

LUBRICATION SYSTEM

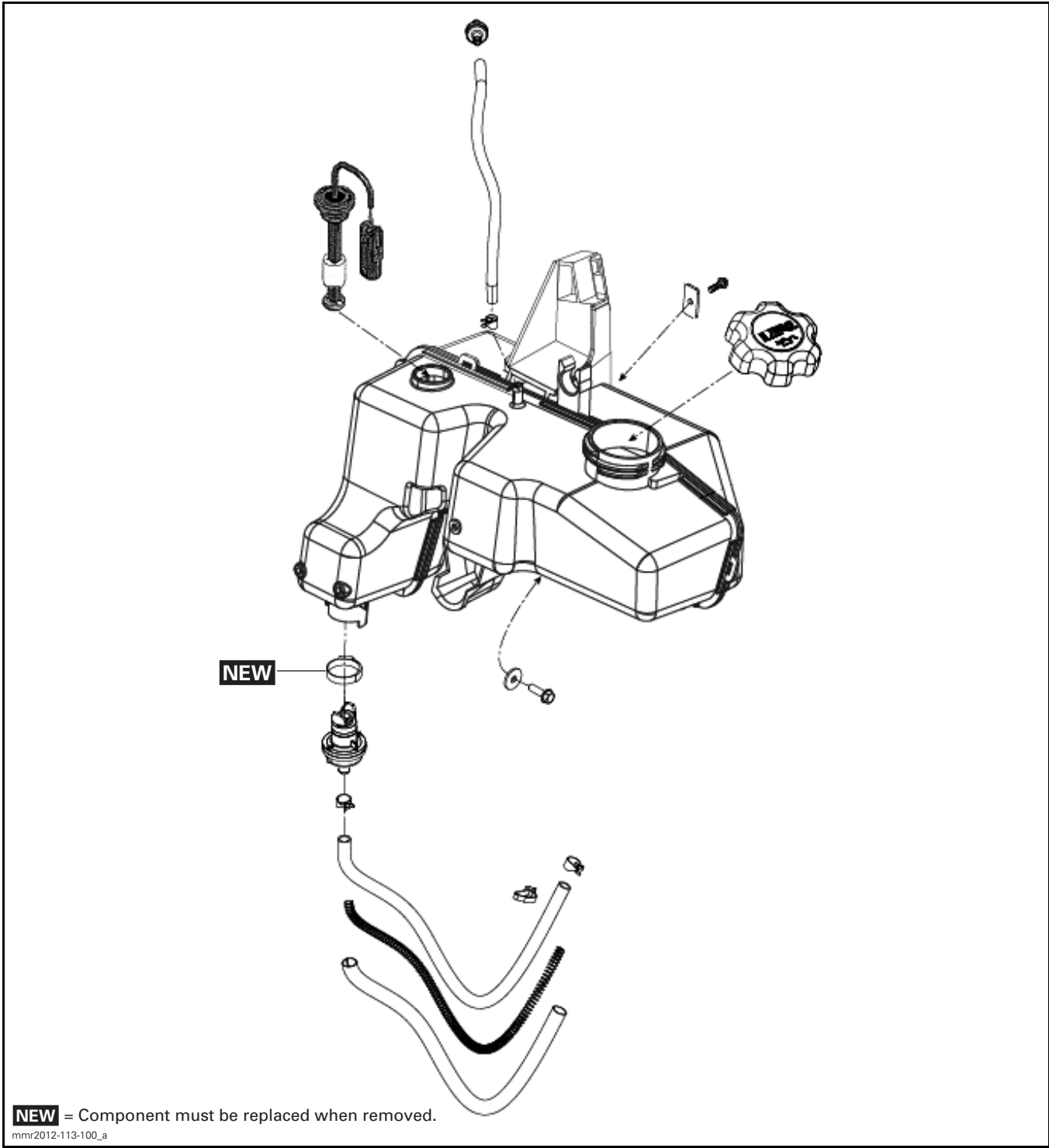
SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	10
LEAK TEST KIT	529 033 100	4
SMALL HOSE PINCHER	295 000 076	5-6
SUCTION PUMP	529 035 880	8
VACUUM/PRESSURE PUMP	529 021 800	5, 11

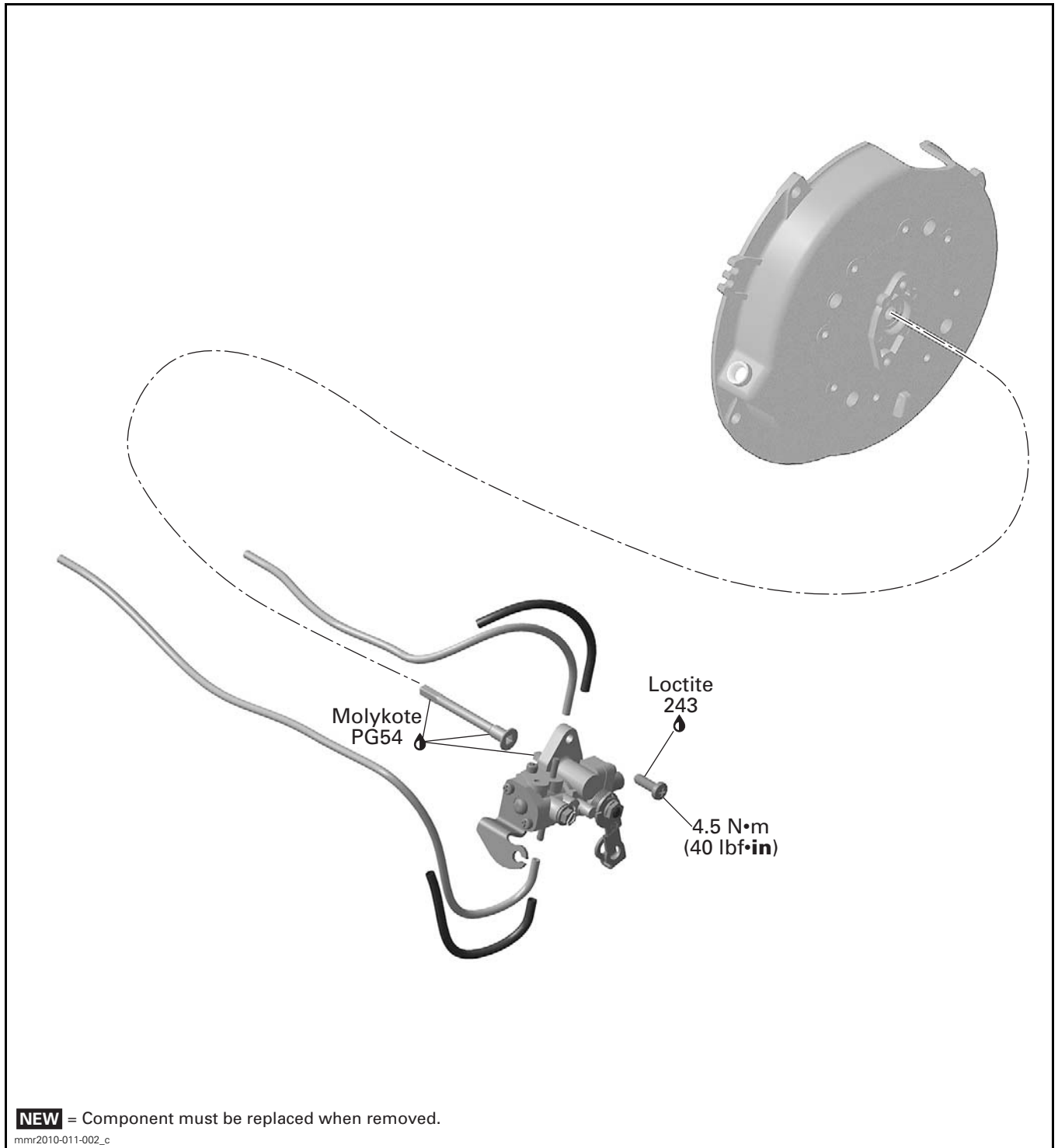
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	7
LOCTITE 648 (GREEN)	413 711 400	12
PULLEY FLANGE CLEANER	413 711 809	12
XPS INJECTION OIL	293 600 117	4
XPS SYNTHETIC 2-STROKE OIL	293 600 132	4
XPS SYNTHETIC BLEND 2-STROKE OIL	293 600 100	4

OIL INJECTION TANK



OIL INJECTION PUMP



GENERAL

During assembly/installation, use the torque values and service products as specified in the exploded views.

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* at the beginning of this manual for complete procedure.

⚠ WARNING

Torque wrench tightening specifications must be strictly adhered to. Locking devices when removed (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be replaced.

NOTICE Hoses, cables or locking ties removed during a procedure must be replaced and installed as per factory specification.

⚠ WARNING

Wipe off any oil spills. Oil is highly flammable.

NOTICE Do not use a hose pincher on the oil tank outlet hose. This would damage the spring inside hose.

SYSTEM DESCRIPTION

These engines employ a variable-rate plunger-type oil injection pump.

This variable-rate mechanical oil injection pump is directly driven by the crankshaft.

This pump delivers the right amount of oil at all engine RPM and at all throttle opening positions.

The pump stroke is variable and controlled by a cam connected to the pump lever and cable, which is linked to the throttle cable. As the throttle is opened wider, the pump stroke changes which increases the amount of oil delivered to the engine.

This pump requires little or no maintenance.

RECOMMENDED OIL

Use one of the following XPS™ injection oils.

ENGINE	RECOMMENDED INJECTION OIL
550F	XPS INJECTION OIL (P/N 293 600 117)
	XPS SYNTHETIC BLEND 2-STROKE OIL (P/N 293 600 100)
	XPS SYNTHETIC 2-STROKE OIL (P/N 293 600 132)

If XPS Mineral Injection Oil is not available, API TC high-quality low ash two-stroke injection oil may be used.

NOTE: All XPS injection oils are compatible, they can be mixed together.

XPS mineral injection oil is a special blend of basic oil and additives especially selected to ensure unequalled lubrication, engine cleanliness and minimum spark plug fouling.

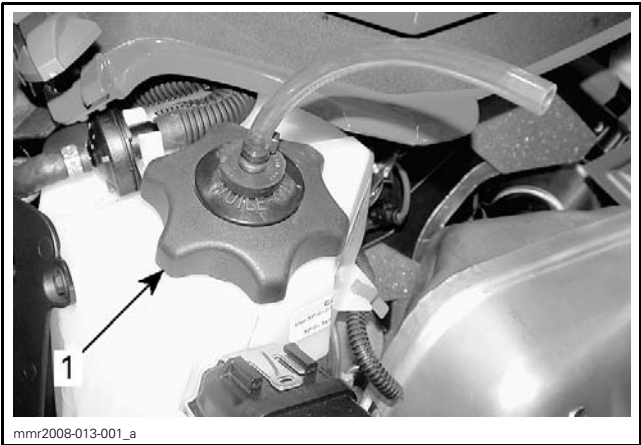
The XPS synthetic blend and synthetic injection oils **provide superior lubrication**, reduced engine component wear and oil deposit, thus maintaining maximum-level performance and antifriction properties. The synthetic blend and synthetic injection oils meet the latest ASTM and JASO standards by ensuring high biodegradability and low exhaust smoke.



INSPECTION

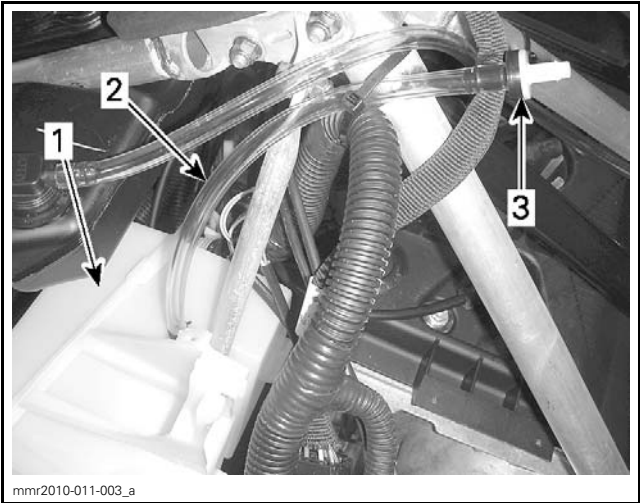
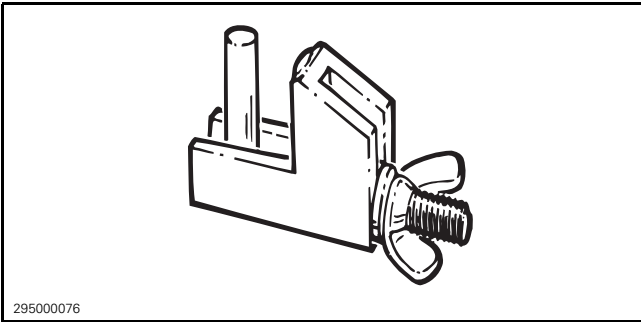
OIL SYSTEM LEAK TEST

Install oil tank test cap from the LEAK TEST KIT (P/N 529 033 100).



TYPICAL
1. Test cap on tank

Install a SMALL HOSE PINCHER (P/N 295 000 076) on the oil tank vent inlet hose.



TYPICAL
1. Oil tank
2. Vent inlet hose
3. Vent check valve

1. Connect the VACUUM/PRESSURE PUMP (P/N 529 021 800) to test cap.



2. Pressurize oil system as follows.

PRESSURE	TIME TO HOLD PRESSURE
18 kPa (2.6 PSI)	3 minutes

NOTE: Do not exceed recommended pressure as the results may lead to a false conclusion.

If pressure drops, locate leak(s) and repair or replace leaking component(s).

If pressure does not drop, there is no leakage in the system.

Check Valve Test

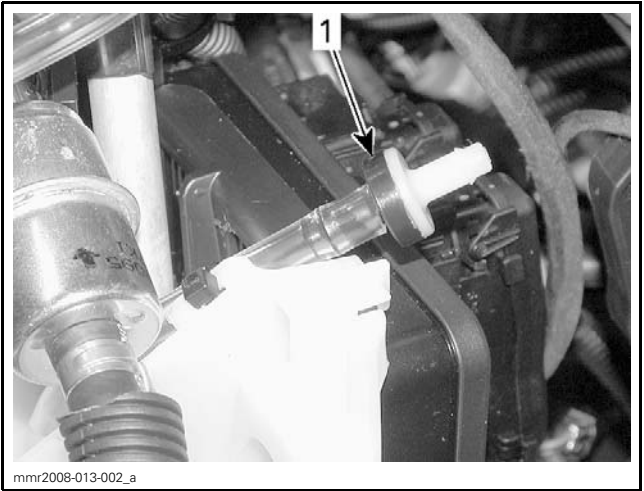
1. Use VACUUM/PRESSURE PUMP (P/N 529 021 800).
2. Pressurize check valve as follows.

Subsection XX (LUBRICATION SYSTEM)

CHECK VALVE TEST	
Air toward oil tank	Valve must let air to enter
Air toward outside	Valve must stop air to exit

NOTICE If check valve does not allow air to enter, serious engine damage will occur.

NOTE: When replacing one-way check valve, ensure that black side is positioned toward oil tank.



TYPICAL
1. Black side here

PROCEDURES

OIL INJECTION PUMP

Oil Injection Pump Operational Test

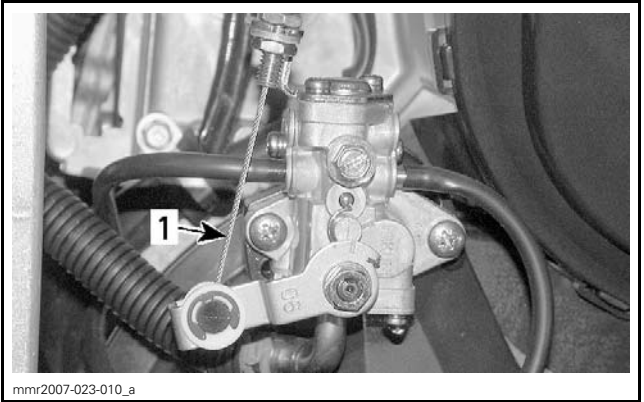
NOTE: Since the pump is a piston type, it functions when the engine rotates, in both forward and reverse.

1. Remove oil pump from engine. Refer to *OIL INJECTION PUMP REMOVAL* in this subsection.
2. Connect a hose filled with injection oil to the supply line fitting on the oil pump.
3. Insert the other ends of the other hoses in an injection oil container.
4. Using a clockwise rotating drill, rotate pump shaft as you hold the pump lever in the fully open position (clockwise when looking at lever end of pump).
5. Oil must drip from both small hoses. If not replace pump.

Oil Pump Removal

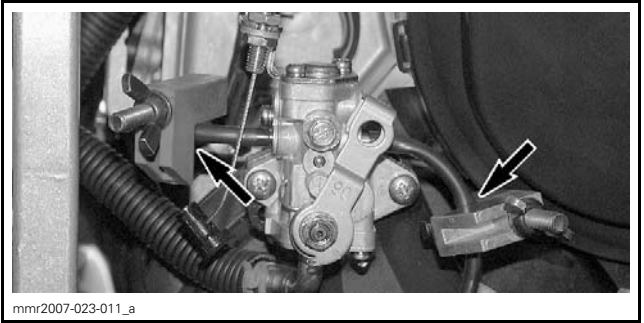
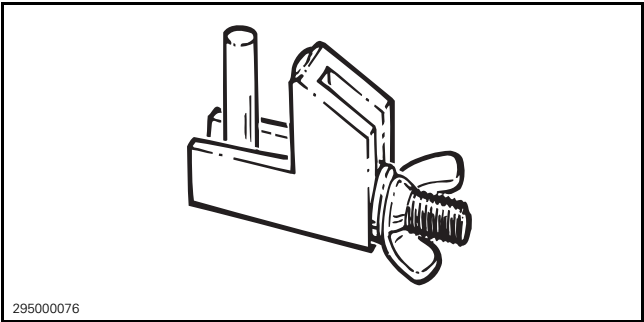
1. Remove oil tank cap and syphon injection oil from tank.

2. Remove the muffler, refer to *EXHAUST SYSTEM*.
3. Disconnect oil pump cable.



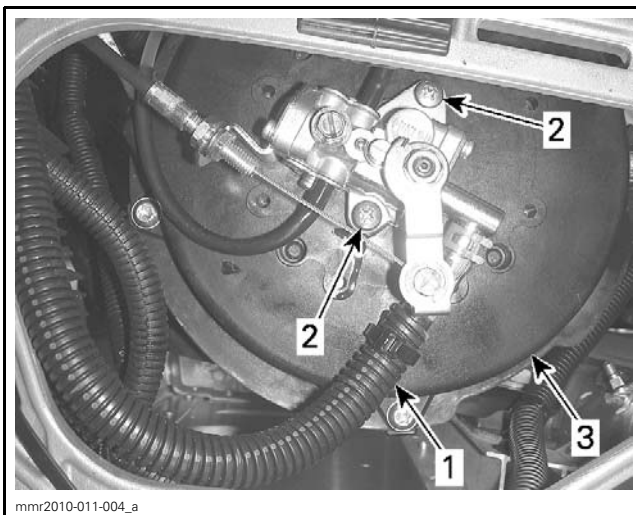
TYPICAL
1. Oil pump cable

4. Install a SMALL HOSE PINCHER (P/N 295 000 076) on each oil pump outlet hose, then disconnect the hoses from the pump.



TYPICAL - HOSE PINCHERS ON PUMP OUTLET HOSES

- NOTE:** Mark hose locations for reinstallation on pump.
5. Remove the oil supply hose from the pump.
 6. Remove the two screws that secure the oil pump to the rewind starter cover.



1. Oil supply hose
2. Oil pump retaining screws
3. Rewind starter

7. Remove oil pump.

Oil Injection Pump Cleaning

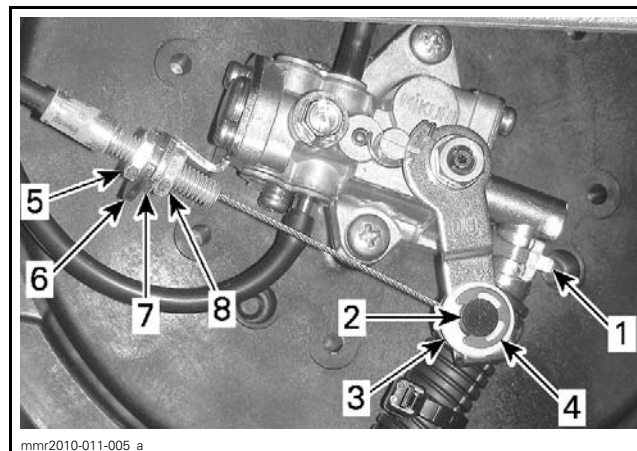
Clean all metal components in a non-ferrous metal cleaner.

Oil Pump Installation

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

NOTE: During installation, always check for spring clip tightness on pump inlet hose.

1. Apply LOCTITE 243 (BLUE) (P/N 293 800 060) on threads of pump mounting screws and torque them to 4.5 N•m (40 lbf•in).
2. Make sure cable barrel end is well seated in oil pump lever.
3. Secure cable barrel end with plastic washer and circlip.
4. Ensure cable barrel end moves freely in pump lever.
5. Install cable lock washer on pump lever side of the cable support.



1. Oil supply hose spring clip
2. Cable barrel end
3. Plastic washer
4. Circlip
5. Adjuster nut
6. Cable support
7. Lock washer
8. Lock nut

6. Verify cable and oil pump lever operation by pressing and releasing throttle lever.

7. Carry out the *OIL INJECTION PUMP ADJUSTMENT* procedure in this subsection.

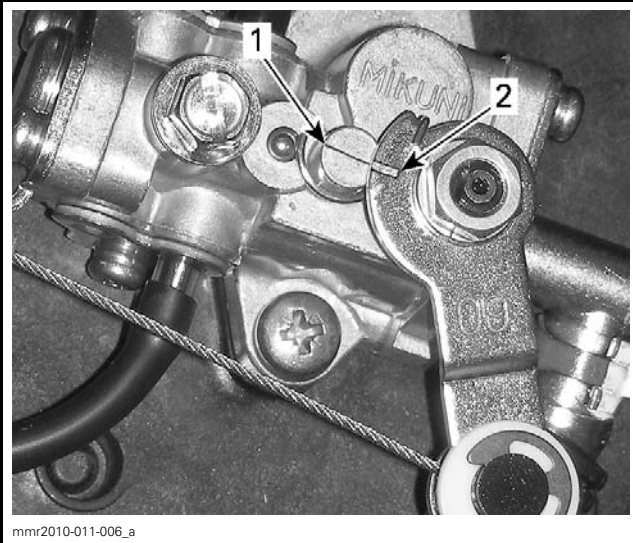
8. Carry out the *OIL INJECTION PUMP BLEEDING* procedure further in this subsection.

NOTICE Always bleed oil pump whenever a component of the oil system has been removed.

Oil Injection Pump Adjustment

NOTICE Prior to adjusting the oil pump, make sure all carburetor adjustments are completed. Refer to *VM CARBURETORS, THROTTLE AND CHOKE CABLES* subsection.

1. Eliminate the throttle cable free-play by pressing lightly on the throttle lever until a light resistance is felt, then hold in place.
2. The index marks on the pump casting and on the lever must align perfectly centered (minimum adjustment), to 0.5 mm (.02 in) off the mark on the tight side (maximum adjustment).
3. Loosen the cable lock nut and turn the adjuster accordingly.
4. Retighten the cable lock nut to 4.5 N•m (40 lbf•in).



TYPICAL

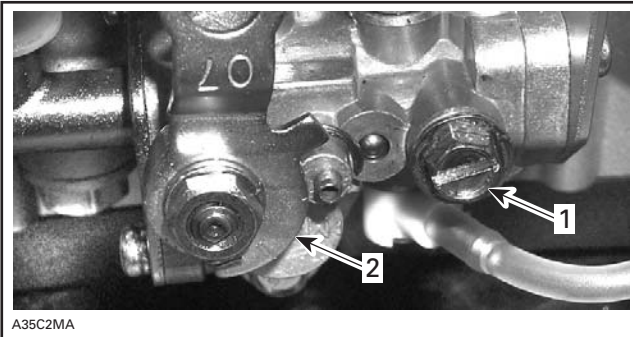
1. Index mark on pump casting
2. Index mark on pump lever

5. Ensure adjustment is still within specifications after cable lock nut is tightened.

NOTICE Improper oil injection pump adjustment can result in serious engine damage.

Oil Injection Pump Bleeding

1. Loosen oil bleeder screw.
2. Fully depress and hold the throttle lever to the handlebar.
3. Bleed supply oil line (between tank and pump) until all the air has escaped from the line and only oil comes out of the bleeder screw.



TYPICAL

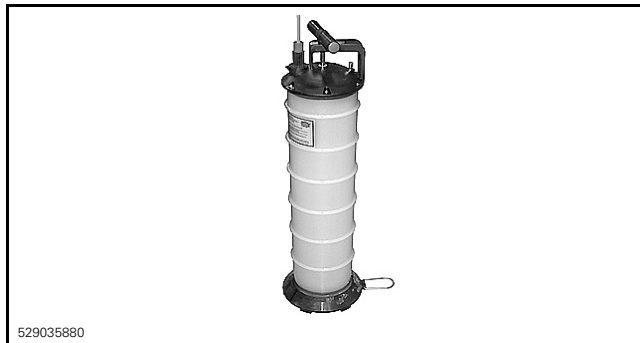
1. Bleeder screw
2. Oil pump lever

4. Tighten bleeder screw.
5. Ensure there are no air bubbles in small oil lines between pump and engine. If so, inject oil using a syringe into lines before connecting them to the engine.

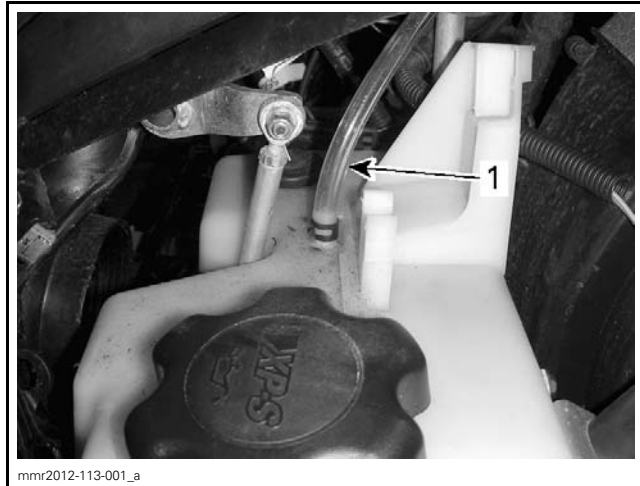
OIL TANK

Oil Tank Removal

1. Remove side panels, refer to *BODY* subsection.
2. Refer to *AIR INTAKE SYSTEM* subsection and remove:
 - Primary air intake silencer
 - Secondary air intake silencer and gauge support as a unit.
3. Drain oil tank using the SUCTION PUMP (P/N 529 035 880).



4. Remove the muffler, refer to *EXHAUST SYSTEM* subsection.
5. Remove rewind starter handle, refer to *REWIND STARTER* subsection.
6. Disconnect the oil tank vent hose from the top of the oil tank.



1. Oil tank vent hose
7. Unscrew shift linkage from gearshift lever.



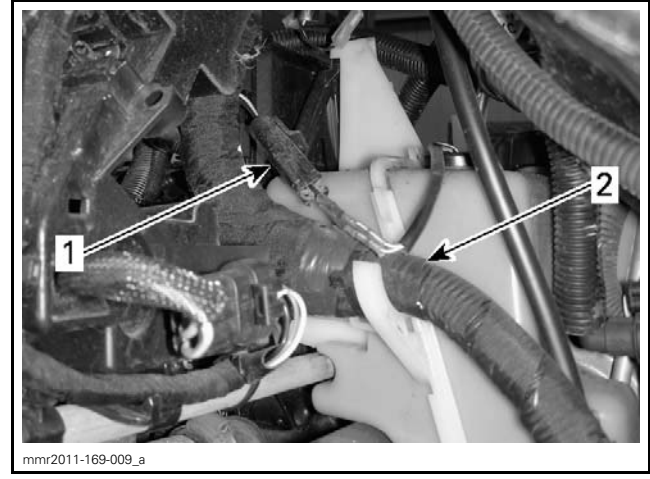
1. Shift linkage

8. Disconnect reverse beeper connector.



1. Reverse beeper

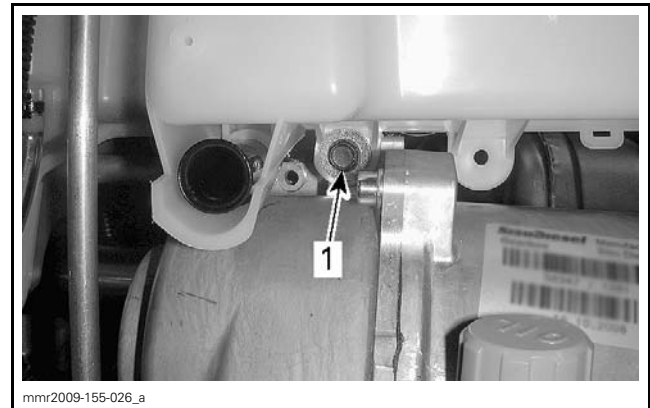
9. From LH side of vehicle:
- Disconnect oil level sensor connector
 - Detach harness from oil tank.



TYPICAL

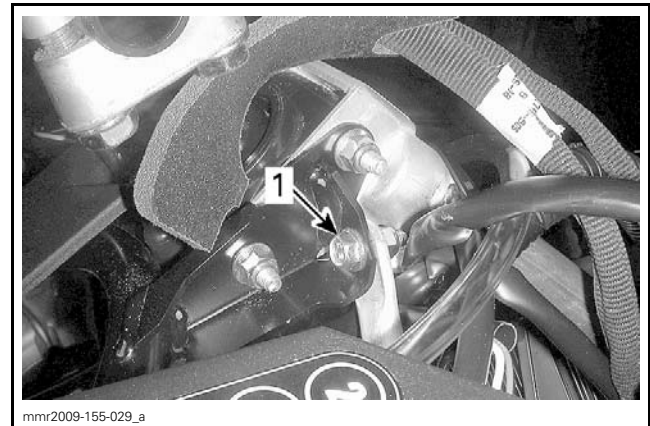
1. Oil level sensor connector
2. Harness

10. Remove screw securing oil tank to gearbox.



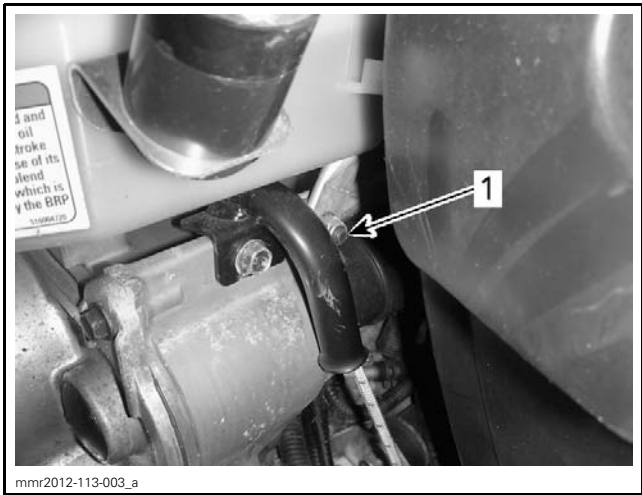
1. Oil tank retaining screw

11. Remove RH side frame member.



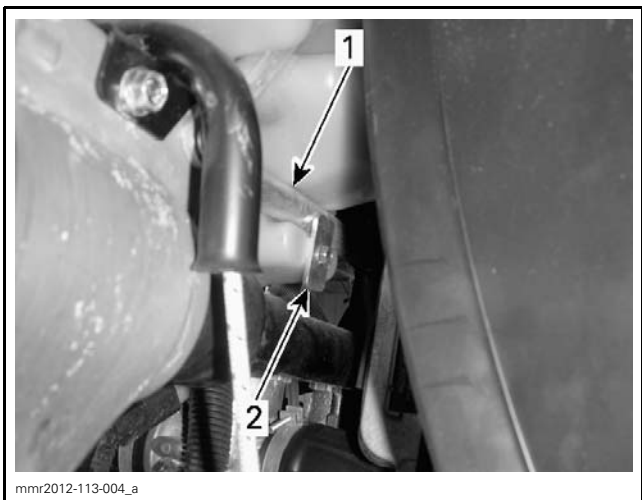
TYPICAL - RH SIDE

1. Side frame member upper bolt



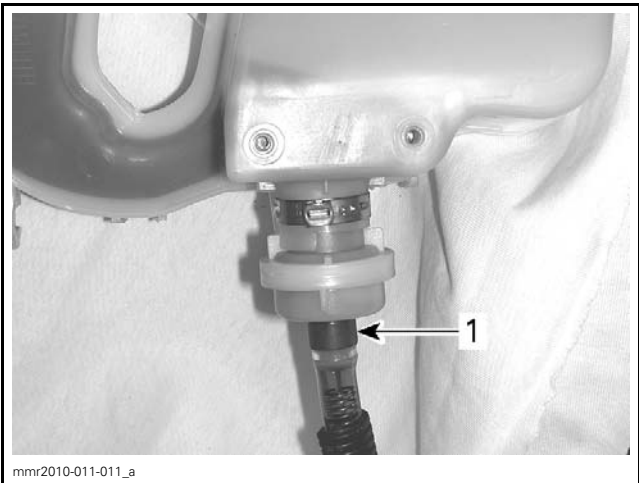
TYPICAL - RH SIDE
1. Side frame member lower bolt

12. Remove holder retaining oil tank to side frame member brace.



TYPICAL
1. Side frame member brace
2. Oil tank holder

13. Remove the oil pump supply hose from the oil filter at the bottom of the tank.



TYPICAL
1. Disconnect oil pump supply hose here

14. Remove oil tank from vehicle.

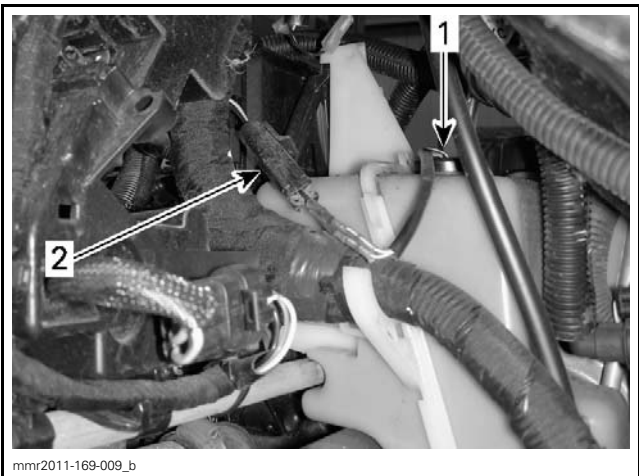
Oil Tank Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Fill up oil tank using recommended oil. See *RECOMMENDED INJECTION OIL* in this subsection.

OIL LEVEL SENSOR

Oil Level Sensor Location

The oil level sensor is located on the top of oil tank.



TYPICAL - VIEW FROM LH SIDE OF VEHICLE
1. Oil level sensor
2. Oil level sensor connector

Oil Level Sensor Test

Measure resistance of the oil level sensor using a FLUKE 115 MULTIMETER (P/N 529 035 868).

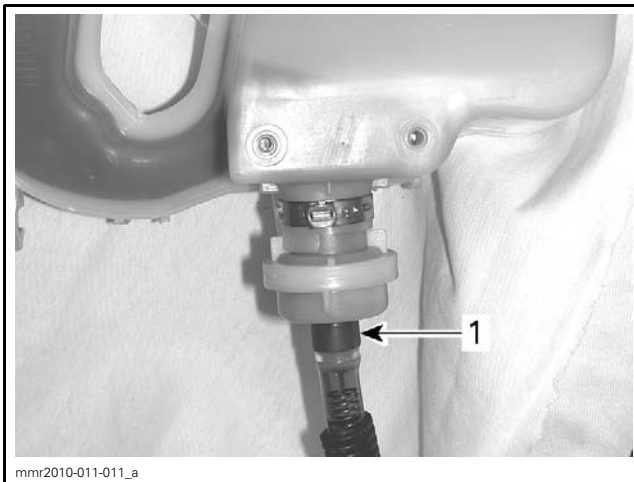
SENSOR POSITION	RESISTANCE
Sensor float downwards	High value or infinite (OL)
Sensor float upwards	0.2 Ω (closed)

If resistance test fails, replace sensor.

OIL FILTER

Oil Filter Removal

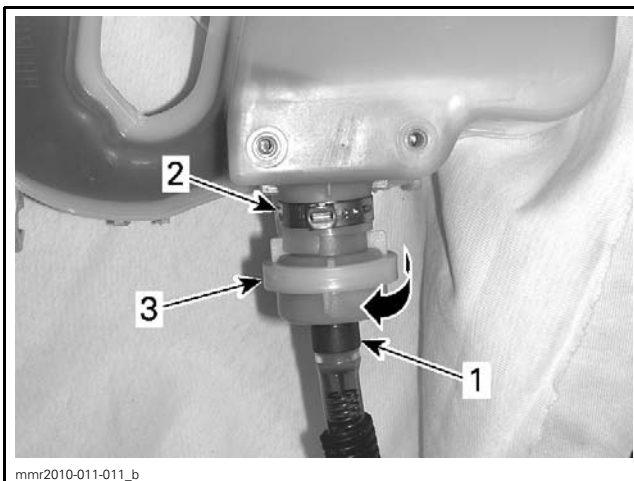
1. Remove RH side panels. Refer to *BODY* subsection.
2. Remove the oil pump supply hose from the oil filter at the bottom of the tank.



TYPICAL

1. Disconnect oil pump supply hose here

3. Remove the Oetiker clamp securing oil filter to tank.
4. Turn oil filter counterclockwise and pull.



TYPICAL

1. Oil pump supply hose
2. Oetiker clamp
3. Oil filter

NOTE: If the spring clip on the oil supply hose cannot be accessed at the oil filter, disconnect the oil supply hose at the oil injection pump.

Oil Filter Installation

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

1. Ensure the circlip retaining oil supply line is in good condition. Replace as required.
2. Ensure filter is properly inserted and locked in before installing a new Oetiker clamp.
3. If the oil supply hose was disconnected at the oil injection pump, bleed oil pump. See *OIL INJECTION PUMP BLEEDING* procedure in this subsection.

INJECTION NOZZLE

Injection Nozzle Inspection

Carry out the *OIL SYSTEM LEAK TEST* as described in this subsection.

If test is successful, repeat leak test but this time at 20.7 kPa (3 PSI).

- If the injector nozzle opens normally, it is in good condition.
- If the test is not successful, repeat test at injector nozzle as described in this topic.

Lift engine to access the injector nozzles.

Using the VACUUM/PRESSURE PUMP (P/N 529 021 800), test check valve of injection nozzle as follows.



529021800

Subsection XX (LUBRICATION SYSTEM)

PUMP SETTING	SET TO VACUUM	SET TO PRESSURE
TO DO	Activate pump several times	Slowly activate pump and listen to check valve
RESULT	Air must not flow through check valve	You should hear it release pressure at approximately 20.7 kPa (3 PSI)

If the injection nozzle does not pass the test, replace it.

Injection Nozzle Removal

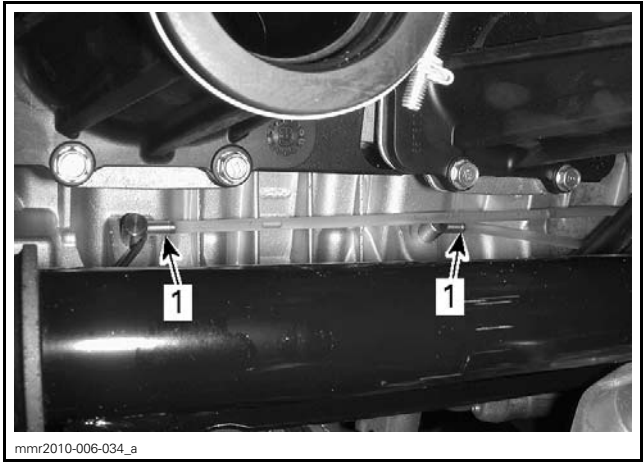
NOTICE Do not remove injection nozzle needlessly. It is likely to be damaged.

- 1. To gain access to the injector nozzles, engine must be lifted off its mounts. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
- 2. Clean injection nozzle area to remove oil or dirt.
- 3. Carefully heat injection nozzle then pull it out of crankcase.

Injection Nozzle Installation

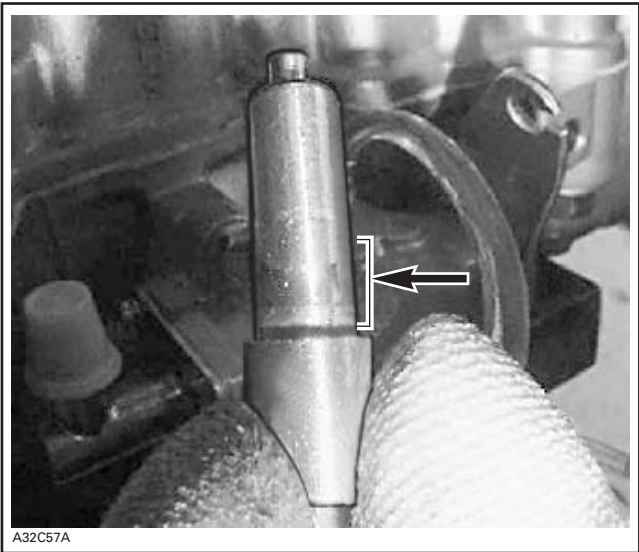
- 1. Prior to coating it with Loctite, make sure check valve body is clean and dry. Clean from dirt or oil, if any, with PULLEY FLANGE CLEANER (P/N 413 711 809).
- 2. Apply LOCTITE 648 (GREEN) (P/N 413 711 400) on the outer diameter of the check valve (machined section). Take care that Loctite is ONLY in this area.

- 3. Install the check valves so the hose fittings are horizontal facing the RH side of the engine.



TYPICAL

- 1. Injector nozzle fitting horizontal facing RH side
- 4. Carefully tap the injection nozzle into the lower crankcase using a plastic hammer.
- 5. Clean the crankcase from surplus of Loctite 648 with a rag.
- 6. Properly reposition engine in vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.



APPLY LOCTITE ON THIS AREA ONLY