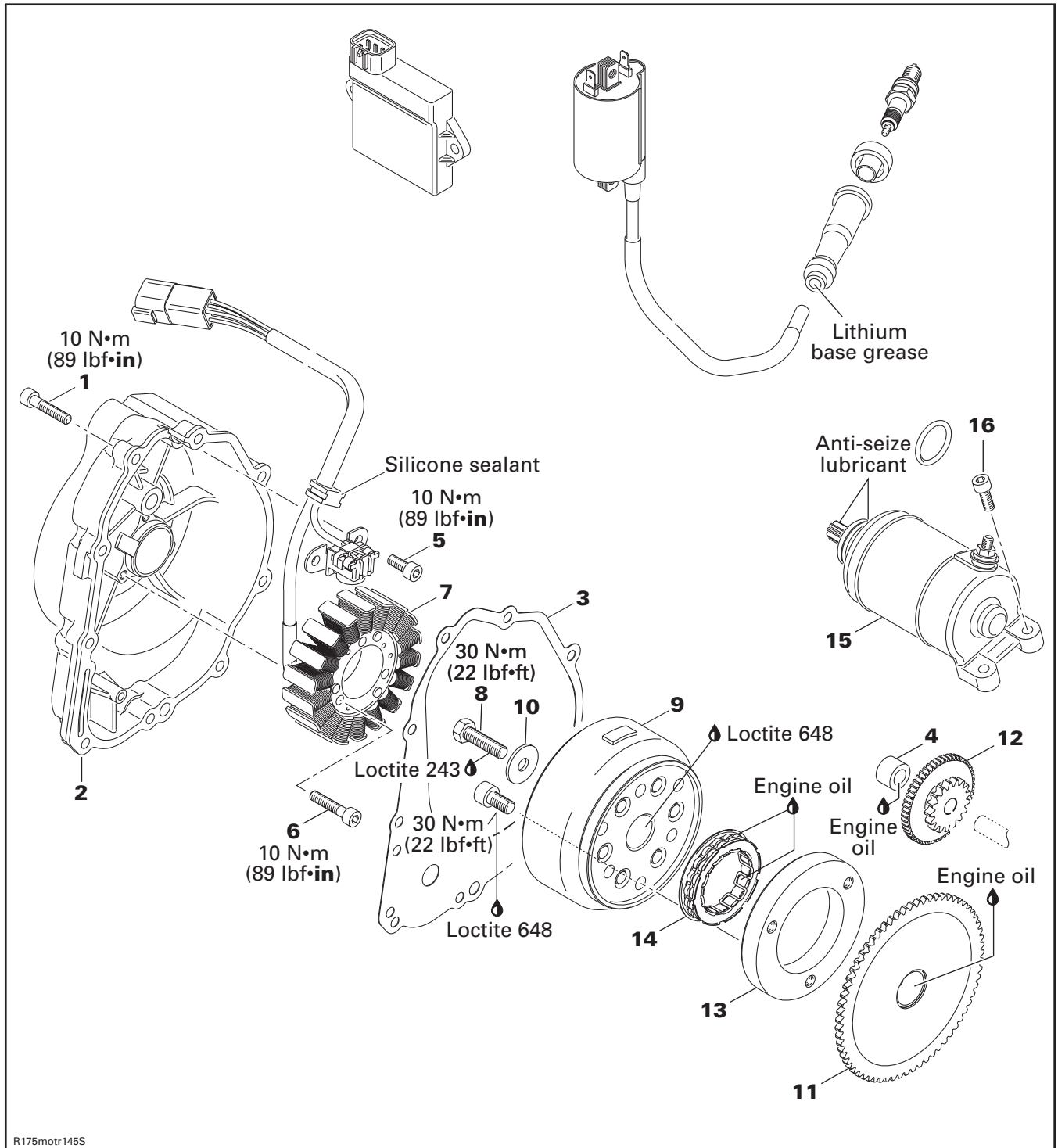
Reinstall carburetor. Reverse the removal procedure.

NOTE: Leave the Loctite 384 dries before installing the carburetor on the vehicle. Refer to manufacturer instructions.

Check coolant level and refill if necessary.

MAGNETO SYSTEM

MAGNETO SYSTEM



Section 03 ENGINE

Subsection 06 (MAGNETO SYSTEM)

GENERAL

Always disconnect battery.

WARNING

Always disconnect battery or starter cables exactly in the specified order, BLACK (-) cable first.

Always perform the electric tests before removing or installing whatever component.

For installation, use the torque values and Loctite products from the exploded views. Clean threads before using Loctite when installing the screws.

MAGNETO COVER

Removal

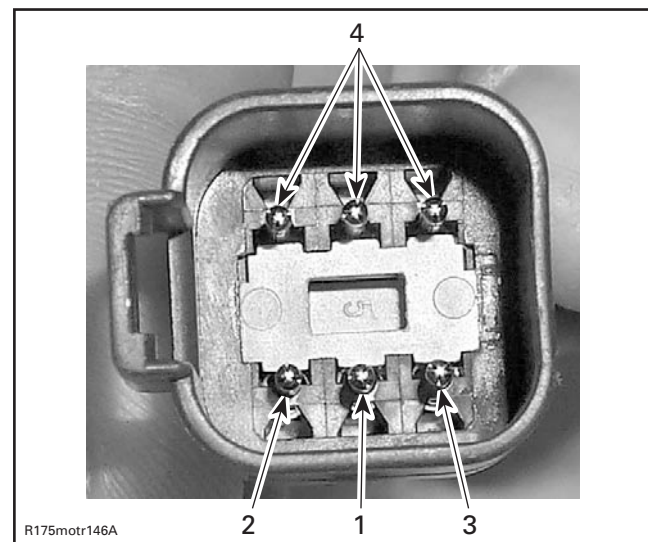
Drain engine oil (refer to LUBRICATION SYSTEM, see OIL CHANGE).

NOTE: No need to drain cooling system.

Remove the RH footwell and the seat (refer to BODY).

Lift up the fuel tank (refer to FUEL CIRCUIT).

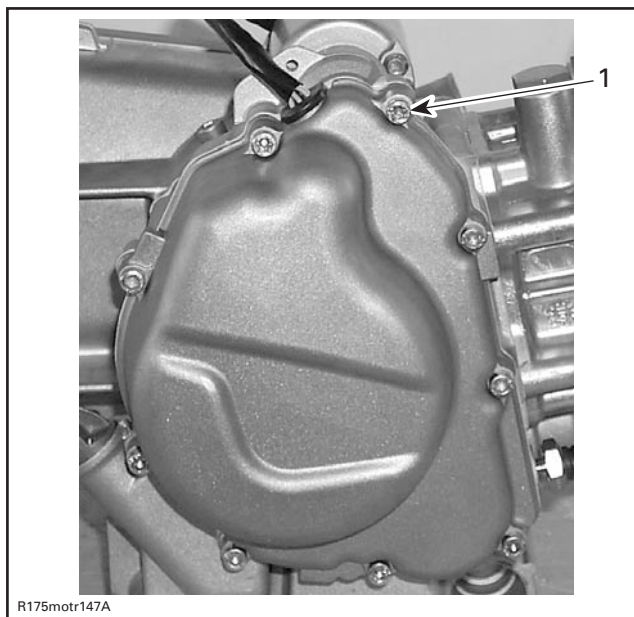
Unplug magneto connector from wire harness.



WIRES LOCATION IN THE CONNECTOR

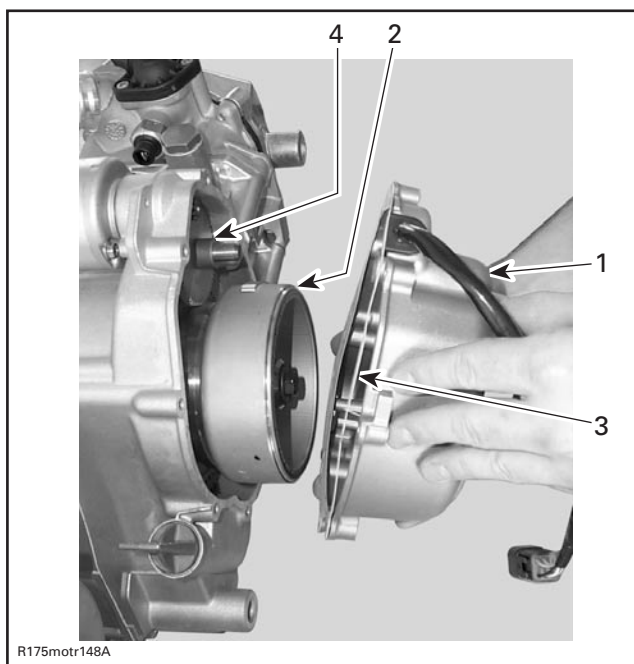
1. Wire WHITE/YELLOW for trigger coil
2. Wire BLUE/YELLOW for trigger coil
3. Wire BLACK/YELLOW for ground
4. Wires YELLOW for charge

Remove magneto cover screws no. 1.



1. Magneto cover screws

Withdraw magneto cover no. 2.



1. Magneto cover
2. Rotor
3. Gasket
4. Distance sleeve

CAUTION: Be careful not to lose the distance sleeve located on the cylindrical pin on the MAG side.

Inspection

Check magneto cover for cracks or other damages.
Replace if necessary.

Installation

Remove all residues on mating surfaces. The mating surfaces must be cleaned of any contaminations.

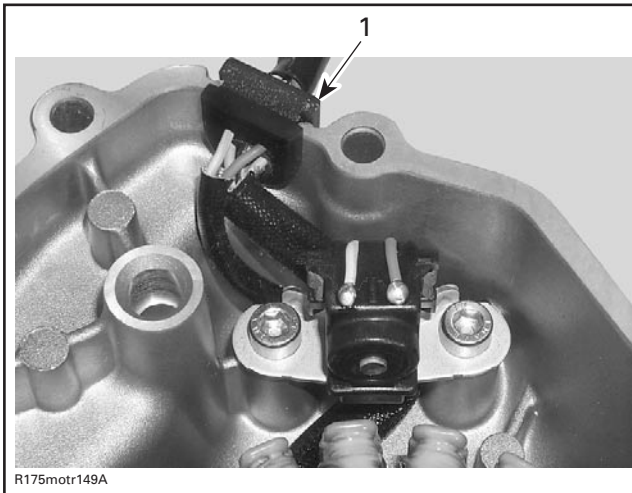
NOTE: Clean all metal component in a non-ferrous metal cleaner. Use Bombardier gasket remover (P/N 413 708 500), or suitable equivalent.

WARNING

Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

For installation, reverse the removal procedure. However, pay attention to the following.

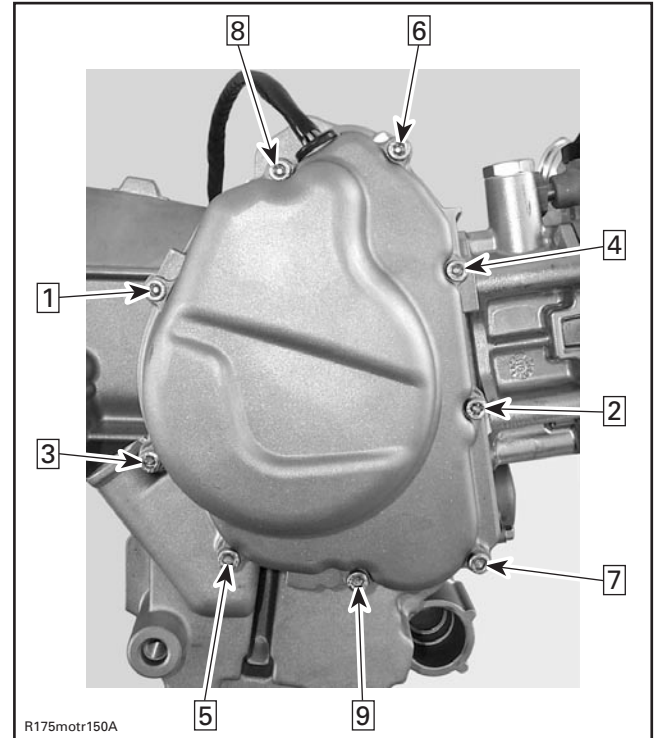
IMPORTANT: Apply small amount of silicon on mating surface in grommet area before placing the gasket.



1. Grommet

Install a new gasket on the magneto cover.

Tightening sequence for screws on magneto cover is as per following illustration.



STATOR AND TRIGGER COIL

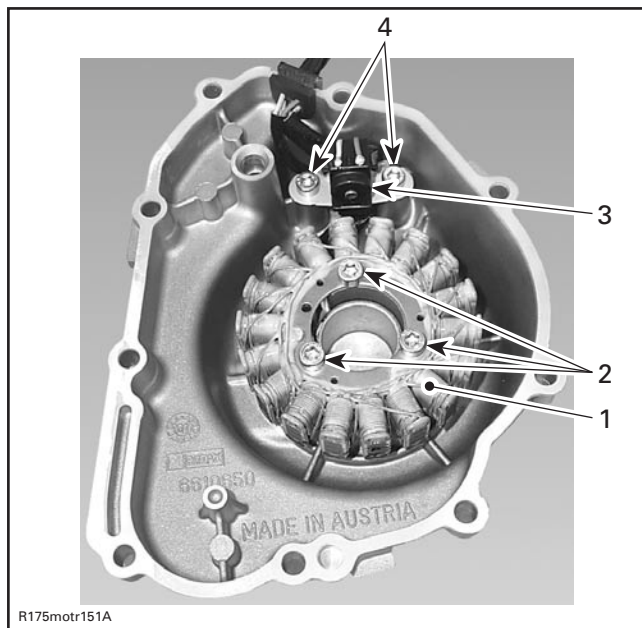
Removal

Remove:

- RH footwell (refer to **BODY**)
- magneto housing cover no. 2
- screws nos. 5 and 6
- stator with trigger coil no. 7.

Section 03 ENGINE

Subsection 06 (MAGNETO SYSTEM)



1. Stator
2. Stator screws
3. Trigger coil
4. Trigger coil screws

Inspection

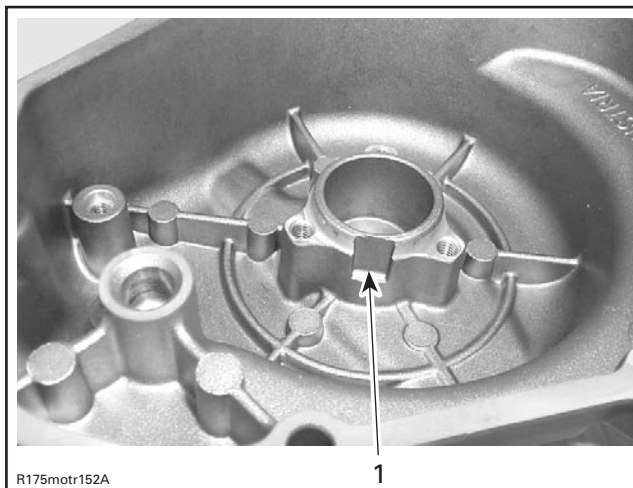
Check stator and trigger coil condition. If damaged replace the faulty part.

For electrical inspection, refer to **CHARGING SYSTEM** for the stator and **IGNITION SYSTEM** for the trigger coil.

Installation

For installation, reverse the removal procedure. However, pay attention to the following.

There is only one position for the stator (notch in the magneto cover).

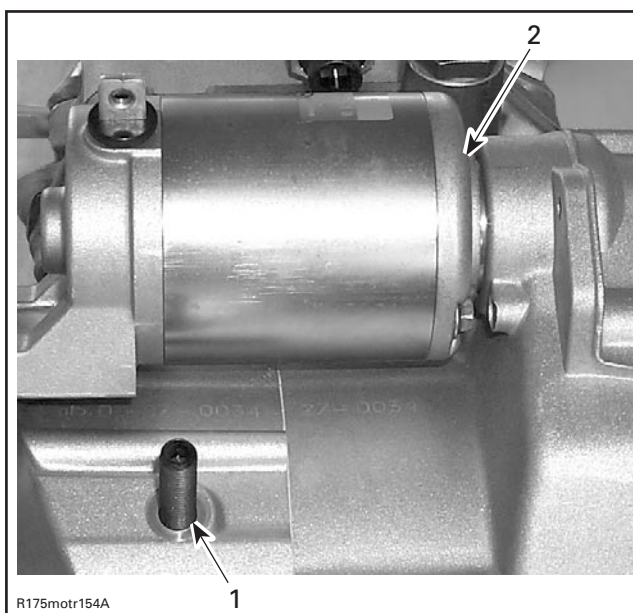


1. Notch for stator

ROTOR

Removal

Lock crankshaft with locking bolt (P/N 529 035 617). Refer to **CRANKSHAFT/BALANCER SHAFT**.



1. Crankshaft locking bolt (P/N 529 035 617)
2. Starter

Section 03 ENGINE

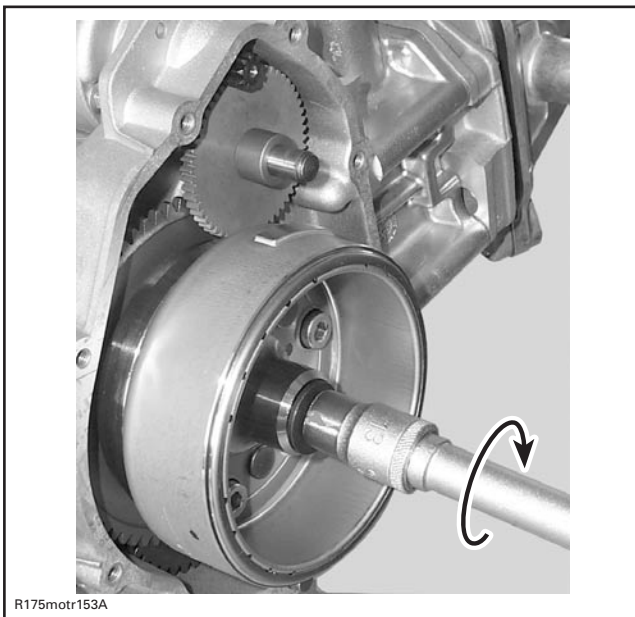
Subsection 06 (MAGNETO SYSTEM)

Remove the RH footwell and the seat (refer to **BODY**).

Lift up the fuel tank (refer to **FUEL CIRCUIT**).

Remove:

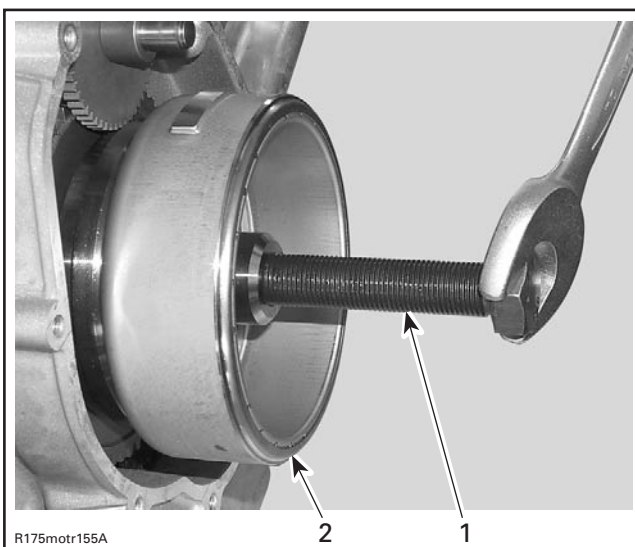
- starter **no. 15** (refer to **STARTER** further)
- magneto housing cover **no. 2**
- screw **no. 8** retaining rotor **no. 9**



TURN CLOCKWISE

- thrust washer **no. 10**.

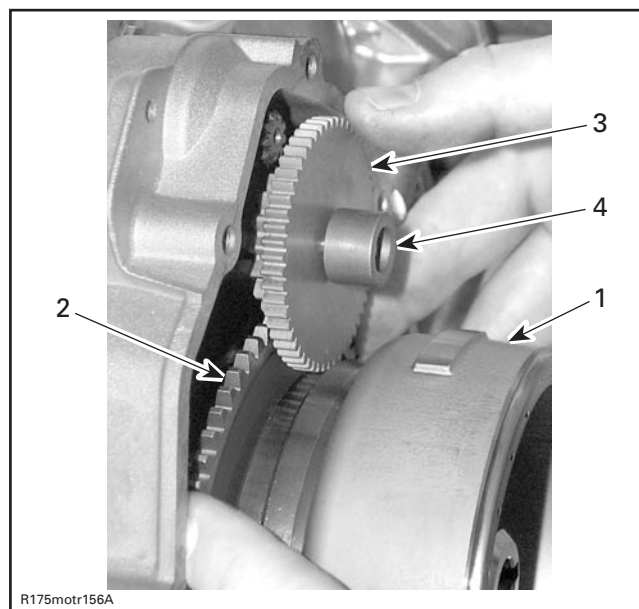
Install bolt included with the magneto puller (P/N 529 035 748), then remove rotor.



1. Magneto puller bolt
2. Rotor

Remove:

- rotor **no. 9** together with sprag clutch gear **no. 11**, distance sleeve **no. 4** and starter intermediate gear **no. 12**



1. Rotor
2. Sprag clutch gear
3. Starter intermediate gear
4. Distance sleeve

- sprag clutch (refer to **SPRAG CLUTCH** further).

Inspection

Check woodruff key and keyway on the crankshaft for wear or damages. Replace if necessary.

Installation

For installation, reverse the removal procedure. However, pay attention to the following.

CAUTION: When installing the rotor, take care that the taper is clean and free of grease.

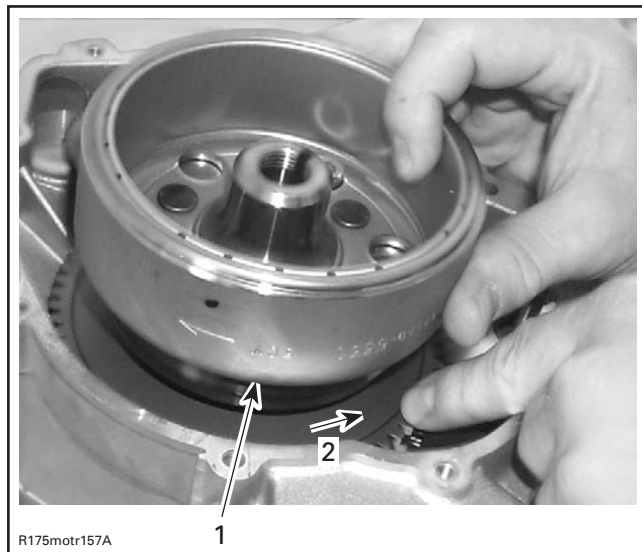
Install the sprag clutch gear **no. 11** in the housing then, install the starter intermediate gear **no. 12**.

Put rotor in place that groove is aligned with woodruff key position on crankshaft.

Section 03 ENGINE

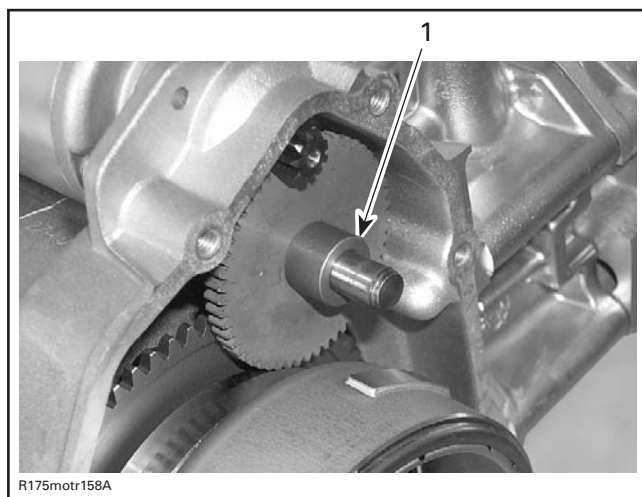
Subsection 06 (MAGNETO SYSTEM)

Turn sprag clutch gear counterclockwise for easily fit in the sprag clutch rollers.



1. Rotor
2. Direction of rotation from sprag clutch gear

Install the distance sleeve no. 4.



1. Distance sleeve

SPRAG CLUTCH

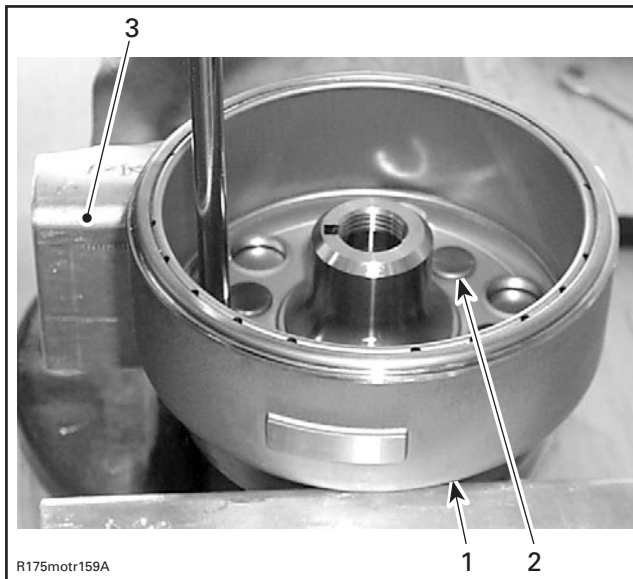
Removal

Remove:

- magneto cover
(refer to MAGNETO COVER above)
- rotor (refer to ROTOR above).

Place the sprag clutch housing no. 13 in vise then remove screws retaining the sprag clutch housing to the rotor.

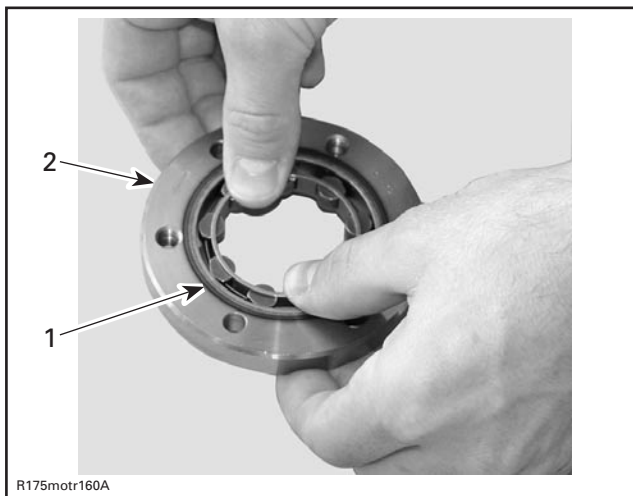
CAUTION: Use protector on the vise jaws to avoid damaging the sprag clutch housing.



1. Rotor
2. 3 screws M8
3. Vise jaw protectors

Separate sprag clutch housing and rotor.

Push the sprag clutch no. 14 out of sprag clutch housing no. 13.



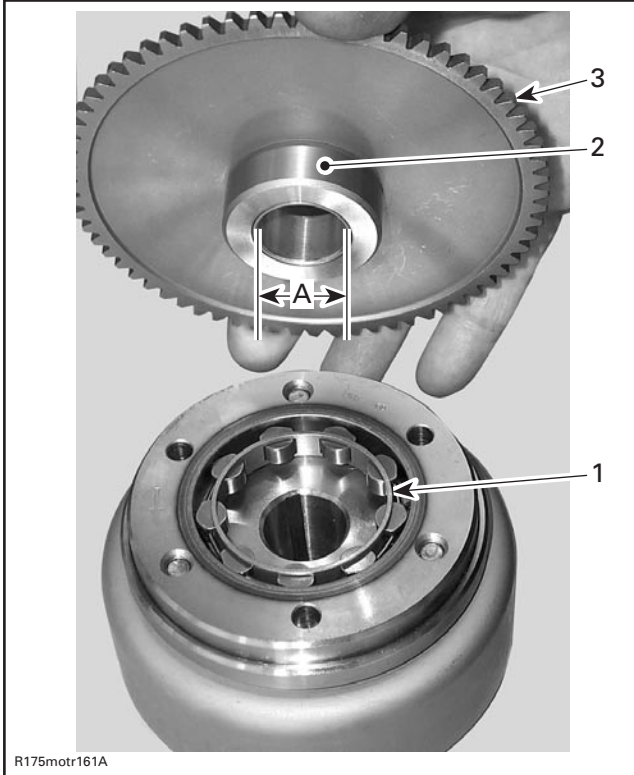
1. Sprag clutch
2. Sprag clutch housing

Inspection

Check contact surface of sprag clutch gear for heavy wear and/or grooves and replace if necessary.

Replace sprag clutch gear no. 11 when spline is worn.

Check bushing of sprag clutch gear for service limit and replace sprag clutch gear no. 11 if necessary.



1. Sprag clutch
2. Contact surface to sprag clutch
3. Sprag clutch gear teeth
- A. Bushing diameter

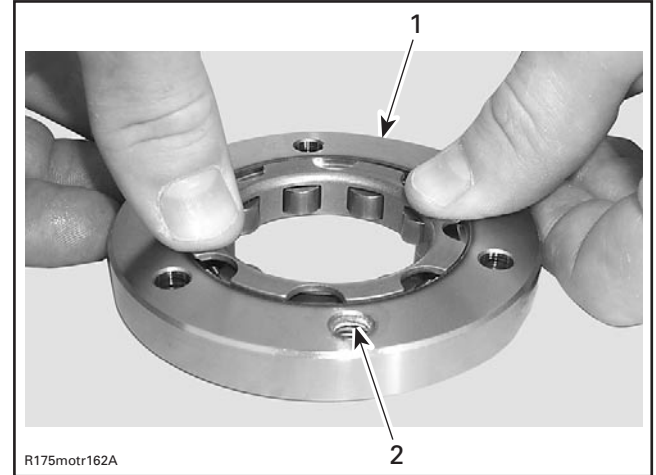
BUSHING DIAMETER mm (in)	
NEW MAXIMUM	22.041 mm (.8677 in)
SERVICE LIMIT	22.050 mm (.8681 in)

Installation

For installation, reverse the removal procedure. However, pay attention to the following.

Sprag clutch has a snap mechanism to the sprag clutch housing. Press the sprag clutch until the mechanism is locked.

CAUTION: Before reassemble the sprag clutch housing clean threads with a tap from remaining Loctite.



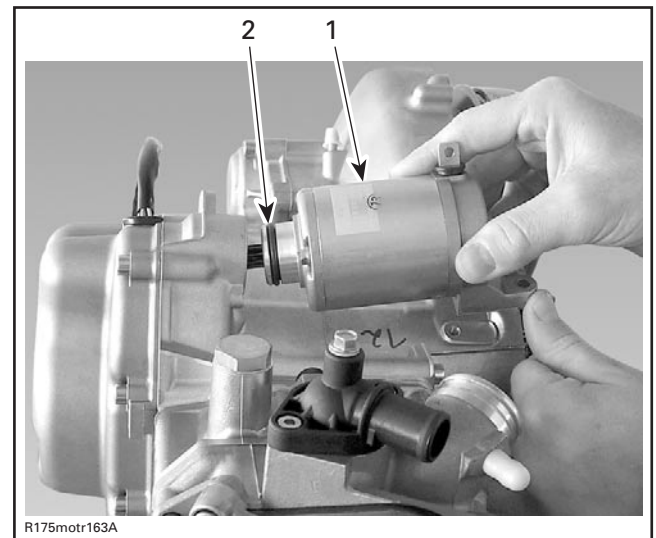
1. Push until snap mechanism works
2. Thread to be clean

STARTER

Removal

Remove:

- wire from starter no. 15
- screws no. 16
- starter.



1. Starter
2. O-ring

Section 03 ENGINE

Subsection 06 (MAGNETO SYSTEM)

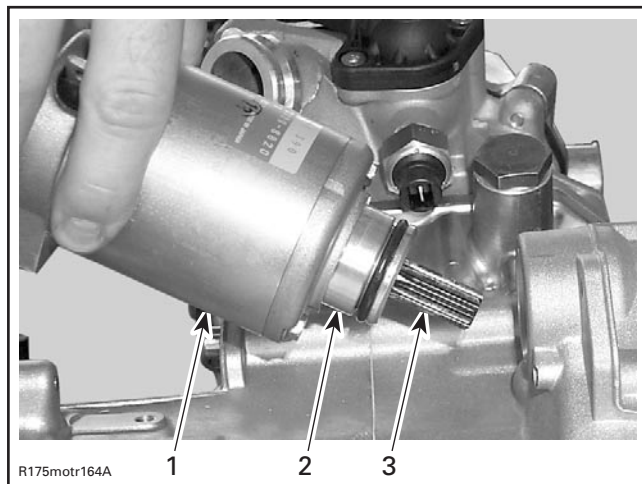
Inspection

Check if O-ring is brittle, hard or otherwise damaged. Replace if necessary.

Installation

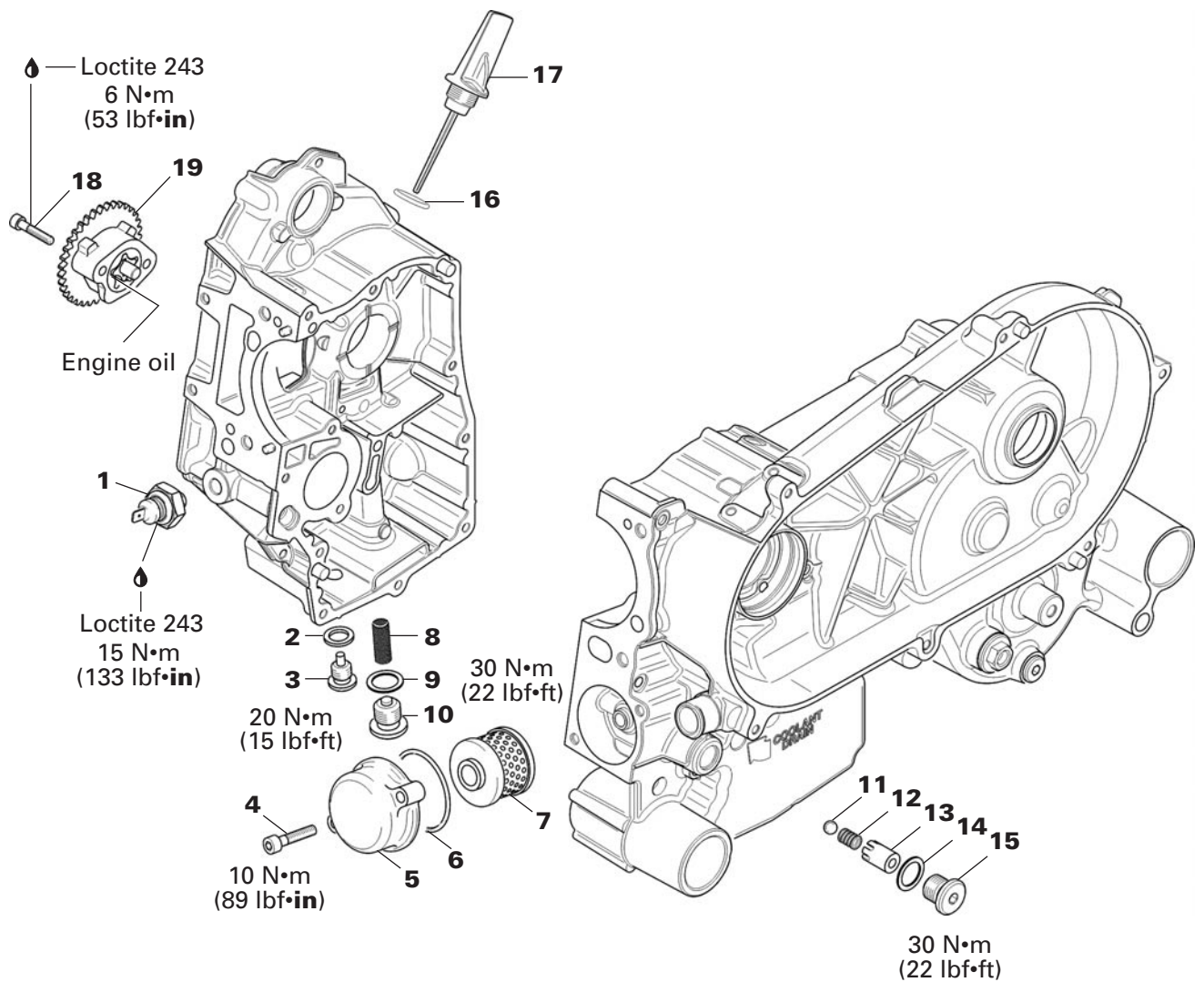
For installation, reverse the removal procedure. However, pay attention to the following.

Always apply the anti-seize lubricant on the support of the starter which is shown in the exploded view.



1. Starter
2. Support to crankcase MAG
3. Spline

LUBRICATION SYSTEM



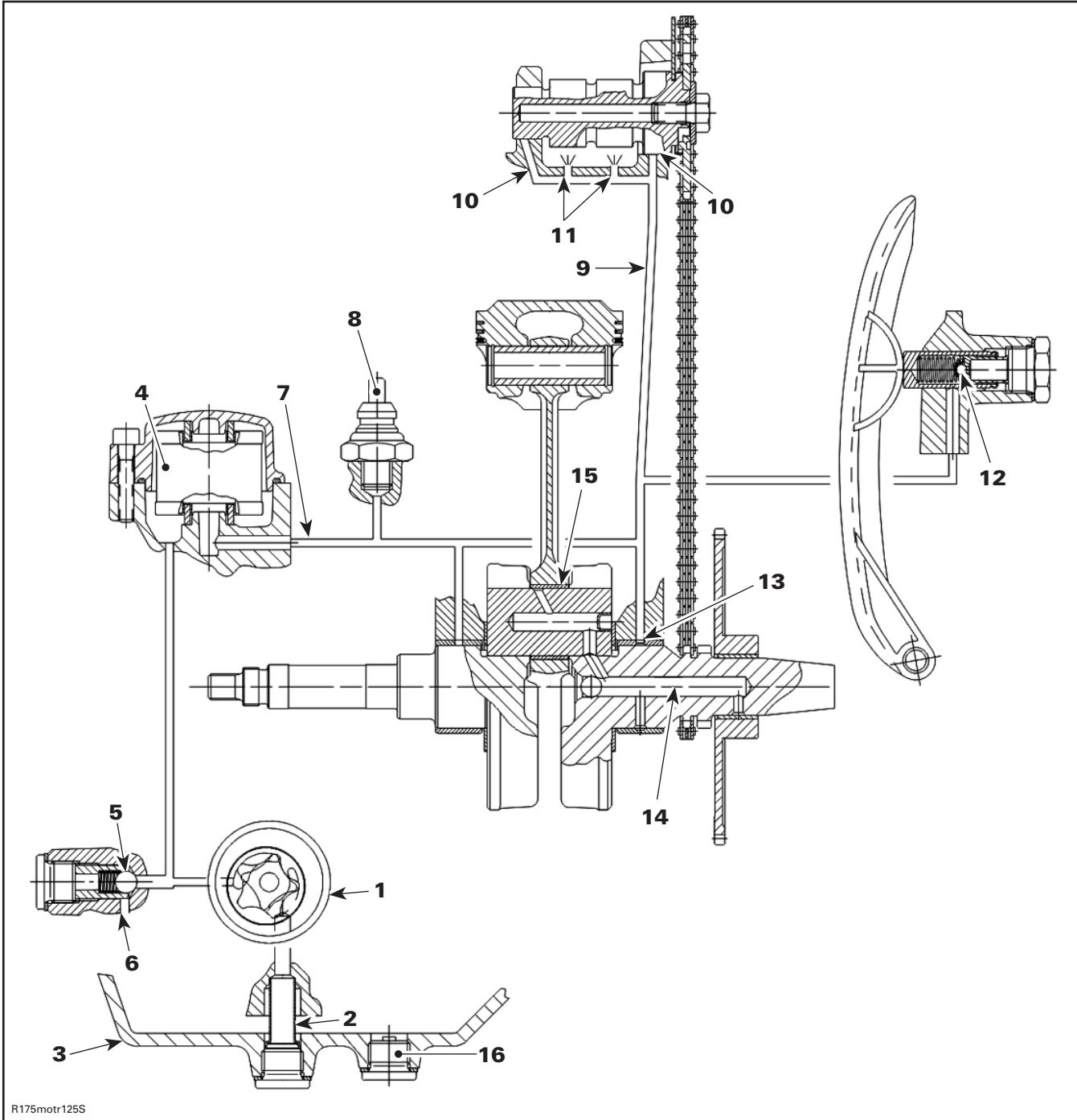
R175motr124S

Section 03 ENGINE

Subsection 07 (LUBRICATION SYSTEM)

ENGINE OIL FLOW CHART

Following illustration gives a general overview regarding the oil supply through the engine.



1. Oil pump
2. Oil strainer
3. Bottom of crankcase
4. Oil filter
5. Pressure regulator valve
6. Bypass back to bottom of crankcase
7. Oil line to pressure switch (crankcase MAG side)
8. Oil pressure switch

9. Cylinder stud screw bore as oil supply to camshaft
10. Camshaft plain bearing
11. Lubrication for rocker arms
12. Chain tensioner
13. Crankshaft plain bearing
14. Oil line to crank pin and sprag clutch gear
15. Big end connecting rod plain bearing
16. Plug screw to separate metallic particles

GENERAL

The engine removal is not necessary when working on the oil pressure switch, oil filter, pressure regulator valve, magnetic plug and/or oil strainer.

Prior to change the engine oil, ensure vehicle is on a level surface.

Oil and oil filter must be replaced at the same time and oil strainer must be cleaned too. Oil change, oil filter replacement and oil strainer cleaning should be done with a warm engine.

WARNING

The engine oil can be very hot. Wait until engine oil is warm.

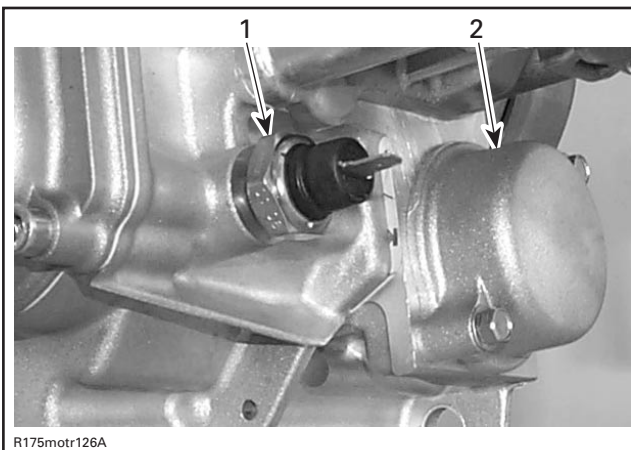
At installation, use torque values and Loctite products from the exploded view. Clean threads before using Loctite products when installing screws.

Dispose oil and filter as per your local environmental regulations.

ENGINE OIL PRESSURE TEST

NOTE: The engine oil pressure test should be done with a **warm engine** and the **recommended oil**.

Remove the oil pressure switch **no. 1** in the area of the cylinder head (exhaust side), mounted on the crankcase MAG side and install the oil pressure gauge (P/N 529 035 709).



- 1. Oil pressure switch
- 2. Oil filter cover

NOTE: Oil pressure switch works between 15 kPa (2 PSI) and 35 kPa (5 PSI).

The engine oil pressure should be as following value at warm engine condition (80°C (176°F) approximately).

PRESSION/RPM	1500 RPM	8500 RPM
MINIMAL	15 kPa (2 PSI)	350 kPa (51 PSI)

If the engine oil pressure is out of specifications, check the points described in **TROUBLESHOOTING** section.

To install oil pressure switch, reverse the removal procedure.

OIL CHANGE

Removal

Place a drain pan under the engine magnetic drain plug area.

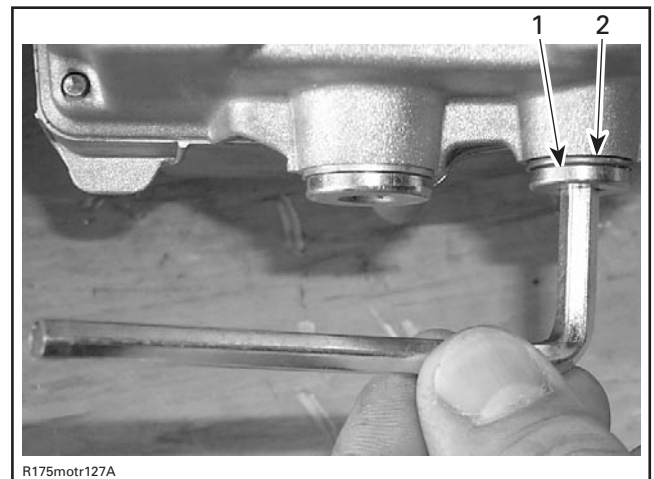
Remove oil dipstick **no. 17**.

CAUTION: Pay attention not to lose O-ring **no. 16** on dipstick.

Clean the magnetic drain plug area.

Unscrew magnetic drain plug **no. 3** then remove dipstick.

CAUTION: Pay attention not to lose gasket ring **no. 2** on magnetic drain plug.



- 1. Magnetic drain plug
- 2. Gasket ring

Wait a while to allow oil to flow out of engine.

Inspection

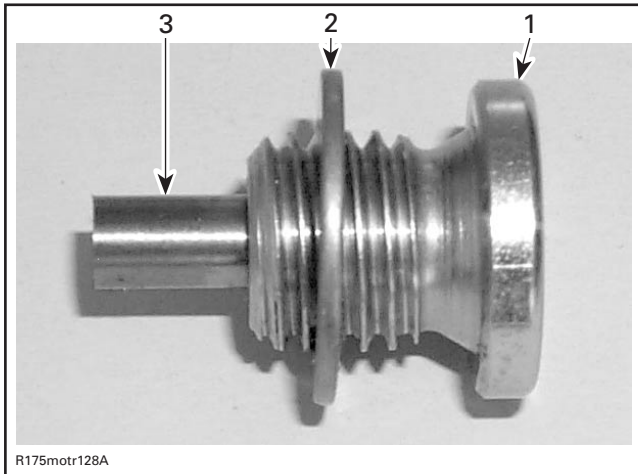
Oil condition gives information about the engine condition. See **TROUBLESHOOTING** section.

Section 03 ENGINE

Subsection 07 (LUBRICATION SYSTEM)

Clean the magnetic drain plug from metal shavings and dirt. Presence of debris gives an indication of failure inside the engine. Check engine to correct the problem.

Change gasket ring on magnetic drain plug if damaged.



1. Magnetic drain plug
2. Gasket ring
3. Magnetic area of drain plug

Installation

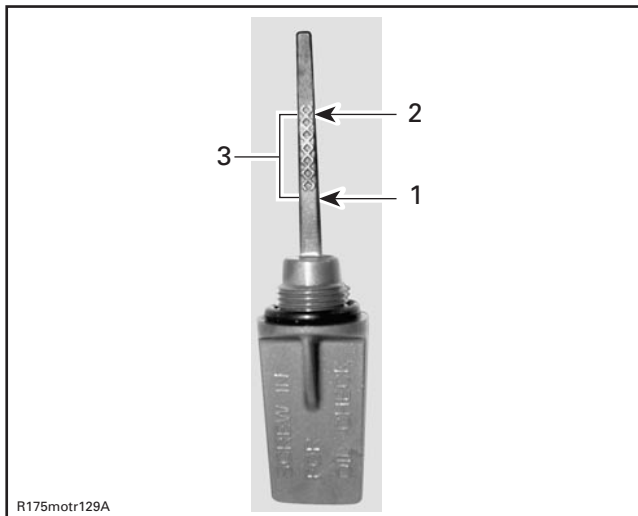
The installation is the reverse of removal procedure.

System Capacity

Refer to **TECHNICAL DATA**.

Double-check the engine oil capacity after operating the vehicle a few minutes.

Oil level should be within the foreseen area.



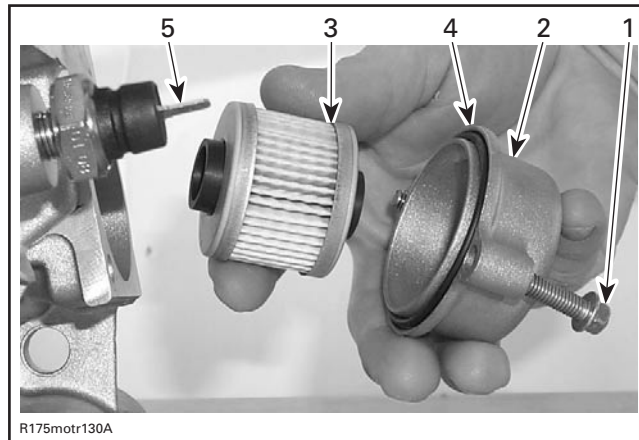
1. Full
2. Add
3. Operating range

OIL FILTER

Removal

Remove:

- engine oil (refer to **Oil Change**)
- oil filter screws **no. 4**
- oil filter cover **no. 5**
- oil filter **no. 7**.

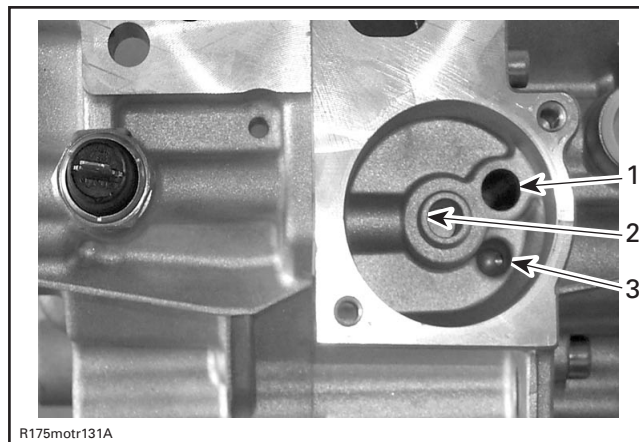


1. Oil filter screws
2. Oil filter cover
3. Oil filter
4. O-ring
5. Oil pressure switch

Inspection

Check oil filter cover O-ring **no. 6**, change it if necessary.

Check and clean the oil filter inlet and outlet area for dirt and other contaminations.

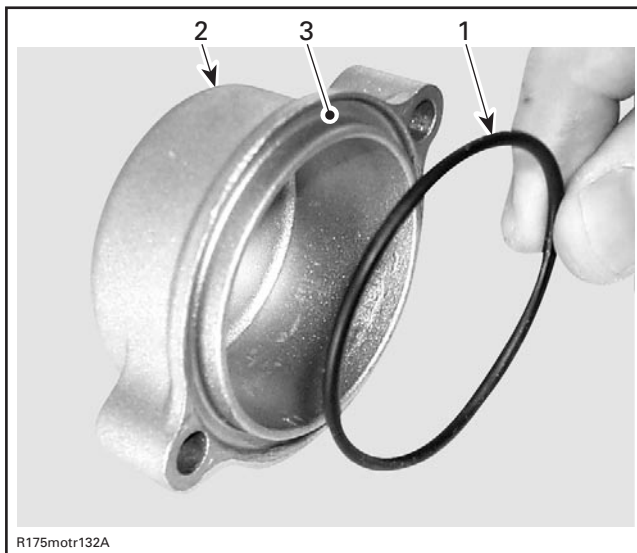


1. Inlet bore from the oil pump to the oil filter
2. Outlet bore to the engine oil providing system
3. Oil line to pressure regulator valve

Installation

The installation is the opposite of the removal procedure. Pay attention to the following details.

Install O-ring **no. 6** on oil filter cover.



1. O-ring
2. Oil filter cover
3. Foreseen groove

Torque oil filter screws to 10 N•m (89 lbf•in).

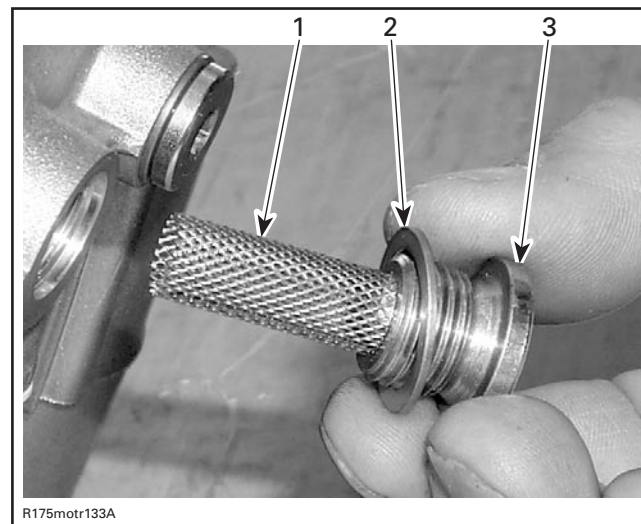
OIL STRAINER

Removal

Remove:

- engine oil (refer to **Oil Change**)
- engine skid plate (refer to **BODY**)
- screw **no. 10** retaining oil strainer **no. 8**.

CAUTION: Pay attention not to lose gasket ring **no. 9** on plug screw.



1. Oil strainer
2. Gasket ring
3. Plug screw

Cleaning and Inspection

Clean oil strainer with a part cleaner then use an air gun to dry it.

WARNING

Always wear eye protector. Chemicals can cause a rash break out in and an injury to your eyes.

On engine, clean the oil strainer area.

CAUTION: To avoid contaminate the oil pump and furthermore engine inside, never use an air gun to clean the hole.

Clean both contact surfaces of plug screw.

Installation

For installation, reverse the removal procedure.

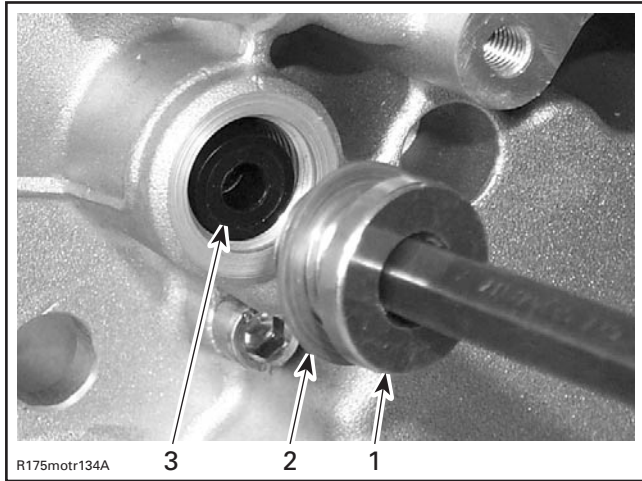
Refill engine at the proper level with the recommended oil. Refer to **TECHNICAL DATA** for capacity.

Start engine and let idle for a few minutes. Ensure plug screw and magnetic drain plug areas are not leaking.

Stop engine. Wait minimum 3 minutes to allow oil to flow down to crankcase then check oil level. Refill as necessary.

ENGINE OIL PRESSURE REGULATOR

The oil pressure regulator is located on the engine PTO side underneath the water inlet port.



- 1. Oil pressure regulator plug
- 2. Gasket ring
- 3. Valve housing

NOTE: The oil pressure regulator system works when the oil pressure exceeds 400 kPa (58 PSI). If oil pressure is low, check ball of oil pressure regulator valve for contamination (refer to **TROUBLESHOOTING**).

Removal

Remove

- oil pressure regulator plug **no. 15**, valve housing **no. 13**, compression spring **no. 12** and ball **no. 11**.

CAUTION: Pay attention not to lose gasket ring **no. 14** on oil pressure regulator plug.

 **WARNING**

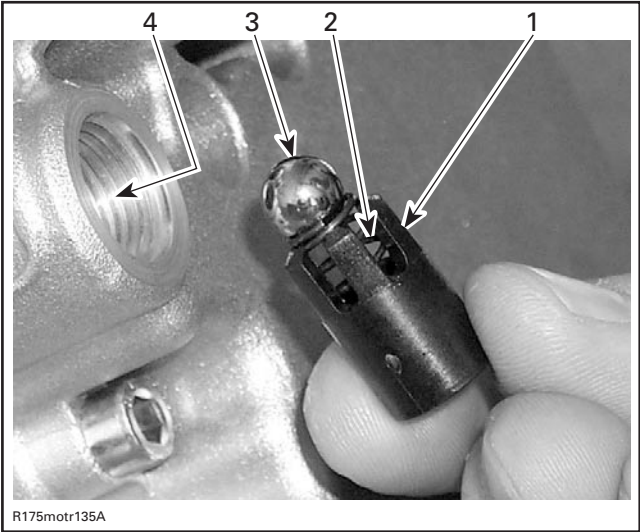
Oil pressure regulator plug is spring loaded.

Extract the ball from the engine.

NOTE: To easily remove the ball use an air gun.

 **WARNING**

Always wear eye protector.



- 1. Valve housing
- 2. Compression spring
- 3. Ball
- 4. Oil pressure regulator port

Clean and Inspection

Clean oil pressure regulator bore from contamination with an air gun.

NOTE: Contamination has to pass oil filter or goes back to bottom of crankcase. The dirt will not reach the oil circulation inside the engine.

Inspect valve housing for damages.

Check compression spring for free length.

COMPRESSION SPRING FREE LENGTH mm (in)	
NEW NOMINAL	13.5 mm (.543 in)
SERVICE LIMIT	13.2 mm (.519 in)

Replace both parts if important wear or damage are present.

Installation

For installation, reverse the removal procedure.

OIL PUMP

The oil pump is located on the engine MAG side near water pump housing (refer to **COOLING SYSTEM**).

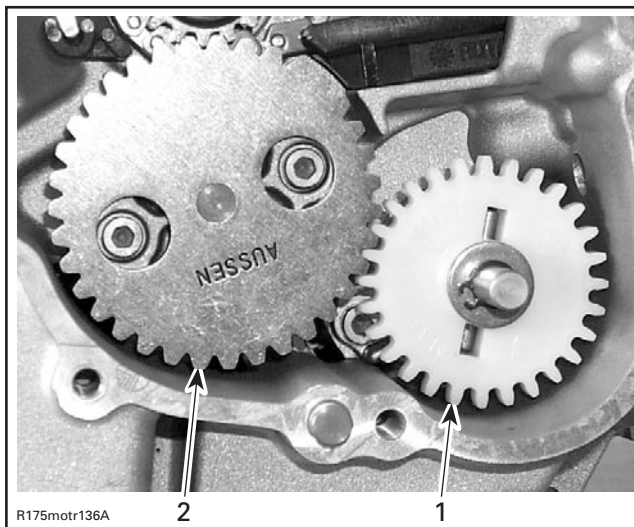
Removal

Remove:

- RH footwell and seat
- engine oil

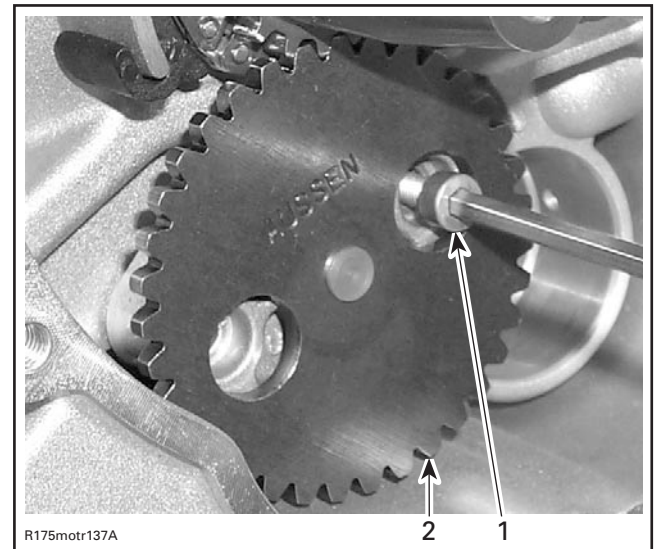
NOTE: No need to drain cooling system.

- magneto cover and rotor (refer to **MAGNETO SYSTEM**)

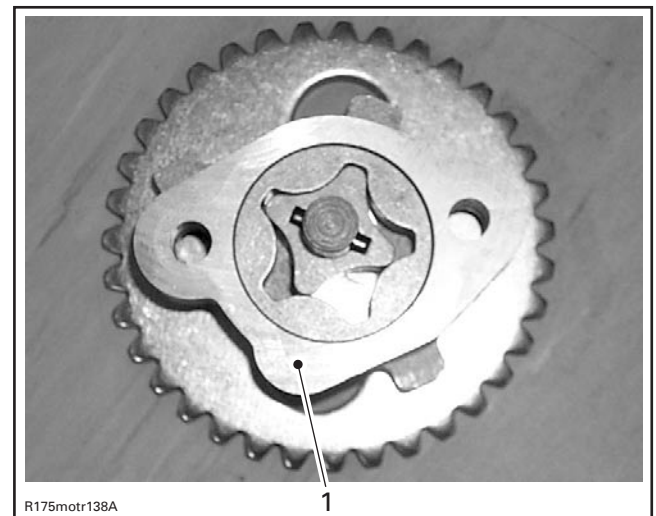


1. Water pump gear
2. Oil pump powered by crankshaft

- screws no. 18
- oil pump assembly no. 19.



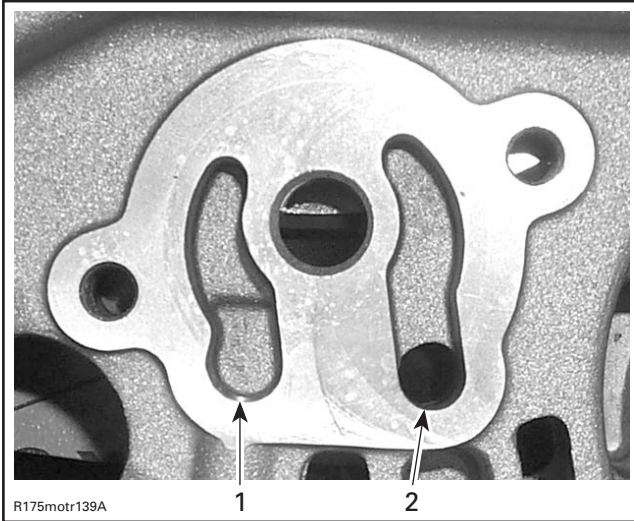
1. 2 screws
2. Oil pump gear



1. Oil pump system

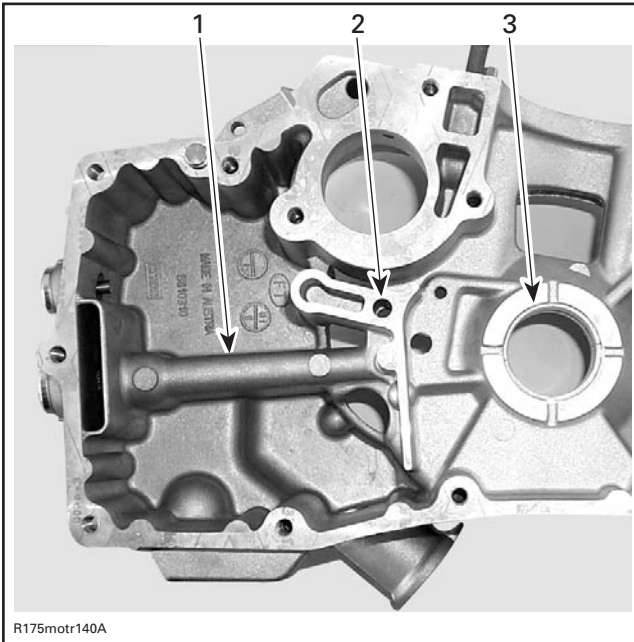
Section 03 ENGINE

Subsection 07 (LUBRICATION SYSTEM)



1. Suction side of the oil pump (oil coming from oil strainer)
2. Oil outlet to pressure regulator valve/oil filter

NOTE: Following illustration shows the oil flow from engine inside.

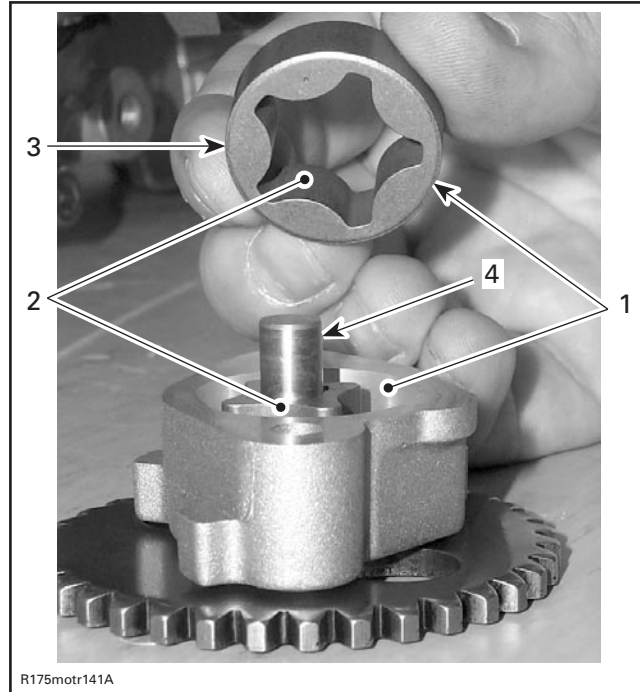


1. Oil line from oil strainer to oil pump
2. Oil pump outlet to pressure regulator valve/oil filter
3. Plain bearing in crankcase MAG

Inspection

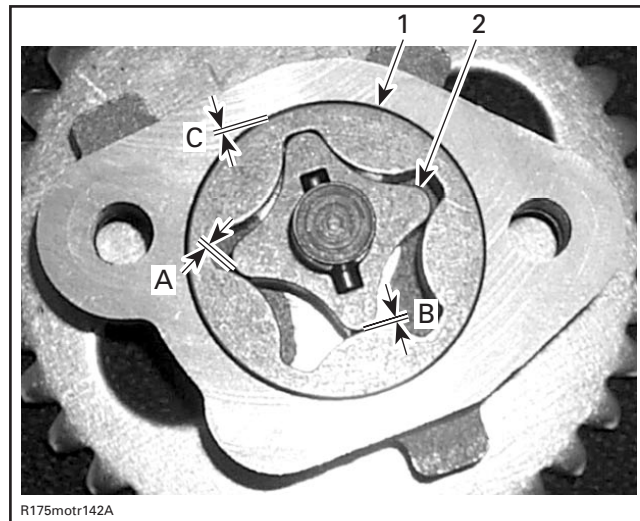
Inspect oil pump assembly for marks or other damages.

Check inner rotor for damages. If so, replace oil pump assembly. Ensure to also check oil pump housing. If damaged, replace the complete oil pump assembly.



1. Bore of oil pump outer rotor
2. Contact surface between inner and outer rotor
3. Mark on outer rotor
4. Oil pump shaft

Using a feeler gauge, measure the clearance between inner and outer rotors.



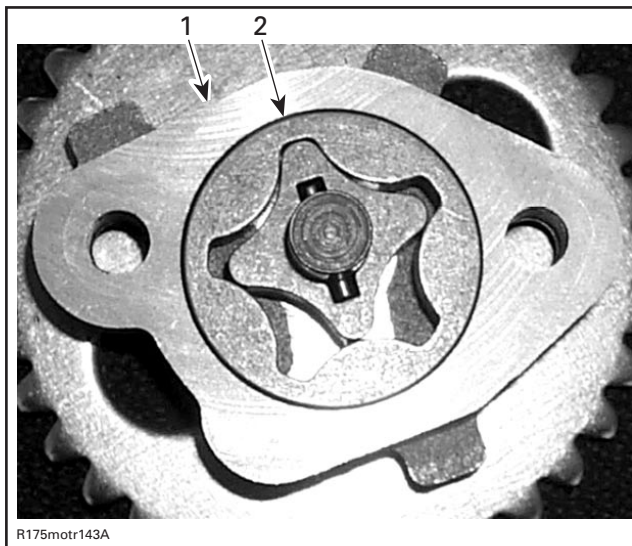
1. Outer rotor
2. Inner rotor

OUTER AND INNER ROTORS CLEARANCE mm (in)	
SERVICE LIMIT	
A	0.25 mm (.009 in)
B	
C	

If clearance between inner and outer rotors exceeds the tolerance, replace oil pump assembly. Ensure to also check oil pump housing. If damaged, replace the complete oil pump assembly.

If clearance between outer rotor and its bore in oil pump exceeds the tolerance, replace the complete oil pump assembly.

Using a dial indicator, measure side wear as shown.



1. Measurement 1 on oil pump housing surface
2. Measurement 2 on oil pump outer rotor surface

ROTOR AND OIL PUMP HOUSING CLEARANCE mm (in)	
NEW MINIMUM	0.02 mm (.00079 in)
NEW MAXIMUM	0.09 mm (.0035 in)
SERVICE LIMIT	0.10 mm (.004 in)

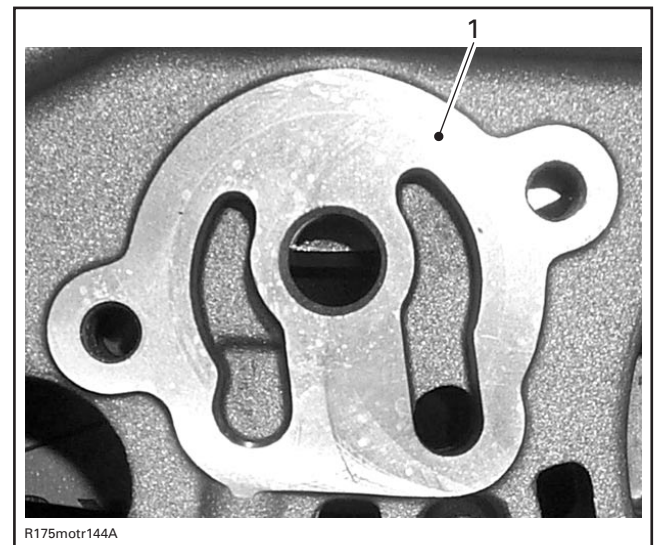
If difference exceeds service limit, replace the complete oil pump assembly.

NOTE: When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases (less discharge).

Check the inside of oil pump housing and crankcase area for scoring or other damages. If so, change the complete oil pump assembly.

NOTE: If the surface only shows a small groove, use a grindstone to burnish burrs.

When the oil pump is seized, replace crankcase assembly and complete oil pump.



1. Oil pump contact surface

Clean the area from contaminations.

Installation

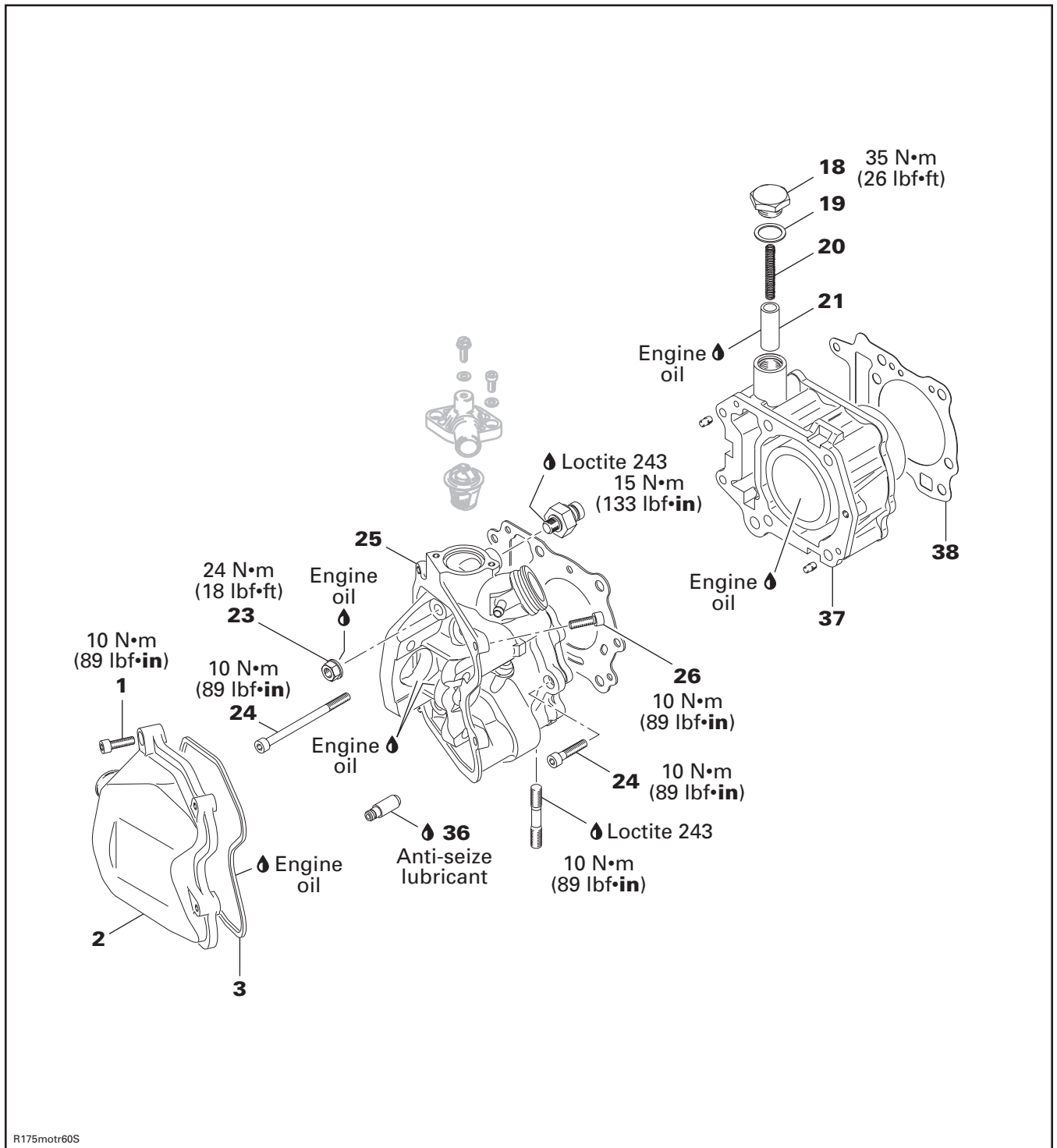
For installation, reverse the removal procedure.

Final Test

After engine is completely reassembled, start engine and make sure oil pressure is within specifications.

CYLINDER AND HEAD

NOTE: For cylinder head, cylinder and piston removal, it is not necessary to remove engine from vehicle.



Subsection 08 (CYLINDER AND HEAD)



GENERAL

NOTE: When diagnosing an engine problem, always perform a cylinder leak test. This will help pin-point a problem. Refer to the instructions included with your leak tester and **LEAK TEST** section for procedures.

Always place the vehicle on level surface.

NOTE: For a better understanding, the following illustrations are taken with engine out of vehicle. To perform the following instructions, it is not necessary to remove engine from vehicle.

Always disconnect the negative wire from the battery before working the engine.

Even if the removal of many parts is not necessary to reach another part, it is recommended to remove these parts in order to check them.

For installation, use the torque values and Loctite products from exploded views. Clean threads before using Loctite product when installing screws.

When disassembling parts that are duplicated in the engine, (eg: valves), it is a strongly recommended to note their position (PTO, MAG side) and to keep them as a "group". If you find a defective component, it would be much easier to find the cause of the failure among its group of parts (eg: you found a worn valve guide. A bent spring could be the cause and it will be easy to know which one among the springs is the cause to replace it if you grouped them at disassembly). Besides, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their "group".

Intake port/air filter contaminated (clogged) with dirt, sand, etc. (leads to worn valves, piston rings and finally to leak of power).

CAUTION: In case of piston rings and/or valve replacement, always clean the whole engine and change oil and oil filter.

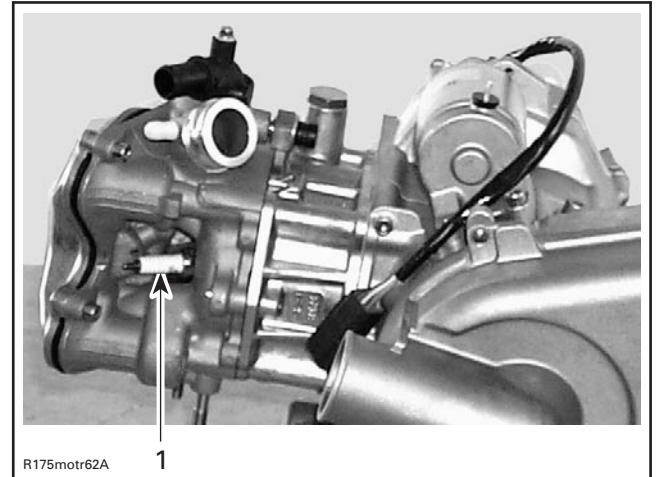
SPARK PLUG

Removal

Unplug the spark plug wire.

Clean spark plug area before disassembly.

Unscrew spark plug.



1. Spark plug on engine PTO side

Inspection

Check spark plug condition (refer to **IGNITION SYSTEM**).

NOTE: To check spark, place connected spark plug with threads against crankcase to simulate electrical ground and crank the engine.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Check spark plug gap (refer to **TECHNICAL DATA**).

Screw spark plug. Torque spark plug to 15 N•m (133 lbf•in). Reinstall the spark plug wire.

THERMOSTAT

Refer to **COOLING SYSTEM**.

VALVE COVER

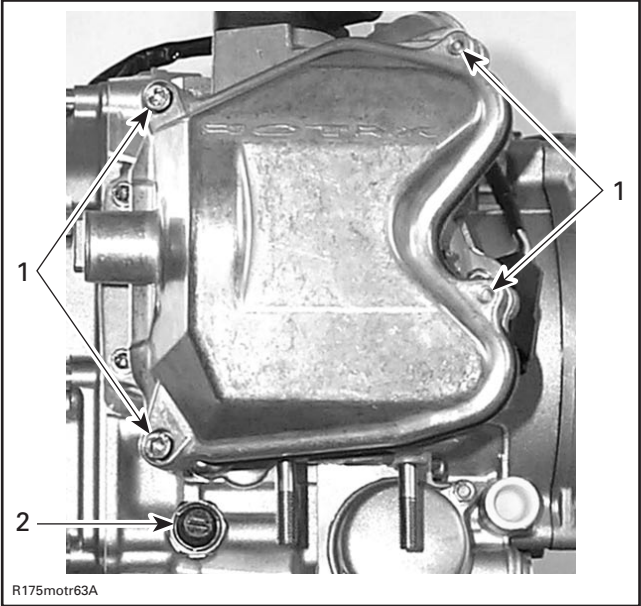
Removal

Remove:

- hose from valve cover
- valve cover screws no. 1

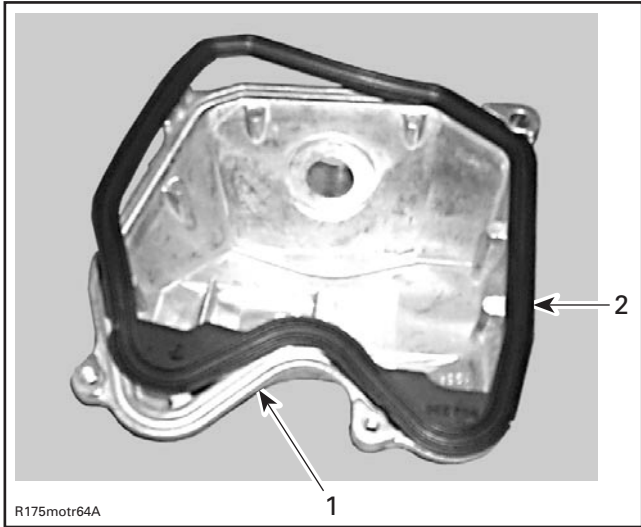
Section 03 ENGINE

Subsection 08 (CYLINDER AND HEAD)



1. Valve cover screws
2. Oil pressure switch

– valve cover no. 2 and profile sealing ring no. 3.



1. Valve cover
2. Profile sealing ring

Inspection

Check the profile sealing ring on the valve cover if it is brittle, cracked or hard. If so, replace the profile sealing ring.

Installation

For installation, reverse the removal procedure.

NOTE: Install the valve cover screws in a criss-cross sequence.

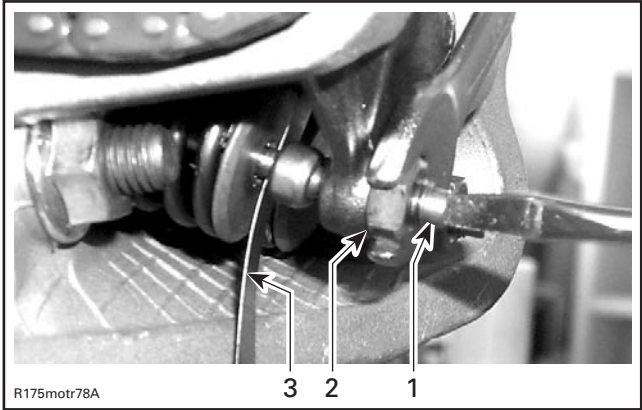
VALVE ADJUSTMENT

Lock crankshaft at the TDC compression position (refer to **CRANKSHAFT**).

Remove valve cover (refer to **VALVE COVER** above).

Hold adjusting screw no. 14 and loosen locking nut no. 13.

Using feeler gauge, check the valve clearance.



1. Adjustment screws
2. Locking nuts
3. Feeler gauge

VALVE CLEARANCE mm (in)	
EXHAUST	0.10 to 0.14 mm (0.0039 to 0.0055 in)
INTAKE	0.05 to 0.09 mm (0.0020 to 0.0035 in)

Hold the adjusting screw at the proper position and torque the locking nut.

Repeat the procedure for each valves.

Before installing valve cover, recheck all valve adjustments.

CHAIN TENSIONER

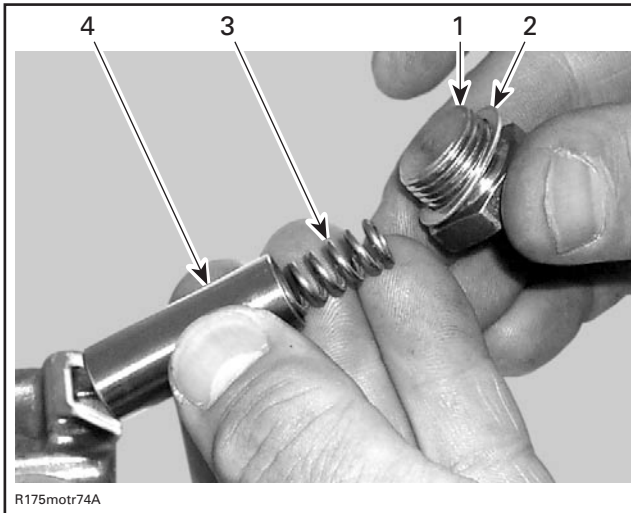
Removal

WARNING

Chain tensioner is spring loaded.

Remove:

- chain tensioner plug **no. 18**
- gasket ring **no. 19** (discard)
- spring **no. 20**
- chain tensioner plunger **no. 21**



1. Chain tensioner plug
2. Gasket ring
3. Spring
4. Chain tensioner plunger

NOTE: To extract the chain tensioner plunger, use a magnetic pick-up tool.

Inspection

Check chain tensioner plunger for free movement and/or scoring.

Check if possible chain guides for wear. Replace as necessary.

Check spring condition. Replace if broken or worn. Install **NEW** gasket ring **no. 19**.

Installation

For installation, reverse the removal procedure.

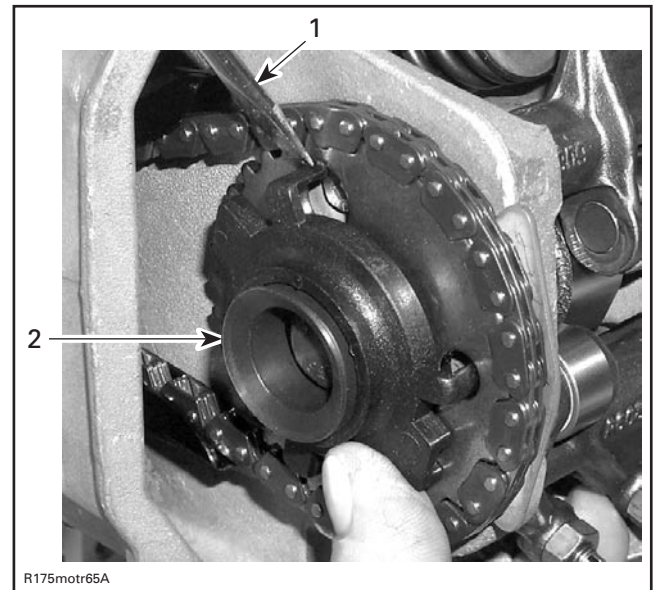
BREATHER

Removal

Remove:

- valve cover
- breather **no. 4** with V-ring **no. 5**.

NOTE: Use flat screwdriver to remove breather as per following illustration.



1. Flat screwdriver
2. Breather

Inspection

Check V-ring **no. 5** and/or breather. If they are brittle, cracked or hard, replace them.

Check if snap mechanism from breather to chain timing gear works properly.

Installation

For installation, reverse the removal procedure.

NOTE: Only one position to place breather on chain timing gear.

Section 03 ENGINE

Subsection 08 (CYLINDER AND HEAD)

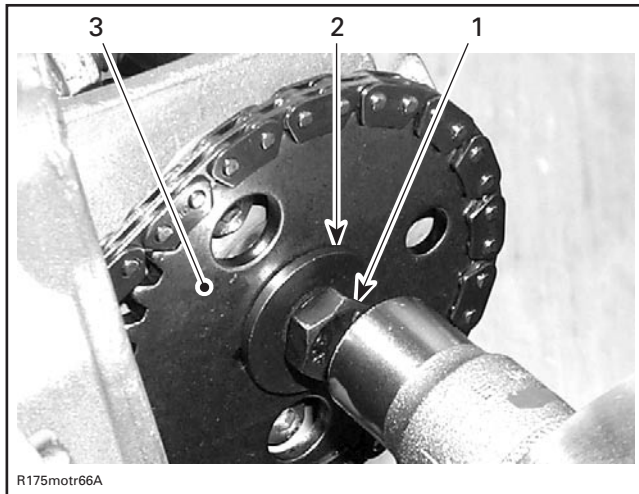
CAMSHAFT TIMING GEAR

Removal

Lock crankshaft at the TDC compression position, refer to **CRANKSHAFT**.

Remove:

- valve cover
- chain tensioner
- chain guide no. 22
- bolt no. 6, washer no. 7 and camshaft timing gear no. 8.



1. Bolt
2. Washer
3. Camshaft timing gear

NOTE: Secure timing chain no. 27 with a retaining wire.

Inspection

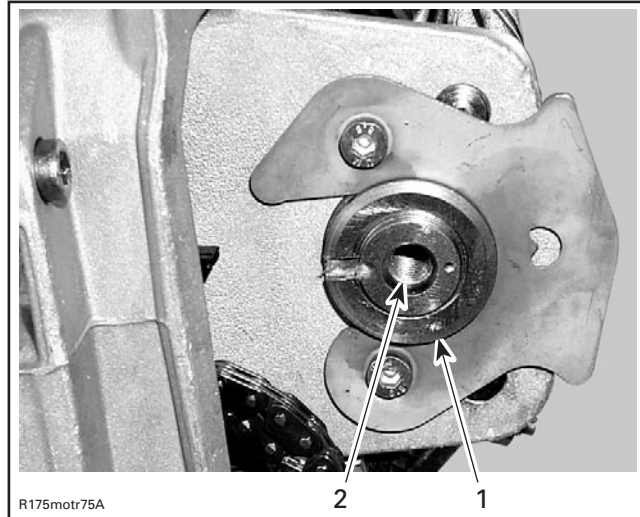
Check camshaft timing gear for wear or deterioration. If gear is worn or damaged, replace it as a set (camshaft timing gear and timing chain).

For crankshaft timing gear, refer to **CRANKSHAFT**.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

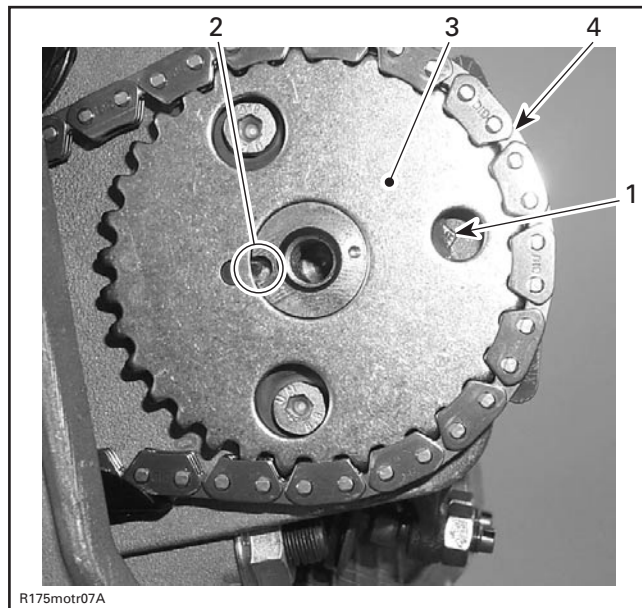
Clean mating surface and threads of camshaft prior to assemble camshaft timing gear.



1. Mating surface on camshaft
2. Threads for timing gear bolt

Camshaft timing gear must be at TDC position before installing the timing chain.

Install camshaft timing gear so that the timing gear tab is located into the camshaft groove. The pointed end of camshaft retaining plate should be visible by the top hole. See the following illustration for a proper positioning.



1. Pointed end of camshaft retaining plate
2. Groove in the camshaft
3. Chain timing gear
4. Timing gear

CAUTION: Crankshaft and camshaft must be locked on TDC position to place camshaft timing gear and timing chain in the proper position.

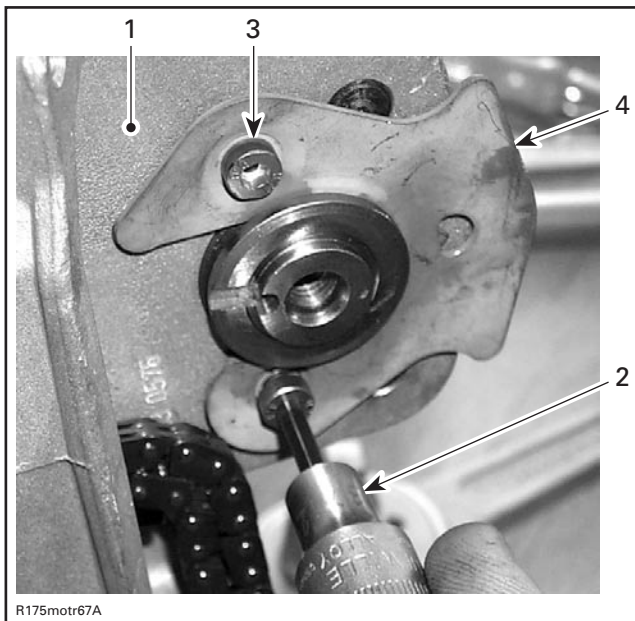
ROCKER ARM

Removal

Lock crankshaft at the TDC compression position, refer to **CRANKSHAFT**.

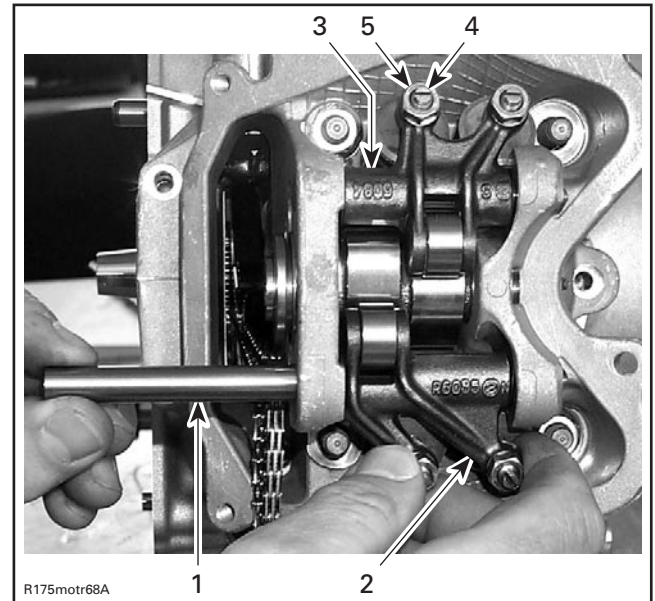
Remove:

- valve cover
- chain tensioner
- breather no. 4
- camshaft timing gear no. 8
- Allen screws no. 9 and camshaft retaining plate no. 10



1. Cylinder head
2. Allen wrench (P/N 529 035 861)
3. Allen screws
4. Camshaft retaining plate

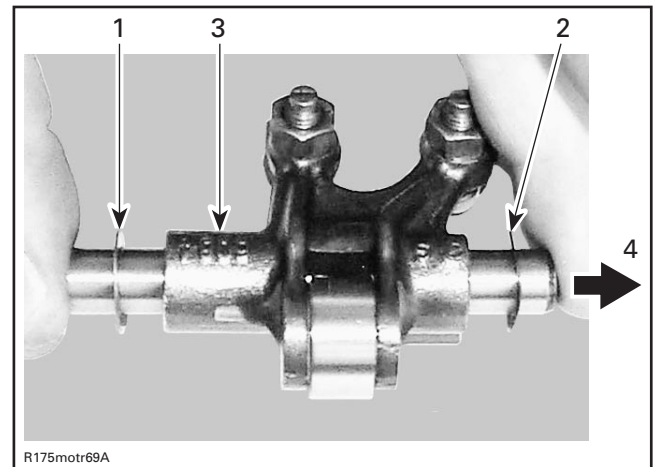
- rocker arm shafts no. 11
- rocker arm assembly (exhaust side no. 12 and intake side no. 15) with adjustment screws no. 14 and nuts no. 13



1. 2 rocker arm shafts
2. Rocker arm assembly exhaust
3. Rocker arm assembly intake
4. 4 adjustments screws
5. 4 nuts

- thrust washers no. 16 and spring washers no. 17.

CAUTION: Pay attention not to lose thrust washer and spring washer.



1. 2 thrust washers
2. 2 spring washers
3. Rocker arm assembly intake
4. Cylinder head — spark plug side

Section 03

ENGINE

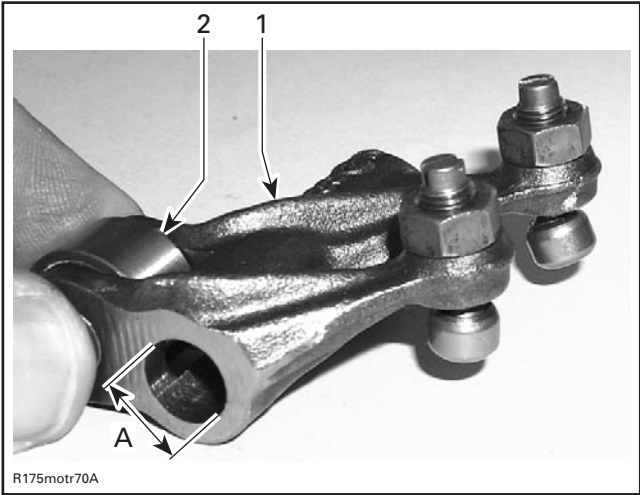
Subsection 08 (CYLINDER AND HEAD)

Inspection

Rocker Arm

Inspect each rocker arm for cracks and scored friction surfaces. If so, replace rocker arm assembly.

Check the rocker arm rollers for free movement, wear and excessive radial play. Replace rocker arm assembly if necessary.

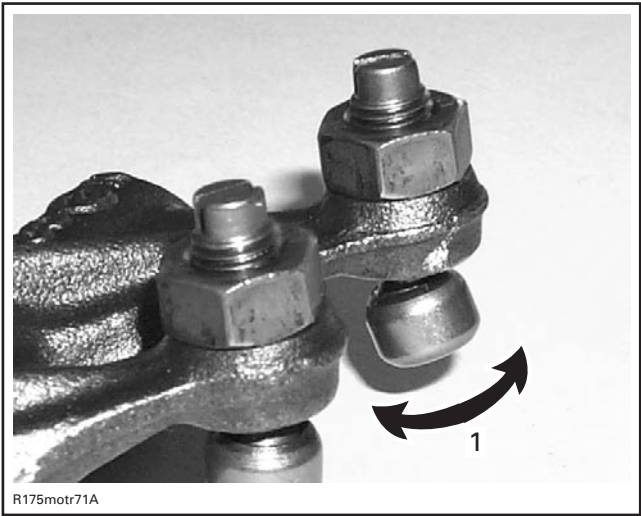


- 1. Rocker arm (exhaust side)
- 2. Roller
- A. Bore for rocker arm shaft

Measure rocker arm bore diameter. If diameter is out of specification, change the rocker arm assembly.

ROCKER ARM BORE DIAMETER	
NEW MINIMUM	10.036 mm (.3951 in)
NEW MAXIMUM	10.050 mm (.3957 in)
SERVICE LIMIT	10.060 mm (.3960 in)

Check adjustment screws for free movement, cracks and/or excessive play.

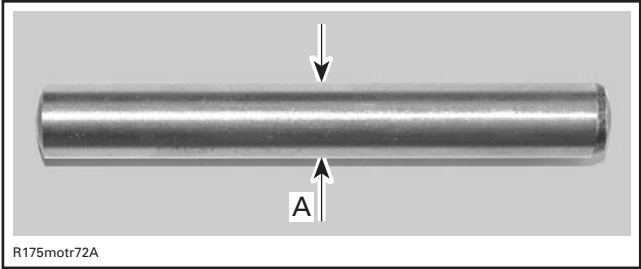


- 1. Free movement of adjustment screw top

Rocker Arm Shaft

Check for scored friction surfaces, if so, replace parts.

Measure rocker arm shaft diameter.



- A. Measure rocker arm shaft diameter here

ROCKER ARM SHAFT DIAMETER	
NEW MINIMUM	10.015 mm (.3942 in)
NEW MAXIMUM	10.006 mm (.3939 in)
SERVICE LIMIT	9.950 mm (.3917 in)

Any area worn excessively will require parts replacement.

Installation

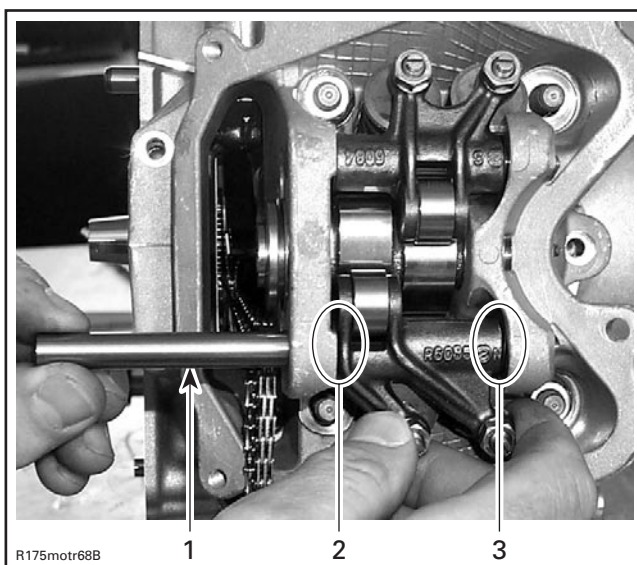
For installation, reverse the removal procedure. Pay attention to the following details.

Apply engine oil on rocker arm shaft.

Install the rocker arm shafts with the chamfered edge first and use following procedure:

CAUTION: Pay attention not to forget thrust washer and spring washer.

- Hold rocker arm intake/exhaust together with thrust washer **no. 16** in place.
- Insert rocker arm shaft **no. 11** until middle of rocker arm bore.



1. Rocker arm shaft
2. Thrust washer
3. Spring washer

- Place spring washer **no. 17** and push rocker arm shaft to end position.

TIMING CHAIN

Refer to **CRANKSHAFT** section.

CYLINDER HEAD

Removal

Lock crankshaft at TDC compression position, refer to **CRANKSHAFT**.

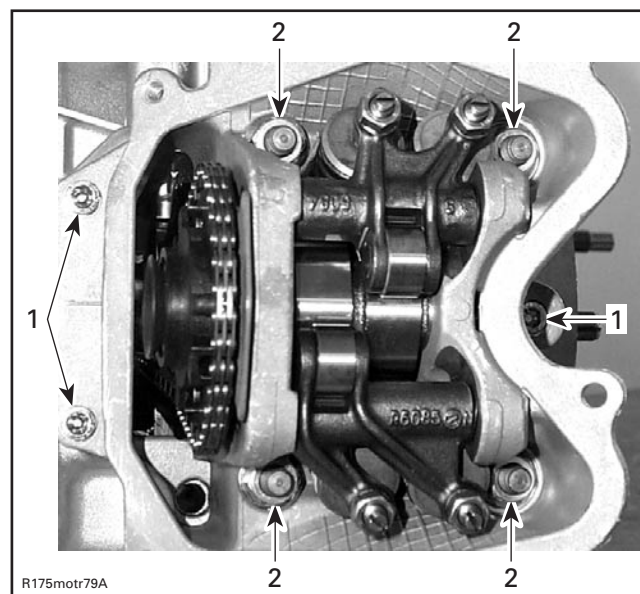
Drain coolant (refer to **COOLING SYSTEM**).

Disconnect:

- spark plug cable
- temperature sensor connector.

Remove:

- RH footwell
- exhaust pipe (refer to **REMOVAL AND INSTALLATION**)
- engine outlet hose
- carburetor (refer to **CARBURETOR**)
- chain tensioner (see **CHAIN TENSIONER** above)
- valve cover and profile sealing ring (see **VALVE COVER** above)
- breather
- camshaft timing gear
- cylinder head screws **no. 24**
- cylinder head nuts **no. 23** retaining cylinder head and cylinder to cylinder base.



1. Cylinder head screws
2. Cylinder head nuts

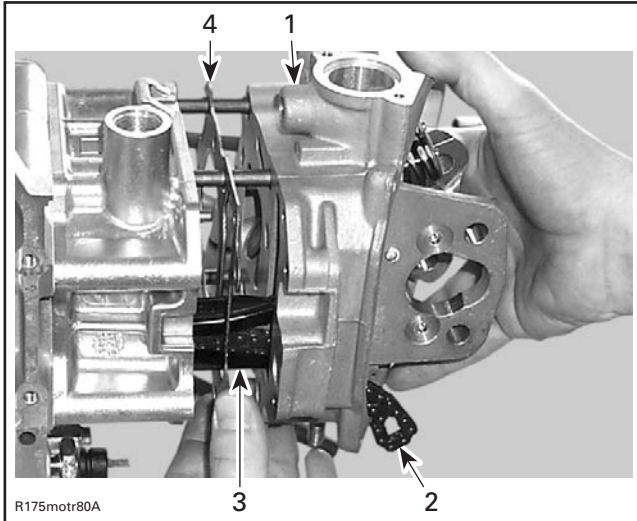
Pull up cylinder head **no. 25**.

Remove:

- chain guide **no. 22**
- gasket **no. 26**.

Section 03 ENGINE

Subsection 08 (CYLINDER AND HEAD)



1. Cylinder head
2. Timing chain
3. Chain guide
4. Head gasket

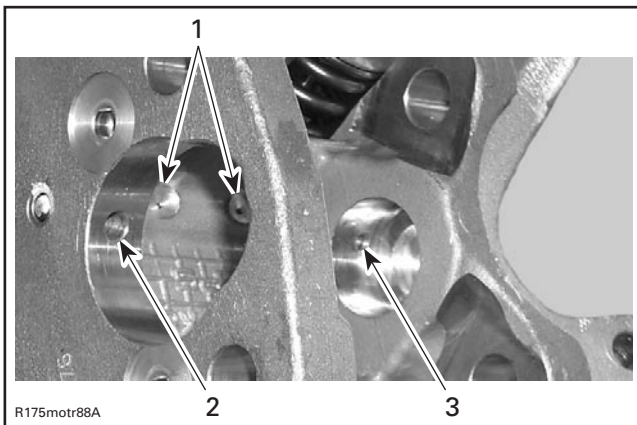
Inspection

Check for cracks between valve seats, if so, replace cylinder head.

Check gasket for cracks or other damages.

Check mating surface between cylinder and cylinder head for contamination. If so, clean both surfaces.

Clean oil support through the cylinder head from contamination.



1. Oil port to lubricate camshaft lobes intake/exhaust
2. Oil supply to camshaft bearing journal MAG side
3. Oil supply to camshaft bearing journal PTO side

Installation

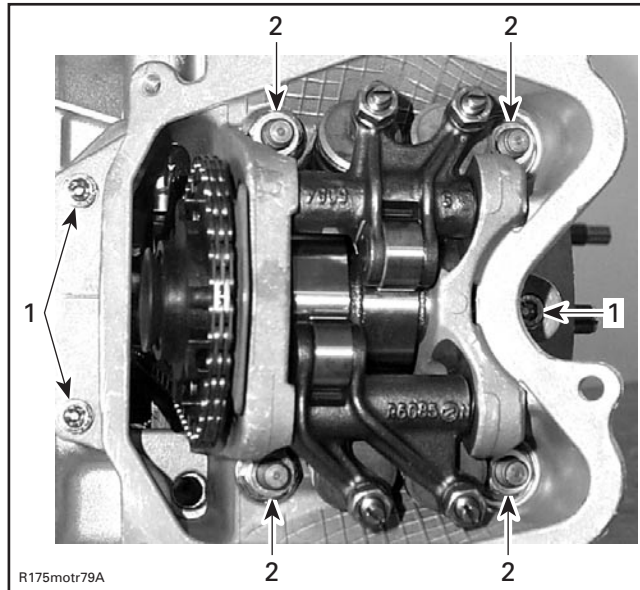
For installation, reverse the removal procedure. Pay attention to the following details.

Ensure dowel pins are in place.

Torque cylinder head nuts **no. 23** in criss-cross sequence at half of the recommended torque value in the exploded view.

Finish tightening hexagonal nuts **no. 23** criss-cross with the recommended values in the exploded view.

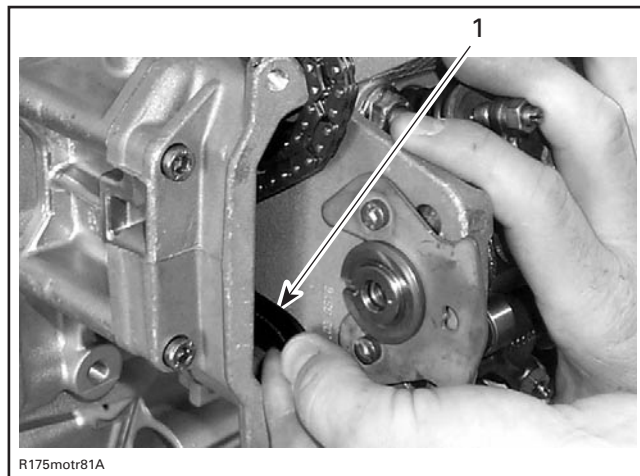
Torque cylinder head screws **no. 24** with the recommended values in the exploded view.



1. Cylinder head screws
2. Cylinder head nuts

Check chain guide **no. 22** for movement.

CAUTION: Chain guide is fixed between cylinder and cylinder head.



1. Chain guide

Remove crankshaft locking bolt then reinstall plug with sealing ring.

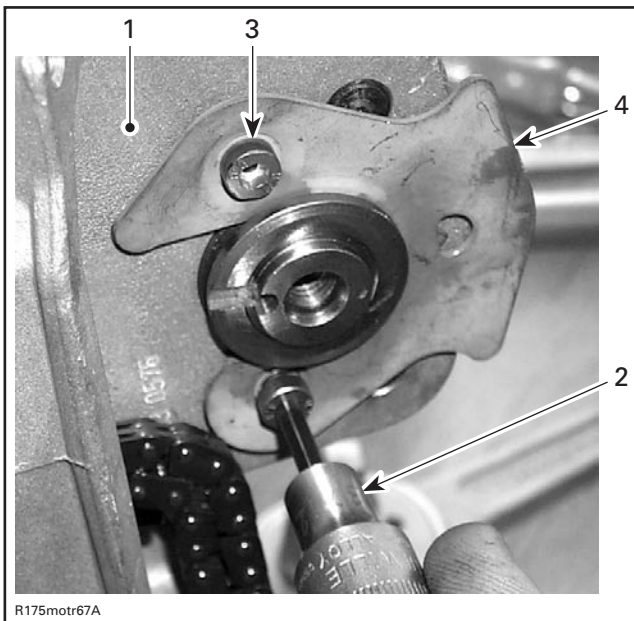
CAMSHAFT

Removal

The camshaft can be removed with the cylinder head installed.

Remove:

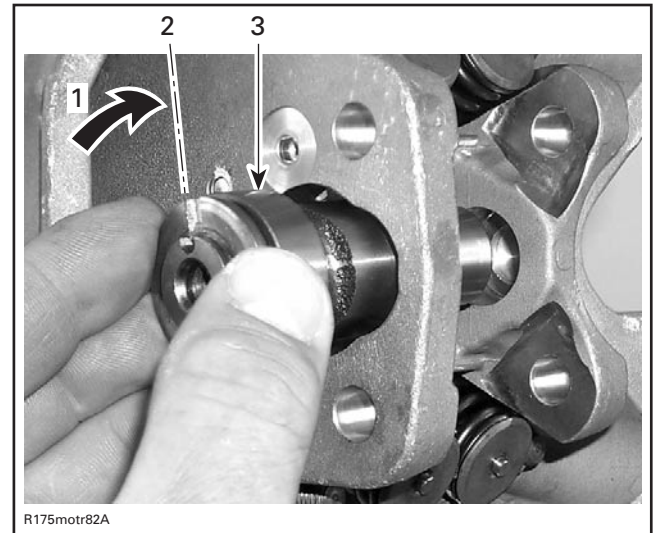
- valve cover (see VALVE COVER above)
- chain tensioner (see CHAIN TENSIONER above)
- breather (see BREATHER above)
- camshaft timing gear (see CAMSHAFT TIMING GEAR above)
- camshaft retaining plate **no. 10**



1. Cylinder head
2. Allen wrench (P/N 529 035 861)
3. Allen screws
4. Camshaft retaining plate

- rocker arms (see ROCKER ARM above)
- camshaft **no. 28**.

NOTE: Rotate camshaft for groove shows to cylinder head intake side to ease removal of the camshaft.

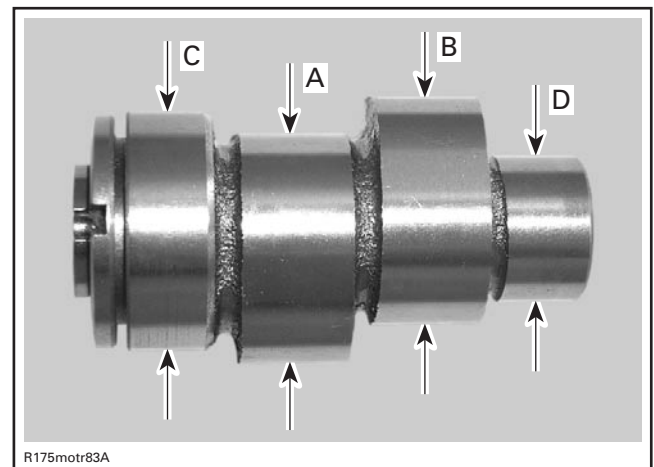


1. Direction of rotation
2. Groove exhaust port
3. Camshaft

Inspection

Check each lobe and bearing journal of camshaft for scoring, scuffing, cracks or other signs of wear.

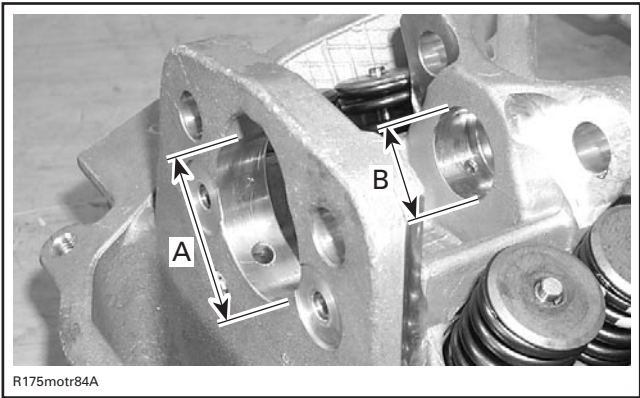
Measure camshaft bearing journal diameter and lobe height using a micrometer.



- A. Camshaft lobe (exhaust valves)
- B. Camshaft lobe (intake valves)
- C. Camshaft bearing journal MAG side
- D. Camshaft bearing journal PTO side

Measure clearance between both ends of camshaft and cylinder head.

Section 03 ENGINE
Subsection 08 (CYLINDER AND HEAD)



A. Cylinder head — camshaft bore MAG side
B. Cylinder head — camshaft bore PTO side

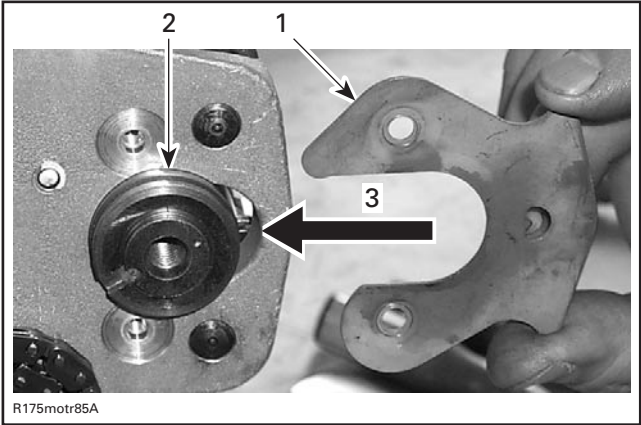
CAMSHAFT LOBE — EXHAUST/INTAKE VALVE	
NEW MINIMUM	30.887 mm (1.216 in)
NEW MAXIMUM	31.087 mm (1.224 in)
SERVICE LIMIT	30.800 mm (1.212 in)
CAMSHAFT BEARING JOURNAL — MAG SIDE	
NEW MINIMUM	31.950 mm (1.2579 in)
NEW MAXIMUM	31.975 mm (1.2589 in)
SERVICE LIMIT	31.930 mm (1.2571 in)
CAMSHAFT BEARING JOURNAL — PTO SIDE	
NEW MINIMUM	19.959 mm (.7858 in)
NEW MAXIMUM	19.980 mm (.7866 in)
SERVICE LIMIT	19.940 mm (.7850 in)
CAMSHAFT BORE — MAG SIDE MEASURED IN DIAMETER	
NEW MINIMUM	32.000 mm (1.2598 in)
NEW MAXIMUM	32.025 mm (1.2608 in)
SERVICE LIMIT	32.040 mm (1.2614 in)
CAMSHAFT BORE — PTO SIDE MEASURED IN DIAMETER	
NEW MINIMUM	20.000 mm (.7874 in)
NEW MAXIMUM	20.021 mm (.7882 in)
SERVICE LIMIT	20.035 mm (.7888 in)

Replace parts that are not within specifications.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Install camshaft in the opposite way of the removal then place the camshaft retaining plate in the slot.



1. Camshaft retaining plate position
2. Slot retaining camshaft
3. Direction of movement

For other parts, refer to proper installation procedure.

VALVE SPRING

Removal

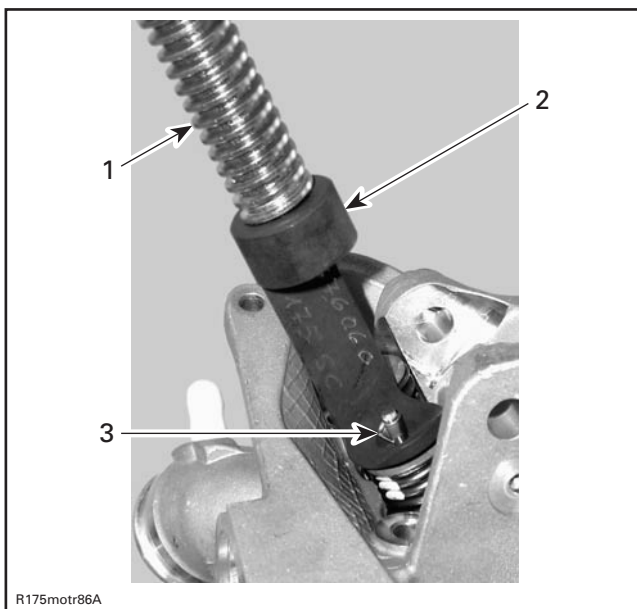
Remove:

- rocker arms (see ROCKER ARM above)
- cylinder head (see CYLINDER HEAD above).

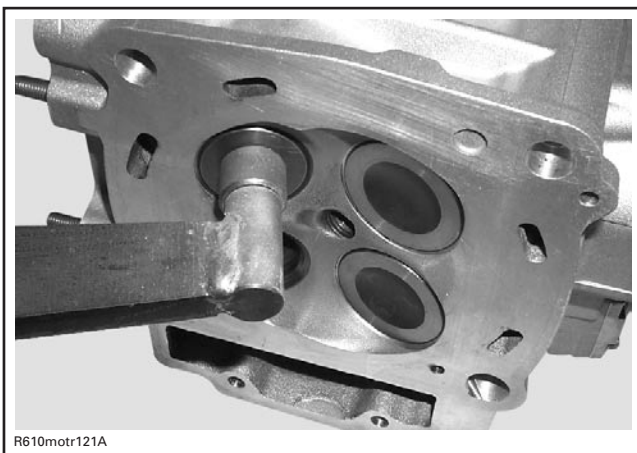
Compress valve spring **no. 29**, use valve spring compressor clamp (P/N 529 035 724) and valve spring compressor cup (P/N 529 035 725).

⚠ WARNING

Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.



1. Valve spring compressor clamp (P/N 529 035 724)
2. Valve spring compressor cup (P/N 529 035 725)
3. Valve cotter



LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

Remove valve cotteners **no. 30**.

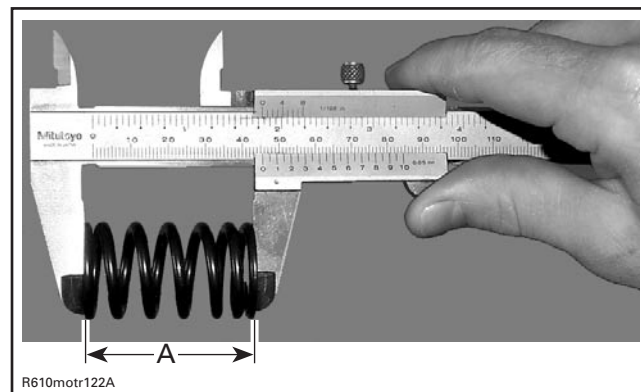
Withdraw valve spring compressor, valve spring retainer **no. 31** and valve spring **no. 29**.

Inspection

Check valve spring for visible damages. If so, replace valve spring.

Check valve spring for free length and straightness.

Replace valves if not within specifications.



A. Valve spring length

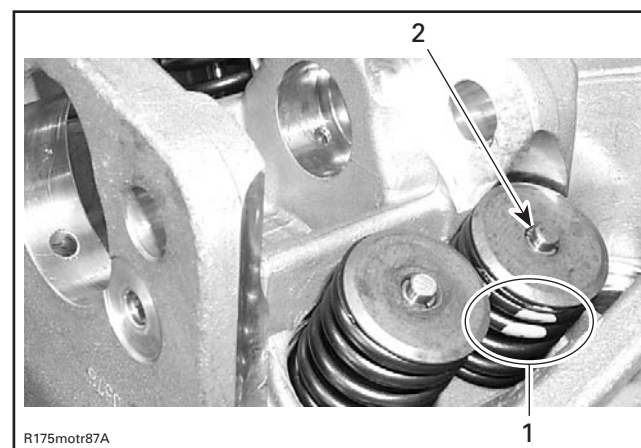
VALVE SPRING FREE LENGTH	
NEW NOMINAL	33.6 mm (1.323 in)
SERVICE LIMIT	33.0 mm (1.299 in)

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Colored area of the valve spring must be placed on top.

NOTE: Valve cotter must be properly engaged in valve stem grooves.



1. Position of the valve spring
2. Valve cotteners

Section 03

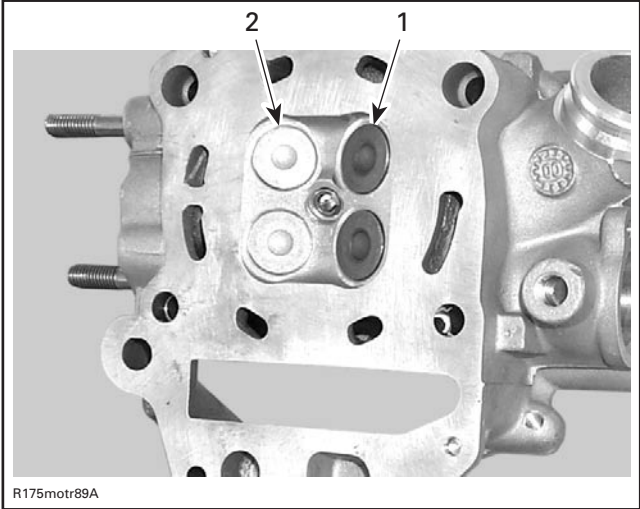
ENGINE

Subsection 08 (CYLINDER AND HEAD)

VALVE

Removal

Remove valve spring.
Push valve stem then pull valves no. 32 and no. 33 out of valve guide no. 36.



- 1. Intake valve 20 mm
- 2. Exhaust valve 18 mm

Remove valve stem seal no. 35 with special pliers such as Snap-ON YA 8230.



Inspection

Valve Stem Seal

Inspection of valve stem seals is not needed because new seals should always be installed whenever cylinder head is removed.

Valve

Inspect valve surface, check for abnormal stem wear and bending. If out of specification, replace by a new one.

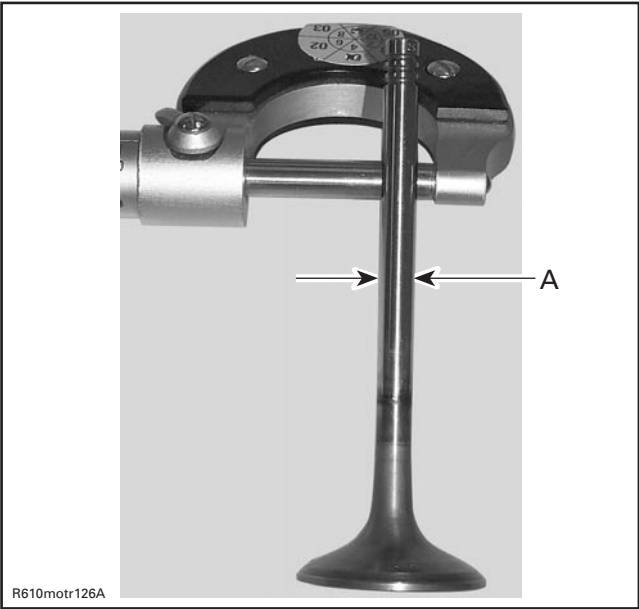
VALVE OUT OF ROUND mm (in)	
NEW NOMINAL	
EXHAUST	0.005 mm (.0002 in)
INTAKE	
SERVICE LIMIT	
EXHAUST	0.06 mm (.0024 in)
INTAKE	

Valve Stem and Valve Guide Clearance

Measure valve stem and valve guide in three places, using a micrometer and a small bore gauge.

NOTE: Clean valve guide to remove carbon deposits before measuring.

Change valve if valve stem is out of specification or has other damages such as wear or friction surface.



A. Valve stem diameter

Section 03 ENGINE

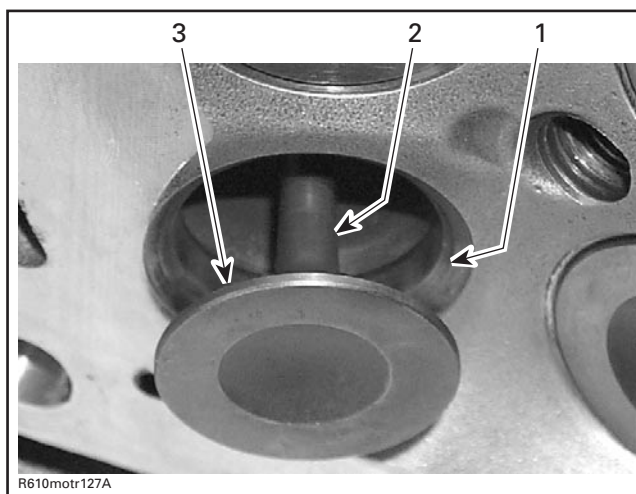
Subsection 08 (CYLINDER AND HEAD)

VALVE STEM DIAMETER mm (in)	
NEW MINIMUM	
EXHAUST	3.96 mm (.1559 in)
INTAKE	3.97 mm (.1563 in)
NEW MAXIMUM	
EXHAUST	3.97 mm (.1563 in)
INTAKE	3.98 mm (.1567 in)
SERVICE LIMIT	
EXHAUST	3.940 mm (.1551 in)
INTAKE	

Replace valve guide out of cylinder head if valve guide is out of specification or has other damages such as wear or friction surface (see VALVE GUIDE PROCEDURE below).

VALVE GUIDE DIAMETER mm (in)	
SERVICE LIMIT	
EXHAUST	4.060 mm (.1598 in)
INTAKE	

Valve Face and Seat



1. Valve seat
2. Exhaust valve contaminated area
3. Valve face (contact surface to valve seat)

Check valve face and seat for burning or pittings and replace valve or cylinder head if there are signs of damage.

Ensure to seat valves properly. Apply some lapping compound to valve face and work valve on its seat with a lapping tool (see VALVE GUIDE PROCEDURE below).

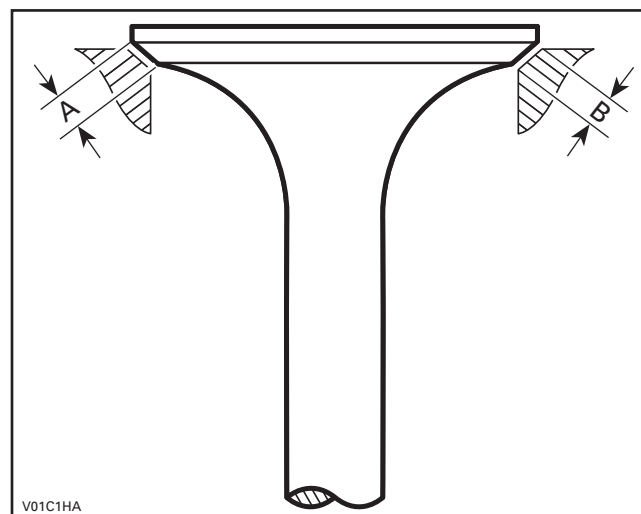
Measure valve face contact width.

NOTE: The location of contact area should be in center of valve seat.

Measure valve seat width, using a caliper.

VALVE SEAT CONTACT WIDTH mm (in)	
NEW	
EXHAUST	1.25 to 1.55 mm (.049 to .061 in)
INTAKE	1.05 to 1.35 mm (.041 to .053 in)
SERVICE LIMIT	
EXHAUST	2 mm (.078 in)
INTAKE	1.8 mm (.07 in)

If valve seat contact width is too wide or has dark spots, replace the cylinder head.



- A. Valve face contact width
B. Valve seat contact width

Section 03 ENGINE

Subsection 08 (CYLINDER AND HEAD)

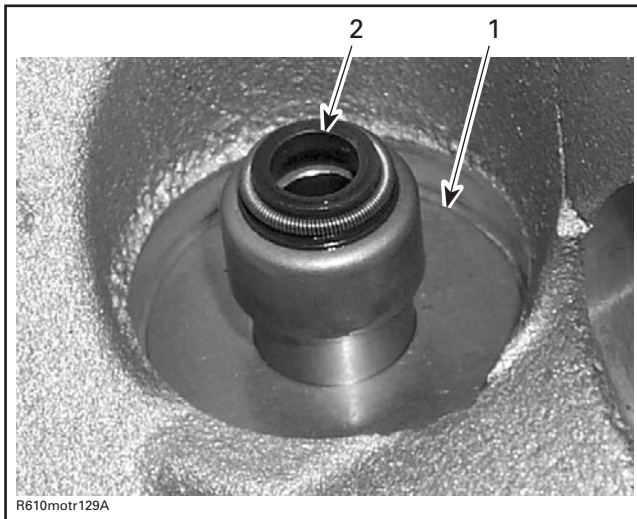
Installation

For installation, reverse the removal procedure. Pay attention to the following details.

CAUTION: Make sure the thrust washer **no. 34** is installed before installing valve stem seal **no. 35**.

Apply engine oil on valve stem and install it.

CAUTION: Be careful when valve stem is passed through sealing lips of valve stem seal.



1. Thrust washer
2. Sealing lips of valve stem seal

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

CAUTION: An improperly locked valve spring will cause engine damage.

VALVE GUIDE PROCEDURE

Removal

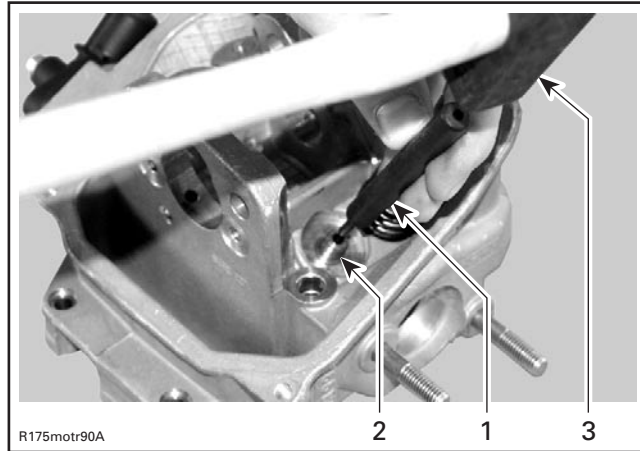
Remove:

- cylinder head (see CYLINDER HEAD above)
- valve spring (see VALVE SPRING above)
- valve (see VALVE above).

NOTE: Clean valve guide area from contamination before removal.

Heat the valve guide area during approximately 10 minutes to 100°C (212°F).

Using valve guide remover (P/N 529 035 852), remove valve guide **no. 36**.



1. Valve guide remover
2. Valve guide
3. Hammer

Inspection

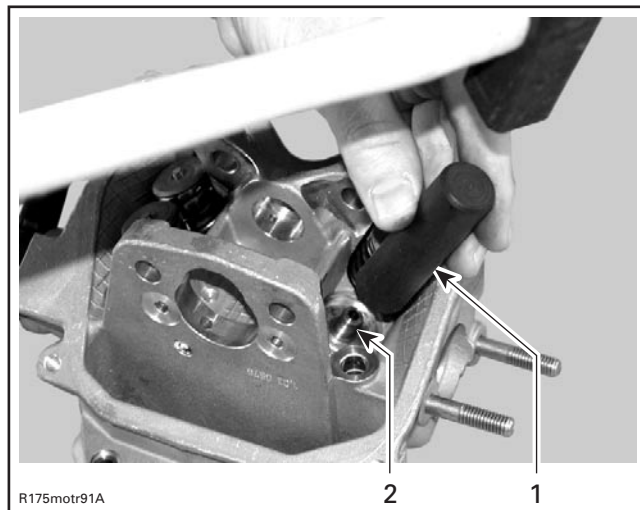
Always replace valve stem seals whenever cylinder head is removed.

Clean the valve guide bore before reinstall the valve guide into cylinder head.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

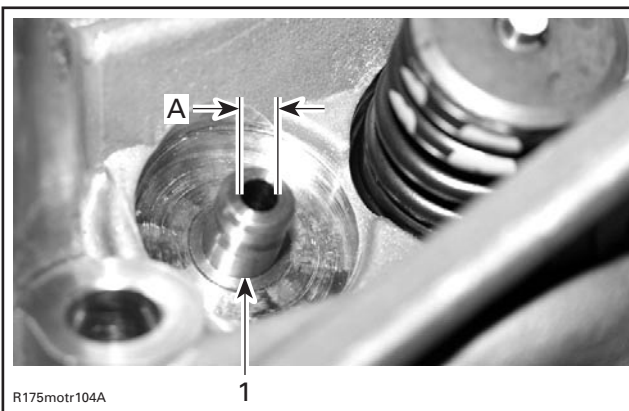
Use valve guide installer (P/N 529 035 853) to install valve guide **no. 36**.



1. Valve guide installer
2. Valve guide

Valve guide to be grinded in diameter by using a reamer.

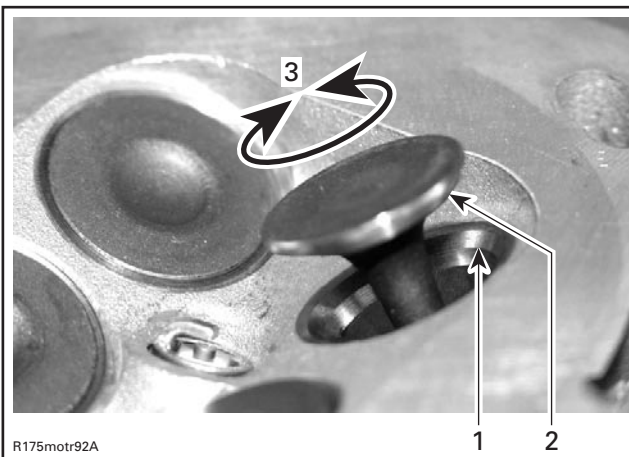
VALVE GUIDE DIAMETER mm (in)	
NEW MINIMUM	
EXHAUST	4.002 mm (.1576 in)
INTAKE	
NEW MAXIMUM	
EXHAUST	4.015 mm (.1581 in)
INTAKE	



1. Valve guide
A. Valve guide diameter

NOTE: Ensure to turn reamer right direction. Use cutting oil and make brakes to clean reamer/valve guide from metal shavings.

Apply some lapping compound to valve face and work valve on its seat with a lapping tool.



1. Valve seat
2. Valve face (contact surface to valve seat)
3. Turn valve while pushing again cylinder head

NOTE: Ensure to seat valves properly. Apply marking paste to ease checking contact pattern.

CYLINDER

Removal

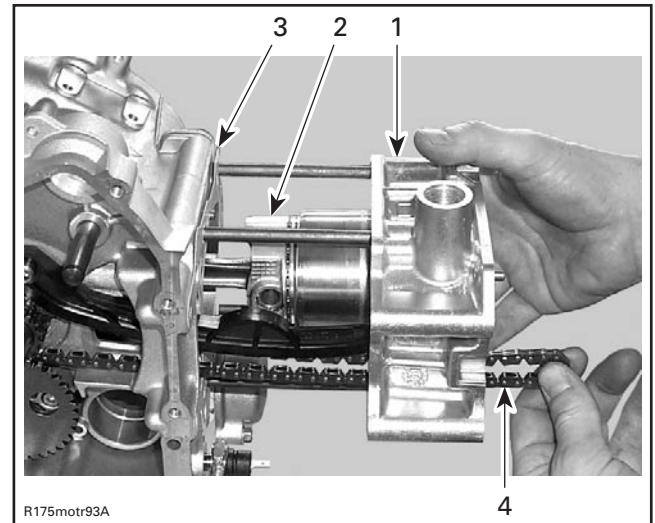
Lock crankshaft at TDC compression position, refer to **CRANKSHAFT**.

Remove:

- chain tensioner (see CHAIN TENSIONER above)
- breather (see BREATHER above)
- camshaft timing chain
- cylinder head (see CYLINDER HEAD above).

Pull cylinder **no. 37**.

Discard cylinder gasket **no. 38**.



1. Cylinder
2. Piston assembly
3. Cylinder base gasket
4. Camshaft timing chain

Inspection

Cylinder

Check cylinder for cracks, scoring and wear ridges on the top and bottom of the cylinder. If so, replace cylinder.

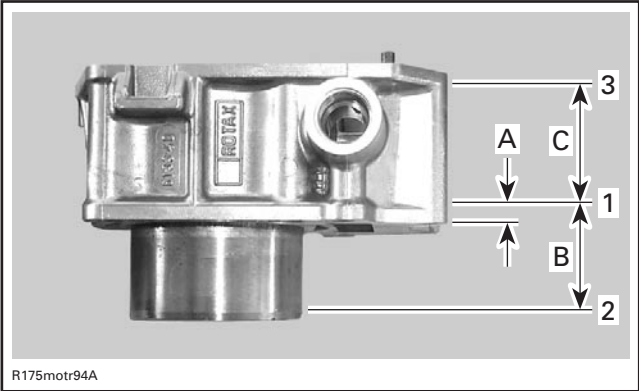
Section 03 ENGINE

Subsection 08 (CYLINDER AND HEAD)

Cylinder Taper

Measure cylinder bore and if it is out of specifications, replace cylinder and piston ring set **no. 39**.

Measure cylinder bore at 3 recommended positions. See the following illustration.



- 1. First measuring diameter
- 2. Second measuring diameter
- 3. Third measuring diameter
- A. 7 mm (.276 in) from cylinder bottom
- B. 36 mm (1.417 in)
- C. 23 mm (.905 in)

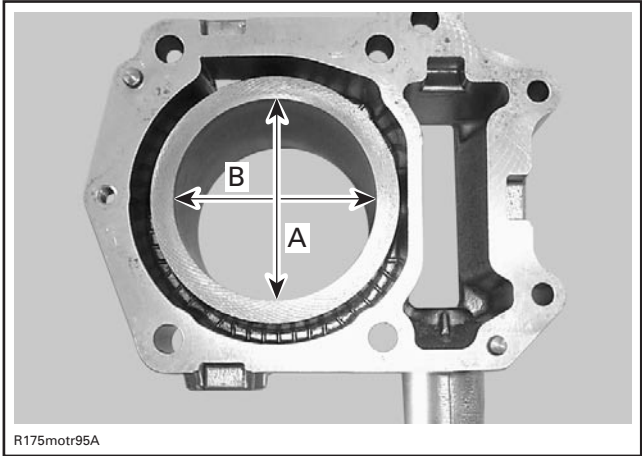
CYLINDER TAPER IN DIAMETER mm (in)	
NEW MAXIMUM	0.052 mm (.002 in)
SERVICE LIMIT	0.090 mm (.004 in)

Distance between measurements should not exceed the service limit mentioned above.

Cylinder Out of Round

Measure cylinder diameter in piston axis direction from top of cylinder. Take an other measurement 90° from first one and compare.

NOTE: Take the same measuring points like described in CYLINDER TAPER above.



- A. Perpendicular to crankshaft axis
- B. Parallel to crankshaft axis

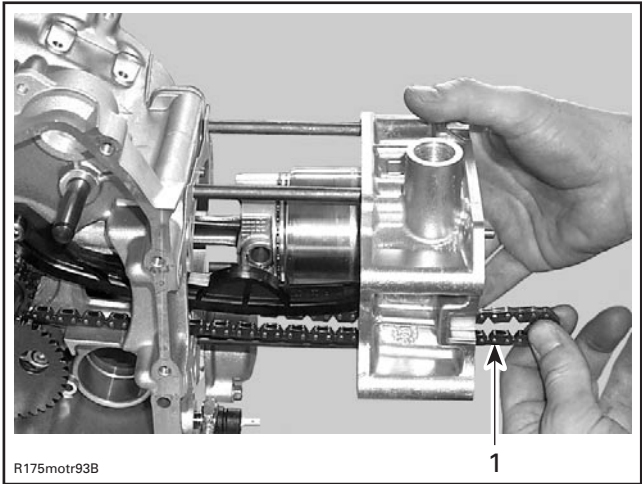
CYLINDER OUT OF ROUND mm (in)	
NEW MAXIMUM	0.015 mm (.0006 in)
SERVICE LIMIT	0.02 mm (.0008 in)

CAUTION: Always replace gasket **no. 38** before installing the cylinder.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Apply engine oil in the bottom area of the cylinder bore and also on the band of the piston ring compressor tool.



- 1. Timing chain

NOTE: Put timing chain through the chain pit then put the cylinder in place.

Install cylinder head and the other parts in accordance with the proper installation procedures.

PISTON

Removal

Remove:

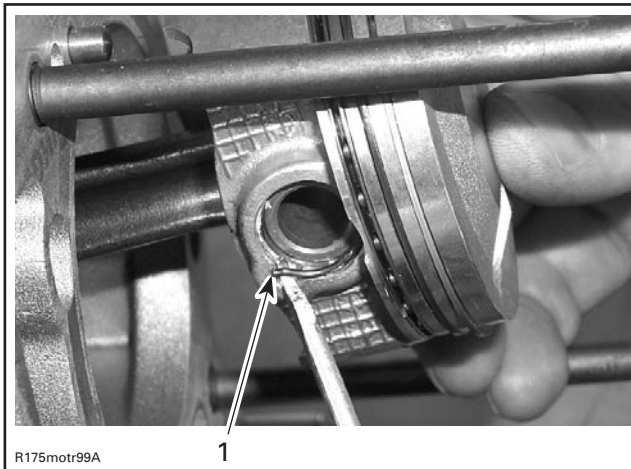
- cylinder head (see CYLINDER HEAD above)
- cylinder (see CYLINDER above).

Place a rag under piston.

WARNING

Piston ring circlips are spring loaded.

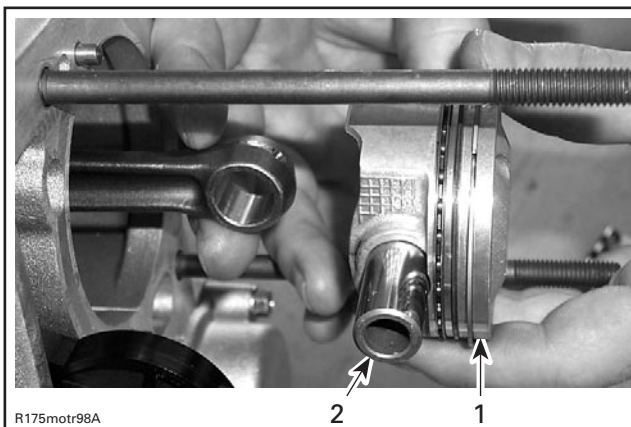
Remove one piston circlip **no. 40** and discard it.



1. Piston circlip

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

Push piston pin **no. 41** out of piston.



1. Piston
 2. Piston pin

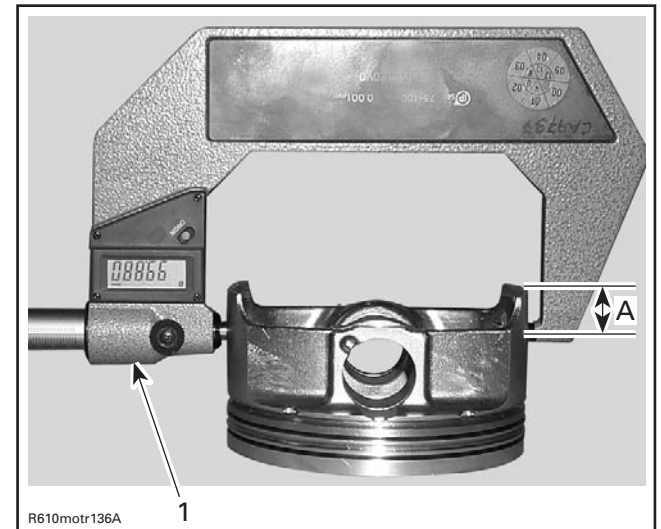
Detach piston **no. 42** from connecting rod.

Inspection

Piston

Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary.

Using a micrometer, measure piston at 9 mm (.354 in) perpendicularly (90°) to piston pin.



1. Measuring perpendicularly (90°) to piston pin
 A. 9 mm (.354 in)

The measured dimension should be as described in the following table. If not, replace piston.

PISTON MEASUREMENT	
NEW NOMINAL	61.942 to 61.958 mm (2.438 to 2.439 in)
SERVICE LIMIT	61.80 mm (2.433 in)

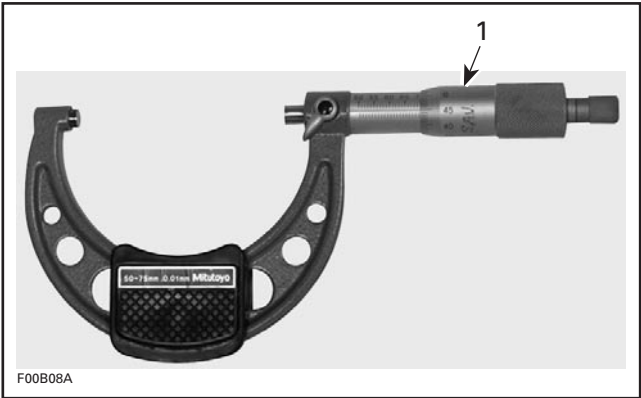
Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.

Section 03

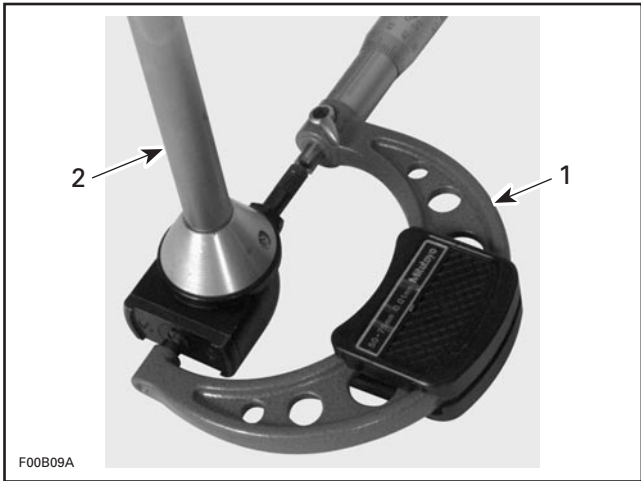
ENGINE

Subsection 08 (CYLINDER AND HEAD)

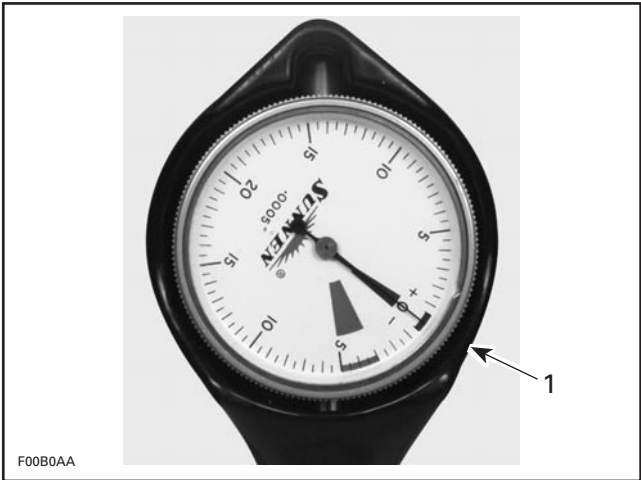


1. Micrometer set to the piston dimension

With the micrometer set to the dimension, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to 0 (zero).



1. Use the micrometer to set the cylinder bore gauge
2. Dial bore gauge



TYPICAL
1. Indicator set to 0 (zero)

Position the dial bore gauge 47 mm (1.85 in) above cylinder base, measuring perpendicularly (90°) to piston pin axis.

Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.

PISTON/CYLINDER CLEARANCE	
NEW NOMINAL	0.042 to 0.072 mm (.0017 to .0028 in)
SERVICE LIMIT	0.090 mm (.004 in)

NOTE: Make sure used piston is not worn. See **Piston Measurement** above.

If clearance exceeds specified tolerance, replace cylinder.

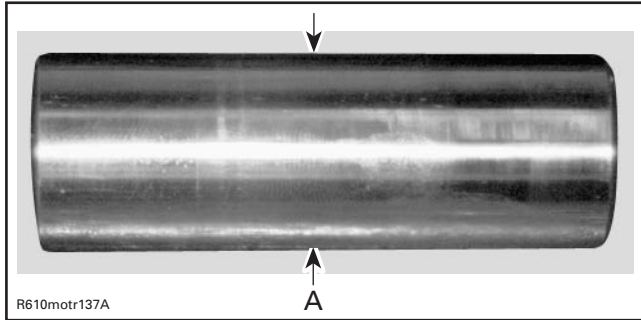
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

Piston Pin

Using synthetic abrasive woven, clean piston pin from deposits.

Inspect piston pin for scoring, cracking or other damages.

Measure piston pin. See the following illustration for the proper measurement positions.



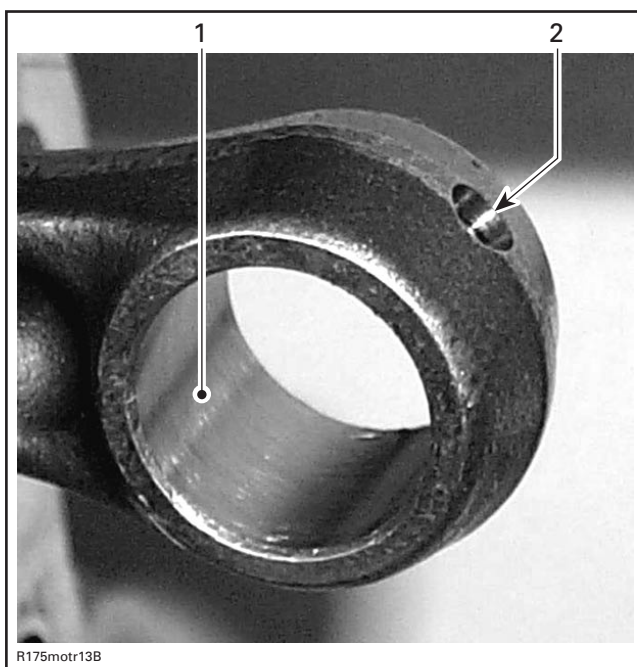
A. Piston pin diameter

PISTON PIN	
NEW MINIMUM	14.997 mm (.5904 in)
NEW MAXIMUM	15.000 mm (.5905 in)
SERVICE LIMIT	14.990 mm (.5902 in)

Replace piston pin if diameter is out of specifications.

Piston Pin/Connecting Rod Bushing Clearance
Measure inside diameter of connecting rod.

CONNECTING ROD SMALL END DIAMETER	
NEW MINIMUM	15.005 mm (.5907 in)
NEW MAXIMUM	15.015 mm (.5911 in)
SERVICE LIMIT	15.06 mm (.593 in)



1. Connecting rod small end diameter
2. Oil supply due to oil dust

Replace crankshaft if diameter of connecting rod small end is out of specifications. Refer to **CRANK-SHAFT** for removal procedure.

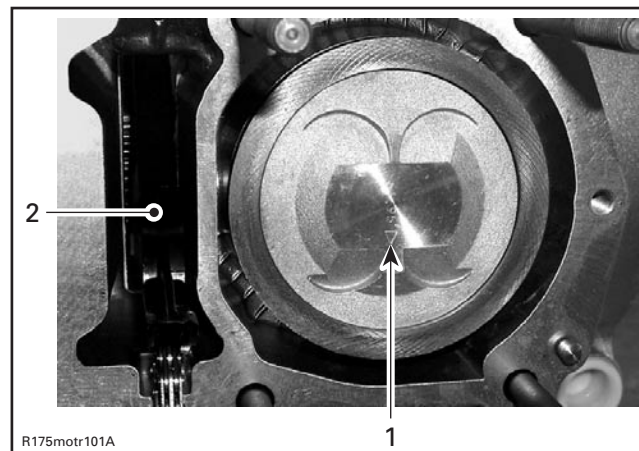
Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Apply engine oil on the piston pin.

Insert piston pin into piston and connecting rod.

CAUTION: Take care that piston will be installed with the punched arrow on piston top to the exhaust side.

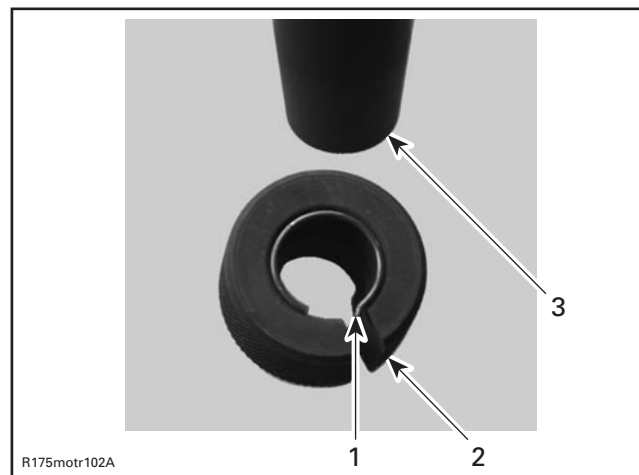


1. Arrow should indicate to the exhaust side
2. Area of timing chain compartment

Use the piston circlip installer (P/N 529 035 859) to assemble the piston circlip as per following procedure:

CAUTION: Secure piston pin with new piston circlips.

- place circlip no. 40 in sleeve as per following illustration



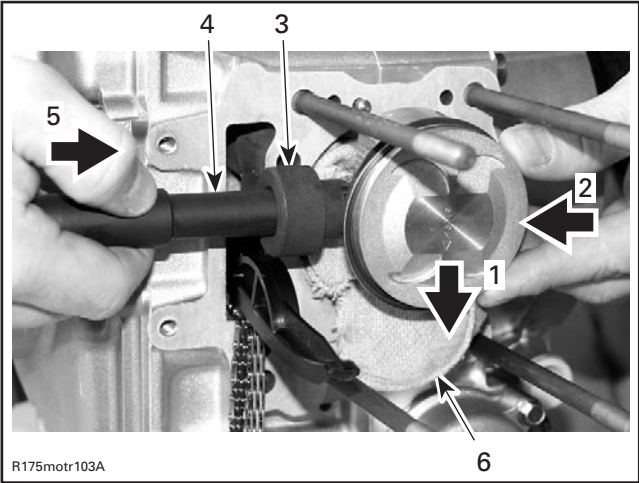
1. Circlip
2. Sleeve
3. Assembly jig from piston clip installer

- push taper side of assembly jig until circlip reaches middle of sleeve
- place sleeve align with piston pin axis and push assembly jig until circlip engages in piston.

Section 03

ENGINE

Subsection 08 (CYLINDER AND HEAD)



- 1. Arrow should indicate to the exhaust side
- 2. Hold piston while pushing circlip in place
- 3. Sleeve
- 4. Assembly jig
- 5. Direction to push circlip
- 6. Cleaning rag

NOTE: Take care that the hook of the piston circlip is positioned properly.



CORRECT POSITION OF THE PISTON CIRCLIP

PISTON RINGS

Removal

Remove:

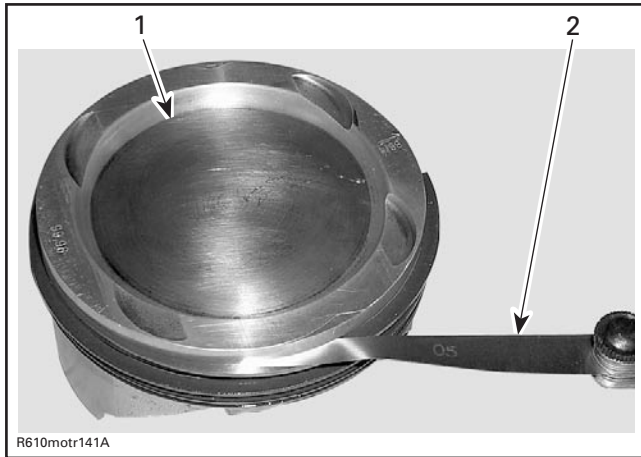
- cylinder head
- cylinder
- piston pin.

Inspection

Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance. If the clearance is too large, the piston and the piston rings should be replaced.

RING/PISTON GROOVE CLEARANCE mm (in)	
NEW MINIMUM	
RECTANGULAR	0.03 mm (.0012 in)
TAPER-FACE	0.03 mm (.0012 in)
OIL SCRAPER RING	0.01 mm (.0004 in)
NEW MAXIMUM	
RECTANGULAR	0.065 mm (.0026 in)
TAPER-FACE	0.065 mm (.0026 in)
OIL SCRAPER RING	0.18 mm (.007 in)
SERVICE LIMIT	
RECTANGULAR TAPER-FACE	0.10 mm (.0039 in)
OIL SCRAPER RING	0.25 mm (.0098 in)



- 1. Piston
- 2. Feeler gauge

Ring End Gap

RING END GAP	
NEW MINIMUM	
RECTANGULAR	0.20 mm (.008 in)
TAPER-FACE	0.20 mm (.008 in)
OIL SCRAPER RING	0.20 mm (.008 in)
NEW MAXIMUM	
RECTANGULAR	0.35 mm (.014 in)
TAPER-FACE	0.35 mm (.014 in)
OIL SCRAPER RING	0.70 mm (.028 in)
SERVICE LIMIT	
RECTANGULAR TAPER-FACE	0.8 mm (.032 in)
OIL SCRAPER RING	1.2 mm (.047 in)

Measure position for ring end gap in the area of 8 to 16 mm (.315 to .630 in) from top of cylinder.

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

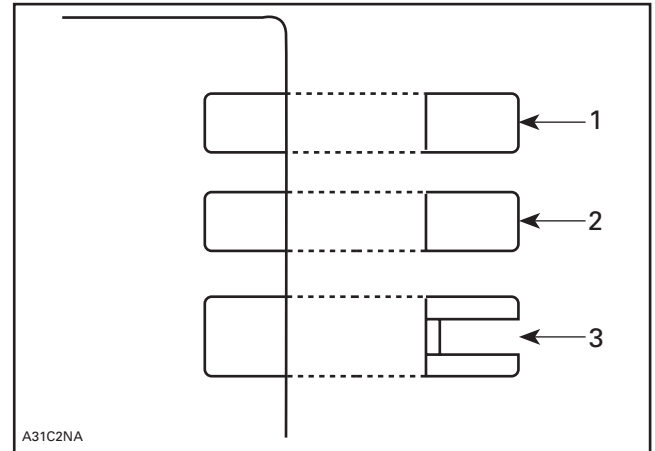
Using a feeler gauge, check ring end gap. Replace ring if gap exceeds above described specified tolerance.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

NOTE: First install spring and then rings of oil scraper ring.

Install the oil scraper ring first, then the taper-face ring with the word "N and TOP" facing up, then the rectangular ring with the word "N and TOP" facing up.



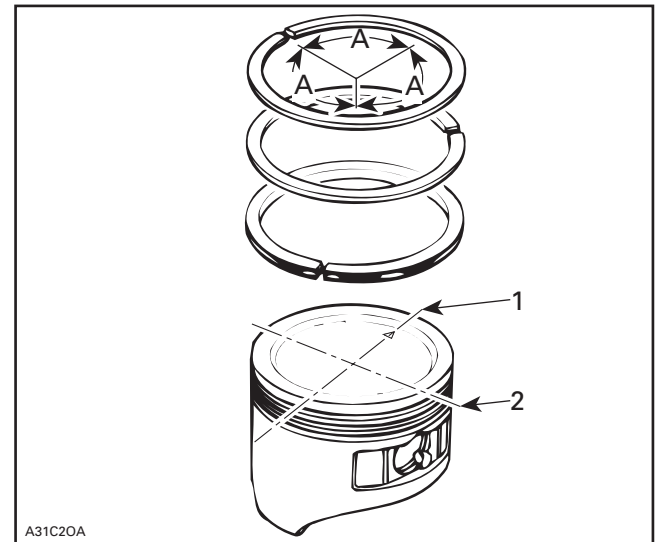
1. Rectangular ring
2. Taper-face ring
3. Oil scraper ring

CAUTION: Ensure that top and second rings are not interchanged.

NOTE: Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.

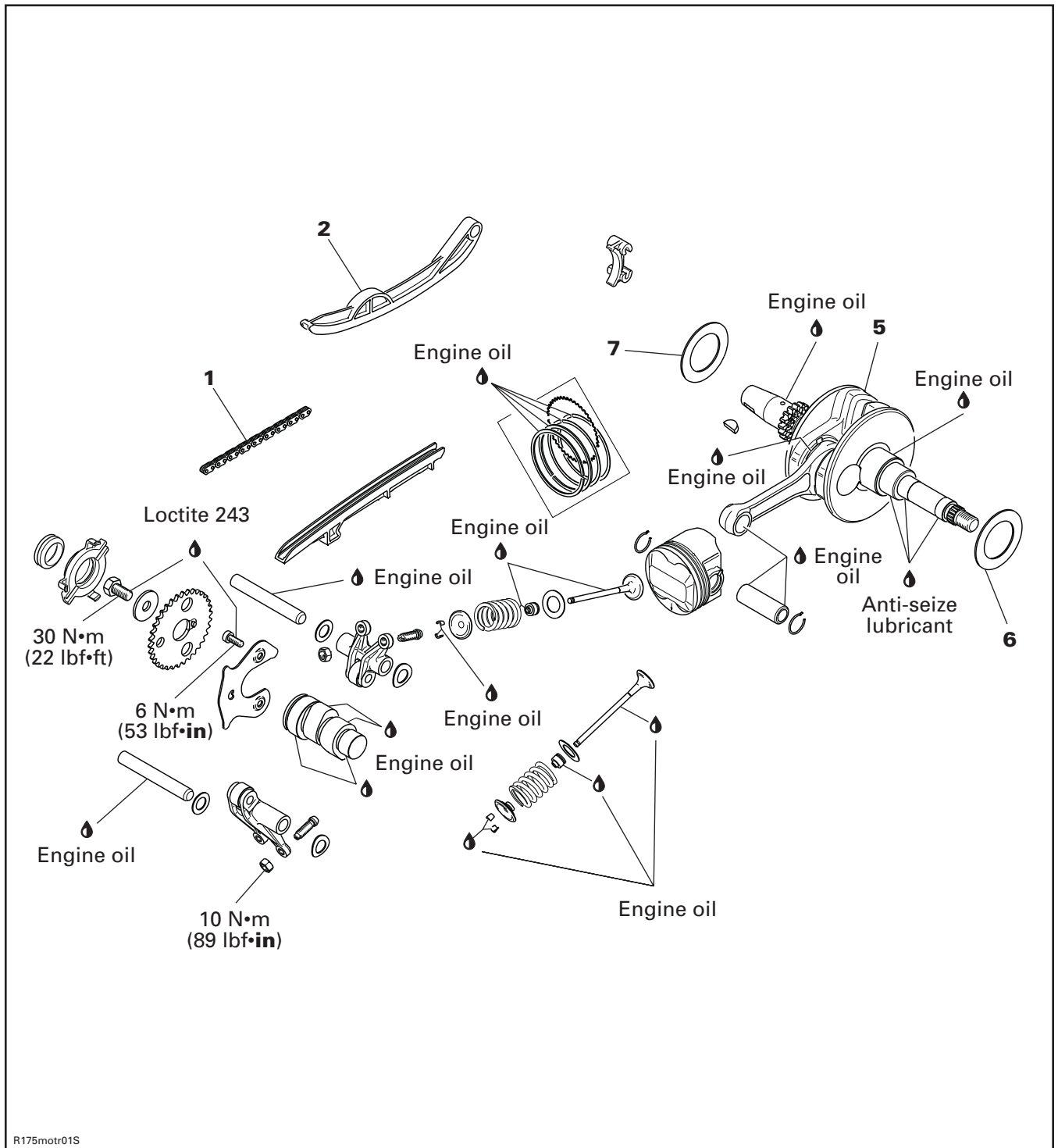
Check that rings rotate smoothly after installation.

Space the piston ring end gaps 120° apart and do not align the gaps with the piston pin bore or the thrust side axis.



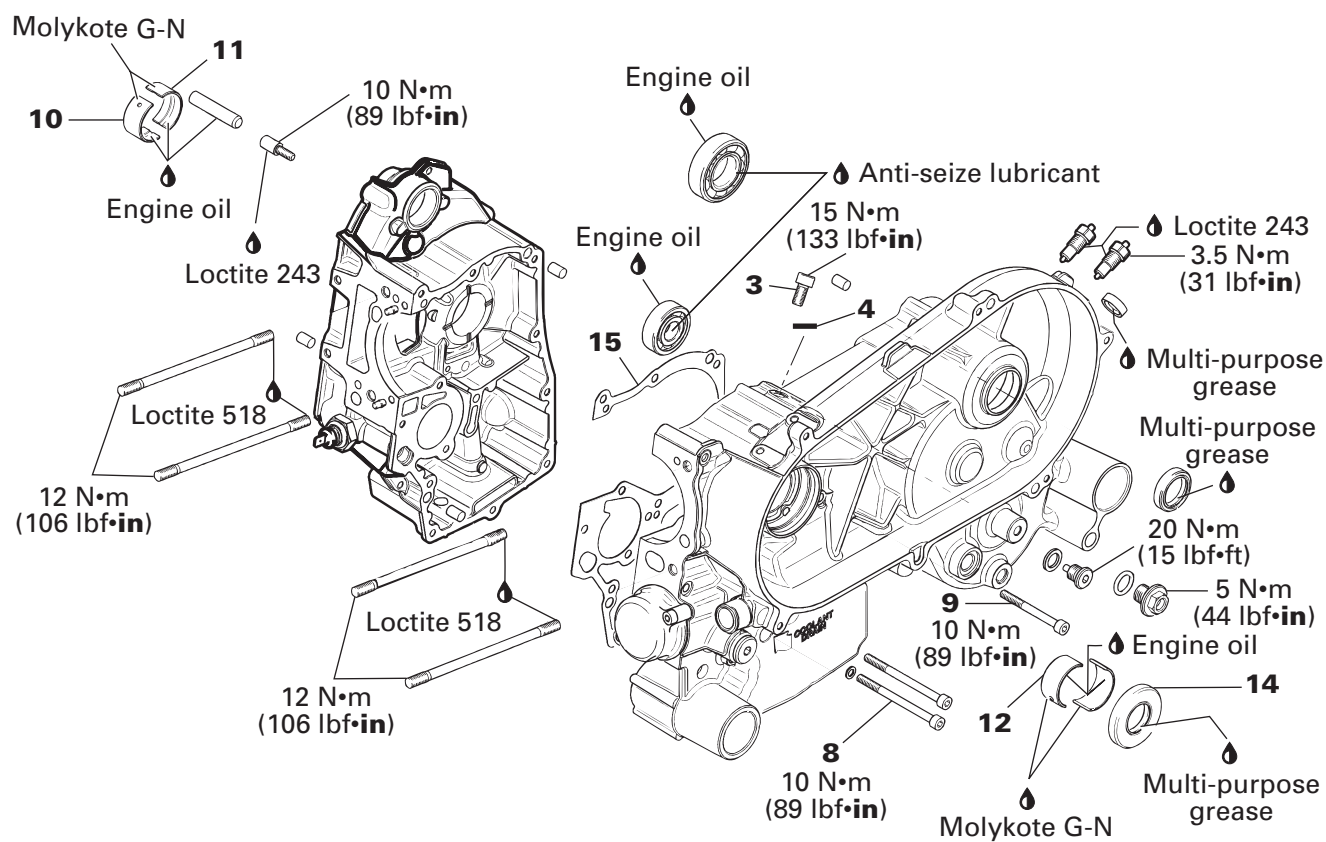
1. DO NOT align ring gap with piston thrust side axis
2. DO NOT align ring gap with piston pin bore axis
- A. 120°

CRANKSHAFT



Section 03 ENGINE

Subsection 09 (CRANKSHAFT)



R175motr03S

GENERAL

For installation, use the torque values and Loctite products from the exploded views. Clean threads before using Loctite when installing the screws.

WARNING

Torque wrench tightening specifications must strictly be adhered to.

Locking devices (ex.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

CRANKSHAFT LOCKING PROCEDURE

Removal

Unplug spark plug cable then remove the spark plug.

Remove:

- RH footwell
- valve cover and breather (refer to **CYLINDER AND HEAD**)
- magneto cover (refer to **MAGNETO SYSTEM**)
- screw **no. 3** and shim **no. 4**.



1. Screw
2. Copper shim

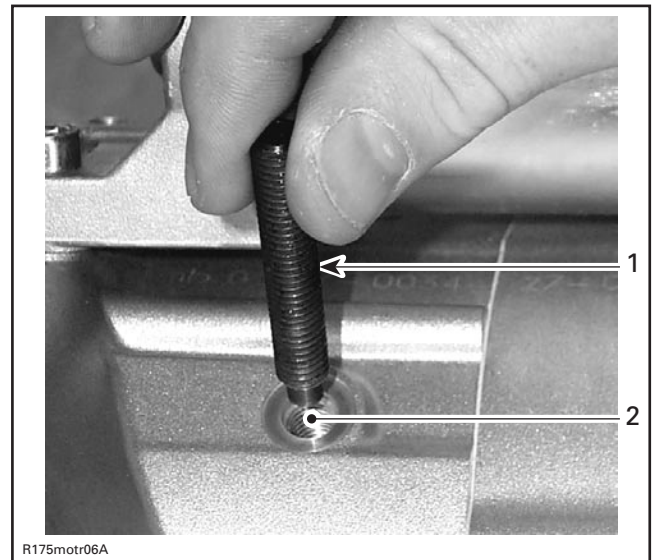
Turn rotor, fixed on crankshaft MAG side, to TDC compression position (refer to **CYLINDER AND HEAD**).

Use a screwdriver to check if groove in crankshaft is aligned with the hole.



1. Screwdriver

Lock crankshaft with crankshaft locking bolt (P/N 529 035 617).

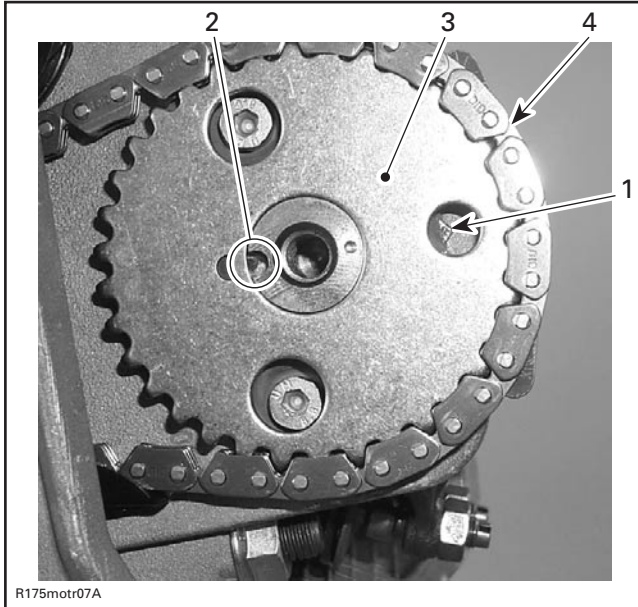


1. Crankshaft locking bolt
2. Hole in the area of electrical starter

Section 03 ENGINE

Subsection 09 (CRANKSHAFT)

Double-check camshaft timing gear position (refer to **CYLINDER AND HEAD**).



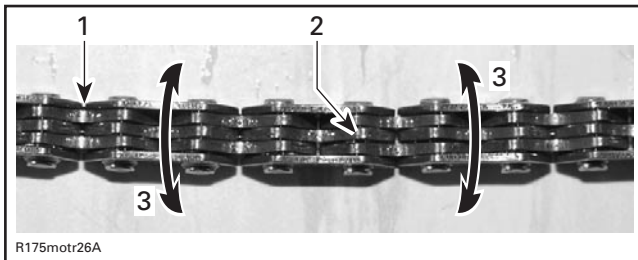
1. Cylinder bore axle (arrow middle of the timing gear bore)
2. Groove in the camshaft
3. Timing chain gear
4. Timing chain

TIMING CHAIN

Inspection

Check timing chain **no. 1** on camshaft timing gear for excessive radial play.

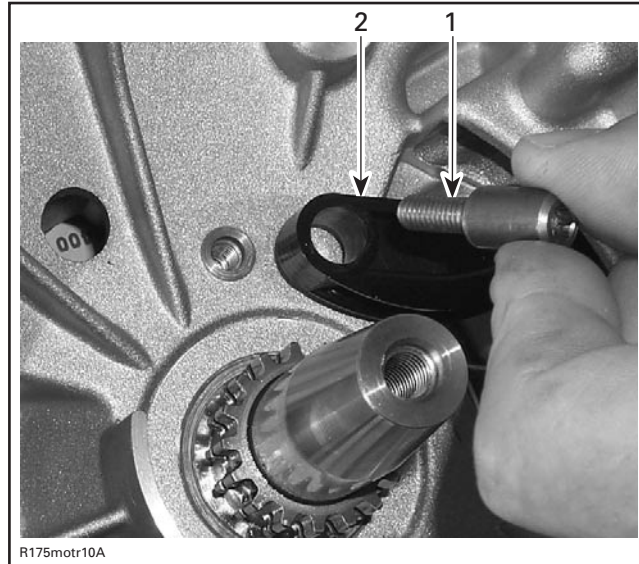
Check chain condition for wear and the condition of the segment.



1. Timing chain
2. Timing chain segments
3. Timing chain bending

If chain is excessively worn or damaged, replace it as a set (camshaft timing gear and timing chain).

Check chain tensioner guide **no. 2** for excessive wear on contact surface to timing chain, replace if necessary.



1. Bearing screw
2. Chain tensioner guide

Removal

Remove RH foot well.

Drain engine oil (refer to **LUBRICATION SYSTEM**, see **OIL CHANGE**).

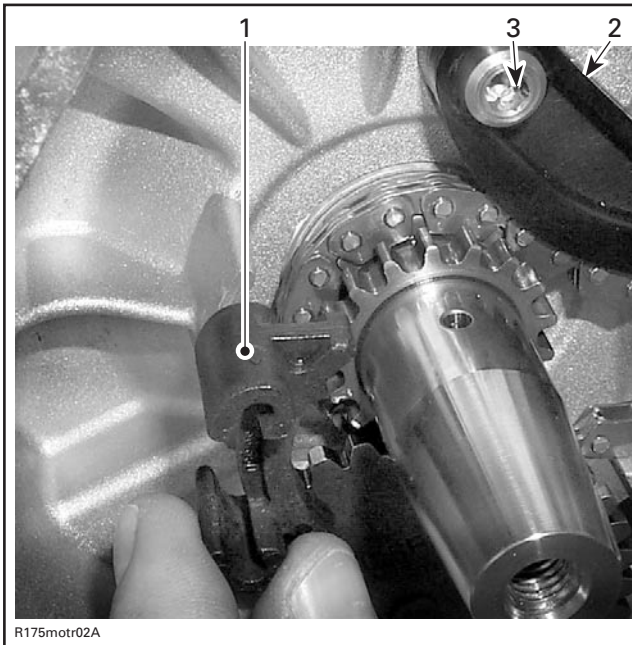
NOTE: No need to drain cooling system.

Remove:

- valve cover
(refer to **CYLINDER AND HEAD**)

Lock crankshaft at TDC compression position (see TDC procedure below).

- chain tensioner
(refer to **CYLINDER AND HEAD**)
- camshaft timing gear
(refer to **CYLINDER AND HEAD**)
- magneto cover and rotor
(refer to **MAGNETO SYSTEM**)
- oil pump
(refer to **LUBRICATION SYSTEM**)
- chain guide



1. Chain guide
2. Chain tensioner guide
3. Bearing screw

– timing chain.

NOTE: Mark timing chain and crankcase MAG as per following illustration for proper chain position after reassembling.



1. Mark on chain
2. Mark on crankcase MAG

Installation

The installation is essentially the reverse of the removal procedure but, pay attention to the following details.

Ensure to perform proper valve timing. Lock crankshaft (see TDC procedure below) and place camshaft at ignition TDC (refer to **CYLINDER AND HEAD**).

CAUTION: Crankshaft and camshaft must be locked on ignition TDC position to place camshaft timing gear and timing chain in the proper position.

NOTE: Place chain according to marks on timing chain and crankcase MAG for proper chain position after reassembling.

Install chain then, adjust chain tension (refer to **CYLINDER AND HEAD**).

CAUTION: Improper valve timing will damage engine components.

CRANKSHAFT

Removal

Drain engine oil and cooling system.

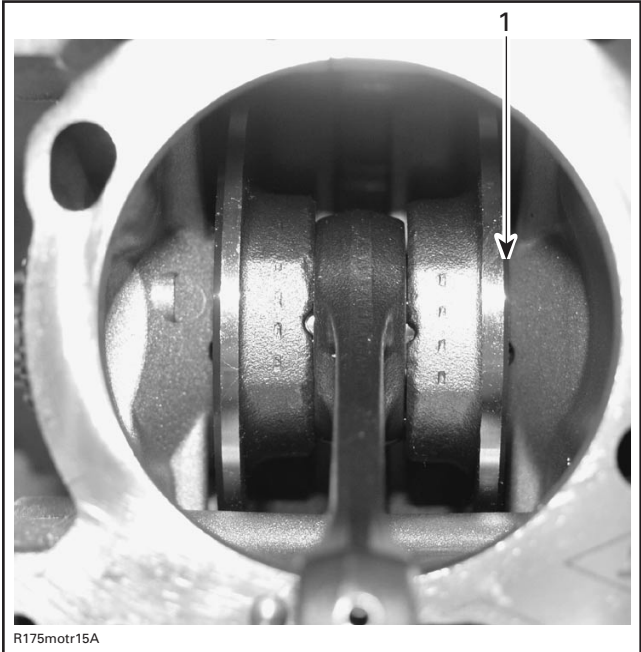
Remove:

- RH footwell and RH cover (refer to **BODY**).
- magneto cover and rotor (refer to **MAGNETO SYSTEM**)
- water pump (refer to **COOLING SYSTEM**)
- oil pump (refer to **LUBRICATION SYSTEM**)
- cylinder and piston (refer to **CYLINDER AND HEAD**).

Section 03 ENGINE

Subsection 09 (CRANKSHAFT)

Measure axial clearance of the crankshaft **no. 5** with a feeler gauge on the PTO side between PTO crankcase and shim **no. 6**.



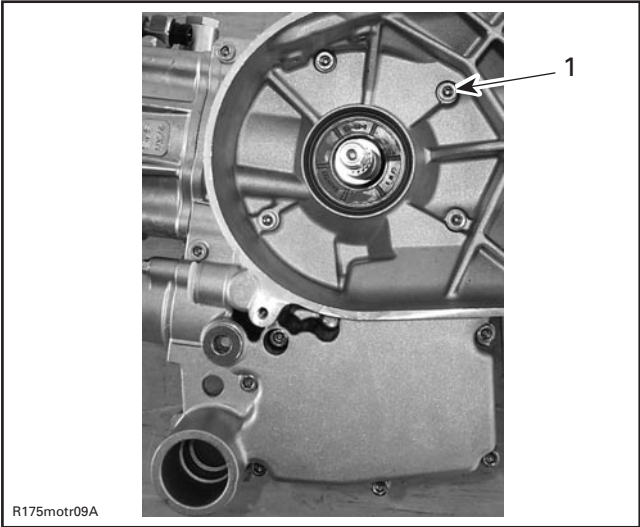
1. Feeler gauge on PTO side

CRANKSHAFT AXIAL CLEARANCE	
NEW MINIMUM	0.2 mm (.0078 in)
NEW MAXIMUM	0.4 mm (.0157 in)

If measurement is out of specification check shims **nos. 6** and **7** for excessive wear and/or if shim(s) is (are) missing. Furthermore, inspect butting faces of crankshaft and crankcases (MAG/PTO side) for excessive wear.

Remove:

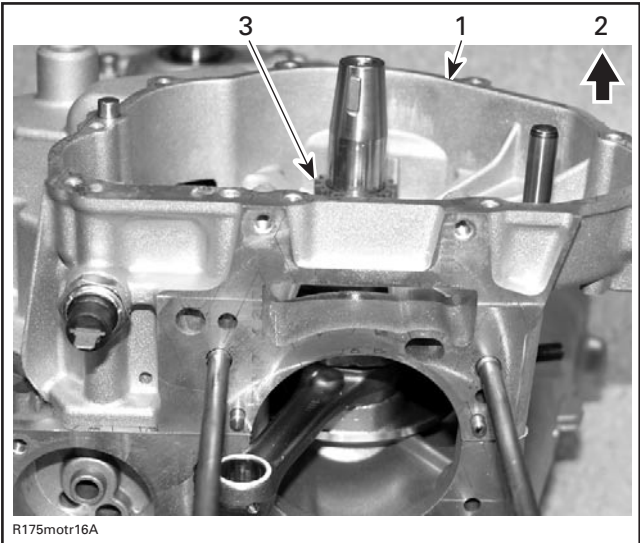
- timing chain
- drive pulley (refer to **CVT**, see **DRIVE PULLEY**)
- screws **no. 8** and screws **no. 9**



1. Screws (12)

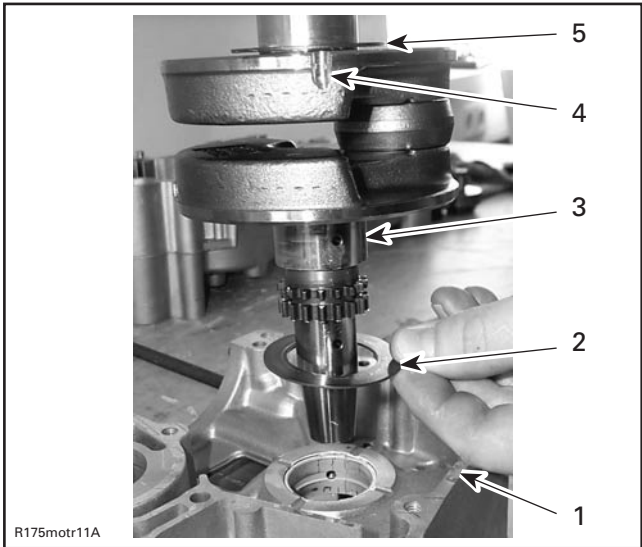
– MAG crankcase (see **CRANKCASE** below)

CAUTION: Pay attention not to damage plain bearing on MAG side with timing gear on crankshaft.



1. Crankcase MAG
2. Lifting direction
3. Timing gear on crankshaft MAG

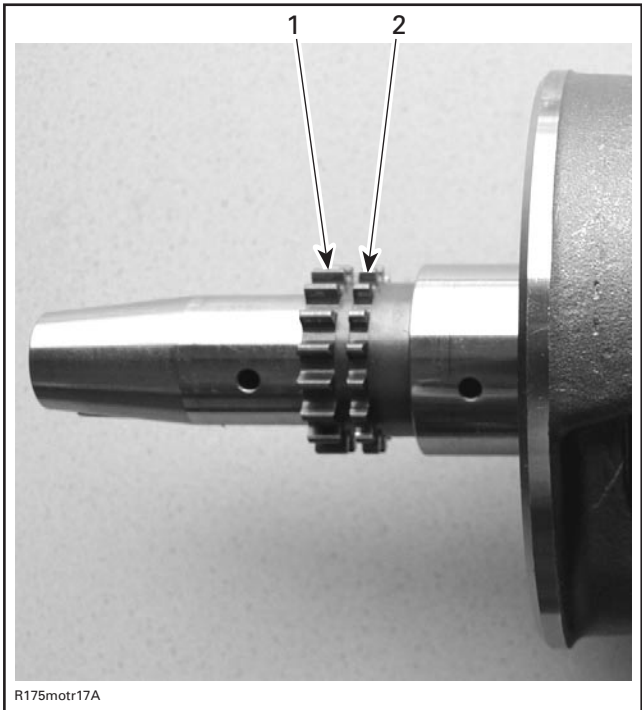
- crankshaft locking bolt
- shim **no. 7** on MAG side
- crankshaft **no. 5**
- shim **no. 6** on PTO side.



1. Crankcase MAG side
2. Shim on MAG side
3. Crankshaft
4. Engagement groove for crankshaft locking bolt
5. Shim on PTO side

Inspection

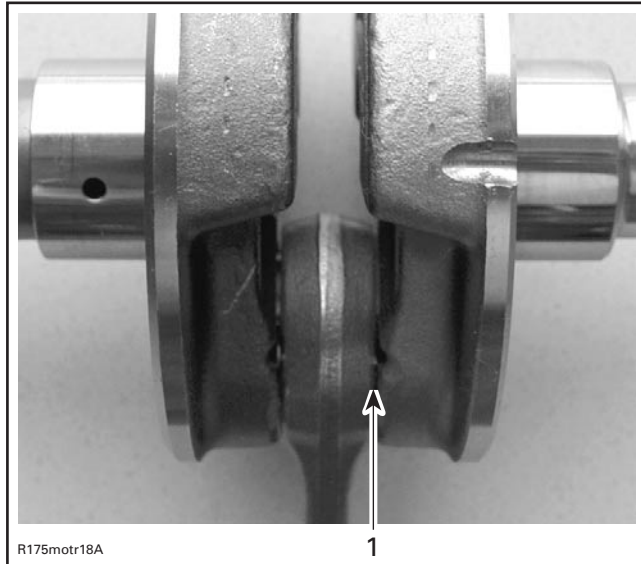
Replace crankshaft if the timing gear is excessive worn or otherwise damaged.



1. Crankshaft timing gear
2. Crankshaft gear for oil pump

Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between butting face of connecting rod and crankshaft counterweight. If the distance exceeds specified tolerance, replace the crankshaft.



1. Measure here with feeler gauge

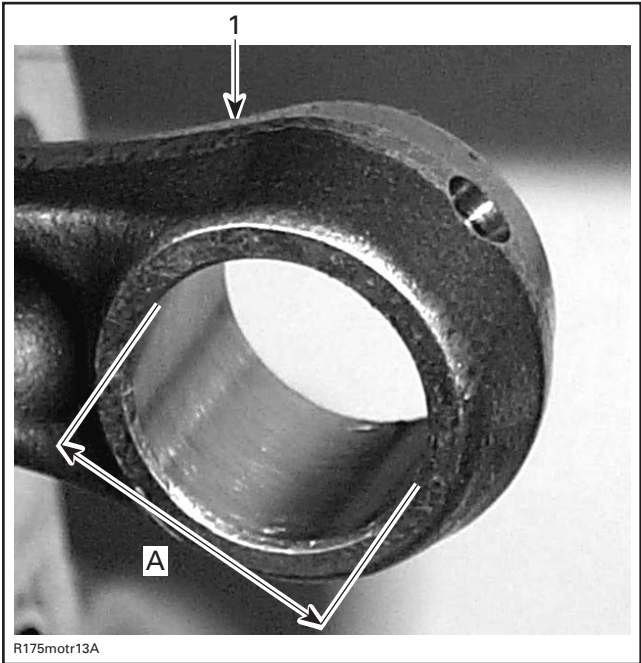
CONNECTING ROD BIG END mm (in)	
NEW MINIMUM	0.3 mm (.012 in)
NEW MAXIMUM	0.627 mm (.025 in)
SERVICE LIMIT	0.8 mm (.032 in)

Section 03 ENGINE

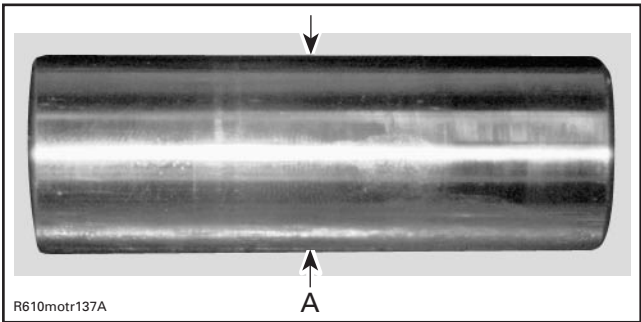
Subsection 09 (CRANKSHAFT)

Connecting Rod/Piston Pin Clearance

Measure piston pin. Compare to inside diameter of connecting rod.



1. Connecting rod
A. Connecting rod small end diameter



A. Piston pin diameter in the area of the bushing

CONNECTING ROD SMALL END DIAMETER	
NEW MINIMUM	15.005 mm (.5907 in)
NEW MAXIMUM	15.015 mm (.5911 in)
SERVICE LIMIT	15.06 mm (.593 in)

PISTON PIN DIAMETER	
NEW MINIMUM	14.997 mm (.5904 in)
NEW MAXIMUM	15.000 mm (.5905 in)
SERVICE LIMIT	14.990 mm (.5902 in)

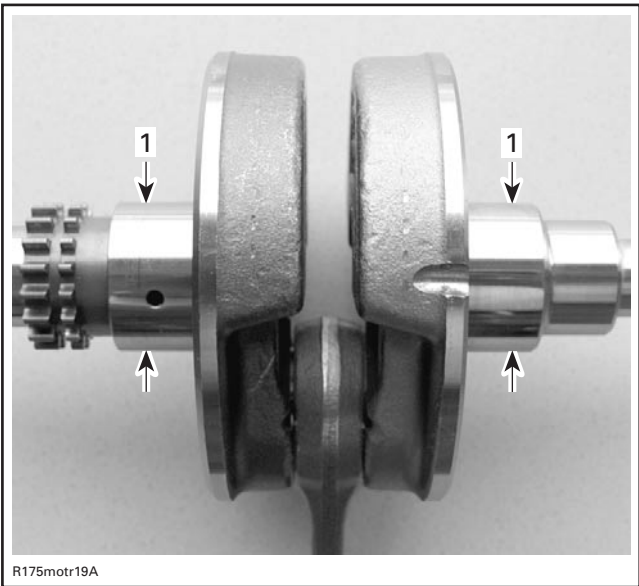
PISTON PIN BORE CLEARANCE

SERVICE LIMIT	0.070 mm (.0028 in)
---------------	---------------------

If the connecting rod small end diameter is out of specification, replace crankshaft and piston pin.

Crankshaft Radial Play MAG/PTO Side

Measure crankshaft on MAG/PTO side. Compare to inside diameter of MAG/PTO bushing (see CRANKCASE below).



1. Measure here with a micrometer

CRANKSHAFT MAG/PTO DIAMETER

NEW MINIMUM	32.010 mm (1.2602 in)
NEW MAXIMUM	32.025 mm (1.2608 in)
SERVICE LIMIT	32.000 mm (1.2598 in)

CRANKSHAFT MAG/PTO RADIAL CLEARANCE

SERVICE LIMIT	0.07 mm (.0028 in)
---------------	--------------------

Installation

For installation, reverse the removal procedure. Pay attention to following details.

CAUTION: Never forget shim **no. 7** for axial adjustment on crankshaft MAG side.



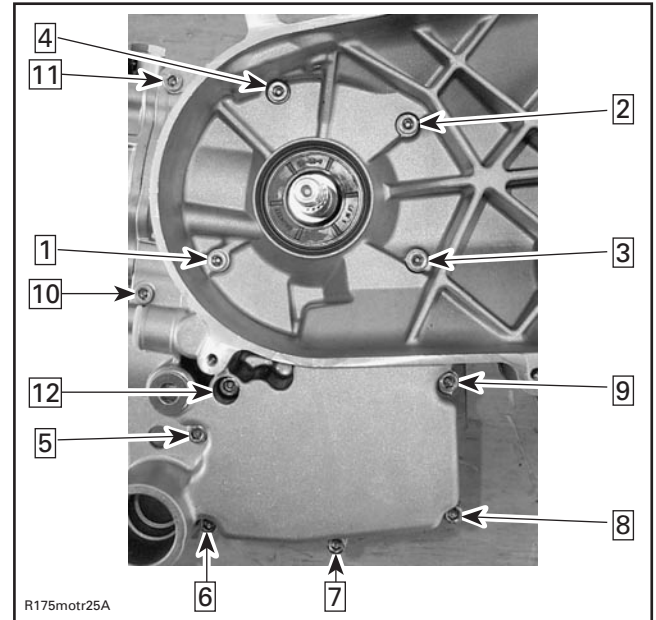
1. Shim for MAG side
2. Oil pump gear
3. Timing chain gear

CAUTION: Install crankshaft locking bolt (P/N 529 035 617) right away to put crankshaft in TDC position before installing rockers (refer to **CYLINDER AND HEAD**).

After reinstalling of crankcase MAG, measure axial clearance of crankshaft with a feeler gauge on the PTO side between PTO crankcase and shim **no. 6**.

Install a new gasket **no. 15** and readjust axial clearance with proper shim on PTO side.

Hand-torqued crankcase screws as per following sequence. Repeat procedure, retightening all screws to 10 N•m (89 lbf•in).



NOTE: Always degrease taper on crankshaft MAG before reinstalling rotor.

CRANKCASE

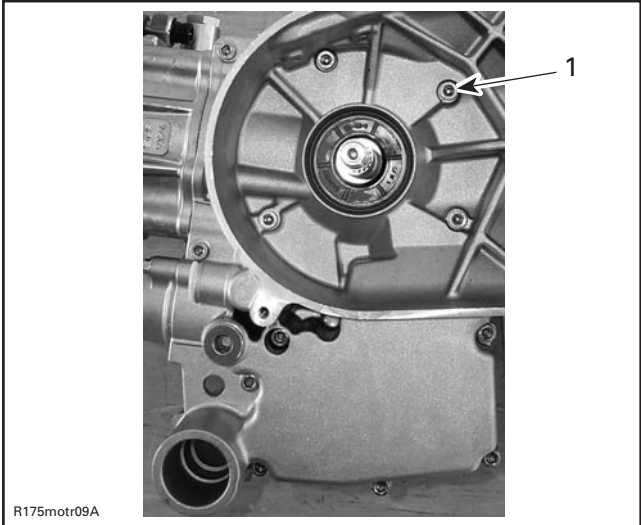
Disassembly

Remove:

- engine from vehicle (refer to **REMOVAL AND INSTALLATION**)
- magneto housing cover and rotor (refer to **MAGNETO SYSTEM**)
- timing chain
- cylinder head and cylinder (refer to **CYLINDER AND HEAD**)
- drive pulley (refer to **CVT**, see **DRIVE PULLEY**)
- screws retaining crankcase MAG

Section 03 ENGINE

Subsection 09 (CRANKSHAFT)



1. 12 screws
- crankshaft.

NOTE: If necessary punch with a soft hammer to ease lifting crankcase MAG.

Inspection

NOTE: To check some parts, it is recommended to remove all components in both crankcase housing.

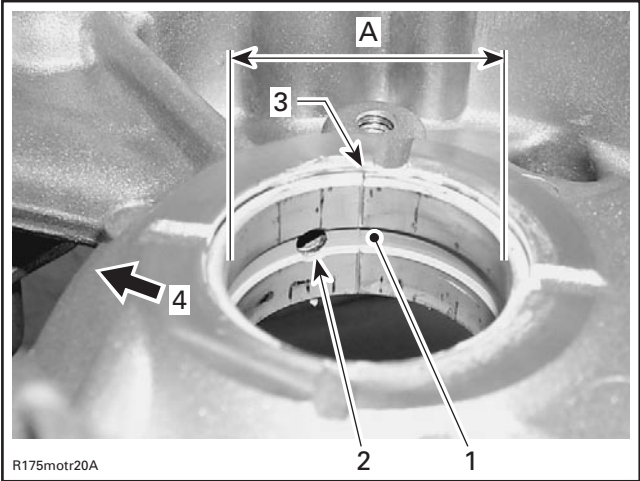
Clean crankcase from contaminations and blow the oil supply lines with compressed air.

WARNING

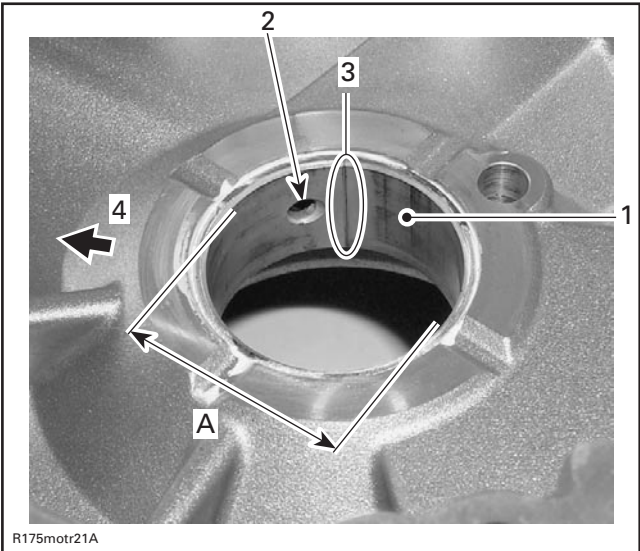
Use safety goggles to avoid injury to your eyes.

Check plain bearings **no. 10**, **no. 11**, **no. 12** and **no. 13** for scorings or other damages.

Measure plain bearing inside diameter. Replace if the measurement is out of specification.



1. MAG plain bearing with groove
2. Oil bore
3. Split of the plain bearing halves
4. Cylinder base direction
A. Plain bearing inside diameter to be measured in area of oil bore



1. PTO plain bearing without groove
2. Oil bore
3. Split of the plain bearing halves
4. Cylinder base direction
A. Plain bearing inside diameter to be measured in area of oil bore

PLAIN BEARING INSIDE DIAMETER (MAG/PTO)	
SERVICE LIMIT	32.070 mm (1.2625 in)

Check oil seal **no. 14** if brittle, hard or otherwise damaged. Replace if necessary.

NOTE: The oil seal is removed easily with a flat screwdriver.

Bearing Removal Procedure

Always heat crankcase housing up to 100°C (212°F) before removing ball bearings, needle bearings or plain bearings.

WARNING

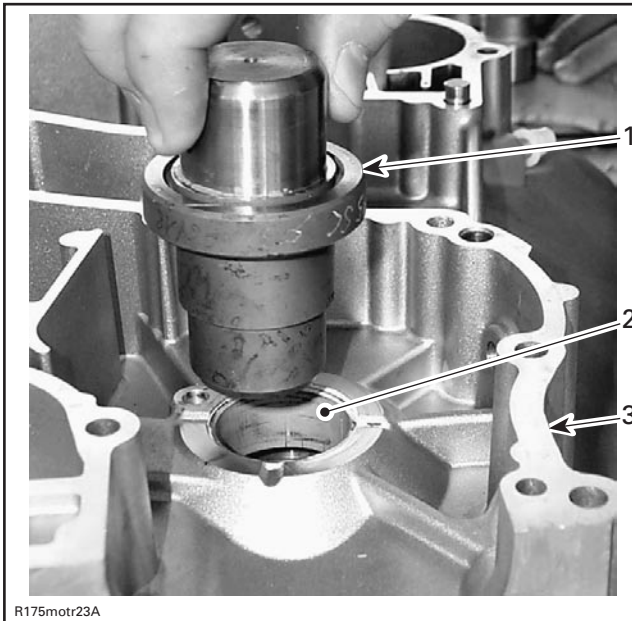
Clean oil, outside and inside, from housing before heat.

CAUTION: Always support crankcase housings properly when ball bearings, needle bearings or plain bearings are removed. Crankcase housing damages may occur if this procedure is not performed correctly.

NOTE: Always use a press for removal or installation of plain bearing halves.

Plain Bearing Procedure

Remove plain bearings no. 10, no. 11, no. 12 and no. 13 with the plain bearing remover/installer (P/N 529 035 855).

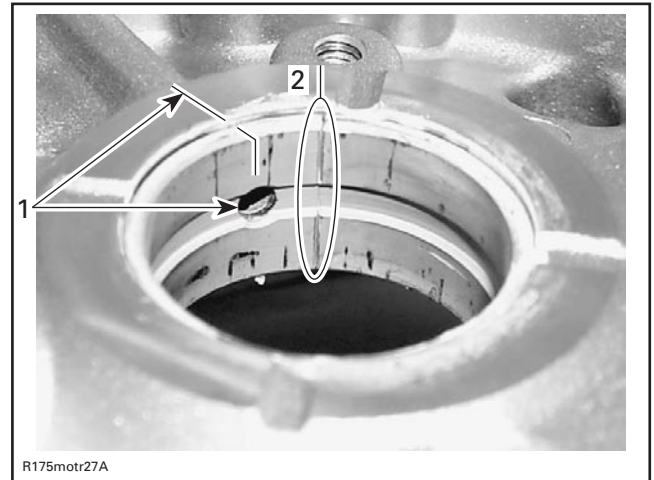


PUSH PLAIN BEARINGS OUTSIDE

1. Plain bearing remover/installer
2. Plain bearing
3. Crankcase MAG

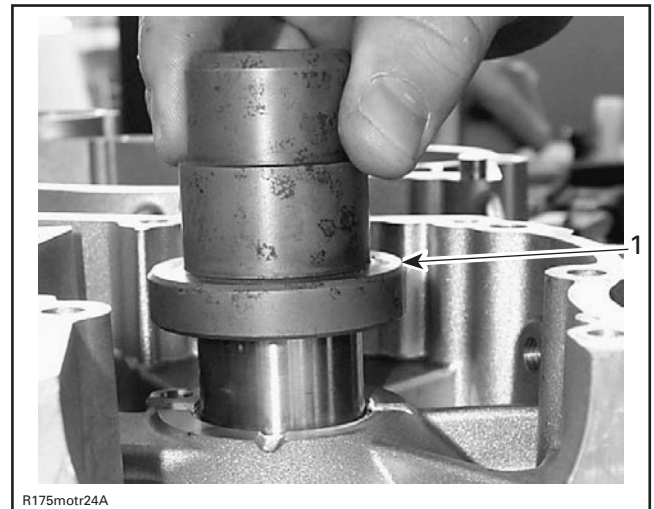
To install the plain bearing turn the plain bearing remover/installer up side down.

NOTE: Apply Molykote grease in crankcase bore to ease installing the plain bearing halves. Mark plain bearing oil bore position together with crankcase thrust surface.



1. Mark on crankcase and oil bore position
2. Split between bearing halves

CAUTION: Push plain bearings correctly in place (oil bore and split between plain bearing halves) to ensure oil supply to crankshaft.



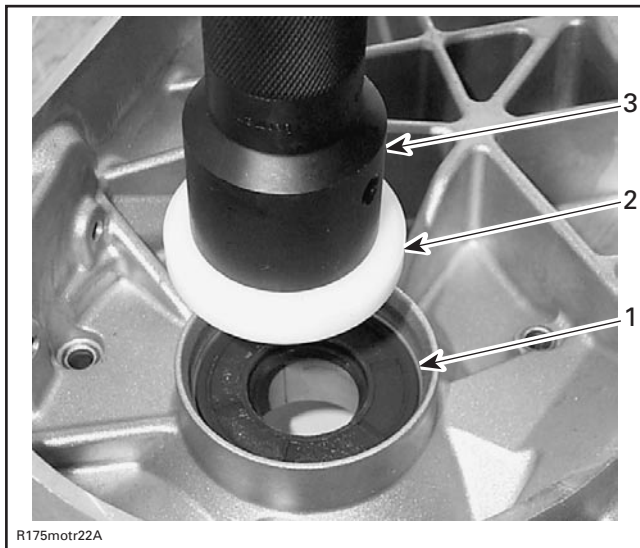
PUSH PLAIN BEARINGS INSIDE

1. Plain bearing installer

Section 03 ENGINE

Subsection 09 (CRANKSHAFT)

Install a new oil seal **no. 14** with the crankshaft oil seal installer (P/N 529 035 847).



1. Crankcase PTO oil seal
2. Crankshaft oil seal installer
3. Insertion jig handle

Assembly

The assembly of crankcase is the reverse of removal procedure. However, pay attention to the following details.

Always install new gasket **no. 15**.

Clean oil passages and make sure they are not clogged.

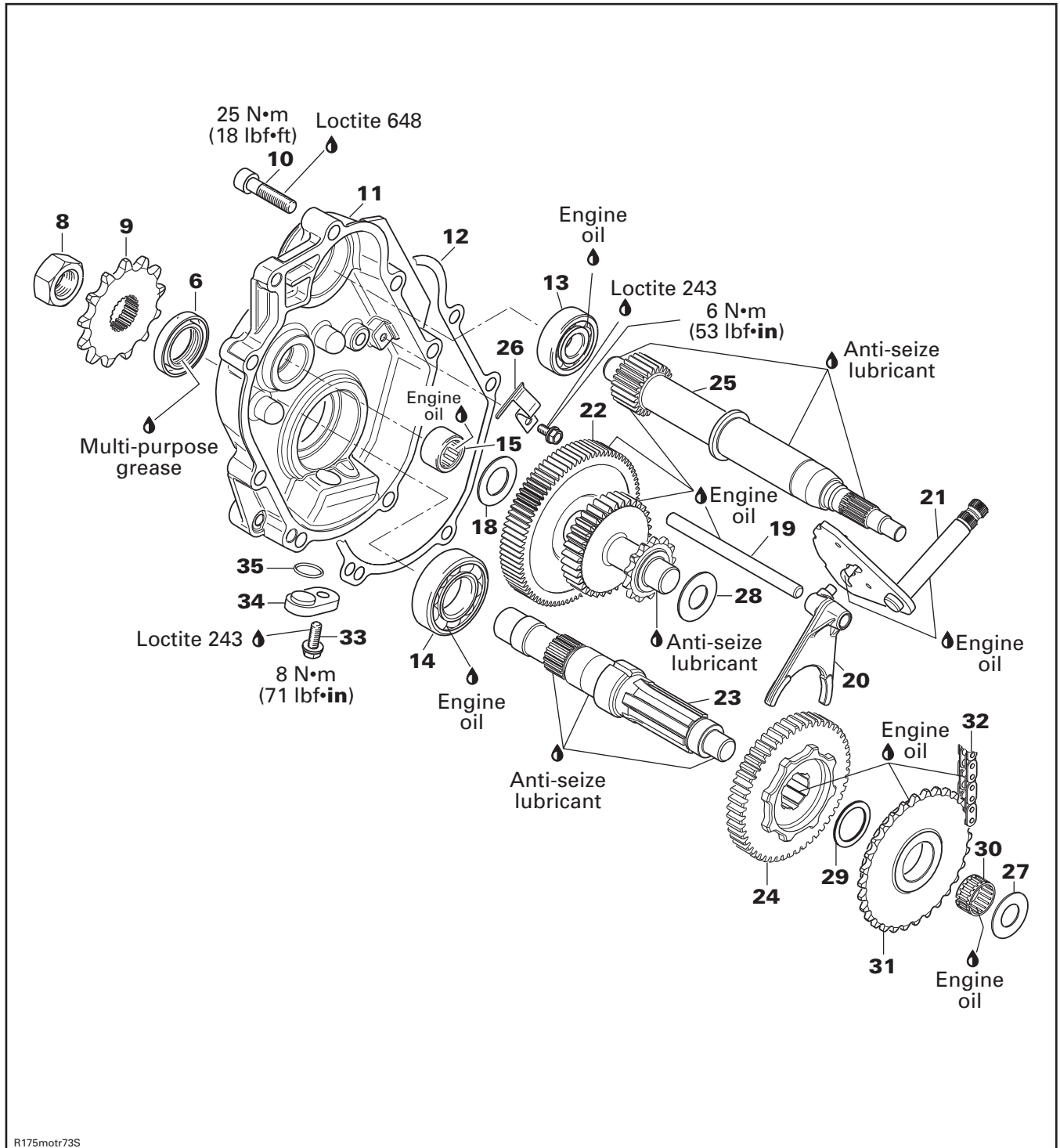
Clean all metal components in a solvent.

Crankcase mating surfaces are best cleaned using a combination of the Chisel gasket remover (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass cross (hatch).

CAUTION: Do not wipe with rags. Use a new clean hand towel only.

GEARBOX

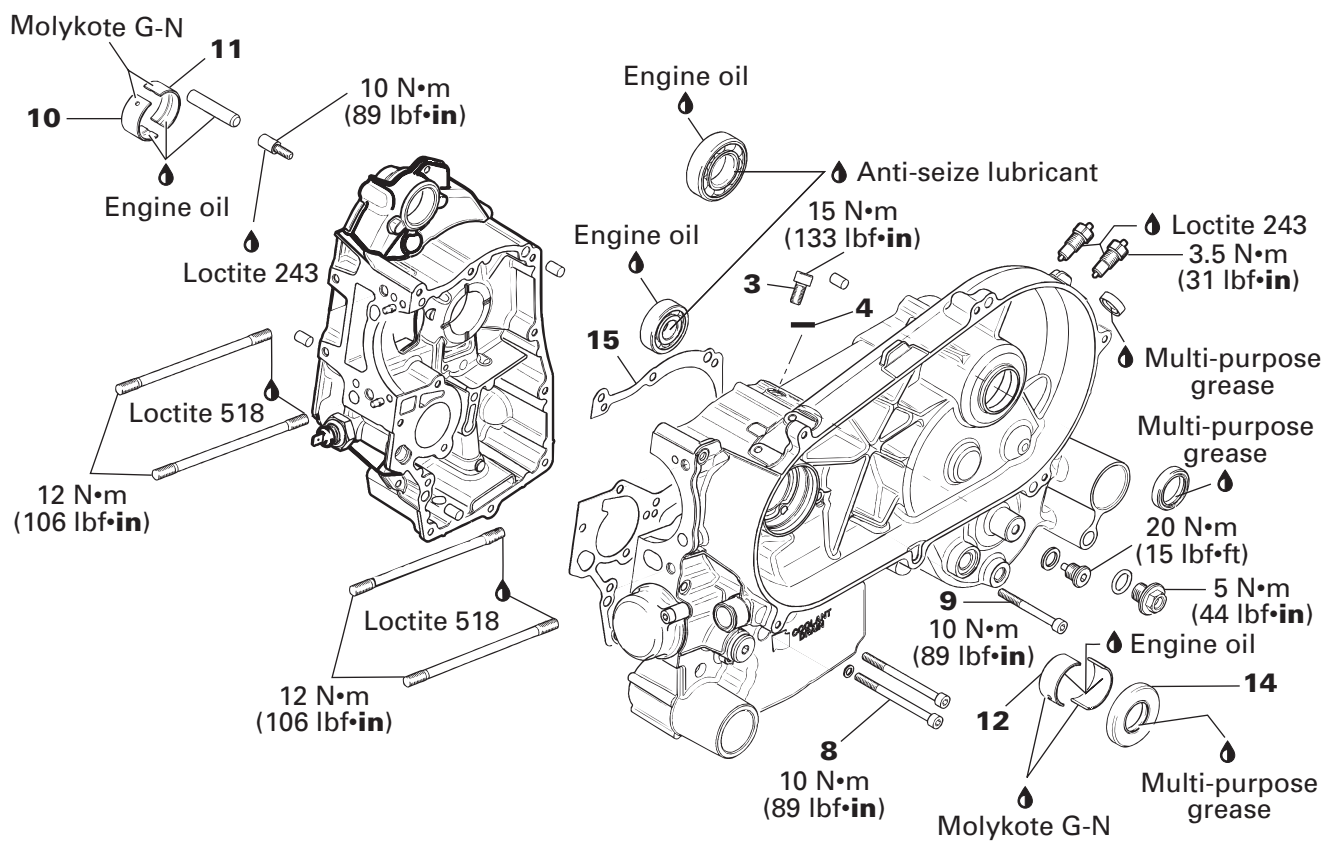
GEARBOX



Section 03 ENGINE

Subsection 10 (GEARBOX)

CRANKCASE



R175motr03S

GENERAL

To remove gear box cover, the engine removal is necessary.

For installation, use the torque values and Loctite products indicated in the exploded views. Clean threads before using Loctite when installing screws.

Always drain the gearbox before working on it.

Prior to change the oil, ensure vehicle is on a level surface.

Oil change should be done with a warm engine.

WARNING

The gear box oil can be very hot. Wait until oil is warm.

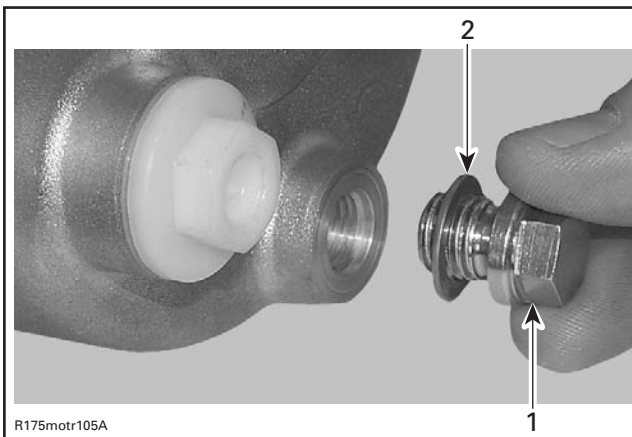
Dispose gear box oil as per your local environmental regulations.

OIL CHANGE

Draining Procedure

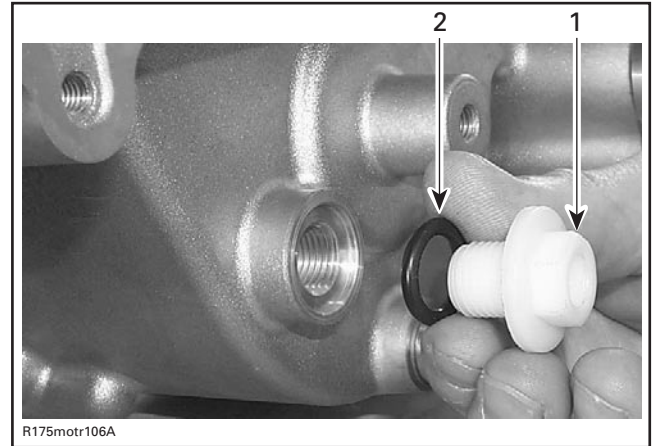
Place a drain pan under the gear box drain plug area.

Clean plug area and unscrew drain plug **no. 1**.



1. Drain plug
2. Gasket ring

Remove oil level screw **no. 3** including O-ring **no. 4**.



1. Oil level screw
2. O-ring

CAUTION: Pay attention not to lose gasket ring **no. 2** on drain plug and/or O-ring **no. 4**.

Wait a while to allow oil to flow out of gear box.

Inspection

Oil condition gives information about the teeth condition inside the gear box. See **TROUBLE-SHOOTING** section.

Clean the drain plug from metal shavings and dirt. Presence of debris gives an indication of failure inside the gear box. Check gear box to correct the problem.

Change gasket ring **no. 2** on drain plug if damaged.

Replace O-ring **no. 4** if brittle, hard or otherwise damaged.

Filling Procedure

With the vehicle on a level surface, fill the gear box with the recommended oil until the oil reaches the lower threads of housing.

Refer to **TECHNICAL DATA** to know which oil and quantity are used in the gear box.

OIL SEALS

Removal

Remove:

- driven pulley on PTO side (refer to **CVT**, see **Driven Pulley**)
- engine sprocket on MAG side (see **CRANKCASE** below)

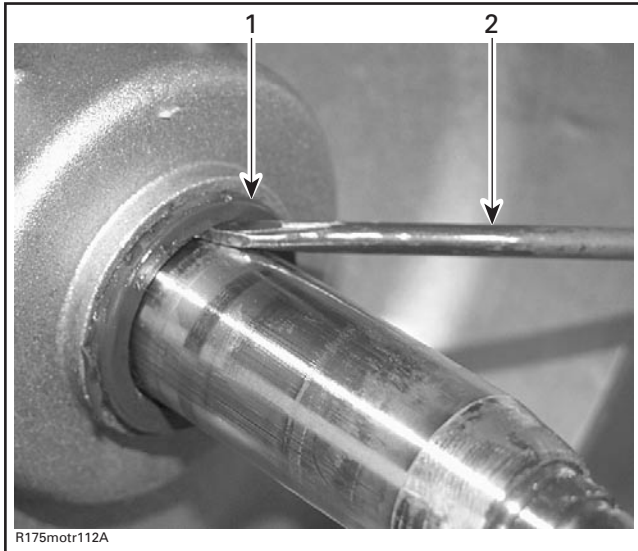
Section 03 ENGINE

Subsection 10 (GEARBOX)

NOTE: Use a small, flat screwdriver to remove oil seals from MAG/PTO side.

CAUTION: Pay attention not to damage CVT/main shaft during removal of oil seals.

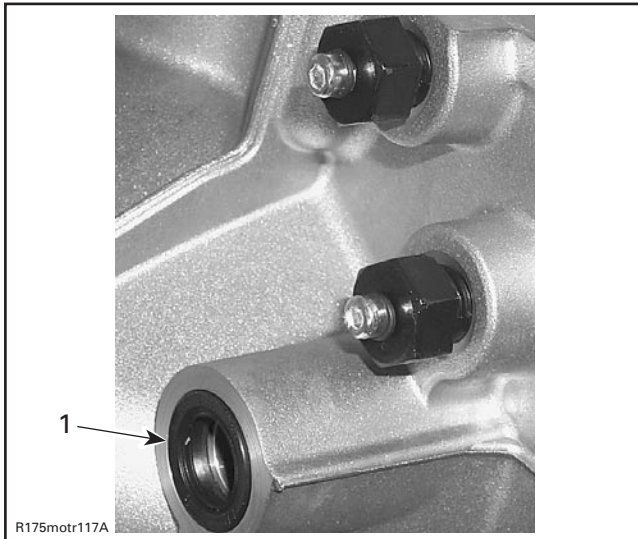
- oil seals no. 6 and no. 5 on engine MAG/PTO side



1. Oil seal MAG/PTO
2. Flat screwdriver

- oil seal no. 7 in shift shaft area.

CAUTION: Pay attention not to damage shift shaft during removal of oil seal.



1. Oil seal on shift shaft

Inspection

Check bearings behind each oil seal for contamination and/or metal shavings.

Check surface on CVT/main shaft in oil seal area for grooves and replace if necessary (see GEAR BOX below).

Installation

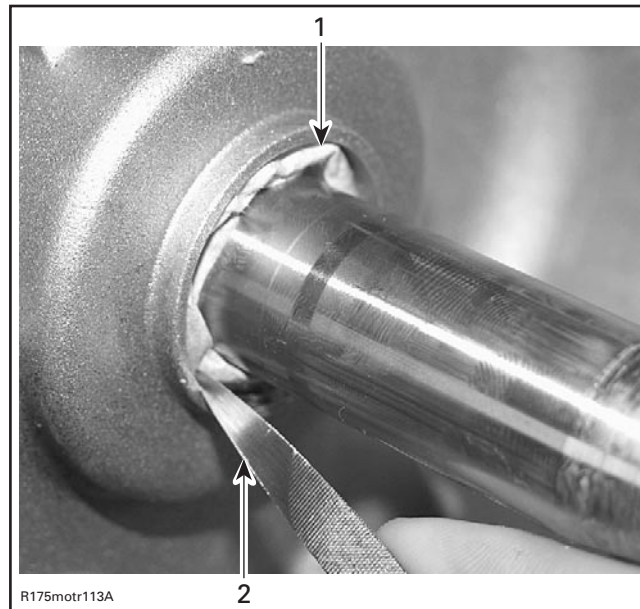
The installation is the reverse of removal procedure.

Pay attention to the following details.

CAUTION: Place a small rag to avoid ball bearing contamination due to metal shavings.

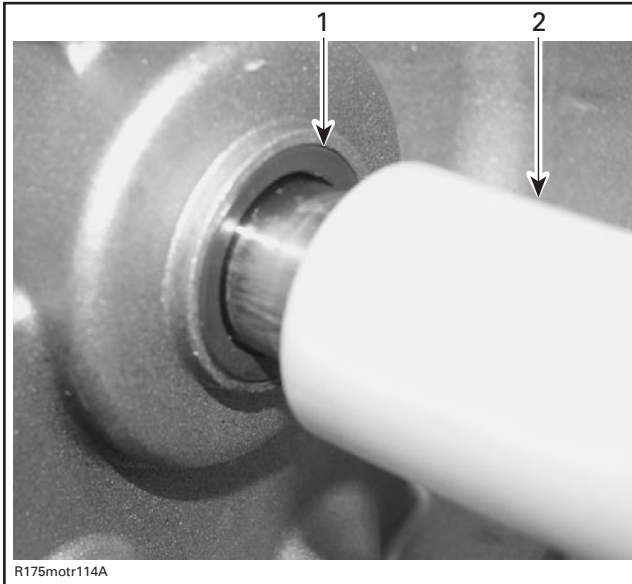
Prepare a chamfer with a three-square scraper to ease placing oil seals no. 5 and no. 6.

NOTE: Size of the chamfer should be approximately 30°.



1. Rag
2. Three-square scraper

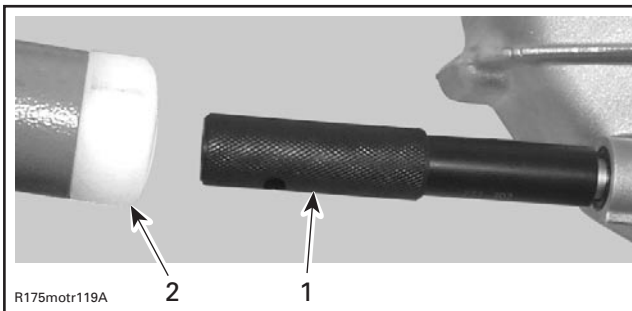
Install oil seal **no. 5** on PTO side with oil seal installer (P/N 529 035 854) as per following illustration.



1. Oil seal
2. Oil seal installer

Install oil seal **no. 6** on MAG side with oil seal installer (P/N 529 035 854).

Install oil seal **no. 7** in shift shaft area with oil seal installer (P/N 529 035 851) as per following illustration.



1. Oil seal installer
2. Soft hammer

CRANKCASE

Disassembly

Drain gear box oil (see OIL CHANGE above).

Remove:

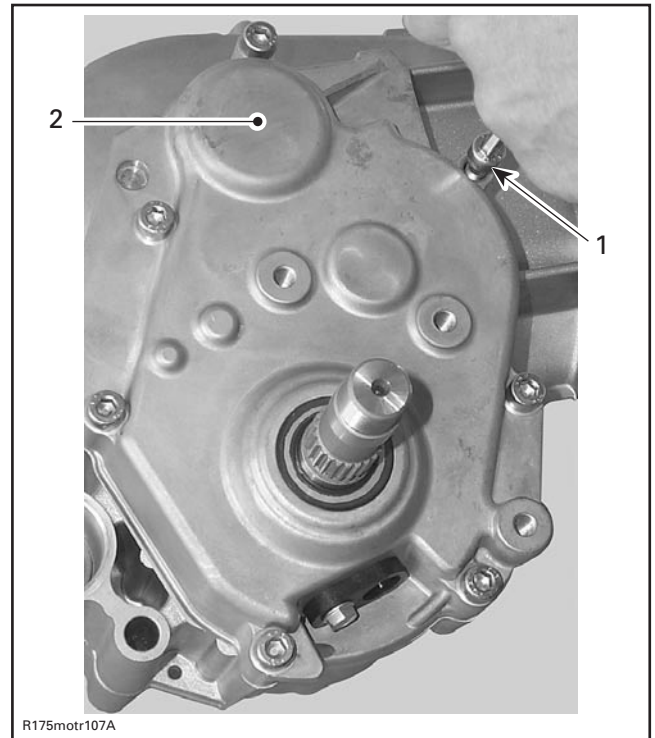
- sprocket nut **no. 8**
- engine sprocket **no. 9**

NOTE: Due to vibrations it is recommended to check/retorque gear box cover screws **no. 10** if only replacing the engine sprocket.

- engine from vehicle
(refer to **REMOVAL AND INSTALLATION**)
- screws **no. 10** retaining gear box cover

NOTE: To ease removing screws **no. 10** it is recommended to warm up the gearbox cover area with a heat gun.

CAUTION: Do not use an impact wrench for removal or installation of the gear box cover screws.



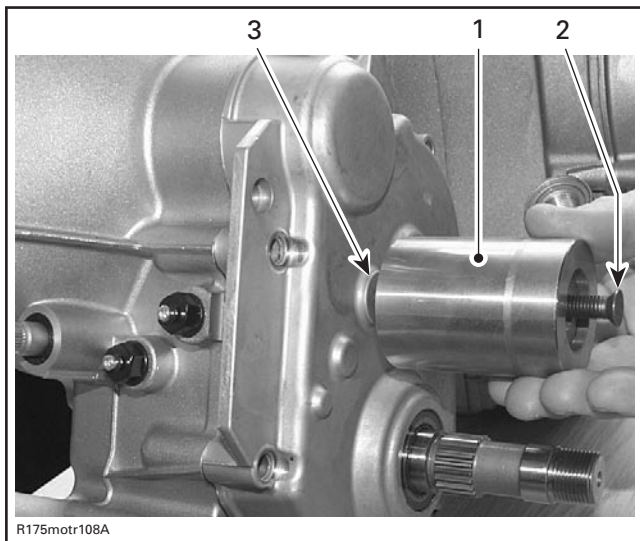
1. 7 screws
2. Gear box cover

Section 03 ENGINE

Subsection 10 (GEARBOX)

NOTE: To ease lifting the gear box cover no. 11 follow the procedure below while holding the main shaft in place:

- Put a distance sleeve on a long M8 screw.
- Place this screw together with distance sleeve in gear box cover thread.
- Pull sleeve until gear box cover gets loose.



1. Distance sleeve
2. Screw M8
3. Gear box cover threads

- gear box assembly (see GEAR BOX below).



Inspection

NOTE: To check some parts, it is recommended to remove all components in both crankcase housing.

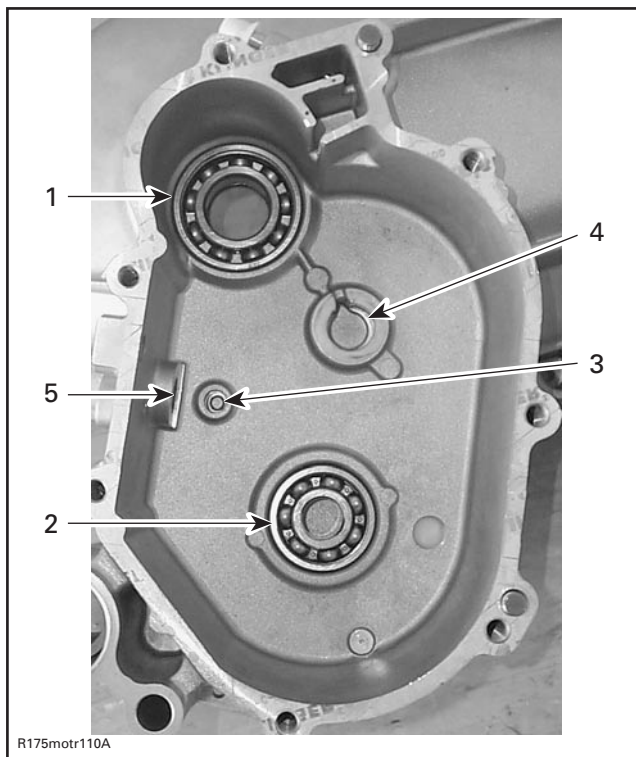
Visually check gasket no. 12 for any damage. Replace if necessary.

Clean crankcase from contaminations and blow the oil with compressed air.

WARNING

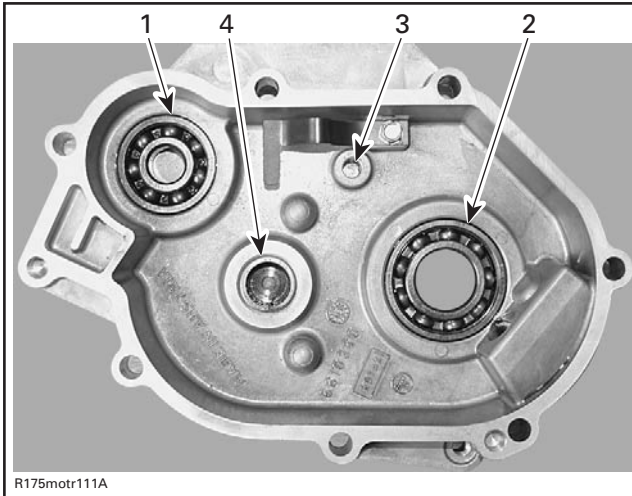
Use safety goggles to avoid injury to your eyes.

Check bearings no. 16 and no. 17 for excessive play and smooth operation. Replace if necessary.



1. Ball bearing main shaft
2. Ball bearing output shaft
3. Bore for shift fork pin
4. Bore for intermediate shaft
5. Bore for shift shaft

Check bearings **no. 13** and **no. 14** as well as needle bearing **no. 15** for excessive play and smooth operation. Replace if necessary.



1. Ball bearing main shaft
2. Ball bearing output shaft
3. Bore for shift fork pin
4. Needle bearing intermediate shaft

Bearing Removal Procedure

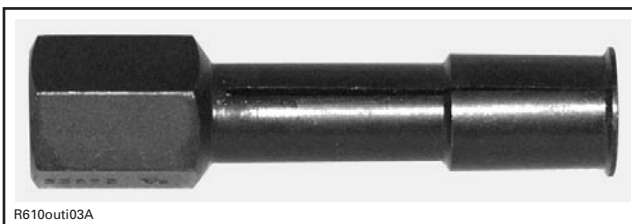
Always heat crankcase housing up to 100°C (212°F) before removing ball bearings and/or needle bearing.

WARNING

Clean oil, outside and inside, from housing before heat.

CAUTION: Always support crankcase housings properly when ball bearings or needle bearings are removed. Crankcase housing damages may occur if this procedure is not performed correctly.

To remove ball bearings **no. 13** and **no. 17** as well as needle bearing **no. 15**, use a blind hole bearing puller.



NOTE: The oil seals **no. 5**, **no. 6** and **no. 7** are removed easily with a flat screwdriver.

Bearing Installation Procedure

Unless otherwise instructed, never use hammer to install ball bearings and/or needle bearings. Use press machine only.

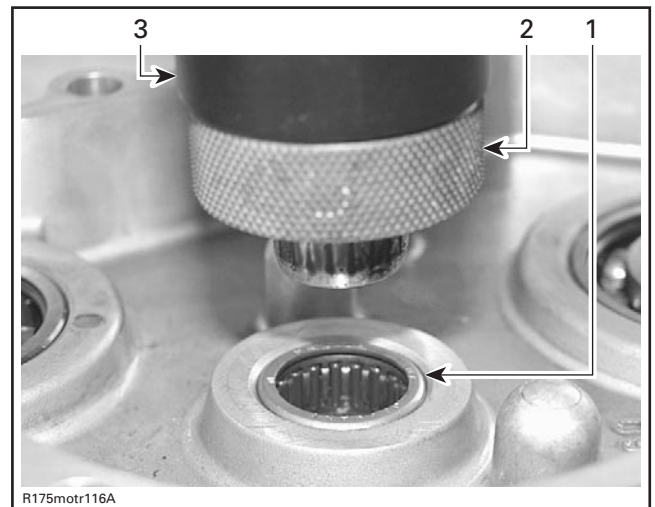
Always heat crankcase housing up to 100°C (212°F) before installing ball bearings and/or needle bearings.

WARNING

Clean oil, outside and inside, from housing before heat.

Place new bearing in freezer for 10 minutes before installation.

Install needle bearing **no. 15** with the needle bearing installer (P/N 529 035 762) and insertion jig handle (P/N 420 877 650).



1. Intermediate shaft needle bearing
2. Needle bearing installer
3. Insertion jig handle

Install new oil seals **no. 5**, **no. 6** and **no. 7** with the proper installer after reassembly of gear box cover (see OIL SEALS above).

Assembly

The assembly of crankcase is essentially the reverse of removal procedure. However, pay attention to the following details.

Clean all metal components in a solvent.

Crankcase mating surfaces are best cleaned using a combination of the Chisel gasket remover (P/N 413 708 500).

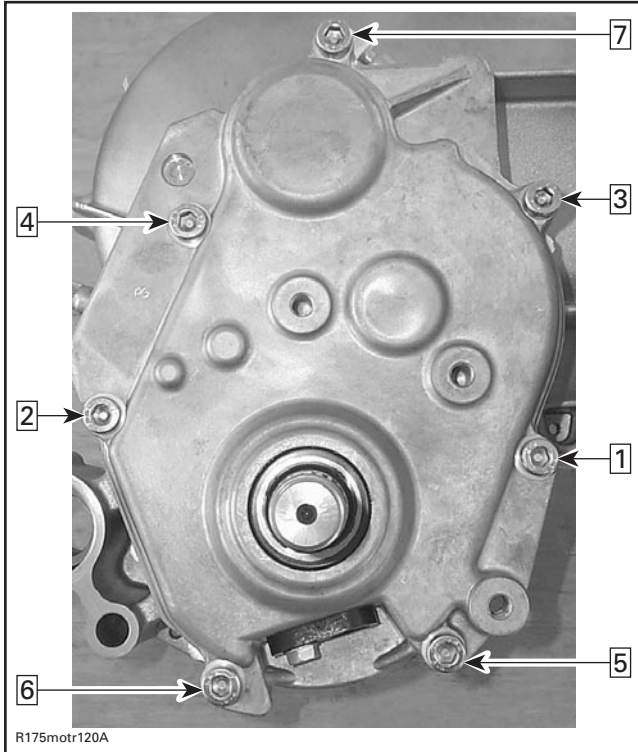
CAUTION: Do not wipe with rags. Use a new clean hand towel only.

Section 03 ENGINE

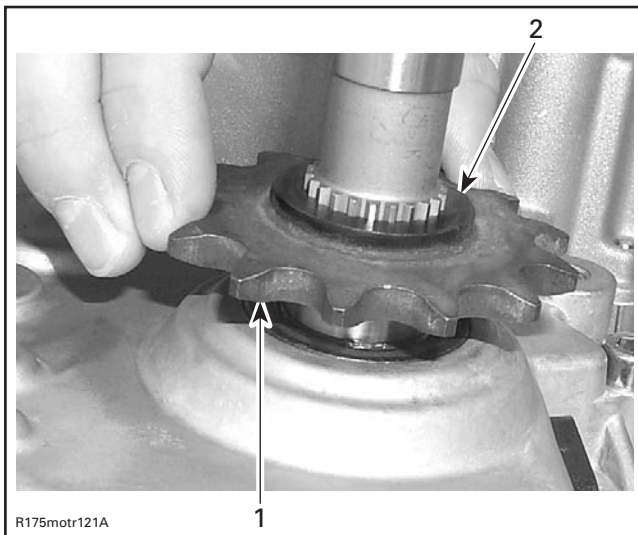
Subsection 10 (GEARBOX)

CAUTION: Do not forget thrust washer **no. 18** and gear box cover gasket **no. 12**.

Hand-torqued crankcase screws as per following sequence. Repeat procedure, retightening all screws to 25 N•m (18.5 lbf•ft).



CAUTION: Always install engine sprocket **no. 9** as per following illustration.



1. Engine sprocket
2. Flange mounted visible to the outside

GEARBOX

General

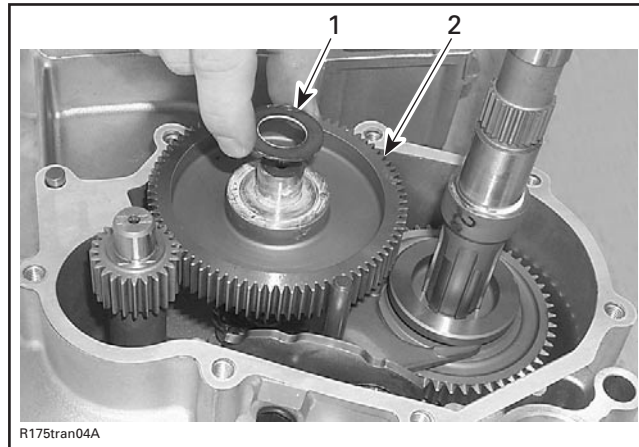
During and after gear box disassembly, inspect the condition of each part closely. In particular, check for:

- gear teeth damage
- worn or scoured bearing surfaces
- worn or scoured shift fork
- worn or scoured shift fork shaft
- rounded engagement dogs and slots
- bent shift forks
- bent shift fork shaft
- worn shift fork engagement pins
- worn tracks on shift shaft plate
- worn shift fork engagement groove
- worn splines on shafts and gears.

Removal

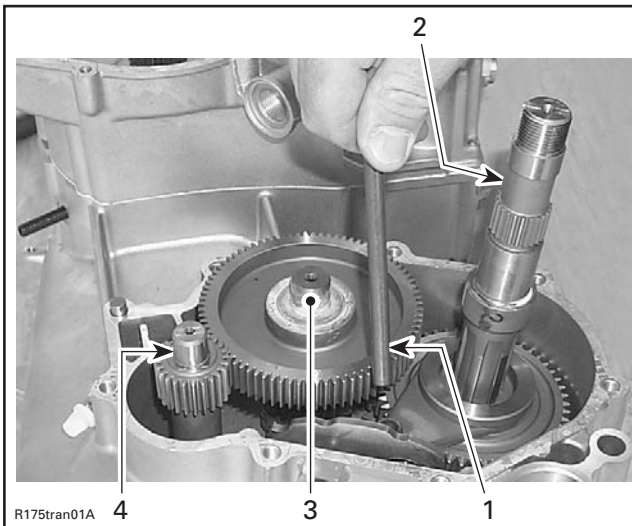
Remove:

- gear box cover (see CRANKCASE above)
- thrust washer **no. 18**



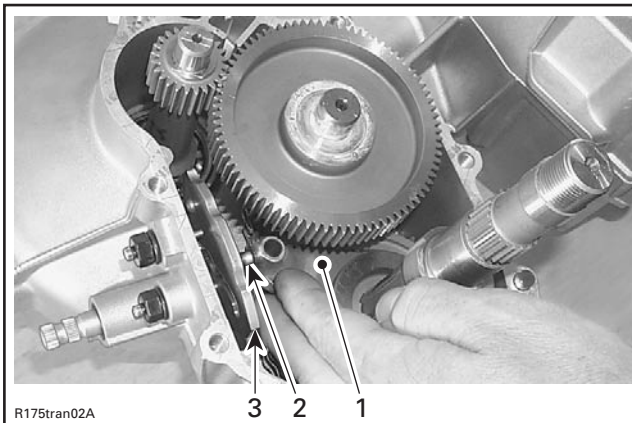
1. Thrust washer
2. Intermediate shaft

– shift fork shaft no. 19.



1. Shift fork shaft
2. Output shaft
3. Intermediate shaft
4. Main shaft

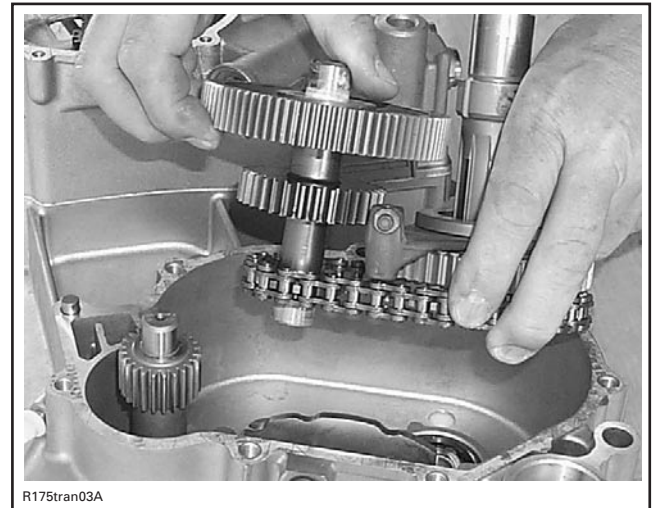
NOTE: Disengage shift fork no. 20 from shift shaft plate no. 21.



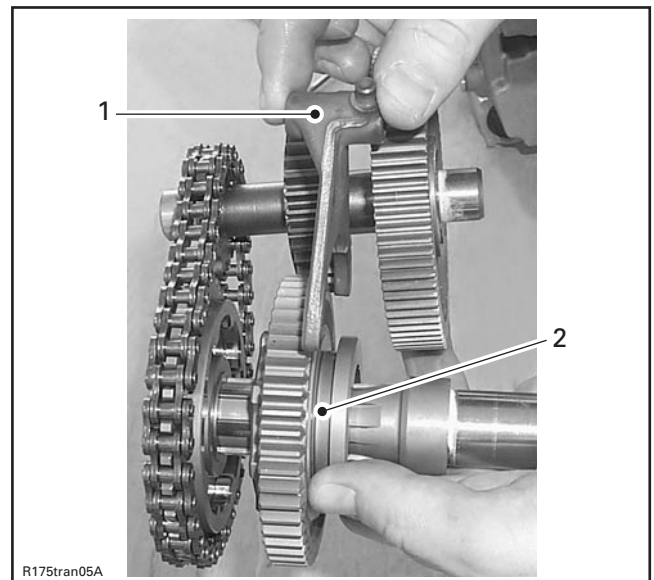
1. Shift fork
2. Engagement pin on shift fork
3. Shift shaft plate

Remove:

– intermediate shaft no. 22 together with output shaft no. 23



– shift fork no. 20

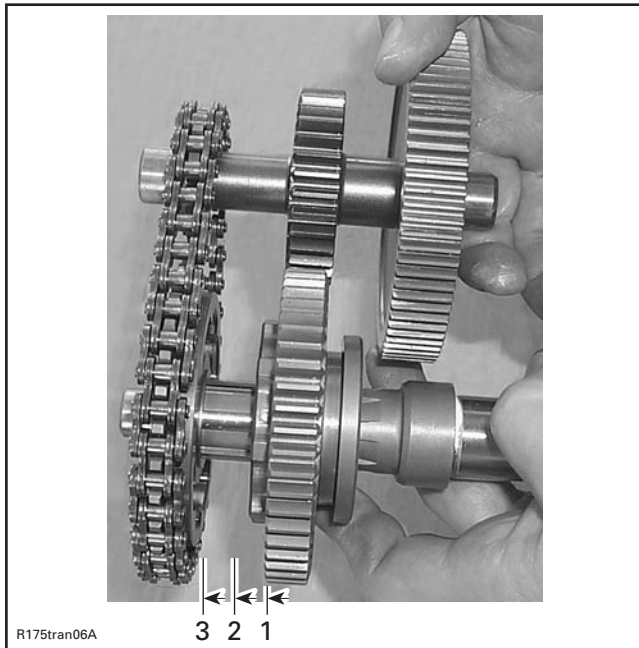


1. Shift fork reverse-neutral-high
2. Engagement groove for shift fork pin

Section 03 ENGINE

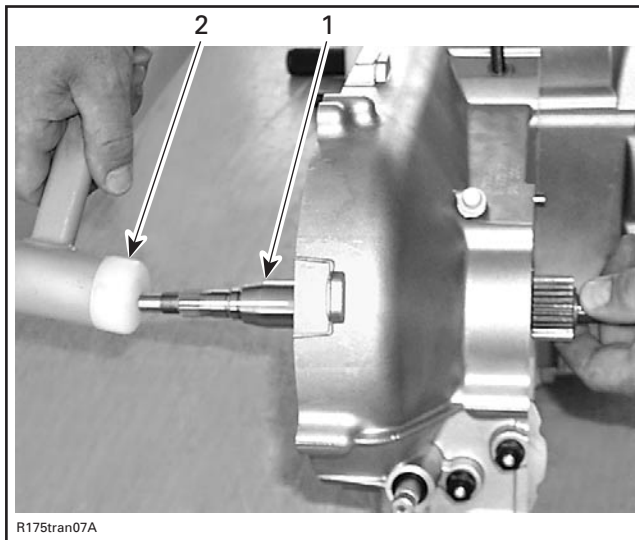
Subsection 10 (GEARBOX)

NOTE: Following illustration shows gear no. 24 and the respective shifting position.



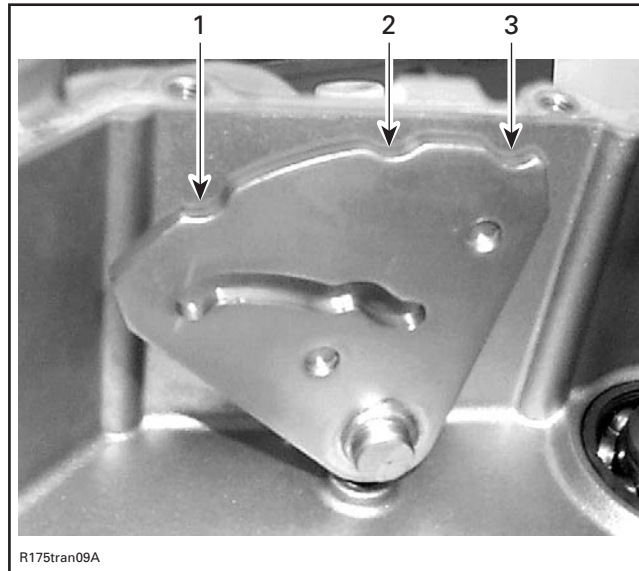
1. High gear position
2. Neutral position
3. Reverse gear (chain drive)

– main shaft no. 25 with a soft hammer



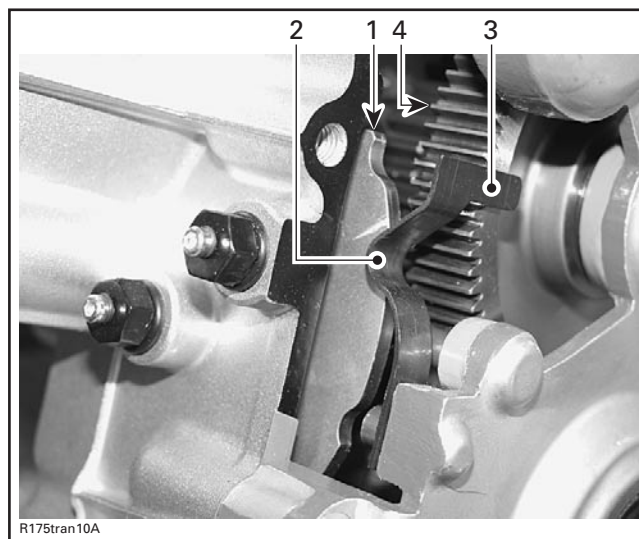
1. Main shaft
2. Soft hammer

NOTE: Following illustration shows engagement grooves for spring plate no. 26 and the respective shifting position.



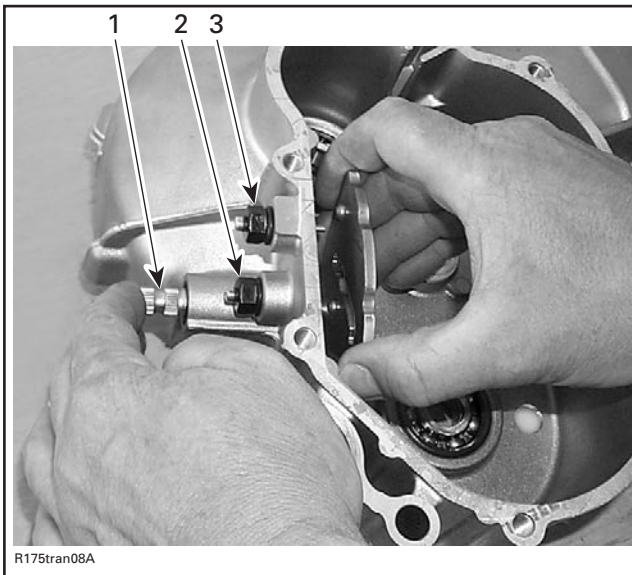
1. High gear position
2. Neutral position
3. Reverse position

NOTE: In neutral position the spring plate engages deeper in the shift shaft groove. The spring plate arm pushes against the intermediate shaft gear and retards its motion in idle.



1. Shift shaft plate
2. Spring plate
3. Spring plate arm
4. Contact area to spring plate arm in neutral position

– shift shaft plate no. 21.



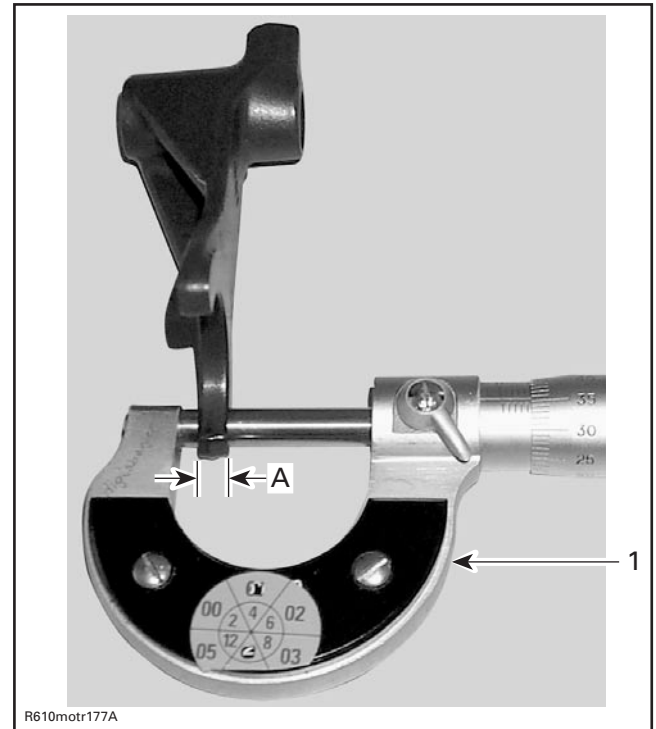
- 1. Shift shaft plate
- 2. Reverse switch
- 3. Neutral switch

Inspection

Check shift fork for visible damage, wear or bent shift fork claws.

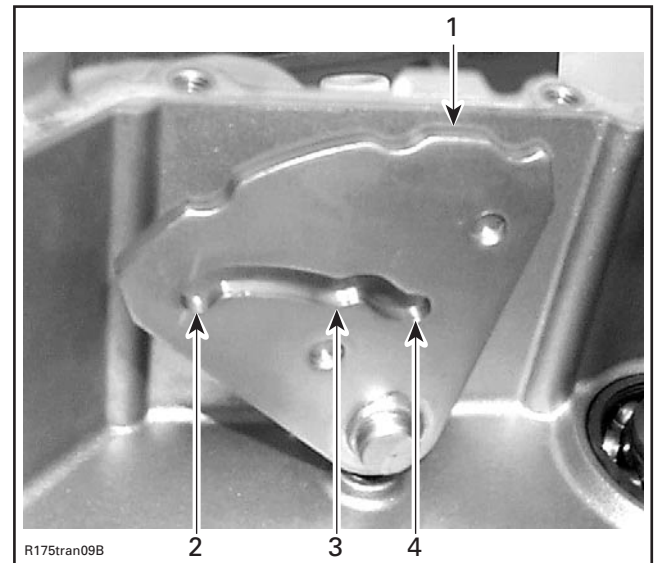
Measure the shift fork claw thickness.

SHIFT FORK CLAW THICKNESS	
NEW MINIMUM	4.800 mm (.189 in)
NEW MAXIMUM	4.900 mm (.193 in)
SERVICE LIMIT	4.750 mm (.187 in)



- 1. Micrometer
- A. Shift fork claw thickness

Check shift shaft plate track for scouring or heavy wear like rounded engagement slots.



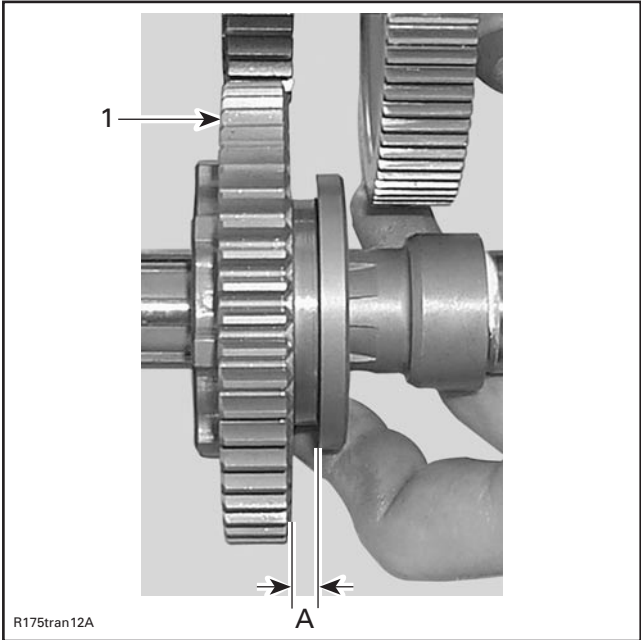
- 1. Shift shaft plate
- 2. Shift fork position for high gear
- 3. Shift fork position for neutral gear
- 4. Shift fork position for reverse gear

Section 03 ENGINE

Subsection 10 (GEARBOX)

Measure the gap of shift fork engagement groove.

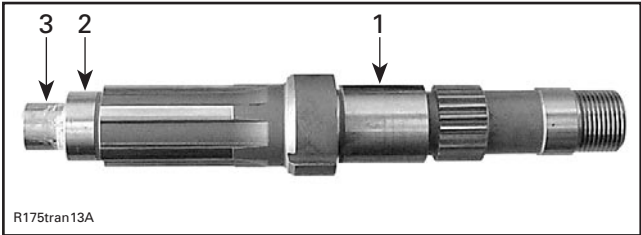
GAP OF SHIFT FORK ENGAGEMENT GROOVE	
NEW MINIMUM	5.00 mm (.197 in)
NEW MAXIMUM	5.10 mm (.201 in)
SERVICE LIMIT	5.20 mm (.205 in)



1. Main gear
A. Gap for engagement of shift fork

Check output shaft for wear.

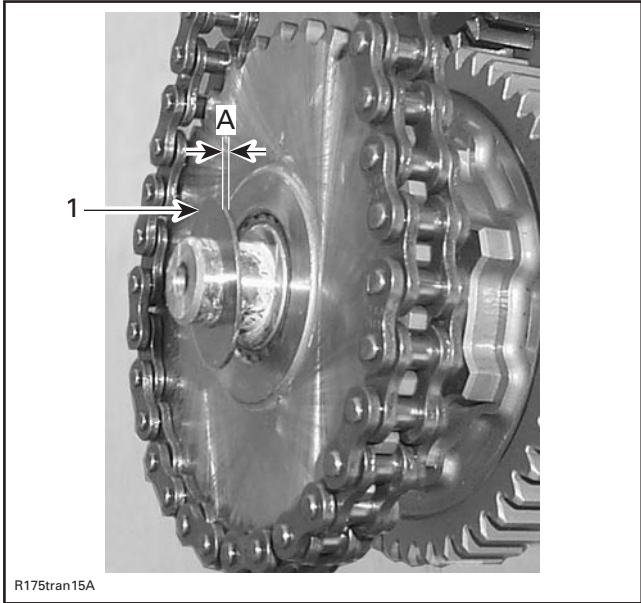
OUTPUT SHAFT	
SERVICE LIMIT	
MAG SIDE	24.960 mm (.983 in)
PTO SIDE (SPROCKET)	21.960 mm (.866 in)
PTO SIDE (CRANKCASE)	14.960 mm (.589 in)



1. Mag side (gearbox cover)
2. PTO side (running surface for reverse gear sprocket)
3. PTO side (crankcase)

Check thrust washer no. 27 on output shaft for wear limit.

THRUST WASHER THICKNESS	
SERVICE LIMIT	
PTO SIDE	0.900 mm (.035 in)

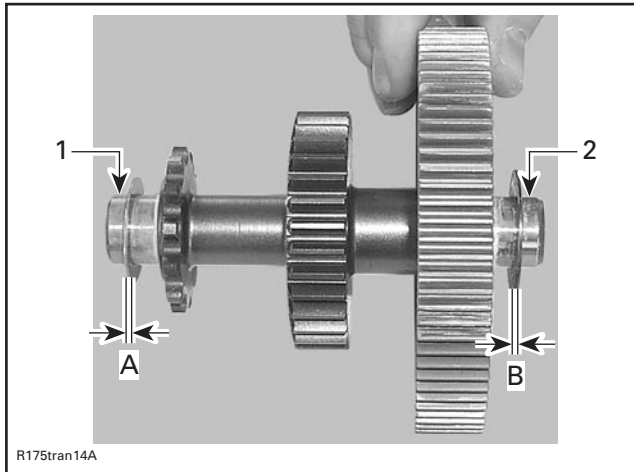


1. Thrust washer (output shaft)
A. Thrust washer PTO

Check intermediate shaft for wear limit and thickness of thrust washer no. 28.

INTERMEDIATE SHAFT	
SERVICE LIMIT	
PTO/MAG SIDE	17.990 mm (.708 in)

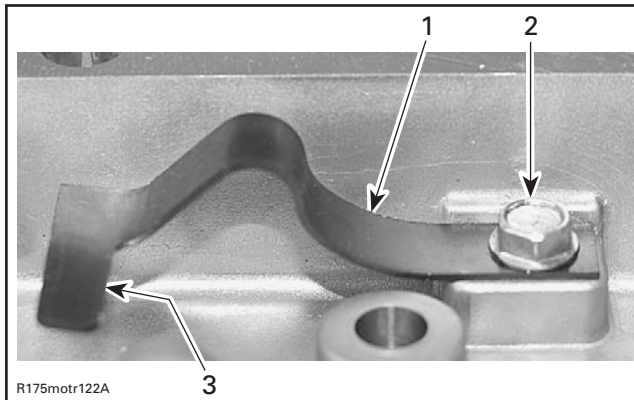
THRUST WASHER THICKNESS	
SERVICE LIMIT	
PTO/MAG SIDE	0.900 mm (.035 in)



1. PTO side (crankcase)
 2. MAG side (gearbox cover)
 A. Thrust washer thickness (PTO side)
 B. Thrust washer thickness (MAG side)

Check all bearings, bearing points, tooth flanks, taper grooves and annular grooves. Annular grooves must have sharp edges.

Check for condition of shift shaft plate in the front area as per following illustration. Replace in case of excessive wear.



1. Spring plate
 2. Screw retaining the spring plate
 3. Front area of spring plate arm

Assembly

NOTE: Preassemble intermediate gear shaft and output shaft prior to insert it into crankcase PTO.

NOTE: Run all gears before installing the gear box cover on MAG side.

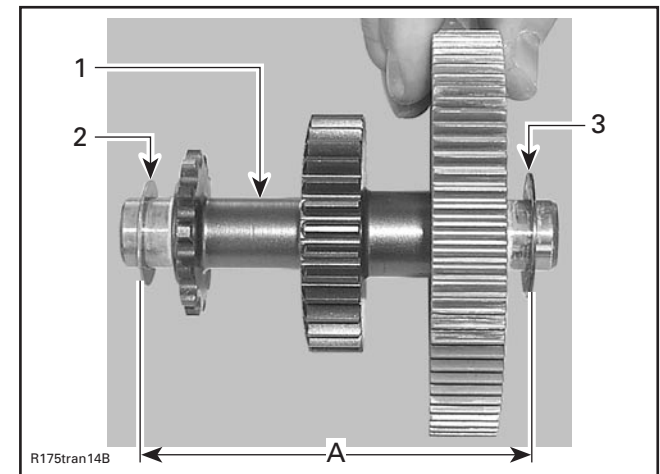
Install:

NOTE: Use lubricants from the exploded view during preassembling of gear box shafts.

- intermediate gear shaft **no. 22**, thrust washer **no. 28** and thrust washer **no. 18**

NOTE: Check axial measurement of intermediate shaft including thrust washer **no. 18** and **no. 28**. If out of measurement check for wrong and/or missing thrust washers MAG/PTO.

AXIAL MEASUREMENT	
NEW MINIMUM	82.00 mm (.269 ft)
NEW MAXIMUM	82.20 mm (.270 ft)



1. Intermediate shaft
 2. Thrust washer PTO
 3. Thrust washer MAG
 A. Axial measurement

- output shaft **no. 23** with main gear **no. 24**, shim **no. 29**, needle bearing **no. 30**, reverse gear sprocket **no. 31** and thrust washer **no. 27**
- gear box chain **no. 32**
- shift fork **no. 20**.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Install:

- main shaft **no. 25**

NOTE: If necessary use a soft hammer to put main shaft in place.

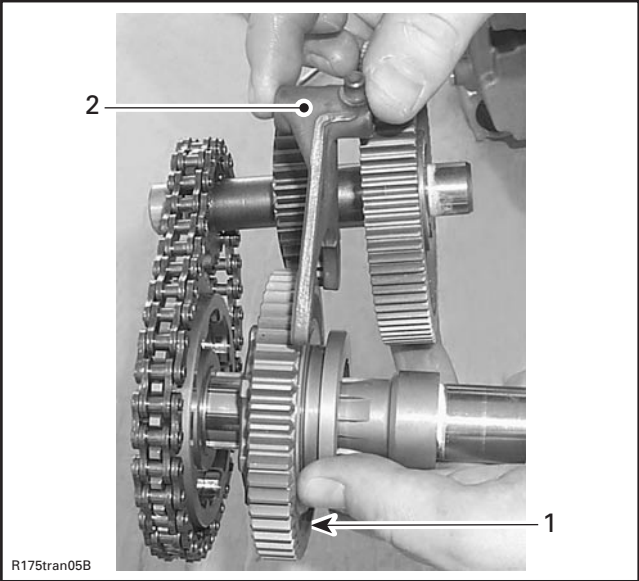
- shift shaft plate **no. 21**
- preassembled gear box as per following illustration.

CAUTION: Don't forget thrust washer **no. 27** and **no. 28**.

NOTE: Check axial measurement of intermediate gear shaft including thrust washers (see **Assembly** above).

Section 03 ENGINE

Subsection 10 (GEARBOX)

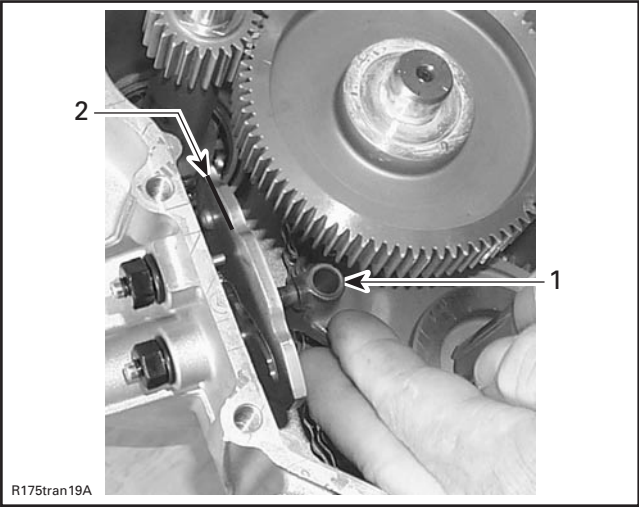


1. Preassembled gears
2. Shift fork

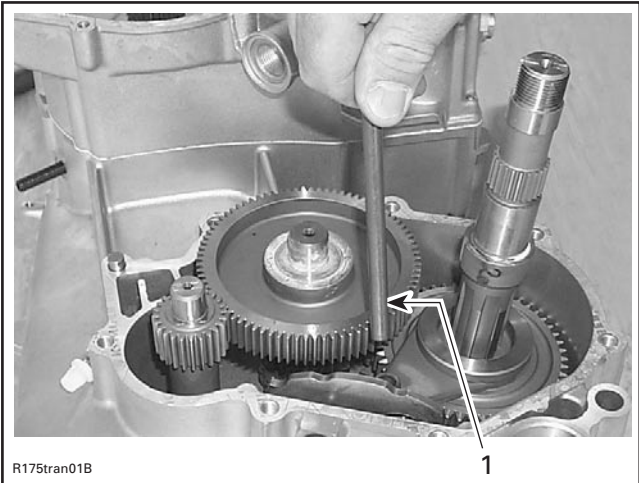
Install the shift fork into shift plate track.

NOTE: Place shift shaft plate in neutral position prior to insert pin of shift fork.

CAUTION: Do not forget thrust washer **no. 18**.



1. Shift fork
2. Neutral position



1. Shift fork shaft

Install gearbox cover (see CRANKCASE above).

NOTE: Run all gears as a final function check. The same time check output shaft and main shaft axial play.

OUTPUT SHAFT AXIAL PLAY	
NEW MINIMUM	0.05 mm (.002 in)
NEW MAXIMUM	0.69 mm (.027 in)

MAIN SHAFT AXIAL PLAY	
NEW MINIMUM	0.05 mm (.002 in)
NEW MAXIMUM	0.49 mm (.019 in)

Refill recommended oil (see **System Capacity** above).

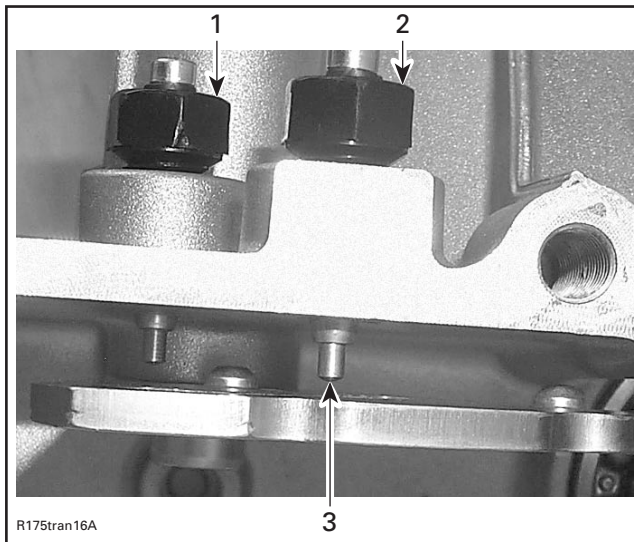
SHIFTING INDICATOR SWITCH

NOTE: The engine removal is not necessary to reach the shifting indicator switches.

Removal

NOTE: Clean area from dirt before removing parts.
Remove screws retaining shifting indicator switch wires.

Unscrew the shifting indicator switches **no. 32**.



- 1. Neutral switch
- 2. Reverse switch
- 3. Contact pin on switch

NOTE: Remove the shifting indicator switches one at a time. It is recommended to use a socket to removing an indicator switch.

Test

Check if shifting indicator switches work properly.

CAUTION: Switch pin has to move freely and must not detach from its housing.

Check wiring harness and replace if brittle or hard.

Using a multimeter, measure the resistance of the shifting indicator switches. Use the following procedure:

- Reinstall screw on each switch.
- Place one probe of multimeter on switch screw and the other on the engine.

NOTE: The alligator clip is recommended.

Apply the end of switch on the engine.

If the resistance is infinite (O.L.), replace the shifting indicator switch.

If the shifting indicator switch and its harness are good, check the vehicle harness and/or indicator lights.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

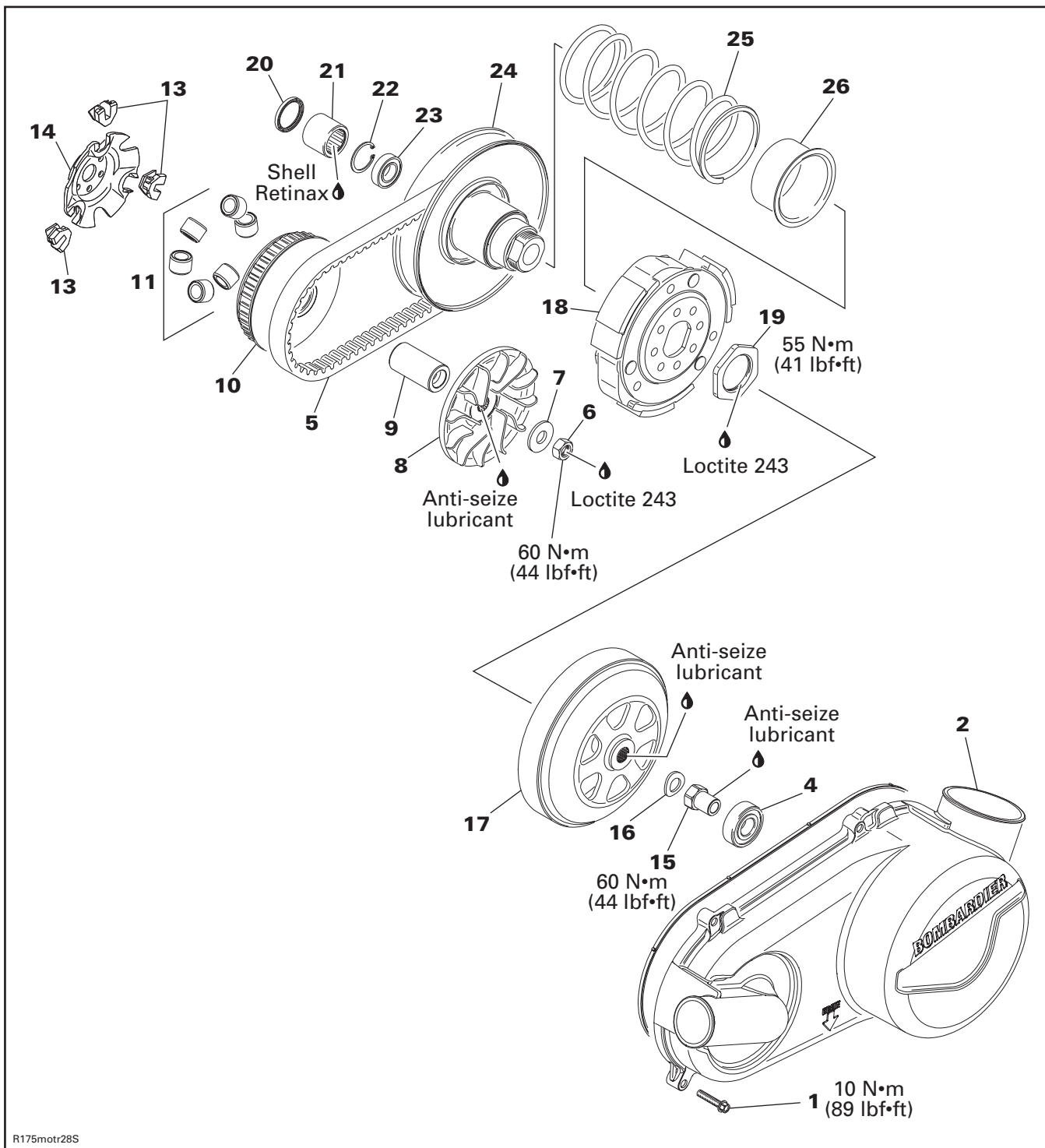
If all switches are removed, take care to put back wires at the proper location.

WIRES	SWITCH
YELLOW/GREY	Neutral
VIOLET/GREY	Reverse

Take care do not damage shifting indicator switches threads during installation.

CVT

NOTE: This is a lubrication free drive pulley.



R175motr28S

GENERAL

NOTE: For a better understanding, the following illustrations are taken with engine out of vehicle. To perform the following instructions, it is not necessary to remove engine.

This CVT is lubrication free. Never lubricate any components.

For installation, use torque values and Loctite products from the exploded view. Clean threads before using Loctite products when installing screws.

⚠ WARNING

Never touch CVT while engine is running. Never drive vehicle when CVT cover is removed.

⚠ WARNING

Any drive pulley repairs must be performed by an authorized Bombardier ATV dealer. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

⚠ WARNING

Never use any type of impact wrench at drive pulley removal and installation.

⚠ WARNING

The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly.

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (ex.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

CAUTION: These pulleys have metric threads. Do not use imperial threads puller. Always tighten puller by hand to ensure that the drive pulley has the same type of threads (metric vs imperial) prior to fully tightening.

DRIVE BELT REPLACEMENT

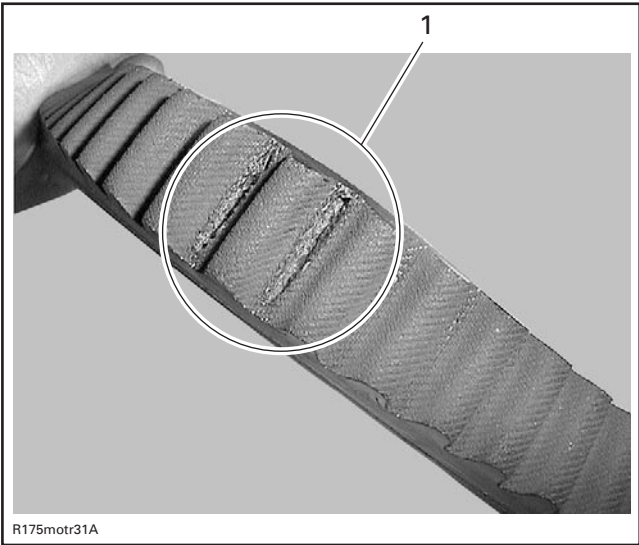
Removal

Remove CVT cover (refer to **CVT Cover** further).

There are two possibilities to remove the drive belt. You can remove the drive pulley or the driven pulley (see **the corresponding sections** further for removal and installation procedure).

Inspection

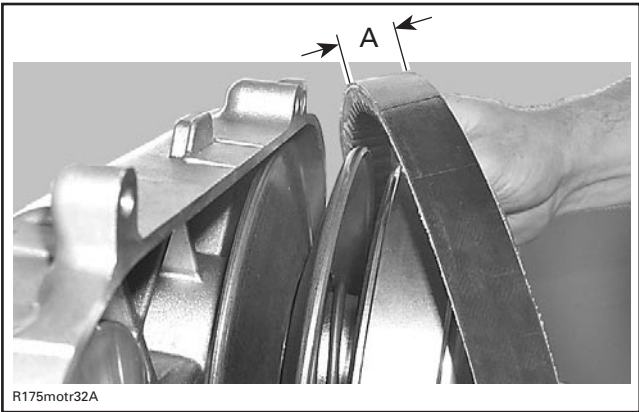
Inspect belt for cracks, fraying or abnormal wear. Replace if necessary.



1. Cracks inside the belt

Check drive belt width. Replace if it is out of specification (see table below).

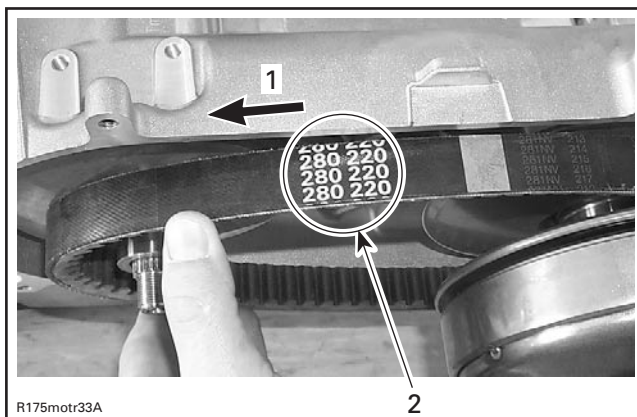
DRIVE BELT WIDTH	
NEW NOMINAL	21.0 to 22.00 mm (.069 to .072 in)
SERVICE LIMIT	19.50 mm (.064 in)



A. Drive belt width

Installation

The maximum drive belt life span is obtained when the drive belt has the proper rotation direction. Install it so the printed text on belt is pointing towards front of the vehicle (the text must be legible).



1. Vehicle front area
2. Printed number

As the case may be, refer to **Drive Pulley Installation** or **Driven Pulley Installation** for the proper procedure.

Install the CVT cover. See below for the procedure.

CVT COVER

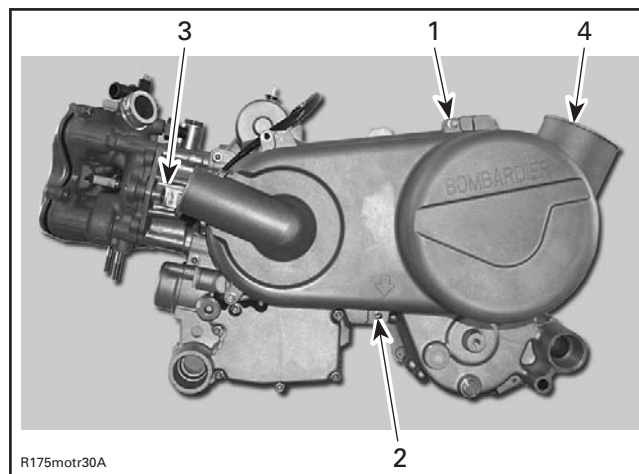
Unscrew clamps retaining CVT cover to CVT inlet and exhaust hoses.

Remove:

- screws no. 1

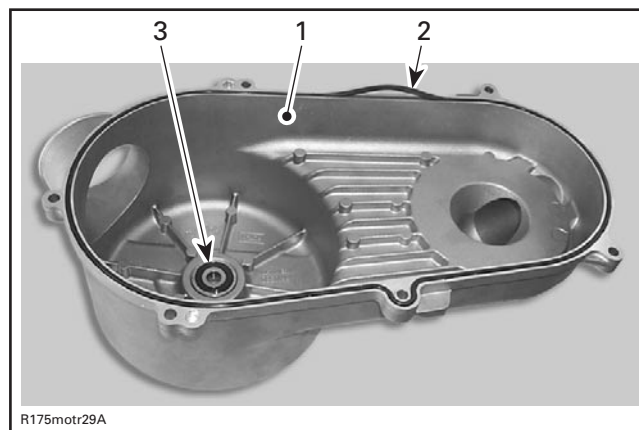
WARNING

To avoid burning yourself, wait until the exhaust system cools down before removing the bottom screws.



1. Center top screw
2. CVT drain plug
3. CVT air inlet hose
4. CVT air outlet hose

- CVT cover no. 2 and gasket no. 3.



1. CVT cover
2. Gasket
3. Ball bearing

NOTE: Remove the center top screw last. This screw allows to support the cover during removal.

Section 03 ENGINE

Subsection 11 (CVT)

Inspection

Check CVT cover for cracks or other damages. Replace if necessary.

Check if the gasket is brittle, hard or otherwise damaged. Replace if necessary.

Check if the CVT cover bearing must turn smoothly and freely. Otherwise, replace it. See **CVT Cover Bearing** below).

Installation

Place the gasket in the CVT cover groove.

Install the CVT cover. Align the end of driven pulley nut **no. 15** with the ball bearing **no. 4**.

NOTE: Do not overdo the CVT cover to install it.

Install the center top screw of cover in first.

Install the other screws then torque them in a crisscross sequence.

Install hoses then torque clamps.

CVT COVER BEARING

Inspection

Check if the CVT cover bearing must turn smoothly and freely. Otherwise, replace it.

Removal

Heat up CVT cover to about 100°C (212°F) for an easy bearing removal.

CAUTION: Do not overheat.

Using a slide hammer with the proper attachment, remove the bearing.

Installation

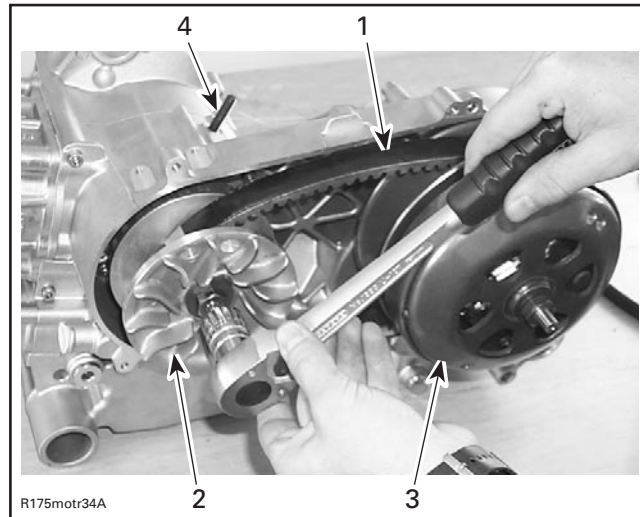
Place the new bearing in freezer for 10 minutes.

Heat the CVT cover to about 100°C (212°F) to put the bearing in place.

CAUTION: Do not overheat.

Then, install the bearing.

DRIVE PULLEY

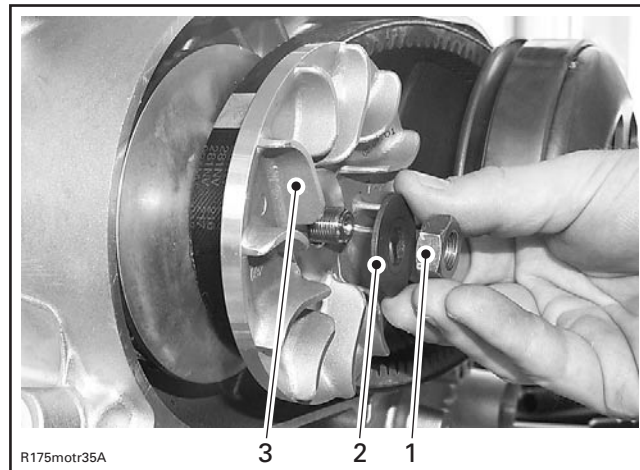


1. Drive belt
2. Drive pulley
3. Driven pulley
4. Crankshaft locking bolt (P/N 529 035 617)

Removal of Drive Pulley

Lock crankshaft at TDC compression position, refer to **CRANKSHAFT**.

Remove drive pulley nut **no. 6** and thrust washer **no. 7** then pull outer half.



1. Drive pulley nut
2. Thrust washer
3. Drive pulley outer half

Remove belt **no. 5**.

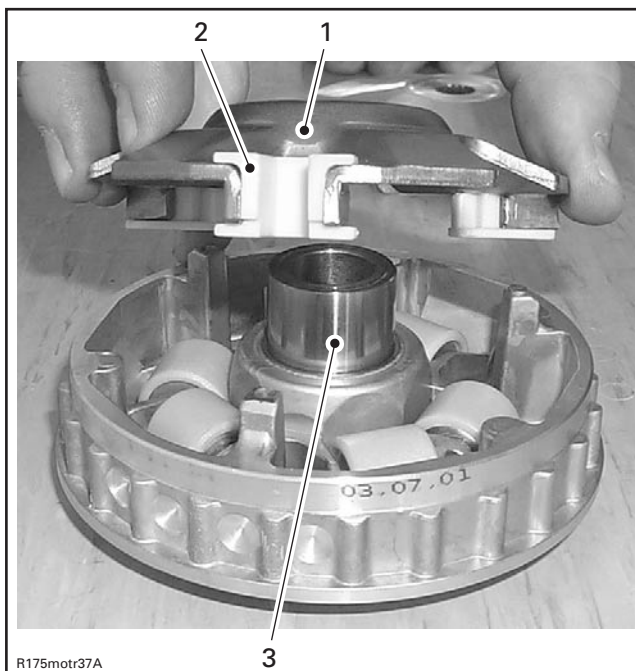
Remove whole drive pulley sliding half, **no. 9** to **no. 14**.

Disassembly of Drive Pulley

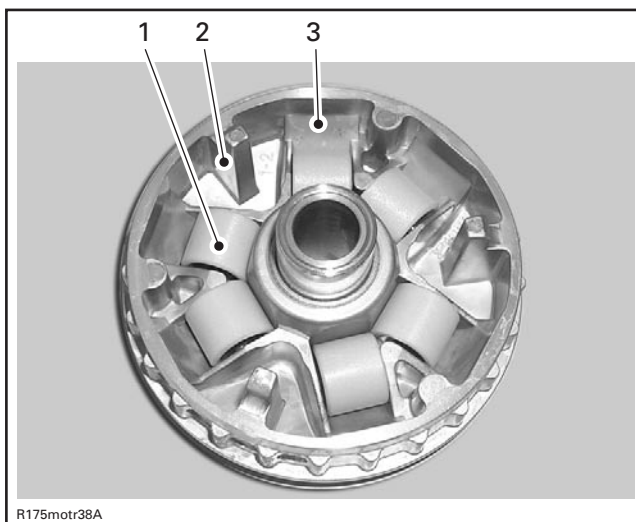
Sliding Half

Lift ramp plate no. 14 with sliding shoes no. 13.

Withdraw spacer no. 9.



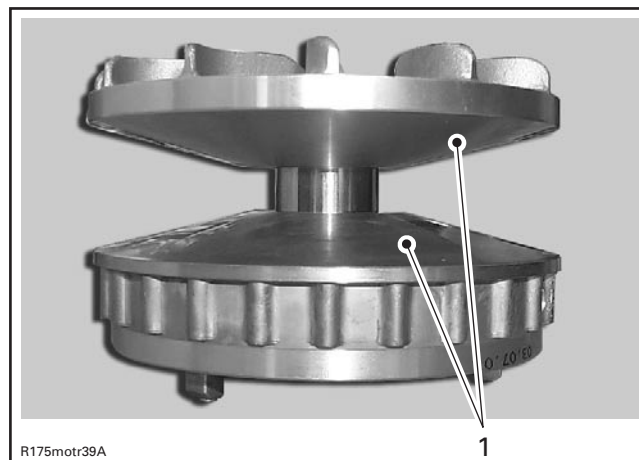
1. Ramp plate
2. Sliding shoes
3. Spacer



1. Roller
2. Contact surface to sliding shoes
3. Ramp for the rollers

Cleaning of Drive Pulley

Clean pulley faces and shaft with fine steel wool and dry cloth.



1. Faces of drive pulley

Reclean mounting surfaces with paper towel and cleaning solvent. Use Bombardier pulley flange cleaner (P/N 413 711 809).

Wipe off the mounting surfaces with a clean, dry paper towel.

Only use petrol base cleaner when cleaning bushings inside sliding half.

CAUTION: Do not use acetone to clean bushing.

Inspection of Drive Pulley

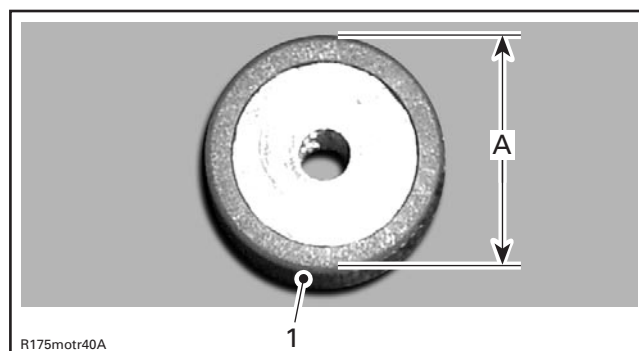
Drive Pulley

Drive pulley should be inspected annually.

Roller

Check roller kit no. 11 for roundness of external diameter.

NOTE: Replace roller kit, when rollers are showing flat surfaces.



1. Contact surface to drive pulley sliding half
- A. Roller diameter

Section 03 ENGINE

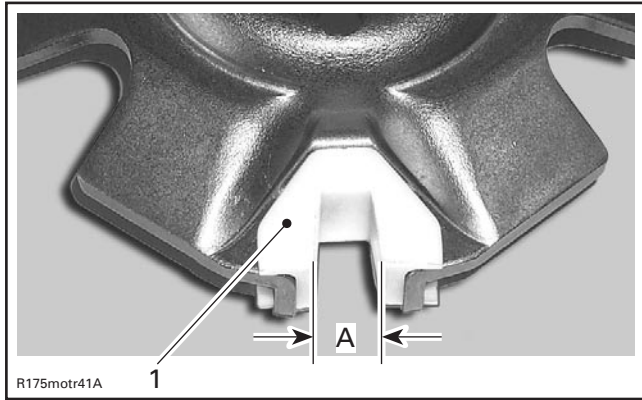
Subsection 11 (CVT)

Measure the roller diameter. If a roller is out of specification, replace roller kit **no. 11**.

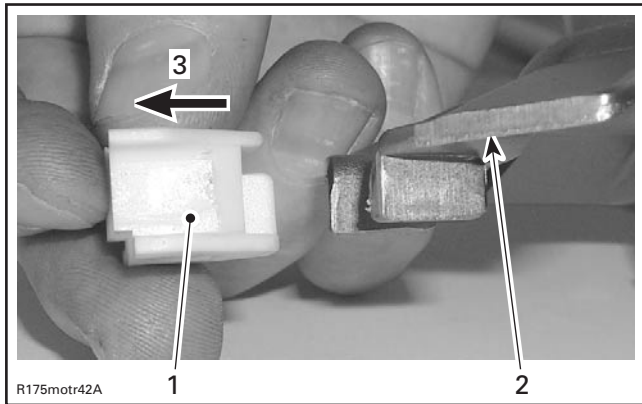
ROLLER DIAMETER	
NEW MINIMUM	20.00 mm (.787 in)
NEW MAXIMUM	20.20 mm (.795 in)
SERVICE LIMIT	19.50 mm (.768 in)

Slider Shoe

Check slider shoes kit **no. 13** for visible wear and replace if damaged or out of specification.



1. Slider shoe
A. Slider shoe gap



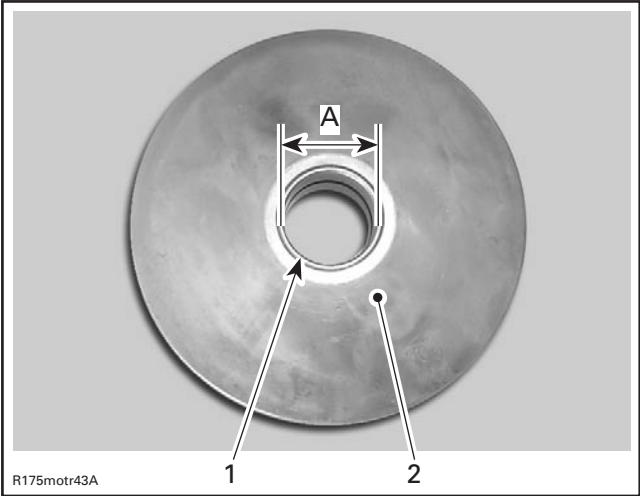
1. Slider shoe
2. Ramp plate
3. Lift slider shoes this way

Sliding Half

Check sliding half for cracks and sliding contact surface for excessive wear. Replace sliding half if necessary.

Measure bushing diameters of sliding half.

Use a dial bore gauge to measure bushing diameter. Measuring point must be at least 5 mm (1/4 in) from each bushing edge.



1. Bushing
2. Drive pulley sliding half
A. Bore diameter of bushing

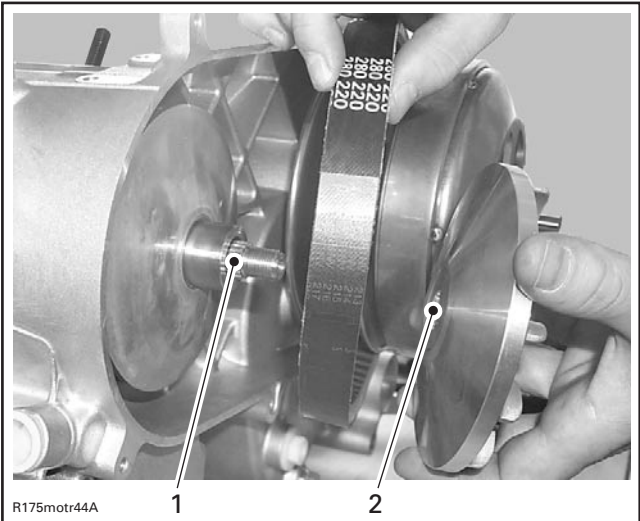
SLIDING HALF BUSHING	
NEW MINIMUM	26.000 mm (1.024 in)
NEW MAXIMUM	26.025 mm (1.025 in)
SERVICE LIMIT	26.100 mm (1.028 in)

Replace sliding half if bushing(s) is(are) out of specification. Visually inspect coatings.

Fixed Half

Check fixed half for scorings and other damages. If so, replace fixed half.

Check for any marks on fixed half spline. Replace if necessary.



1. Spline on crankshaft PTO side
2. Drive pulley fixed half spline

Assembly of Drive Pulley

For assembly, reverse the disassembly procedure. Pay attention to following details.

Insert slider shoes into ramp plate to properly slide in guides of drive pulley sliding half.

Installation of Drive Pulley

For installation, reverse the removal procedure. Pay attention to the following details.

WARNING

Do not apply anti-seize or any lubricant on drive pulley.

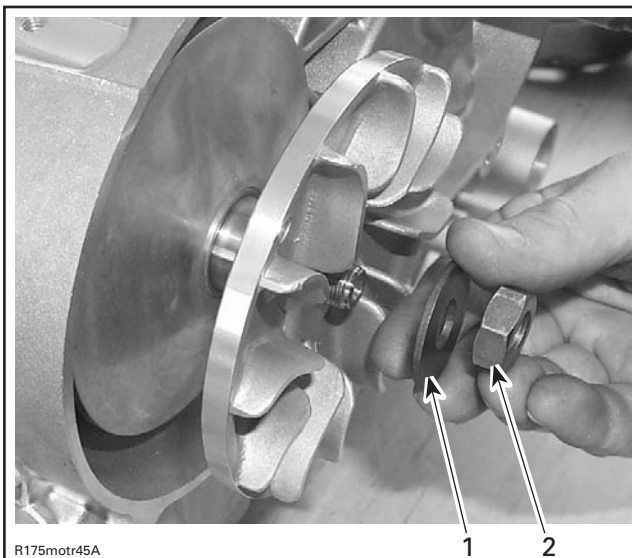
WARNING

Never use any type of impact wrench at drive pulley removal and installation.

Clean mounting surfaces as described in CLEANING above.

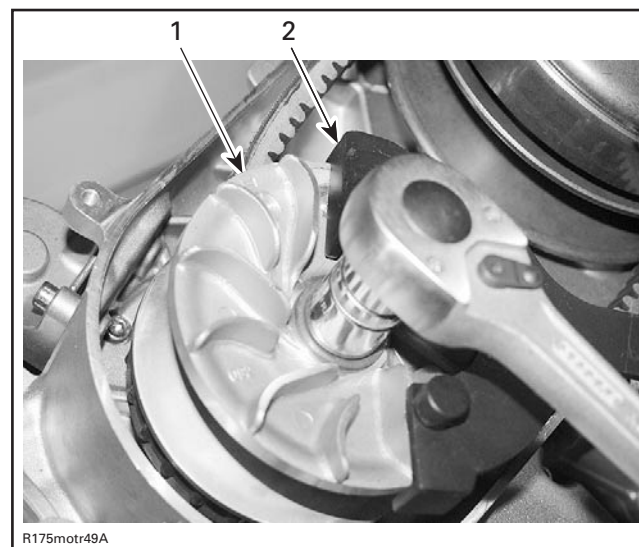
Install drive pulley on crankshaft extension.

NOTE: Do not forget shim no. 7.



1. Shim
2. Drive pulley nut

Install crankshaft locking bolt (P/N 529 035 617) or clutch holding tool (P/N 529 035 862) and torque screw to 60 N•m (44 lbf•ft).



1. Drive pulley outer half
2. Clutch holding tool

DRIVEN PULLEY

Removal of Driven Pulley

Remove:

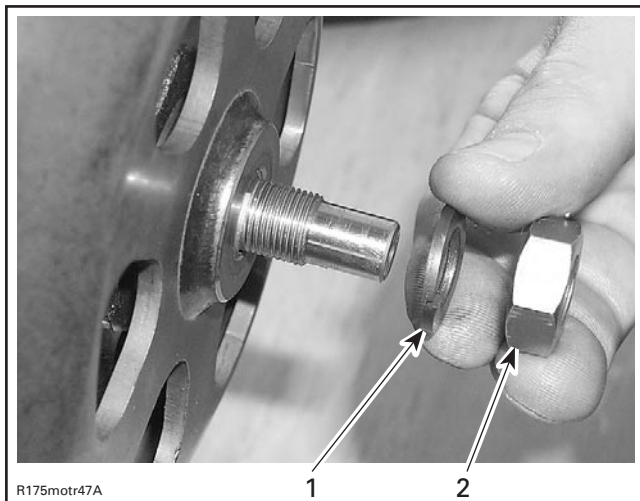
- driven pulley nut no. 15, lock washer no. 16



1. Clutch holding tool
2. Clutch drum

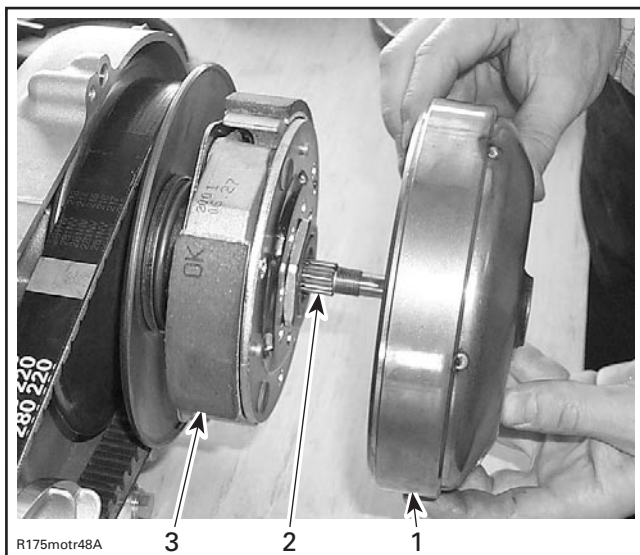
Section 03 ENGINE

Subsection 11 (CVT)



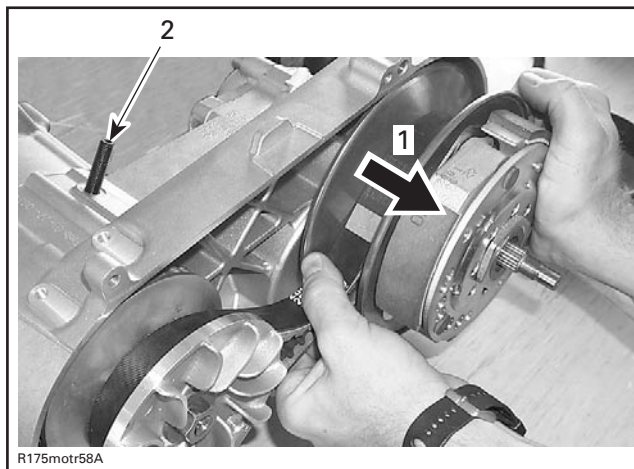
1. Lock washer
2. Driven pulley nut

– withdraw clutch drum no. 17



1. Clutch drum
2. CVT shaft
3. Clutch

– belt no. 5.



1. Driven pulley outer half against clutch assembly
2. Crankshaft locking bolt

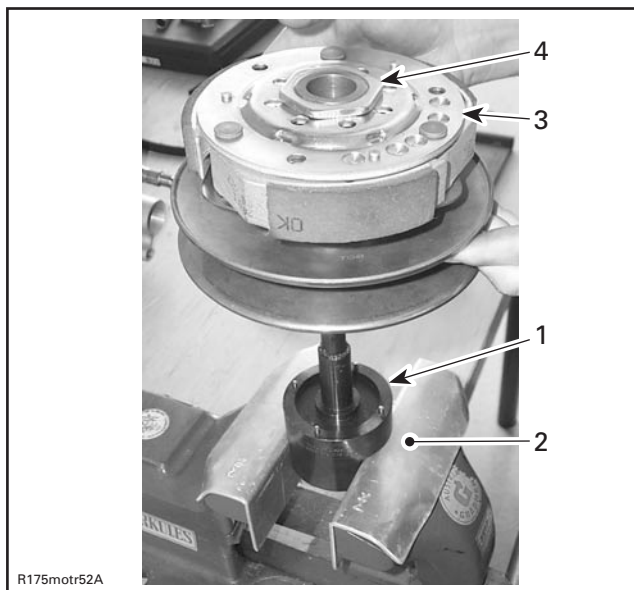
Disassembly of Driven Pulley

NOTE: The following procedure is not necessary except if clutch no. 18 must be removed. Refer to **Inspection** before proceed.

Remove:

– nut no. 19 as per following procedure.

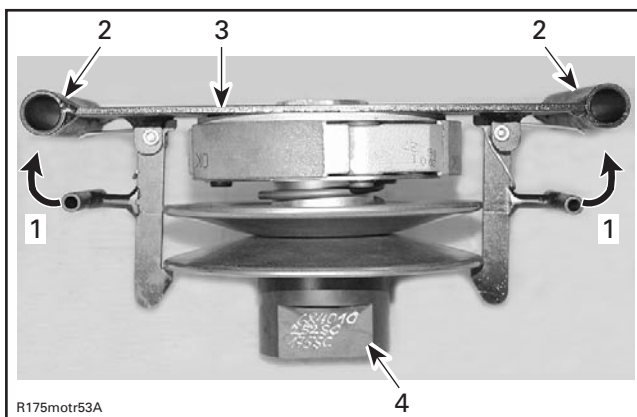
Fix clutch support (P/N 529 035 863) in a vise and place driven pulley assembly.



1. Clutch holding tool
2. Vise
3. Driven pulley assembly
4. Nut wrench size 46

Mount clutch holding tool (P/N 529 035 864).

CAUTION: Both hooks on spring loaded levers have to be engaged on outside diameter of driven pulley fixed half.



1. Withdraw levers to install tool
2. Handle grip
3. Clutch holding tool
4. Clutch support

Disassemble nut, disengage the hooks of the levers on clutch holding tool and slowly release tool.

⚠ WARNING

Centrifugal clutch is spring loaded.

Cleaning of Driven Pulley

When a dust deposit has to be removed use dry cloth.

Clean pulley faces and shaft with fine steel wool and dry cloth.

Use Bombardier pulley flange cleaner (P/N 413 711 809) to clean driven pulley.

Clean the CVT crankcase area from contamination.

⚠ WARNING

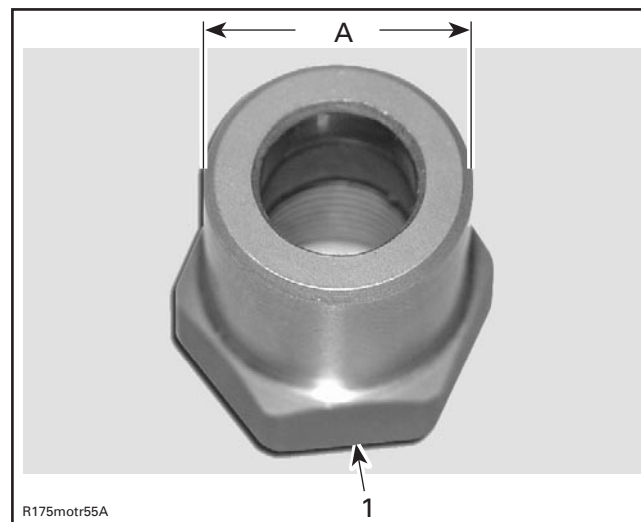
This procedure must be performed in a well-ventilated area.

CAUTION: Avoid contact between cleaner and oil seals because damage may occur.

Inspection

Nut

Measure nut no. 15 for wear on outside diameter and replace if necessary.



1. Nut
- A. Wearing diameter

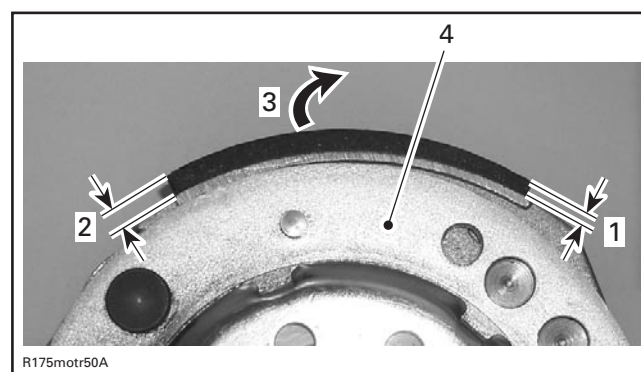
NUT OUTSIDE DIAMETER

NEW MINIMUM	16.980 mm (.6685 in)
NEW MAXIMUM	16.991 mm (.6689 in)
SERVICE LIMIT	16.880 mm (.6646 in)

Centrifugal Clutch

Check levers on centrifugal clutch no. 18 for free movement and lining wear.

NOTE: When lining thickness is getting less, higher RPM is needed for centrifugal clutch engagement.



1. Lining thickness next to lever fixation
2. Lining thickness on lever end
3. Direction of lever movement
4. Centrifugal clutch ass'y

LINING THICKNESS

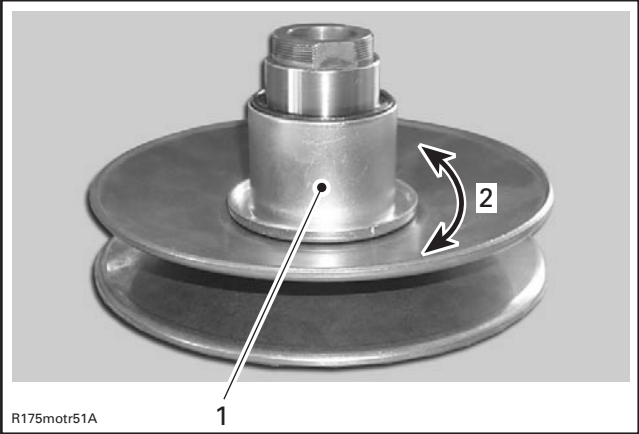
NEW NOMINAL	2.50 mm to 4.50 mm (.0984 in to .1772 in)
SERVICE LIMIT	1.00 mm (.0394 in)

Section 03 ENGINE

Subsection 11 (CVT)

Sliding Half

Check sliding half of driven pulley for free movement. Replace driven pulley if necessary.



Fixed Half

Check oil seal **no. 20** if brittle hard or otherwise damaged. Replace if necessary.

Check ball bearing **no. 23** for free play and smooth operation. Replace if necessary.

Check one-way clutch **no. 21** for free movement and lock function. Replace if necessary.

Check CVT shaft for heavy wear or visible damage. Replace if necessary.

Spring

Measure spring free length and squareness. If spring is out of specification, replace by a new.

SPRING FREE LENGTH	
NEW NOMINAL	159 mm (6.260 in)
SERVICE LIMIT	150 mm (5.905 in)

CLUTCH SPRING SQUARENESS	
NEW NOMINAL	4.5 mm (.177 in)
SERVICE LIMIT	4.2 mm (.165 in)

Assembly of Driven Pulley

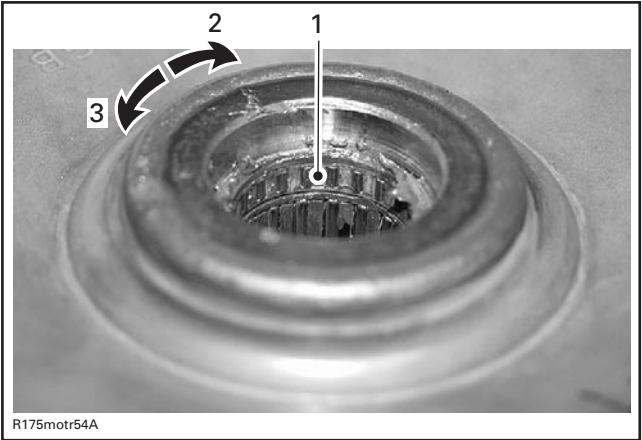
For installation, reverse the removal procedure. Pay attention to following details

Heat ball bearing area up to 100°C (212°F) before installing ball bearing **no. 23** or one-way clutch **no. 21**.

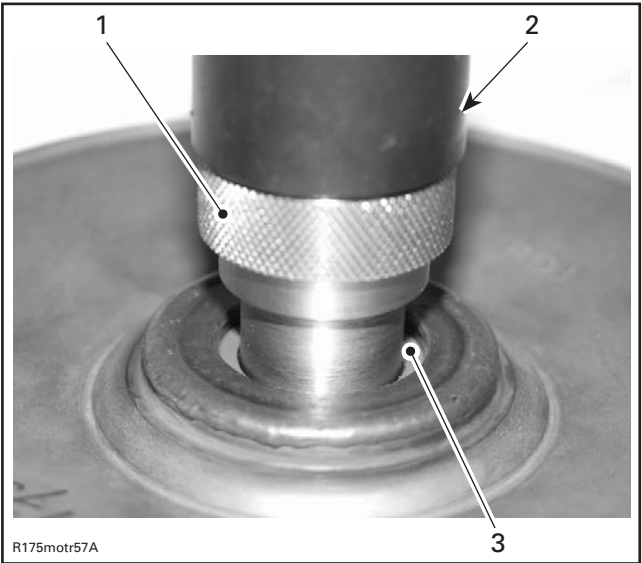
NOTE: Place new ball bearing in a freezer for 10 minutes before installation.

Install ball bearing **no. 23** by pushing only on the outer ring.

For installation of one-way clutch **no. 21** and oil seal **no. 20** use bearing installer (P/N 529 035 858).



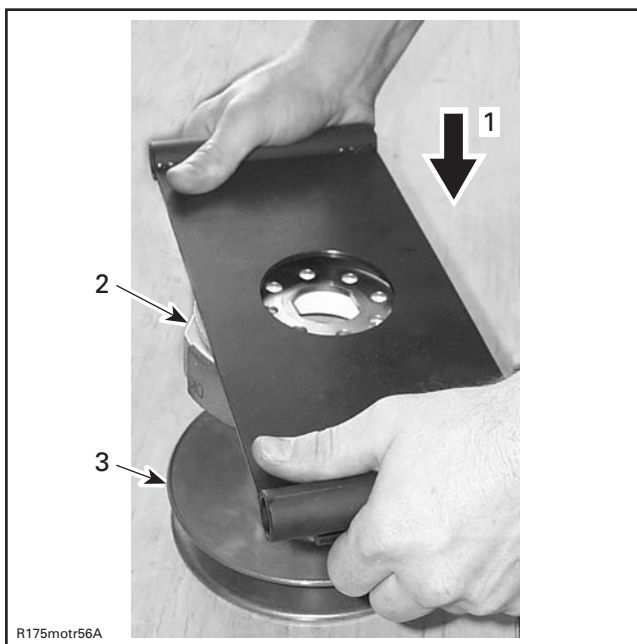
CAUTION: Do not use hammer, use press machine only for one-way clutch installation.



Place spring **no. 25**, sleeve **no. 26** behind sliding half and push the centrifugal clutch assembly **no. 18** against driven pulley with clutch holding tool (P/N 529 035 864).

⚠ WARNING

Centrifugal clutch is a spring loaded system.



1. Pushing direction
2. Centrifugal clutch assembly
3. Driven pulley assembly

Installation of Driven Pulley

For installation, reverse the removal procedure. Pay attention to the following details.

CAUTION: Always use a new spring washer **no. 16** at the time of driven pulley installation.

NOTE: Driven pulley end-play is 0 (zero).

Install clutch holding tool (P/N 529 035 862) to torque driven pulley nut to 60 N•m (44 lbf•ft).