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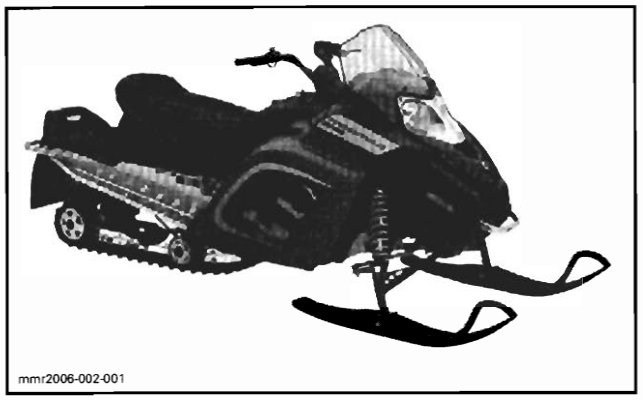
INTRODUCTION

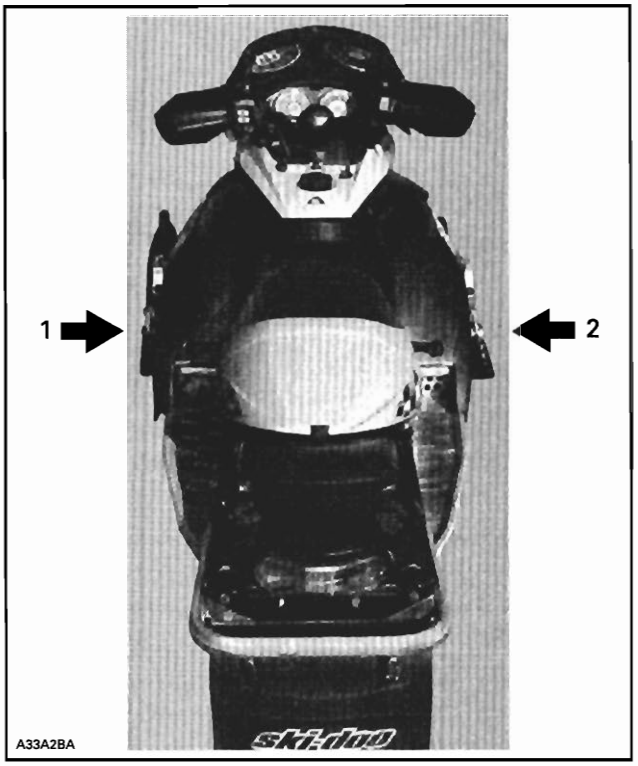
GENERAL INFORMATIONS

This shop manual covers the following BRP made 2007 RF Series models:



TYPICAL — RF SERIES

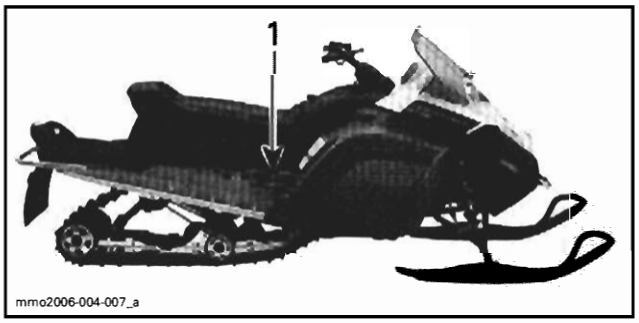
MODEL	ENGINE TYPE
Expedition Sport 550F	552
Expedition Sport V800	V810
Freestyle Back Country 550F	552
Freestyle Park 550F	552
Freestyle Session 300F	277
Freestyle Session 550F	552
Legend Touring V800	V810
Legend Trail V800	V810
Tundra 300F	277
Tundra V800	V810



TYPICAL
1. Left
2. Right

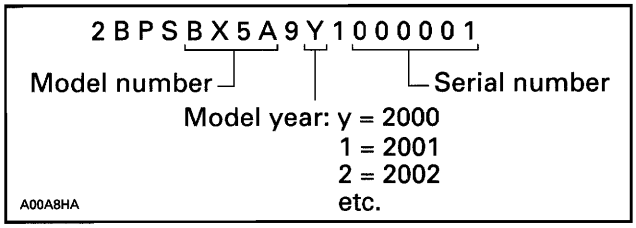
VEHICLE IDENTIFICATION NUMBER

Vehicle Identification Number Location



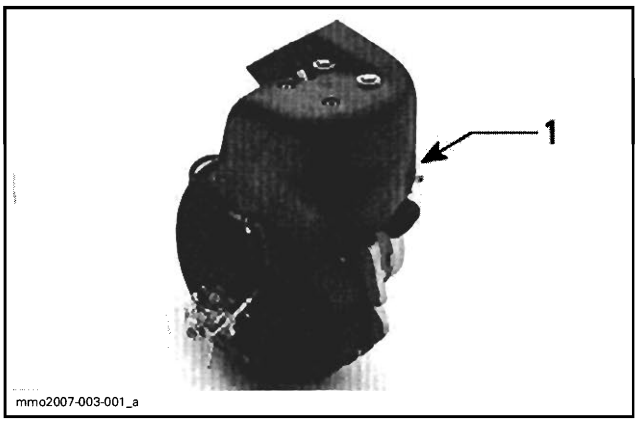
TYPICAL
1. Vehicle identification number

Identification Number Meaning

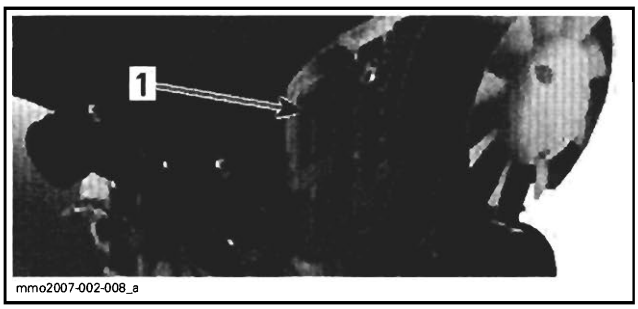


ENGINE SERIAL NUMBER

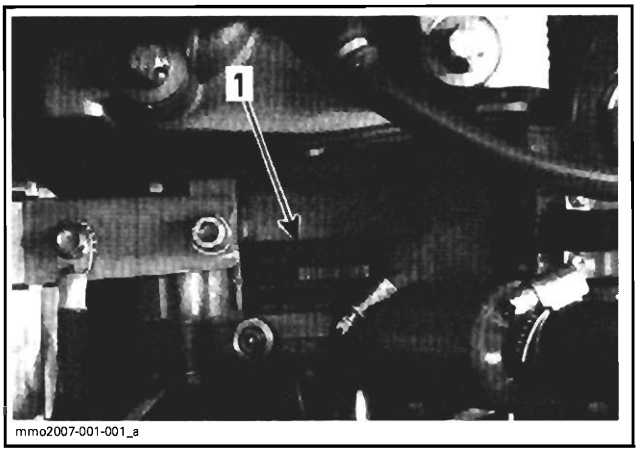
Engine Serial Number Location



TYPICAL — 300F
1. Engine serial number



TYPICAL — 500F
1. Engine serial number



TYPICAL — V800
1. Engine serial number

ARRANGEMENT OF THIS MANUAL, ILLUSTRATIONS AND PROCEDURES

The manual is divided into many major sections as you can see in the main table of contents at the beginning of the manual.

Each section is divided in various subsections, and again, each subsection has one or more division.

Illustrations and photos show the typical construction of the different assemblies and, in all cases, may not reproduce the full detail or exact shape of the parts shown. However, they represent parts which have the same or a similar function.

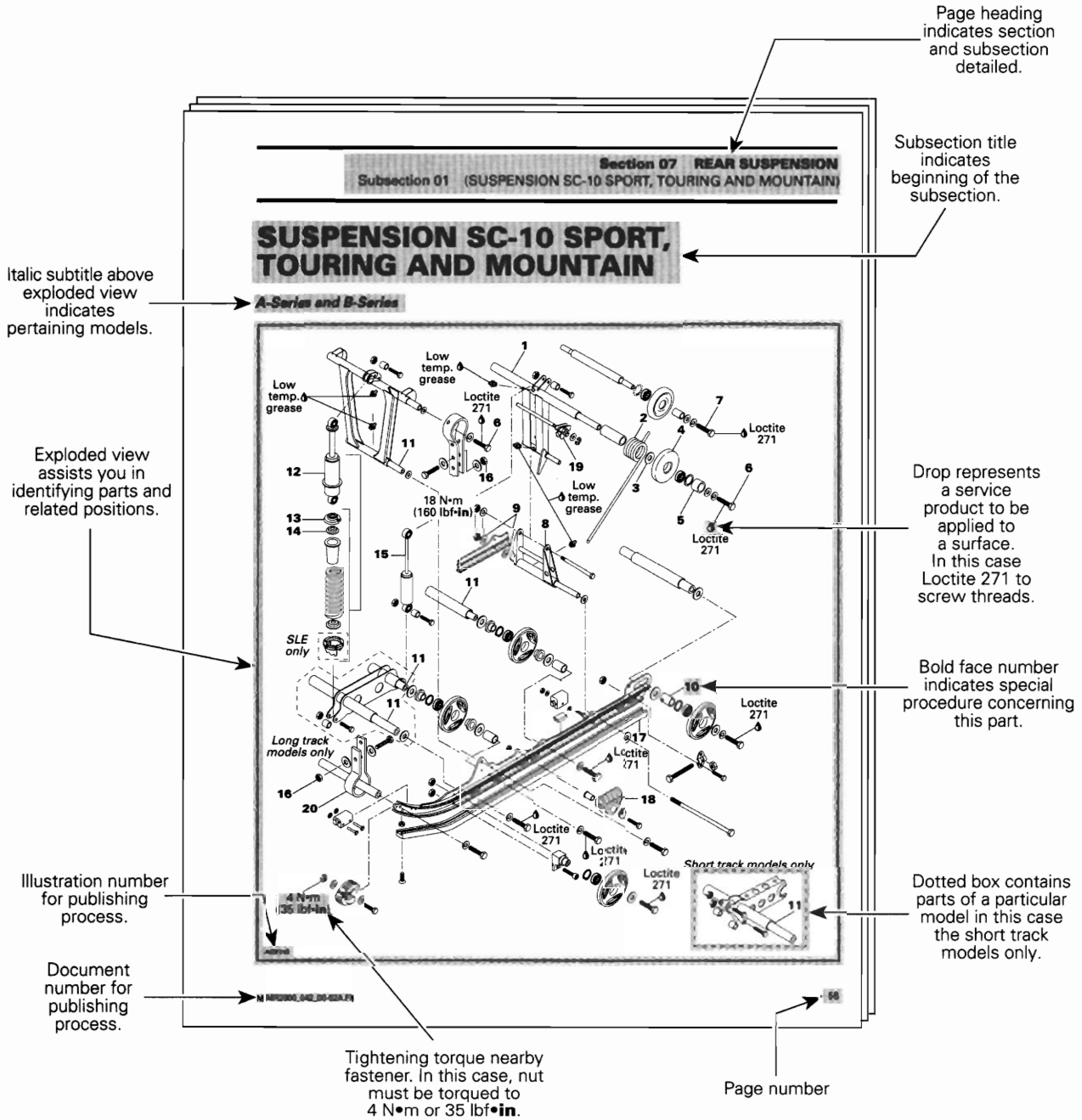
CAUTION: Most components of those vehicles are built with parts dimensioned in the metric system. Most fasteners are metric and must not be replaced by customary fasteners or vice-versa. Mismatched or incorrect fasteners could cause damage to the vehicle or possible personal injury.

As many of the procedures in this manual are interrelated, we suggest, that before undertaking any task, you read and thoroughly understand the entire section or subsection in which the procedure is contained.

A number of procedures throughout the book require the use of special tools. Before commencing any procedure, be sure that you have on hand all the tools required, or approved equivalents.

This *Shop Manual* uses technical terms wich may be slightly different from the ones in the parts catalog.

TYPICAL PAGE

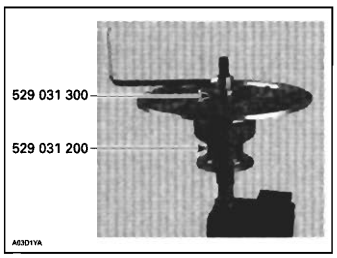


CAUTION: Pay attention to torque specifications. Some of these are in lbf•**in** instead of lbf•ft. Use appropriate torque wrench.

A00A7XS

TYPICAL PAGE

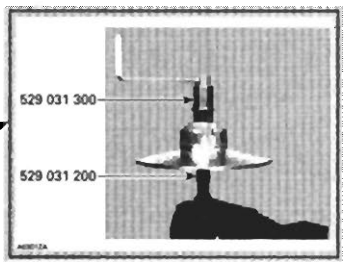
Turn puller handle and sliding half at once to extract the bushing.



IMPORTANT: Large bushing retaining screws and washers must be removed before small bushing installation.

Coat bushing outside diameter with Loctite 609 (P/N 413 703 100).

Install bushing as following photo.



ASSEMBLY

Came Slider Shoe

When replacing slider shoes **no. 4**, always install a new set (3 shoes) to maintain equal pressure on the cam.

Assemble driven pulley components by reversing the disassembly procedure.

Cam

Coat cam **no. 18** interior with anti-seize lubricant.

INSTALLATION

Countershaft

CAUTION: Always apply anti-seize lubricant (P/N 413 701 000) on the countershaft before final pulley installation.

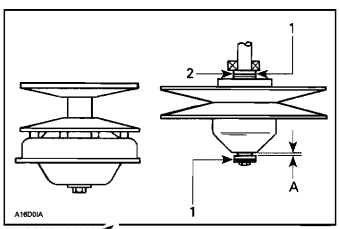
A-Series and B-Series Only

Should installation procedure be required, refer to BRAKE then look for **Brake Disc and Countershaft Bearing Adjustment**.

Reinstall the pulley on the countershaft by reversing the removal procedure.

All Models

Check end play of driven pulley on countershaft by pushing pulley towards outer housing so that the inner shims (P/N 504 108 200) contact it. Measure end play at the mounting screw end between shim(s) and puley. See illustration.



Torque retaining screw **no. 13** to 25 N•m (18 lbf•ft).

ADJUSTMENT

Refer to PULLEY DISTANCE AND ALIGNMENT to adjust pulley distance. Adjust drive belt height between pulley halves to obtain specified belt deflection.

Title indicates main procedure to be carried-out.

Italic bold face type setting indicates a particular procedure concerning a model.

Italic bold face setting in this case indicates that particular procedure for A and B-Series is finished, so from this point, all models are concerned.

"TYPICAL" caption indicates a general view which does not represent full detail. "TOP VIEW" caption helps you in understanding illustration.

Illustration always follows text to which it pertains.

Call-outs for above illustration.

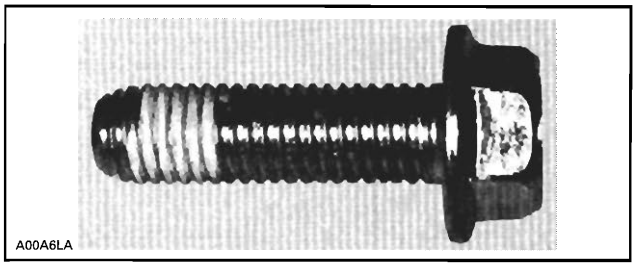
Subtitle indicates a particular procedure for the named part.

Reference to look up a certain section and subsection. In this case it concerns pulleys adjustment.

Bold face number following part name refers to exploded view at beginning of subsection.

A00A7YS

SELF-LOCKING FASTENERS PROCEDURE



TYPICAL — SELF-LOCKING FASTENER

The following describes the most common application procedures when working with self-locking fasteners.

Use a metal brush or a tap to clean the hole properly then use a solvent, let act during 30 minutes and wipe off. The solvent utilization is to ensure the adhesive works properly.

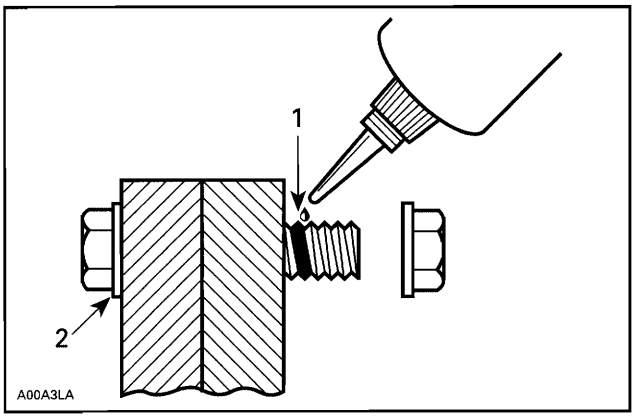
LOCTITE® APPLICATION PROCEDURE

The following describes the most common application procedures when working with Loctite products.

NOTE: Always use proper strength Loctite product as recommended in this shop manual.

Threadlocker

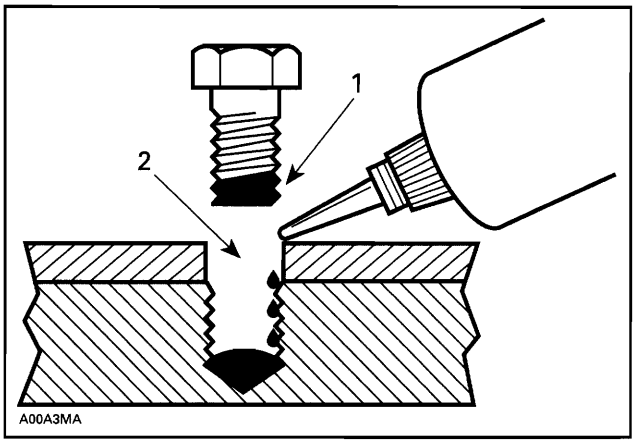
Uncovered Holes (bolts and nuts)



1. Apply here
2. Do not apply

- Clean threads (bolt and nut) with solvent.
- Apply Loctite Primer N (P/N 293 800 041) on threads and allow to dry.
- Choose proper strength Loctite threadlocker.
- Fit bolt in the hole.
- Apply a few drops of threadlocker at proposed tightened nut engagement area.
- Position nut and tighten as required.

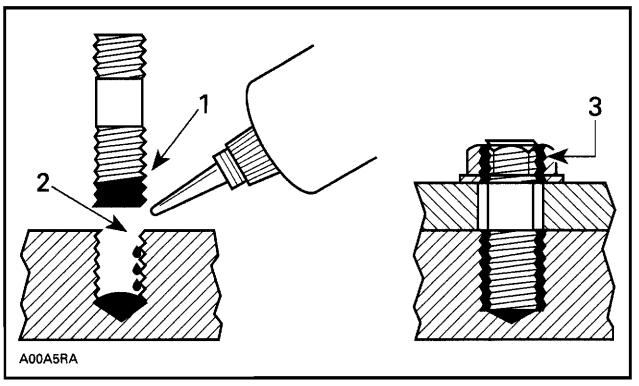
Blind Holes



1. On threads
2. On threads and at the bottom of hole

- Clean threads (bolt and hole) with solvent.
- Apply Loctite Primer N (P/N 293 800 041) on threads (bolt and nut) and allow to dry for 30 seconds.
- Choose proper strength Loctite threadlocker.
- Apply several drops along the threaded hole and at the bottom of the hole.
- Apply several drops on bolt threads.
- Tighten as required.

Stud in Blind Holes

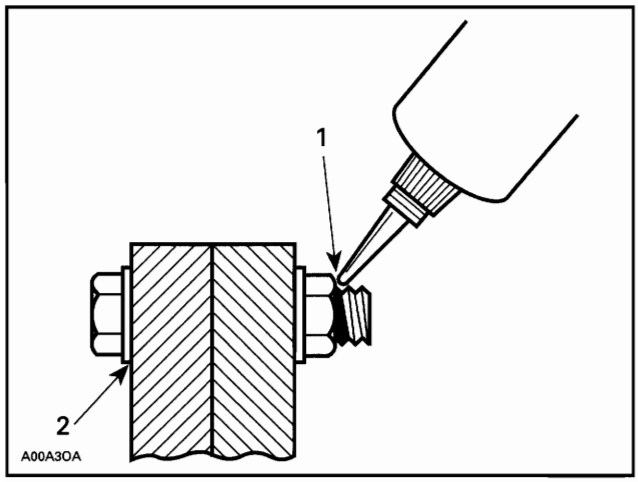


1. On threads
2. On threads and in the hole
3. Onto nut threads

- Clean threads (stud and hole) with solvent.
- Apply Loctite Primer N (P/N 293 800 041) on threads and allow to dry.
- Put several drops of proper strength Loctite threadlocker on female threads and in hole.
- Apply several drops of proper strength Loctite on stud threads.

- Install stud.
- Install cover, etc.
- Apply drops of proper strength Loctite on uncovered threads.
- Tighten nuts as required.

Preassembled Parts

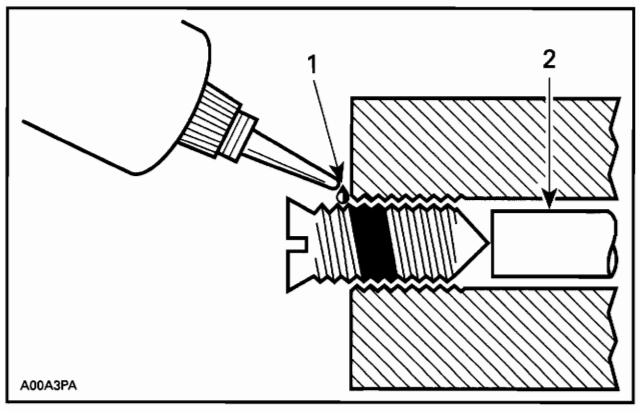


1. Apply here
2. Do not apply

- Clean bolts and nuts with solvent.
- Assemble components.
- Tighten nuts.
- Apply drops of proper strength Loctite on bolt/nut contact surfaces.
- Avoid touching metal with tip of flask.

NOTE: For preventive maintenance on existing equipment, retighten nuts and apply proper strength Loctite on bolt/nut contact surfaces.

Adjusting Screw

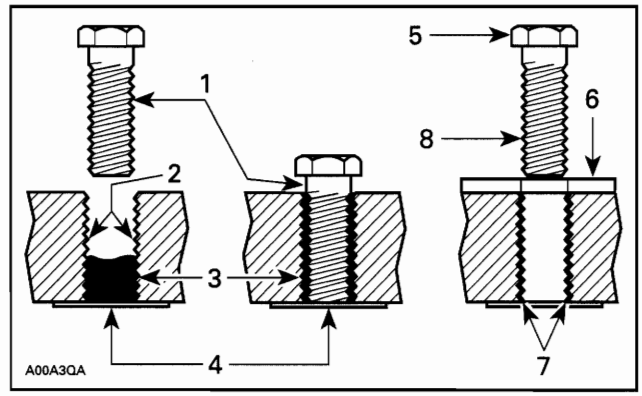


1. Apply here
2. Plunger

- Adjust screw to proper setting.
- Apply drops of proper strength Loctite threadlocker on screw/body contact surfaces.
- Avoid touching metal with tip of flask.

NOTE: if it is difficult to readjust, heat screw with a soldering iron (232°C (450°F)).

Stripped Thread Repair



1. Release agent
2. Stripped threads
3. Form-A-Thread
4. Tapes
5. Cleaned bolt
6. Plate
7. New threads
8. Threadlocker

Standard Thread Repair

- Follow instructions on Loctite FORM-A-THREAD 81668 package.
- if a plate is used to align bolt:

a. Apply release agent on mating surfaces.
b. Put waxed paper or similar film on the surfaces.

- Twist bolt when inserting it to improve thread conformation.

NOTE: NOT intended for engine stud repairs.

Repair of Small Holes/Fine Threads

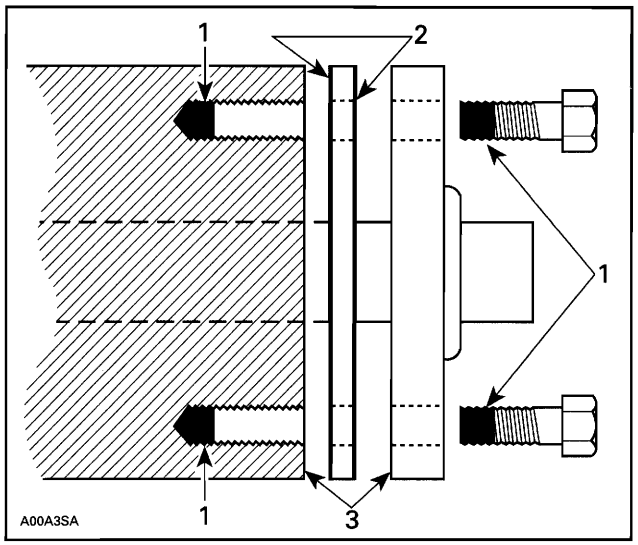
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

Option 2: Apply FORM-A-THREAD on the screw and insert in damaged hole.

Permanent Stud Installation (light duty)

- Use a stud or thread on desired length.
- DO NOT apply release agent on stud.
- Do a STANDARD THREAD REPAIR.
- Allow to cure for 30 minutes.
- Assemble.

Gasket Compound



1. Proper strength Loctite
2. Loctite Primer N (P/N 293 800 041) and Loctite 518 (P/N 293 800 038) on both sides of gasket
3. Loctite Primer N only

- Remove old gasket and other contaminants with Loctite chisel (gasket remover) (P/N 413 708 500). Use a mechanical mean if necessary.

NOTE: Avoid grinding.

- Clean both mating surfaces with solvent.
- Spray Loctite Primer N on both mating surfaces and on both sides of gasket. Allow to dry 1 or 2 minutes.
- Apply Loctite 518 (P/N 293 800 038) on both sides of gasket, using a clean applicator.
- Place gasket on mating surfaces and assemble immediately.

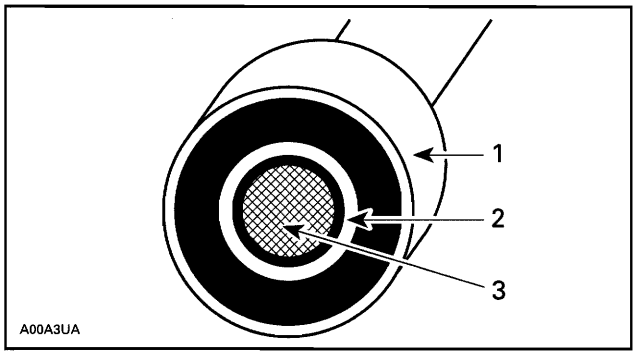
NOTE: If the cover is bolted to blind holes (above), apply proper strength Loctite in the hole and on threads. Tighten.

If holes are sunken, apply proper strength Loctite on bolt threads.

- Tighten as usual.

Mounting on Shaft

Mounting with a Press



1. Bearing
2. Proper strength Loctite
3. Shaft

- Clean shaft external part and element internal part.
- Apply a strip of proper strength Loctite on shaft circumference at insert or engagement point.

NOTE: Retaining compound is always forced out when applied on shaft.

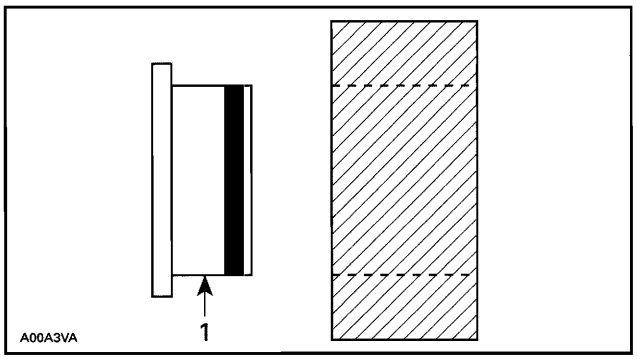
- DO NOT use antiseize Loctite or any similar product.
- No curing period is required.

Mounting in Tandem

1. Apply retaining compound on internal element bore.
2. Continue to assemble as shown above.

Case-In Components

Metallic Gaskets



1. Proper strength Loctite

- Clean inner housing diameter and outer gasket diameter.
- Spray housing and gasket with Loctite Primer N (P/N 293 800 041).
- Apply a strip of proper strength Loctite on leading edge of outer metallic gasket diameter.

NOTE: Any Loctite product can be used here. A low strength liquid is recommended as normal strength and gap are required.

- Install according to standard procedure.
- Wipe off surplus.
- Allow it to cure for 30 minutes.

NOTE: Normally used on worn-out housings to prevent leaking or sliding.

It is generally not necessary to remove gasket compound applied on outer gasket diameter.

TIGHTENING TORQUE

Tighten fasteners to torque mentioned in exploded views and/or text, When they are not specified, refer to following table. The table also gives the metric conversion.

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: 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.

In order to avoid a poor assembling, tighten screws, bolts or nuts in accordance with the following procedure:

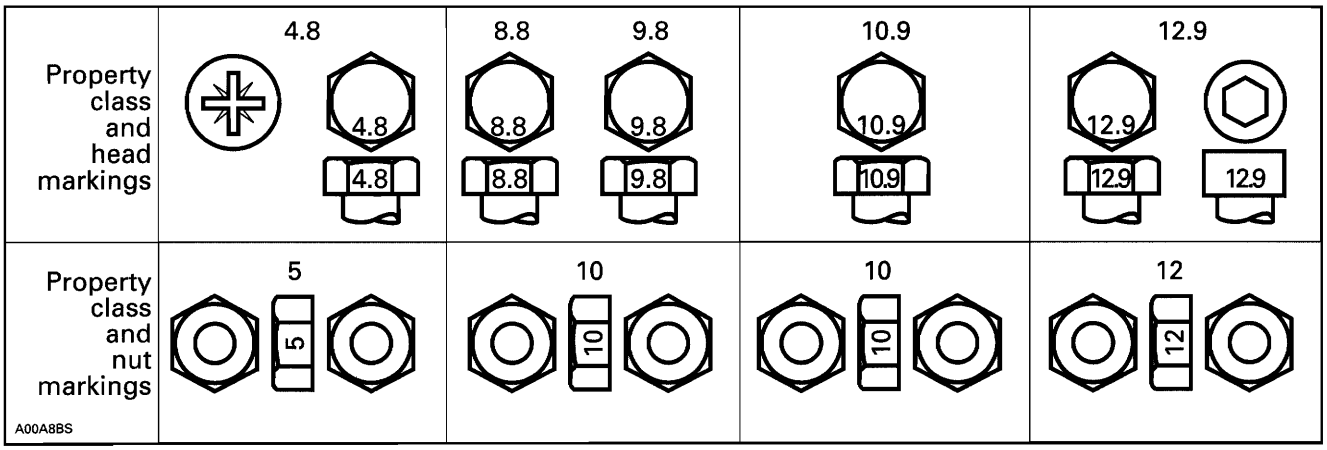
- Manually screw all screws, bolts and/or nuts.
- Apply the half of the recommended torque value.

CAUTION: Be sure to use proper tightening torque for the proper strength grade.

NOTE: When possible, always apply torque on the nut.

- Torque at the recommended torque value.

NOTE: Always torque screws, bolts and/or nuts in a criss-cross sequence.



FASTENER SIZE	FASTENER GRADE/TORQUE			
	5.8 Grade	**8.8** Grade	**10.9** Grade	**12.9** Grade
M4	1.5 – 2 N•m (13 – 18 lbf•**in**)	2.5 – 3 N•m (22 – 27 lbf•**in**)	3.5 – 4 N•m (31 – 35 lbf•**in**)	4 – 5 N•m (35 – 44 lbf•**in**)
M5	3 – 3.5 N•m (27 – 31 lbf•**in**)	4.5 – 5.5 N•m (40 – 47 lbf•**in**)	7 – 8.5 N•m (62 – 75 lbf•**in**)	8 – 10 N•m (71 – 89 lbf•**in**)
M6	6.5 – 8.5 N•m (58 – 75 lbf•**in**)	8 – 12 N•m (71 – 106 lbf•**in**)	10.5 – 15 N•m (93 – 133 lbf•**in**)	16 N•m (142 lbf•**in**)
M8	15 N•m (11 lbf•ft)	24.5 N•m (18 lbf•ft)	31.5 N•m (23 lbf•ft)	40 N•m (30 lbf•ft)
M10	29 N•m (21 lbf•ft)	48 N•m (35 lbf•ft)	61 N•m (45 lbf•ft)	72.5 N•m (53 lbf•ft)
M12	52 N•m (38 lbf•ft)	85 N•m (63 lbf•ft)	105 N•m (77 lbf•ft)	127.5 N•m (94 lbf•ft)
M14	85 N•m (63 lbf•ft)	135 N•m (100 lbf•ft)	170 N•m (125 lbf•ft)	200 N•m (148 lbf•ft)

MAINTENANCE CHART (300F/550F)

A: ADJUST
I: INSPECT
L: LUBRICATE
R: REPLACE
C: CLEAN
T: PROCEED WITH TASK

PART/TASK	10-HOUR OR 500 KM (300 mi) INSPECTION (1)	WEEKLY OR EVERY 240 KM (150 mi)	MONTHLY OR EVERY 800 KM (500 mi)	ONCE A YEAR OR EVERY 3200 KM (2000 mi)	EVERY 2 YEARS OR 6000 KM (3700 mi)	STORAGE (1)	PRESEASON PREPARATION (1)	REFER TO SUBSECTION
ENGINE								
Rewind starter							I, L, C	*REWIND STARTER*
Engine support	I			I		I		*ENGINE REMOVAL AND INSTALLATION*
Exhaust system	I			I		I		*EXHAUST SYSTEM*
Air filter			C				C	*AIR INTAKE SYSTEM*
Engine lubrication						T		*STORAGE*
LUBRICATION SYSTEM								
Injection oil filter					R			*OIL INJECTION SYSTEM*
Oil injection pump	A			A			A	*OIL INJECTION PUMP*
Injection oil	AS REQUIRED							*OIL INJECTION SYSTEM*
FUEL SYSTEM								
Add fuel stabilizer						T		*STORAGE*
Fuel filter					R			*FUEL TANK AND FUEL PUMP*
Fuel lines and connections	I						I	*CARBURETOR, THROTTLE AND CHOKE CABLES*
Carburetor	A			A			A, C	
Throttle cable	I			I			I	
ELECTRICAL SYSTEM								
Spark plugs (3)	I		I				R	*IGNITION SYSTEM*
Battery (if so equipped)	I		I			I	I	*CHARGING SYSTEM*
Wiring harnesses, cables	I		I			I		*ELECTRICAL SYSTEM*
Headlamp beam aiming				A				*LIGHTS, INSTRUMENTS AND ACCESSORIES*
Operation of lighting system (HI/LO beam, taillight and brake light)	I	I				I		
Engine cut-out switch and tether cut-out switch operation test	I	I				I		*IGNITION SYSTEM*

A: ADJUST
I: INSPECT
L: LUBRICATE
R: REPLACE
C: CLEAN
T: PROCEED WITH TASK

PART/TASK	10-HOUR OR 500 KM (300 mi) INSPECTION (1)	WEEKLY OR EVERY 240 KM (150 mi)	MONTHLY OR EVERY 800 KM (500 mi)	ONCE A YEAR OR EVERY 3200 KM (2000 mi)	EVERY 2 YEARS OR 6000 KM (3700 mi)	STORAGE (1)	PRESEASON PREPARATION (1)	REFER TO SUBSECTION
DRIVE SYSTEM								
Drive belt	I	I					I	*DRIVE BELT*
Drive belt height adjustment	EACH BELT REPLACEMENT							*DRIVE BELT*
Drive and driven pulleys	I		I	C		I	C	*DRIVE PULLEY* and *DRIVEN PULLEY*
Tightening torque of drive pulley screw	I			I				*DRIVE PULLEY*
Drive chain tension	A		A			A		*CHAINCASE*
Chaincase oil	I		I			R	I	*CHAINCASE*
Drive axle end bearing (2)	L		L			L		*DRIVE AXLE*
Countershaft	L		L			L		*COUNTERSHAFT AND BRAKE*
Track	I	I				I		*TRACK*
Track tension and alignment	A	AS REQUIRED						*TRACK*
BRAKE SYSTEM								
Brake fluid	I	I			R		I	*COUNTERSHAFT AND BRAKE*
Brake hose, pads and disk	I	I					I	*COUNTERSHAFT AND BRAKE*
SUSPENSION								
Front and rear suspensions	I		I, L			I, L		*SUSPENSION*
Rear suspension stopper strap				I		I		*SUSPENSION*
STEERING SYSTEM								
Steering mechanism (2)	I, L		I	L		I, L		*STEERING AND HANDLEBAR*
Wear and condition of skis and runners	I	I				I		*SKIS AND STEERING ALIGNMENT*
VEHICLE								
Vehicle cleaning and protection	T		T			T		*STORAGE*

(1) To be performed by an authorized Ski-Doo dealer.

(2) Lubricate whenever the vehicle is used in wet conditions (wet snow, rain, puddles).

(3) Before installing new spark plugs at preseason preparation, it is suggested to burn excess storage oil by starting the engine with the old spark plugs. Only perform this operation in a well-ventilated area.

MAINTENANCE CHART (V800)

A: ADJUST
I: INSPECT
L: LUBRICATE
R: REPLACE
C: CLEAN
T: PROCEED WITH TASK

PART/TASK	10-HOUR OR 500 KM (300 mi) INSPECTION (1)	WEEKLY OR EVERY 240 KM (150 mi)	MONTHLY OR EVERY 800 KM (500 mi)	ONCE A YEAR OR EVERY 3200 KM (2000 mi)	EVERY 2 YEARS OR 6000 KM (3700 mi)	STORAGE (1)	PRESEASON PREPARATION (1)	REFER TO SUBSECTION
ENGINE								
Engine and oil filter					R			*LUBRICATION SYSTEM*
Valve adjustment	I, A			I, A				*CYLINDER AND HEAD*
Engine seals							I	*ENGINE*
Engine supports	I			I		I		*ENGINE REMOVAL AND INSTALLATION*
Exhaust system	I		I			I		*EXHAUST SYSTEM*
Air filter			C				C	*AIR INTAKE SYSTEM*
Air intake silencer							I, C	
Cooling system cap, hoses and clamps	I			I			I	*COOLING SYSTEM*
Coolant	I				R			
Engine lubrication						T		*STORAGE*
FUEL SYSTEM								
Add fuel stabilizer						T		*STORAGE*
Fuel filter					R			*FUEL TANK AND FUEL PUMP*
Fuel lines and connections	I						I	*ENGINE MANAGEMENT*
Throttle body							C	
Throttle cable	I			I			I	
ELECTRICAL SYSTEM								
EMS fault codes	I					I		*ENGINE MANAGEMENT*
Spark plugs	I				R			*IGNITION SYSTEM*
Battery	I		I			I	I	*CHARGING SYSTEM*
Wiring harnesses and cables	I		I			I		*ELECTRICAL SYSTEM*
Headlamp beam aiming				A				*LIGHTS, INSTRUMENTS AND ACCESSORIES*
Operation of lighting system (HI/LO beam, taillight and brake light)	I	I				I		
Engine cut-out switch and tether cut-out switch operation test	I	I				I		*IGNITION SYSTEM*

A: ADJUST
I: INSPECT
L: LUBRICATE
R: REPLACE
C: CLEAN
T: PROCEED WITH TASK

PART/TASK	10-HOUR OR 500 KM (300 mi) INSPECTION (1)	WEEKLY OR EVERY 240 KM (150 mi)	MONTHLY OR EVERY 800 KM (500 mi)	ONCE A YEAR OR EVERY 3200 KM (2000 mi)	EVERY 2 YEARS OR 6000 KM (3700 mi)	STORAGE (1)	PRESEASON PREPARATION (1)	REFER TO SUBSECTION
DRIVE SYSTEM								
Drive belt	I	I					I	*DRIVE BELT*
Drive belt height adjustment	EACH BELT REPLACEMENT							
Drive and driven pulley	I		I	C		I	C	*DRIVE PULLEY* and *DRIVEN PULLEY*
Tightening torque of drive pulley screw	I			I			I	*DRIVE PULLEY*
Driven pulley preload	I			I			I	*DRIVEN PULLEY*
Drive chain tension	A		A			A		*CHAINCASE*
Chaincase oil	I		I			R	I	
Drive axle end bearing (2)	L		L			L		DRIVE AXLE
Countershaft	L		L			L		*COUNTERSHAFT AND BRAKE*
Track	I	I				I		*TRACK*
Track tension and alignment	A	AS REQUIRED						
BRAKE SYSTEM								
Brake fluid	I	I			R		I	*COUNTERSHAFT AND BRAKE*
Brake hose, pads and disk	I	I					I	
SUSPENSION								
Front and rear suspensions	I		I, L			I, L		*SUSPENSION*
Rear suspension stopper strap				I		I		
STEERING SYSTEM								
Steering mechanism (2)	I, L		I	L		I, L		*STEERING AND HANDLEBAR*
Wear and condition of skis and runners	I	I				I		*SKIS AND STEERING ALIGNMENT*
VEHICLE								
Vehicle cleaning and protection	T		T			T		*STORAGE*

(1) To be performed by an authorized Ski-Doo dealer.

(2) Lubricate whenever the vehicle is used in wet conditions (wet snow, rain, puddles).

STORAGE PROCEDURE (300F/550F)

SERVICE PRODUCTS

Description	Part Number	Page
BRP fuel stabilizer	413 408 600	6
heavy duty cleaner	293 110 001	7
Loctite 767 (antiseize lubricant)	293 800 070	6
plastic & vinyl cleaner	413 711 200	7
scratch remover	861 774 800	7
suspension grease	293 550 033	6–7
XP-S Lube	293 600 016	6–7
XP-S storage oil (USA)	413 711 900	5
XP-S storage oil	413 711 600	5

GENERAL

Proper snowmobile storage is a necessity during the summer months or when a vehicle is not being used for more than one month.

Refer to storage column from *MAINTENANCE CHART* jointly with the present storage procedure in order to cover each and every aspect of the snowmobile storage procedure. Any worn, broken or damaged parts should be replaced.

⚠ WARNING

Unless otherwise specified, engine should be turned off for storage procedure.

To facilitate the inspection and ensure adequate lubrication of components, it is recommended to clean the entire vehicle first.

PROCEDURES

ENGINE SYSTEM

Engine Support

Check if engine support is cracked, bent or otherwise damaged. Replace if necessary.

Check rubber mounts on engine support. Replace them if brittle, cracked or otherwise damaged.

Exhaust System

Check and replace if necessary:
- tuned pipe shield for damages
- tuned pipe ends for cracks or damages
- manifold for cracks or damages.

Engine

Crankshaft PTO Seal

Make sure there is no grease coming out from crankshaft PTO seal, if so replace seal.

Engine Lubrication

Engine internal parts must be lubricated to protect them from possible rust formation during the storage period.

NOTE: Be sure to add fuel stabilizer before starting the engine.

Proceed as follows:

Start the engine and allow it to run at idle speed until the engine reaches its operating temperature.

Stop the engine.

Remove primary air intake silencer to spray storage oil into carburetor.

Restart engine and run at idle speed.

Inject storage oil until the engine stalls or until a sufficient quantity of oil has entered the engine (approximately half a can).

With the engine stopped, remove the spark plug and spray XP-S storage oil (P/N 413 711 600) into cylinder.

NOTE: For US citizens, use the XP-S storage oil (USA) (P/N 413 711 900) only.

Crank slowly 2 or 3 revolutions to lubricate cylinder.

Reinstall the spark plug and air intake silencer.

⚠ WARNING

This procedure must only be performed in a well-ventilated area. Do not run engine during storage period.

LUBRICATION SYSTEM

Injection Oil Filter

Replace injection oil filter, refer to *OIL INJECTION SYSTEM* section.

FUEL SYSTEM

Fuel Stabilizer

It is critical to use the BRP fuel stabilizer (P/N 413 408 600) to prevent fuel deterioration, gum formation and fuel system components corrosion. Follow manufacturer's instructions for proper use.

Pour fuel stabilizer in fuel tank **prior to starting engine** for internal parts lubrication so that stabilizer flows everywhere in fuel system and ensures carburetor protection against varnish deposit. Fill up fuel tank completely. Ensure there is no water inside fuel tank.

Do not drain fuel system.

⚠ WARNING

Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity. Fuel tank may be pressurized, slowly turn cap when opening. Never use an open flame to check fuel level. When fueling, keep vehicle level. Do not overfill or top off the fuel tank and leave vehicle in the sun. As temperature increases, fuel expands and might overflow. Always wipe off any fuel spillage from the vehicle. Periodically inspect fuel system.

ELECTRICAL

Lighting System and Switches

Check operation of lighting system (HI/LO beam, brake light, etc.).

Check if engine cutout switch and tether cord cutout switch work properly.

Battery (if so equipped)

Remove battery, clean its tray and close area with water and baking soda.

Inspect, clean and charge battery as explained in *CHARGING SYSTEM.*

Wiring Harnesses, Cables and Connectors

Inspect for wear, deterioration or damage, replace defective parts if necessary.

DRIVE SYSTEM

Drive and Driven Pulleys

After inspection and interior cleaning of pulleys, spray XP-S Lube (P/N 293 600 016) on sheaves. Do not reinstall drive belt.

Chaincase

Check drive chain tension and adjust if necessary. Replace chaincase oil. Refer to *DRIVE SYSTEM* section.

Drive Axle End Bearing

Lubricate end housing bearing with suspension grease (P/N 293 550 033). Continue lubricating until grease flows out of the pilot hole on end cap.

Countershaft

Driven pulley and brake disc must be floating on the countershaft for efficient operation. Lubricate with Loctite 767 (antiseize lubricant) (P/N 293 800 070).

CAUTION: Do not lubricate excessively as lubricant could contact and soil brake pads and/or drive belt.

Track

Visually inspect track for:
- cuts and abnormal wear
- broken rods
- broken or missing track cleats.

Replace damaged or missing cleats.

If track is damaged or rods are broken, replace track.

NOTE: Do not release track tension.

SUSPENSION

Front Suspension

Lubricate ski legs if needed with suspension grease (P/N 293 550 033). **Inspect all suspension components for tightness.**

Rear Suspension

Inspect rear suspension components for wear, deterioration or damage.

Lubricate front and rear arms at grease fittings using suspension grease (P/N 293 550 033).

Suspension Stopper Strap

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation.

STEERING

Steering Mechanism

Lubricate the steering mechanism if needed. **Inspect all components for tightness.**

Skis and Runners

Inspect skis and runners for wear, deterioration or damage.

VEHICLE

Vehicle Cleaning

Clean the engine compartment. Remove grass, twigs, cloth, etc. These are combustible under certain conditions.

To clean the entire vehicle, use only flannel cloths or equivalent.

CAUTION: It is necessary to use flannel cloths or equivalent on windshield and hood to avoid further damaging surfaces to clean.

To clean the entire vehicle, including bottom pan and metallic parts use heavy duty cleaner (P/N 293 110 001).

CAUTION: Do not use this product on decals or vinyl.

For vinyl and plastic parts use plastic & vinyl cleaner (P/N 413 711 200).

To remove scratches on windshield or hood use scratch remover (P/N 861 774 800).

CAUTION: Never clean plastic parts or hood with strong detergent, degreasing agent, paint thinner, acetone, products containing chlorine, etc.

Inspect the hood and repair any damage.

Touch up all metal spots with touch-up paint where paint has been scratched off.

Spray all bare metal parts including shock chromed rods with XP-S Lube (P/N 293 600 016).

Wax the hood and the painted portion of the frame for better protection. Use a non-abrasive wax such as silicone wax.

NOTE: Apply non-abrasive wax on glossy finish only.

Vehicle Protection

Block air intake and exhaust system using clean rags.

Protect the vehicle with a cover to prevent dust accumulation during storage.

CAUTION: The snowmobile has to be stored in a cool and dry place and covered with an opaque but ventilated tarpaulin. This will prevent sun rays and grime from affecting plastic components and vehicle finish.

Lift rear of vehicle until track is clear of the ground. Install on a snowmobile mechanical stand.

STORAGE PROCEDURE (V800)

SERVICE PRODUCTS

Description	Part Number	Page
BRP fuel stabilizer	413 408 600	10
heavy duty cleaner	293 110 001	11
Loctite 767 (antiseize lubricant)	293 800 070	10
plastic & vinyl cleaner	413 711 200	11
scratch remover	861 774 800	11
suspension grease	293 550 033	10
XP-S Lube	293 600 016	10–11
XP-S storage oil (USA)	413 711 900	9
XP-S storage oil	413 711 600	9

GENERAL

Proper snowmobile storage is a necessity during the summer months or when a vehicle is not being used for more than one month.

Refer to storage column from *MAINTENANCE CHART* jointly with the present storage procedure in order to cover each and every aspect of the snowmobile storage procedure. Any worn, broken or damaged parts should be replaced.

⚠ WARNING

Unless otherwise specified, engine should be turned off for storage procedure.

To facilitate the inspection and ensure adequate lubrication of components, it is recommended to clean the entire vehicle first.

PROCEDURES

ENGINE SYSTEM

Engine Support

Check if engine support is cracked, bent or otherwise damaged. Replace if necessary.

Check rubber mounts on engine support. Replace them if brittle, cracked or otherwise damaged.

Exhaust System

Check and replace if necessary:
- tuned pipe shield for damages
- tuned pipe ends for cracks or damages
- manifold for cracks or damages.

Engine

Engine internal parts must be lubricated to protect them from possible rust formation during the storage period.

NOTE: Be sure to add fuel stabilizer before starting the engine.

Proceed as follows:

Start the engine and allow it to run at idle speed until the engine reaches its operating temperature.

Stop the engine.

Change engine oil and filter. Refer to *LUBRICATION SYSTEM*.

With the engine stopped, remove spark plugs and spray XP-S storage oil (P/N 413 711 600) into each cylinder.

NOTE: For US citizens, use the XP-S storage oil (USA) (P/N 413 711 900) only.

CAUTION: Do not inject storage oil into throttle body bore to avoid blocking idle bypass valve.

Press start button, 1 or 2 seconds maximum, to lubricate cylinder.

Reinstall the spark plugs.

⚠ WARNING

This procedure must only be performed in a well-ventilated area. Do not run engine during storage period.

FUEL SYSTEM

Fuel Stabilizer

It is critical to use the BRP fuel stabilizer (P/N 413 408 600) to prevent fuel deterioration, gum formation and fuel system components corrosion. Follow manufacturer's instructions for proper use.

Pour fuel stabilizer in fuel tank **prior to starting engine** for internal parts lubrication so that stabilizer flows everywhere in fuel system. Fill up fuel tank completely. Ensure there is no water inside fuel tank.

Do not drain fuel system.

⚠ WARNING

Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity. Fuel tank may be pressurized, slowly turn cap when opening. Never use an open flame to check fuel level. When fueling, keep vehicle level. Do not overfill or top off the fuel tank and leave vehicle in the sun. As temperature increases, fuel expands and might overflow. Always wipe off any fuel spillage from the vehicle. Periodically inspect fuel system.

ELECTRICAL

Lighting System and Switches

Check operation of lighting system (HI/LO beam, brake light, etc.).

Check if engine cutout switch and tether cord cutout switch work properly.

Battery

Remove battery, clean its tray and close area with water and baking soda.

Inspect, clean and charge battery as explained in *CHARGING SYSTEM*.

Wiring Harnesses, Cables and Connectors

Inspect for wear, deterioration or damage, replace defective parts if necessary.

DRIVE SYSTEM

Drive and Driven Pulleys

After inspection and interior cleaning of pulleys, spray XP-S Lube (P/N 293 600 016) on sheaves. Do not reinstall drive belt.

Chaincase

Check drive chain tension and adjust if necessary. Replace chaincase oil. Refer to *DRIVE SYSTEM* section.

Drive Axle End Bearing

Lubricate end housing bearing with suspension grease (P/N 293 550 033). Continue lubricating until grease flows out of the pilot hole on end cap.

Countershaft

Driven pulley and brake disc must be floating on the countershaft for efficient operation. Lubricate with Loctite 767 (antiseize lubricant) (P/N 293 800 070).

CAUTION: Do not lubricate excessively as lubricant could contact and soil brake pads and/or drive belt.

Track

Visually inspect track for:
- cuts and abnormal wear
- broken rods
- broken or missing track cleats.

If track is damaged or rods are broken, replace track.

Replace damaged or missing cleats by new ones.

NOTE: Do not release track tension.

SUSPENSION

Front Suspension

Lubricate ski legs if needed with suspension grease (P/N 293 550 033). **Inspect all suspension components for tightness.**

Rear Suspension

Inspect rear suspension components for wear, deterioration or damage, replace defective parts if necessary.

Lubricate front and rear arms at grease fittings using suspension grease (P/N 293 550 033).

Suspension Stopper Strap

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace if necessary.

STEERING

Steering Mechanism

Lubricate the steering mechanism if needed. **Inspect all components for tightness.**

Skis and Runners

Inspect skis and runners for wear, deterioration or damage, replace if necessary.

VEHICLE

Vehicle Cleaning

Clean the engine compartment. Remove grass, twigs, cloth, etc. These are combustible under certain conditions.

To clean the entire vehicle, use only flannel cloths or equivalent.

CAUTION: It is necessary to use flannel cloths or equivalent on windshield and hood to avoid further damaging surfaces to clean.

To clean the entire vehicle, including bottom pan and metallic parts use heavy duty cleaner (P/N 293 110 001).

CAUTION: Do not use this product on decals or vinyl.

For vinyl and plastic parts use plastic & vinyl cleaner (P/N 413 711 200).

To remove scratches on windshield or hood use scratch remover (P/N 861 774 800).

CAUTION: Never clean plastic parts or hood with strong detergent, degreasing agent, paint thinner, acetone, products containing chlorine, etc.

Inspect the hood and repair any damage.

Touch up all metal spots with touch-up paint where paint has been scratched off.

Spray all bare metal parts including shock chromed rods with XP-S Lube (P/N 293 600 016).

Wax the hood and the painted portion of the frame for better protection. Use a non-abrasive wax such as silicone wax.

NOTE: Apply non-abrasive wax on glossy finish only.

Vehicle Protection

Block air intake and exhaust system using clean rags.

Protect the vehicle with a cover to prevent dust accumulation during storage.

CAUTION: The snowmobile has to be stored in a cool and dry place and covered with an opaque but ventilated tarpaulin. This will prevent sun rays and grime from affecting plastic components and vehicle finish.

Lift rear of vehicle until track is clear of the ground. Install on a snowmobile mechanical stand.

PRESEASON PREPARATION

SERVICE PRODUCTS

Description	Part Number	Page
pulley flange cleaner	413 711 809	14
XP-S chaincase oil	413 801 900	14
XP-S synthetic chaincase oil	413 803 300	14

Proper vehicle preparation is necessary after the summer months or when a vehicle has not been used for more than one month.

Refer to preseason preparation column from *MAINTENANCE CHART* jointly with the present preseason preparation procedure in order to cover each and every aspect of the snowmobile preseason preparation procedure.

Any worn, broken or damaged parts found during the storage procedure should have been replaced. If not, proceed with the replacement.

⚠ WARNING

Unless otherwise specified, engine should be turned off for preparation procedure.

ENGINE

Rewind Starter and Rope

300F and 550F Models

Check if rope is fraying.

When pulling starter grip, it must return freely. If not, check for damaged parts or lack of lubrication. Replace parts or lubricate accordingly.

Muffler

Remove rags that were installed during storage preparation.

Axial Fan

550F Models

Inspect fan belt, adjust or replace if required.

Cooling System

V800 Models

Inspect cooling system for leaks, to perform a cooling system leak test, refer to *COOLING SYSTEM*.

Check coolant level in coolant reservoir. Add coolant if necessary.

If engine is cold, refill up to 15 mm (5/8 in) over COLD level line.

If engine is hot, refill up to 25 mm (1 in) over COLD level line. Use caution when opening pressurized coolant reservoir cap. Place a rag over cap and turn it slowly to release pressure.

Engine Seals

300F and 550F Models

Make sure there is no grease coming out from crankshaft PTO seal, if so replace seal. Refer to *BOTTOM END* section.

V800 Models

Check engine for leaks, if so replace the defective seal.

Air Filter and Air Intake Silencer

Remove rags that were installed for storage.

Check that inside of air silencer is clean and dry then properly reinstall the filter.

CAUTION: These snowmobiles have been calibrated with the filter installed. Operating the snowmobile without it, may cause engine damage.

LUBRICATION SYSTEM

Oil Injection Pump

300F and 550F Models

Make sure oil injection pump is properly adjusted, refer to *OIL INJECTION PUMP*.

FUEL SYSTEM

Fuel Lines, Fuel Rails and Connections

Inspect fuel system for leaks. Perform a fuel system leak test, refer to *FUEL TANK AND FUEL PUMP*.

Carburetors

300F and 550F Models

Disassemble carburetors in order to clean all internal parts. Do not hesitate to replace any jets having gum or varnish on their surfaces.

Make sure carburetors are properly adjusted, refer to *CARBURETOR, THROTTLE AND CHOKE CABLES.*

Throttle Body

V800 Models

Using the pulley flange cleaner (P/N 413 711 809), clean the throttle plates and throttle body bores.

NOTE: To ease cleaning, throttle body should be partially pulled from engine, without disconnecting throttle cable or coolant hose.

CAUTION: Ensure the cleaner does not enter engine intake.

Throttle Cable

Make sure that cable operates freely, replace if necessary, refer to *CARBURETOR, THROTTLE AND CHOKE CABLES (300F AND 550F MODELS)* or *ENGINE MANAGEMENT (V800 MODELS).*

Choke Cable

300F and 550F Models

Make sure that cable operates freely, replace if necessary, refer to *CARBURETOR, THROTTLE AND CHOKE CABLES.*

DRIVE SYSTEM

Drive Belt

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

Make sure to install the proper belt with arrow printed on belt pointing front of vehicle.

Drive and Driven Pulleys

Clean drive and driven pulleys sheaves with pulley flange cleaner (P/N 413 711 809).

V800 Models

Check tightening of drive pulley screw.

Verify the drive pulley preload. refer to *DRIVE PULLEY (TRA IV).*

Brake

Brake Fluid

Check brake fluid in reservoir for proper level. Add fluid (DOT 4) as required.

CAUTION: Use only (DOT 4) brake fluid from a sealed container. Do not store or use a started bottle of brake fluid.

Brake Hose, Pads and Disk

Inspect brake hose for wear, deterioration or damage, replace if necessary.

Inspect brake pads for proper thickness. Refer to *COUNTERSHAFT AND BRAKE.*

Remove any rust built-up on braking surfaces. Clean brake disk braking surfaces with pulley flange cleaner (P/N 413 711 809).

Chaincase

Check chaincase oil for proper level. Add recommended chaincase oil as required.

MODELS	CHAINCASE OIL
300F AND 550F	XP-S chaincase oil (P/N 413 801 900)
V800	XP-S synthetic chaincase oil (P/N 413 803 300)

Track

Verify track tension and alignment, refer to *TRACK.*

NOTE: Track tension and alignment are interrelated. Do not adjust one without checking the other. Track tension procedure must be carried out prior to track alignment.

ELECTRICAL SYSTEM

Battery (if so equipped)

Verify that battery is fully charged, if not, refer to the appropriate charging procedure in *CHARGING SYSTEM.*

Spark Plugs

300F and 550F Models

Once preseason preparation is done, start engine with the old spark plugs to burn excess storage oil. Then, install new properly gapped spark plugs.

NOTE: Ensure to replace with recommended spark plugs.

ENGINE (300F/550F)

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline.

Symptom: **ENGINE BACKFIRES.**

1. **Check spark plug.**
   - *Carbon accumulation caused by defective spark plug. Clean carbon accumulation from piston and cylinder head and install dry properly gapped spark plug.*
2. **Check ignition timing.**
   - *Timing is too advanced. Refer to* IGNITION SYSTEM *to find defective parts.*
3. **Check for erratic sparks.**
   - *Poor electrical connections. Repair.*
   - *Faulty stator. Replace defective parts.*
4. **Check carburetor.**
   - *Fuel passages obstructed. Clean carburetor and install new filter(s).*
   - *Fuel level too low. Adjust float level according to specifications.*

Symptom: **ENGINE SUDDENLY TURNS OFF AT HIGH RPM AND/OR WITH LIGHT LOAD.**

1. **Check spark plug.**
   - *Non-resistor type spark plug installed. Install resistor type spark plug.*
2. **Check that ground wires are well connected.**
   - *Loose or corroded ground. Screw or repair.*

Symptom: **ENGINE SUDDENLY TURNS OFF.**

1. **Perform engine leak test. Refer to *LEAK TEST*. Check possible piston seizure.**
   - *Damaged gasket and/or seal. Replace defective parts.*
2. **"Four-corner" seizure of piston.**
   - *High acceleration when engine is cold. Piston expands faster than cylinder. Replace piston. Ask driver to refer to the* WARM-UP PROCEDURE *in the* OPERATOR'S GUIDE.
3. **Piston seizure on exhaust side (color on piston dome is correct).**
   - *Kinked fuel tank vent tube. Repair fuel tank vent tube.*
   - *Leaks at fuel line connections or damaged fuel lines. Replace defective lines.*
   - *Fuel does not flow through carburetor (foreign particles in needle area and/or varnish formation in carburetor). Clean carburetor and install new filter(s).*
   - *Spark plug heat range is too warm. Install spark plug with appropriate heat range (refer to* TECHNICAL SPECIFICATIONS*).*
   - *Improper ignition timing. Refer to* IGNITION SYSTEM *to find defective parts.*
   - *Restriction in exhaust system. Replace.*
   - *Compression ratio is too high. Install genuine parts.*
   - *Too low fuel octane number. Use proper fuel octane number.*
   - *Carburetor calibration is too lean. Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*).*
   - *Poor quality oil. Use XP-S injection oil.*
   - *Leaks at air intake silencer. Replace air intake silencer grommet.*
   - *Excessive wear of piston rings. Replace piston rings.*

Symptom: **ENGINE SUDDENLY TURNS OFF.** (cont'd)

4. **Melted and/or perforated piston dome; melted section at ring end gap.**
   - *When piston reaches TDC, mixture is ignited by heated areas in combustion chamber. This is due to an incomplete combustion of a poor quality oil. Clean residue accumulation in combustion chamber and replace piston. Use XP-S injection oil.*
   - *Spark plug heat range is too high. Install recommended dry properly gapped spark plug (refer to* TECHNICAL SPECIFICATIONS*).*
   - *Ignition timing is too advanced. Refer to* IGNITION SYSTEM *to find defective parts.*
   - *Inadequate fuel quality. Use appropriate fuel.*
   - *Carburetion is too lean. Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*).*
5. **Seized piston all around the circumference (dry surface).**
   - *Lack of oil, damaged oil line, defective check valve or defective injection pump. Replace defective part(s).*
6. **Grooves on intake side of piston only.**
   - *Oil film eliminated by water (snow infiltration in engine). This can also be caused by running engine on choke for too long. Excessive fuel will remove the oil film on the piston and make marks. Replace piston and check if intake system leaks.*
7. **Piston color is dark due to seizure on intake and exhaust sides.**
   - *Accumulation of foreign particles in needle valve and/or main jet area. Clean carburetor.*
8. **Cracked or broken piston.**
   - *Cracked or broken piston due to excessive piston/cylinder clearance or engine over-revving. Replace piston. Check piston/cylinder clearance (refer to* ENGINE MEASUREMENT*). Adjust drive pulley according to specifications (refer to* TECHNICAL SPECIFICATIONS*) and/or clean pulley sheaves if they are contaminated with greasy particles.*

Symptom: **PISTON RING AND CYLINDER SURFACE ARE SCRATCHED.**

1. **Check oil quality.**
   - *Poor quality oil. Use XP-S injection oil.*
2. **Check injection pump and its hoses.**
   - *Inadequate injection pump adjustment and/or defective hoses. Adjust pump according to specifications (refer to* OIL INJECTION PUMP*) and/or replace hoses.*

Symptom: **ENGINE DOES NOT OFFER MAXIMUM POWER AND/OR DOES NOT REACH MAXIMUM OPERATING RPM.**

1. **Check spark plug condition and gap.**
   - *Fouled spark plug or wrong spark plug gap. Replace or readjust gap.*
2. **Check if there is water in fuel.**
   - *There is water in fuel. Drain fuel system, then fill with appropriate fuel.*
3. **Check items listed in *ENGINE RUNS OUT OF FUEL* (refer to *FUEL AND OIL INJECTION SYSTEMS* subsection).**
4. **Check carburetor adjustments and cleanliness.**
   - *Inadequate carburetor adjustments or dirt accumulation. Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*) or clean.*
5. **Check drive belt.**
   - *Worn belt. Replace belt if the wear limit is reached (refer to* TECHNICAL SPECIFICATIONS*).*
6. **Check track adjustment.**
   - *Too much tension and/or improper alignment. Align track and adjust its tension to specifications (refer to* TECHNICAL SPECIFICATIONS*).*

Symptom: **ENGINE DOES NOT OFFER MAXIMUM POWER AND/OR DOES NOT REACH MAXIMUM OPERATING RPM.** (cont'd)

7. **Check drive pulley.**
   - *Worn bushing. Replace drive pulley.*
8. **Check driven pulley.**
   - *Worn bushing and/or spring tension. Replace spring and/or adjust its tension according to specifications (refer to* TECHNICAL SPECIFICATIONS*).*
   - *Worn bushing. Replace driven pulley.*
   - *Worn spring tension. Install new spring with proper tension (refer to* DRIVEN PULLEY*).*
9. **Check exhaust system.**
   - *Restriction or exhaust system leakage. Replace or reseal with Ultra Copper.*
10. **Check ignition timing.**
    - *Decrease in power due to delayed ignition. Refer to* IGNITION SYSTEM *to find defective parts.*
11. **Check engine compression.**
    - *Worn piston and ring(s). Replace (refer to* TECHNICAL SPECIFICATIONS *for specifications).*

Symptom: **ENGINE DETONATION AT MAXIMUM RPM.**

1. **Check which type of fuel is used.**
   - *Octane number is too low. Use recommended fuel type.*
2. **Check spark plug type.**
   - *Improper spark plug heat range. Install recommended spark plug (refer to* TECHNICAL SPECIFICATIONS*).*
3. **Check exhaust system.**
   - *Too much restriction. Replace.*
4. **Check ignition timing.**
   - *Timing is too advanced. Refer to* IGNITION SYSTEM *to find defective parts.*
5. **Check if engine is overheating. (Refer to *HIGH ENGINE OPERATING TEMPERATURE*).**
6. **Check carburetion.**
   - *Fouled and/or improper carburetor components. Clean or replace according to specifications (refer to* TECHNICAL SPECIFICATIONS*).*
7. **Check compression ratio.**
   - *Compression ratio is too high. Install genuine parts.*

Symptom: **ENGINE TURNS OVER BUT FAILS TO START.**

1. **Check switches.**
   - *Ignition switch, emergency cut-out switch or tether switch is OFF. Place all switches in the RUN or ON position.*
2. **Check fuel level.**
   - *Mixture too lean to start cold engine. Check fuel tank level and use choke.*
3. **Check spark plug.**
   - *Defective spark plug (no spark) or wrong spark plug gap. Replace spark plug or readjust gap.*
4. **Check amount of fuel on spark plug.**
   - *Flooded engine (spark plug wet when removed). Do not over-choke. Remove wet spark plug, turn ignition switch to OFF and crank engine several times. Install clean dry properly gapped spark plug. Start engine following usual starting procedure.*

Symptom: **ENGINE TURNS OVER BUT FAILS TO START.** (cont'd)

5. **Check fuel lines.**
   - *No fuel to the engine (spark plug dry when removed). Check fuel tank level; check fuel filter, replace if clogged; check condition of fuel and impulse lines and their connections.*
6. **Check engine compression.**
   - *Insufficient engine compression. Replace defective part(s) (ex.: piston, ring(s), etc.).*

Symptom: **IRREGULAR ENGINE IDLE.**

1. **Check choke.**
   - *Choke plunger may be partially opened. Readjust.*
2. **Check carburetor adapter.**
   - *Air enters through a crack. Replace.*
3. **Check dimension of pilot jet.**
   - *Inadequate fuel/air mixture. Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*).*
4. **Perform engine leak test.**
   - *Leaking gaskets allow air to enter in engine. Replace defective parts.*
5. **Check throttle slide height.**
   - *Incorrect throttle slide height. Readjust according to specifications.*

Symptom: **HIGH ENGINE OPERATING TEMPERATURE.**

1. **Check air ducts.**
   - *Blocked air ducts or dirty cylinder cooling fins. Clean.*
2. **Check axial fan belt (550F models).**
   - *Loose or broken belt. Repair.*

Symptom: **REWIND STARTER ROPE DOES NOT REWIND.**

1. **Check rewind spring.**
   - *Broken spring. Replace spring.*

Symptom: **REWIND STARTER PAWL DOES NOT ENGAGE.**

1. **Check stopper spring.**
   - *Broken stopper spring. Replace.*
2. **Check pawl and pawl lock.**
   - *Pawl and pawl lock have stuck together because of heat. Replace.*
3. **Check pawl and rope sheave.**
   - *Pawl and rope sheave have stuck together because of heat. Replace.*

Symptom: **ENGINE PINGING.**

1. **Check for proper fuel octane number according to engine type.**
   - *Too low fuel octane number. Use appropriate fuel octane number (Refer to* OPERATOR'S GUIDE*).*
2. **Check fuel lines.**
   - *Bent fuel lines (preventing fuel from flowing through). Repair or replace fuel lines.*
3. **Check if carburetor is clean.**
   - *Dirt prevents fuel from flowing through. Clean.*

Symptom: **ENGINE PINGING.** (cont'd)

4. **Check ignition timing.**
   - *Timing is too advanced. Refer to* IGNITION SYSTEM *to find defective parts.*
5. **Check compression ratio.**
   - *Compression ratio is too high. Replace inadequate part(s) to obtain manufacturer's recommended compression ratio or use a higher grade fuel.*
6. **Check for carbon accumulation in combustion chamber and/or on piston dome.**
   - *Carbon accumulation. Remove carbon accumulation.*

Symptom: **ENGINE GENERATES A LOT OF VIBRATIONS.**

1. **Check engine supports and stopper.**
   - *Loose and/or broken supports or interference between support and chassis. Retighten to specification (refer to* ENGINE REMOVAL AND INSTALLATION*) or replace.*
2. **Check drive pulley.**
3. **Check for crankshaft and bearings.**
   - *Loose crankshaft bearings or uneven crankshaft. Retighten or replace the parts.*

ENGINE (V800)

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 before concluding that the engine is faulty.

COOLING SYSTEM

Symptom: **HIGH ENGINE OPERATING TEMPERATURE.**

1. **Check coolant level.**
   - *Coolant level lower than recommended. Refill (refer to* COOLING SYSTEM*).*
2. **Check for air bubbles in cooling system.**
   - *Air in cooling system. Refill and bleed cooling system (refer to* COOLING SYSTEM*).*
3. **Check temperature sensor for electrical/mechanical failure.**
   - *Temperature sensor defective. Replace.*
4. **Check thermostat.**
   - *Thermostat defective (does not open when engine gets hot). Replace (refer to* COOLING SYSTEM*).*
5. **Check leak indicator hole (in crankcase MAG side-water pump housing area) if coolant leaks.**
   - *Coolant leaking from indicator hole means a damaged water pump rotary seal. Replace rotary seal (refer to* COOLING SYSTEM*).*
6. **Check condition of hoses and hose clamps fixation.**
   - *Hoses are brittle and/or hard. Replace.*
   - *Hose clamps are loose. Retighten clamps.*
7. **Check condition of impeller located on the water pump shaft.**
   - *Impeller wings broken and/or impeller threads are damaged. Replace (refer to* COOLING SYSTEM*).*
8. **Check gasket on water pump housing.**
   - *Gasket on water pump housing leaks. Retighten screws and/or replace gasket.*
9. **Check cylinder head and/or cylinder base gasket.**
   - *Worn out gasket(s) is (are) causing coolant leakage. Replace.*
10. **Check coolant drain screw on water pump housing MAG side (marked "DRAIN").**
    - *Copper ring on drain screw leaks. Retighten screw and/or replace copper ring.*
11. **Check intermediate gear(s) behind of PTO cover.**
    - *Worn out and/or broken gear(s) is/are causing less coolant supply. Replace worn out and/or broken gear(s) (refer to* BOTTOM END*).*
12. **Check if water pump shaft is seized.**
    - *Water pump shaft does not turn. Replace defective part(s).*
13. **Check radiators condition.**
    - *Radiator cracked or deformed. Replace radiator.*

MAGNETO SYSTEM

Symptom: **BATTERY NOT CHARGING OR CHARGING VOLTAGE INADEQUATE.**

1. **Check battery.**
   - *Battery shows less power. Reload battery.*
   - *Battery has electrical failure. Replace.*
2. **Check magneto for damage and/or electrical failure.**
   - *Radial position of rotor wrong due to broken Woodruff key. Replace Woodruff key.*
   - *Coating on stator winding is damaged. Replace stator.*
   - *Resistance value is out of specification (refer to* TECHNICAL SPECIFICATIONS*). Replace magneto.*
   - *Connector on magneto is damaged and/or has electrical failure. Repair and clean contacts of connector.*
3. **Check voltage regulator/rectifier.**
   - *Refer to* CHARGING SYSTEM.
4. **Check wiring harness for cracks or other damages.**
   - *Harness shows electrical failure and/or other damages. Replace/repair wiring harness.*

LUBRICATION

Symptom: **LOW OR NO OIL PRESSURE/HIGH OIL CONSUMPTION.**

1. **Check oil level and search for leakage on crankcase and/or sealing parts.**
   - *Crankcase is leaking due to damage. Rebuild engine with new crankcase and gasket parts. Use recommended oil (refer to* TECHNICAL SPECIFICATIONS*).*
   - *Crankcase is leaking due to loose screws. Retighten screws with recommended torque.*
   - *Sealing rings, O-rings and/or gaskets are brittle, hard or damaged. Replace damaged parts.*
   - *Piston rings worn out (blue colored engine exhaust emission). Replace piston rings (refer to* CYLINDER AND HEAD*).*
   - *Piston rings are broken (low compression). Replace piston rings (refer to* CYLINDER AND HEAD*).*
   - *Valve stem seal damaged and/or sealing lip is hard and/or brittle. Replace all valve stem seals.*
2. **Check oil filter for contamination.**
   - *Oil filter clogged. Replace oil and oil filter at the same time. Use recommended oil (refer to* TECHNICAL SPECIFICATIONS*).*
3. **Check oil drain plug on engine bottom.**
   - *Plug is loose and/or gasket ring is missing. Retighten the plug and/or place gasket ring.*
4. **Check leak indicator hole if oil leaks (in crankcase MAG side-water pump housing area).**
   - *Oil leaking from leak indicator hole means a damaged oil seal on water pump shaft. Replace oil seal (refer to* COOLING SYSTEM*).*
5. **Check oil pressure switch function.**
   - *Oil pressure switch damaged. Replace oil pressure switch.*
6. **Check oil orifice(s) on the oil pump suction side.**
   - *Oil orifice(s) is (are) clogged. Clean from contamination. Replace oil and oil filter if necessary (refer to* MAINTENANCE *or* LUBRICATION SYSTEM*).*

Symptom: **LOW OR NO OIL PRESSURE/HIGH OIL CONSUMPTION.** (cont'd)

7. **Check oil pump function.**
   - *Oil pump rotor is out of wear limit. Replace oil pump (refer to* LUBRICATION SYSTEM*).*
   - *Oil pump seized due to oil leakage and/or air inclusion. Replace oil pump (refer to* LUBRICATION SYSTEM*).*
   - *Gears driving oil pump are broken or otherwise damaged. Replace gears.*
   - *Incorrect oil being used. Use recommended oil (refer to* TECHNICAL SPECIFICATIONS*).*
8. **Check oil pressure regulator valve (spring) function.**
   - *Valve spring damaged (valve always open). Replace spring.*
   - *Valve piston is worn or broken. Replace valve piston (refer to* LUBRICATION SYSTEM*).*
   - *Valve piston stays open due to contamination. Clean or repair valve piston.*
9. **Check plain bearings in crankcase for heavy wear.**
   - *Plain bearings out of specification (increased clearance). Replace plain bearings (refer to* BOTTOM END*).*
10. **Check engine oil strainer in crankcase.**
    - *Oil strainer is clogged due to contamination. Clean or replace strainer and diagnose causes. Replace possible damaged parts (refer to* BOTTOM END*).*

Symptom: **OIL CONTAMINATION (white appearance).**

1. **Check leak indicator hole (in crankcase MAG side-water pump housing area) if water and oil leaks.**
   - *Leakage of oil/water mixture from indicator bore means damaged water pump seal ring and rotary seal. Replace sealing ring, rotary seal and change oil, oil filter and/or coolant (refer to* LUBRICATION SYSTEM, COOLING SYSTEM *and* BOTTOM END*).*
2. **Check cylinder head and/or cylinder base gasket.**
   - *Gasket damaged or leaking. Retighten cylinder head with recommended torque and/or replace gasket.*
3. **Check tightening torque of cylinder head screws.**
   - *Screws not properly tightened. Retighten screws to recommended torque and replace oil.*
4. **Check oil for particles (may indicate possible engine internal damages).**
   - *Oil contamination due to metal or plastic particles. Replace possibly damaged part(s) including oil and oil filter. Use recommended oil (refer to* TECHNICAL SPECIFICATIONS*).*

CYLINDER AND HEAD

Symptom: **UNUSUAL ENGINE NOISE AND/OR VIBRATION.**

1. **Check noise coming from cylinder head area.**
   - *Improper valve clearance adjustment. Readjust valve clearance and/or replace defective part(s).*
   - *Faulty chain tensioner. Replace spring and/or mechanism.*
   - *Chain guide worn out. Replace chain guide.*
   - *Stretched chain and/or worn out sprockets. Replace chain and sprockets.*
   - *Sprocket screws got loose. Retighten screws with recommended torque.*
   - *Rocker arm(s) is (are) worn out (valve adjustment). Readjust valve clearance and/or replace rocker arm(s).*
   - *Incorrect camshaft timing adjustment. Replace damaged components and readjust camshaft timing (refer to* CYLINDER AND HEAD*).*

Symptom: **OIL CONTAMINATION ON CYLINDER AND/OR HEAD.**

1. **Check screws for torque.**
   - *Loose screws. Retighten screws with recommended torque.*
   - *Gaskets are brittle, hard, worn out or otherwise damaged. Replace damaged gaskets, O-rings or the V-ring on breather.*

CRANKSHAFT

Symptom: **UNUSUAL ENGINE NOISE AND/OR VIBRATIONS.**

1. **Check noise coming from crankshaft area.**
   - *Crankshaft plain bearings are damaged. Replace crankshaft plain bearings (refer to* BOTTOM END*).*
   - *Connecting rod plain bearings are damaged. Replace connecting rod plain bearings (refer to* BOTTOM END*).*
   - *Magneto rotor got loose. Replace damaged components and retighten rotor retaining screw with recommended torque (refer to* MAGNETO SYSTEM*).*

ENGINE GENERAL

Symptom: **ENGINE CRANKS BUT FAILS TO START.**

1. **Check if spark plug connectors fit on spark plugs (refer to *IGNITION SYSTEM*).**
2. **Check spark plugs.**
   - *Define spark plugs (no spark) or wrong spark plug gap. Readjust gap and clean spark plugs or replace.*
3. **Check for fuel on spark plugs.**
   - *Flooded engine (spark plugs wet when removed). Activate engine drowned mode and crank engine with rags over the spark plug holes (refer to* OVERVIEW *in* EMS SYSTEM*).*
4. **Check battery voltage.**
   - *Battery is discharged and starter works not properly. Charge battery.*
5. **Check fault codes in B.U.D.S system.**
   - *Check if electrical actuator(s) is/are defective. Replace defective part(s) (refer to* COMPONENT INSPECTION AND ADJUSTMENT*).*
6. **Check fuel level in fuel tank and fuel pressure. Ensure fuel pump was not disabled by B.U.D.S.**
   - *Low or no fuel pressure. Replace defective part(s) (refer to* FUEL TANK AND FUEL PUMP*).*
7. **Check fuel injectors.**
   - *Plugged or faulty injector(s). Replace defective part(s) (refer to* ENGINE MANAGEMENT*).*
8. **Check idle bypass valve.**
   - *Stuck or defective. Refer to* ENGINE MANAGEMENT.
9. **Check encoder wheel.**
   - *Bent tooth. Refer to* MAGNETO SYSTEM.
10. **Check engine compression.**
    - *Insufficient engine compression. Replace defective part(s) (refer to* LEAK TEST*).*

Symptom: ENGINE DOES NOT START.

1. **Electrical problem.**
   - *Determine if the electrical system works correctly (fuse(s), battery, wiring harness, etc.). Refer to* IGNITION SYSTEM.
2. **Problem with fuel system (carburetor, fuel pump, hoses, etc.).**
   - *Clean, inspect, repair or replace defective parts. Refer to* FUEL SYSTEM.
3. **Check engine compression.**
   - *Insufficient engine compression. Replace defective parts.*
   - *Valve seat worn and/or damaged. Repair by performing valve guide procedure (refer to* CYLINDER AND HEAD*). Readjust valve clearance.*
4. **Internal engine problem.**
   - *Overhaul engine to find defective parts. refer to the appropriate section in* ENGINE.

Symptom: ENGINE HARD TO START.

1. **Check idle bypass valve.**
   - *Stuck or defective. Refer to* ENGINE MANAGEMENT.
2. **Check closed throttle and idle actuator with B.U.D.S.**
   - *Wrong TPS zero setting/idle bypass valve reset. Refer to* ENGINE MANAGEMENT.
3. **Check throttle cable adjustment.**
   - *Wrong adjustment (likely too tight). Refer to* ENGINE MANAGEMENT.
4. **Check engine compression.**
   - *Insufficient engine compression. Replace defective part(s) (refer to* LEAK TEST*).*
5. **Verify spark plug condition.**
   - *Defective, improperly set, worn out, fouled. Identify source of problem and correct. Replace spark plug.*
6. **Check fuel level in fuel tank and fuel pressure.**
   - *Low or no fuel pressure. Replace defective part(s) (refer to* FUEL TANK AND FUEL PUMP*).*
7. **Check CAPS (camshaft position sensor).**
   - *Defective sensor/wiring. Refer to* ENGINE MANAGEMENT.

Symptom: ENGINE SUDDENLY TURNS OFF.

1. **Perform engine leak test. Refer to *ENGINE LEAK TEST* procedure.**
   - *Damaged head gasket and/or seal and/or leaking inlet/exhaust valve(s). Replace and/or repair defective parts.*
2. **Check fault codes in B.U.D.S. system.**
   - *Check if electrical actuator(s) is/are defective. Replace defective part(s) (refer to* COMPONENT INSPECTION AND ADJUSTMENT*).*
3. **Check spark plugs condition and/or gap.**
   - *Fouled spark plugs or wrong spark plug gap. Readjust gap and clean spark plugs or replace.*

Symptom: **ENGINE SUDDENLY TURNS OFF.** (cont'd)

4. **Piston seizure.**
   - *Spark plugs heat range is too hot. Install spark plugs with appropriate heat range (refer to* TECHNICAL SPECIFICATIONS*).*
   - *Compression ratio is too high. Install genuine parts.*
   - *Poor oil quality. Use recommended oil.*
   - *Leaks at air intake manifold (engine gets too lean). Retighten screws or replace air intake manifold gasket.*
   - *Snow/water intrusion through intake system into combustion chamber. Clean intake system and replace defective part(s).*
5. **Melted and/or perforated piston dome; melted section at ring end gap.**
   - *Spark plugs heat range is too hot. Install recommended spark plugs (refer to* TECHNICAL SPECIFICATIONS*).*
   - *Coolant less than recommended level (engine gets too hot). Repair cooling circuit and/or refill with recommended liquid.*
   - *Poor quality and/or wrong fuel. Clean from contamination and use appropriate fuel (refer to* TECHNICAL SPECIFICATIONS*).*
6. **Piston color is dark due to seizure on intake and exhaust sides.**
   - *Cooling system leaks and lowers coolant level. Tighten clamps or replace defective parts. Add antifreeze in cooling system until appropriate level is reached. Replace damaged parts.*
7. **Cracked or broken piston.**
   - *Cracked or broken piston due to excessive piston/cylinder clearance or engine overreving. Replace piston. Check piston/cylinder clearance (refer to* CYLINDER AND HEAD*).*
8. **Check piston rings and cylinder surface for grooves.**
   - *Poor oil quality. Use recommended oil.*
   - *Contamination through engine intake. Replace defective part(s) and use new air filter.*
9. **Check crankshaft, rocker arms movement.**
   - *Oil pump failure due to lack of oil. Repair and replace defective parts and use recommended oil.*
   - *Oil contamination due to clogged oil filter/oil strainer. Replace oil and oil filter at the same time, replace defective part(s) (refer to* MAINTENANCE CHART *and LUBRICATION SYSTEM).*
10. **Check valve springs exhaust/intake.**
    - *Broken valve spring damages the cylinder head, valve(s), rocker arm(s), piston, piston rings and connecting rod. Replace defective part(s).*
11. **Check if fuel supply is sufficient.**
    - *Low fuel level.*
    - *Clogged fuel filter or fuel injector filter.*
    - *Fuel line is contaminated and/or bent. Clean and/or replace defective part(s).*

Symptom: **ENGINE BACKFIRES.**

1. **Check fault codes in B.U.D.S. system.**
   - *Check if electrical actuator(s) is/are defective. Replace defective part(s) (refer to* COMPONENT INSPECTION AND ADJUSTMENT*).*
2. **Check spark plugs.**
   - *Carbon accumulation caused by defective spark plugs. Replace spark plugs.*
3. **Check leakage on intake manifold.**
   - *Air leak on intake system. Retighten screws and/or replace intake manifold gasket.*
4. **Check exhaust air leaking.**
   - *Exhaust gasket is leaking. Retighten screws and/or replace exhaust gasket.*

Symptom: **ENGINE BACKFIRES.** (cont'd)

5. **Check intake valve(s) for leaking.**
   - *Intake valve(s) is (are) leaking. Repair or replace valve(s).*
6. **Check if fuel supply is sufficient.**
   - *Fuel line is contaminated and/or bent (engine gets lean). Clean and/or replace defective part(s).*
7. **Check engine ground.**
   - *Poor engine ground. Clean.*

Symptom: **ENGINE DOES NOT OFFER MAXIMUM POWER AND/OR DOES NOT REACH MAXIMUM OPERATING RPM.**

1. **Check spark plugs condition and/or gap.**
   - *Fouled spark plugs or wrong spark plug gap. Readjust gap and clean spark plugs or replace.*
2. **Check spark plugs type.**
   - *Improper spark plugs heat range. Install recommended spark plugs (refer to* TECHNICAL SPECIFICATIONS*).*
3. **Perform engine leak test. Refer to *ENGINE LEAK TEST* procedure.**
   - *Damaged head gasket and/or seal and/or leaking intake/exhaust valve(s). Replace and/or repair defective parts.*
4. **Check for water in fuel (wrong fuel).**
   - *There is water in fuel or wrong fuel. Drain fuel system, search for leakage and refill it with appropriate fuel.*
5. **Check engine compression.**
   - *Worn piston(s) and/or piston ring(s). Replace defective part(s) (refer to* CYLINDER AND HEAD *and* LEAK TEST*).*
6. **Check fuel pressure.**
   - *Low fuel pressure. Perform fuel pressure test (refer to* FUEL SYSTEM*).*
7. **Check air intake system.**
   - *Air filter is clogged due to contamination. Replace air filter.*
8. **Check if EMS (Engine Management System) is in limp home mode. Check fault codes in B.U.D.S system.**
   - *Check if electrical actuator(s) is/are defective. Replace defective part(s) (refer to* COMPONENT INSPECTION AND ADJUSTMENT*).*
9. **Check drive belt.**
   - *Worn. Replace belt if its width is less than specified (refer to* CONTINUOUSLY VARIABLE TRANSMISSION (CVT)*).*

Symptom: **HIGH ENGINE OPERATING TEMPERATURE.**

1. **Check if cooling system shows any failure (see *COOLING SYSTEM*).**
   - *System is leaking. Repair and/or replace damaged part(s).*
2. **Check function of lubrication system (see *LUBRICATION SYSTEM*).**
   - *Lubrication is not working properly. Repair and/or replace damaged part(s).*
3. **Check condition and heat range of spark plugs.**
   - *Melted spark plug tip or inadequate heat range. Replace.*
4. **Check air leakage on engine intake.**
   - *Leakage causes overheating. Replace/repair damaged part(s).*

FUEL AND OIL INJECTION SYSTEMS

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline.

NOTE: For troubleshooting the lubrication system of the V800 models, refer to *ENGINE (V800)*.

Symptom: **HIGH FUEL CONSUMPTION OR RICH MIXTURE (300F AND 550F).**

1. **Check fuel tank.**
   - *Perforated fuel tank. Replace fuel tank.*
2. **Check fuel pump, reservoir and carburetor fittings.**
   - *Leaking fittings. Replace defective part.*
3. **Check choke adjustment.**
   - *Fuel flows through choke circuit while engine runs. Readjust choke.*
4. **Check float height in carburetor(s).**
   - *Fuel level is too high in float bowl(s). Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*).*
5. **Check needle valve on each carburetor.**
   - *Foreign particles prevent needle valve from closing and/or pounded seating area. Clean or replace needle valve, then clean seating area.*

Symptom: **FUEL LEAKS IN ENGINE BASE WHEN ENGINE IS STOPPED (300F AND 550F).**

1. **Check items 3, 4 and 5 of *HIGH FUEL CONSUMPTION*.**
2. **Check fuel pump diaphragm.**
   - *Cracked diaphragm. Replace pump.*

Symptom: **ENGINE LACKS POWER OR STALLS AT HIGH RPM.**

1. **Check in-line fuel filter (V800).**
   - *Clogged filter. Replace fuel filter.*
2. **Check electric fuel pump pressure (V800).**
   - *Electric fuel pump defective. Replace.*
   - *Regulator defective. Replace.*
3. **Check fuel tank vent hose.**
   - *Kinked or clogged hose. Relocate or replace.*
4. **Check in-tank strainer.**
   - *Clogged strainer. Replace.*
5. **Check fuel lines.**
   - *Kinked or clogged lines. Relocate or replace.*
6. **Check fuel pump flow (300F and 550F).**
   - *Check impulse hose. Replace.*
   - *Dried diaphragm. Replace.*
7. **Check if carburetor(s) is(are) clean (300F and 550F).**
   - *Varnish. Clean.*
8. **Check fuel injectors flow (V800).**
   - *Dirty or defective fuel injectors. Replace.*

Symptom: **HIGH INJECTION OIL CONSUMPTION (300F AND 550F).**

1. **Check oil injection pump adjustment.**
   - *Oil injection pump adjusted too rich. Adjust.*
2. **Check injection pump identification.**
   - *Wrong pump. Replace with the appropriate pump. Refer to* LUBRICATION SYSTEM.
3. **Check injection oil line and its fitting.**
   - *Leaking line and/or cover. Replace defective part(s).*
4. **Check injection pump cover gasket.**
   - *Broken gasket. Replace.*
5. **Check nipple check valve.**
   - *Check valve stuck open. Replace.*
6. **Check pump.**
   - *Defective pump. Replace pump or connecting cable.*
7. **Test pump shaft gear reservoir for leaks.**
   - *Leaking seal(s). Replace seal(s).*

Symptom: **OIL STARVATION (300F AND 550F).**

1. **Check for oil flow in pump inlet tube.**
   - *Clogged oil filter. Replace filter.*
2. **Check for oil leaks of pump inlet and outlet tubes and fittings.**
   - *Loose, kinked or plugged hose. Loose/damage fitting. Replace hose or fitting.*
3. **Verify vent line check valve.**
   - *Defective check valve or plugged/kinked line. Replace check valve or line.*
4. **Check pump.**
   - *Defective pump. Replace pump.*

DRIVE SYSTEM

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline. **Some causes or corrections may not apply to a specific model.**

DRIVE SYSTEM

Symptom: **THE SNOWMOBILE ACCELERATES SLOWLY, ESPECIALLY FROM A STANDING START.**

1. **Check drive belt condition.**
   - *Belt is too narrow (drive belt engagement is higher in drive pulley). Replace belt if width is less than specified in* DRIVE BELT.
2. **Check drive belt deflection.**
   - *Deflection is too high (drive belt engagement is higher in drive pulley). Adjust drive belt height according to specifications (refer to* PULLEY ALIGNMENT *and* DRIVE BELT*).*
3. **Check if driven pulley sliding half slides freely.**
   - *Jammed sliding half. Replace.*
4. **Check spring tension of driven pulley sliding half.**
   - *Sliding half rotation is accelerated when spring tension is too weak. Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*) or replace.*
5. **Refer to *VIBRATIONS ORIGINATING FROM DRIVE PULLEY* and *VIBRATIONS ORIGINATING FROM DRIVEN PULLEY* and check items listed.**
6. **Check drive pulley spring tension.**
   - *Spring tension is too weak. Replace.*

Symptom: **ENGINE MAXIMUM RPM IS TOO HIGH AND TOP SPEED IS NOT REACHED.**

1. **Check items 1, 2 and 3 of *THE SNOWMOBILE ACCELERATES SLOWLY, ESPECIALLY FROM A STANDING START.***
2. **Check driven pulley spring tension.**
   - *Spring tension is too stiff.*
3. **Refer to *VIBRATIONS ORIGINATING FROM DRIVE PULLEY* and check items listed.**
4. **Check the driven pulley.**
   - *Driven pulley does not open completely. Clean, readjust or replace driven pulley.*

Symptom: **LOOSE IN DRIVE SYSTEM WHEN ACCELERATING/DECELERATING.**

1. **Check drive chain tension.**
   - *Drive chain is too loose. Adjust.*
2. **Check radial play of driven pulley.**
   - *Worn splines. Replace pulley.*

Symptom: **VIBRATIONS ORIGINATING FROM DRIVE PULLEY.**

1. **Check drive belt.**
   - *Belt width is uneven on several places. Replace.*
2. **Check tightening torque of drive pulley screw.**
   - *Moving drive pulley cover. Retighten screw.*

Symptom: **VIBRATIONS ORIGINATING FROM DRIVEN PULLEY.**

1. **Check sliding half side play.**
   - *Sliding half bushing worn out. Replace sliding half bushing.*
2. **Check sliding half and fixed half straightness.**
   - *Sliding half/fixed half warped. Replace.*
3. **Check slider shoes.**
   - *Slider shoes can be broken. Replace.*

Symptom: **PULLEYS DO NOT DOWN SHIFT PROPERLY.**

1. **Check driven pulley spring tension.**
   - *Spring tension is too low. Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*) or replace spring.*
2. **Refer to *VIBRATIONS COMING FROM DRIVEN PULLEY* and check items listed.**
3. **Check drive pulley bushings (cleanliness, wear, etc.).**
   - *Bushings stick to fixed half pulley shaft. Clean or replace.*

Symptom: **IN REVERSE (RER) ENGINE FAILS AND DRIVEN PULLEY OPENS TOO FAST (drive belt is low in drive pulley).**

1. **Check pulley alignment.**
   - *Improper adjustment. Adjust according to specifications (refer to* PULLEY ALIGNMENT*).*
2. **Check for reverse sliding shoes.**
   - *Sliding shoes are worn or missing. Replace sliding shoes.*
3. **Check spring.**
   - *Spring is weak or insufficient tension. Replace spring.*

Symptom: **IT IS DIFFICULT TO ENGAGE FORWARD OR REVERSE (V800).**

1. **Check reverse link rod adjustment.**
   - *Reverse link rod is not adjust properly. Adjust. Refer to* CHAINCASE (V800).
2. **Check reverse rod.**
   - *The reverse rod is bent. Replace.*

Symptom: **UNEVEN BELT WEAR ON ONE SIDE.**

1. **Check tightening torque of engine mount bolts.**
   - *Loose engine mount. Tighten mount nuts/bolts equally.*
2. **Check pulley alignment.**
   - *Pulley misalignment. Align pulleys.*
3. **Check drive belt contact area on pulleys.**
   - *Rough or scratched pulley surfaces. Repair or replace pulley half.*
4. **Check driven pulley sliding half play.**
   - *Driven pulley bushing worn. Replace bushing.*

Symptom: **BELT TOO NARROW ON ONE SECTION.**

1. **Vehicle started with a frozen track.**
   - *Free track from ice before starting vehicle.*

Symptom: **BELT TOO NARROW ON ONE SECTION.** (cont'd)

2. **Vehicle ridden with parking brake engaged.**
   - *Release parking brake before riding vehicle.*
3. **Check track tension/alignment.**
   - *Track too tight. Adjust track tension and alignment.*
4. **Check drive pulley.**
   - *Drive pulley does not operate properly. Repair or replace drive pulley.*
5. **Check idle speed.**
   - *Engine idle speed is too high. Adjust according to specifications.*
6. **Check drive belt length.**
   - *Incorrect belt length. Replace with an appropriate drive belt (refer to* TECHNICAL SPECIFICATIONS*).*
7. **Check belt height.**
   - *Belt height is incorrect. Adjust according to specifications.*

Symptom: **BELT GLAZED EXCESSIVELY OR HAVING BAKED APPEARANCE.**

1. **Check if drive pulley bushings are worn.**
   - *Slipping due to insufficient pressure on belt sides. Replace bushing.*
2. **Check condition of drive pulley fixed half shaft.**
   - *Slipping due to rusted drive or driven pulley shafts. Clean shaft with fine steel wool.*
3. **Check if pulley halves are clean.**
   - *Slipping due to oily pulley surfaces. Clean pulley halves.*
4. **Check pulley calibration.**
   - *Slipping due to improper pulley calibration. Calibrate according to specifications.*

Symptom: **BELT WORN EXCESSIVELY IN TOP WIDTH.**

1. **Check drive pulley.**
   - *Excessive slippage due to jamming of drive pulley. Inspect drive pulley.*
2. **Check drive belt identification number.**
   - *Improper belt angle (wrong type of belt). Replace belt with an appropriate drive belt.*
3. **Check drive belt width.**
   - *Considerable use. Replace belt if less than specified in* DRIVE BELT.

Symptom: **BELT SIDES WORN CONCAVE.**

1. **Check pulley half surfaces.**
   - *Rough or scratched pulley half surfaces. Repair or replace.*
2. **Check drive belt identification number.**
   - *Wrong belt. Replace with an appropriate drive belt (refer to* TECHNICAL SPECIFICATIONS*).*

Symptom: **BELT DISINTEGRATION.**

1. **Check drive belt identification number.**
   - *Excessive belt speed. Wrong type of belt. Replace with proper type of belt (refer to* TECHNICAL SPECIFICATIONS*).*

Symptom: **BELT DISINTEGRATION.** (cont'd)

2. **Check if pulley halves are clean.**
   - *Oil on pulley surfaces. Clean pulley surfaces with fine emery cloth and wipe clean using pulley flange cleaner (P/N 413 711 809) and a cloth.*

Symptom: **BELT CORD POP OUT.**

1. **Check pulley alignment.**
   - *Pulley misalignment. Align pulley (refer to* PULLEY ALIGNMENT*).*

Symptom: **FATIGUE CRACKS BETWEEN COGS.**

1. **Check drive belt condition.**
   - *Belt considerably worn, worn out. Replace.*
   - *Distortion of natural belt shape due to improper storage. Store properly.*

Symptom: **TOOTH CHUNK OUT.**

1. **Check drive belt rotational direction.**
   - *Improper belt installation. Replace.*
2. **Check if drive belt rubs against components.**
   - *Belt rubs against fixed components. Relocate components.*
3. **Check drive pulley.**
   - *Violent engagement of drive pulley. Check drive pulley engagement speed, drive pulley bushings and components.*

Symptom: **BELT "FLIP-OVER" AT HIGH SPEED.**

1. **Check pulley alignment.**
   - *Pulley misalignment. Align pulley (refer to* PULLEY ALIGNMENT*).*
2. **Check drive belt identification number.**
   - *Wrong type of belt. Replace with an appropriate drive belt.*

Symptom: **SLIDER SHOES WEAR OUT PREMATURELY/OR TRACK CLEATS BECOME BLUE.**

1. **Check track tension.**
   - *Pressure is too great on slider shoes. Adjust according to specifications (refer to* TRACK*). Replace defective parts.*
2. **Check idler wheel condition.**
   - *Stuck bearing, flat spot on wheel or damaged wheel. Replace defective parts.*
3. **Check snow conditions or lack of snow.**
   - *Lack of lubrication of slider shoes. Ask driver to ride in appropriate snow conditions (see* OPERATOR'S GUIDE*).*
4. **Check slider shoes and/or suspension retaining screws.**
   - *Twisted slider shoes or loose retaining screws. Replace defective parts and/or tighten loose screws.*

Symptom: **DERAILING TRACK.**

1. **Check track tension.**
   - *Track is too loose. Adjust.*
2. **Check if track and slider shoes are properly aligned.**
   - *Improper alignment. Adjust.*

Symptom: **NOISE OR VIBRATION COMING FROM THE TRACK.**

1. **Check track tension.**
   - *Track is too loose. Adjust to recommended tension.*
2. **Check slide suspension retaining bolts.**
   - *Missing bolt(s) (some components interfere with track rotation). Replace missing bolt(s).*
3. **Check condition of idler wheel(s).**
   - *Idler wheel rubber is damaged. Replace.*
4. **Check guide cleats.**
   - *Top portion of guide cleat(s) is bent. Replace.*
5. **Check sprockets.**
   - *One or several teeth of drive shaft sprockets are broken. Replace sprocket(s).*
6. **Check track rods and/or internal traction teeth.**
   - *One or several track rods and/or teeth are broken. Replace track.*

BRAKE SYSTEM

Symptom: **SPONGY BRAKE CONDITION.**

1. **Brake pads worn.**
   - *Replace brake pads.*
2. **Air in brake system.**
   - *Bleed system.*
3. **Contaminated brake fluid.**
   - *Replace brake fluid and bleed system.*
4. **Leak in brake system.**
   - *Repair leak.*
5. **Master cylinder faulty.**
   - *Replace master cylinder.*
6. **Piston seals worn or damaged.**
   - *Replace caliper.*

Symptom: **BRAKE FLUID LEAKAGE.**

1. **Check for loosen hose connectors.**
   - *Replace copper washers and retighten.*
2. **Check for damaged hose, master cylinder and caliper.**
   - *Replace part(s) and check for proper mounting.*

Symptom: **BRAKE SYSTEM IS NOISY.**

1. **Check brake pad thickness.**
   - *Pads are worn out. Replace.*
2. **Check Woodruff key and/or key way on countershaft.**
   - *Key and/or key way is (are) worn out. Replace defective part(s).*

ELECTRICAL SYSTEM

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline. **Some causes or corrections may not apply to a specific model.**

Symptom: **STARTER DOES NOT TURN.**

1. **Check fuses.**
   - *Burnt fuse. Check wiring condition and replace fuse.*
2. **Check battery charge.**
   - *Discharged or disconnected battery. Recharge battery and check charging system and wires.*
3. **Check ground. Check terminal of BLACK wire at engine connector.**
   - *Poor, or corroded ground contacts. Check, clean and tighten.*
4. **Check continuity of ignition switch contact points.**
   - *Poor contact of ignition switch contact points. Repair or replace switch.*
5. **Check continuity between ignition switch and solenoid.**
   - *Open circuit. Repair.*
6. **Check starter solenoid.**
   - *Inadequate connection (too much resistance) or defective solenoid. Clean, reconnect and/or replace.*
7. **Check starter.**
   - *Inadequate connection (too much resistance) or defective starter. Reconnect and/or replace.*
8. **Check ECM tracking connector (V800 engines).**
   - *Connector disconnected. Refer to* STARTING SYSTEM.
9. **Check engine problems.**
   - *Damaged engine. Check and repair.*

Symptom: **STARTER TURNS BUT DOES NOT CRANK THE ENGINE (V800 engine).**

1. **Check splines condition on electric starter.**
   - *Worn and/or damaged starter splines. Replace electric starter and drive gear.*
2. **Check condition of starter drive gears and sprag clutch gear.**
   - *Worn and/or damaged gears. Replace gears.*
3. **Check sprag clutch.**
   - *Defective sprag clutch. Replace.*

Symptom: **CLUTCH PINION DOES MESH WITH RING GEAR BUT STARTER DOES NOT CRANK THE ENGINE (300F AND 550F).**

1. **Check battery capacity.**
   - *Shorted battery cell(s). Replace.*
2. **Check battery charge.**
   - *Low battery. Recharge battery and check recharge system and wires.*
3. **Check engine.**
   - *Engine seized. Overhaul the engine.*
4. **Check wire connection.**
   - *Inadequate connection (too much resistance). Clean and reconnect.*

Symptom: **CLUTCH PINION DOES MESH WITH RING GEAR BUT STARTER DOES NOT CRANK THE ENGINE (300F AND 550F).** (cont'd)

5. **Check starter brushes.**
   - *Poor contact of brushes. Replace brushes.*
6. **Check starter commutator.**
   - *Burnt commutator. Repair or replace. Refer to* ELECTRIC STARTER.
7. **Check height of commutator mica.**
   - *Commutator mica too high. Undercut mica.*
8. **Check starter armature resistance.**
   - *Shorted armature. Repair or replace armature.*
9. **Check tension of starter brush springs.**
   - *Weak brush spring tension. Replace springs.*
10. **Check starter magnets.**
    - *Weak magnets. Replace yoke assembly or starter.*
11. **Check if starter bushings are worn.**
    - *Worn bushings. Replace bushings.*

Symptom: **STARTER TURNS, BUT OVERRUNNING CLUTCH PINION DOES NOT MESH WITH RING GEAR.**

1. **Check clutch pinion gear.**
   - *Worn clutch pinion gear. Replace clutch.*
2. **Check clutch.**
   - *Defective clutch. Replace clutch.*
3. **Check mounting brackets.**
   - *Worn or broken brackets. Replace brackets.*
4. **Check movement of clutch on splines.**
   - *Poor movement of clutch on splines. Clean and correct.*
5. **Check clutch bushing.**
   - *Worn clutch bushing. Replace clutch.*
6. **Check starter bushings.**
   - *Worn starter bushing(s). Replace bushing(s).*
7. **Check ring gear.**
   - *Worn ring gear. Replace ring gear.*
8. **Check for proper starter rotation direction.**
   - *Starter turns in wrong direction, incorrectly installed brushes, wrong polarity or wrong starter. Replace starter or reconnect properly.*

Symptom: **ELECTRIC STARTER KEEPS TURNING WHEN ENGINE IS STARTED.**

1. **Check clutch (300F and 550F).**
   - *Jammed clutch pinion gear. Replace or clean.*
2. **Check movement of clutch on splines (300F and 550F).**
   - *Clutch is stuck on splines. Clean.*
3. **Check starter brackets (300F and 550F).**
   - *Broken bracket(s). Replace bracket(s).*

Symptom: **ELECTRIC STARTER KEEPS TURNING WHEN ENGINE IS STARTED.** (cont'd)

4. **Check ignition switch.**
   - *Ignition switch does not return to its ON position or is short-circuited. Adjust switch position. Face nut is too far in.*
5. **Check starter solenoid.**
   - *Shorted starter solenoid winding(s). Replace starter solenoid.*
   - *Melted starter solenoid contacts. Replace starter solenoid.*
   - *Starter solenoid returns poorly. Replace starter solenoid.*
6. **Check ignition switch contacts.**
   - *Contacts shorted. Replace ignition switch.*

Symptom: **NOISE OCCURRENCE WHEN STARTING ENGINE.**

1. **Check if ring gear is well-mounted to drive pulley fixed sheave.**
   - *Loose and/or broken bolts. Retighten bolts using thread locker or replace ring gear and drive pulley fixed sheave.*
2. **Check sprag clutch (V800 engines).**
   - *Defective or loose sprag clutch. Tighten or replace.*

Symptom: **ACCESSORY FUSE IS BURNT (ground protection).**

1. **Check that large ground wire at battery is well connected to chassis.**
   - *Corroded and/or loose connection(s). Clean and/or retighten.*

Symptom: **ELECTRIC STARTER SOMETIMES DOES NOT WORK WHEN ACTIVATED.**

1. **Check battery cables and starter wires.**
   - *Corroded and/or loose connection(s). Clean and/or retighten.*
2. **Check fuse.**
   - *Oxidized or burnt fuse. Clean or replace.*
3. **Check wiring harness connections.**
   - *Oxidized connections. Clean or replace defective terminals.*
4. **Check ignition switch.**
   - *Defective contacts in ignition switch. Replace.*
5. **Check solenoid of electric starter.**
   - *Shorted solenoid wiring harness or corroded contact washer. Replace.*

Symptom: **THE MPEM DOES NOT WORK.**

1. **Check that spark plug high tension cable does not touch any metal parts.**
   - *Short circuit. Isolate and reroute cable.*

Symptom: **ENGINE DOES NOT START — NO SPARK AT SPARK PLUG.**

1. **Verify spark plug condition.**
   - *Defective, improperly set, worn-out, fouled. Identify source of problem and correct. Replace spark plugs.*
2. **Verify spark plug cap resistance with an ohmmeter.**
   - *Defective part. Replace cap.*

Symptom: **ENGINE DOES NOT START — NO SPARK AT SPARK PLUG.** (cont'd)

3. **Verify if problem originated from electrical system wiring harness and/or accessories and/or ignition cut-out switches by unplugging the engine connector. Check condition of terminals.**
   - *Heating, rotating or sharp part in contact with harness. Improper harness routing. Defective switch(es). Corroded connector terminals. Replace or repair damaged connectors/wires. Reroute where necessary. Replace defective switch(es). Clean terminals and apply silicone dielectric grease.*
4. **Verify trigger coil (CPS on V800) and connector condition.**
   - *Defective coil. Corroded connector terminals. Replace defective coil. Clean terminals and apply silicone dielectric grease.*
5. **Verify condition of ignition coil.**
   - *Mechanically damaged part. Vibration problem. Electrically damaged part. Tighten mounting screws. Replace ignition coil.*
6. **Verify condition of ignition generator coils.**
   - *Mechanically damaged part. Vibration problem. Electrically damaged part. Tighten mounting screws. Replace coils.*
7. **Verify MPEM (300F and 550F).**
   - *Mechanically damaged part. Vibration problem. Electrically damaged part. Tighten mounting screws. Replace MPEM, retest and verify ignition timing.*

Symptom: **ENGINE IS MISFIRING — ERRATIC SPARK AT SPARK PLUG.**

1. **Verify misfiring by observing flash of stroboscopic timing light; unplug connectors between magneto/generator and vehicle wiring harness to isolate problem. Check condition of connectors.**
   - *Defective spark plug and/or cable/cap. Defective electrical system wiring harness and/or accessories and/ignition cut-out switches. Condition of connector terminals. Replace defective parts and/or repair damaged wires. Replace defective switch(es). Clean terminals and apply silicone dielectric grease.*

Symptom: **ENGINE IS MISFIRING — ERRATIC SPARK AT SPARK PLUG (riding on wet snow).**

1. **Check if spark plug wire and/or spark plug cap seal are sealing out moisture.**
   - *Defective wire and/or seal. Replace defective part.*
2. **Check if ignition system wiring harness connectors are in good condition and/or are sealing out moisture.**
   - *Loose connectors, corroded terminals or defective parts. Clean terminals and apply silicone dielectric grease. Replace defective parts.*

Symptom: **ENGINE IS MISFIRING — ERRATIC SPARK AT SPARK PLUG (riding in deep and thick snow).**

1. **Perform all verifications outlined under *ENGINE DOES NOT START — NO SPARK AT SPARK PLUG.***
2. **Check spark plugs. Proceed with spark plug analysis in order to identify source of problem.**
   - *Defective and/or worn spark plug(s) and/or cable(s) and/or cap(s). Engine related problem. Replace defective part(s). Proceed with ignition system testing procedures. Perform engine analysis.*

Symptom: **FOULED (black) SPARK PLUG TIP (300F AND 550F).**

1. **Check carburetor**
   - *Carburation is too rich. Adjust according to specifications (refer to* TECHNICAL SPECIFICATIONS*).*

Symptom: **FOULED (black) SPARK PLUG TIP (300F AND 550F).** (cont'd)

2. **Check injection oil consumption.**
   - *Injection pump flow is too high. Adjust according to specifications or replace.*
3. **Check oil quality.**
   - *Poor quality oil (creation of deposits). Use XP-S injection oil.*
4. **Check engine compression.**
   - *Leaking piston ring(s). Replace.*

Symptom: **SPARK PLUG TIP IS LIGHT GRAY (300F AND 550F).**

1. **Check spark plug heat range.**
   - *Spark plug heat range is too high. Replace by BRP's recommended spark plug (refer to* TECHNICAL SPECIFICATIONS*).*
2. **Check air intake silencer.**
   - *Leak at air intake silencer. Seal.*
3. **Check carburetor adapter or throttle body adapters collars.**
   - *Loose collar(s). Tighten.*
4. **Check carburetor adapter or throttle body adapters.**
   - *Cracked or deformed adapter. Replace.*
5. **Check if primary compression leaks.**
   - *Primary compression leaks. Perform leak down test and repair as necessary.*

Symptom: **RER (Rotax Electronic Reverse) DOES NOT WORK (300F AND 550F).**

1. **Check idle speed.**
   - *Wrong idle speed. Adjust according to specification (refer to* TECHNICAL SPECIFICATIONS*).*
2. **Check spark plug.**
   - *Faulty spark plug. Replace.*
3. **Check drive belt height.**
   - *Wrong belt height. Adjust according to specification (refer to* DRIVE BELT*).*
4. **Check engine compression.**
   - *Too low engine compression; engine stalls when pushing RER button. Rebuilt the engine.*
5. **Check carburetor mixture screw adjustment.**
   - *Wrong adjustment. Adjust according to specification (refer to* TECHNICAL SPECIFICATIONS*).*
6. **Check switch electrical connections.**
   - *Bad electrical connections or damaged wires. Clean or replace.*
7. **Check MPEM.**
   - *Faulty MPEM. Replace.*

Symptom: **RER (Rotax Electronic Reverse) SOMETIMES DOES NOT WORK WHEN ACTIVATED (300F AND 550F).**

1. **Check RER switch.**
   - *Defective contacts in ignition switch. Replace.*
   - *Moisture in RER switch. Blow dry RER switch.*
2. **Check engine condition.**
   - *Low engine compression and/or defective piston. Replace defective parts.*

Symptom: **HEADLAMP NOT LIGHTING (white bulb).**

1. **Check bulb.**
   - *Gas leak. Replace bulb.*

Symptom: **HEADLAMP NOT LIGHTING (broken element).**

1. **Check for loose headlamp housing and bulb socket.**
   - *Vibration problem. Tighten headlamp mounting screws. Lock bulb in socket. Replace bulb.*

Symptom: **HEADLAMP NOT LIGHTING (melted filament (ends of element holder) and black bulb).**

1. **Check voltage at headlamp at different speeds. It must not be above 13.8 Vac.**
   - *Excessive voltage in lighting circuit. Replace voltage regulator and ensure proper grounding. Retest.*

Symptom: **HEADLAMP DIMMING.**

1. **Check voltage at headlamp at different speeds.**
   - *Insufficient voltage in lighting circuit. Replace voltage regulator and retest.*
2. **Visually inspect wiring harness for damaged and/or melted wires and/or bad wire terminal crimping and/or connections.**
   - *Heating, rotating or sharp part in contact with harness. Improper harness routing. Repair/replace damaged wires and/or terminals. Reroute harness where necessary.*
3. **On** manual start models: **Verify voltage regulator ground.**
   - *Rusted or loose retaining screws. Clean, apply lithium grease (LMZ1) and firmly tighten screws.*
4. **Verify if there is an interconnection between AC and DC current.**
   - *Faulty installation of optional equipment. Find optional equipment connected directly to DC ground (BLACK wire or chassis) or to any DC hot wire (RED or RED/BLUE). Disconnect and reconnect to AC current (YELLOW and YELLOW/BLACK wires). Refer to the appropriate section.*
5. **Check if optional electric accessories are overloading the magneto/generator.**
   - *Excessive electrical load to magneto/generator. Reduce the electrical load by removing excess accessories. Reconnect as recommended by manufacturer.*
6. **Check heating grips.**
   - *Grounded wire or element causing short. Repair.*

Symptom: **BRAKE LIGHT REMAINS ON.**

1. **Check if bulb is properly installed.**
   - *Bulb is not installed correctly (contact elements are reversed). Install bulb correctly.*
2. **Check brake switch.**
   - *Switch contact remains closed. Replace brake switch.*
3. **Check wiring harness.**
   - *Shorted wiring harness. Replace or repair wiring harness.*

Symptom: **REAR LIGHT BULB FLASHES.**

1. **Check bulb tightness in housing.**
   - *Looseness at bulb contact elements. Install bulb correctly.*
2. **Check if rear light is properly connected.**
   - *Connector housing is partially connected. Install connector housing properly.*

Symptom: **REAR LIGHT BULB FLASHES.** (cont'd)

3. Check continuity of wires.

- Corroded terminals and/or broken wires. Replace terminal(s) or crimp defective wires.

STEERING SYSTEM

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline.

Symptom: **WHEN HANDLEBAR IS TURNED, SNOWMOBILE UNDERSTEERS.**

1. **Check ski runner condition.**
   - *Worn ski runners. Replace.*
2. **Check if front arm stopper strap is too long (rear suspension).**
   - *Insufficient ski pressure on the ground. Shorten stopper strap.*
3. **Check front arm spring preload (rear suspension).**
   - *Insufficient ski pressure on the ground. Loosen spring tension.*

Symptom: **HANDLEBAR IS DIFFICULT TO TURN.**

1. **Check if the handlebar turns freely when skis are off the ground.**
   - *Ball joints corrosion restrains movement. Lubricate or replace the ball joint.*
   - *Component needs proper lubrication. Lubricate. Refer to* MAINTENANCE.
   - *Bent parts. Replace parts.*
2. **Check position of stopper strap (rear suspension).**
   - *Too much weight when stopper strap is short. Lengthen front arm stopper strap.*
3. **Check camber of front suspension.**
   - *A-arm is bent. Replace defective parts.*
4. **Check ski runners.**
   - *Wrong ski runners type. Replace.*

Symptom: **THE SNOWMOBILE ZIGZAGS.**

1. **Check ski runner condition.**
   - *Worn or bent ski runners. Replace ski runners.*
2. **Check ski alignment.**
   - *Improper ski alignment. Align skis in order to obtain proper toe-out (opening), refer to* STEERING SYSTEM.
3. **Check if bushings are too loose in steering system.**
   - *Bushings are too loose. Replace.*
4. **Check ski pressure.**
   - *Too much pressure on skis. Increase center spring preload (rear suspension).*
5. **Check ski runners.**
   - *Wrong ski runner type. Replace.*

SUSPENSION

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline.

Symptom: **SUSPENSION IS TOO LOW.**

1. **Check springs preload.**
   - *Low spring preload. Increase preload to the recommended position.*
2. **Check condition of springs.**
   - *Springs are weakened or broken. Replace springs.*
3. **Wrong springs.**
   - *Springs are too soft. Install optional stiffer springs.*
4. **Check condition of shock.**
   - *Shock frozen. Replace shock.*

Symptom: **REAR SUSPENSION BOTTOMS OUT.**

1. **Check springs preload.**
   - *Low spring preload. Increase preload to the recommended position.*
2. **Check condition of springs.**
   - *Springs are weakened or broken. Replace springs.*
3. **Wrong springs.**
   - *Springs are too soft. Install optional stiffer springs.*
4. **Check condition of the rear shock absorber.**
   - *Damaged rear shock absorber. Replace rear shock absorber.*
5. **Check gas pressure in HPG shock.**
   - *Low gas pressure. Add gas and check for leak. Refer to* SHOCK ABSORBER INSPECTION AND SERVICING.

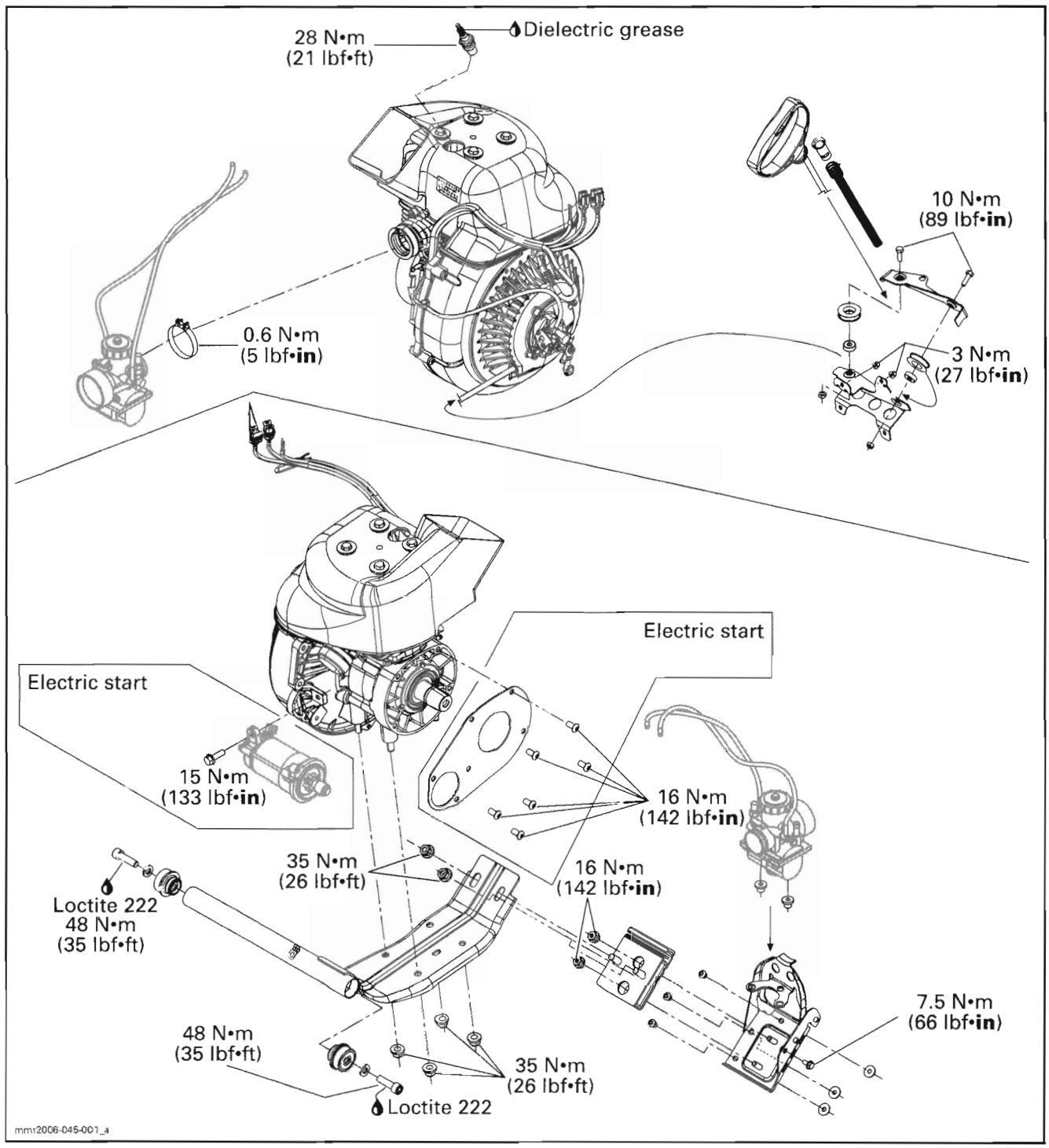
Symptom: **REAR SUSPENSION IS TOO STIFF.**

1. **Check rear spring preload.**
   - *Too much preload. Adjust to a softer position.*
2. **Wrong springs.**
   - *Springs are too stiff. Install optional softer springs.*
3. **Check track tension.**
   - *Track is too tight. Adjust.*
4. **Check if axles are properly lubricated.**
   - *Improper lubrication and/or contaminated grease (sticky oil sludge) Clean and/or lubricate.*
5. **Check condition of the rear shock absorber.**
   - *Damaged rear shock absorber. Replace rear shock absorber.*

ENGINE REMOVAL AND INSTALLATION

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 222	413 703 400	53



GENERAL

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

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 strictly be adhered to.
Locking devices (e.g.: 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.

PROCEDURES

ENGINE

Removal

Place vehicle at workstation that will have access to an engine-lifting hoist.

Remove hood then RH and LH side panels.

If the vehicle is equipped with a battery, disconnect BLACK (-) cable then the RED (+) cable.

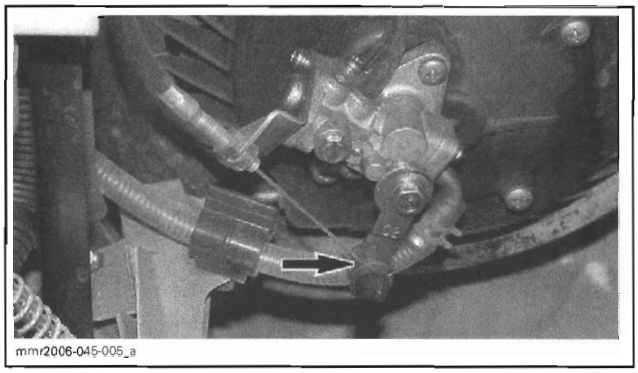
⚠ WARNING

Always disconnect battery or starter cables exactly in the specified order, BLACK (-) cable first. It is recommended to disconnect electrical connections prior to disconnecting fuel lines.

Remove the following components and refer to the appropriate section in this manual for the procedure.

- exhaust system
- belt guard, drive and driven pulleys
- primary and secondary air intake silencers
- carburetor.

Remove oil pump cable from oil pump.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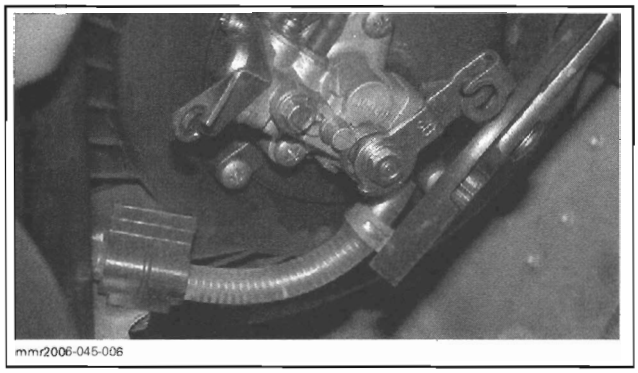
Remove oil pump inlet hose.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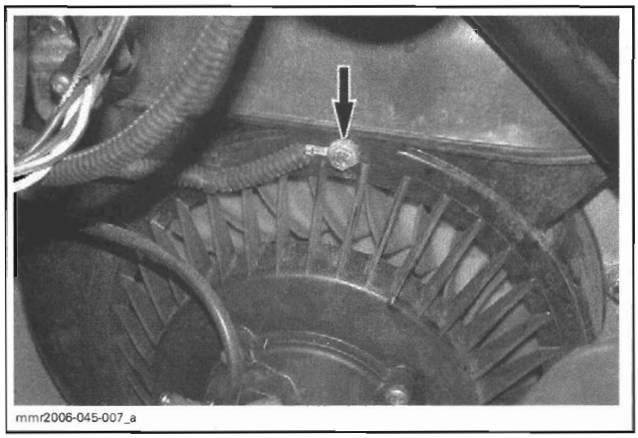
Unscrew ground wire from rewind stater housing.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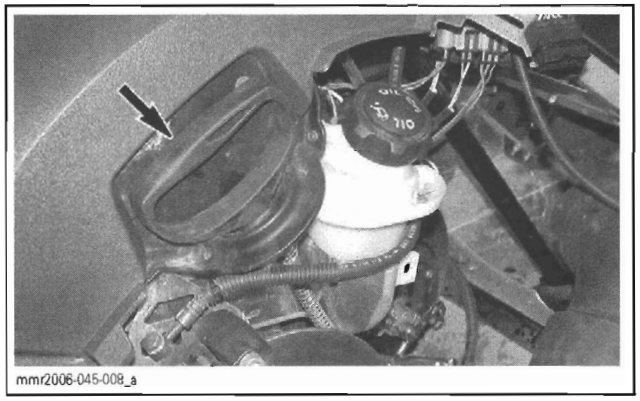
Remove rewind starter handle.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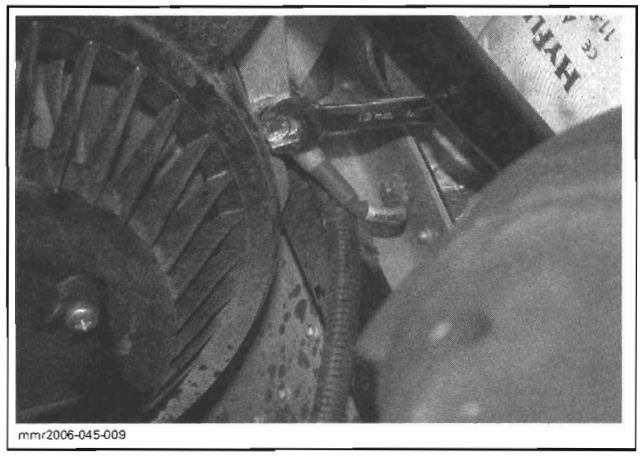
Unscrew engine ground wire.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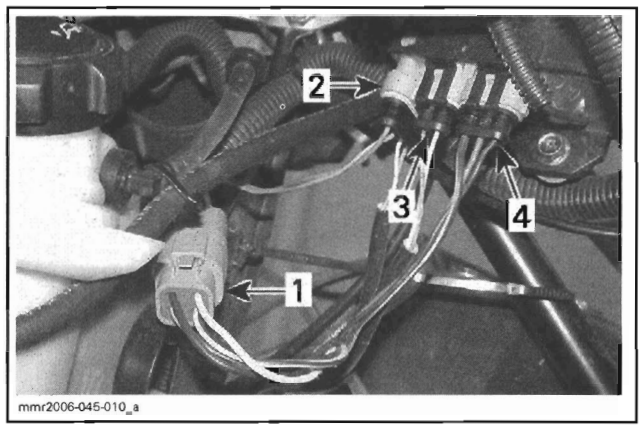
Disconnect electrical connectors.



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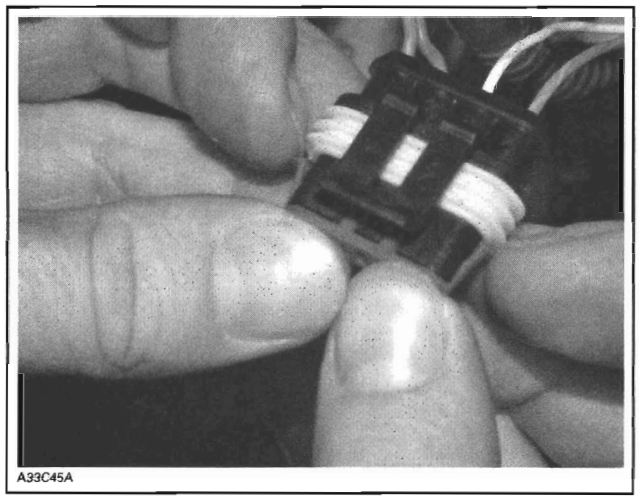
1. *Magneto connector*
2. *RER connector*
3. *Trigger coil connector*
4. *Engine stop switch connector*

NOTE: On RER connector, disconnect the BLUE/YELLOW and the WHITE/YELLOW wires from the connector. To do this, remove the lock the using a small tool, extract wires from connector.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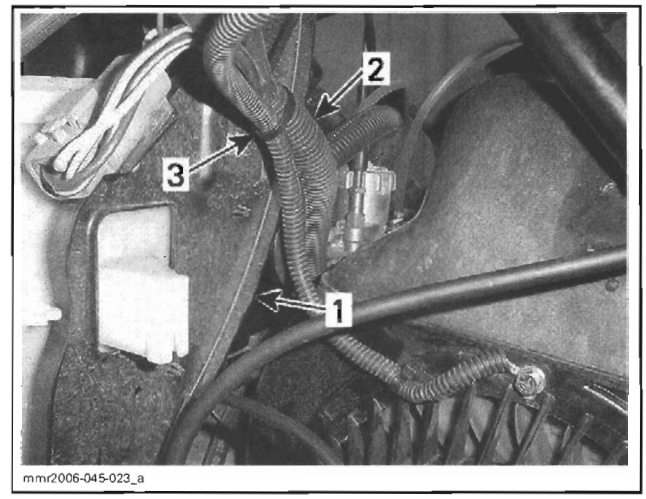
MOVE ASIDE BOTH TABS TO REMOVE LOCK

Cut locking tie retaining harnesses to steering support.



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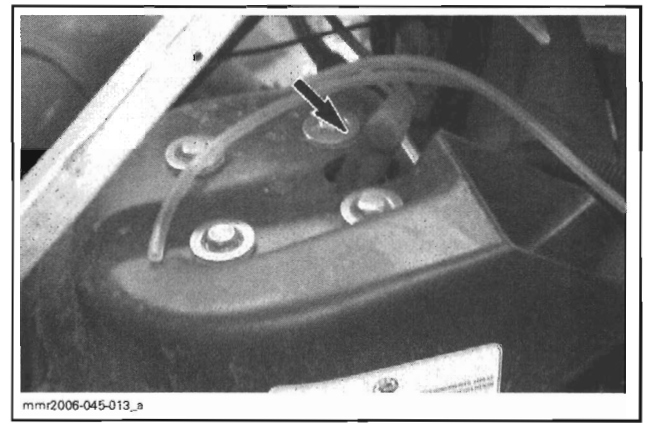
1. *Steering support*
2. *Wiring harnesses*
3. *Locking tie*

Disconnect spark plug cable.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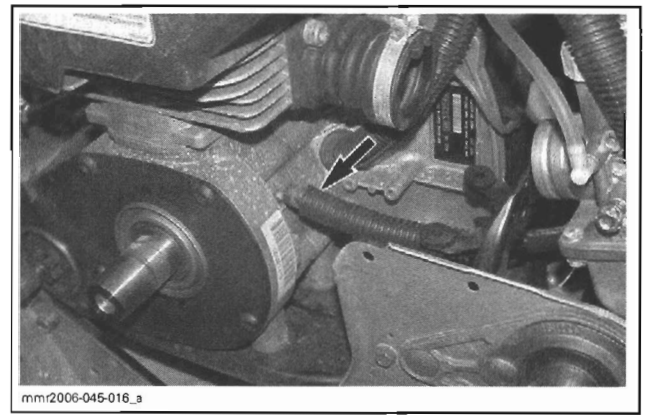
Unplug crankcase impulse line.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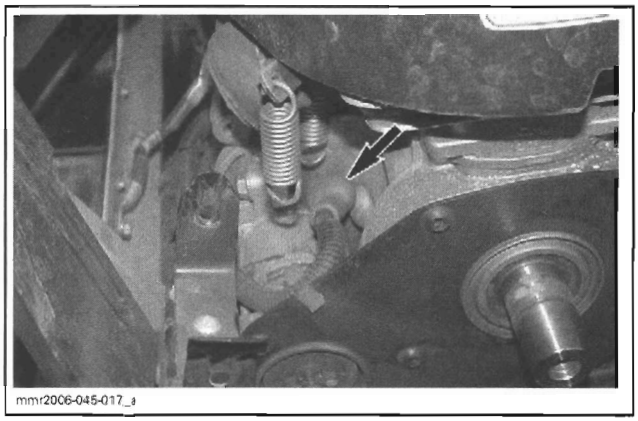
Disconnect starter cable.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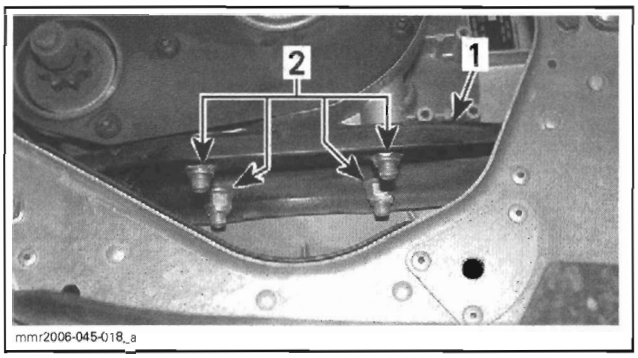
Remove engine nuts retaining engine to its support.



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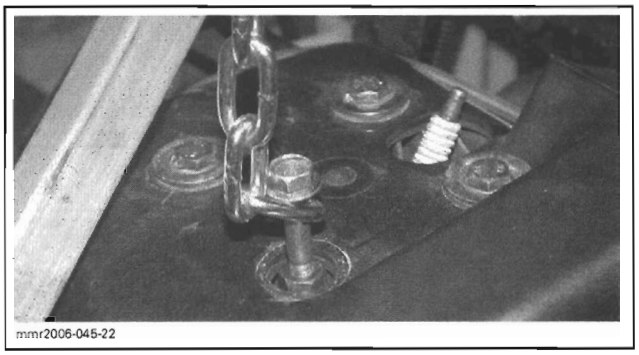
1. *Engine support*
2. *Engine nuts*

Unscrew one of the cylinder cowl screw. Using a longer screw, install a chain to lift the engine.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Lift up engine and remove it from vehicle.

Installation

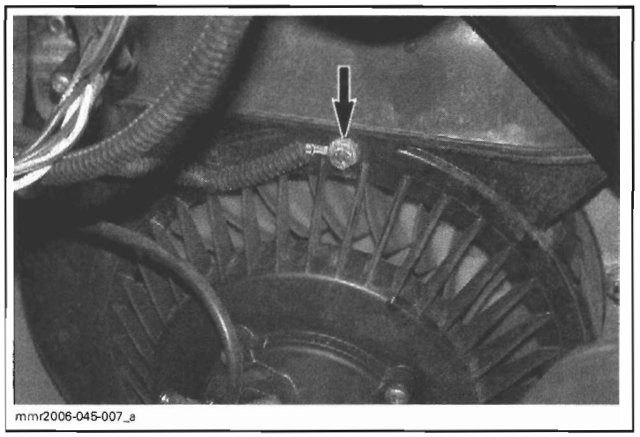
The installation is the reverse of the removal procedure. However, pay attention to the following.

Torque engine nuts to 35 N•m (26 lbf•ft).

To adjust oil pump cable, refer to *LUBRICATION SYSTEM*.

When installing ground wire on rewind starter housing, place parts in the following order:

- rewind starter housing
- star washer
- ground wire connector
- flat washer
- lock washer
- bolt.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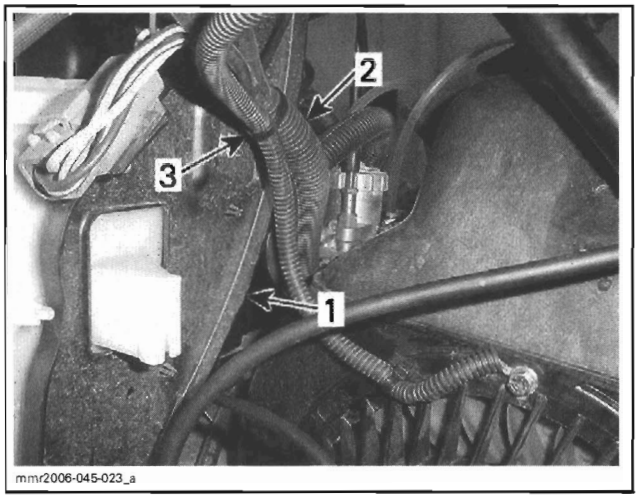
When all wires are connected, install a new locking tie to retain wiring harnesses to steering support.



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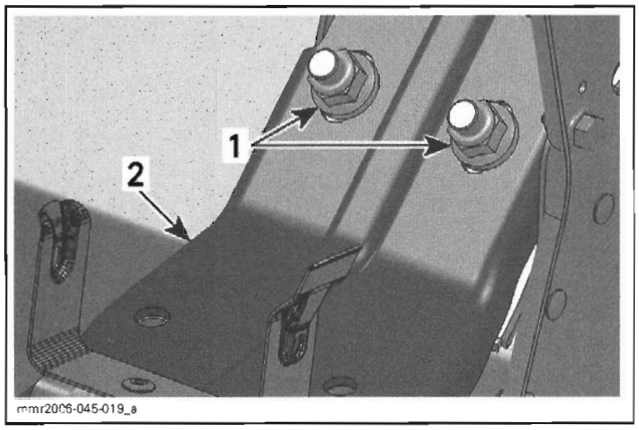
1. *Steering support*
2. *Wiring harnesses*
3. *Locking tie*

ENGINE SUPPORT

Removal

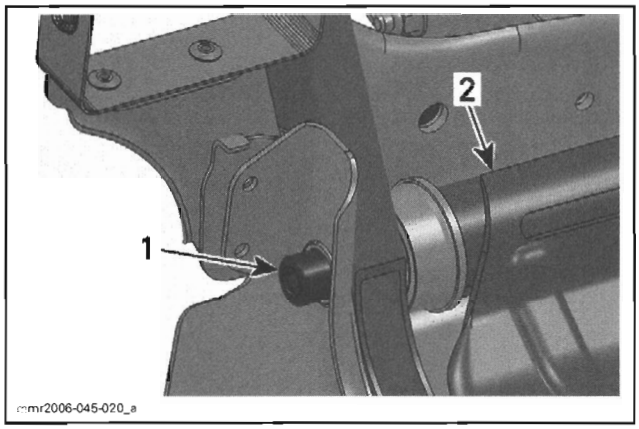
Remove engine from vehicle.

Unscrew nuts retaining support to frame.



1. Engine support nuts
2. Engine support

Unscrew both socket screws that retain support tube to the front part of frame.



LH SIDE SHOWN
1. Socket screw
2. Engine support

Remove engine support from vehicle.

Inspection

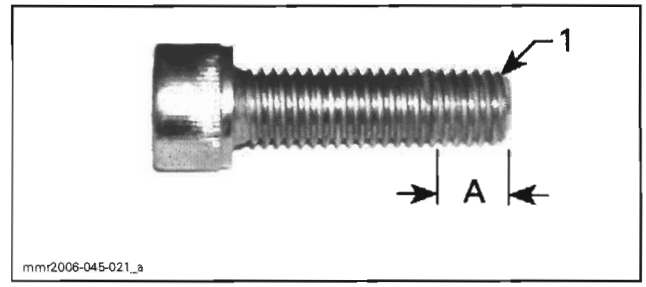
Check support for cracks, torsion or other damages, replace if necessary.

Check the condition of support bushings, replace support if necessary.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Apply Loctite 222 (P/N 413 703 400) on socket screw threads in accordance with the next illustration.



1. Apply threadlocker on this section only
A. 10 mm (.3937 in)

Torque socket screws to 48 N•m (35 lbf•ft).

Torque engine support nuts to 35 N•m (26 lbf•ft).

ENGINE LEAK TEST

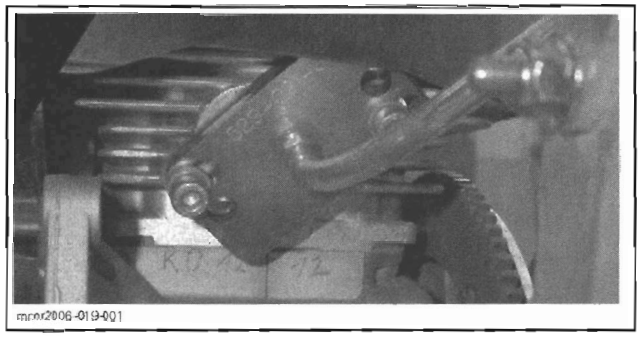
SERVICE TOOLS

Description	Part Number	Page
exhaust plate	529 021 300	55
intake plug	529 011 000	55
small hose pincher	295 000 076	55
vacuum/pressure pump	529 021 800	55

PREPARATION

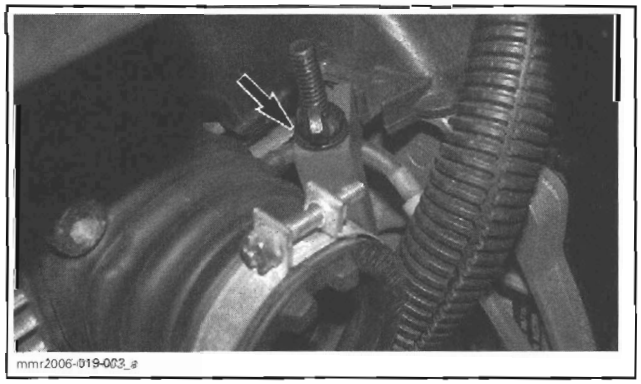
Remove extension pipe and manifold of exhaust system.

Install an exhaust plate (P/N 529 021 300) instead of exhaust manifold.

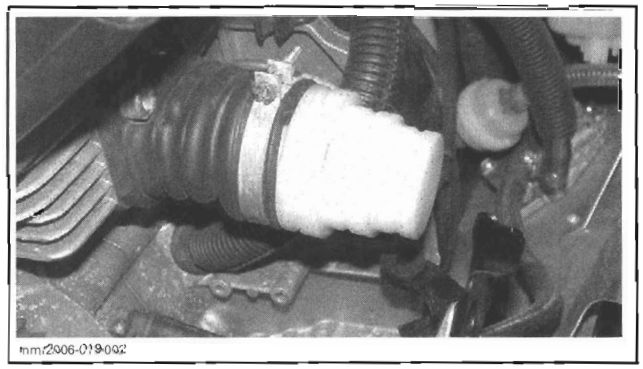


Remove primary air intake silencer and carburetor.

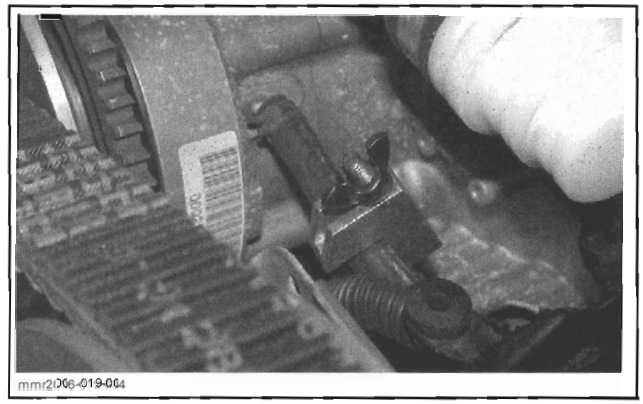
Install a small hose pincher (P/N 295 000 076) on injection oil line (between engine and check valve).



Install an intake plug (P/N 529 011 000) in the rubber boot and secure it with carburetor clamp.



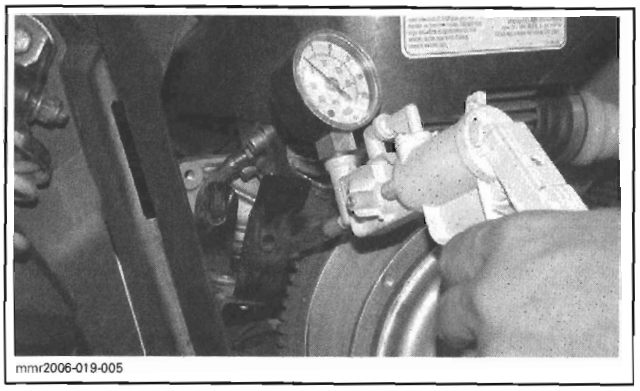
Using another small hose pincher (P/N 295 000 076), block impulse hose.



PROCEDURE

NOTE: A flow chart has been prepared as a visual reference. See last page of this chapter.

Install vacuum/pressure pump (P/N 529 021 800) air pump on exhaust plug.


mmr2006-019-005

Activate pump and pressurize engine to 34 kPa (5 PSI). Do not exceed this pressure.

Engine must stand this pressure during 3 minutes.

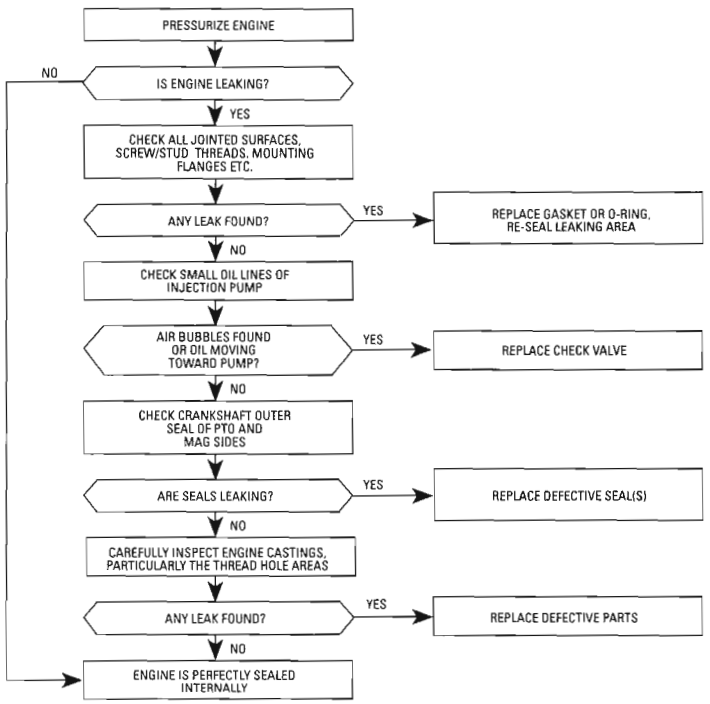
NOTE: If pressure drops before 3 minutes, check tester kit by spraying a soapy solution on pump cylinder, all plugs and fittings. Bubbles will indicate where leak comes from. If kit does not leak, proceed as follows.

Check the following:
- All jointed surfaces and screw/stud threads of engine:
  - spark plug base, insulator
  - cylinder head
  - cylinder crankcase halves (joint).
- Remove drive pulley then check crankshaft outer seal.
- Remove rewind starter and magneto system then check crankshaft outer seal.

After engine is repaired, always recheck for leakage.

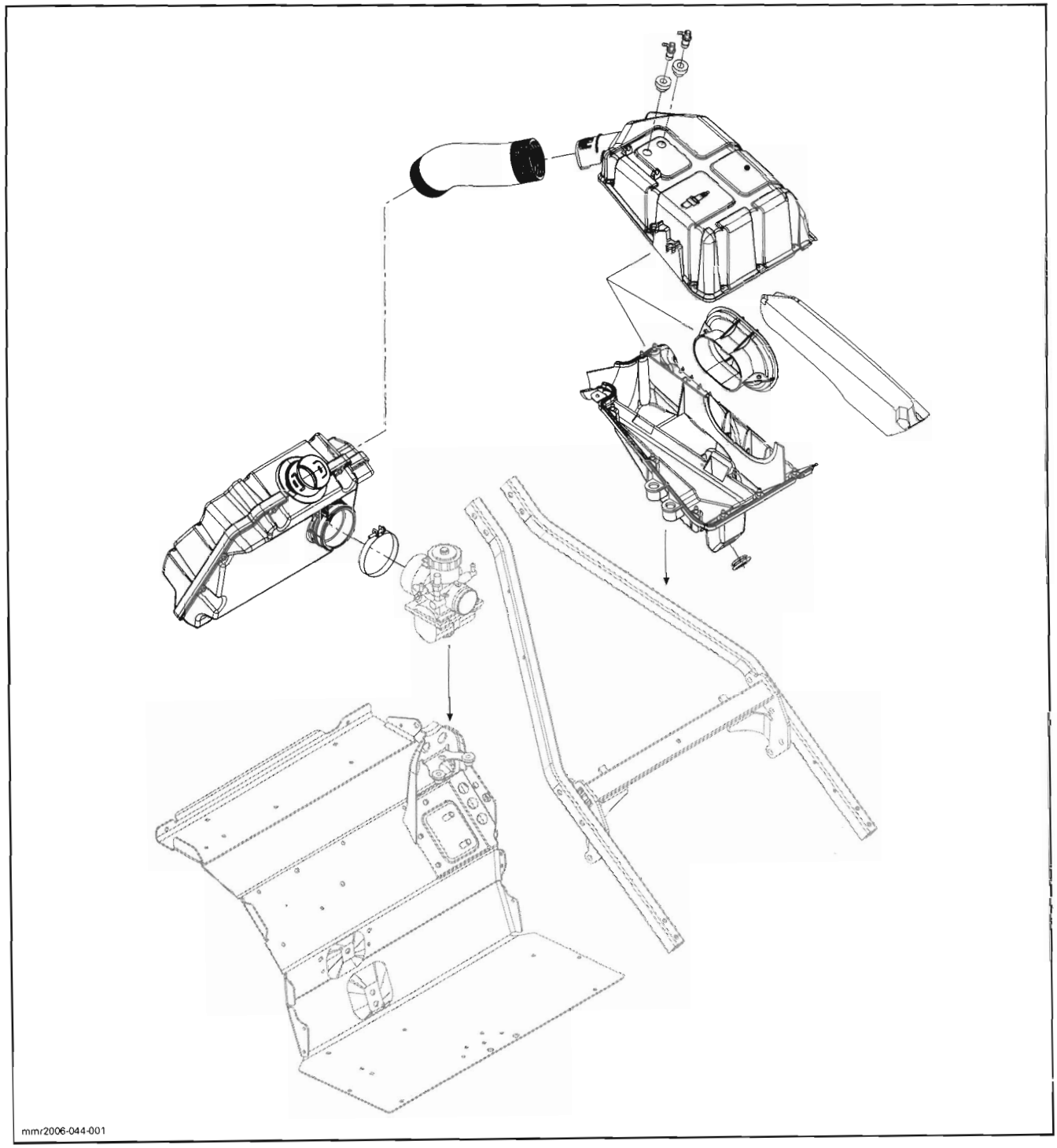
ENGINE LEAK VERIFICATION FLOW CHART

ENGINE LEAK VERIFICATION FLOW CHART



A32C1KU

AIR INTAKE SYSTEM



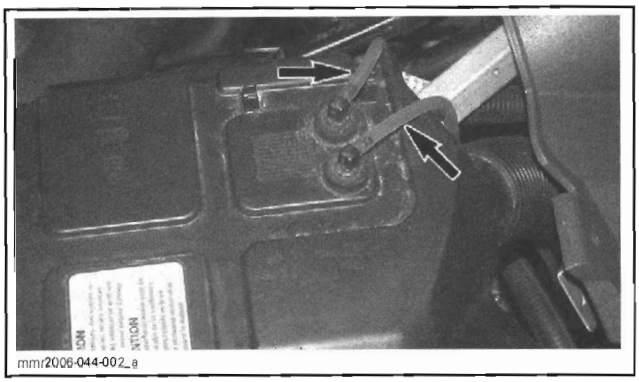
PROCEDURES

SECONDARY AIR INTAKE SILENCER

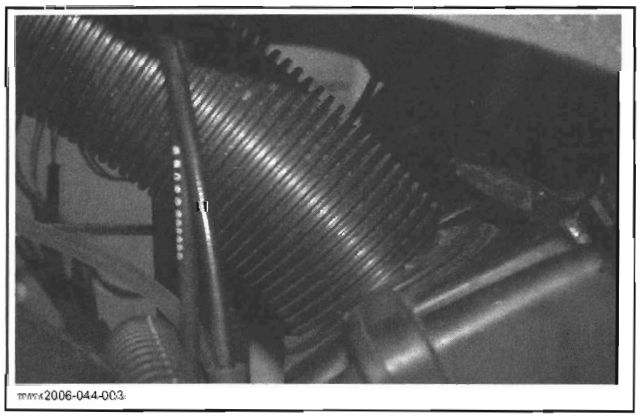
Removal

Open LH side panel and remove hood.

Disconnect both tubes on the top of secondary air intake silencer.



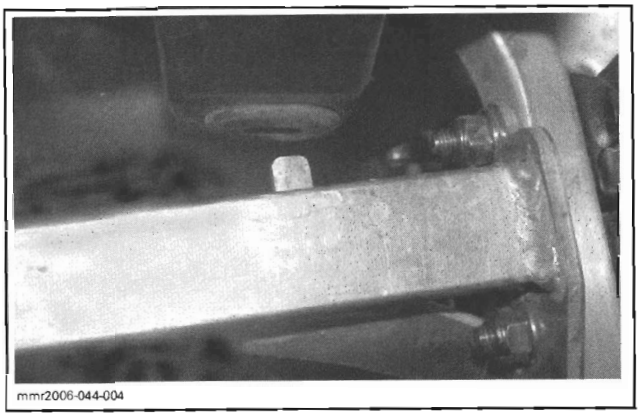
Disconnect air intake silencer tube from the primary air intake silencer.



Pull up secondary air intake silencer and remove it from vehicle.

Installation

Insert frame pin into rubber grommet.



Align locking tabs under air intake silencer with the upper cross member then press the air intake silencer to lock its tabs on arm.

Install air intake silencer tube on primary air intake silencer.

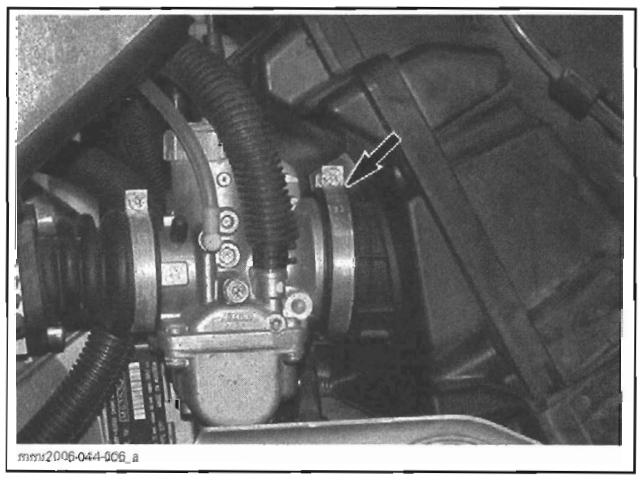
PRIMARY AIR INTAKE SILENCER

Removal

Open LH side panel.

Remove pulley guard then the driven pulley. Refer to *DRIVEN PULLEY*.

Unscrew primary air intake silencer clamp.



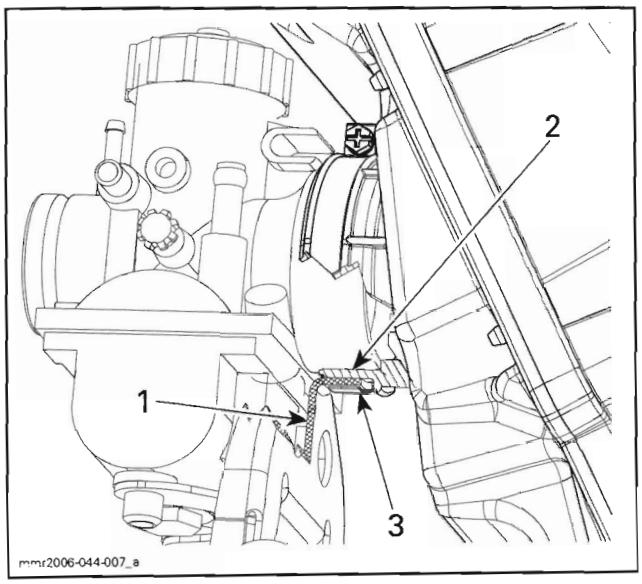
Pull primary air intake silencer from carburetor.

Pull primary air intake silencer out of vehicle.

Installation

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

CAUTION: When installing primary air intake silencer, make sure its adaptor is inserted between carburetor and carburetor support. The clamp must tight carburetor support and adapter to carburetor. See the following illustration.



1. *Carburetor support*
2. *Air intake silencer adapter*
3. *Clamp*

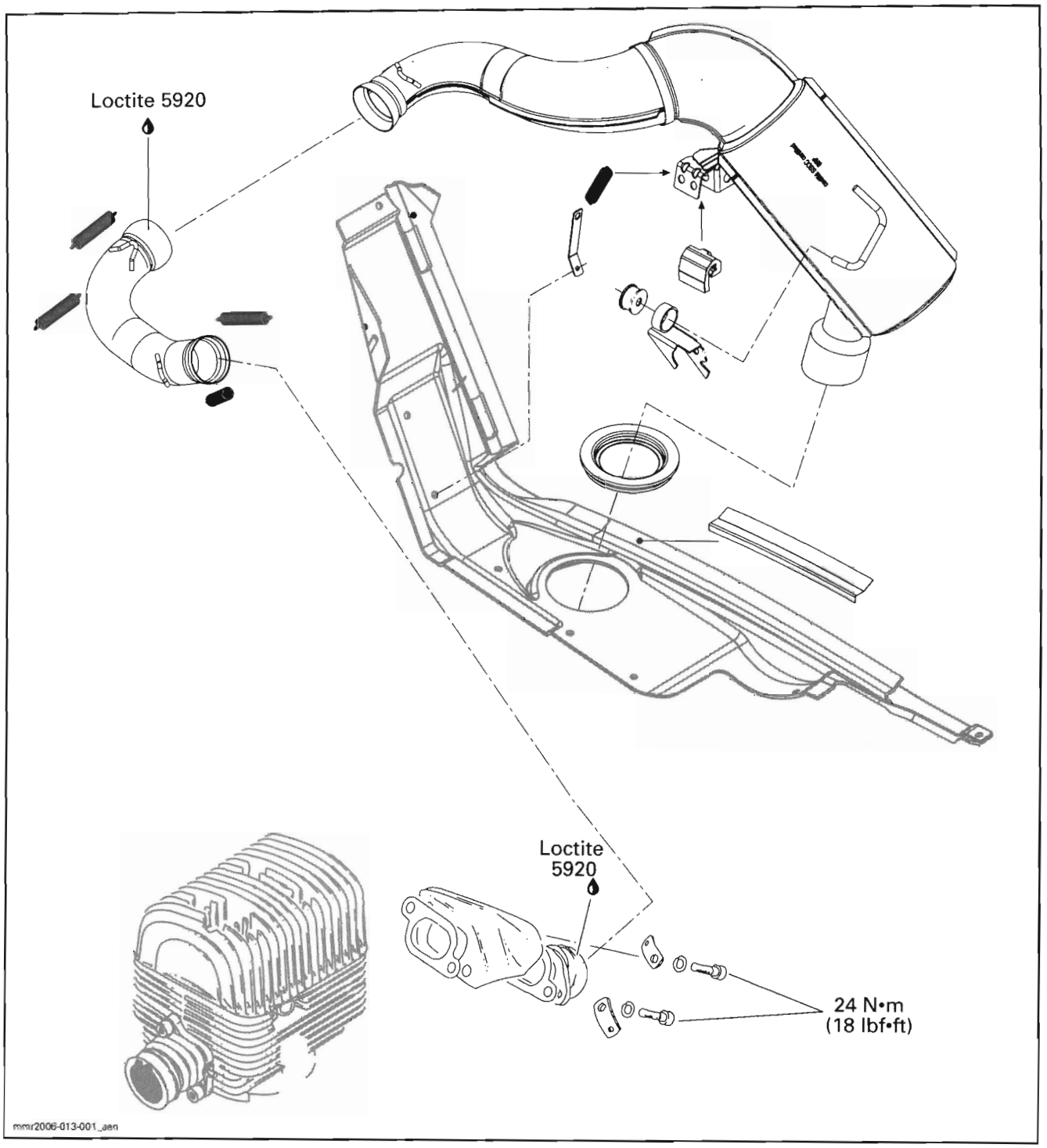
EXHAUST SYSTEM

SERVICE TOOLS

Description	Part Number	Page
exhaust spring installer/remover	529 035 401	63–64

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 5920 (RTV high temperature sealant)	293 800 090	63


Loctite 5920
Loctite 5920
24 N•m
(18 lbf•ft)
mmr2006-013-001_aen

GENERAL

⚠ WARNING

To avoid potential burns, never touch exhaust system components immediately after the engine has been run because these components are very hot. Let engine and exhaust system cool down before performing any servicing.

During assembly/installation, use the torque value and service products as in the exploded view.

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

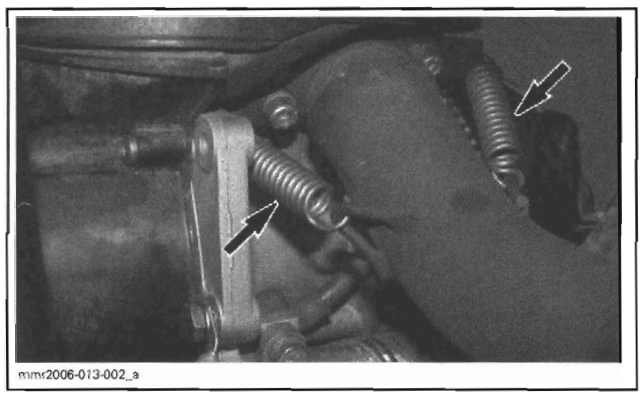
PROCEDURES

EXTENSION PIPE

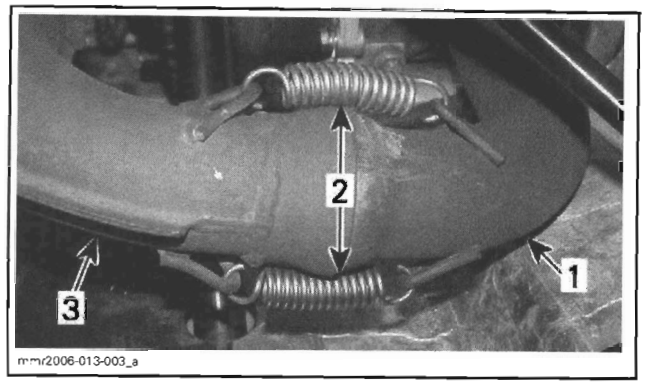
Removal

Remove hood and right side panel.

Using exhaust spring installer/remover (P/N 529 035 401), remove exhaust springs that retain extension pipe to manifold.



Use the same tool to remove exhaust springs that retain extension pipe to tuned pipe/muffler.



1. *Extension pipe*
2. *Exhaust spring*
3. *Tuned pipe/muffler*

Remove extension pipe from vehicle.

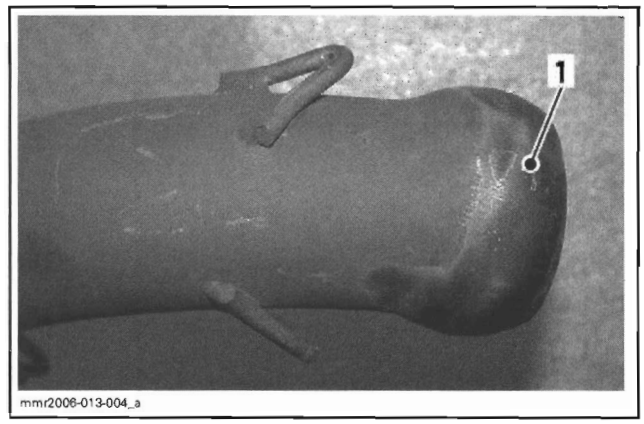
Inspection

Check extension pipe for cracks or damages.

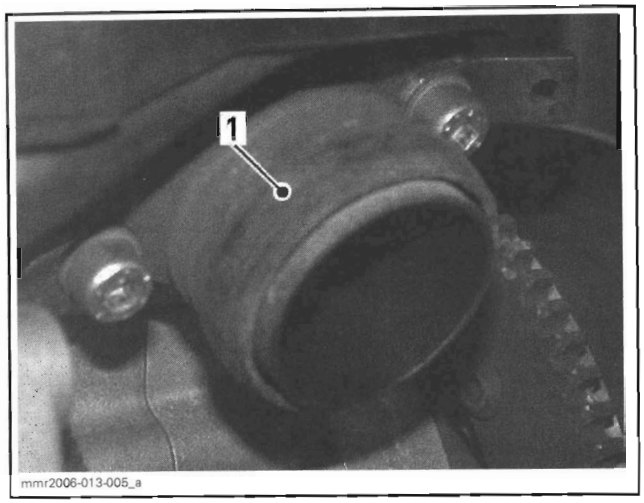
Installation

Apply Loctite 5920 (RTV high temperature sealant) (P/N 293 800 090) on mating surfaces as follows.

NOTE: Clean all sealant residue before applying a new layer.



1. *Apply sealant on extension pipe mating surface with tuned pipe/muffler*



1. Apply sealant on exhaust manifold

Position extension pipe between tuned pipe/muffler and manifold then install all exhaust springs using exhaust spring installer/remover (P/N 529 035 401).

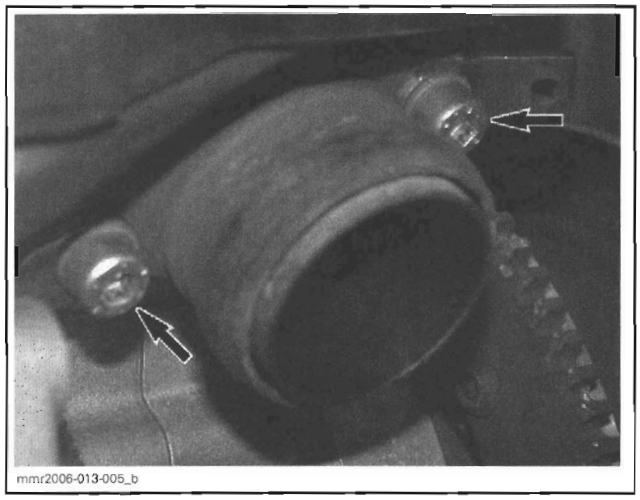
Install all other removed parts.

MANIFOLD

Removal

Remove extension pipe, see above.

Unscrew and remove manifold socket screws.



Remove socket screws, lock washers, exhaust spring brackets, manifold, first gasket, air deflector and the second gasket.

Inspection

Check if the manifold is cracked or damaged. Replace if necessary.

Installation

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

Torque socket screws to 24 N•m (18 lbf•ft).

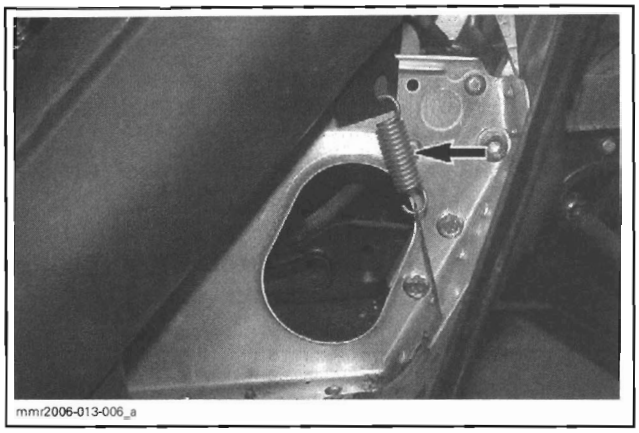
Install extension pipe. Refer to *EXTENSION PIPE* for procedure.

TUNED PIPE/MUFFLER

Removal

Remove extension pipe.

Remove exhaust spring retaining the muffler to frame. Use exhaust spring installer/remover (P/N 529 035 401).



Rotate muffler by lifting the front section and disengage the retaining rod from the rubber mount. Then lift muffler and remove it from vehicle.

Inspection

Check the muffler for cracks or other damages.

Installation

For installation, reverse the removal procedure.

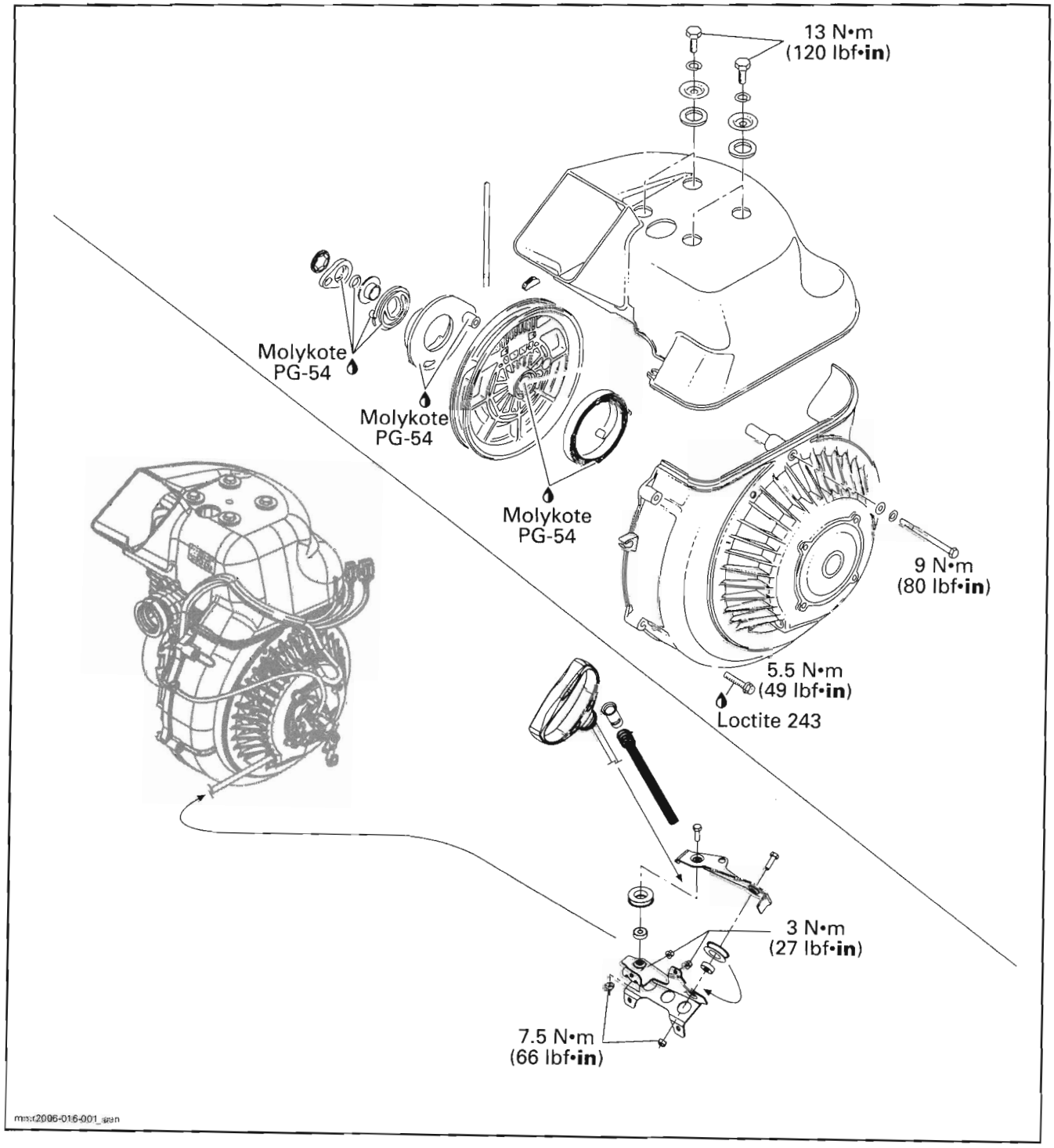
REWIND STARTER

SERVICE TOOLS

Description	Part Number	Page
small hose pincher	295 000 076	67

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	71
Molykote PG 54	420 899 763	69–71


13 N•m
(120 lbf•in)
Molykote
PG-54
Molykote
PG-54
Molykote
PG-54
9 N•m
(80 lbf•in)
5.5 N•m
(49 lbf•in)
Loctite 243
3 N•m
(27 lbf•in)
7.5 N•m
(66 lbf•in)
mmr2006-016-001_gen

GENERAL

NOTE: Due to dust accumulation, rewind starter must be periodically cleaned, inspected and relubricated.

CAUTION: It is of the utmost importance that the rewind starter spring be lubricated periodically using specific lubricant. Otherwise, rewind starter component life will be shortened and/or rewind starter will not operate properly under very cold temperatures.

Check if rope is fraying, replace if so.

When pulling starter handle, mechanism must engage within 30 cm (1 ft) of rope pulled. If not, disassemble rewind starter, clean and check for damaged plastic parts. Replace as required, lubricate, reassemble and recheck. Always replace O-ring in lock lever every time rewind starter is disassemble.

When releasing starter handle, it must return to its stopper and stay against it. If not, check for proper spring preload or damages. Readjust or replace as required.

When pulling starter handle 10 times in a row, it must return freely. If not, check for damaged parts or lack of lubrication. Replace parts or lubricate accordingly.

PROCEDURES

STARTER HANDLE

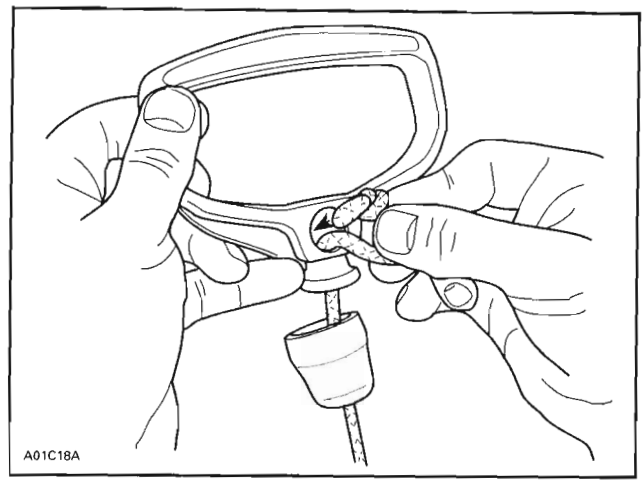
Removal

Pull rope for 50 cm (20 in) approximately. Using a small hose pincher (P/N 295 000 076), lock rope near rewind starter.

Using a small screwdriver, extract rope knot from stater handle. Cut rope close to knot.

Installation

Prior to installing starter handle on rope, it is first necessary to fuse the rope end with a lit match. Pass rope through starter handle and tie a knot in the rope end. Fuse the knot with a lit match then insert rope end down and pull the starter handle over the knot.



TYPICAL

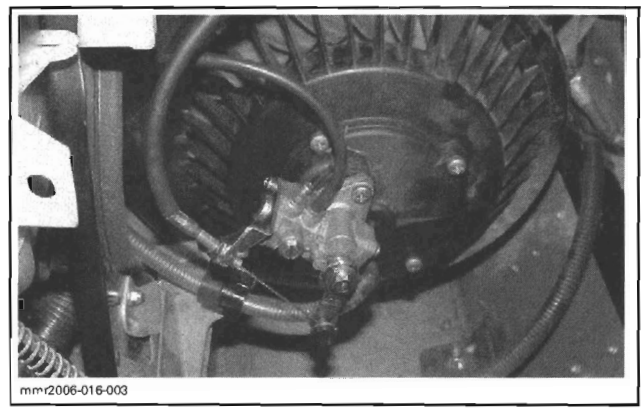
IDLER

Inspection

Check if idlers turn freely and smoothly. Replace idlers if necessary.

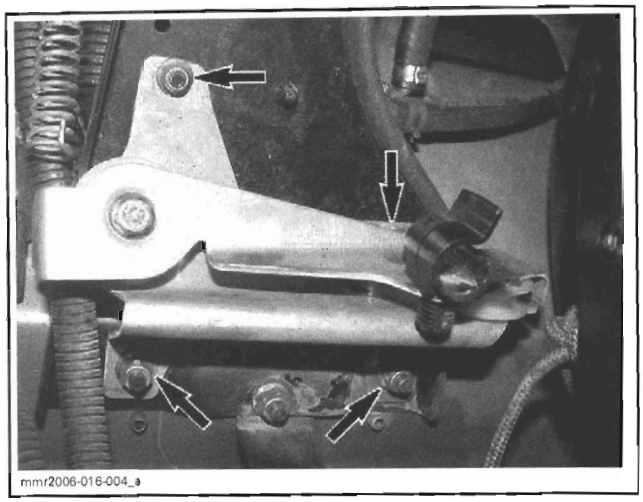
Removal

Remove oil pump from rewind starter.



Remove rope from idlers.

Remove nuts that retain idler bracket to frame.



Remove idler bracket from vehicle.

Unscrew and remove idler screw.

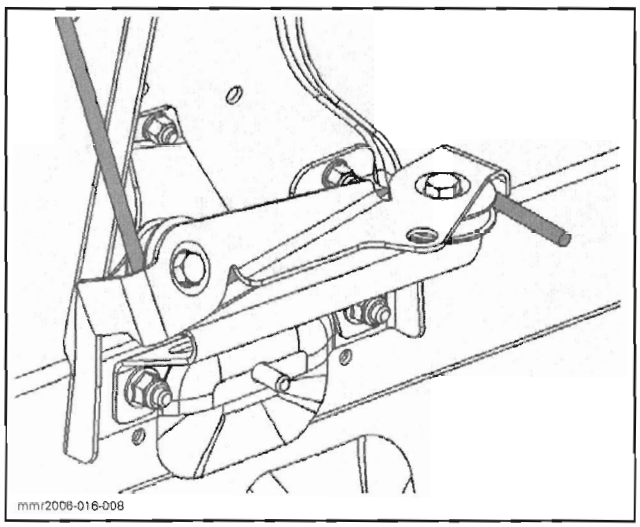
Remove idler from its bracket.

Installation

The installation is the reverse of the removal procedure.

Torque M5 nuts to 3 N•m (27 lbf•**in**) and M6 nuts to 7.5 N•m (66 lbf•**in**).

NOTE: Use the following illustration to position cord correctly in idler bracket.

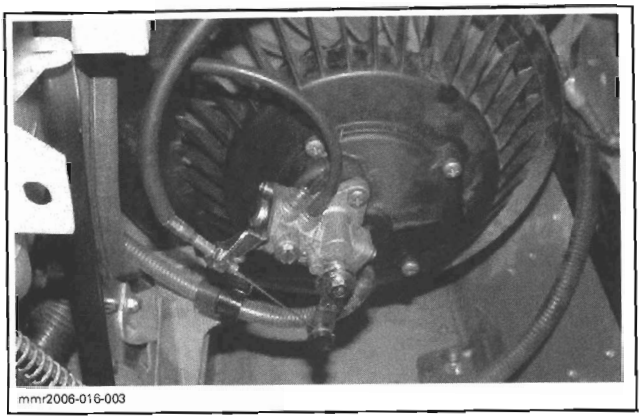


REWIND STARTER

Removal

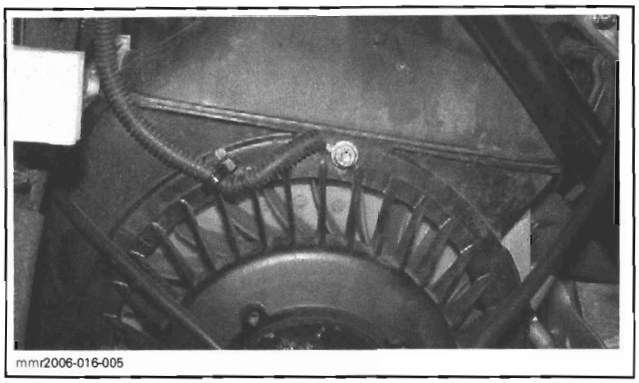
Remove starter handle.

Remove oil pump from rewind starter.



Remove oil pump shaft.

Unscrew ground wire from rewind starter.

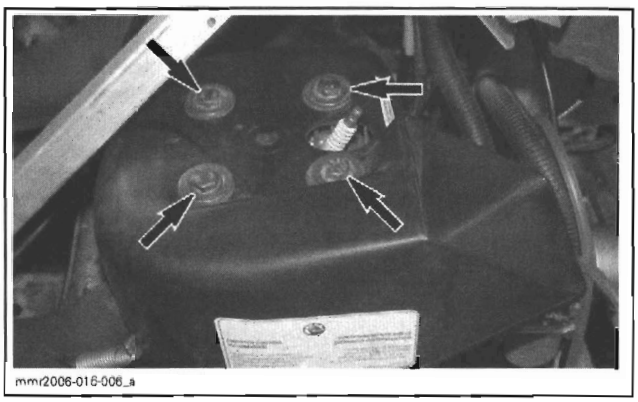


Remove idler bracket.

Remove secondary air intake silencer to reach two (2) rewind starter screws.

Remove all screws retaining rewind starter.

Remove bolts retaining the engine air deflector and lift it.



Remove rewind starter from vehicle.

Inspection

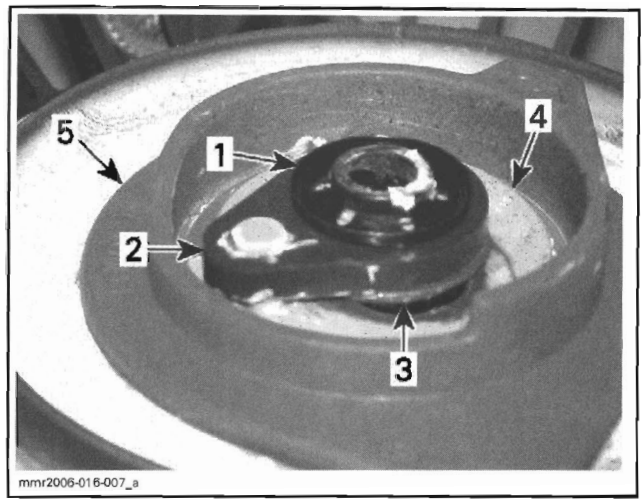
When rewind starter is removed, check starting pulley on cooling fan for wear or damages. Refer to *MAGNETO SYSTEM* if its replacement is necessary.

Disassembly

Undo knot and let sheave get free to release spring preload then remove rewind starter.

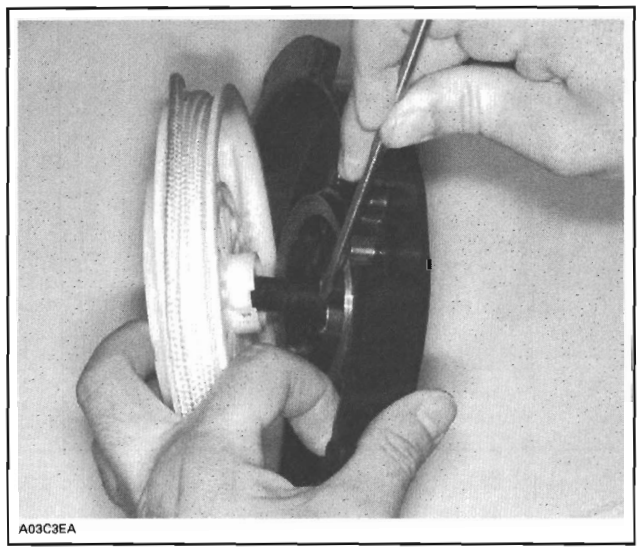
Cut push nut retaining lock lever and discard.

Remove lock lever, O-ring, collar sleeve, pawl lock and pawl.

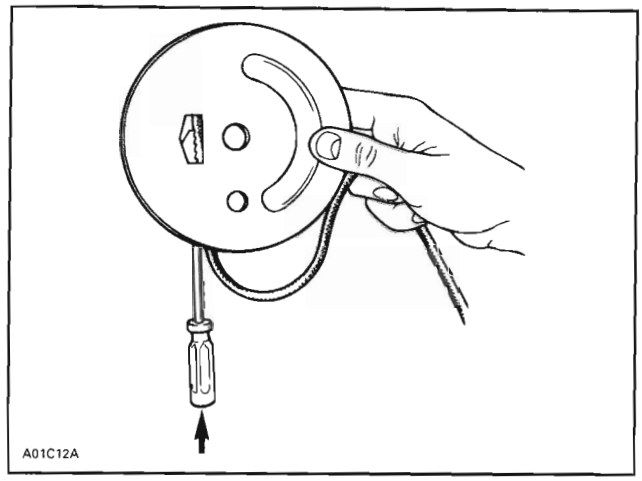


1. *Push nut*
2. *Lock lever*
3. *Collar sleeve*
4. *Pawl lock*
5. *Pawl*

Remove sheave from rewind starter. Hold spring with a screwdriver.



Using a long thin rod, push the key to disengage key then pull out rope.



PUSH THE ROD IN TO RELEASE KEY

Assembly

At assembly, position spring outer end into spring guide notch then wind the spring counterclockwise into guide.

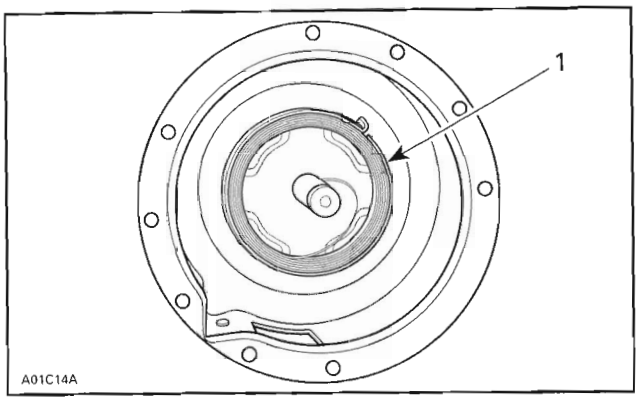
⚠ WARNING

Since the spring is tightly wound inside the guide it may fly out when rewind is handled. Always handle with care.

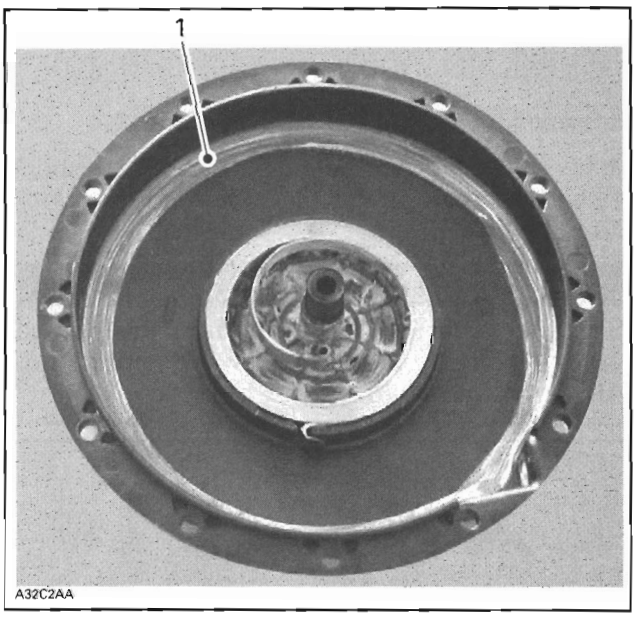
1. *Outer end into guide notch*

Lubricate spring and 1 cm (1/2 in) wide on bottom of rewind starter with Molykote PG 54 (P/N 420 899 763).

CAUTION: It is of the utmost importance that the rewind starter spring be lubricated periodically using Molykote PG 54 (P/N 420 899 763). Otherwise, rewind starter component life will be shortened and/or rewind starter will not operate properly under very cold temperatures.



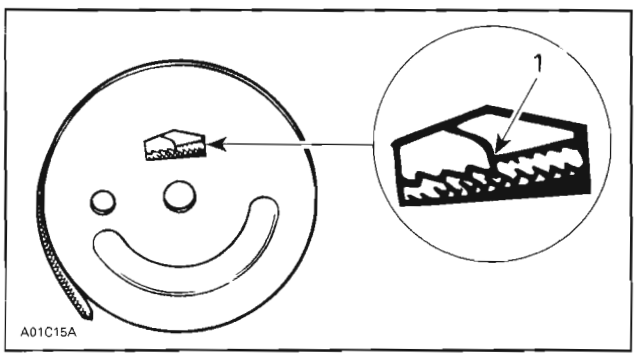
TYPICAL
1. Molykote PG 54 inside spring guide



TYPICAL
1. Molykote PG 54 applied 1 cm (1/2 in) wide on bottom of rewind starter

CAUTION: The use of standard multipurpose grease could result in rewind starter malfunction.

To install rope, insert rope into sheave orifice and lock it with the key as illustrated.



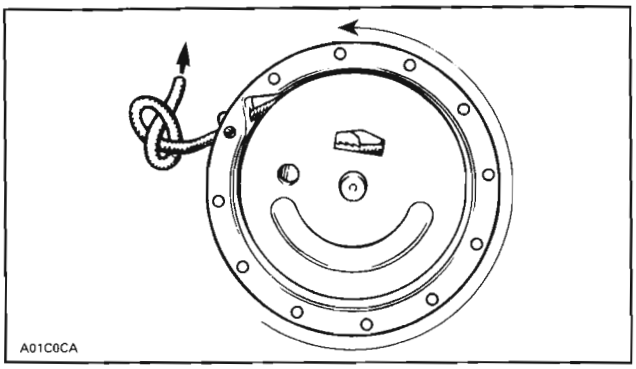
TYPICAL
1. Push to lock

Lubricate rewind starter post with Molykote PG 54 (P/N 420 899 763). Install sheave.

Wind rope on sheave and place rope sheave into rewind starter making sure that the sheave hub notch engages in the rewind spring hook.

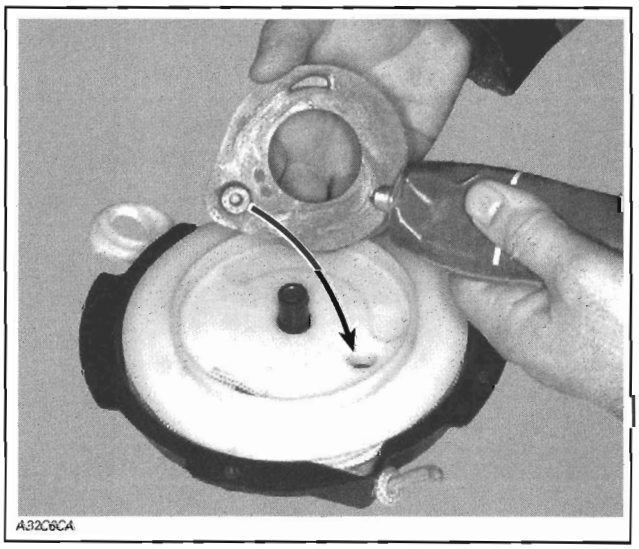
Rotate the sheave counterclockwise until rope end is accessible through rope exit hole. This will give 1/2 turn of preload.

Pull the rope out of the rewind starter and temporarily make a knot to hold it.

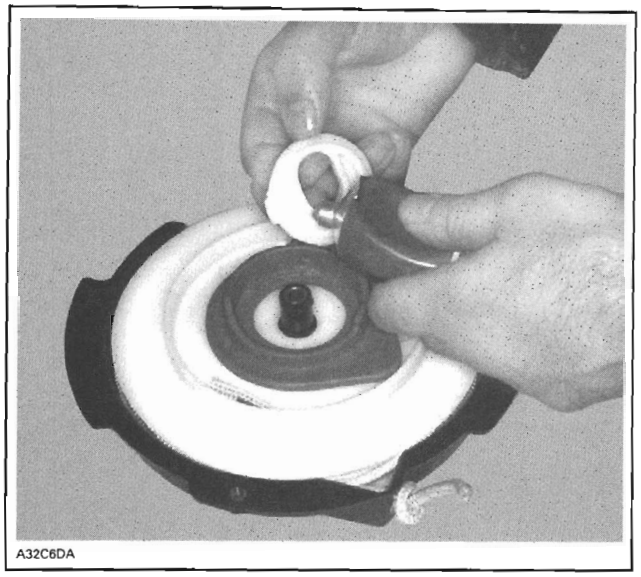


TYPICAL

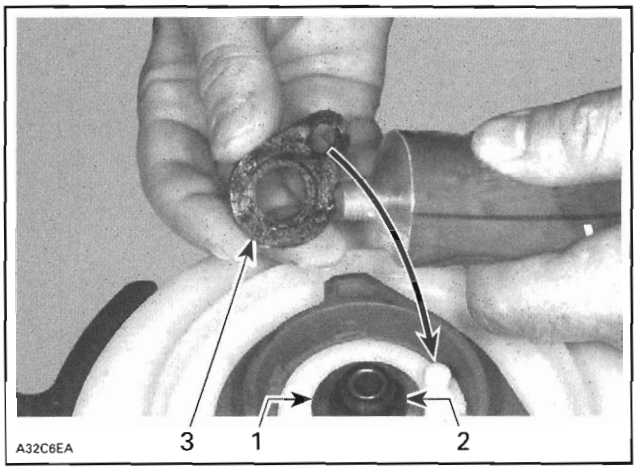
Lubricate pawl with Molykote PG 54 (P/N 420 899 763) then install over rope sheave.



Lubricate pawl lock with Molykote PG 54 (P/N 420 899 763). Install over pawl.



Install collar sleeve with its collar first. Lubricate the new O-ring and lock lever with Molykote PG 54 (P/N 420 899 763). Install over pawl lock.



1. Collar sleeve
2. O-ring
3. Lock lever

Position a new push nut.

Installation

Install on engine.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of all M6 x 35 screws. The M6 x 75 screw retaining wire ground on rewind starter must be freed of threadlocker.

Thread rope through both idlers then through rope guide.

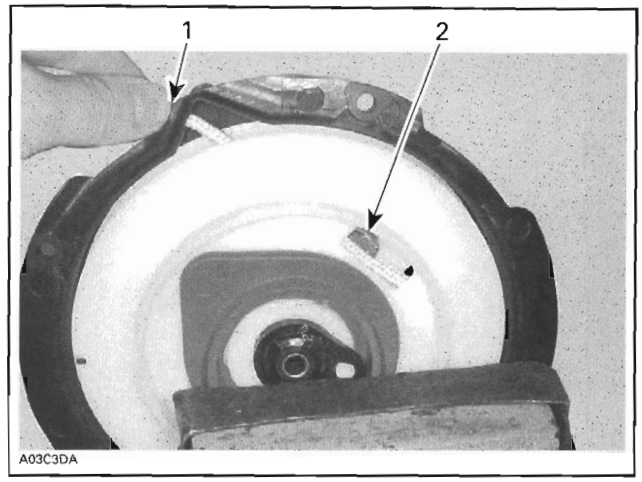
Install starter handle.

ROPE

Replacement

Remove rewind starter from engine.

Completely pull out rope. Hold rewind starter in a vise.



1. Rope exit hole
2. Key to be removed

With a long thin pin punch inserted through rope exit hole, push key. Remove key and rope. Install a new rope and lock it using key.

NOTE: When rope is completely pulled out, spring preload is 4-1/2 turns.

OIL INJECTION SYSTEM

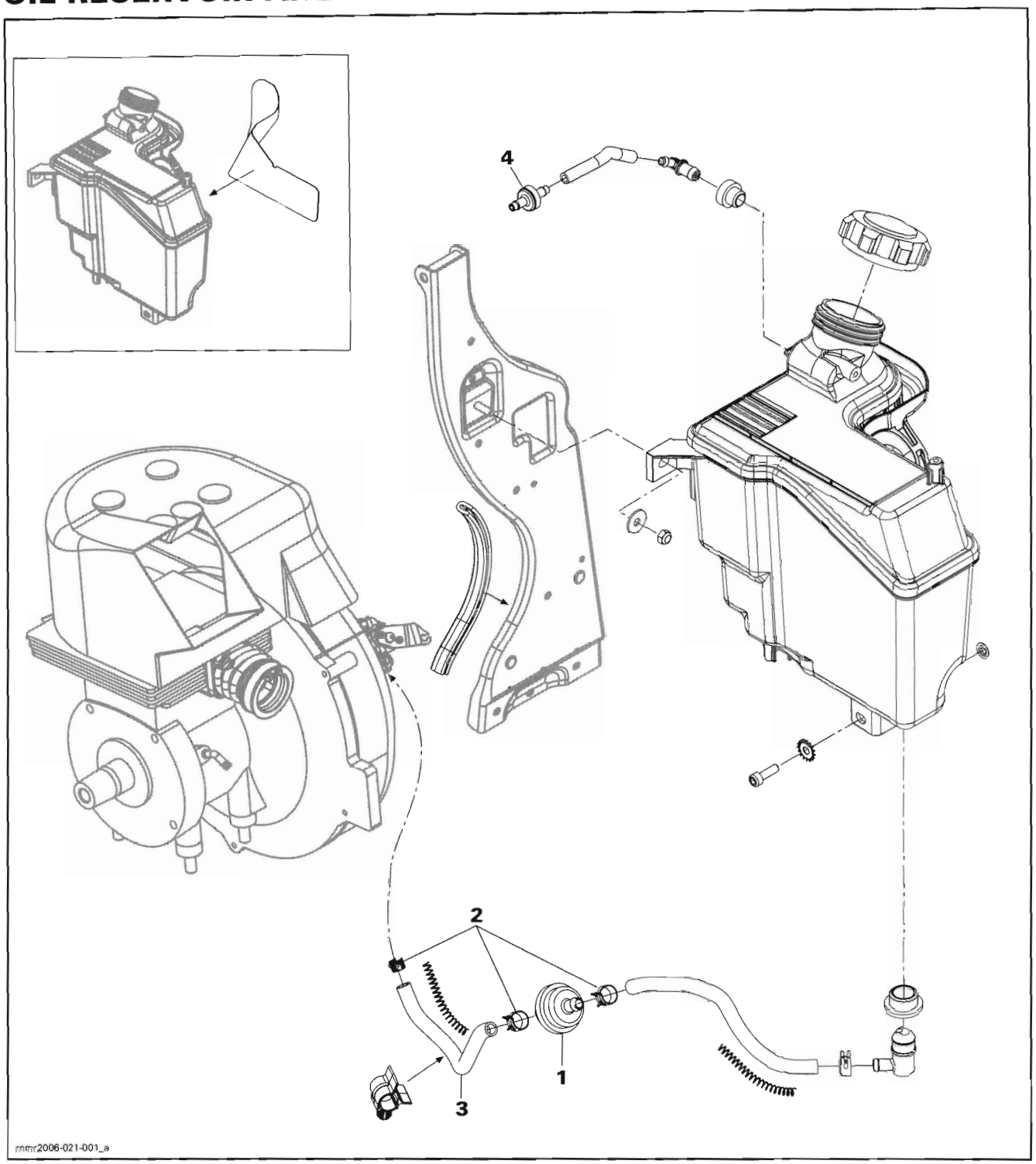
SERVICE TOOLS

Description	Part Number	Page
gear holder	420 876 695	81
hose pincher	295 000 076	76
leak testing kit	529 033 100	76

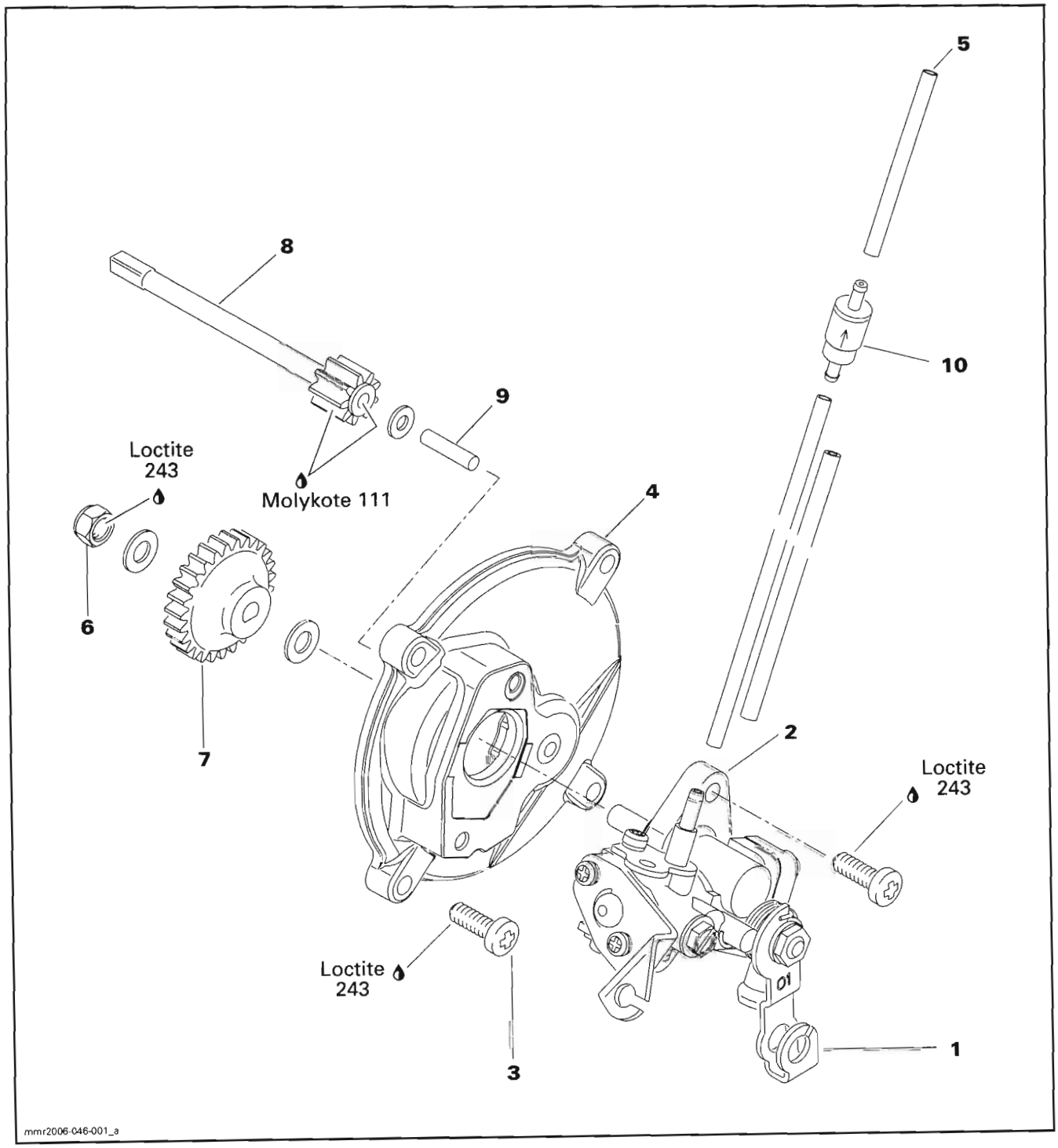
SERVICE PRODUCTS

Description	Part Number	Page
Molykote 111	413 707 000	81

OIL RESERVOIR AND FILTER



OIL INJECTION PUMP



GENERAL

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

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 strictly be adhered to.
Locking devices (e.g.: 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.

⚠ WARNING

Wipe off any oil spills. Oil is highly flammable.

Oil Type

ENGINE	OIL TYPE
277	XP-S™ synthetic 2-stroke oil or XP-S™ 2-stroke synthetic blend or XP-S™ mineral injection oil (1) (2)

(1) If XP-S™ mineral injection oil is not available, API TC high-quality low ash two-stroke injection oil may be used.

(2) XP-S™ synthetic 2-stroke, XP-S™ 2-stroke synthetic blend and XP-S™ mineral injection oil are compatible, they can be mixed together.

INSPECTION

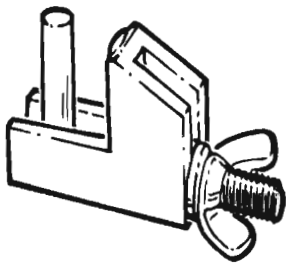
OIL SYSTEM LEAK TEST

The following test will indicate any leak from oil injection system.

Fill up oil reservoir.

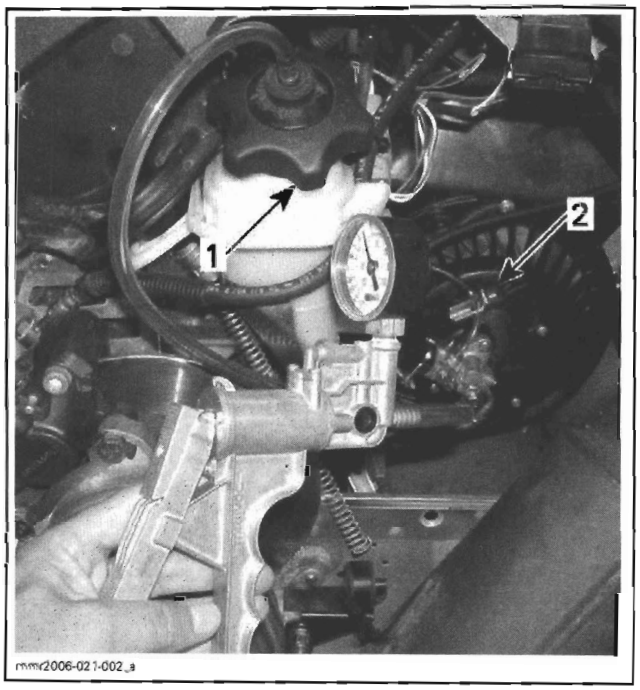
Install special cap of leak testing kit (P/N 529 033 100) on oil reservoir .

Install a hose pincher (P/N 295 000 076) on outlet hose.



295 000 076

Connect leak testing kit pump to special cap.



1. Special cap on reservoir
2. Hose pincher on outlet hose

Pressurize oil system as follows.

PRESSURE	TIME TO HOLD PRESSURE
21 kPa (3 PSI)	3 minutes

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

If air leaks through check valve **no. 4**, replace it.

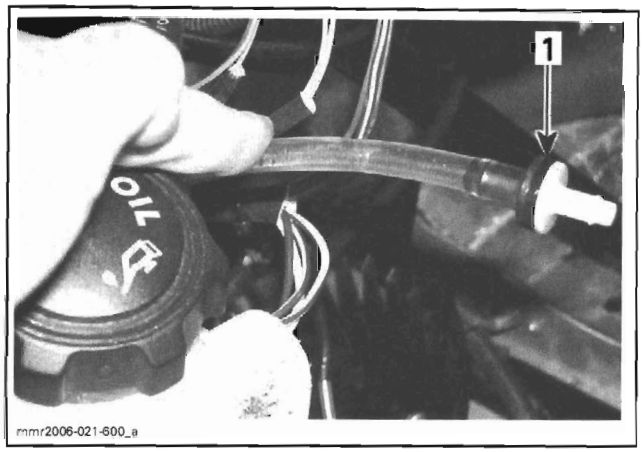
Check Valve Inspection

Check valve **no. 4** allows air to go in reservoir and prevent oil to flow out.

Remove oil cap from reservoir. Connect leak testing kit pump to white end of check valve and activate pump. Air must flow towards reservoir. Otherwise, replace check valve.

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

When replacing/installing check valve, insert its black side into vent line.



1. Black side here

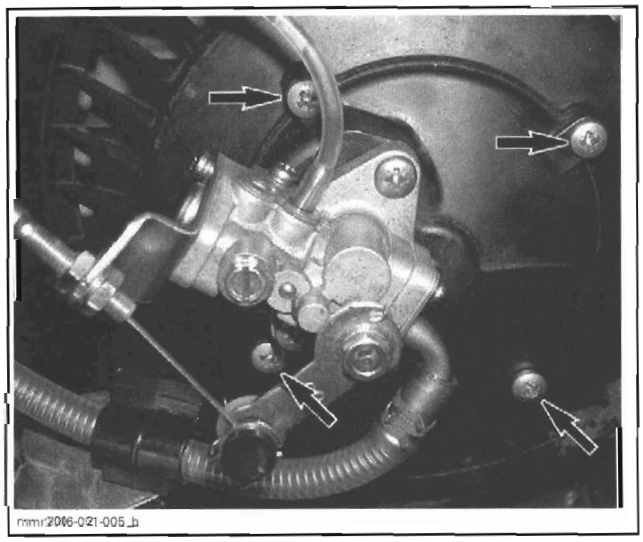
PROCEDURES

NOTE: The following procedures can be done without removing the engine from chassis.

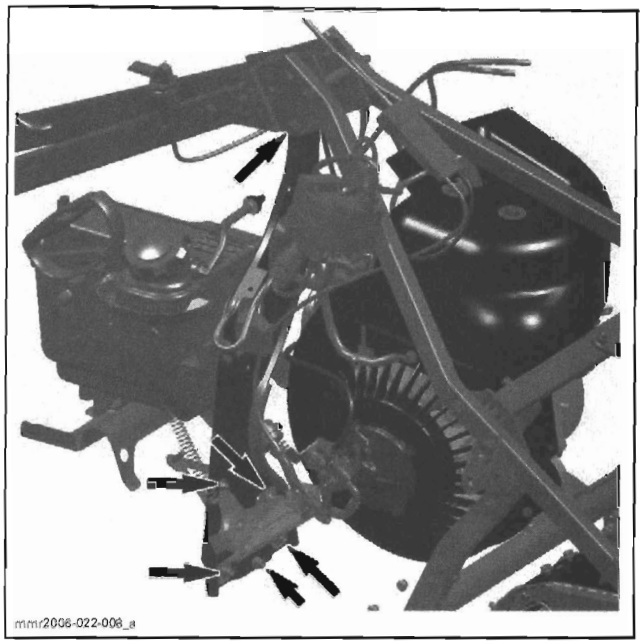
OIL RESERVOIR

Reservoir Removal

Remove oil pump from rewind starter.



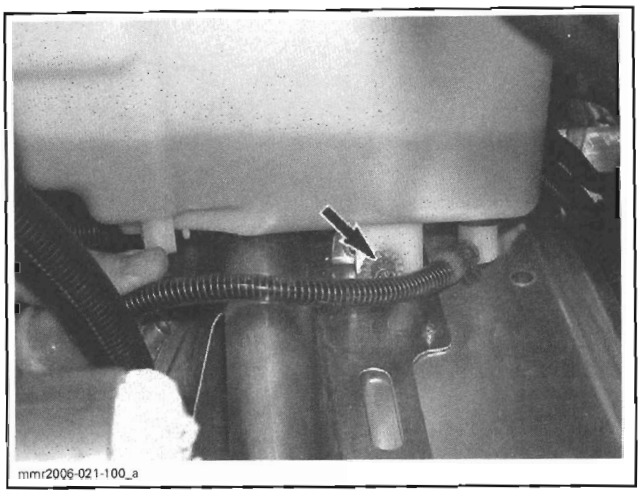
Remove retaining screws on support of rewind starter pulleys and on front plate.



Remove air intake silencer. Refer to *AIR INTAKE SYSTEM*.

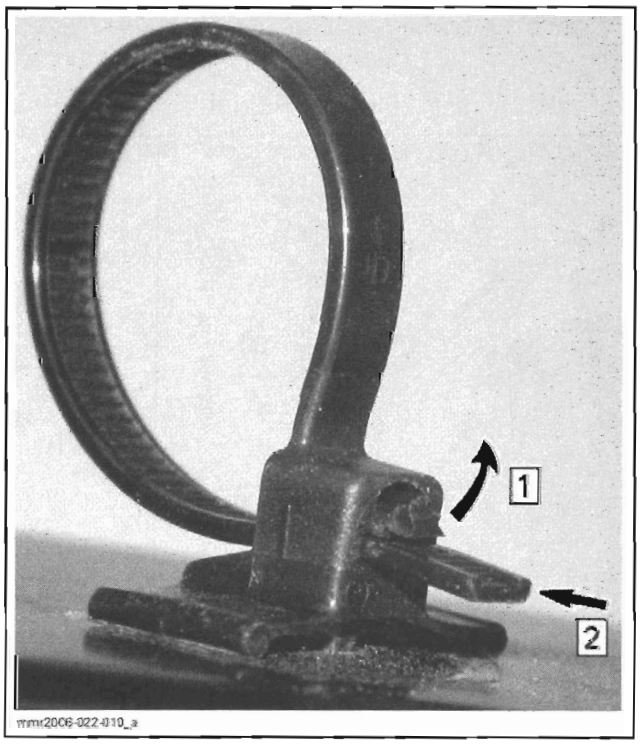
Remove oil reservoir retaining nut.

Remove oil reservoir retaining screw.



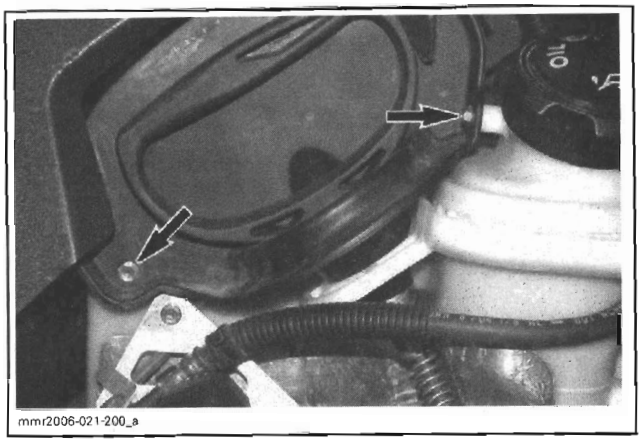
Disconnect wiring harnesses/hoses from front plate.

NOTE: Locking ties with an anchor tree can be detached to be then reused. Unlock as shown.



Pull front plate out beginning with bottom.

Remove rewind handle support screws.



Detach rope from rewind handle and make a knot in rope end to prevent it falling into rewind starter. Refer to *REWIND STARTER*.

Remove circlip **no. 2** then unplug hose from pump. Plug end of hose to prevent oil spillage.

CAUTION: Do not use a hose pincher on inlet hose. This would damage the spring inside hose.

Pull reservoir out.

Reservoir Installation

Installation is the reverse of removal. However, pay attention to the following.

Ensure spring clip is tight on oil supply line.

Bleed oil pump. See procedure in this section.

OIL FILTER

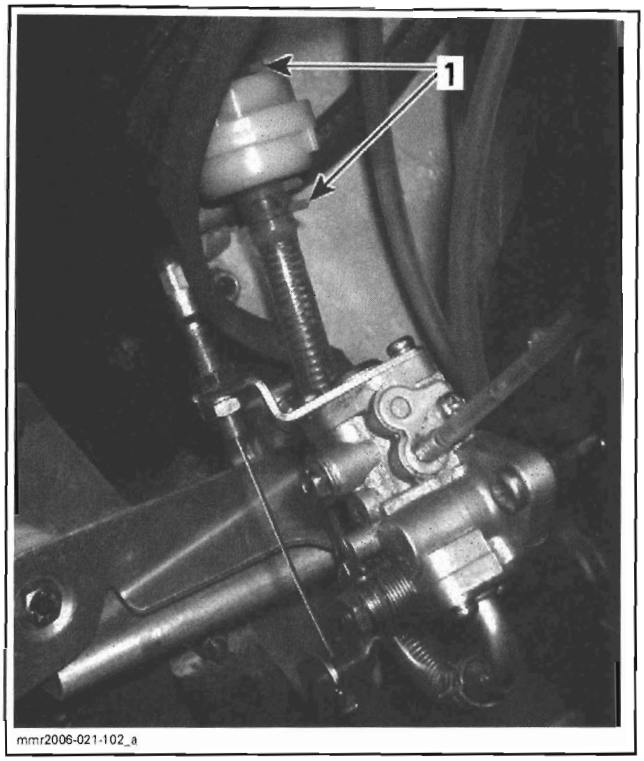
Filter Removal

Remove clips **no. 2** each side of filter then unplug filter. Plug end of inlet hose **no. 3** to prevent oil spillage.

CAUTION: Do not use a hose pincher on inlet hose. This would damage the spring inside hose.

Filter Installation

Install new filter paying attention to place arrow on filter towards pump.



1. Clips

Bleed oil pump. See procedure in this section.

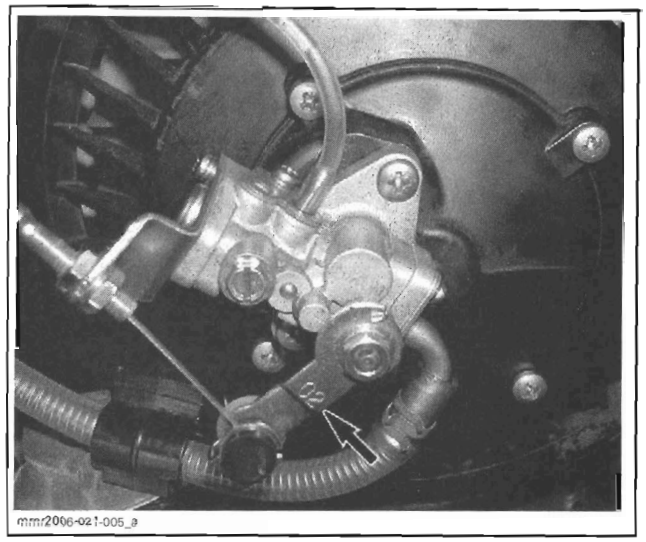
OIL PUMP

Oil Pump Identification

Different engines need different pumps. See identification on lever **no. 1**.

CAUTION: Always mount proper pump on engine.

ENGINE TYPE	OIL PUMP IDENTIFICATION
277	02



NOTE: The following procedures can be done without removing the engine from chassis.

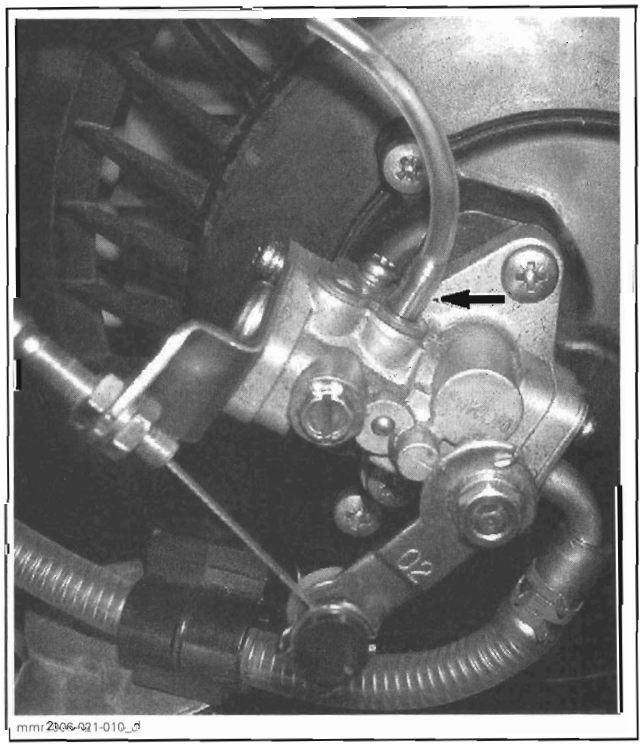
Oil Pump Verification

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

On Vehicle

NOTE: Main oil line must be full of oil. See *OIL PUMP BLEEDING*.

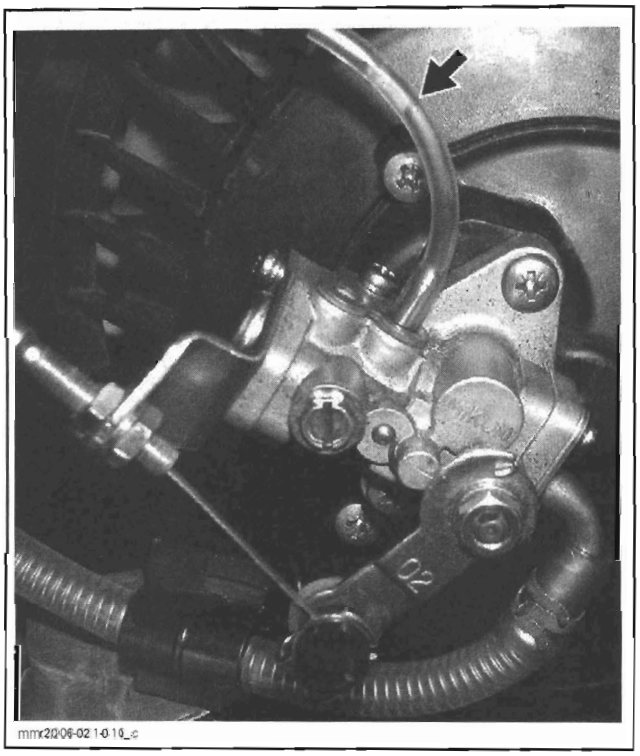
Lift rear of vehicle and support with a mechanical stand. Disconnect small oil line **no. 5** from pump.



Start engine and stop it as soon as it fires.

Check that oil in small oil line has been sucked up (this will be indicated by a clear section of small oil line). Repeat the procedure until this condition is attained.

Reconnect small oil line. Start engine and run at idle while holding the pump lever in fully open position. Oil column must advance into small oil line.



If not, remove pump assembly and check the pump gear and drive shaft for defects, replace as necessary. Test pump as describes below.

NOTE: Through normal use, oil level must not drop in small oil line. If oil drops or moves back and forth, verify check valve **no. 10** operation before replacing pump. Replace check valve as necessary. At installation, ensure to orient check valve according to oil flow.

Test Bench

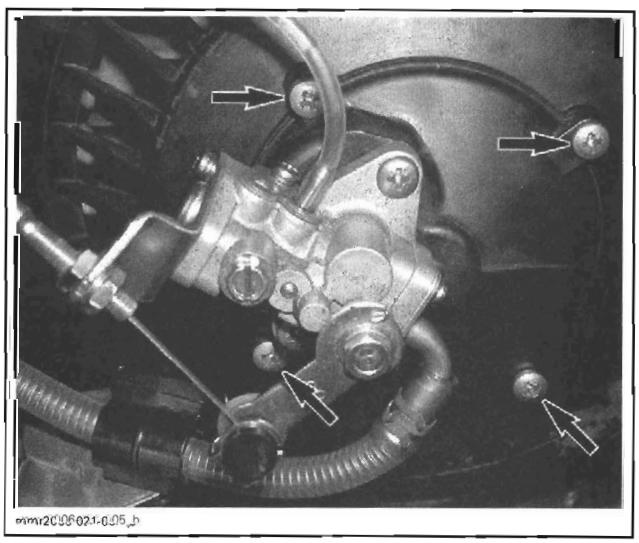
Connect a hose filled with injection oil to supply line fitting. Insert other hose end in an injection oil container. Using a clockwise rotating drill, rotate pump shaft. Oil must drip from outlet fitting while holding lever in a fully open position. If not replace pump.

Oil Pump Removal

NOTE: Before removing the injection oil pump **no. 2**, check its operation.

CAUTION: Never try to pull out oil pump without removing mounting flange no. 4. Damage to pump components would occur.

Remove screws **no. 3**.



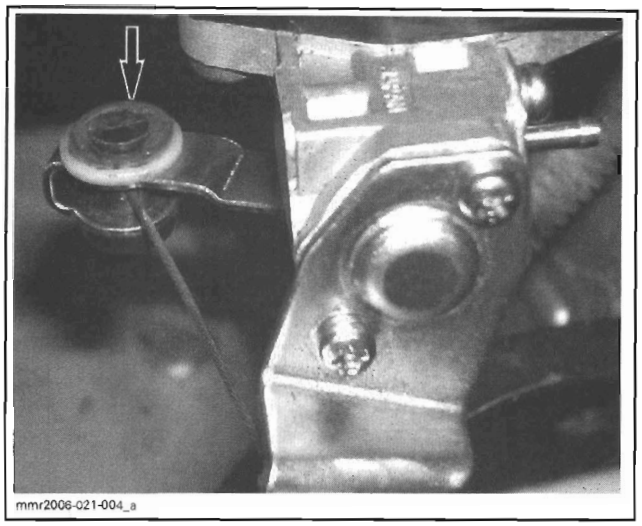
Slightly pull mounting flange. Retain small gear **no. 8** to avoid it falls down then, pull it out.

Remove circlip **no. 2** then unplug hose from pump. Plug end of hose to prevent oil spillage.

CAUTION: Do not use a hose pincher on inlet hose. This would damage the spring inside hose.

Unplug outlet hose from pump.

Remove circlip then pull out throttle cable.


mmr2006-021-004_a

Withdraw pump.

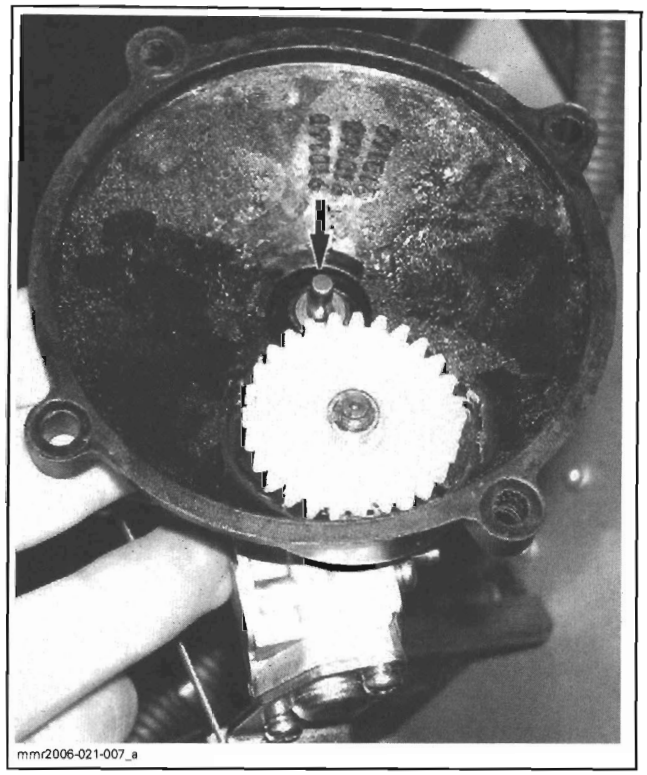
Oil Pump Cleaning

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

Oil Pump Disassembly

NOTE: Some oil pump components are not available as single parts.

First extract the needle roller with pliers.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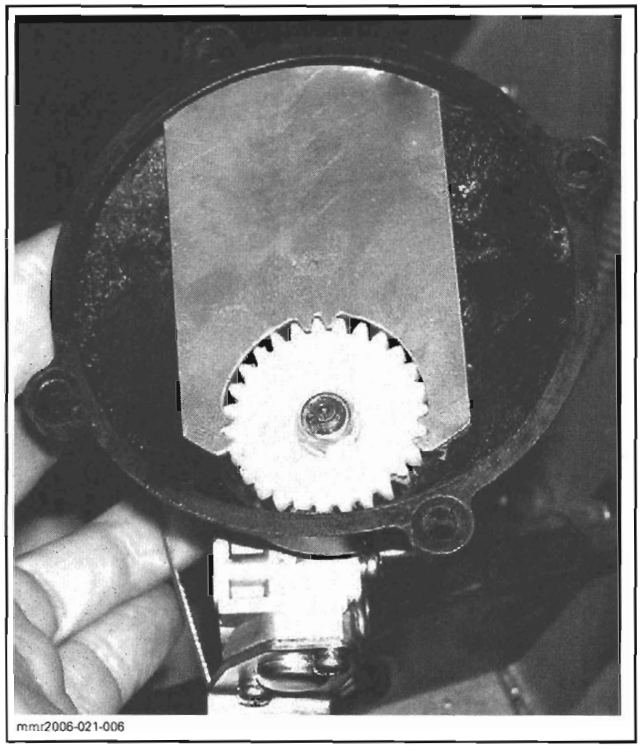
Lock gear in place using gear holder (P/N 420 876 695).

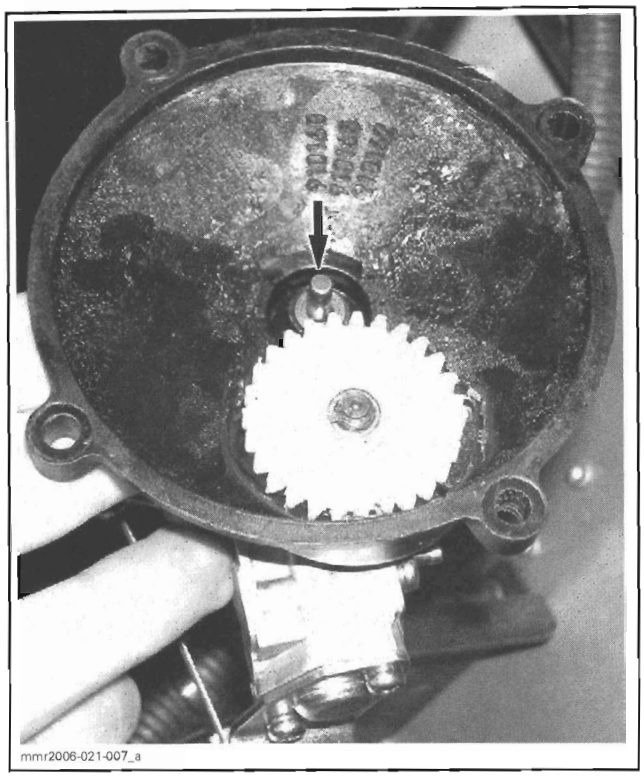

mmr2006-021-006

Oil Pump Assembly

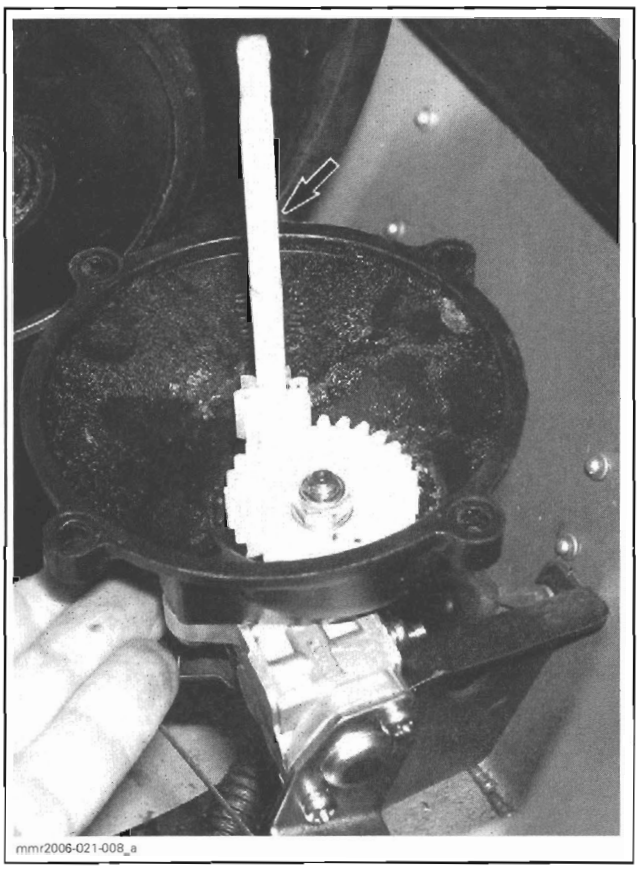
For assembly, reverse the disassembly procedure. However, pay attention to the following.

At gear **no. 7** assembly, apply a light coat of grease Molykote 111 (P/N 413 707 000) on gear teeth.

The needle roller must be engaged as deep as possible in the pump mounting flange.



Install small gear **no. 8** in mounting flange.



Oil Pump Installation

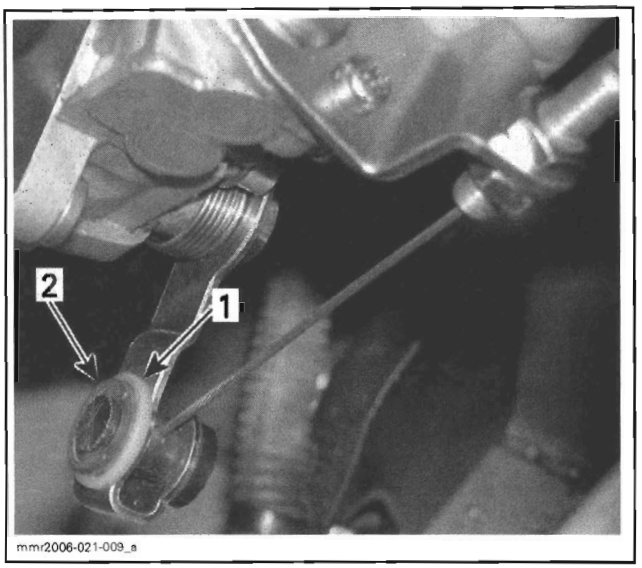
Install pump mounting flange on rewind starter.

CAUTION: Do not force flange onto rewind starter for installation. Rotate flange while inserting so that gear shaft properly mesh with crankshaft end.

Torque the screws **no. 3** to 5 N•m (44 lbf•**in**).

Make sure cable barrel is well seated in oil pump lever.

Secure barrel with plastic washer and circlip as shown.



1. *Plastic washer on this side*
2. *Circlip on this side*

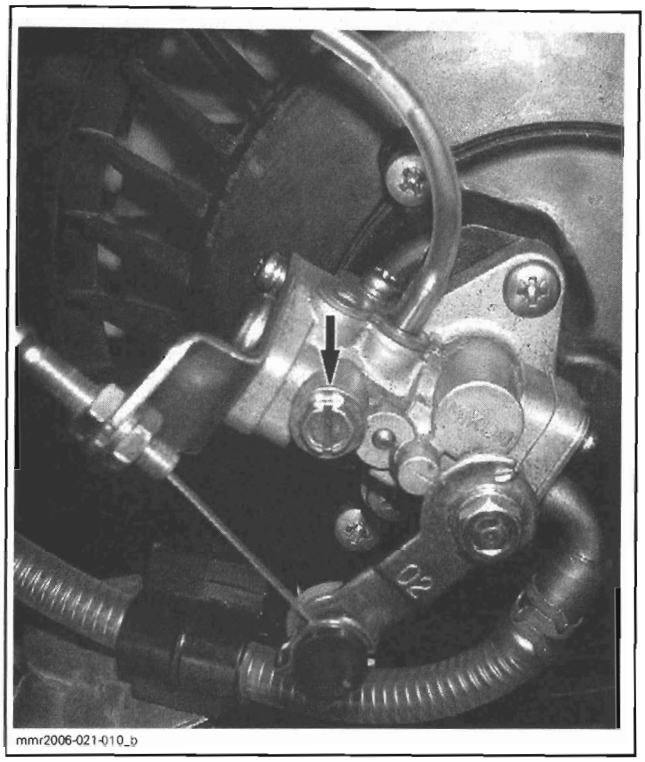
Verify cable and oil pump lever operation then adjust cable.

Always check for spring clip tightness on inlet hose.

Bleed oil pump.

Oil Pump Bleeding

Bleed main oil line (between tank and pump) by loosening the bleeder screw until air has escaped from the line. Add injection oil as required.



Reinstall all parts.

Bleed the small oil line between pump and engine by running engine at idle while holding the pump lever in fully open position until the line is completely full of oil.

⚠ WARNING

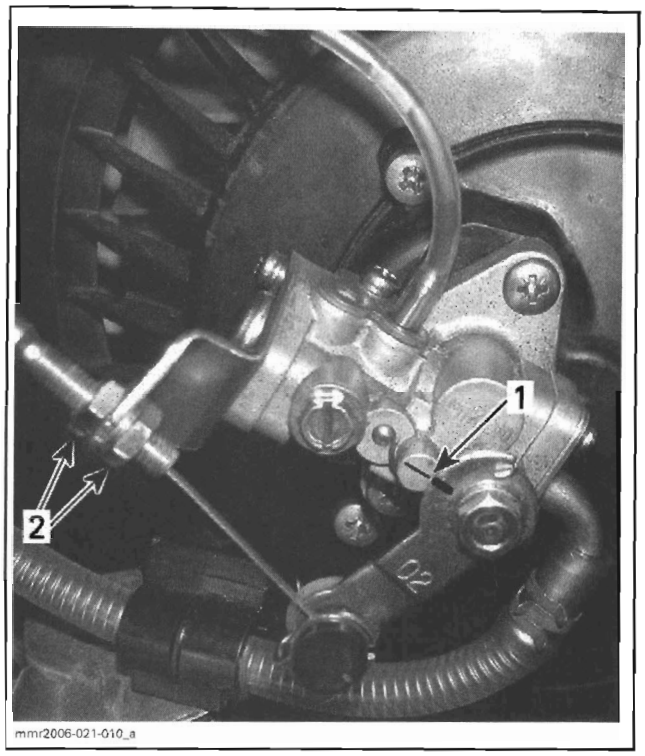
Ensure not to operate carburetor throttle mechanism. Secure the rear of the vehicle on a stand.

Oil Pump Adjustment

Prior to adjusting the pump, make sure all carburetor adjustments are completed and engine is stopped.

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place.

The mark on the pump casting and on the lever must align. Width of lever mark is the tolerance.



1. Marks
2. Adjuster nuts

Loosen the adjuster nuts and adjust accordingly.

Retighten the adjuster nuts.

CAUTION: Proper oil injection pump adjustment is very important. Any delay in the opening of the pump can result in serious engine damage.

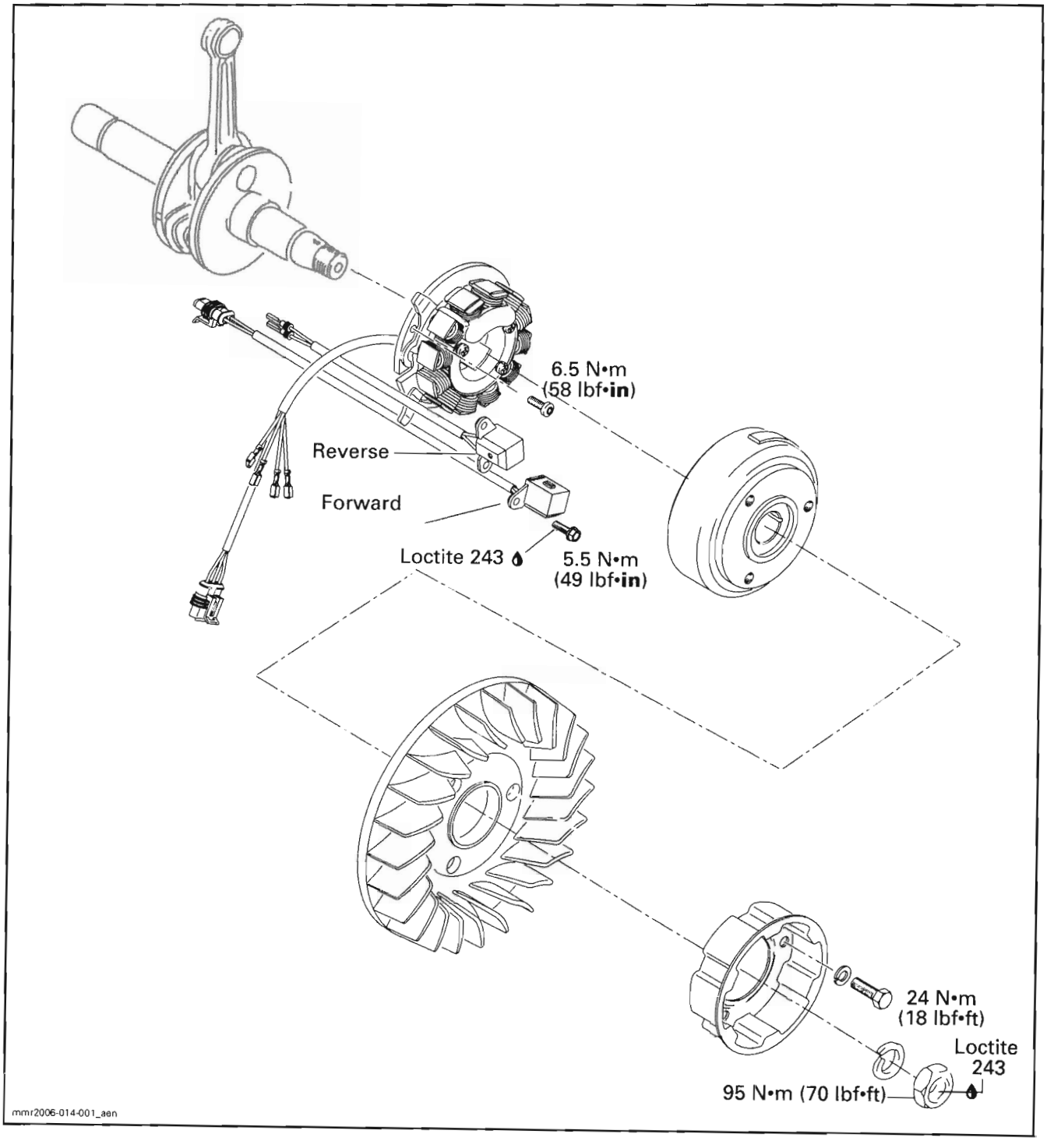
MAGNETO AND AXIAL FAN

SERVICE TOOLS

Description	Part Number	Page
crankshaft protector	420 876 557	87
Loctite 243 (blue)	293 800 060	89
magneto puller	529 035 547	87
magneto puller ring	529 036 001	87

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	88
pulley flange cleaner	413 711 809	88


6.5 N•m
(58 lbf•in)
Reverse
Forward
Loctite 243
5.5 N•m
(49 lbf•in)
24 N•m
(18 lbf•ft)
Loctite
243
95 N•m (70 lbf•ft)
mmr2006-014-001_aen

GENERAL

NOTE: To perform procedures described in this section, the engine removal is recommended.

During assembly/installation, use the torque values and service products as 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 strictly be adhered to.
Locking devices (e.g.: 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.

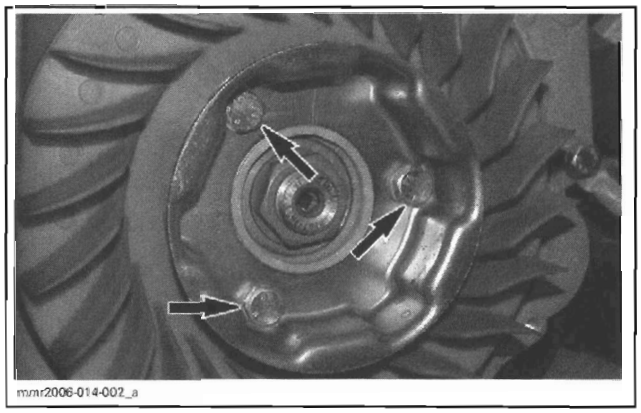
PROCEDURES

STARTING PULLEY

Removal

Remove all bolts attaching rewind starter housing to engine.

Remove starter pulley bolts with their lock washers.



Pull starting pulley.

Installation

The installation is the reverse of the removal procedure.

COOLING FAN

Removal

To remove cooling fan, use same procedure that starting pulley.

Inspection

Check wings for damages. Replace cooling fan if a broken wing or excessive wear at the end of wings is detected.

Installation

The installation is the reverse of the removal procedure.

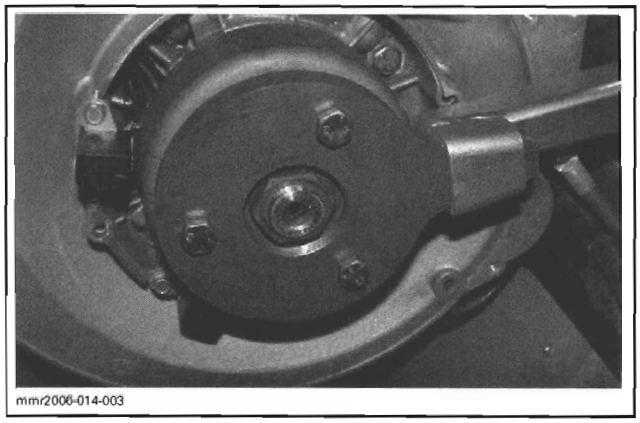
MAGNETO FLYWHEEL

Removal

Remove starting pulley and fan.

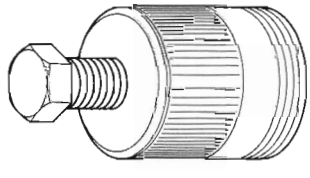
Using starting pulley bolts, install the magneto puller ring (P/N 529 036 001) on magneto flywheel.

Install a tube on magneto puller ring tab to retain it during magneto flywheel nut removal.



Remove magneto flywheel nut, using a 30 mm socket machined to 40 mm (1.580 in) outside diameter by 16 mm (5/8 in) long. Tap on socket with a hammer to break threadlocker and avoid thread breakage.

Install the crankshaft protector (P/N 420 876 557) on crankshaft end. Screw the magneto puller (P/N 529 035 547) into magneto puller ring.



529 035 547

Remove magneto flywheel by screwing the magneto puller bolt. Tap on the head of magneto puller bolt to release magneto flywheel from its taper.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Clean magneto flywheel taper and crankshaft taper with pulley flange cleaner (P/N 413 711 809).

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of magneto flywheel nut.

Torque magneto flywheel nut to 95 N•m (70 lbf•ft).

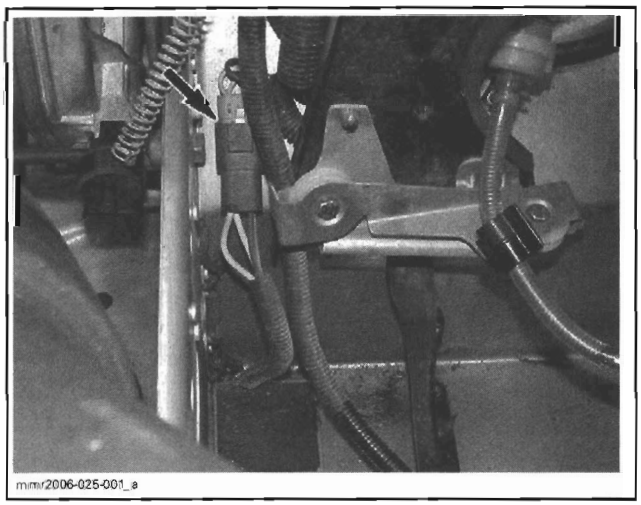
STATOR

NOTE: Always check stator before changing it, refer to *CHARGING SYSTEM*.

Removal

Remove magneto flywheel, see procedure above.

Unplug magneto connector.



Unscrew stator bolts.

Remove stator from engine.

Installation

The installation is the reverse of the removal procedure.

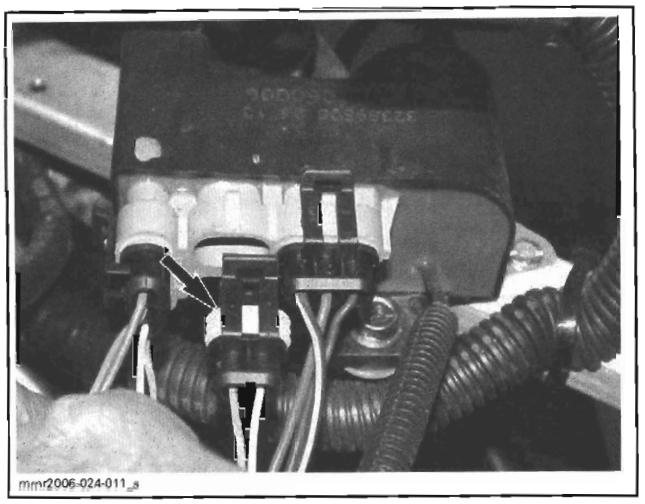
TRIGGER COIL

NOTE: Always check trigger coils before changing them, refer to *IGNITION SYSTEM (300F)* or *DESS* sections.

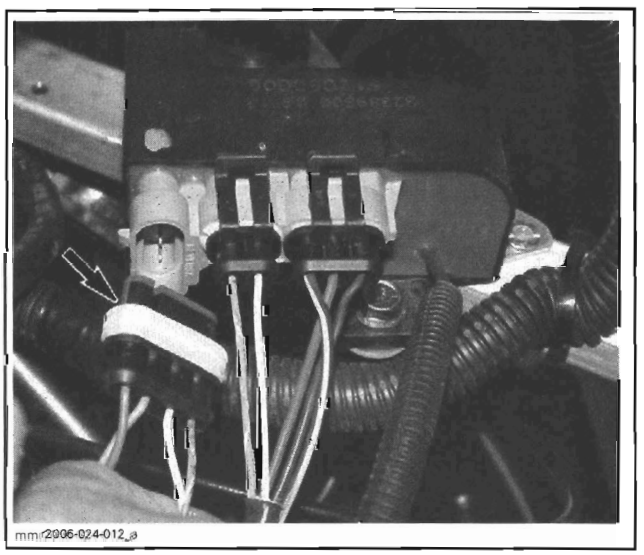
Removal

Remove rewind starter.

Unplug trigger coil(s) from MPEM.



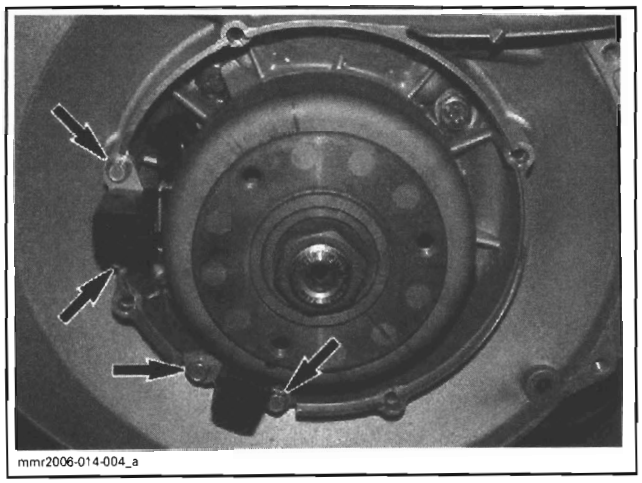
TRIGGER COIL CONNECTOR (FORWARD)



REVERSE CONNECTOR

NOTE: On reverse connector, disconnect the BLUE/YELLOW and the WHITE/YELLOW wires of the reverse trigger coil.

Remove screws retaining trigger coil to magneto housing.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Installation

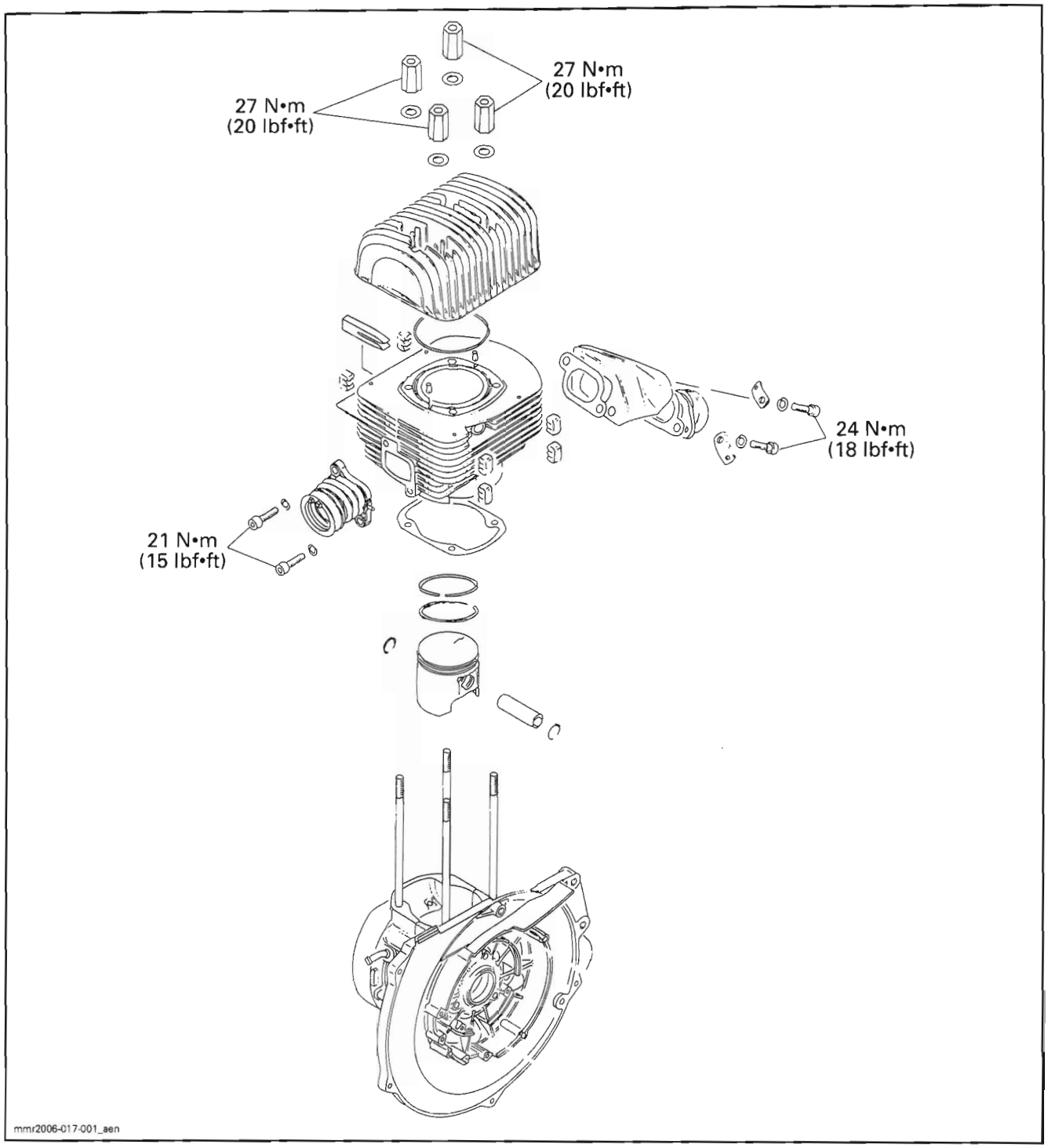
The installation is the reverse of the removal procedure.

Apply Loctite 243 (blue) (P/N 293 800 060) on bolt threads.

TOP END

SERVICE TOOLS

Description	Part Number	Page
18 mm sleeve kit	529 035 541	94
locating sleeve	529 023 800	94
piston circlip installer	529 035 561	96
piston pin puller	529 035 503	94


27 N•m
(20 lbf•ft)
27 N•m
(20 lbf•ft)
24 N•m
(18 lbf•ft)
21 N•m
(15 lbf•ft)
mmr2006-017-001_aen

GENERAL

Before completely disassembling the engine, check airtightness. Refer to *LEAK TEST*.

To measure internal parts, refer to *ENGINE MEASUREMENT* section.

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

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

PROCEDURES

NOTE: To reach any internal parts, the engine removal is necessary.

CYLINDER COWL

Removal

Unscrew cylinder cowl screws on the top of engine.

Remove screws with lock washers, cowl washers and rubber washers.

Pull cylinder cowl.

Installation

The installation is the reverse of the removal procedure.

Torque cylinder cowl screws to 13.5 N•m (120 lbf•**in**).

CYLINDER HEAD

Removal

Remove cylinder cowl. See above.

Remove distance sleeves and flat washers.

Lift cylinder head over cylinder studs to remove it.

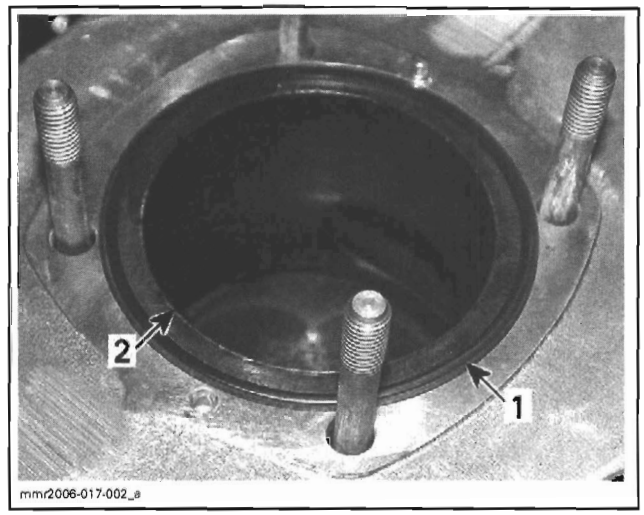
Inspection

Check cylinder head for cracks, broken fins or other damages. Replace if necessary.

Using a straightedge and a feeler gauge, check cylinder head warpage.

MAXIMUM CYLINDER HEAD WARPAGE
0.05 mm (.002 in) per 50 mm (2 in) of surface
0.5 mm (.020 in) for total length of cylinder head

Check O-ring between cylinder head and cylinder.



1. *O-ring*
2. *Cylinder*

Installation

The installation is the reverse of the removal procedure.

Torque distance sleeves to 27 N•m (20 lbf•ft).

CYLINDER

Removal

Remove intake and exhaust manifolds.

Remove cylinder cowl and cylinder head.

Lift cylinder.

Discard the cylinder gasket.

Inspection

Check cylinder for cracks and scoring on the top and bottom of cylinder. Replace if necessary.

Refer to table below to find cylinder specifications. For dimension measurement procedures, refer to *ENGINE MEASUREMENT*.

ENGINE MEASUREMENT	MAXIMUM TOLERANCES
Cylinder taper	0.10 mm (.004 in)
Cylinder out of round	0.08 mm (.003 in)
Cylinder/piston clearance (piston skirt wear)	0.15 mm (.006 in)

Installation

Before inserting piston in the cylinder, lubricate the cylinder with new injection oil or equivalent.

Install a new gasket.

Using fingers or a piston ring compressor, slide piston into cylinder.

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

PISTON

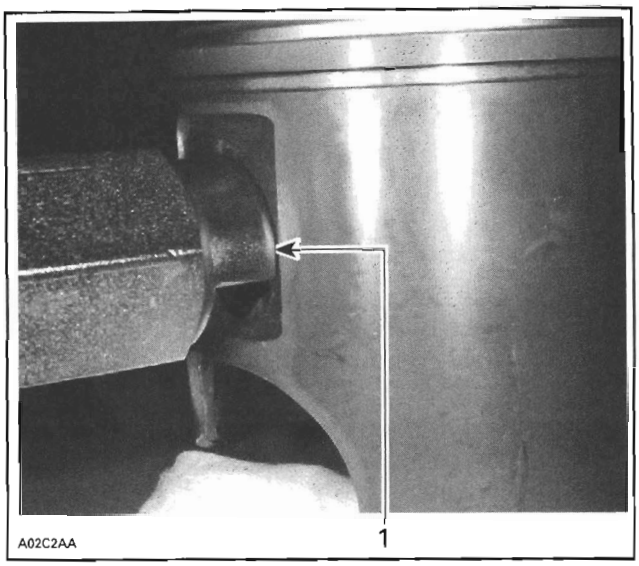
Removal

Remove cylinder.

Place a clean rag over crankcase to prevent circlips from falling into crankcase. Then with a pointed tool inserted in piston notch, remove both circlips from piston.

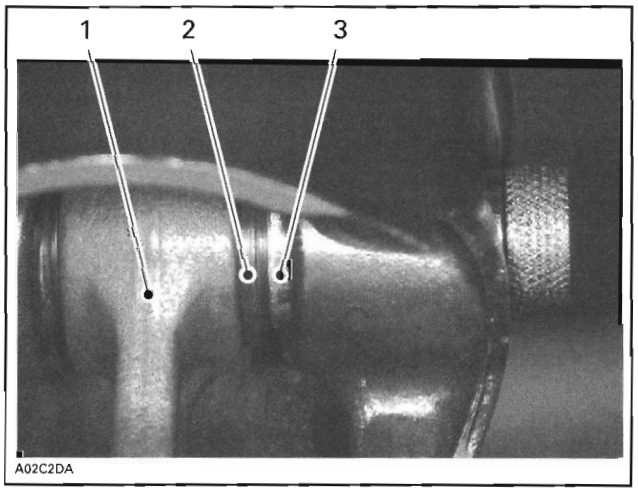
Use the piston pin puller (P/N 529 035 503) along with the 18 mm sleeve kit (P/N 529 035 541) and the locating sleeve (P/N 529 023 800) to remove piston pin. Use the following procedure.

- When inserting piston pin puller, make sure it sits squarely against piston.



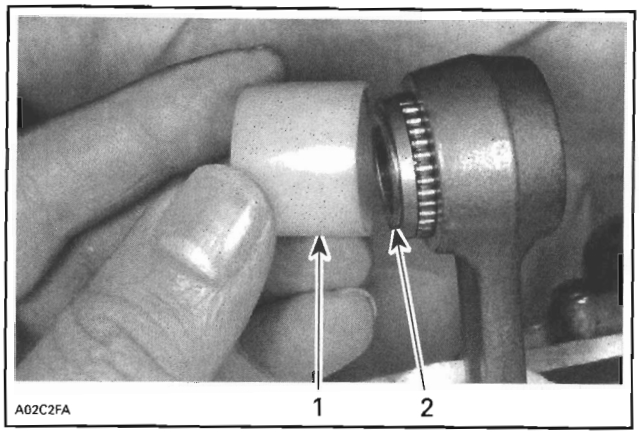
TYPICAL
1. Properly seated all around

- Install sleeve then shouldered sleeve over puller rod.
- Pull out piston pin by unscrewing puller until shouldered sleeve end is flush with thrust washer of piston pin bearing.



TYPICAL
1. Sleeve inside bearing
2. Thrust washer
3. Shouldered sleeve end

- Remove puller. Pull out shouldered sleeve carefully.
- Remove piston from connecting rod.
- Install locating sleeve. Then push needle bearings along with thrust washers and sleeve.



TYPICAL
1. *Locating sleeve*
2. *Sleeve*

– Use a locking tie to fasten all needles and thrust washers along with locating sleeve.

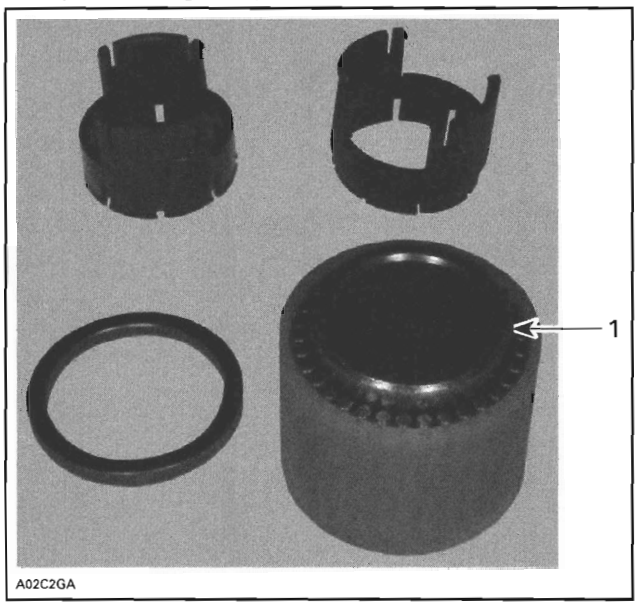
Inspection

Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary. Refer to *ENGINE MEASUREMENT* to complete inspection.

Installation

When reinstalling original needle bearings, make sure that 31 needles are inserted between sleeve and locating sleeve.

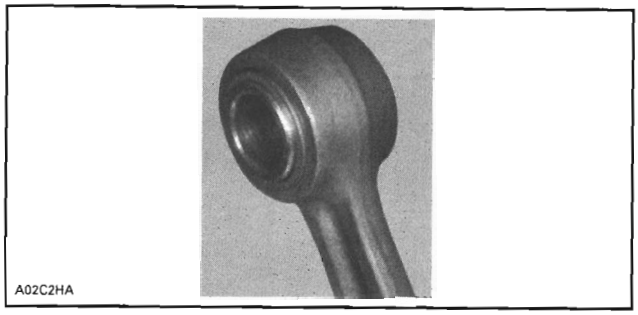
When installing a new cageless bearing, replace half plastic cages by sleeve.



TYPICAL
1. *Sleeve*

Grease thrust washers and install them on each end of needles.

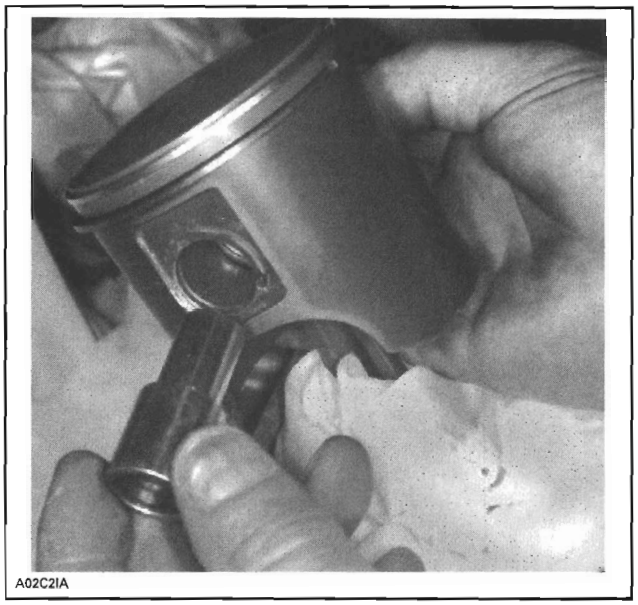
Insert cageless bearing into connecting rod.



TYPICAL — CAGELESS BEARING AND SLEEVE INSTALLED

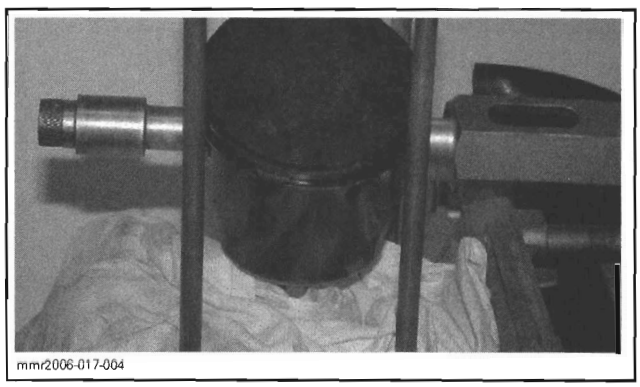
Mount piston over connecting rod with the letters "AUS" (over an arrow on the piston dome) facing in the direction of exhaust port.

Install shouldered sleeve.



TYPICAL — SHOULDERED SLEEVE INSTALLATION

Install piston pin puller and turn handle until piston pin is correctly positioned in piston.

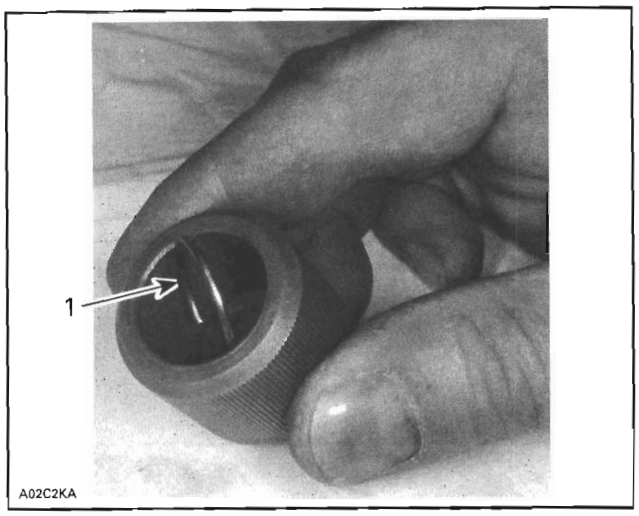


TYPICAL

Remove piston pin puller and sleeve kit.

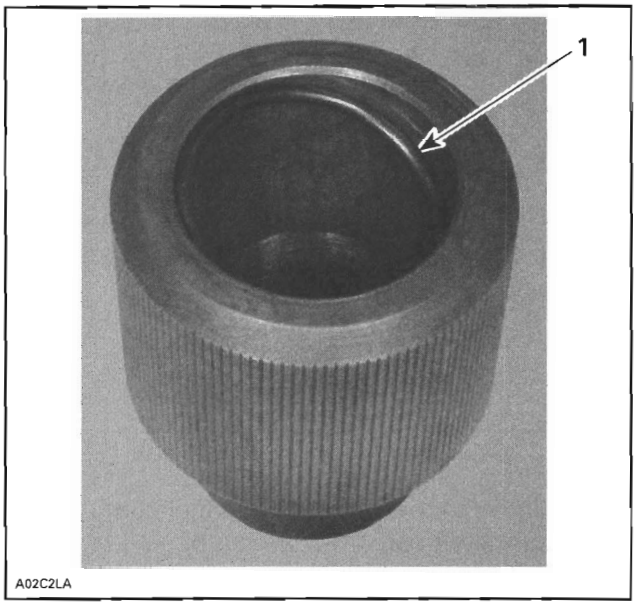
Use piston circlip installer (P/N 529 035 561) to install circlips.

Insert circlip in tool at an angle.



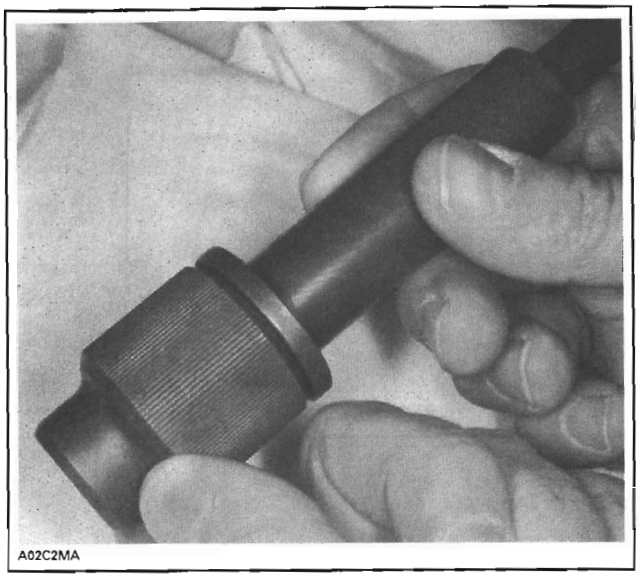
1. Circlip

Square it up using a finger.

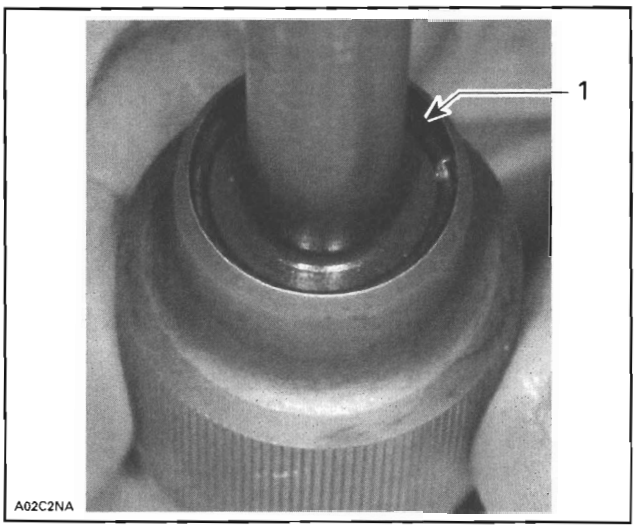


1. Circlip

Continue to square it up using round end of circlip installer.

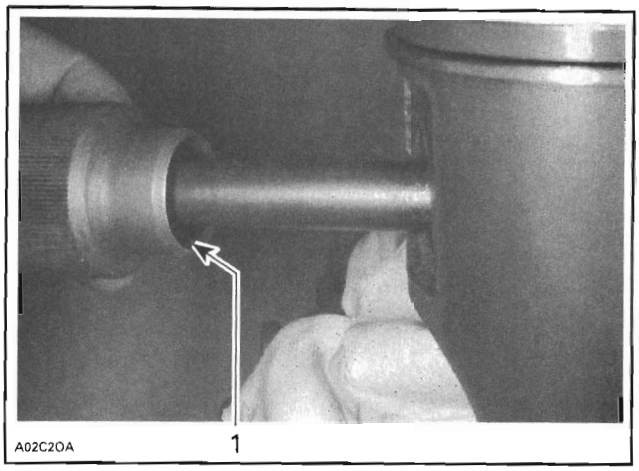


Using square end of tool, push circlip in until it rests in groove.



1. Circlip in groove

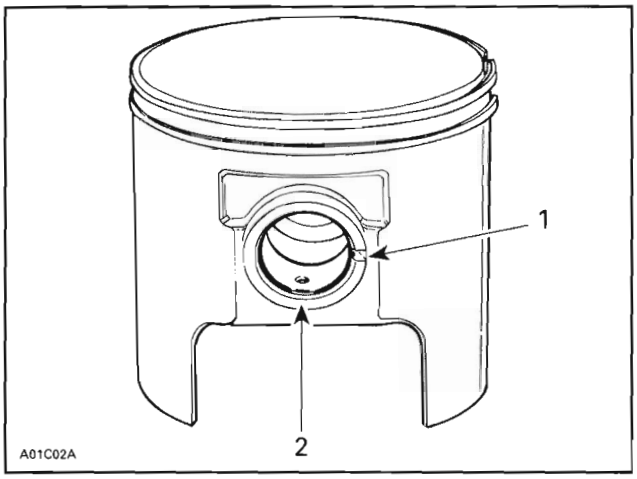
Mount tool in piston making sure that circlip break is facing down.



TYPICAL
1. Circlip break facing down

Hold tool firmly against piston then strike on round end of tool. Circlip will move from tool groove to piston groove.

TYPICAL



1. Piston notch
2. Circlip break

CAUTION: Circlips must not move freely in the groove after installation. If so, replace them.

Before inserting piston in the cylinder, lubricate the cylinder with new injection oil or equivalent.

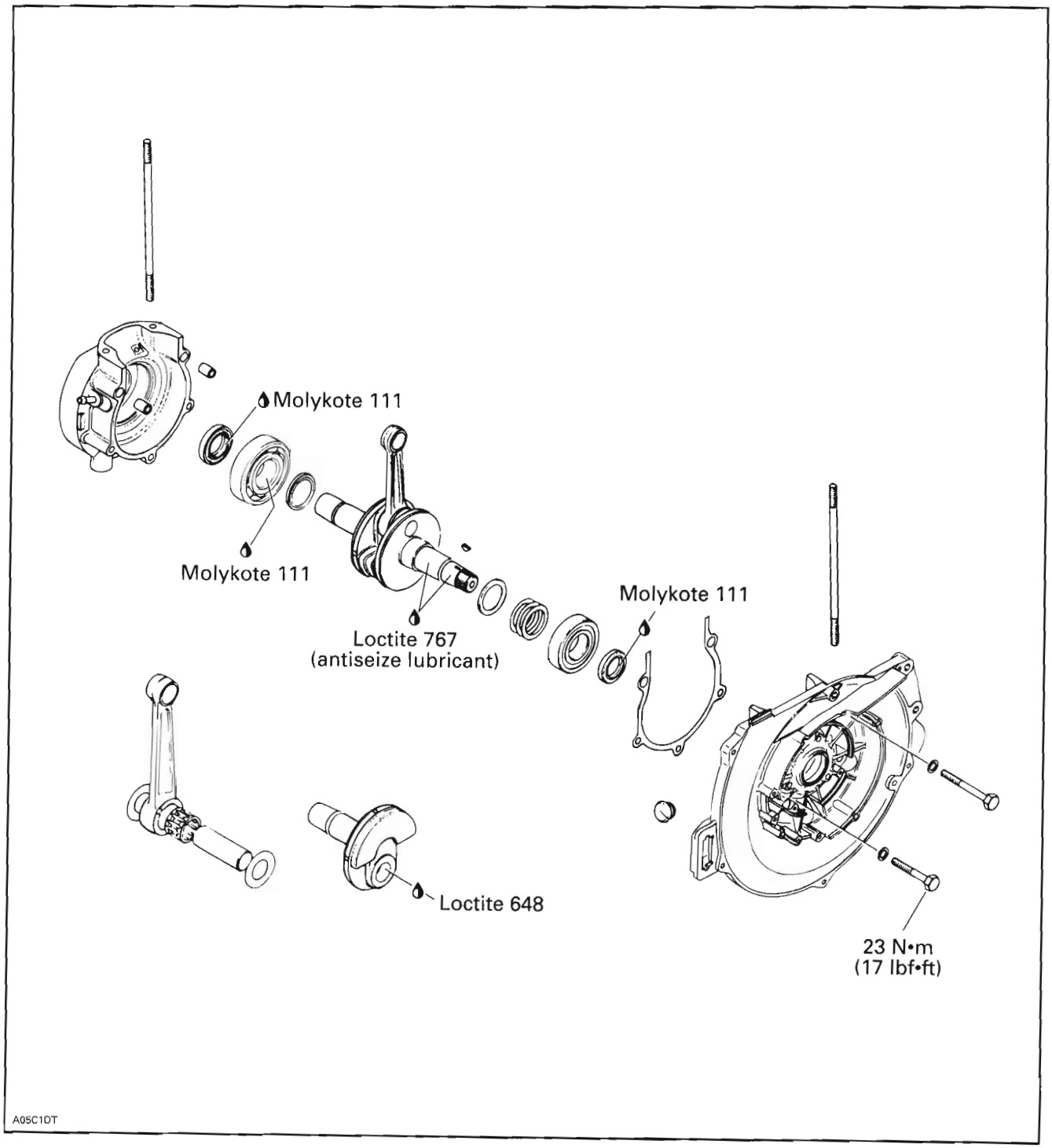
BOTTOM END

SERVICE TOOLS

Description	Part Number	Page
bearing heater	529 035 969	103
crankshaft bearing puller	420 877 635	103
MAG oil seal pusher	420 277 875	103
protective cap	420 976 890	103
PTO oil seal pusher	420 876 660	103

SERVICE PRODUCTS

Description	Part Number	Page
Molykote 111	413 707 000	102


Molykote 111
Molykote 111
Loctite 767
(antiseize lubricant)
Molykote 111
Loctite 648
23 N•m
(17 lbf•ft)
A05C1DT

GENERAL

Before completely disassembling the engine, check airtightness. Refer to *LEAK TEST*.

To verify internal parts, refer to *ENGINE MEASUREMENT* section.

All oil seals and gaskets must be discard and replace with new ones when crankcase is split.

CAUTION: After rebuilding an engine always observe a break-in period as described in *OPERATOR'S GUIDE*.

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

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

PROCEDURES

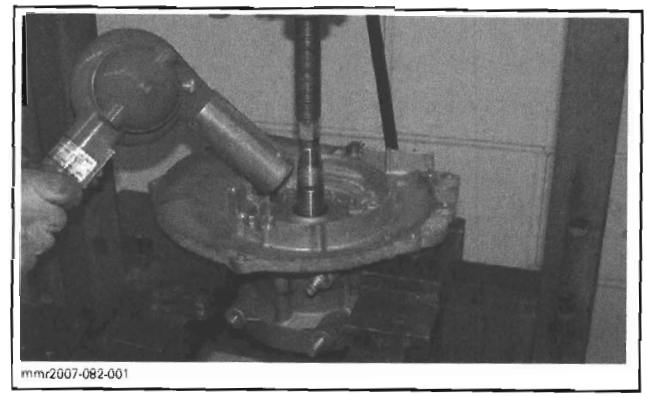
CRANKCASE

Disassembly

Remove:
- engine from vehicle, refer to *REMOVAL AND INSTALLATION*
- starter and starter plate on electric started models
- cylinder cowl, cylinder head and cylinder, refer to *TOP END*
- rewind starter, refer to *REWIND STARTER*
- magneto flywheel, stator and trigger coils, refer to *MAGNETO SYSTEM*.

On MAG side, remove bolts holding both parts of crankcase together.

Install the MAG crankcase on suitable supports and press crankshaft out of housing. Heat all around bearing area using a heat gun.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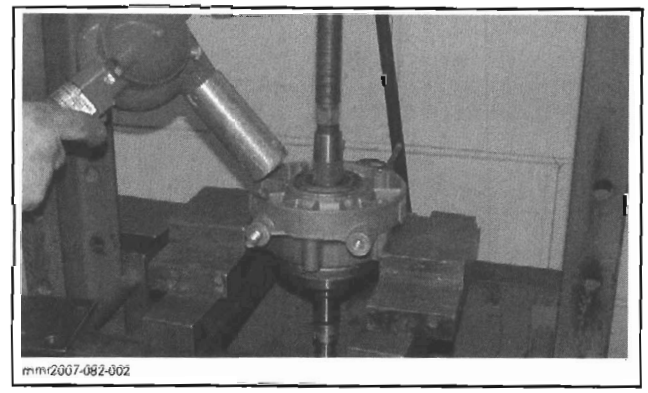
Support the PTO crankcase and press the crankshaft out of housing.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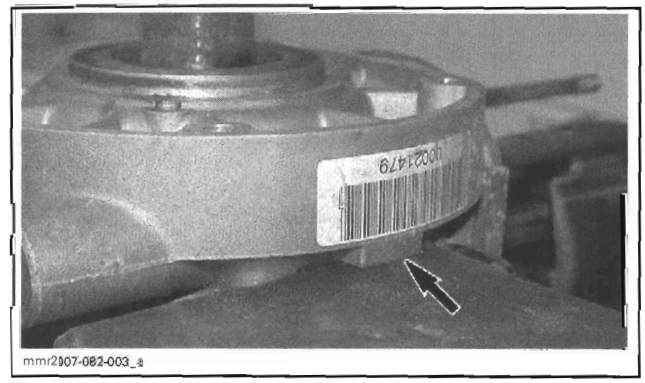
NOTE: Use housing bumps to support the housing correctly.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Inspection

Check crankcase for cracks. Replace if necessary.

Assembly

NOTE: The adjustment of crankshaft end play is required when crankshaft and/or crankcase is replaced. Refer to *ENGINE MEASUREMENT* for the complete procedure.

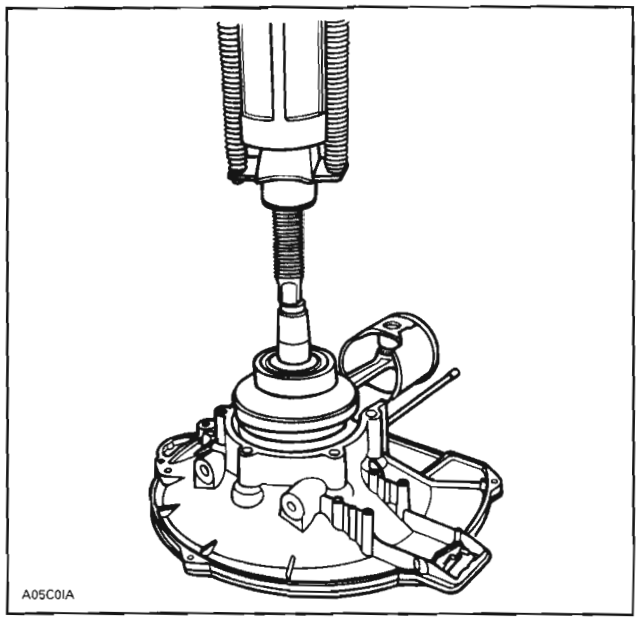
Heat crankshaft to 80°C (176°F) to ease its installation into crankcase.

Install a protector on each crankshaft end to prevent oil seal damage.

Apply a light coat of Molykote 111 (P/N 413 707 000) on oil seal lips.

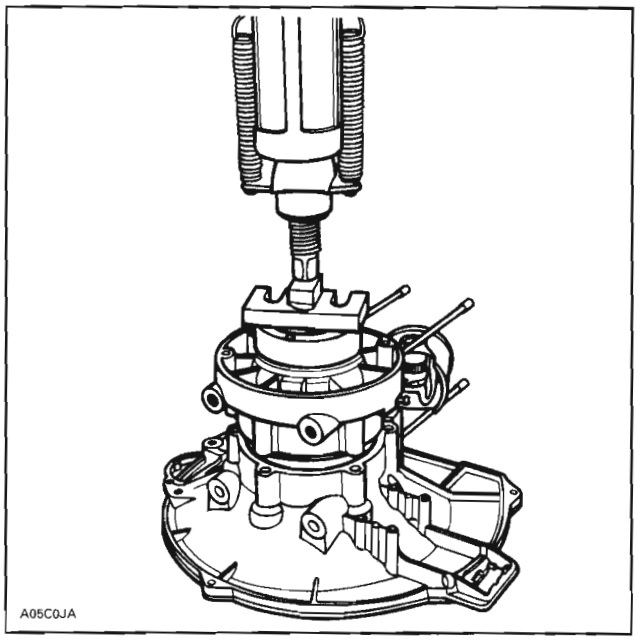
Spray some new injection oil on all moving parts of crankshaft.

Using a press, install crankshaft into MAG crankcase.

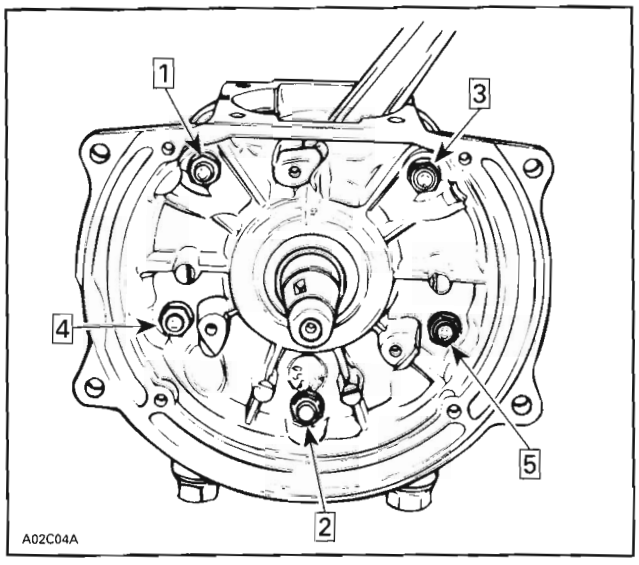


Install a new crankcase gasket.

Press down PTO crankcase onto crankshaft using appropriate spacer(s).



Install crankcase bolts with their lock washers. Torque bolts to 23 N•m (17 lbf•ft) as per following sequence.



Install all other removed parts.

CRANKSHAFT

Removal/Installation

Refer to *CRANKCASE* to remove or install crankshaft into crankcase.

Inspection

Refer to table below to find crankshaft dimensions. For dimension measurement procedures, refer to *ENGINE MEASUREMENT*.

ENGINE MEASUREMENT	TOLERANCES mm (in)		
	NEW PARTS MIN.	NEW PARTS MAX.	WEAR LIMIT
Crankshaft deflection on PTO side	—	0.06 (.0024)	—
Crankshaft deflection in center of crankshaft	—	0.08 (.0031)	—
Crankshaft deflection on MAG side	—	0.03 (.0012)	—
Connecting rod big end axial play	0.20 (.008)	0.33 (.013)	1.2 (.047)
Crankshaft end play	0.10 (.004)	0.030 (.012)	—

CRANKSHAFT BEARING

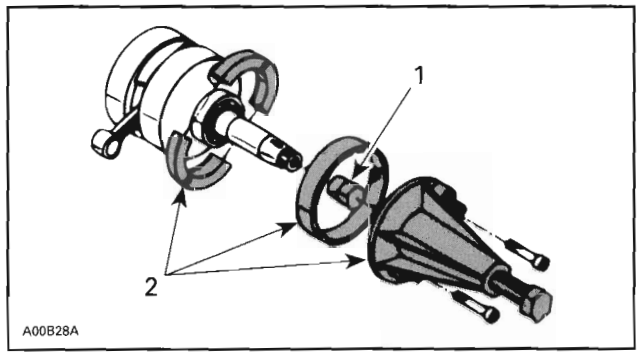
Inspection

Check if the bearings turn smoothly and freely. Replace if necessary.

Removal

Remove crankshaft from crankcase.

Install the crankshaft bearing puller (P/N 420 877 635) with the proper half ring and the protective cap (P/N 420 976 890).



1. *Protective cap*
2. *Crankshaft bearing puller*

Installation

NOTE: The adjustment of crankshaft end play is required when crankshaft and/or crankcase is replaced. Refer to *ENGINE MEASUREMENT* for the complete procedure. This procedure must be done before bearings installation.

Using the bearing heater (P/N 529 035 969), heat up bearings. This will expand bearings and ease installation.

CAUTION: Bearings should not be heated to more than 80°C (176°F). Do not heat bearings on direct flame, or with a heat gun or in an oil bath. Inappropriate bearings heating may result in inner seals or cage failure.

Install spacers on both sides and calculated shims on MAG side then put bearings on crankshaft with the groove outward.

Install all other removed parts.

OIL SEAL

Removal

Split crankcase and remove crankshaft.

Push oil seals from outside towards the inside of crankcase.

Installation

To install the PTO oil seal, use the PTO oil seal pusher (P/N 420 876 660) and the MAG oil seal pusher (P/N 420 277 875) for the oil seal on MAG side.

CAUTION: To ensure appropriate crankshaft bearing lubrication, seal outer surface must be pressed against seal crankcase shoulder.

ENGINE MEASUREMENT

SERVICE TOOLS

Description	Part Number	Page
dial indicator	414 104 700	108

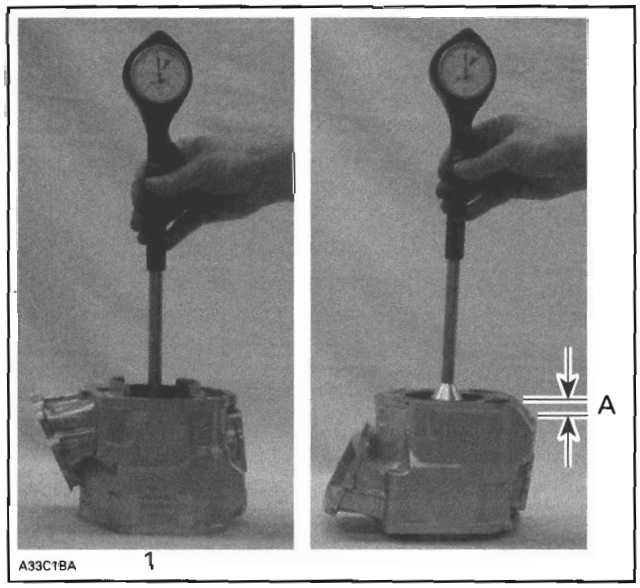
NOTE: This subsection explains the procedures to correctly measure engine components. For the engine technical specifications, refer to *INSPECTION* in the appropriate *ENGINE* subsection.

CYLINDER TAPER

Compare cylinder diameter 16 mm (5/8 in) from top of cylinder to just below its intake port area.

If the difference exceeds the specified dimension the cylinder should be rebored and honed or should be replaced.

NOTE: If cylinder is rebored, be sure to restore the chamfer around all cylinder sleeve port openings.

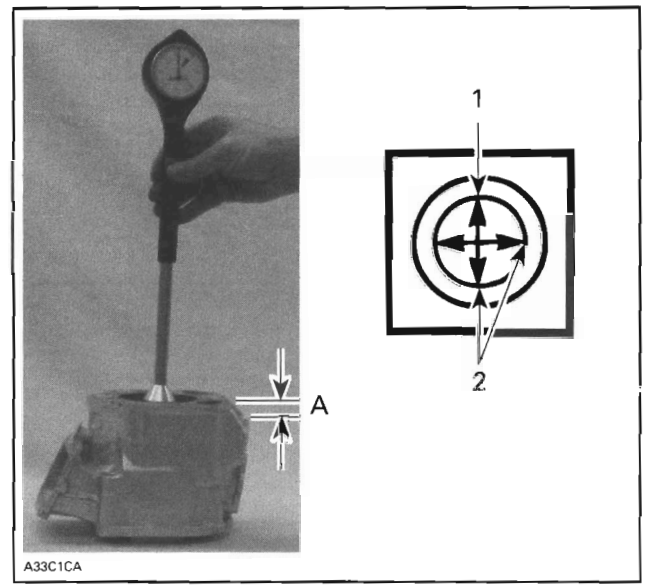


TYPICAL
1. Below the intake port
A. 16 mm (5/8 in) from top

CYLINDER OUT OF ROUND

Measuring 16 mm (5/8 in) from top of cylinder with a cylinder gauge, check if the cylinder out of round is more than the specified dimension. If larger, cylinder should be rebored and honed or should be replaced. Nikasil cylinder can be honed using diamond hone but can not be rebored.

NOTE: If cylinder is rebored, be sure to restore the chamfer around all cylinder sleeve port openings.

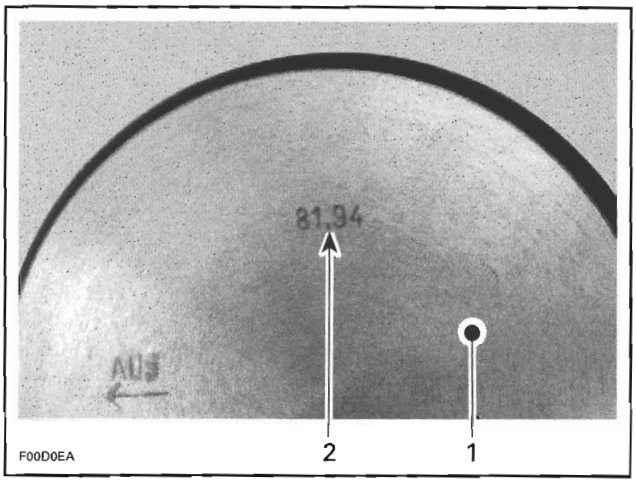


TYPICAL
1. Piston pin position
2. Measures to be compared
A. 16 mm (5/8 in)

CYLINDER/PISTON CLEARANCE

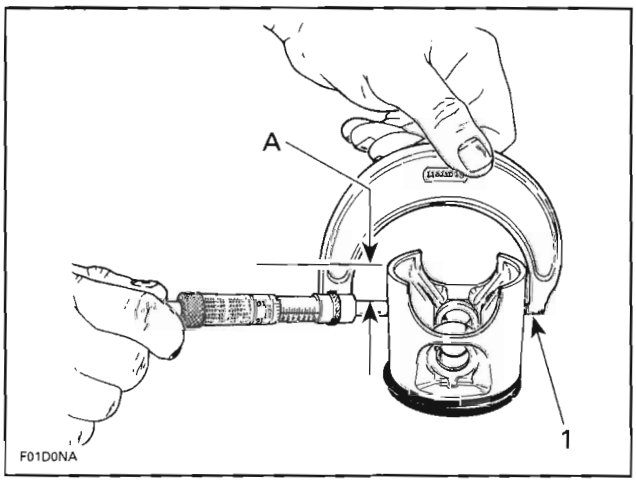
Procedure with a Used Piston

Note the piston diameter on the piston dome.



TYPICAL
1. Piston dome
2. Piston diameter

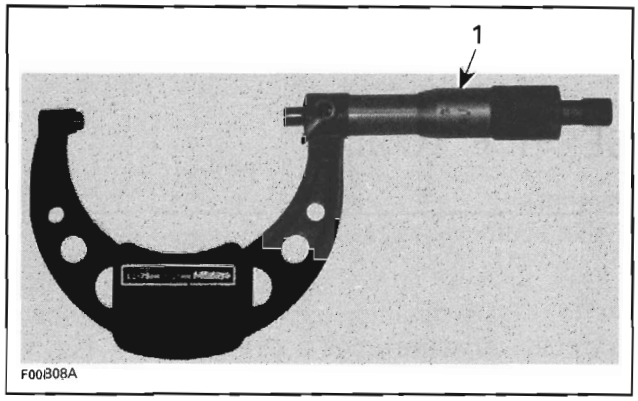
Using a micrometer, measure piston at "A" perpendicularly (90°) to piston pin.



TYPICAL
1. Measuring perpendicularly (90°) to piston pin axis
A. 15 mm (.590 in)

The measured dimension must not be less than 0.15 mm (.006 in) of the one scribed on piston dome. Otherwise, install a new piston.

If piston is within tolerance, adjust and lock a micrometer to the piston dimension.

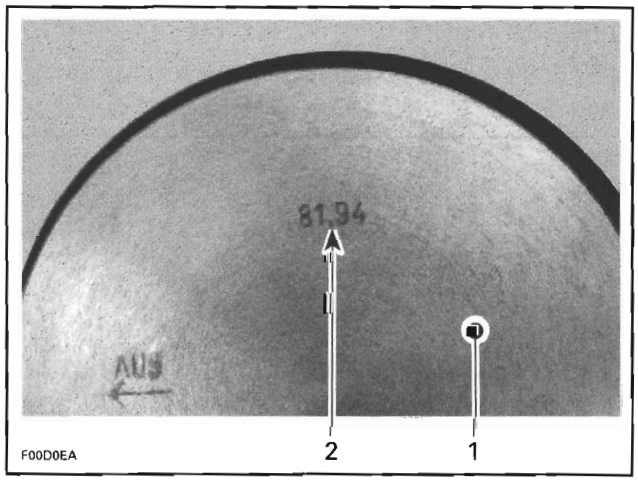


1. Micrometer set to the piston dimension

Refer to *PROCEDURE CONTINUATION WITH A NEW OR USED PISTON* further.

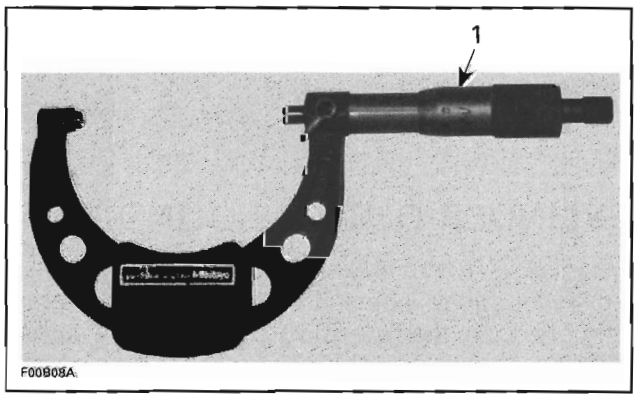
Procedure with a New Piston

Read the piston diameter on the piston dome.



TYPICAL
1. Piston dome
2. Piston diameter

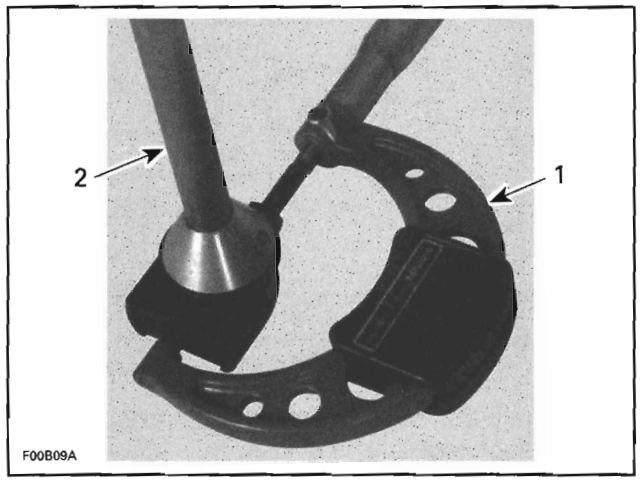
Adjust and lock a micrometer to the specified value on the piston dome.



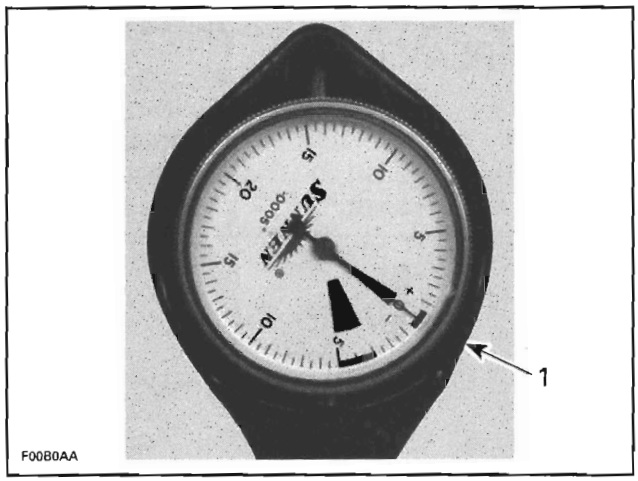
TYPICAL
1. Micrometer set to the piston dimension

Procedure Continuation with a New or Used Piston

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



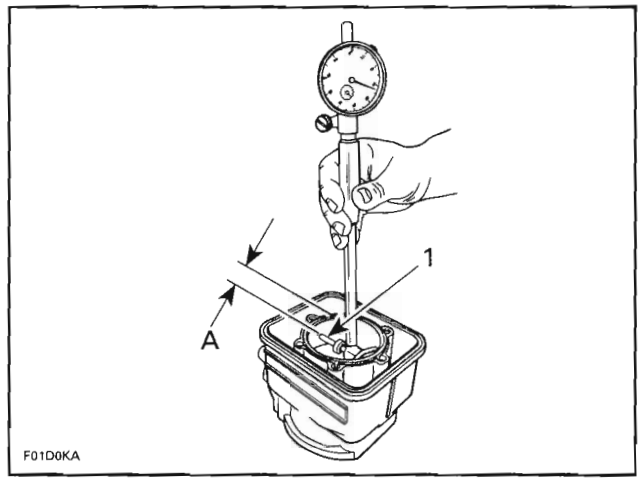
TYPICAL
1. Use the micrometer to set the cylinder bore gauge
2. Dial bore gauge



TYPICAL
1. Indicator set to 0 (zero)

IMPORTANT: Always remove cylinders from crankcase before measuring.

Position the dial bore gauge at 16 mm (5/8 in) below cylinder top edge.



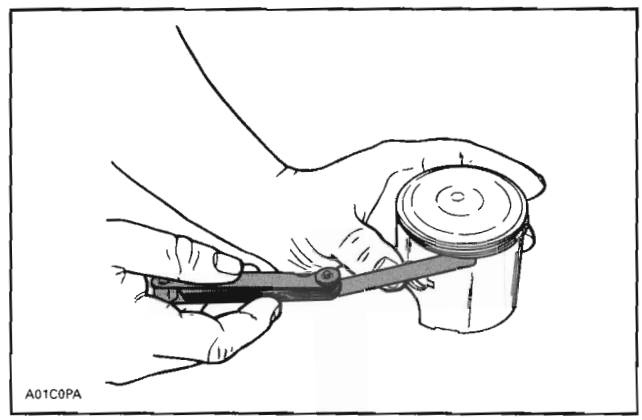
TYPICAL
1. Measuring perpendicularly (90°) to piston pin axis
A. 16 mm (5/8 in)

Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance. If clearance exceeds specified tolerance, replace cylinder or rebore. Refer to *TECHNICAL SPECIFICATIONS.*

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.

RING/PISTON GROOVE CLEARANCE

Using a feeler gauge check clearance between upper compression ring and groove. Replace piston if clearance exceeds specified tolerance. Refer to *TECHNICAL SPECIFICATIONS.*

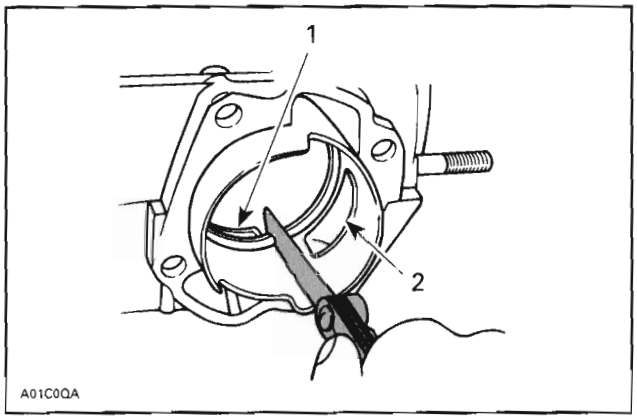


RING END GAP

Position ring halfway between transfer port and intake port.

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 specified tolerance. Refer to *TECHNICAL SPECIFICATIONS*.



1. Transfer port
2. Intake port

CRANKSHAFT DEFLECTION

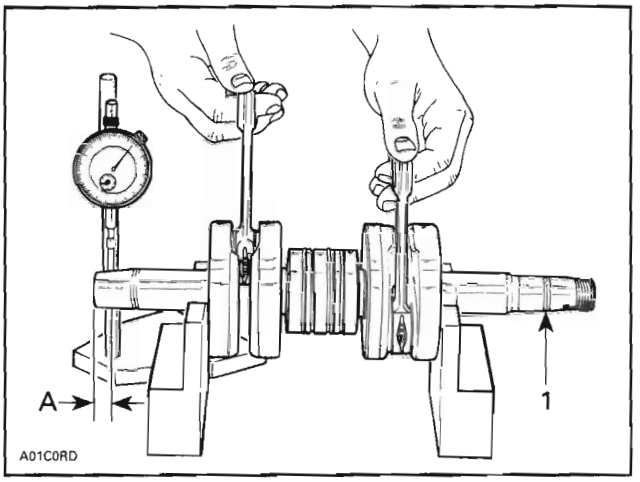
Crankshaft deflection is measured with a dial indicator (P/N 414 104 700).

Measuring (in crankcase)

First, check deflection with crankshaft in engine. If deflection exceeds the specified tolerance, recheck deflection using V-shaped blocks to determine the defective part(s). See below.

Measuring (on bench)

Once engine is disassembled, check crankshaft deflection on V-shaped blocks. If deflection exceeds the specified tolerance, it can be worn bearings or a bent crankshaft. Remove crankshaft bearings and check deflection again on V-shaped blocks to determine the defective part(s). See measurement "A" in following illustration.



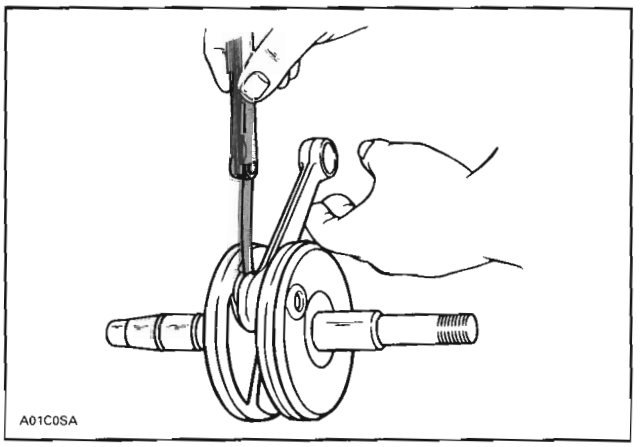
TYPICAL
1. Measure at mid point between the key and the first thread
A. 3 mm (1/8 in)

Crankshaft deflection cannot be correctly measured between centers of a lathe.

If the deflection exceeds the specified tolerance, crankshaft should be repaired or replaced.

CONNECTING ROD BIG END AXIAL PLAY

Using a feeler gauge, measure distance between thrust washer and crankshaft counterweight. If the distance exceeds specified tolerance, repair or replace the crankshaft.

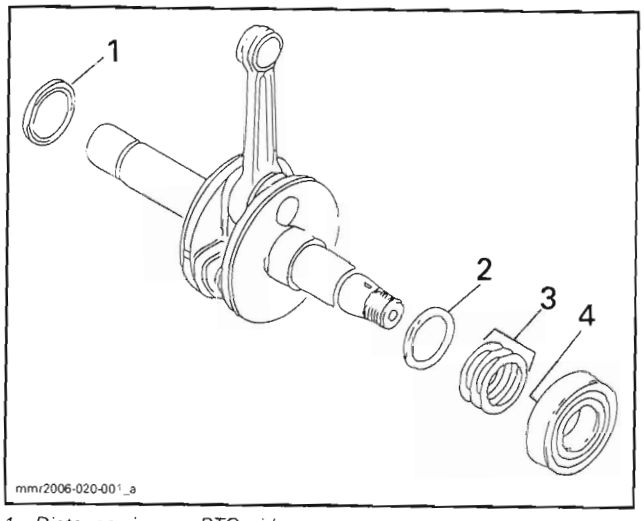


TYPICAL

CRANKSHAFT END-PLAY

Adjustment

Crankshaft end-play is adjusted with shims located between crankshaft and magneto side bearing.



1. Distance ring on PTO side
2. Distance ring on MAG side
3. Shims
4. Bearing

CAUTION: Always install end-play adjustment shims on the magneto side between bearing and crankshaft counterweight.

The following is required for the adjustment procedure:

– adjustment shims (refer to *PARTS CATALOG*)

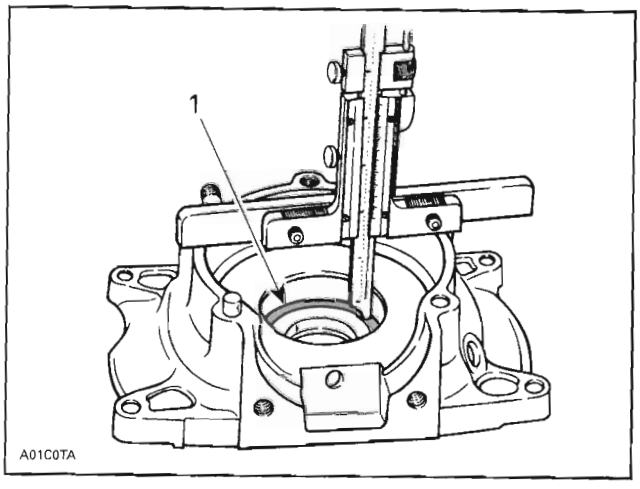
THICKNESSES AVAILABLE
0.10 mm (.004 in)
0.20 mm (.008 in)
0.30 mm (.012 in)
0.50 mm (.020 in)

– micrometer
– caliper.

Total shim thickness needed for the end-play adjustment is determined with the following procedure:

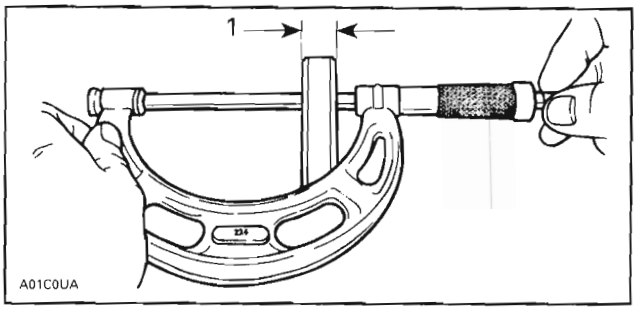
- Measure crankcase halves as illustrated (M_1 and M_2).

A standard compressed crankcase gasket will have a 0.30 mm (.012 in) thickness (M_3). **Add these measurements to obtain dimension "A".**



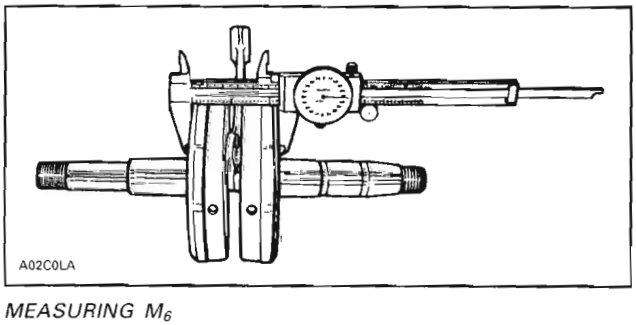
MEASURING M_1 AND M_2
1. Bearing seat

- Measure the thickness of each bearing (M_4 and M_5).



MEASURING M_4 AND M_5
1. Bearing thickness

- Measure distance between bearing shoulders on crankshaft (M_6).



MEASURING M_6

- Measure the distance ring (M_7) and adjustment shims thickness (M_8). **Add these measurements to obtain dimension "B".**
- **From dimension "A", subtract dimension "B".**

The result is the actual crankshaft end-play that must be within specification.

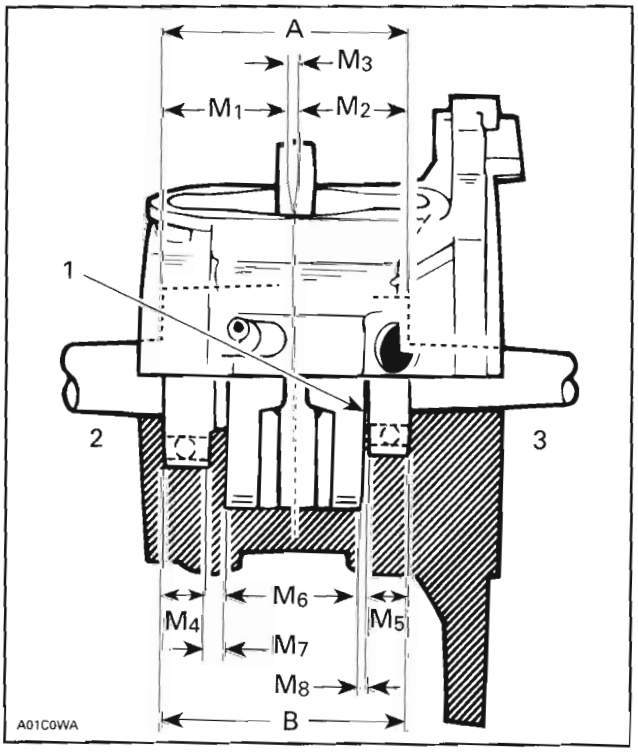
If the result is over specification, add adjustment shim(s) to reach this specification.

If the result is under specification, remove adjustment shim(s) to reach this specification.

To Summarize

A	=	$M_1 + M_2 + M_3$
B	=	$M_4 + M_5 + M_6 + M_7 + M_8$
A - B	=	Actual end-play that must be within specification

M_8 is the dimension that must be adjusted to obtain the specified crankshaft end-play.



1. End-play is adjusted with shims
2. PTO
3. MAG

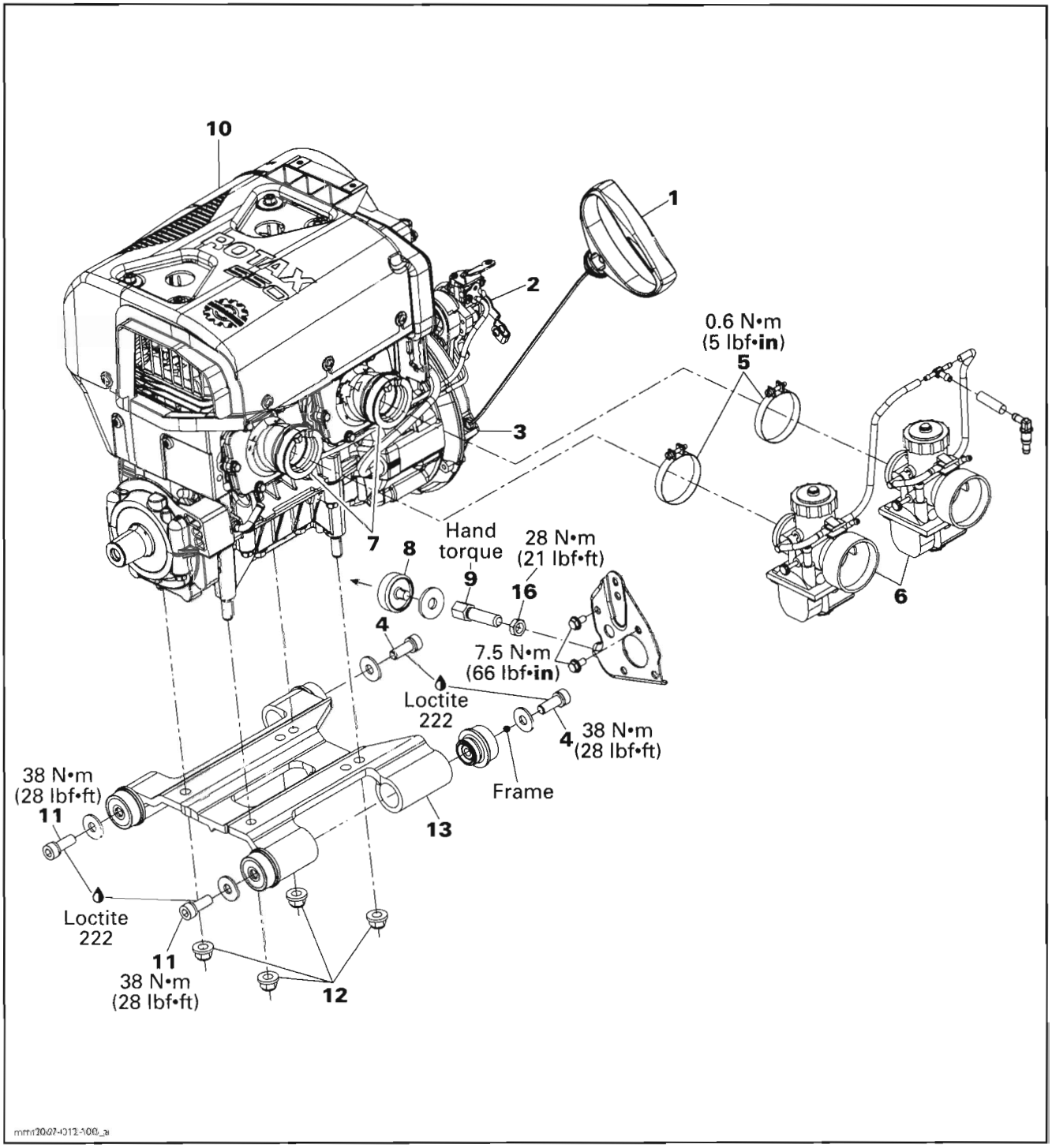
ENGINE REMOVAL AND INSTALLATION

SERVICE TOOLS

Description	Part Number	Page
ball joint installer	529 000 012	117
small hose pincher	295 000 076	114

SERVICE PRODUCTS

Description	Part Number	Page
Molykote 111	413 707 000	117


10
1
2
3
0.6 N•m
(5 lbf•in)
5
6
7
8
Hand
torque
28 N•m
(21 lbf•ft)
9
16
4
7.5 N•m
(66 lbf•in)
Loctite
222
4
38 N•m
(28 lbf•ft)
Frame
38 N•m
(28 lbf•ft)
11
13
Loctite
222
11
38 N•m
(28 lbf•ft)
12

GENERAL

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

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 strictly be adhered to.
Locking devices (e.g.: 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.

PROCEDURES

Vehicle and Engine Preparation

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

Remove the RH and the LH side panels.

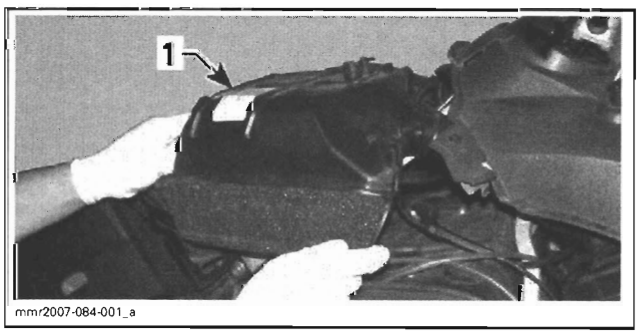
Disconnect BLACK (-) cable from battery, then the RED (+) cable.

⚠ WARNING

Always disconnect battery or starter cables exactly in the specified order, BLACK (-) cable first. It is recommended to disconnect electrical connections prior to disconnecting fuel lines.

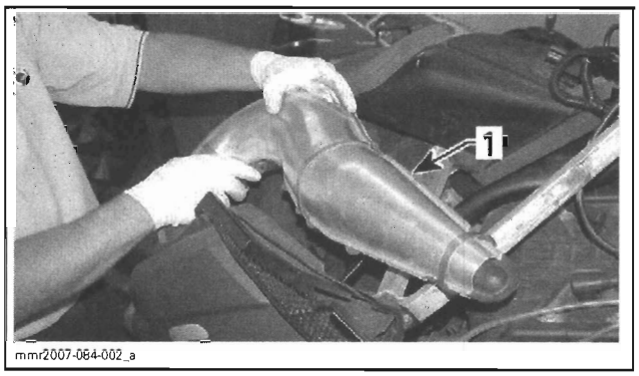
Front of Vehicle

Remove the secondary air intake silencer.



1. Secondary air intake silencer

Remove tuned pipe and manifold, refer to *EXHAUST SYSTEM*.

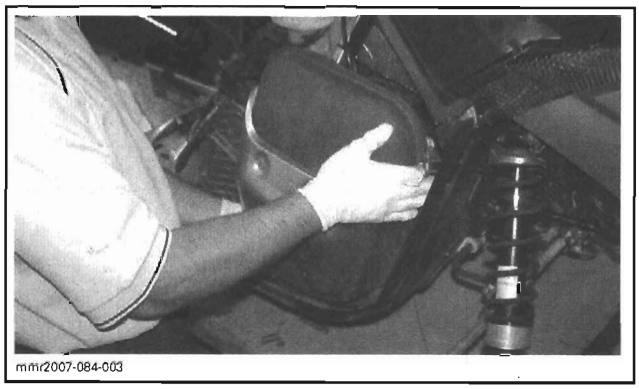


1. Tuned pipe

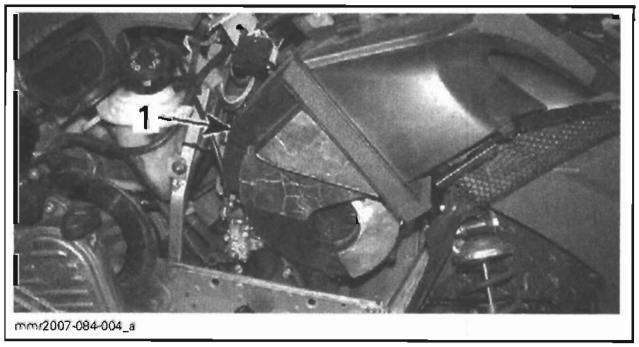
Disconnect starter cables.

Right Side of Vehicle

Remove muffler.

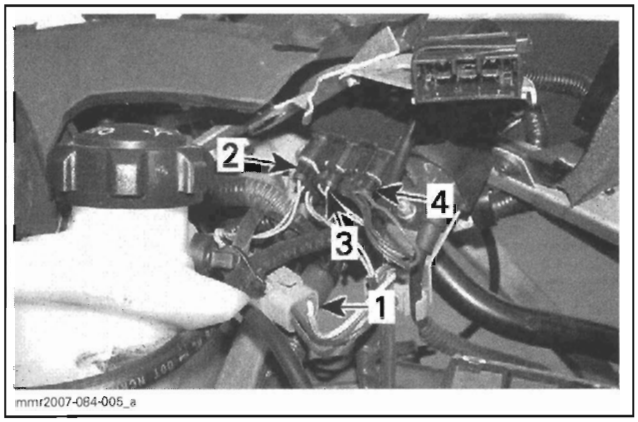


Unfasten the screws retaining the air inlet duct, lift up the retaining tabs and remove the air inlet duct.



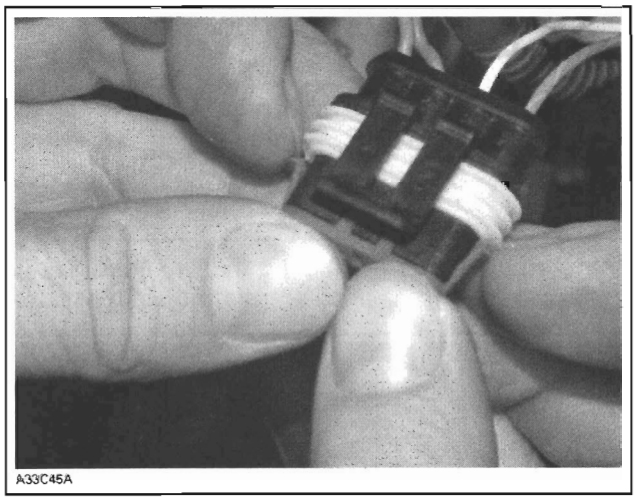
1. Air inlet duct

Unplug electrical connectors near injection oil reservoir.



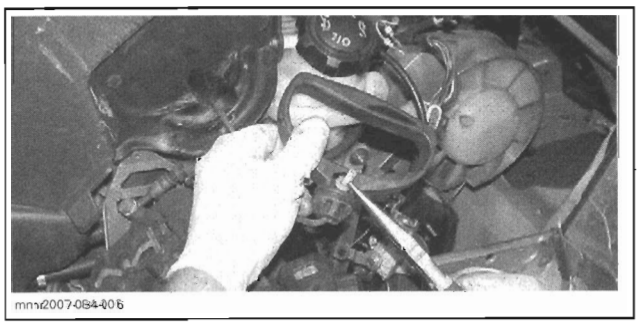
1. *Magneto connector*
2. *RER connector*
3. *Trigger coil connector*
4. *Engine stop switch connector*

On the RER connector, disconnect the BLUE/YELLOW and the WHITE/YELLOW wires from the connector. To do this, remove the lock then using a small tool extract wires from connector.

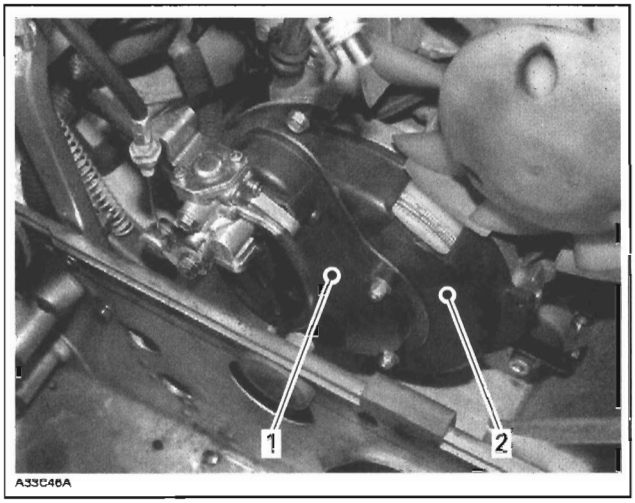


MOVE ASIDE BOTH TABS TO REMOVE LOCK

Remove the rewind starter handle **no. 1**.

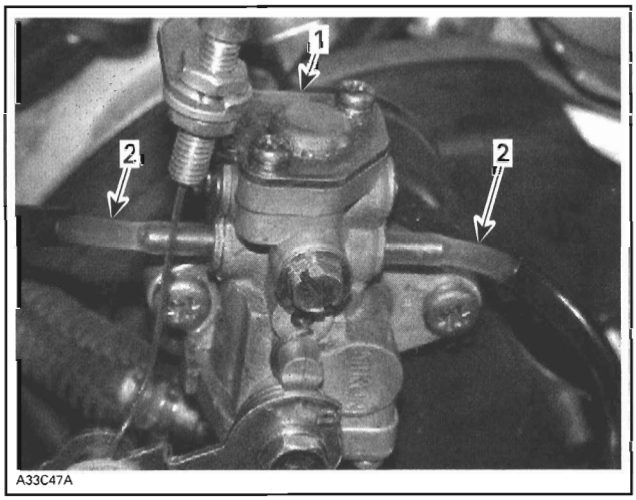


Unscrew oil pump **no. 2** from rewind starter housing **no. 3**.



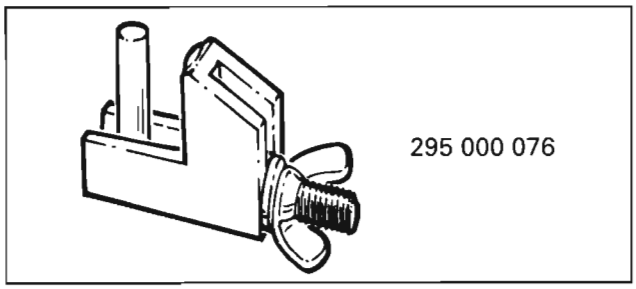
1. *Oil pump*
2. *Rewind starter housing*

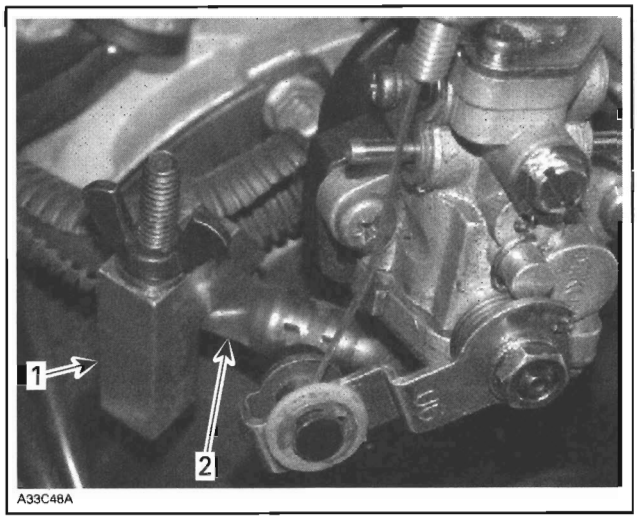
Unplug both outlet hoses from oil pump.



1. *Oil pump*
2. *Outlet hoses*

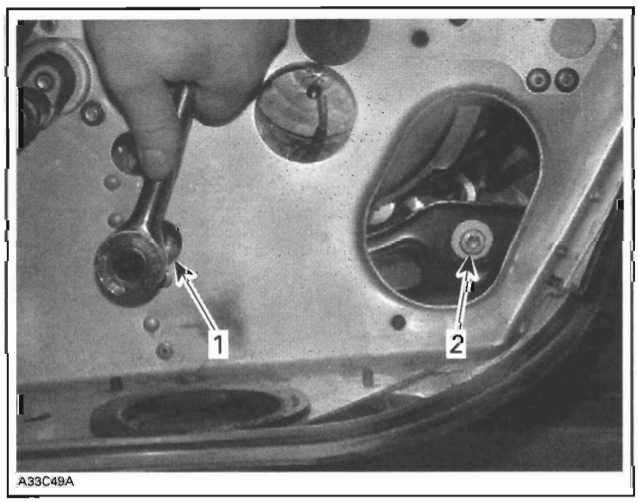
Install a small hose pincher (P/N 295 000 076) on the inlet oil line and disconnect it from oil pump. Clean any spillage.





1. Hose pincher
2. Inlet oil line

Unscrew engine support bolts **no. 4**.

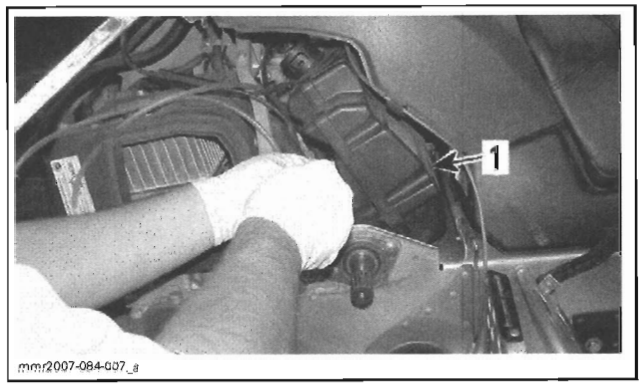


TYPICAL
1. Rear engine support bolt location
2. Front engine support bolt

Left Side of Vehicle

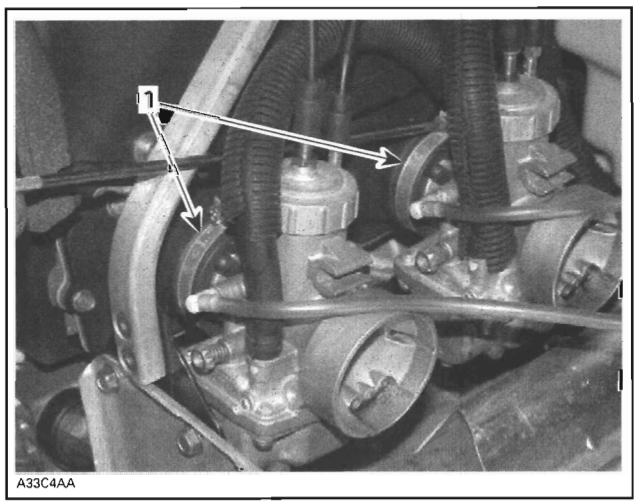
Remove drive and driven pulleys. Refer to the appropriate section.

Remove primary air intake silencer.



1. Primary air intake silencer

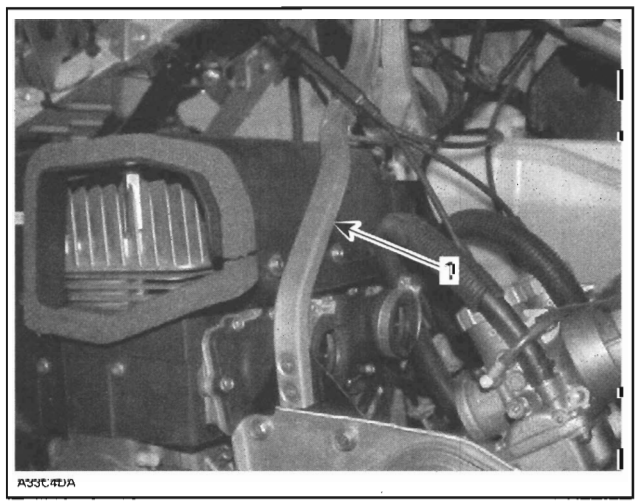
Unscrew carburetor clamps **no. 5** then remove the carburetors **no. 6** from intake adapters **no. 7**.



1. Carburetor clamps

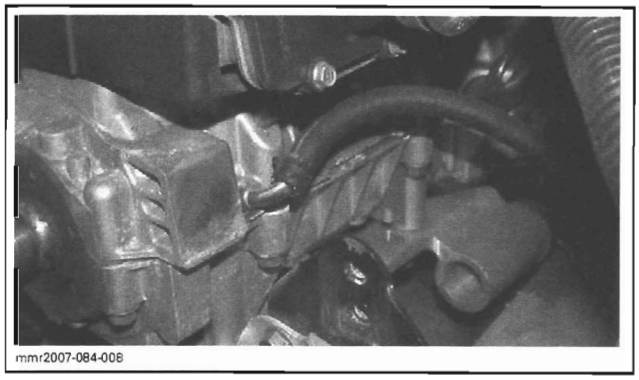
Disconnect the spark plug cables and remove spark plugs.

Unscrew the front LH side member.

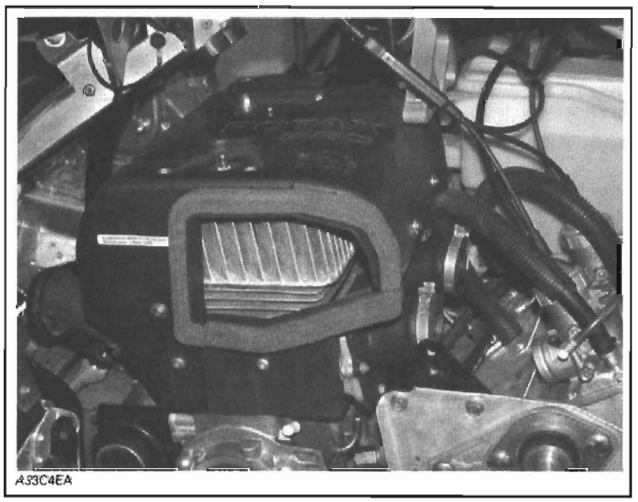


1. Front LH side member

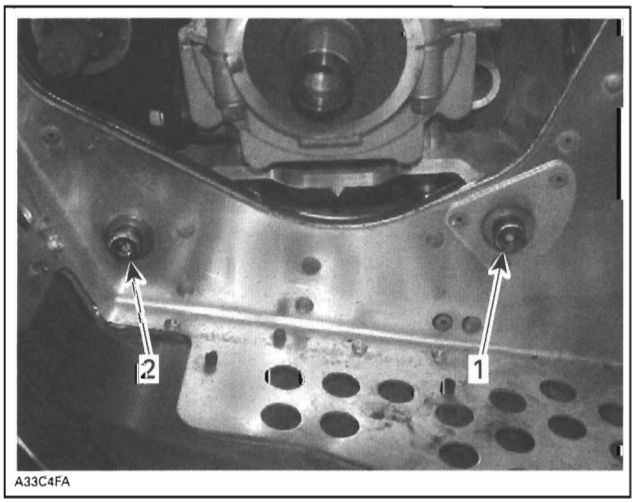
Remove the impulse line from crankcase.



Remove the cylinder cowl **no. 10**.

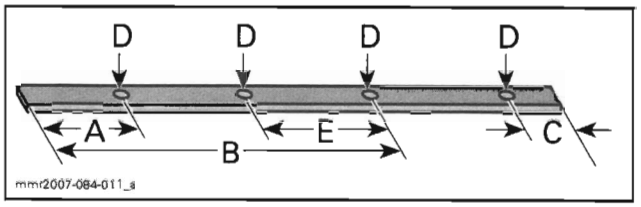


Remove the engine support bolts **no. 11**.



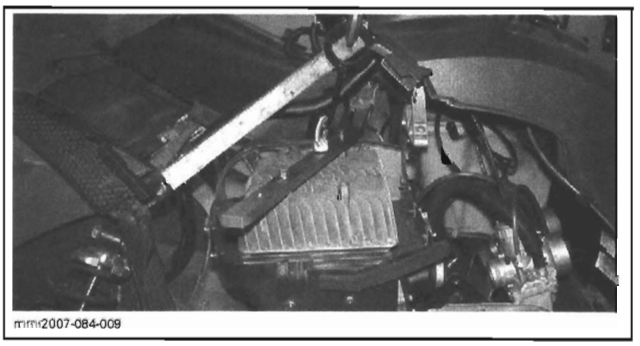
1. Rear engine support bolt
2. Front engine support bolt

Use the following illustration to fabricate a lifting tool.



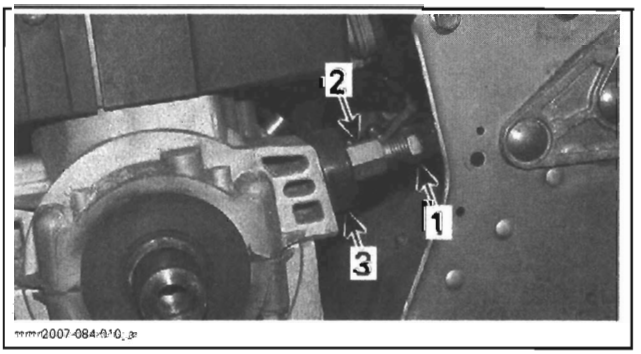
FLAT BAR 152 x 25.4 x 13 mm (16 x 1 x 1/2 in)
A. 51 mm (2 in)
B. 260 mm (10-1/4 in)
C. 38 mm (1-1/2 in)
D. Diameter: 13 mm (1/2 in)
E. 105 mm (4-1/8 in)

Install the lifting tool and attach hoist.



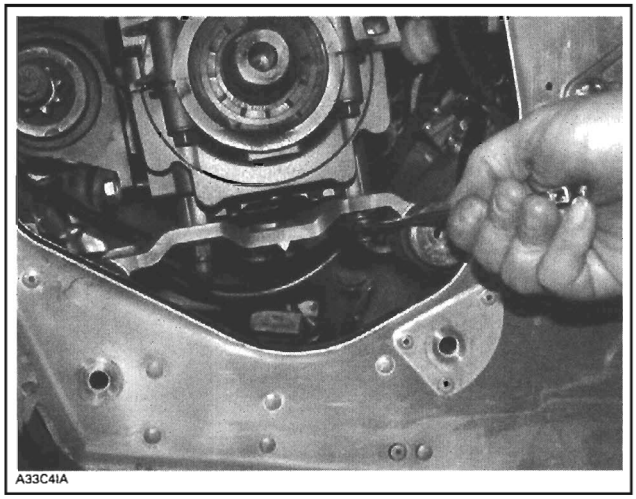
Lift up the engine.

Unscrew jam nut and remove the engine stopper.



1. Jam nut
2. Screwed rod
3. Rubber damper

Unscrew the nuts **no. 12** retaining engine support **no. 13** to engine.


A33C4IA

Remove the support from engine and lower it in frame.

Remove engine from vehicle.

Inspection

Check if engine support **no. 13** is cracked, bent or damaged. Replace if necessary.

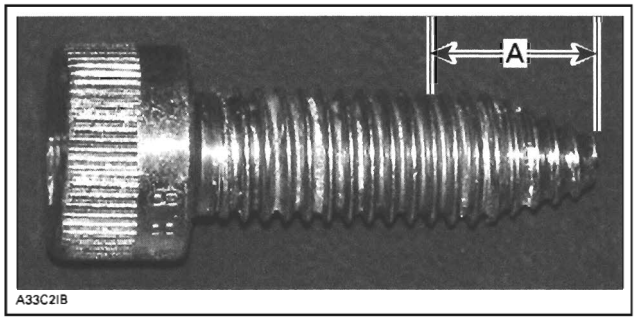
Check rubber mounts **no. 14** on engine support. Replace them if brittle, cracked or damaged.

Installation

To install engine in vehicle, reverse the removal procedure. However, pay attention to the following.

Install engine support under engine then torque engine support nuts to 35 N•m (26 lbf•ft).

Before installing engine support bolts, apply as shown in the following illustration.



A33C2IB

A. Apply Loctite in this area, 10 ± 1.5 mm (.39 ± .059 in)

Torque engine support bolts to 38 N•m (28 lbf•ft).

Hand torque engine stopper **no. 9** then torque its nut **no. 15** to 28 N•m (21 lbf•ft).

Reinstall all removed parts by using the appropriate component/system reinstallation procedures described in this shop.

ENGINE SUPPORT

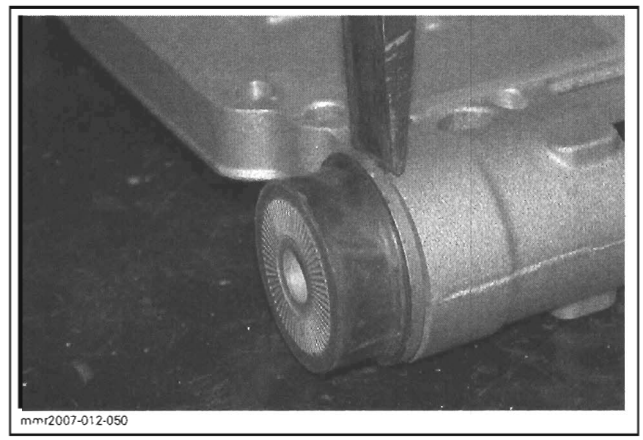
Engine Support Removal

Remove engine from vehicle.

Unscrew nuts securing the engine support.

Rubber Mount Replacement

Install the support on a flat surface and using a chisel remove the rubber mount.

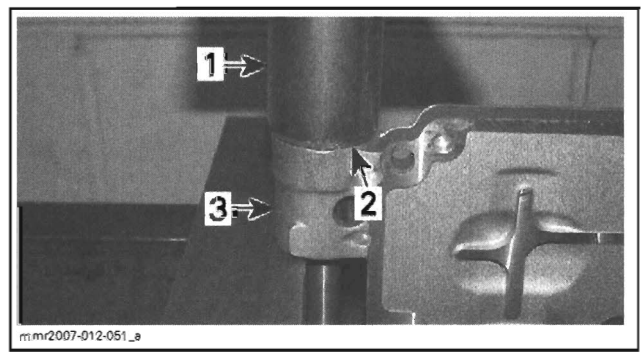

mmr2007-012-050

It is recommended to replace all rubber mounts at the same time.

Before installing the rubber mount, file chisel marks on engine support.

Using a press and the ball joint installer (P/N 529 000 012), press the rubber mount into engine support.

Support the engine support to avoid damaging it during the installation.



mmr2007-012-051_a

1. Special tool (P/N 529 000 012)
2. Rubber mount
3. Engine support

Engine Support Installation

Install the engine support on engine and torque nuts to 35 N•m (26 lbf•ft).

ENGINE LEAK TEST

SERVICE TOOLS

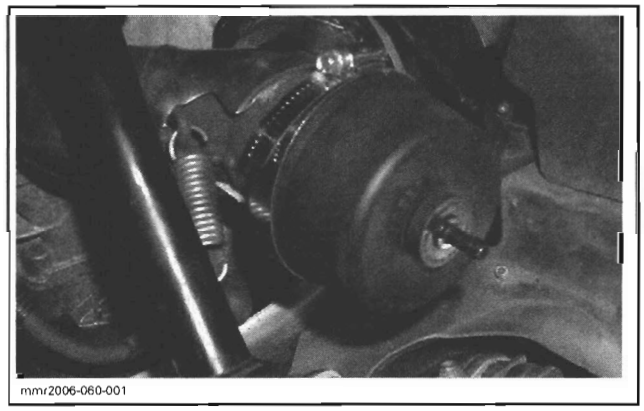
Description	Part Number	Page
intake plug	529 011 000	119
manifold plug	529 035 961	119
small hose pincher	295 000 076	119
vacuum/pressure pump	529 021 800	120

Prior to take apart an engine, it is important to proceed with a leak test to diagnose engine problems. Whenever the engine is disassembly, a leak test should be performed after reassembly.

PREPARATION

Remove tuned pipe. Refer to *EXHAUST SYSTEM.*

Install the manifold plug (P/N 529 035 961) over exhaust manifold.

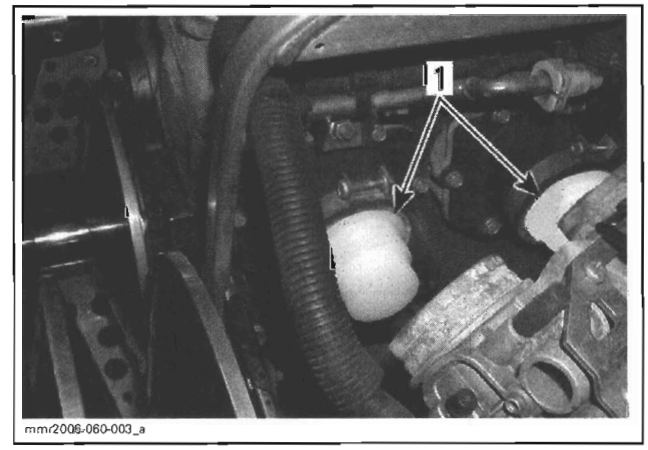


TYPICAL

Open the LH side panel and remove primary air intake silencer. Refer to *AIR INTAKE SYSTEM.*

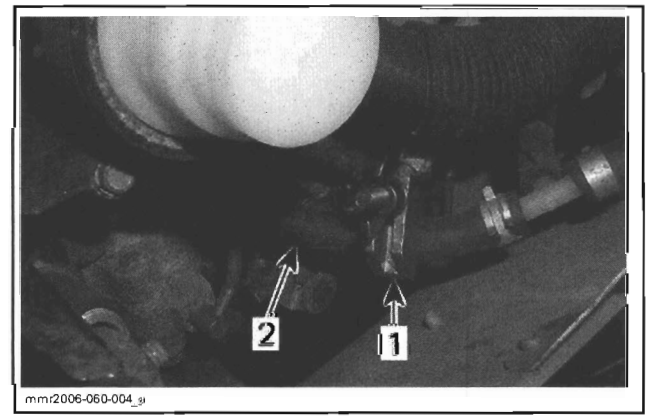
Remove carburetors.

Insert an intake plug (P/N 529 011 000) in each intake adaptors. Tighten with existing clamps.



TYPICAL
1. Intake plug

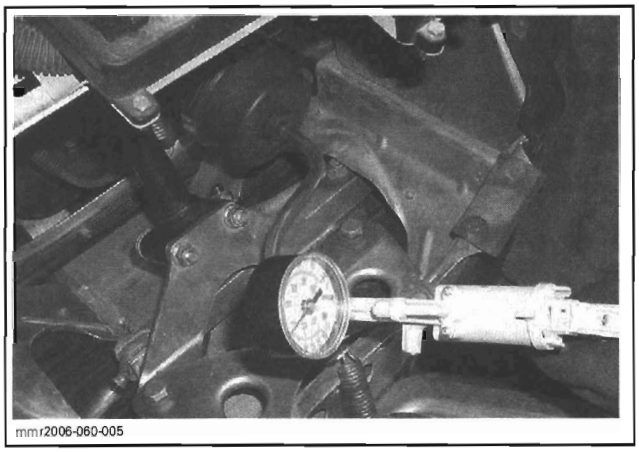
Using a small hose pincher (P/N 295 000 076), block impulse hose.



1. Small hose pincher
2. Impulse hose

PROCEDURE

Install the vacuum/pressure pump (P/N 529 021 800) on manifold plug.



TYPICAL

Activate pump and pressurize engine to 34 kPa (5 PSI). Do not exceed this pressure.

Engine must stand this pressure during 3 minutes. If pressure drops before 3 minutes, spray a soapy solution on tester kit (manifold and intake plugs, vacuum/pressure pump and its hose).

- If tester kit (manifold and intake plugs, hoses and pump) is leaking, bubbles will indicate where leak comes from.
- If tester kit is not leaking, check engine, see below for procedure.
- If there is a leak at the tested location, it is recommended to continue testing next items before overhauling engine. There is a possibility of more than one leak.
- If there is no leak at the tested location, continue pumping to maintain pressure and continue with next items until leak is found.

Engine

Check the following:

- All jointed surfaces and screw/stud threads of engine:
  - spark plug bases, insulators
  - cylinder head
  - pistons and cylinders
  - crankcase halves (housing and joint)
  - oil injection pump mounting flange.
- Crankshaft outer seals. One behind drive pulley and the other behind magneto.

If leak still persists, it indicates a defective casting somewhere in engine. Disassemble engine and carefully check for defects in castings. Pay attention to tapped holes which may go through engine sealed area and thus lead to leakage.

After engine is repaired, always recheck for leakage.

AIR INTAKE SYSTEM

PROCEDURES

AIR FILTER

Removal

The air filter is located inside secondary air intake silencer.

Open LH side panel and pull air filter out of secondary air intake silencer.

Cleaning

Blow low pressure compressed air on filter to clean it.

Replace air filter as required.

NOTE: If the filter is very dirty, clean the interior of secondary air intake silencer at the same time.

Installation

The installation is the reverse of the removal procedure.

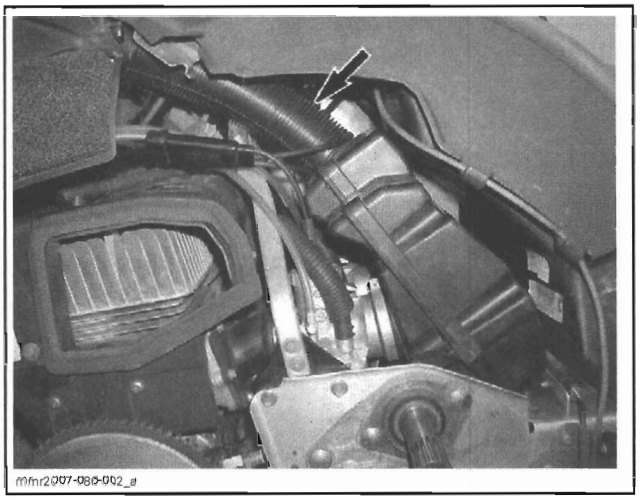
PRIMARY AIR INTAKE SILENCER

Removal

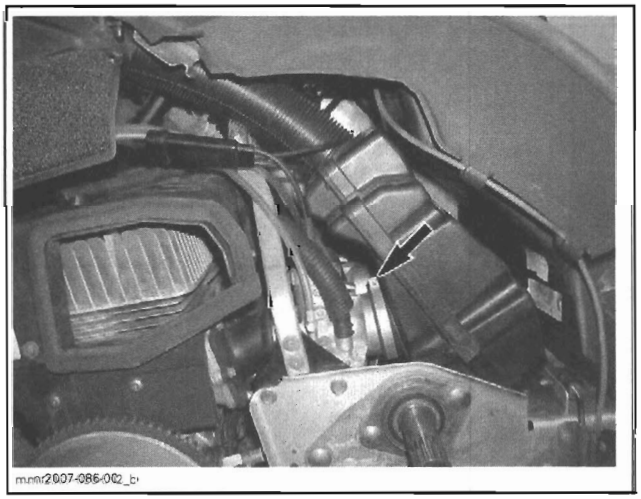
Open LH side panel.

Remove driven pulley. Refer to *DRIVE SYSTEM*.

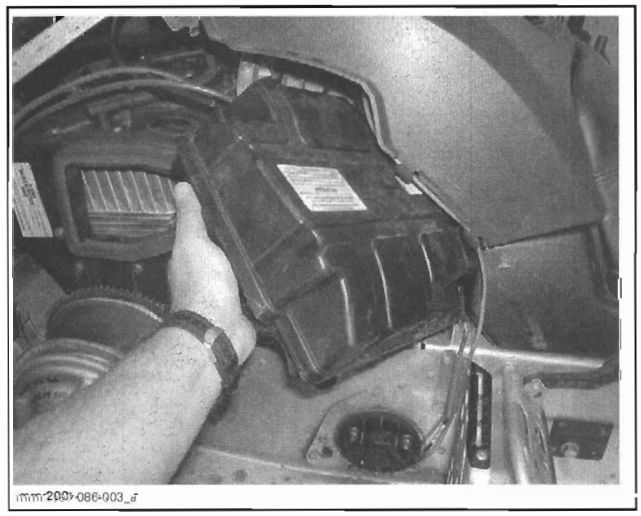
Disconnect secondary air intake silencer.



Unscrew clamps that retain air intake adaptor to carburetors.



Separate primary air intake silencer from carburetors and pull it out of vehicle.



Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

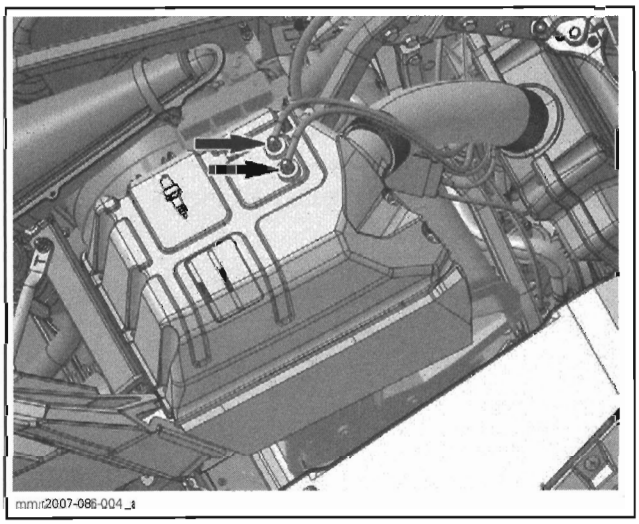
Tighten clamps to 0.8 N•m (7 lbf•**in**).

SECONDARY AIR INTAKE SILENCER

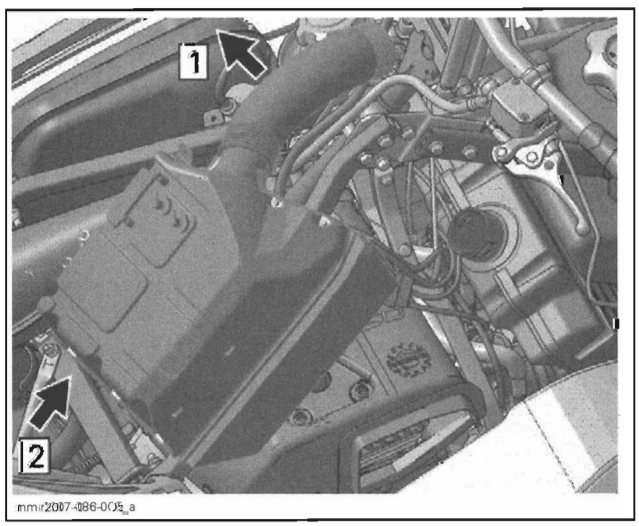
Removal

Remove hood and LH side panel. Refer to *BODY*.

Disconnect vent tubes.



Remove air intake silencer.

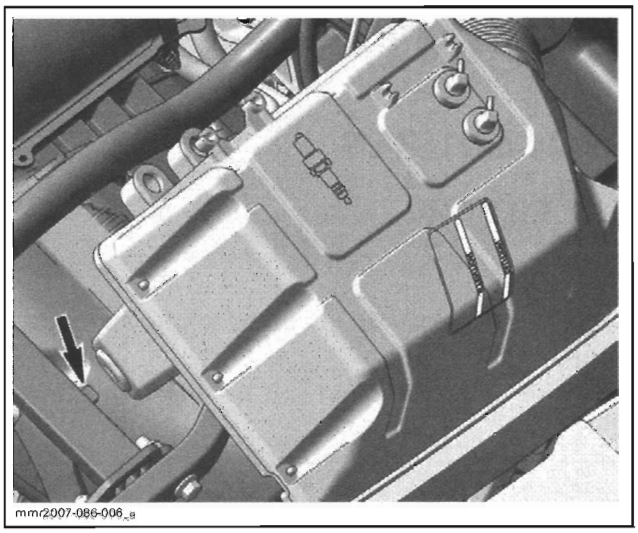


Step 1: Lift back of air intake silencer to disconnect tube
Step 2: Push rearward

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

First insert grommet of air intake silencer to chassis tab.



Ensure to reconnect vent tubes.

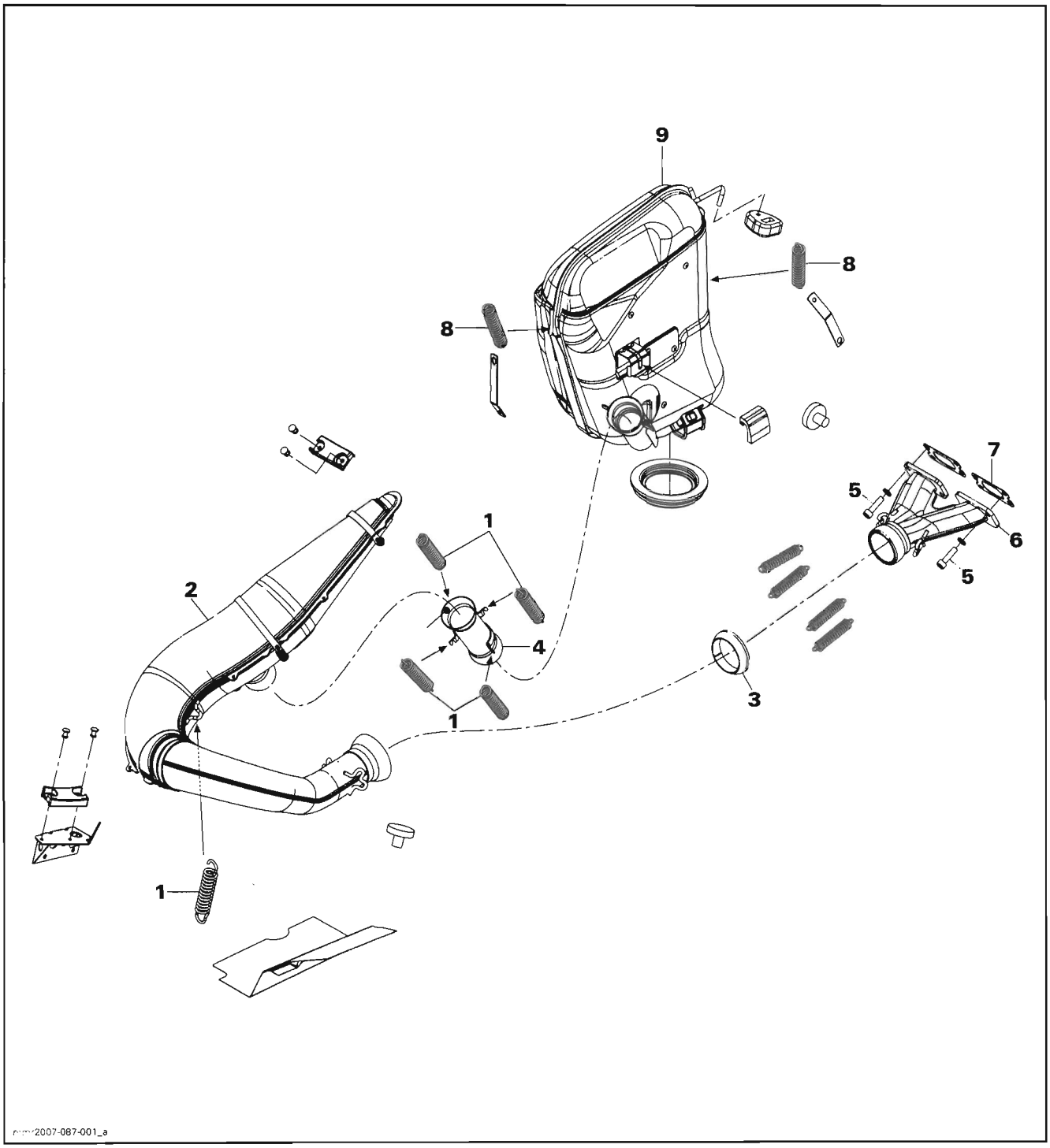
EXHAUST SYSTEM

SERVICE TOOLS

Description	Part Number	Page
exhaust spring installer/remover	529 035 401	125–127

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 5920 (RTV high temperature sealant)	293 800 090	126


9
8
8
7
5
6
5
1
2
4
1
3
1
mmr2007-087-001_a

GENERAL

⚠ WARNING

To avoid potential burns, never touch exhaust system components immediately after the engine has been run because these components are very hot. Let engine and exhaust system cool down before performing any servicing.

During assembly/installation, use the torque value and service products as in the exploded view.

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

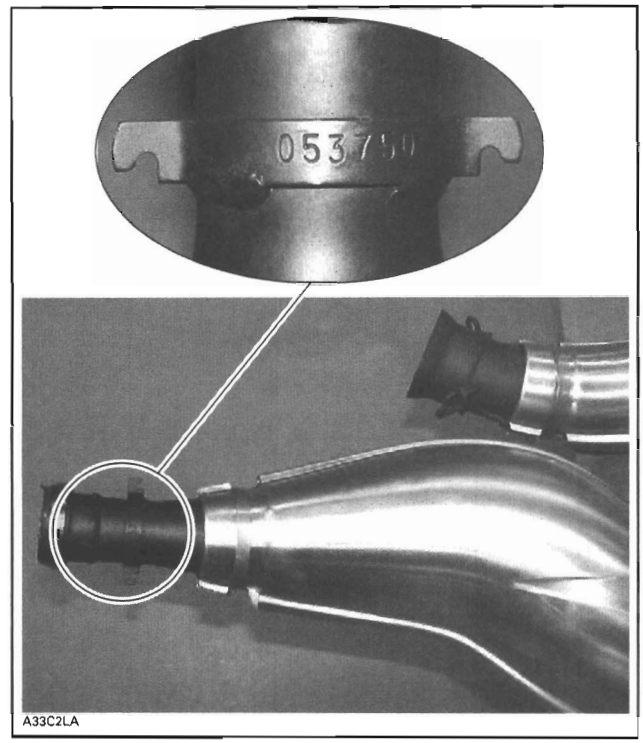
NOTE: On applicable models, it is good practice to check for fault codes using B.U.D.S. software as a first troubleshooting step. Refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS*.

PROCEDURES

TUNED PIPE

Identification

Each tuned pipe is identified by a number. To use the proper tuned pipe with the proper vehicle, check the number on the welded clamp at the end of tuned pipe. This number depicts the 6 last digits of the BRP part number.



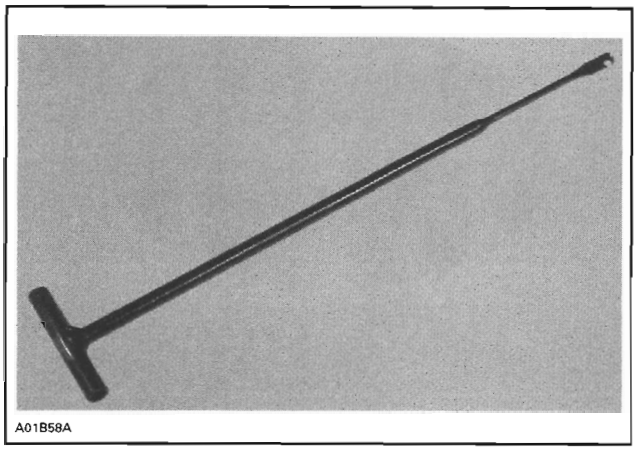
TYPICAL

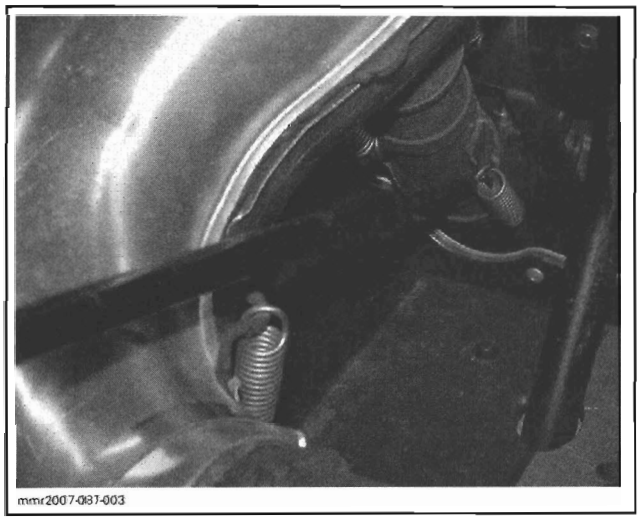
Removal

Open hood and right side panel.

Remove brace.

Remove exhaust bottom springs no. 1 using exhaust spring installer/remover (P/N 529 035 401).





NOTE: Do not unhook exhaust pipe **no. 4** from tuned pipe needlessly.

Remove tuned pipe **no. 2**.

Remove exhaust gasket **no. 3** if applicable.

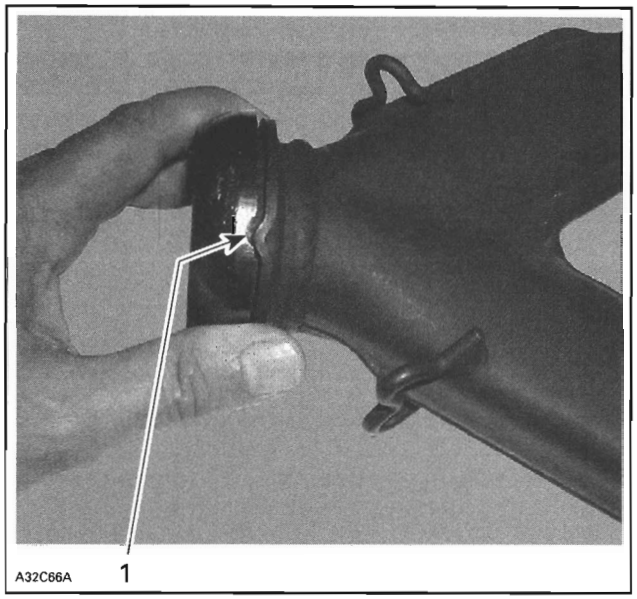
Inspection

Check tuned pipe shield for damages.

Check tuned pipe ends for cracks or damages.

Installation

Install doughnut shaped exhaust gasket **no. 3** with both of its notches aligned with Y-manifold protrusions.



1. Align notches

If the gasket is damaged, replace it.

Apply Loctite 5920 (RTV high temperature sealant) (P/N 293 800 090) on gasket contact surfaces.

Install all exhaust springs using exhaust spring installer/remover (P/N 529 035 401).

MANIFOLD

Removal

Remove tuned pipe **no. 2**.

Remove doughnut shaped exhaust gasket **no. 3**.

Remove manifold screws **no. 5**

CAUTION: Heat screws for 30 seconds before loosening to prevent screw breakage.

Remove manifold **no. 6**.

Remove gaskets **no. 7**.

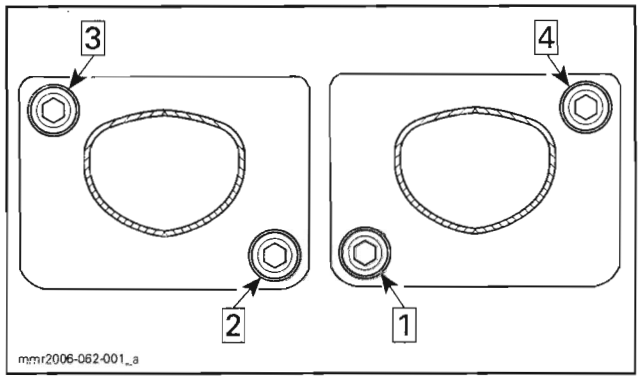
Inspection

Check if the manifold is cracked or damaged. Replace if necessary.

Installation

Install the manifold with new gaskets.

Torque manifold screws **no. 5**.



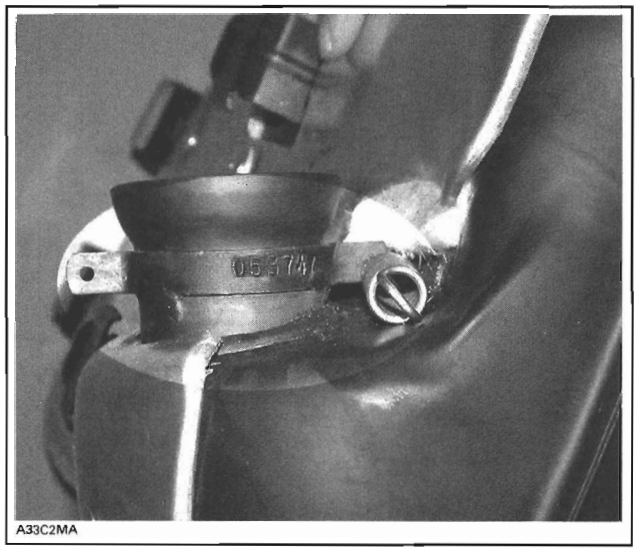
ENGINE	TORQUE
552	22 N•m (16 lbf•ft)

Install tuned pipe.

MUFFLER

Identification

Each muffler is identified by a number. To use the proper muffler with the proper vehicle, check the number on the welded clamp at the end of muffler. This number depicts the 6 last numbers of BRP part number.



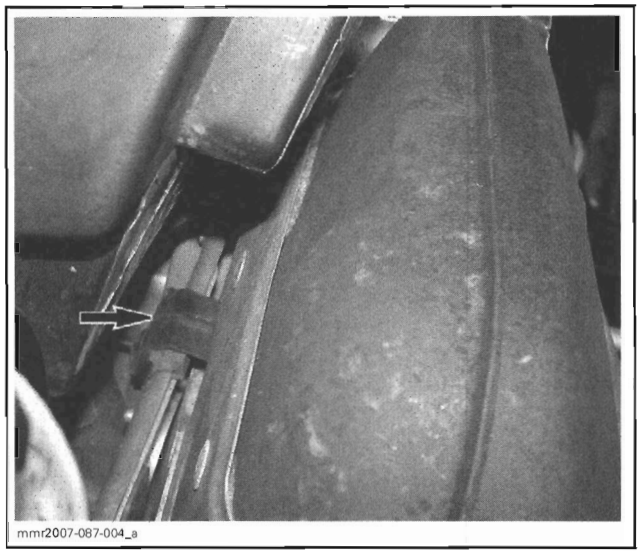
TYPICAL

Removal

Remove tuned pipe **no. 2**.

Remove springs **no. 8** retaining the muffler **no. 9** to chassis. Use exhaust spring installer/remover (P/N 529 035 401).

Remove the muffler by first lifting it to unhook and then pulling it out.



FIRST LIFT MUFFLER TO UNHOOK HERE

Inspection

Check the muffler for cracks or other damages.

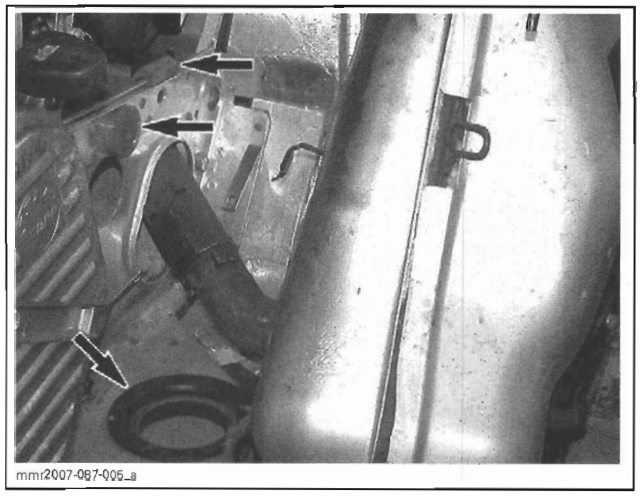
Check springs condition. Ensure they well retain exhaust parts.

Check muffler rubber pads and grommet condition.

Installation

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

Ensure rubber pads and grommet are in position before installing muffler.



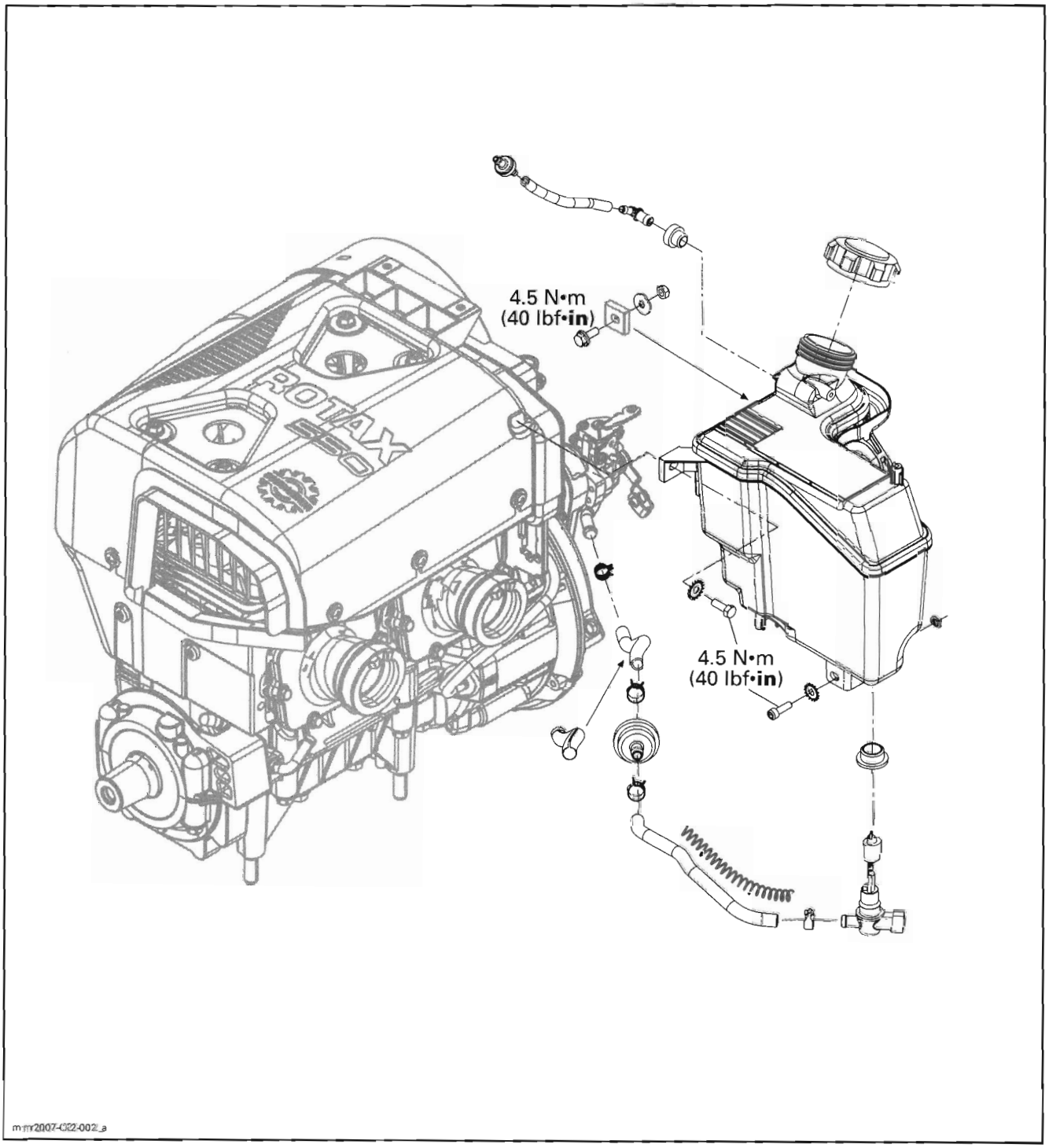
OIL INJECTION SYSTEM

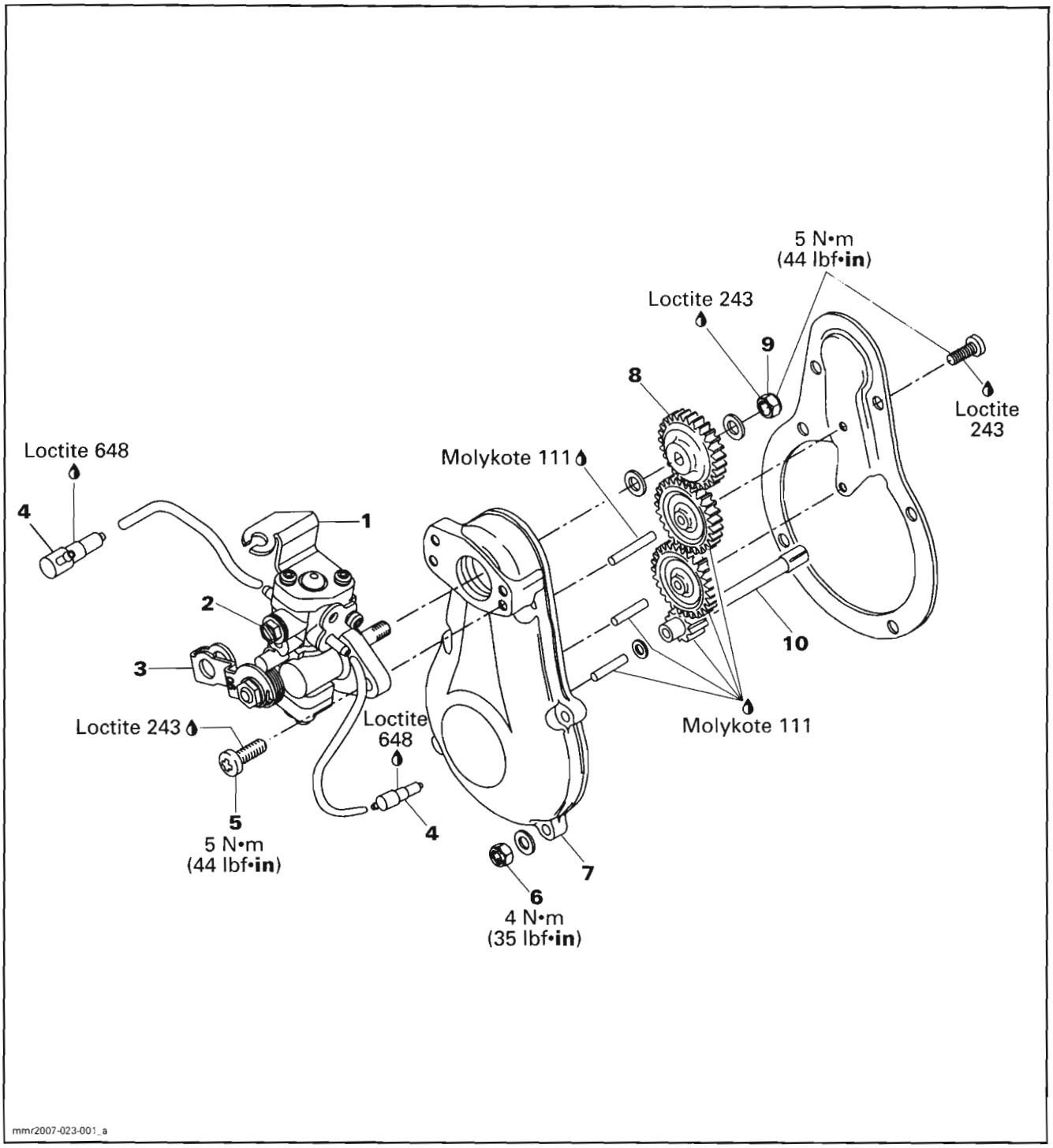
SERVICE TOOLS

Description	Part Number	Page
gear holder	529 036 061	136
leak testing kit	529 033 100	132
multimeter Fluke 111	529 035 868	134
small hose pincher	295 000 076	132, 135
vacuum/pressure pump	529 021 800	132, 137

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	136
Loctite 648 (green)	413 711 400	137
pulley flange cleaner	413 711 809	137


4.5 N•m
(40 lbf•in)
4.5 N•m
(40 lbf•in)
ROTAX
mmr2007-022-002_a


5 N•m
(44 lbf•in)
Loctite 243
9
8
Loctite
243
Loctite 648
4
1
Molykote 111
2
3
10
Loctite 243
Loctite
648
Molykote 111
5
5 N•m
(44 lbf•in)
4
7
6
4 N•m
(35 lbf•in)
mmr2007-023-001_a

GENERAL

During assembly/installation, use the torque values and service products as 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 strictly be adhered to.
Locking devices (e.g.: 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.

⚠ WARNING

Wipe off any oil spills. Oil is highly flammable.

CAUTION: Do not use a hose pincher on inlet/outlet hoses. This would damage the spring inside hose.

NOTE: The following procedures can be done without removing the engine from chassis.

OIL TYPE

MODEL	OIL TYPE
550F	All XP-S 2-stroke oil (synthetic, synthetic blend or mineral) can be used(1) (2)

(1) If XP-S 2-stroke oil (synthetic, synthetic blend or mineral) is not available, API TC high-quality low ash two-stroke injection oil may be used.

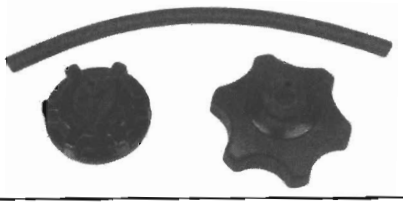
(2) XP-S synthetic 2-stroke oil, XP-S synthetic blend 2-stroke and XP-S mineral injection oil are compatible, they can be mixed together.

INSPECTION

OIL SYSTEM LEAK TEST

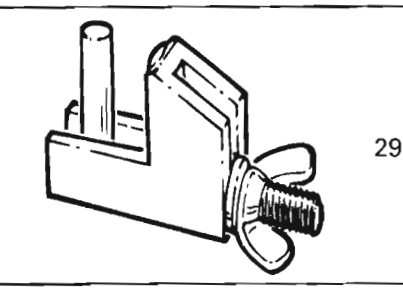
The following test will indicate any leak from oil injection system.

Install on oil reservoir a special cap from the leak testing kit (P/N 529 033 100).

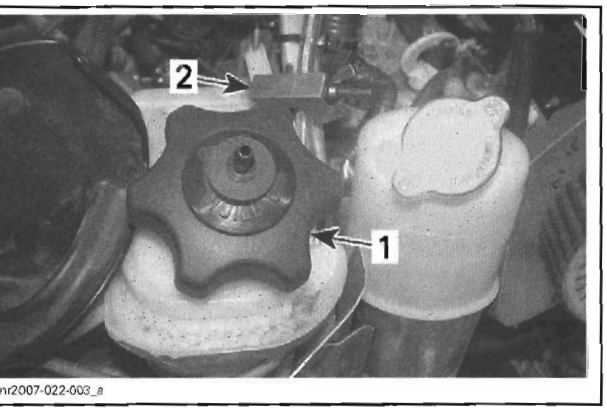


529 033 100

Install a small hose pincher (P/N 295 000 076) on check valve outlet hose.

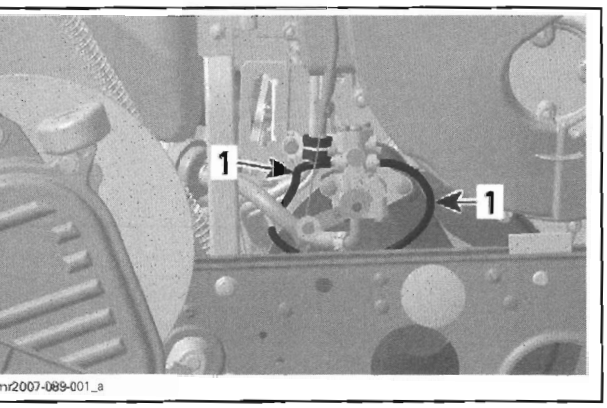


295 000 076



TYPICAL
1. *Special cap on reservoir*
2. *Hose pincher on check valve outlet hose*

Remove the muffler to gain access to the oil pump hoses. Install a small hose pincher (P/N 295 000 076) on each outlet hoses.



TYPICAL
1. *Outlet hoses of oil pump*

Connect the vacuum/pressure pump (P/N 529 021 800) to special cap.

529 021 800

Pressurize oil system as follows.

PRESSURE	TIME TO HOLD PRESSURE
21 kPa (3 PSI)	3 minutes

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

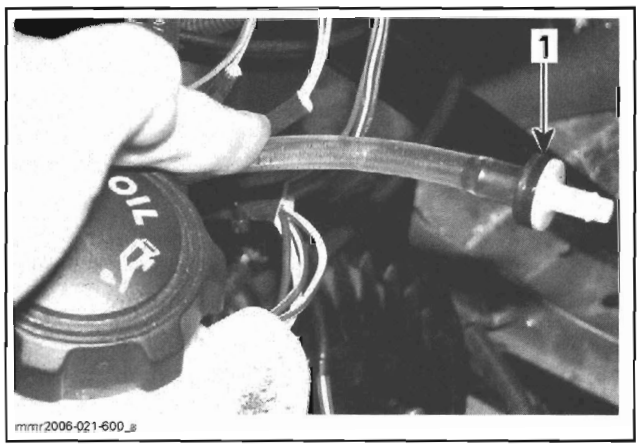
NOTE: An oil pump shaft test must be done to complete the oil system leak test. Refer to *LEAK TEST* and *ENGINE DIMENSION MEASUREMENT* for the procedure.

Check Valve

It allows air to get into the reservoir. To verify this one-way check valve, remove it along with the hose. Make sure that it holds pressure and that it does not let air go through.

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

When replacing/installing check valve, insert its black side into vent line.



TYPICAL
1. Black side here

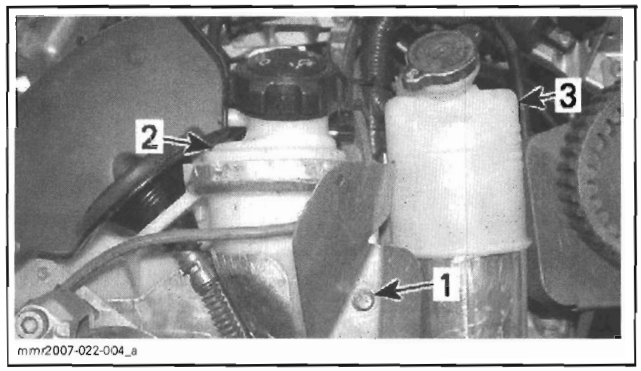
PROCEDURES

OIL RESERVOIR

Reservoir Removal

Empty oil reservoir by siphoning injection oil.

Remove:
- primary air intake silencer
- upper screw securing oil reservoir



1. Upper screw
2. Oil reservoir
3. Coolant reservoir

- rewind starter support and grip
- hose protector support
- electronic module (if the module is located on the reservoir)
- lower fasteners.

NOTE: Cut the ties retaining the wiring harness if necessary.

Pull oil reservoir and unplug all hoses.

Reservoir Installation

For installation, reverse the removal procedure.

Bleed oil pump. Refer to *OIL PUMP*.

OIL LEVEL SENSOR

Sensor Removal

To remove the oil level sensor, use the following procedure.

Remove oil reservoir, as mentioned above.

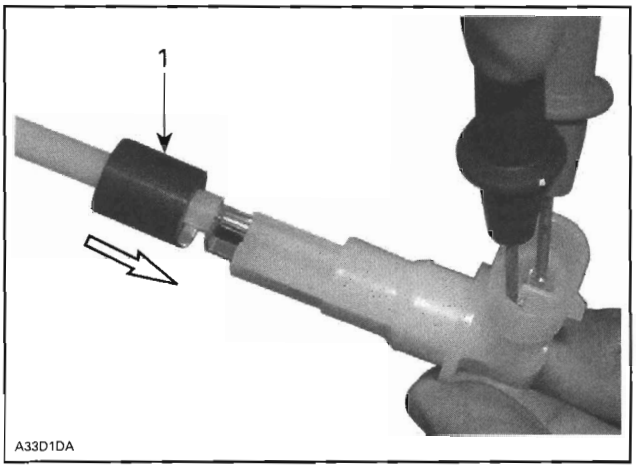
Unplug sensor connector.

Pull sensor out of reservoir.

Before replacing the oil level sensor, check it according to the following procedure:

CAUTION: Do not remove or bend the reed switch protective float magnet. It can damage the reed switch glass.

With the float magnet ring at the lowest position and using the multimeter Fluke 111 (P/N 529 035 868), measure the resistance of the oil level sensor.



1. Float magnet at the lowest position

MEASURE	SENSOR CONDITION
Closed circuit (close to 0 Ω)	Good
Open or resistive circuit more than 0.5 Ω	Defective

Sensor Installation

For installation, reverse the removal procedure.

OIL FILTER

Filter Removal

Remove primary air intake silencer and carburetor.

Siphon injection oil reservoir.

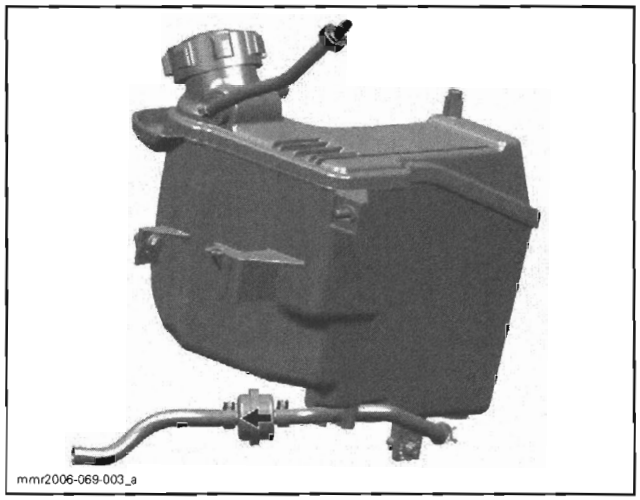
Disconnect oil filter hose from the oil level sensor.

Disconnect filter from oil hoses and remove it.

Filter Installation

For installation, reverse the removal procedure.

The filter must be installed with the arrow pointing toward the pump.



Bleed oil pump. Refer to *OIL PUMP*.

OIL INJECTION PUMP

Oil Pump Identification

Different engines need different pumps. See identification on lever **no. 3**.

CAUTION: Always mount proper pump on engine.

ENGINE TYPE	OIL PUMP IDENTIFICATION
552	06

Oil Pump Verification

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

On Vehicle

NOTE: Main oil line must be full of oil. See bleeding procedure further.

Lift rear of vehicle and support with a mechanical stand. Unplug small oil lines from pump. Start engine and stop it as soon as it fires.

Check that oil in small oil lines has been sucked up (this will be indicated by a clear section of small oil lines). Repeat the procedure until this condition is attained.

Reconnect small oil lines, start engine and run at idle while holding the pump lever **no. 3** in fully open position. Oil columns must advance into small oil lines.

If not, remove injection oil pump **no. 1** and check the pump gear **no. 8** and drive shaft (if applicable) for defects, replace as necessary. Test pump as described below.

NOTE: Through normal use, oil level must not drop in small tubes. If oil drops, verify injection nozzle **no. 4** operation. Replace as necessary.

Test Bench

Connect a hose filled with injection oil to main line fitting. Insert other hose end in an injection oil container. Using a clockwise rotating drill rotate pump shaft. Oil must drip from outer fittings while holding lever in a fully open position. If not replace pump.

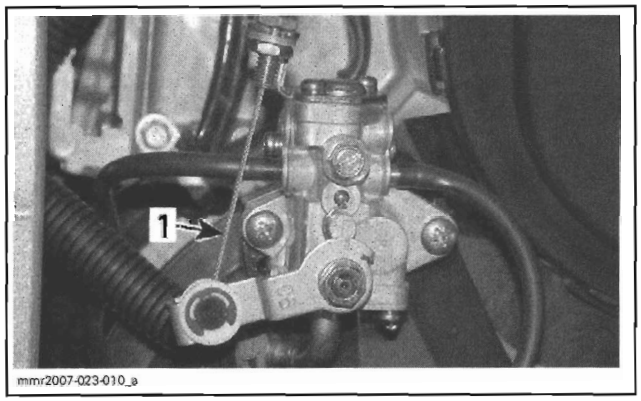
Oil Pump Removal

NOTE: Before removing the injection oil pump **no. 1**, check its operation. Refer to *VERIFICATION*, above in this section.

Drain injection oil reservoir.

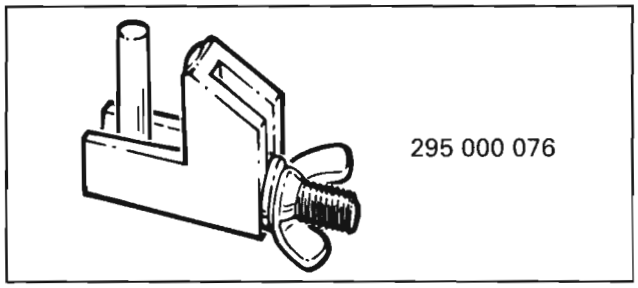
Remove the muffler.

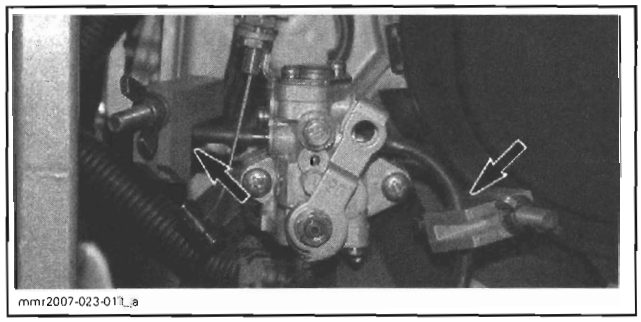
Disconnect oil pump cable.



1. Oil pump cable

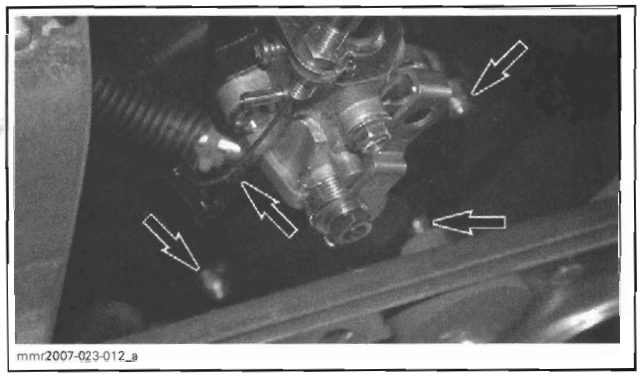
Install a small hose pincher (P/N 295 000 076) on each oil pump outlet hoses then disconnect them.



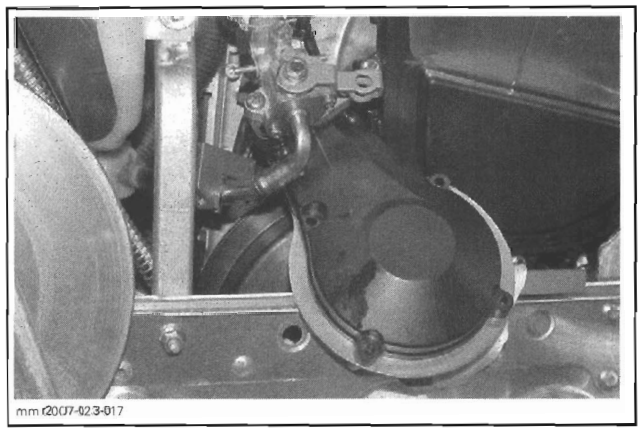


NOTE: Mark hoses locations for installation.

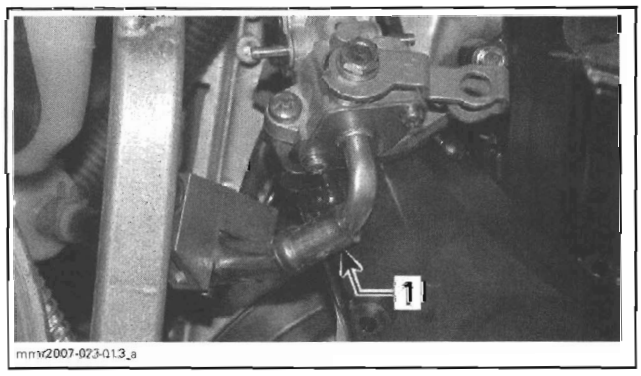
Unscrew nuts **no. 6** holding oil pump mounting housing.



Remove oil pump mounting housing **no. 7**.

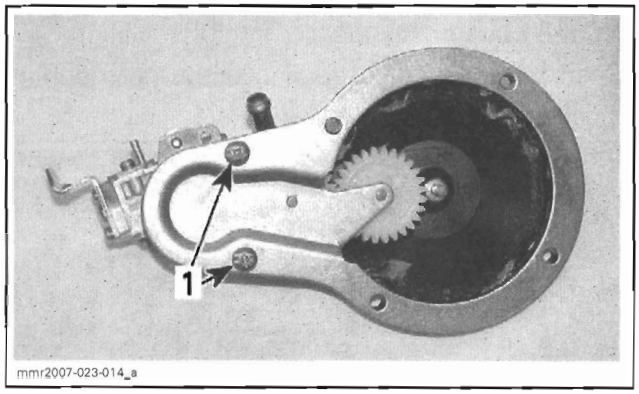


Disconnect the oil line from oil pump.



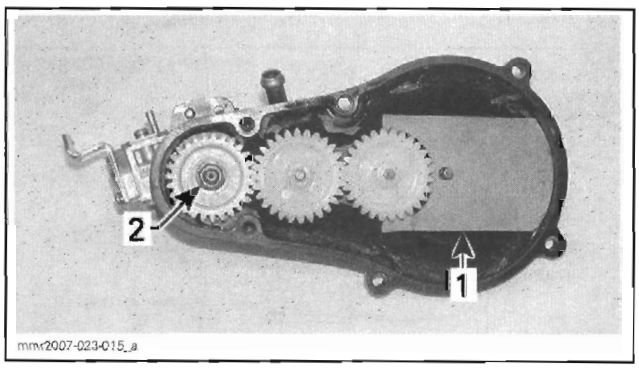
1. Oil line from oil injection reservoir

Remove the plate on the back of oil pump mounting housing.



1. Unscrew these nuts

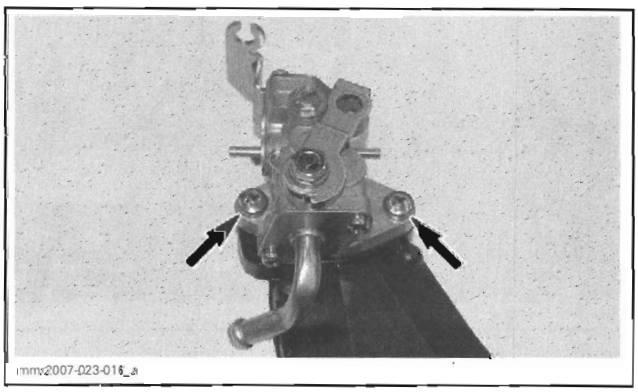
Install the gear holder (P/N 529 036 061) and unscrew oil gear nut.



1. Gear holder
2. Oil gear nut

Remove oil pump gear **no. 8**.

Remove screws **no. 5** securing oil pump to oil pump mounting housing.



Remove oil pump.

Oil 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 clips tightness on pump inlet hoses.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of screws **no. 5** and torque them to 6 N•m (53 lbf•**in**).

Make sure cable barrel is well seated in oil pump lever.

Secure barrel with plastic washer and circlip.

Install cable lock washer on left side of support.

Verify cable and oil pump lever operation then adjust cable.

Bleed oil pump. See procedure further.

CAUTION: Always bleed oil pump when the system has been opened.

Oil Pump Cable Adjustment

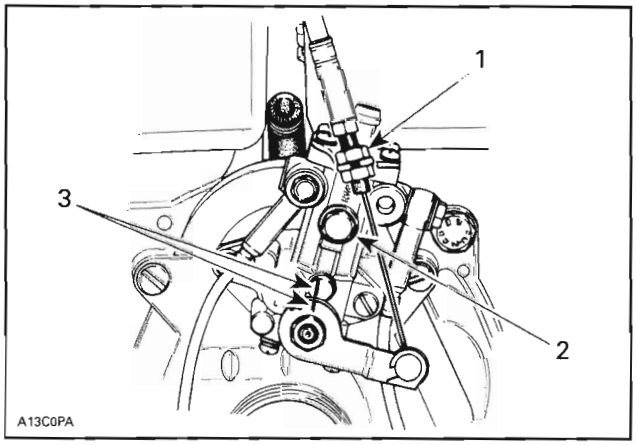
Prior to adjusting the pump, make sure all carburetor adjustments are completed and engine is stopped. Refer to *CARBURETOR AND THROTTLE CABLE*.

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place.

The mark on the pump casting and on the lever must align. Width of lever mark is the tolerance.

Loosen the adjuster nut and adjust accordingly.

Retighten the adjuster nut.

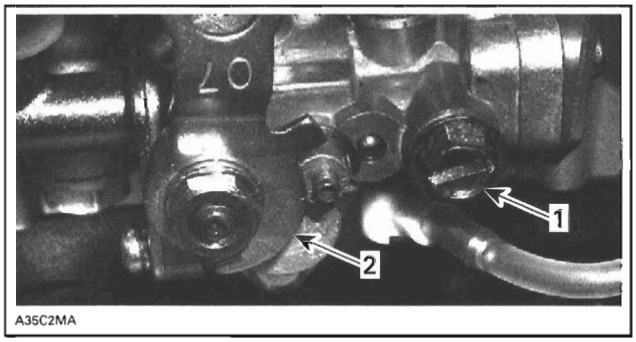


TYPICAL
1. Adjuster nut
2. Bleeder screw
3. Marks

CAUTION: Proper oil injection pump adjustment is very important. Any delay in the opening of the pump can result in serious engine damage.

Oil Pump Bleeding

Bleed main oil line (between reservoir and pump) by loosening the bleeder screw until air has escaped from the line. Add injection oil as required.



TYPICAL
1. Bleeder screw
2. Oil pump lever

Bleed the small oil line between pump and engine by running engine at idle while holding the pump lever in fully open position.

NOTE: Make a "J" hook out of mechanical wire to lift the lever.

⚠ WARNING

Do not operate throttle mechanism. Secure the rear of the vehicle on a stand.

INJECTION NOZZLE

Nozzle Inspection

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

Use the vacuum/pressure pump (P/N 529 021 800).

529 021 800

Connect pump to injection nozzle **no. 4**.

Test check valve of injection nozzle as follows.

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 approx. 20.7 kPa (3 PSI)
ACTION	**Success:** Perform next test	**Success:** Check valve is good
	Failed: Replace injection nozzle	**Failed:** Replace injection nozzle

Nozzle Removal

NOTE: Before removing injection nozzle **no. 4**, check its operation. Refer to the end of this section.

Remove air intake silencer and carburetor or throttle body.

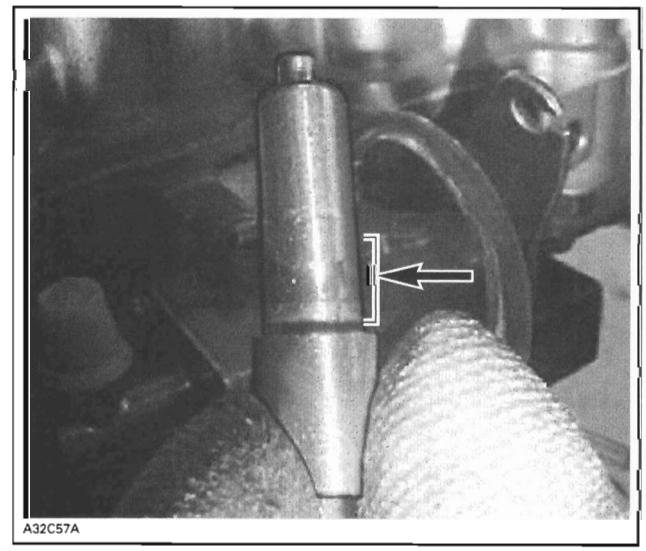
Clean injection nozzle area to remove oil or dirt.

Heat injection nozzle **no. 4** then pull it out of crankcase.

Nozzle Installation

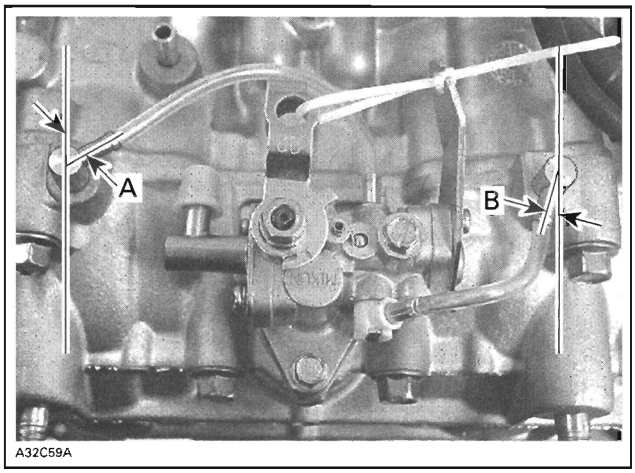
Prior to coating it with Loctite, make sure check valve body is clean and dry. Clean from dirt or oil, if any, with pulley flange cleaner (P/N 413 711 809).

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.



APPLY LOCTITE ON THIS AREA ONLY

Install the check valve in the correct position as described on next photos into the crankcase lower side.



TYPICAL
A. PTO side 45° ± 5° from cylinder axis to the top
B. MAG side 20° ± 5° from cylinder axis to the bottom

Punch in the injection nozzle carefully with a plastic hammer.

Clean the crankcase from surplus of Loctite 648 with a rag.

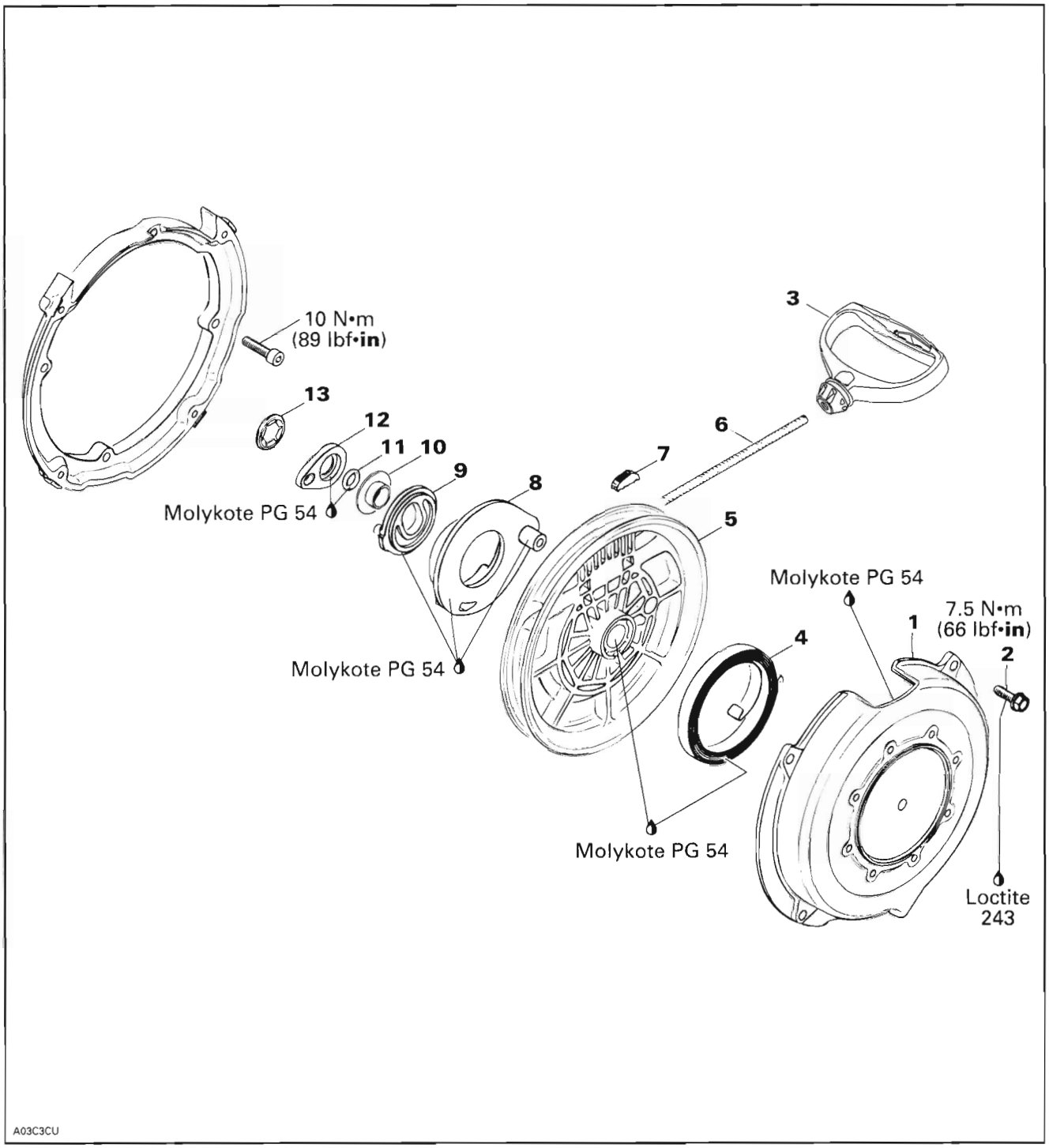
REWIND STARTER

SERVICE TOOLS

Description	Part Number	Page
small hose pincher	295 000 076	141

SERVICE PRODUCTS

Description	Part Number	Page
Molykote PG 54	420 899 763	142–144


10 N•m
(89 lbf•in)
13
12
11
10
9
8
7
6
3
5
Molykote PG 54
Molykote PG 54
Molykote PG 54
Molykote PG 54
4
1
7.5 N•m
(66 lbf•in)
2
Loctite
243
A03C3CU

GENERAL

NOTE: Due to dust accumulation, rewind starter must be periodically cleaned, inspected and relubricated.

CAUTION: It is of the utmost importance that the rewind starter spring be lubricated periodically using specific lubricant. Otherwise, rewind starter component life will be shortened and/or rewind starter will not operate properly under very cold temperatures.

Inspection

Check if rope **no. 6** is fraying, replace if so.

When pulling starter grip, mechanism must engage within 30 cm (1 ft) of rope pulled. If not, disassemble rewind starter, clean and check for damaged plastic parts. Replace as required, lubricate, reassemble and recheck. Always replace O-ring **no. 11** every time rewind starter is disassemble.

When releasing starter grip, it must return to its stopper and stay against it. If not, check for proper spring preload or damages. Readjust or replace as required.

When pulling starter grip 10 times in a row, it must return freely. If not, check for damaged parts or lack of lubrication. Replace parts or lubricate accordingly.

PROCEDURES

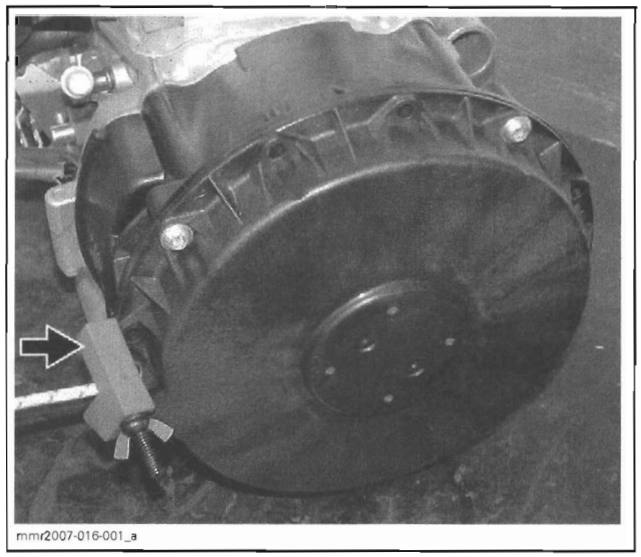
STARTER HANDLE

Removal

Remove muffler. Refer to *EXHAUST SYSTEM*.

Remove fan cowl. Refer to *AXIAL COOLING FAN*.

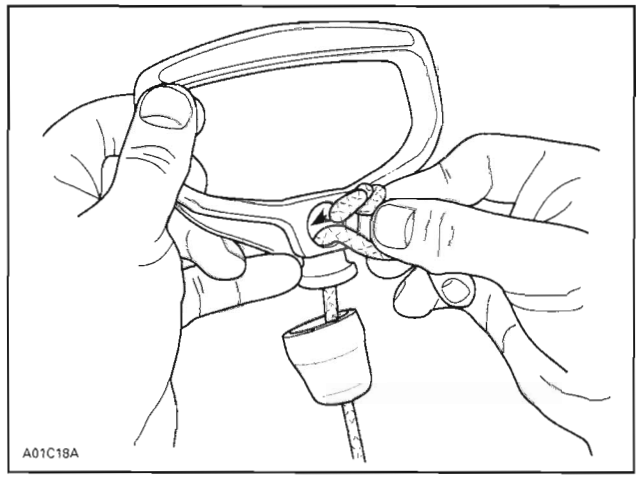
Pull rope for 50 cm (20 in) approximately. Using a small hose pincher (P/N 295 000 076), lock rope near rewind starter.



Using a small screwdriver, extract rope knot from starter handle **no. 3**. Cut rope close to knot.

Installation

Prior to installing starter handle on rope, it is first necessary to fuse the rope end with a lit match. Pass rope through starter handle and tie a knot in the rope end. Fuse the knot with a lit match then insert rope end down and pull the starter handle over the knot.



TYPICAL

Reinstall other removed parts.

REWIND STARTER

Removal

Remove starter handle **no. 3**.

Remove nuts retaining oil injection pump to rewind starter housing.

Remove oil injection pump shaft.

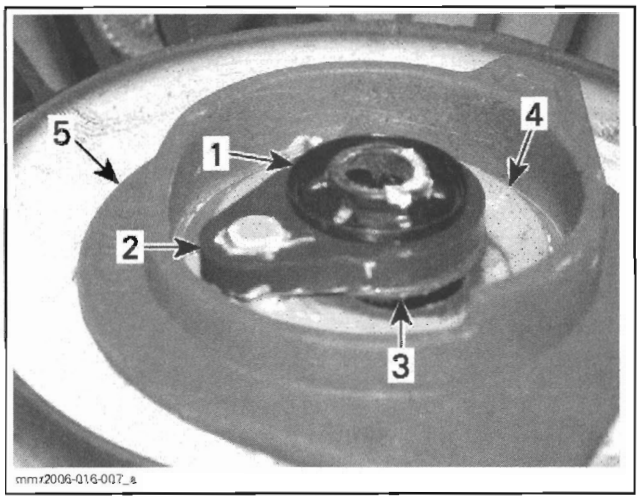
Remove screws **no. 2** securing rewind starter **no. 1** to engine then remove rewind starter.

Disassembly

Undo knot previously tied at removal. Let sheave get free to release spring preload.

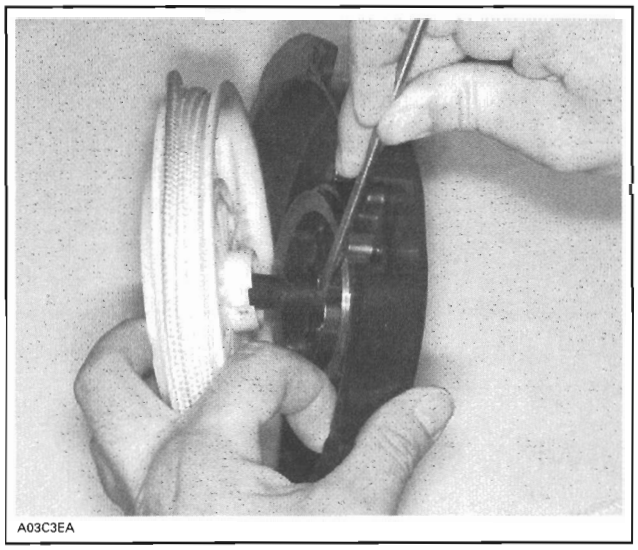
Cut push nut and discard.

Remove lock lever, O-ring **no. 11**, collar sleeve, pawl lock and pawl.

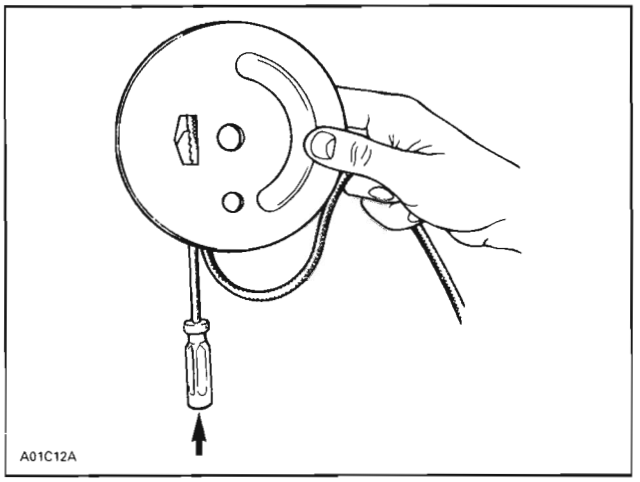


1. *Push nut*
2. *Lock lever*
3. *Collar sleeve*
4. *Pawl lock*
5. *Pawl*

Remove sheave **no. 5** from starter housing **no. 1**. Hold spring with a screwdriver.



Disengage key **no. 7** and pull out rope **no. 6**.



GENTLY TAP ON KEY

Assembly

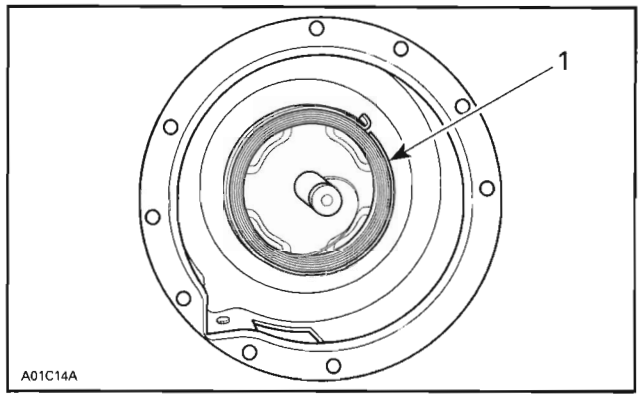
At assembly, position spring **no. 4** outer end into spring guide notch then wind the spring counter-clockwise into guide.

⚠ WARNING

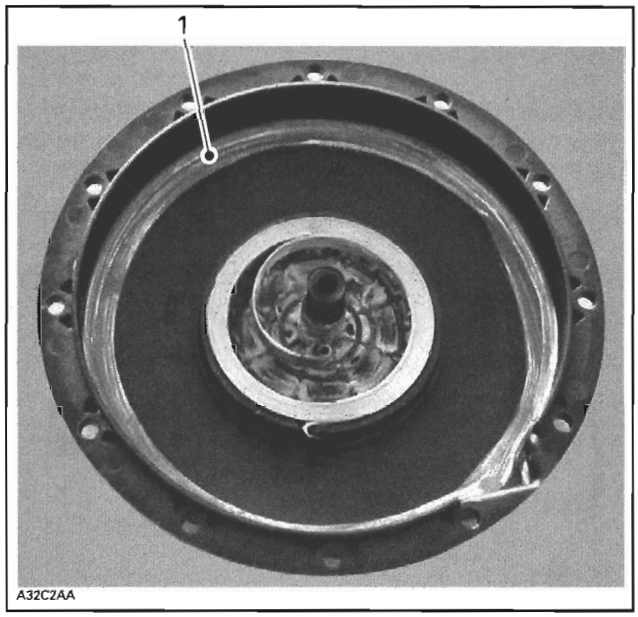
Since the spring is tightly wound inside the guide it may fly out when rewind is handled. Always handle with care.

1. *Outer end into guide notch*

Lubricate spring assembly and 1 cm (1/2 in) wide on bottom of housing with Molykote PG 54 (P/N 420 899 763).



TYPICAL
1. Molykote PG 54 inside spring guide



1. Molykote PG 54 applied 1 cm (1/2 in) wide on bottom of housing

CAUTION: It is of the utmost importance that the rewind starter spring be lubricated periodically using Molykote PG 54 (P/N 420 899 763). The use of standard multipurpose grease could result in rewind starter malfunction under very cold temperatures and components life will be shortened.

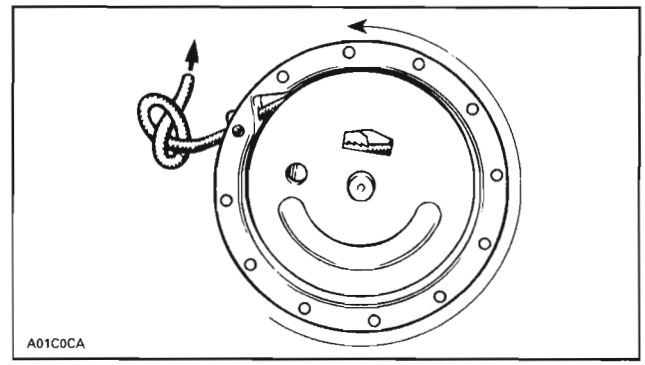
Lubricate housing post with silicone compound grease. Install sheave.

To adjust spring tension:

Wind rope on sheave and place rope sheave into starter housing making sure that the sheave hub notch engages in the rewind spring hook.

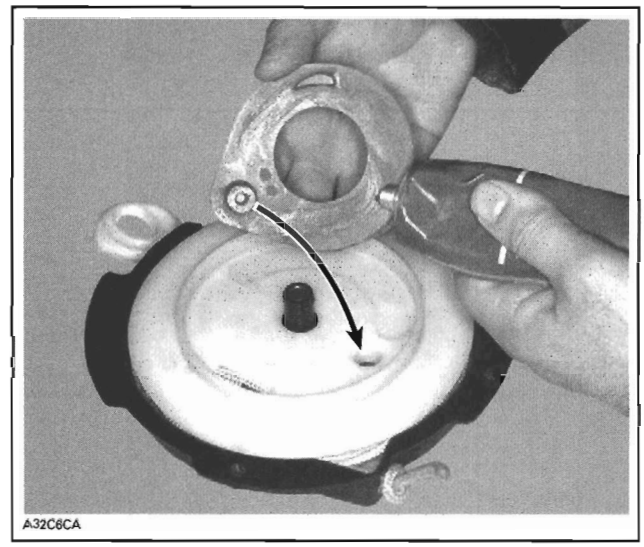
Rotate the sheave counterclockwise until rope end is accessible through rope exit hole. This will give 1/2 turn of preload.

Pull the rope out of the starter housing and temporarily make a knot to hold it.

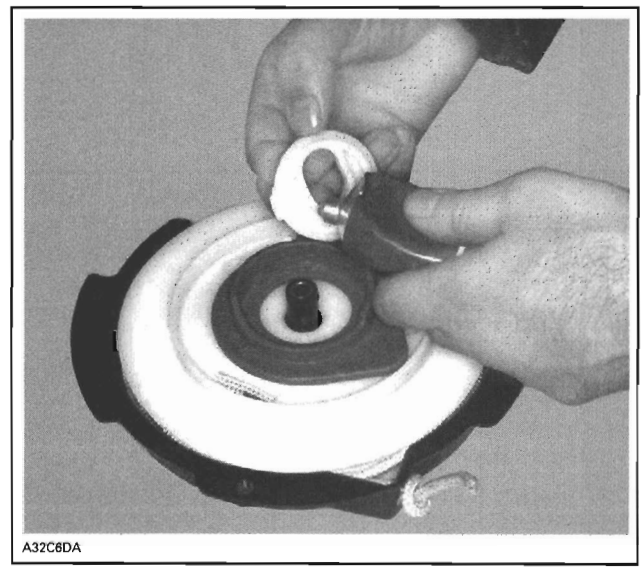


TYPICAL

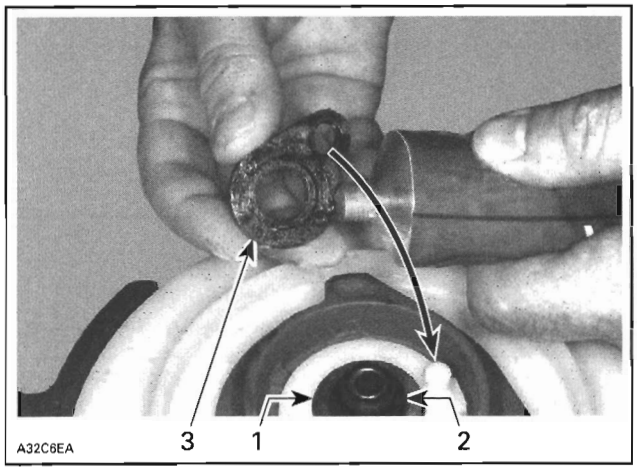
Lubricate pawl **no. 8** with Molykote PG 54 (P/N 420 899 763) then install over rope sheave.



Lubricate pawl lock **no. 9** with Molykote PG 54 (P/N 420 899 763). Install over pawl.



Install collar sleeve **no. 10** with its collar first. Lubricate a new O-ring **no. 11** and lock lever **no. 12** with Molykote PG 54 (P/N 420 899 763). Install over pawl lock.

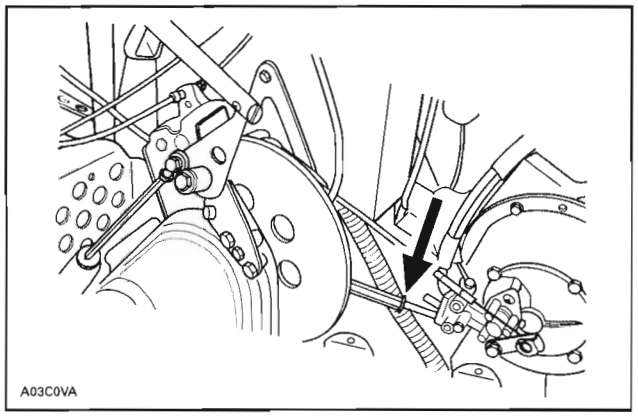


1. *Collar sleeve*
2. *O-ring*
3. *Lock lever*

Position a new push nut **no. 13**.

Installation

Thread starter rope **no. 6** through rope guide when applicable.



TYPICAL

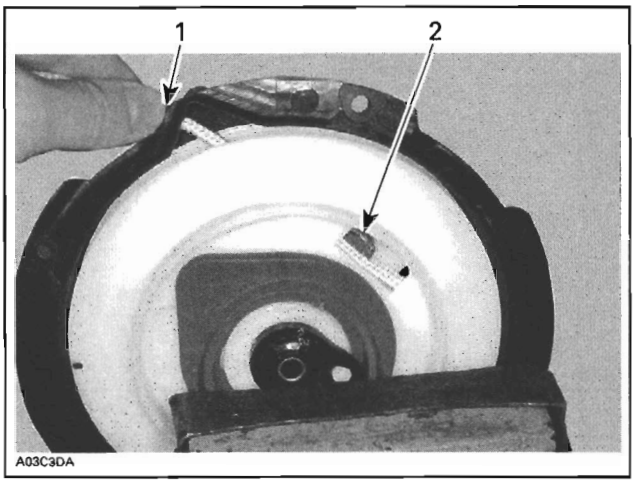
Reinstall rewind starter assembly on engine.

Reinstall oil injection pump and its shaft. Refer to *OIL INJECTION PUMP*.

ROPE

Replacement

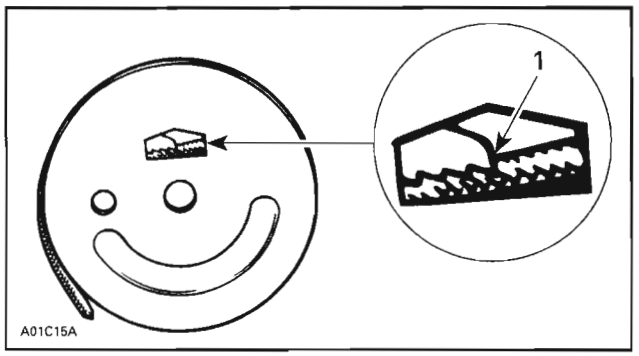
Completely pull out rope. Hold rewind starter in a vise.



1. *Rope exit hole*
2. *Key to be removed*

With a long thin pin punch or a long screwdriver inserted through rope exit hole, gently tap on key **no. 7** to disengage it. Remove key and rope.

To install rope **no. 6**, insert rope into sheave **no. 5** orifice and lock it with the key **no. 7** as illustrated.



1. *Push to lock*

NOTE: When rope is completely pulled out, spring preload is 4-1/2 turns.

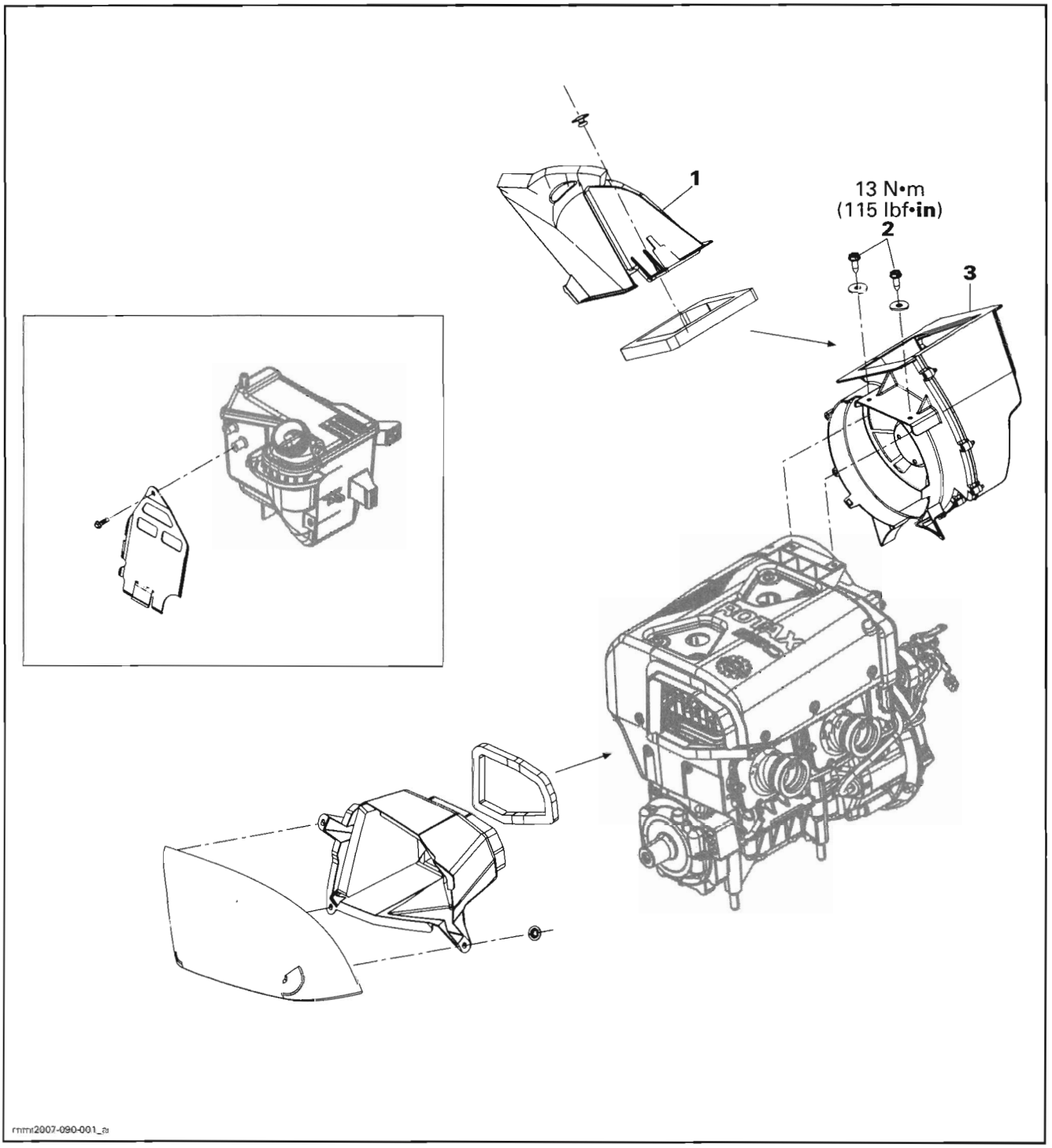
AXIAL FAN

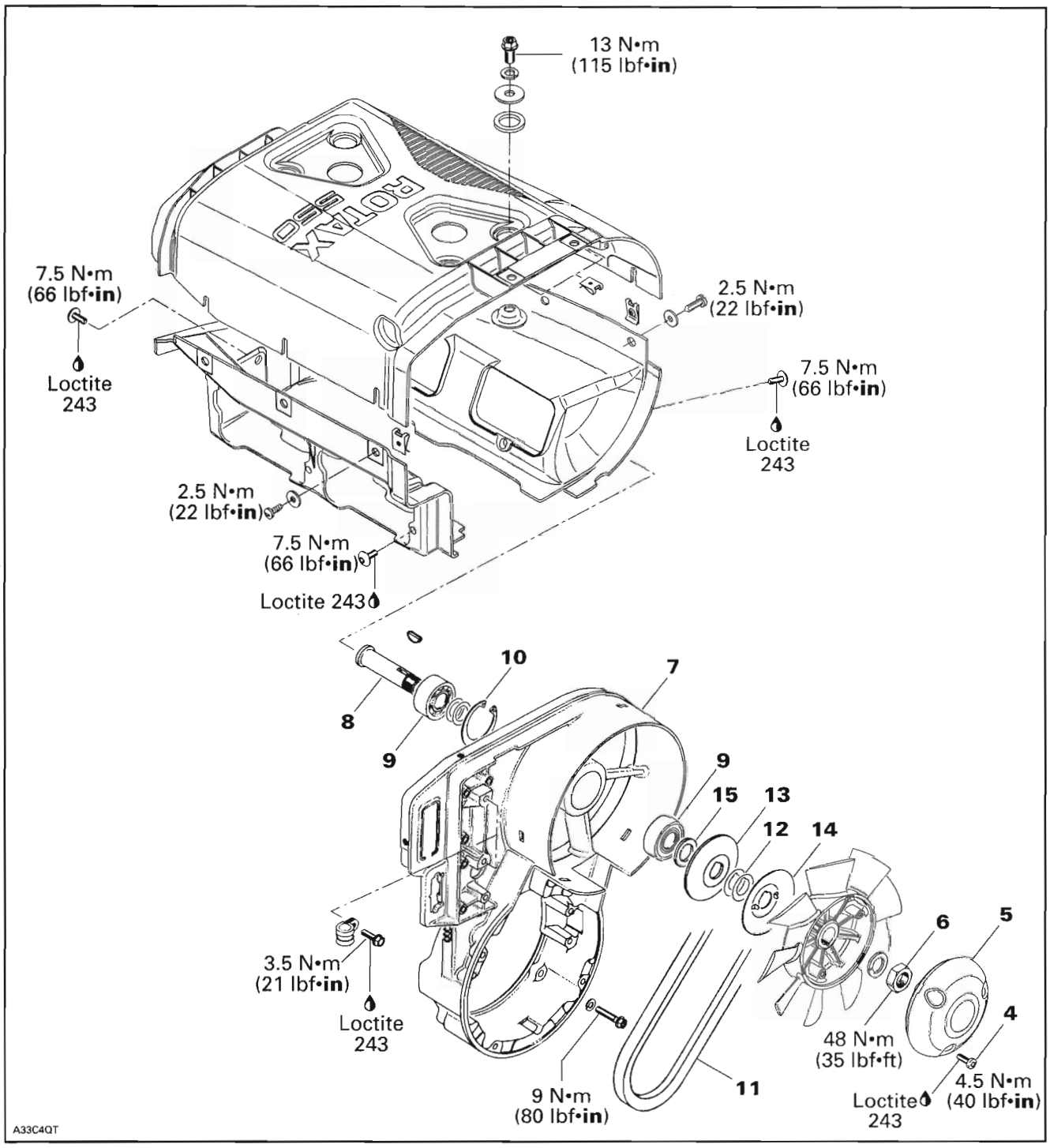
SERVICE TOOLS

Description	Part Number	Page
Holder wrench	529 036 006	150

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	150


1
13 N•m
(115 lbf•in)
2
3
ROTAX
mmr2007-090-001_a


13 N•m
(115 lbf•in)
ROTAX 650
7.5 N•m
(66 lbf•in)
Loctite
243
2.5 N•m
(22 lbf•in)
7.5 N•m
(66 lbf•in)
Loctite
243
2.5 N•m
(22 lbf•in)
7.5 N•m
(66 lbf•in)
Loctite 243
10
8
9
7
9
15
13
12
14
6
5
3.5 N•m
(21 lbf•in)
Loctite
243
48 N•m
(35 lbf•ft)
4
4.5 N•m
(40 lbf•in)
Loctite
243
9 N•m
(80 lbf•in)
11
A33C4QT

GENERAL

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

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

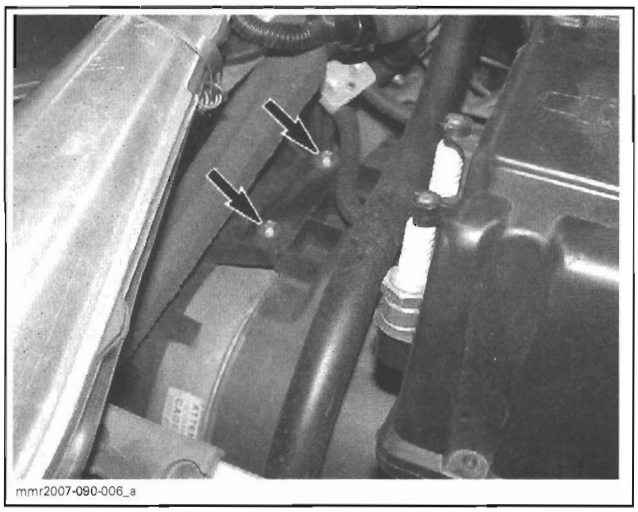
PROCEDURES

Remove RH side panel and hood.

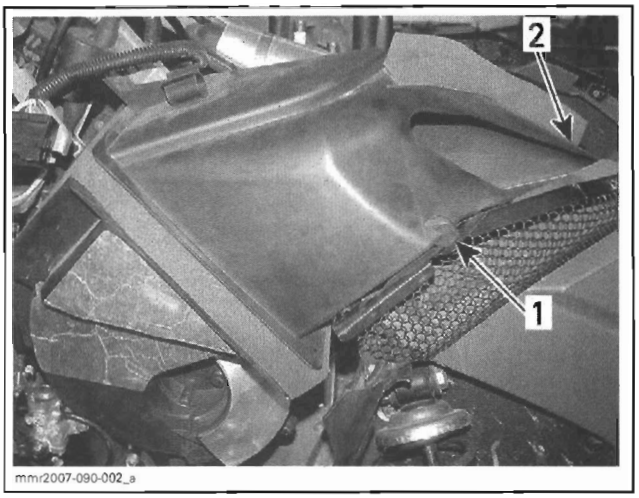
UPPER FAN DUCT

Removal

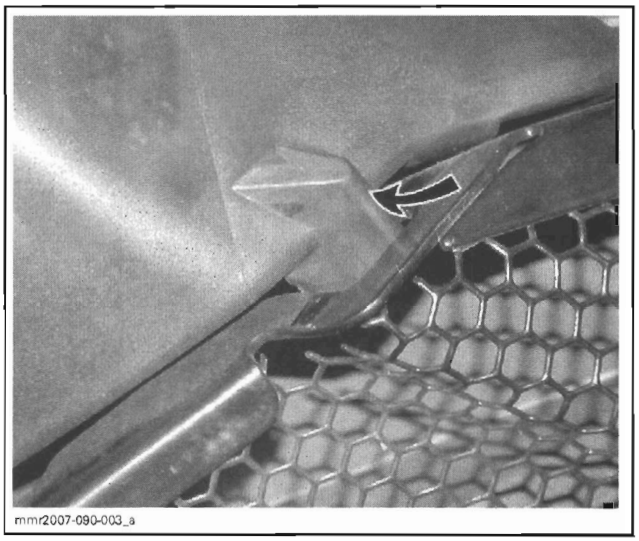
Remove retaining screws.



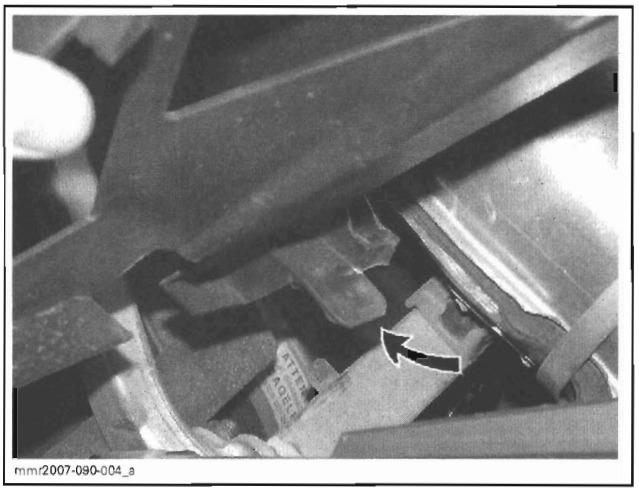
Unlock upper fan duct.



1. Unlock side tab
2. Unlock front tab



SIDE TAB



FRONT TAB

Remove fan duct.

Installation

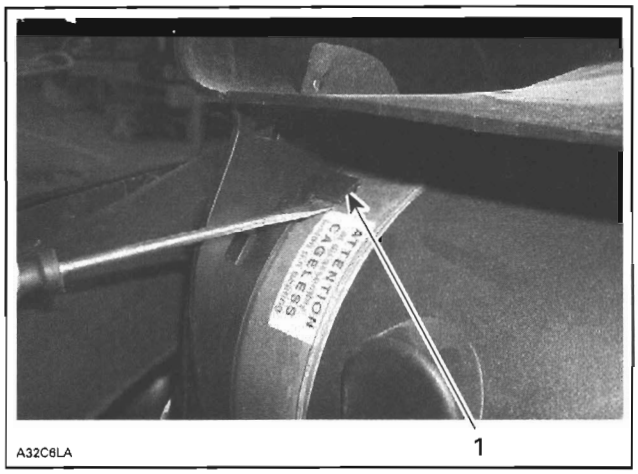
Installation is the reverse of removal procedures.

LOWER FAN DUCT

Removal

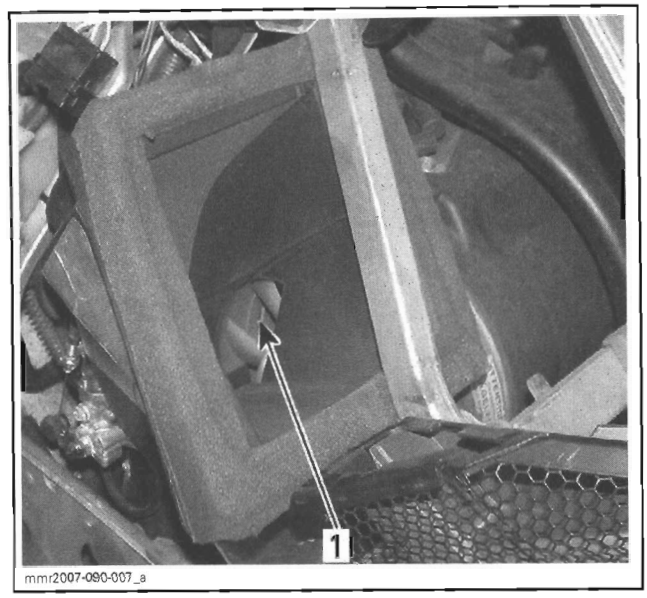
Remove upper fan duct.

Remove lower fan duct by unclipping the 3 tabs using a flat screwdriver as shown.



TYPICAL
1. Tab

To reach the 3rd tab, insert the screwdriver through the duct inlet and push tab out.



1. Push tab out here

Installation

Installation is the reverse of removal procedures.

CYLINDER COWL

Removal

Unscrew cylinder cowl screws on the top of engine.

Remove screws with lock washers, flat washers and rubber washers.

Pull cylinder cowl.

Installation

The installation is the reverse of the removal procedure.

Torque cylinder cowl screws.

SCREW	TORQUE
M4	2.5 N•m (22 lbf•**in**)
M8	13 N•m (115 lbf•**in**)

AXIAL FAN

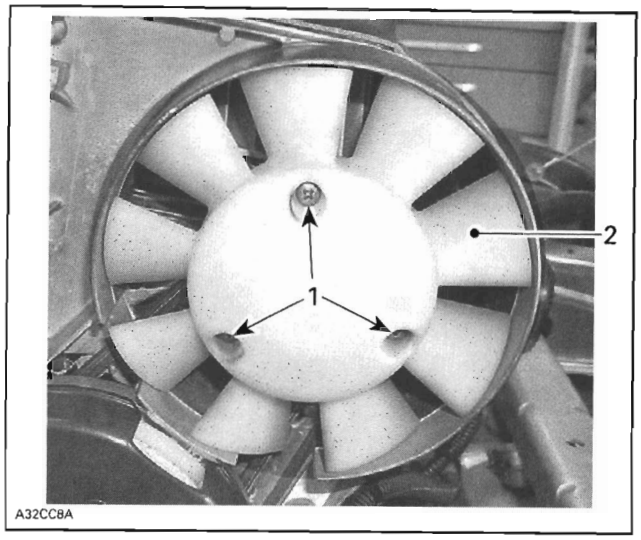
Removal

Remove the muffler to gain access. Refer to *EXHAUST SYSTEM*.

Unlock upper fan duct and pivot rearward.

Remove lower fan duct.

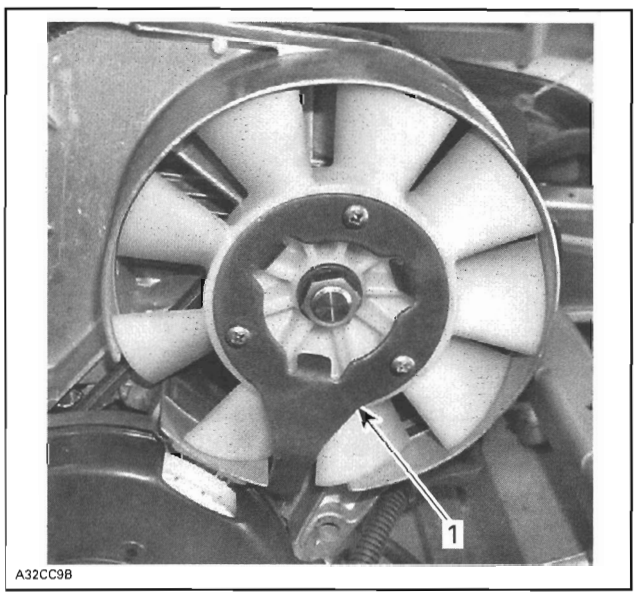
Unscrew the screws **no. 4** to remove the fan cover **no. 5**.



1. Screws
2. Cooling fan

To remove fan pulley retaining nut **no. 6**, lock fan pulley with special holder wrench and 3 screws as per following table:

ENGINE	TOOL
552	Holder wrench (P/N 529 036 006)



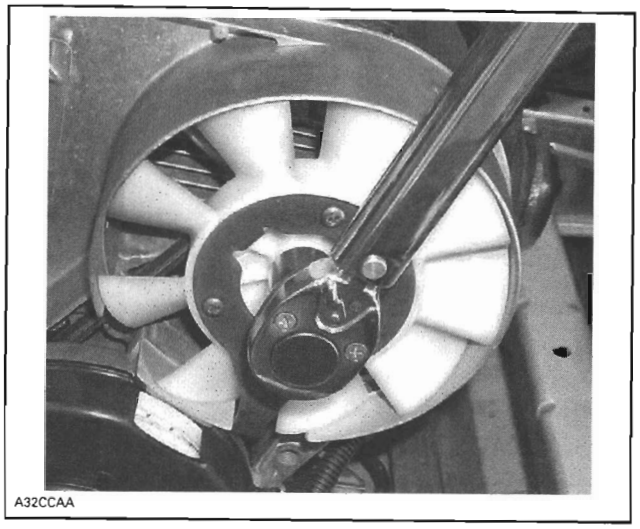
1. Holder wrench

Inspection

Check cooling fan for cracks or damaged fins.

Installation

At assembly, torque nut **no. 6** to 48 N•m (35 lbf•ft).



TYPICAL

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of fan cover screws then torque them to 4.5 N•m (40 lbf•**in**).

FAN BELT

Removal

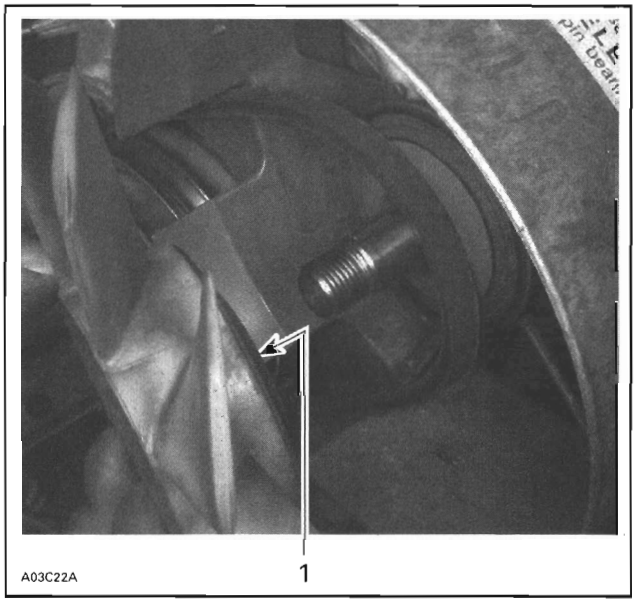
Remove muffler. Refer to *EXHAUST SYSTEM.*

Remove upper and lower fan ducts.

Remove rewind starter. Refer to *REWIND STARTER.*

Remove cooling fan as explained in this section.

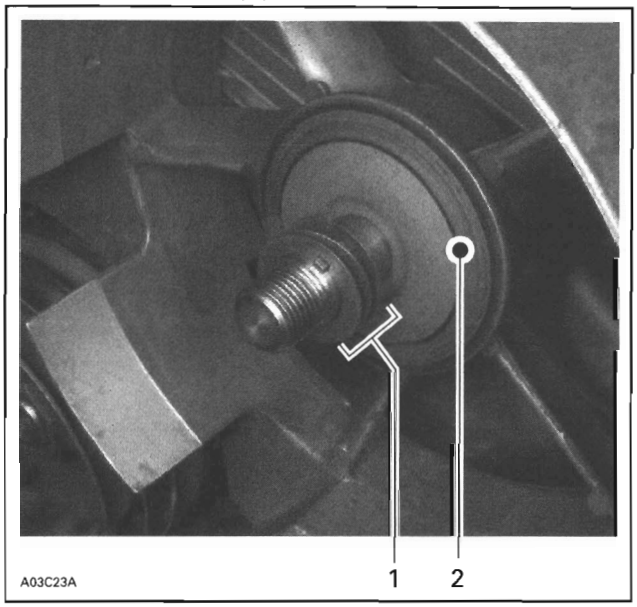
Remove pulley half.



1. Fan with pulley half

Remove fan belt **no. 11**.

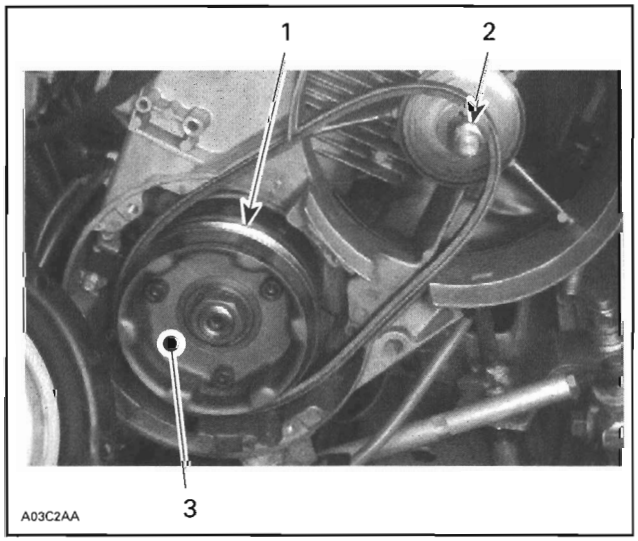
Leave shims and second half pulley in place. Refer to the following photo.



1. *Keep shims*
2. *Leave second half pulley in place*

Installation

Install new fan belt on bottom pulley first then position onto fan shaft, as shown in the next photo.



FAN BELT PROPERLY INSTALLED ON BOTTOM PULLEY AND FAN SHAFT
1. *Bottom pulley*
2. *Fan shaft*
3. *Starting pulley*

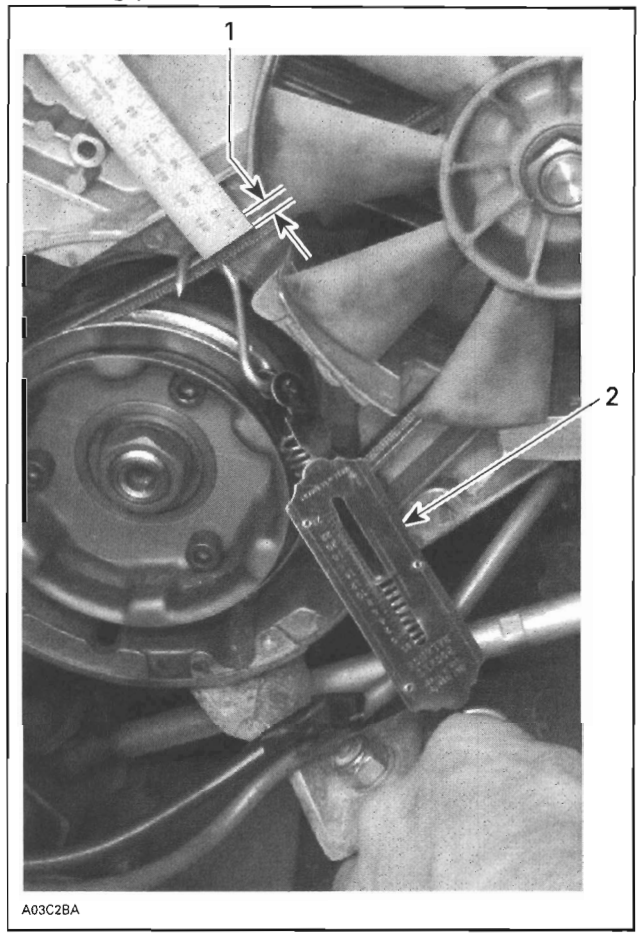
Reinstall fan assembly on fan shaft. Temporarily tighten fan nut.

CAUTION: When reinstalling fan assembly, ensure that key is properly positioned into fan shaft keyway.

Check belt deflection and adjust it if needed.

Deflection and Adjustment

Check fan belt deflection using a ruler and a fish scale positioned midway between pulleys as per following photo.

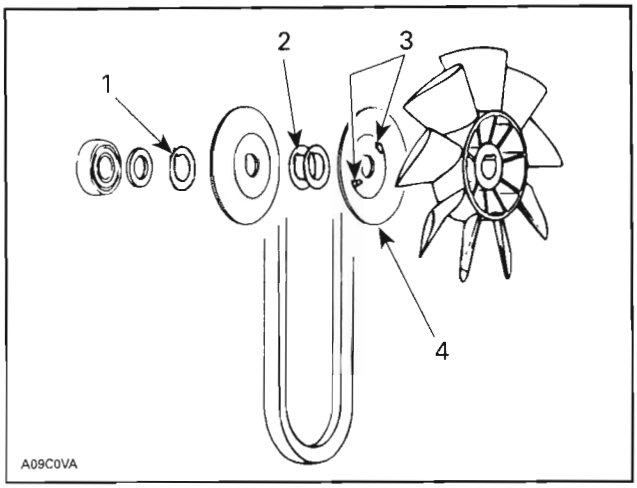


TYPICAL
1. *Measure deflection here*
2. *Fish scale*

Belt deflection must be according to the following specifications:

ENGINE	BELT DEFLECTION	FORCE APPLIED
552	9.5 mm ± 1.5 mm (3/8 in ± 1/16 in)	5 kgf (11 lbf)

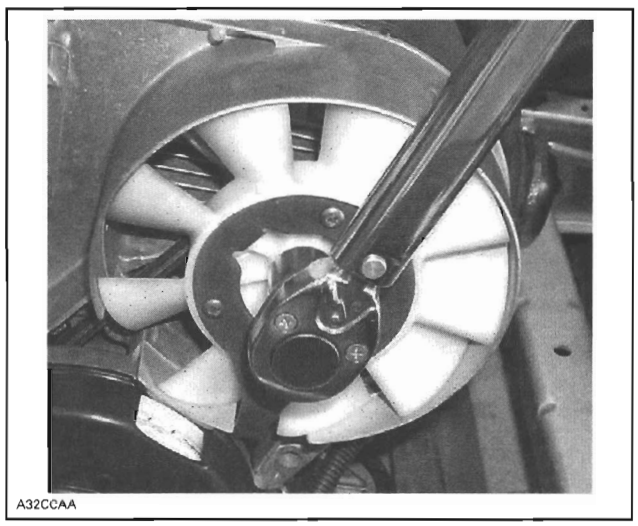
To adjust deflection tension, add or remove shim(s) **no. 12** between pulley halves **no. 13** and **no. 14**. Install excess shim(s) between distance sleeve **no. 15** and pulley half **no. 13** (housing side).



TYPICAL
1. *Unused shim(s) here*
2. *Adjust here*
3. *Positioning noses*
4. *Some engines only*

Select pulley halves so that the one with 2 positioning noses will be on fan side. Ensure to insert these noses into fan notches.

Once fan belt is properly adjusted, torque fan nut to 48 N•m (35 lbf•ft) using holder wrench, as shown in the following photo.



TYPICAL — TORQUE FAN NUT USING HOLDER WRENCH

Finalizing Reassembly

Reinstall rewind starter. Refer to *REWIND STARTER*.

Install the upper and lower ducts .

Reinstall muffler. Refer to *EXHAUST SYSTEM*.

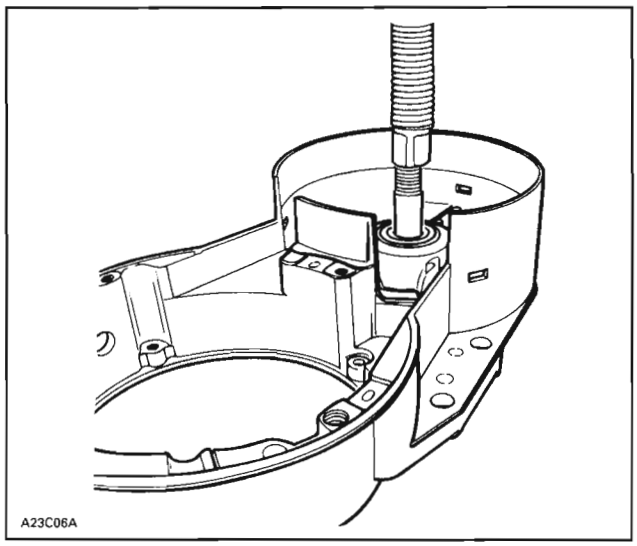
COOLING FAN BEARING

Removal

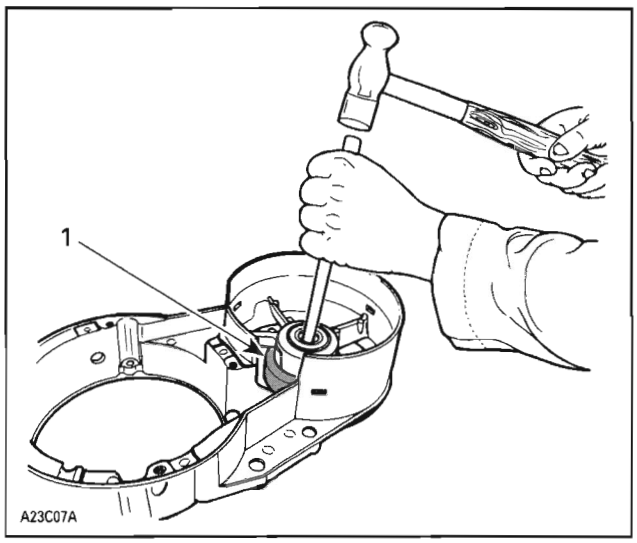
To remove the fan support housing **no. 7**, do the following:

- Remove muffler. Refer to *EXHAUST SYSTEM*.
- Remove upper and lower ducts, rewind starter, cooling fan, fan belt, magneto and stator. Refer to appropriate sections for procedures.
- Unscrew bolts that retain support fan housing to engine.

Using a press, drive the fan shaft **no. 8** out. Install a support under fan housing before using the press.

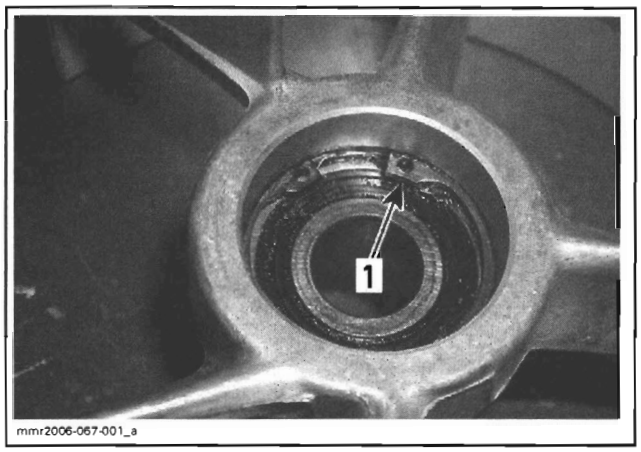


Support fan housing **no. 7** with a ring. With a punch, working all around bearing **no. 9** inner race, drive bearing out of fan housing. Keep shims for installation.



1. Ring supporting fan housing

Remove circlip **no. 10** then remaining bearing.



TYPICAL
1. Circlip

Installation

To install, press one bearing in place then install circlip and shims. Press the other bearing from opposite side until it is flush with housing. Press fan shaft from engine side of fan housing. Check for free rolling action.

NOTE: The bearings are sealed, do not add grease at time of assembly.

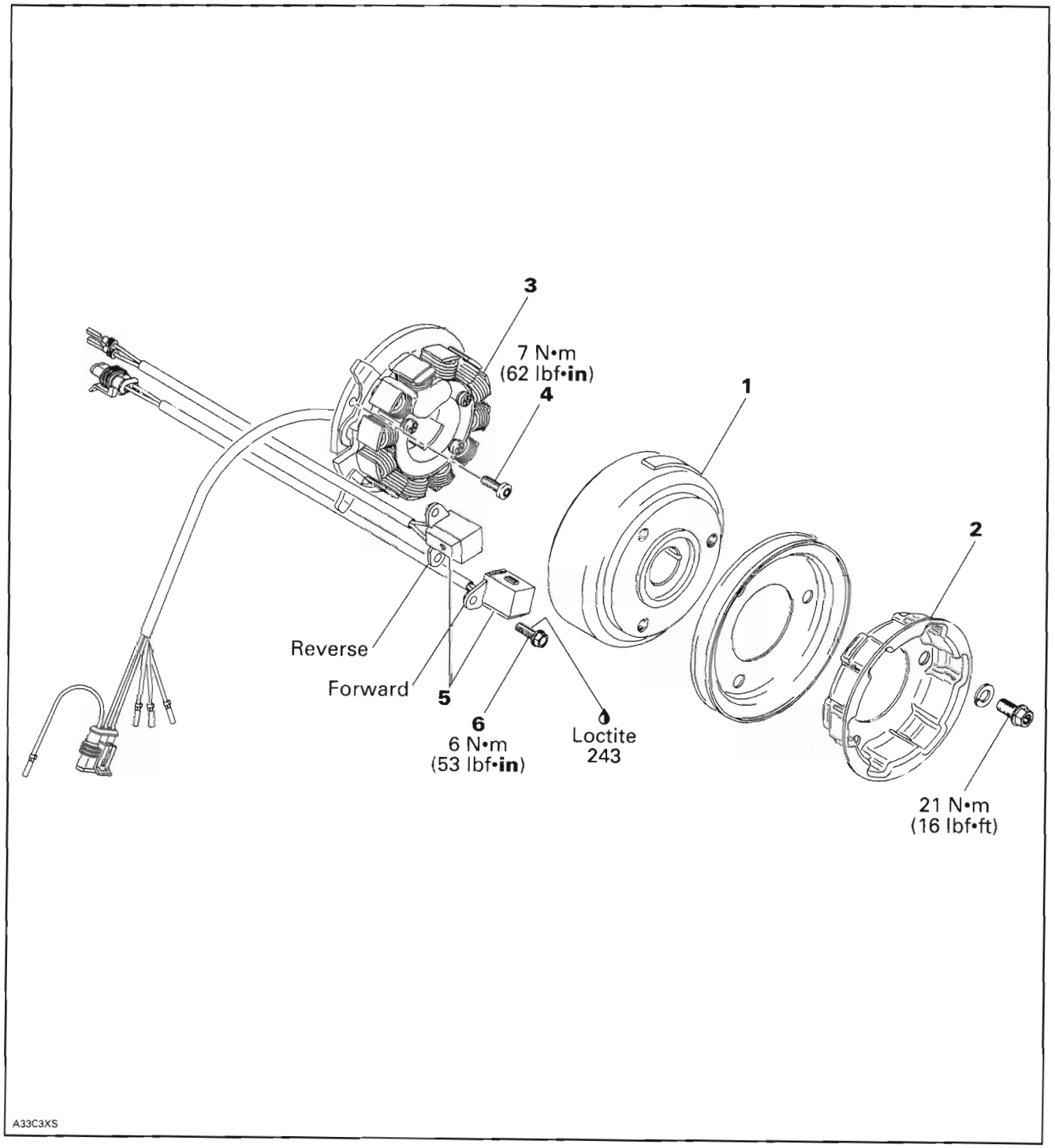
MAGNETO SYSTEM

SERVICE TOOLS

Description	Part Number	Page
crankshaft protector	420 876 557	158
magneto puller	529 035 547	158
puller ring	420 876 081	158

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	159
silicone dielectric grease	293 550 004	159


3
7 N•m
(62 lbf•in)
4
1
2
Reverse
Forward
5
6
6 N•m
(53 lbf•in)
Loctite
243
21 N•m
(16 lbf•ft)
A33C3XS

GENERAL

NOTE: The following procedures can be done without removing the engine. To facilitate magneto removal, hold drive pulley with the appropriate tool. Refer to *DRIVE PULLEY*.

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

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 strictly be adhered to.
Locking devices (e.g.: 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.

PROCEDURES

MAGNETO FLYWHEEL

Cleaning

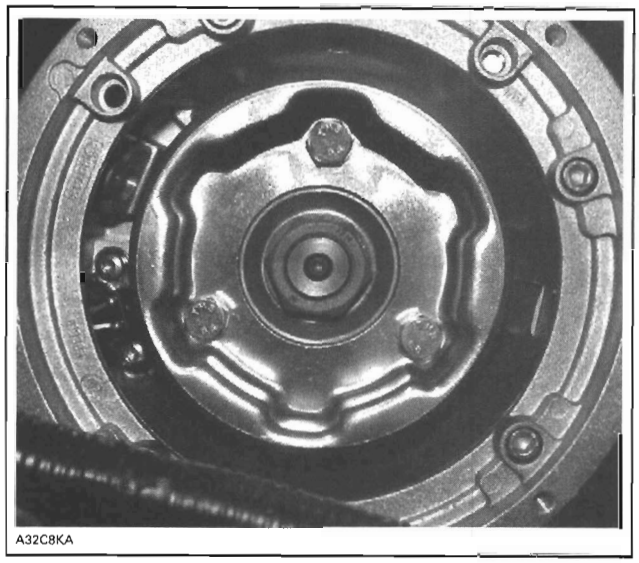
Clean all metal components in a non-ferrous metal cleaner.

CAUTION: Clean magneto flywheel using only a clean cloth.

Removal

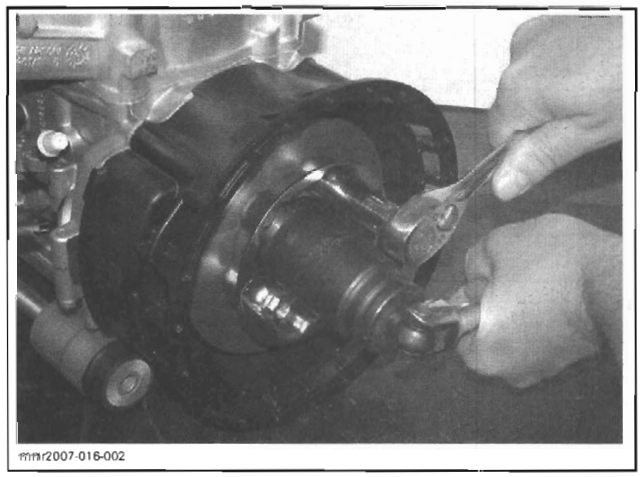
To gain access to magneto flywheel **no. 1** assembly, remove the following parts as needed on different engines:

- tuned pipe and muffler
- rewind starter
- starting pulley **no. 2**.


A32C8KA

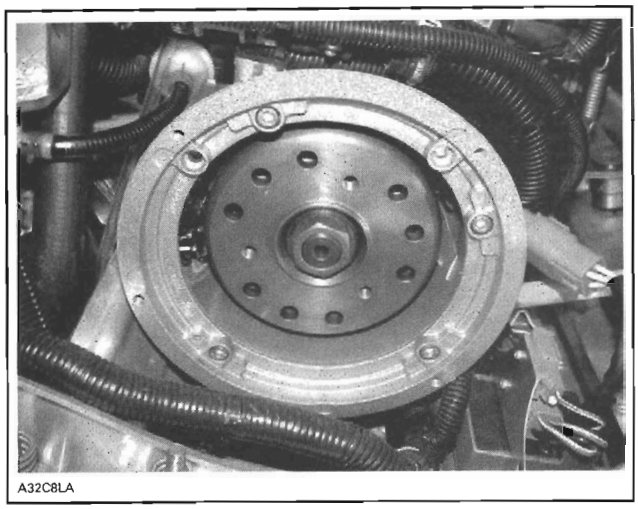
TYPICAL

NOTE: To remove starting pulley bolts, hold magneto flywheel with a socket as shown.


mmr2007-016-002

TYPICAL

As necessary, remove the connecting flange retaining the rewind starter to the engine housing.

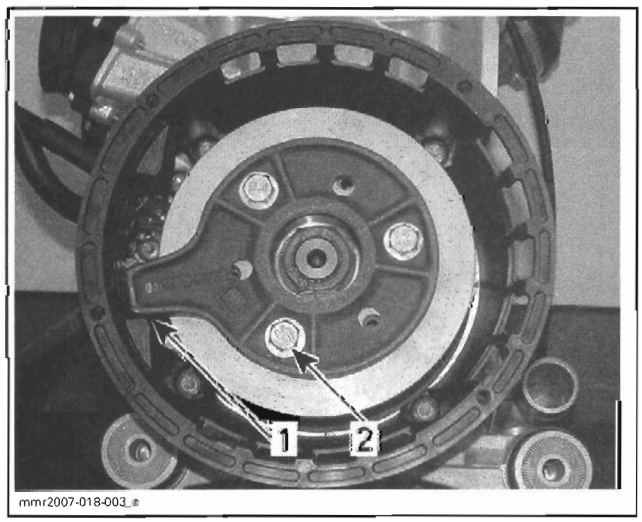


TYPICAL

Install the puller ring (P/N 420 876 081) on magneto flywheel (or counterweight if so equipped).

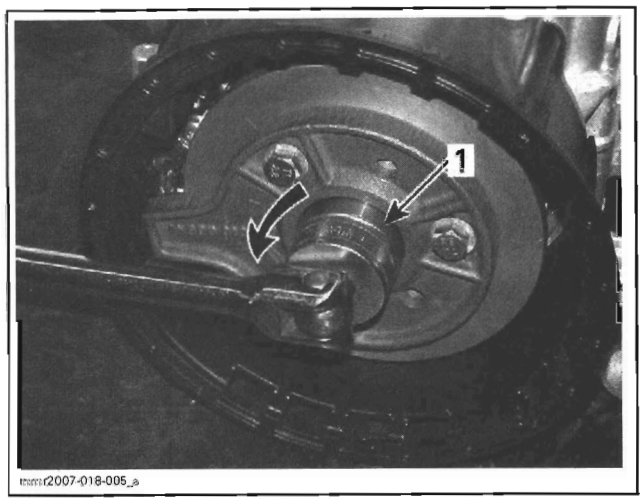
CAUTION: Use only the following screw length to bolt puller to magneto flywheel. Otherwise damage to stator behind magneto flywheel could occur.

ENGINE	SCREW LENGTH	
	WITHOUT COUNTERWEIGHT INSTALLED	WITH COUNTERWEIGHT INSTALLED
552	M8 x 20 mm	M8 x 30 mm



TYPICAL
1. Tab in magneto housing opening
2. M8 screws of appropriate length

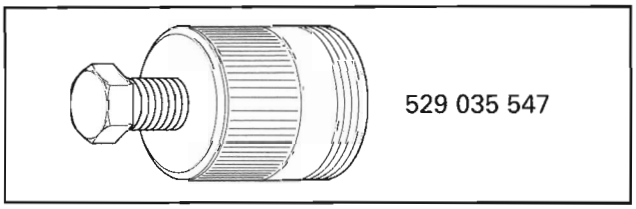
Remove magneto flywheel nut, using a 30 mm socket machined to 40 mm (1.580 in) outside diameter by 16 mm (5/8 in) long.

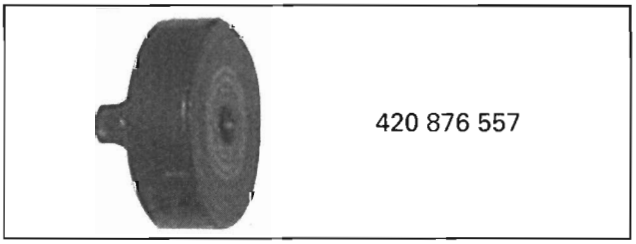


TYPICAL
1. Machined 30 mm socket

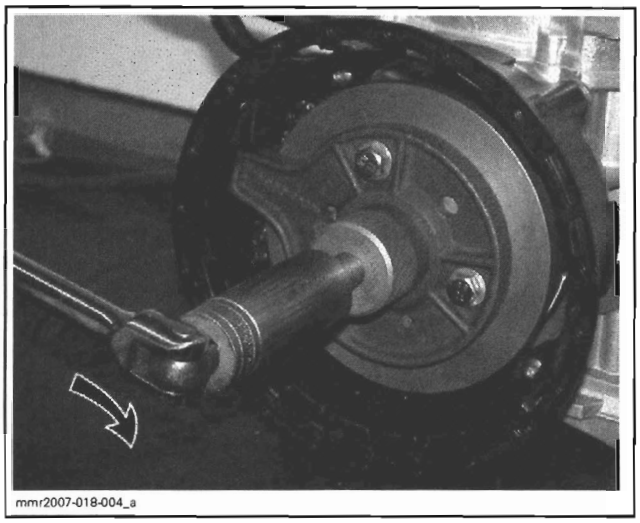
NOTE: To correctly remove a threadlocked fastener, first tap on the fastener to break threadlocker bond. This will avoid thread breakage.

To remove magneto flywheel, install the crankshaft protector (P/N 420 876 557) on crankshaft end. Screw the magneto puller (P/N 529 035 547) into puller ring.





Tighten puller bolt and at the same time, tap on bolt head using a hammer to release magneto flywheel from its taper.


mmr2007-018-004_a

Installation

Clean crankshaft extension (taper) and apply Loctite 243 (blue) (P/N 293 800 060) on taper, then position Woodruff key, magneto flywheel **no. 1** and lock washer on crankshaft.

Clean magneto flywheel nut threads and apply Loctite 243 (blue) (P/N 293 800 060) then tighten nut.

ENGINE	TORQUE
552	105 N•m (77 lbf•ft)

At reassembly coat all electric connections except Deutsch housings (waterproof housing) with silicone dielectric grease (P/N 293 550 004) to prevent corrosion or moisture penetration.

CAUTION: Do not use silicone «sealant», this product will corrode contacts. Do not apply silicone dielectric grease on any Deutsch waterproof housing otherwise housing seal will be damaged.

Ignition Timing

Check as described in *IGNITION SYSTEM*.

STATOR

Inspection

Always check stator **no. 3** before changing it. Refer to *CHARGING SYSTEM*.

Cleaning

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

CAUTION: Clean stator using only a clean cloth.

Removal

Remove:

- magneto flywheel **no. 1**
- all Allen socket screws **no. 4** retaining stator to magneto housing
- grommet from crankcase where trigger coils **no. 5** and stator wires exit magneto housing.

Unplug the trigger coil connectors and pull the wires through the grommet location.

NOTE: To pass the stator connector into the grommet location it is necessary to pass the trigger coil connector first.

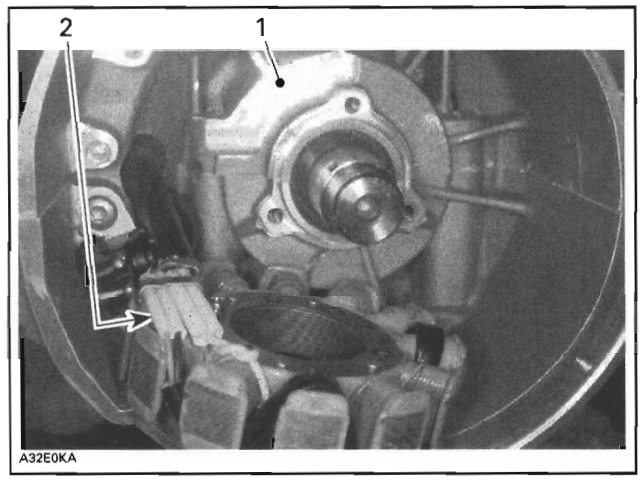
Unplug the stator connector and remove the stator **no. 3**.

Installation

Insert the stator connector into crankcase grommet then the trigger coil connector(s).

Install the grommet on crankcase.

Position stator **no. 3** so that its wire protectors are over crankcase recess.



1. Crankcase recess
2. Wire protectors

NOTE: During installation, make sure the stator harness is located on the left side.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of stator screws then torque them to 9 N•m (80 lbf•**in**).

Reinstall all other removed parts.

TRIGGER COIL

Inspection

For trigger coil inspection, refer to *IGNITION SYSTEM* and/or *RER SYSTEM*.

Removal

To replace the trigger coil(s) **no. 5**, remove or disconnect the following:

- magneto flywheel **no. 1**
- air intake silencer to allow an access to the trigger coil connectors (if necessary)
- trigger coil connector housing(s)
- grommet from crankcase where trigger coil wire(s) exit(s) magneto housing
- retaining screws **no. 6**
- trigger coil(s) and carefully pull wires.

Installation

For installation, reverse the removal procedure.

NOTE: It is important to remove the old silicon at trigger coil location then apply new silicon. Screw trigger coil then stick the trigger coil wires in the silicon.

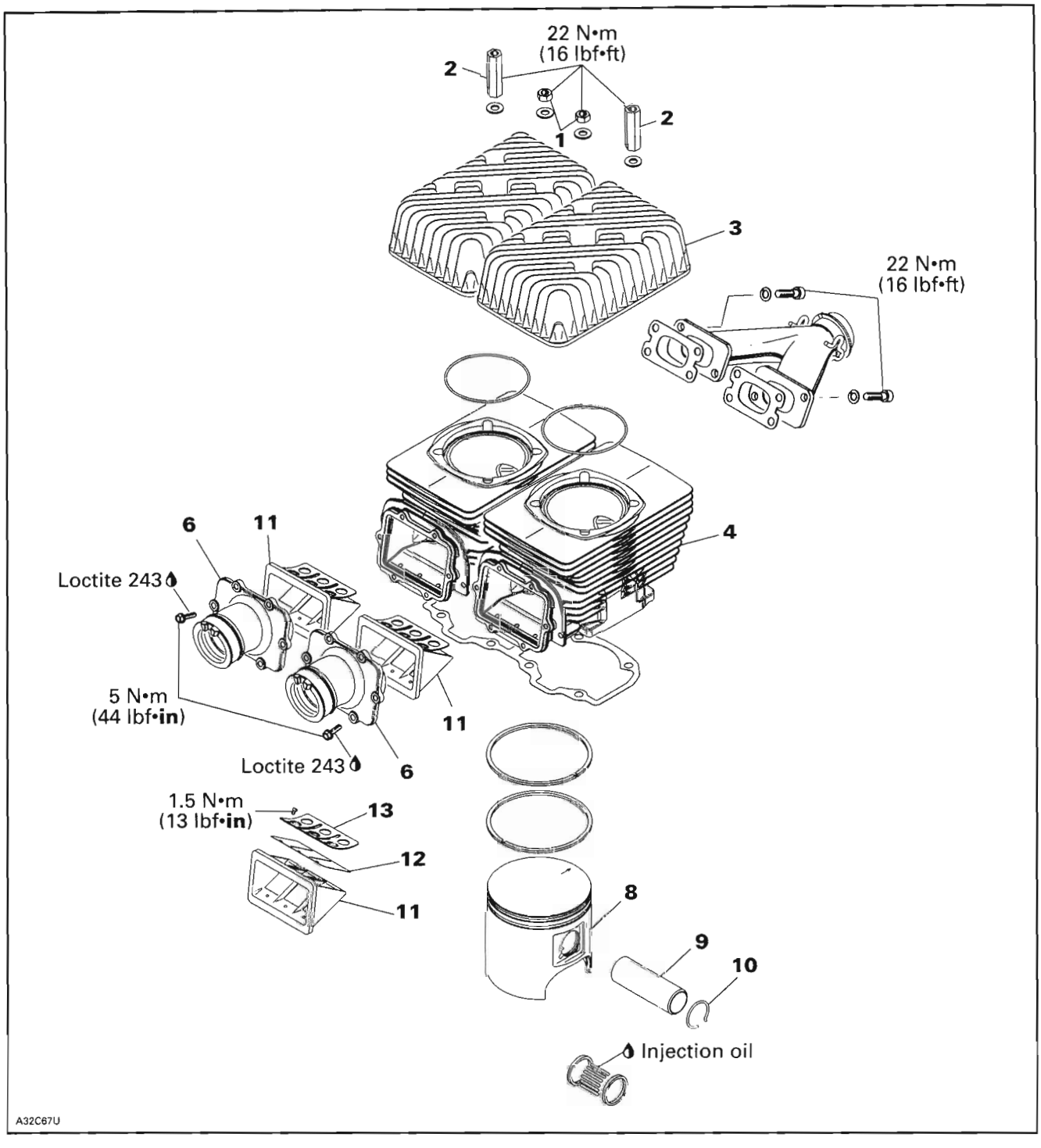
TOP END

SERVICE TOOLS

Description	Part Number	Page
20 mm sleeve kit	529 035 542	165
locating sleeve	529 023 800	165
piston circlip installer	529 035 686	167
piston pin puller	529 035 503	165
ring compressor	420 876 972	164

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 518	293 800 038	164
Loctite Chisel	413 708 500	163


22 N•m
(16 lbf•ft)
2
2
1
3
22 N•m
(16 lbf•ft)
4
6
11
Loctite 243
5 N•m
(44 lbf•in)
11
Loctite 243
6
1.5 N•m
(13 lbf•in)
13
12
11
8
9
10
Injection oil
A32C67U

GENERAL

Before completely disassembling the engine, check airtightness. Refer to *LEAK TEST*.

To measure internal parts, refer to *ENGINE MEASUREMENT* section.

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

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

Cleaning

Discard all gaskets and O-rings. Use Loctite Chisel (P/N 413 708 500) to clean mating surfaces.

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

PROCEDURES

NOTE: To reach any internal parts or to remove cylinder head and cylinder, the engine removal is necessary.

CYLINDER HEAD

Removal

Remove cylinder cowl. Refer to *AXIAL FAN*.

Remove cylinder head nuts **no. 1**, distance nuts **no. 2** and flat washers.

Lift cylinder heads **no. 3** over cylinder studs to remove them.

Inspection

Check cylinder heads for cracks, broken fins, warp or other damages.

Refer to tables below to find cylinder head specifications. For dimension measurement procedures, refer to *ENGINE MEASUREMENT*.

MAXIMUM CYLINDER HEAD WARPAGE
0.05 mm (.002 in) per 50 mm (2 in) of surface
0.5 mm (.020 in) for total length of cylinder head

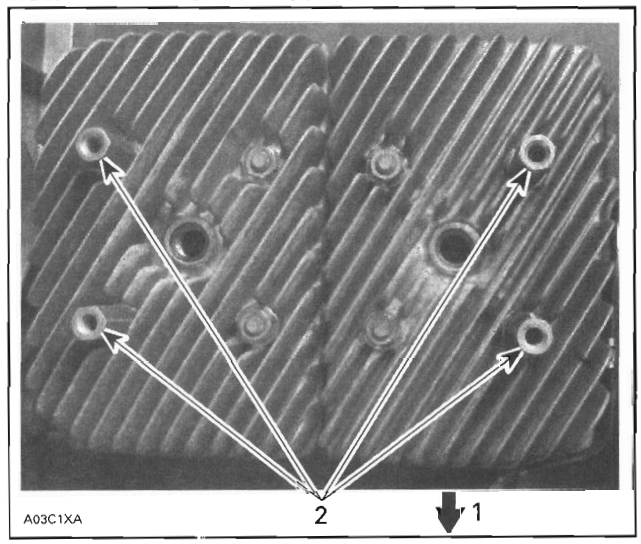
COMBUSTION CHAMBER VOLUME (CC)
35.5

Cleaning

Scrape off carbon formation from cylinder head.

Installation

Position cylinder head nuts **no. 1** and distance nuts **no. 2** as shown below.



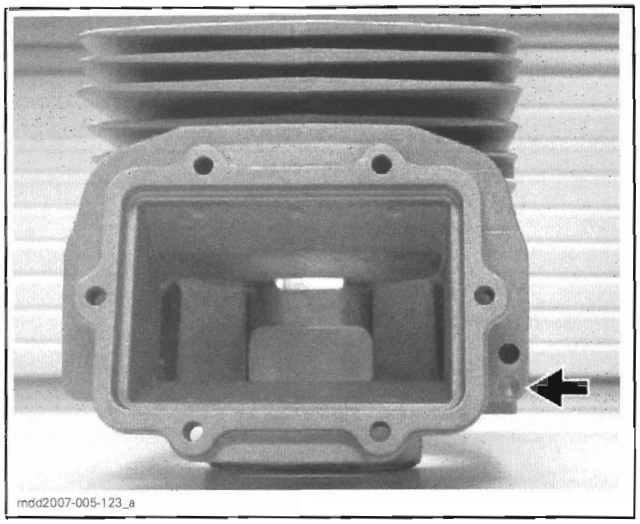
1. Exhaust side
2. Distance nuts

Torque in a criss-cross sequence cylinder head nuts **no. 1** and **no. 2** to 22 N•m (16 lbf•ft); torque each cylinder head individually.

CYLINDER

Identification

On the RF chassis, the 552 engine has a lower exhaust port. The cylinder can be recognized with a drilled indent near intake manifold.



Removal

Remove intake adapters **no. 6** and reed valves **no. 11**.

Remove exhaust manifold.

Remove cylinder cowl and cylinder heads.

Lift cylinders **no. 4**.

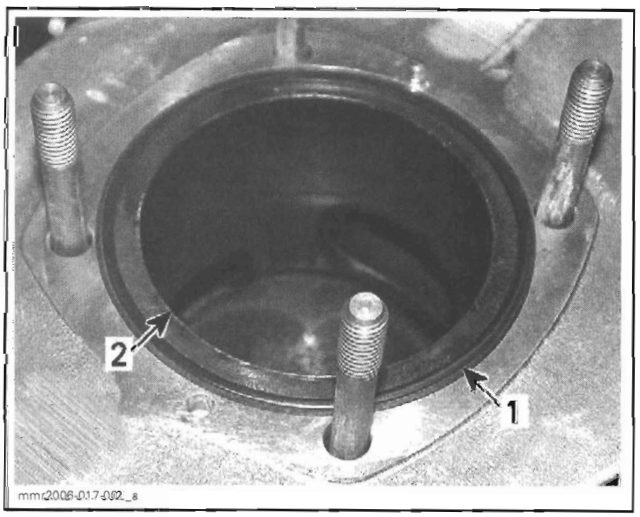
Discard the cylinder gasket.

Inspection

Check cylinders for cracks and scoring.

Check exhaust flanges for flatness.

Check cylinder O-ring.



1. *O-ring*
2. *Cylinder*

Refer to table below to find cylinder specifications. For dimension measurement procedures, refer to *ENGINE MEASUREMENT*.

MEASUREMENT	MAXIMUM TOLERANCES
Cylinder taper	0.10 mm (.0039 in)
Cylinder out of round	0.08 mm (.0031 in)

Cleaning

Scrape off carbon formation from exhaust ports.

Installation

Apply a thin layer of Loctite 518 (P/N 293 800 038) to crankcase mating surface of base gasket.

Install a new cylinder base gasket of the same thickness as previously used.

NOTE: If the old gasket thickness is unknown or if a cylinder head or cylinder is replaced, measure the combustion chamber volume to determine the right gasket to use. Refer to *ENGINE MEASUREMENT* for the measurement procedures. Refer to *CYLINDER HEAD* above for the combustion chamber volume specifications.

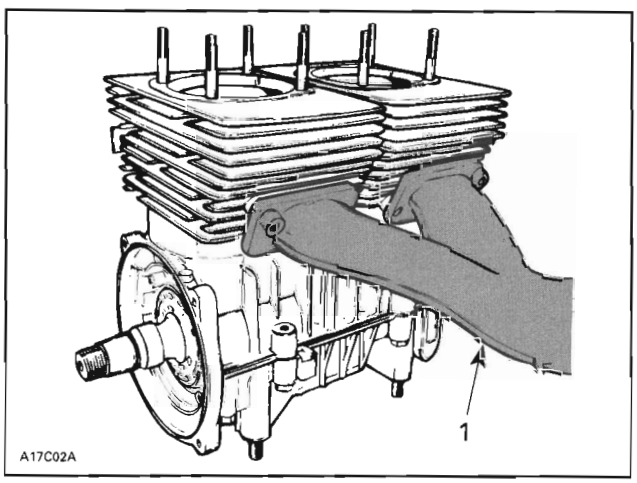
CAUTION: Always install a gasket of the proper thickness. Failure to do so may cause detonation and severe engine damage.

Coat gasket with Loctite 518.

Before inserting piston in the cylinder, lubricate the cylinder with new injection oil or equivalent.

Using fingers or the ring compressor (P/N 420 876 972), slide piston **no. 8** into cylinder **no. 4**.

Install exhaust manifold to align cylinders.



1. *Use exhaust manifold to align cylinders*

Install reed valves and intake adapters.

NOTE: Check intake adapters for cracks or delamination.

Torque intake adapter screws to 5 N•m (44 lbf•**in**).

Torque exhaust manifold bolts to 22 N•m (16 lbf•ft).

Install all other removed parts.

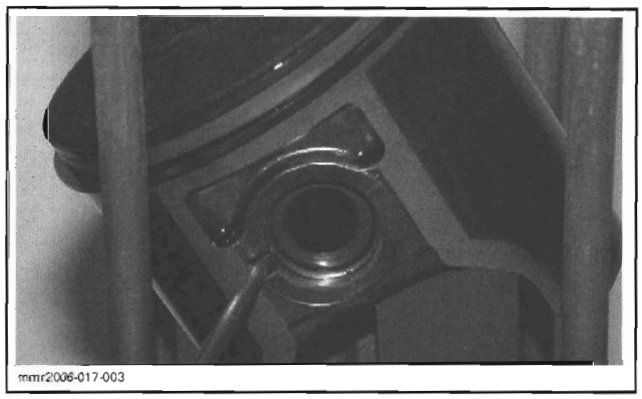
PISTON

Removal

Remove cylinders.

NOTE: The PTO cylinder or fan housing have to be removed to give access to MAG piston with puller.

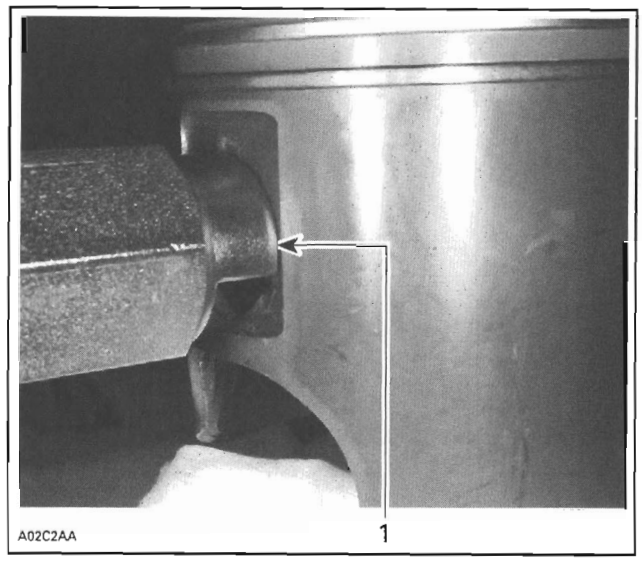
Place a clean rag over crankcase to prevent circlips **no. 10** from falling into crankcase. Then with a pointed tool inserted in piston notch, remove both circlips from piston **no. 8**.



NOTE: On this engine, piston pin is mounted with cageless bearing.

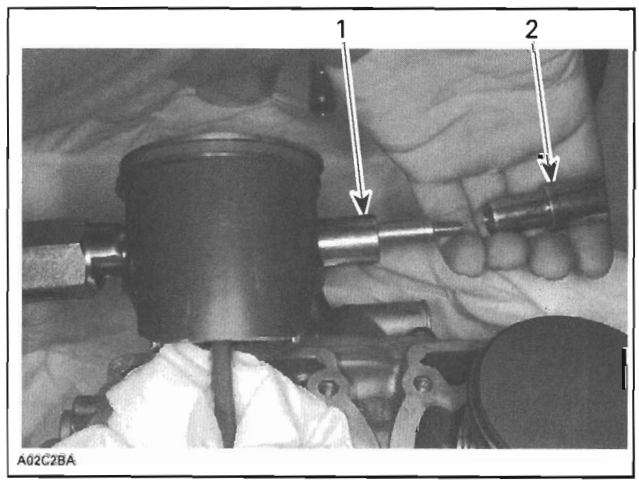
Use the piston pin puller (P/N 529 035 503) along with the 20 mm sleeve kit (P/N 529 035 542) and the locating sleeve (P/N 529 023 800) to remove piston pin **no. 9**. Use the following procedure.

- When inserting piston pin puller, make sure it sits squarely against piston.



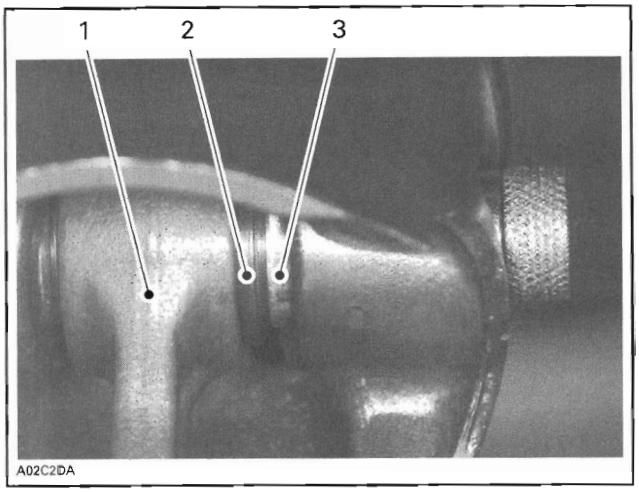
TYPICAL
1. Properly seated all around

- Install sleeve then shouldered sleeve over puller rod.



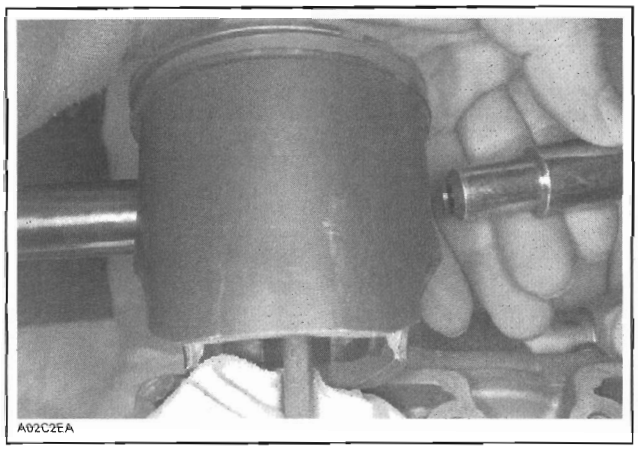
TYPICAL — INSTALLATION OF SLEEVE KIT
1. Sleeve
2. Shouldered sleeve

- Pull out piston pin by unscrewing puller until shouldered sleeve end is flush with thrust washer of piston pin bearing.



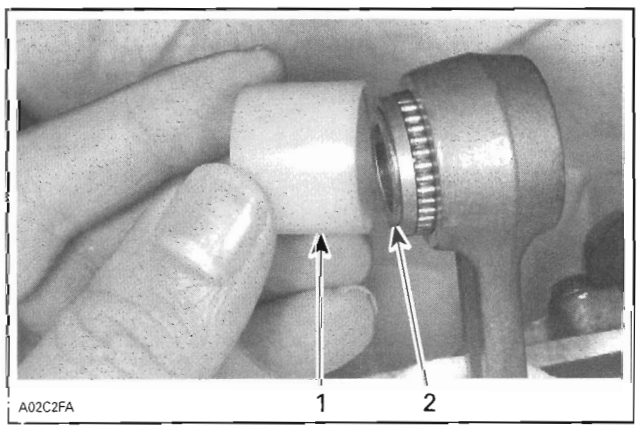
TYPICAL
1. *Sleeve inside bearing*
2. *Thrust washer*
3. *Shouldered sleeve end*

– Remove puller. Pull out shouldered sleeve carefully.



TYPICAL

– Remove piston from connecting rod.
– Install locating sleeve. Then push needle bearings along with thrust washers and sleeve.



TYPICAL
1. *Locating sleeve*
2. *Sleeve*

– Use a locking tie to fasten all needles and thrust washers along with locating sleeve.

Inspection

Inspect piston for scoring, cracking or other damages.

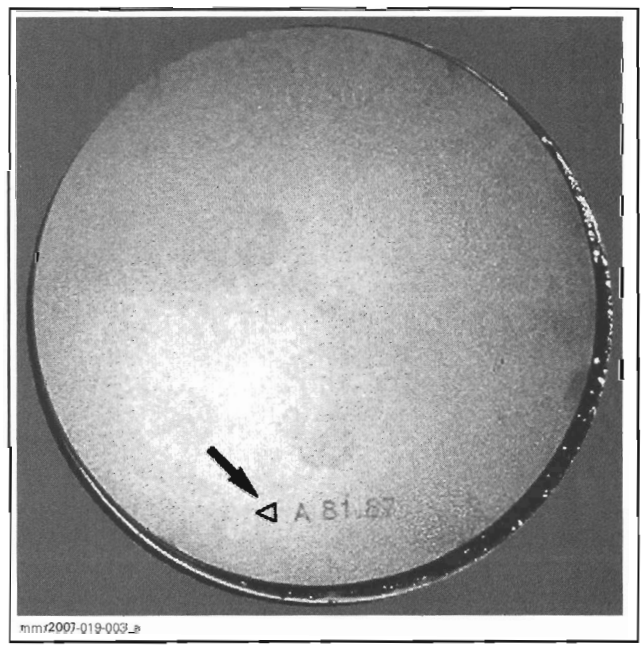
Refer to table below to find piston specifications. For dimension measurement procedures, refer to *ENGINE MEASUREMENT*.

MEASUREMENT	MAXIMUM TOLERANCES
Piston/cylinder wall clearance	0.2 mm (.0079 in)
Piston skirt wear	0.15 mm (.006 in)
Ring end gap	1.0 mm (.039 in)
Ring/piston groove clearance	0.2 mm (.0079 in)

Cleaning

Scrape off carbon formation from piston dome.

NOTE: The arrow on the piston dome must be visible after cleaning.

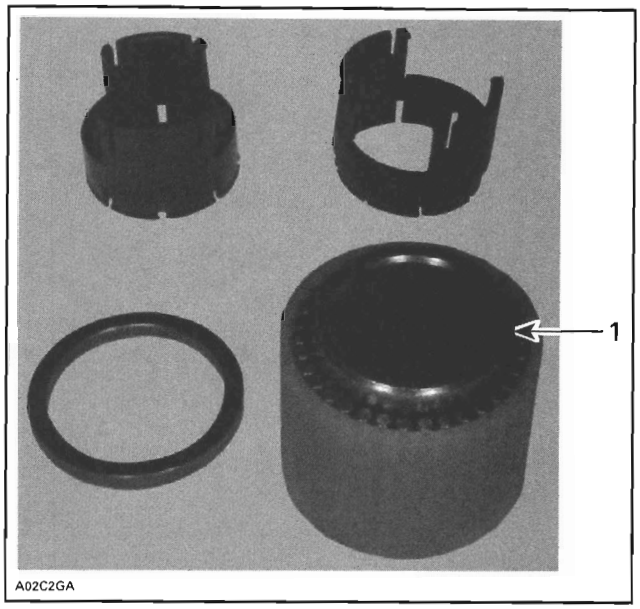


Clean the piston ring groove with a groove cleaner tool or with a piece of broken ring.

Installation

When reinstalling original needle bearings, make sure that 34 needles are inserted between sleeve and locating sleeve.

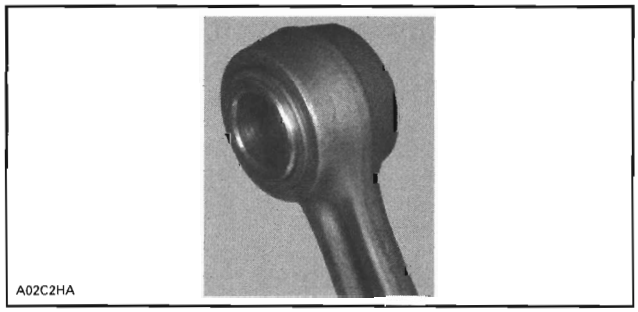
When installing a new cageless bearing, replace half plastic cages by sleeve.



TYPICAL
1. Sleeve

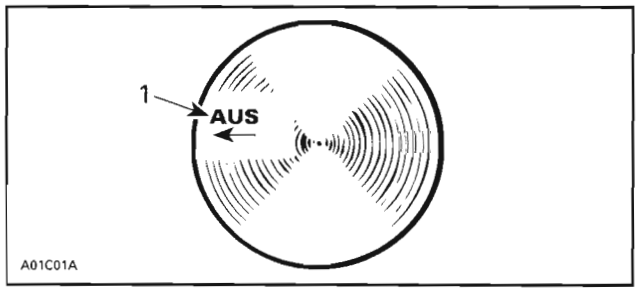
Grease thrust washers and install them on each end of needles.

Insert cageless bearing into connecting rod.



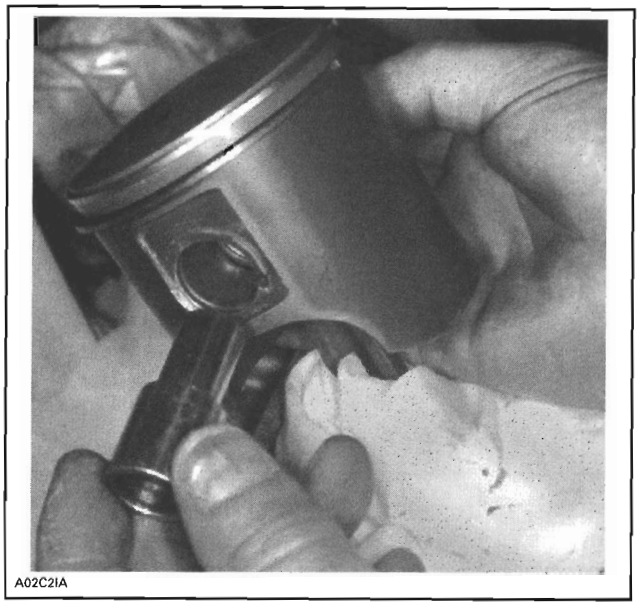
TYPICAL — CAGELESS BEARING AND SLEEVE INSTALLED

Mount piston over connecting rod with the letters "AUS" (over an arrow on the piston dome) facing in the direction of exhaust port.



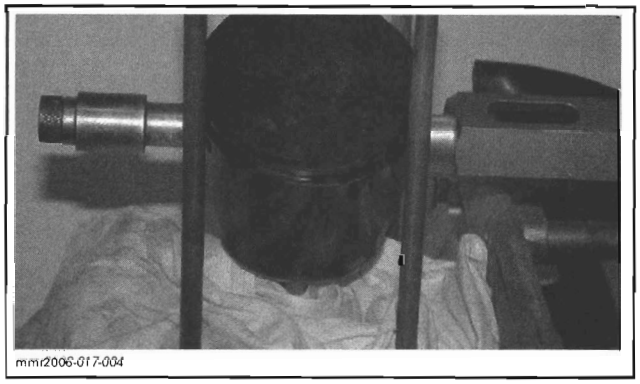
1. Exhaust

Install shouldered sleeve.



TYPICAL — SHOULDERED SLEEVE INSTALLATION

Install piston pin puller and turn handle until piston pin is correctly positioned in piston.

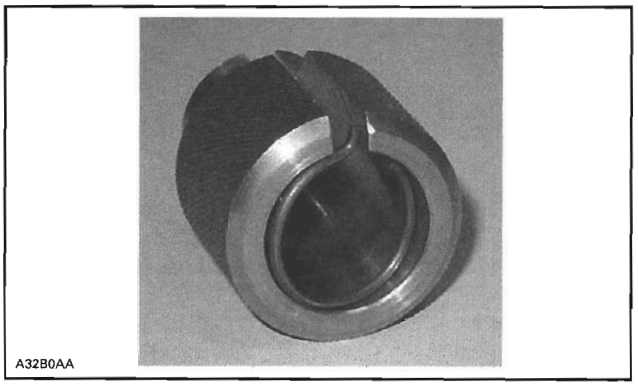


TYPICAL

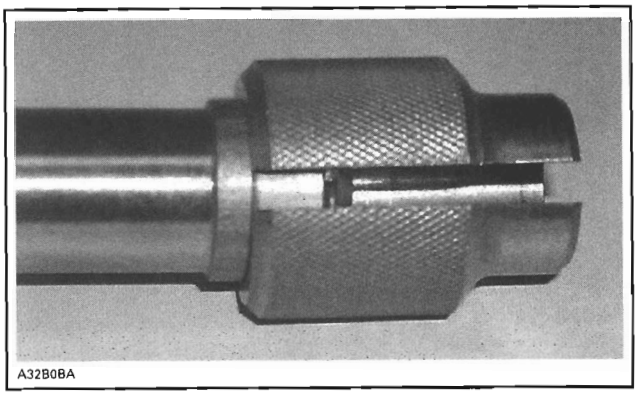
Remove piston pin puller and sleeve kit.

Use piston circlip installer (P/N 529 035 686) to install mono-hook circlips **no. 10**.

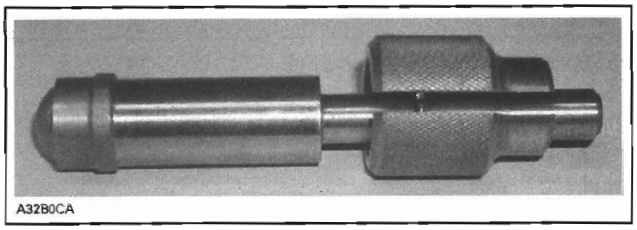
Insert circlip into support in such a way that when installed in piston groove, the tab will face upward.

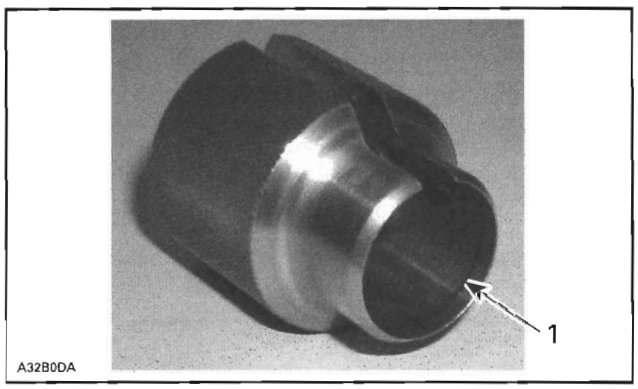


With round end of pusher, position circlip perpendicular to the support axis.

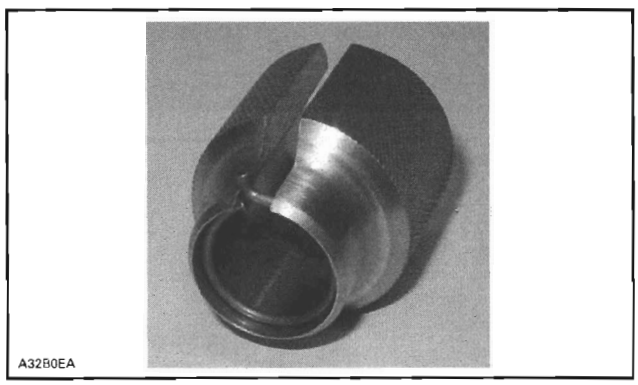


With the other end of the pusher, push circlip into the support groove.



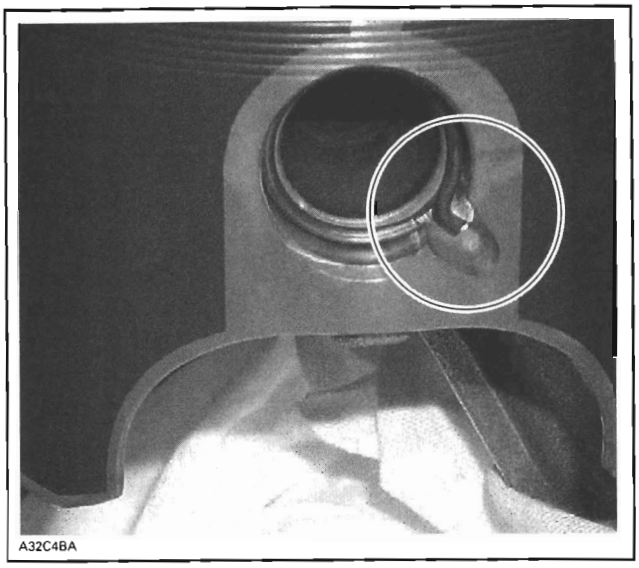


1. Groove



CIRCLIP READY TO BE INSTALLED ON PISTON

Using a plastic hammer, tap pusher to insert circlip in place. Take care to install new circlips with tab toward top as per following photo.



TAB TOWARD TOP

CAUTION: Always install new mono-hook circlips. If circlip installation fails at the first attempt, always retry with a new one as on a second attempt circlip will lose its normal retaining capabilities.

CAUTION: Circlips must not move freely after installation; if so, replace them.

Before inserting piston in the cylinder, lubricate the cylinder with new injection oil or equivalent.

REED VALVE

Removal

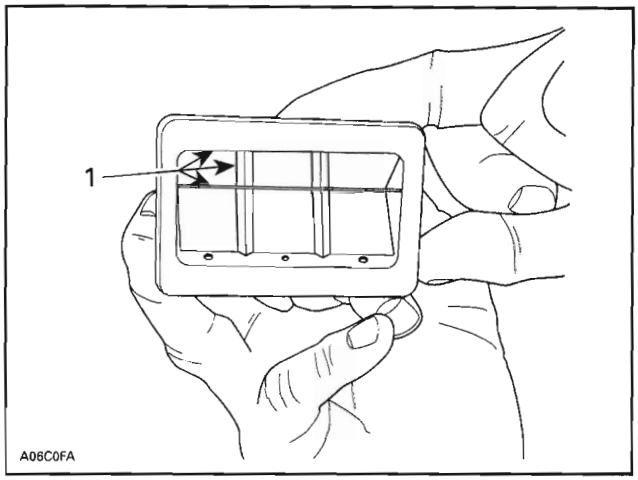
Remove intake adapters **no. 6** by removing carburetors and screws retaining intake adapters.

Remove reed valves **no. 11** from engine.

Inspection

With blade stopper **no. 13** removed, check reed valve for proper tightness. There must be no play between blade **no. 12** and valve body when exerting a finger pressure on blade at blade stopper location.

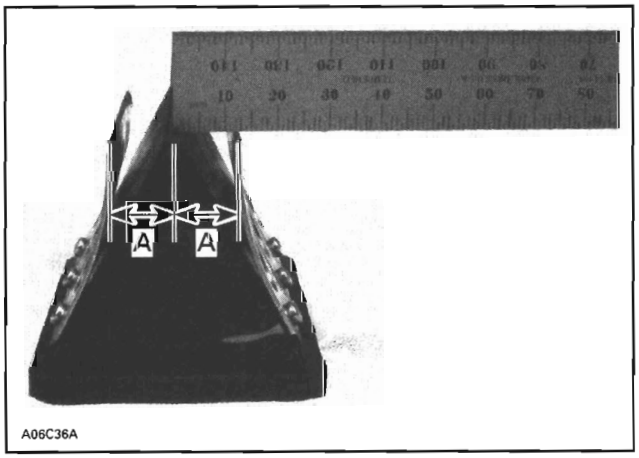
In case of a play, turn blade upside down and recheck. If there is still a play, replace blade and/or valve body.



1. No play

NOTE: Blades **no. 12** have a curved shape. Install with their curve facing reed block.

Check distance from blade stopper inner edge and distance from center of reed valve block.



TYPICAL
A. 14.75 - 0, + 0.75 mm (.580 - 0, + .030 in)

Bent blade stopper as required to obtain the proper distance.

Installation

The installation is the reverse of the removal procedure.

NOTE: Blade stoppers may slightly interfere with cylinder during installation. Adjusted distance will be reduced automatically upon installation.

BOTTOM END

SERVICE TOOLS

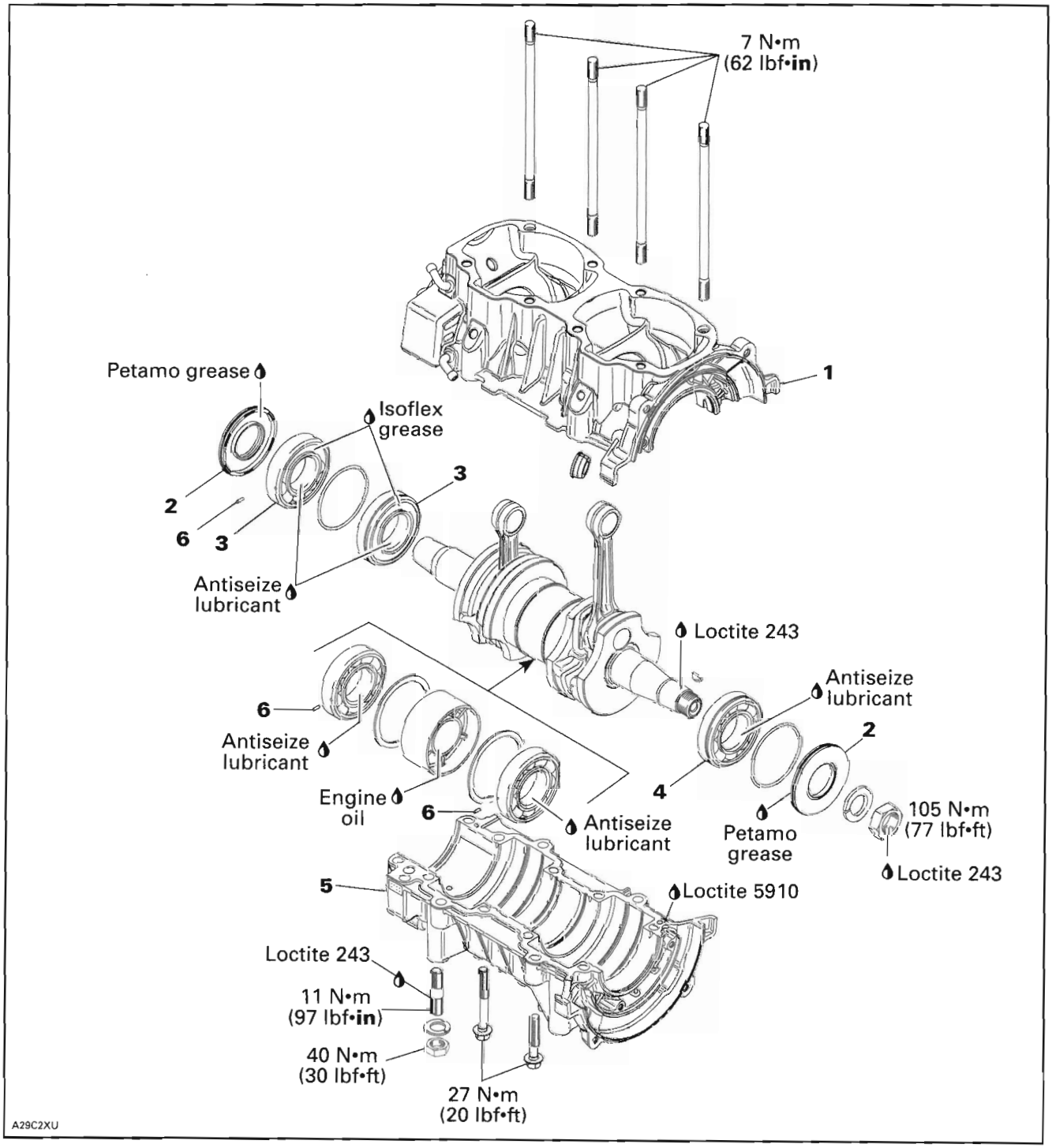
Description	Part Number	Page
bearing heater	529 035 969	176
bearing installer	529 035 980	178
bearing installer	529 035 990	177
bearing puller	529 036 004	175
crankshaft protector	420 876 552	175
crankshaft protector	420 876 557	176
distance gauge	529 035 965	178
half rings	420 977 475	175
indicator stick	529 035 970	177
puller ring	420 977 490	175
screws	420 840 681	175
support plate	529 035 976	178

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
bearing separator Snap-on	CJ951	176
bearing separator SPX/OTC	1124	176

SERVICE PRODUCTS

Description	Part Number	Page
Isoflex grease	293 550 021	174
Loctite 5910	293 800 081	173
Loctite 767 (antiseize lubricant)	293 800 070	176
Loctite Chisel	413 708 500	173
Petamo grease	420 899 271	174
pulley flange cleaner	413 711 809	174, 176
Thermo Lube grease	219 700 417	175


7 N•m
(62 lbf•in)
1
Petamo grease
Isoflex
grease
2
6
3
3
Antiseize
lubricant
Loctite 243
6
Antiseize
lubricant
Antiseize
lubricant
2
4
Engine
oil
6
Antiseize
lubricant
Petamo
grease
105 N•m
(77 lbf•ft)
Loctite 243
5
Loctite 5910
Loctite 243
11 N•m
(97 lbf•in)
40 N•m
(30 lbf•ft)
27 N•m
(20 lbf•ft)
A29C2XU

GENERAL

Before completely disassembling the engine, check airtightness. Refer to *LEAK TEST*.

To verify internal parts, refer to *ENGINE MEASUREMENT* section.

All oil seals and gaskets must be discarded and replaced with new ones when crankcase is split.

CAUTION: After rebuilding an engine always observe a break-in period as described in *OPERATOR'S GUIDE*.

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

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

PROCEDURES

CRANKCASE

Disassembly

Remove:
- engine from chassis (refer to *ENGINE REMOVAL AND INSTALLATION*)
- engine fan cowls, cylinder heads and cylinders (refer to *TOP END*)
- rewind starter (refer to *REWIND STARTER*)
- fan belt pulley, trigger coils, magneto flywheel and stator (refer to *MAGNETO SYSTEM*).

Remove all screws that retain both housings together.

Split crankcase and remove internal components.

Clean all metal components and remove old sealant from crankcase mating surfaces with Loctite Chisel (P/N 413 708 500).

CAUTION: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

Inspection

Check crankcase for cracks. Replace if needed.

Assembly

Crankcase halves **no. 1** and **no. 5** are factory matched and therefore, are not interchangeable as single halves.

Install all internal components.

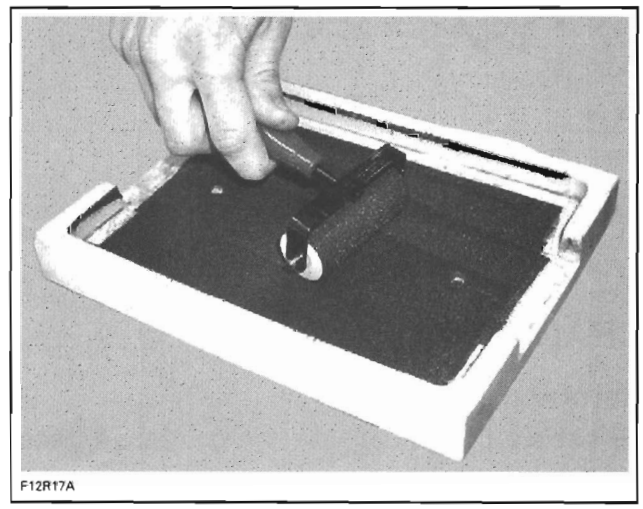
Close and torque crankcase by performing the following:

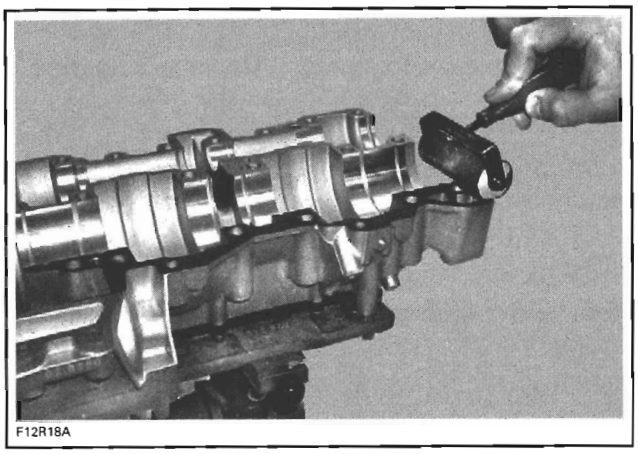
IMPORTANT: The total assembly sequence, including sealing compound application, crankcase screw installation and torquing, must be performed within 10 minutes. The torquing sequence must be accomplished without interruption.

Before screwing both parts of crankcase, seal it with Loctite 5910 (P/N 293 800 081).

NOTE: It is recommended to apply this specific sealant as described here to get an uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant.

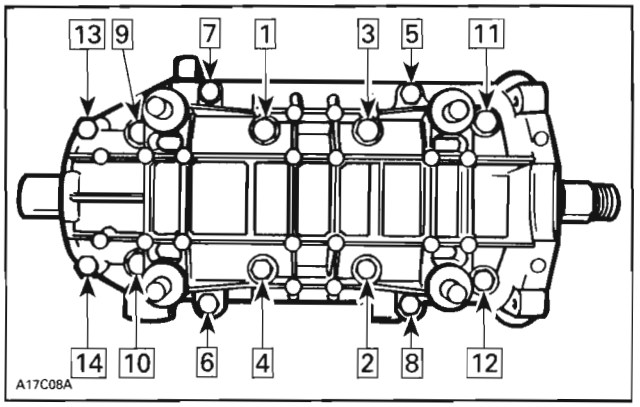
Use a plexiglass plate and apply some sealant on it. Use a 50 - 75 mm (2 - 3 in) soft rubber roller and spread the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on crankcase mating surfaces.


F12R17A



TYPICAL

Tighten all crankcase screws in place in the following sequence and to the appropriate torque through a two steps torquing: first, tighten screws up to 60% of the final torque 13 N•m (115 lbf•**in**) for M8 screws, then, tighten to the required torque (i.e. 22 N•m (16 lbf•ft).



TIGHTENING SEQUENCE

CAUTION: After rebuilding an engine always observe a break-in period as described in *OPERATOR'S GUIDE*.

CRANKSHAFT

Removal

To remove crankshaft, use the crankcase disassembly procedure.

Inspection

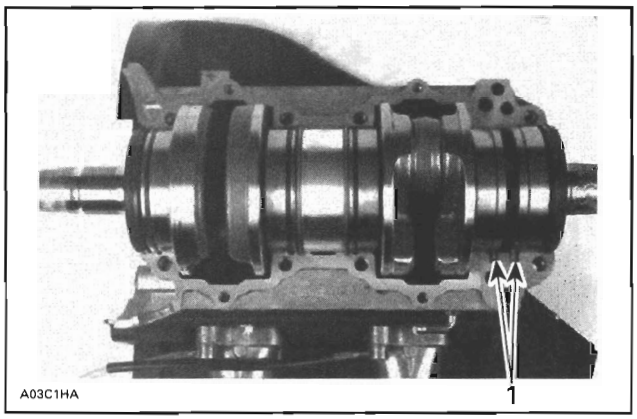
Refer to table below to find crankshaft dimension specifications. For dimension measurement procedures, refer to *ENGINE MEASUREMENT*.

ENGINE MEASUREMENT	TOLERANCES		
	NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT
Crankshaft deflection on PTO side	N.A.	0.06 mm (.0024 in)	N.A.
Crankshaft deflection on MAG side	N.A.	0.03 mm (.001 in)	N.A.
Crankshaft deflection in center of crankshaft	N.A.	0.08 mm (.0031 in)	N.A.
Connecting rod big end axial play	0.2 mm (.008 in)	0.53 mm (.0209 in)	1.20 mm (.047 in)
Crankshaft end-play	0.10 mm (.004 in)	0.30 mm (.012 in)	N.A.

Installation

Using pulley flange cleaner (P/N 413 711 809), remove all trace of Loctite 243 from crankshaft taper.

When installing crankshaft, position drive pins **no. 6** as illustrated.



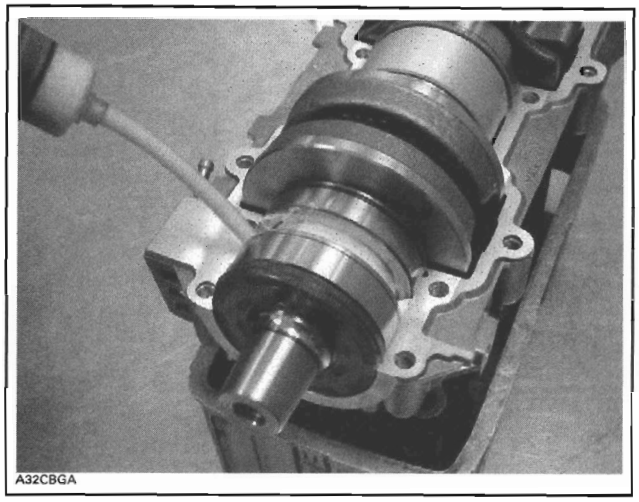
TYPICAL
1. Drive pins

At seal **no. 2** assembly, apply a light coat of Petamo grease (P/N 420 899 271) on seal lip.

Put 15 to 20 mL of Isoflex grease (P/N 293 550 021) in a syringe.

NOTE: The 50 g tube corresponds to 50 mL of grease.

With the syringe, fill in the PTO side ball bearings as shown below.



TYPICAL — BALLS COATED WITH A SEAM OF GREASE

CAUTION: Use only the recommended grease. Make sure not to push grease between outside bearing race and half crankcase.

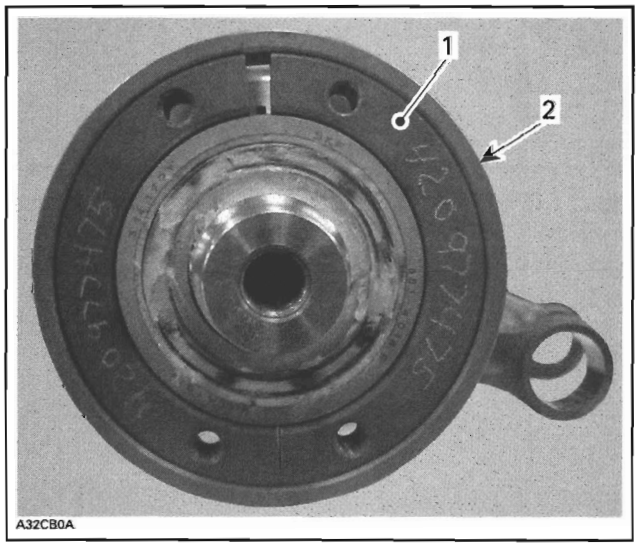
Close crankcase and install all removed parts.

CRANKSHAFT BEARINGS

Removal

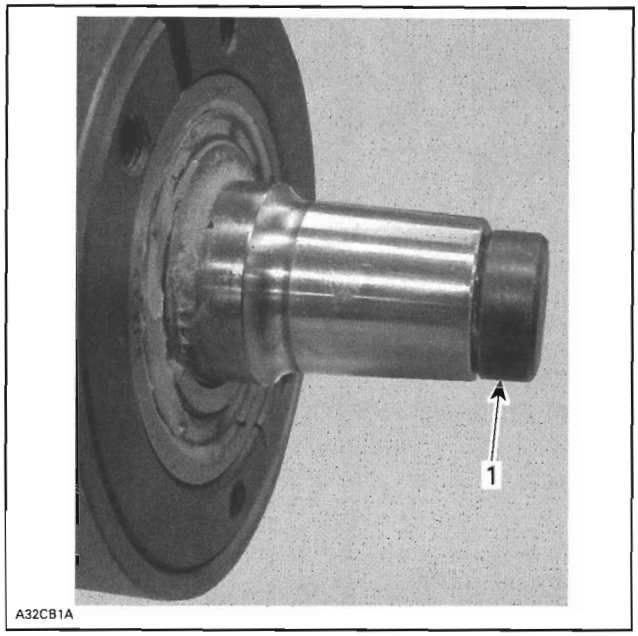
NOTE: Normally it takes approximately 10 minutes to heat up a bearing so in the event of replacing bearing, it's recommended to start the bearing heating process prior to removal operation. See procedure further.

To remove PTO side bearings **no. 3** from crankshaft, install half rings (P/N 420 977 475) and puller ring (P/N 420 977 490) on the bearing.



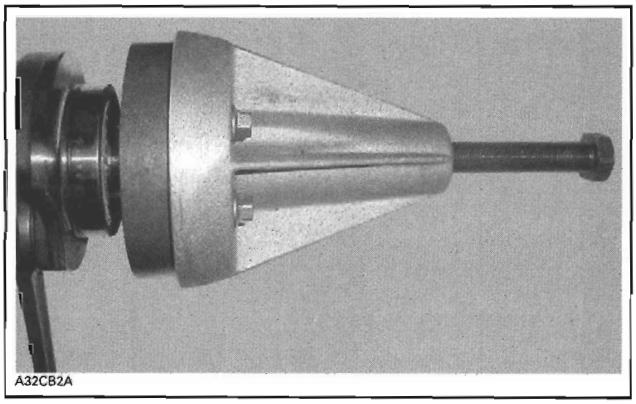
1. *Half ring*
2. *Puller ring*

Apply Thermo Lube grease (P/N 219 700 417) on the crankshaft end and install crankshaft protector (P/N 420 876 552).



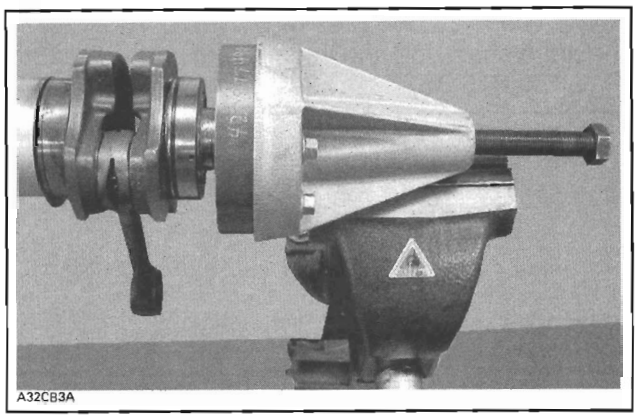
1. *Crankshaft protector*

Install bearing puller (P/N 529 036 004) and secure to half rings using screws (P/N 420 840 681).



PULLER INSTALLED ON THE HALF RINGS

Secure the bearing puller in a vise by one of its rib.



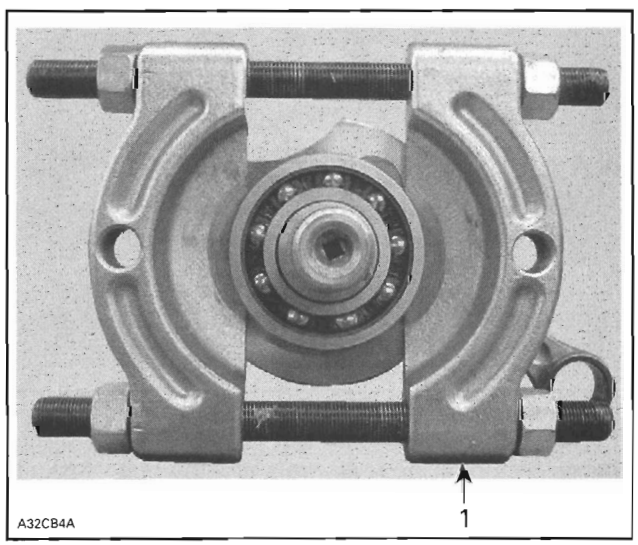
BEARING PULLER SECURED IN THE VISE

CAUTION: Never use any air impact tool for tightening the puller bolt.

Lubricate the puller bolt and then proceed with tightening the puller bolt until the bearing comes out.

Follow the same procedure for the inner bearing.

NOTE: In the case of damaged bearing or less clearance between crankshaft counterbalance and the bearing or on the MAG side bearing, use a bearing separator Snap-on (P/N CJ951) or a bearing separator SPX/OTC (P/N 1124) to facilitate the removal.

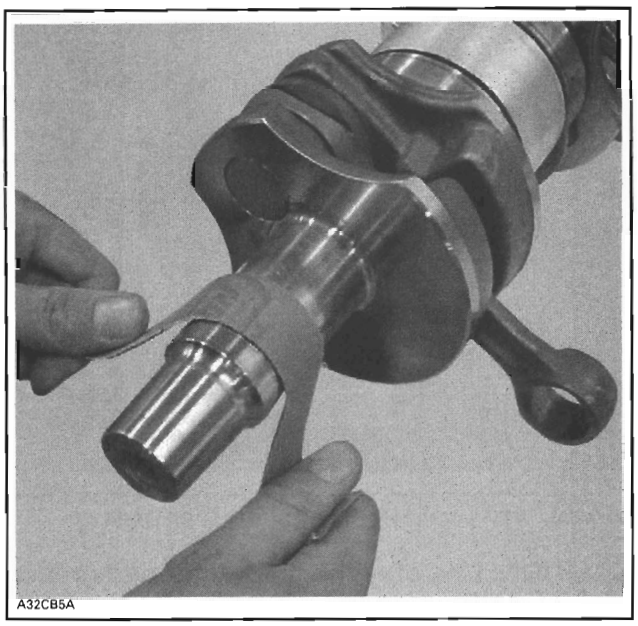


1. Bearing separator

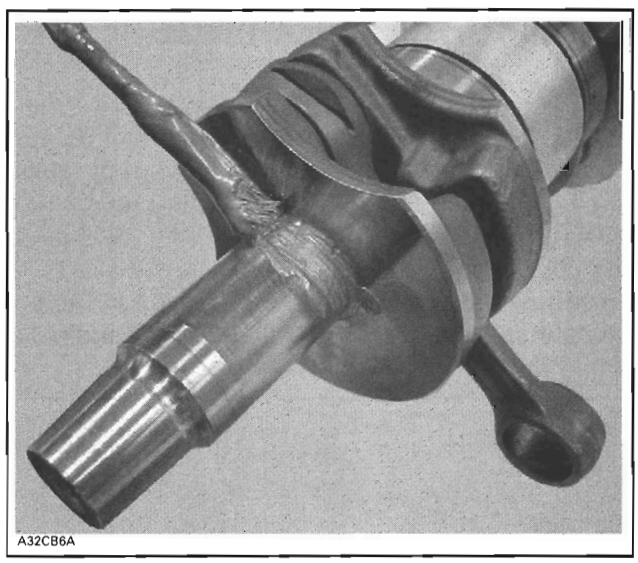
Procedure for MAG side bearings **no. 4** is same as of PTO side with the exception of the crankshaft protector (P/N 420 876 557).

Installation

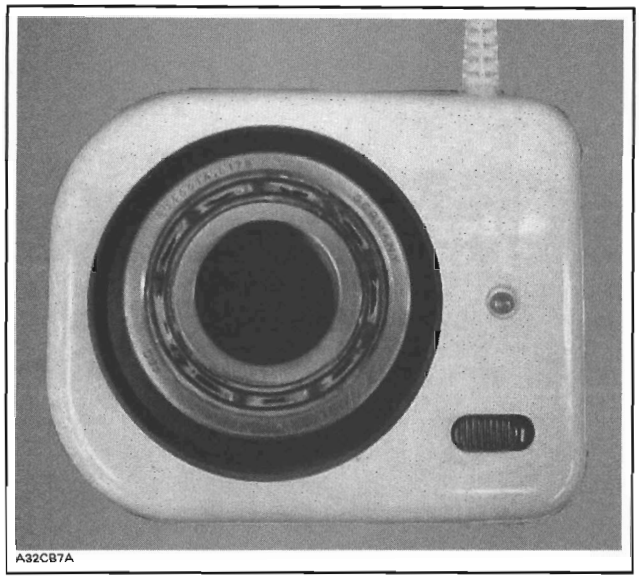
Clean crankshaft end with sand paper no. 180 and remove all residue using pulley flange cleaner (P/N 413 711 809).



Smear Loctite 767 (antiseize lubricant) (P/N 293 800 070) on part of crankshaft where bearing fits.



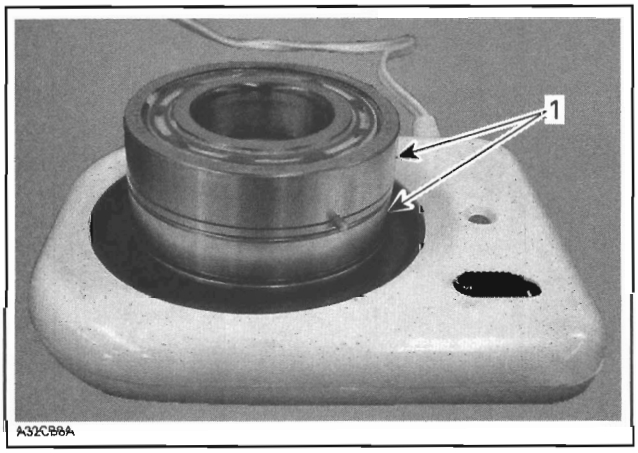
Heat up the bearing(s) using bearing heater (P/N 529 035 969). This will expand bearings and ease installation. If required, put a suitable plate or shim to avoid the direct contact between integrated seal (if applicable) with the heating surface.



CAUTION: Bearing should not be heated to more than 80°C (176°F). Do not heat bearing with direct flame or heat gun or heated oil. Inappropriate heating procedure(s) may cause inner seal failure.

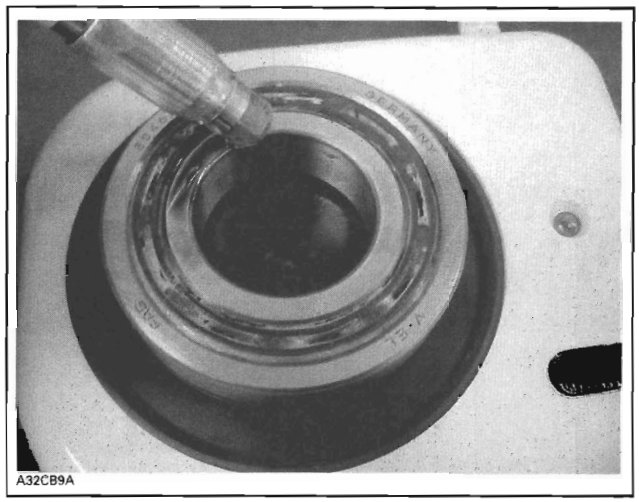
For even heat distribution, turn bearing several times during heating process.

NOTE: Two bearings can be heated at the same time on one bearing heater.



1. Bearings

Touch the inner race of the bearing with the temperature indicator stick (P/N 529 035 970). Stick will liquefy when the bearing reach the proper temperature.

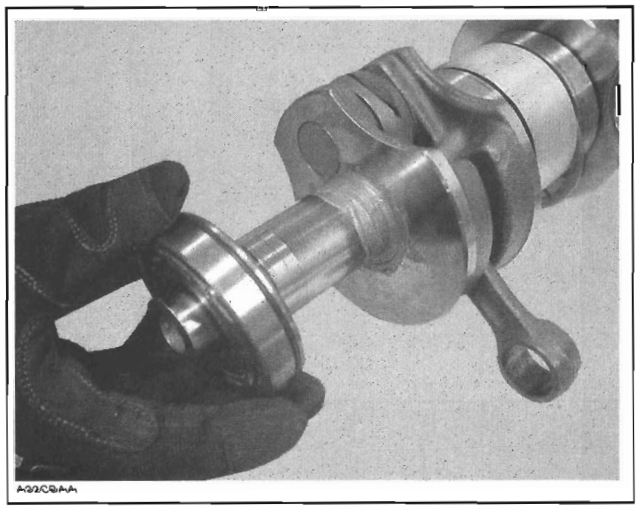


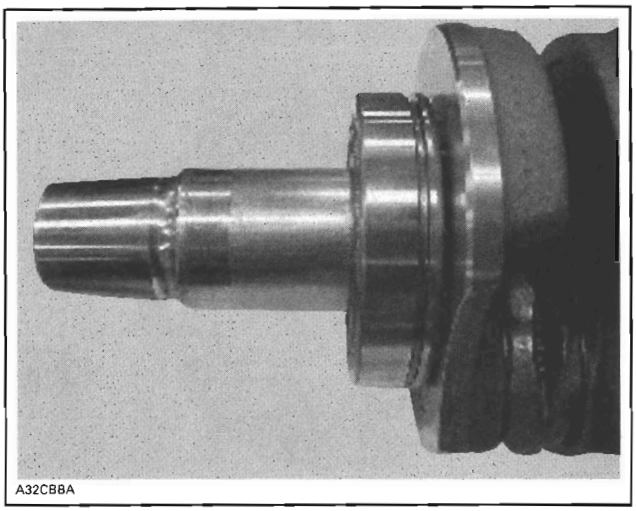
⚠ WARNING

Do not touch heated bearing with bare hands. Wear heat resisting gloves before handling the heated bearing(s).

Slide in the inner PTO bearing with the integrated seal facing crankshaft. Push bearing to end position.

NOTE: The heated bearing should slide easily on the crankshaft. If required, push with a bearing installer (P/N 529 035 990).

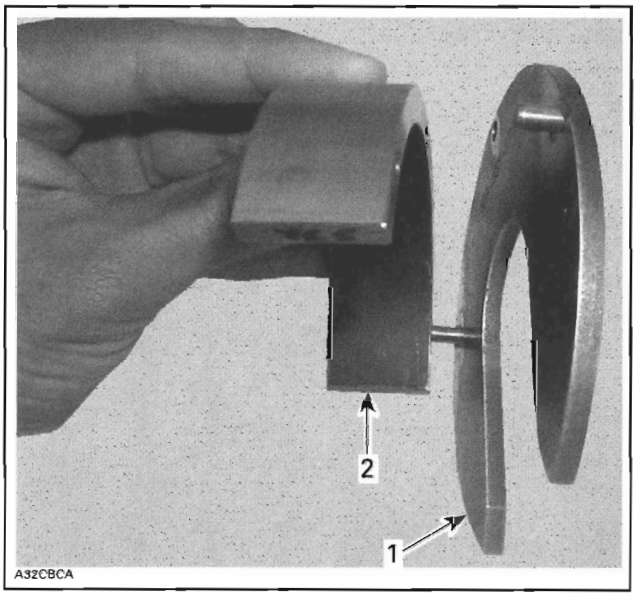




BEARING TO END POSITION

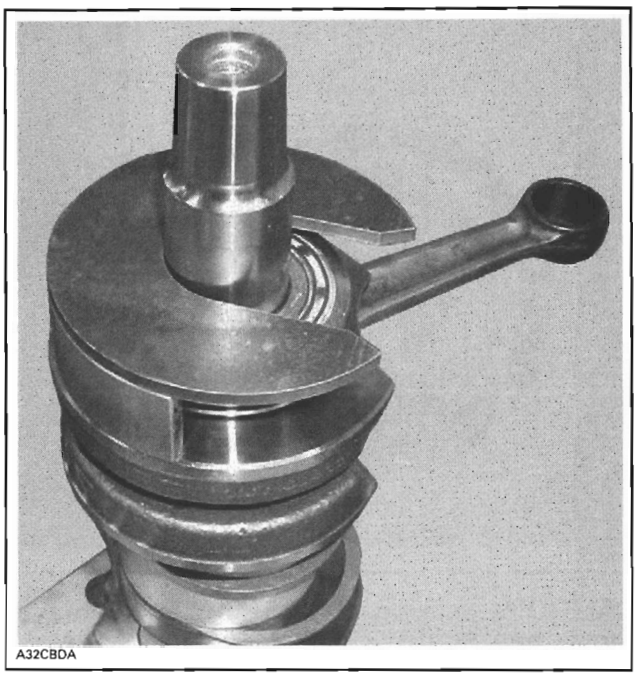
Install the O-ring.

Make a bearing locator tool using support plate (P/N 529 035 976) and distance gauge (P/N 529 035 965).

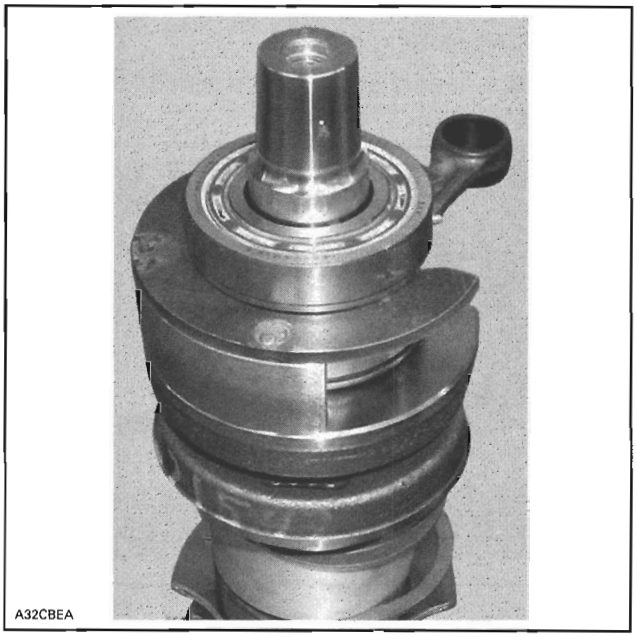


1. *Support plate*
2. *Distance gauge*

Install bearing locator tool.

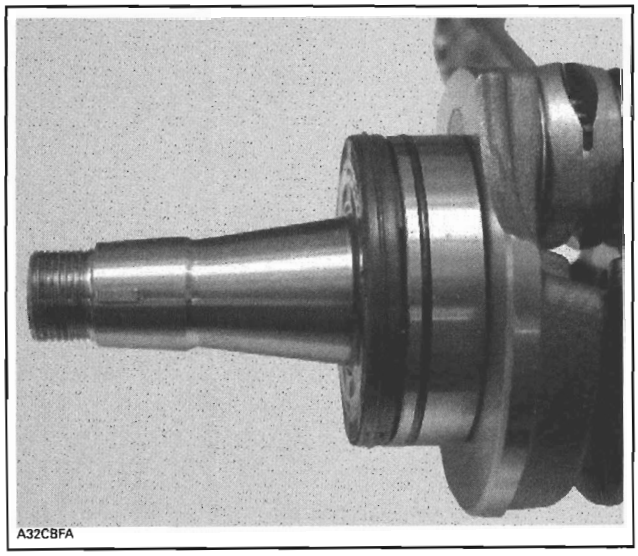


Slide in the heated outer PTO bearing onto the crankshaft.



Install the heated MAG side bearing.

NOTE: The heated bearing should slide easily on the crankshaft. If required, push with a bearing installer (P/N 529 035 980).



TYPICAL

ENGINE MEASUREMENT

SERVICE TOOLS

Description	Part Number	Page
degree wheel	529 035 607	185
dial indicator	414 104 700	184–185

NOTE: This subsection explains the procedures to correctly measure engine components. For the engine technical specifications, refer to *INSPECTION* in the appropriate *ENGINE* subsection.

CYLINDER HEAD WARPAGE

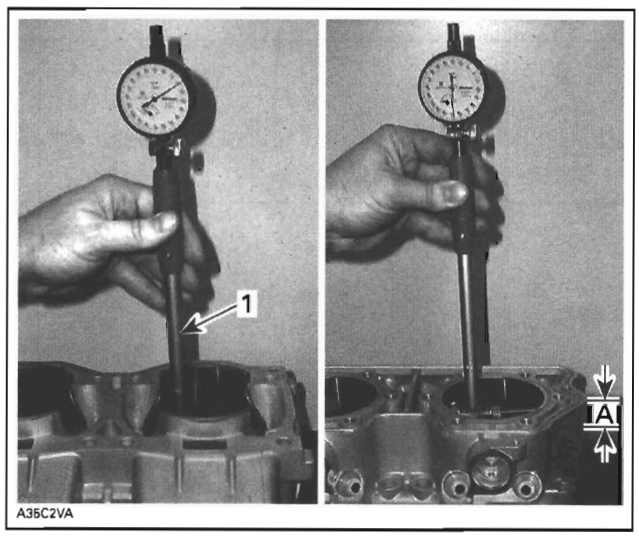
Check gasketed surface of the cylinder head with a straight edge and a feeler gauge. Make sure part is within the given specification. If cylinder head is out of specification, replace it. Verify combustion chamber volume to use the correct cylinder base gasket with the new part.

CYLINDER TAPER

Compare cylinder diameter 33 mm (1.3 in) from top of cylinder to just below its intake port area.

If the difference exceeds the specified dimension the cylinder should be rebored and honed or should be replaced.

NOTE: If cylinder is rebored, be sure to restore the chamfer around all cylinder sleeve port openings.

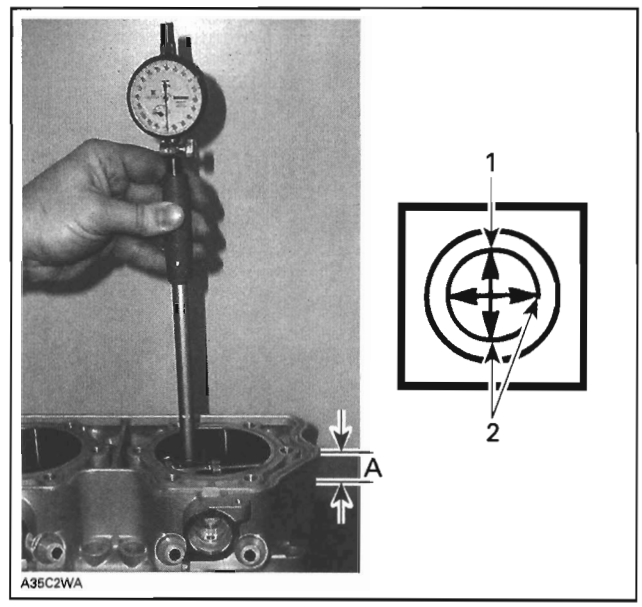


TYPICAL
1. Below the intake port
A. 33 mm (1.3 in) from top

CYLINDER OUT OF ROUND

Measuring 33 mm (1.3 in) from top of cylinder with a cylinder gauge, check if the cylinder out of round is more than the specified dimension. If larger, cylinder should be rebored and honed or should be replaced.

NOTE: If cylinder is rebored, be sure to restore the chamfer around all cylinder sleeve port openings.

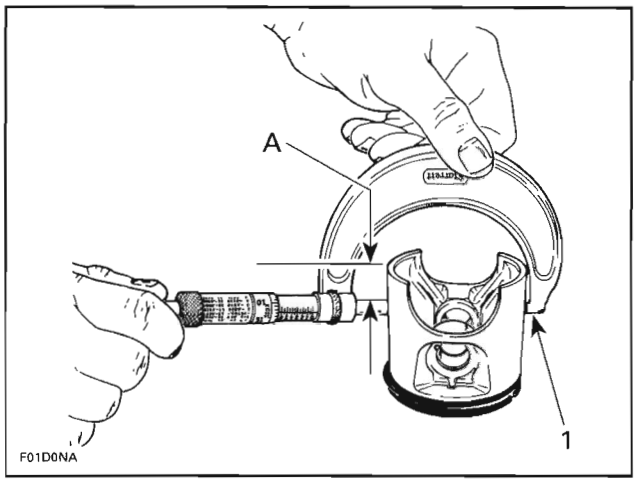


TYPICAL
1. Piston pin position
2. Measures to be compared
A. 33 mm (1.3 in)

CYLINDER/PISTON CLEARANCE

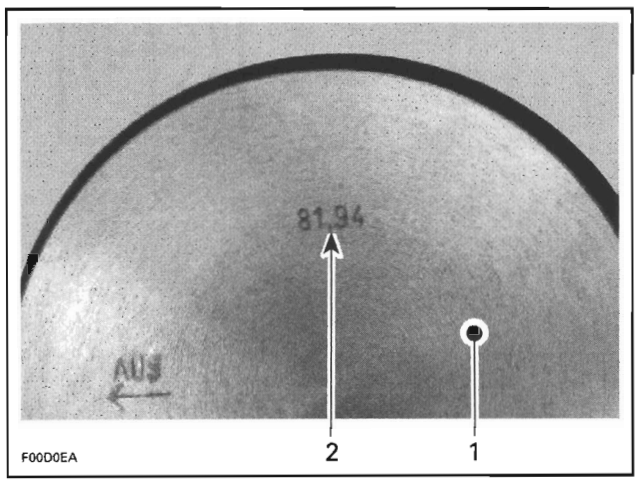
Procedure with a Used Piston

Using a micrometer, measure piston at A perpendicularly (90°) to piston pin.



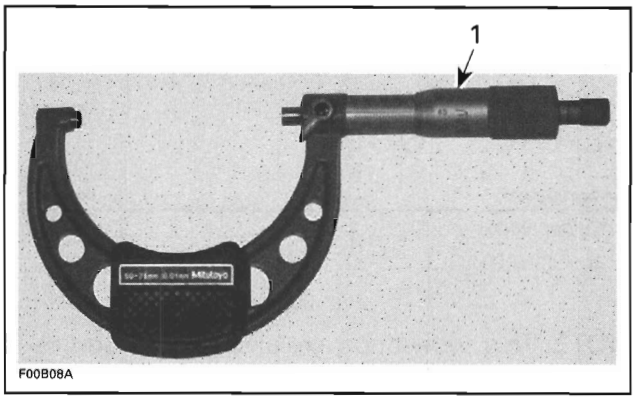
TYPICAL
1. Measuring perpendicularly (90°) to piston pin axis
A. 15 mm (.590 in)

The measured dimension must not be less than 0.15 mm (.006 in) of the one scribed on piston dome. Otherwise, install a new piston.



TYPICAL
1. Piston dome
2. Piston measurement

If piston is within tolerance, adjust and lock a micrometer to the piston dimension.

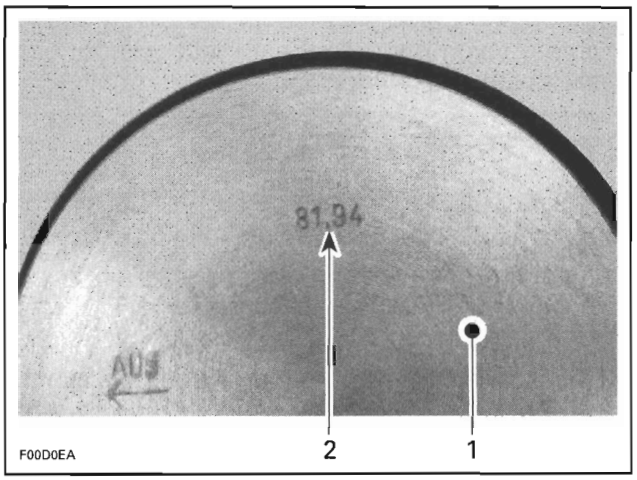


1. Micrometer set to the piston dimension

Refer to *PROCEDURE CONTINUATION WITH A NEW OR USED PISTON* further.

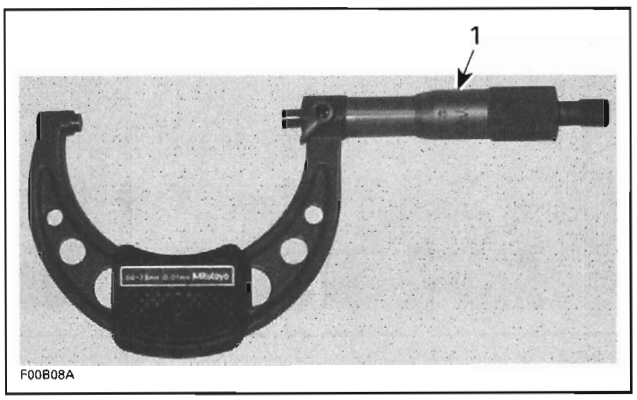
Procedure with a New Piston

Read the piston diameter on the piston dome.



1. Piston dome
2. Piston diameter

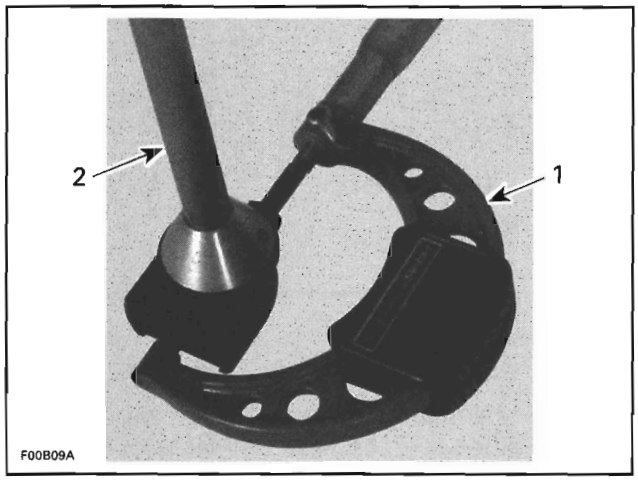
Adjust and lock a micrometer to the specified value on the piston dome.



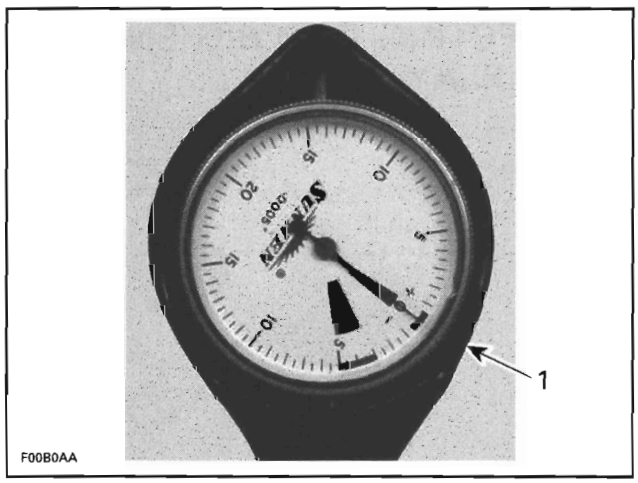
1. Micrometer set to the piston dimension

Procedure Continuation with a New or Used Piston

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



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

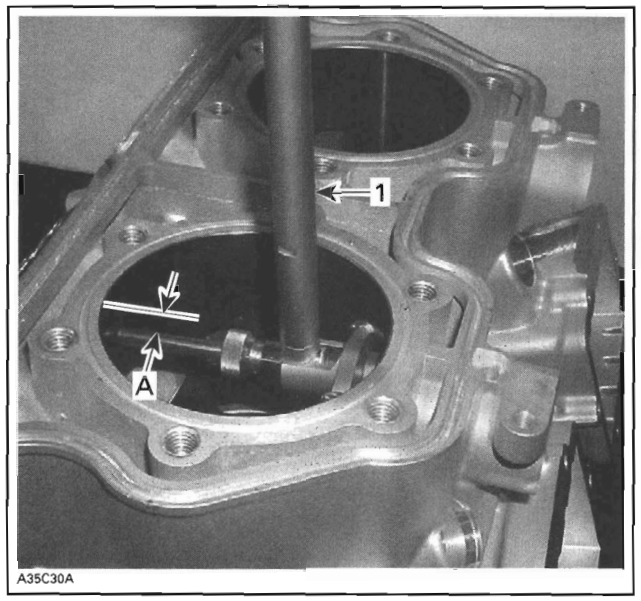


1. Indicator set to 0 (zero)

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.

Position the dial bore gauge at 33 mm (1.3 in) below cylinder top edge.

IMPORTANT: Always remove cylinder-block from crankcase before measuring.



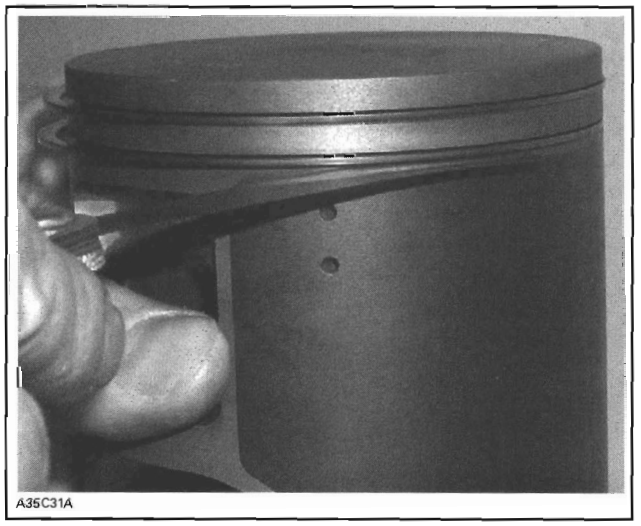
TYPICAL
1. Measuring perpendicularly (90°) to piston pin axis
A. 33 mm (1.3 in)

Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance. If clearance exceeds specified tolerance, replace piston and cylinder.

NOTE: Oversize pistons are available for the 552 engine.

RING/PISTON GROOVE CLEARANCE

Using a feeler gauge check clearance between rectangular ring and groove. Replace piston if clearance exceeds specified tolerance.

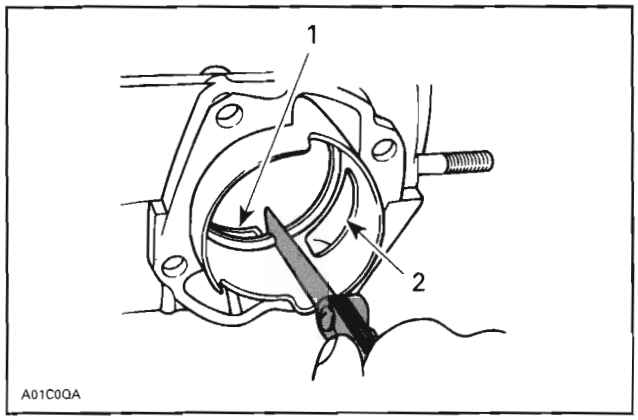


RING END GAP

Position ring halfway between transfer ports and intake port.

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 specified tolerance.



TYPICAL
1. Transfer port
2. Intake port

CRANKSHAFT DEFLECTION

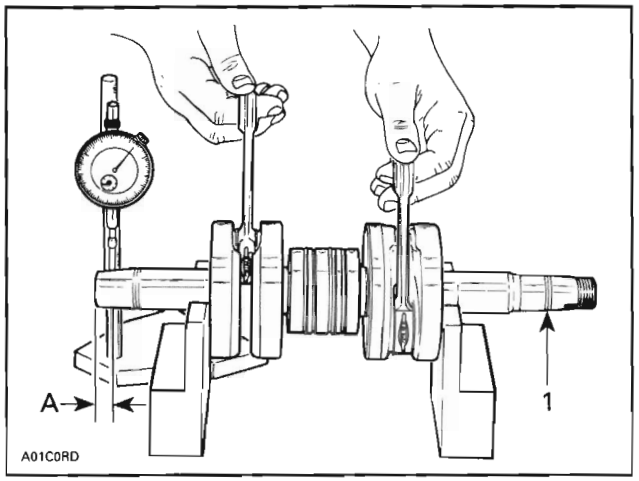
Crankshaft deflection is measured with the dial indicator (P/N 414 104 700).

Measuring in Crankcase

First, check deflection with crankshaft in crankcase. If deflection exceeds the specified tolerance, recheck deflection using V-shaped blocks to determine the defective part(s). See below.

Measuring on Bench

Once engine is disassembled, check crankshaft deflection on V-shaped blocks. If deflection exceeds the specified tolerance, it can be worn bearings or a bent crankshaft. Remove crankshaft bearings and check deflection again on V-shaped blocks to determine the defective part(s). See measurement "A" in following illustration.



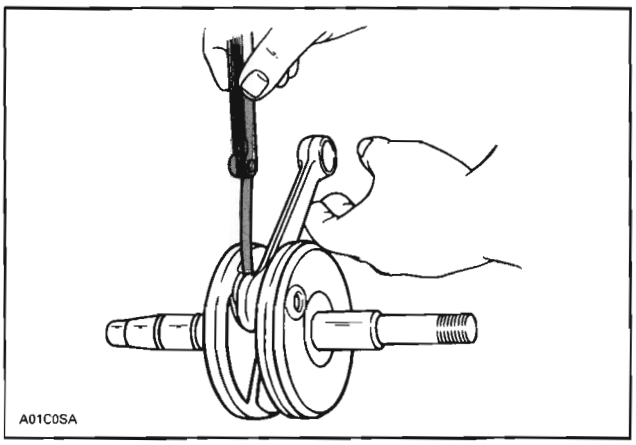
TYPICAL
1. Measure at mid point between the key and the first thread
A. 3 mm (1/8 in)

NOTE: Crankshaft deflection cannot be correctly measured between centers of a lathe.

If the deflection exceeds the specified tolerance, crankshaft should be repaired or replaced.

CONNECTING ROD BIG END AXIAL PLAY

Using a feeler gauge, measure distance between thrust washer and crankshaft counterweight. If the distance exceeds specified tolerance, repair or replace the crankshaft.

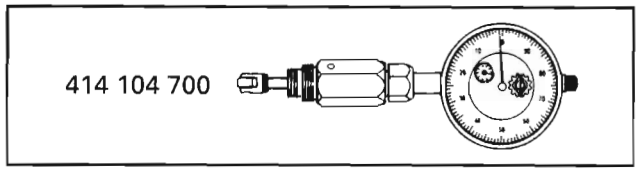


TYPICAL

CRANKSHAFT ALIGNMENT

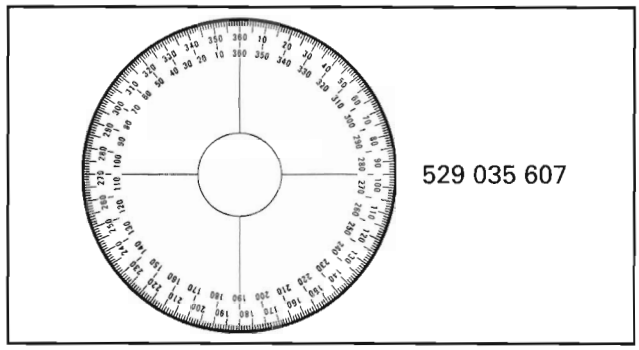
Remove both spark plugs.

Install the dial indicator (P/N 414 104 700) in spark plug hole on MAG side.



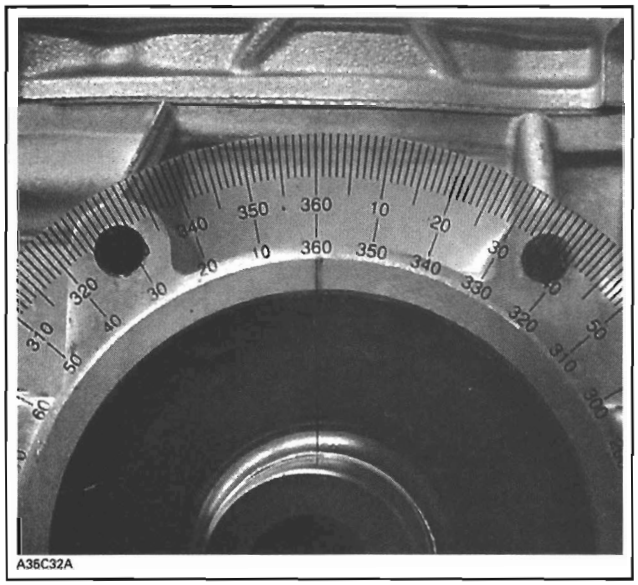
Bring MAG piston at top dead center.

Install the degree wheel (P/N 529 035 607) on crankshaft end.



Scribe a mark on crankcase.

Install degree wheel so that 360° mark aligns with the mark on crankcase. Do not rotate crankshaft.



Remove dial indicator and install it in spark plug hole on PTO side.

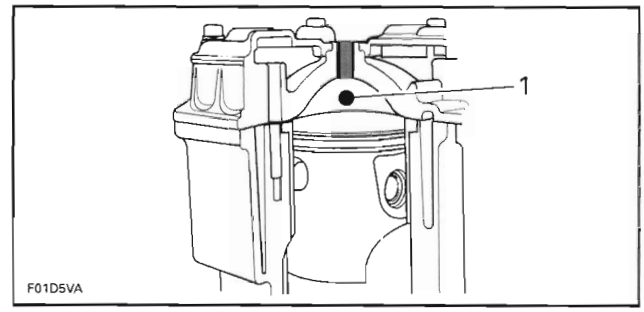
Bring PTO piston to top dead center. Degree wheel must rotate with crankshaft.

Interval between cylinders must be 180° ± 0.5.

Any other reading indicates a misaligned (twisted) crankshaft.

COMBUSTION CHAMBER VOLUME MEASUREMENT

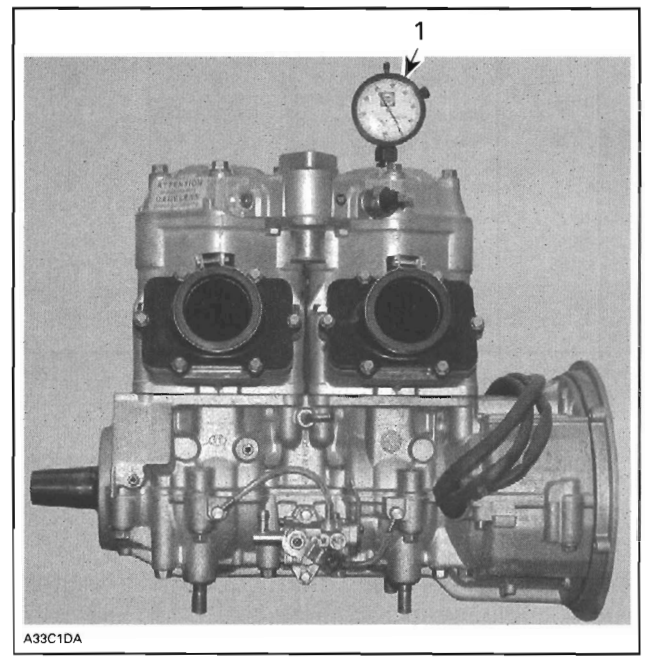
The combustion chamber volume is the region in the cylinder head above the piston at Top Dead Center (TDC). It is measured with the cylinder head installed on the engine.



TYPICAL
1. Combustion chamber

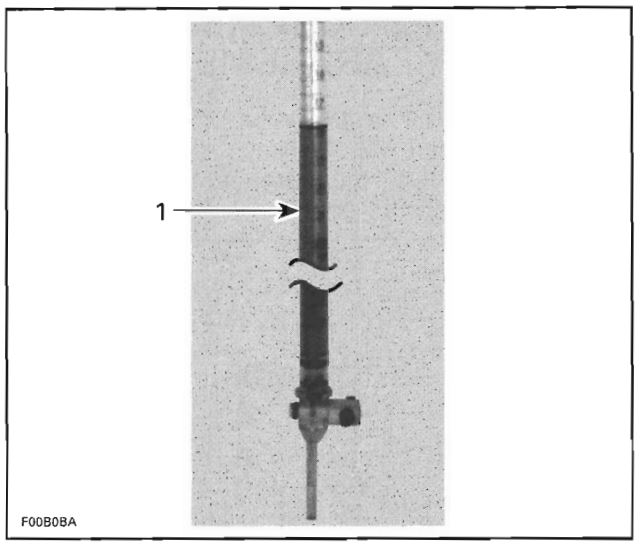
NOTE: When checking the combustion chamber volume, engine must be cold, piston must be free of carbon deposits and cylinder head must be leveled.

- Remove both spark plugs and bring one piston to Top Dead Center using the dial indicator (P/N 414 104 700).



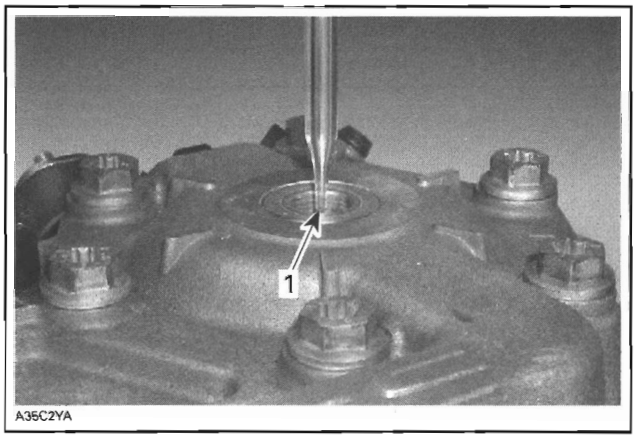
TYPICAL
1. Bring piston to TDC

- Obtain a graduated burette (capacity 0 - 50 cc) and fill with an equal part (50/50) of gasoline and injection oil.



1. Graduated burette (0 - 50 cc)

- Open burette valve to fill its tip. Add liquid in burette until level reaches 0 cc.
- Inject the burette content through the spark plug hole until liquid touches the top spark plug hole.



TYPICAL
1. Top of spark plug hole

NOTE: The liquid level in cylinder must not drop for a few seconds after filling. If so, there is a leak between piston and cylinder. The recorded volume would be false.

- Let burette stand upward for about 10 minutes, until liquid level is stabilized.
- Read the burette scale to obtain the quantity of liquid injected in the combustion chamber.

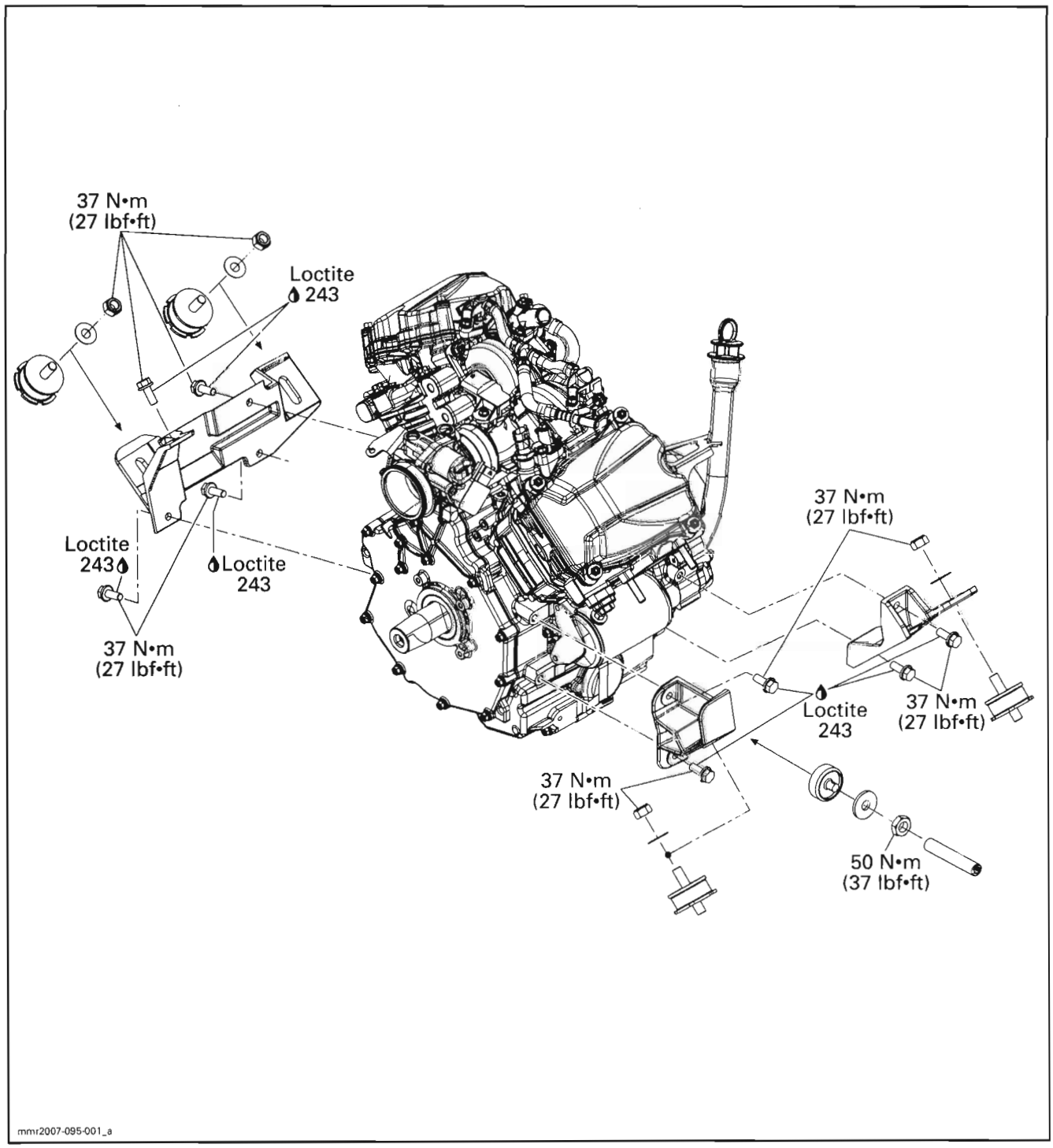
NOTE: When the combustion chamber is filled to top of spark plug hole, it includes an amount of 2.25 cc corresponding to the spark plug well.

- Repeat the procedure for the other cylinder.
- Install a thicker or thinner cylinder/crankcase gasket (refer to *PARTS CATALOGS*) in order to obtain the specified combustion chamber volume.

ENGINE REMOVAL AND INSTALLATION

SERVICE TOOLS

Description	Part Number	Page
engine lifting tool	529 036 022	191



GENERAL

⚠ WARNING

To avoid potential burns, let engine and exhaust system cool down before performing any servicing.

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

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

PROCEDURES

ENGINE REMOVAL

Vehicle and Engine Preparation

Place vehicle on a work station that will have access to an engine-lifting hoist. Then start with initial preparation of vehicle by doing the following.

Remove both side panels, hood and console. Refer to *BODY*.

On right side of vehicle, do the following:

Unplug the BLACK (-) cable from battery, then the RED (+) cable.

⚠ WARNING

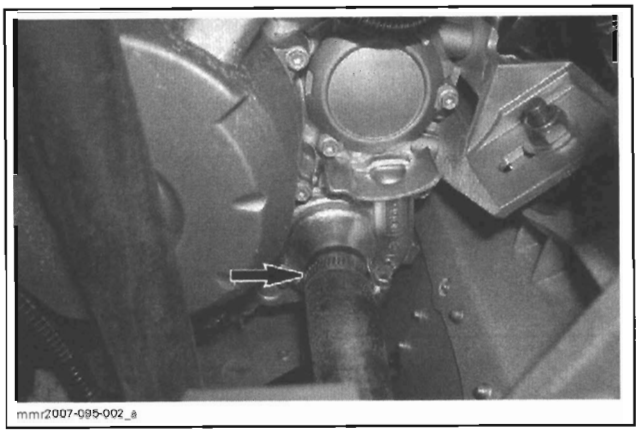
Always unplug battery cables exactly in the specified order, the BLACK (-) cable first. It is recommended to unplug electrical connections prior to disconnecting fuel lines.

Drain cooling system. Refer to *COOLING SYSTEM*.

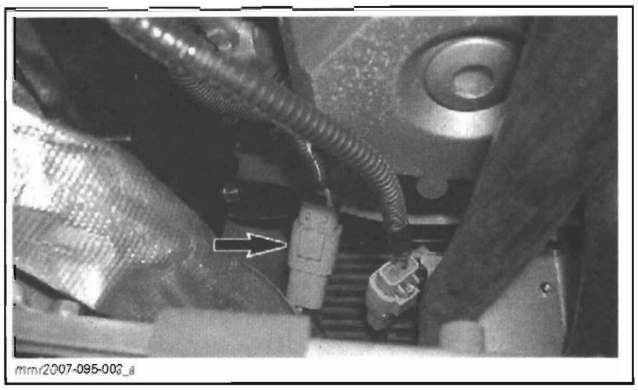
NOTE: It is not necessary to drain engine oil. Drain engine oil only if engine overhaul is necessary.

Remove muffler. Refer to *EXHAUST SYSTEM*.

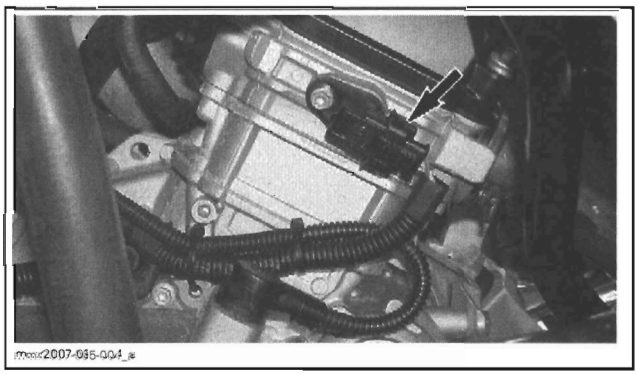
Disconnect coolant hose from water pump cover.



Unplug the magneto connector and cut locking ties securing its harness.

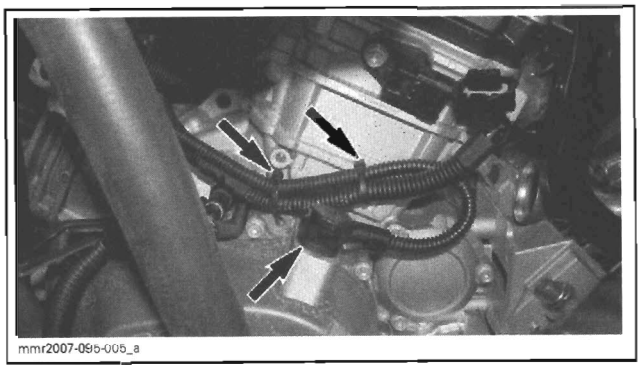


Unplug the CAPS on cylinder **no. 1**.



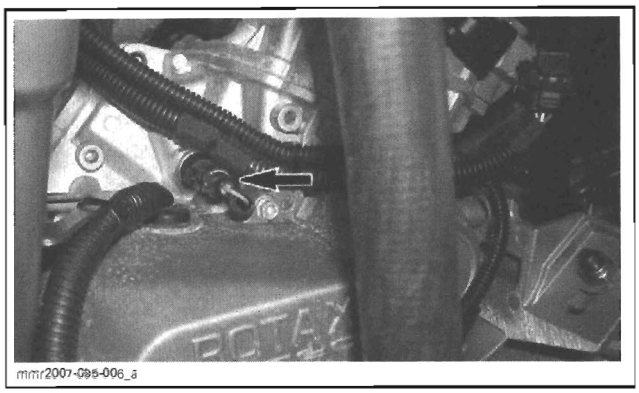
CAMSHAFT POSITION SENSOR (CAPS)

Remove CPS from engine and cut locking ties retaining harnesses.



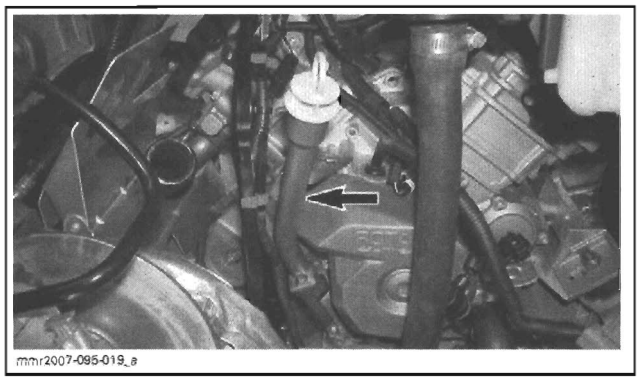
CRANKSHAFT POSITION SENSOR (CPS)

Unplug OPS.

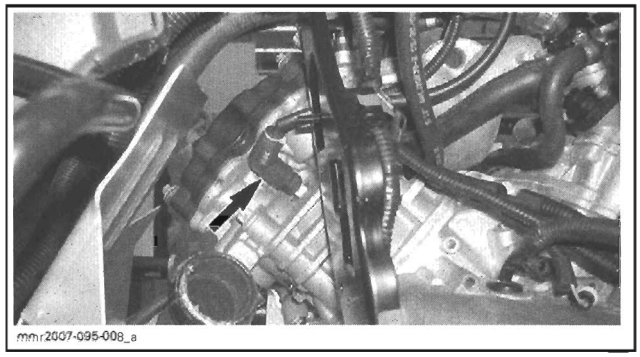


OIL PRESSURE SWITCH (OPS)

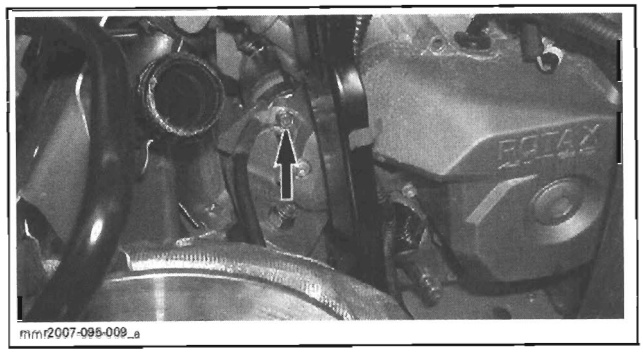
Remove the dipstick tube.



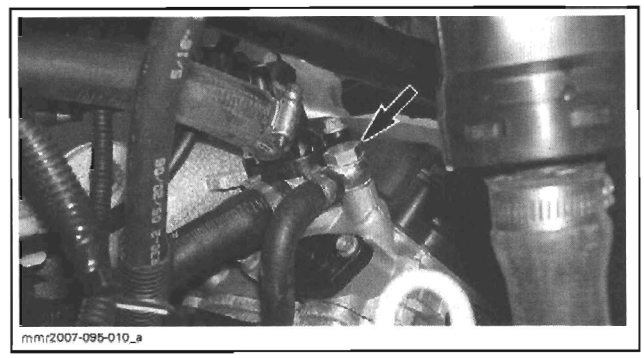
Unplug spark plug cable on cylinder no. 2.



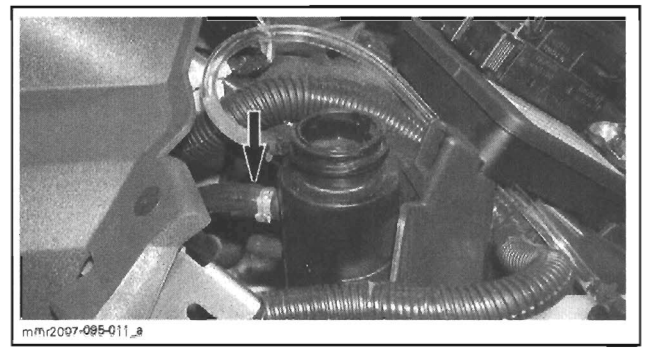
Unscrew ground wire from engine.



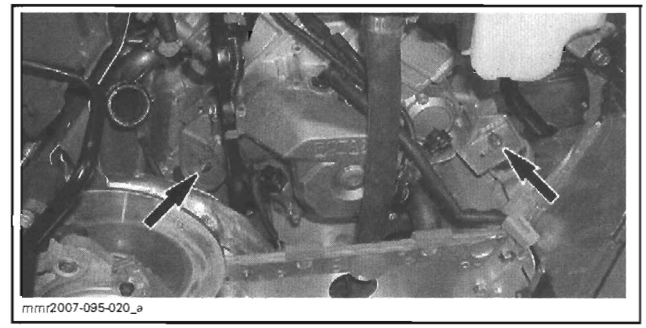
Unscrew the Banjo fitting on the top of cylinder no. 1. Discard sealing rings.



Disconnect throttle body heater hose from coolant reservoir.



Remove nuts securing engine supports to rubber mounts.

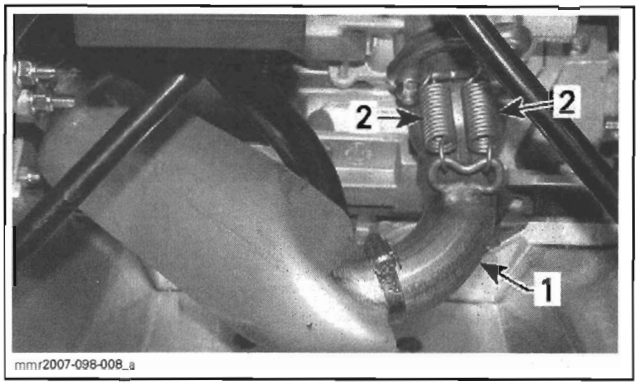


On left side of vehicle, do the following:

Remove air intake silencer. Refer to *AIR INTAKE SILENCER*.

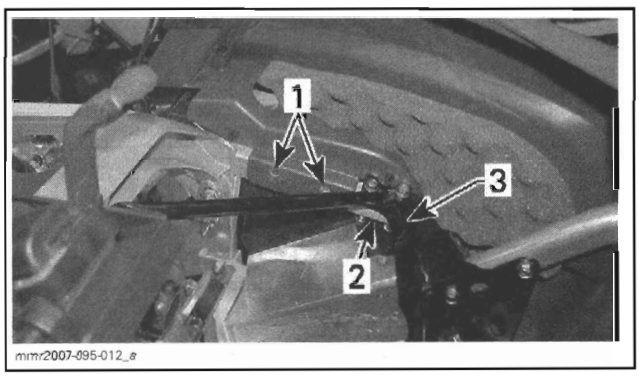
Remove drive and driven pulleys. Refer to *DRIVE SYSTEM*.

Remove springs securing front exhaust pipe to exhaust manifold.



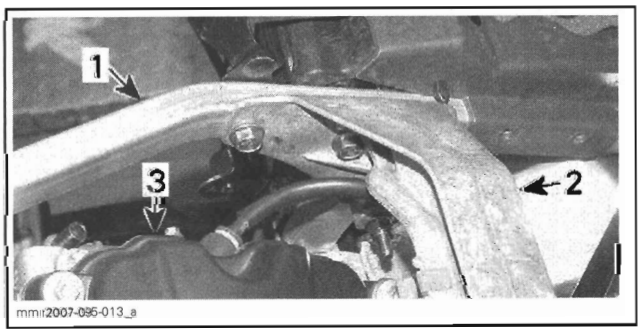
1. *Front exhaust pipe*
2. *Exhaust springs*

Drill rivets that attach bottom pan to the LH upper tube and remove bolts securing upper tube to front plate.



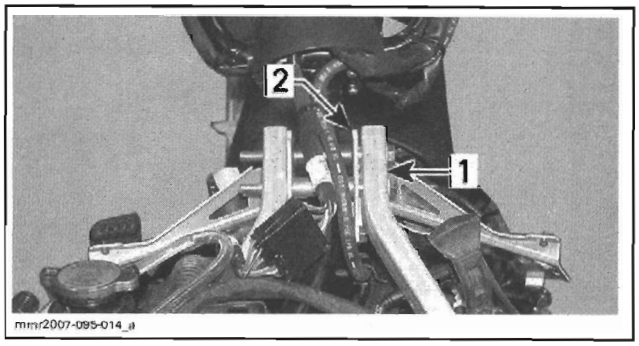
1. *Rivets locations*
2. *Upper tube*
3. *Front plate*

Remove bolts retaining upper tube and upper cross member.



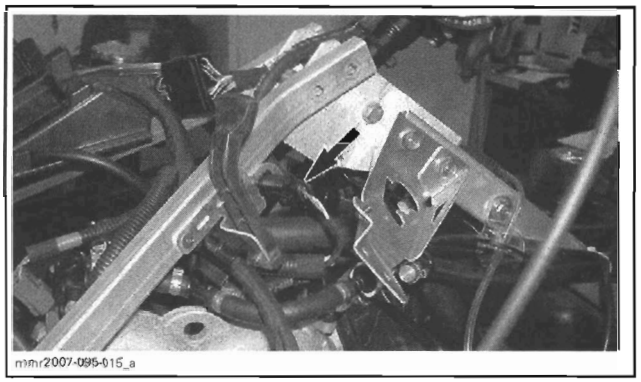
1. *Upper tube*
2. *Upper cross member*
3. *Cylinder no. 1*

Near handlebar, remove bolts retaining upper tube to retaining block.



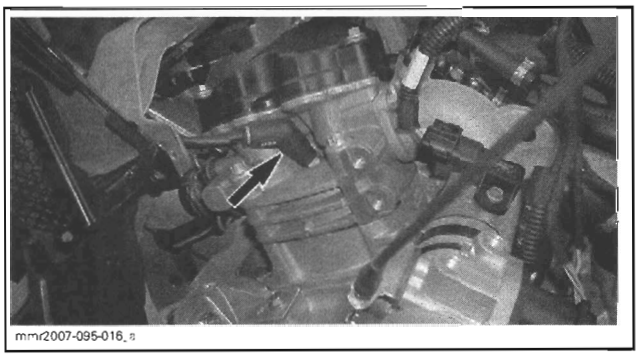
1. *LH upper tube*
2. *Retaining block*

Unplug CPS connector on LH upper tube.

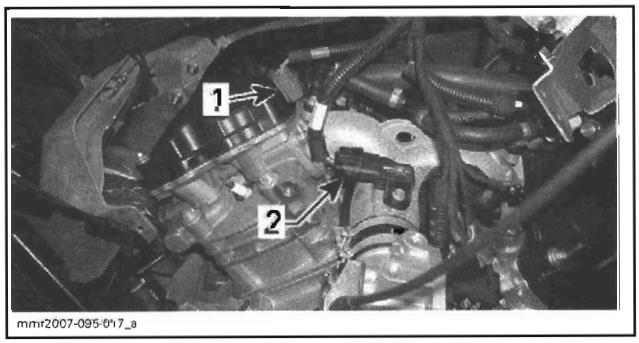


Remove upper tube with CPS.

Unplug spark plug cable cylinder no. 1.

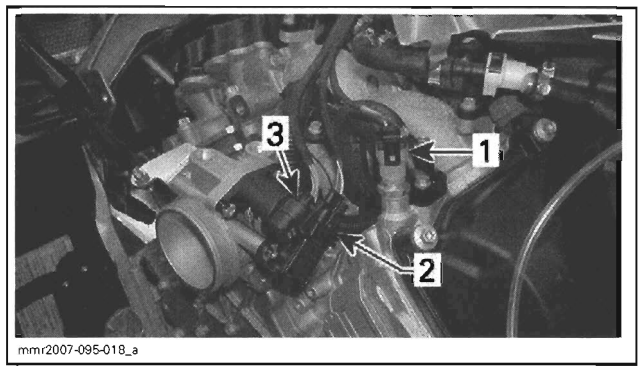


Unplug the fuel injector on cylinder no. 1 and the MAPTS.



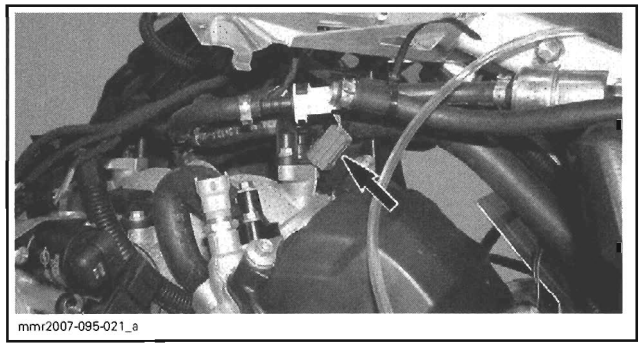
1. *Fuel injector*
2. *Manifold air pressure and temperature sensor (MAPTS)*

Unplug CTS, TPS and IBV.



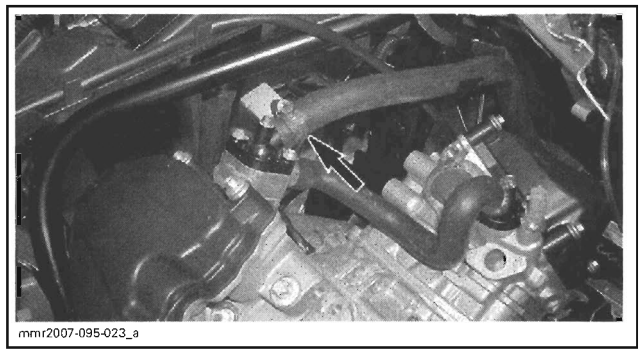
1. *Coolant Temperature Sensor (CTS)*
2. *Throttle Position Sensor (TPS)*
3. *Idle Bypass Valve (IBV)*

Unplug the fuel injector on cylinder no. 2.

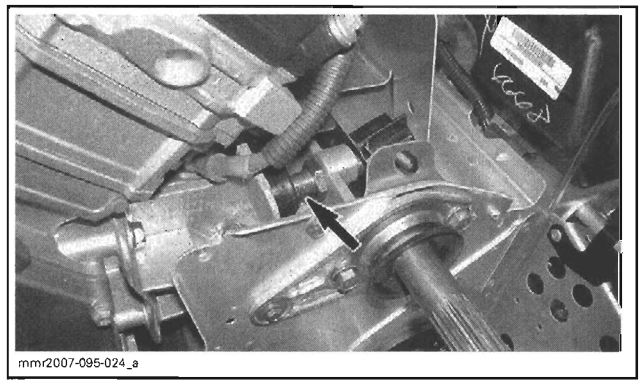


Remove the intake manifold screws then remove manifold.

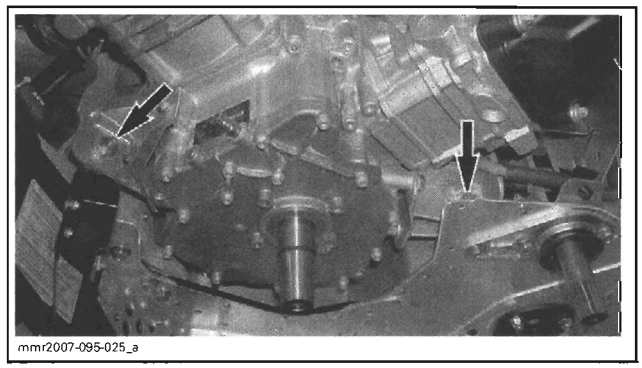
Disconnect the coolant hose on the top of cylinder no. 1.



Unscrew engine stopper.



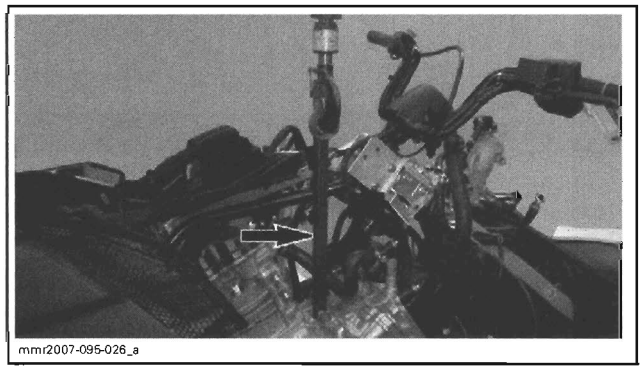
Remove nuts securing engine supports to rubber mounts.



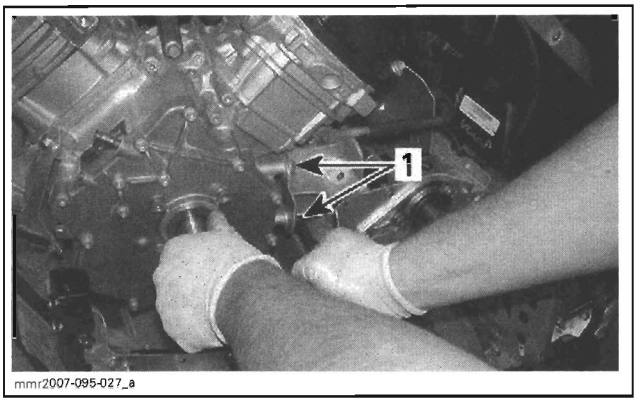
Remove the rear exhaust pipe. Refer to *EXHAUST SYSTEM*.

Lifting Engine

Install the engine lifting tool (P/N 529 036 022).



Lift the engine a little to remove the LH rear engine support.



1. LH rear engine support bolts

Remove starter.

Lift engine a little and push down the cylinder no. 2 to clear the console support.

Lift and turn engine to remove it, cylinder no. 2 first.

ENGINE INSTALLATION

The installation is the reverse of the removal procedure. However, pay attention to the following.

Check condition of rubber mounts and replace them if necessary.

Make sure oil drain plug is installed and tight.

Final Assembly Procedure

Fill cooling system. Refer to *COOLING SYSTEM.*

Fill engine with the right amount of oil. Put oil of appropriate viscosity.

Reconnect battery.

⚠ WARNING

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

Start vehicle. Let engine reaches the operating temperature.

Stop engine and check if coolant and oil levels are correct. Refill as necessary.

Test drive vehicle to confirm proper operation.

ENGINE LEAK TEST

SERVICE TOOLS

Description	Part Number	Page
camshaft locking tool	529 035 926	194
dial gauge	414 104 700	194

GENERAL

Before performing the cylinder leak test, verify the following:

- clamp(s) tightness
- radiator and hoses.

NOTE: For best accuracy, the leak test should be done with the engine at normal operating temperature.

⚠ WARNING

Prevent burning yourself on hot engine parts.

Repair Tips

- blue exhaust gas means damaged/worn piston rings or valve stem seals
- oily contamination on leak indicator hole means a damaged oil seal on water pump shaft (refer to *COOLING SYSTEM*)
- coolant out of leak indicator hole means a damaged rotary seal on water pump shaft (refer to *COOLING SYSTEM*)
- coolant escaping from water pump housing means damaged gasket(s) and/or loosened screws (refer to *COOLING SYSTEM*).

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

PROCEDURES

NOTE: The following instructions are valid for both cylinders.

PREPARATION

Disconnect battery.

⚠ WARNING

Always respect this order for disassembly; disconnect BLACK (-) cable first.

Remove coolant tank cap.

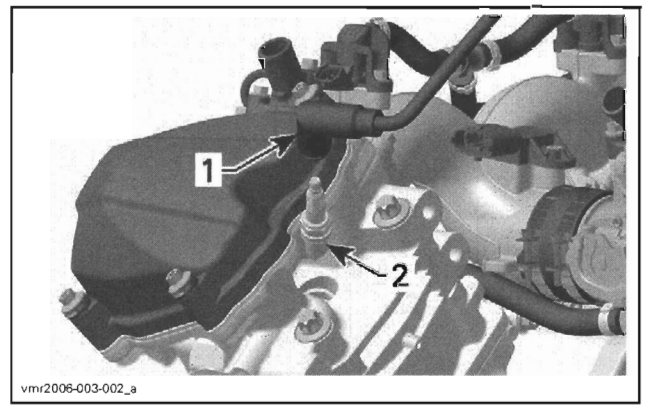
⚠ WARNING

To avoid potential burns only remove the radiator cap by wearing the appropriate safety equipment.

Remove any parts to have access to engine cylinder heads.

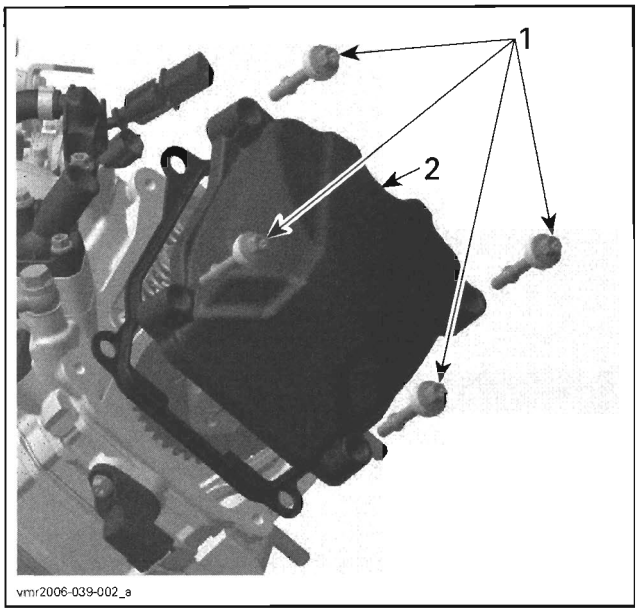
Unplug and remove spark plug cable.

Clean spark plug area and remove spark plug from cylinder head.



TYPICAL
1. Spark plug cable
2. Spark plug

Remove valve cover.



1. Valve cover screws
2. Valve cover

Rotate crankshaft until piston is at ignition TDC. See procedure below.

How to Turn Crankshaft

To turn crankshaft, there are two possible procedures.

First Procedure

– Turn the drive pulley.

Second Procedure

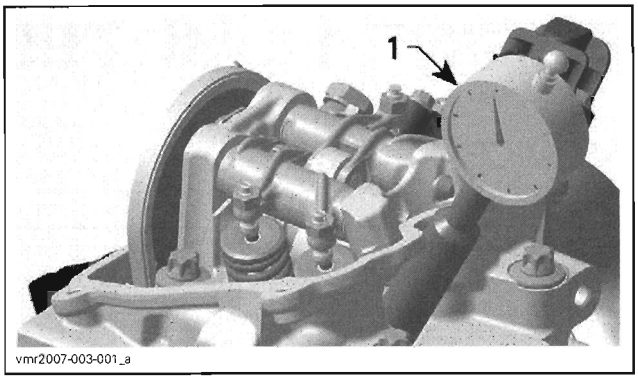
– Remove plug screw with O-ring from magneto cover.
– Use a 14 mm Allen key and turn crankshaft.

NOTE: Muffler must be removed for this operation.

CAUTION: Turn only clockwise to avoid loosening of magneto flywheel Allen screw.

How to Position Piston at TDC

Using the dial gauge (P/N 414 104 700), turn the crankshaft and set the piston to precisely ignition TDC.

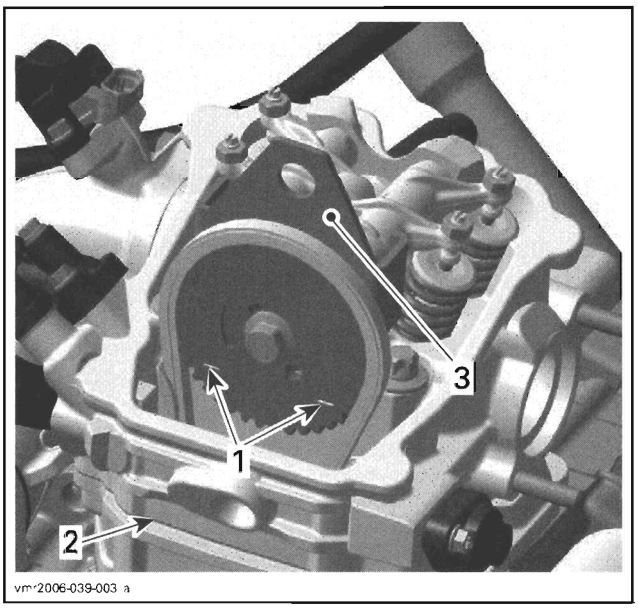


TYPICAL
1. Dial gauge

NOTE: If a dial gauge is not available, use a screwdriver or another similarly tool.

CAUTION: Do not scratch or damage piston/cylinder surface.

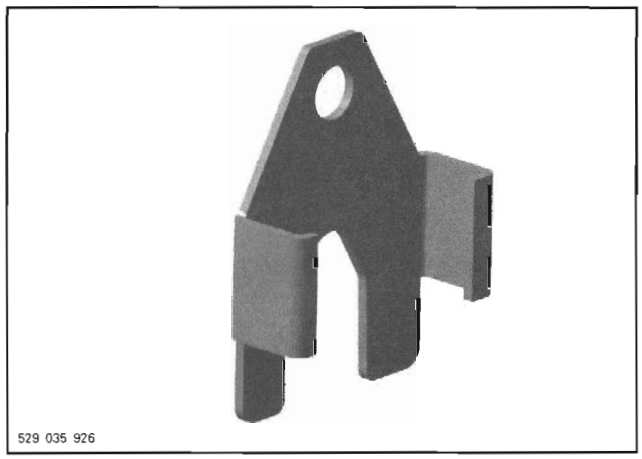
NOTE: At ignition TDC the marks on the camshaft timing gear have to be parallel to cylinder head base as per following illustration.



1. Marks on camshaft timing gear
2. Cylinder head base
3. Camshaft locking tool

How to Lock Camshaft

Lock camshaft at TDC by using camshaft locking tool (P/N 529 035 926).



CAMSHAFT LOCKING TOOL

LEAK TEST

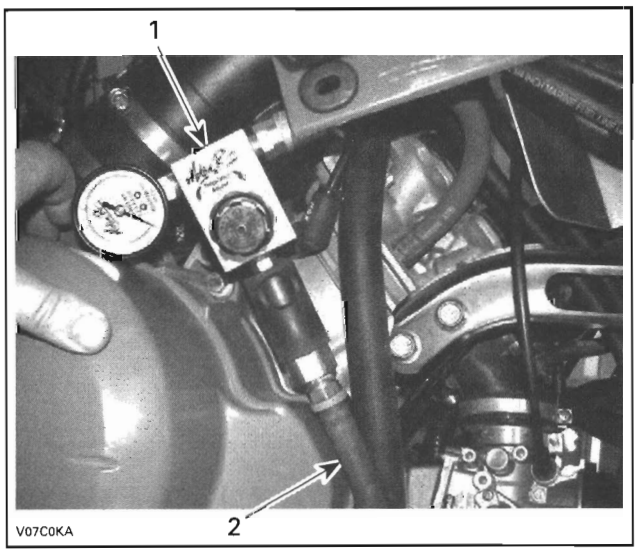
Connect to adequate air supply.

Set needle of measuring gauge to zero.

NOTE: All testers have specific instructions on gauge operation and required pressure.

Install gauge adapter into previously cleaned spark plug hole.

Supply combustion chamber with air pressure.



TYPICAL
1. Leak Tester
2. Air supply hose

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

LEAKAGE PERCENTAGE	ENGINE CONDITION
0% to 15%	Excellent condition
16% to 25%	Good condition
26% to 40%	Fair condition; reduced engine performance
41% and higher	Poor condition, diagnose and repair engine

Diagnosis

Listen for air leaks.

- air escaping on intake port/throttle body 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 *BOTTOM END*)
- 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 (refer to *CYLINDER AND HEAD*).

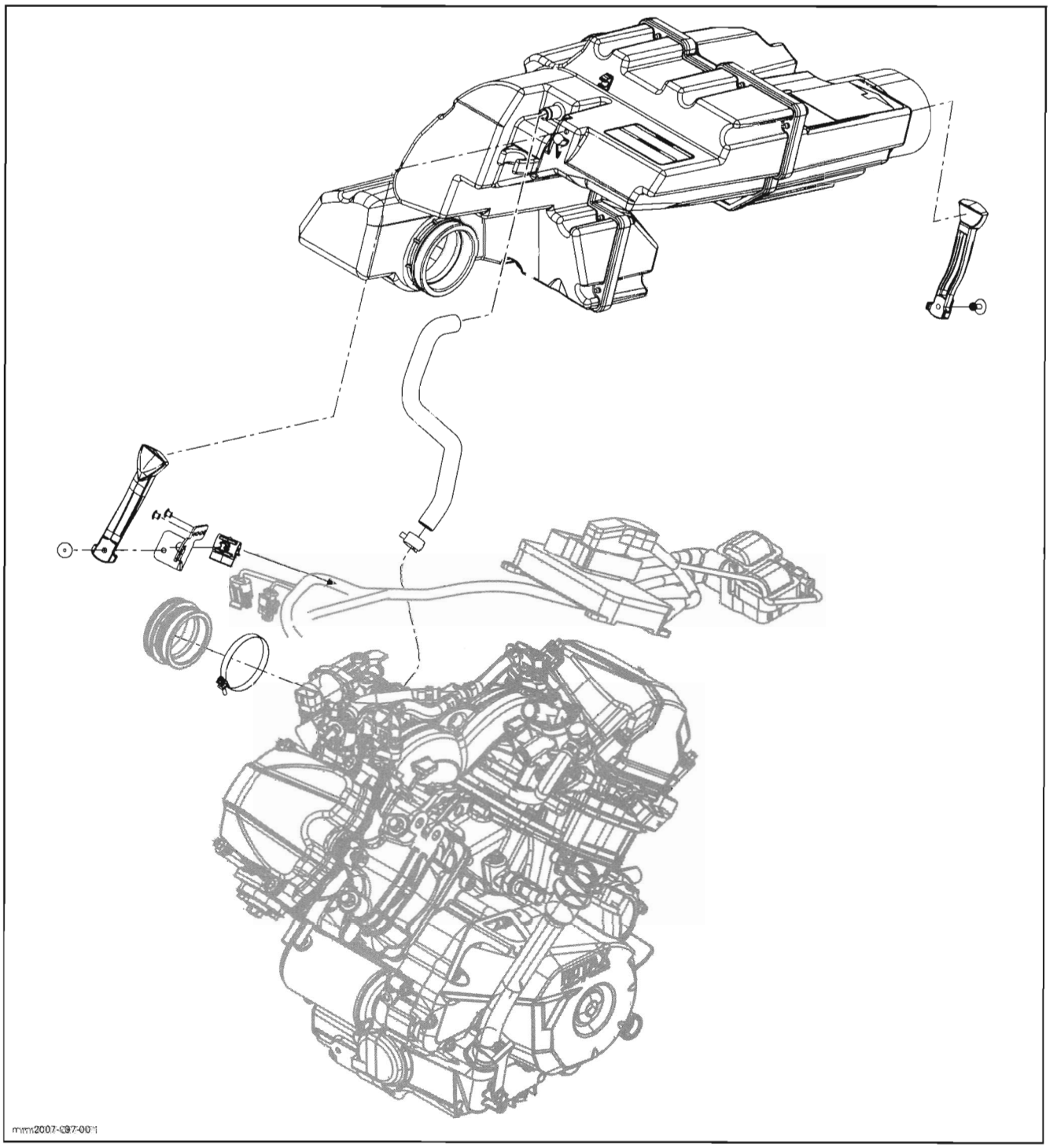
NOTE: For all the checkpoints mentioned above, see the appropriate engine section to diagnose and repair the engine.

REASSEMBLY

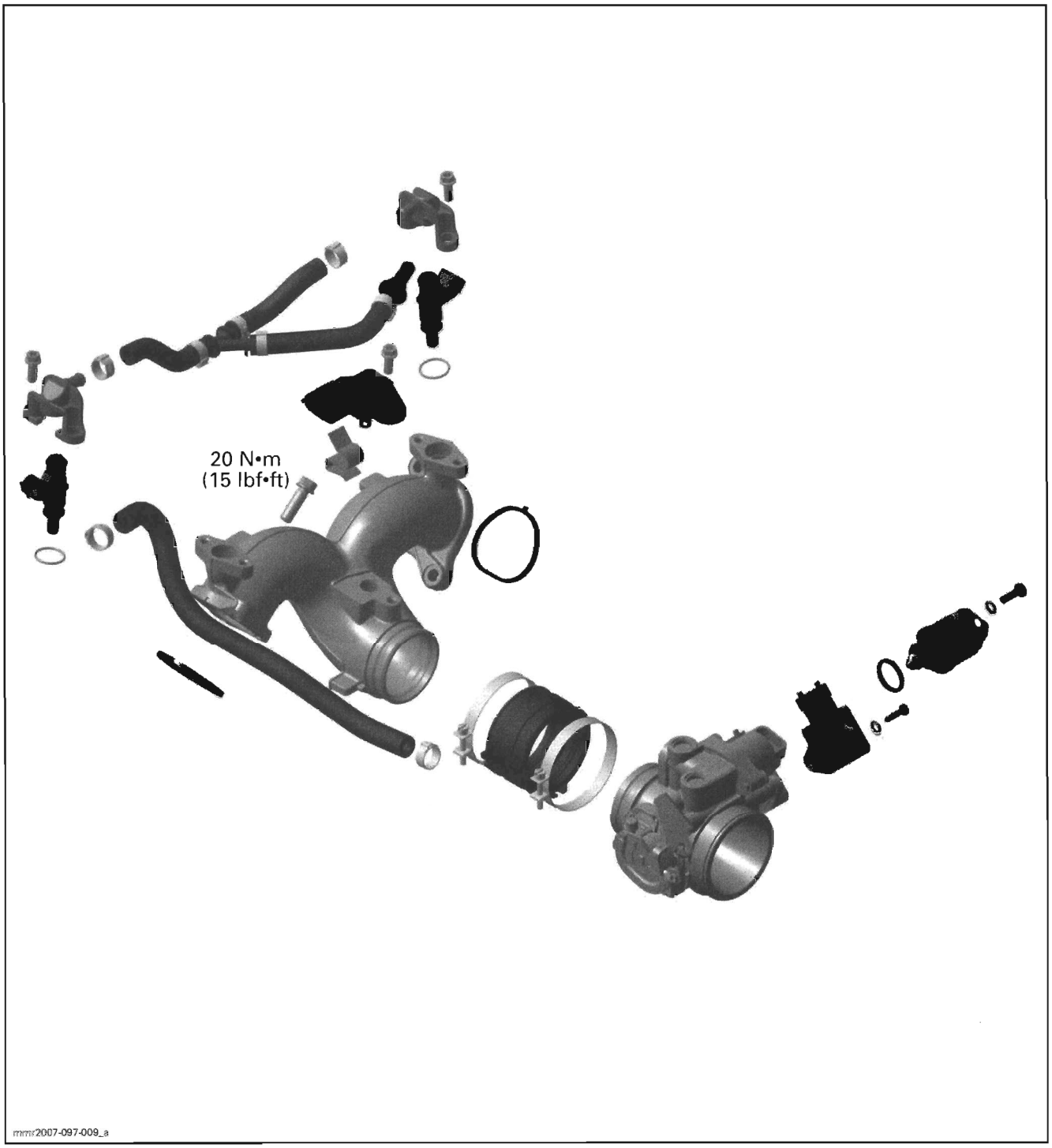
Reverse the preparation procedure. Ensure to respect torque values and use of appropriate products/lubricants. Refer to exploded views in other sections of this manual as required.

AIR INTAKE SYSTEM

AIR INTAKE SILENCER



INTAKE MANIFOLD



GENERAL

During assembly/installation, use the torque values and service products as 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 strictly be adhered to.
Locking devices (e.g.: 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.

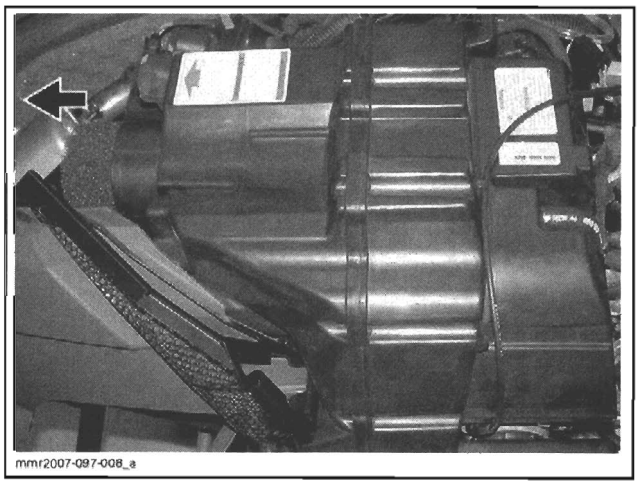
PROCEDURES

AIR FILTER

Removal

The air filter is located on air intake silencer.

Open hood and pull air filter from air intake silencer.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Cleaning

Blow low pressure compressed air on filter to clean it.

Replace air filter as required.

NOTE: If the filter is very dirty, clean the interior of air intake silencer at the same time.

Installation

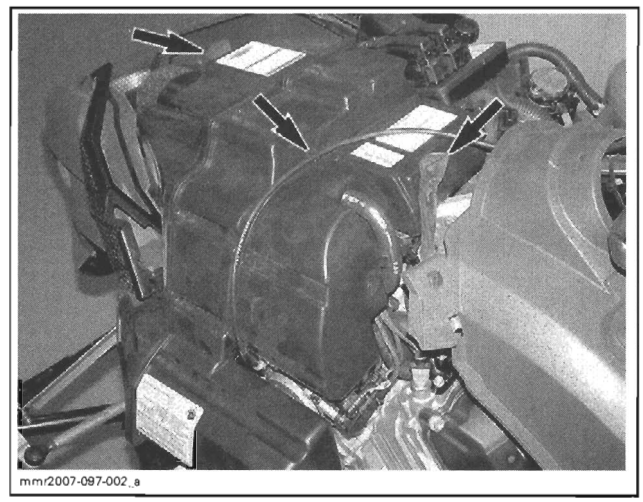
The installation is the reverse of the removal procedure.

AIR INTAKE SILENCER

Removal

Remove hood and LH side panel. Refer to *BODY*.

Unhook latches and throttle cable.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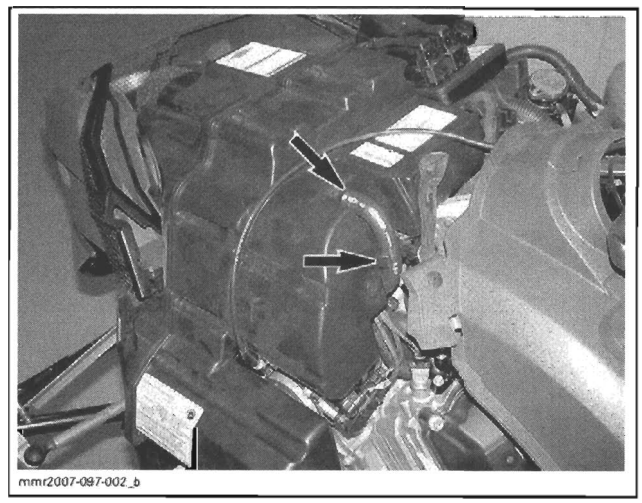
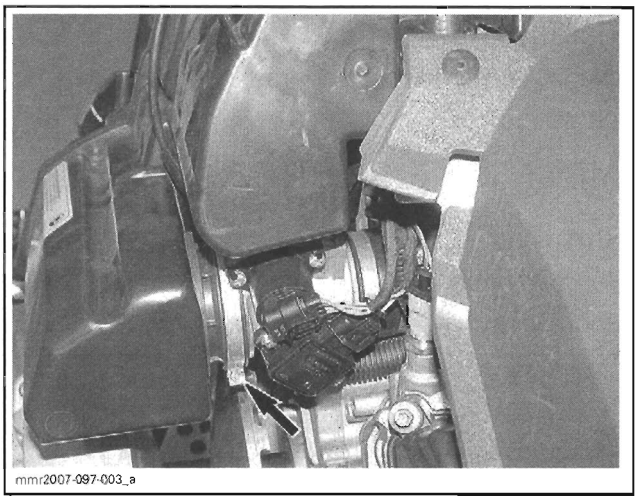
Unhook vent tube.


mmr2007-097-002_b

Loosen throttle body clamp.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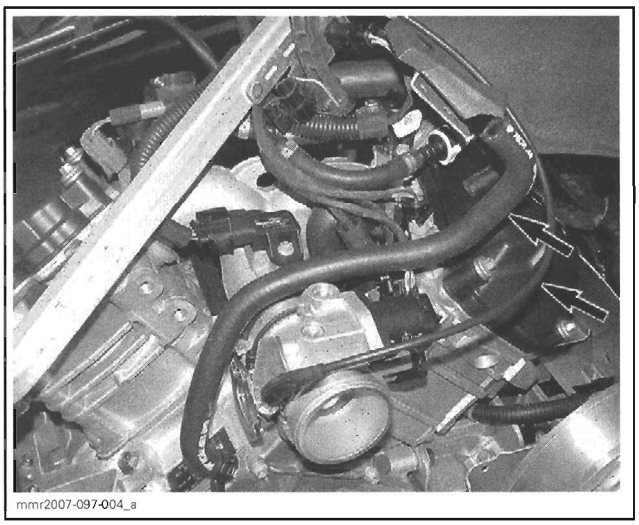
Pull out air intake silencer.

Installation

Move aside throttle cable and vent tube prior to installing air intake silencer.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First insert the front corner of air intake silencer into body, then lower it in place.

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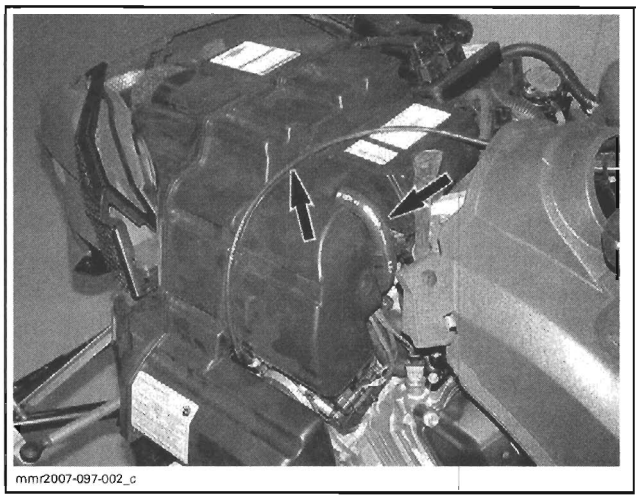
Properly route throttle cable and clip it in place.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Latch air intake silencer.

Tighten throttle body clamp.

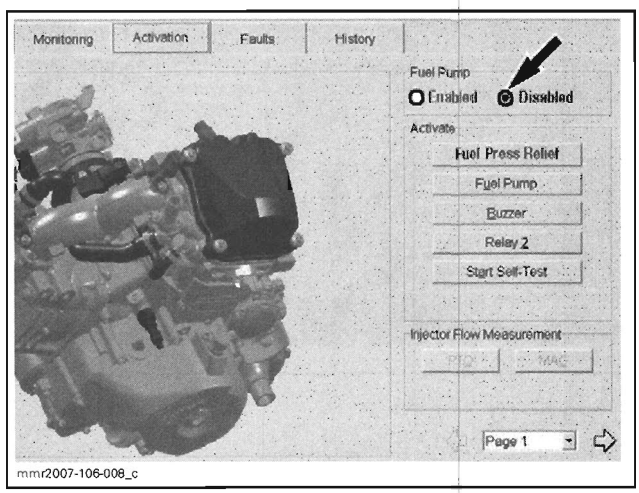
CAUTION: Make sure air intake silencer boot is properly installed onto throttle body and the clamp is tight.

INTAKE MANIFOLD

Removal

NOTE: For throttle body, fuel injectors and fuel rails procedures, refer to *ENGINE MANAGEMENT*.

Disable fuel pump using B.U.D.S. Look in the **Activation** tab.



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Release fuel pressure by running engine until it runs out of gas.

⚠ WARNING

The fuel hose may be under pressure. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to release the pressure. Wipe off any fuel spillage inside engine compartment.

Remove air intake silencer.

Disconnect throttle position sensor (TPS) and idle bypass valve connectors.

Pull throttle body and move aside.

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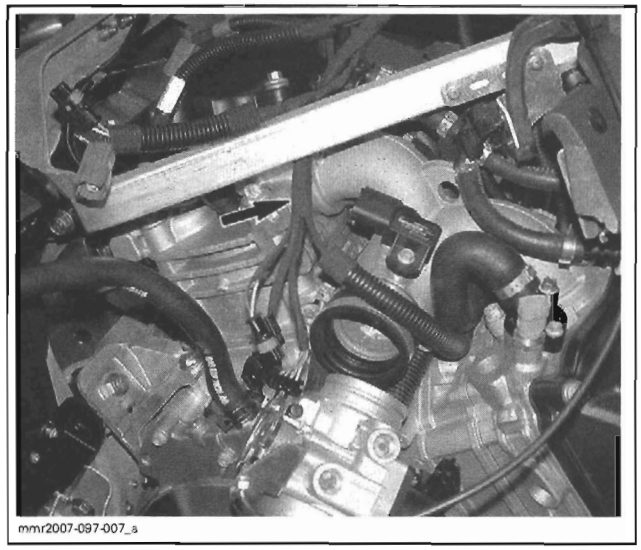
NOTE: Keep coolant hoses connected.

Disconnect injectors, manifold air pressure and temperature sensor (MAPTS), camshaft position sensor (CPS) and coolant temperature sensor (CTS).

Move harness aside.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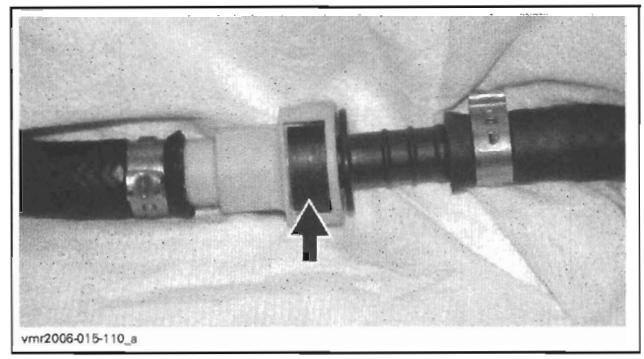
Disconnect outlet hose from fuel pump.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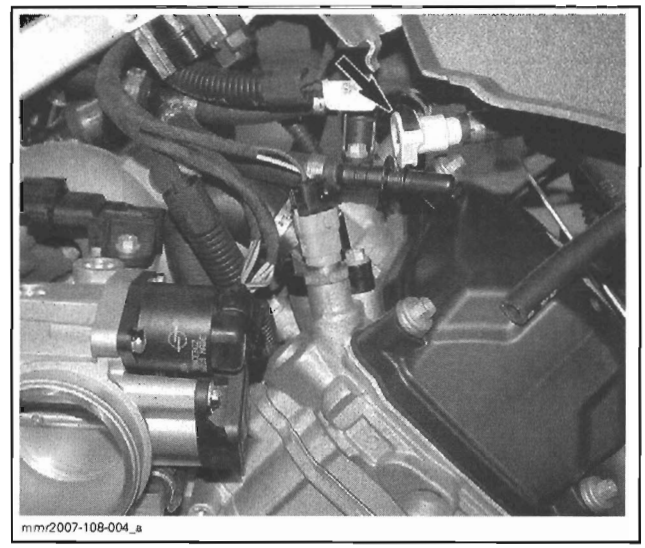
PRESS TAB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HOSE DISCONNECTED

Remove intake manifold.

NOTE: To remove fuel injectors and fuel rails from intake manifold, refer to *ENGINE MANAGEMENT*.

Inspection

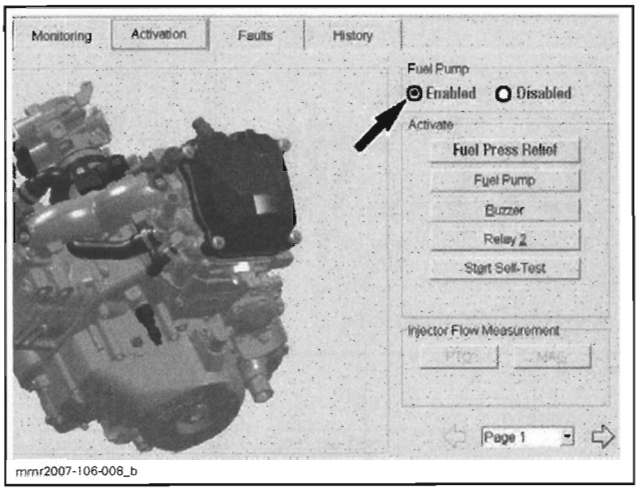
Check intake manifold for cracks, warping at flanges or any other damage. Replace if necessary.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Torque manifold screws to 20 N•m (15 lbf•ft) one cylinder at a time.

Re-enable fuel pump using B.U.D.S.



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EXHAUST SYSTEM

SERVICE TOOLS

Description	Part Number	Page
exhaust spring tool	529 035 983	203–205

GENERAL

⚠ WARNING

To avoid potential burns, never touch exhaust system components immediately after the engine has been run because these components are very hot. Let engine and exhaust system cool down before performing any servicing.

During assembly/installation, use the torque values and service products as 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

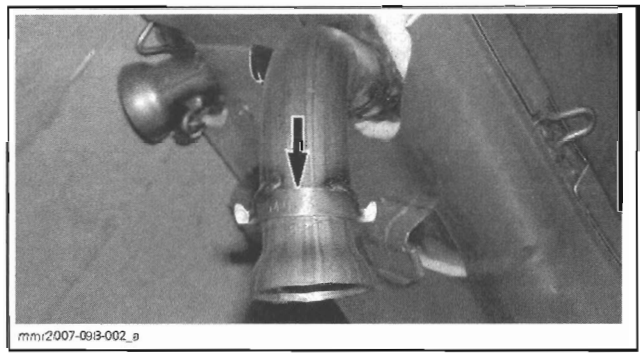
Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

PROCEDURES

MUFFLER

Identification

Each muffler is identified by a number. To use the proper muffler with the proper vehicle, check the number on the welded clamp at the end of muffler. This number depicts the 6 last digits of BRP part number.



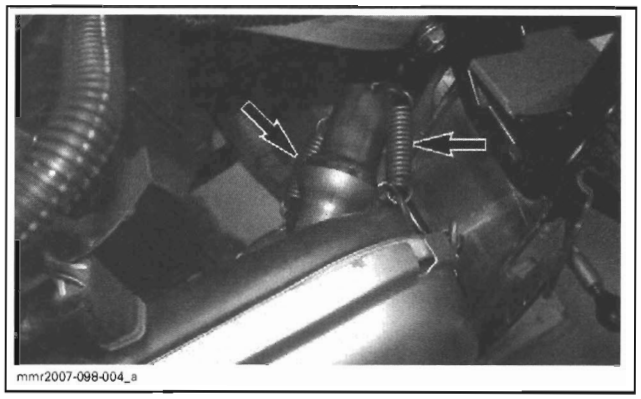
Removal

Remove the RH side panel and the hood.

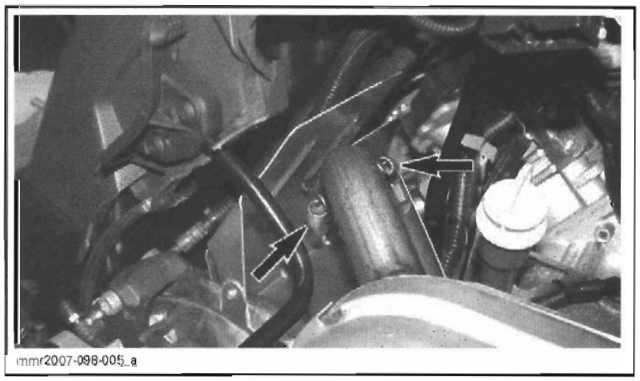
Lift coolant tank and move it aside to allow access to exhaust springs.

1. Coolant tank
2. Muffler

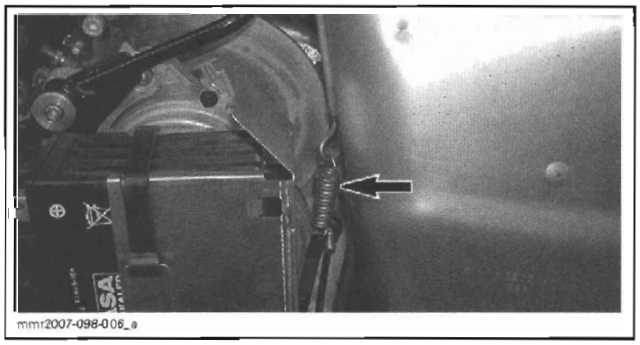
Using the exhaust spring tool (P/N 529 035 983), remove all exhaust springs.



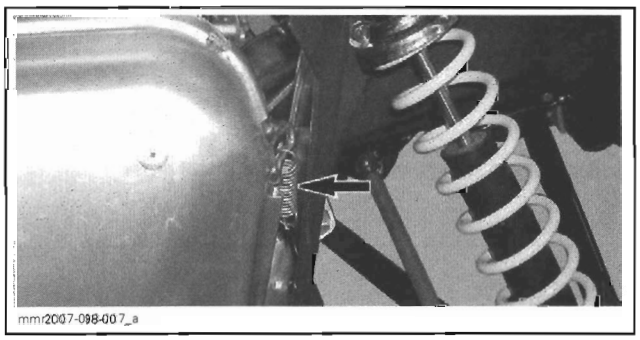
MUFFLER AND FRONT EXHAUST PIPE



MUFFLER AND REAR EXHAUST PIPE



ON LEFT SIDE OF MUFFLER



ON RIGHT SIDE OF MUFFLER

Lift and remove muffler.

Discard gaskets located on the ends of exhaust pipes.

Inspection

Check muffler for cracks, perforation or other damages. Replace as required.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

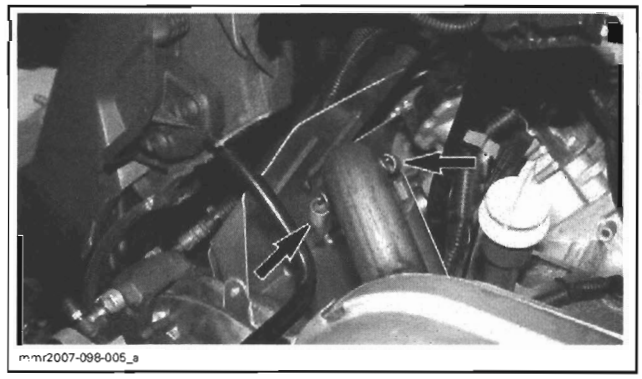
Install new exhaust gaskets on the front and the rear exhaust pipe ends

REAR EXHAUST PIPE

Removal

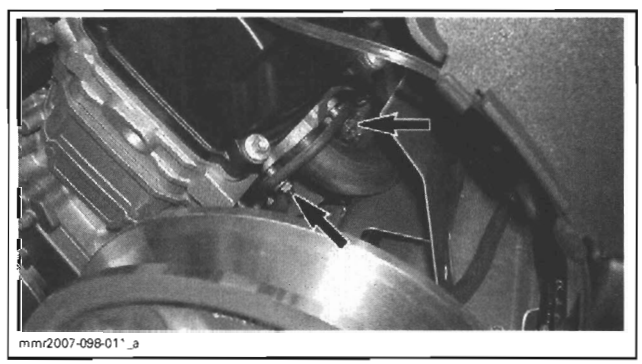
Open RH side panel.

Using the exhaust spring tool (P/N 529 035 983), remove exhaust springs securing the rear exhaust pipe to muffler.



On LH side, open side panel and remove belt guard.

Unscrew exhaust pipe nuts from cylinder head.



Remove exhaust pipe.

Inspection

Check the rear exhaust pipe for cracks or other damages. Replace as required.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Install new exhaust gaskets.

Torque nuts to 13 N•m (115 lbf•**in**).

Install all other removed parts.

FRONT EXHAUST PIPE

Inspection

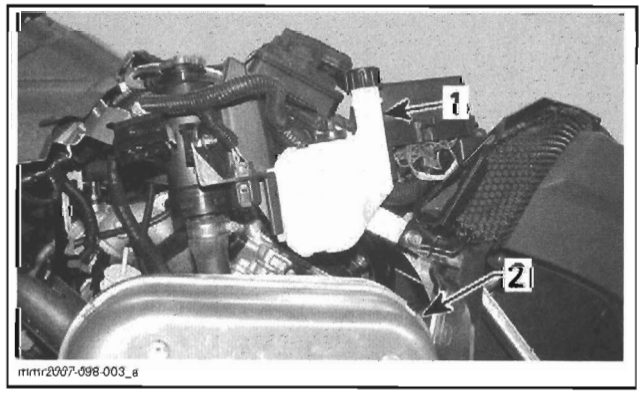
Check for cracks or other damages. Replace if necessary.

Removal

Remove hood.

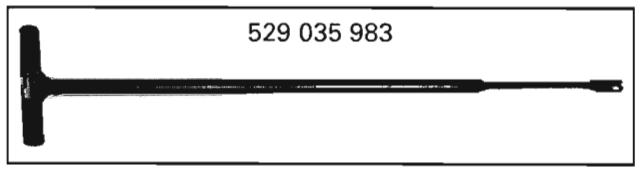
Remove the air intake silencer. Refer to *AIR INTAKE SILENCER*.

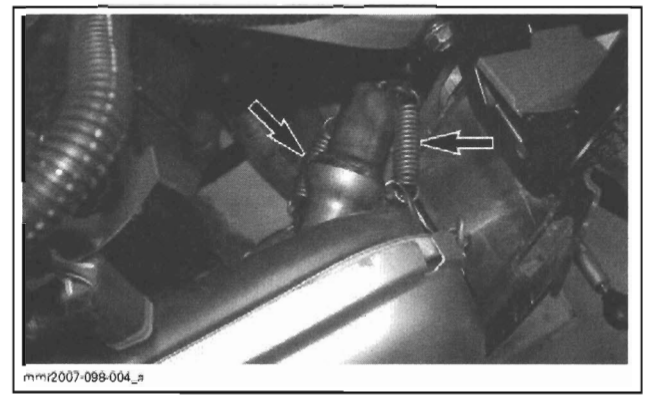
Lift coolant tank and move it aside to allow access to exhaust springs.



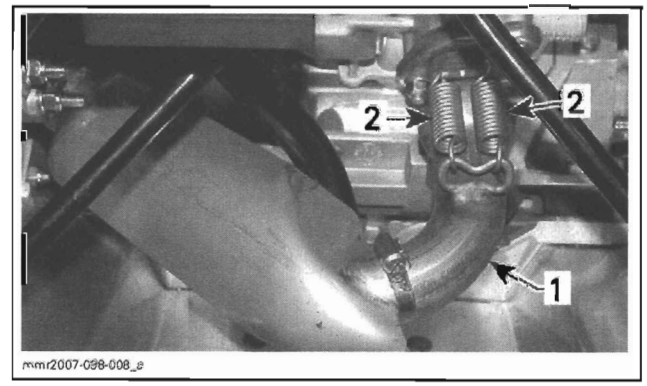
1. Coolant tank
2. Muffler

Using the exhaust spring tool (P/N 529 035 983), remove exhaust springs securing the front exhaust pipe to muffler.





Remove exhaust springs securing the front exhaust pipe to manifold.



1. Front exhaust pipe
2. Exhaust spring

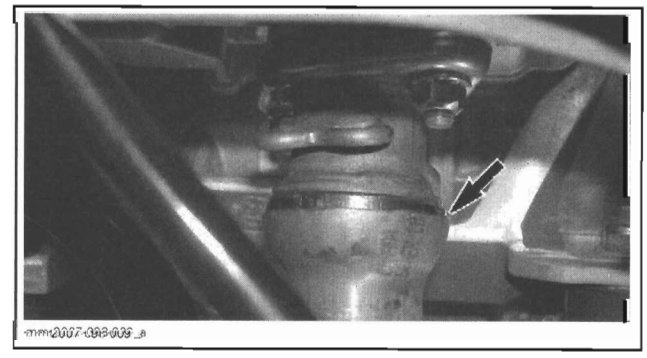
Move front exhaust pipe forward then remove it.

Discard exhaust pipe gaskets.

Installation

Install new gaskets on both ends of front exhaust pipe.

Secure front exhaust pipe on manifold with exhaust springs. Make sure manifold end is properly aligned inside ball socket of exhaust pipe.



Align the other end of front exhaust pipe with muffler. Install exhaust springs.

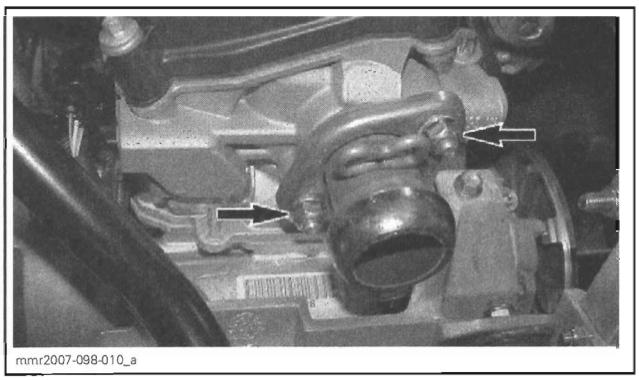
Install all other removed parts.

EXHAUST MANIFOLD

Removal

Remove front exhaust pipe. See procedure above.

Remove nuts securing manifold to cylinder.



Remove the exhaust manifold and its gasket.

Inspection

Check exhaust manifold for cracks or other damages. Replace if necessary.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Install a new gasket on manifold end (cylinder head side).

Torque nuts to 13 N•m (115 lbf•**in**).

Install all other removed parts.

LUBRICATION SYSTEM

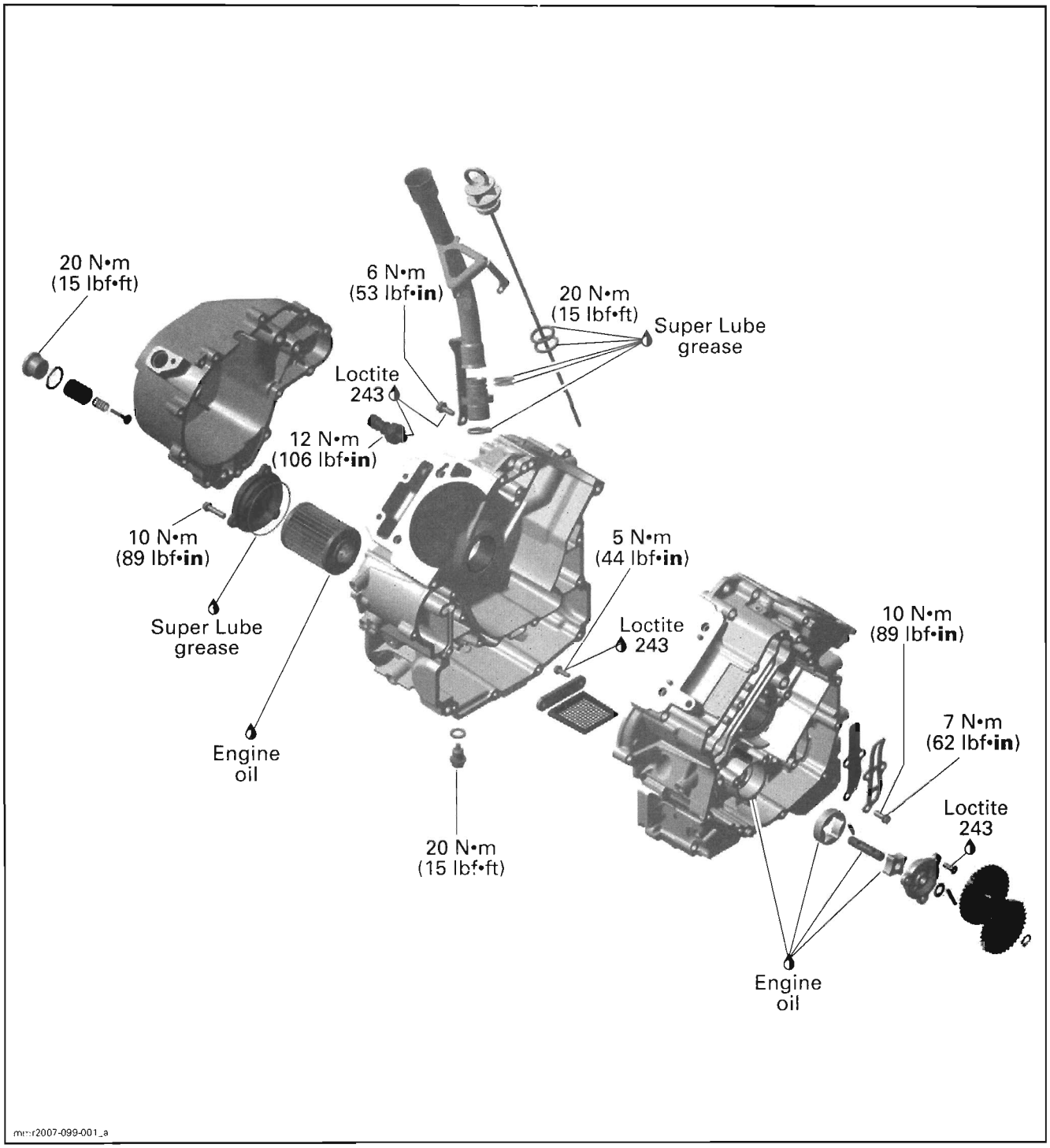
SERVICE TOOLS

Description	Part Number	Page
adapter hose	529 035 652	213
disconnect tool	529 035 714	213
oil pressure gauge	529 035 709	213
suction pump	529 035 880	212

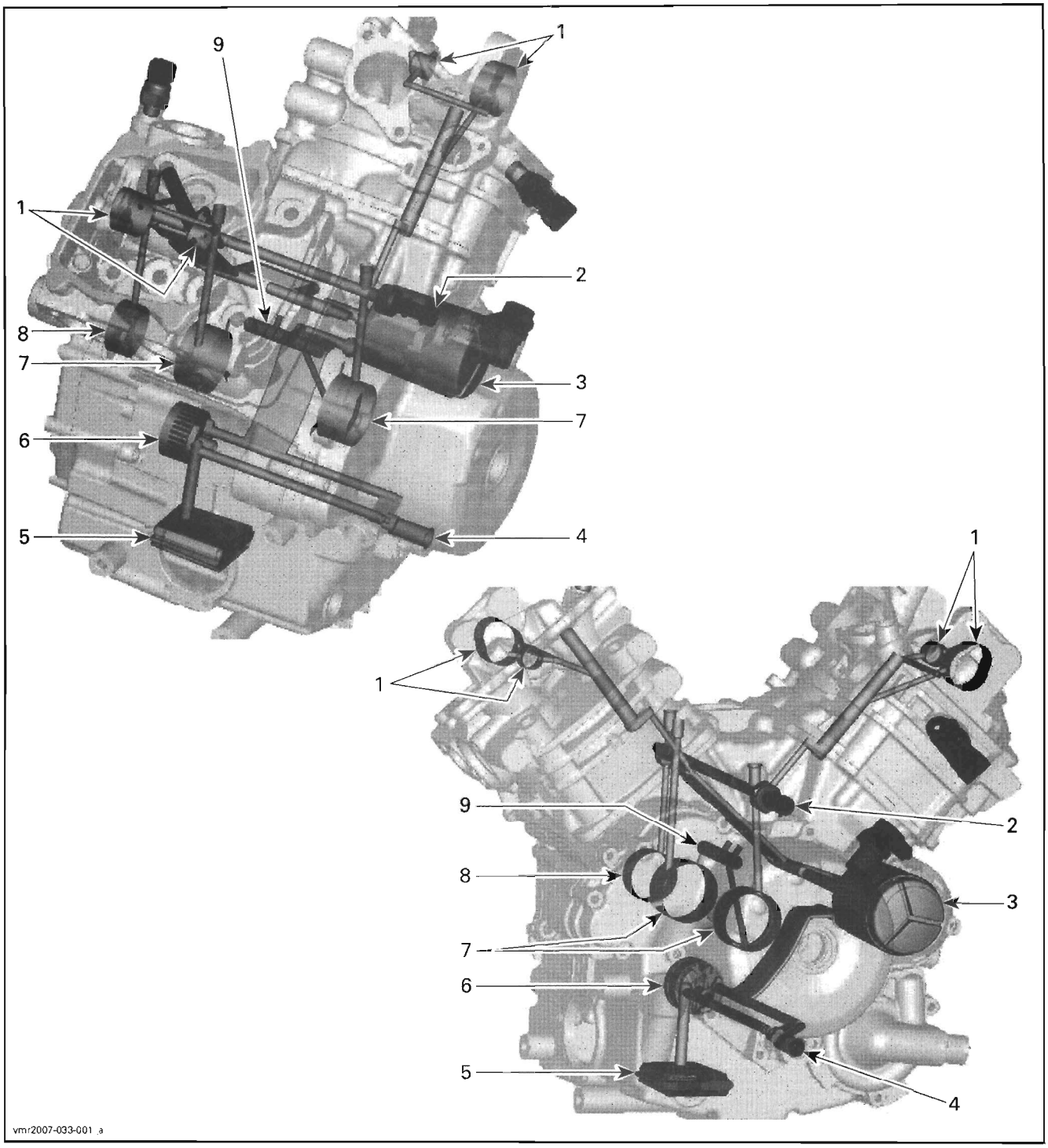
SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	214

COMPONENTS


20 N•m
(15 lbf•ft)
6 N•m
(53 lbf•in)
20 N•m
(15 lbf•ft)
Super Lube
grease
Loctite
243
12 N•m
(106 lbf•in)
10 N•m
(89 lbf•in)
Super Lube
grease
5 N•m
(44 lbf•in)
Loctite
243
10 N•m
(89 lbf•in)
7 N•m
(62 lbf•in)
Loctite
243
Engine
oil
20 N•m
(15 lbf•ft)
Engine
oil
mmr2007-099-001_a

ENGINE LUBRICATION



TYPICAL
1. *Camshaft bearings*
2. *Oil pressure switch*
3. *Oil filter*
4. *Oil pressure regulator valve*
5. *Oil strainer*
6. *Oil pump*
7. *Crankshaft main bearings*
8. *Crankshaft support bearing*
9. *Connecting rod bearings*

GENERAL

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

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 strictly be adhered to.
Locking devices (e.g.: 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.

MAINTENANCE

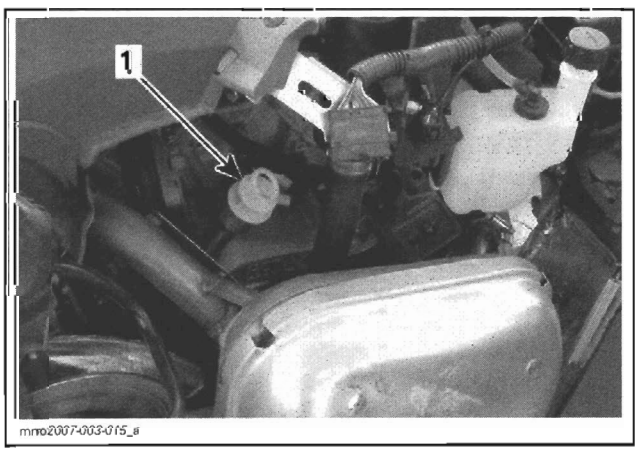
OIL LEVEL VERIFICATION

CAUTION: Check level frequently and refill if necessary. Do not overfill. Operating the engine with an improper level may severely damage engine. Wipe off any spillage.

With vehicle on a level surface and engine cold, not running, check the oil level as follows:

- Remove dipstick and wipe clean.
- Reinstall dipstick.

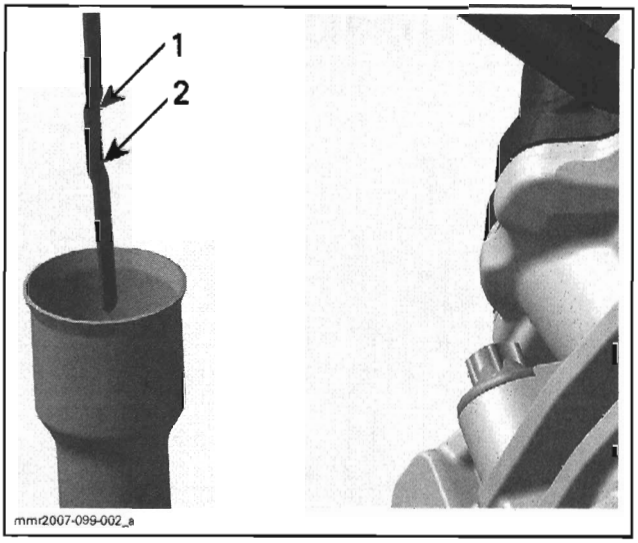
NOTE: Make sure it is completely inserted inside tube.



1. Dipstick fully inserted in tube

- Remove dipstick and read oil level.

Oil level must be between minimum and maximum marks on dipstick.



1. Maximum
2. Minimum

NOTE: There is a capacity of 300 mL (10 U.S. oz) between the two marks.

Refill oil as necessary. Place a funnel into the dipstick tube to avoid spillage. Do not overfill.

Reinstall dipstick.

OIL CHANGE

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

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

⚠ WARNING

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

Dispose oil and filter as per your local environmental regulations.

Oil Drain

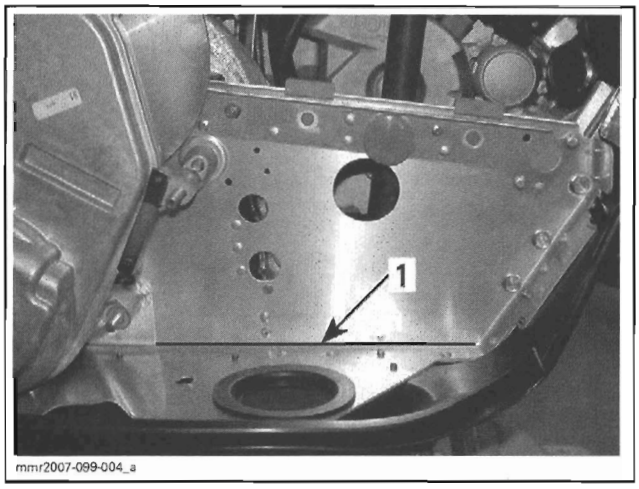
Procedure Using Drain Plug

Remove muffler. Refer to *EXHAUST SYSTEM*.

Clean the drain plug area.

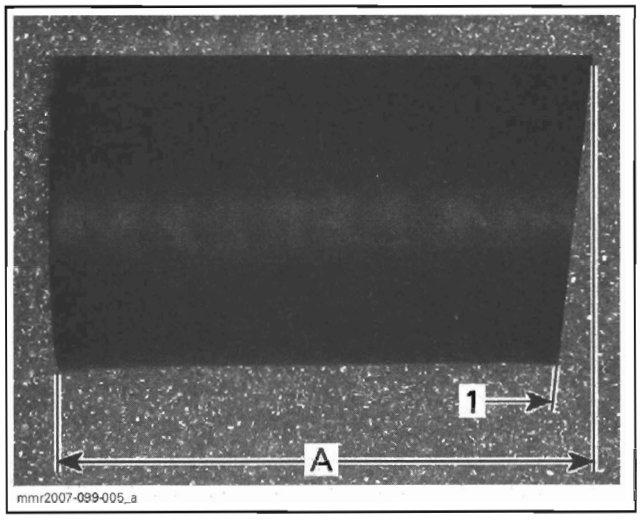
To prevent oil spillage in bottom pan, the following may be performed.

- Lift rear of vehicle so that the lowest edge of bottom pan is level.



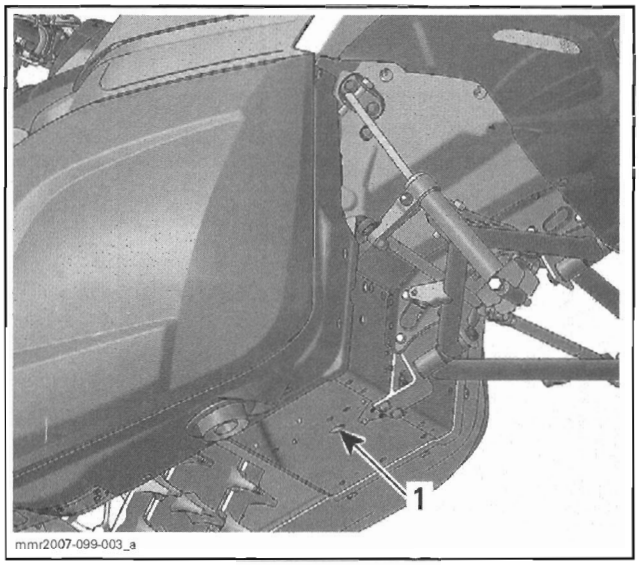
1. This surface level

– To prevent spillage in bottom pan, use a coolant hose and cut it as shown.

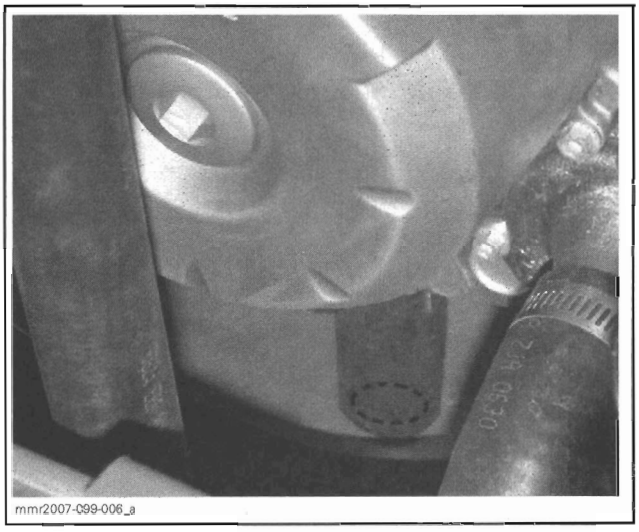


25 MM (1") DIAMETER MIN.
1. Angled side
A. 60 mm (2-3/8 in)

– Temporarily install hose underneath engine drain plug between engine and bottom pan. Place the angled side to match the bottom pan. Ensure drain hole is completely inside hose.

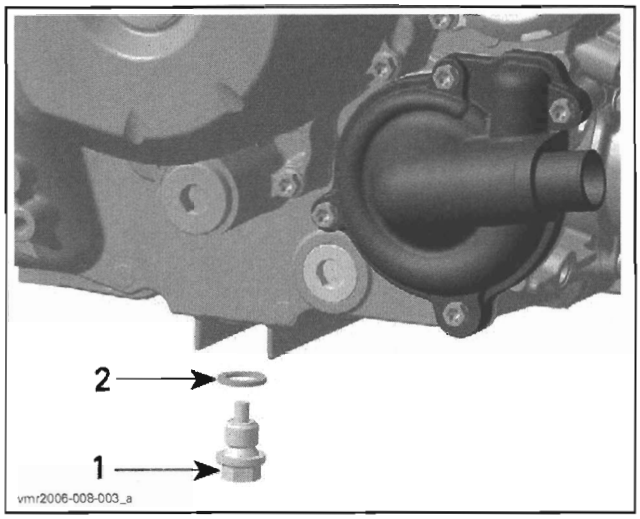


1. Access hole



Place a drain pan under the bottom pan access hole.

From bottom pan access hole unscrew drain plug then remove dipstick.



TYPICAL — DRAIN HOSE NOT SHOWN
1. *Drain plug*
2. *Gasket ring*

Allow oil to drain completely from crankcase.

Remove drain hose.

Procedure Using Suction Pump

Remove dipstick.

Using the suction pump (P/N 529 035 880), siphon oil through dipstick tube.

Oil Inspection

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

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

Oil Fill

Install a new gasket ring on drain plug. Torque drain plug to 20 N•m (15 lbf•ft).

CAUTION: Never use the gasket ring a second time. Always replace by a new one.

Refill engine with BRP XP-S 0W40 synthetic oil or an equivalent.

Oil change capacity with filter: 2 L (2.11 qt).

After filling, check the oil level with the dipstick. Refer to *OIL LEVEL CHECK* above.

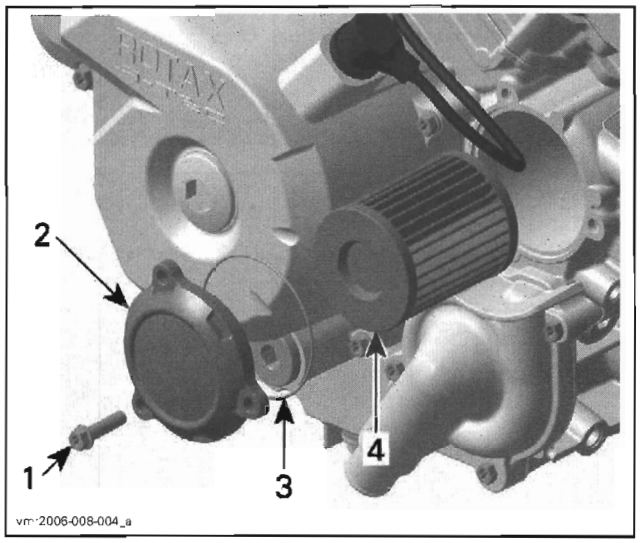
NOTE: Run engine to ensure oil filter and drain plug areas are not leaking.

Ensure to completely wipe out oil that may have spilled in bottom pan.

OIL FILTER

Removal

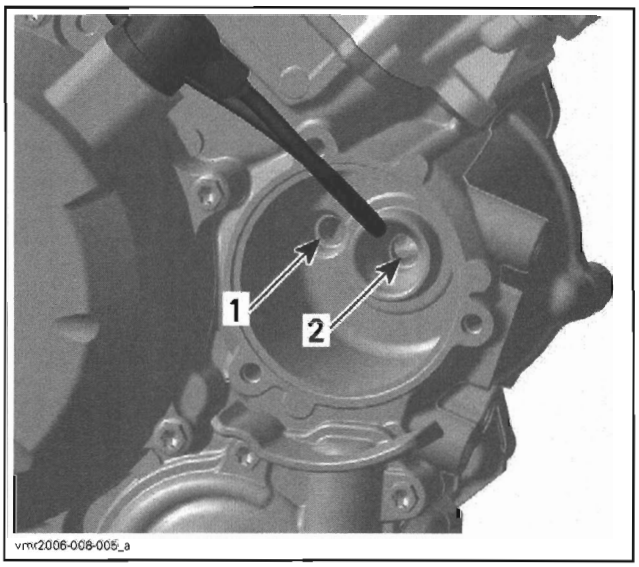
Remove:
- muffler, refer to *EXHAUST SYSTEM*
- oil filter screws
- oil filter cover
- oil filter.



TYPICAL
1. *Oil filter screw*
2. *Oil filter cover*
3. *O-ring*
4. *Oil filter*

Inspection

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



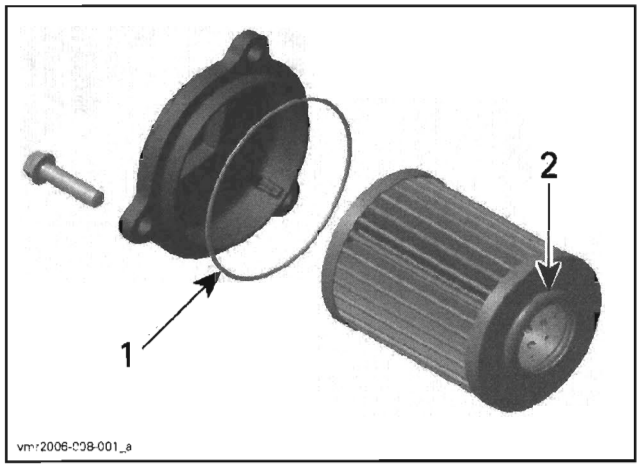
1. *Inlet bore from the oil pump to the oil filter*
2. *Outlet bore to the engine oil providing system*

Installation

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

Install a new gasket on oil filter cover.

To ease assembly and prevent displacement of the gasket during installation, refer to following illustration.



1. Slightly oil
2. Slightly grease

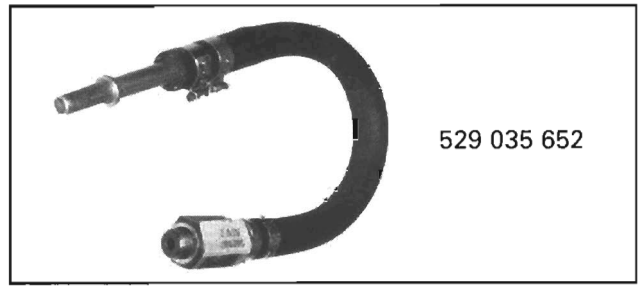
INSPECTION

ENGINE OIL PRESSURE

NOTE: The engine oil pressure test should be done with a **warm engine** 90°C (194°F) and the **recommended oil**.

Remove the oil pressure switch. See procedure below.

Install oil pressure gauge (P/N 529 035 709) and adapter hose (P/N 529 035 652).



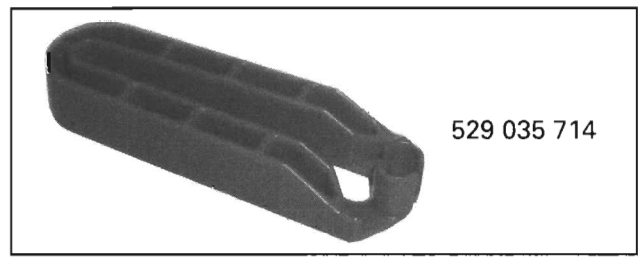
The engine oil pressure should be within the following values.

OIL PRESSURE	1250 RPM	6000 RPM
MINIMAL	70 kPa (10 PSI)	350 kPa (51 PSI)
NOMINAL	180 kPa (26 PSI)	420 kPa (61 PSI)
MAXIMAL	300 kPa (43 PSI)	550 KPa (80 PSI)

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

Remove oil pressure gauge and adapter hose.

NOTE: To remove adapter hose from oil pressure gauge, use the disconnect tool (P/N 529 035 714).



Reinstall the oil pressure switch.

PROCEDURES

OIL PRESSURE SWITCH

Switch Activation

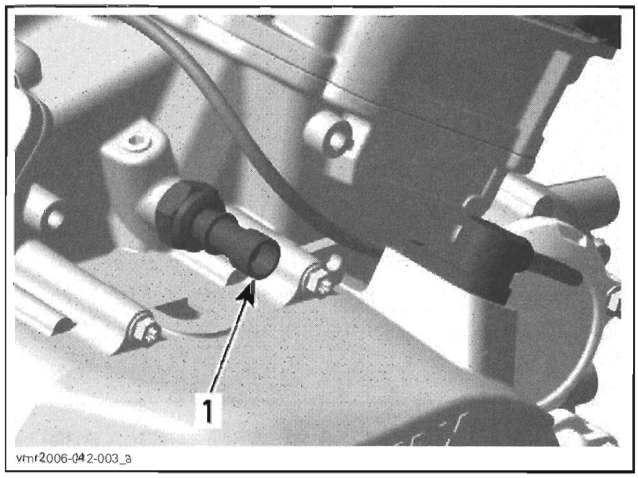
Oil pressure switch works when engine oil pressure is between 20 and 40 kPa (2.9 and 5.8 PSI).

Test

Refer to *ENGINE MANAGEMENT*.

Removal

Unplug then unscrew the oil pressure switch, mounted on the crankcase.



1. Oil pressure switch

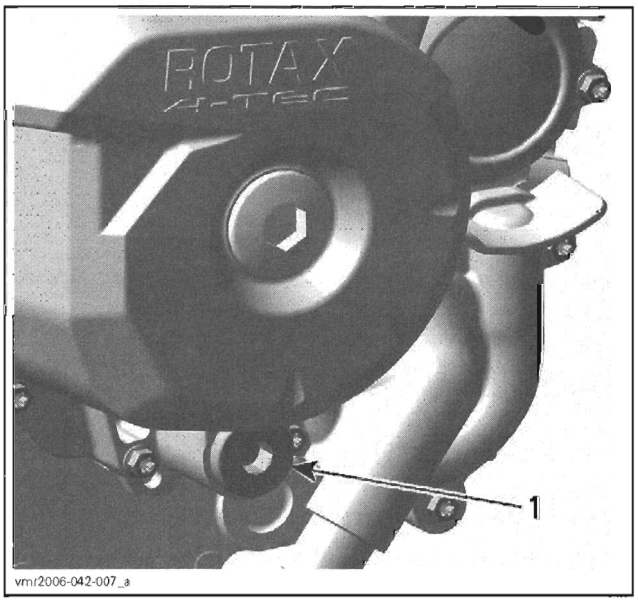
Installation

Torque switch to 12 N•m (106 lbf•**in**).

NOTE: Install oil pressure switch with Loctite 243 (blue) (P/N 293 800 060).

ENGINE OIL PRESSURE REGULATOR

The oil pressure regulator is located on the engine magneto side (inside magneto cover).

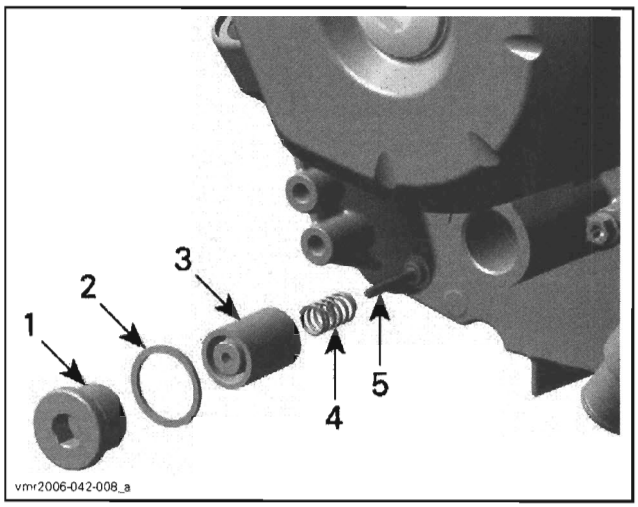


TYPICAL
1. Engine oil pressure regulator

NOTE: The oil pressure regulator system works when the oil pressure exceeds 450 kPa (65 PSI).

Removal

Remove plug screw and pull oil pressure regulator out.



1. Plug screw
2. Gasket ring
3. Pressure regulator housing
4. Spring
5. Pressure regulator valve

Inspection

Inspect pressure regulator housing and valve for scoring or other damages.

Check spring for free length.

SPRING FREE LENGTH	
NEW NOMINAL	39 mm (1.535 in)
SERVICE LIMIT	37 mm (1.457 in)

NOTE: Replace worn or damaged components.

Clean bore and thread in the magneto housing from metal shavings and other contaminations.

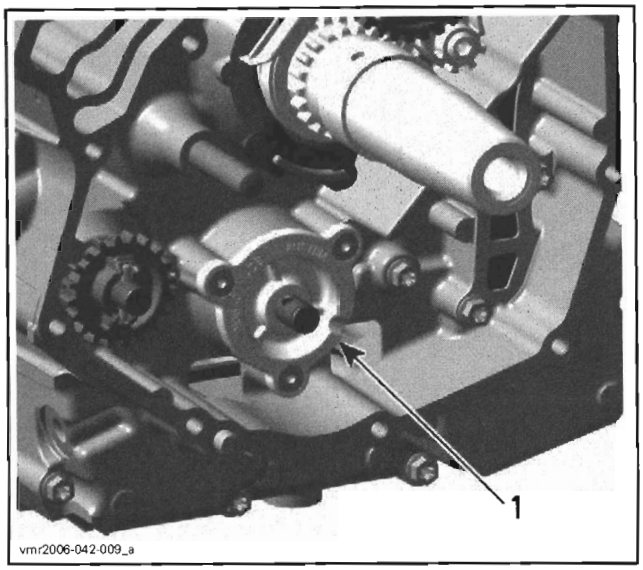
Installation

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

NOTE: At installation, always replace the gasket ring of the plug screw.

OIL PUMP

The oil pump is located on the engine PTO side (behind cover).



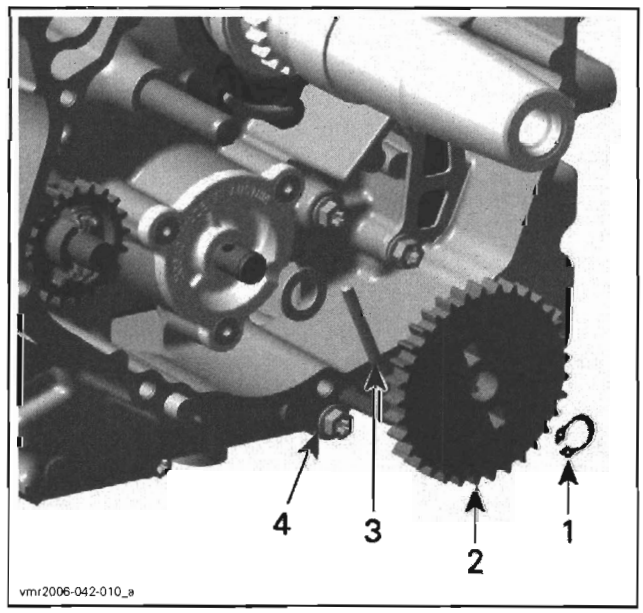
1. Oil pump

Removal

Remove parts to access the engine crankcase PTO cover.

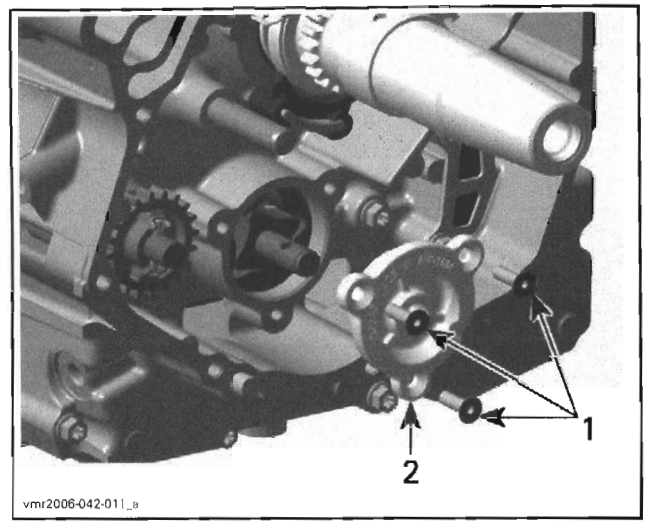
Remove the engine crankcase PTO cover. Refer to *BOTTOM END* section.

Remove:
- retaining ring
- oil pump gear
- needle pin
- thrust washer



1. Retaining ring
2. Oil pump gear
3. Needle pin
4. Thrust washer

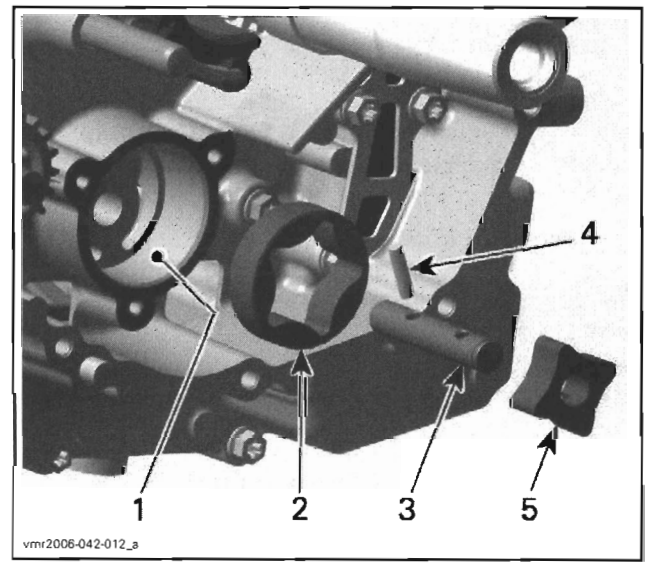
- oil pump cover screws and pull oil pump cover
- oil pump shaft with inner rotor and outer rotor.



1. Retaining screws
2. Oil pump cover

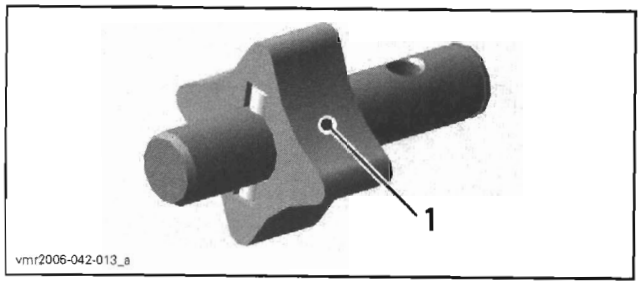
Inspection

Inspect oil pump for marks or other damages. Check for scratches in crankcase between outer rotor and oil pump bore. If so, replace damaged parts.



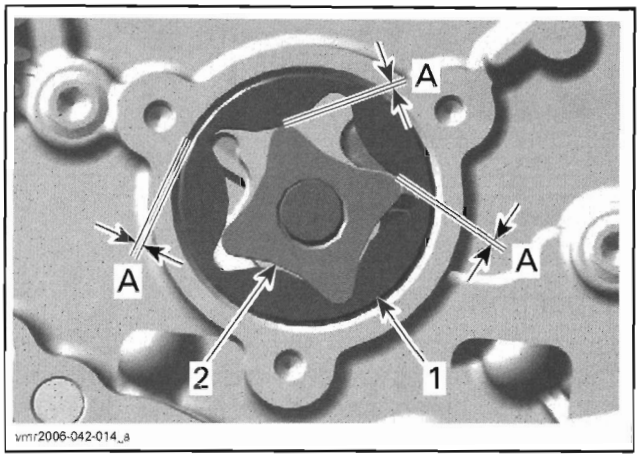
1. Oil pump bore
2. Outer rotor
3. Oil pump shaft
4. Needle pin
5. Inner rotor

Check inner rotor for corrosion pin holes or other damages. If so, replace oil pump shaft assembly.



1. Pittings on the teeth

Using a feeler gauge, measure the clearance of inner and outer rotors as shown.

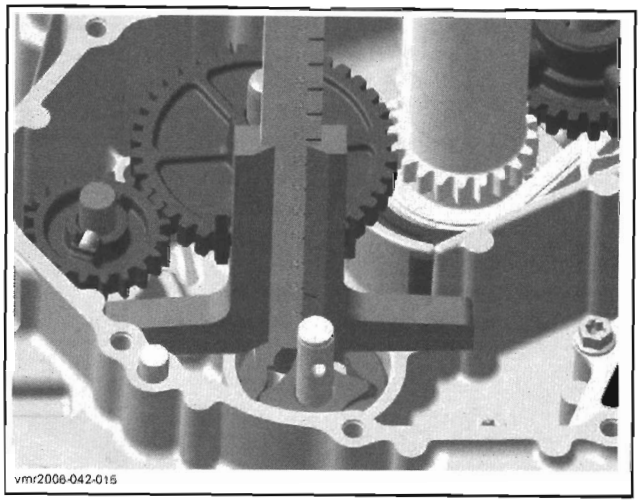


1. Outer rotor
2. Inner rotor
A. SERVICE LIMIT: 0.25 mm (.009 in)

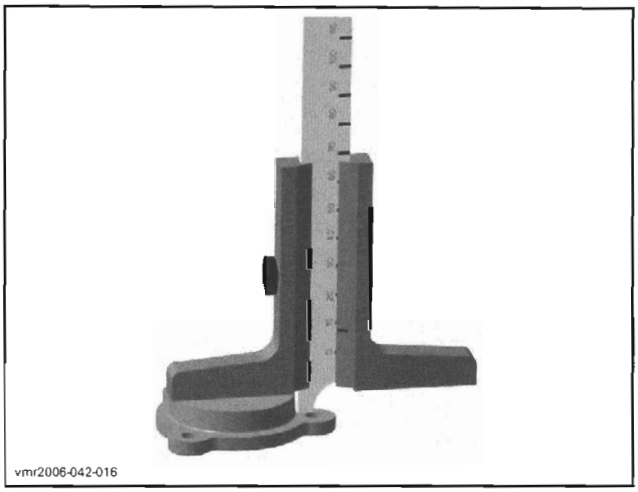
If clearance of inner and outer rotors exceeds the tolerance, replace oil pump shaft assembly. Ensure to also check oil pump cover. If damaged, replace the complete oil pump assembly.

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

Using a depth gauge, measure the axial clearance of the oil pump as shown.



OIL PUMP — MEASUREMENT "A"



OIL PUMP COVER — MEASUREMENT "B"

Difference between measurements should not exceed 0.2 mm (.008 in). If so, replace the complete oil pump assembly.

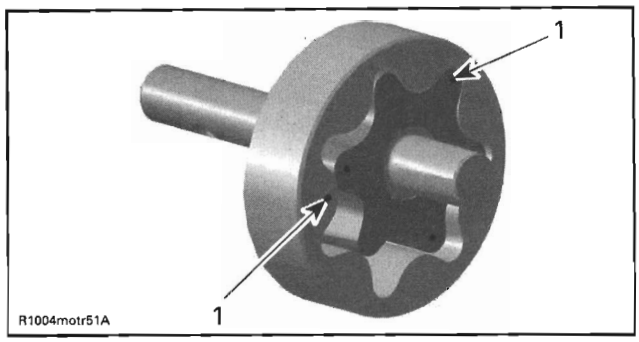
NOTE: When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases.

Installation

For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: The outer rotor and inner rotor are marked. When installing, make sure both markings are on the upper side.



TYPICAL
1. Markings

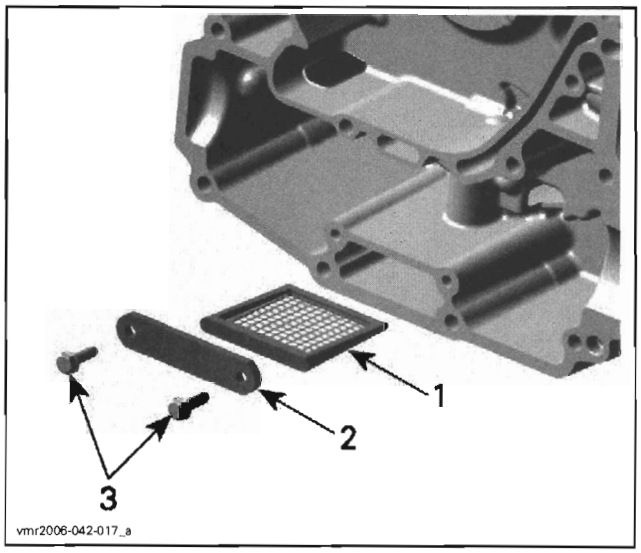
After reinstallation of the remaining parts, check for smooth operation of the oil pump assembly.

Final Test

After engine is completely reassembled, start engine and make sure oil pressure is within specifications (refer to *OIL PRESSURE TEST* above).

ENGINE OIL STRAINER

The engine oil strainer is located between both crankcase halves.



1. Engine oil strainer
2. Retaining plate
3. Screws

Removal

Refer to *BOTTOM END* section.

Cleaning and Inspection

Clean engine 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 and injure your eyes.

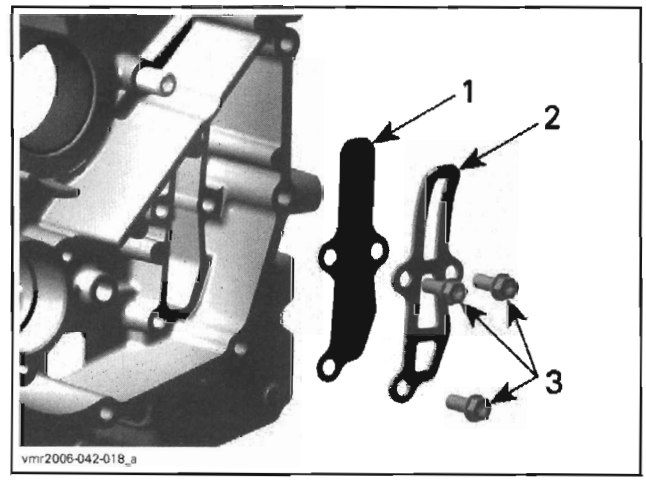
Check engine oil strainer for cracks or other damage. Replace if damaged.

Installation

Refer to *BOTTOM END* section.

REED VALVE

The engine is equipped with a reed valve which prevents accumulation of larger oil quantities in the crankcase. The reed valve is fitted into the crankcase.



1. Reed valve
2. Stopper
3. Screws

Removal

Refer to *BOTTOM END*.

Inspection

Check reed valve for cracks or other damage.

NOTE: Replace reed valve if damaged.

Installation

Refer to *BOTTOM END*.

COOLING SYSTEM

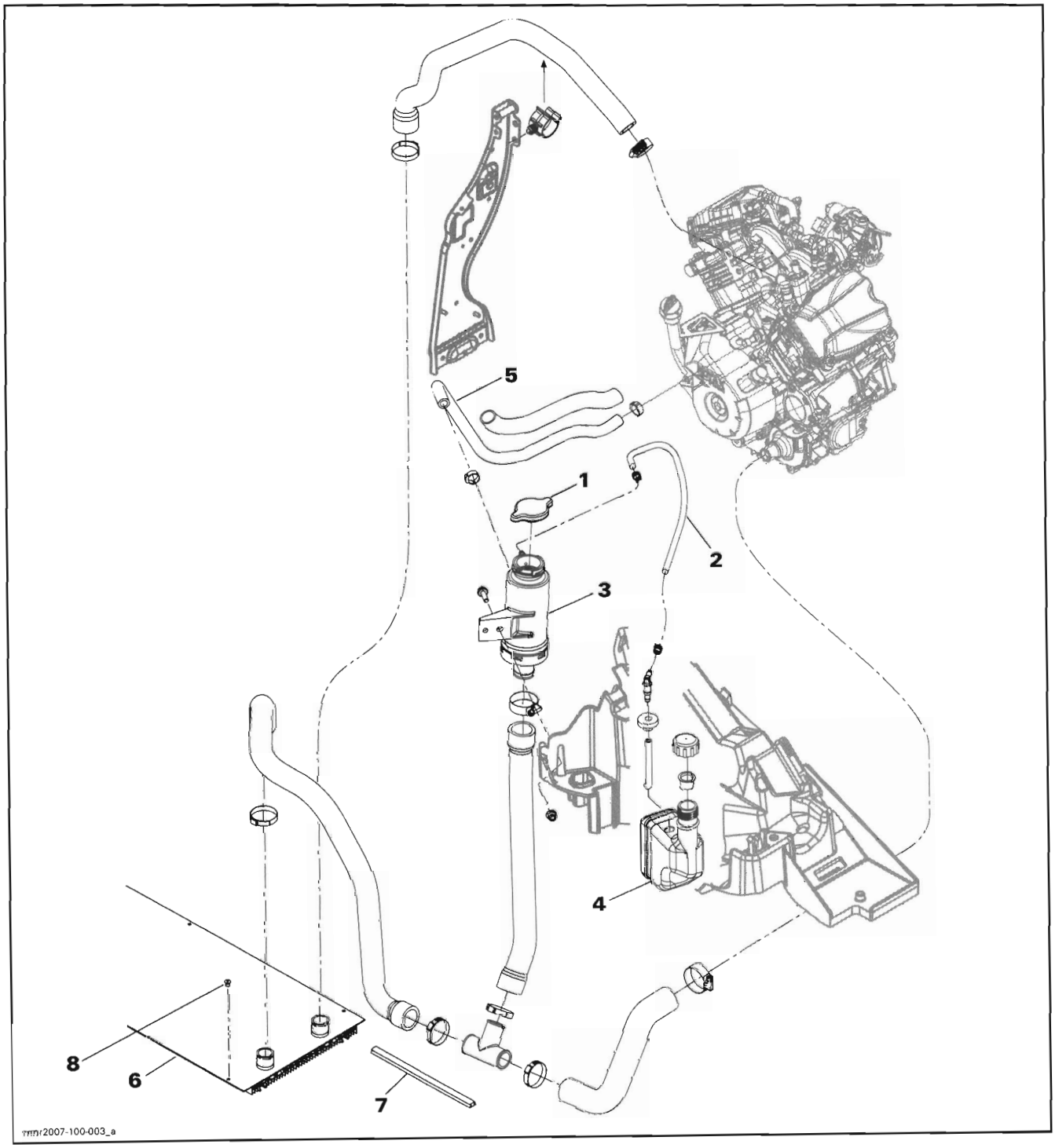
SERVICE TOOLS

Description	Part Number	Page
installer handle	420 877 650	229
oil seal pusher	529 035 757	229
pressure/vacuum pump	529 021 800	222
rotary seal installer	529 035 766	230
small hose pincher	295 000 076	222
test cap	529 035 991	222

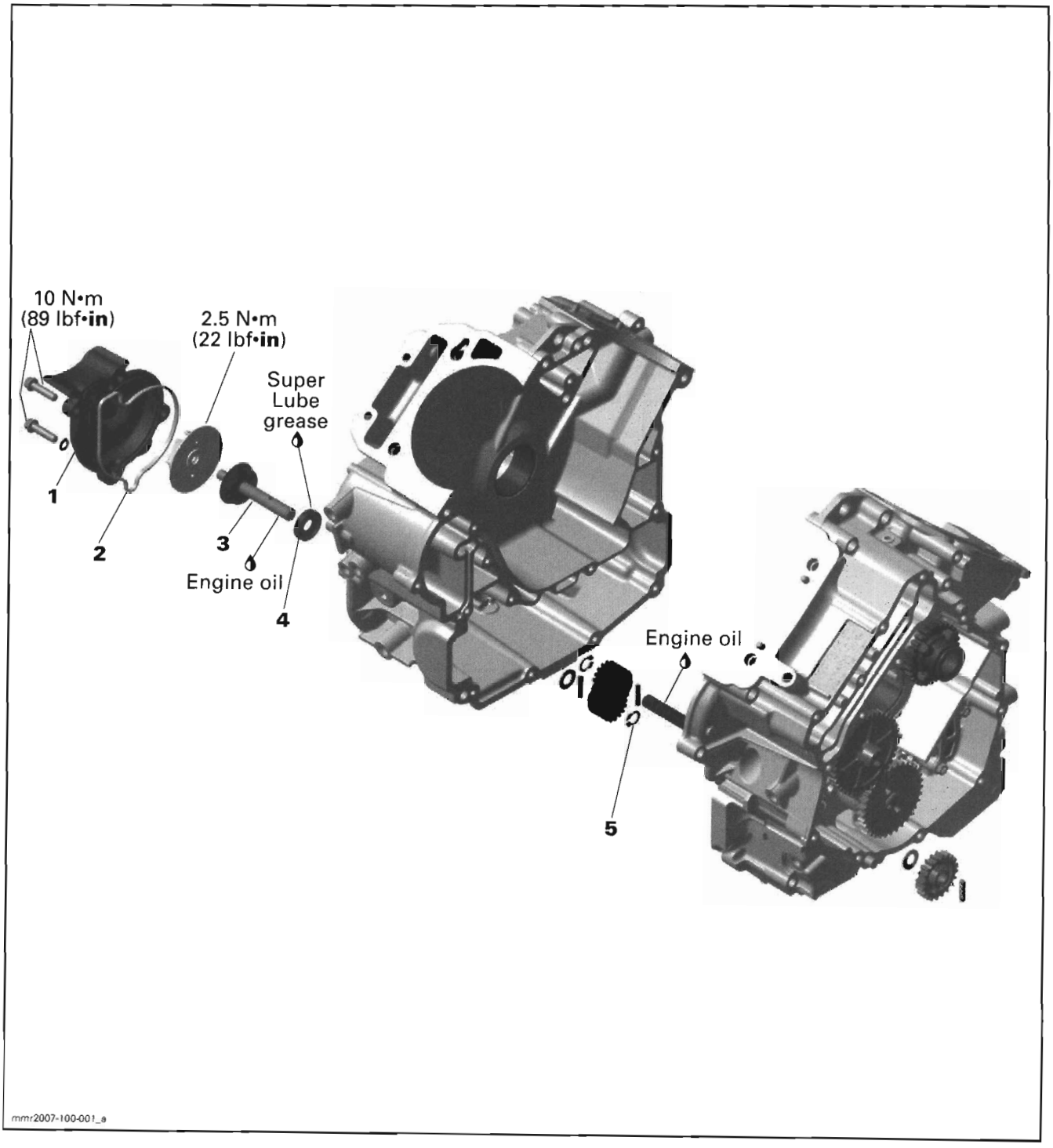
SERVICE PRODUCTS

Description	Part Number	Page
BRP premixed coolant	219 700 362	223
Molykote 111	413 707 000	229

RADIATOR



WATER PUMP


10 N•m
(89 lbf•in)
2.5 N•m
(22 lbf•in)
Super
Lube
grease
1
2
3
Engine oil
4
Engine oil
5
mmr2007-100-001_a

GENERAL

⚠ WARNING

Never start engine without coolant. Some engine parts such as the rotary seal on water pump shaft can be damaged.

During assembly/installation, use the torque values and service products as 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 strictly be adhered to.
Locking devices (e.g.: 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.

INSPECTION

COOLING SYSTEM LEAK TEST

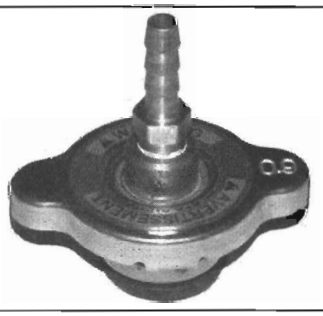
⚠ WARNING

To avoid potential burns, do not remove the coolant tank cap if the engine is hot.

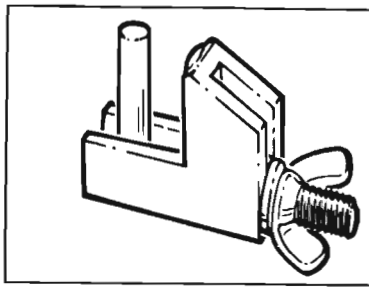
Open side panels, hood and remove the coolant tank cap **no. 1**.

Install the test cap (P/N 529 035 991) and a small hose pincher (P/N 295 000 076) on overflow hose **no. 2**.

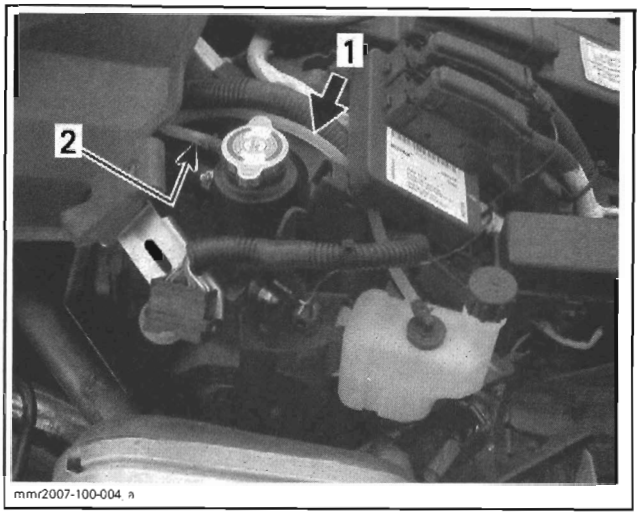
Using pressure/vacuum pump (P/N 529 021 800), pressurize system to 103 kPa (15 PSI).



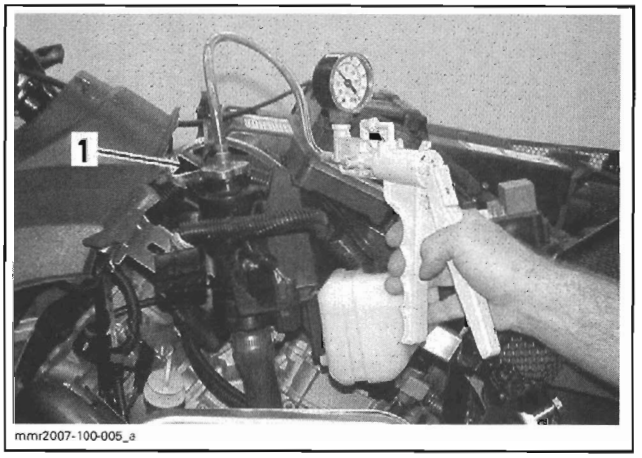
529 035 991



295 000 076



1. Install hose pincher here
2. Overflow hose



1. Special radiator cap

Check all hoses and cylinder(s)/base for coolant leaks or air bubbles.

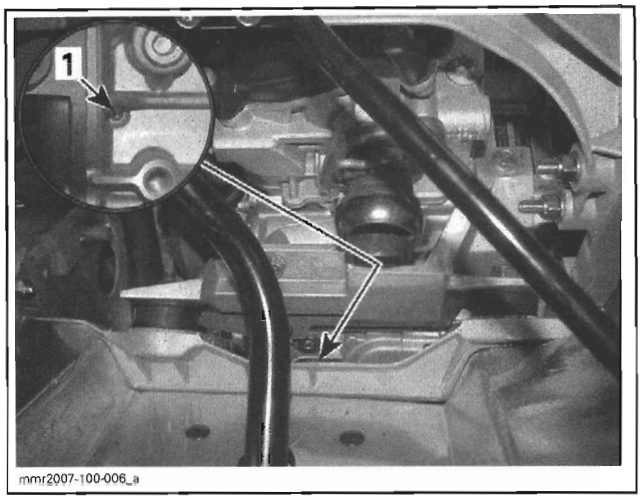
Inspection

Check general condition of hoses and clamps tightness.

Check the leak indicator holes.

Leak Indicator in Front of Engine

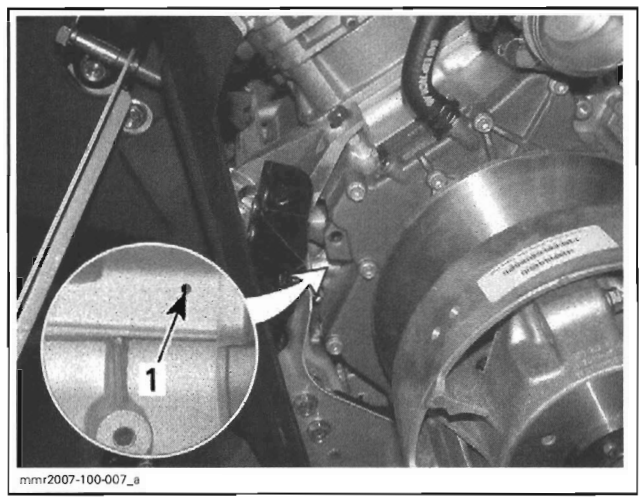
Flowing coolant indicates a defective rotary seal. Oil indicates a defective inner oil seal. If either seal is leaking, both seals must be replaced at the same time. Refer to *WATER PUMP SHAFT AND SEALS* in this section.



1. Leak indicator hole

Leak Indicator on PTO Side

The PTO side leak indicator hole indicates if the PTO gasket is in good condition. If a liquid leaks by this hole, the PTO gasket replacement is necessary.



1. Leak indicator hole

MAINTENANCE

COOLANT REPLACEMENT

⚠ WARNING

To avoid potential burns, do not remove the coolant tank cap if the engine is hot.

Recommended Coolant

Use BRP premixed coolant (P/N 219 700 362) or a blend of 50% antifreeze with 50% water.

To prevent antifreeze deterioration, always use the same brand. Never mix different brands unless cooling system is completely flushed and refilled.

CAUTION: To prevent rust formation or freezing condition, always replenish the system with the BRP premixed coolant or with 50% antifreeze and 50% water. Do not use tap water, straight antifreeze or straight water in the system. Tap water contains minerals and impurities which build up in the system. During cold weather, straight water causes the system to freeze while straight antifreeze thickens and does not have the same efficiency. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

Draining the System

⚠ WARNING

Never drain or refill cooling system when engine is hot.

Remove coolant tank cap **no. 1**.

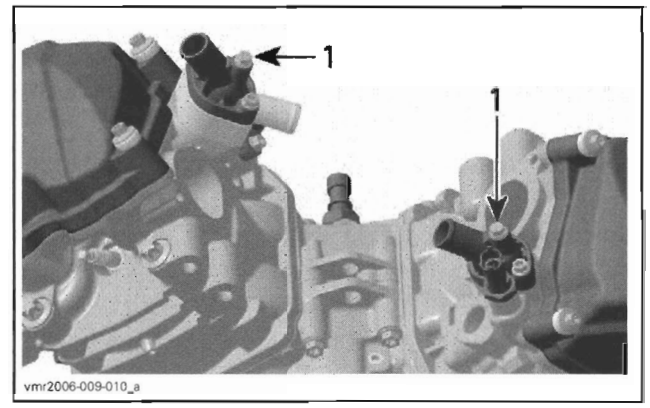
Siphon as much coolant through coolant tank **no. 3**.

When the coolant level is low enough, lift the rear of the vehicle to drain the radiator.

Empty the overflow coolant tank **no. 4**.

Refilling the System

Unscrew bleeding screw on each cylinder head.

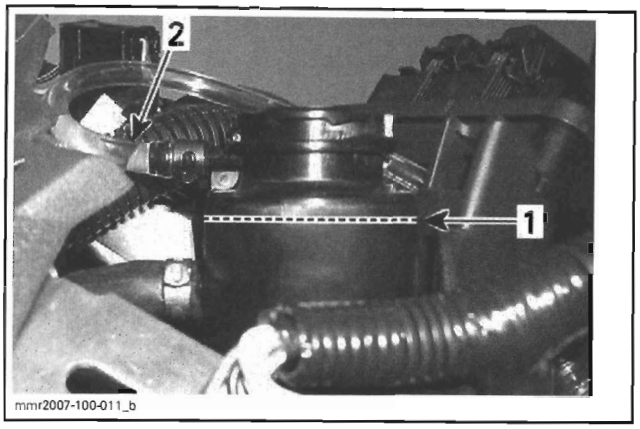


1. Bleeding screws

NOTE: Both cylinders must be bled.

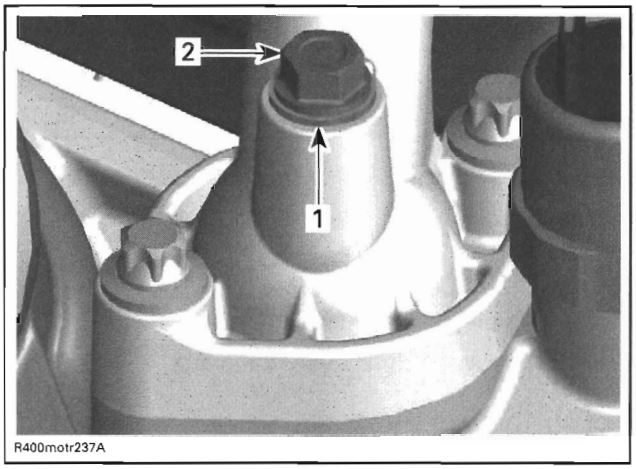
With vehicle on a flat surface, engine cold, refill coolant tank **no. 3**.

NOTE: While refilling, always maintain coolant level below the overflow hose.



1. *Maintain coolant level below the overflow hose*
2. *Overflow hose*

When the coolant comes out by the rear cylinder head, install the bleeding screw. Continue filling until coolant comes out from front cylinder head, then install the bleeding screw.



TYPICAL
1. *Gasket ring*
2. *Bleeding screw*

Lift the front of the vehicle 50 cm (20 in) off the ground and secure safely.

Unscrew bleeding screw again on each cylinder head.

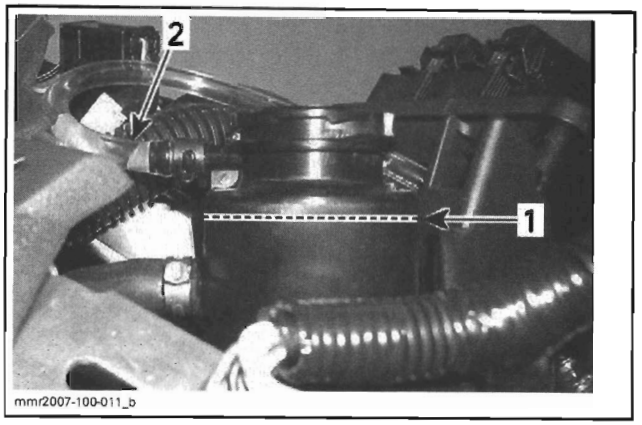
Continue filling coolant tank **no. 3** until coolant comes out by the rear cylinder head, then install the bleeding screw.

Continue filling until coolant comes out from front cylinder head, then install the bleeding screw.

NOTE: While refilling, always maintain coolant level below the overflow hose.

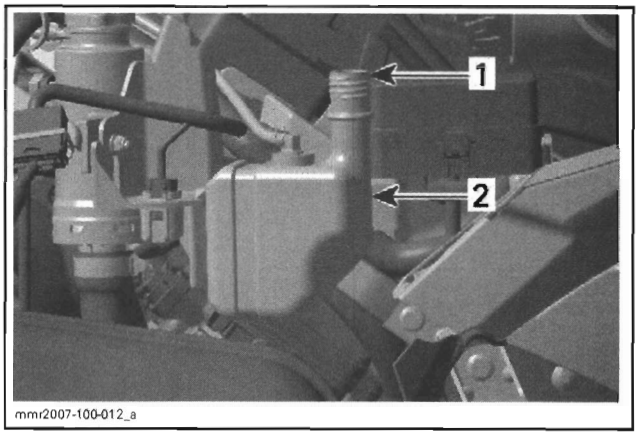
Put vehicle back on the ground.

Verify coolant level in coolant tank **no. 3**, if coolant level exceeds overflow hose fitting, remove excess coolant.



1. *Maximum coolant level*
2. *Overflow hose*

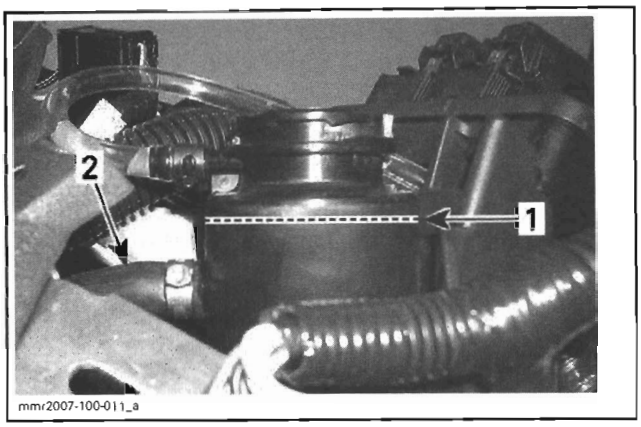
Fill up overflow coolant tank **no. 4** up to the rim. Instal cap.



1. *Coolant level*
2. *Overflow coolant tank*

Start engine.

Continuously check coolant level in coolant tank **no. 3**. Coolant level must be maintain above the throttle body outlet hose **no. 5**.



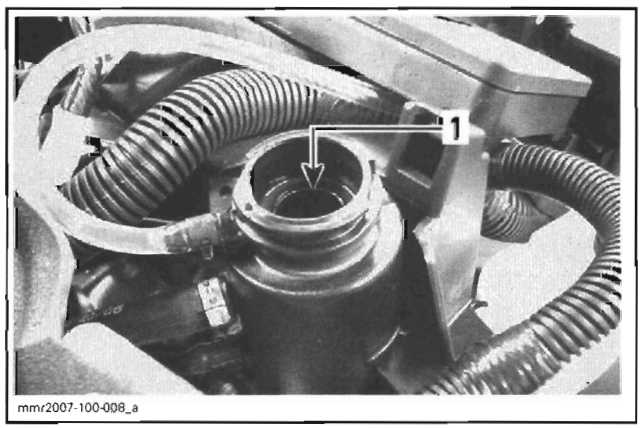
COOLANT TANK
1. Coolant level
2. Throttle body outlet hose

CAUTION: Never allow coolant tank to be empty during the filling procedure.

Let engine idling until coolant temperature reach 100°C (212°F). Monitor engine coolant temperature by using B.U.D.S. or any appropriate digital thermometer.

Stop engine.

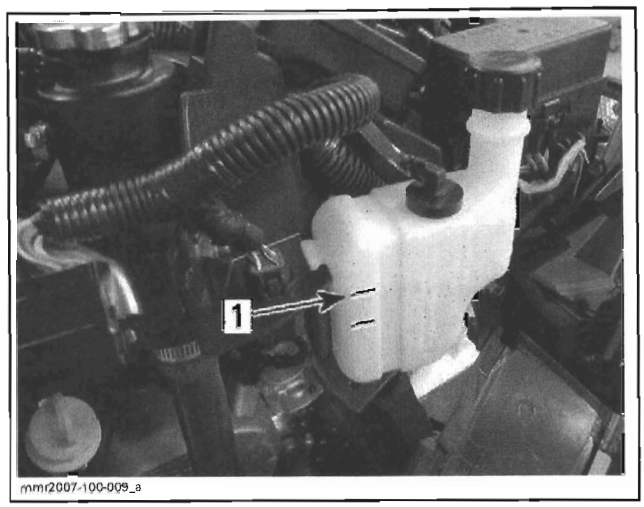
Fill up coolant tank **no. 3**. Install cap.



COOLANT TANK
1. Maximum level

Let engine cool down for a minimum of 60 minutes.

Fill overflow coolant tank **no. 4** to maximum level line.



OVERFLOW COOLANT TANK
1. Maximum level

Recheck coolant level after vehicle has completely cooled down. Coolant tank **no. 3** must be filled to the maximum level and the overflow coolant tank **no. 4** must be between the minimum and maximum marks.

After the first few kilometers (miles) of running, recheck level in expansion coolant tank.

PROCEDURES

THERMOSTAT

Thermostat Type

The thermostat is a single action type.

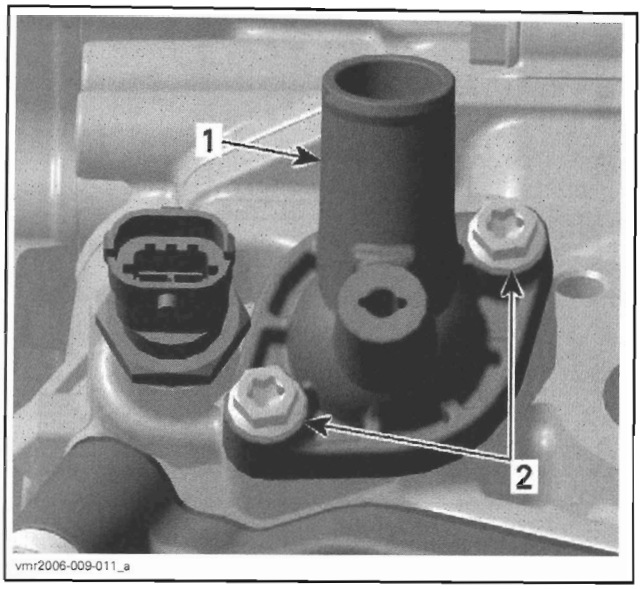
Thermostat Removal

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

Install a hose pincher on both radiator hoses.

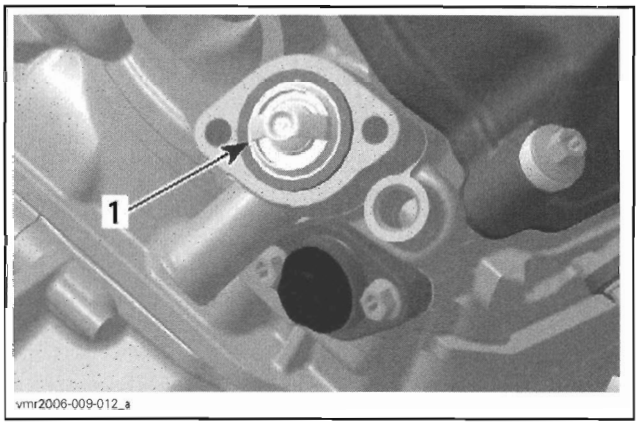
Remove:

– thermostat housing screws and pull thermostat housing



TYPICAL
1. *Thermostat cover*
2. *Screws*

– thermostat with gasket out of the hole.



TYPICAL
1. *Thermostat with gasket*

Thermostat Test

To check thermostat, put in water and heat water. Thermostat should open when water temperature reaches 75°C (167°F).

Check if the gasket is brittle, hard or damaged. If so, replace gasket.

Thermostat Installation

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

Install the thermostat cover then torque screws to 6 N•m (53 lbf•**in**).

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

CAUTION: Do not forget to bleed the cooling system. Refer to *COOLANT REPLACEMENT*.

COOLANT TANK CAP

Using a pressure cap tester, check the efficiency of radiator cap **no. 1**. If the efficiency is feeble, install a new 110 kPa (16 PSI) cap (do not exceed this pressure).

RADIATOR AND RADIATOR PROTECTOR

Cleaning and Inspection

Remove all debris between radiator fins. A clean radiator is more efficient than a dirty one.

Check if the radiator fins are damaged. Replace the radiator **no. 6** if necessary.

NOTE: A radiator with many broken fins does not work properly.

Removal

Drain cooling system, see *DRAINING THE SYSTEM*.

Remove rear suspension. Refer to *SC REAR SUSPENSION* or *SC-4 REAR SUSPENSION*.

Remove fuel tank. Refer to *FUEL TANK AND FUEL PUMP*.

Using a grinding disk, grind all rivets **no. 8** retaining rear radiator **no. 6** to frame.

Unplug radiator hoses from radiator then remove radiator from vehicle.

Installation

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

Insert radiator protector **no. 7** onto radiator C-rail and crimp C-rail at rear end.

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 **no. 4**.

Tank Removal

Open side panels and hood.

Unplug overflow hose **no. 2**.

Lift tank vertically to remove.

Empty overflow coolant tank.

Tank Installation

The installation is the reverse of the removal procedure.

COOLANT TEMPERATURE SENSOR (CTS)

Refer to *ENGINE MANAGEMENT* section for testing and replacement procedures of the coolant temperature sensor (CTS).

WATER PUMP HOUSING

It is located on the engine MAG side.

Water Pump Housing Removal

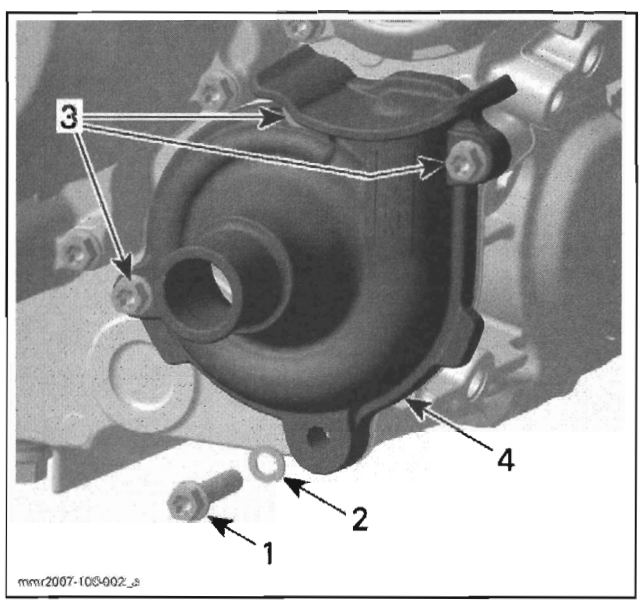
⚠ WARNING

To avoid potential burns, do not remove the radiator cap or loosen the cooling drain plug if the engine is hot.

Drain cooling system.

Remove radiator outlet hose from water pump housing.

Remove screws retaining water pump housing.

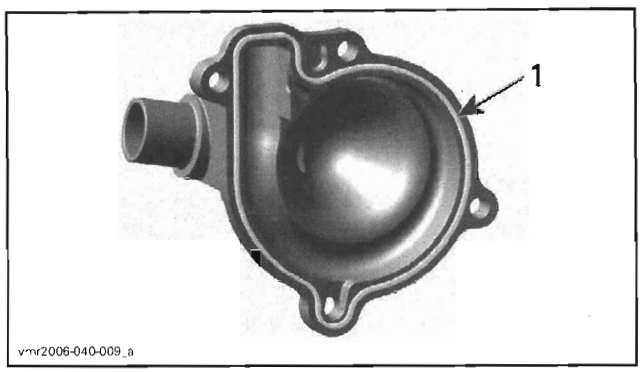


1. *Cooling drain plug*
2. *Sealing ring*
3. *Screws*
4. *Water pump housing*

Pull water pump housing to remove it.

Water Pump Housing Inspection

Check if gasket is brittle, hard or damaged and replace as necessary.



TYPICAL
1. *Gasket*

Water Pump Housing Installation

The installation is the opposite of the removal procedure.

CAUTION: To prevent leaking, take care that the gasket is exactly in groove when you reinstall the water pump housing.

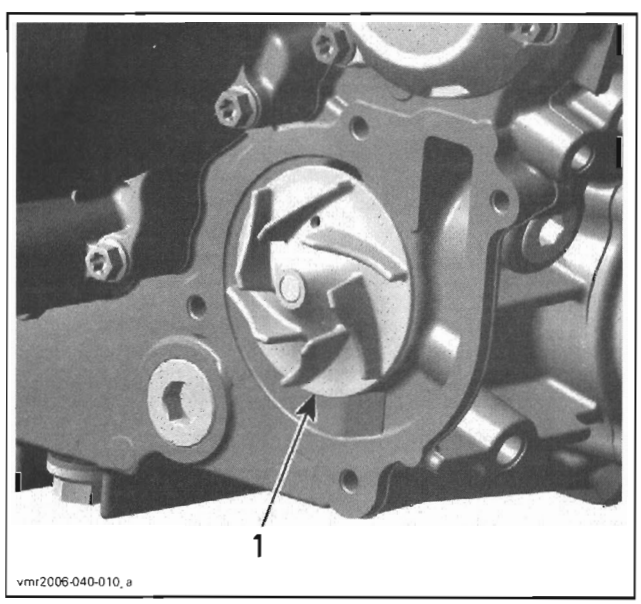
Tighten screws of water pump housing in a criss cross sequence.

WATER PUMP IMPELLER

Impeller Removal

Remove water pump housing.

Unscrew impeller.



TYPICAL
1. *Impeller*

CAUTION: Water pump shaft and impeller have right-hand threads. Remove by turning counterclockwise and install by turning clockwise.

Impeller Inspection

Check impeller for cracks or other damage. Replace impeller if damaged.

Impeller Installation

The installation is the opposite of the removal procedure.

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

WATER PUMP SHAFT AND SEALS

Shaft/Seal Removal

NOTE: To replace the water pump shaft and seals, engine removal and disassembly is necessary.

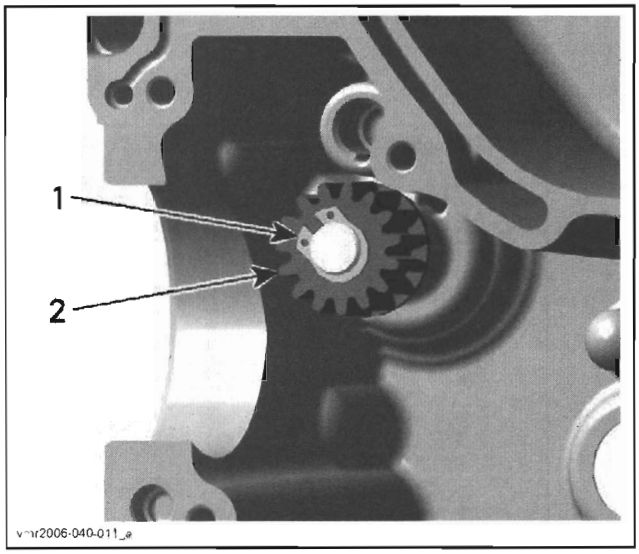
Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* section.

Remove both cylinders and heads, refer to *CYLINDER AND HEAD.*

Separate crankcase, refer to *BOTTOM END.*

Remove water pump housing and impeller. See procedures in this section.

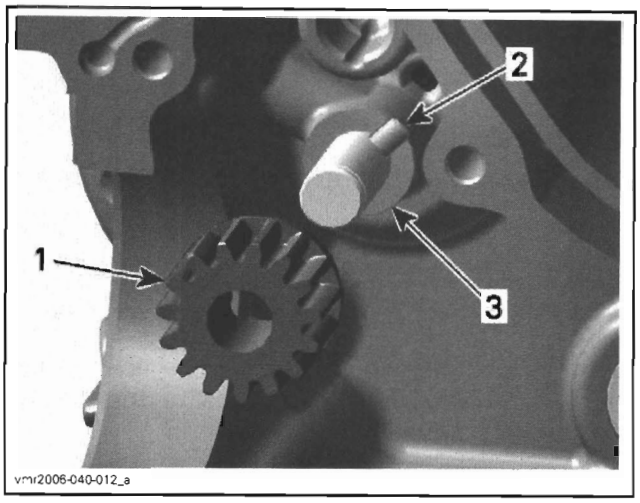
Remove retaining ring **no. 5** with appropriate pliers.



TYPICAL
1. *Retaining ring*
2. *Water pump gear*

NOTE: The water pump gear is held by a needle pin on the water pump shaft.

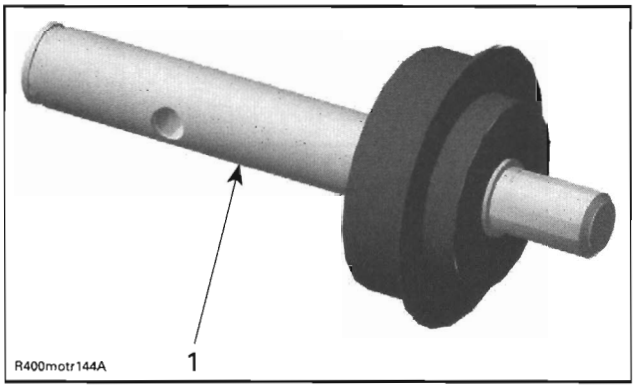
Remove needle pin and thrust washer.



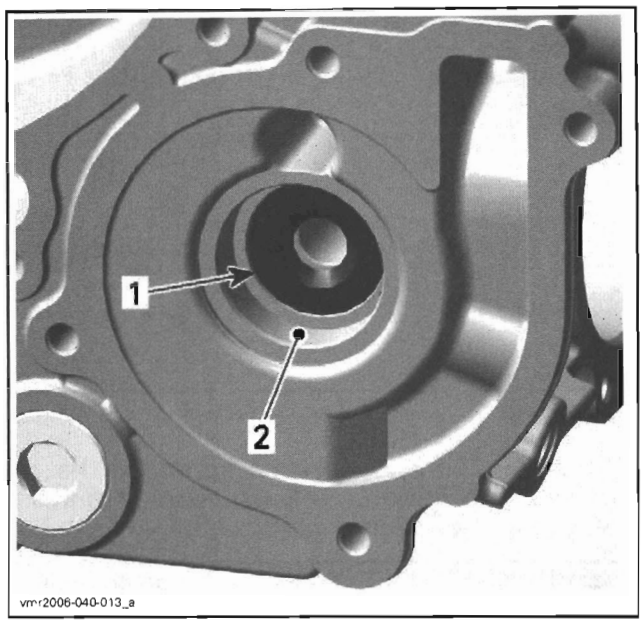
TYPICAL
1. *Water pump gear*
2. *Needle pin*
3. *Thrust washer*

Using a soft hammer to push out water pump shaft with rotary seal from inside of crankcase MAG side.

CAUTION: When removing water pump shaft, always replace rotary seal with water pump shaft **no. 3** and oil seal **no. 4** (behind rotary seal).



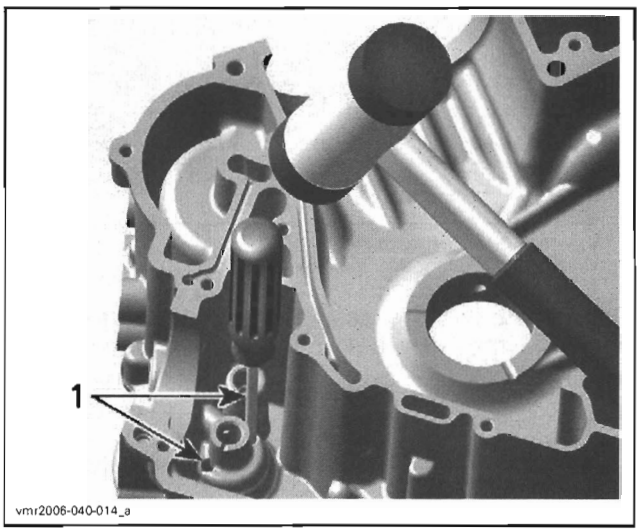
1. *Water pump shaft with rotary seal*



TYPICAL
1. *Oil seal behind the rotary seal*
2. *Rotary seal bore*

Extract oil seal **no. 4** from inside of crankcase MAG side with a pusher.

CAUTION: Be careful not to damage the surface of the rotary seal bore in crankcase MAG side.



TYPICAL
1. *Extract oil seal with a pusher*

Parts Inspection

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

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

Shaft/Seal Installation

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

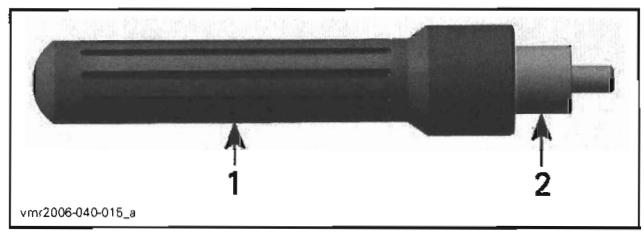
NOTE: For installation use the torque values in the exploded view.

CAUTION: Always replace rotary seal and water pump shaft together. Also, install a new inner oil seal (behind rotary seal) at the same time.

Apply engine oil on the water pump shaft and intermediate shaft.

NOTE: Never use oil in the press fit area of the oil seal and rotary seal.

Use the oil seal pusher (P/N 529 035 757) and the installer handle (P/N 420 877 650) to install inner oil seal.

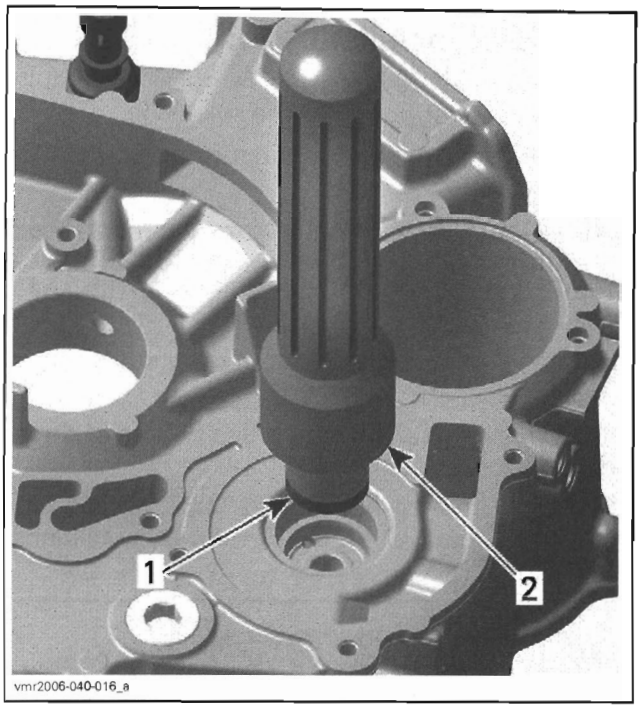


1. *Handle*
2. *Pusher*

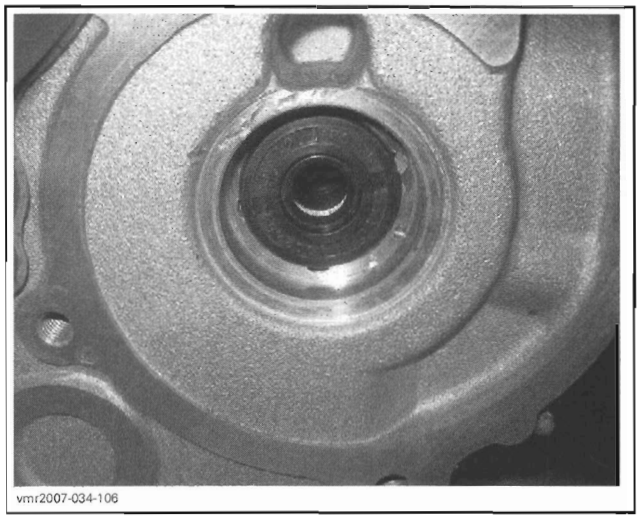
Apply Molykote 111 (P/N 413 707 000) inside lips of oil seal.

When installing the oil seal on the pusher, make sure sealing lip points outside.

Push inner oil seal in place.

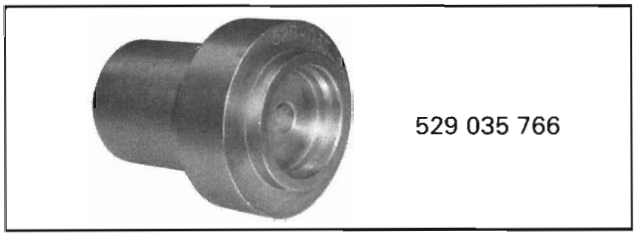


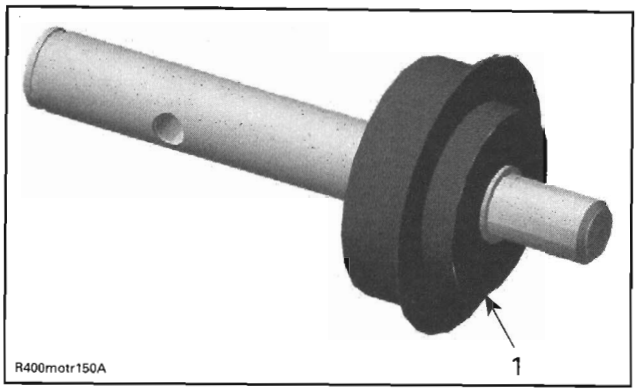
1. *Inner oil seal*
2. *Installer handle with oil seal pusher*



Slide water pump shaft with the new rotary seal into crankcase.

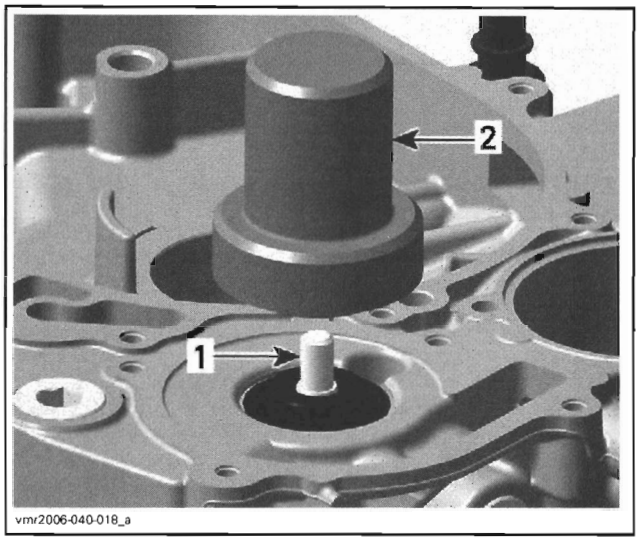
To properly install water pump shaft with rotary seal, use the rotary seal installer (P/N 529 035 766).





1. *Surface where rotary seal is pushed by tool*

CAUTION: Never use a hammer for the rotary seal installation. Only use a press to avoid damaging the ceramic component.



1. *Water pump shaft with rotary seal*
2. *Water pump rotary seal installer*

CAUTION: Never use the retaining ring no. **5** a second time. Always install a new one.

After installation, water pump shaft with rotary seal must rotate freely.

Tighten screws of the water pump housing crosswise.

Properly reinstall remaining parts. Refer to appropriate sections.

Refill all fluids.

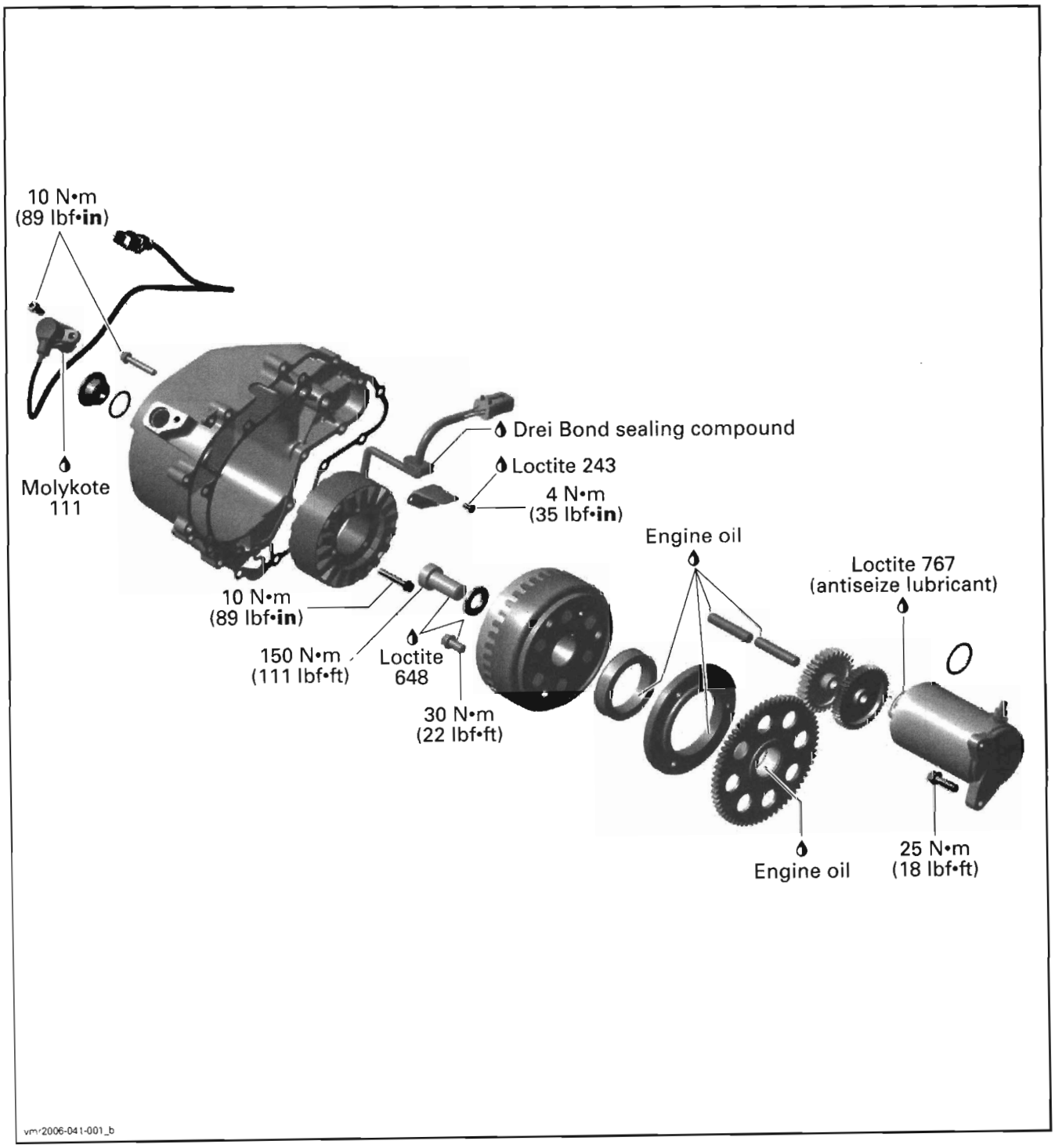
MAGNETO SYSTEM

SERVICE TOOLS

Description	Part Number	Page
crankshaft protector	529 036 034	235
magneto puller	529 035 748	235
siphon pump	529 035 880	233

SERVICE PRODUCTS

Description	Part Number	Page
BRP premixed coolant	219 700 362	234
Drei Bond sealing compound	420 297 906	233
Loctite 648 (green)	413 711 400	237
Loctite 767 (antiseize lubricant	293 800 070	238
Loctite Chisel (gasket remover)	413 708 500	233
pulley flange cleaner	413 701 809	236
XP-S synthetic 0W40 motor oil	293 600 054	234


10 N•m
(89 lbf•in)
Molykote
111
Drei Bond sealing compound
Loctite 243
4 N•m
(35 lbf•in)
Engine oil
Loctite 767
(antiseize lubricant)
10 N•m
(89 lbf•in)
150 N•m
(111 lbf•ft)
Loctite
648
30 N•m
(22 lbf•ft)
Engine oil
25 N•m
(18 lbf•ft)
vmr2006-041-001_b

GENERAL

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

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

⚠ WARNING

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

PROCEDURES

MAGNETO COVER

NOTE: The magneto cover can be removed without removing the engine.

Magneto Cover Removal

Remove muffler. Refer to *EXHAUST SYSTEM*.

Lower coolant tank level. Use siphon pump (P/N 529 035 880).

Disconnect the coolant hose from tank.

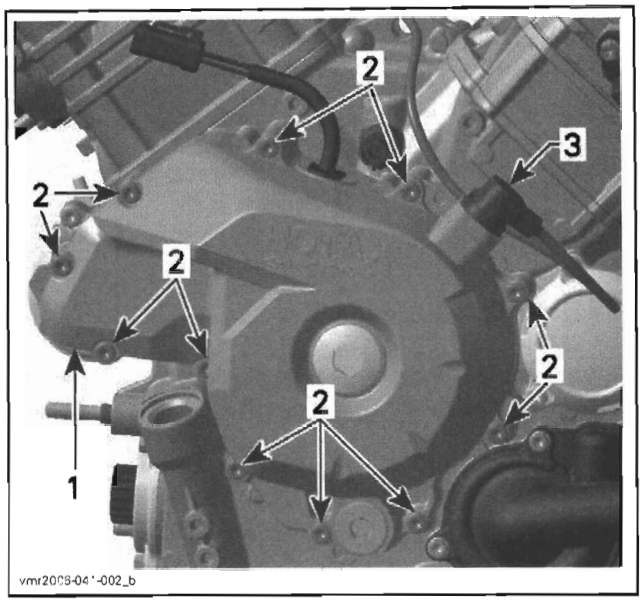
Drain engine oil (refer to *LUBRICATION SYSTEM*).

Remove crankshaft position sensor (CPS) and cut tie raps.

Disconnect magneto connector.

Remove the dipstick's tube and unscrew its adaptor.

Remove magneto cover retaining screws.



TYPICAL
1. *Magneto cover*
2. *Retaining screws*
3. *Crankshaft position sensor*

Pull magneto cover.

Magneto Cover Inspection and Cleaning

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

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

⚠ WARNING

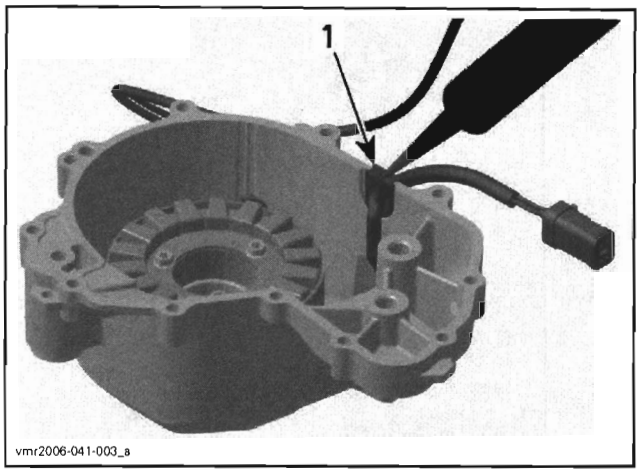
Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

Magneto Cover Installation

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

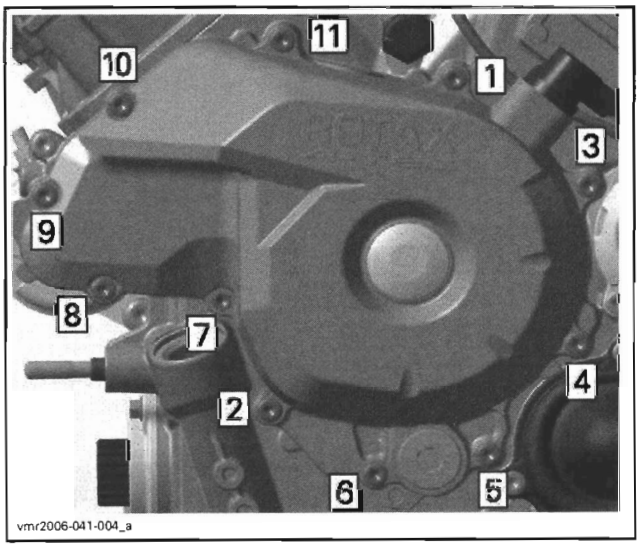
NOTE: At installation replace magneto cover gasket.

Apply Drei Bond sealing compound (P/N 420 297 906) on stator cable grommet as shown in next illustration.



1. Apply Drei Bond sealing compound

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



TYPICAL — TIGHTENING SEQUENCE

Refill engine with XP-S synthetic 0W40 motor oil (P/N 293 600 054).

Refill cooling system with BRP premixed coolant (P/N 219 700 362).

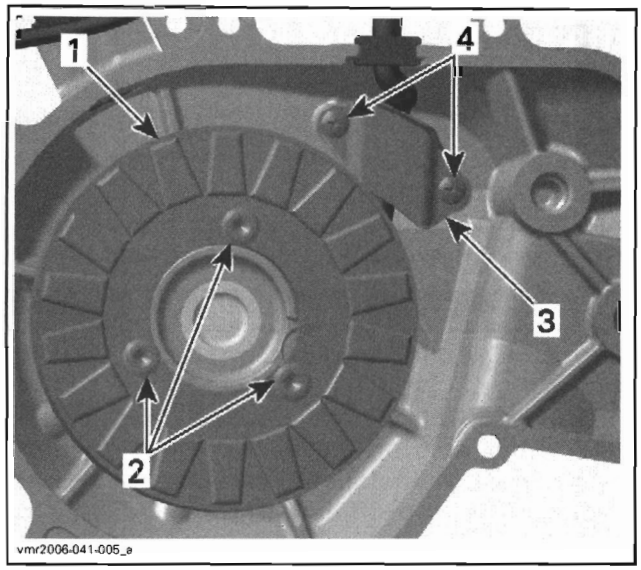
STATOR

Stator Removal

Remove magneto cover (refer to *MAGNETO COVER* above).

Remove screws securing holding strip.

Remove stator retaining screws then the stator.



1. Stator
2. Stator retaining screws
3. Holding strip
4. Holding strip screws

Stator Inspection

Check stator condition. If damaged replace it.

Check if stator wires are brittle, hard or otherwise damaged.

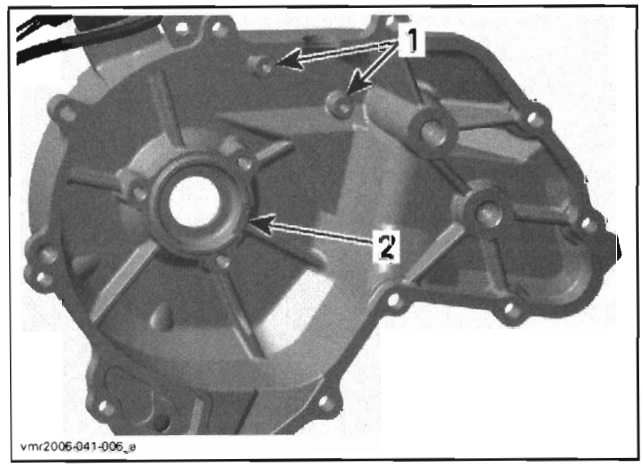
For electrical inspection, refer to *CHARGING SYSTEM*.

Stator Installation

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

CAUTION: When installing the stator take care that the cable is in place (guide for the wire).

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



1. Threads for cable holding strip
2. Notch for stator

ROTOR

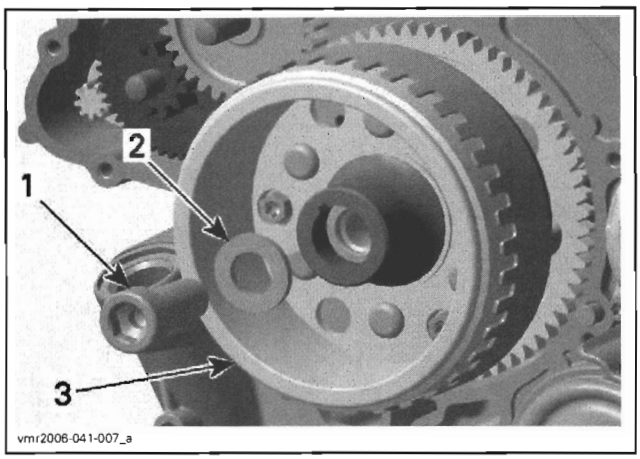
Rotor Removal

Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION.*

Lock crankshaft (refer to *BOTTOM END*).

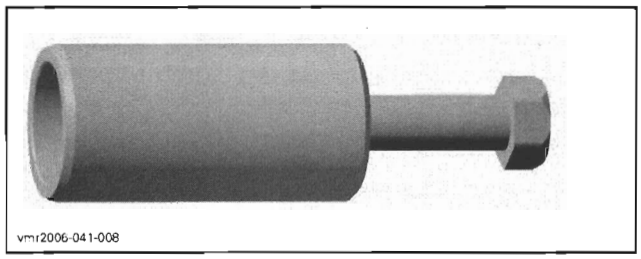
Remove magneto cover. Refer to *MAGNETO COVER* above.

Using a 14 mm Allen key, remove screw and washer securing rotor to crankshaft.

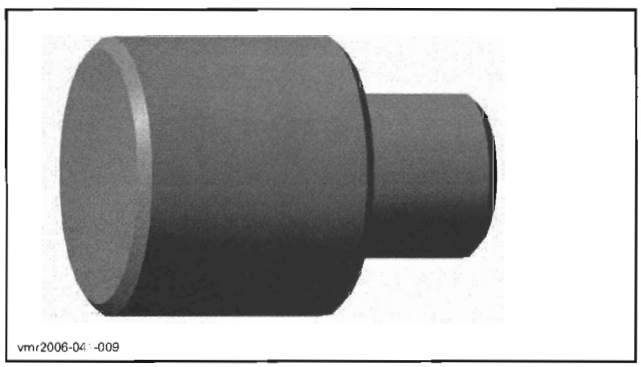


TYPICAL
1. *Rotor screw*
2. *Washer*
3. *Rotor*

Install magneto puller (P/N 529 035 748) and crankshaft protector (P/N 529 036 034) then remove rotor.

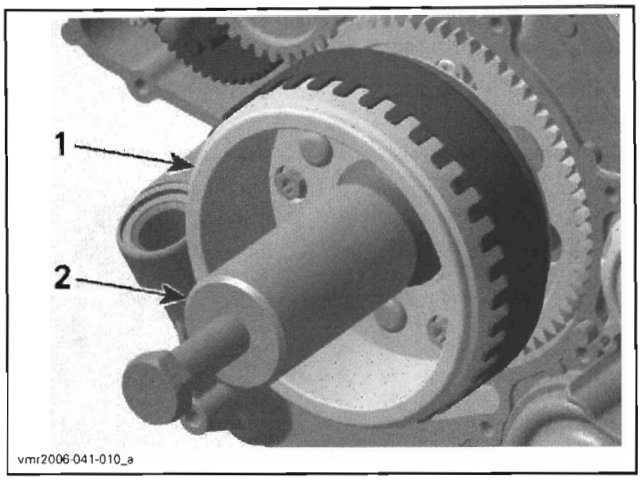


MAGNETO PULLER



CRANKSHAFT PROTECTOR

NOTE: Use grease to place protector on crankshaft end prior to screw on the magneto puller.



TYPICAL
1. *Rotor*
2. *Magneto puller*

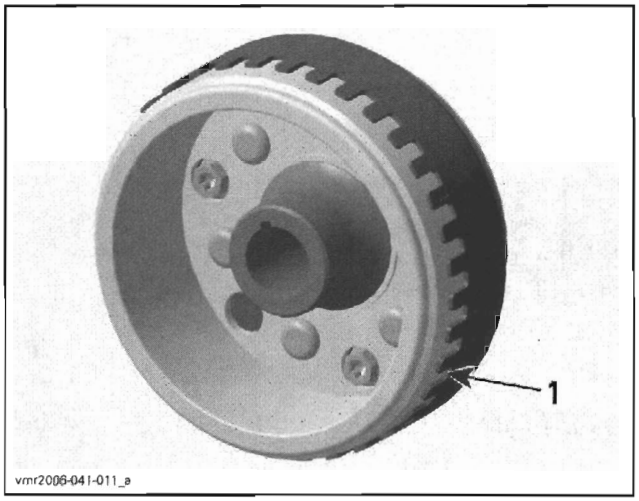
Screw magneto puller bolt to remove rotor.

Rotor Inspection

Check inner side of rotor for scratches or other damage.

Check keyway of the rotor for wear or damages.

Check if trigger wheel teeth are bent or otherwise damaged.



1. *Rotor with trigger wheel*

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

Replace parts as necessary.

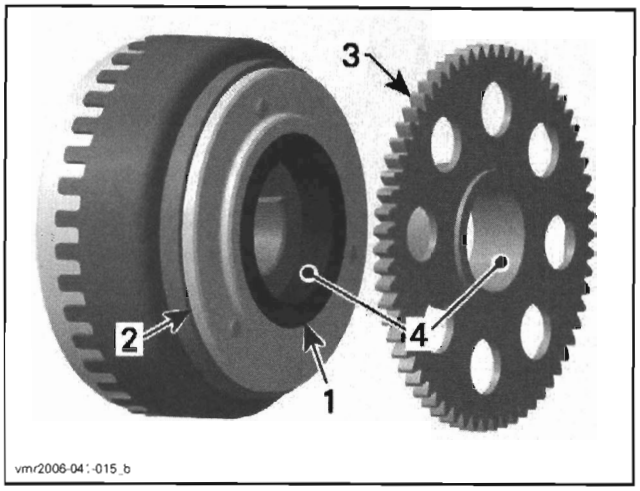
Rotor Installation

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

Clean crankshaft taper and rotor with pulley flange cleaner (P/N 413 701 809).

CAUTION: Taper on crankshaft and rotor must be free of grease.

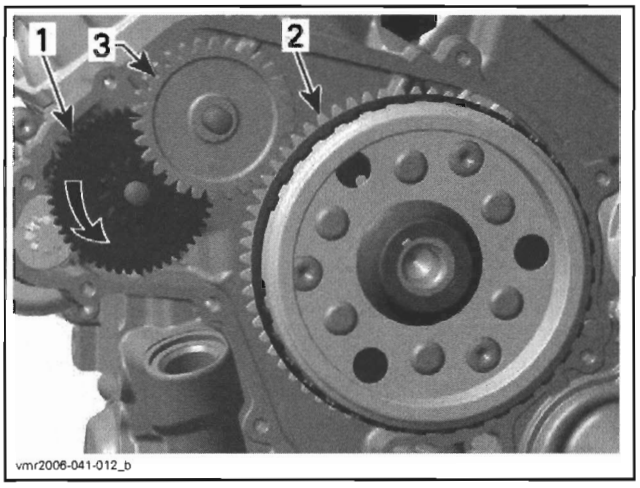
Oil sprag clutch in sprag clutch housing and install sprag clutch gear.



1. *Sprag clutch*
2. *Sprag clutch housing*
3. *Sprag clutch gear*
4. *Apply engine oil here*

Slide rotor onto crankshaft. The woodruff key and the keyway must be aligned.

Rotate starter double gear counterclockwise to align intermediate gear teeth with sprag clutch gear.



TYPICAL
1. *Starter double gear*
2. *Sprag clutch gear*
3. *Intermediate gear*

SPRAG CLUTCH

Sprag Clutch Removal

Remove engine from vehicle (refer to *ENGINE REMOVAL AND INSTALLATION*).

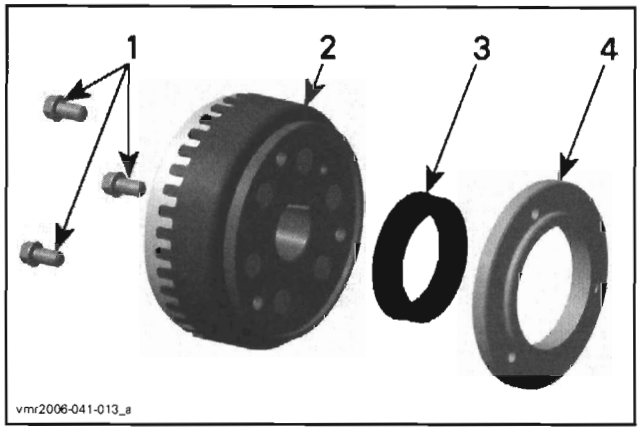
Remove magneto cover (refer to *MAGNETO COVER* above).

Loosen sprag clutch housing screws located inside rotor.

Remove rotor (refer to *ROTOR* above).

Remove sprag clutch gear.

Remove sprag clutch housing screws and sprag clutch housing.



1. *Sprag clutch housing screws*
2. *Rotor*
3. *Sprag clutch*
4. *Sprag clutch housing*

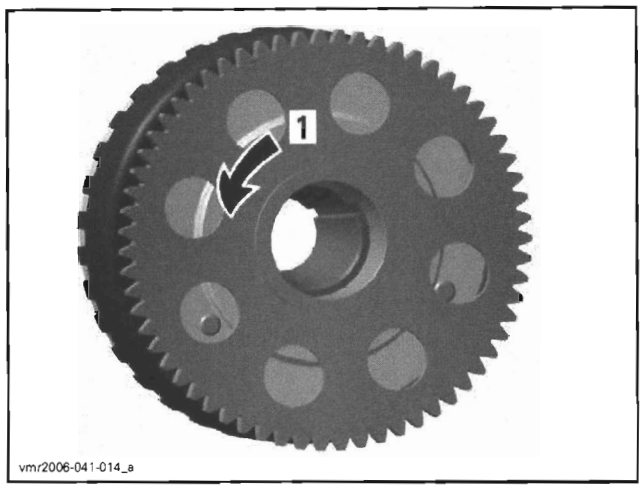
Sprag Clutch Inspection

Inspect sprag clutch and sprag clutch housing for wear and damage.

Also check the collar of the sprag clutch gear.

Perform a functional test of the sprag clutch. To do so, rotate sprag clutch gear in sprag clutch.

NOTE: Sprag clutch must lock in counterclockwise direction.



SPRAG CLUTCH FUNCTIONAL TEST
1. Lock

NOTE: Sprag clutch, housing and gear must be replaced at the same time, if damaged.

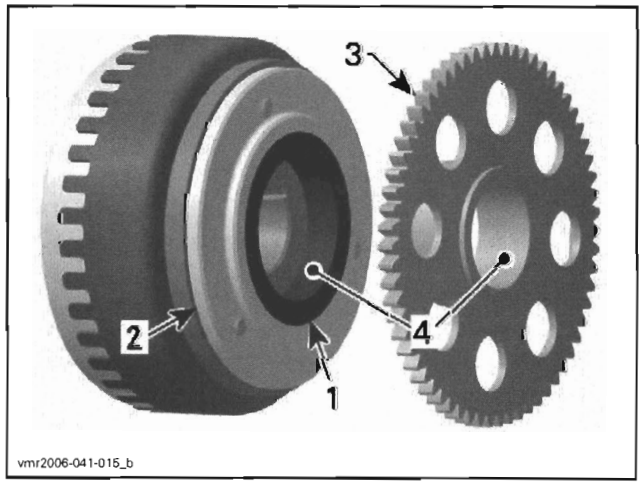
Sprag Clutch Installation

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

Apply Loctite 648 (green) (P/N 413 711 400) on threads of sprag clutch housing screws.

Install screws but do not torque yet.

Apply engine oil on sprag clutch and inside sprag clutch gear hole.



1. Sprag clutch
2. Sprag clutch housing
3. Sprag clutch gear
4. Apply engine oil here

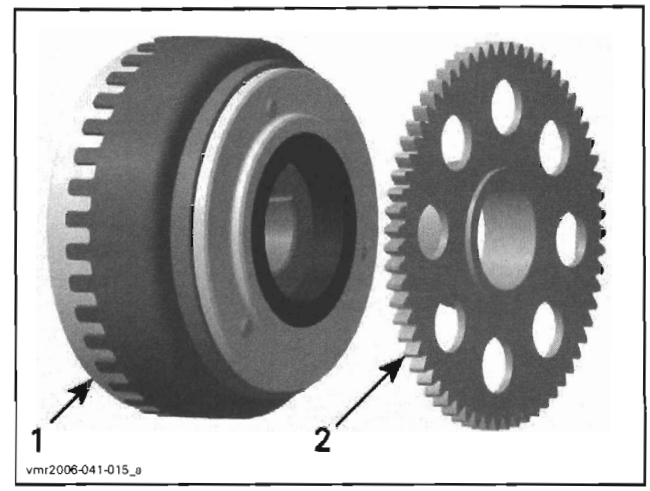
Install rotor then torque sprag clutch housing screws to 30 N•m (22 lbf•ft).

SPRAG CLUTCH GEAR

Sprag Clutch Gear Removal

Remove rotor (refer to *ROTOR* above).

Pull sprag clutch gear from the rotor.

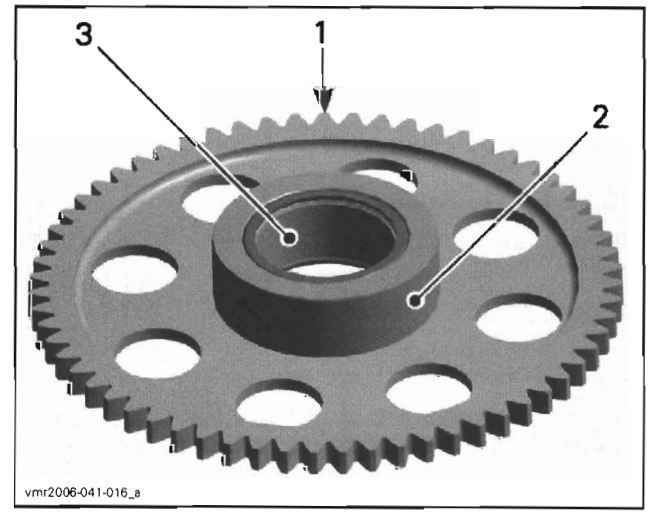


1. Rotor
2. Sprag clutch gear

Sprag Clutch Gear Inspection

Inspect gear, especially teeth and sprag clutch collar, for wear and other damage.

Check needle bearing condition. Replace sprag clutch gear if necessary.



INSPECT
1. Teeth
2. Collar
3. Needle bearing

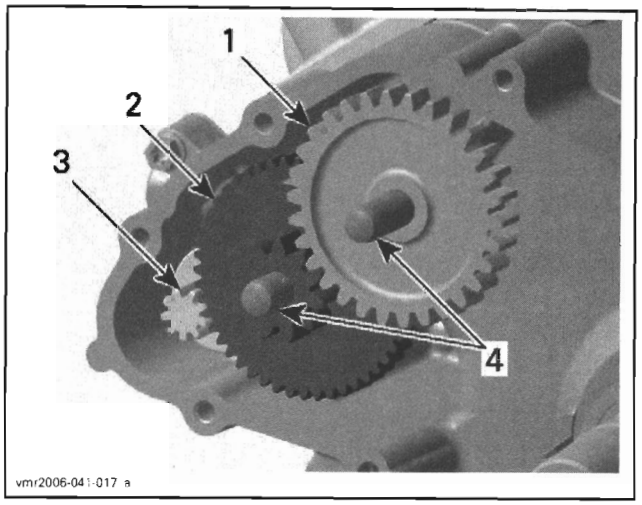
Sprag Clutch Gear Installation

The installation is the reverse of the removal procedure.

NOTE: Apply engine oil on needle bearing and collar of sprag clutch gear.

STARTER DRIVE GEARS

The starter drive gears are located on the engine MAG side behind the magneto cover. No need to remove engine.



1. *Intermediate gear*
2. *Starter double gear*
3. *Starter gear*
4. *Location pins*

Gear Removal

Remove magneto cover (refer to *MAGNETO COVER* above).

Remove location pins, starter double gear and intermediate gear.

Gear Inspection

Inspect gears and location pins for wear and damage.

Replace parts as necessary.

Gear Installation

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

Apply Loctite 767 (antiseize lubricant (P/N 293 800 070) on starter gear before installing the starter double gear.

Apply engine oil on location pins.

CYLINDER AND HEAD

SERVICE TOOLS

Description	Part Number	Page
camshaft locking tool	529 035 926	246
piston circlip installer	529 035 921	264
piston ring compressor	529 035 919	261
valve guide installer	529 035 853	259
valve guide remover	529 035 924	259
valve spring compressor clamp	529 035 724	255
valve spring compressor cup	529 035 764	255

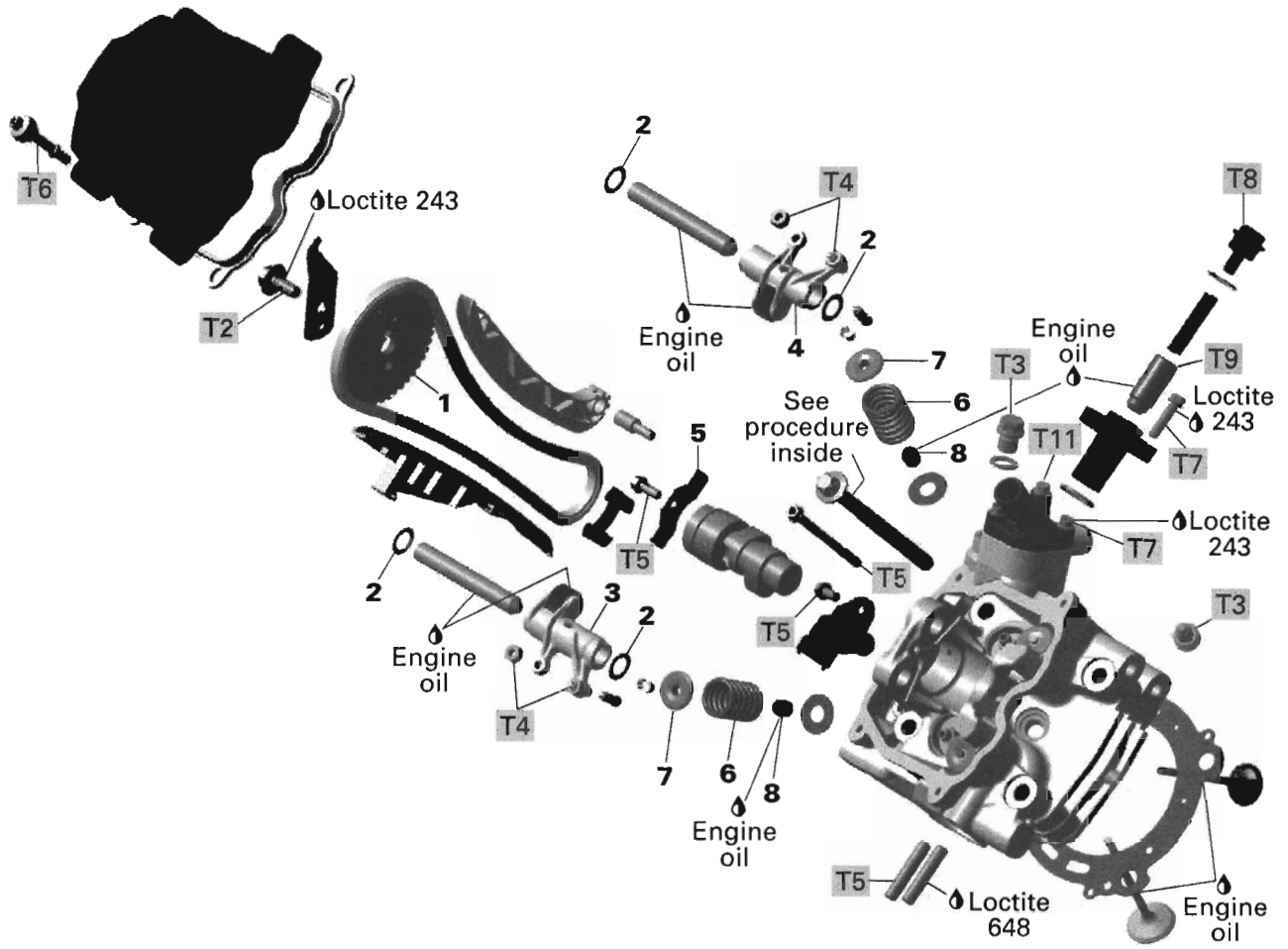
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Snap-on pliers	YA 8230	256

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	247
Loctite 767 (antiseize lubricant)	293 800 070	259

CYLINDER HEAD NO. 1



T1	60 N•m (44 lbf•ft)
T2	30 N•m (22 lbf•ft)
T3	20 N•m (15 lbf•ft)
T4	12 N•m (106 lbf•**in**)
T5	10 N•m (89 lbf•**in**)
T6	7 N•m (62 lbf•**in**)

T7	6 N•m (53 lbf•**in**)
T8	4.5 N•m (40 lbf•**in**)
T9	0.1 N•m (0.89 lbf•**in**)
T10	16 N•m (141 lbf•**in**)
T11	5 N•m (44 lbf•**in**)

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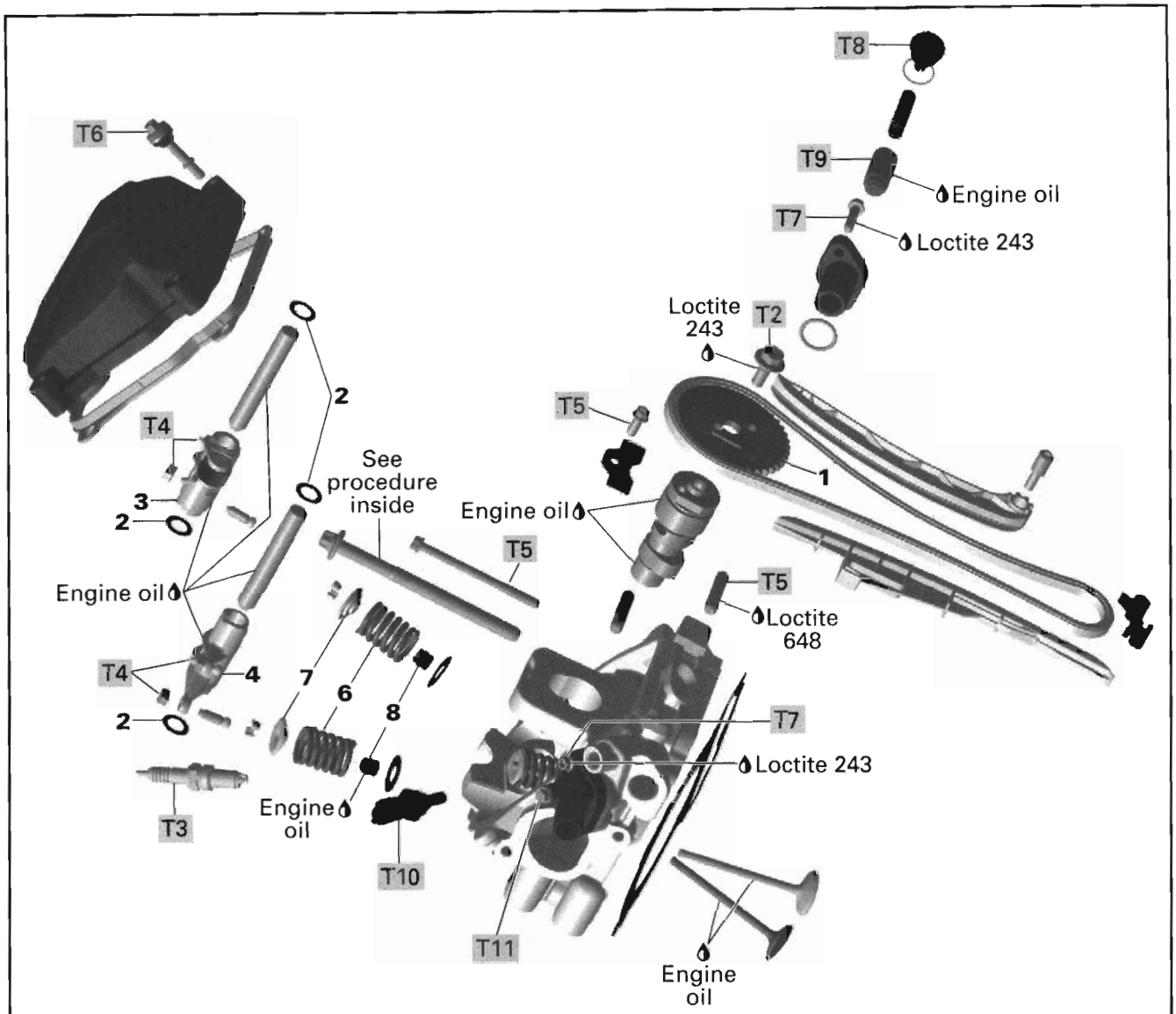
CYLINDER HEAD NO. 2



T1	60 N•m (44 lbf•ft)
T2	30 N•m (22 lbf•ft)
T3	20 N•m (15 lbf•ft)
T4	12 N•m (106 lbf•**in**)
T5	10 N•m (89 lbf•**in**)
T6	7 N•m (62 lbf•**in**)

T7	6 N•m (53 lbf•**in**)
T8	4.5 N•m (40 lbf•**in**)
T9	0.1 N•m (0.89 lbf•**in**)
T10	16 N•m (141 lbf•**in**)
T11	5 N•m (44 lbf•**in**)

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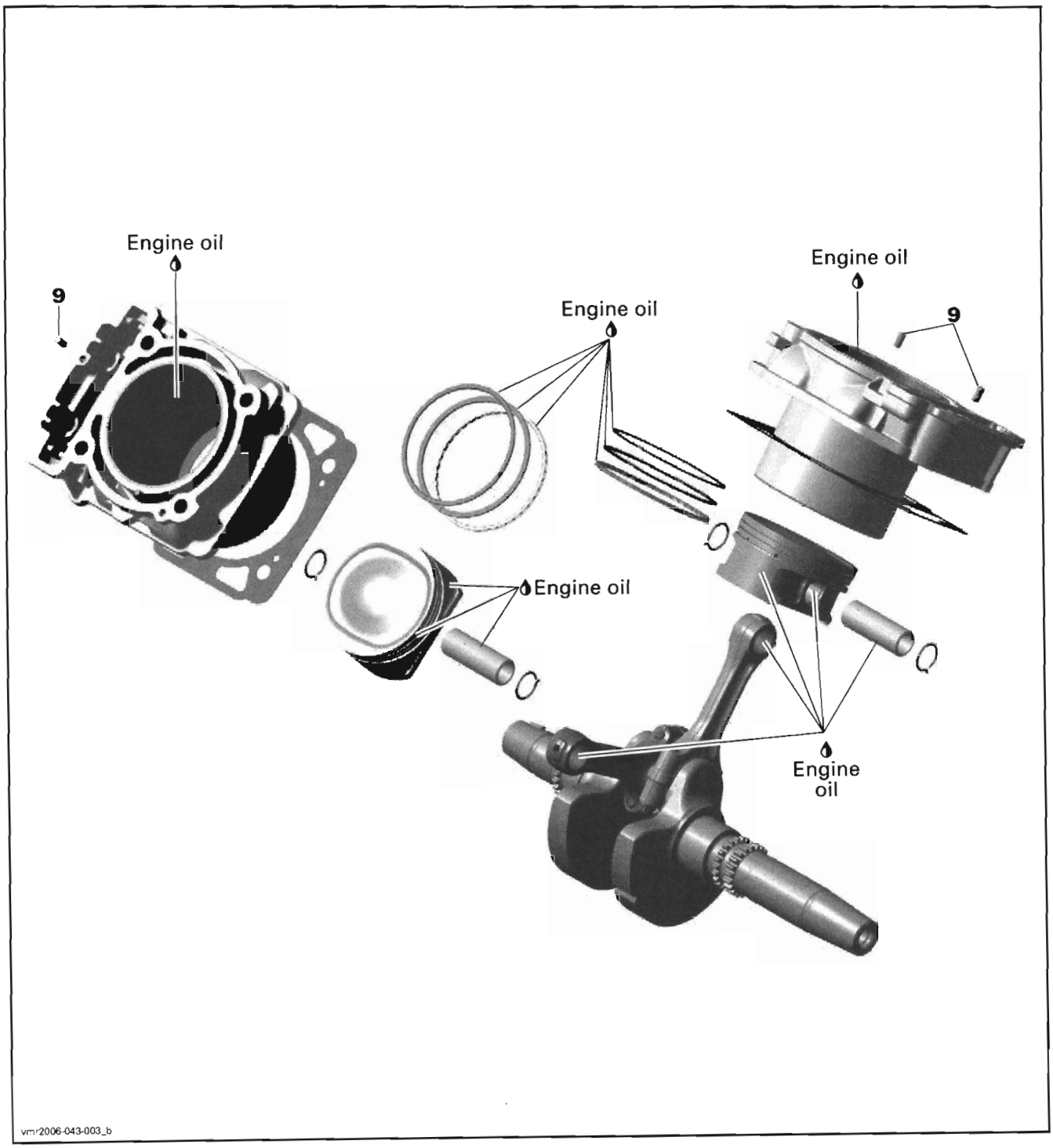
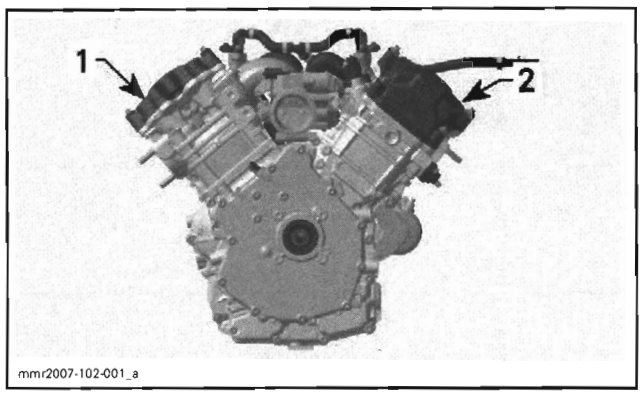
CYLINDERS AND PISTONS



GENERAL

Components which are identical for both cylinders/cylinder heads are identified in the two exploded views by the same number. Components which are different or which are, for instance, present of one of the cylinders/cylinder heads but not on the other, have different numbers. The information given below always relates as a general rule.

Special reference is made in the text to work instructions which are not the same for cylinder no. 1 and cylinder no. 2.



1. Cylinder 1 (front)
2. Cylinder 2 (rear)

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

Always place the vehicle on level surface.

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

Always disconnect BLACK (-) cable from the battery, then RED (+) cable before working on 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.

During assembly/installation, use the torque values and service products as 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 strictly be adhered to.
Locking devices (e.g.: 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.

When disassembling parts that are duplicated in the engine, (e.g.: valves), it is a strongly recommended to note their position (PTO/MAG side, front/rear cylinder) 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 (e.g.: 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). Also, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their "group".

MAINTENANCE

VALVE CLEARANCE ADJUSTMENT

NOTE: Check and adjust valve clearance only when engine is cold.

Remove valve covers. Refer to *VALVE COVER*.

Before checking or adjusting the valve clearance, turn crankshaft to TDC ignition of the respective cylinder, see *CAMSHAFT*.

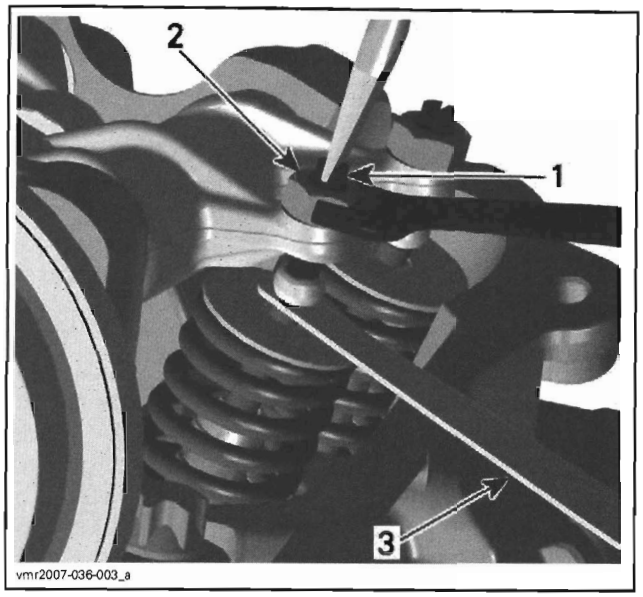
Using a feeler gauge, check the valve clearance.

VALVE CLEARANCE	
EXHAUST	0.11 to 0.19 mm (.0043 to .0075 in)
INTAKE	0.06 to 0.14 mm (.0024 to .0055 in)

If the valve clearance is out of specification, adjust valves as follows.

NOTE: Use mean value of exhaust/intake to ensure a proper valve adjustment.

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



1. Adjustment screw
2. Locking nut
3. Feeler gauge

Repeat the procedure for each valve.

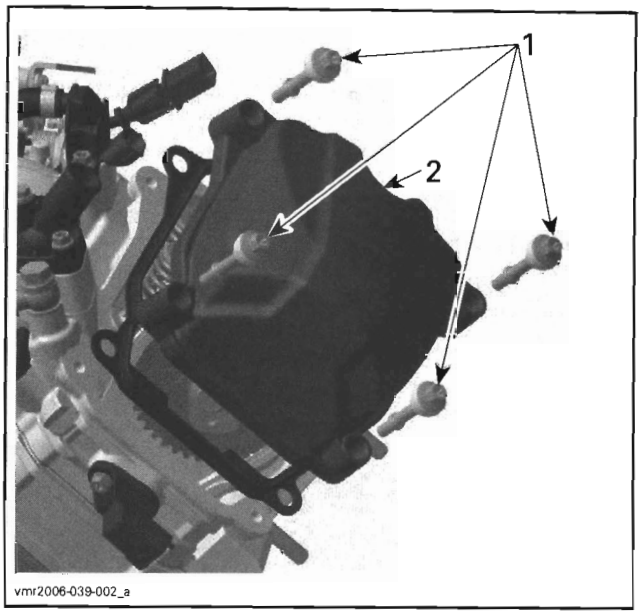
Before installing valve covers, recheck valve clearance.

PROCEDURES

VALVE COVER

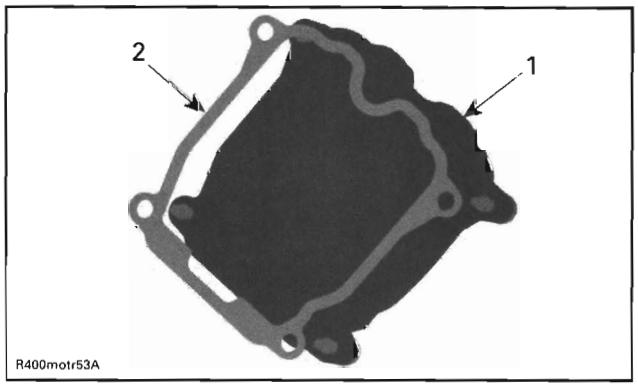
Cover Removal

Remove:
- LH side panel and hood, refer to *BODY*
- air intake silencer, refer to *AIR INTAKE SYSTEM*
- distance screws of valve cover



1. Distance screws
2. Valve cover

- valve cover and gasket.



1. Valve cover
2. Gasket

Repeat the procedure for the other valve cover if required.

Cover Inspection

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

Cover Installation

For installation, reverse the removal procedure.

Torque the valve cover distance screws in a criss-cross sequence.

TIMING CHAIN TENSIONER

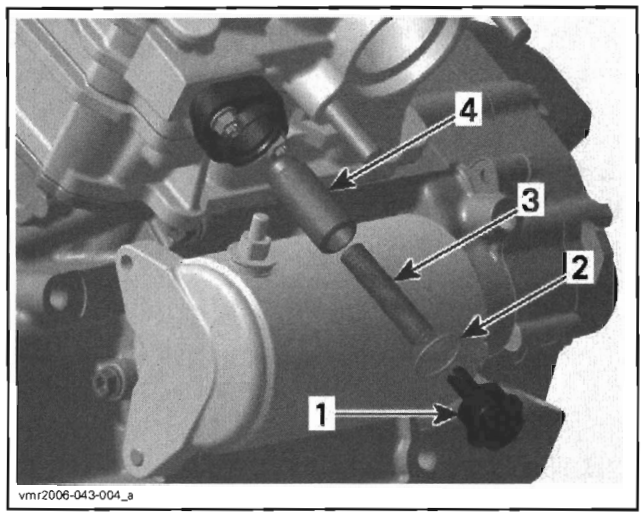
NOTE: Before removal and installation, make sure that the respective cylinder is set to TDC ignition. Refer to *CAMSHAFT*.

Tensioner Removal

⚠ WARNING

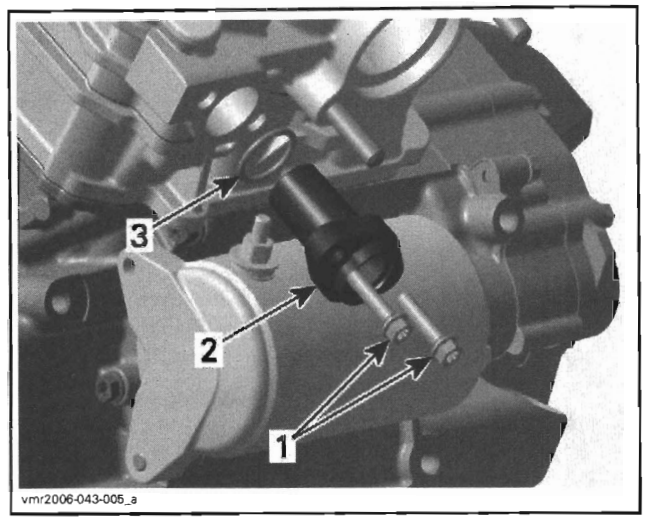
Timing chain tensioner is spring loaded. Never perform this operation immediately after the engine has been run because the exhaust system can be very hot. Wait until exhaust system is warm or cold.

Remove:
- chain tensioner plug
- O-ring
- spring
- chain tensioner plunger



TYPICAL
1. *Chain tensioner plug*
2. *O-ring*
3. *Spring*
4. *Chain tensioner plunger*

- screws retaining chain tensioner housing
- chain tensioner housing with O-ring.



TYPICAL
1. *Chain tensioner screws*
2. *Chain tensioner housing*
3. *O-ring*

Tensioner Inspection

Check the housing for cracks or other damages. Replace if necessary.

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

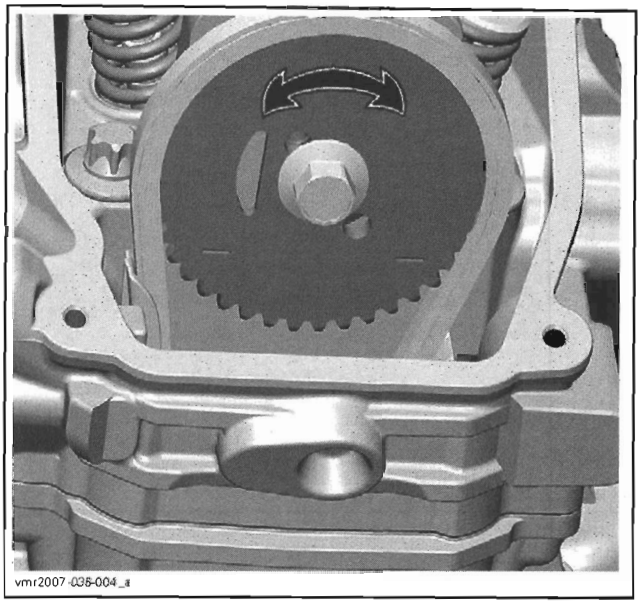
Check if O-rings are brittle, cracked or hard. Replace if necessary.

Check spring condition. Replace if broken or worn.

Tensioner Installation

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

Before installing the chain tensioner make sure, that the camshaft timing gear can be moved back and forth.



MOVE GEAR BACK AND FORTH

Apply engine oil on the plunger before installing.

Slightly screw in the plunger until the timing chain allows no more back and forth movement of the camshaft timing gear. Then screw in the plunger an additional 1/8 turn to reach the required torque of 0.1 N•m (.9 lbf•**in**).

CAUTION: Improper adjustment of the timing chain will lead to severe engine damage.

Fit the spring on one side into the slot of the plug screw and on the other side into the plunger. Turn spring only clockwise in order to fit the spring end into the notch of the plunger and to avoid loosening the plunger during spring installation. Do not preload the spring.

NOTE: Do not forget to place the O-ring on chain tensioner plug.

Then compress the spring and screw in the plug screw.

Finally, tighten the plug screw to 4.5 N•m (40 lbf•**in**).

CAMSHAFT TIMING GEAR

Gear Removal

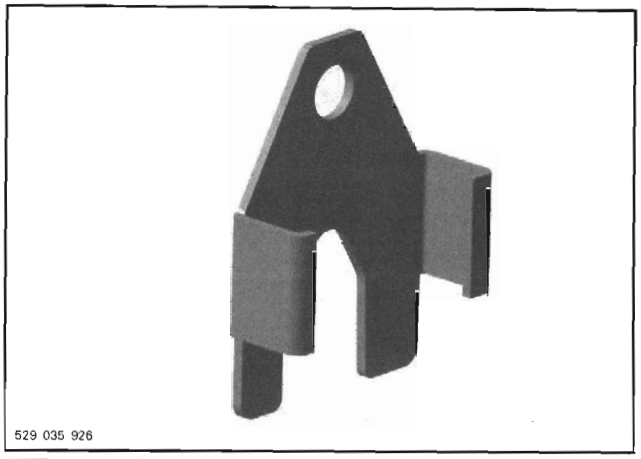
Remove the valve cover.

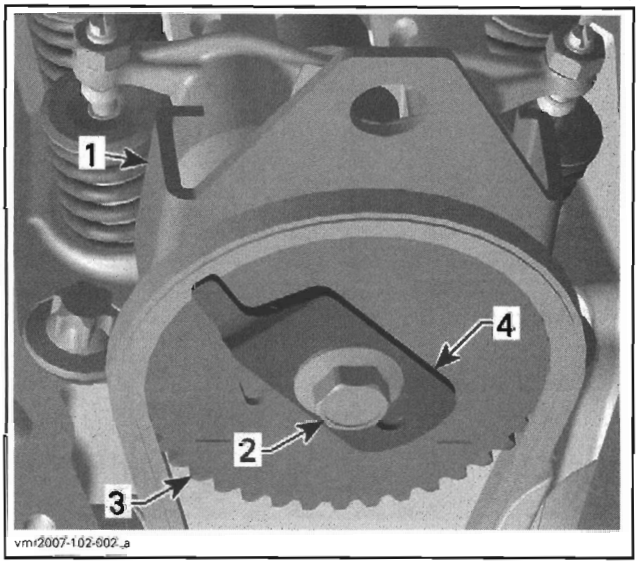
Turn crankshaft to TDC ignition of the respective cylinder, see *CAMSHAFT*.

Unscrew timing chain tensioner.

Remove camshaft timing gear screw.

To prevent timing chain stretching during removal of camshaft timing gear screw, use the camshaft locking tool (P/N 529 035 926).





1. *Camshaft locking tool*
2. *Camshaft timing gear screw*
3. *Camshaft timing gear*
4. *Trigger wheel (cylinder head 1 only)*

Remove the camshaft timing gear.

NOTE: Secure timing chain with a retaining wire.

Gear Inspection

Check camshaft timing gear for wear or deterioration.

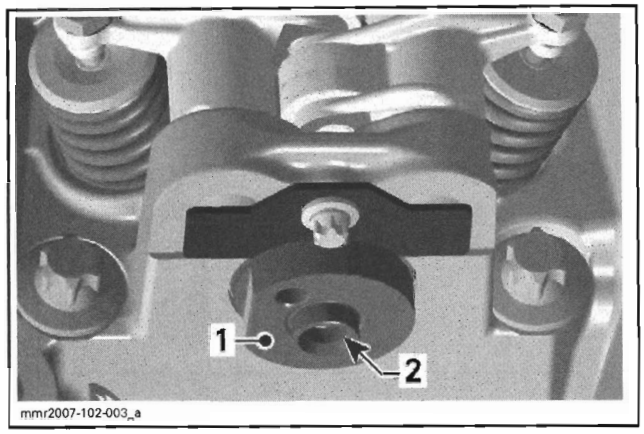
If gear is worn or damaged, replace it as a set (camshaft timing gear and timing chain).

For crankshaft gear, refer to *BOTTOM END* section, see *CRANKSHAFT*.

Gear 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.

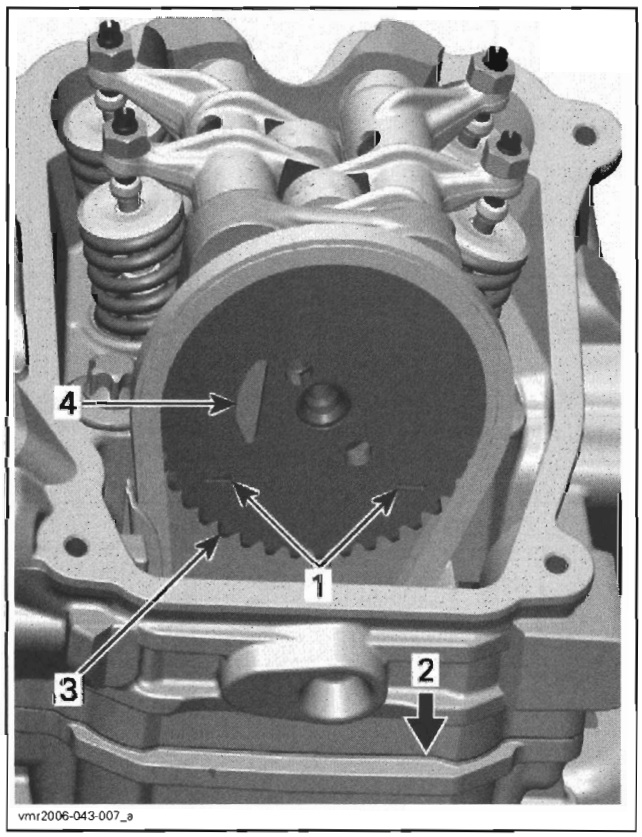


1. Mating surface on camshaft
2. Threads for camshaft screw

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

Install camshaft timing gear so that the timing gear tabs are located into the flat zone of the camshaft.

The printed marks on the camshaft timing gear must be parallel to the cylinder head base. See the following illustration for a proper positioning.



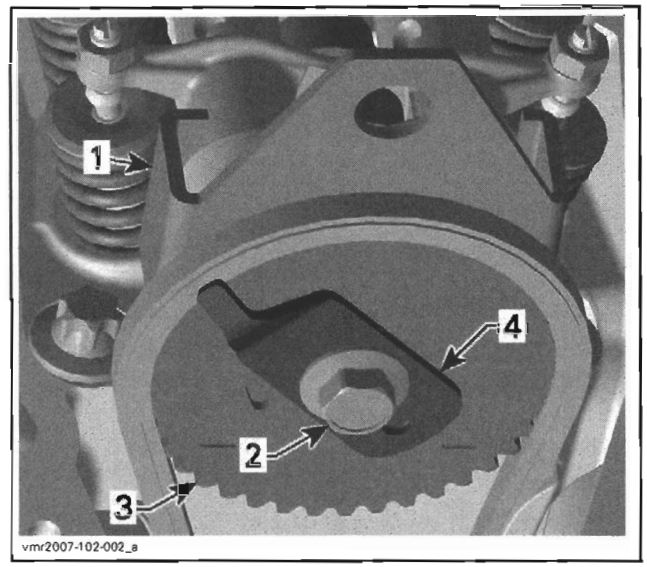
1. Printed marks on camshaft timing gear
2. Cylinder head base
3. Camshaft timing gear
4. Timing gear tab

Install the camshaft locking tool.

Install the chain tensioner (see *CHAIN TENSIONER* above) and check again if marks on the timing gear are parallel to cylinder head base and crankshaft is at TDC ignition.

Apply Loctite 243 (blue) (P/N 293 800 060) on camshaft screw threads and tighten it to 30 N•m (22 lbf•ft).

NOTE: On cylinder 1, install the trigger wheel on camshaft timing gear.



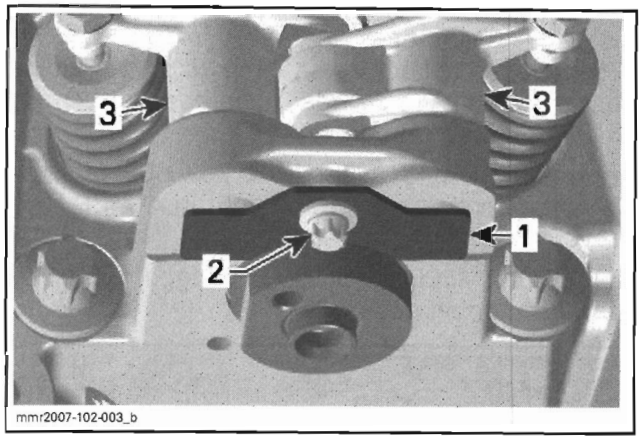
1. Camshaft locking tool
2. Camshaft screw
3. Camshaft timing gear
4. Trigger wheel (cylinder head 1 only)

Remove the camshaft locking tool.

ROCKER ARM

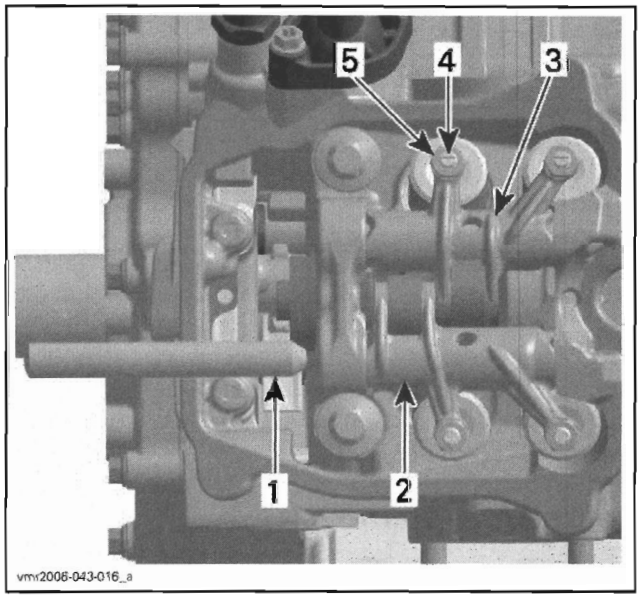
Rocker Arm Removal

Remove:
- valve cover
- chain tensioner
- camshaft timing gear **no. 1**
- Allen screw and camshaft retaining plate



1. *Camshaft retaining plate*
2. *Camshaft retaining plate screw*
3. *Rocker arms*

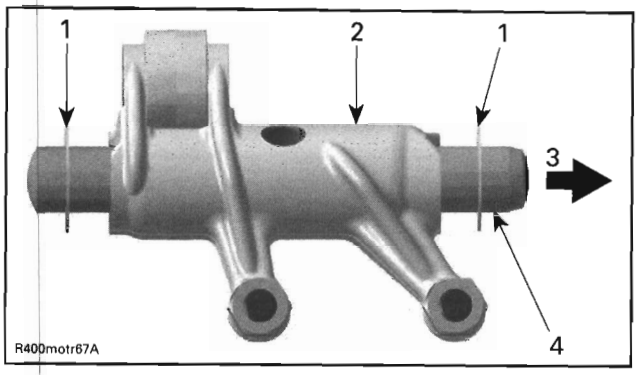
– rocker arm shafts
– rocker arm assembly (exhaust side and intake side) with adjustment screws and nuts



1. *Rocker arm shaft*
2. *Rocker arm (exhaust side)*
3. *Rocker arm (intake side)*
4. *Adjustment screw*
5. *Locking nut*

– thrust washers no. 2.

CAUTION: Pay attention not to lose thrust washers or drop them into the timing chain compartment.

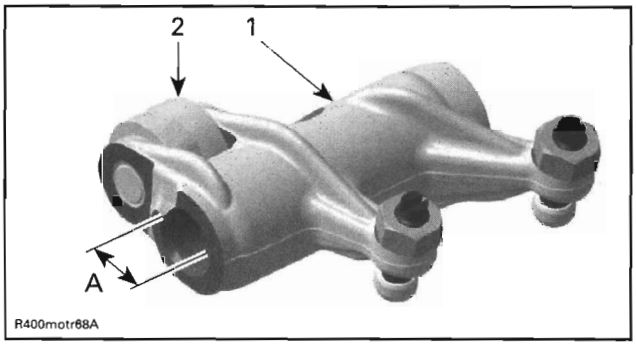


1. *2 thrust washers*
2. *Rocker arm (exhaust side)*
3. *Cylinder head — spark plug side*
4. *Big taper to spark plug side*

Rocker Arm Inspection

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.



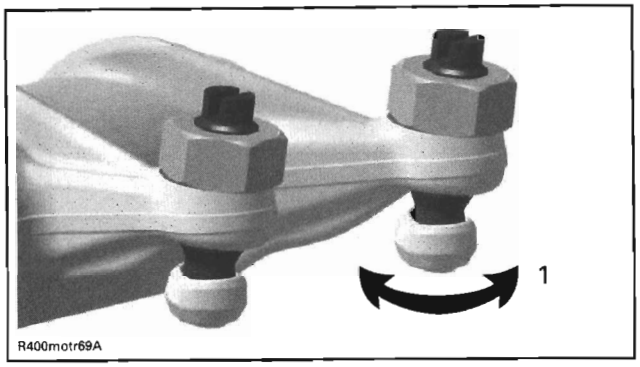
1. *Rocker arm (exhaust side)*
2. *Roller*

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	12.036 to 12.050 mm (.4739 to .4744 in)
SERVICE LIMIT	12.060 mm (.4748 in)

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

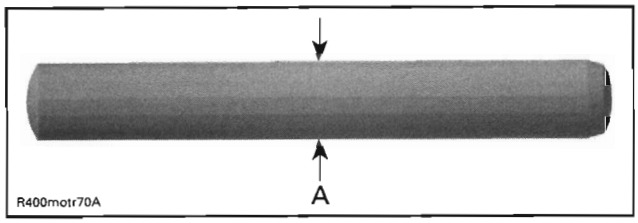


1. Free movement of adjustment screw top

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	12.000 to 12.018 mm (.4724 to .4731 in)
SERVICE LIMIT	11.990 mm (.4720 in)

Any area worn excessively will require parts replacement.

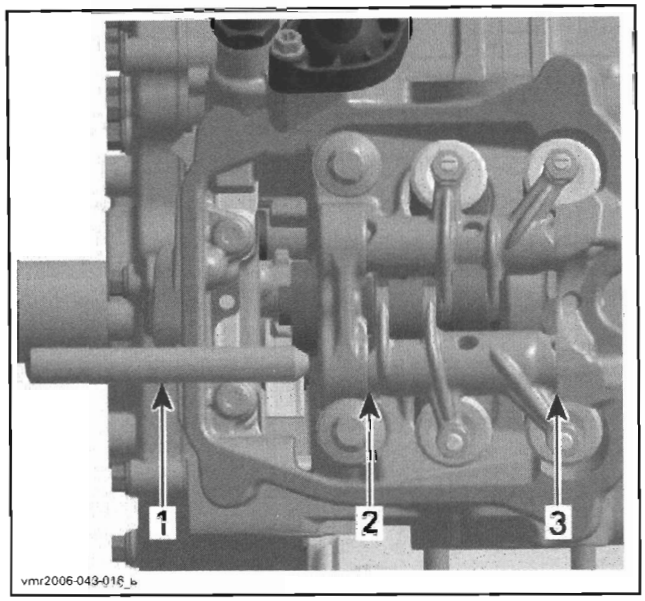
Rocker Arm Installation

NOTE: Use the same procedure for exhaust and intake rocker arm.

Apply engine oil on rocker arm shaft.

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

- Insert a rocker arm shaft in its bore in cylinder head.
- Install a thrust washer **no. 2** then the proper rocker arm **no. 3** (exhaust side) or **no. 4** (intake side).
- Push in rocker arm shaft until its chamfer reaches the end of rocker arm bore.



1. Rocker arm shaft
2. Thrust washer (timing chain side)
3. Thrust washer (spark plug side)

- Place the other thrust washer and push rocker arm shaft to end position.
- Install the camshaft retaining plate **no. 5**.

TIMING CHAIN

Refer to *BOTTOM END*, see *TIMING CHAIN*.

CYLINDER HEAD

Cylinder Head Removal

Remove both side panels and hood.

Remove air intake silencer. Refer to *AIR INTAKE SYSTEM*.

Disconnect battery. Refer to *CHARGING SYSTEM*.

Using B.U.D.S., remove pressure in fuel system.

Drain coolant (refer to *COOLING SYSTEM*).

NOTE: Before removing cylinder head, blow out remaining coolant by air pressure. During cylinder head removal, the remaining coolant in cylinder head could overflow into the engine and a little quantity of coolant could drop into the engine. In this case, the engine oil will be contaminated.

Unplug throttle body coolant return hose from coolant reservoir.

Remove muffler. Refer to *EXHAUST SYSTEM*.

Nearby throttle body, disconnect the throttle position sensor (TPS), the idle by-pass valve (IBV) and the manifold air pressure and temperature sensor (MAPTS).

Disconnect the connector from both fuel injectors.

Unplug fuel line.

Remove the thermostat housing on cylinder 2.

Unscrew the Banjo fitting on the top of cylinder 1.

Remove intake manifold with throttle body.

Cylinder 1

Disconnect spark plug cable.

Unplug coolant hose on the top of cylinder head.

Disconnect CAPS.

Remove the front exhaust pipe and the exhaust manifold.

Cylinder 2

Remove the rear exhaust pipe.

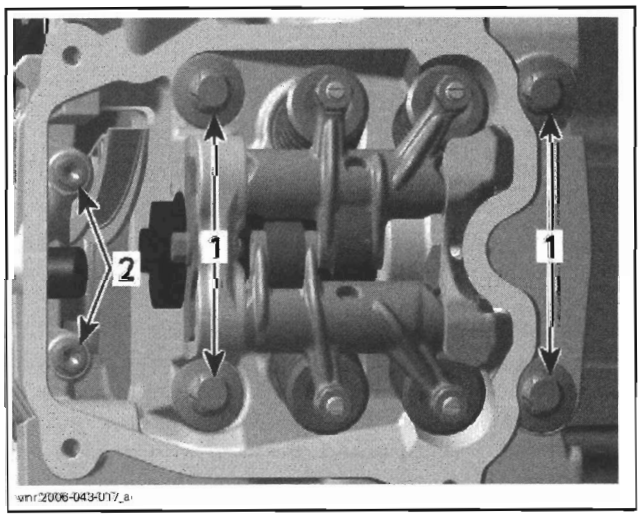
Disconnect spark plug cable.

Disconnect CTS.

For Both Cylinders

Remove:

- chain tensioner (see *CHAIN TENSIONER* above)
- valve cover and gasket (see *VALVE COVER* above)
- camshaft timing gear
- cylinder head screws M6
- cylinder head screws M10 retaining cylinder head and cylinder to cylinder base.

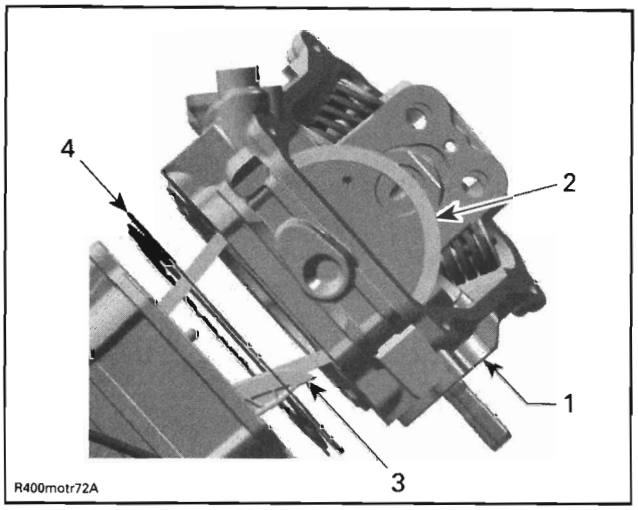


1. Cylinder head screws M10
2. Cylinder head screws M6

Pull up cylinder head.

Remove:

- chain guide
- cylinder head gasket and scrap it.



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

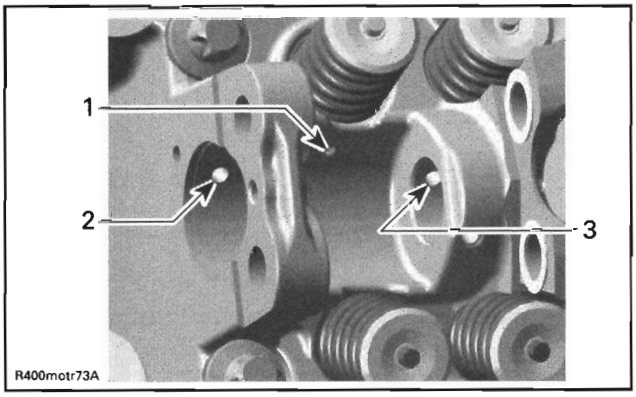
Cylinder Head Inspection

Inspect timing chain guide for wear, cracks or other damages. Replace if necessary.

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

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

Clean oil support through the cylinder head from contamination.



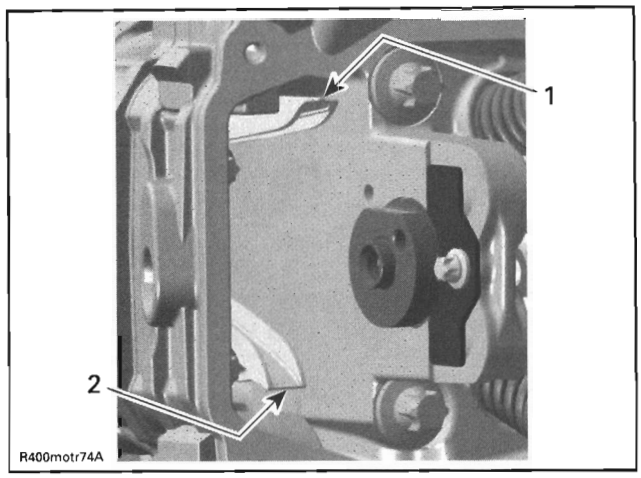
1. Oil port to lubricate camshaft lobes intake/exhaust
2. Oil supply to camshaft bearing journal timing chain side
3. Oil supply to camshaft bearing journal spark plug side

Cylinder Head Installation

NOTE: The cylinder heads are not identical in design. Do not invert the cylinder heads at assembly.

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

Ensure dowel pins **no. 9** are in place.

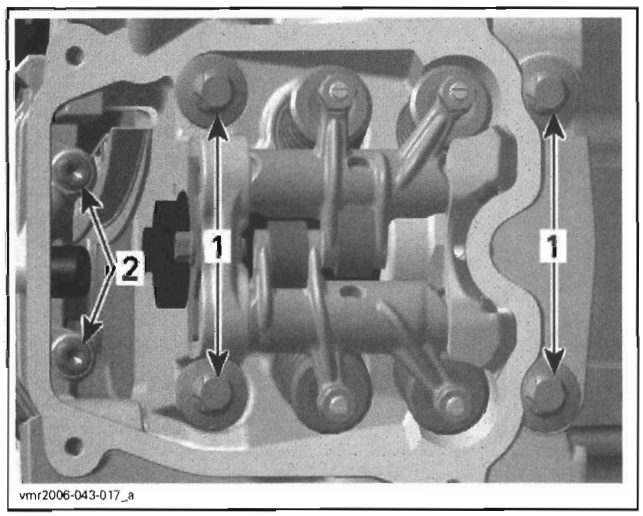


1. Chain guide (fixed between cylinder and cylinder head)
2. Chain tensioner guide (mounted in crankcase)

Install a new cylinder head gasket.

First, torque cylinder head screws M10 in criss-cross sequence to 20 N•m (15 lbf•ft) then finish by tightening to 60 N•m (44 lbf•ft).

Install cylinder head screws M6.



1. Cylinder head screws M10
2. Cylinder head screws M6

Check chain guide for movement.

CAUTION: Chain guide has to be fixed between cylinder and cylinder head.

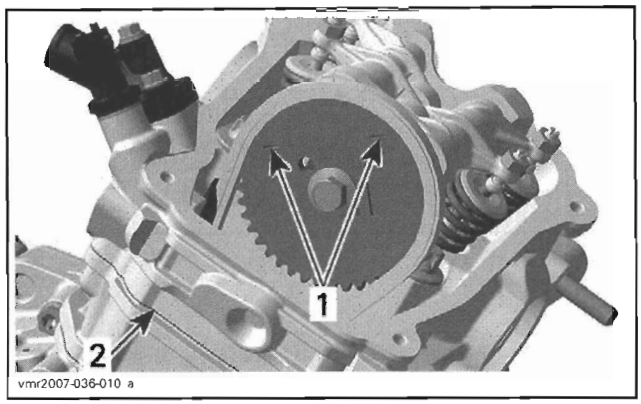
Install camshaft timing gear and perform proper camshaft timing. Refer to *CAMSHAFT*.

Install all remaining components as described in this section.

CAMSHAFT

Camshaft Timing

NOTE: If a piston (of cylinder 1 or 2) is set to TDC ignition, the camshaft timing gear of the opposite cylinder must be in the following position.



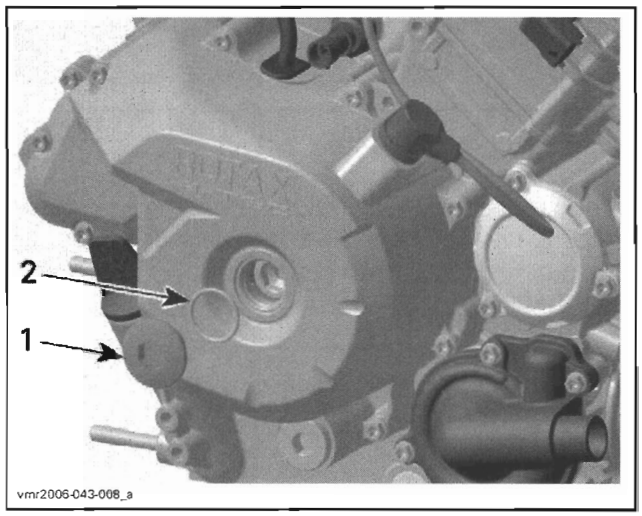
TYPICAL
1. Marks on timing gear of the opposite cylinder
2. Cylinder head base

Camshaft Timing Cylinder 2

Turn crankshaft until piston is at TDC ignition as follows.

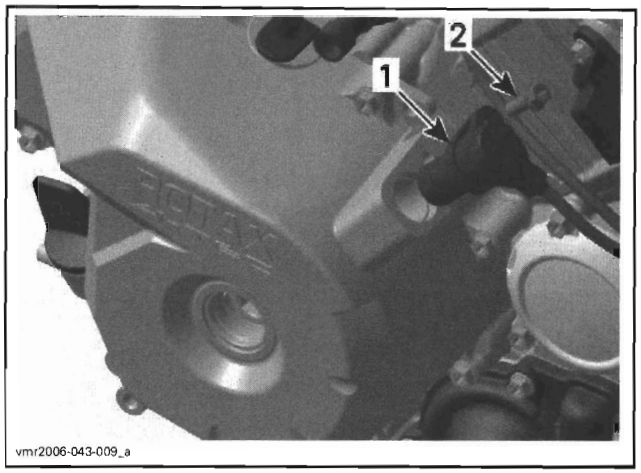
Remove:

- spark plug cable and spark plug of both cylinders
- valve covers of both cylinders
- plug screw and O-ring of magneto cover



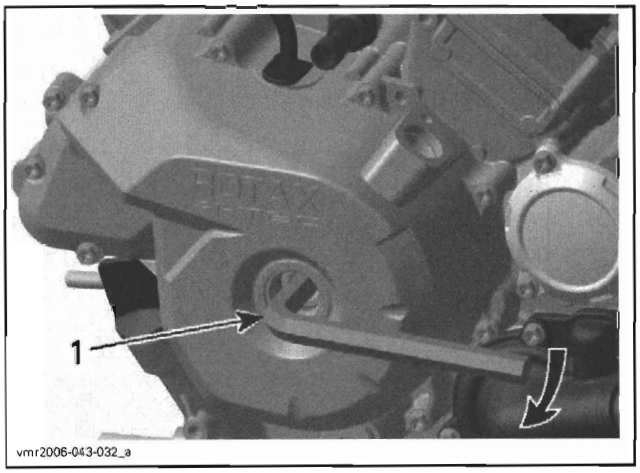
TYPICAL
1. Plug screw
2. O-ring

- crankshaft position sensor.



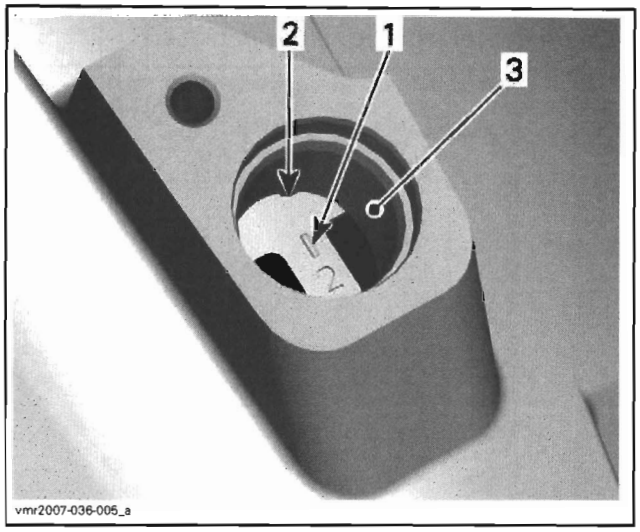
TYPICAL
1. *Crankshaft position sensor*
2. *Screw*

Use a 14 mm Allen key to turn crankshaft until piston 2, rear is at TDC ignition.



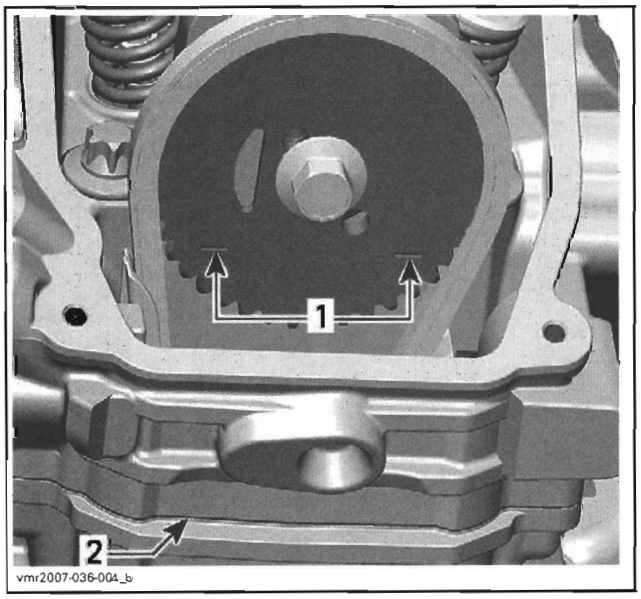
TYPICAL
1. *Allen key 14 mm*

When rear piston is at TDC ignition, marks on magneto flywheel "2" and on the magneto cover are aligned.



1. *Mark "2" on magneto flywheel*
2. *Notch on magneto cover*
3. *Crankshaft position sensor location*

At TDC ignition, the printed marks on the camshaft timing gear have to be parallel to cylinder head base.

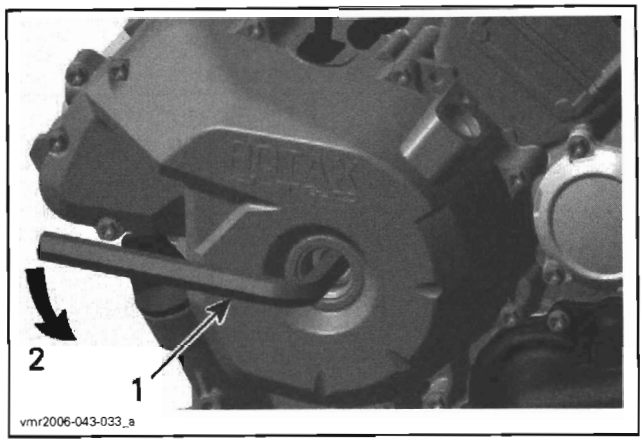


TYPICAL
1. *Printed marks on camshaft timing gear*
2. *Cylinder head base*

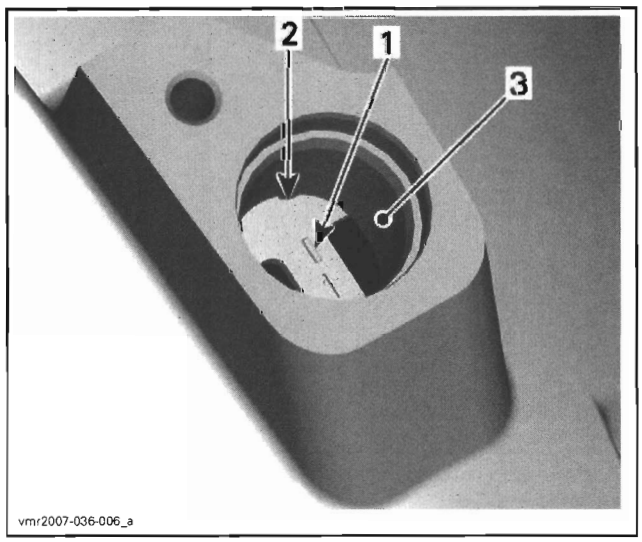
Camshaft Timing Cylinder 1

Turn cylinder 2 to TDC ignition, see *CAMSHAFT TIMING CYLINDER 2*.

Using a 14 mm Allen key, turn crankshaft 280° counterclockwise, until marks on magneto flywheel "1" and magneto cover are aligned.

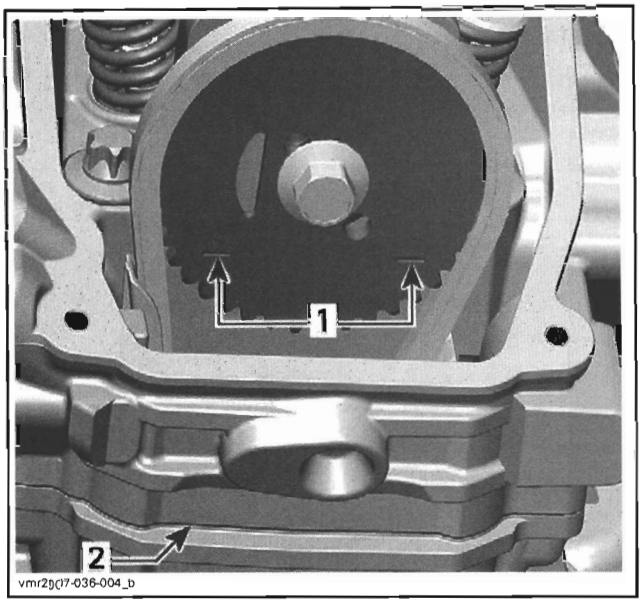


TYPICAL
1. *Allen key 14 mm*
2. *Turn crankshaft 280° counterclockwise*



1. *Mark "1" on magneto flywheel*
2. *Notch on magneto cover*
3. *Location of crankshaft position sensor*

NOTE: At TDC ignition, the printed marks on the camshaft timing gear have to be parallel to cylinder head base as per following illustration.



TYPICAL
1. *Printed marks on camshaft timing gear*
2. *Cylinder head base*

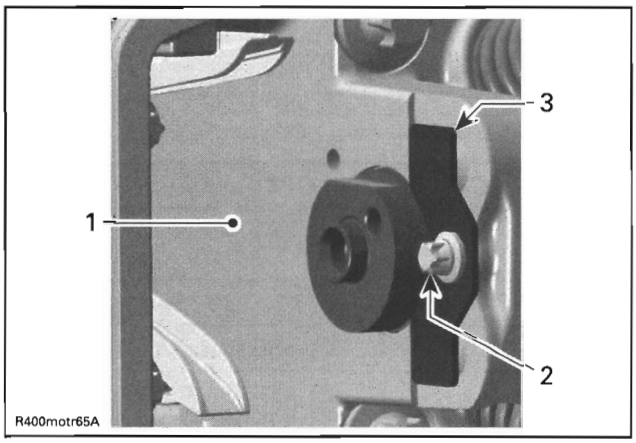
Camshaft Removal

The removal procedure is the same for both camshafts.

Each camshaft is different in design. Thus, it is important not to mix up any parts of the camshaft assembly with that of the other cylinder. Keep parts as a group.

Remove:

- valve cover (see *VALVE COVER* above)
- chain tensioner (see *CHAIN TENSIONER* above)
- camshaft timing gear (see *CAMSHAFT TIMING GEAR* above)
- camshaft retaining plate

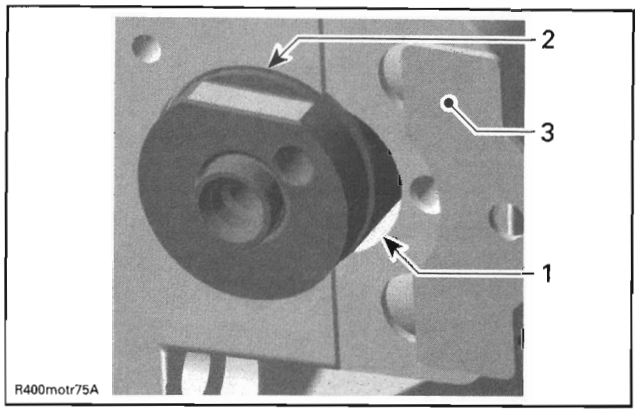


1. *Cylinder head*
2. *Allen screw*
3. *Camshaft retaining plate*

- rocker arms (see *ROCKER ARM* above)

– camshaft.

NOTE: For removal rotate camshaft so that intake/exhaust lobe shows to upper side of cylinder head.

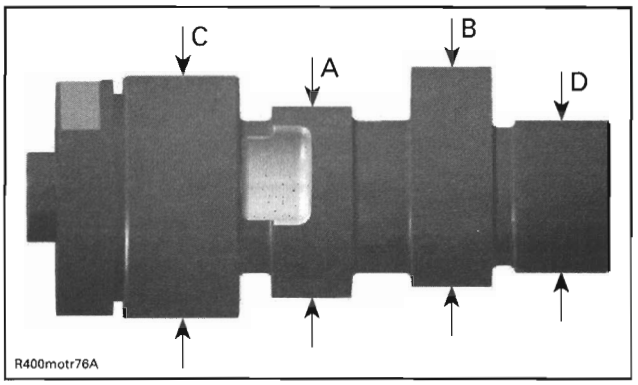


1. Area for camshaft lobes
2. Camshaft
3. Camshaft retaining plate

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.

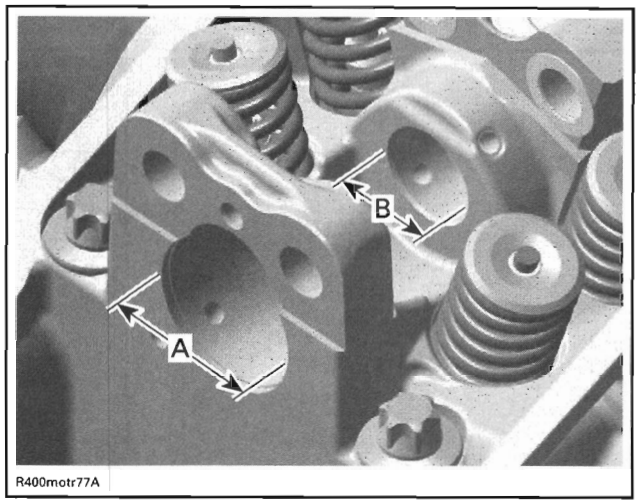


A. Camshaft lobe (exhaust valves)
B. Camshaft lobe (intake valves)
C. Camshaft journal timing chain side
D. Camshaft journal spark plug side

CAMSHAFT LOBE (exhaust)	
NEW	31.940 to 32.140 mm (1.2575 to 1.2654 in)
SERVICE LIMIT	31.920 mm (1.2567 in)
CAMSHAFT LOBE (intake)	
NEW	32.110 to 32.310 mm (1.2642 to 1.2721 in)
SERVICE LIMIT	32.090 mm (1.2634 in)

CAMSHAFT JOURNAL (timing chain side)	
NEW	34.959 to 34.975 mm (1.3763 to 1.3770 in)
SERVICE LIMIT	34.950 mm (1.3760 in)
CAMSHAFT JOURNAL (spark plug side)	
NEW	21.959 to 21.980 mm (.8645 to .8654 in)
SERVICE LIMIT	21.950 mm (.8642 in)

Measure clearance between both ends of camshaft and cylinder head.



A. Camshaft bore timing chain side
B. Camshaft bore spark plug side

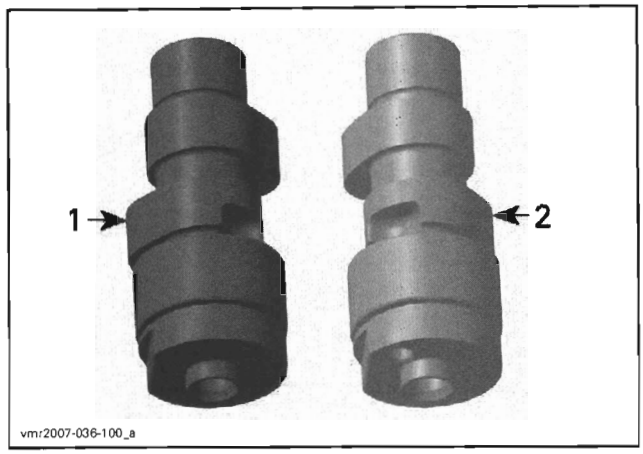
CAMSHAFT BORE (timing chain side)	
NEW	35.000 to 35.025 mm (1.3780 to 1.3789 in)
SERVICE LIMIT	35.040 mm (1.3795 in)
CAMSHAFT BORE (spark plug side)	
NEW	22.000 to 22.021 mm (.8661 to .8670 in)
SERVICE LIMIT	22.040 mm (.8677 in)

Replace parts that are not within specifications.

Camshaft Installation

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

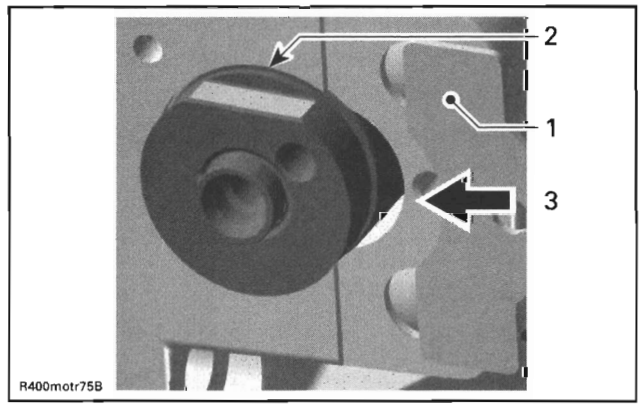
CAUTION: The camshafts are not identical in design. Do not invert the camshafts during assembly. Any mix-up of the components will lead to engine damage.



1. Camshaft of cylinder 1
2. Camshaft of cylinder 2

Properly install rocker arms. Refer to *ROCKER ARM* above.

Place the camshaft retaining plate in the slot of the camshaft.



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

Install camshaft timing gear and perform proper camshaft timing, as described above.

Adjust valve clearance. Refer to *VALVE CLEARANCE ADJUSTMENT*.

For other parts, refer to proper installation procedure.

VALVE SPRING

Valve Spring Removal

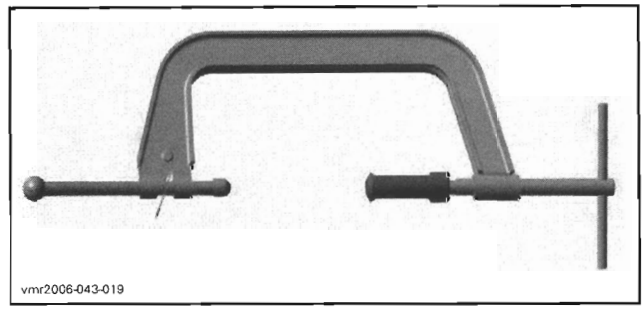
Remove:

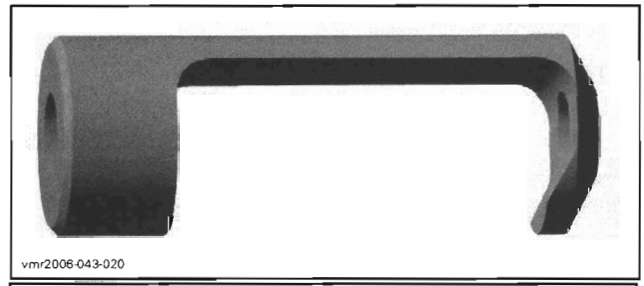
- rocker arms (see *ROCKER ARM* above)
- cylinder head (see *CYLINDER HEAD* above).

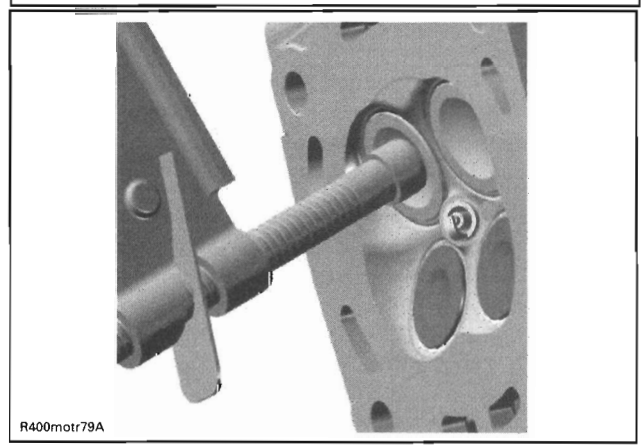
Compress valve spring **no. 6**; use valve spring compressor clamp (P/N 529 035 724) and valve spring compressor cup (P/N 529 035 764).

⚠ WARNING

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

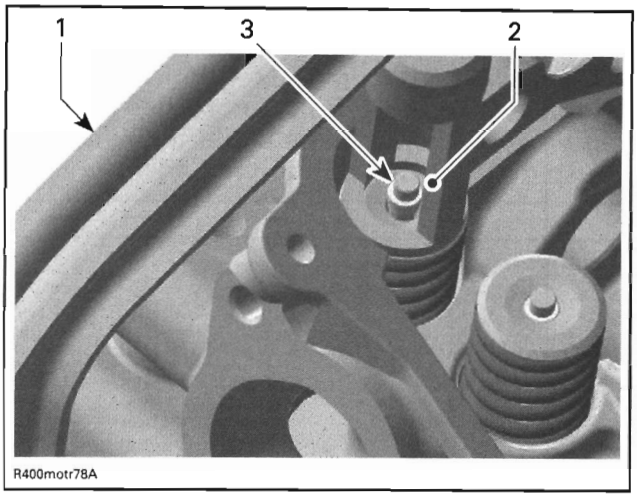






LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

Remove valve cotters.



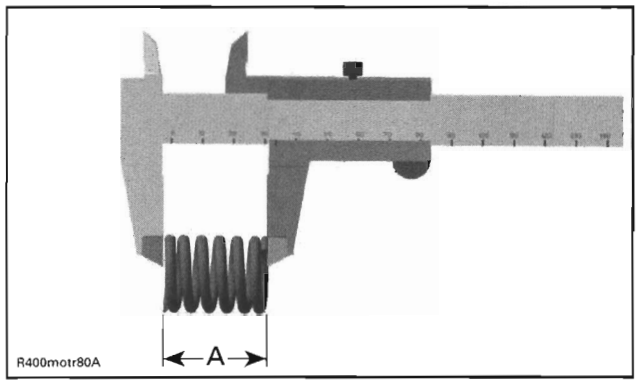
1. Valve spring compressor clamp
2. Valve spring compressor cup
3. Valve cotter

Withdraw valve spring compressor, valve spring retainer **no. 7** and valve spring **no. 6**.

Valve Spring Inspection

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

Check valve spring for free length and straightness.



A. Valve spring length

VALVE SPRING FREE LENGTH	
NOMINAL NEW	40.81 mm (1.607 in)
SERVICE LIMIT	39.00 mm (1.535 in)

Replace valves springs if not within specifications.

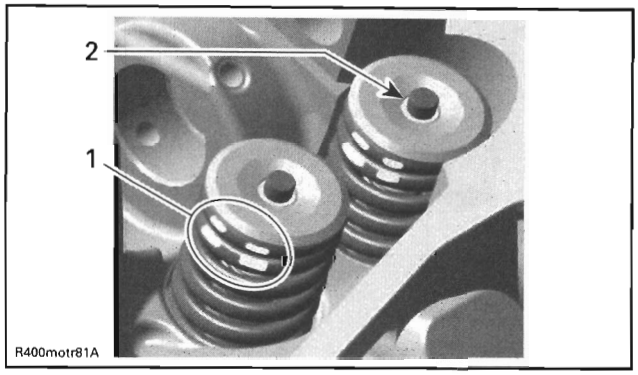
Valve Spring Installation

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

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

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

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



1. Position of the valve spring
2. Valve cotter

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.

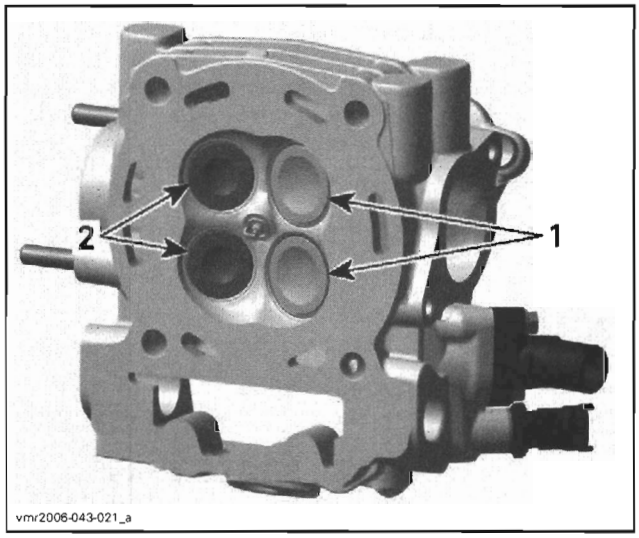
CAUTION: An improperly locked valve spring will cause engine damage.

VALVE

Valve Removal

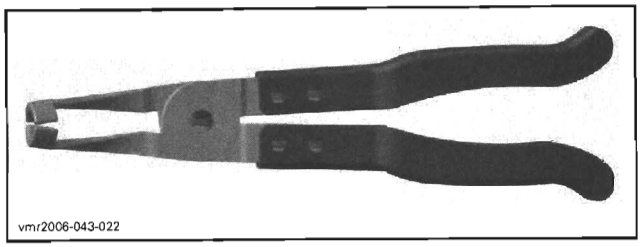
Remove valve spring, see *VALVE SPRING* above.

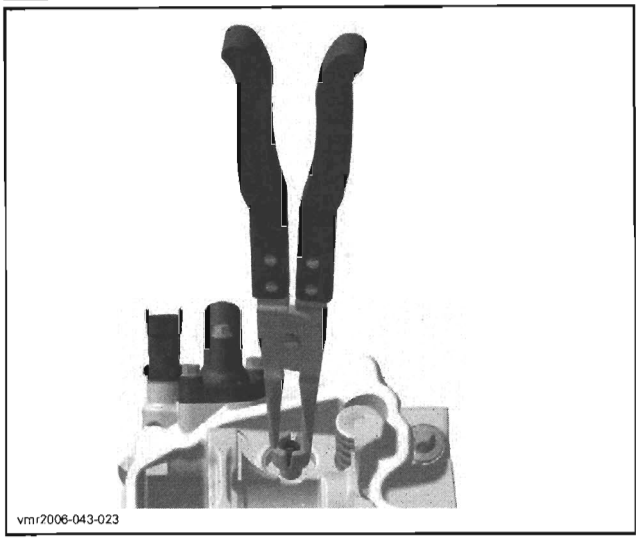
Push valve stem, then pull valves (intake and exhaust) out of valve guide.



1. Intake valves 31 mm
2. Exhaust valves 27 mm

Remove valve stem seal **no. 8** with Snap-on pliers (P/N YA 8230) and discard it.


vmr2006-043-022


vmr2006-043-023

Valve Inspection

Valve Stem Seal

Always install new seals whenever valves are removed.

Valve

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

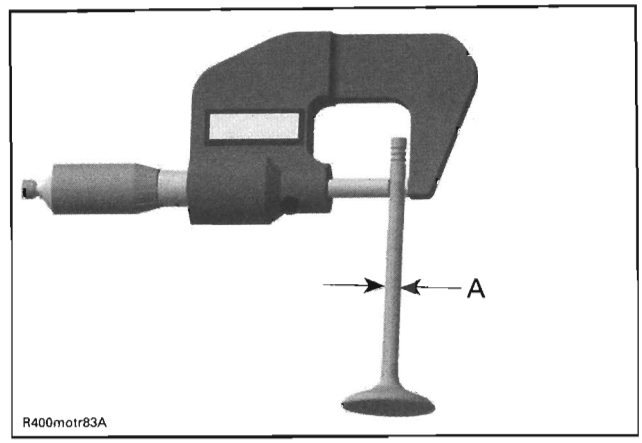
VALVE OUT OF ROUND (intake and exhaust valves)	
NEW	0.005 mm (.0002 in)
SERVICE LIMIT	0.06 mm (.0024 in)

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.



R400motr83A

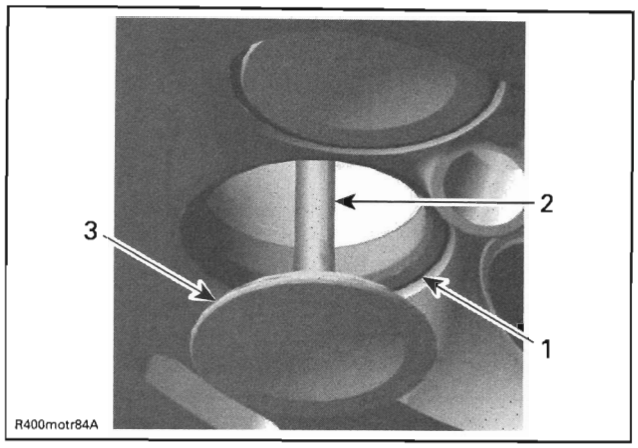
A. Valve stem diameter

VALVE STEM DIAMETER	
EXHAUST VALVE	
NEW	4.956 to 4.970 mm (.1951 to .1957 in)
SERVICE LIMIT	4.930 mm (.1941 in)
INTAKE VALVE	
NEW	4.966 to 4.980 mm (.1955 to .1960 in)
SERVICE LIMIT	4.930 mm (.1941 in)

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 (intake and exhaust valves)	
NEW	5.006 to 5.018 mm (.1971 to .1976 in)
SERVICE LIMIT	5.050 mm (.1988 in)

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).

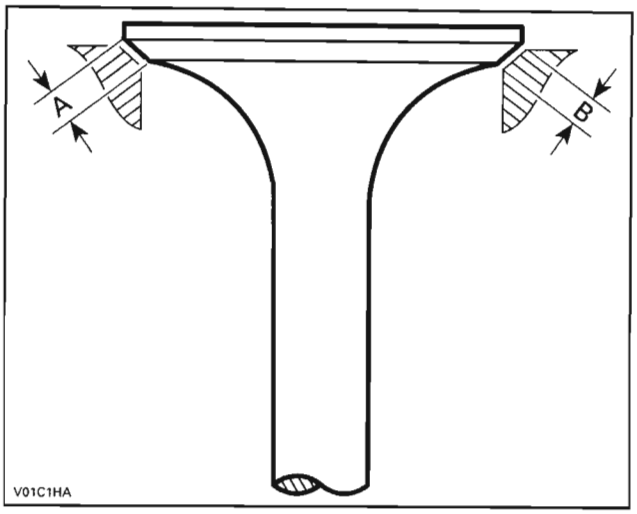
Measure valve face contact width.

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

Measure valve seat width using a caliper.

VALVE SEAT CONTACT WIDTH	
EXHAUST VALVE	
NEW	1.25 to 1.55 mm (.049 to .061 in)
SERVICE LIMIT	2.00 mm (.078 in)
INTAKE VALVE	
NEW	1.05 to 1.35 mm (.041 to .053 in)
SERVICE LIMIT	1.80 mm (.070 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

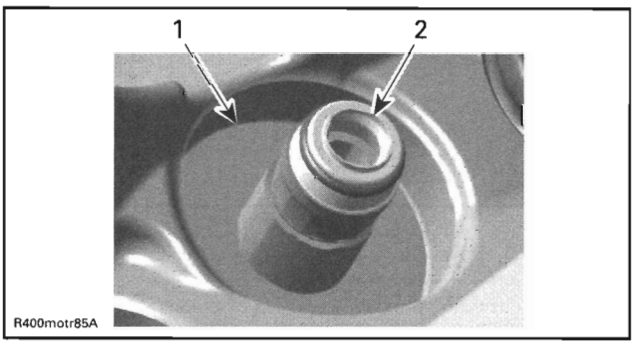
Valve Installation

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

Install a NEW valve stem seal. Make sure thrust washer is installed before installing seal.

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.

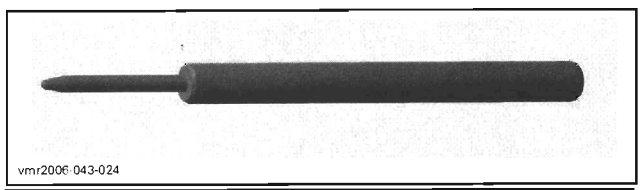
VALVE GUIDE

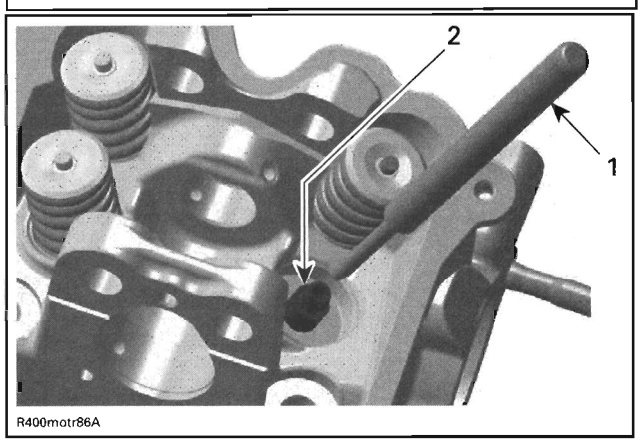
Valve Guide Removal

Remove:
- cylinder head (see *CYLINDER HEAD* above)
- valve spring (see *VALVE SPRING* above)
- valves (see *VALVE* above).

NOTE: Clean valve guide area from contamination before removal.

Using valve guide remover (P/N 529 035 924), remove valve guide with a hammer.





1. *Valve guide remover*
2. *Valve guide*

Valve Guide Inspection

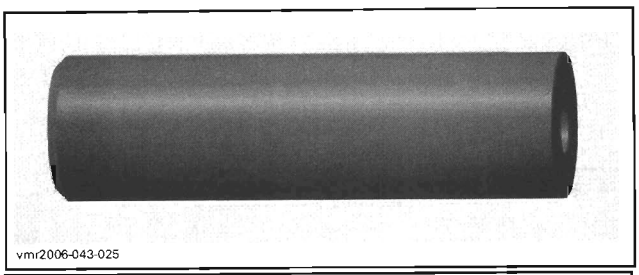
Always replace valve stem seals whenever valve guides are removed.

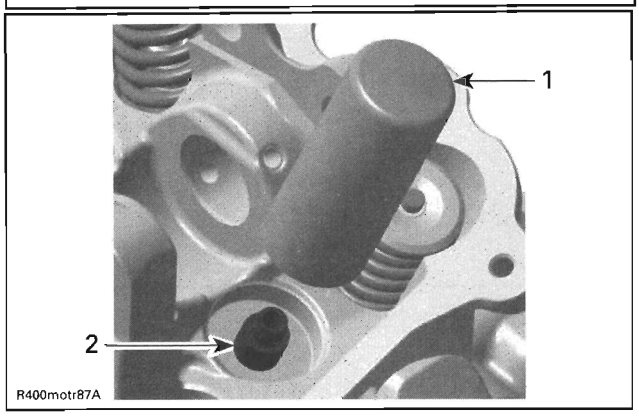
Clean the valve guide bore before reinstalling the valve guide into cylinder head.

Valve Guide 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.

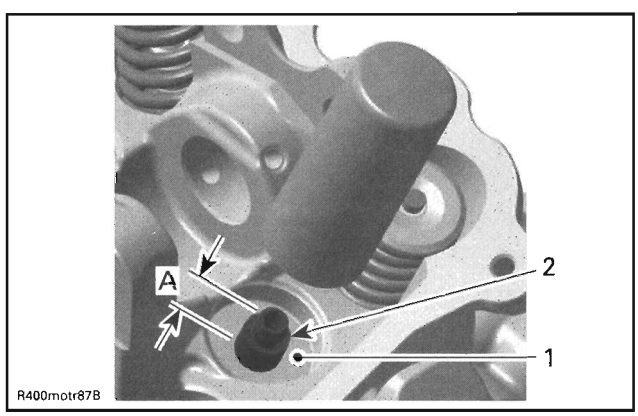




1. *Valve guide installer*
2. *Valve guide*

NOTE: Apply Loctite 767 (antiseize lubricant) (P/N 293 800 070) on valve guide prior to install it into the cylinder head.

CAUTION: Push valve guide in the cold cylinder head as per following illustration.



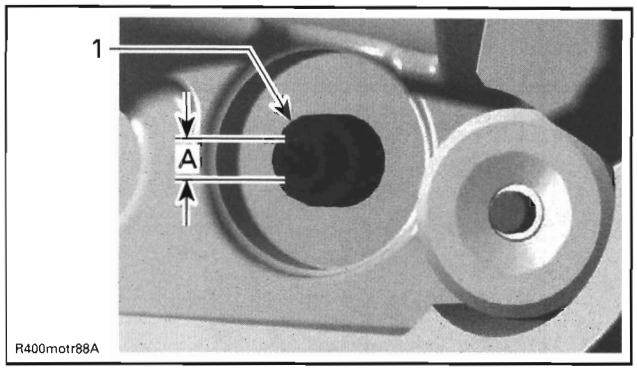
1. *Thrust surface of cylinder head*
2. *Valve guide*

A. *Measurement from thrust surface to valve guide top*

VALVE GUIDE (measurement "A")	
NEW	14.00 to 14.40 mm (.5512 to .5669 in)

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

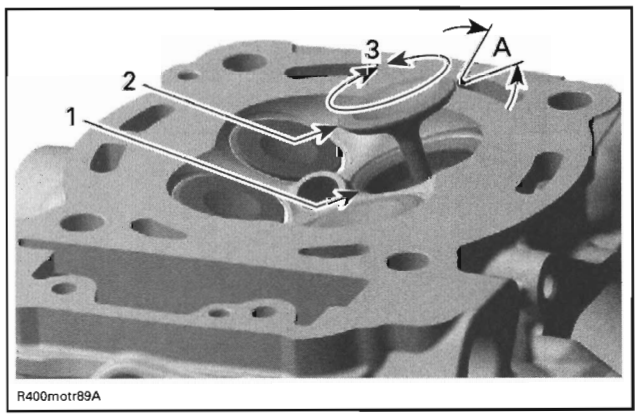
VALVE GUIDE DIAMETER (intake and exhaust valves)	
NEW	5.006 to 5.018 mm (.1971 to .1976 in)



1. Valve guide
A. Valve guide diameter

NOTE: Ensure to turn reamer in the 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 against cylinder head
A. Valve seat angle 45°

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

Repeat procedure until valve seat/valve face fits together.

CYLINDER

Cylinder Removal

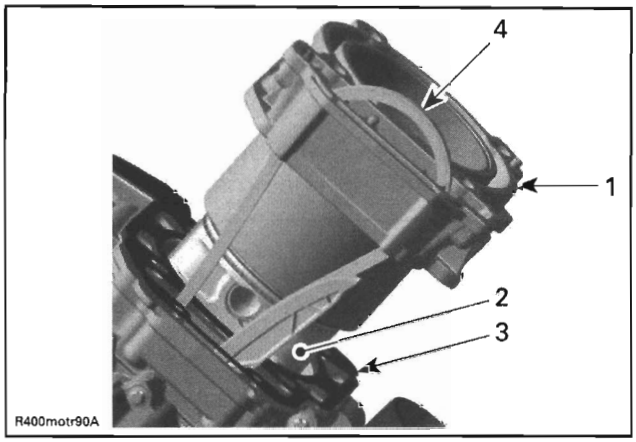
NOTE: Before removal or installation, make sure respective cylinder is set to TDC ignition. Refer to *CAMSHAFT.*

Remove:

- chain tensioner (see *CHAIN TENSIONER*)
- camshaft timing gear (see *CAMSHAFT TIMING GEAR*)
- cylinder head (see *CYLINDER HEAD*).

Pull cylinder.

Discard cylinder base gaskets.



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

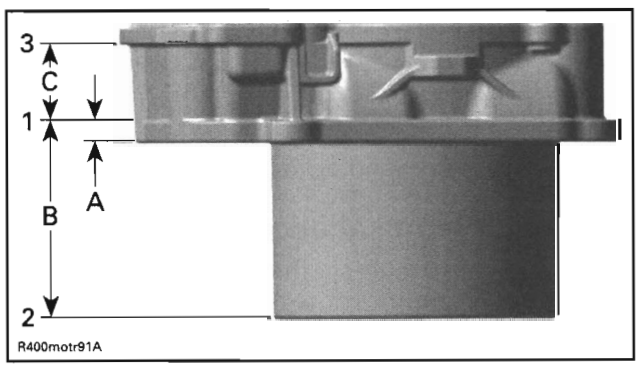
Cylinder Inspection

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

Cylinder Taper

Measure cylinder bore and if it is out of specifications, replace cylinder and piston rings.

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



1. First measuring of diameter
2. Second measuring of diameter
3. Third measuring of diameter
A. 7 mm (.276 in) from cylinder bottom
B. 68 mm (2.68 in)
C. 32 mm (1.260 in)

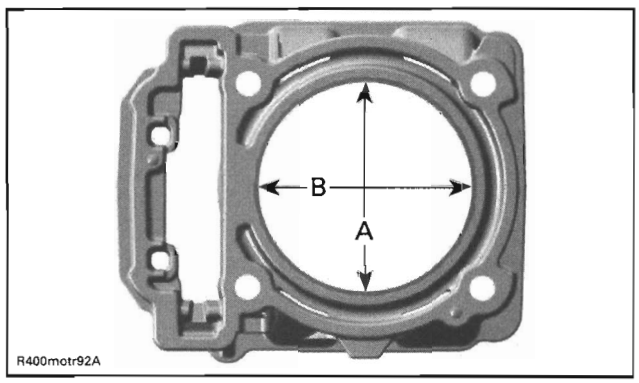
CYLINDER TAPER IN DIAMETER	
NEW (maximum)	0.038 mm (.0015 in)
SERVICE LIMIT	0.090 mm (.0035 in)

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 another 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	
NEW (maximum)	0.015 mm (.0006 in)
SERVICE LIMIT	0.020 mm (.0008 in)

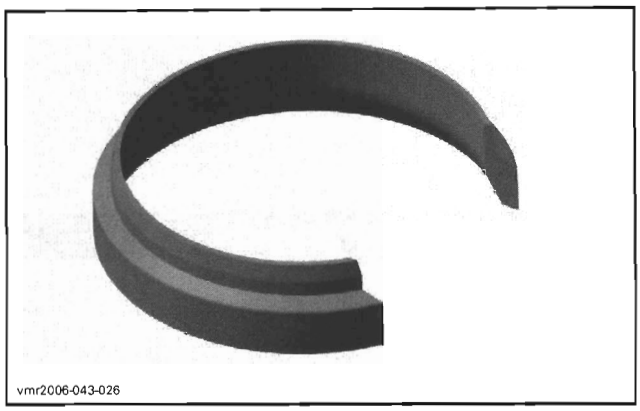
Cylinder Installation

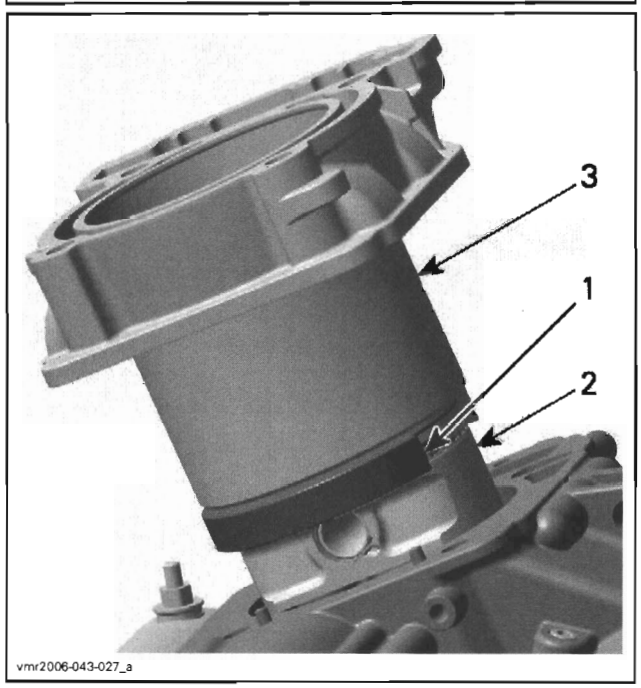
For installation, reverse the removal procedure. Pay attention to the following details.

CAUTION: Always replace cylinder base gasket before installing the cylinder.

First mount cylinder 2. Then remove crankshaft locking bolt (P/N 529 035 617). Crank the engine further and position piston 1 at TDC. Mount cylinder 1. The cylinder can not be pushed fully over the piston unless the piston is located at TDC.

Apply engine oil in the bottom area of the cylinder bore and also on the band of the piston ring compressor (P/N 529 035 919) piston ring compressor tool.





1. Piston ring compressor
2. Piston
3. Cylinder

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

CAUTION: Chain guide has to be fixed between cylinder and cylinder head.

NOTE: After both cylinders are installed, turn crankshaft until piston of cylinder 2 is at TDC ignition and lock crankshaft. Refer to *CAMSHAFT*.

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

PISTON

Piston Removal

NOTE: Before removal or installation, make sure respective cylinder is set to TDC ignition. Refer to *CAMSHAFT*.

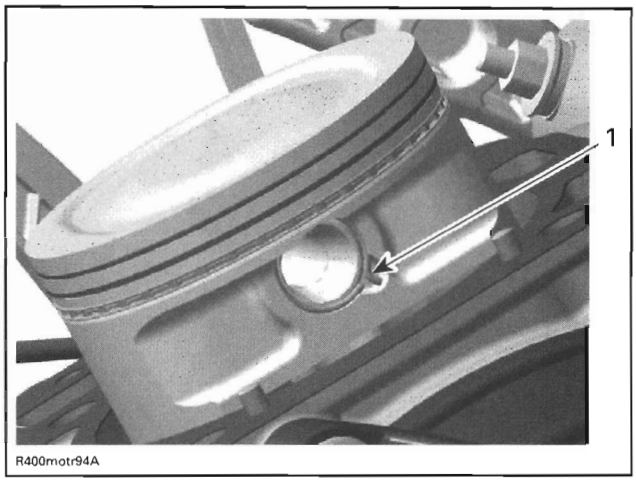
Remove:
- cylinder head (see *CYLINDER HEAD* above)
- cylinder (see *CYLINDER* above).

Place a rag under piston and in the area of timing chain compartment.

⚠ WARNING

Piston circlips are spring loaded.

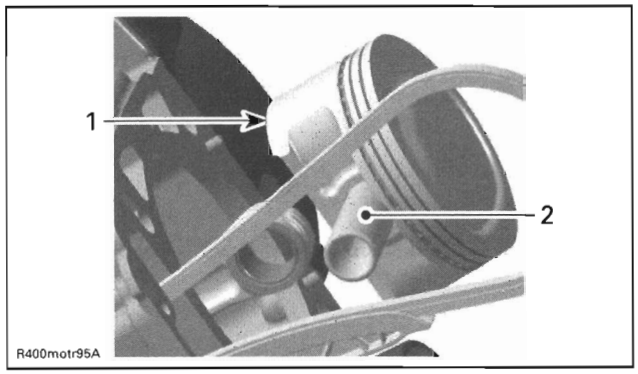
Remove one piston circlip and discard it.



1. Piston circlip

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

Push piston pin out of piston.



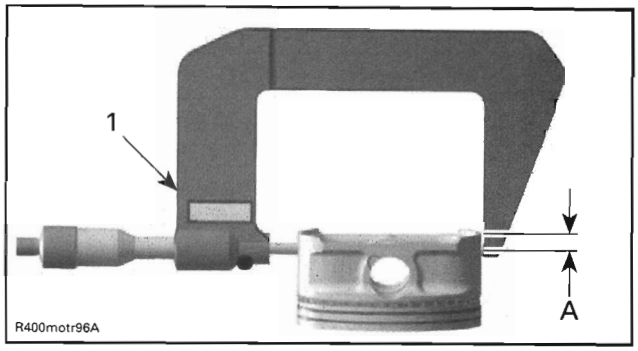
1. Piston
2. Piston pin

Detach piston from connecting rod.

Piston Inspection

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

Using a micrometer, measure piston at 8 mm (.315 in) perpendicularly (90°) to piston pin.



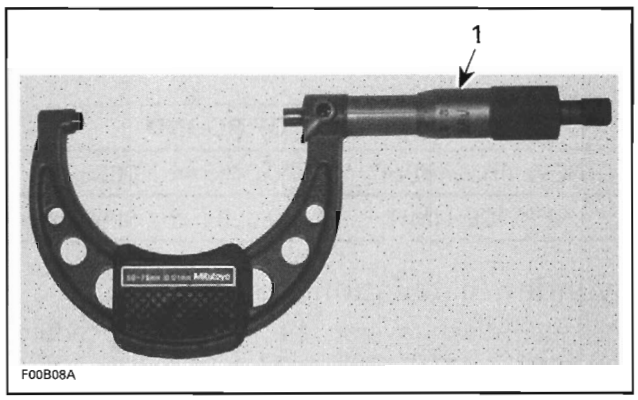
1. Measuring perpendicularly (90°) to piston pin
A. 8 mm (.315 in)

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

PISTON MEASUREMENT	
NEW	90.950 to 90.966 mm (3.5807 to 3.5813 in)
SERVICE LIMIT	90.850 mm (3.577 in)

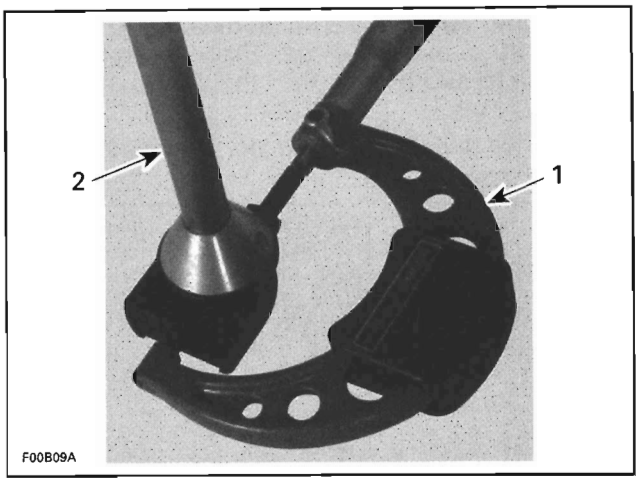
Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.

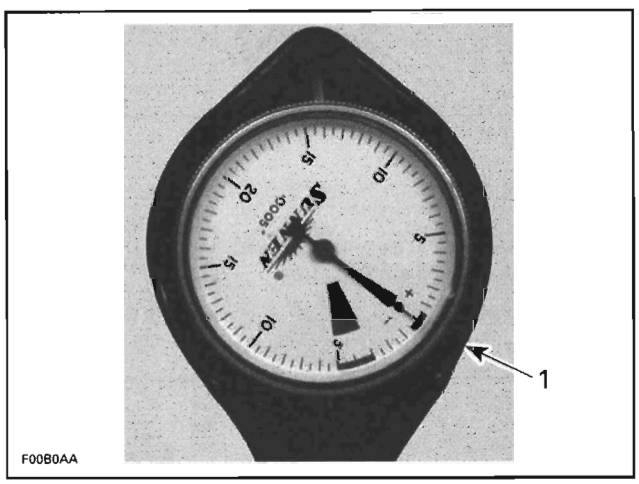


1. Micrometer set to the piston dimension

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 20 mm (.787 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	0.027 to 0.057 mm (.0011 to .0022 in)
SERVICE LIMIT	0.100 mm (.0040 in)

NOTE: Make sure used piston is not worn.

If clearance exceeds specified tolerance, replace piston by a new one and measure piston/cylinder clearance again.

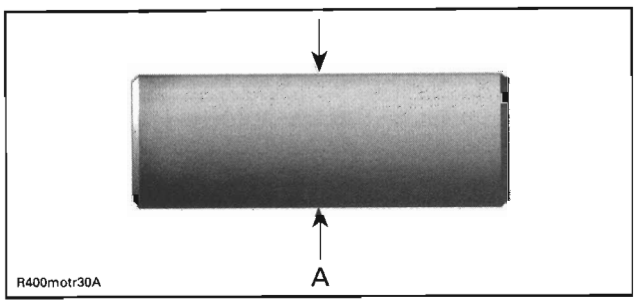
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

Connecting Rod/Piston Pin Clearance

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.

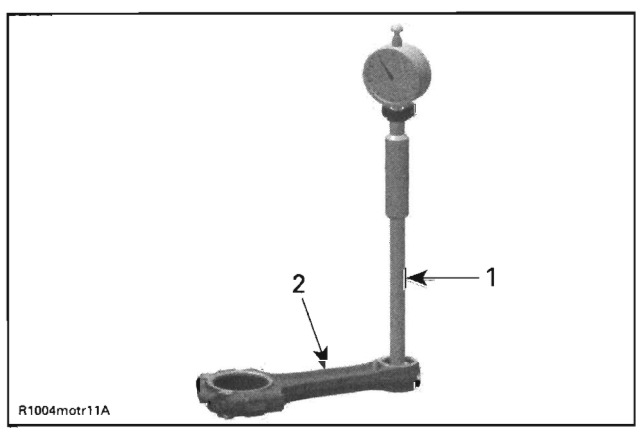


A. Piston pin diameter

PISTON PIN DIAMETER	
NEW	19.996 to 20.000 mm (.7872 to .7874 in)
SERVICE LIMIT	19.980 mm (.7866 in)

Replace piston pin if diameter is out of specifications.

Measure inside diameter of connecting rod small end bushing.



1. *Bore gauge*
2. *Connecting rod*

CONNECTING ROD SMALL END DIAMETER	
NEW	20.010 to 20.020 mm (.7878 to .7882 in)
SERVICE LIMIT	20.060 mm (.7898 in)

Replace connecting rod if diameter of connecting rod small end is out of specifications. Refer to *BOTTOM END* for removal procedure.

Compare measurements to obtain the connecting rod/piston pin clearance.

CONNECTING ROD/ PISTON PIN CLEARANCE	
SERVICE LIMIT	0.080 mm (.0035 in)

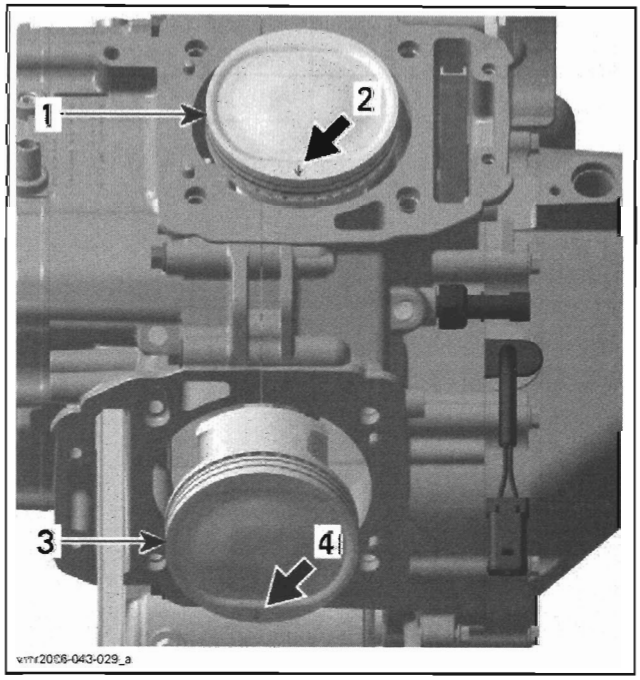
Piston Installation

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

Apply engine oil on the piston pin.

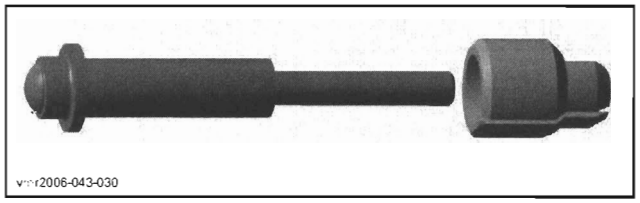
Insert piston pin into piston and connecting rod.

CAUTION: Take care that pistons will be installed with the punched arrow on piston top direction to the rear side of the engine.
Front cylinder: Mark on top of piston must show to intake side.
Rear cylinder: Mark on top of piston must show to exhaust side.



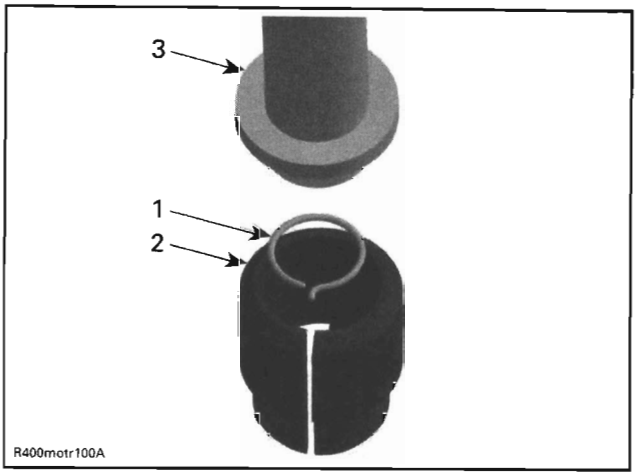
1. *Piston of cylinder 1*
2. *Mark on piston must show to intake side of cylinder 1*
3. *Piston of cylinder 2*
4. *Mark on piston must show to exhaust side of cylinder 2*

Use the piston circlip installer (P/N 529 035 921) piston appropriate circlip installer to assemble the new piston circlip as per following procedure:



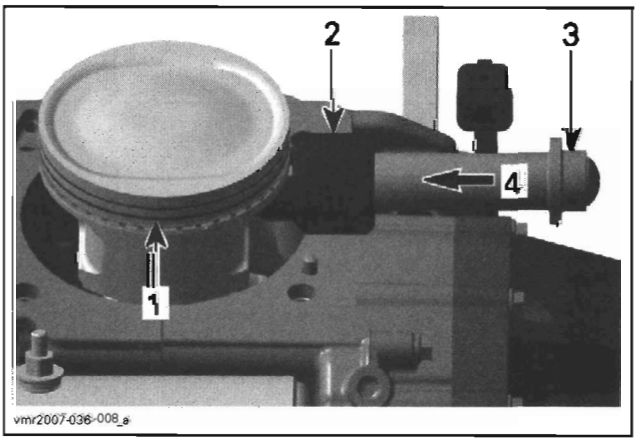
CAUTION: Always replace disassembled piston circlip(s) by new ones. Place a rag on cylinder base to avoid dropping the circlip inside the engine.

- Place circlip in sleeve as per following illustration.



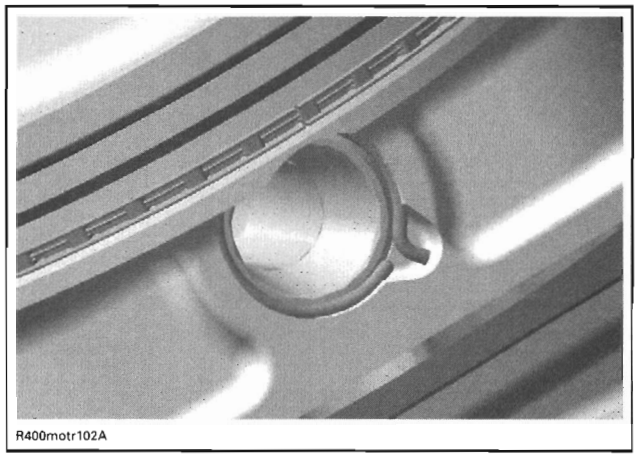
1. *Circlip*
2. *Sleeve*
3. *Assembly jig from piston clip installer*

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



1. *Hold piston while pushing circlip in place*
2. *Sleeve*
3. *Assembly jig*
4. *Direction to push circlip*

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



CORRECT POSITION OF THE PISTON CIRCLIP

PISTON RINGS

Ring Removal

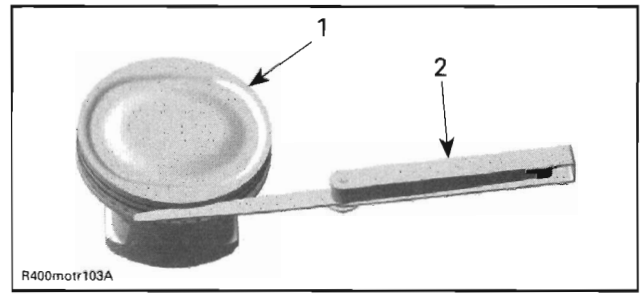
Remove:
- cylinder head
- cylinder
- piston.

Ring 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	
UPPER COMPRESSION RING	
NEW	0.030 to 0.070 mm (.0012 to .0028 in)
SERVICE LIMIT	0.150 mm (.0059 in)
LOWER COMPRESSION RING	
NEW	0.020 to 0.060 mm (.0008 to .0024 in)
SERVICE LIMIT	0.150 mm (.0059 in)
OIL SCRAPER RING	
NEW	0.010 to 0.180 mm (.0004 to .0071 in)
SERVICE LIMIT	0.250 mm (.0098 in)



1. Piston
2. Feeler gauge

Ring End Gap

To measure the ring end gap place the ring in the cylinder in the area of 8 to 16 mm (5/16 to 5/8 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.

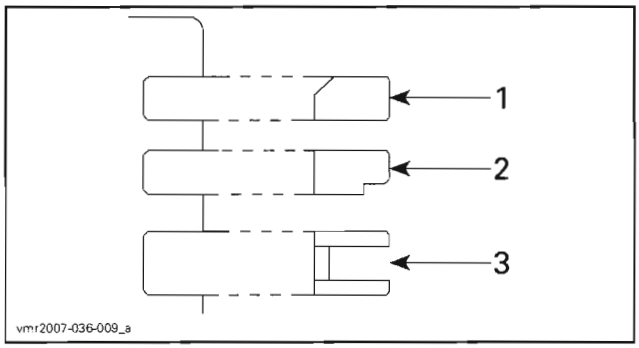
RING END GAP	
UPPER COMPRESSION RING	
NEW	0.20 to 0.40 mm (.008 to .016 in)
SERVICE LIMIT	1.50 mm (.059 in)
LOWER COMPRESSION RING	
NEW	0.20 to 0.40 mm (.008 to .016 in)
SERVICE LIMIT	1.50 mm (.059 in)
OIL SCRAPER RING	
NEW	0.20 to 0.70 mm (.008 to .028 in)
SERVICE LIMIT	1.50 mm (.059 in)

Ring 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 lower compression ring with the word "N and TOP " facing up, then the upper compression ring with the word "N and TOP" facing up.



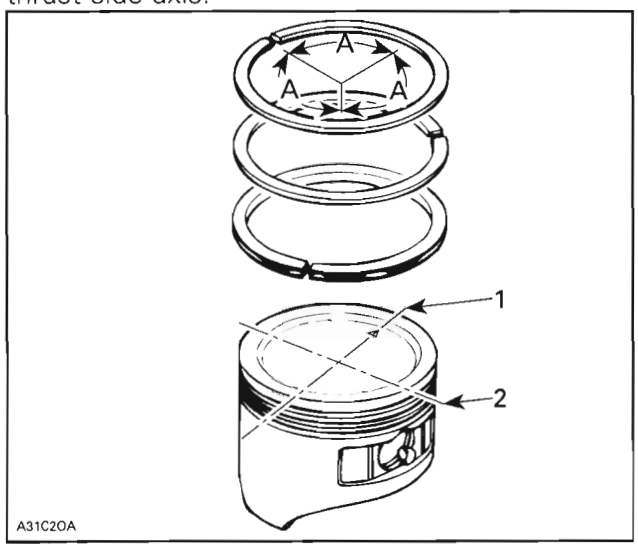
1. Upper compression ring
2. Lower compression ring
3. Oil scraper ring

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.



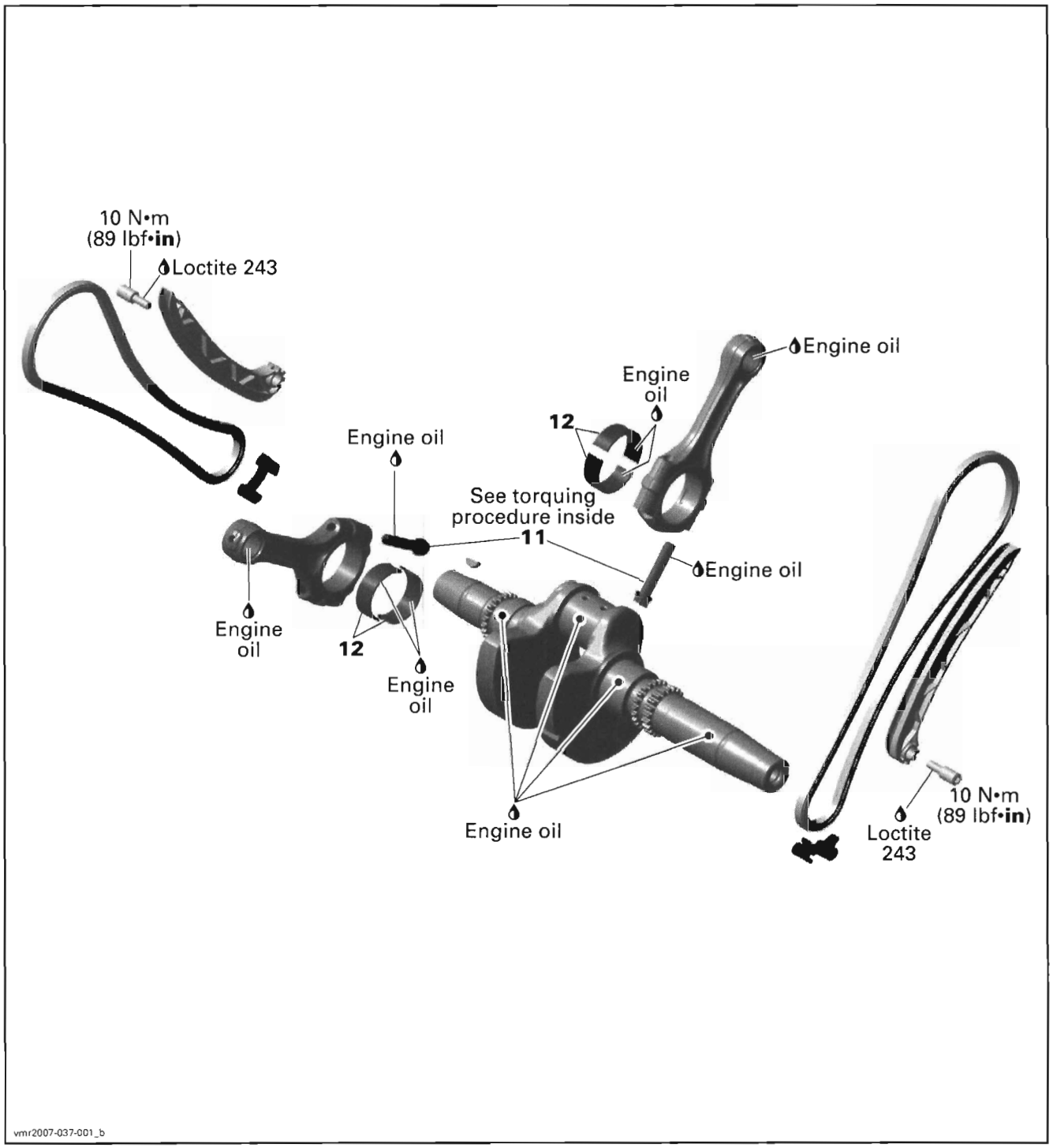
1. DO NOT align ring gap with piston thrust side axis
2. DO NOT align ring gap with piston pin bore axis
A. 120°

BOTTOM END

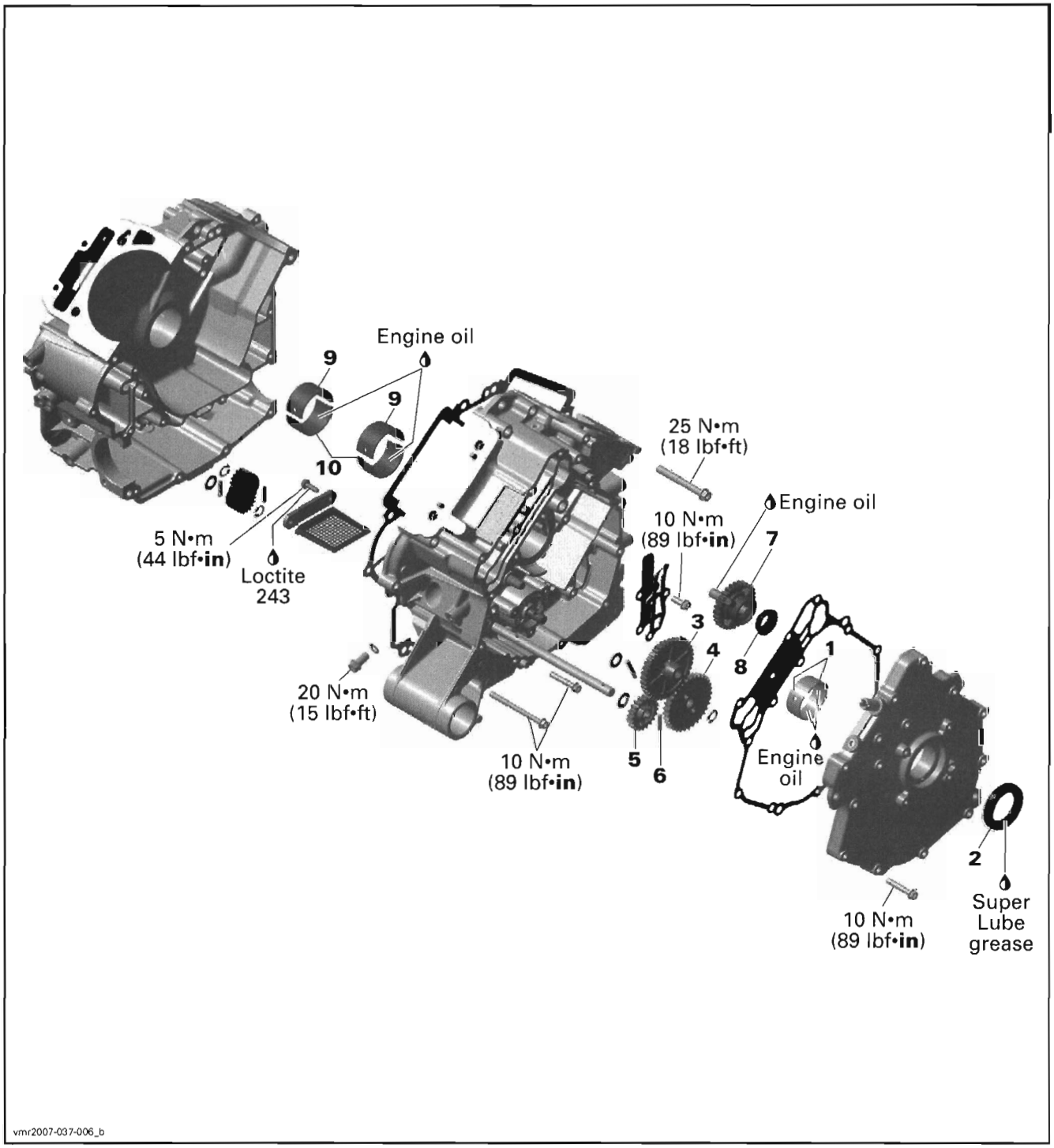
SERVICE TOOLS

Description	Part Number	Page
crankcase support sleeve	529 036 031	277
crankshaft locking bolt	529 035 617	281
engine lifting tool	529 036 022	271
oil seal installer	529 036 033	270
plain bearing remover/installer	529 036 032	271–272
plain bearing remover/installer	529 035 917	277–278

CRANKCASE AND PTO COVER



CRANKSHAFT


Engine oil
9
9
10
5 N•m
(44 lbf•in)
Loctite
243
20 N•m
(15 lbf•ft)
10 N•m
(89 lbf•in)
25 N•m
(18 lbf•ft)
10 N•m
(89 lbf•in)
Engine oil
7
8
3
4
5
6
1
Engine
oil
2
Super
Lube
grease
10 N•m
(89 lbf•in)
vmr2007-037-006_b

GENERAL

During assembly/installation, use the torque values and service products as shown in the exploded view(s).

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* in *INTRODUCTION* section.

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: 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.

The following components can be serviced without removing engine from vehicle:
- PTO cover oil seal
- PTO cover
- drive gears
- reed valve
- timing chain
- timing chain guide.

Engine removal is necessary to service the following components:
- crankcase
- crankshaft.

PROCEDURES

PTO COVER OIL SEAL

To replace oil seal **no. 2**, it is not necessary to remove engine from vehicle and PTO cover from the crankcase.

Oil Seal Removal

Remove belt guard.

Remove drive pulley.

Remove oil seal **no. 2** with a small flat screwdriver.

CAUTION: Avoid scoring surfaces with tool.

Oil Seal Inspection

Check oil seal running surface of crankshaft PTO side for grooves. Replace if necessary.

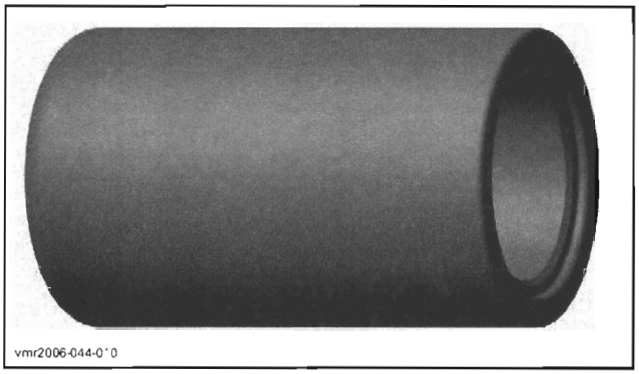
Oil Seal Installation

The installation is the reverse of the removal procedure.

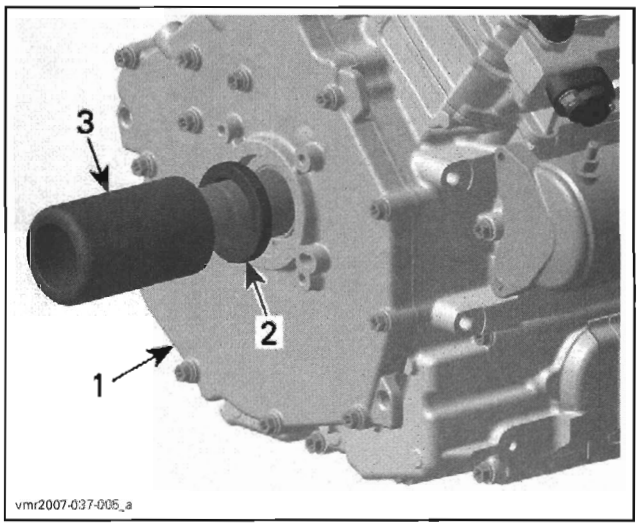
Pay attention to the following details.

CAUTION: Oil seal must be installed with sealing lip toward the engine.

Push oil seal in place by using the oil seal installer (P/N 529 036 033).



OIL SEAL INSTALLER



1. *PTO cover*
2. *Oil seal*
3. *Oil seal installer*

PTO COVER

NOTE: It is necessary to raise the engine in order to remove the PTO cover.

Cover Removal

On RH Side of Vehicle

Disconnect battery. Refer to *CHARGING SYSTEM*.

Remove the muffler.

Unscrew the ground wire from engine.

Remove engine support nuts.

On LH Side of Vehicle

Remove LH side panel and hood.

Remove air intake silencer.

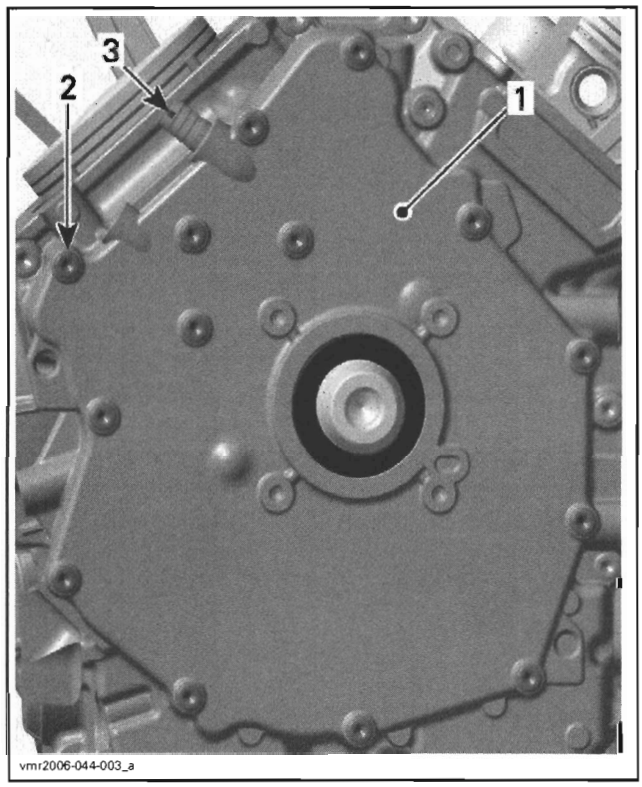
Remove drive pulley. Refer to *DRIVE SYSTEM*.

Remove engine support nuts.

Install the engine lifting tool (P/N 529 036 022) on intake manifold.

Lift engine until the bottom of PTO cover is over frame opening.

Remove PTO cover screws and pull the cover.



1. *PTO cover*
2. *PTO cover screws*
3. *Vent hose nipple*

Cover Inspection

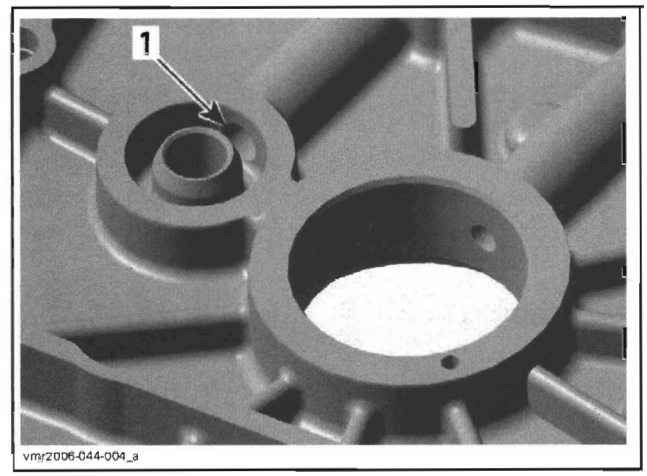
Check the PTO cover for cracks or other damage.

Replace PTO cover if damaged.

Clean oil breather bore in PTO cover from contaminations with part cleaner then use an air gun to dry it.

⚠ WARNING

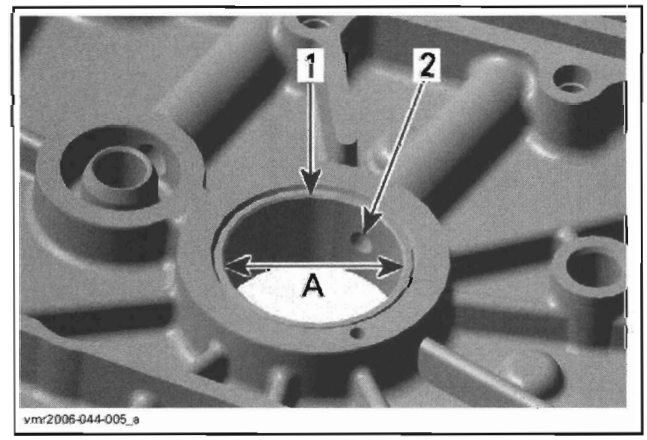
Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.



1. *Oil breather bore*

Check plain bearings **no. 1** for scorings or other damages.

NOTE: Measure plain bearing inside diameter and compare to crankshaft journal diameter (PTO support bearing). Refer to *CRANKSHAFT* in this section. Replace if the measurement is out of specification.



1. *Plain bearing*
2. *Oil bore*

A. *Measure plain bearing inside diameter*

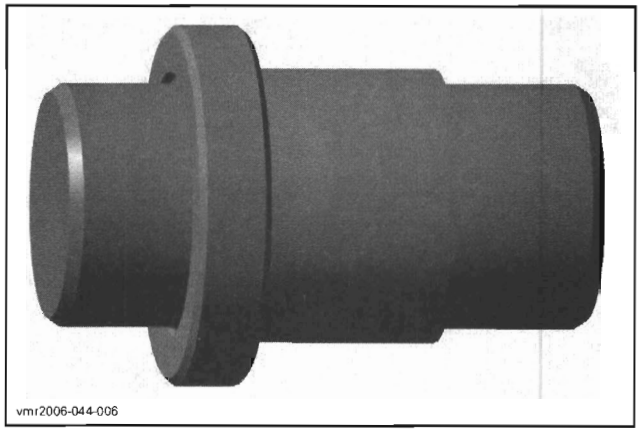
PLAIN BEARING INSIDE DIAMETER (PTO side support bearing)	
SERVICE LIMIT	34.120 mm (1.3433 in)

Plain Bearing Replacement Procedure

Plain Bearing Removal

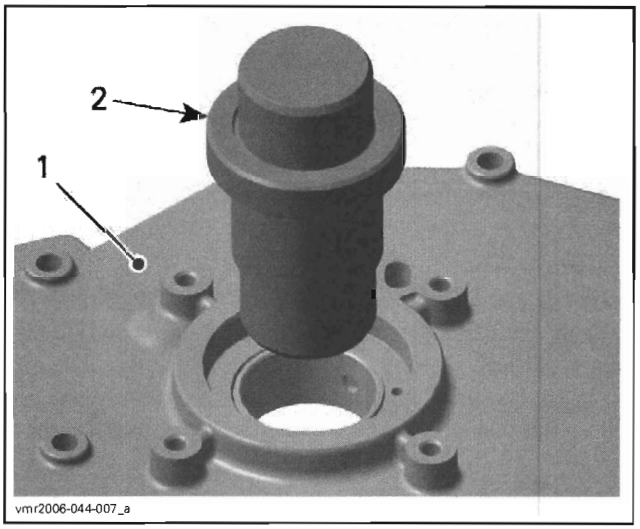
Carefully remove the oil seal **no. 2** with a screwdriver, without damaging the PTO cover.

Push-out the plain bearings from the outside towards the inside using the plain bearing remover/installer (P/N 529 036 032).



PLAIN BEARING REMOVER/INSTALLER — PTO COVER

The PTO cover has to be supported from below with suitable support with straight surface, in order to prevent damage of the sealing surface.



1. *PTO cover*
2. *Plain bearing remover/installer*

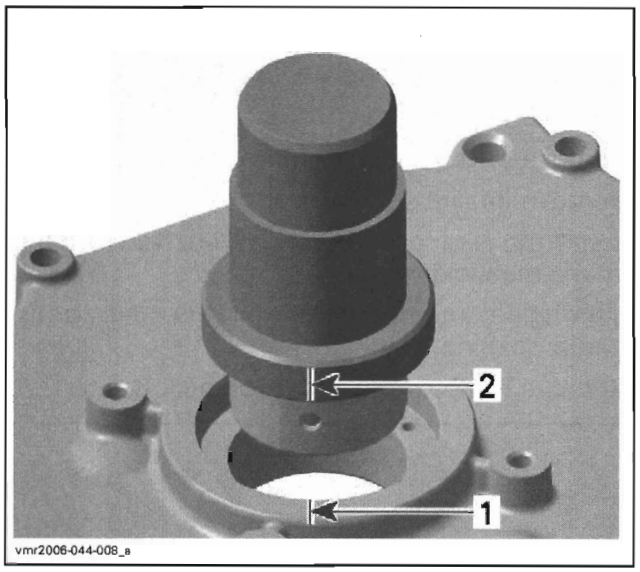
Plain Bearing Installation

CAUTION: Unless otherwise instructed, never use hammer to install plain bearings. Use press only.

Install plain bearings with the proper plain bearing remover/installer (P/N 529 036 032) in a cool PTO cover. Do not lubricate plain bearings and/or PTO cover for installation.

Carefully press-in the plain bearings in the same direction as during disassembly, from the outside towards the inside. Support PTO cover with suitable support with straight surface, in order to prevent damage of the sealing surface.

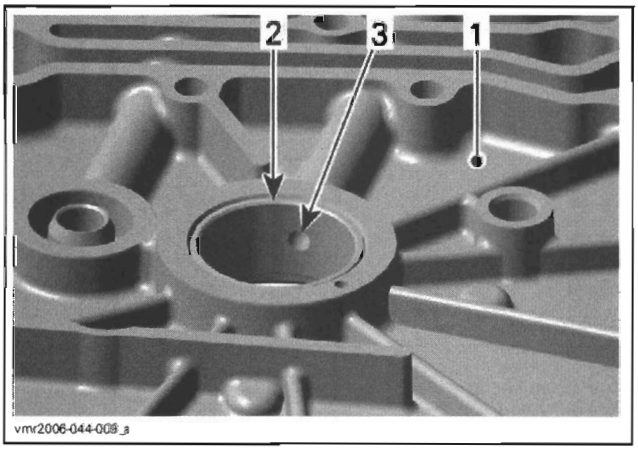
CAUTION: Mark position of oil bore on PTO cover and on plain bearing remover/installer. Align mark on plain bearing remover/installer with mark on PTO cover.



1. *Mark position of oil bore on PTO cover*
2. *Mark position of oil bore on plain bearing remover/installer*

NOTE: Wrong oil bore position will stop oil supply to plain bearings and will damage the engine.

CAUTION: The partition of the plain bearings must be positioned near to oil bore in counterclockwise direction. (refer to no. 3 in next illustration).



1. *PTO cover (inside)*
2. *Partition*
3. *Oil bore*

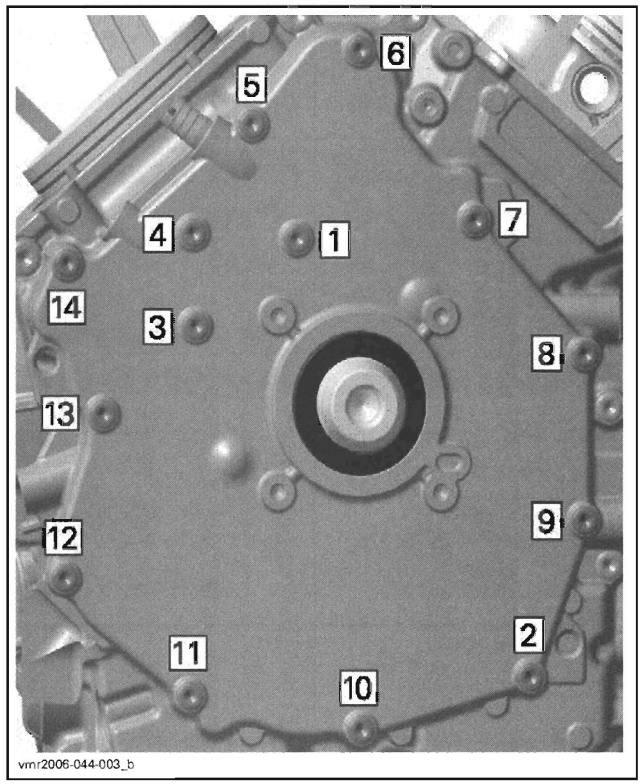
Cover Installation

For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: At installation, replace PTO cover gasket and oil seal.

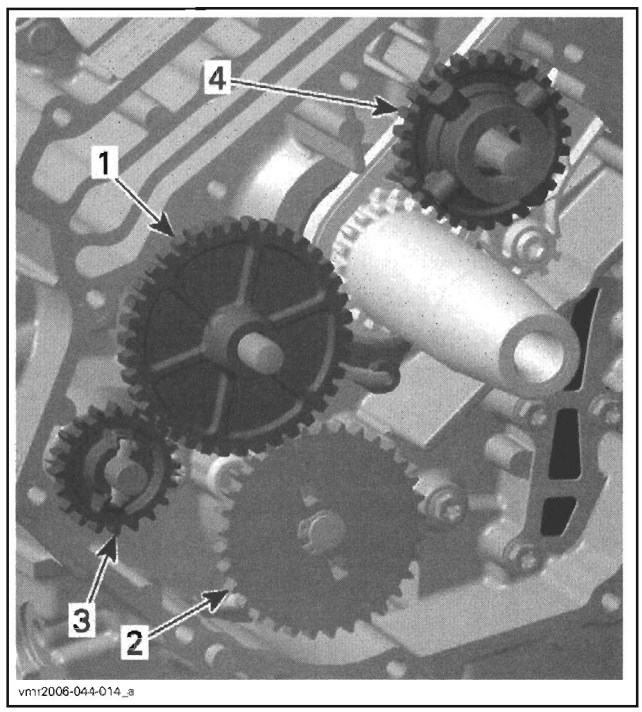
Tightening sequence for screws on PTO cover is as per following illustration.



TIGHTENING SEQUENCE

DRIVE GEARS

The drive gears are located on the engine PTO side behind the PTO cover.



1. *Intermediate gear*
2. *Oil pump gear*
3. *Water pump gear*
4. *Breather gear*

Drive Gear Removal

Remove:

- PTO cover (refer to *PTO COVER*)
- intermediate gear **no. 3**
- oil pump gear **no. 4** (refer to *OIL PUMP* in *LUBRICATION SYSTEM*)
- water pump gear **no. 5**.

To remove water pump gear, pull the shaft assembly a bit out and turn it about one teeth until it stays out.

Now you can push water pump gear down. Remove needle pin **no. 6** and pull water pump gear out.

Remove breather gear **no. 7**.

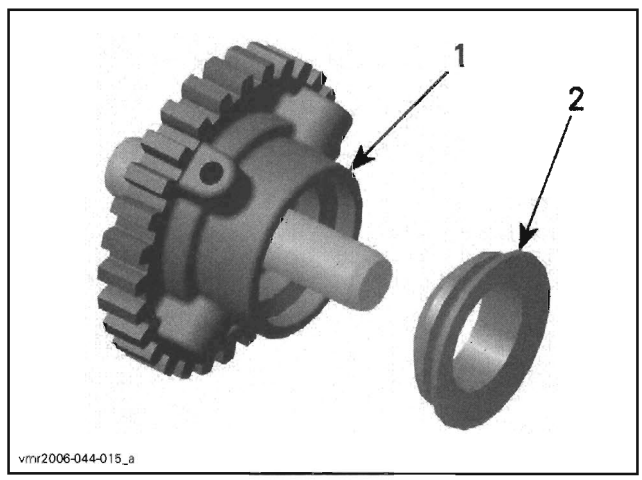
Drive Gear Inspection

Intermediate Gear/Oil Pump Gear/ Water Pump Gear

Inspect gears for wear or other damage. Replace if damaged.

Breather Gear

The engine is equipped with a breather gear which prevents engine oil coming out through the breathing system into the air box.



1. *Breather gear*
2. *V-ring*

Inspect gear for wear or other damage.

Check ball bearing for excessive play and smooth operation. Replace breather gear assembly if necessary.

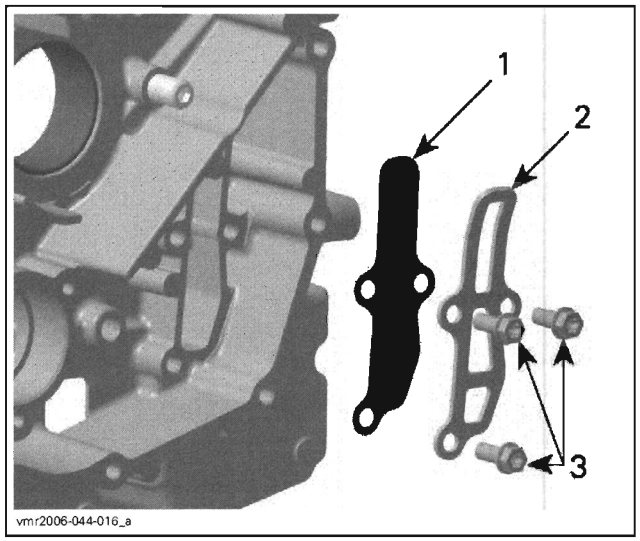
Drive Gear Installation

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

NOTE: At installation replace the V-ring **no. 8** of the breather gear.

Adequately oil the ball bearing of the breather gear.

REED VALVE



1. *Reed valve*
2. *Stopper plate*
3. *Screws*

Valve Removal

Remove:
- PTO cover (refer to *PTO COVER*)
- reed valve retaining screws
- stopper plate
- reed valve.

Valve Inspection

Check reed valve for cracks or other damage.

NOTE: Replace reed valve if damaged.

Valve Installation

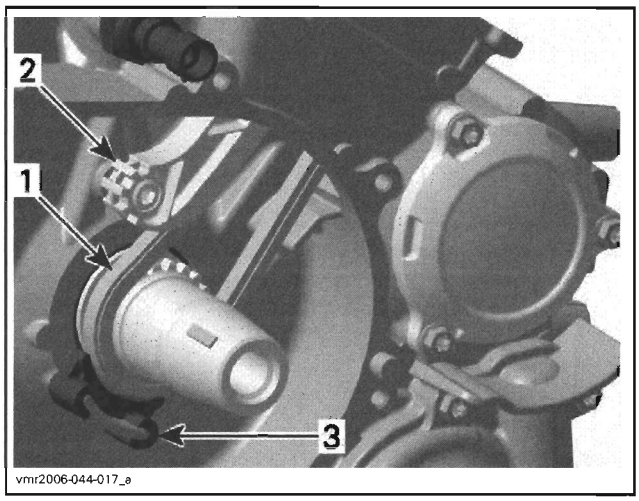
The installation is the reverse of the removal procedure.

TIMING CHAIN

The engine is equipped with two timing chains. One of the timing chain is located on engine MAG side behind the magneto cover. The second timing chain is located on engine PTO side behind the PTO cover.

Removal of Magneto Side Timing Chain

Remove:
- valve cover, chain tensioner and camshaft timing gear (refer to *CYLINDER AND HEAD*)
- magneto cover and rotor (refer to *MAGNETO SYSTEM*)
- timing chain guide and lower timing chain guide.



1. *Timing chain*
2. *Timing chain guide*
3. *Lower timing chain guide*

Carefully pull the timing chain sideward and down from the crankcase.

NOTE: Mark the operating direction of the timing chain before removal.

Removal of PTO Side Timing Chain

Remove:
- valve cover, chain tensioner and camshaft timing gear (refer to *CYLINDER AND HEAD* section)
- PTO cover (refer to *PTO COVER*)
- intermediate gear and breather gear (refer to *DRIVE GEARS*)
- timing chain guide and lower timing chain guide (see illustration above).

Carefully pull the timing chain sideward and down from the crankcase.

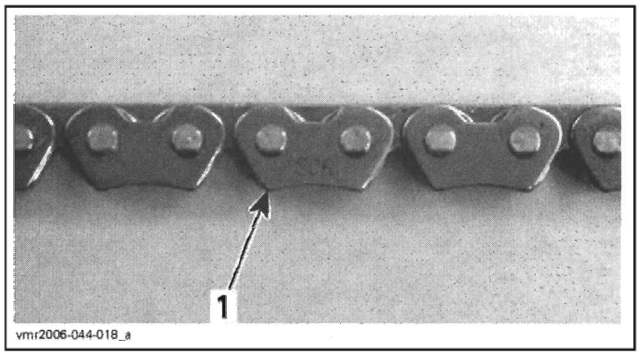
NOTE: Mark the operating direction of the timing chain before removal.

Timing Chain Inspection

Inspection is the same for both timing chains.

NOTE: Check timing chain on camshaft timing gear for excessive radial play.

Check chain condition for wear and teeth condition.



1. Timing chain

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

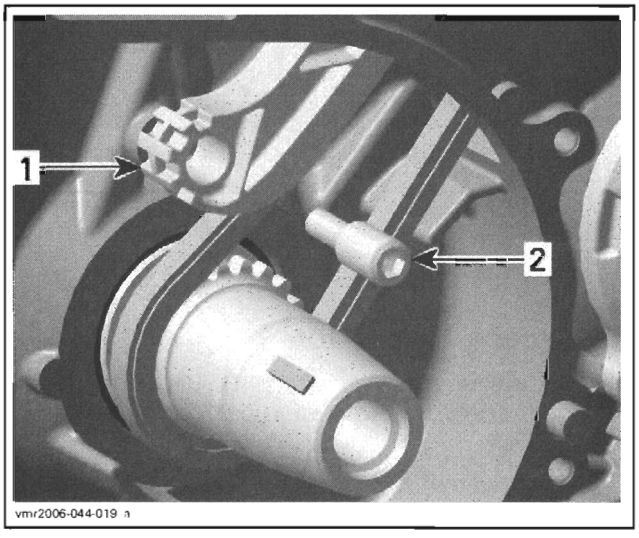
Timing Chain Installation

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

Refer to *CYLINDER AND HEAD* for proper camshaft timing gear installation.

CAUTION: Improper valve timing will damage engine components.

TIMING CHAIN GUIDE



1. Timing chain guide
2. Bearing screw

Guide Removal

Refer to *TIMING CHAIN* above.

Guide Inspection

Check timing chain guide for wear, cracks or other damage. Replace if necessary.

Guide Installation

The installation is the reverse of the removal procedure.

CRANKCASE

NOTE: Before disassembly, remove engine from vehicle, refer to *ENGINE REMOVAL AND INSTALLATION*.

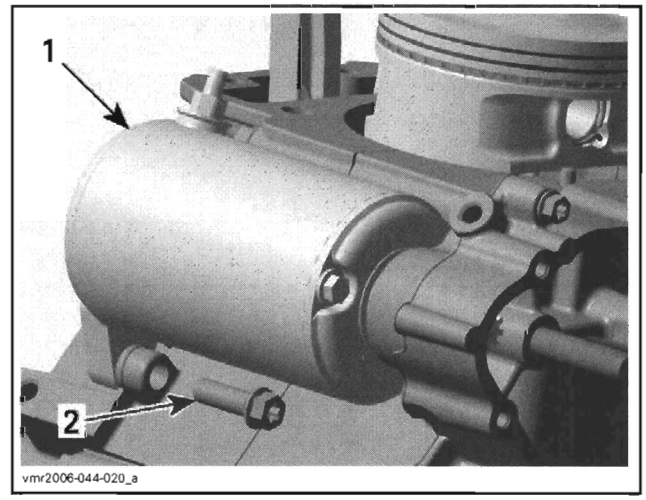
Crankcase Disassembly

Remove:

- PTO cover (refer to *PTO COVER*)
- drive gears (refer to *DRIVE GEARS*)

NOTE: Oil pump removal from crankcase is not necessary, but recommended to see condition of oil pump (refer to *LUBRICATION SYSTEM* section).

- electric starter

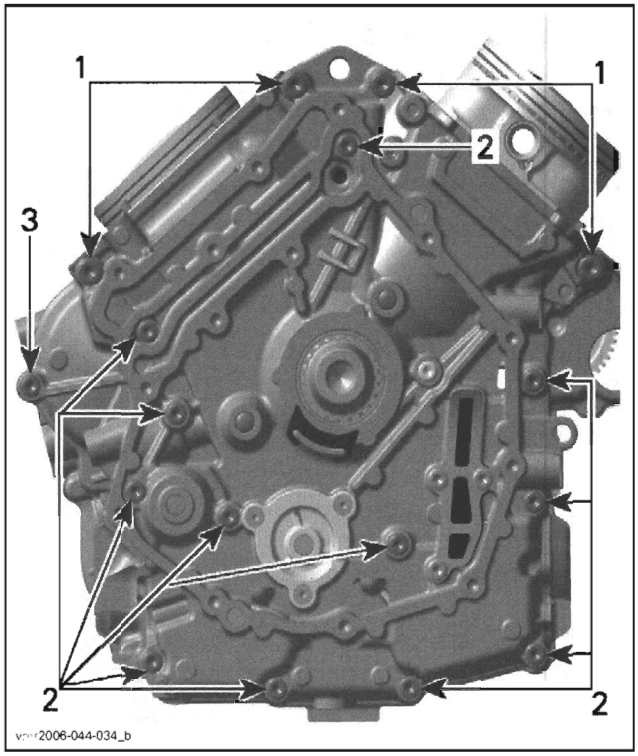


1. Electric starter
2. Screw

- magneto cover and rotor (refer to *MAGNETO SYSTEM* section)
- electric starter drive gears (refer to *MAGNETO SYSTEM* section)
- water pump housing (refer to *COOLING SYSTEM* section)
- oil filter (refer to *LUBRICATION SYSTEM* section)
- cylinder head and cylinder (refer to *CYLINDER AND CYLINDER HEAD* section)
- timing chains and timing chain guides (refer to *TIMING CHAIN* and *TIMING CHAIN GUIDE*).

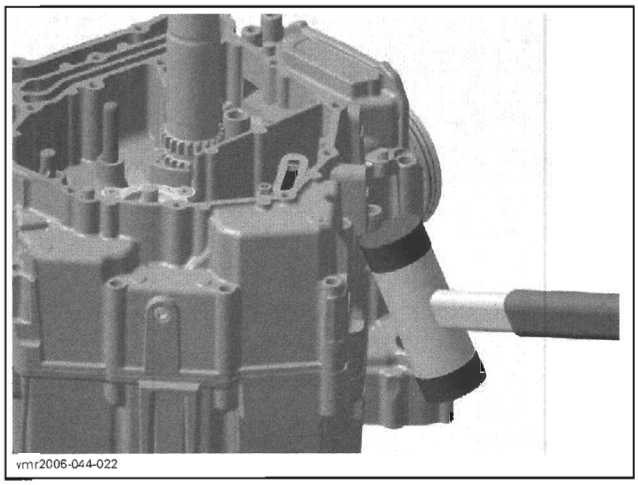
NOTE: Before splitting the crankcase, measure crankshaft axial play on PTO end. Refer to *CRANKSHAFT INSPECTION*.

Remove retaining screws of crankcase.



TYPICAL
1. *Four screws M8 x 65*
2. *12 screws M6 x 75*
3. *One screw M6 x 35*

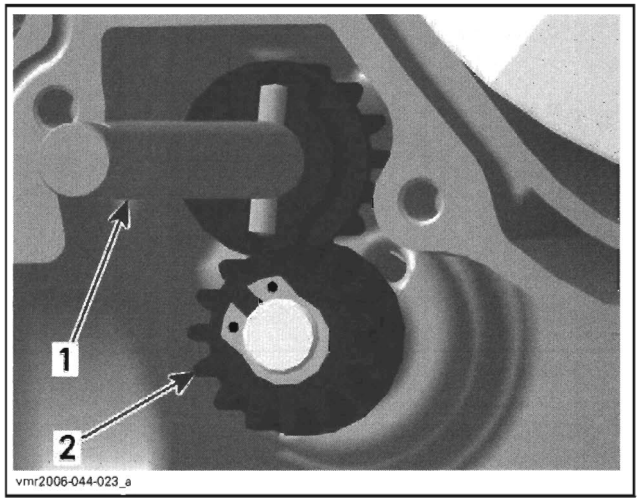
Carefully split crankcase halves by using a screwdriver and a soft hammer.



NOTE: During disassembly, do not damage the sealing surfaces of the crankcase halves.

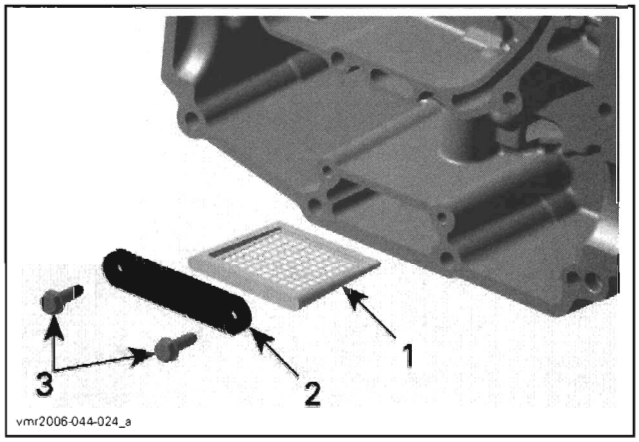
Pull crankshaft out of crankcase.

Remove the water pump intermediate shaft and the water pump gear.



1. *Water pump intermediate shaft*
2. *Water pump gear*

Remove engine oil strainer.



1. *Engine oil strainer*
2. *Retaining plate*
3. *Screws*

Crankcase Inspection

NOTE: Remove all remaining parts from the crankcase halves; they could get damaged during repair work.

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

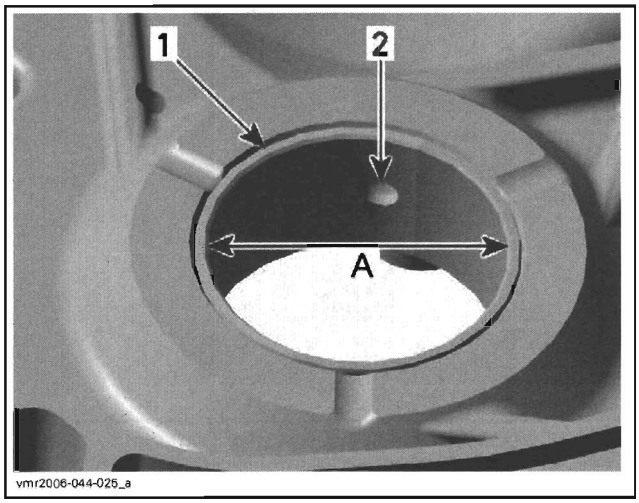
⚠ WARNING

Use safety goggles to avoid eye injuries.

Check crankcase halves for cracks or other damage. Replace if damaged.

Check plain bearings **no. 9** and **no. 10** for scorings or other damages.

NOTE: Measure plain bearing inside diameter and compare to PTO/MAG side journal diameters of crankshaft (refer to *CRANKSHAFT*). Replace if the measurements are out of specification.



1. *Plain bearing*
2. *Oil bore*

A. Measure plain bearing inside diameter

PLAIN BEARING INSIDE DIAMETER (PTO/MAG)	
SERVICE LIMIT	42.100 mm (1.6574 in)

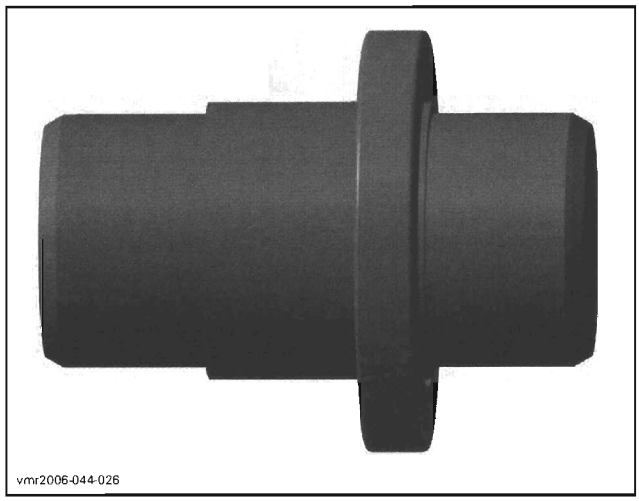
Plain Bearing Replacement

Plain Bearing Removal

CAUTION: Always support crankcase halves properly when ball bearings or plain bearings are removed. Damages to crankcase halves may occur if this procedure is not performed correctly.

NOTE: Always use a press for removal of plain bearings.

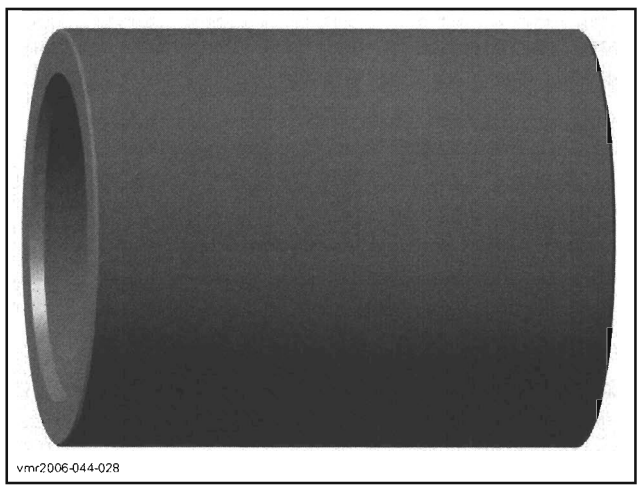
Remove plain bearings **no. 9** and **no. 10** with the proper plain bearing remover/installer (P/N 529 035 917).



PLAIN BEARING REMOVER/INSTALLER (P/N 529 035 917)

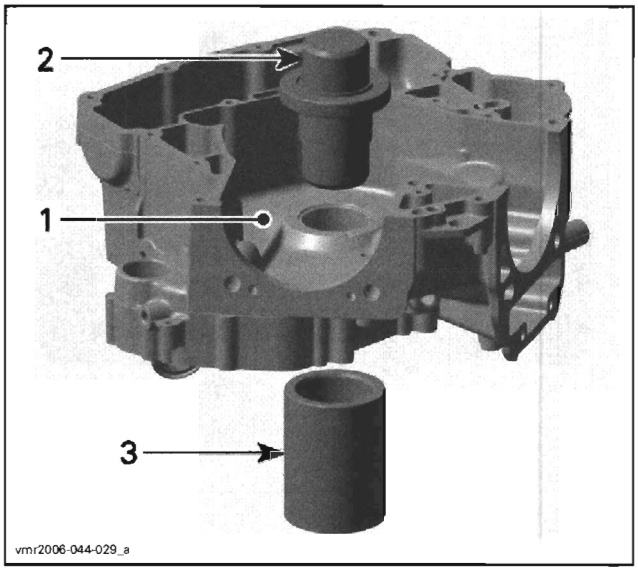
Carefully push the plain bearings out, from the crankcase half inside towards the outside.

NOTE: Place the proper crankcase support sleeve (P/N 529 036 031) under crankcase halves before removing plain bearings.



CRANKCASE SUPPORT SLEEVE (P/N 529 036 031)

NOTE: During disassembly, make sure not to damage the sealing surfaces of the crankcase halves.



PUSH PLAIN BEARINGS OUTSIDE
1. *Crankcase half*
2. *Plain bearing remover/installer (P/N 529 035 917)*
3. *Crankcase support sleeve (P/N 529 036 031)*

Plain Bearing Installation

CAUTION: Unless otherwise instructed, never use hammer to install ball bearings or plain bearings. Use press only.

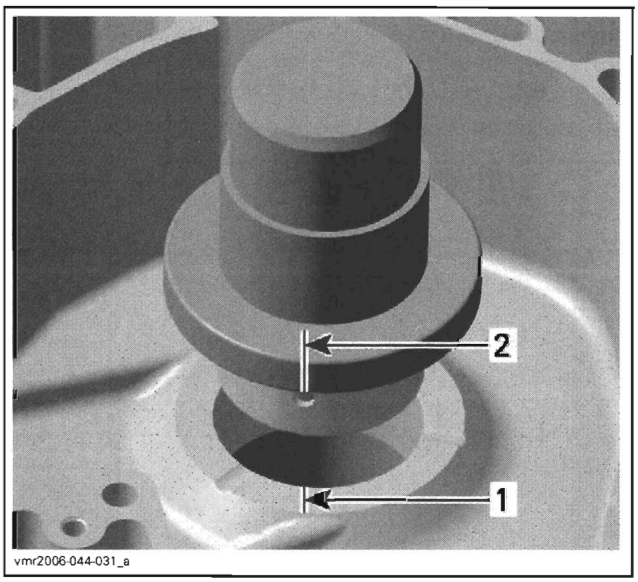
Install plain bearings with the proper plain bearing remover/installer (P/N 529 035 917) in a cool crankcase. Do not lubricate plain bearings and/or crankcase for installation.

NOTE: Place the proper crankcase support sleeve under crankcase halves before installing the plain bearings (refer to *BEARING REMOVAL PROCEDURE*).

Carefully press-in the plain bearings in the same direction as during disassembly, from the crankcase inside towards the outside.

During reassembly, make sure not to damage the sealing surfaces of the crankcase halves.

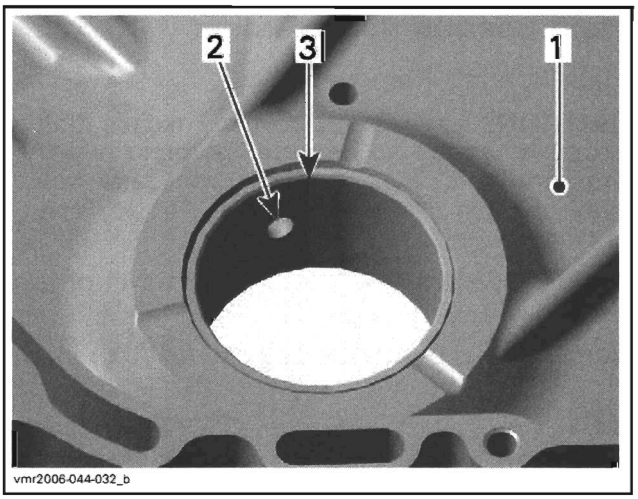
CAUTION: Mark position of oil bore on crankcase half and on plain bearing remover/installer. Align mark on plain bearing remover/installer with mark on crankcase half.



1. *Oil bore position marked on crankcase*
2. *Oil bore position marked on plain bearing remover/installer*

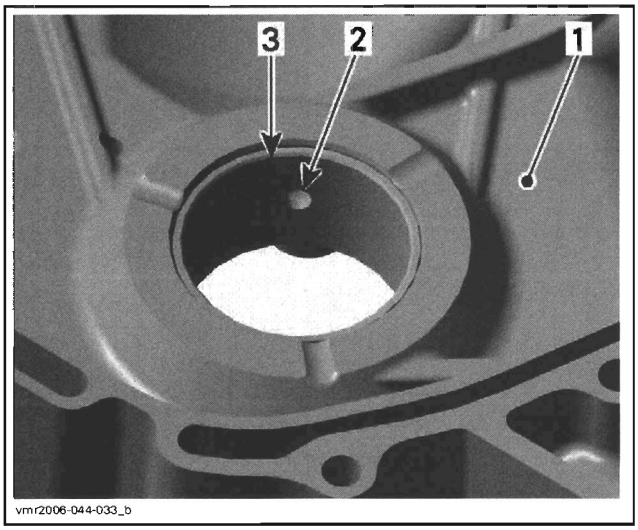
NOTE: Wrong oil bore position will stop oil supply to plain bearings and will cause engine damage.

CAUTION: The partition of the plain bearings in crankcase half MAG side must be positioned near to oil bore in clockwise direction (refer to no. 3 in next illustration).



1. *Crankcase half* MAG *(inside)*
2. *Oil bore*
3. *Partition*

CAUTION: The partition of the plain bearings in crankcase half PTO side must be positioned near to oil bore in counterclockwise direction (refer to no. 3 in next illustration).



1. *Crankcase half* PTO *(inside)*
2. *Oil bore*
3. *Partition*

NOTE: Use an O-ring (42 mm diameter x 1 to 1.5 mm (.04 to .06 in) thickness) to hold plain bearings in place during installation. The O-ring will disappear in the groove of the plain bearing remover/installer.

Crankcase Assembly

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

NOTE: Clean oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

NOTE: At installation, replace crankcase gasket.

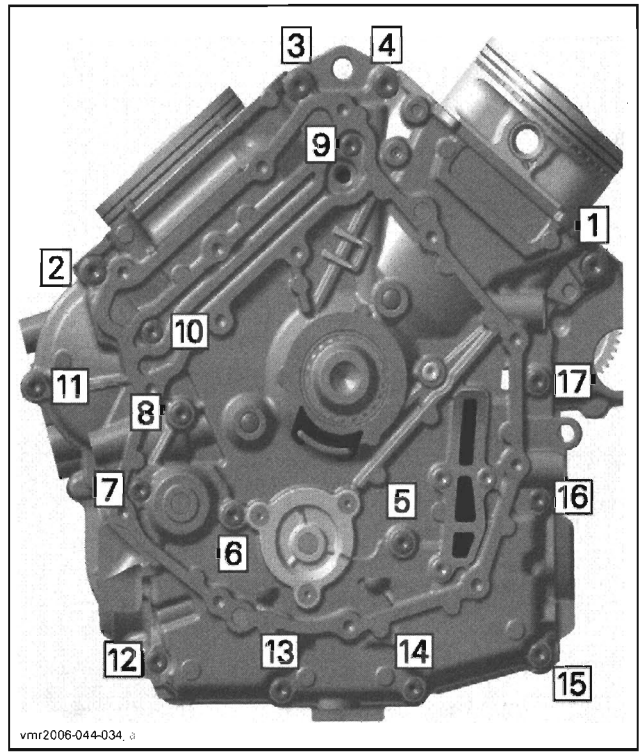
Oil the plain bearings before mounting the crankshaft.

CAUTION: Correctly reinstall crankshaft (refer to *CRANKSHAFT*).

Reinstall engine oil strainer.

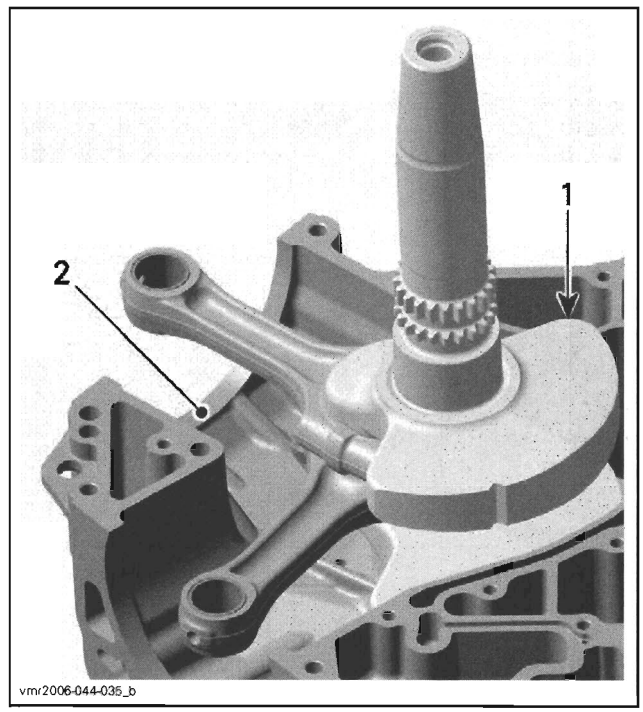
Reinstall water pump shaft shafts/gears (refer to *COOLING SYSTEM* section).

Tightening sequence for screws on crankcase is as per following illustration.



TIGHTENING SEQUENCE

CRANKSHAFT



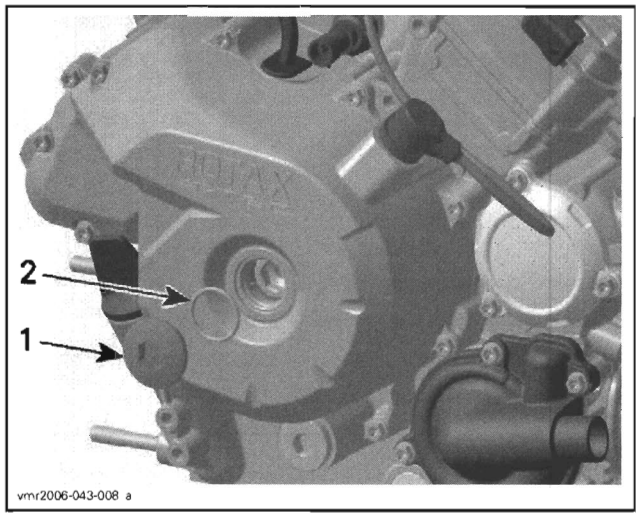
1. *Crankshaft*
2. *Crankcase MAG*

Crankshaft Locking Procedure

NOTE: When crankshaft is locked, the rear piston (cylinder 2, rear) is at TDC ignition. Crankshaft can not be locked at cylinder 1 (front) TDC.

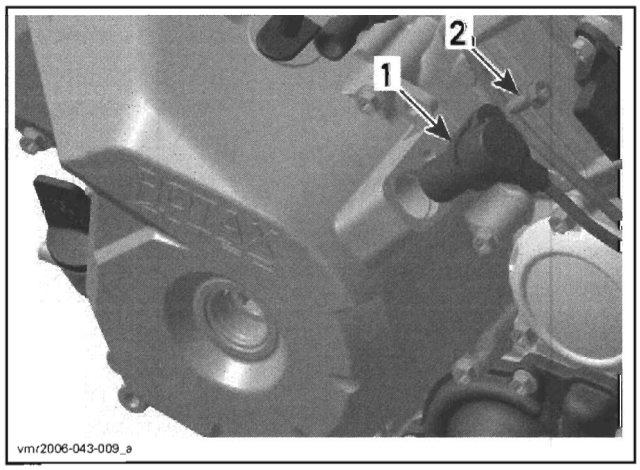
Remove:

- spark plug cable and spark plug of both cylinders
- valve covers of both cylinders
- plug screw and O-ring of magneto cover



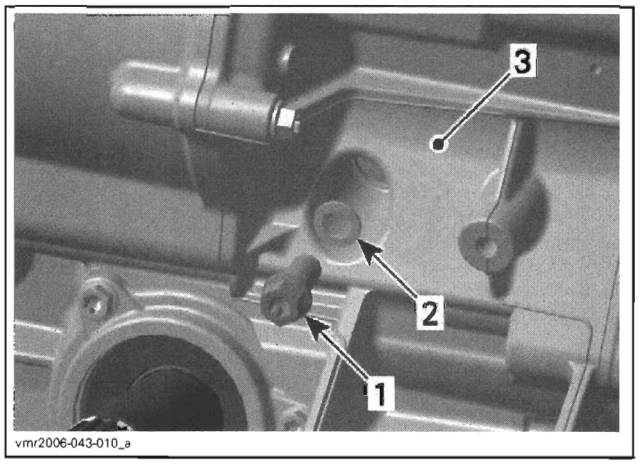
TYPICAL
1. Plug screw
2. O-ring

- crankshaft position sensor



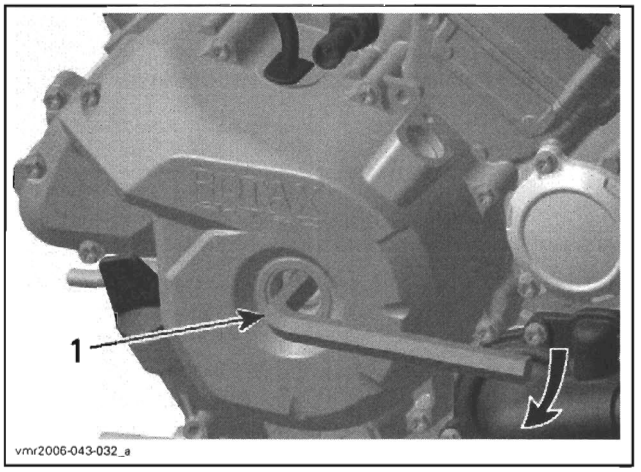
TYPICAL
1. Crankshaft position sensor
2. Screw

- plug screw with sealing ring.



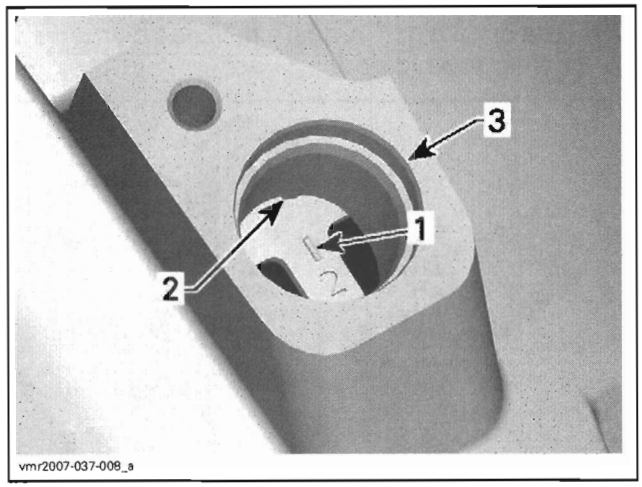
TYPICAL
1. Plug screw
2. Sealing ring
3. Crankcase PTO side, front side

Use a 14 mm Allen key to turn crankshaft until piston 2, rear is at TDC ignition.



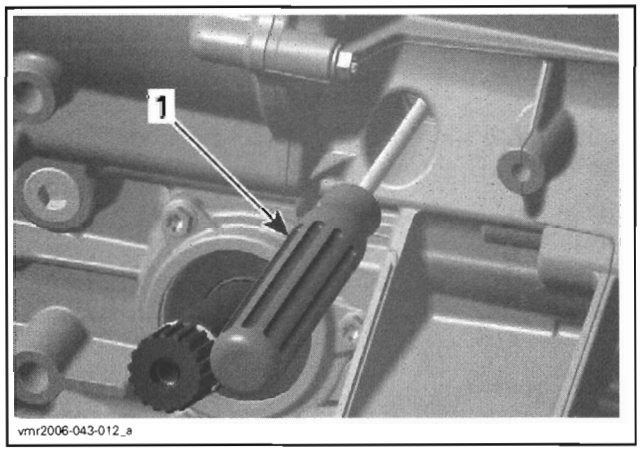
TYPICAL
1. Allen key 14 mm

When rear piston is at TDC ignition, marks on magneto flywheel "2" and on the magneto cover are aligned.



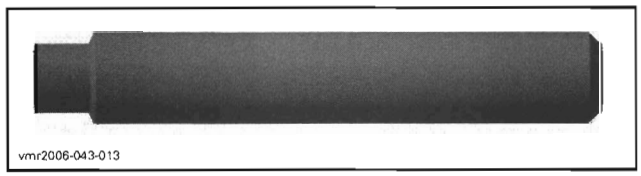
1. *Mark "2" on magneto flywheel*
2. *Notch on magneto cover*
3. *Crankshaft position sensor location*

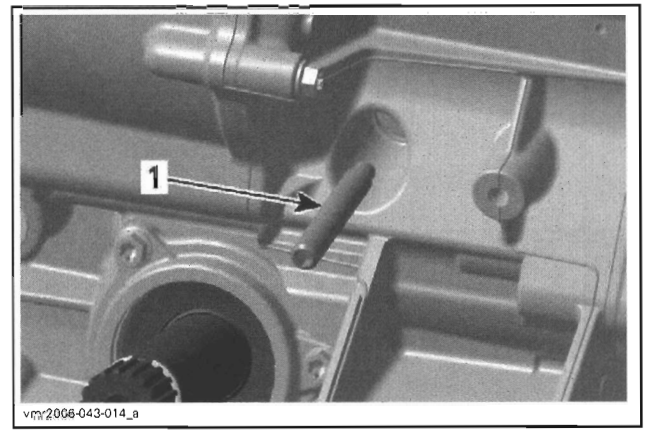
Use a screwdriver to check if the groove in the crankshaft is aligned with the hole.



TYPICAL
1. *Screwdriver*

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





TYPICAL
1. *Crankshaft locking bolt*

Crankshaft Removal

Refer to *CRANKCASE*.

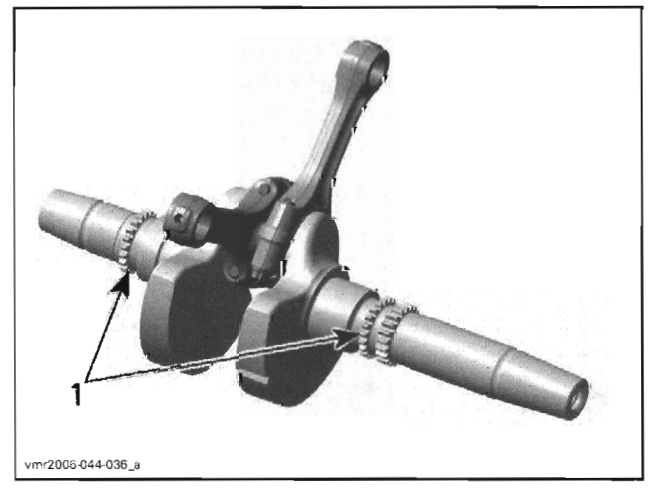
NOTE: It is recommended to verify crankshaft axial play before splitting the crankcase. Refer to *CRANKSHAFT INSPECTION*.

Crankshaft Inspection

NOTE: Check each bearing journal of crankshaft for scoring, scuffing, cracks or other signs of wear.

NOTE: Replace crankshaft if the gears are worn or otherwise damaged.

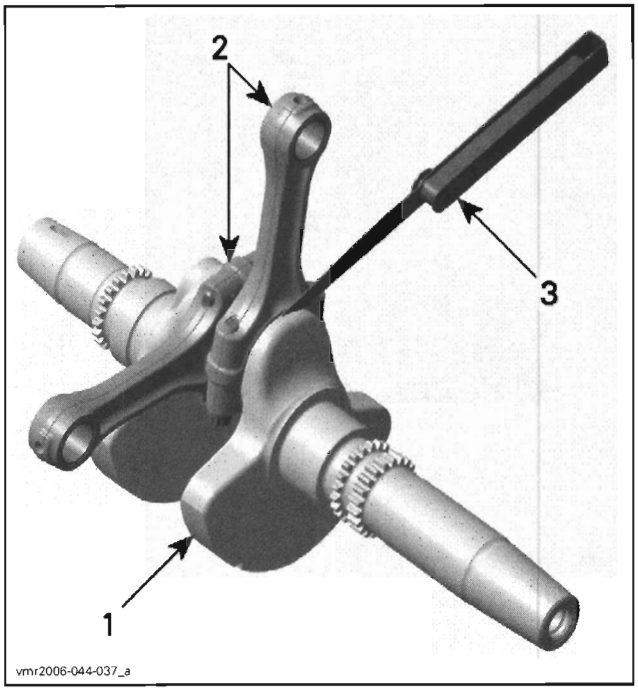
CAUTION: Components with less than the service limit always have to be replaced. If this is not observed, severe damage may be caused to the engine.



1. *Crankshaft timing gears*

Connecting Rod Big End Axial Play

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



1. *Crankshaft*
2. *Connecting rods*
3. *Feeler gauge*

CONNECTING ROD BIG END AXIAL PLAY	
NEW	0.200 to 0.500 mm (.008 to .020 in)
SERVICE LIMIT	0.6 mm (.024 in)

Connecting Rod/Piston Pin Clearance

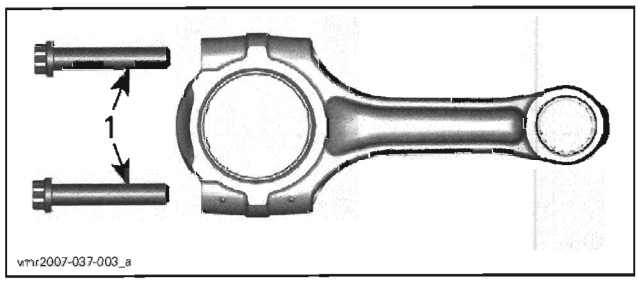
Refer to *CYLINDER AND HEAD* section.

Connecting Rod Big End Radial Play

NOTE: Prior to remove connecting rod from the crankshaft, mark big end halves together to ensure a correct reinstallation (cracked surface fits in only one position).

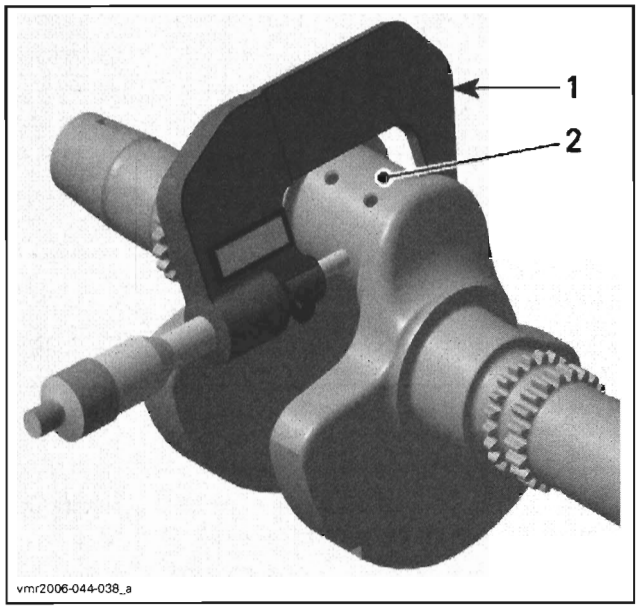
Remove connecting rods from crankshaft.

CAUTION: Always replace connecting rod screws no. 11 if removing the connecting rod. It is recommended to replace plain bearings no. 12, in case of installing the connecting rod.



1. *Connecting rod screws*

Measure crankpin. Compare to inside diameter of connecting rod big end.

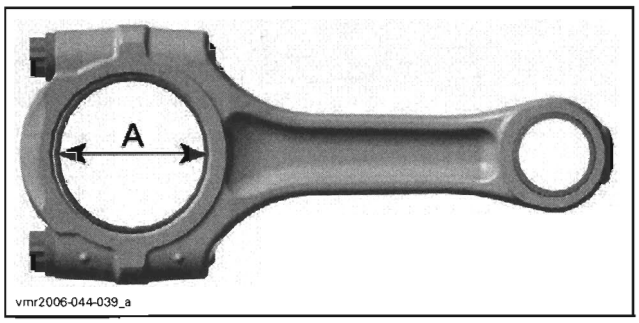


1. *Micrometer*
2. *Crankpin area for plain bearing*

To measure the connecting rod big end diameter, use the OLD screws **no. 11**.

Install the OLD plain bearings **no. 12** as they were mounted initially.

Do the torque procedure as described further.



A. Connecting rod big end plain bearing

CRANKSHAFT PIN DIAMETER	
NEW	40.009 to 40.025 mm (1.5752 to 1.5758 in)
SERVICE LIMIT	39.990 mm (1.5744 in)
CONNECTING ROD BIG END DIAMETER	
SERVICE LIMIT	40.100 mm (1.5787 in)
CONNECTING ROD BIG END RADIAL CLEARANCE	
SERVICE LIMIT	0.09 mm (.0035 in)

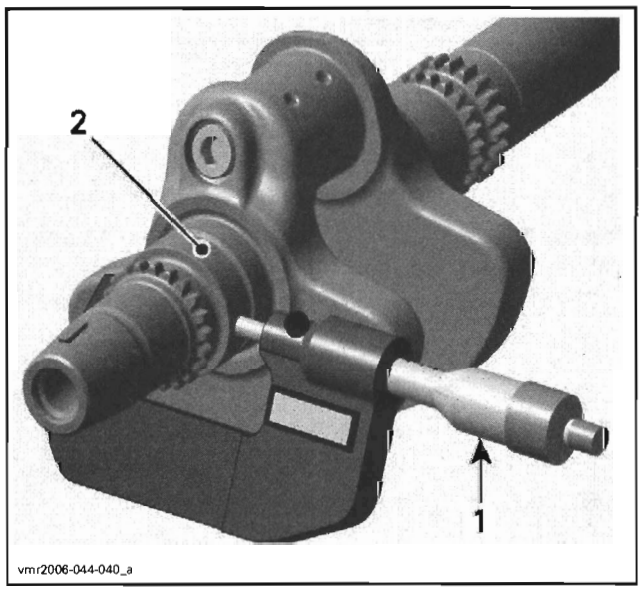
Crankshaft Axial Play

Measure crankshaft axial play on PTO end using a dial indicator. If the distance exceeds specified tolerance, replace crankcase and/or crankshaft.

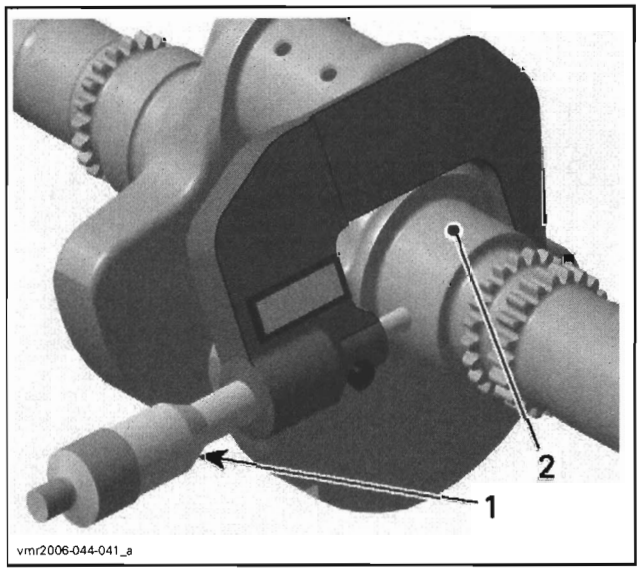
CRANKSHAFT AXIAL PLAY	
NEW	0.200 to 0.500 mm (.008 to .020 in)
SERVICE LIMIT	0.6 mm (.024 in)

Crankshaft Radial Play MAG/PTO Side

Measure crankshaft on MAG/PTO side. Compare to inside diameter of MAG/PTO plain bearing (refer to *CRANKCASE*).



1. *Micrometer*
2. *Crankshaft area for MAG plain bearing*



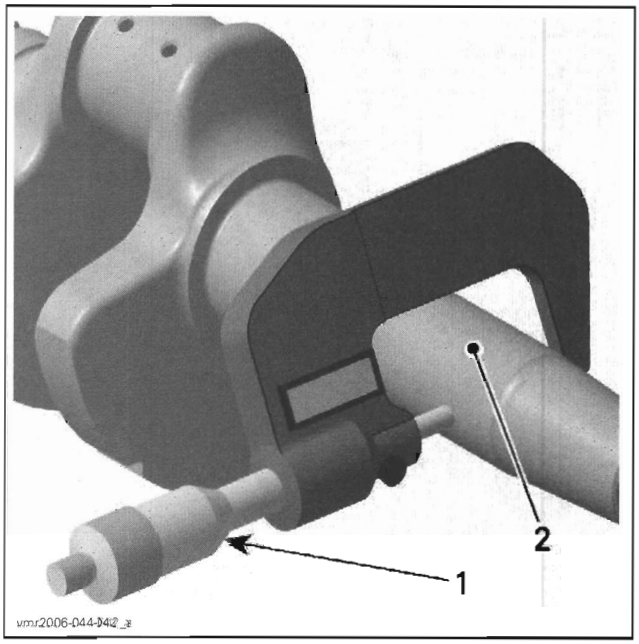
1. *Micrometer*
2. *Crankshaft area for PTO plain bearing*

CRANKSHAFT MAG/PTO SIDE DIAMETER	
NEW	42.024 to 42.040 mm (1.6545 to 1.6551 in)
SERVICE LIMIT	42.000 mm (1.6535 in)

CRANKSHAFT MAG/PTO SIDE RADIAL CLEARANCE	
SERVICE LIMIT	0.07 mm (.0031 in)

Crankshaft Radial Play (PTO side support bearing)

Measure crankshaft journal of PTO support bearing. Compare to inside diameter of PTO support bearing in PTO cover (refer to *PTO COVER*).



1. Micrometer
2. Crankshaft journal (PTO support bearing)

CRANKSHAFT JOURNAL DIAMETER (PTO support bearing)	
NEW	34.024 to 34.040 mm (1.3395 to 1.3402 in)
SERVICE LIMIT	34.010 mm (1.3390 in)

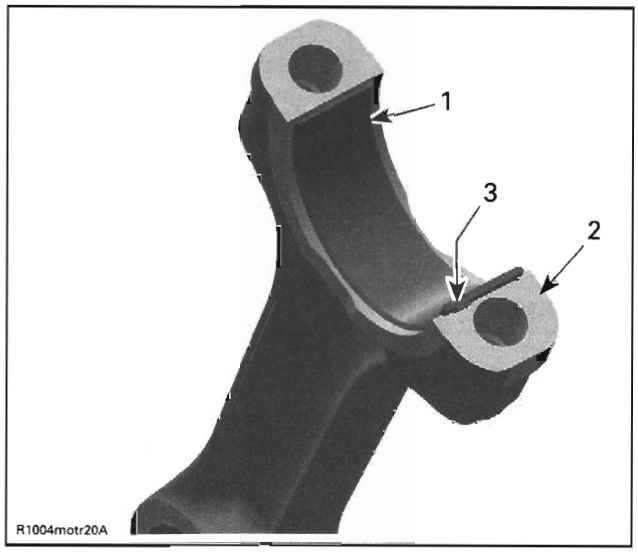
CRANKSHAFT PTO SUPPORT BEARING RADIAL CLEARANCE	
SERVICE LIMIT	0.10 mm (.0039 in)

Crankshaft Assembly

For assembly, reverse the disassembly procedure. Pay attention to following details.

NOTE: Use NEW plain bearings **no. 12**, when connecting rod big end diameter is out of specification.

Put plain bearings correctly in place and clean the split surface on both sides (cracked area) carefully with compressed air.

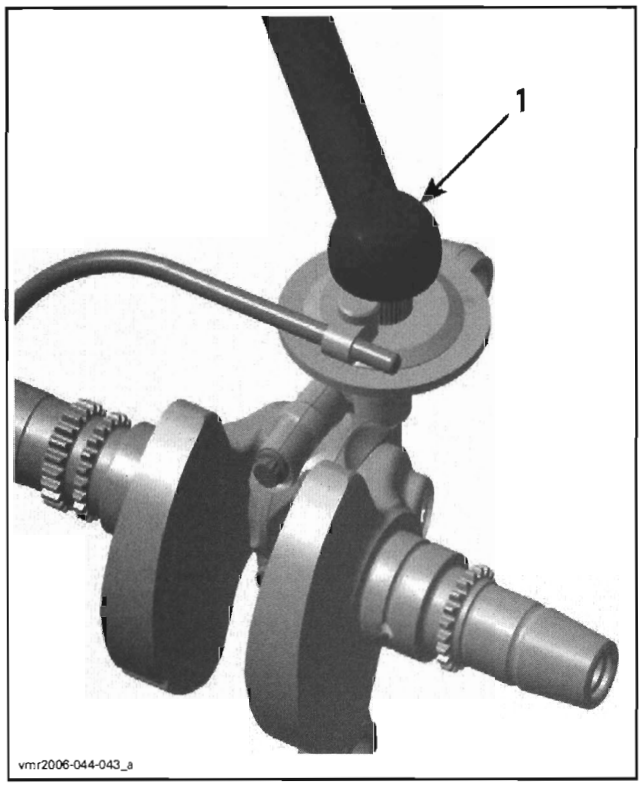


1. Half plain bearing of connecting rod big end
2. Split surface of the connecting rod
3. Nose of plain bearing in line with connecting rod groove

NOTE: Oil the plain bearing surface of the connecting rod and crank pin before installation.

Torque NEW connecting rod screws **no. 11** as per following procedure:

- First, install screws with half of the recommended torque. Do not apply any thread locker.
- Secondly, torque connecting rod screws to 20 N•m (15 lbf•ft).
- Finish tightening the screws with an additional 60° turn using an angle torque wrench.



1. Angle torque wrench

CAUTION: Failure to strictly follow this procedure may cause screw to loosen and lead to engine damage. The plain bearing tapered end must be against the counterweight. Besides, as the "crankpin" screw has been stretched from the previous installation, it is very important to **use a new screw at assembly**.

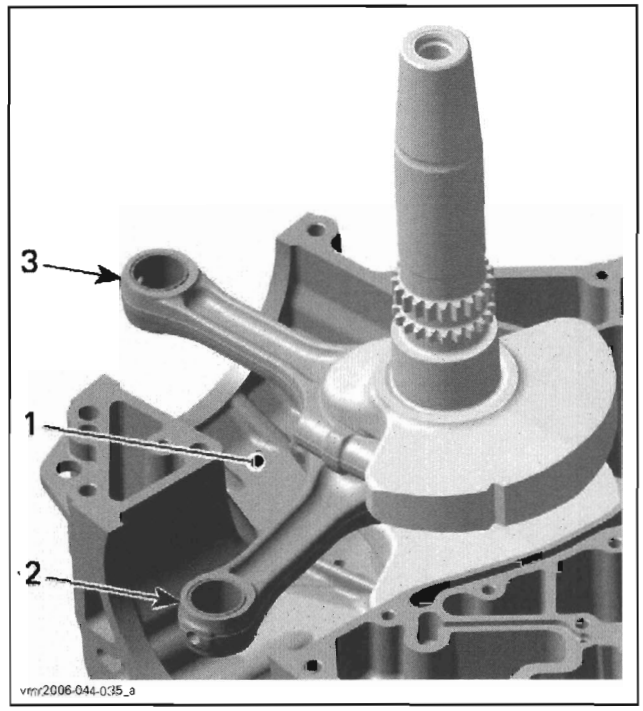
NOTE: The running direction of the big end bearings and of the piston pins must not change.

Crankshaft Installation

For installation of crankshaft in crankcase reverse the removal procedure. Pay attention to the following details.

Do not mix up the connecting rods of cylinders 1 and 2 during installation.

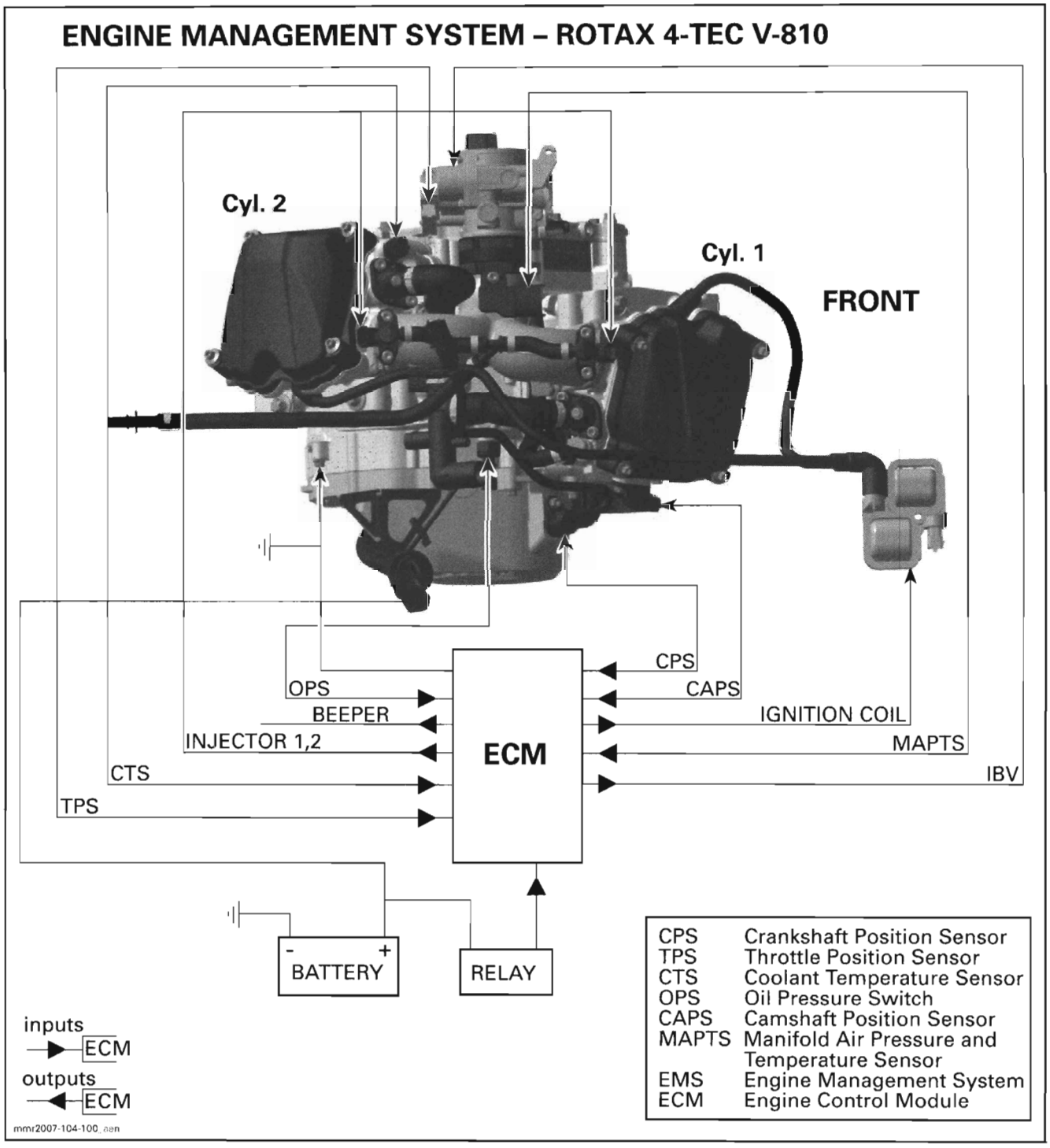
CAUTION: Observe the correct installation position when fitting the crankshaft with the connecting rods. The connecting rod MAG side has to face to cylinder 1.



1. Crankcase half MAG side
2. Connecting rod cylinder 1
3. Connecting rod cylinder 2

CAUTION: Install CRANKSHAFT LOCKING BOLT to put crankshaft in TDC position before installing the camshaft and rocker arms (refer to *CRANKSHAFT LOCKING PROCEDURE*).

OVERVIEW


ENGINE MANAGEMENT SYSTEM – ROTAX 4-TEC V-810
Cyl. 2
Cyl. 1
FRONT
CPS
CAPS
OPS
BEEPER
IGNITION COIL
INJECTOR 1,2
MAPTS
ECM
CTS
IBV
TPS
- +
BATTERY
RELAY
inputs
ECM
outputs
ECM
mmr2007-104-100_aen
CPS Crankshaft Position Sensor
TPS Throttle Position Sensor
CTS Coolant Temperature Sensor
OPS Oil Pressure Switch
CAPS Camshaft Position Sensor
MAPTS Manifold Air Pressure and Temperature Sensor
EMS Engine Management System
ECM Engine Control Module

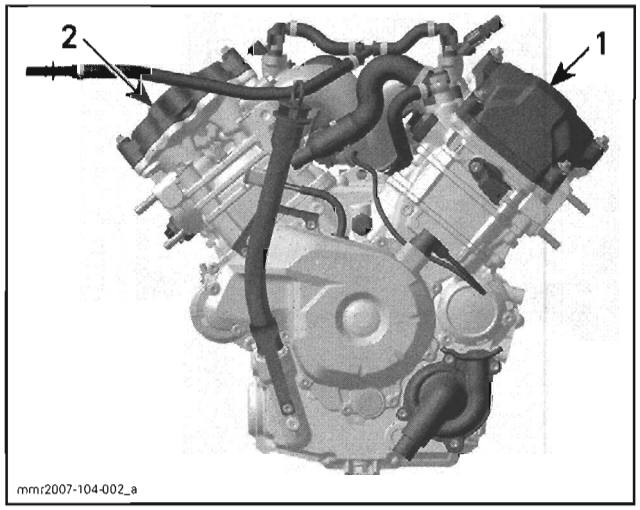
OPERATING PRINCIPLE

A highly advanced engine management system (EMS) has been used to ensure a high power output with cleaner combustion.

There are 3 main systems in interaction with the engine management system (EMS):

1. Air induction.
2. Fuel system.
3. Electrical system.

NOTE: The cylinders are referenced as 1 (front) and 2 (rear).



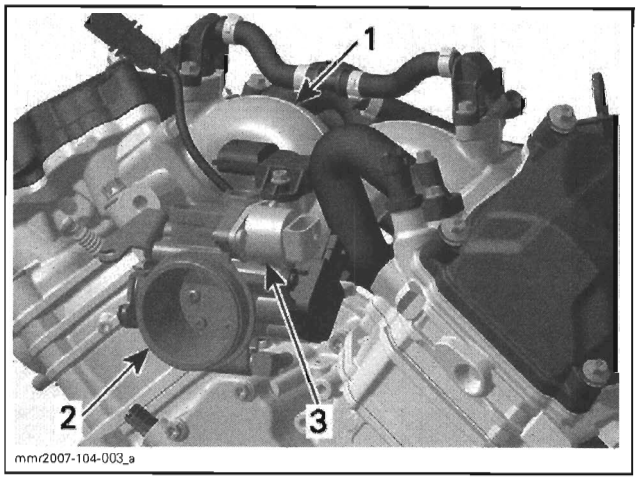
1. Cylinder 1 (front)
2. Cylinder 2 (rear)

AIR INDUCTION

Air flows through air filter, air intake silencer, throttle body, intake manifold and then goes into combustion chamber. Air pressure and temperature are measured directly in the intake manifold.

Throttle Body

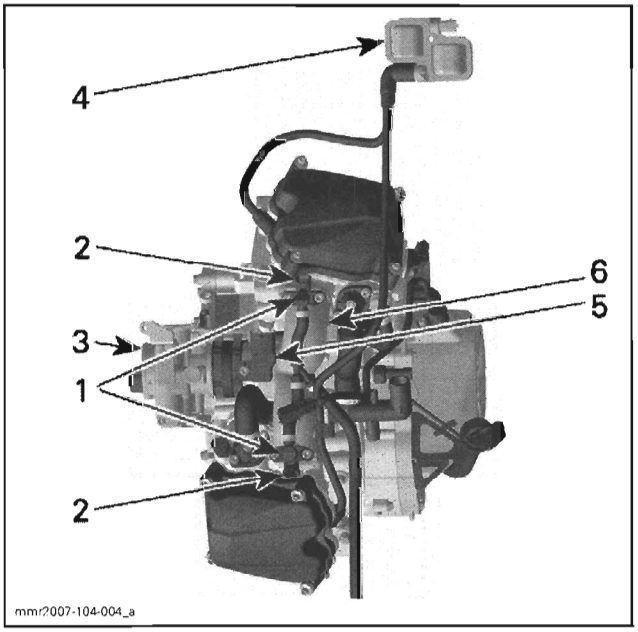
The 46 mm throttle body is mounted on the side of intake manifold. Fitted on the throttle body, there is the TPS and the idle bypass valve which allows the ECM to control the idle speed while the throttle plate is closed.



1. Intake manifold
2. Throttle body
3. Idle bypass valve

Intake Manifold

The intake manifold is mounted on the top of the engine on both cylinder heads. It provides support for the throttle body, fuel injectors, the fuel rails and the MAPTS (manifold air pressure and temperature sensor).



INTAKE MANIFOLD
1. Fuel rail
2. Injector
3. Throttle body
4. Ignition coil
5. Manifold air pressure and temperature sensor (MAPTS)
6. Intake manifold

FUEL SYSTEM

During the intake stroke, the ECM (engine control module) activates the fuel injector and fuel is sprayed into the intake port. The injector uses the high pressure inside the fuel rail. The air/fuel mixture then enters the combustion chamber through the open intake valve. This mixture is then ignited by the spark plug at the end of the compression stroke.

Fuel Rail

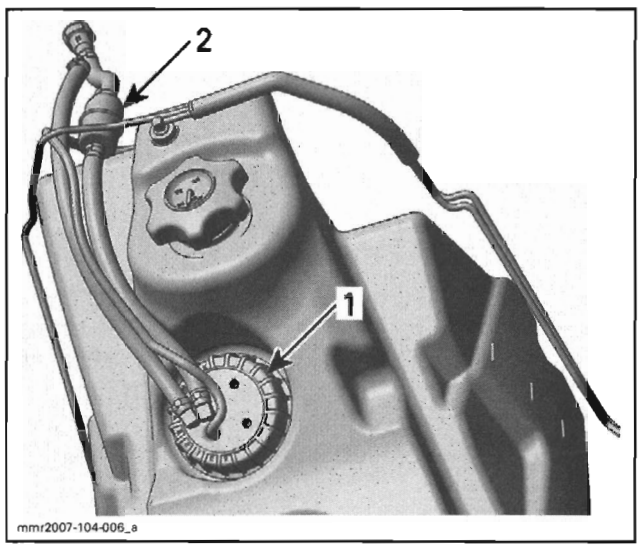
The fuel rail distributes the correct fuel pressure to each injector which are mounted on the intake manifold. The fuel rail is fed by the fuel pump at a specific fuel pressure.

Fuel Injector

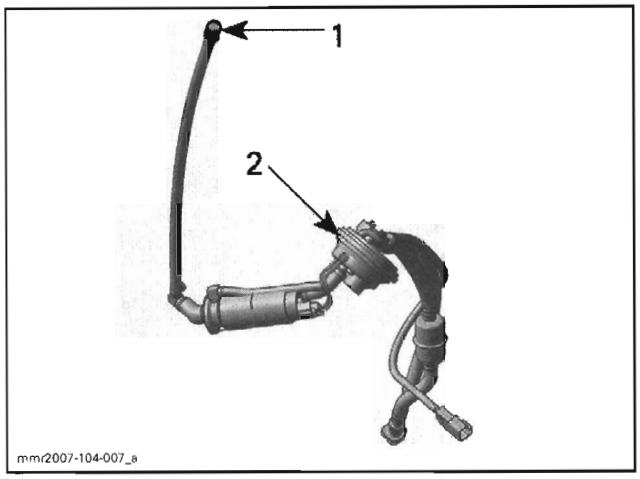
Two fuel injectors (one per cylinder) are used to inject fuel into the intake port of the cylinder head.

Fuel Pump Module

The fuel pump module is inside fuel tank. The module includes fuel pump and the fuel pressure regulator. The fuel pump inlet includes a strainer. Refer to *FUEL SYSTEM*.



1. *Fuel pump module*
2. *In-line fuel filter*



1. *Strainer*
2. *Fuel pressure regulator (inside)*

Fuel Pressure Regulator

A fuel pressure regulator, inside fuel pump module, controls the pressure in the system. Excess fuel is returned to the fuel tank. Refer to *FUEL SYSTEM*.

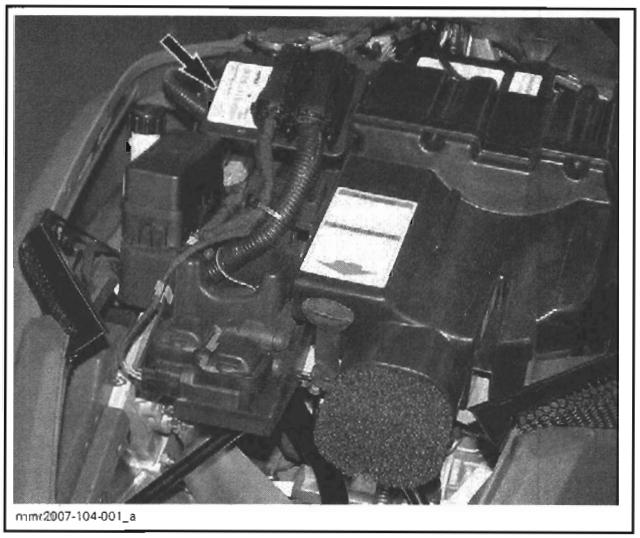
ELECTRICAL SYSTEM

A communication link (CAN lines) is used to communicate between the ECM and the B.U.D.S. software. CAN lines consist of a pair of wires (WHITE/BEIGE and WHITE/BLACK). Refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS*.

Engine Control Module (ECM)

The ECM controls the electrical system and the engine management functions, by processing the information given by various sensors.

The ECM is located just under hood.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The ECM features a permanent memory that will keep the fault codes, customer information and other engine information, even when the battery is removed from the vehicle.

When ignition key is turned to START, the ECM initiates a self-diagnostic mode. However, some components need the engine to be running so that they can be monitored. Some problems will turn on a warning lamp and will set the engine in limp home mode. Refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS* section for more information.

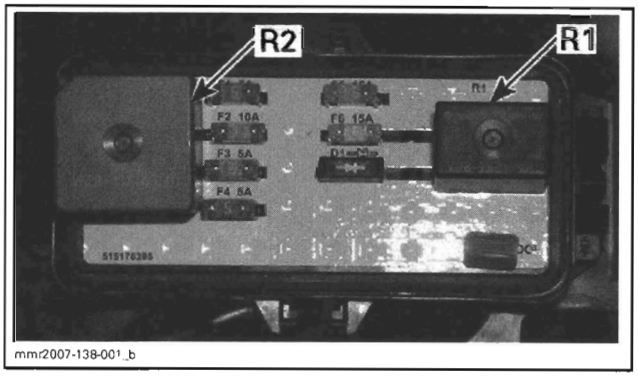
Power Distribution

Electrical system is protected by fuses located in the fuse box. Refer to *LIGHTS, INSTRUMENTS AND ACCESSORIES*.

⚠ WARNING

Engine-related sensors and injectors are continuously powered from the battery when the ECM is woken up. The ECM switches the ground to complete the electrical circuits it controls. Take this into account when troubleshooting the electrical system. Always disconnect the battery prior to disconnecting any electric or electronic parts.

The system uses 2 relays that control different components. See illustration.



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R1: ECM, EMS (Ignition/injectors, fuel pump) and gauges
R2: Lights and accessories

When the ignition key is briefly turned to START or held, it wakes up the EMS and powers the relay 1. Then, if the cut-off switch and the tether cord are in the RUN position while the START position is held, the starter solenoid is activated.

When engine reaches approximately 800 RPM, the ECM activates the relay 2.

Gauges Current Supply

Gauges are supplied with current for 30 seconds when briefly turning ignition key to START. At the same moment, the fuel pump is activated for 2 seconds to build up pressure in the fuel injection system.

NOTE: On vehicle without gauges, the oil light will turn on.

NOTE: Setting engine cut-out switch to OFF or removing the tether cord will prevent engine cranking.

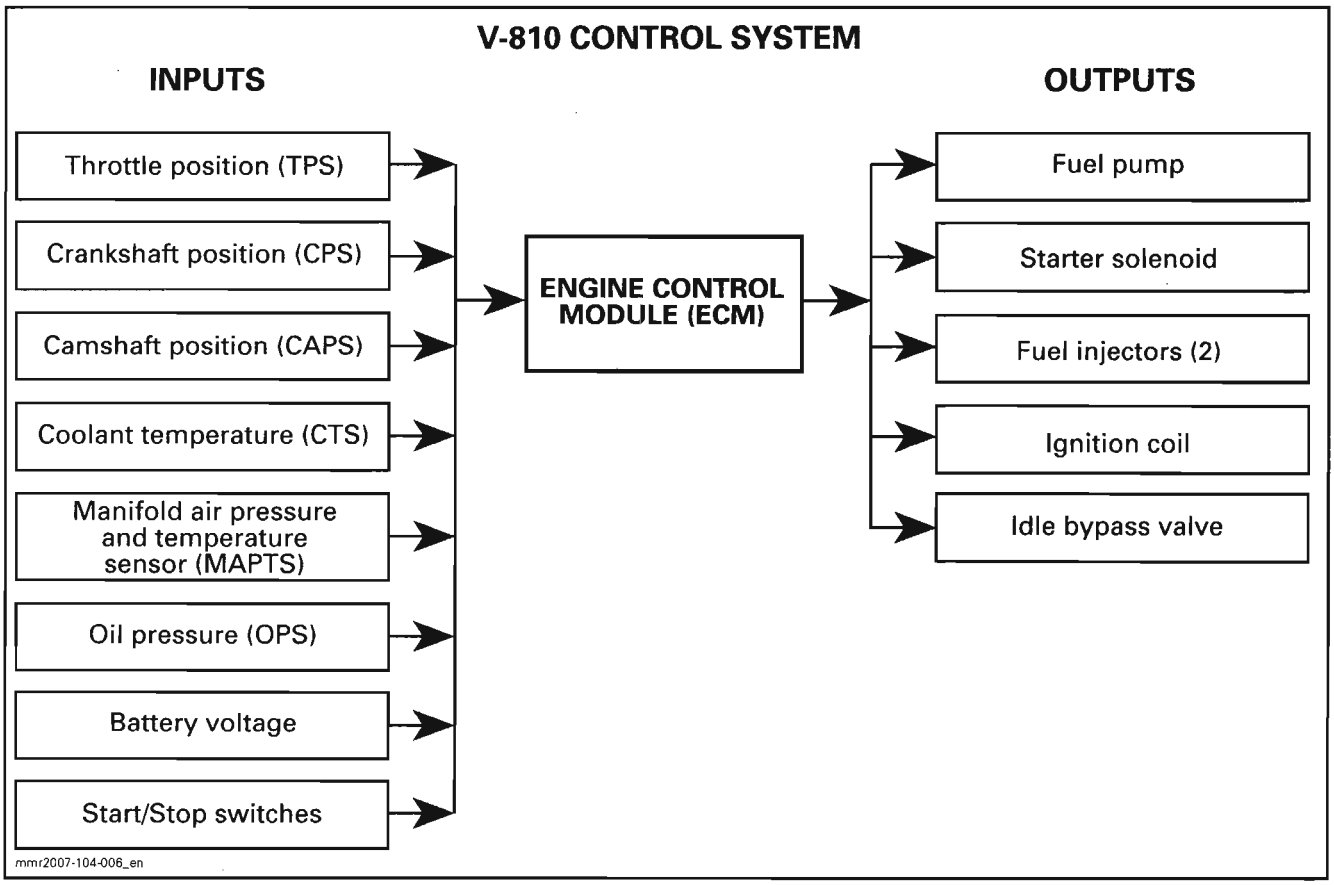
Automatic Power Shut-Down

The ECM is equipped with an automatic power shut-down. This feature prevents the battery from discharging if the ignition key is left in the ON position when the engine is not running for more then 30 seconds. The ECM will remain offline until the ignition key is turned to START.

ENGINE MANAGEMENT SYSTEM

The EMS calculates the proper air/fuel mixture and ignition timing for each cylinder separately.

The ECM is the central point of the engine management system. It reads the inputs, makes computations, uses pre-determined parameters and sends the proper signals to the outputs for proper engine management.



ELECTRONIC FUEL INJECTION

The ECM reads the signals from different sensors which indicate engine operating conditions at millisecond intervals.

Signals from sensors are used by the ECM to determine the injection parameters (fuel maps) required for optimum air-fuel ratio.

The CPS, the MAPTS and the TPS are the primary sensors used to control the injection and ignition timing. Other sensors (like temperature sensors, etc.) are used for secondary input.

IGNITION

The ignition system is fully managed by the ECM which controls the ignition system parameters, such as spark timing, duration and firing order to achieve the proper engine requirements.

Ignition Coil

A double ignition coil induces voltage to a high level in the secondary winding to produce a spark at each spark plug independently.

The ignition coil receives input from the ECM.

The ignition coil is located just under hood.

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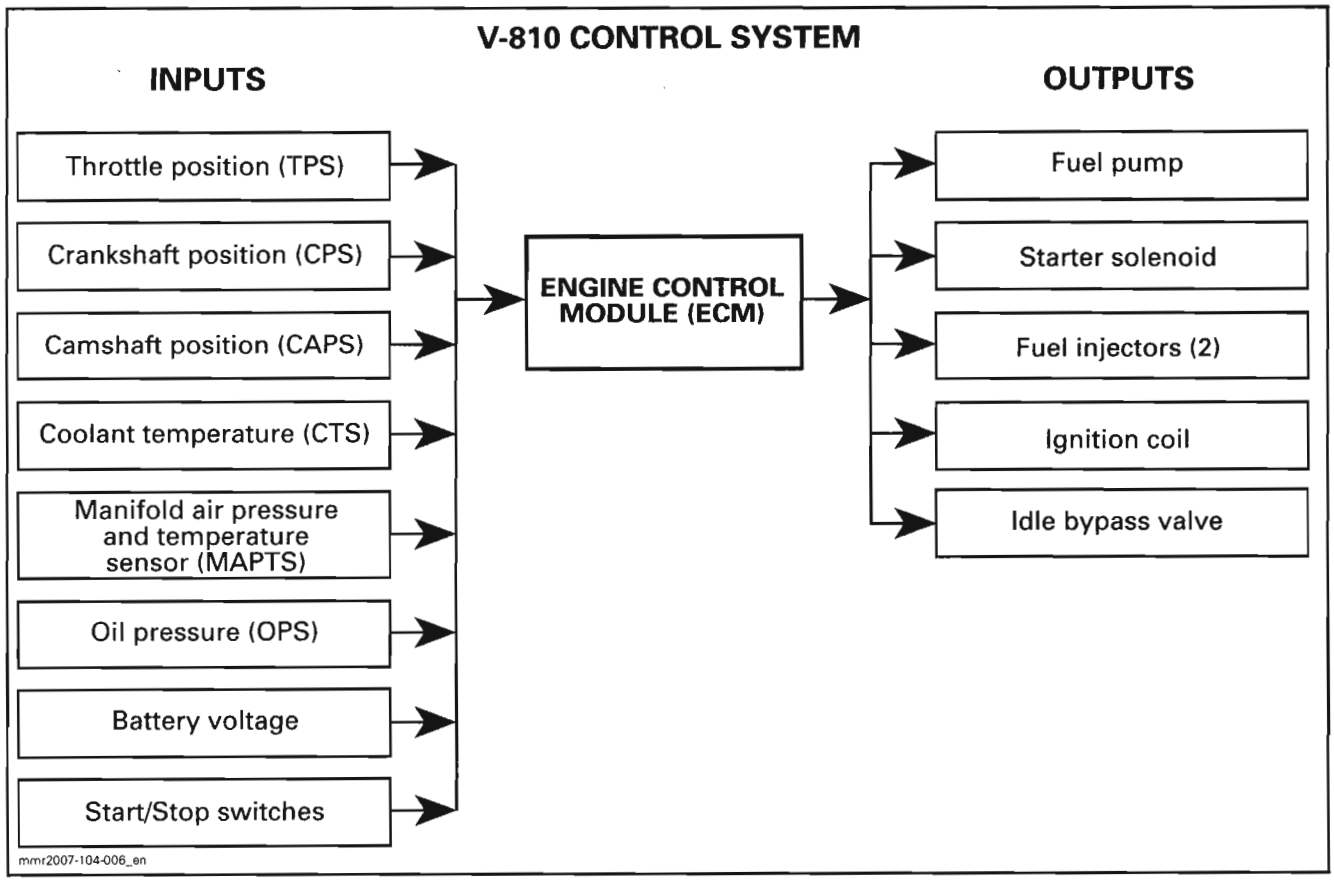

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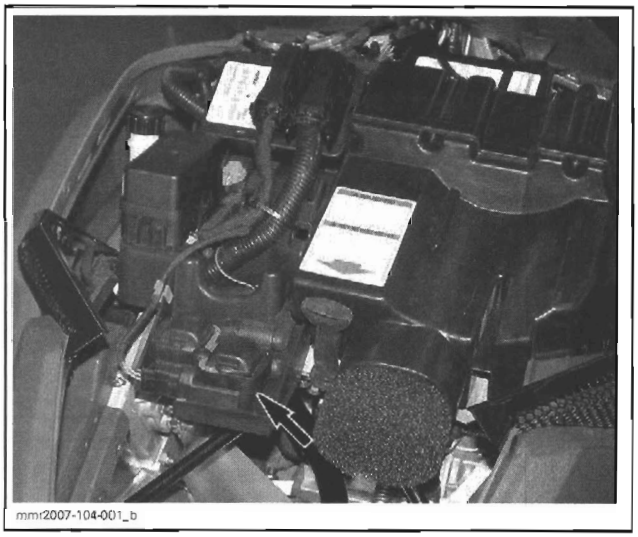


Ignition Timing

The ECM is programmed with data (it contains ignition mappings) for optimum ignition timing under all operating conditions. Using engine operating conditions provided by the sensors, the ECM controls the ignition timing for optimum engine operation. There is no mechanical adjustment to perform.

ENGINE MODES OF OPERATION

Engine RPM Limiter

The ECM will limit the maximum engine speed to approximately 8000 RPM by cutting fuel injection and ignition.

The ECM uses the CPS for this function.

Limp Home Mode

The ECM may automatically set default parameters to the engine management to ensure the adequate operation of the engine if a component of the fuel injection system is not operating properly. The engine will operate with reduced performance to protect the engine. In more severe cases, the engine RPM will be limited, also to protect the engine.

These performance-reduced modes allow the rider to go back home which would not be otherwise possible without this advanced system. Refer to the *EMS DIAGNOSTIC AND COMMUNICATION TOOLS* for a complete chart.

In the following situations, engine RPM will be limited.

CONDITION	MAX ALLOWED RPM
High engine temperature	5000
Low oil pressure	4500
Safety fuel cut-off (TPS or internal memory error)	5000

Drowned Mode (Flooded Engine)

If engine is fuel-flooded and does not start, this special mode can be activated to prevent fuel injection and ignition while cranking. Proceed as follows to activate it.

Install tether cord and set engine cut-off switch to RUN.

Press and HOLD throttle lever at WOT position.

Turn ignition key to START. The mode is now on.

If engine does not start, it may be necessary to remove spark plugs and crank engine with rags over spark plug holes. Refer to *ADJUSTMENT AND REPAIR PROCEDURES* subsection.

To leave the drowned mode, release START (ignition key) and throttle lever.

MONITORING SYSTEM

The ECM monitors the electronic components of the fuel injection system and also parts of the electrical system. When a significant fault occurs, it sends visual messages through the referring warning light and sometimes audible signals through a beeper to inform you of a particular condition. Refer to the *EMS DIAGNOSTIC AND COMMUNICATION TOOLS* for a chart.

For some faults, the warning light/beeper may disappear automatically when the condition no longer exists.

Releasing throttle and letting the engine returning at idle speed may allow normal operation to come back. If it does not work, try stopping engine then restarting it. An analysis of occured faults using B.U.D.S. is recommended. Refer to the *EMS DIAGNOSTIC AND COMMUNICATION TOOLS*.

Battery Voltage Warning Device

When the battery voltage is either too low or too high, the ECM sends out a signal to the check engine light, battery light and beeper will warn. Limp home will be set.

Low Oil Pressure Warning Device

When the oil pressure falls under a certain level, the OPS sends out a signal to the low oil pressure light and to the ECM. The ECM then activates the check engine light. Limp home will be set.

High Coolant Temperature Warning Device

When the coolant temperature is getting too high, the ECM sends out signals to the engine overheating light and to the check engine light. Limp home will be set.

EMS DIAGNOSTIC AND COMMUNICATION TOOLS

SERVICE TOOLS

Description	Part Number	Page
Communication kit	529 035 981	295
diagnostic cable	710 000 851	298
Diagnostic cable	710 000 851	297
MPI-2	529 036 018	297–298
Optional extension cable	529 035 697	297
Optional extension cable	529 035 703	295
supply T-harness	529 035 869	296, 298
Supply T-harness	529 035 869	295, 297

GENERAL

Here is the basic order suggested to diagnose a suspected engine management or fuel injection related problem:

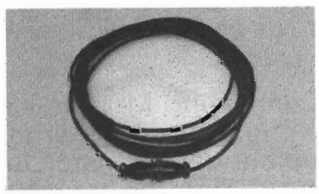
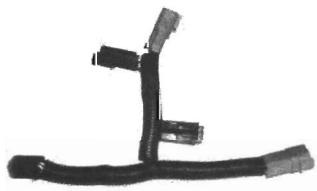
- Check the chart in the *TROUBLESHOOTING* section to have an overview of problems and suggested solutions.
- Check if the engine management system (EMS) pilot lamp blinks. If so, use the B.U.D.S. software and look for fault codes to diagnose the trouble.
- Check all fuses.
- Check relay 1.
- Check fuel pressure.
- Check spark plugs condition.
- Check all connections of the wiring harness.
- Refer to *ADJUSTMENT AND REPAIR PROCEDURES* section for procedures.

When using the service action suggested in the Fault section of B.U.D.S., the system circuits are referred to as 2-A-41, which means connector "A" on the ECM and pin 41. The first digit (2) indicates connector location in vehicle such as shown in the *WIRING DIAGRAMS*.

COMMUNICATION TOOLS

Two different MPI (Multi-Purpose Interface) can be used with B.U.D.S. software: MPI and MPI-2.

MULTI-PURPOSE INTERFACE (MPI)

PART REQUIRED
PC computer
B.U.D.S. software Use latest version available on BOSSWeb
Communication kit (P/N 529 035 981)
Optional extension cable (P/N 529 035 703) 
Supply T-harness (P/N 529 035 869) 

MPI Supply

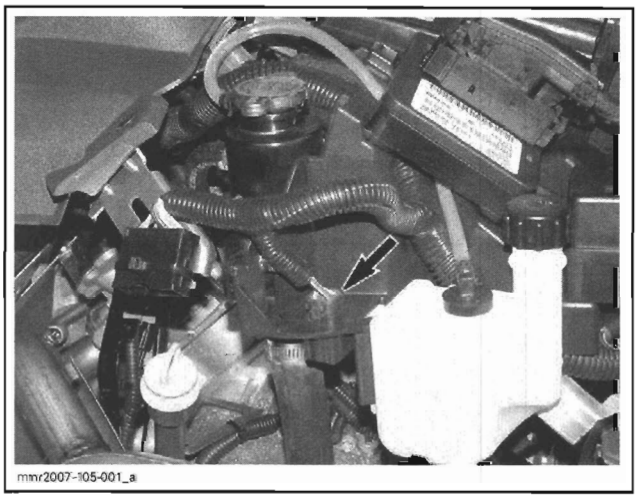
The MPI can use the vehicle power for its supply. Four AA batteries or an AC/DC power supply can also be used. Make sure to respect MPI specification if a power supply is used.

Connections with Vehicle

⚠ WARNING

If the computer you are using is connected to the power outlet, there is a potential risk of electric shock when working in contact with water. Be careful not to touch water while working with the computer.

Remove the 6 pin connector from its receptacle on the right side of the vehicle.

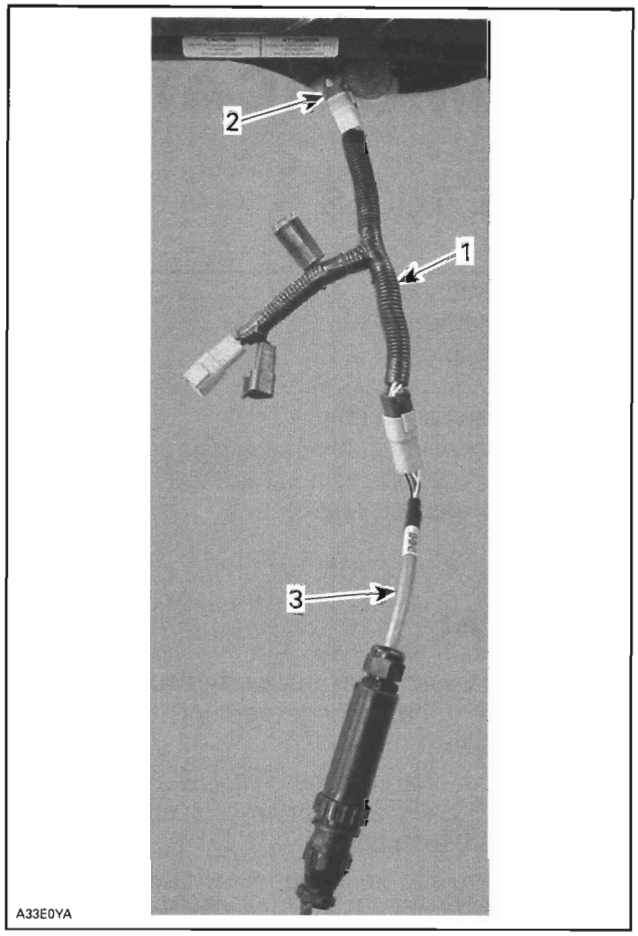


Connect supply T-harness (P/N 529 035 869), to vehicle 6-pin connector.

NOTE: The use of the supply T-harness will keep the ECM ON. Not using it will allow the ECM shutting-off after some time.

CAUTION: Connecting MPI directly to vehicle connector (without supply T-harness) may lead to an incomplete data transfer to the ECM if it shuts down during the transfer. If this occurs during a reflashing of the ECM, it could become unusable. Always use the proper supply T-harness to allow continuous communication.

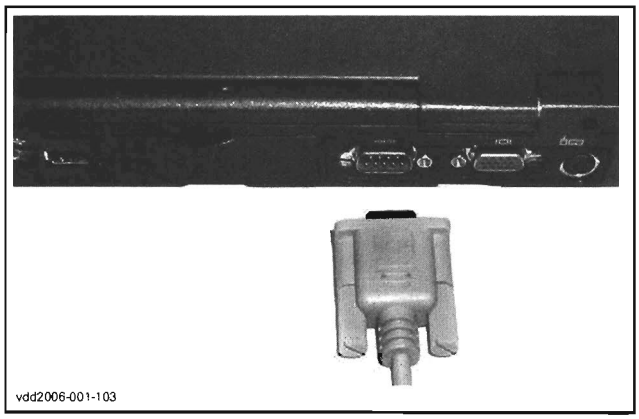
Connect the 6 pin diagnostic cable from MPI to supply T-harness.



TYPICAL
1. *Supply T-harness*
2. *Vehicle 6-pin connector*
3. *MPI cable*

Connect remaining MPI connector to the serial port of a PC (personal computer).

Use B.U.D.S. software as described further in *B.U.D.S. SOFTWARE*.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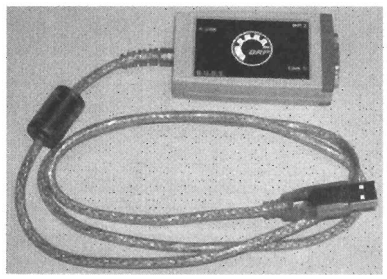
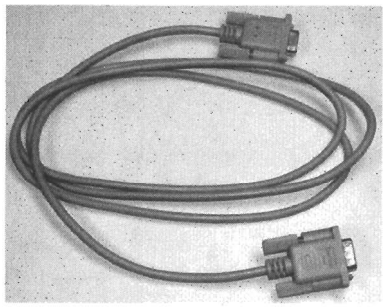
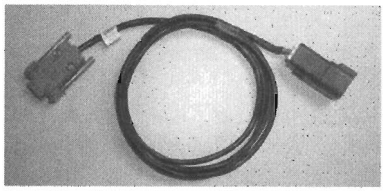
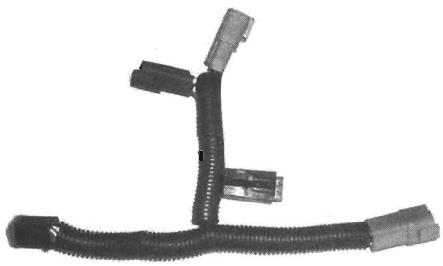
MULTI-PURPOSE INTERFACE-2 (MPI-2)

PART REQUIRED
PC computer
B.U.D.S. software Use latest version available on BOSSWeb
MPI-2 (P/N 529 036 018) 
Optional extension cable (P/N 529 035 697) 
Diagnostic cable (P/N 710 000 851) 
Supply T-harness (P/N 529 035 869) 

MPI-2 Supply

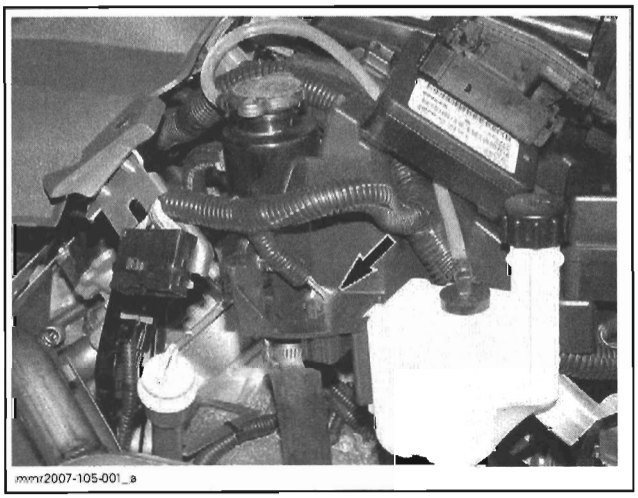
The MPI uses the PC computer USB port power for its supply.

Connections with Vehicle

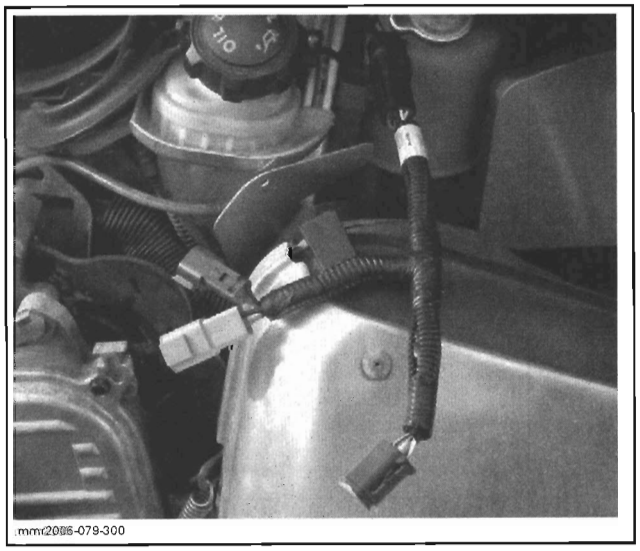
⚠ WARNING

If the computer you are using is connected to the power outlet, there is a potential risk of electric shock when working in contact with water. Be careful not to touch water while working with the computer.

Remove the 6 pin connector from its receptacle on the right side of the vehicle.



Connect supply T-harness (P/N 529 035 869), to vehicle 6-pin connector.

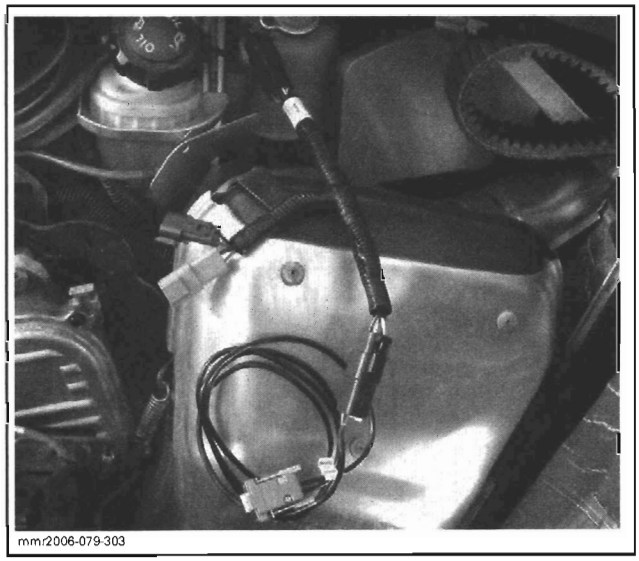


TYPICAL

NOTE: The use of the supply T-harness will keep the ECM ON. Not using it will allow the ECM shutting-off after some time.

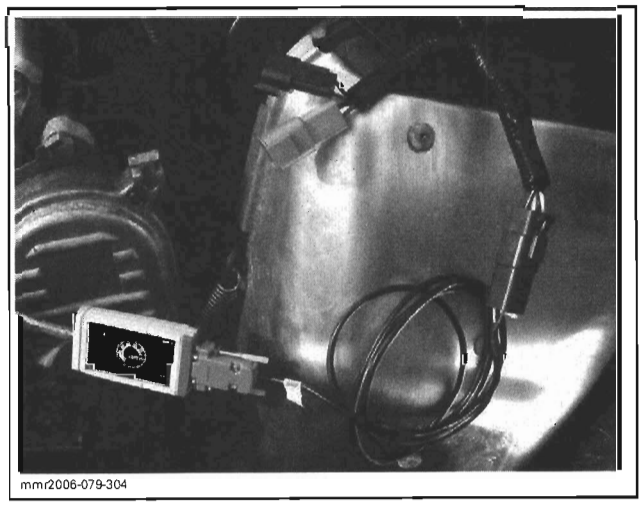
CAUTION: Connecting MPI directly to vehicle connector (without supply T-harness) may lead to an incomplete data transfer to the ECM if it shuts down during the transfer. If this occurs during a reflashing of the ECM, it could become unusable. Always use the proper supply T-harness to allow continuous communication.

Connect diagnostic cable (P/N 710 000 851) to supply T-harness connector.



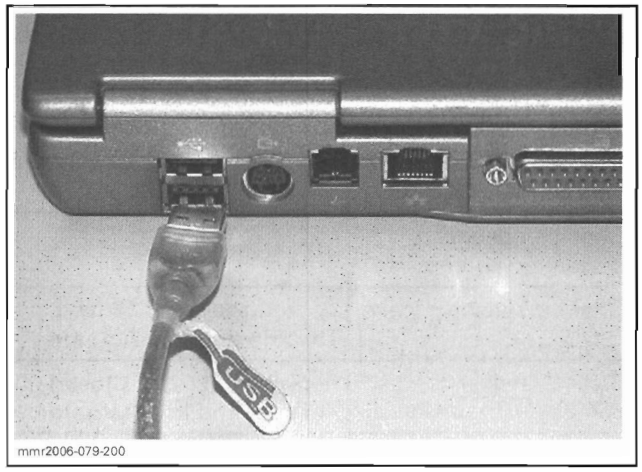
TYPICAL

Connect MPI-2 (P/N 529 036 018) to diagnostic cable.



TYPICAL

Connect remaining MPI-2 connector to the USB port of a PC (personal computer).


mmr2006-079-200

B.U.D.S. SOFTWARE

B.U.D.S. (Bombardier Utility and Diagnostic Software) is designed to allow electrical component inspection, diagnostic options and adjustments such as the closed throttle.

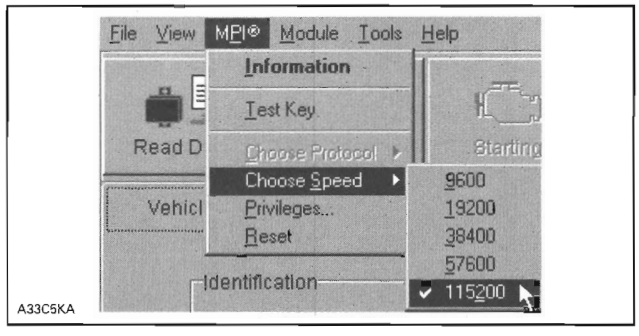
For more information pertaining to the use of the B.U.D.S. software, use its help which contains detailed information on its functions.

When using the service action suggested in the Fault section of B.U.D.S., for instance, a system circuit referred to as DA-35, means connector "A" on the ECM and the contact 35.

When using the B.U.D.S. software:

MPI Only

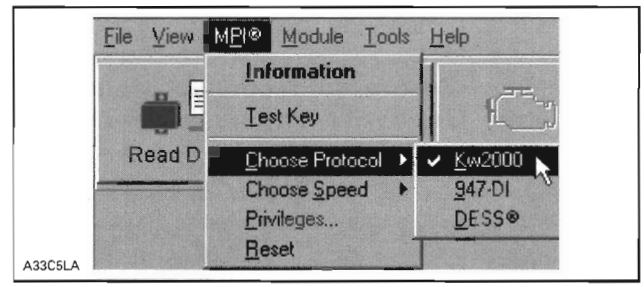
– ensure that 115200 speed is properly selected in "MPI" under "**Choose speed**".



NOTE: If you are using an old PC computer, it may be necessary to use a slower speed so that the communication works.

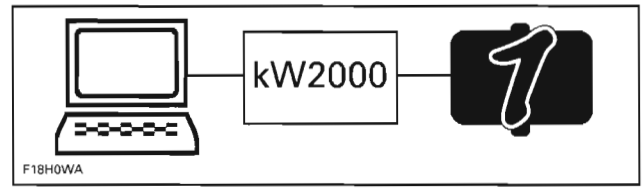
MPI and MPI-2

– ensure that the protocol "kW2000" is properly selected in "MPI" under "**Choose protocol**



– ensure the status bar shows the kW2000 and the number 1 to the right. To communicate with the ECM, number 1 must be displayed.

Number 1 indicates that the ECM is recognized by the MPI.



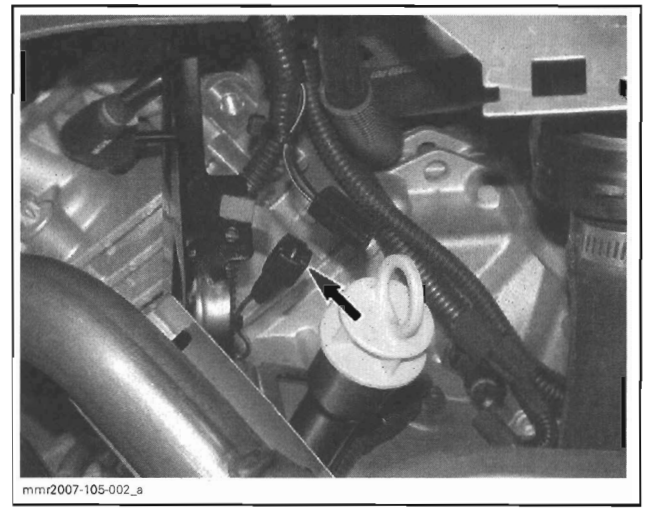
CONNECTION SUCCESSFUL

If an "X" is shown, this means that no communication between the MPI and the ECM is possible. In this case possible causes are:

– ECM is not powered-up
– wrong protocol is used
– bad connection between MPI and ECM.

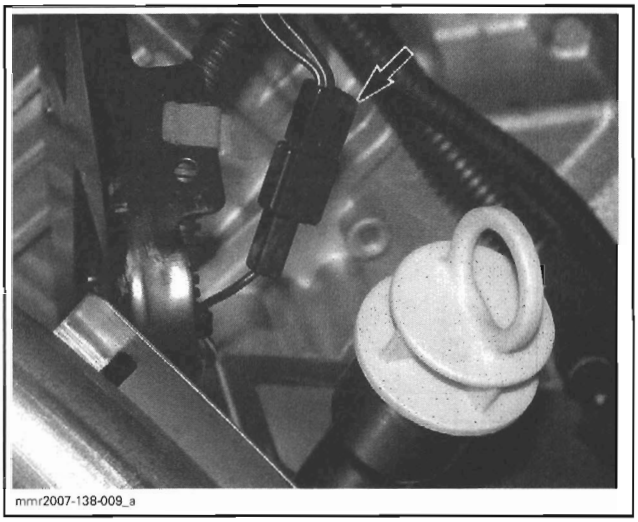
Changes in ECM

Anytime a change is brought in ECM through B.U.D.S., there will be an "EMS Tracking" message that will say "Remove key from vehicle". When this occurs, disconnect the EMS tracking connector.


mmr2007-105-002_a

CONNECTOR CLOSE TO OIL DIPSTICK

Wait until the message disappears (it lasts approximately 15 seconds after connector disconnection). **Ensure to reconnect connector afterwards. Otherwise, engine will not crank.**



CONNECTED FOR NORMAL ENGINE OPERATION

DIAGNOSTIC

FAULT CODES

General

The faults saved in the ECM (Engine Control Module) are kept even if the battery is disconnected.

IMPORTANT: After a problem has been solved, ensure to clear the fault(s) in the ECM using the B.U.D.S. software. This will properly reset the appropriate counter(s) and will also record that the problem has been fixed in the ECM memory.

Many fault codes at the same time is likely to be burnt fuse(s) or a faulty relay.

For more information pertaining to the fault codes (state, count, first, etc.) and report, refer to B.U.D.S. online help.

TPS (Throttle Position Sensor) Faults

Faults which are reported in B.U.D.S. fall into two groups: TPS faults and adaptation faults. These are displayed on the B.U.D.S. system as TPS OUT OF RANGE and TPS ADAPTATION FAILURE.

TPS "OUT OF RANGE" Fault

It is caused by the sensor reading going out of its allowable range. This fault can occur during the whole range of movement of the throttle.

To diagnose this fully, it is recommended to operate the throttle through its full range. It is also recommended to release the throttle quickly as this may also reveal a fault that is intermittent.

POSSIBLE CAUSES	ACTION
Check if connector is disconnected from TPS	Fix.
Check if sensor is loose	Tighten and reset **Closed Throttle and Idle Actuator**.
Inspect sensor for damage or corrosion	Replace and reset **Closed Throttle and Idle Actuator**.
Inspect wiring (voltage test)	Repair.
Inspect wiring and sensor (resistance test)	If bad wiring, repair. If bad TPS, replace and reset **Closed Throttle and Idle Actuator**.
Test sensor operation (wear test)	Replace and reset **Closed Throttle and Idle Actuator**.

TPS "ADAPTATION FAILURE" Fault

It is caused by the idle position moving out of an acceptable range.

Following problems can be caused by a TPS "Adaptation Failure":

- Idle speed is out of range.
- Engine stops when throttle is released quickly.
- Engine runs inconsistent in low partload or low RPM.

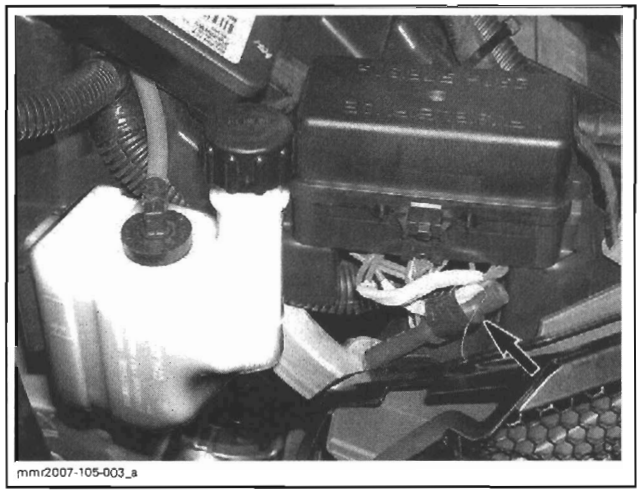
POSSIBLE CAUSES	ACTION
Sensor has been replaced and TPS closed position not reset	Reset **Closed Throttle and Idle Actuator**.
Throttle body has been replaced and TPS closed position not reset	Reset **Closed Throttle and Idle Actuator**.
ECM has been replaced and TPS closed position not reset	Reset **Closed Throttle and Idle Actuator**.
Throttle cable too tight	Tighten and reset **Closed Throttle and Idle Actuator**.
Sensor is loose	Tighten and reset **Closed Throttle and Idle Actuator**.
Throttle bracket is loose	Tighten and reset **Closed Throttle and Idle Actuator**.
Idle speed screw (tamper proof) worn or loose	Change throttle body.
Idle bypass valve replaced but not reset	Reset **Closed Throttle and Idle Actuator** using B.U.D.S.

Fault Code P0654

If this code occurs and tachometer works normally, disregard this fault code.

Fault Code P1611

If you experience the check engine light slightly flashing and the beeper sounding erratically, it may be the capacitor in wiring harness under fuse box.


mmr2007-105-003_a

Refer to service action in B.U.D.S. pertaining to this code and if everything tests good, try a new capacitor.

FAULT CODE TABLE

CHECK ENGINE LIGHT	BEEPER	LIMP HOME MODE	FAULT CODE	DESCRIPTION	CAUSE	ACTION
OFF	OFF	Active	P0106	Air pressure sensor voltage out of range	Sensing port dirty or blocked. Sensor failure or unexpected reading. Disconnected sensor. Intake leakage, cracked gasket, sensor fit, loose bolts.	Make sure sensor's connector is fully inserted. Check for approximately 5 volts between sensor connector pins 1 and 4. Check system circuits DA-12, DA-28 and DA-40. Check for intake leakage, cracked gasket, sensor fit, loose bolts.
Flash	OFF	Active	P0107	Air pressure sensor voltage too low	Damaged circuit wires, damaged or disconnected sensor, sensor shorted to ground.	Make sure sensor's connector is fully inserted. Check for approximately 5 volts between sensor connector pins 1 and 4. Check system circuits DA-12, DA-28 and DA-40.
Flash	OFF	Active	P0108	Air pressure sensor voltage too high	Damaged circuit wires, damaged or disconnected sensor, sensor shorted to a supply.	Make sure sensor's connector is fully inserted. Check for approximately 5 volts between sensor connector pins 1 and 4. Check system circuits DA-12, DA-28 and DA-40.
Flash	OFF	Active	P0111	Air temperature sensor functional problem	Intermittent air temperature sensor reading or circuit wires shorted to ground.	The air temperature sensor is part of the pressure temperature sensor. Check for approximately 2500 ohms between sensor connector pins 1 and 2. Check system circuits DA-7 and DA-28. Replace the sensor if necessary.

CHECK ENGINE LIGHT	BEEPER	LIMP HOME MODE	FAULT CODE	DESCRIPTION	CAUSE	ACTION
Flash	OFF	Active	P0112	Air temperature sensor voltage too low	Air temperature sensor or circuit wires shorted to ground.	The air temperature sensor is part of the pressure temperature sensor. Check the air temperature sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between sensor connector pins 1 and 2. Check system circuits DA-7 and DA-28. Replace the sensor if necessary.
Flash	OFF	Active	P0113	Air temperature sensor voltage too high	Disconnected sensor or sensor's resistance too high.	The air temperature sensor is part of the pressure temperature sensor. Check the air temperature sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between sensor connector pins 1 and 2. Check system circuits DA-7 and DA-28. Replace the sensor if necessary.
Flash	OFF	Active	P0116	Engine temperature sensor functional problem	Intermittent engine temperature sensor reading or circuit wires shorted to ground.	Check system circuits DA-11 and DA-27. Replace the sensor if necessary.
Flash	OFF	Active	P0117	Engine temperature sensor voltage too low	Engine temperature sensor or circuit wires shorted to ground.	Disconnect the sensor and check for a change in the fault code. If the fault code stays the same, look for a short circuit on the harness. If the fault code is different, replace the sensor. Check for leakage between sensor's connection and ground. Check system circuits DA-11 and DA-27.
Flash	OFF	Active	P0118	Engine temperature sensor voltage too high	Disconnected sensor or sensor's resistance too high.	Check for disconnected engine temperature sensor. Check the engine temperature sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). Replace the sensor if necessary. Check system circuits DA-11 and DA-27.
Flash	OFF	Active	P0122	Throttle position sensor voltage too low	Damaged circuit wires, damaged throttle position sensor or damaged ECM pins.	Check system circuits DA-24, DA-25 and DA-39. Refer to the service manual for complete throttle position sensor testing procedure.
Flash	OFF	Active	P0123	Throttle position sensor voltage too high	Damaged circuit wires, damaged throttle position sensor or damaged ECM pins.	Check system circuits DA-24, DA-25 and DA-39. Refer to the service manual for complete throttle position sensor testing procedure.
Flash	OFF	Active	P0231	Fuel pump open circuit or shorted to ground	Blown fuse, damaged or disconnected fuel pump, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse F2. Check for approximately 1 ohm between pins PE-1 and PE-2 of the fuel pump connector. Check for approximately 12 volts on pin PE-2 and chassis. Check system circuit DB-29.
Flash	OFF	Active	P0232	Fuel pump shorted to battery	Damaged fuel pump, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse F2. Check for approximately 1 ohm between pins PE-1 and PE-2 of the fuel pump connector. Check for approximately 12 volts on pin PE-2 and chassis. Check system circuit DB-29.
Flash	OFF	Active	P0261	MAG injector open circuit or shorted to ground	Blown fuse, damaged or disconnected injector, damaged or disconnected circuit wires, damaged ECM output pins.	Check fuse F1. Check connections on injector. Check for approximately 14.5 ohms on injector. Check system circuit DA-15. Check connector CJ connecting the two harnesses together.
Flash	OFF	Active	P0262	MAG injector shorted to battery	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 14.5 ohms on injector. Check if system circuit DA-15 is shorted to 12 V.

CHECK ENGINE LIGHT	BEEPER	LIMP HOME MODE	FAULT CODE	DESCRIPTION	CAUSE	ACTION
Flash	OFF	Active	P0264	PTO injector open circuit or shorted to ground	Blown fuse, damaged or disconnected injector, damaged or disconnected circuit wires, damaged ECM output pins.	Check fuse F1. Check connections on injector. Check for approximately 14.5 ohms on injector. Check system circuit DA-33. Check connector CJ connecting the two harnesses together.
Flash	OFF	Active	P0265	PTO injector shorted to battery	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check if system circuit DA-33 is shorted to 12 V.
Flash	OFF	Active	P0344	Cam phase sensor signal missing	Damaged circuit wires or damaged sensor.	Check for 12 volts between sensor's connector pins 1 and 3.Check system circuits DA-20 and DA-34. Check connector CJ-3 for approximately 12 volts.
Flash	OFF	Active	P0351	No MAG ignition output stage	Blown fuse, damaged circuit wires, damaged connector or damaged ignition coil.	Check fuse F2. Check for 0.40 to 1.15 ohm between ignition coil pins. Check connector CJ connecting the two harnesses together. Check system circuit DA-41.
Flash	OFF	Active	P0352	No PTO ignition output stage	Blown fuse, damaged circuit wires, damaged connector or damaged ignition coil.	Check fuse F2. Check for 0.40 to 1.15 ohm between ignition coil pins. Check connector CJ connecting the two harnesses together. Check system circuit DA-1.
Flash	OFF	None	P0505	Idle air control valve output stage cutoff memory difference	Damaged actuator, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 50 ohms between pins A and D and also between pins B and C of the idle air control valve. Check for damaged circuit wires. Check system circuits DA-35, DA-36, DA-37 and DA-38. Check for damaged connector or damaged ECM output pins.
Flash	OFF	Active	P0505	Idle air control valve output stage fault	Damaged actuator, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 50 ohms between pins A and D and also between pins B and C of the idle air control valve. Check for damaged circuit wires. Check system circuits DA-35, DA-36, DA-37 and DA-38. Check for damaged connector or damaged ECM output pins. Check for faulty capacitor under the fuse box.
Flash	OFF	Active	P0520	Oil pressure switch functional problem	Low oil level, engine leak, oil pump failure, damaged sensor, damaged or shorted circuit wires.	Check oil level. Check oil pressure switch resistance. With engine stopped, the resistance should be less than 1 ohm. With engine running, the resistance should be infinitely high (OL). Check system circuit DA-10.
Flash	2 sec beeep every 15 min	Active	P0562	Battery voltage too low	Battery failure, damaged circuit wires, damaged or disconnected regulator/rectifier.	Check battery voltage for 11 to 13 volts with engine stopped. Check battery voltage for 14.1 to 14.7 volts with engine idling. Check connections on regulator. Check ground and positive connections near the battery.
Flash	2 sec beeep every 15 min	Active	P0563	Battery voltage too high	Damaged regulator/rectifier. An external battery charger may have been used.	Check battery voltage for 14.1 to 14.7 volts with engine idling. Check connections on regulator/rectifier. Check ground and positive connections near the battery.
Flash	OFF	Active	P0601	Throttle position sensor adaptation failure	Wrong throttle body mechanical position during reset of closed TPS or no initialisation after ECM replacement.	Check cable adjustment. Check idle stop for wear. Make sure throttle plate is against throttle stop. Reset closed TPS.
Flash	OFF	None	P0601	Module call monitoring	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.

CHECK ENGINE LIGHT	BEEPER	LIMP HOME MODE	FAULT CODE	DESCRIPTION	CAUSE	ACTION
Flash	OFF	Active	P0602	ECM not coded	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.
Flash	OFF	Active	P0604	RAM fault	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.
Flash	OFF	Active	P0605	EEPROM fault	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.
Flash	OFF	Active	P0605	EEPROM checksum fault	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.
Flash	OFF	Active	P0605	Coding ID checksum fault	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.
Flash	OFF	Active	P0605	Coding checksum fault	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.
Flash	OFF	Active	P0605	Programming checksum fault	Damaged ECM or faulty programmation.	Try updating the ECM. If the problem persists, replace the ECM.
Flash	OFF	Active	P0608	Sensor's power supply voltage too low	Damaged circuit wires, shorted air pressure sensor or shorted TPS.	Check system circuits DA-12, DA-28, DA-40, DA-24, DA-25 and DA-39.
Flash	OFF	Active	P0608	Sensor's power supply voltage too high	Damaged circuit wires, TPS or air pressure sensor shorted to a supply.	Check system circuits DA-12, DA-28, DA-40, DA-24, DA-25 and DA-39.
OFF	OFF	Active	P0650	Engine lamp shorted to battery	Damaged speedometer, damaged circuit wires, damaged cab connector or damaged ECM output pins.	Check if system circuit DB-33 is shorted to 12 V. Check for damaged cab connector.
OFF	OFF	Active	P0650	Engine lamp open circuit or shorted to ground	Blown fuse, damaged speedometer, damaged or disconnected circuit wires, disconnected connector on speedometer or cab, damaged ECM output pins.	Check fuse F4. Check for approximately 12 volts between pins 8 and 11 of the speedometer connector. Check system circuit DB-33. Check for disconnected or damaged cab connector.
OFF	OFF	None	P0654	Tachometer RPM signal shorted to battery	Damaged or wrong speedometer, damaged circuit wires, damaged cab connector or damaged ECM output pins.	Check if system circuit DB-4 is shorted to 12 V. Check if the right speedometer part number is installed. Check for damaged cab connector.
OFF	OFF	None	P0654	Tachometer RPM signal open circuit or shorted to ground	Blown fuse, damaged speedometer, damaged or disconnected circuit wires, disconnected connector on speedometer or cab, damaged ECM output pins.	Check fuse F4. Check for approximately 12 volts between pins 8 and 11 of the speedometer connector. Check system circuit DB-4. Check for disconnected or damaged cab connector.
Flash	OFF	None	P0655	Engine temperature lamp shorted to battery	Damaged speedometer, damaged circuit wires, damaged cab connector or damaged ECM output pins.	Check if system circuit DB-5 is shorted to 12 V. Check for damaged cab connector.
Flash	OFF	None	P0655	Engine temperature lamp open circuit or shorted to ground	Blown fuse, damaged speedometer, damaged or disconnected circuit wires, disconnected connector on speedometer or cab, damaged ECM output pins.	Check fuse F4. Check for approximately 12 volts between pins 8 and 11 of the speedometer connector. Check system circuit DB-5. Check for disconnected or damaged cab connector.

CHECK ENGINE LIGHT	BEEPER	LIMP HOME MODE	FAULT CODE	DESCRIPTION	CAUSE	ACTION
Flash	OFF	Active	P1102	Throttle position sensor adaptation failure	Wrong throttle body mechanical position during reset of closed TPS or no initialisation after ECM replacement.	Check cable adjustment. Check idle stop for wear. Make sure throttle plate is against throttle stop. Reset closed TPS.
Flash	OFF	Active	P1104	Throttle position sensor adaptation failure	Wrong throttle body mechanical position during reset of closed TPS or no initialisation after ECM replacement.	Check cable adjustment. Check idle stop for wear. Make sure throttle plate is against throttle stop. Reset closed TPS.
Flash	OFF	Active	P1148	Safety fuel cut off detected	TPS adaptation failure, TPS failure, damaged ECM memory or battery voltage out of range.	Check cable adjustment. Check idle stop for wear. Make sure throttle plate is against throttle stop. Reset closed TPS.
Flash	OFF	None	P1611	P+ Test of idle air control valve output signal failed	Damaged actuator, damaged circuit wires, damaged connector or damaged ECM output pins.Damaged or disconnected capacitor.	Check for approximately 50 ohms between pins A and D and also between pins B and C of the idle air control valve. Check for damaged circuit wires. Check system circuits DA-35, DA-36, DA-37 and DA-38. Check for damaged connector or damaged ECM output pins. Check for faulty capacitor under the fuse box.
Flash	OFF	Active	P1646	Engine temperature lamp shorted to battery	Damaged speedometer, damaged circuit wires, damaged cab connector or damaged ECM output pins.	Check if system circuit DB-5 is shorted to 12 V. Check for damaged cab connector.
OFF	OFF	None	P1647	Engine temperature lamp open circuit or shorted to ground	Blown fuse, damaged speedometer, damaged or disconnected circuit wires, disconnected connector on speedometer or cab, damaged ECM output pins.	Check fuse F4. Check for approximately 12 volts between pins 8 and 11 of the speedometer connector. Check system circuit DB-5. Check for disconnected or damaged cab connector.
OFF	OFF	None	P1670	Buzzer shorted to battery	Damaged buzzer, damaged circuit wires, damaged connector or damaged ECM output pins.	Check if system circuit DB-18 is shorted to 12 V. Refer to the service manual for complete buzzer testing procedure.
OFF	OFF	None	P1671	Buzzer open circuit or shorted to ground	Blown fuse, damaged buzzer, damaged or disconnected circuit wires, disconnected connector on buzzer, damaged ECM output pins.	Check fuse F4. Check for approximately 12 volts between connector pin AR-A and negative battery terminal. Check system circuit DB-18. Refer to the service manual for complete buzzer testing procedure.
OFF	OFF	Active	P1675	Relay 2 shorted to battery	Damaged relay, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 100 ohms between relay pins 85 and 86. Check if system circuit DB-16 is shorted to 12 V.
OFF	OFF	Active	P1676	Relay 2 open circuit or shorted to ground	Blown fuse, damaged or disconnected relay, damaged or disconnected circuit wires, damaged ECM output pins.	Check fuse F4. Check for approximately 100 ohms between relay pins 85 and 86. Check system circuit DB-16.

ADJUSTMENT AND REPAIR PROCEDURES

SERVICE TOOLS

Description	Part Number	Page
ECM adapter	420 277 010	309
Fluke 111	529 035 868	309
hose pincher	295 000 076	318
pliers	295 000 070	317, 320
tachometer	529 014 500	310

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
rigid back probe Fluke	TP88	309

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243	293 800 060	322, 326, 328

GENERAL

Engine problems are not necessarily related to the electronic fuel injection system.

It is important to ensure that the mechanical integrity of the engine/propulsion system is present:
- good transmission system operation
- good engine compression and properly operating mechanical components, no leaks etc.
- fuel pump connection and fuel lines without leaks.

Check the chart in *TROUBLESHOOTING* section to have an overview of problems and suggested solutions.

When replacing a component, always check its operation after installation.

FUEL SYSTEM

⚠ WARNING

Fuel is flammable and explosive under certain conditions. Ensure work area is well ventilated. Do not smoke or allow open flames or sparks in the vicinity.

⚠ WARNING

Always disconnect battery prior to working on the fuel system. Always disconnect battery exactly in the specified order, BLACK (-) cable first. It is recommended to disconnect electrical connections prior to disconnecting fuel lines.

⚠ WARNING

The components of a fuel injection system holds much more pressure than on a carbureted engine. Prior to disconnecting a hose or removing a component from the fuel system, follow the recommendation described here.

- Use the B.U.D.S. software to release the fuel pressure in the system (refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS*). Look in the *ACTIVATION* section of the software B.U.D.S.

⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses. Proceed with care when removing/installing pressure test equipment or disconnecting fuel line connections. Use the B.U.D.S. software to release fuel pressure prior to removing a hose. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to minimize spilling. Wipe off any fuel spillage in the engine compartment. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Never use a hose pincher on injection system high pressure hoses. Replace any damaged or deteriorated fuel lines.

When the repair is completed, ensure that all hoses are connected and secured. Perform the *FUEL PRESSURE TEST* and the *FUEL TANK LEAK TEST* as explained in *FUEL TANK AND FUEL PUMP* section. A fuel pressure drop indicates a leak. Check for leaking fuel.

⚠ WARNING

Always perform the fuel pressure test if any component has been removed. A pressure test must be done before turning the ignition key to START. The fuel pump is activated each time ignition key is turned to START. After performing a fuel pressure test, use the valve on the fuel pressure gauge to release the pressure (if so equipped).

ELECTRICAL SYSTEM

It is important to check that the electrical system is functioning properly:

- battery
- fuses
- relay 1
- diode
- ignition (spark)
- ground connections
- wiring connectors
- speedometer.

It is possible that a component seems to operate in static condition but in fact, it is defective. In this case, the best way to solve this problem is to remove the original part and replace it with one which is in good condition.

Never use a battery charger to substitute temporarily the battery, as it may cause the ECM (engine control module) to work erratically or not to work at all. Check related-circuit fuse solidity and condition with an ohmmeter. Visual inspection could lead to false results.

⚠ WARNING

Some EMS components are continuously powered when ignition key is turned to START. The ECM switches the circuit to the ground to complete the electrical circuits it controls. Take this into account when troubleshooting. Always disconnect the battery prior to disconnecting any electric or electronic parts.

Pay particular attention to ensure that pins are not out of their connectors or out of shape.

When probing terminals, pay attention not to bend the terminal as this could bring a loose connection that would be difficult to troubleshoot.

⚠ WARNING

Ensure all terminals are properly crimped on wires and connector housings are properly fastened.

Before replacing an ECM, always check electrical connections. Make sure terminals are properly crimped on wires and fastened in housing, and that they are free of corrosion or moisture. Check if wiring harness shows any signs of scoring. Ensure proper electrical connection. Particularly check ECM ground connections. A "defective module" could possibly be "repaired" simply by unplugging and replugging the ECM. The voltage and current might be too weak to go through dirty wire pins.

For the electrical connectors, pay attention to the following:

- ECM connectors: Do not apply dielectric grease or any other lubricant.
- Other connectors: Apply a silicon-based dielectric grease or other appropriate lubricant.

Ensure that all electronic components are genuine. Any modification on the wiring harness may lead to generate fault codes or bad operation.

NOTE: For diagnostics purposes, use B.U.D.S. software. See *EMS DIAGNOSTIC AND COMMUNICATION TOOLS* subsection.

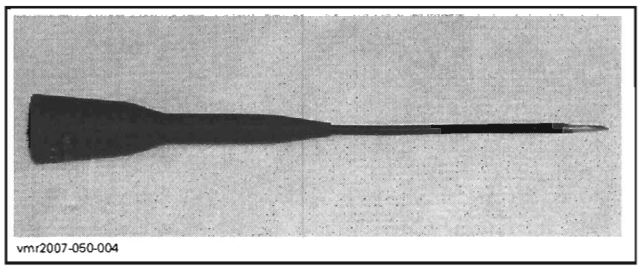
After a problem has been solved, ensure to clear the fault(s) in the ECM using the B.U.D.S. software. Refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS* subsection.

Diagnostic Tools

To perform verifications, a good quality multimeter such as Fluke 111 (P/N 529 035 868) should be used.

529 035 868

To easily probe wire terminals through the back of their connectors, rigid back probe Fluke (P/N TP88) pins or equivalent can be used.



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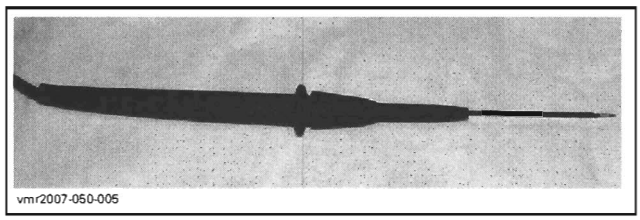
They can be inserted at the end of the standard probes of the Fluke 111 multimeter.



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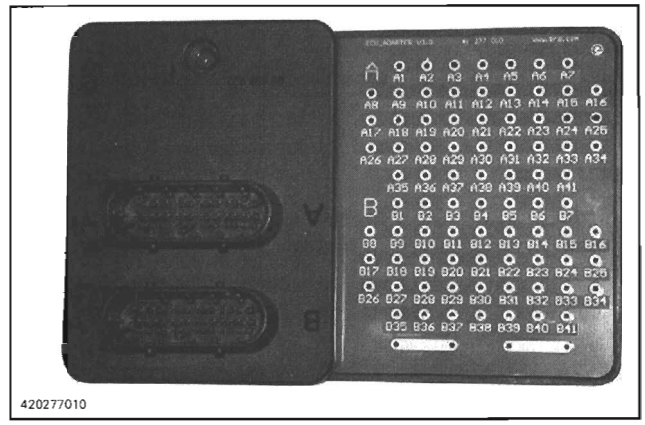
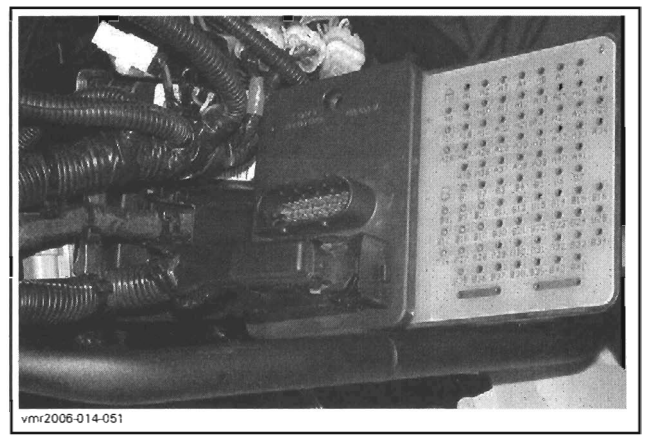
The most recommended and safest method to probe ECM connector terminals is to use the ECM adapter (P/N 420 277 010). This tool will prevent deforming or enlarging terminals which would lead to bad ECM terminal contact creating intermittent or permanent problems.



420277010

Disconnect the desired connector from ECM and reconnect on the tool connector. Probe required terminals directly in the tool holes.



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Resistance Measurement

When measuring the resistance with an ohmmeter, all values are given for a temperature of 20°C (68°F). The resistance value of a resistance varies with the temperature. The resistance value for usual resistor or windings (such as injectors) **increases** as the temperature increases. However, our temperature sensors are NTC types (Negative Temperature Coefficient) and work the opposite which means that the resistance value **decreases** as the temperature increases. Take it into account when measuring at temperatures different from 20°C (68°F). Use this table for resistance variation relative to temperature for **temperature** sensors.

TEMPERATURE SENSOR TABLE			
TEMPERATURE		RESISTANCE (ohms)	
°C	°F	MAPTS	CTS
- 40	- 40	—	45000
- 30	- 22	28000	28000
- 20	- 4	15000	15000
0	32	5500	5500
20	68	2500	2500
40	104	1200	1200
60	140	600	600
80	176	320	320
100	212	180	180
130	266	90	90

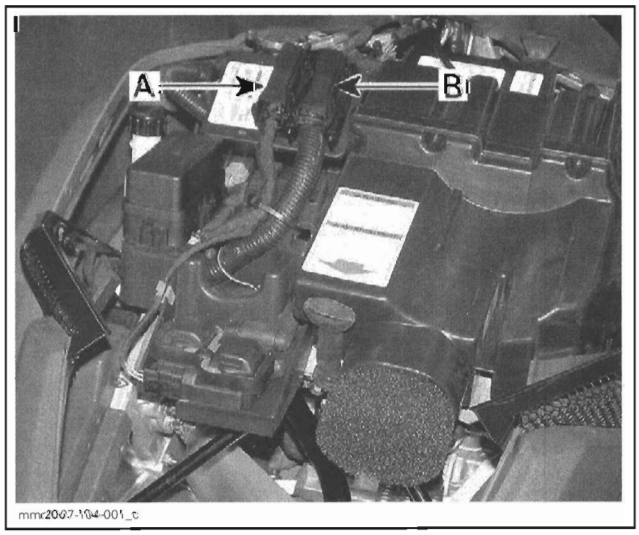
CONVERSION CHART FOR TEMPERATURE SENSORS

The resistance value of a temperature sensor may test good at a certain temperature but it might be defective at other temperatures. If in doubt, try a new sensor.

Also remember this validates the operation of the sensor at room temperature. It does not validate the over temperature functionality. To test it, the sensor could be removed from the engine and heated with a heat gun while it is still connected to the harness to see if the ECM will detect the high temperature condition and generate a fault code.

ECM Connectors

The ECM connectors are identified by the letter "A" and "B".



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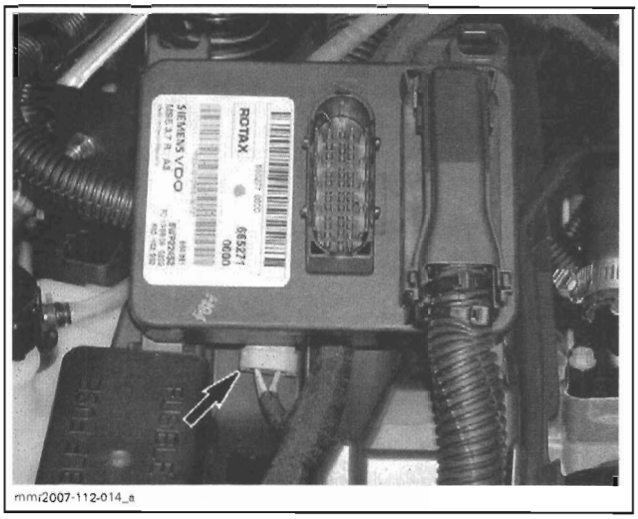
Engine Connector

Engine connector is located under ECM.



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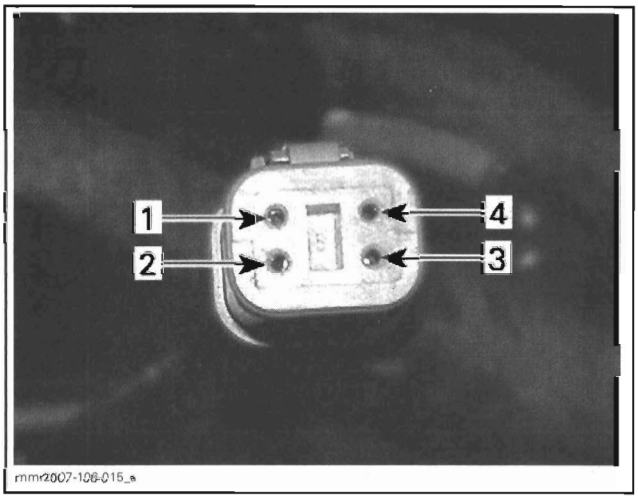
Use this illustration to locate the pin numbers on the engine connector when performing tests.



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ENGINE CONNECTOR PIN-OUT (ENGINE SIDE)

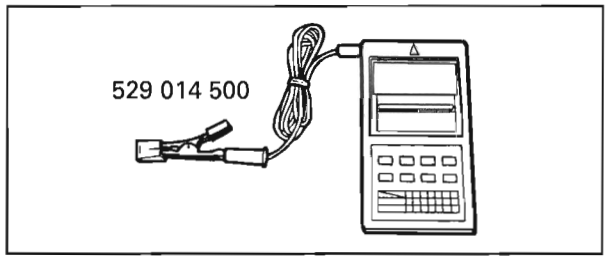
BASIC ADJUSTMENTS

IDLE SPEED

The idle speed is not adjustable. The ECM controls the idle speed of the engine.

CAUTION: Never attempt to adjust the sealed idle stop screw. It is calibrated at the factory. If the screw adjustment is changed, the throttle body must be replaced.

If desired, the engine RPM can be verified with the tachometer (P/N 529 014 500).



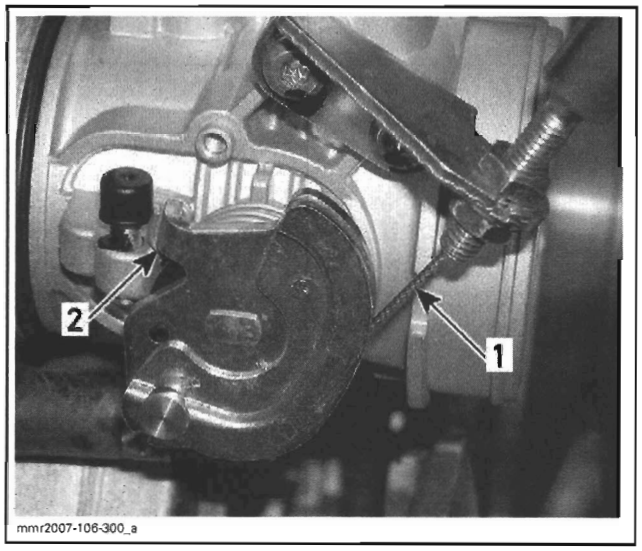
THROTTLE CABLE

Handlebar and throttle cable must be at their normal position.

Wide Open Throttle Position Verification

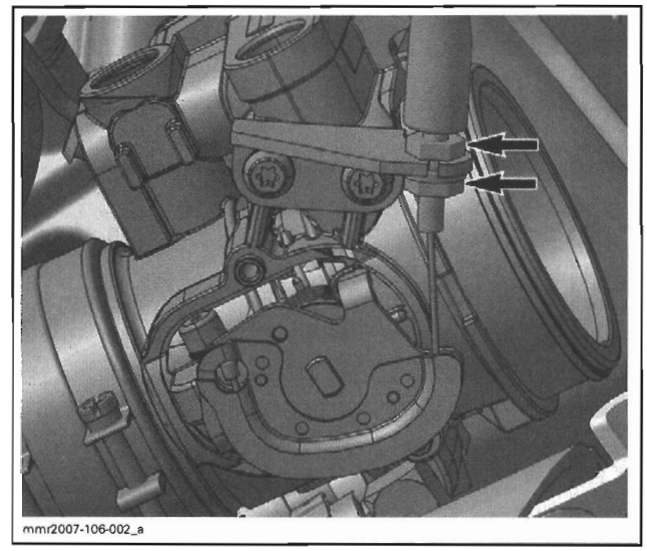
Squeeze throttle lever and hold it at wide open throttle (WOT).

There must be free-play in throttle cable. Push against throttle cable to see if cam stopper will move just a little to touch throttle body. If so, it confirms proper free-play.



WOT POSITION
1. *Push here to feel free-play*
2. *Stopper just close to touching throttle body*

If adjustment is needed, use adjuster nuts.

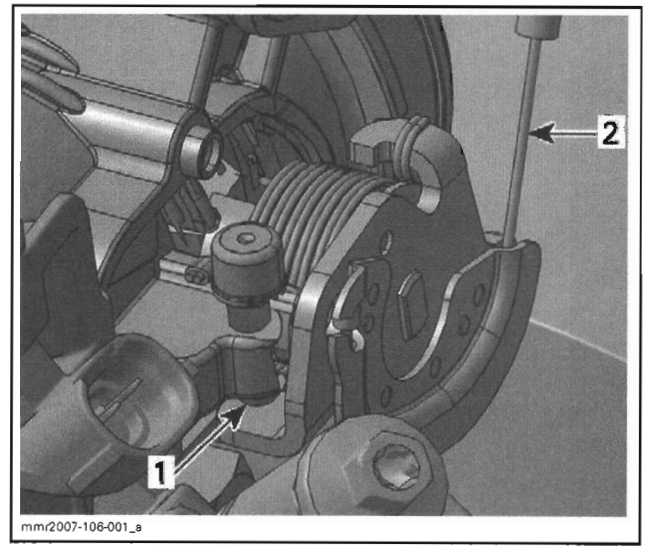


When done, turn handlebar side to side and ensure there is still free-play in each position while at WOT.

CAUTION: Improper cable adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

Idle Position Verification

Activate throttle lever a few times. Make sure throttle cam of throttle body rests against set screw with some free-play in the cable.



1. *Contact here*
2. *Free-play here*

CAUTION: If there is no free-play at idle position, it may cause poor idling and startability problems.

⚠ WARNING

Make sure idle speed stopper contacts throttle cam when throttle lever is fully released at handlebar.

CLOSED THROTTLE AND IDLE ACTUATOR RESET

NOTE: This operation performs a reset of the values in the ECM.

This reset is very important. The setting of the TPS will determine the basic parameters for all fuel mapping and several ECM calculations.

NOTE: Reset must be done each time the throttle position sensor (TPS) is loosened, removed or replaced, and also if throttle body or ECM are replaced.

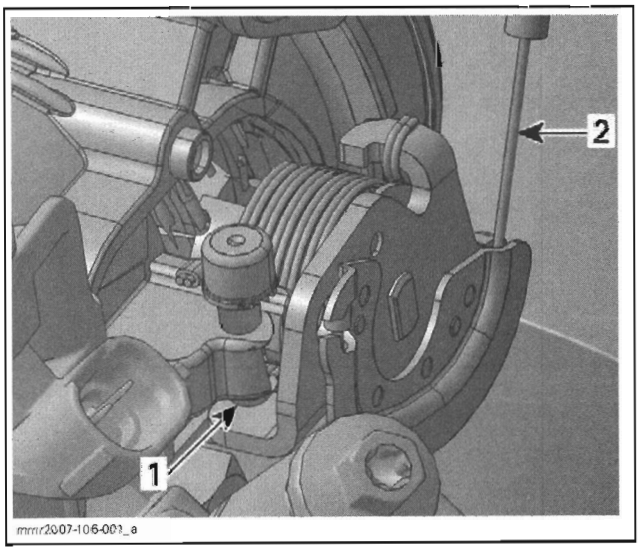
CAUTION: An improperly set TPS may lead to poor engine performance and emission compliance could possibly be affected.

Reset

Use the B.U.D.S. software to perform this adjustment.

Open throttle approximately one quarter then quickly release. Repeat 2 - 3 times to settle throttle plate.

Ensure the throttle cam of throttle body rests against set screw without any tension in the cable. Otherwise, perform the throttle cable adjustment.



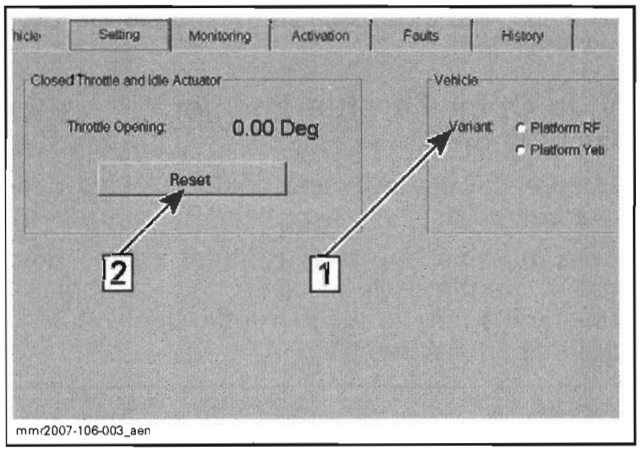
1. *Contact here*
2. *Free-play here*

Select the **Setting** tab of B.U.D.S.

Ensure the proper variant according to vehicle is selected.

V800 MODEL	VARIANT
Legend, Expedition Sport and Tundra	Platform RF
Skandic SWT and Expedition TUV	Platform Yeti

Click on the **Reset** button.



Step 1: Select variant according to vehicle
Step 2: Click reset

Reset is completed.

NOTE: No message will be displayed if operation is successful. If TPS is not within the allowed range while resetting the **Closed Throttle and Idle Actuator**, the ECM will generate a fault code and will not accept the setting.

Start engine and make sure it operates normally through its full engine RPM range. If fault codes appear, refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS* section for more information.

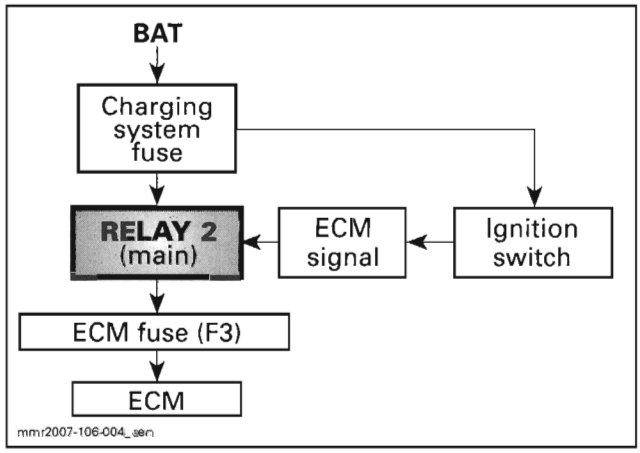
IGNITION TIMING

The ignition timing is not adjustable.

REPAIR PROCEDURES

ENGINE CONTROL MODULE (ECM)

Power Supply to ECM



ECM Power Supply and Ground Pinout

FUNCTION	CONNECTOR PIN
Power 12 Vdc	B-11
Grounds	B1, B2, B32 and B41

Troubleshooting ECM

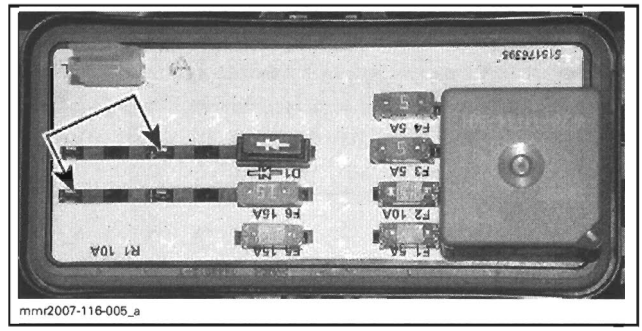
Briefly turn ignition key to START.

QUICK INDICATION THAT ECM IS NOT WORKING (assuming the observed component is working)
Speedometer does not turn on. On models without speedometer, oil light will not turn on.
Fuel pump does not turn on for approx. 5 seconds.

If ECM does not turn on, check the following.

Check charging system fuse and fuse F3. If they test good, check relay 1.

To check relay, remove relay and bypass it with a jumper between terminals as shown.



RELAY R1 (ECM, EMS AND GAUGES)

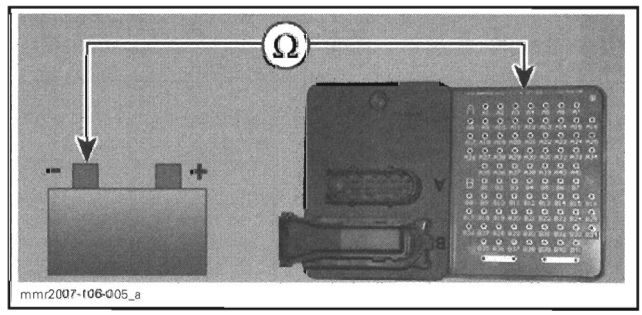
If ECM is now WORKING, replace relay.

If ECM is NOT working, check ignition switch. Refer to *IGNITION SYSTEM*.

If ECM still does not work, check wiring/connectors from battery to ECM.

If they test good, check ECM grounds.

ECM GROUND TEST		MEASUREMENT
ECM connector B-1, B-2, B-32, B-41	Battery ground	Close to 0 Ω (continuity)



If everything is good, refer to *ECM REPLACEMENT*.

ECM Replacement

Prior to replacing a possibly faulty ECM, ensure that all the recommendations in the general introduction of this section have been carried out. Also, check ECM power supply and all grounds for proper contact/cleanliness and tightness.

IMPORTANT: When the ECM is replaced, the **Closed Throttle and Idle Actuator** must be reset. Refer to *BASIC ADJUSTMENTS*.

To allow transferring the previous recorded information from the old ECM to the new one, use the B.U.D.S. software. Use **Replace** ECM in the ECM menu. Follow instructions in its help system.

NOTE: If the old ECM still works, its information must be read by B.U.D.S. before being removed from the vehicle in order to transfer vehicle information and history to the new ECM.

Disconnect battery cables.

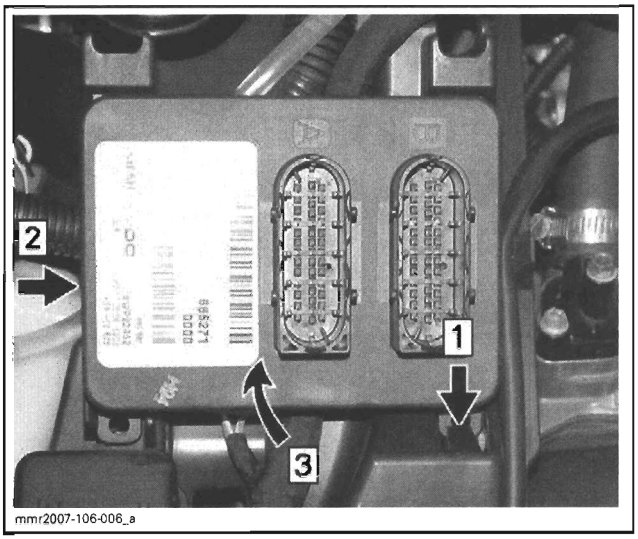
⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

Remove hood.

Disconnect both connectors from ECM.

Remove ECM.



Step 1: Unlock tab
Step 2: Slide toward right to unlock tab
Step 3: Lift this side of ECM to release from opposite tabs

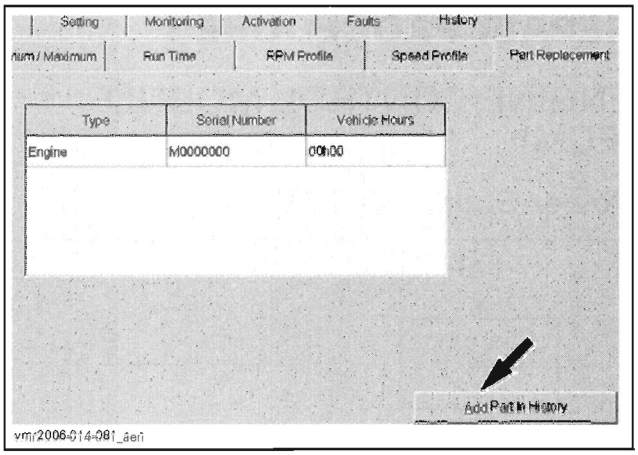
Install the new ECM to the vehicle.

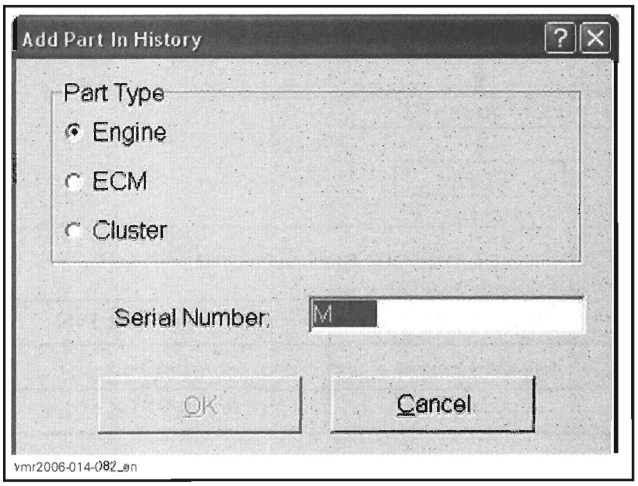
Ensure to securely lock ECM to vehicle.

Reconnect connectors to ECM, and then battery cables.

Transfer the data from the previous ECM to the new one using B.U.D.S. then proceed with the required resets and reprogram ignition key(s), if you were unable to transfer the data.

NOTE: If data cannot be transferred, manually enter information in **Vehicle** tab and **Engine Serial Number** in **History**, **Part Replacement**.





After performing the required resets, ensure to clear all faults from the newly replaced ECM.

FUEL INJECTOR

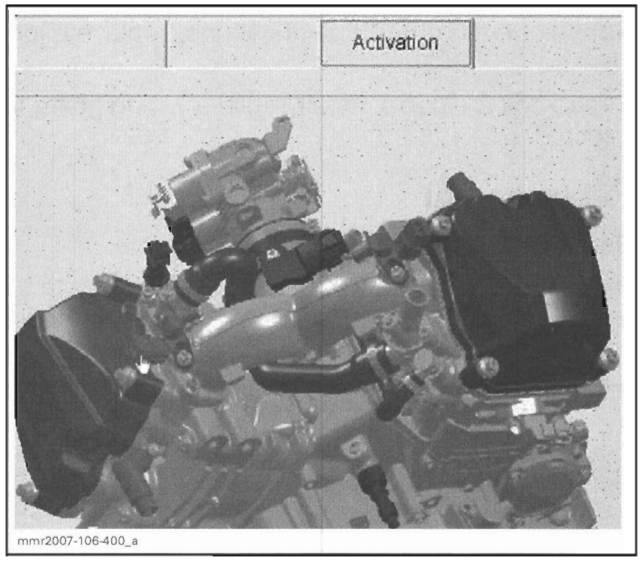
Leakage Test

The leakage test is validated when performing the "fuel delivery system diagnostic flow chart" in *FUEL TANK AND FUEL PUMP*.

Electrical Test

Briefly turn ignition key to START.

Using the B.U.D.S. software, energize the fuel injector from the **Activation** section.



You should hear the injector working.

CAUTION: While doing fuel injector electrical test, do not apply continuous voltage for more than 10 seconds. This can damage the injector.

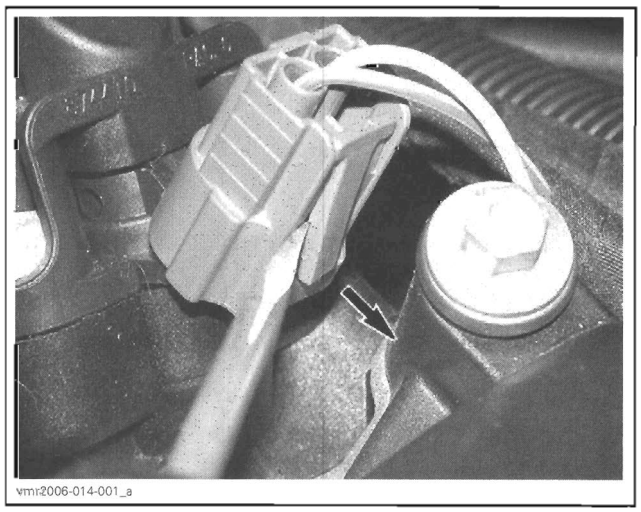
This will validate the injector mechanical and electrical operation.

If the injector does not work, check injector power supply.

Voltage Test

Disconnect the connector from the injector.

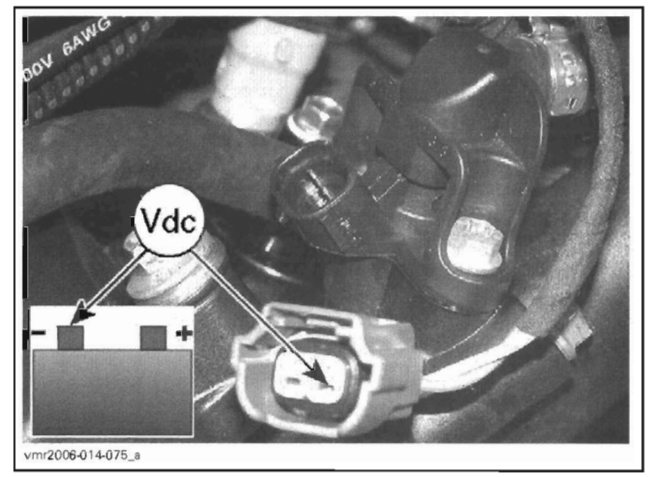
NOTE: If connector is hard to unlock, gently use a screwdriver to release connector.



Briefly turn ignition key to START.

Use a multimeter and set it to Vdc. Read voltage.

CYLINDER	INJECTOR CONNECTOR		MEASUREMENT
	WIRE		
FRONT REAR	VIOLET/ BLUE	Battery ground	12 Vdc



If supply voltage is good, check ground circuit between injector and ECM (see *WIRING DIAGRAMS*).

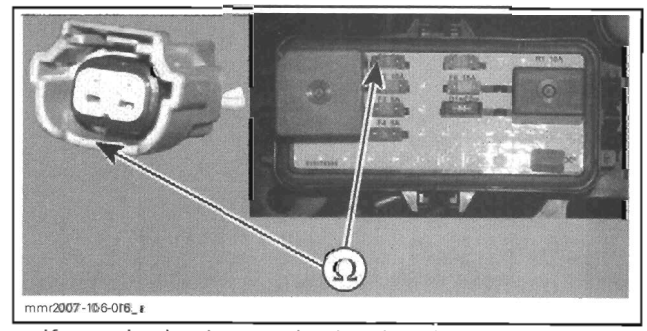
- If ground circuit is faulty, repair/replace.
- If ground circuit is good, refer to *ECM REPLACEMENT*.

If supply voltage is not good, check continuity between fuse F1 and injector (see *WIRING DIAGRAMS*).

NOTE: Probe fuse exactly as shown. This validates fuse at the same time.

Use a multimeter and set it to Ω. Read resistance.

CYLINDER	INJECTOR CIRCUIT		MEASUREMENT
	WIRE		
FRONT REAR	VIOLET/ BLUE	Fuse F1	Close to 0 Ω



- If continuity is good, check relay 1 and wiring from battery.
- If continuity is faulty, check fuse and if ok, repair/replace wiring going to injector.

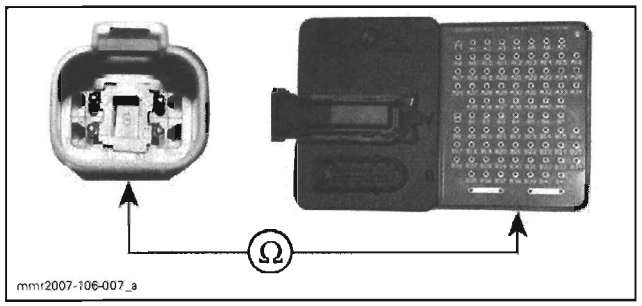
Resistance Test

Reconnect the injector connector.

Disconnect the connector "A" from the ECM and the engine connector.

Using a multimeter, check resistance value between terminals as follows.

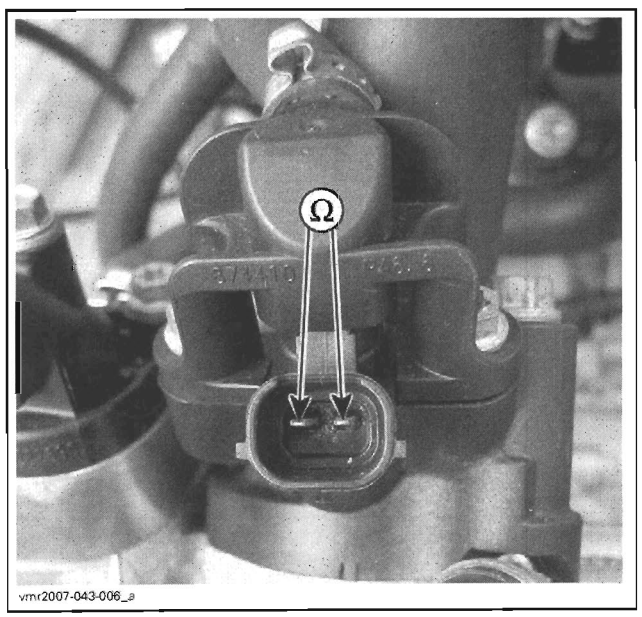
INJECTOR	ENGINE CONNECTOR PIN	ECM CONNECTOR "A"	RESISTANCE @ 20°C (68°F)
FRONT	1	A-15	13.8 - 15.2 Ω
REAR		A-33	



If resistance value is correct, refer to *ECM REPLACEMENT*.

If resistance value is incorrect, remove injector connector and check resistance value between injector pins as follows.

INJECTOR	INJECTOR PIN		RESISTANCE @ 20°C (68°F)
FRONT	1	2	13.8 - 15.2 Ω
REAR			



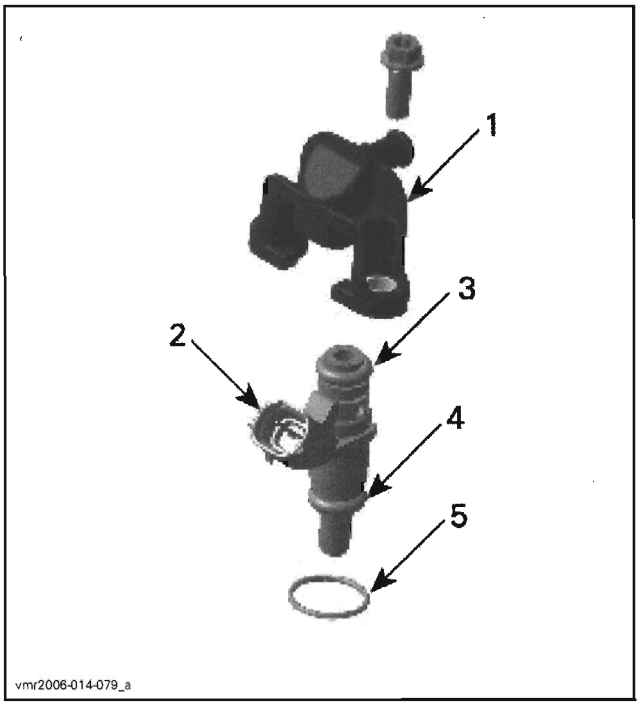
If readings are out of specifications, replace injector.

If readings are good, repair/replace wiring going to injector.

Replacement

Removal

Before removing the injector, the fuel rail has to be removed from the engine. Refer to *FUEL RAIL* for the procedure.



FUEL RAIL ASS'Y
1. *Fuel rail*
2. *Fuel injector*
3. *Injector top O-ring*
4. *Injector bottom O-ring*
5. *Manifold O-ring*

The fuel injector can be easily pulled out of the fuel rail.

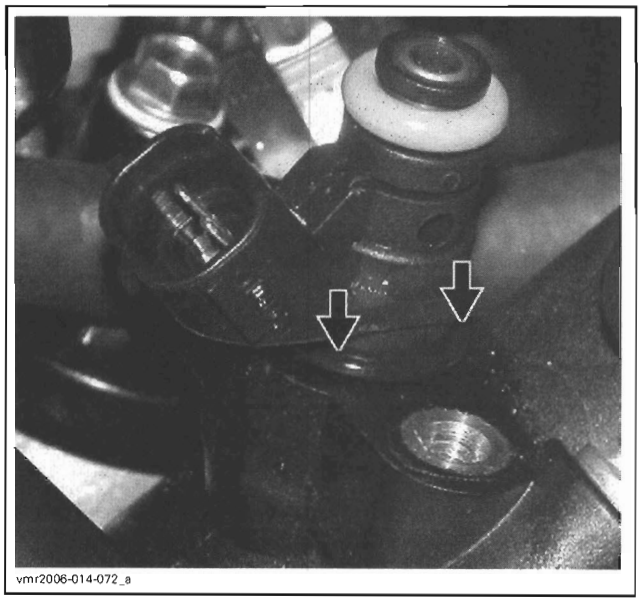
Installation

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

Apply a thin film of engine oil to O-rings to ease insertion in rail.

Install new O-rings, if you reinstall a used injector then insert the fuel injector in place with your hand. Do not use any tool.

Carefully insert injector in manifold. Gently push in evenly all around while inserting injector. O-ring must be completely inserted and not visible, before finishing pushing injector.



Firmly push injector until it bottoms.

Reinstall fuel rail.

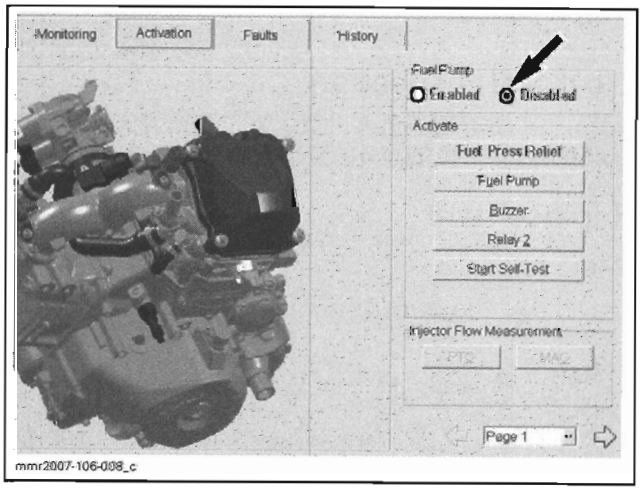
FUEL RAIL

Pressure at fuel rails is supplied and controlled by the fuel pump module. Refer to *FUEL TANK AND FUEL PUMP* for pressure test.

Replacement

Removal

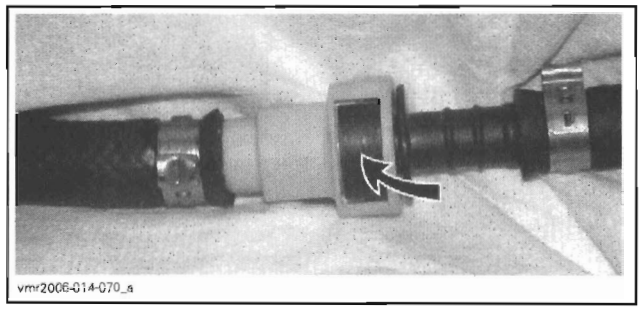
Disable fuel pump using B.U.D.S. Look in the **Activation** tab.



Release fuel pressure by running engine until it runs out of gas.

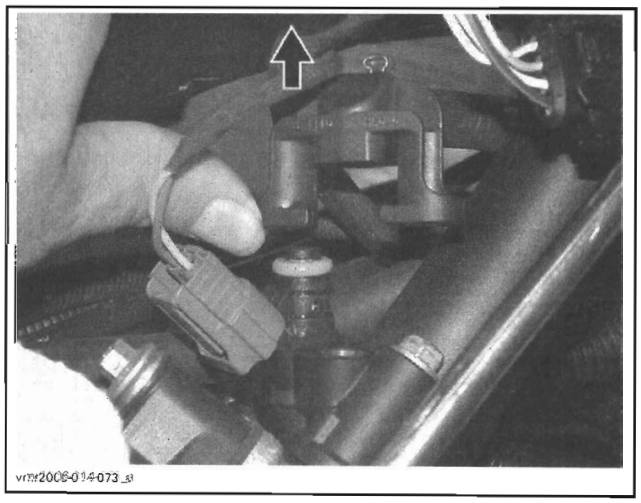
Turn ignition key off.

Wrap a rag around the inlet hose and release the quick fitting.



Unscrew rail retaining screws.

Gently pull rail up by hand.



To disconnect fuel rail, cut clamp on fuel hose using pliers (P/N 295 000 070). Refer to *FUEL TANK AND FUEL PUMP* for clamp removal/installation procedures.

NOTE: If fuel rail is removed purposely to access fuel injector, it is not necessary to cut hose clamp. Only to replace fuel rail.

Installation

For installation, reverse the removal process but pay attention to the following.

Install new clamps using pliers as per removal (if fuel rail was replaced).

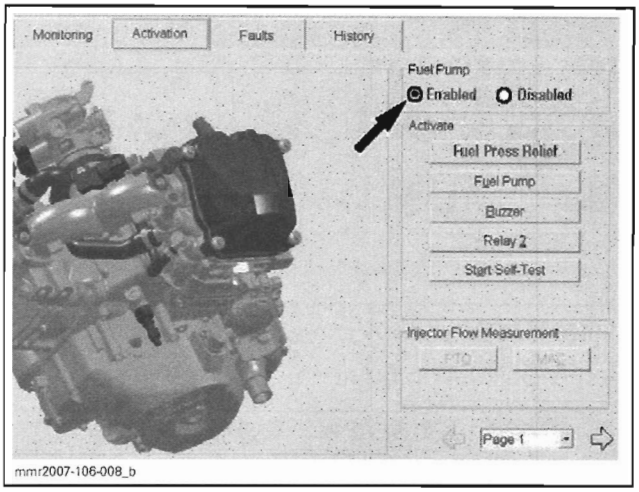
A thin film of oil should be applied to O-rings of fuel injector to ease installation of fuel rail.

Install new O-rings.

Install fuel rail and evenly tighten screws a little at a time each side.

Tightening torque of the rail retaining screws is 6 N•m (53 lbf•**in**).

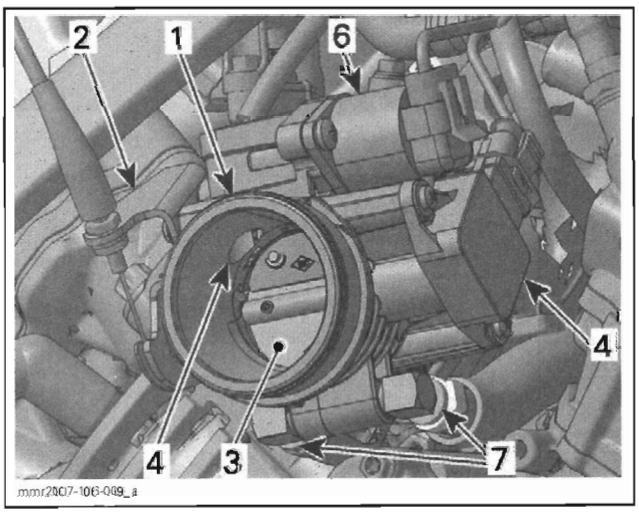
After securing inlet hose at quick fitting, re-enable fuel pump using B.U.D.S.



⚠ WARNING

Perform a fuel pressure test and ensure that there is no leak. Refer to *FUEL TANK AND FUEL PUMP*. Run engine and check for leaks.

THROTTLE BODY

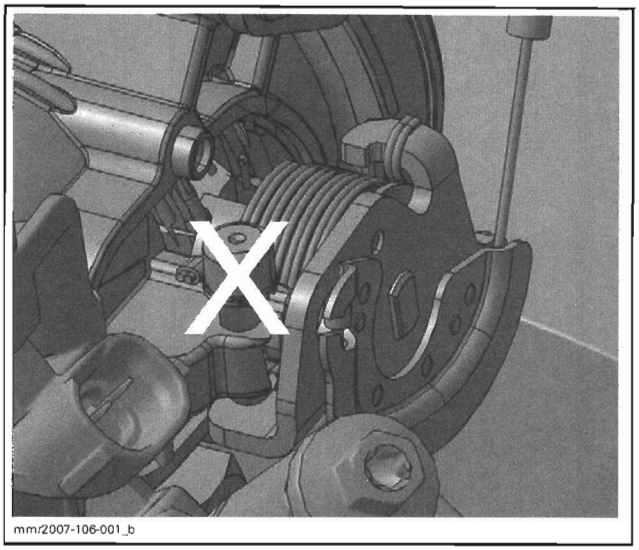


1. *Throttle body*
2. *Throttle cable attachment*
3. *Throttle plate*
4. *TPS*
5. *Idle bypass channel*
6. *Idle bypass valve*
7. *Coolant hoses*

Mechanical Inspection

Check that the throttle plate moves freely and smoothly when depressing throttle lever.

IMPORTANT: Never attempt to adjust the sealed idle stop screw. It is calibrated at the factory. If the screw adjustment is changed, the throttle body must be replaced.



Before replacing any part, check the following as these could be causing the fault. Perform the test while the engine is off.

- Throttle cable adjustment too tight. Not returning fully to idle stop.
- Throttle body idle set screw is loose or worn (throttle body must be replaced).
- TPS is loose.
- Idle bypass valve is loose.
- Corroded or damaged wiring or connectors.
- Throttle body has been replaced and the **Closed Throttle and Idle Actuator** reset has not been performed.
- ECM has been replaced and the **Closed Throttle and Idle Actuator** reset has not been performed.

Electrical Inspection

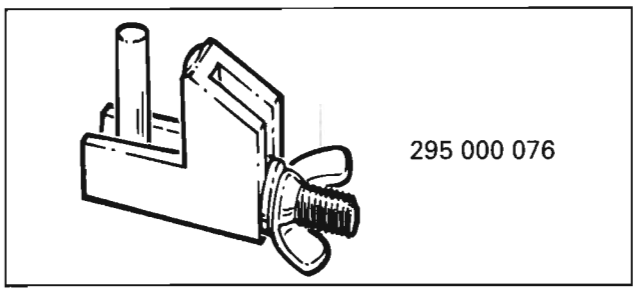
Refer to *THROTTLE POSITION SENSOR (TPS)* and *IDLE BYPASS VALVE* in this section.

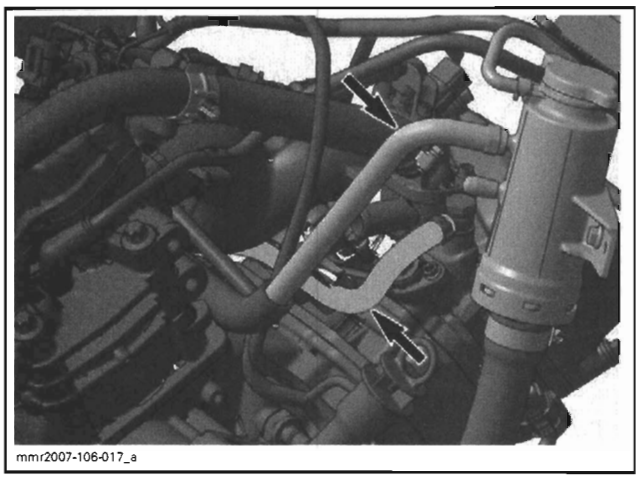
Replacement

Removal

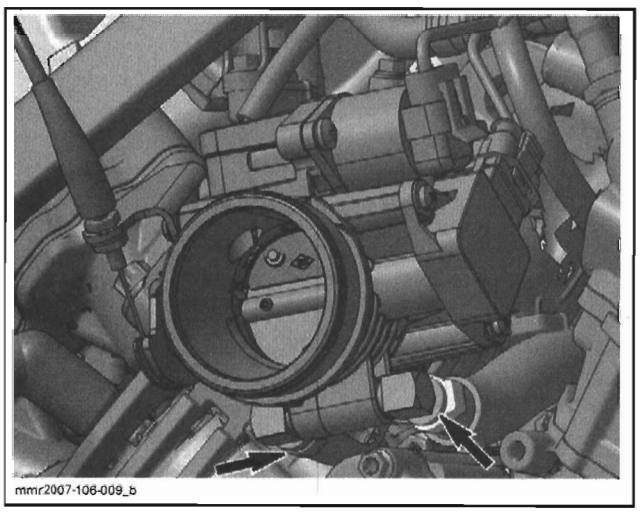
To remove the throttle body from engine, proceed as follows:

- Remove hood and LH side panel. Refer to *BODY*.
- Remove air intake silencer. Refer to *AIR INTAKE SYSTEM*.
- Install a hose pincher (P/N 295 000 076) on each coolant hose connected to throttle body.

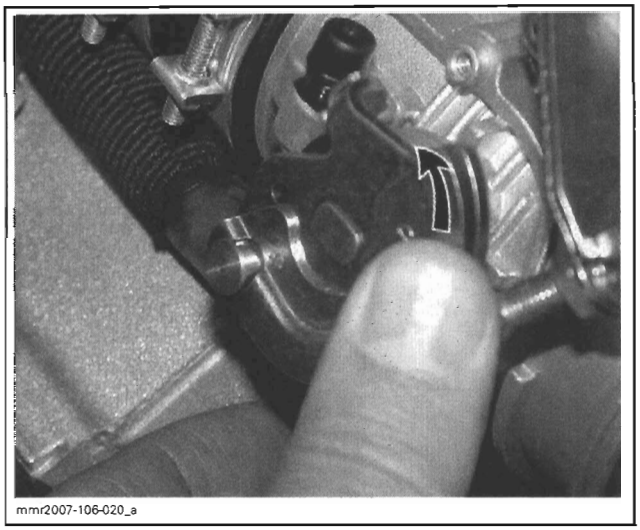




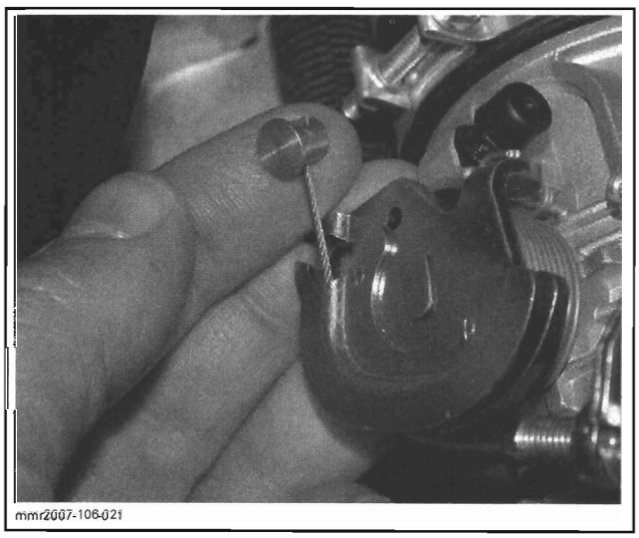
– Disconnect coolant hoses from throttle body.



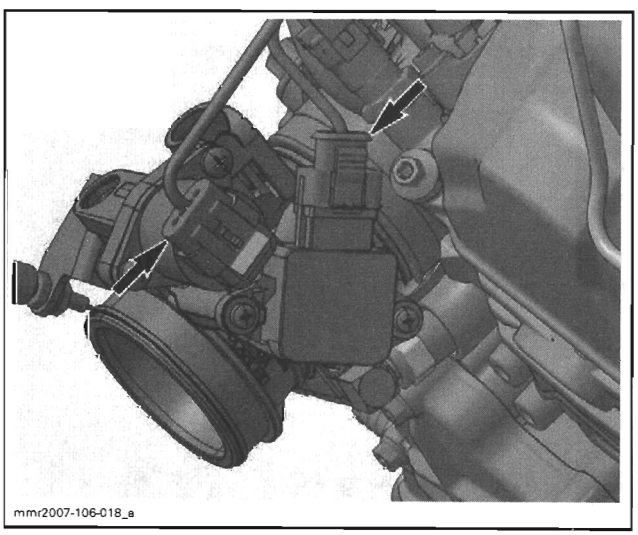
– Turn throttle lever cam to increase throttle cable free-play.



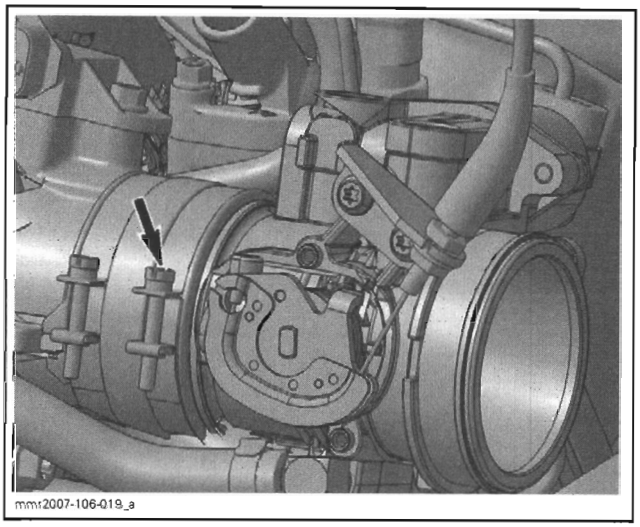
– Hold cam in this position and pull out cable barrel. Detach throttle cable.



– Disconnect TPS and idle bypass valve connectors.



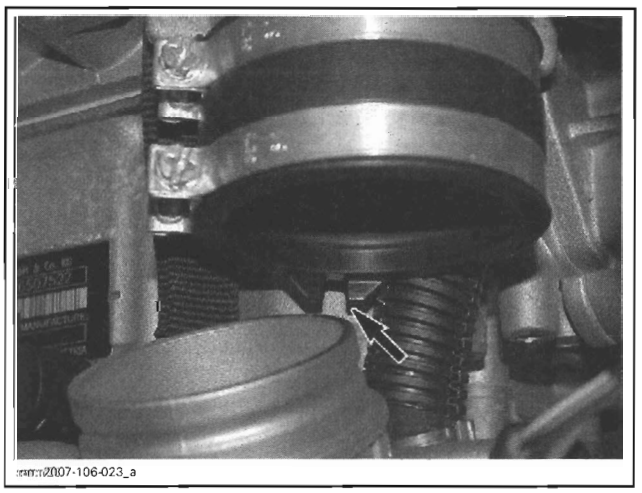
– Detach throttle body from intake manifold.

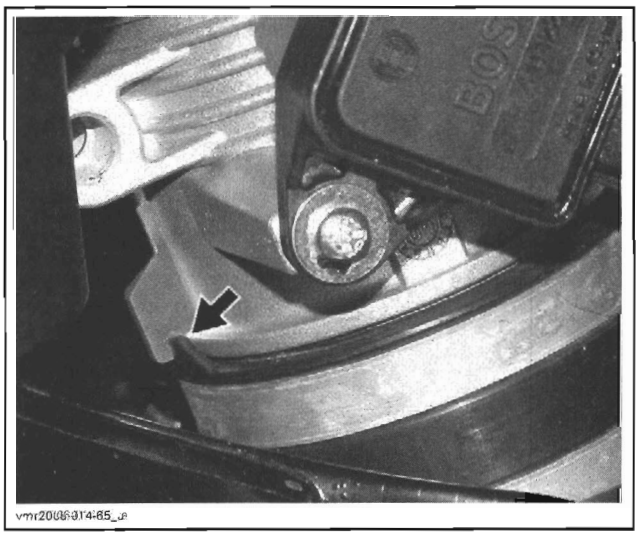


Installation

Installation of the throttle body is the reverse of the removal procedure. Pay attention for the following details.

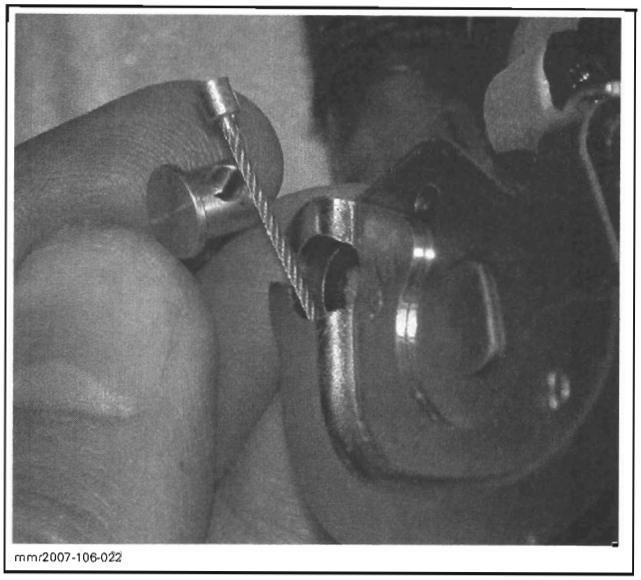
Install throttle body on intake manifold. Ensure to index throttle body tab with boot notch.



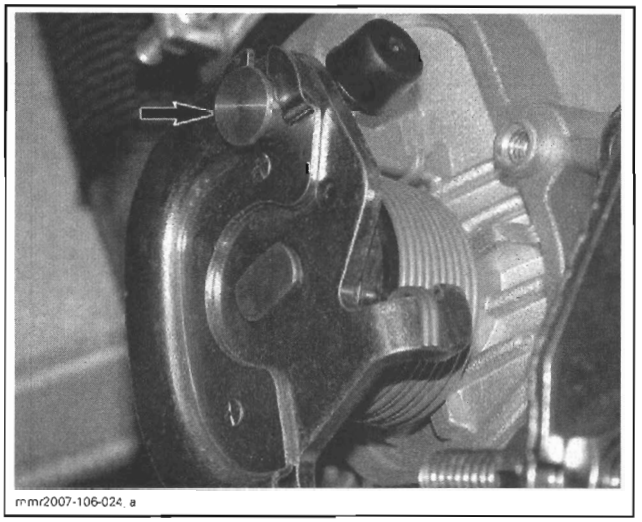


Insert throttle cable in lever cam.

Properly install cable barrel to throttle cable end.

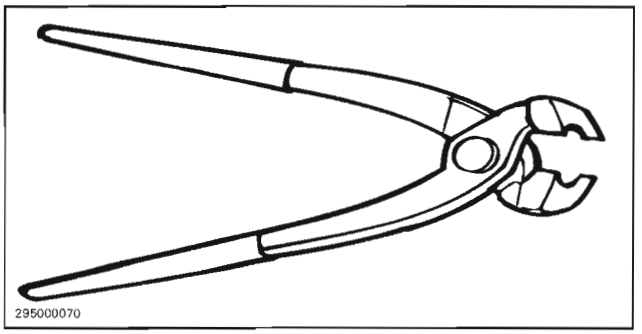


Turn cam to slacken throttle cable and insert barrel in cam.



Release cam and ensure throttle cable is properly locked. Activate throttle lever several times.

To install coolant hose clamps, use pliers (P/N 295 000 070).



Refill and bleed cooling system if necessary. Refer to *COOLING SYSTEM*.

For TPS and idle bypass valve replacement procedures, refer to the respective paragraph in this section.

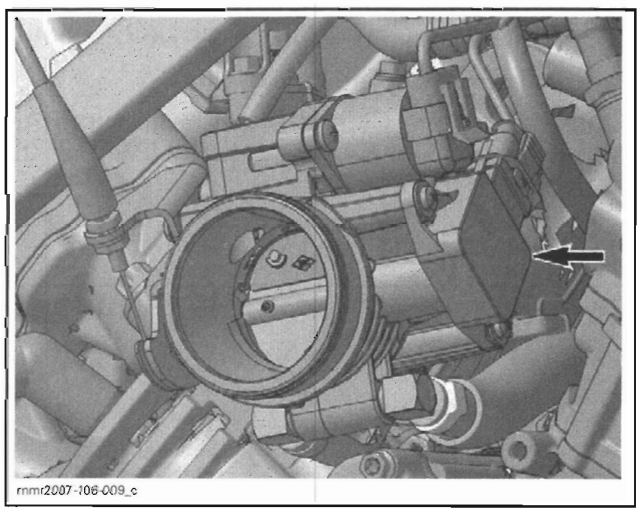
Adjustment

When the throttle body has been replaced, perform throttle cable adjustment and the **Closed Throttle and Idle Actuator** reset. Refer to *BASIC ADJUSTMENTS* in this section.

THROTTLE POSITION SENSOR (TPS)

General

The throttle position sensor (TPS) is a potentiometer that sends a signal to the ECM which is proportional to the throttle shaft angle.



Remove LH side panel. Refer to *BODY*.

NOTE: Air intake silencer may be removed to ease access.

IMPORTANT: Prior to testing the TPS, ensure that mechanical components/adjustments of throttle body are adequate.

The EMS may generate several fault codes pertaining to the TPS. Refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS* section for more information.

Wear Test

While engine is not running, activate throttle and pay attention for smooth operation without physical stops of the cable.

Using the B.U.D.S. software, use the **Throttle Opening** display under **Monitoring**.

Slowly and regularly depress the throttle. Observe the needle movement. It must change gradually and regularly as you move the throttle. If the needle "sticks", bounces, suddenly drops or if any discrepancy between the throttle movement and the needle movement is noticed, it indicates that the TPS needs to be replaced or the computer used may be too slow to transfer data fast enough for real time display.

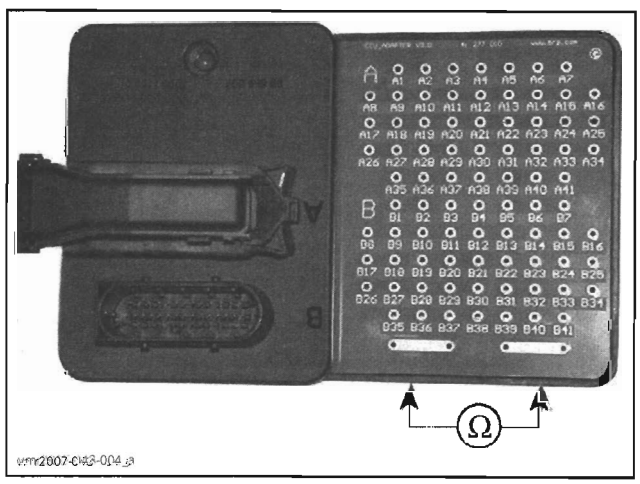
Resistance Test

Ensure TPS is connected to wiring harness.

Disconnect the "A" connector from the ECM.

Using a multimeter, check resistance values on ECM connector as per the following table.

ECM CONNECTOR		THROTTLE IDLE POSITION	WIDE OPEN THROTTLE POSITION
PIN		RESISTANCE Ω @ 20°C (68°F)	
A-24	A-25	710 - 1300	2600 - 2700
A-25	A-39	1600 - 2400	1600 - 2400
A-24	A-39	2600 - 2700	710 - 1300



NOTE: The resistance value should change smoothly and proportionally to throttle movement. Otherwise, replace TPS.

If resistance values are correct, perform the *VOLTAGE TEST* below.

If resistance values are incorrect, check wiring harness. If wiring is faulty, repair/replace. If wiring is good, replace TPS.

Reconnect ECM connector.

Voltage Test

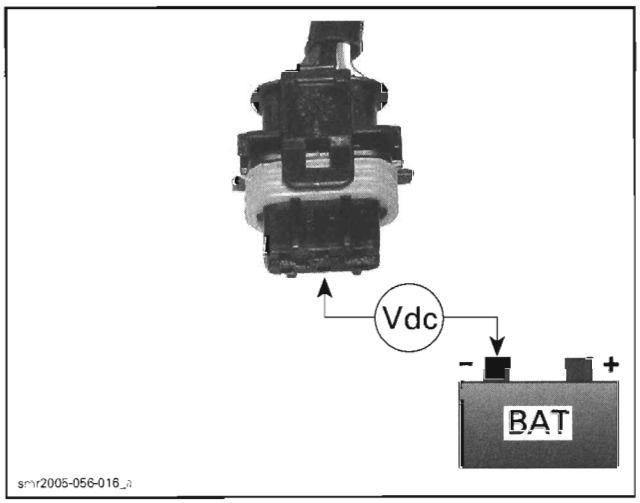
Check the ECM voltage output to the TPS.

Disconnect connector from TPS.

Briefly turn ignition key to START.

Check the voltage readings from harness connector as follows.

CONNECTION	VOLTAGE
Pin 1 with battery ground	5.0 V
Pin 2 with battery ground	0 V
Pin 3 with battery ground	4.75 - 5 V



If voltage test is not good, check/repair wiring harness. If wiring tests good, refer to *ECM REPLACEMENT*.

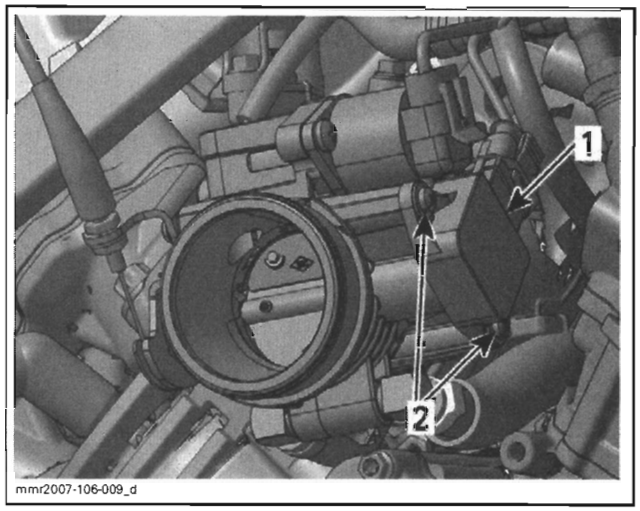
If voltage test is good, everything is in order (assuming resistance test was performed).

Replacement

Remove hood.

Loosen two screws retaining the TPS.

Remove TPS.



THROTTLE BODY
1. *Throttle position sensor (TPS)*
2. *Screws*

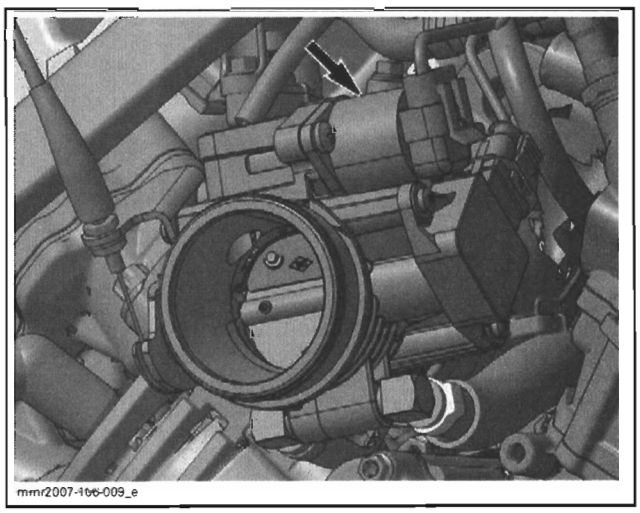
Install the new TPS.

Apply Loctite 243 (P/N 293 800 060) on the TPS retaining screws, then torque to 3 N•m (27 lbf•**in**).

Reinstall remaining removed parts.

Proceed with the **Closed Throttle and Idle Actuator Reset**. See *BASIC ADJUSTMENTS* at the beginning of this section.

IDLE BYPASS VALVE



Remove LH side panel. Refer to *BODY*.

NOTE: Air intake silencer may be removed to ease access.

An idle bypass valve with good resistance measurement can still be faulty. It is also possible that a mechanical failure occurs which is not detectable without measuring the air flow. Replacing the idle bypass valve may be necessary as a test.

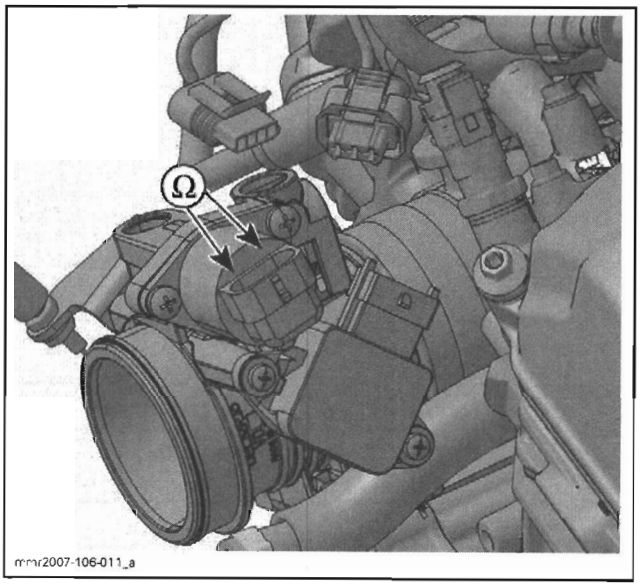
Resistance Test

Disconnect idle bypass valve from the wiring harness.

Using a multimeter, check the resistance in both windings.

Check the resistance between pins as shown.

IDLE BYPASS VALVE		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	4	50
2	3	



If the resistance of one or both windings is not good, replace the idle bypass valve.

If resistance test of valve windings is good, check continuity of circuits A-35, A-36, A-37, A-38. If not good, check/repair wiring/connectors.

Visual Inspection

NOTE: Make sure the ignition key is turned off during the following procedure.

Remove idle bypass valve from throttle body.

Check the piston and bypass channel for dirt/deposits which can cause a sticking piston.

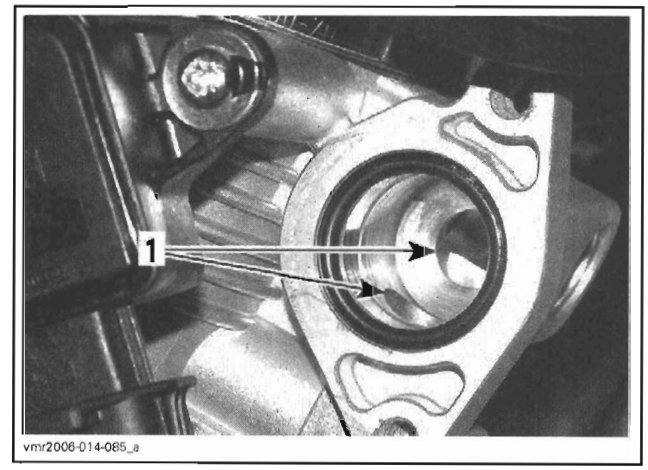
CAUTION: Always keep the ignition key turned OFF, while the idle bypass valve is removed.

CAUTION: Do not try to operate the piston of the idle bypass valve when it is dismounted. Also do not move the piston by hand. The drive screw is very sensitive and may be destroyed.

Using a part cleaner, clean idle bypass in throttle body from contamination then use an air gun to dry it.

⚠ WARNING

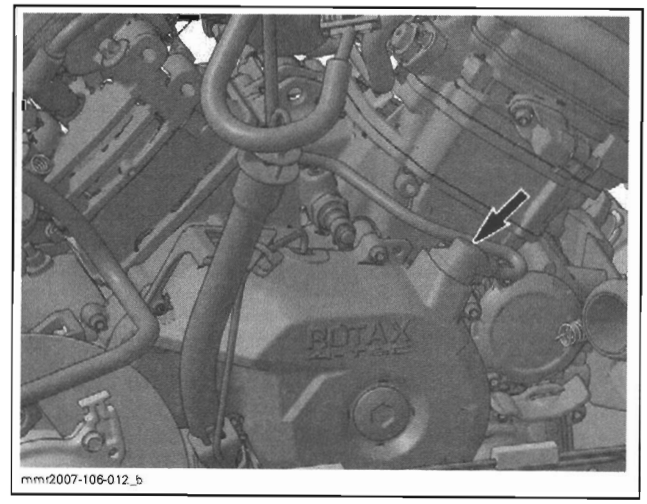
Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.



TYPICAL — IDLE BYPASS VALVE REMOVED
1. Clean bore from contamination

Clean all remaining parts and install the idle bypass valve on the throttle body.

CRANKSHAFT POSITION SENSOR (CPS)



NOTE: Take into account that a CPS fault can be triggered by bent or missing encoder wheel teeth. First check fault codes (refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS*) then check the teeth condition if necessary (refer to *MAGNETO SYSTEM*).

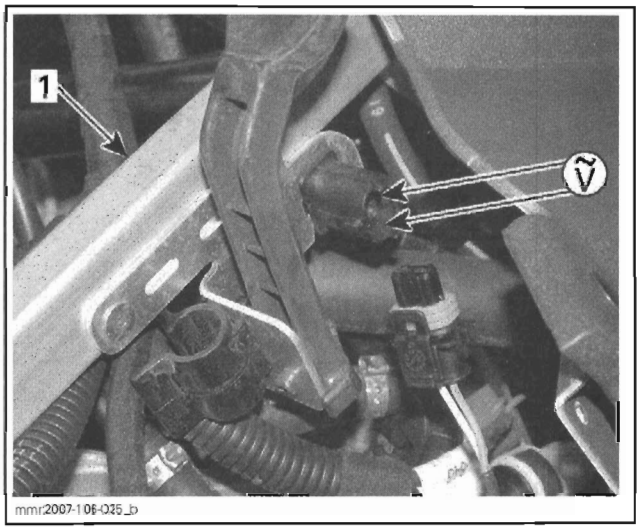
Remove hood and side panels. Refer to *BODY*.

NOTE: Air intake silencer may be removed to ease access.

Voltage Test

Disconnect CPS wiring harness connector. Probe pins while cranking engine, as shown.

CPS CONNECTOR		MEASUREMENT
PIN		VOLTAGE
1	2	Approximately 2 Vac



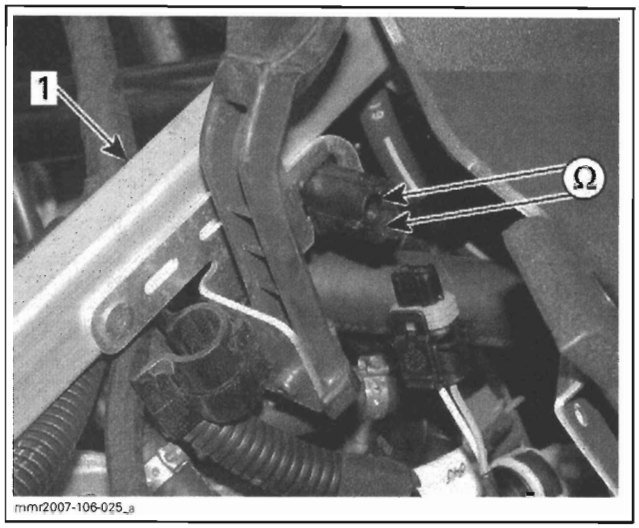
1. Upper LH tube

If voltage is not within specifications, inspect wiring and replace CPS if wiring is good.

Resistance Test

Disconnect CPS wiring harness connector. Probe terminals as shown.

CPS CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	2	700 - 900 Ω



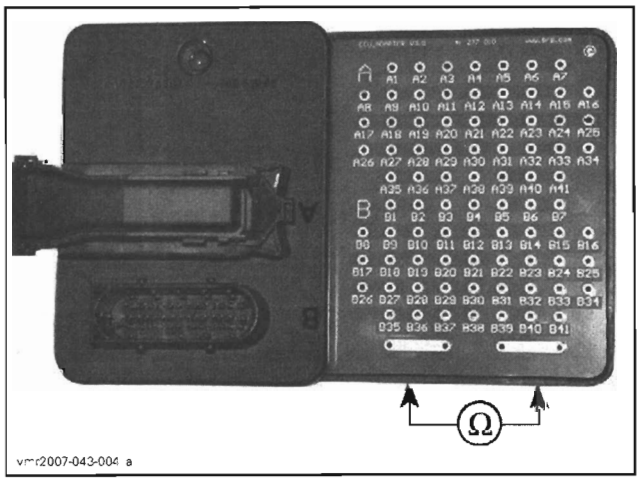
LH SIDE OF VEHICLE
1. Upper LH tube

If resistance is not within specifications, replace the CPS.

If resistance tests good, **reconnect** the CPS connector and disconnect the connector "A" on the ECM.

Using a multimeter, recheck resistance as per table.

ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
A-5	A-19	700 - 900 Ω



If resistance value is correct, refer to *ECM REPLACEMENT*.

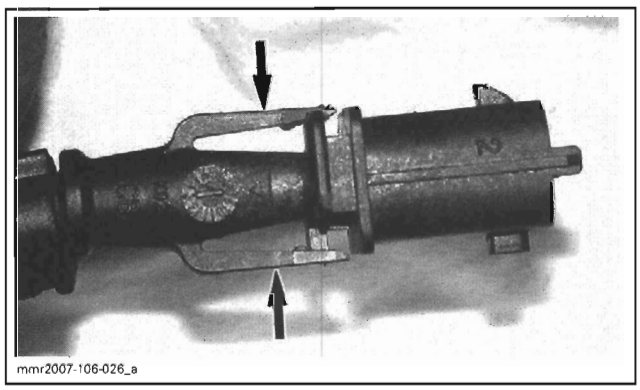
If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CPS.

Replacement

NOTE: Muffler may be removed to ease access.

Unplug CPS connector.

To remove connector from upper LH tube, firmly squeeze connector tabs and slide connector out.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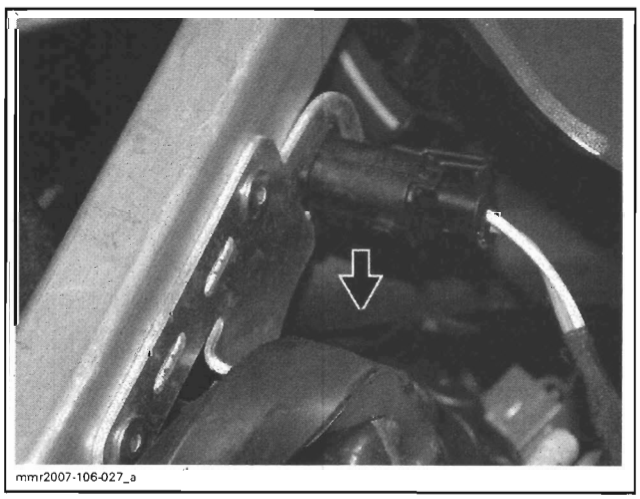
CONNECTOR ALONE FOR CLARITY PURPOSE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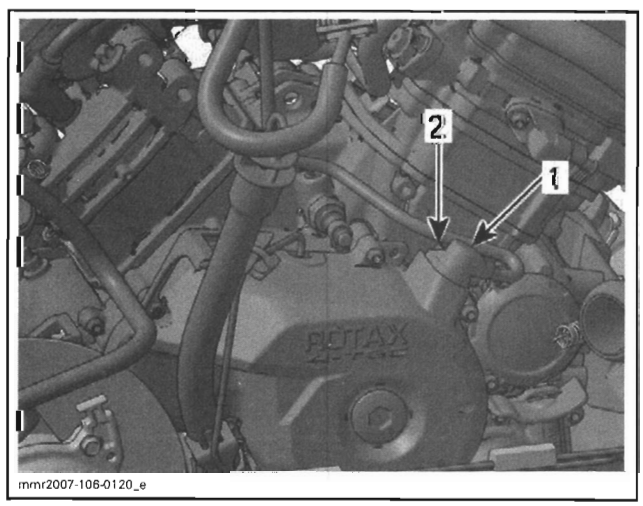
Remove CPS.



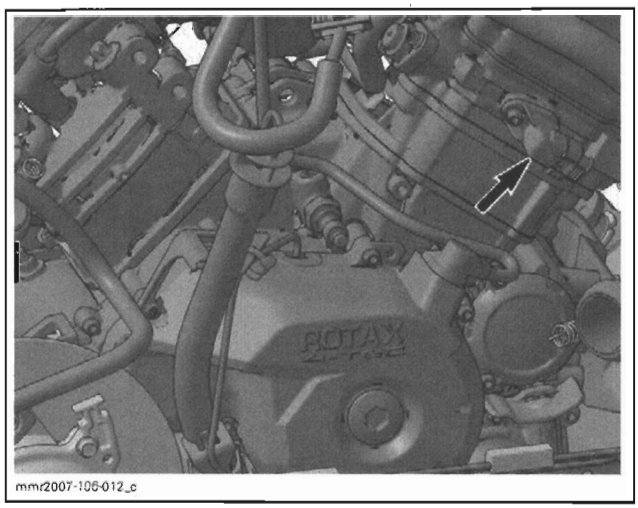
mmr2007-106-0120_e

1. *CPS*
2. *Retaining screw*

Install new CPS and secure harness with a locking tie.

Tightening torque of the CPS retaining screws is 10 N•m (89 lbf•**in**).

CAMSHAFT POSITION SENSOR (CAPS)


mmr2007-106-012_c

Remove LH side panel. Refer to *BODY*.

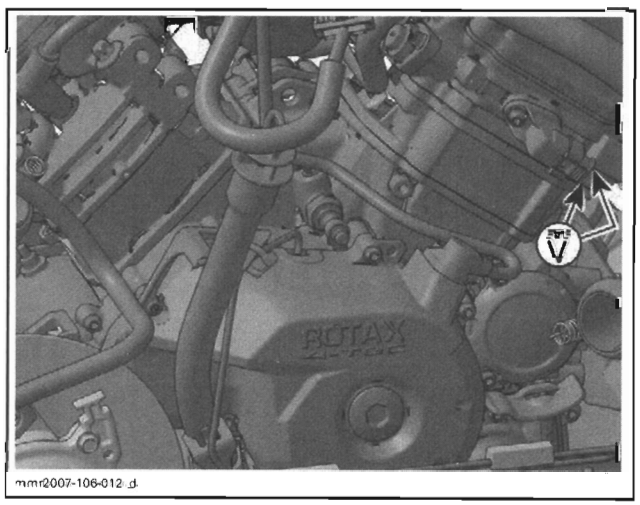
Voltage Test

Briefly turn ignition key to START.

Use a multimeter and set it to Vdc.

Back-probe connector and read voltage as follows.

CAPS CONNECTOR		VOLTAGE
VIOLET/PINK	BLACK/GREEN	Battery voltage


mmr2007-106-012_d

If voltage is not good, check/repair wiring/connectors.

If voltage is good, do the following test.

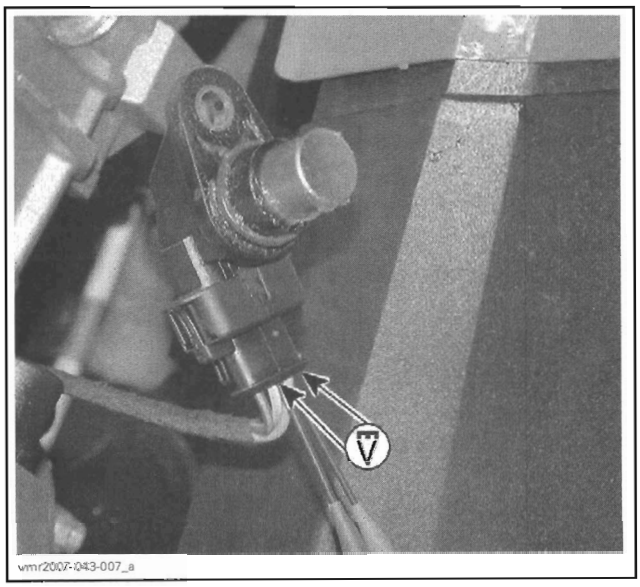
Remove CAPS sensor from engine.

Ensure connector is plugged.

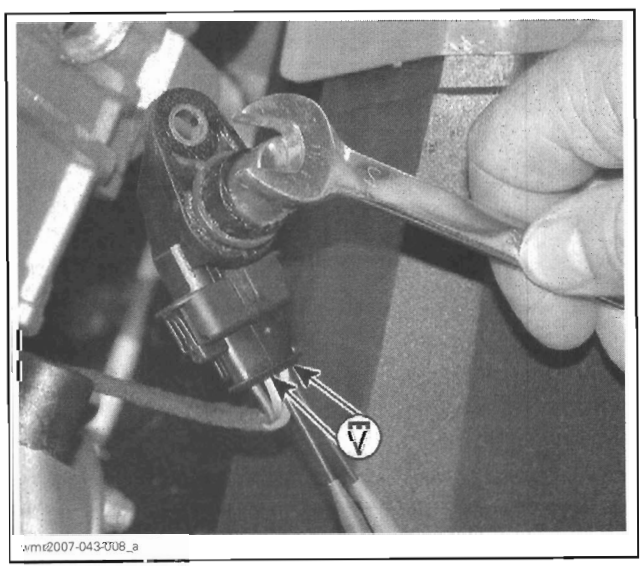
Use a multimeter and set it to Vdc.

Back-probe connector and read voltage as follows.

CAPS CONDITION	CAPS CONNECTOR		VOLTAGE
Free	VIOLET/ PINK	BLACK/ GREEN	Close to 0 Vdc



CAPS CONDITION	CAPS CONNECTOR		VOLTAGE
Metallic object on sensor	VIOLET/ PINK	BLACK/ GREEN	Battery voltage

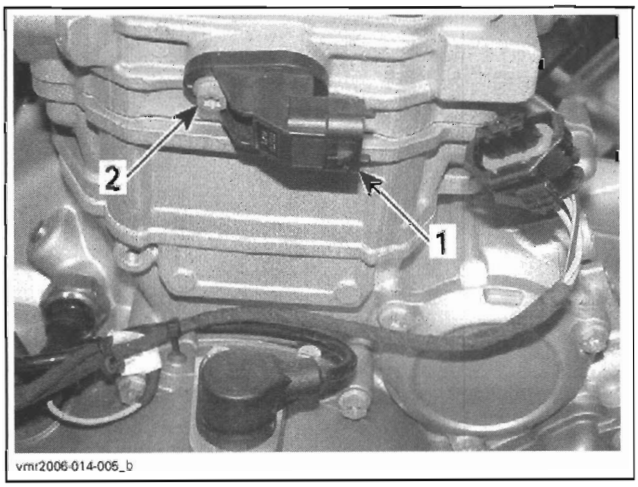


If voltage is appropriate, check/repair wiring/ connector between sensor and ECM. If it is good, refer to *ECM REPLACEMENT*.

If voltage is wrong, try a new CAPS.

Replacement

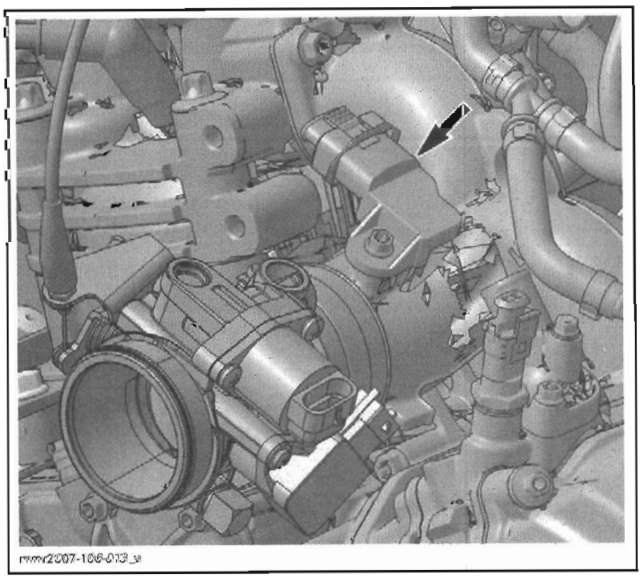
Unscrew the retaining screw and replace the CAPS. Ensure to reinstall O-ring.



1. CAPS
2. Retaining screw

Apply Loctite 243 (P/N 293 800 060) on thread and torque to 10 N•m (89 lbf•**in**).

MANIFOLD AIR PRESSURE AND TEMPERATURE SENSOR (MAPTS)



NOTE: This sensor is a multifunction device. It measures ambient pressure, intake manifold air pressure and temperature for air flow calculations.

Remove hood and LH side panel. Refer to *BODY*.

Remove air intake silencer. Refer to *AIR INTAKE SYSTEM*.

Sensor Pressure Function

Ensure sensor is correctly installed on intake manifold. Otherwise, the MAPTS could generate a fault code for an unexpected sensor range at idle when it reads the atmospheric pressure. Remove sensor and check for oil or dirt on its end and if problem persists, check throttle plate condition/position and the wiring harness. Perform the following tests.

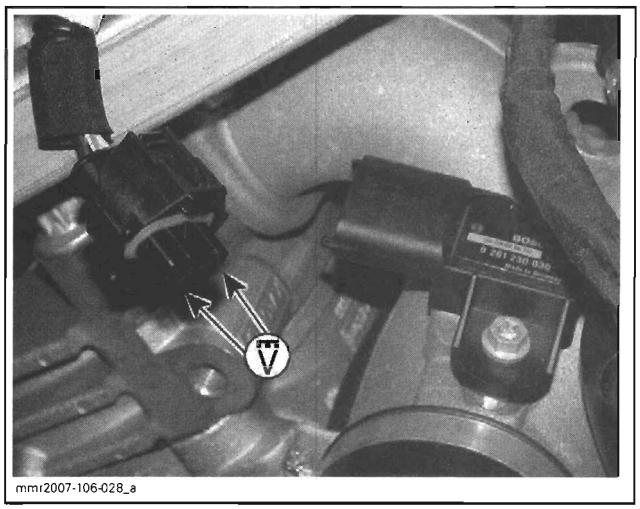
Voltage Test

Check the voltage output from ECM to the pressure sensor.

Briefly turn ignition key to START.

Disconnect plug connector from MAPTS and connect a voltmeter as shown.

MAPTS CONNECTOR		MEASUREMENT
PIN		VOLTAGE
1	3	5 Vdc



mmr2007-106-028_a

If voltage test is good, replace the MAPTS.

If voltage test is not good, check the continuity of the MAPTS circuit. See below.

Resistance Test

Disconnect the connector "A" from the ECM.

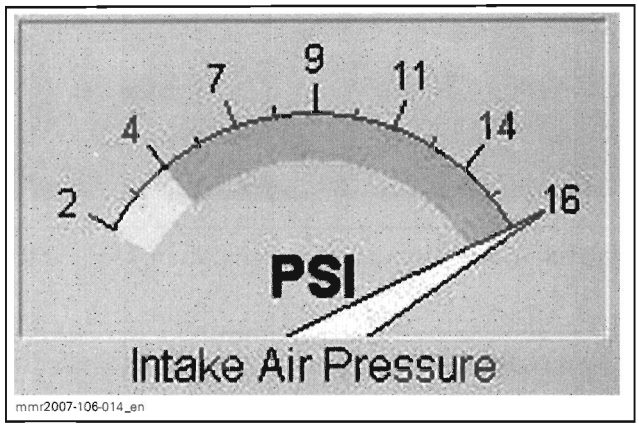
Using a multimeter, check continuity of circuits 12, 28 and 40.

If wiring harness is good, refer to *ECM REPLACEMENT*.

Otherwise, repair the connectors or replace the wiring harness between ECM connector and the MAPTS.

Quick Test

Using B.U.D.S. software, look the MAPTS from the **Monitoring** section and read out the pressure value while engine is stopped.



mmr2007-106-014_en

Perform the same test with a new MAPTS and compare both readings.

Values have to be within ± 3.4 kPa (0.5 PSI).

If old MAPTS's value is out of this range, replace it.

Sensor Temperature Function

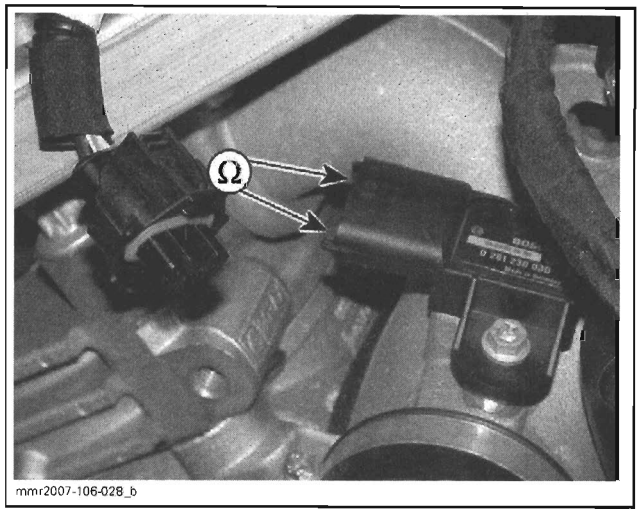
The sensor also monitors the temperature at manifold.

Resistance Test

Disconnect the connector from the MAPTS.

Using a multimeter, check the resistance of the sensor itself as shown.

MAPTS		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	2	2280 - 2740



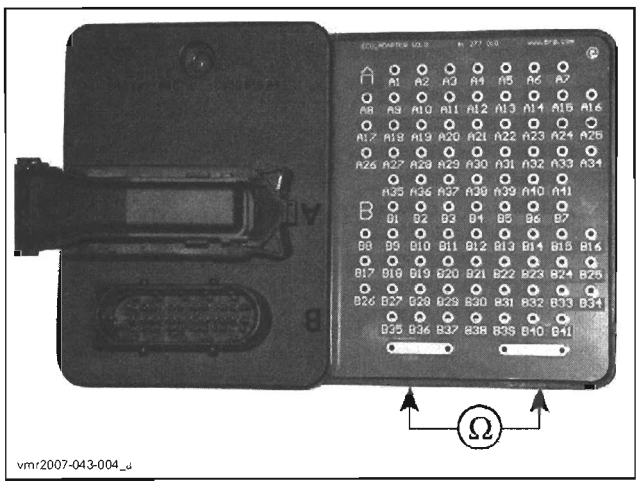
mmr2007-106-028_b

If resistance is not within specification, replace the MAPTS.

If resistance tests good, **reconnect** the MAPTS and disconnect the connector "A" from the ECM.

Using a multimeter, recheck resistance value between pins as shown.

ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
A-7	A-28	2280 - 2740



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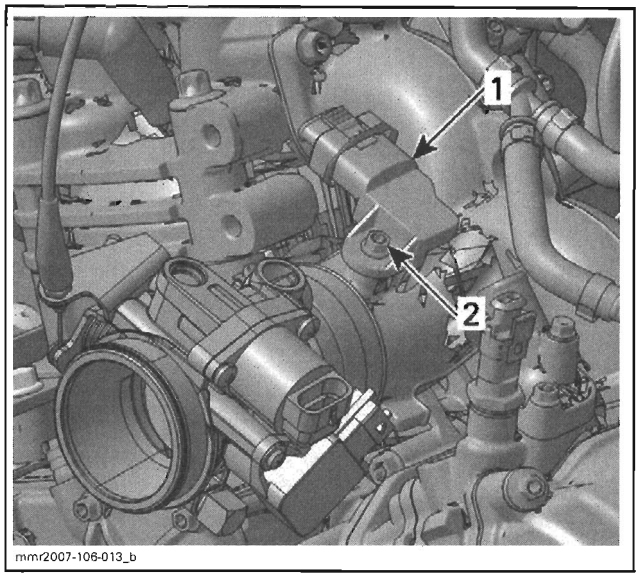
If resistance value is correct, refer to *ECM REPLACEMENT*.

If resistance value is incorrect, inspect/repair/replace wiring harness between ECM connector and the MAPTS.

Replacement



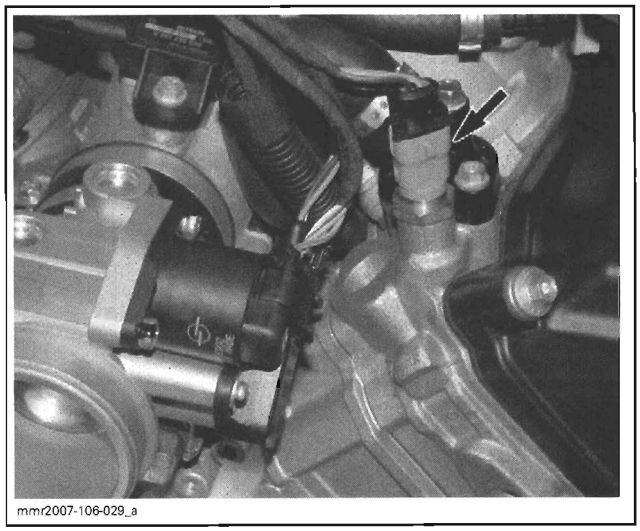
mmr2007-106-013_b

1. MAPTS
2. Retaining screw

Disconnect MAPTS connector and remove the MAPTS.

Apply Loctite 243 (P/N 293 800 060) on screw then torque to 6 N•m (53 lbf•**in**).

COOLANT TEMPERATURE SENSOR (CTS)


mmr2007-106-029_a

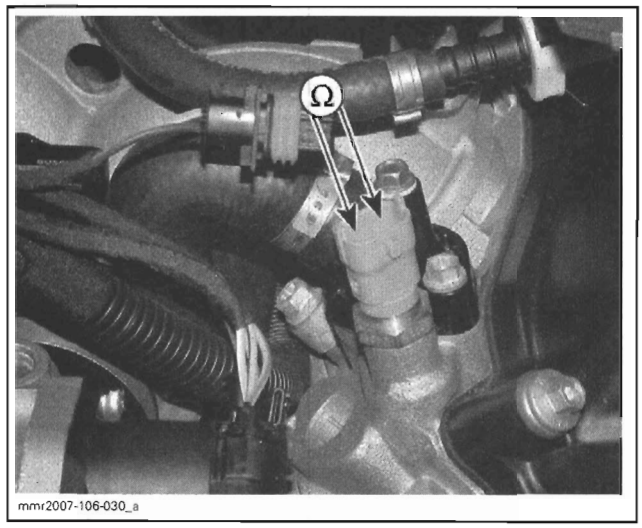
COOLANT TEMPERATURE SENSOR (CTS)

Remove hood and LH side panel. Refer to *BODY*.

Resistance Test

Disconnect the plug connector from the CTS and check the resistance of the sensor itself.

CTS SENSOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	2	2280 - 2740

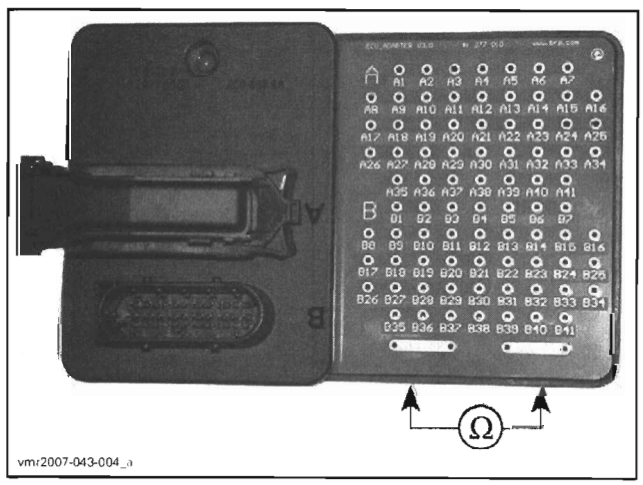


If resistance is out of specification, replace the CTS.

If resistance tests good,**reconnect** the CTS and disconnect the ECM connector "A" from the ECM.

Using a multimeter, recheck resistance on the ECM connector as per table.

ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
A-11	A-27	2280 - 2736



If resistance value is correct, refer to *ECM REPLACEMENT.*

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CTS.

Replacement

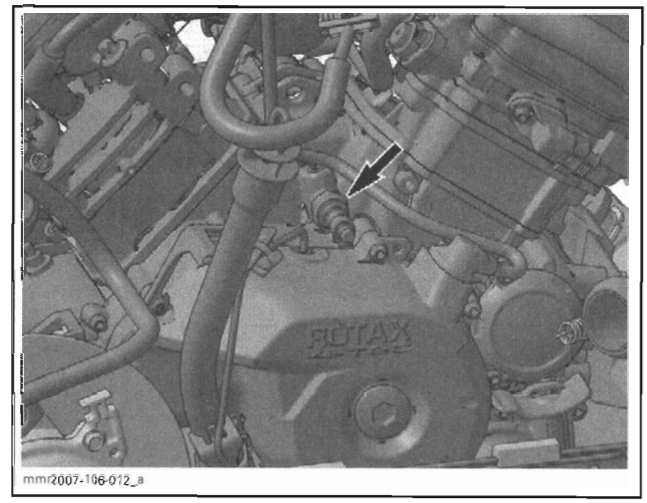
Disconnect CTS connector and remove CTS.

Install the new CTS and torque to 16 N•m (142 lbf•**in**).

Reinstall remaining removed parts.

Refill and bleed the cooling system, refer to *COOLING SYSTEM* subsection.

OIL PRESSURE SWITCH (OPS)



Oil Pressure Test

To check the function of the oil pressure switch, an oil pressure test has to be performed. Refer to *OIL PRESSURE TEST* in *LUBRICATION SYSTEM* section.

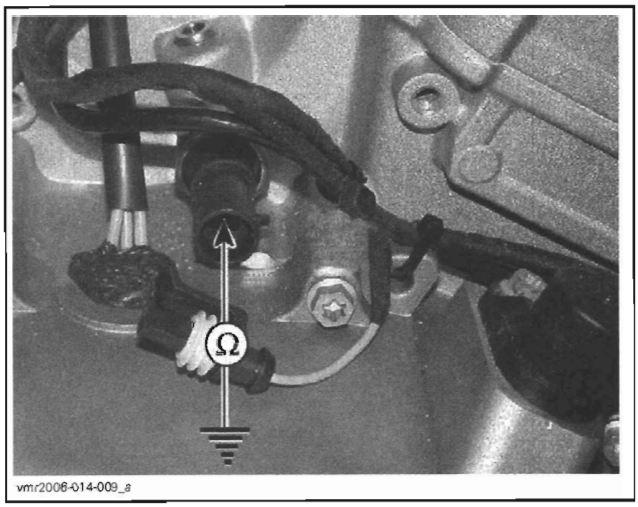
If the engine oil pressure is good, check the resistance of the OPS while engine is off and while engine is running.

Resistance Test

Disconnect the connector from the OPS.

Use a multimeter to check the resistance as shown.

OPS CONNECTOR		ENGINE NOT RUNNING	ENGINE RUNNING
PIN		RESISTANCE (Ω)	
1	Engine ground	Close to 0 Ω (normally closed switch)	Infinitely high when pressure reaches 30 - 60 kPa (4.4 - 8.7 PSI)



If resistance values are incorrect, replace OPS.

If the values are correct, check the continuity of the wiring harness.

Disconnect the connector "A" from the ECM and check continuity of circuit 10.

If wiring harness is good, refer to *ECM REPLACEMENT*.

Otherwise, repair the connector or replace the wiring harness between ECM connector and OPS.

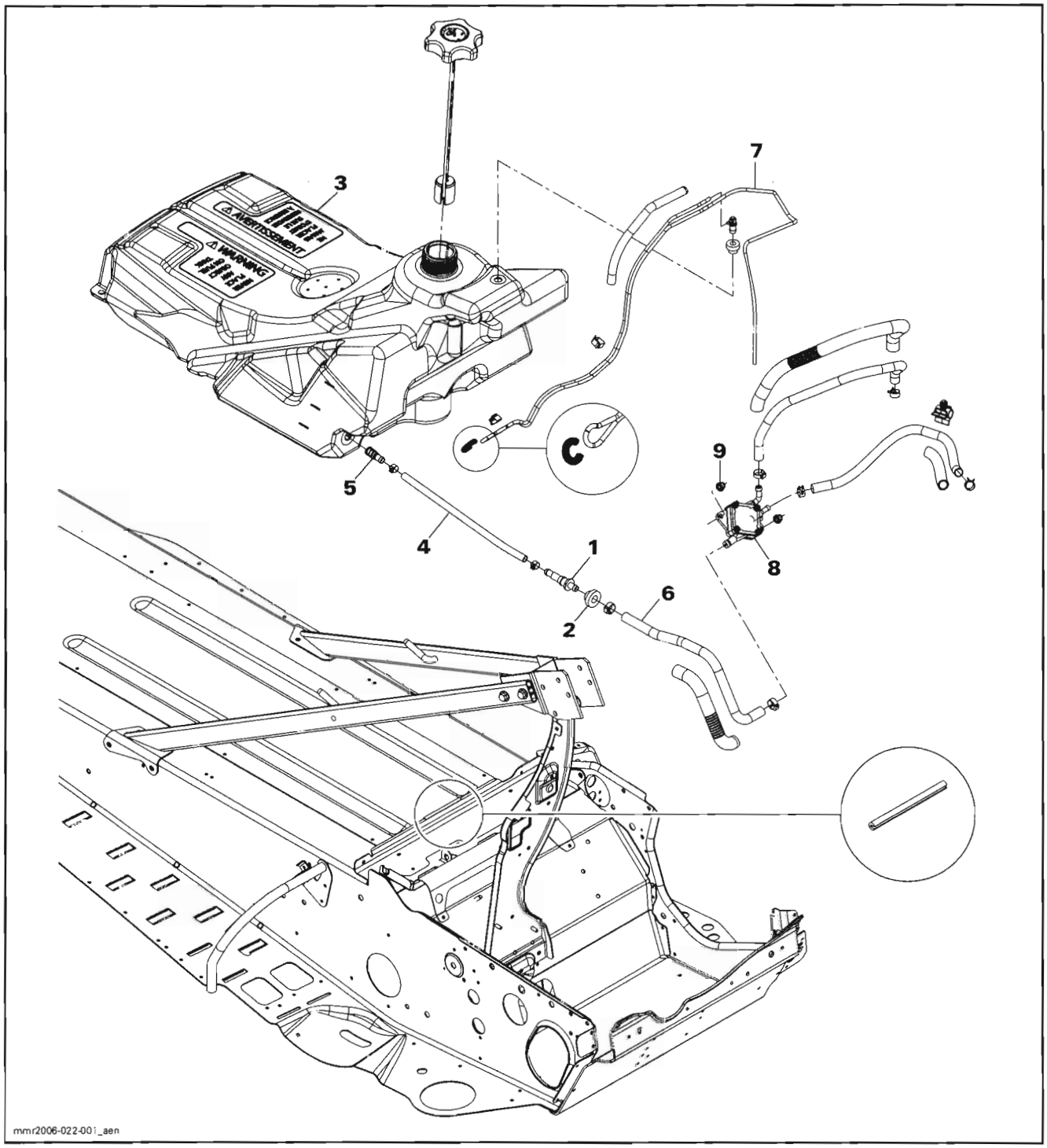
Replacement

Refer to *LUBRICATION SYSTEM* section.

FUEL TANK AND FUEL PUMP (300F/550F)

SERVICE TOOLS

Description	Part Number	Page
leak tester kit	529 033 100	333
pliers Oetiker 1099	295 000 070	333
pressure pump kit	529 021 800	333
small hose pincher	295 000 076	333, 335
wrench	529 035 891	334


3
7
5
4
1
2
6
9
8
C
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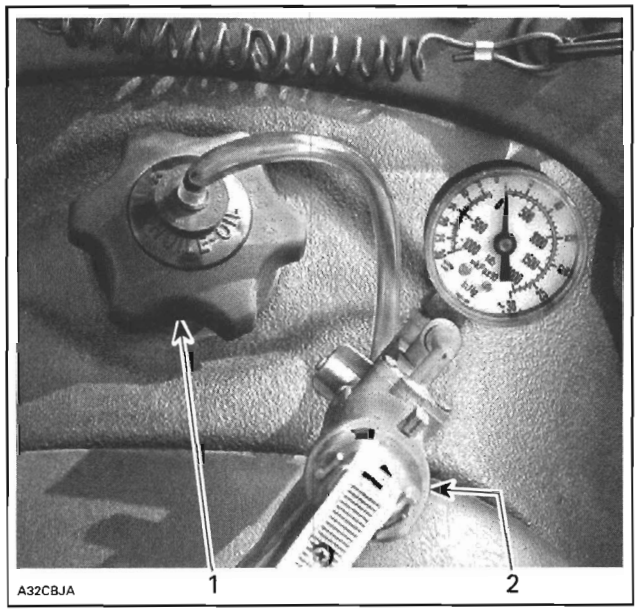
INSPECTION

FUEL SYSTEM LEAK TEST

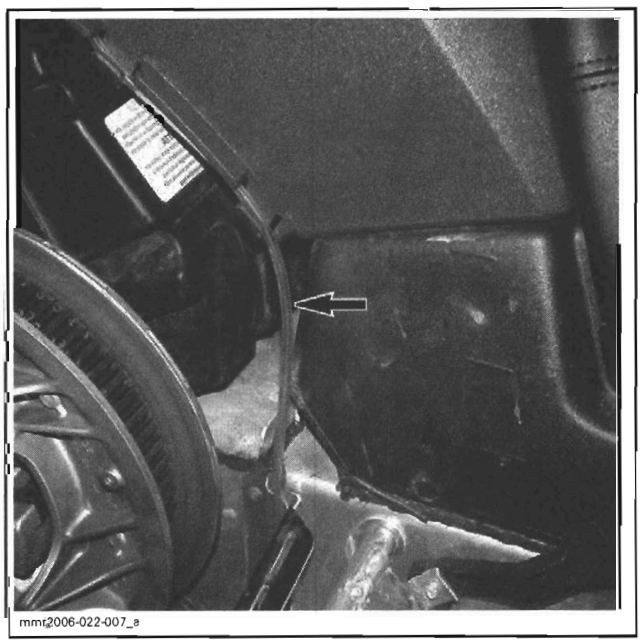
Fill up fuel tank.

Install the special cap of leak tester kit (P/N 529 033 100) on fuel tank.



TYPICAL
1. *Special cap on tank*
2. *Air pump*

Install a small hose pincher (P/N 295 000 076) on vent line.



Using air pump in pressure pump kit (P/N 529 021 800), inject air into fuel tank.

Pressurize fuel system as follows.

PRESSURE	TIME TO HOLD PRESSURE
21 kPa (3 PSI)	3 minutes

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

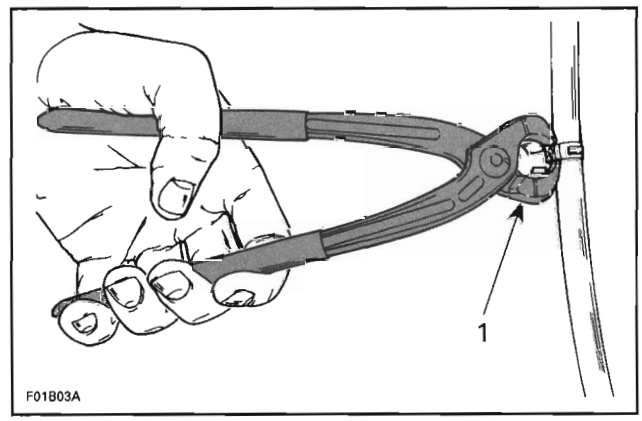
To ease locating leak(s), spray soapy water on components; bubbles will indicate leak location(s).

PROCEDURES

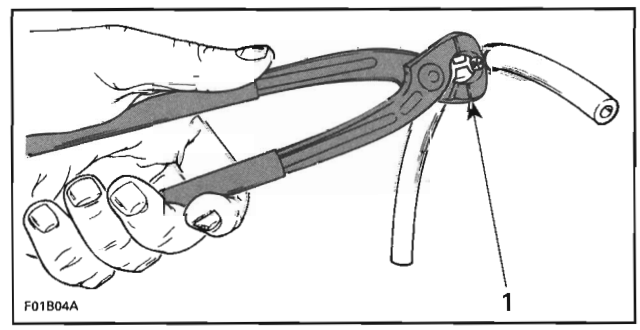
OETIKER CLAMPS

Replacement

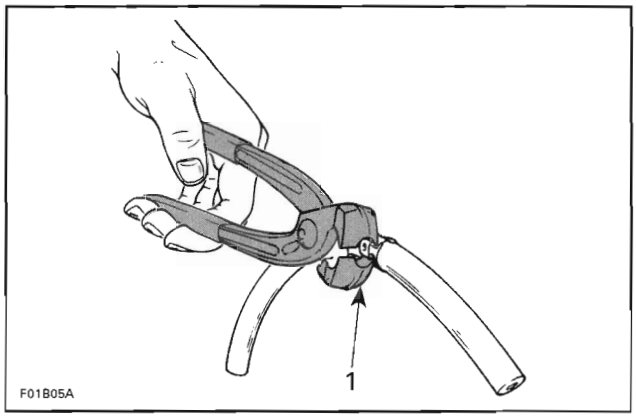
To secure or cut Oetiker clamps on fuel lines, use pliers Oetiker 1099 (P/N 295 000 070).



1. Cutting clamp



1. Securing clamp



1. Securing clamp in limited access

⚠ WARNING

Use of improper fuel lines could compromise fuel system integrity.

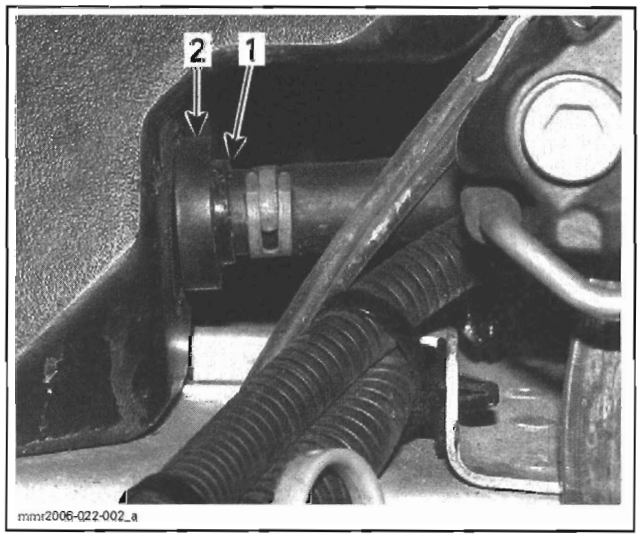
IN-TANK FUEL STRAINER

Replacement

Drain fuel tank.

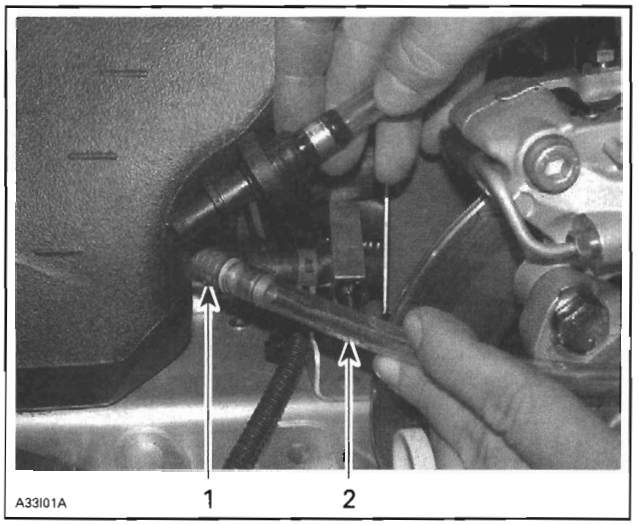
Unplug supply hose.

Pull out male connector **no. 1** from grommet.



1. Male connector (under hose end)
2. Grommet

Pull out grommet **no. 2** from fuel tank **no. 3** then, pull out pickup hose **no. 4** and fuel strainer **no. 5**.



1. Fuel strainer
2. Pickup hose

Replace fuel strainer and grommet. To facilitate the installation, grommet should be on smaller diameter of male connector. Install grommet on fuel tank and push male connector through grommet.

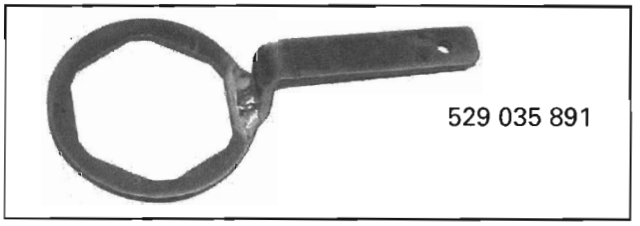
FUEL TANK

Removal

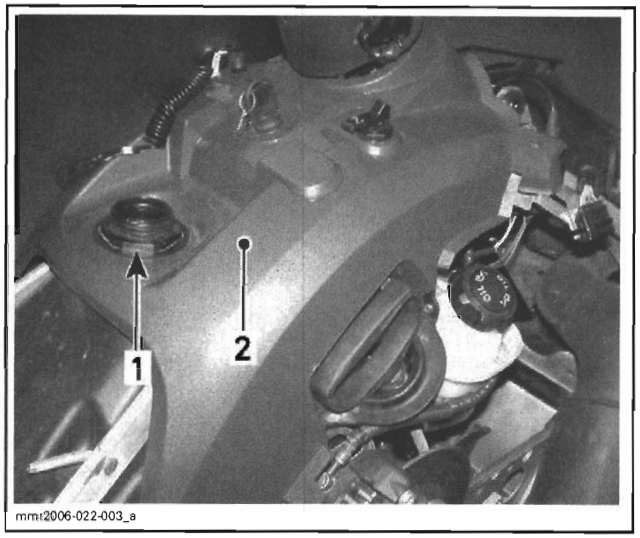
Remove seat and trunk, refer to *BODY*.

Remove fuel tank cap.

Remove filler neck plastic nut using wrench (P/N 529 035 891).

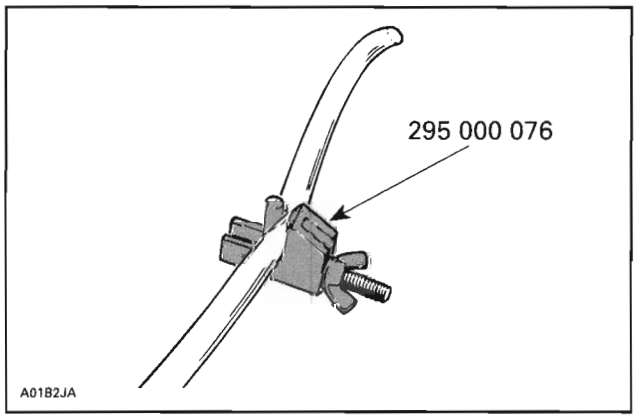


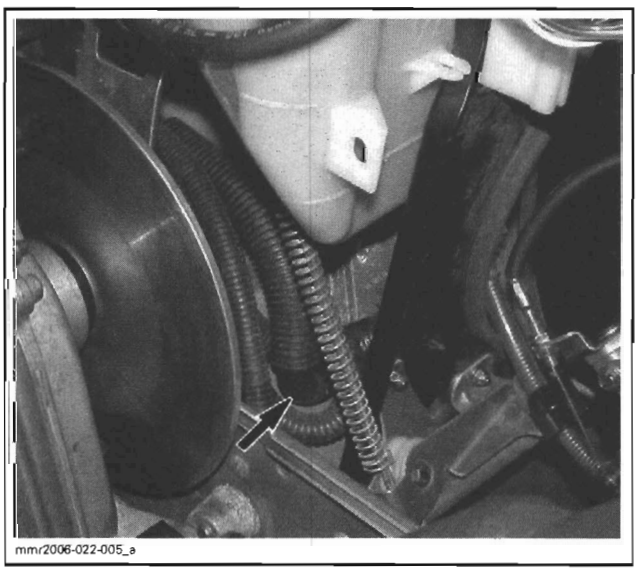
Remove console. Refer to *BODY*.



1. Neck nut
2. Console

Empty fuel tank and install a small hose pincher (P/N 295 000 076) on fuel line **no. 6**.



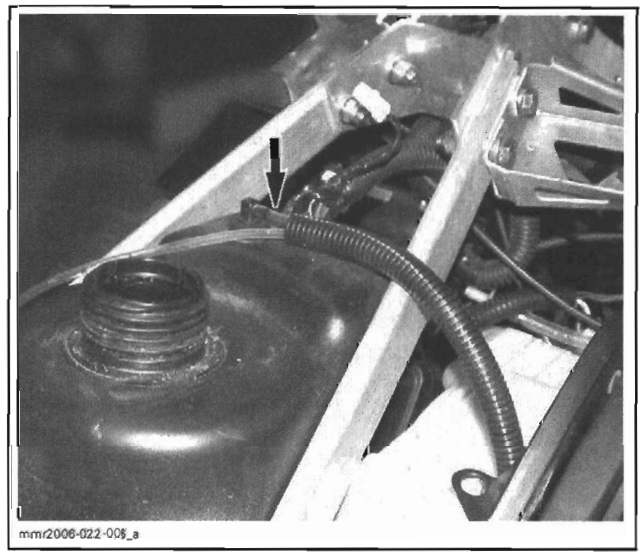


Disconnect supply hose at fuel pump.

⚠ WARNING

Whenever a fuel line is disconnected, obstruct line with a hose pincher. Fuel is flammable and explosive under certain conditions. Always wipe off any fuel or oil spillage from the vehicle. Ensure work area is well ventilated. Do not smoke or allow open flames or sparks in the vicinity.

Unplug vent tube **no. 7** from tank.



Remove aluminum braces each side of fuel tank.

Remove fuel tank **no. 3** and set it aside.

Installation

Installation is the reverse of removal procedures. However, pay attention to the following.

Ensure to reconnect vent tube **no. 7**.

⚠ WARNING

Make sure vent tube is not kinked.

Connect fuel line and remove hose pincher.

When reinstalling aluminum braces, install new Torx screws at bottom and new lock nuts at top.

Pressurize fuel system to ensure there is no leak.

DIAPHRAGM FUEL PUMP

Verification

Check fuel pump valves operation as follows:

Empty fuel tank.

NOTE: For the following test, ensure hoses have a tight fit.

Disconnect outlet hose from fuel tank.

Alternately apply pressure and vacuum with pump of leak test kit to disconnected fuel tank hose. The inlet valve should release with pressure and hold under vacuum.

Disconnect inlet hose from carburetor.

Repeat the same procedure with disconnected carburetor inlet hose. This time the outlet valve should hold with pressure and release under vacuum.

Removal

Empty fuel tank.

Disconnect hoses from fuel tank, carburetor and impulse hose from crankcase.

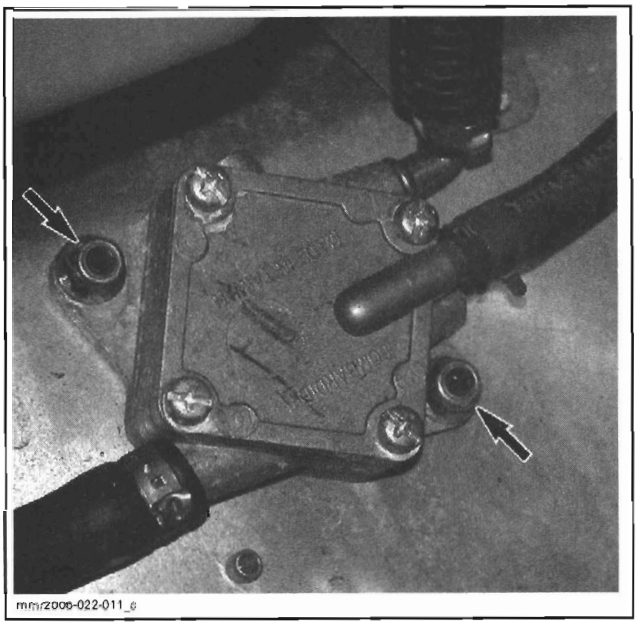
Remove air intake silencer. Refer to *AIR INTAKE SYSTEM*.

Remove nuts and or screws securing the injection oil reservoir. Refer to *OIL INJECTION SYSTEM*.

Slightly move oil reservoir to gain access to fuel pump nuts.

Remove nuts **no. 9** securing fuel pump to chassis.

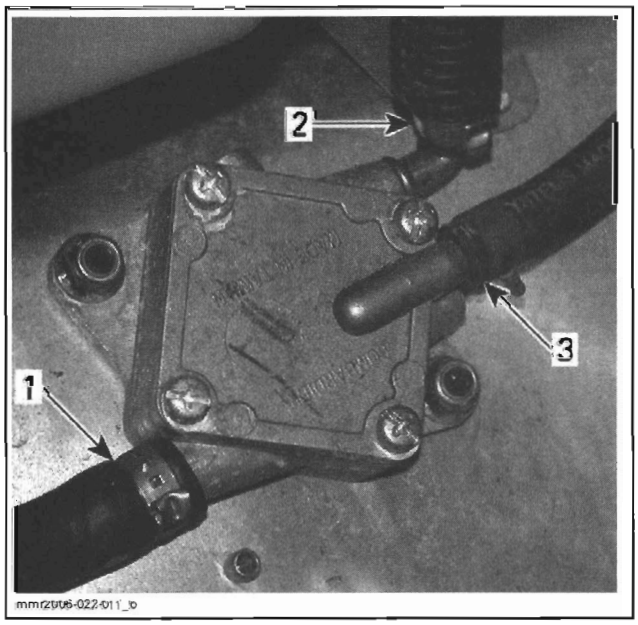
CAUTION: If a nut is hard to unscrew, be careful not to break screw. Apply a lubricant on threads to ease removal.



Installation

Reverse removal procedure paying attention to the following.

Install hoses on pump prior to installing pump in vehicle.



TYPICAL VIEW AFTER INSTALLATION
1. *Inlet (hose from fuel tank)*
2. *Outlet (hose going to carburetor)*
3. *Impulse (hose from crankcase)*

Secure hoses with new collars and ensure spring clip on impulse hose is tight.

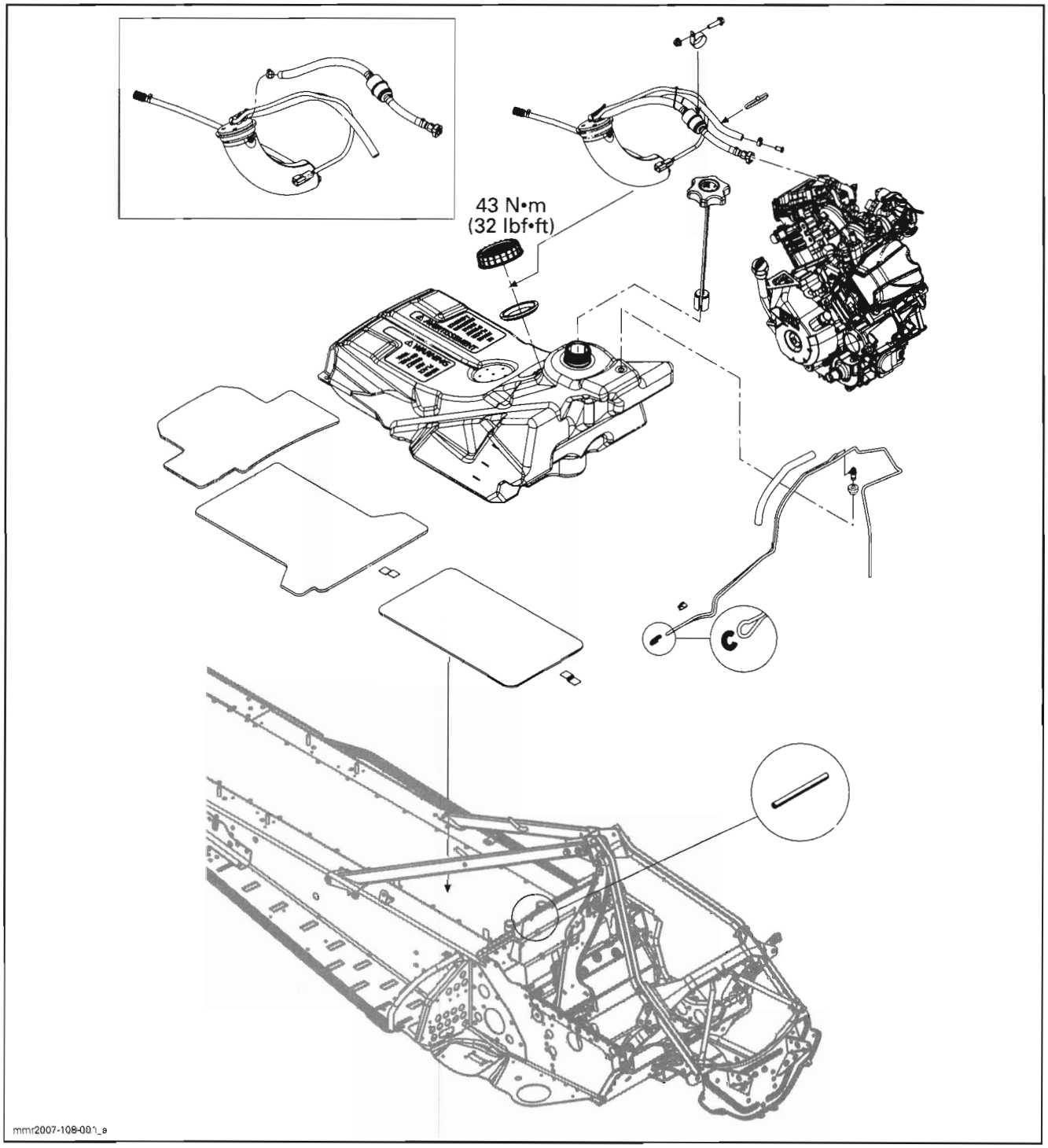
⚠ WARNING

Proceed with a fuel system leak test.

FUEL TANK AND FUEL PUMP (V800)

SERVICE TOOLS

Description	Part Number	Page
hose pincher	295 000 076	339
leak tester kit	529 033 100	339
pliers Oetiker 1099	295 000 070	341
pressure gauge	529 035 709	340
pressure pump kit	529 021 800	339
T-fitting	529 036 023	340
wrench	529 035 899	344


43 N•m
(32 lbf•ft)
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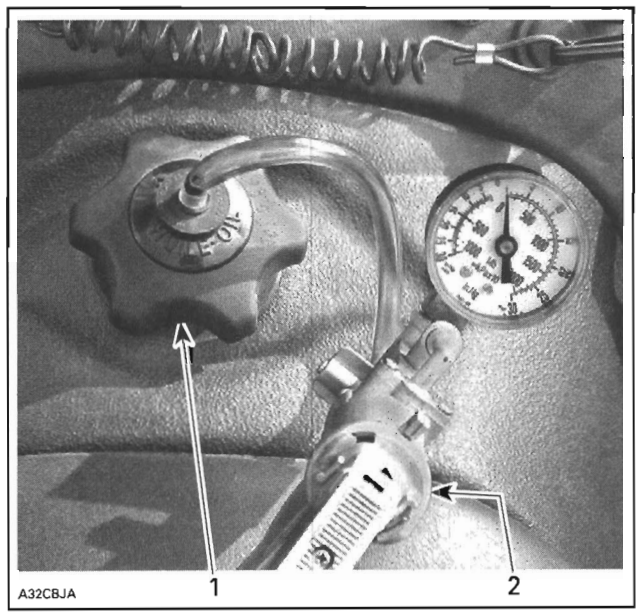
INSPECTION

FUEL TANK LEAK TEST

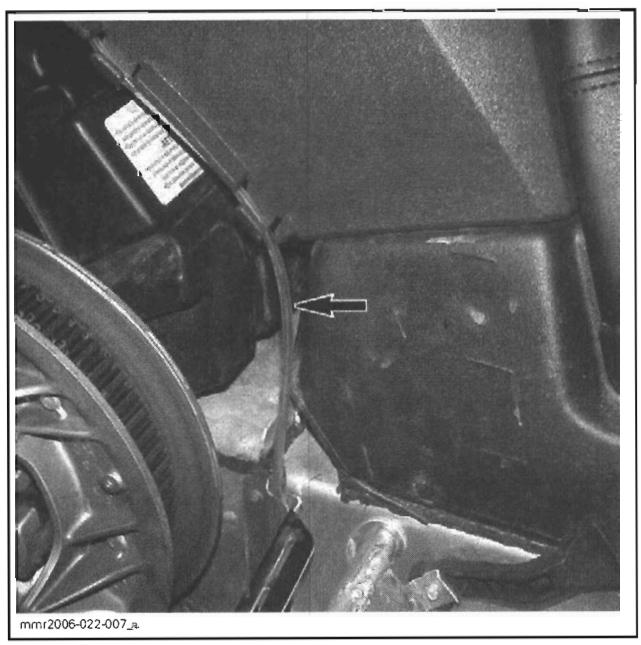
Fill up fuel tank.

Install the special cap of leak tester kit (P/N 529 033 100) on fuel tank.



TYPICAL
1. *Special cap on tank*
2. *Air pump*

Install a hose pincher (P/N 295 000 076) on vent line.



Using air pump in pressure pump kit (P/N 529 021 800), inject air into fuel tank.

Pressurize fuel system as follows.

PRESSURE	TIME TO HOLD PRESSURE
21 kPa (3 PSI)	3 minutes

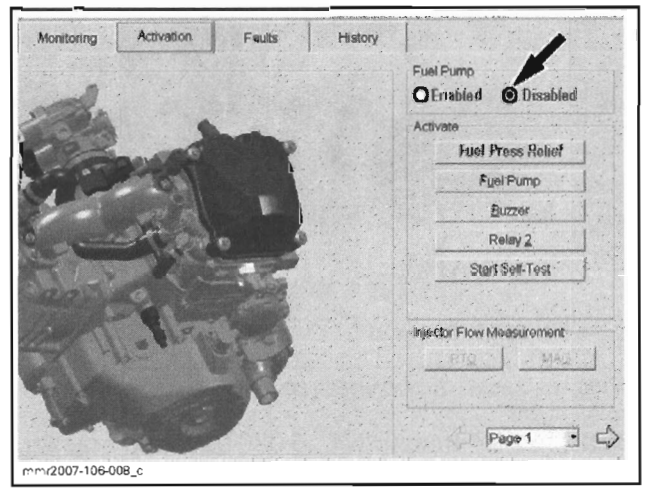
If pressure drops, locate fuel leak(s) and repair/replace leaking component(s).

To ease locating leak(s), spray soapy water on components; bubbles will indicate leak location(s).

FUEL PRESSURE TEST

Before proceeding to the pressure test, ensure the battery is fully charged. Battery voltage must be over 12 volts.

Disable fuel pump using B.U.D.S. Look in the **Activation** tab.



Release fuel pressure by running engine until it runs out of gas.

⚠ WARNING

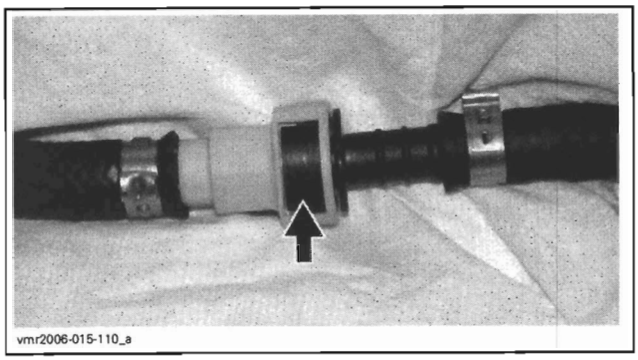
The fuel hose may be under pressure. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to release the pressure. Wipe off any fuel spillage inside engine compartment.

The pressure test will show the available pressure at the fuel pump outlet. It validates the pressure regulator, the fuel pump and leaks in the system.

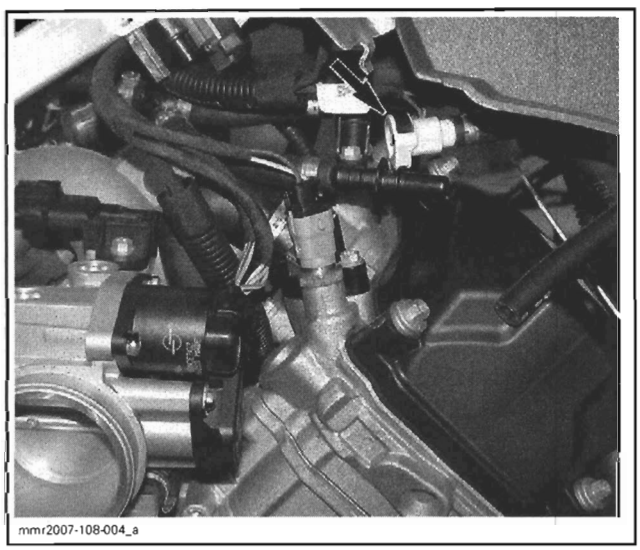
Ensure there is no leak from hoses and fittings. Repair any leak.

Ensure there is enough gas in fuel tank.

Disconnect outlet hose from fuel pump.

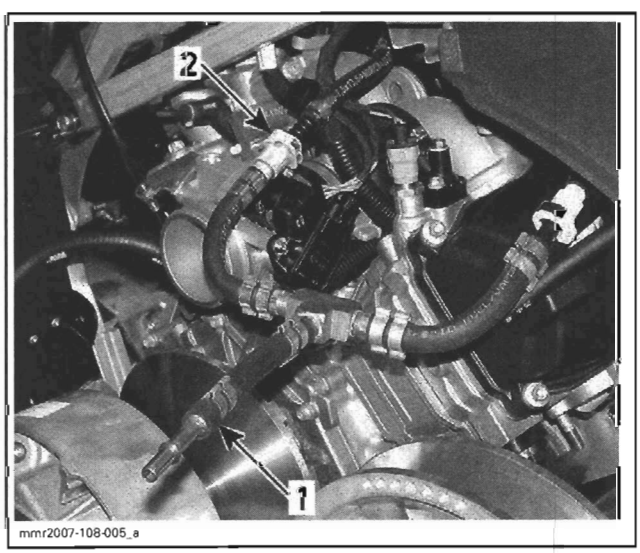


PRESS TAB

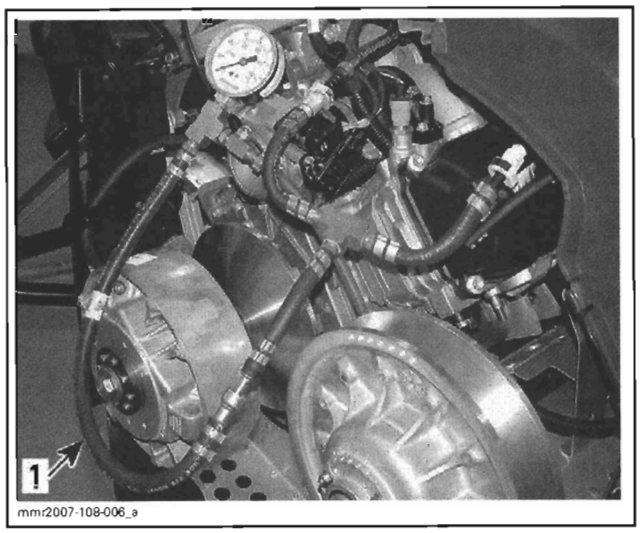


TYPICAL — HOSE DISCONNECTED

Install fuel T-fitting (P/N 529 036 023) and pressure gauge (P/N 529 035 709) between disconnected hoses (in-line installation).

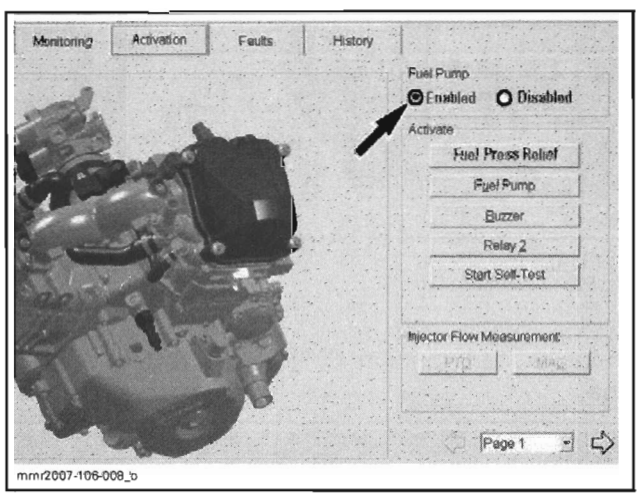


1. *T-fitting*
2. *T-fitting adapter (spare part P/N 513 033 135)*



1. *Pressure gauge connected to T-fitting*

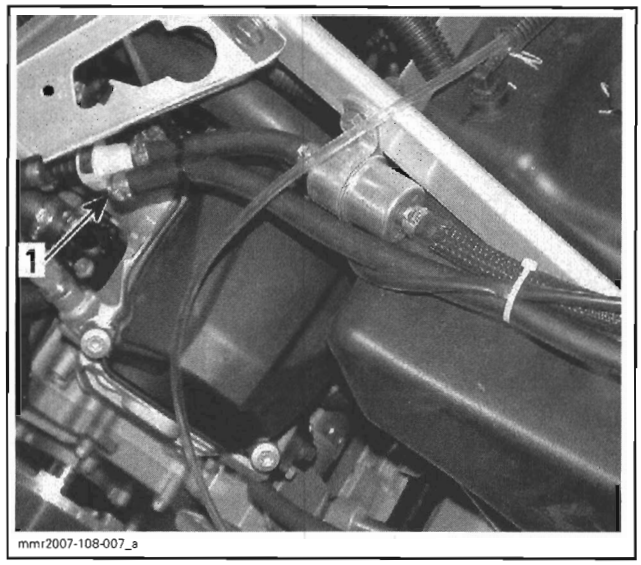
Re-enable fuel pump using B.U.D.S.



Briefly turn ignition key to START **Do not crank engine.** Repeat twice. Release pressure using valve on fuel gauge. Ensure gauge is "reset" to zero (0).

FUEL PRESSURE (when briefly turning ignition key to START)
400 ± 20 kPa (58 ±3 PSI)

Ensure plug is not leaking on the unused fuel pump hose.



SOME COMPONENTS REMOVED FOR CLARITY PURPOSE ONLY
1. Plug on unused hose

NOTE: This hose is only for factory use.

Crank or start engine and observe fuel pressure. The fuel pressure should be the same as above.

If pressure is within limits, the fuel pump and pressure regulator are working adequately.

A rapid pressure drop indicates leakage either from the fuel rail or from the fuel pump check valve. Check fuel rail for leaks. If it is not leaking then replace the fuel pump.

A slow pressure drop indicates leakage either from the fuel injector or from the fuel pressure regulator. Check fuel injector for leaks (see below). If it is not leaking then replace the fuel pump.

NOTE: For resolving a fuel pressure problem, refer to *TROUBLESHOOTING* in this section.

Release fuel pressure from fuel gauge valve.

Remove pressure gauge and T-fitting from inlet hose.

Reconnect inlet hose.

⚠ WARNING

Wipe off any fuel spillage in the engine compartment. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area.

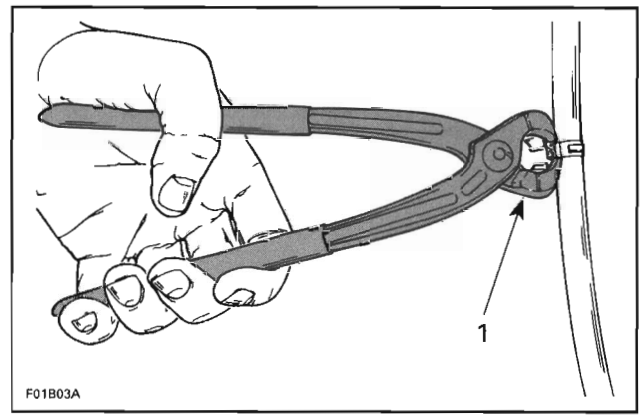
Reinstall removed parts.

PROCEDURES

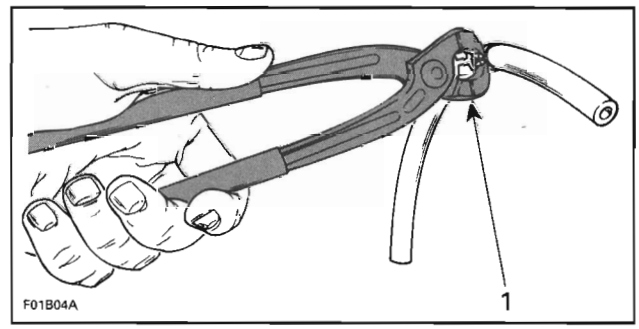
OETIKER CLAMPS

Clamp Replacement

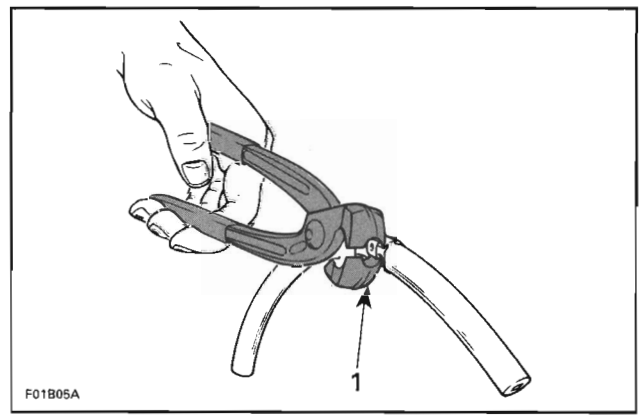
To secure or cut Oetiker clamps on fuel lines, use pliers Oetiker 1099 (P/N 295 000 070).



1. Cutting clamp



1. Securing clamp



1. Securing clamp in limited access

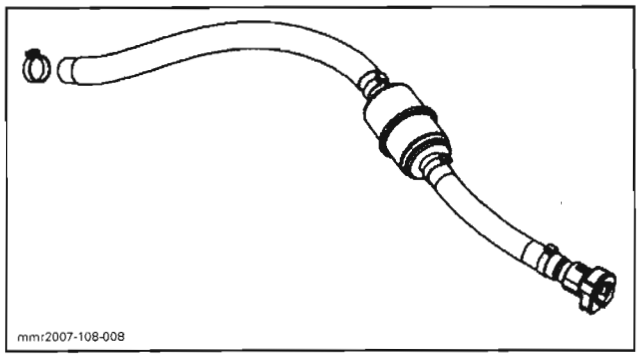
⚠ WARNING

Use of improper fuel lines could compromise fuel system integrity.

FUEL FILTER

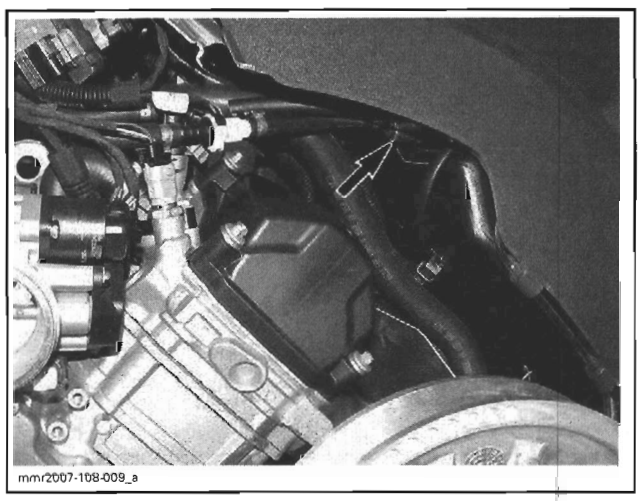
Fuel Filter Replacement

NOTE: The fuel filter comes as an assembly with the hoses.



FUEL FILTER AND HOSES

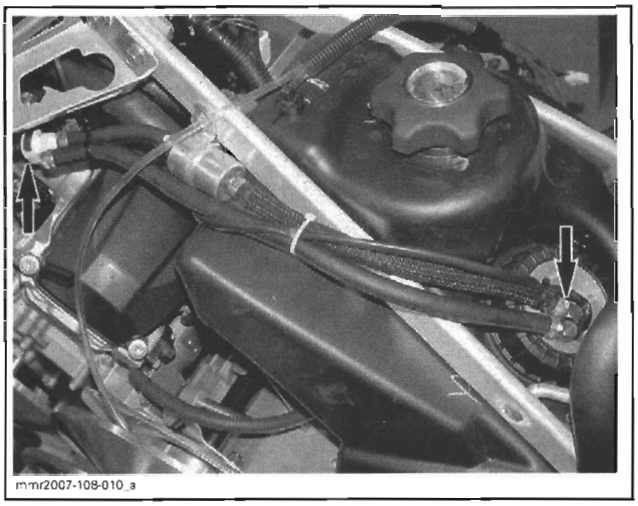
The fuel filter is located on LH side of the vehicle underneath console.



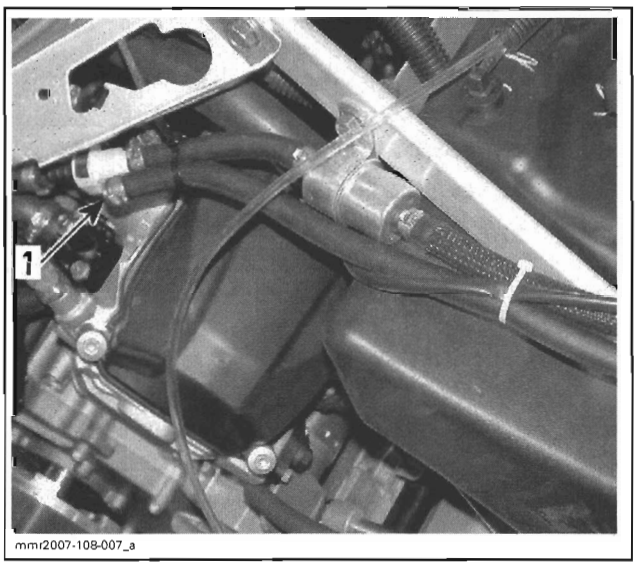
Release fuel pressure. Refer to *FUEL PRESSURE TEST* above.

Remove console. Refer to *BODY*.

Disconnect both ends of fuel filter hoses.



Unscrew fuel filter support then remove the filter with hoses.



1. Unscrew fuel filter support

Installation is reverse of removal procedure.

Install a new Oetiker clamp.

Re-enable fuel pump. Refer to *FUEL PRESSURE TEST* above.

FUEL PUMP

Fuel Pressure Test

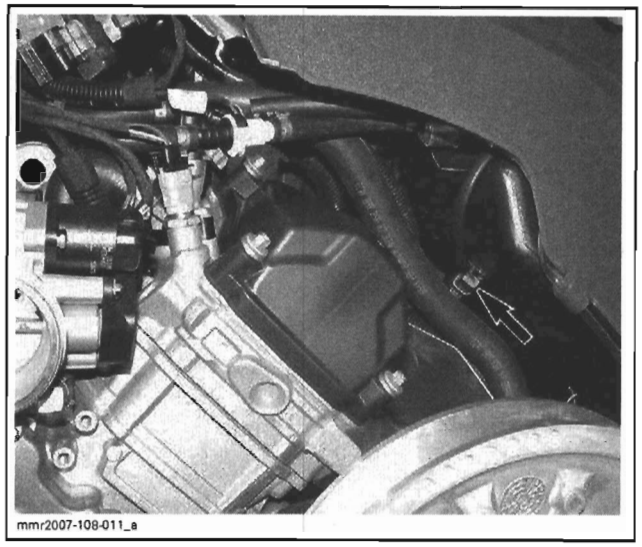
Refer to *INSPECTION* in this section.

Fuel Pump Electrical Test

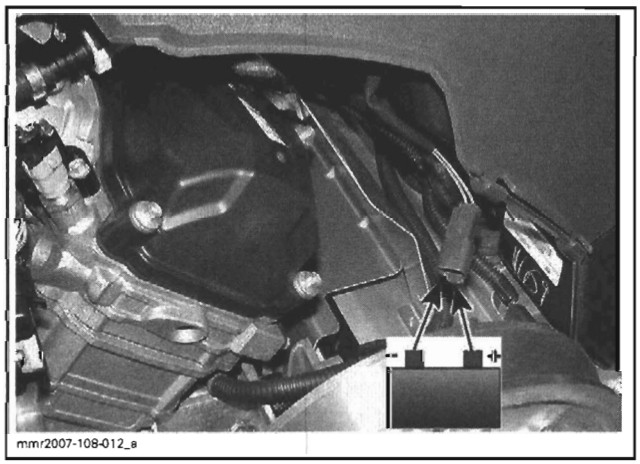
NOTE: Ensure fuel pump is enabled in B.U.D.S.

Briefly turn ignition key to START. The fuel pump should run for 2 seconds to build up the pressure in the system.

If pump does not work, disconnect its plug connector.

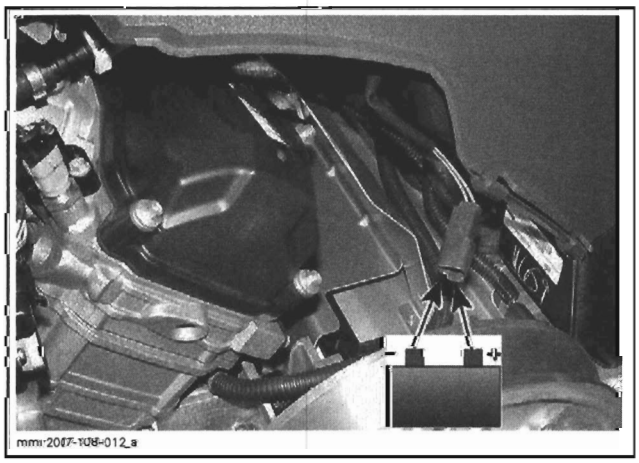

mmr2007-108-011_a

Install a temporary connector to the suspected fuel pump connector to test. Apply 12 V (+) on pin 2 and (–) on pin 1 to this test harness.


mmr2007-108-012_a

If pump does not run, replace it.

Otherwise, probe pin 2 and battery ground of fuel pump connector on vehicle harness side.


mmr2007-108-012_a

Briefly turn ignition key to START. You should read battery voltage; otherwise, the problem can be in fuse 2, relay 1, harness or in fuel pump connector. Repair or replace appropriate part.

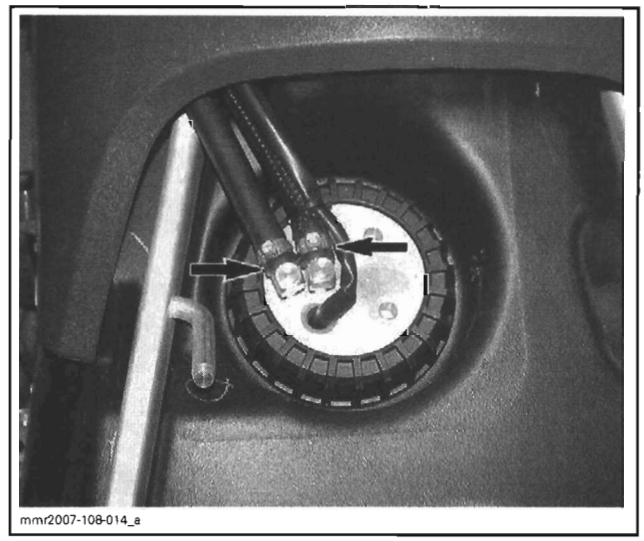
Check continuity between pin 1 of the fuel pump connector on the vehicle harness side and terminal 29 of the ECM connector "B". If there is no continuity the problem is in the harness. Otherwise, try a new ECM.

Fuel Pump Removal

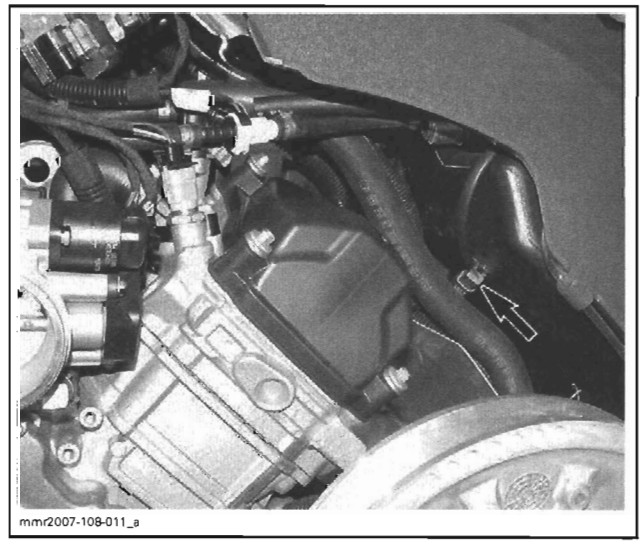
Remove seat, refer to *BODY*.

Release fuel pressure and disable fuel pump. Refer to *FUEL PRESSURE TEST* above.

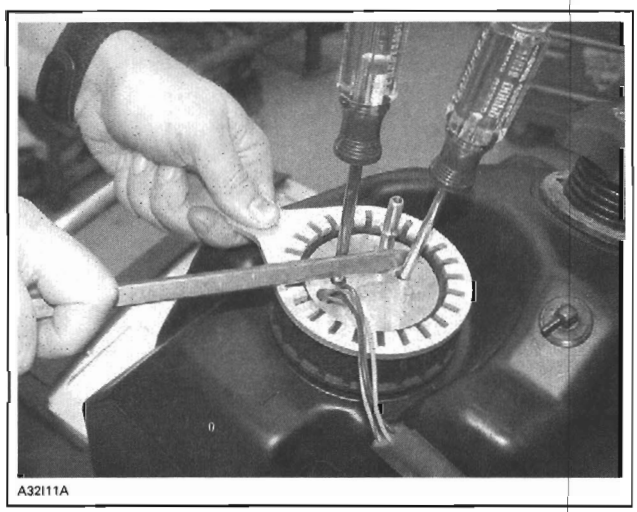
Disconnect hoses from fuel pump.


mmr2007-108-014_a

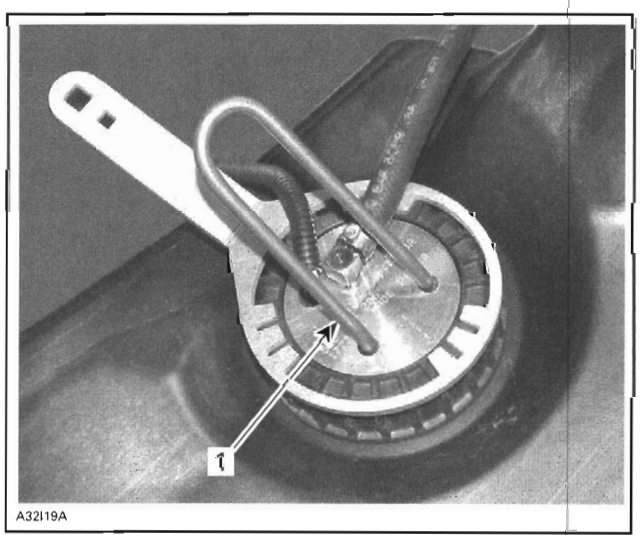
Disconnect the fuel pump connector and cut the hidden locking tie behind console. Pull pump harness.


mmr2007-108-011_a

With two screwdrivers or a bent rod holding the flange, unscrew the fuel pump nut using fuel pump nut wrench (P/N 529 035 899).


A32I11A

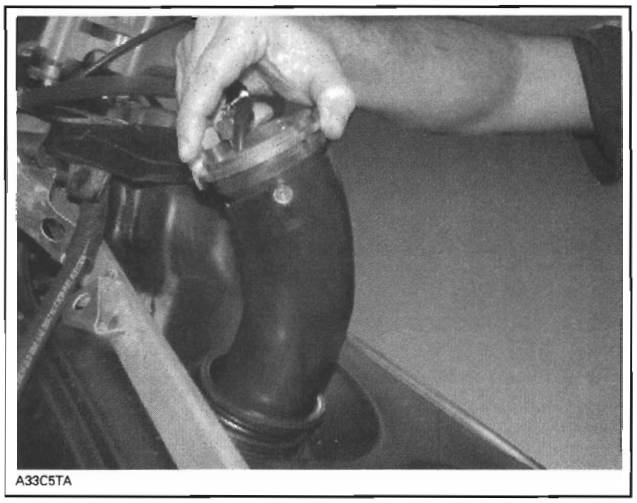
CONSOLE REMOVED FOR CLARITY PURPOSE ONLY



A32I19A

1. Bent rod

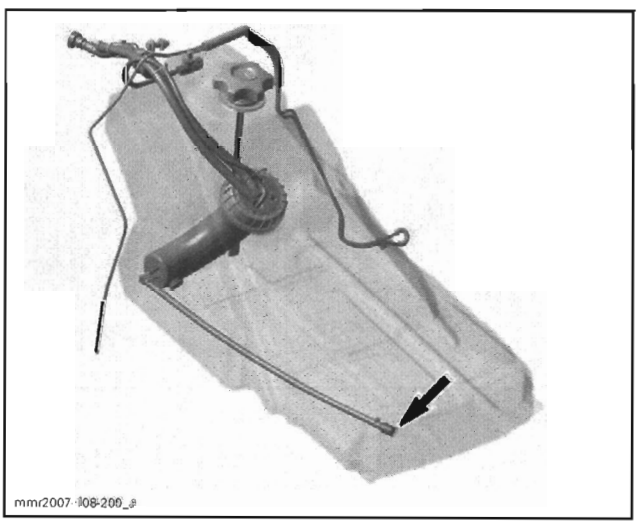
Remove fuel pump assembly.


A33C5TA

Fuel Pump Installation

For installation, reverse the removal process but pay attention to the following.

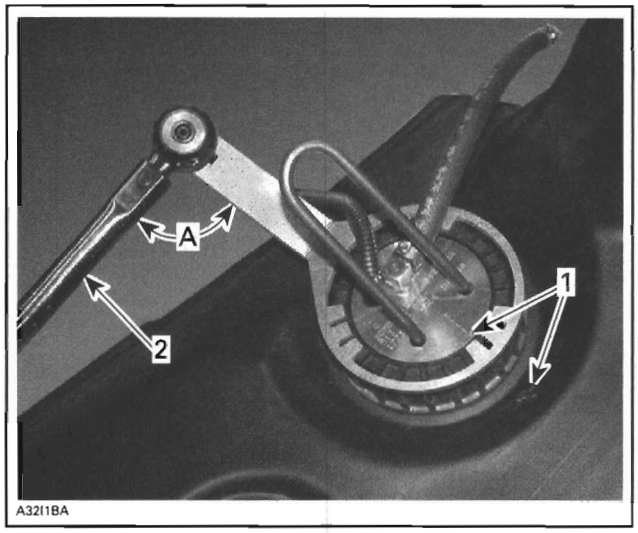
Ensure to insert strainer to the rearmost and left most position in fuel tank.


mmr2007-108-206_a

Install a new gasket.

Align the arrow on fuel pump assembly with the one on fuel tank. Keep arrows aligned when tightening fuel pump assembly.

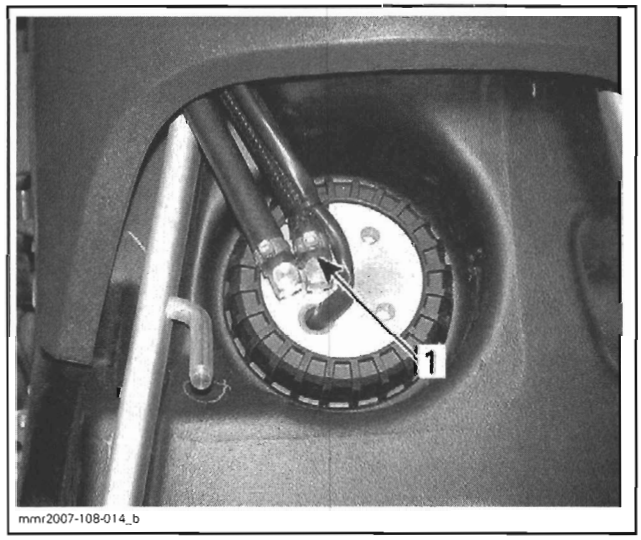
Install a torque wrench perpendicularly (90°) to fuel pump nut wrench (P/N 529 035 899). Torque fuel pump nut to 43 N•m (32 lbf•ft).



1. Arrows
2. Torque wrench
A. 90°

Use new clamps to secure hoses to fuel pump fitting.

Ensure to install hose with the fuel filter on RH fitting of fuel pump.



1. Hose with fuel filter here

CAUTION: Make sure that hose clamps are tight to avoid that they turn on their fittings.

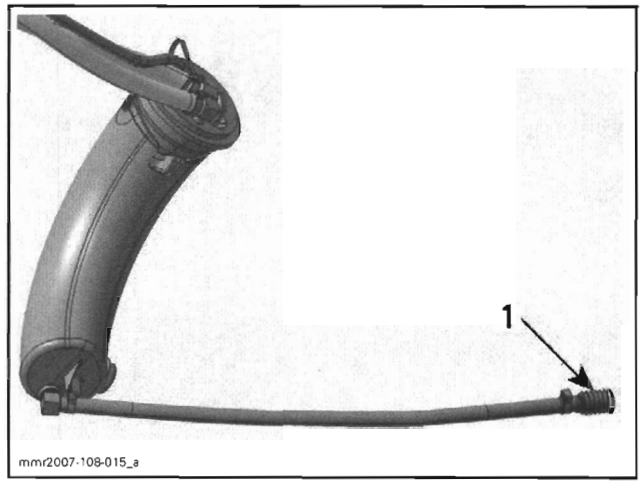
Re-enable fuel pump. Refer to *FUEL PRESSURE TEST* above.

IN-TANK FUEL STRAINER

Strainer Replacement

Remove fuel pump from fuel tank.

Cut clamp and pull out strainer.



1. Fuel strainer

Reinstall new strainer and secure with a new clamp.

Reinstall fuel pump.

FUEL TANK

Fuel Tank Removal

Release fuel pressure. Refer to *FUEL PRESSURE TEST* above.

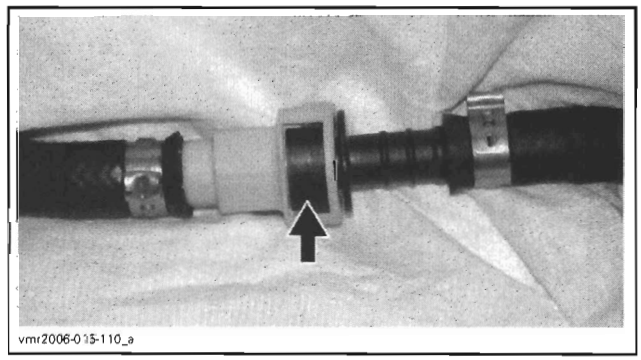
Remove seat and console. Refer to *BODY*.

1-Up Seat Models

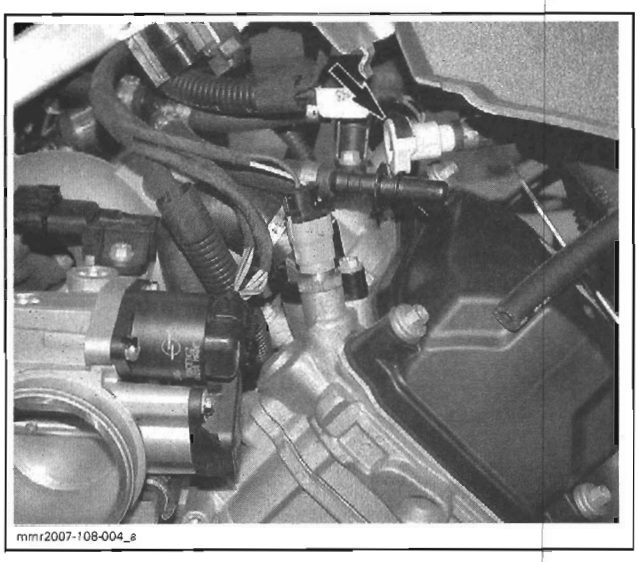
Remove trunk. Refer to *BODY*.

All Models

Disconnect outlet hose from fuel pump.

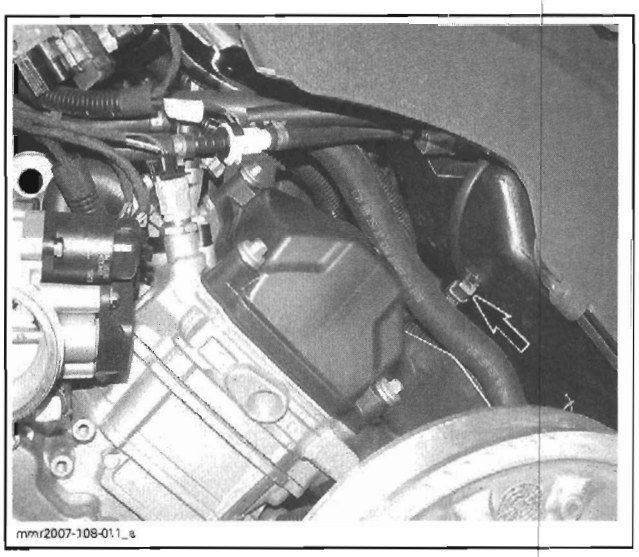


PRESS TAB

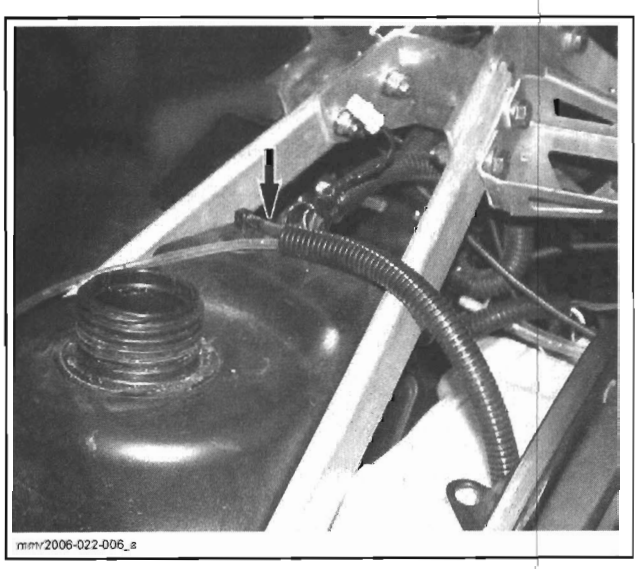


TYPICAL — HOSE DISCONNECTED

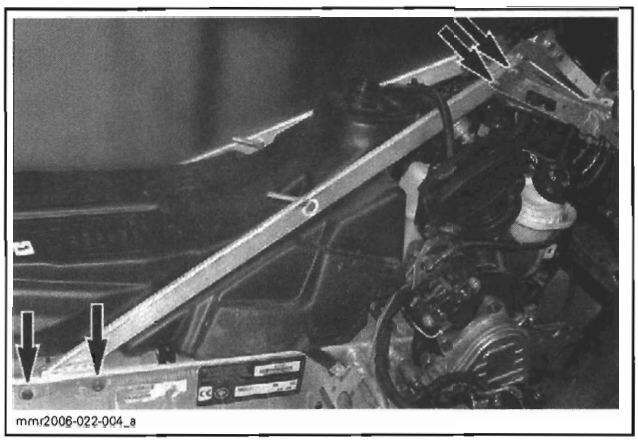
Disconnect the fuel pump connector.



Unplug vent tube from tank.



Remove aluminum braces each side of fuel tank.



Remove fuel tank and set it aside.

Fuel Tank Installation

Installation is the reverse of removal procedures. However, pay attention to the following.

Ensure to reconnect vent tube .

⚠ WARNING

Make sure vent tube is not kinked.

Connect fuel line and remove hose pincher.

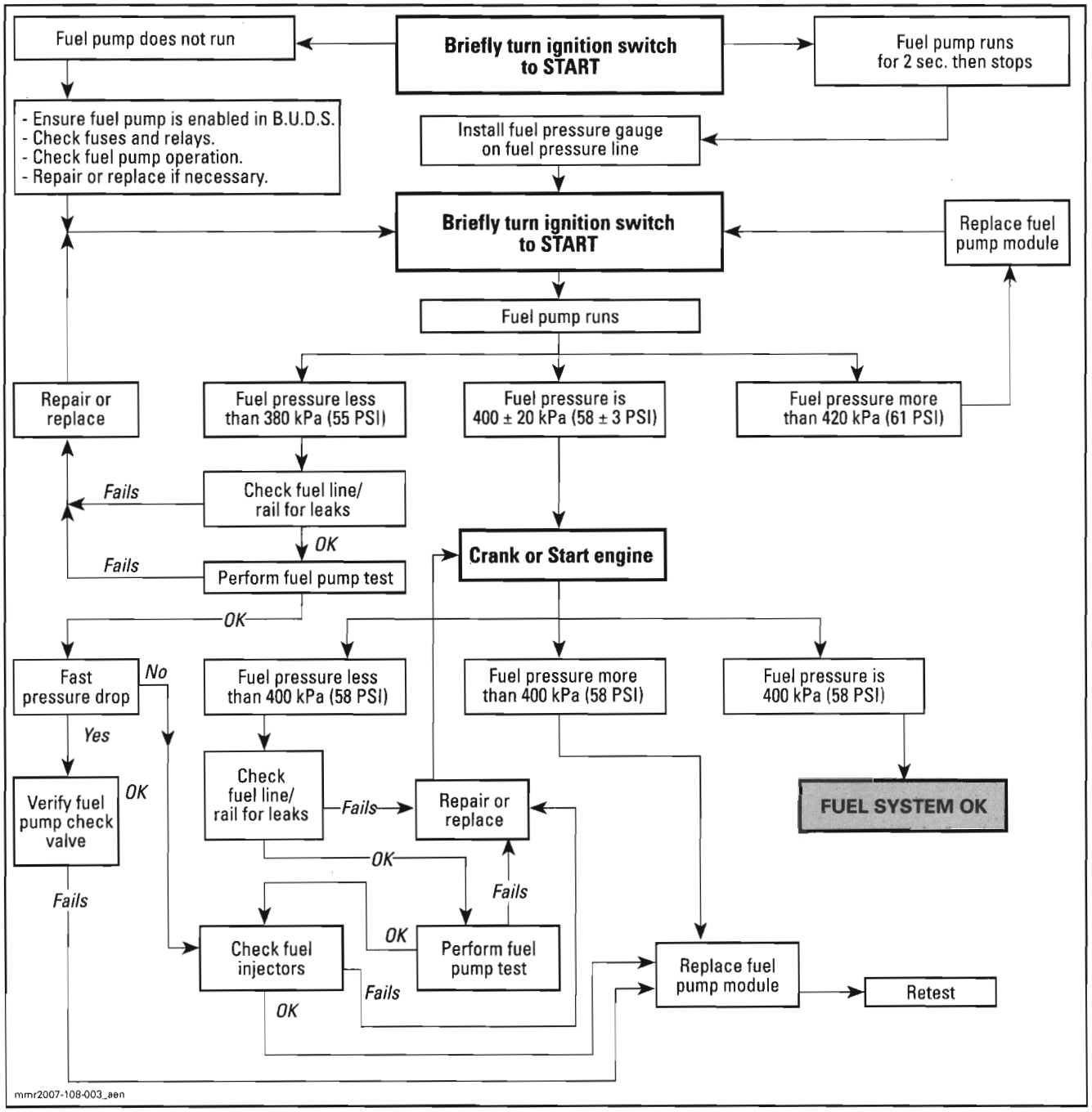
When reinstalling aluminum braces, install new Torx screws at bottom and new lock nuts at top.

Re-enable fuel pump. Refer to *FUEL PRESSURE TEST* above.

Pressurize fuel system to ensure there is no leak.

TROUBLESHOOTING

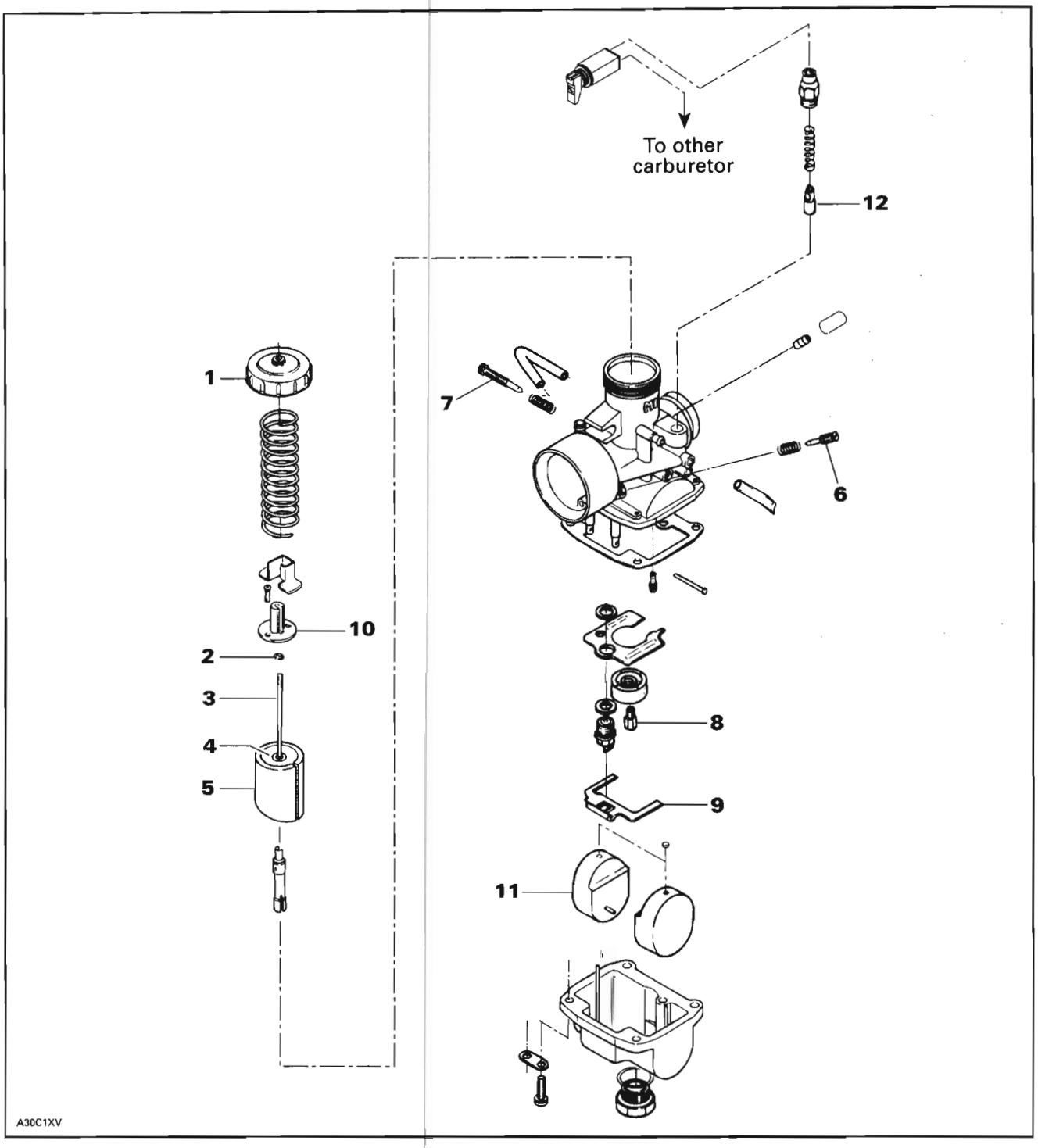
FUEL SYSTEM DIAGNOSTIC FLOW CHART



CARBURETOR (300F/550F)

SERVICE TOOLS

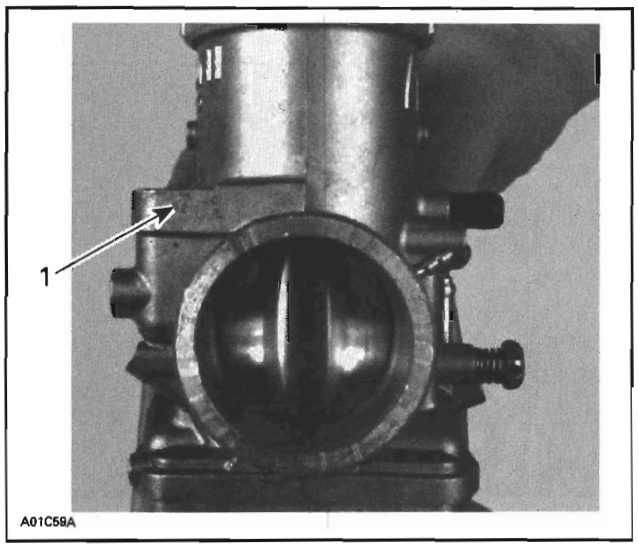
Description	Part Number	Page
carburetor tool kit	404 112 000	351–352
choke plunger tool	529 035 602	359
float gauge	529 035 520	354


To other carburetor
12
1
7
6
10
2
3
4
5
8
9
11
A30C1XV

CARBURETOR

Carburetor Identification

All carburetors are identified on their body.



TYPICAL
1. Identification: 34-617

Carburetor Removal

Lift hood and open LH side panel.

Disconnect carburetor vent hose from primary air intake silencer.

Loosen clamps retaining primary air intake silencer adapter to carburetors.

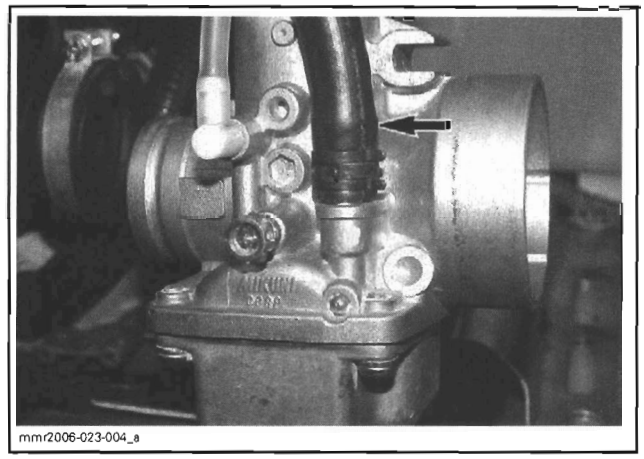
Remove the primary air intake silencer.

NOTE: The following procedure applies to both carburetors. Carburetors can be removed individually.

Loosen clamp retaining carburetor to intake adapter.

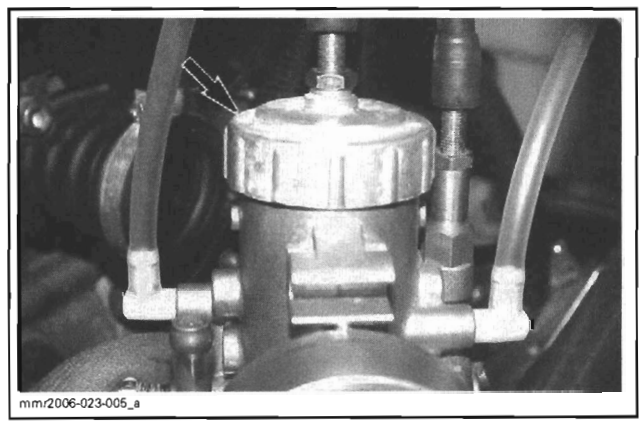
Remove carburetor from engine.

Disconnect fuel inlet line.



TYPICAL

Unscrew carburetor cover **no. 1** then pull out throttle slide **no. 5** from carburetor.



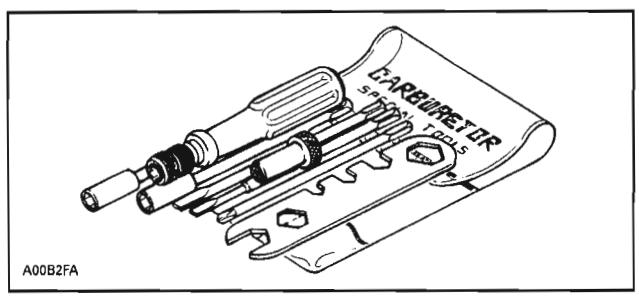
TYPICAL

Disconnect throttle cable from throttle slide.

Unscrew choke plunger from carburetor.

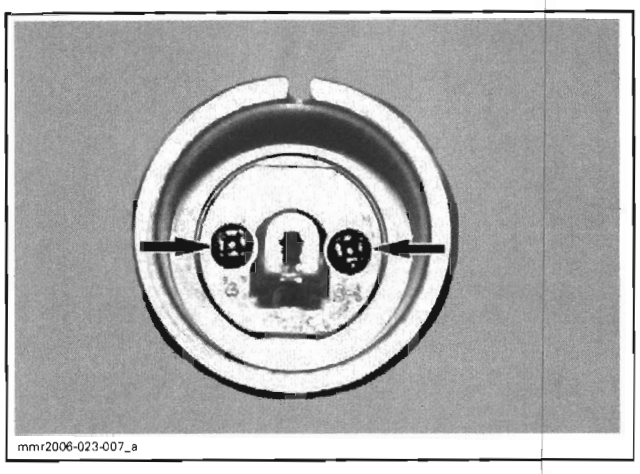
Carburetor Disassembly

NOTE: To ease the carburetor disassembly and assembly procedures it is recommended to use carburetor tool kit (P/N 404 112 000).



E-Clip and Jet Needle

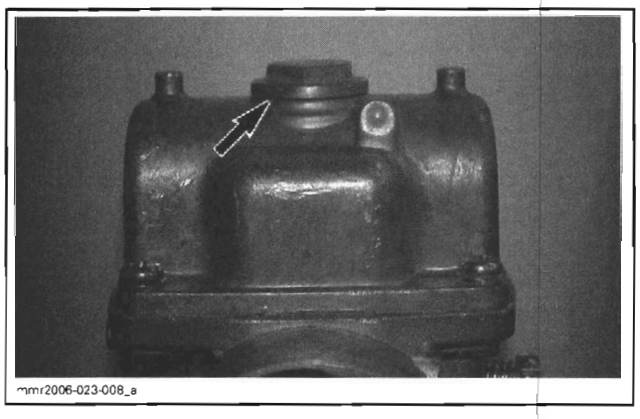
Remove screws from needle retaining plate **no. 10** to remove the jet needle **no. 3**.


mmr2006-023-007_a

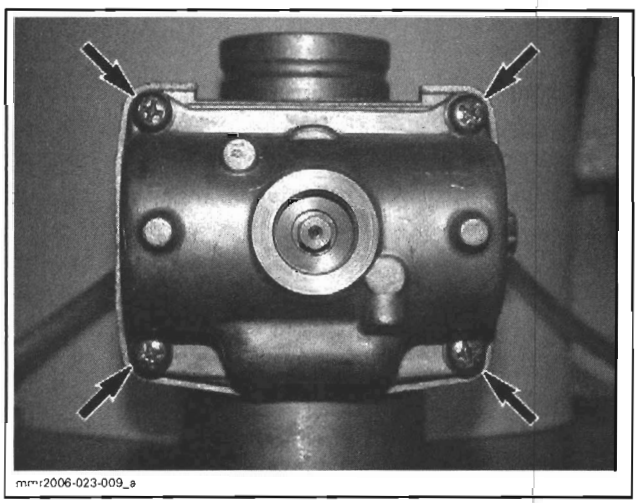
Remove jet needle with its E-clip.

Float Bowl

Unscrew drain plug of float bowl. Recover the remaining fuel in a container.


mmr2006-023-008_a

Unscrew the 4 screws retaining the float bowl to the carburetor body.


mmr2006-023-009_a

Remove float bowl.

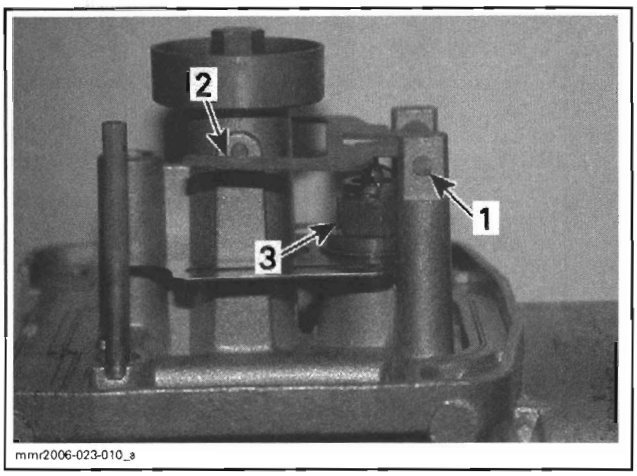
NOTE: Upon float bowl removal, make sure not to drop carburetor floats.

Needle Valve

Remove float bowl as explained above.

Pull out pin retaining float arm to carburetor body. Remove float arm.

Unscrew needle valve.



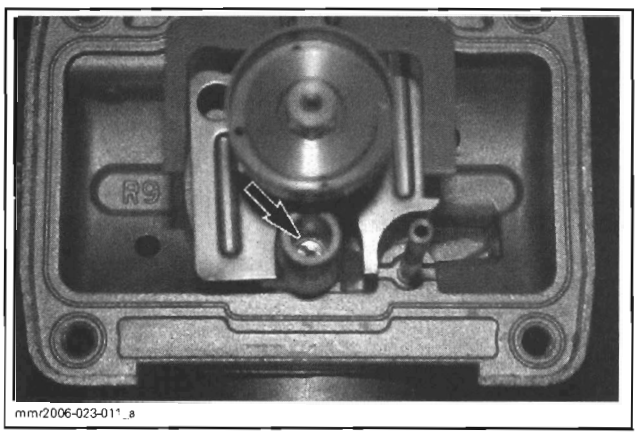
mmr2006-023-010_a

1. *Float arm pin*
2. *Float arm*
3. *Needle valve*

Pilot Jet

Remove float bowl as explained above.

Unscrew pilot jet **no. 8** using narrow screwdriver from carburetor tool kit (P/N 404 112 000).

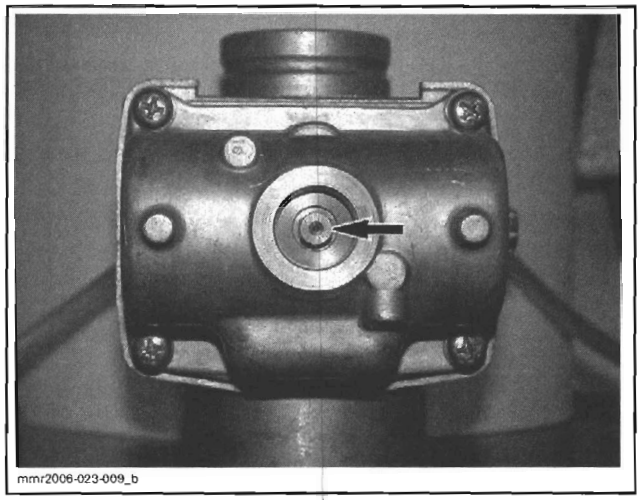

mmr2006-023-011_a

Main Jet

Remove float bowl as explained above.

Unscrew main jet from carburetor body.

NOTE: To replace main jet by a different size, main jet is accessible through the drain plug without removing float bowl.


mmr2006-023-009_b

Carburetor Cleaning

The entire carburetor should be cleaned with a general solvent and dried with compressed air.

CAUTION: Heavy duty carburetor cleaner may be harmful to the float material and to the rubber parts, O-rings, etc. Therefore, it is recommended to remove those parts prior to cleaning.

Carburetor body and pilot/main jets should be cleaned in a carburetor cleaner following manufacturer's instructions.

⚠ WARNING

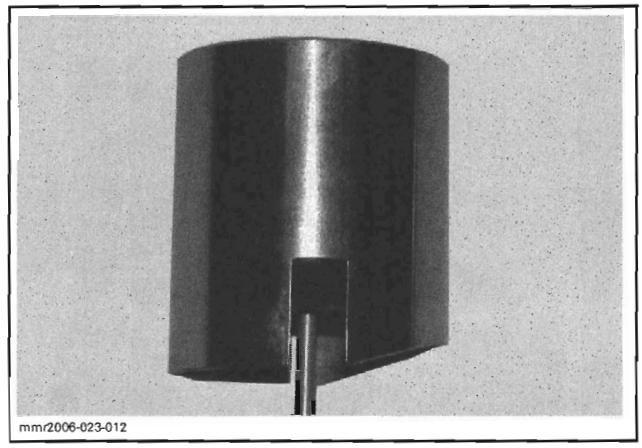
Solvent with a low flash point such as gasoline, naphtha, benzol, etc., should not be used as they are flammable and explosive.

Carburetor Inspection

Check inlet needle tip condition. If worn, the inlet needle and seat must be replaced as a matched set.

NOTE: Install needle valve for snowmobile carburetor only. It is designed to operate with a fuel pump system.

Check throttle slide **no. 5** for wear. Replace as necessary.


mmr2006-023-012

Check idle speed screw straightness. Replace as necessary.

Check for fuel soaked into float **no. 11**; replace as necessary.

Check float for cracks or other damages affecting free movement; replace as necessary.

Carburetor Assembly

The assembly is the reverse of the disassembly procedure. Pay attention to the following.

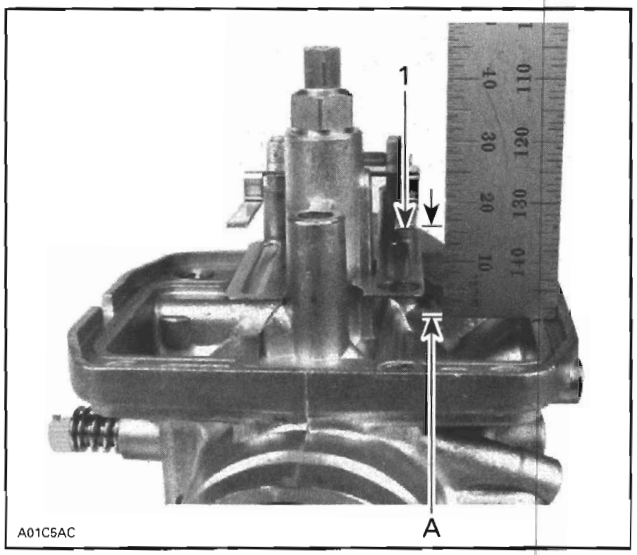
Float

Verify float adjustment after installation.

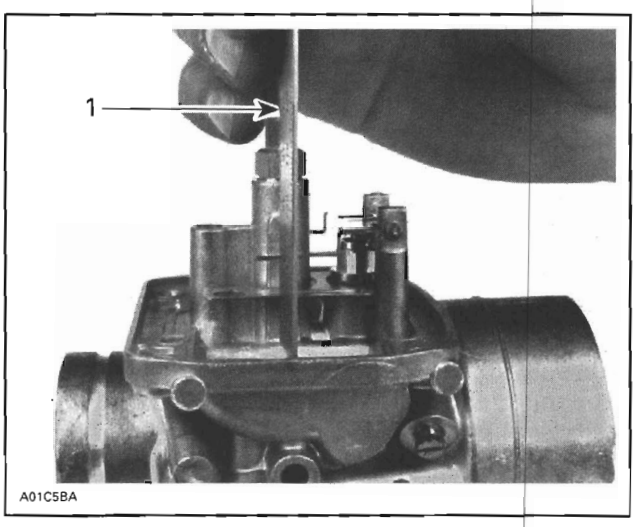
CAUTION: Spark plugs will foul if float is adjusted too low. Engine may be damaged if float is adjusted too high.

Correct fuel level in float chamber is vital toward maximum engine efficiency. To check for correct float level proceed as follows:

- Make sure that float arm **no. 9** is symmetrical — not distorted.
- With carburetor chamber **upside-down** on a level surface, measure height between bowl seat and top edge of float arm. Keep ruler perfectly vertical and in line with main jet hole.

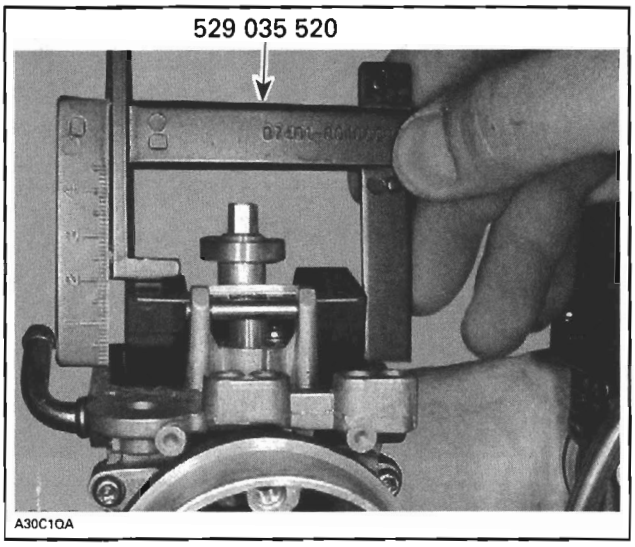


TYPICAL — VM TYPE
1. Measure from top of float arm
A. Float height (including float arm thickness)



TYPICAL — VM TYPE
1. Ruler vertical and in line with main jet

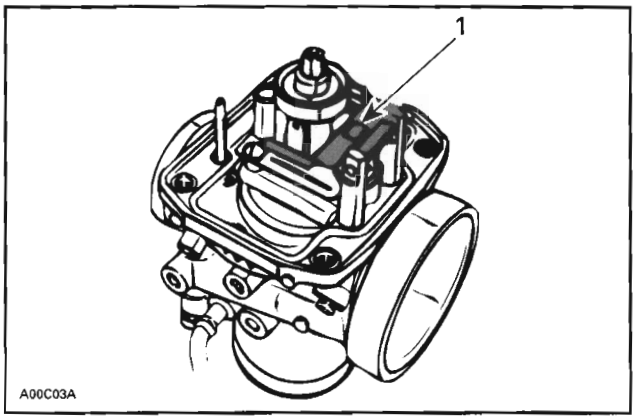
Float level height can be checked using the float gauge (P/N 529 035 520). Keep tool in line with main jet as explained above.



MODELS	FLOAT HEIGHT
300F	24.9 ± 1.0 mm (.980 ± .039 in)
550F	23.9 ± 1.0 mm (.941 ± .039 in)

To Adjust Height

– Bend the contact tab of float arm until the specified height is reached.



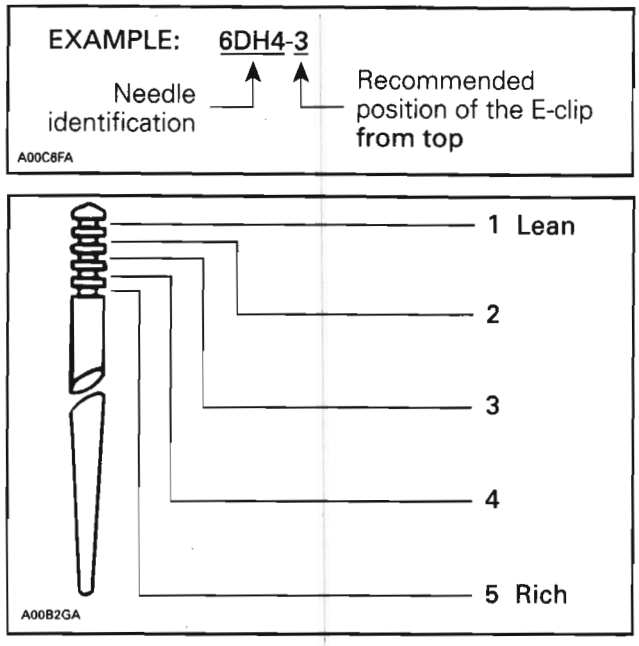
TYPICAL
1. Contact tab

E-Clip and Jet Needle

Make sure E-clip is installed in the proper groove of jet needle.

The position of the needle in the throttle slide is adjustable by means of an E-clip **no. 2** inserted into 1 of 5 grooves located on the upper part of the needle. Position 1 (at top) is the leanest, 5 (at bottom) the richest.

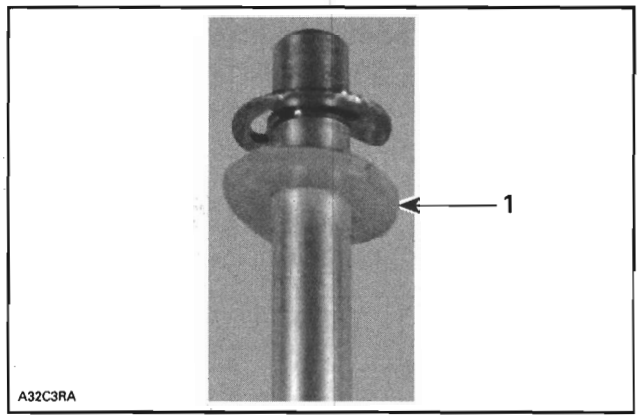
NOTE: The last digit of the needle identification number gives the recommended calibrated position of the E-clip **from the top** of the needle.



CLIP POSITIONS

Install the nylon packing **no. 4** underneath jet needle E-clip on all applicable throttle slides.

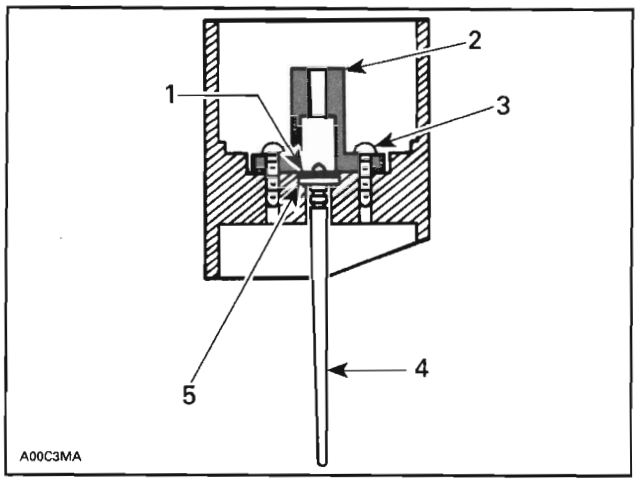
CAUTION: Serious engine damage can occur if this part is not installed.



TYPICAL
1. Nylon packing

Install jet needle in throttle slide.

When installing jet needle plate, do not obstruct hole in throttle slide.



1. Clip
2. Jet needle plate
3. Screw
4. Jet needle
5. Nylon packing

Carburetor Installation

To install carburetor on engine, inverse removal procedure. However, pay attention to the following:

Prior to installing carburetor, adjust air screw and preliminary idle speed as described in *ADJUSTMENTS*.

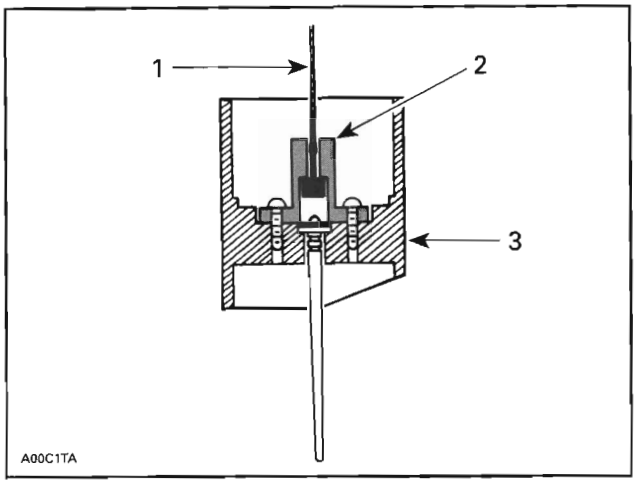
On applicable models, make sure to align tab of carburetor with notch of intake adapter.

CAUTION: The rubber intake adapter must be checked for cracks and/or damage. At assembly, the intake adapter must be perfectly matched with carburetor and engine otherwise severe engine damage will occur.

Hook throttle cable into jet needle plate.

⚠ WARNING

Ensure throttle slide return spring is installed.



1. Throttle cable
2. Jet needle plate
3. Throttle slide

Install throttle slide with spring in carburetor.

CAUTION: Never allow throttle slide to snap shut. Be careful not to bent jet needle.

Tighten carburetor cap.

⚠ WARNING

Ensure throttle lever operates normally.

Carburetor Adjustments

NOTE: Carburetor is calibrated at the factory for a temperature of - 20°C (0°F) at sea level. For colder temperature or high altitude applications, carburetor must be recalibrated. A service bulletin gives information about carburetor calibration according to altitude and temperature.

Adjustments should be performed following this sequence:

- float height
- jet needle
- air screw
- preliminary idle speed adjustment
- throttle cable
- choke cable
- final idle speed adjustment.

Float Height

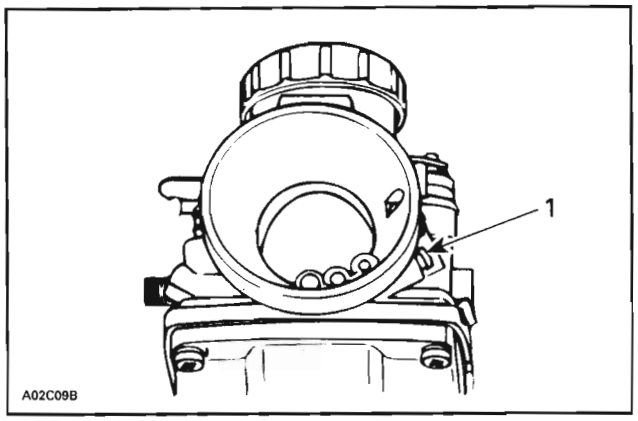
Refer to *ASSEMBLY* to verify float height.

Jet Needle

Refer to *ASSEMBLY* to position E-clip in the proper jet needle groove.

Air Screw

Completely close the **air screw no. 6** (until a slight seating resistance is felt) then back off as specified.



1. Air screw

NOTE: Turning screw in clockwise enriches mixture and conversely, turning it out counterclockwise leans mixture.

MODELS	AIR SCREW
300F and 550F	2.0 turns

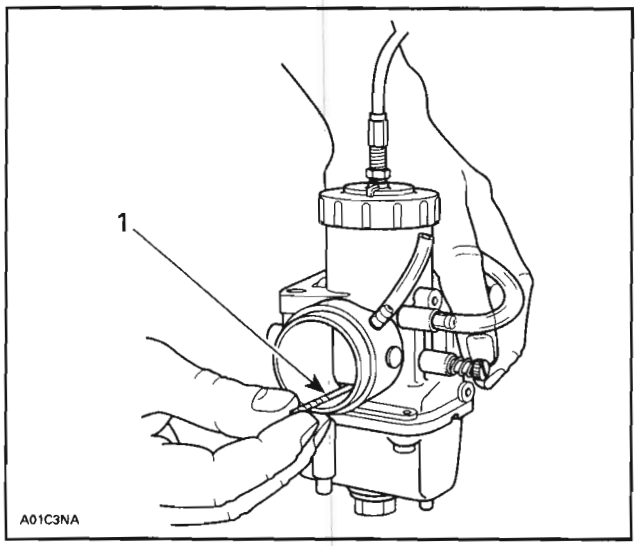
Preliminary Idle Speed Adjustment

Using a drill bit, adjust throttle slide height (see following table) by turning idle speed screw **no. 7**.

Throttle slide height is measured on outlet side of carburetor (engine side).

NOTE: Make sure that throttle cable does not hold throttle slide. Loosen cable adjuster accordingly.

MODEL	THROTTLE SLIDE HEIGHT (drill bit size)
300F	1.6 ± 0.1 mm (.063 ± .004 in)
550F	1.5 ± 0.1 mm (.059 ± .004 in)



TYPICAL
1. Drill bit used as gauge for throttle slide height

Throttle Cable

Refer to *THROTTLE CABLE* further in this section for proper procedure.

Choke Cable

Adjust choke cable. Refer to *CHOKE CABLE* further in this section.

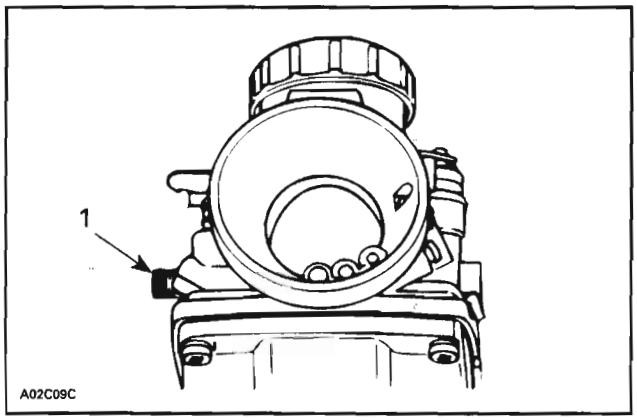
Final Idle Speed Adjustment

CAUTION: Before starting engine for the final idle adjustment, make sure that oil pump is adjusted. The oil injection pump adjustment must be checked after each time carburetor idle is adjusted. Refer to *OIL INJECTION SYSTEM*.

Install primary air intake silencer. Refer to *AIR INTAKE SYSTEM*.

Start engine and allow it to warm then adjust idle speed to specifications by turning **idle speed screw** clockwise to increase engine speed or counterclockwise to decrease it.

CAUTION: Do not attempt to set the idle speed by using the air screw. Severe engine damage can occur.



1. Idle speed screw

MODELS	IDLE SPEED (RPM)
300F and 550F	1650 ± 200

NOTE: On **550F models**, turn adjustment screw the same amount on each carburetor to keep carburetors synchronized.

Final idle speed adjustment (engine running at idle speed) should be within 1/2 turn of idle speed screw from preliminary adjustment.

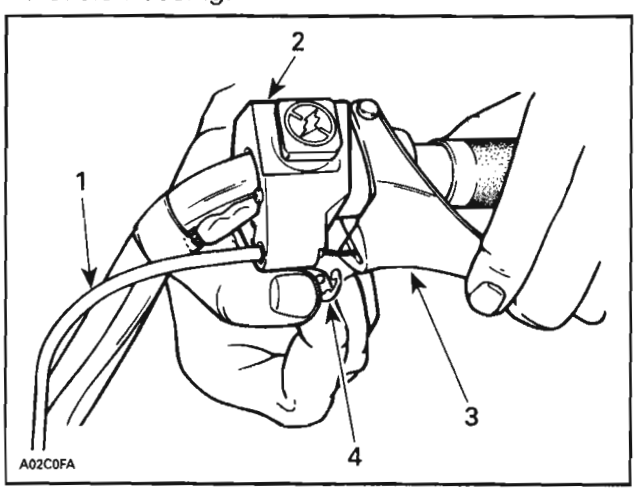
THROTTLE CABLE

Throttle Cable Removal

NOTE: Before removing throttle cable from vehicle, note its routing for installation.

On Handlebar

Remove the circlip retaining throttle cable to throttle cable housing.



1. Throttle cable housing
2. Throttle lever housing
3. Throttle lever
4. Circlip

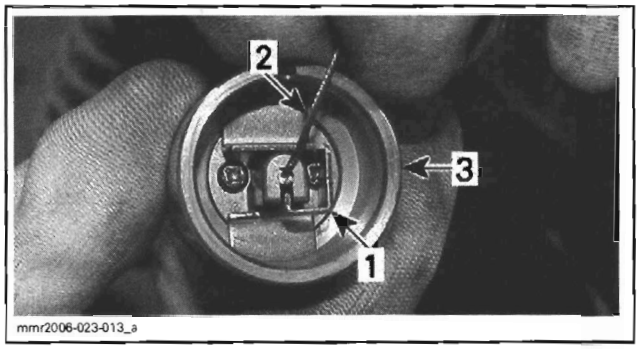
Using long nose pliers to hold cable, push the end of cable out of its location in throttle lever.

Remove cable from throttle cable housing.

On Carburetor

Unscrew carburetor cover then pull out throttle slide from carburetor.

Disconnect throttle cable from throttle slide.



1. Throttle cable lock
2. Throttle cable
3. Throttle slide

On RH side of vehicle, disconnect cable end from oil pump.

Cut all locking ties and remove throttle cable.

Throttle Cable Inspection

Inspect throttle cable and housing for any damages. Replace as necessary.

Throttle Cable Installation

The installation is the reverse of the removal procedure.

CAUTION: Check that throttle cable is routed away from sharp edges, hot or vibrating parts.

Throttle Cable Adjustment

⚠ WARNING

Ensure the engine is turned OFF, prior to performing the throttle cable adjustment.

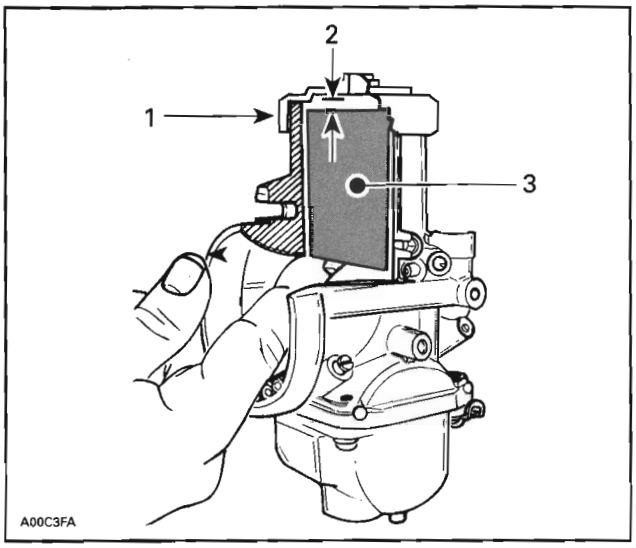
Carburetor(s) must be installed on engine and throttle cable properly routed.

Adjust throttle cable as per following procedure:

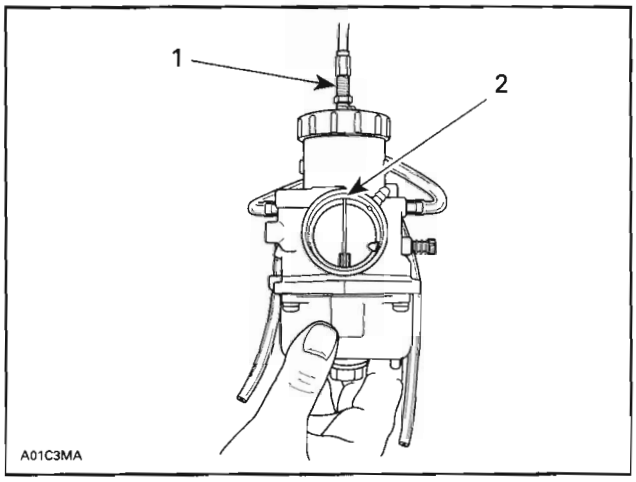
Loosen throttle cable housing adjusting and locking nuts.

While holding throttle lever to wide open throttle position, adjust throttle cable until cut-away lower edge is equal or 1.0 mm (.040 in) lower than the venturi bore on engine side. In this position, turn cable housing adjusting nut and tighten lock nut. Proceed on both carburetors.

CAUTION: If the throttle slide rests against the carburetor cover at full throttle opening, this will create too much strain and may damage the throttle cable or other components in throttle mechanism.



FULL OPENING (THROTTLE LEVER AGAINST HANDLE GRIP)
1. Cover
2. Free play
3. Throttle slide



FULL OPENING (THROTTLE LEVER AGAINST HANDLE GRIP)
1. Adjusting nut
2. Throttle slide flush or 1.0 mm (.040 in) lower than carburetor outlet bore (engine side)

Also ensure that, when throttle is released to idle position, the idle adjusting screw end touches its stopper. No tension should be applied to throttle cable.

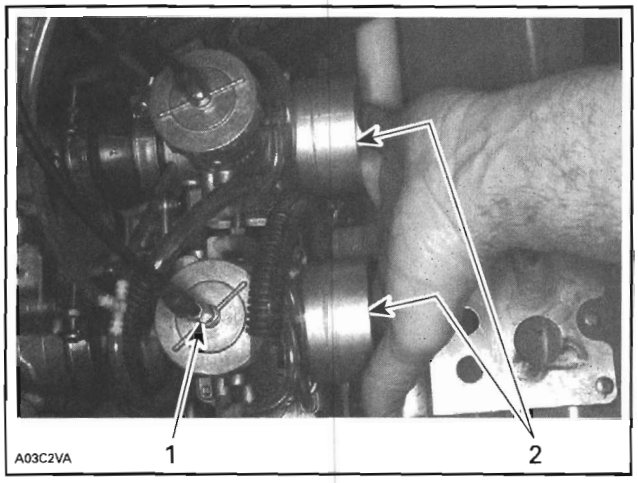
550F Models

Carburetor Synchronization

When depressing throttle lever, both carburetor slides must start to open at same time.

Screw or unscrew cable adjuster until all carburetor slides start to open at the same time. Cable play will be identical on all carburetors. Retighten jam nut.

CAUTION: Make sure carburetors start to operate simultaneously.



TYPICAL
1. *Screw or unscrew adjuster*
2. *Check that all slides start to open at the same time*

300F and 550F Models

When throttle cable adjustment is completed, check oil pump cable adjustment (refer to *OIL INJECTION PUMP*).

CAUTION: Oil pump cable adjustment must be verified, otherwise serious engine damage may occur.

CHOKE CABLE

Choke Cable Removal

NOTE: Before removing choke cable, note its routing for installation.

Remove choke cable nut and pull cable underneath console.

Unscrew choke cable from carburetor.

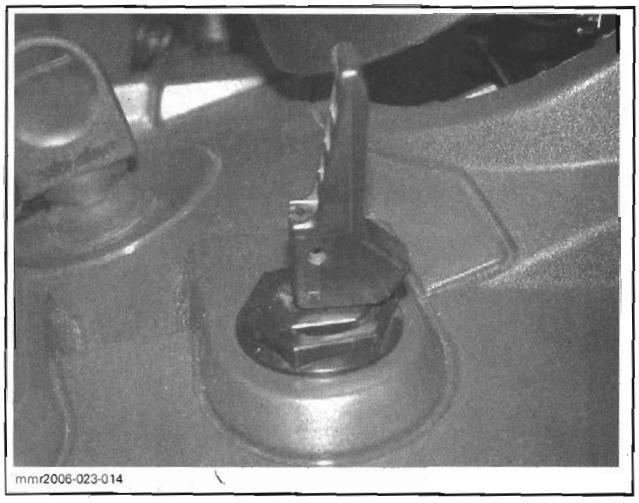
Cut all locking ties retaining cable and remove it from vehicle.

Choke Cable Installation

The installation is the reverse of the removal procedure.

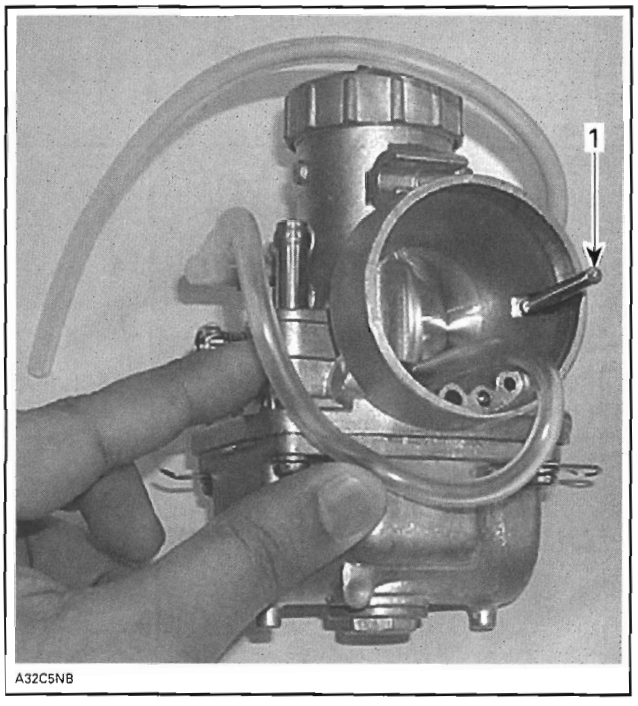
Choke Cable Adjustment

Set choke lever to half open position.

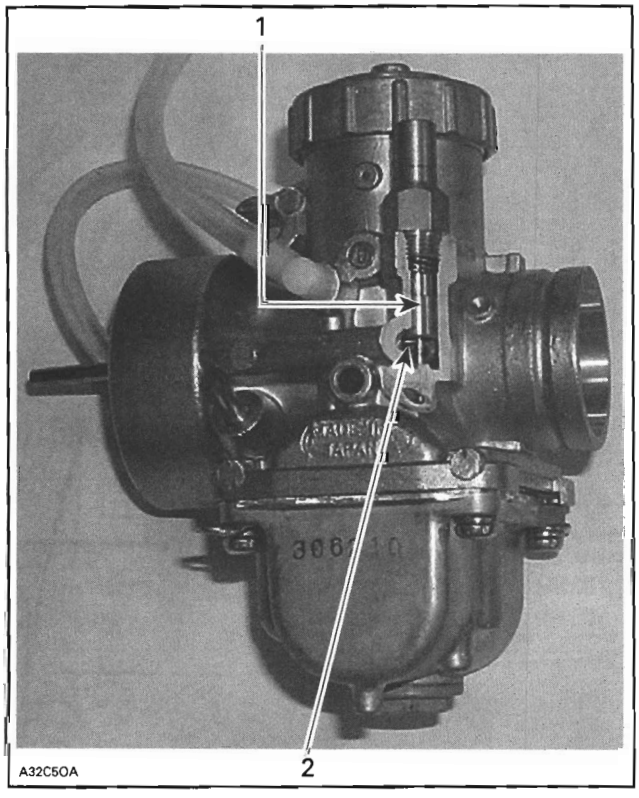


CHOKE LEVER — MID OPEN POSITION

Insert the choke plunger tool (P/N 529 035 602) into choke air inlet of carburetor. Tool stopper may not lean against recess wall.



AIR SILENCER SIDE SHOWN
1. *Choke plunger tool*

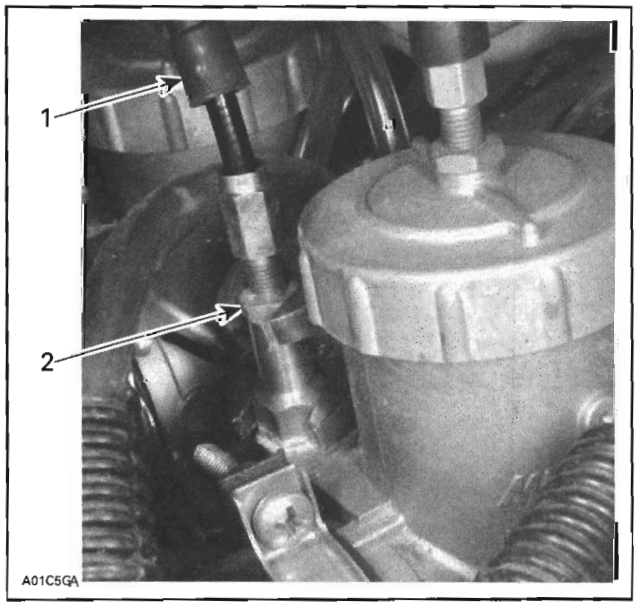


CUT-AWAY — ENGINE SIDE SHOWN
1. *Choke plunger*
2. *Tool properly seated under choke plunger*

If tool tip does not seat under choke plunger **no. 12**, adjust as follows:

Make sure choke lever is at mid open position.

Lift up protector cap and loosen choke cable lock nut, as shown in the next photo.



TYPICAL
1. *Lift up protector cap*
2. *Loosen lock nut*

Turn choke cable adjustment nut by hand until tool properly seats under choke plunger.

NOTE: A light pressure should be needed to position tool under plunger.

Tighten choke cable lock nut and reinstall protector cap.

Set choke lever to close and open positions and ensure that tool properly seats under plunger **only** when lever is set to half open position.

Set choke lever to close position and make sure there is no tension on cable (free play).

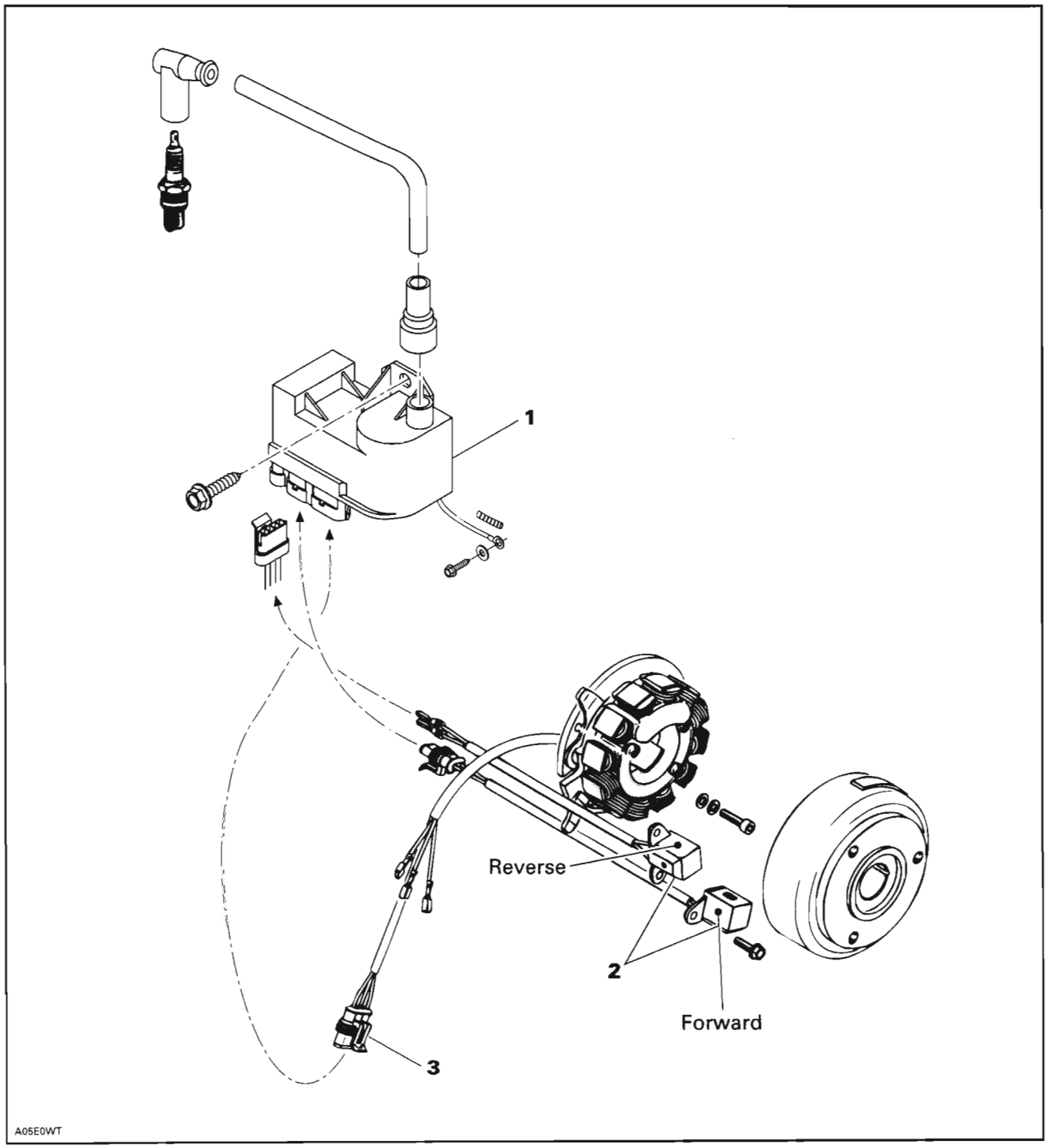
IGNITION SYSTEM (300F)

SERVICE TOOLS

Description	Part Number	Page
digital inductive type tachometer	529 014 500	370
multimeter Fluke 111	529 035 868	363

SERVICE PRODUCTS

Description	Part Number	Page
antiseize lubricant	293 800 070	364


1
Reverse
2
Forward
3
A05E0WT

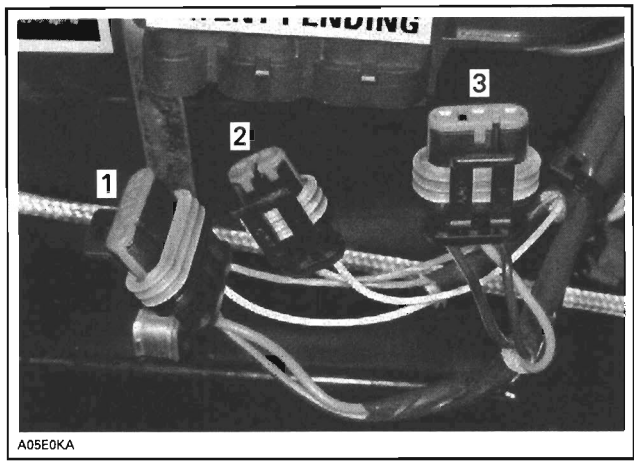
GENERAL

The RER dual trigger coil CDI system features an ignition coil integrated to the MPEM.

NOTE: For more information pertaining to RER, refer to *ROTAX ELECTRONIC REVERSE (RER)*.

Multi-Purpose Electronic Module (MPEM)

The following illustration identifies the connector functions on the MPEM.



MPEM
1. *Reverse switch, reverse indicator and reverse trigger coil*
2. *Trigger coil (forward rotation)*
3. *Ignition generator coil and cut-off switches*

NOTE: A MPEM problem can be resolve simply by unplugging and re-plugging the module, indicating a connection problem. Also, check MPEM ground connections.

Electrical Connectors

Before replacing a component, always check electrical connections. The voltage and current might be too weak to go through dirty wire terminals. Clean as required. Make sure terminals are properly crimped on wires and fastened in housing, and that they are free of corrosion or moisture.

IGNITION SYSTEM TESTING SEQUENCE

In the case of ignition problems, check the following in the prescribed order until the problem can be solved.

1. spark plug
2. electrical connectors
3. ignition switch
4. tether cut-out switch
5. engine cut-out switch
6. wiring harness
7. ignition coil
8. ignition generator coil
9. trigger coil
10. MPEM.

Testing Conditions

Voltage measurements are always taken upon engine cranking using the rewind starter. Readings when the engine is running would be higher than specified range. Part temperature must be approximately 20°C (68°F) (room temperature), otherwise readings could be distorted.

CAUTION: When taking measurements, it is useless to try to run the engine since readings would then be distorted.

Analysis of Readings

Voltage Readings

Take into consideration that readings vary according to the force applied onto the manual starter. It is therefore important to employ enough force upon each trial.

It is recommended to proceed 3 times with the test. Each reading must be within the range indicated in the corresponding table. If the reading is too low, the part is considered to be defective and must be replaced.

Resistance Readings

Readings must be within the indicated range. Otherwise, replace the part.

Intermittent Ignition Problems

It is difficult to make a diagnostic in the case of intermittent ignition problems. Thus, problems occurring only when the engine operating temperature is normal must be checked in similar conditions.

In most cases when problems are caused by temperature or vibrations, these can only be solved by replacing parts. Most problems cannot be detected when the engine is stopped.

Multiple Problems

More that one component can be defective. As a result, if the problem remains although a part was replaced, start over the whole verification from the beginning in order to identify the other defective component.

PROCEDURES

For best results, use the multimeter Fluke 111 (P/N 529 035 868).

SPARK PLUG

Removal

First unscrew the spark plug 1 turn.

Clean the spark plug and cylinder head with pressurized air, then completely unscrew.

⚠ WARNING

Whenever using compressed air, always wear protective eye wear.

Spark Testing

Use the snowmobile spark plug and not a new one. Bring the plug in contact with the engine. Pull rewind starter. If no spark is produced, replace the spark plug with a new one and do the test again.

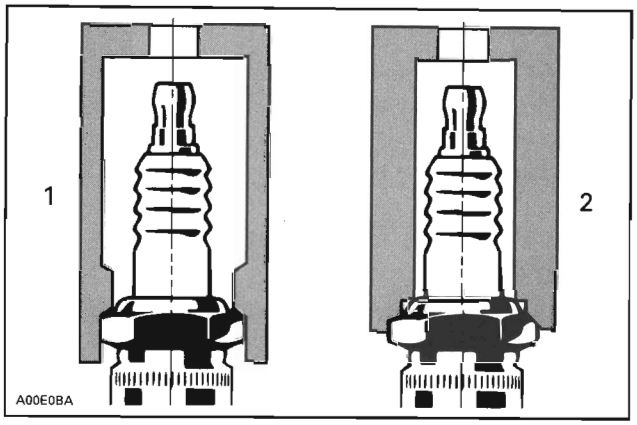
If there is still no spark, continue testing.

Installation

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

Using a feeler gauge, set electrode gap as per *TECHNICAL SPECIFICATIONS*.

1. Apply antiseize lubricant (P/N 293 800 070) over the spark plug threads to prevent possible seizure.
2. Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



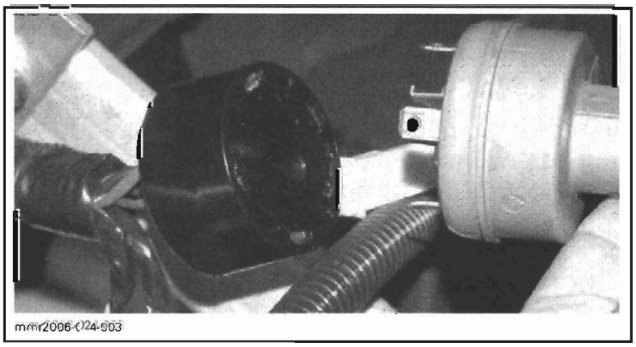
TYPICAL
1. Proper socket
2. Improper socket

Use the following table to torque the spark plug.

MODEL	SPARK PLUG	TORQUE N•m (lbf•ft)
300F	NGK BR9ES	27 (20)

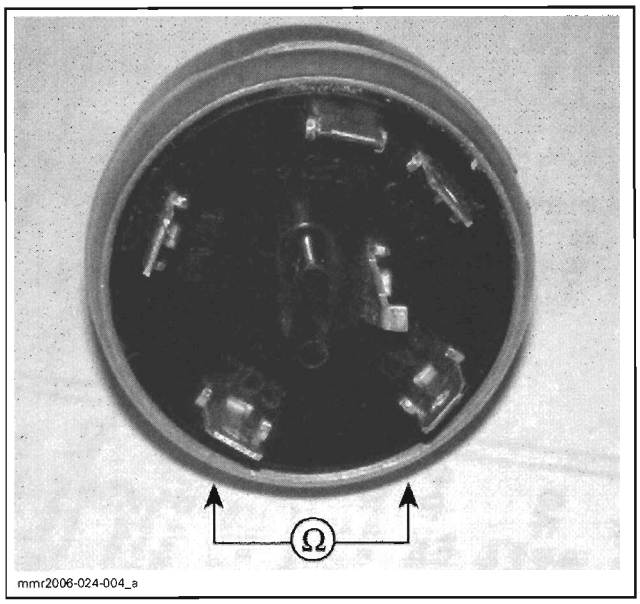
IGNITION SWITCH

Unplug ignition switch connector.



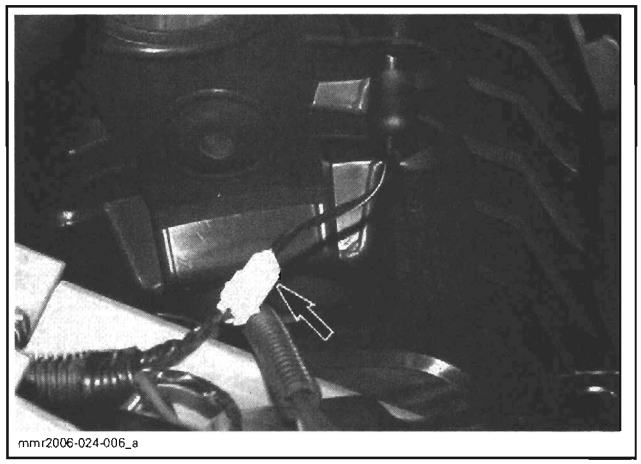
Check switch as follows.

POSITION	TERMINAL		RESISTANCE
OFF	MAG	GRD	0.2 Ω (closed)
	BAT	ACC	Infinite (0L)
	BAT	SOL	
ON	MAG	GRD	Infinite (0L)
	BAT	ACC	0.2 Ω (closed)
	BAT	SOL	Infinite (0L)
START	BAT	SOL	0.2 Ω (closed)



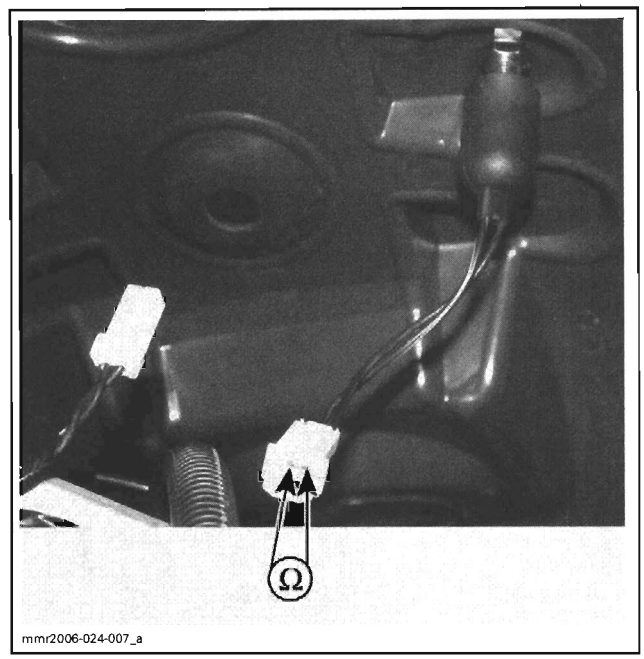
TETHER CUT-OUT SWITCH

Unplug tether cut-out switch connector.



Check switch as follows.

SWITCH POSITION	RUN	STOP
TEST PROBES	BLACK/YELLOW and BLACK wires	BLACK/YELLOW and BLACK wires
RESISTANCE	OL	0 to 0.5 Ω

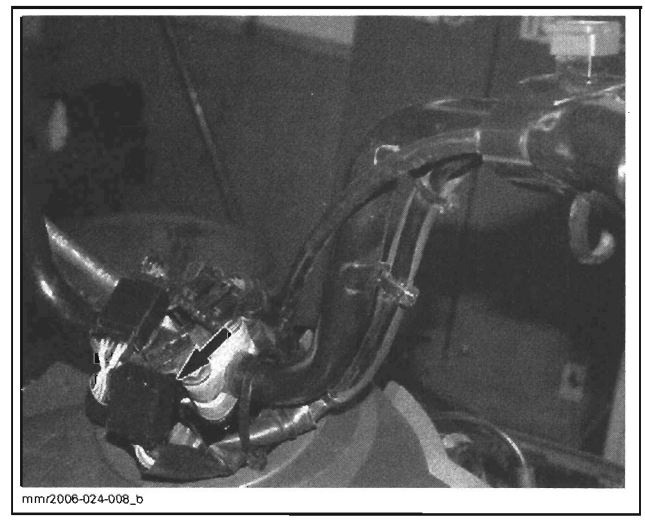


NOTE: When checking switch in the RUN position, use the tether cap. This validates its ability to remain on switch to make proper electrical contact.

If readings do not correspond to the above specifications, replace switch.

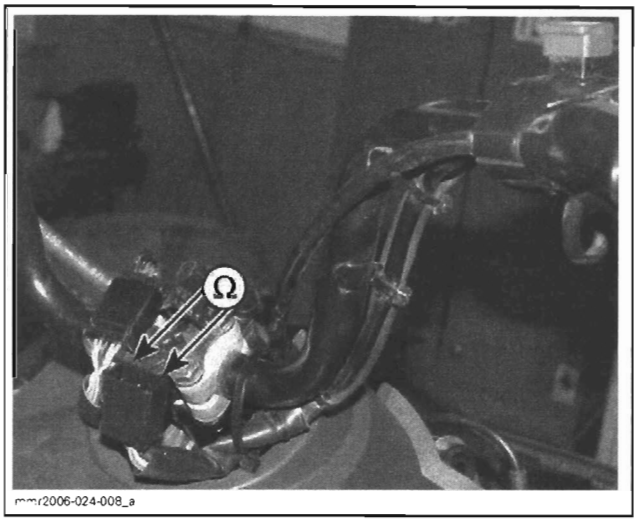
ENGINE CUT-OUT SWITCH

Unplug connector under steering cover.



Check the condition of engine cut-out switch as follows.

SWITCH POSITION	RUN	STOP
TEST PROBES	BLACK/YELLOW and BLACK wires	
RESISTANCE	OL	0 to 0.5 Ω



If readings do not correspond to the above-mentioned indications, check switch wires/connector and if good, replace switch.

WIRING HARNESS

When switches test good, check wiring harness as follows.

Check if wiring harness shows any signs of scoring or other damage.

No spark problem: Disconnect all switches from the main wiring harness and ensure BLACK/YELLOW wire is completely isolated from ground. Otherwise, repair/replace wiring.

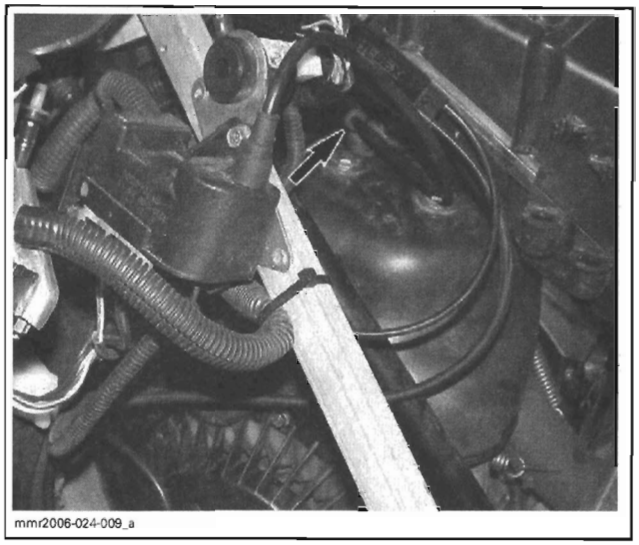
No engine stop problem: Disconnect all switches from the main wiring harness and ensure there is continuity between each end of wires of the same color related to ignition. Otherwise, repair/replace wiring.

NOTE: All wires of the same color within a given harness are connected together.

IGNITION COIL

Static Test

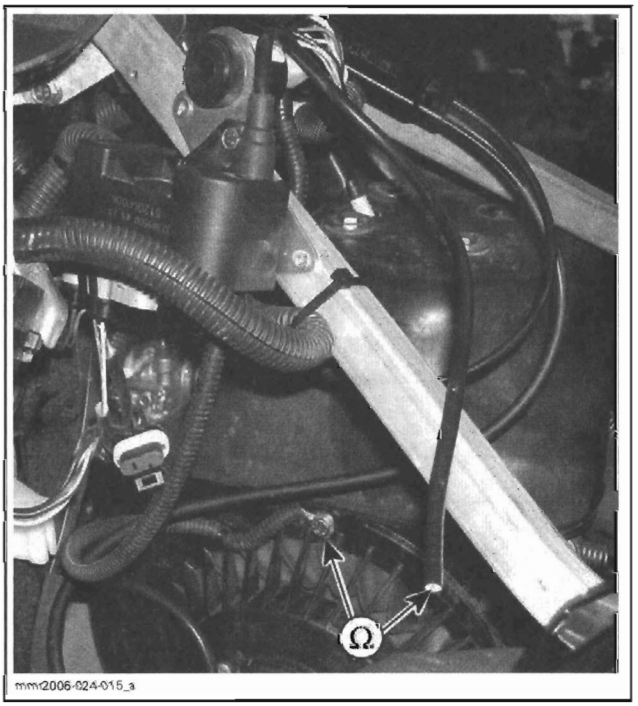
Disconnect spark plug cable.



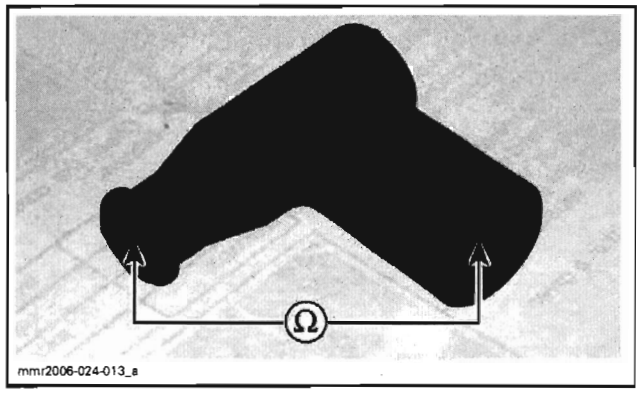
Take measurements and compare readings with the following table.

NOTE: Primary side of ignition coil cannot be measured.

TEST	Secondary winding resistance (WITHOUT spark plug cap)	Spark plug cap resistance
TEST PROBES	Cable end and on engine	Each side of cap
RESISTANCE	.900 – 1100 Ω	4 – 6 kΩ



SECONDARY WINDING RESISTANCE TEST



SPARK PLUG CAP RESISTANCE TEST

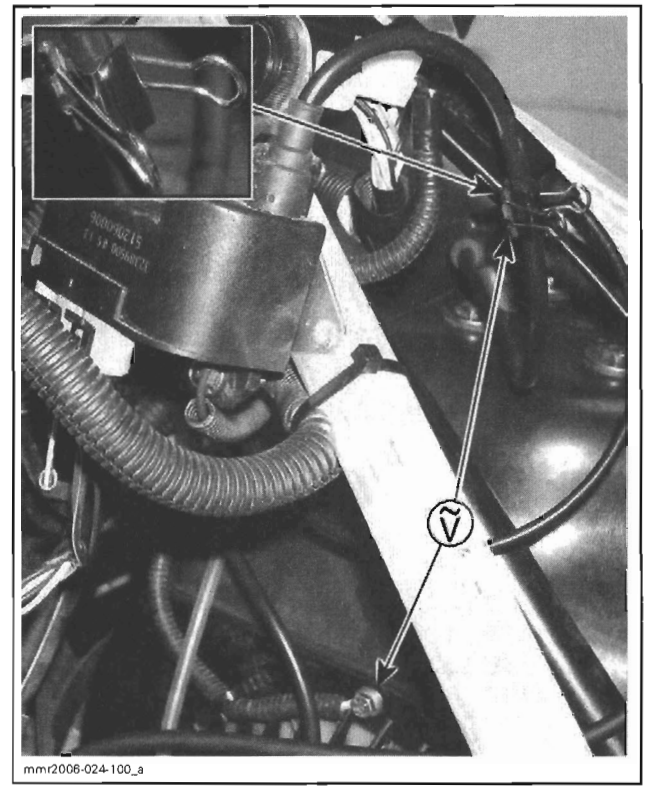
If ignition coil is out of specification, replace it.

NOTE: Keep in mind that even if this static test is good, voltage requirement is higher to produce a spark in the combustion chamber when engine is running. Ignition coil may be faulty. Replacing ignition coil/MPEM may be necessary as a test.

Dynamic Test

Take measurements and compare readings with the following table.

TEST	Secondary winding induced voltage
TEST PROBES	On cable (with a clip) and on engine
VOLTAGE	.15 - .35 Vac
	Crank engine with spark plug cable installed and measure voltage.

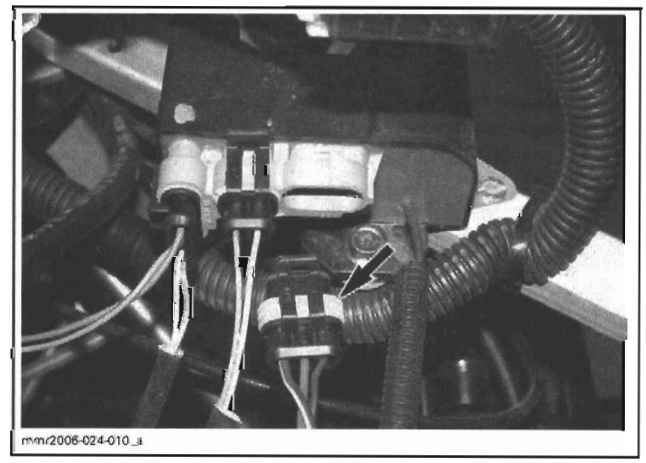


CABLE INDUCED VOLTAGE TEST

IGNITION GENERATOR COIL

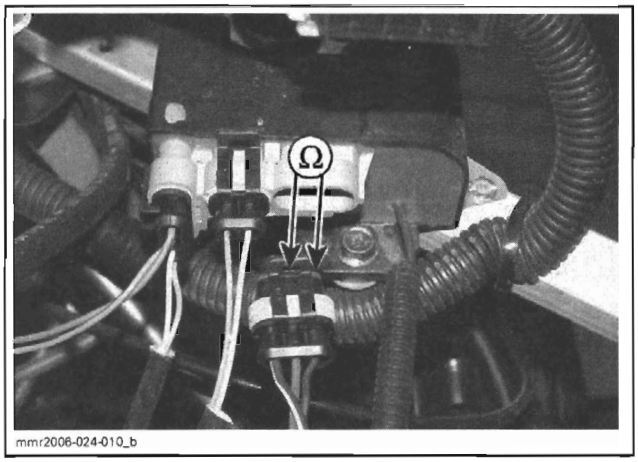
Static Test

Disconnect 3-pin connector from MPEM.



Take measurements and compare readings with the following table.

TEST PROBES	RED and BLACK/RED wires	BLACK/RED wire and engine
RESISTANCE	4.5 to 6.5 Ω	0 to 0.5 Ω
NOTE	The term engine refers to the engine metal parts connected to the magneto housing.	

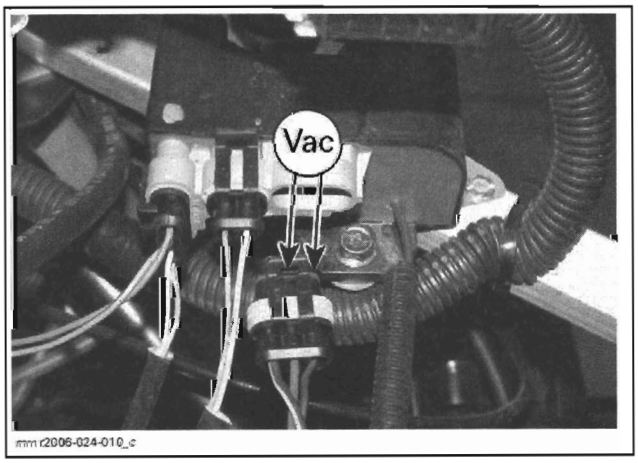


RESISTANCE TEST

Dynamic Test

Take measurements and compare readings with the following table.

TEST PROBES	RED and BLACK/RED wires
VOLTAGE	7.0 to 15.0 Vac
NOTE	When manually cranking the engine with the spark plug installed, the engine will tend to accelerate beyond the compression point. This will result in higher magneto output. Always repeat the procedure 3 times.



VOLTAGE TEST

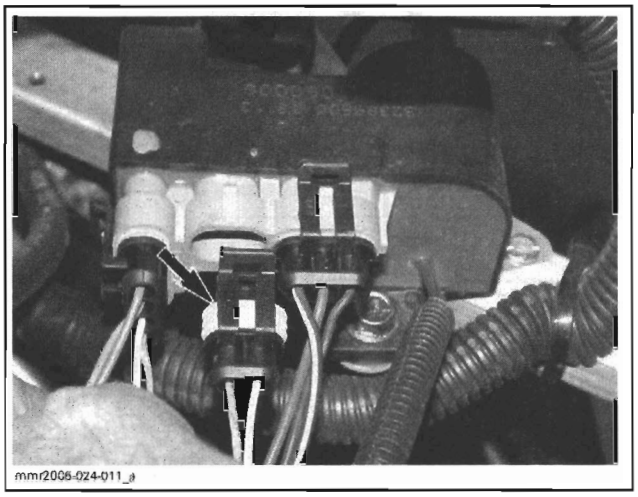
If generator coil is out of specification, replace it.

TRIGGER COIL (forward rotation)

NOTE: RER trigger coil is used only when engine is in reverse operation. For testing, refer to *ROTAX ELECTRONIC REVERSE.*

Static Test

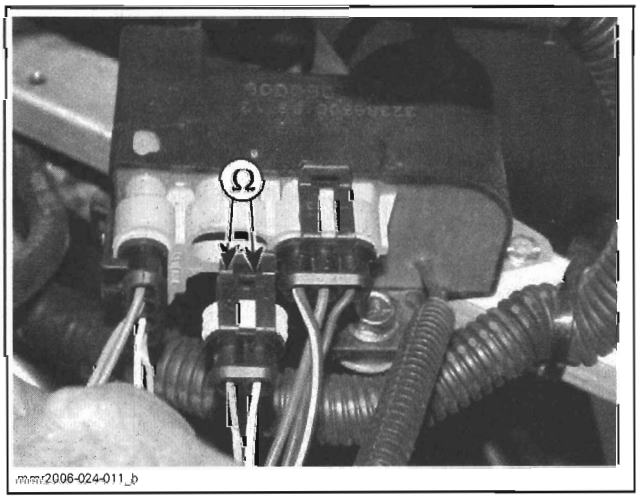
Disconnect 2-pin connector from MPEM.



FORWARD TRIGGER COIL CONNECTOR

Check the resistance of the forward trigger coil.

TEST PROBES	BLUE/YELLOW and WHITE/YELLOW wires
RESISTANCE	160 to 180 Ω



FORWARD TRIGGER COIL CONNECTOR — RESISTANCE TEST

Dynamic Test

Check the voltage of the forward trigger coil.

TEST PROBES	BLUE/YELLOW and WHITE/YELLOW wires
VOLTAGE	0.15 to 0.35 Vac
NOTE	Voltage testing: Manually crank engine with the spark plug installed. Always repeat the procedure 3 times.

If trigger coil is out of specification, replace it.

MPEM

When other components have been tested above and are good, the electronic module can be suspected.

ADJUSTMENT

IGNITION TIMING

If for any reason, ignition timing accuracy is suspected, it can be verified as follows.

PROCEDURE OVERVIEW
Verify timing mark position
Check ignition timing with a timing light

Verifying Timing Mark Position

General

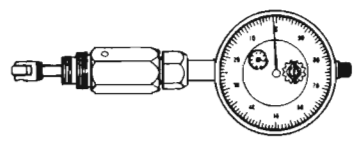
Verification of the position of the timing mark on the magneto flywheel is required for the following reasons:

- To detect a missing or broken magneto flywheel Woodruff key.
- To correctly locate and mark a timing mark on a new service magneto flywheel.
- To verify the correct location of the factory timing mark.

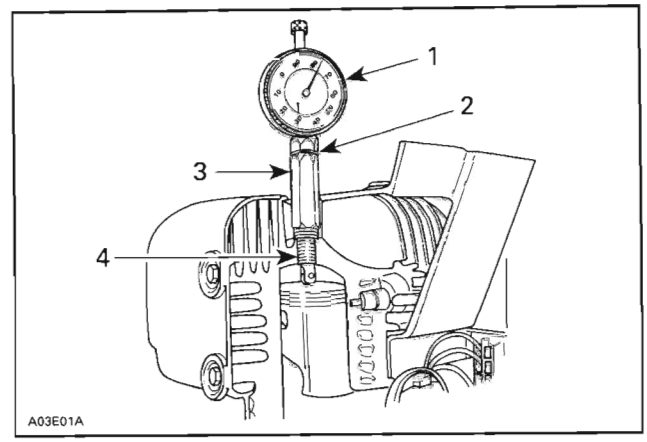
TDC Gauge Installation

- Clean the area around the spark plug, and remove it.
- Install the TDC gauge in the spark plug hole and adjust as follows:

414 104 700



- Rotate magneto flywheel clockwise until piston is just Before Top Dead Center.



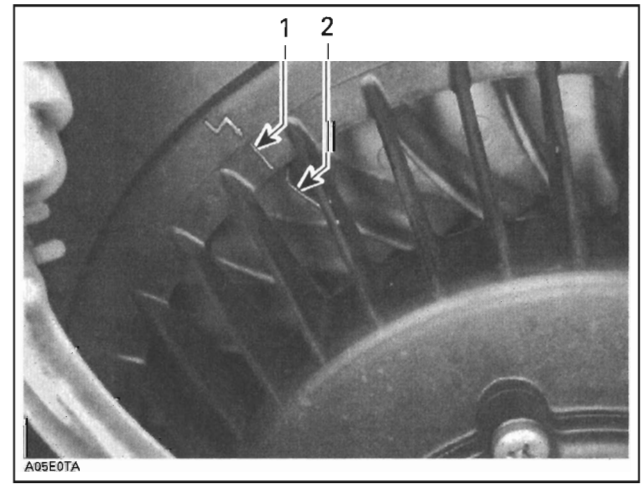
1. *Outer ring*
2. *Adaptor lock nut*
3. *Roller lock nut*
4. *Adaptor*

- Loosen adaptor lock nut then holding gauge with dial face toward magneto, screw adaptor in spark plug hole.
- Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
- Rotate magneto flywheel clockwise until piston is at Top Dead Center.
- Unlock outer ring of dial and turn it until "0" (zero) on dial aligns with pointer.
- Lock outer ring in position.

From this point, rotate magneto flywheel back 1/4 turn then rotate it clockwise to reach the specified position. Refer to *TECHNICAL SPECIFICATIONS*.

Verification of Timing Mark

Check if red fin aligns with mark on fan cowl.



1. *Fan cowl timing mark*
2. *Red fin*

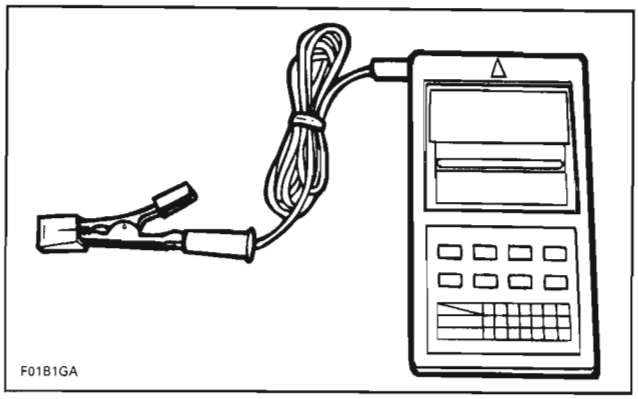
If marks do not align, there is something wrong with magneto flywheel mounting. Check Woodruff key and flywheel.

If marks align, check ignition timing.

Checking Ignition Timing

CAUTION: Always check the timing with a stroboscopic timing light at 3500 RPM after the marks have been checked.

Use a timing light and the digital inductive type tachometer (P/N 529 014 500).



TACHOMETER

To check the ignition timing, refer to illustration and proceed as follows:

- Place ski tips against a wall, raise rear of vehicle on a stand, so that track does not contact the ground.

⚠ WARNING

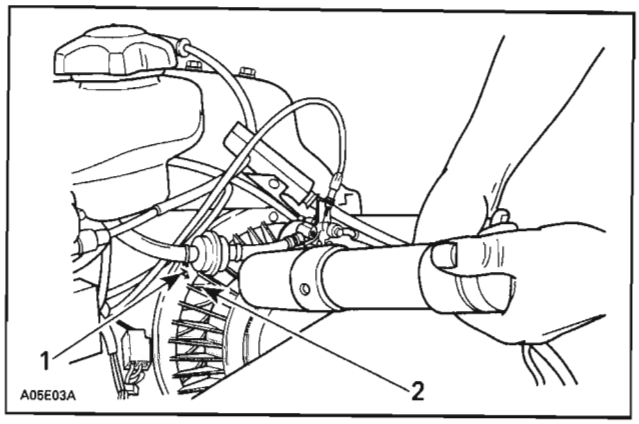
Do not allow anyone in front of or behind the vehicle while engine is running. Keep clear of track and do not wear loose clothing which can get caught in moving parts.

- Connect the timing light pick-up to spark plug cable.

NOTE: To avoid an incorrect reading due to parallax, view the magneto flywheel and the crankcase timing marks in a straight line.

- Connect tachometer wire to spark plug wire or aim tachometer toward spark plug wire without using any connection wire.
- Start the engine and raise the engine speed within 3000 - 4000 RPM while observing the timing marks, refer to illustration.

The red fin must align with the fan cowl timing mark. Tolerance is ± 1°.



TYPICAL
1. Fan cowl timing mark
2. Red fin

- If marks align, timing is correct.
- If marks do not align, ignition timing is incorrect. Since there is no adjustment, a faulty trigger coil (check proper grounding of coil), flywheel, Woodruff key or MPEM could be the cause. Substitute one part at a time and recheck timing marks.
- Install parts which were removed.

IGNITION SYSTEM (550F)

SERVICE TOOLS

Description	Part Number	Page
digital inductive type tachometer	529 014 500	378
multimeter Fluke 111	529 035 868	372

SERVICE PRODUCTS

Description	Part Number	Page
antiseize lubricant	293 800 070	372

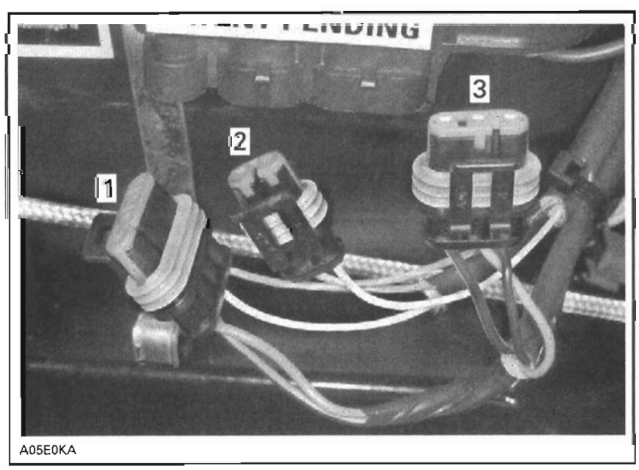
GENERAL

The RER dual trigger coil CDI system features an ignition coil integrated to the MPEM.

NOTE: For more information pertaining to RER, refer to *ROTAX ELECTRONIC REVERSE (RER).*

Multi-Purpose Electronic Module (MPEM)

The following illustration identifies the connector functions on the MPEM.



MPEM
1. *Reverse switch, reverse indicator and reverse trigger coil*
2. *Trigger coil (forward rotation)*
3. *Ignition generator coil and cut-off switches*

NOTE: A MPEM problem can be resolve simply by unplugging and re-plugging the module, indicating a connection problem. Also, check MPEM ground connections.

Electrical Connectors

Before replacing a component, always check electrical connections. The voltage and current might be too weak to go through dirty wire terminals. Clean as required. Make sure terminals are properly crimped on wires and fastened in housing, and that they are free of corrosion or moisture.

IGNITION SYSTEM TESTING SEQUENCE

In the case of ignition problems, check the following in the prescribed order until the problem can be solved.

1. spark plug
2. electrical connectors
3. ignition switch
4. tether cut-out switch
5. engine cut-out switch
6. wiring harness
7. ignition coil
8. ignition generator coil
9. trigger coil
10. MPEM.

Testing Conditions

Voltage measurements are always taken upon engine cranking using the rewind starter. Readings when the engine is running would be higher than specified range. Part temperature must be approximately 20°C (68°F) (room temperature), otherwise readings could be distorted.

CAUTION: When taking measurements, it is useless to try to run the engine since readings would then be distorted.

Analysis of Readings

Voltage Readings

Take into consideration that readings vary according to the force applied onto the manual starter. It is therefore important to employ enough force upon each trial.

It is recommended to proceed 3 times with the test. Each reading must be within the range indicated in the corresponding table. If the reading is too low, the part is considered to be defective and must be replaced.

Resistance Readings

Readings must be within the indicated range. Otherwise, replace the part.

Intermittent Ignition Problems

It is difficult to make a diagnostic in the case of intermittent ignition problems. Thus, problems occurring only when the engine operating temperature is normal must be checked in similar conditions.

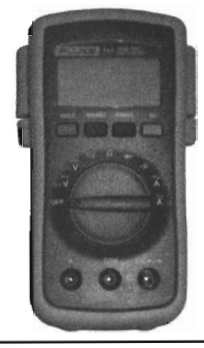
In most cases when problems are caused by temperature or vibrations, these can only be solved by replacing parts. Most problems cannot be detected when the engine is stopped.

Multiple Problems

More that one component can be defective. As a result, if the problem remains although a part was replaced, start over the whole verification from the beginning in order to identify the other defective component.

PROCEDURES

For best results, use the multimeter Fluke 111 (P/N 529 035 868).



529 035 868

SPARK PLUG

Removal

First unscrew the spark plug 1 turn.

Clean the spark plug and cylinder head with pressurized air, then completely unscrew.

⚠ WARNING

Whenever using compressed air, always wear protective eye wear.

Spark Testing

Use the snowmobile spark plug and not a new one. Bring the plug in contact with the engine. Pull rewind starter. If no spark is produced, replace the spark plug with a new one and do the test again.

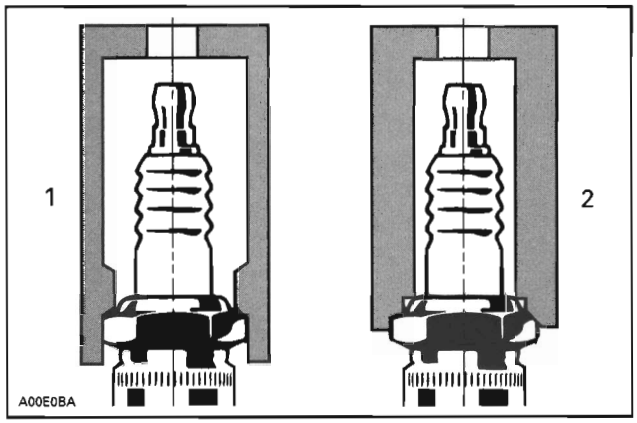
If there is still no spark, continue testing.

Installation

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

Using a feeler gauge, set electrode gap (except if spark plug is an ECS type) as per *TECHNICAL SPECIFICATIONS*.

1. Apply antiseize lubricant (P/N 293 800 070) over the spark plug threads to prevent possible seizure.
2. Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



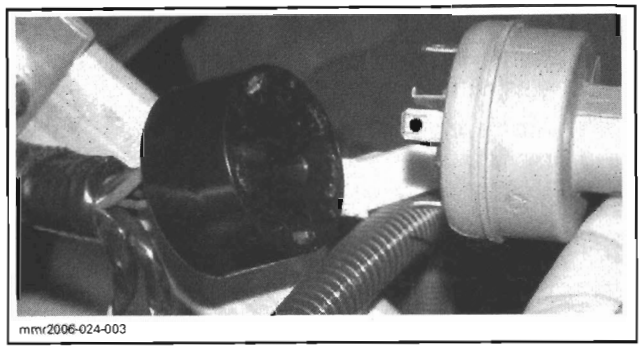
TYPICAL
1. Proper socket
2. Improper socket

Use the following table to torque the spark plug.

MODEL	SPARK PLUG	TORQUE N•m (lbf•ft)
550F	NGK	27 (20)

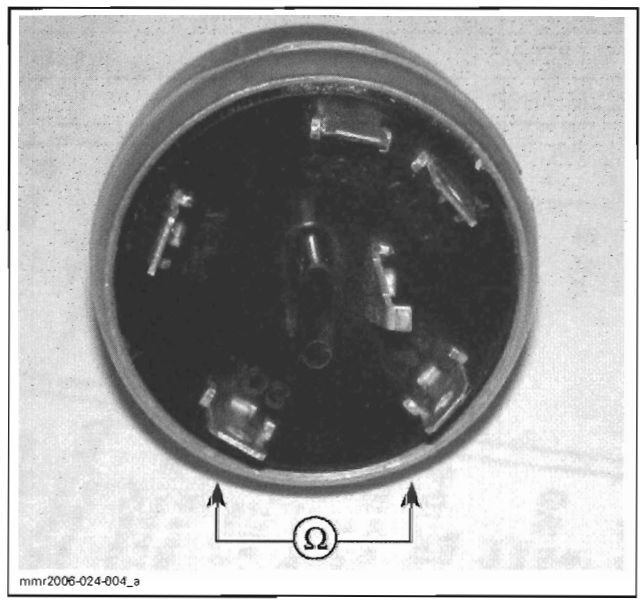
IGNITION SWITCH

Unplug ignition switch connector.



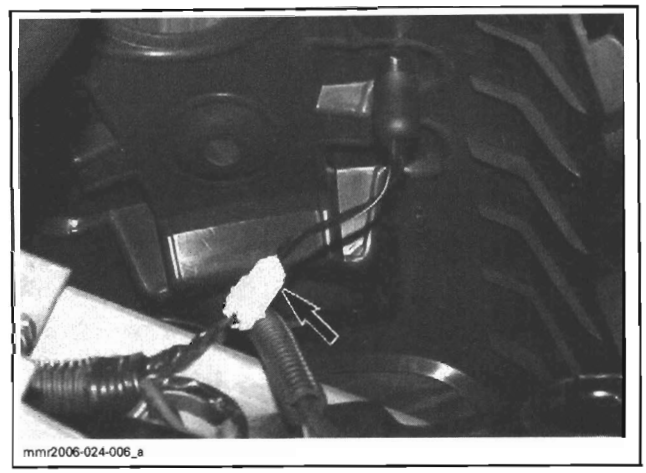
Check switch as follows.

POSITION	TERMINAL		RESISTANCE
OFF	MAG	GRD	0.2 Ω (closed)
	BAT	ACC	Infinite (0L)
	BAT	SOL	
ON	MAG	GRD	Infinite (0L)
	BAT	ACC	0.2 Ω (closed)
	BAT	SOL	Infinite (0L)
START	BAT	SOL	0.2 Ω (closed)



TETHER CUT-OUT SWITCH

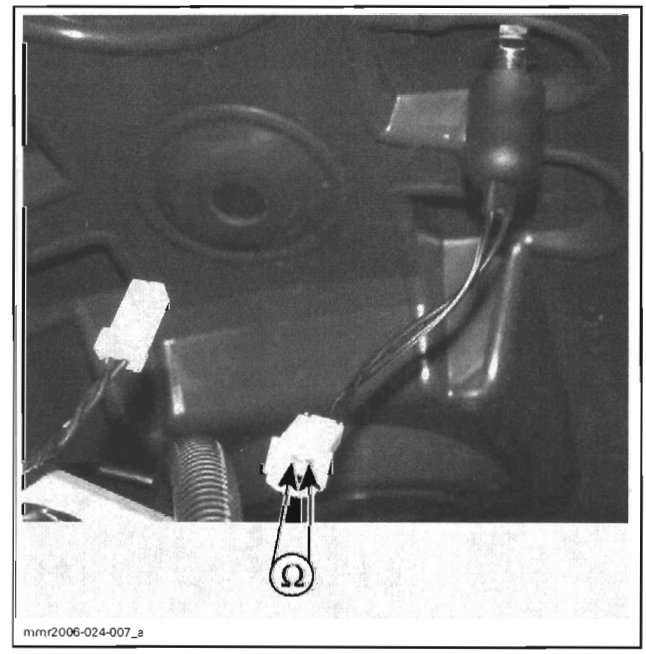
Unplug tether cut-out switch connector.



TYPICAL

Check switch as follows.

SWITCH POSITION	RUN	STOP
TEST PROBES	BLACK/YELLOW and BLACK wires	BLACK/YELLOW and BLACK wires
RESISTANCE	0L	0 to 0.5 Ω



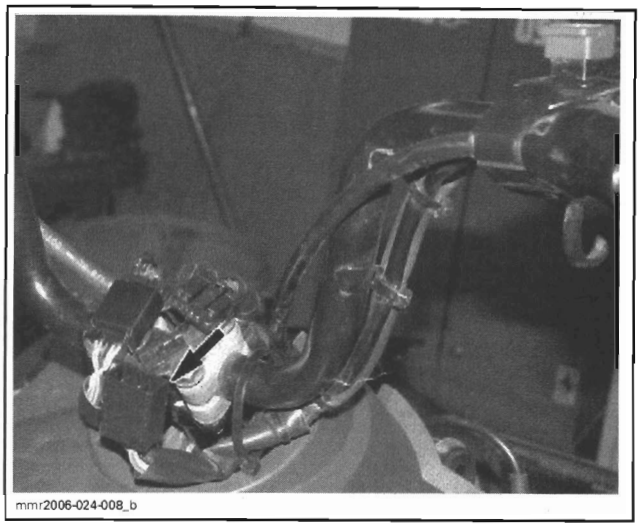
TYPICAL

NOTE: When checking switch in the RUN position, use the tether cap. This validates its ability to remain on switch to make proper electrical contact.

If readings do not correspond to the above specifications, replace switch.

ENGINE CUT-OUT SWITCH

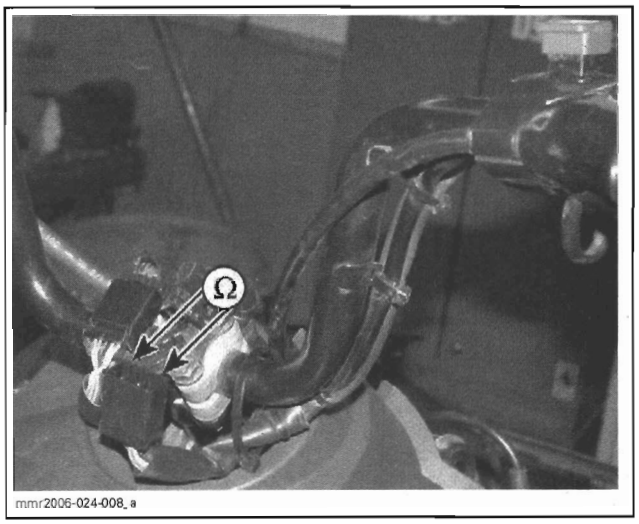
Unplug connector under steering cover.



TYPICAL

Check the condition of engine cut-out switch as follows.

SWITCH POSITION	RUN	STOP
TEST PROBES	BLACK/YELLOW and BLACK wires	
RESISTANCE	OL	0 to 0.5 Ω



TYPICAL

If readings do not correspond to the above-mentioned indications, check switch wires/connector and if good, replace switch.

WIRING HARNESS

When switches test good, check wiring harness as follows.

Check if wiring harness shows any signs of scoring, chaffing or other damage.

No spark problem: Disconnect all switches from the main wiring harness and ensure BLACK/YELLOW wire is completely isolated from ground. Otherwise, repair/replace wiring.

No engine stop problem: Disconnect all switches from the main wiring harness and ensure there is continuity between each end of wires of the same color related to ignition. Otherwise, repair/replace wiring.

NOTE: All wires of the same color within a given harness are connected together.

IGNITION COIL

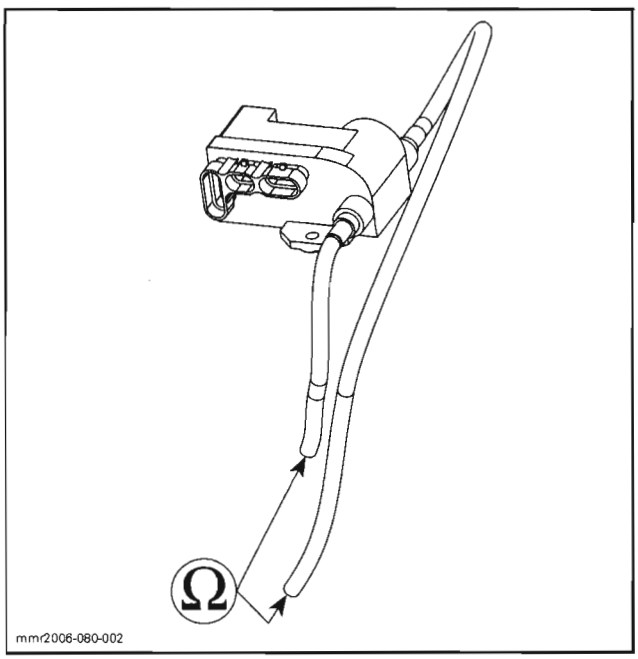
Static Test

Disconnect spark plug cables and remove each cap.

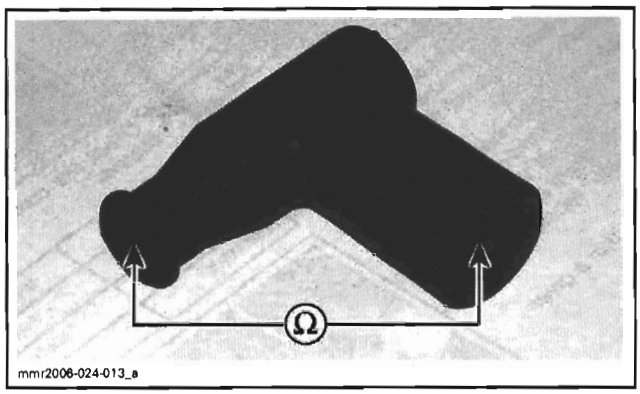
Take measurements and compare readings with the following table.

NOTE: Primary side of ignition coil cannot be measured.

TEST	Secondary winding resistance (WITHOUT spark plug cap)	Spark plug cap resistance
TEST PROBES	Each cable end	Each side of cap
RESISTANCE	900 - 1000 Ω	4 – 6 kΩ



SECONDARY WINDING RESISTANCE TEST



SPARK PLUG CAP RESISTANCE TEST

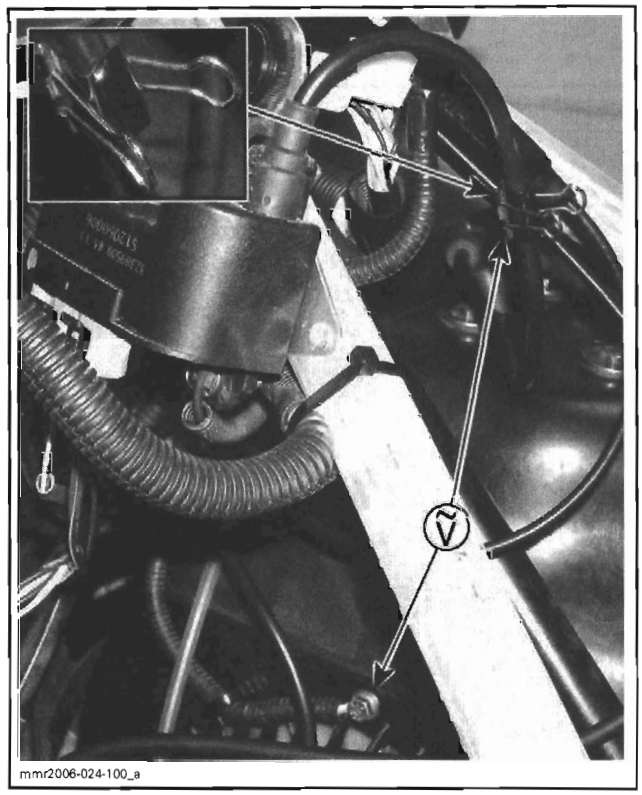
NOTE: Keep in mind that even if this static test is good, voltage requirement is higher to produce a spark in the combustion chamber when engine is running. Ignition coil may be faulty. Replacing ignition coil/MPEM may be necessary as a test.

Dynamic Test

Take measurements and compare readings with the following table.

TEST	Spark plug cable induced voltage
TEST PROBES	On cable (with a clip) and on engine
VOLTAGE	.100 – .250 Vac
	Crank engine with spark plug cable installed and measure voltage.

NOTE: Proceed with each cylinder spark plug cable.



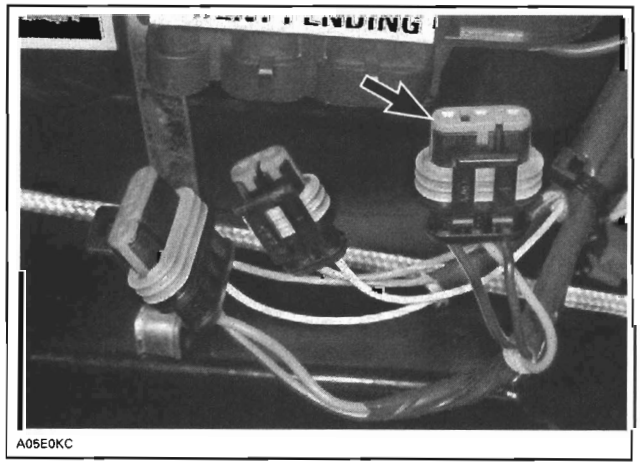
TYPICAL VIEW — SPARK PLUG CABLE INDUCED VOLTAGE TEST

If ignition coil is out of specification, replace it.

IGNITION GENERATOR COIL

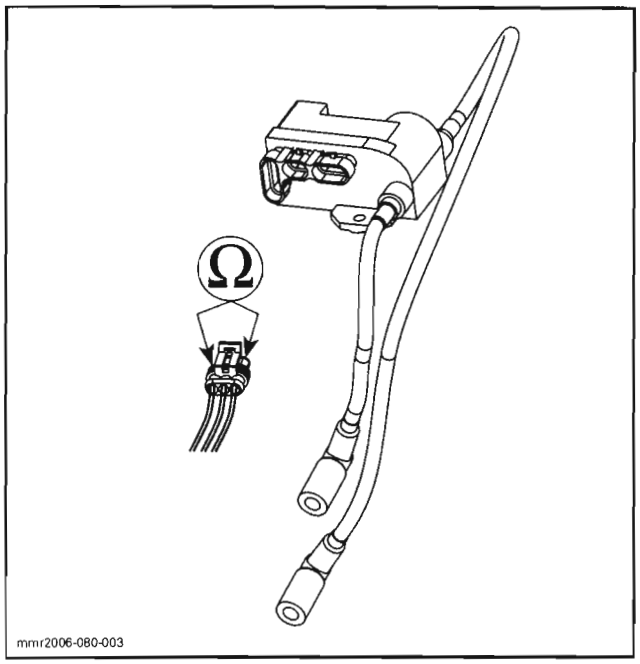
Static Test

Disconnect 3-pin connector from MPEM.



Take measurements and compare readings with the following table.

TEST PROBES	RED and BLACK/RED wires	BLACK/RED wire and engine
RESISTANCE	6.5 to 8.5 Ω	0 to 0.5 Ω
NOTE	The term engine refers to the engine metal parts connected to the magneto housing.	

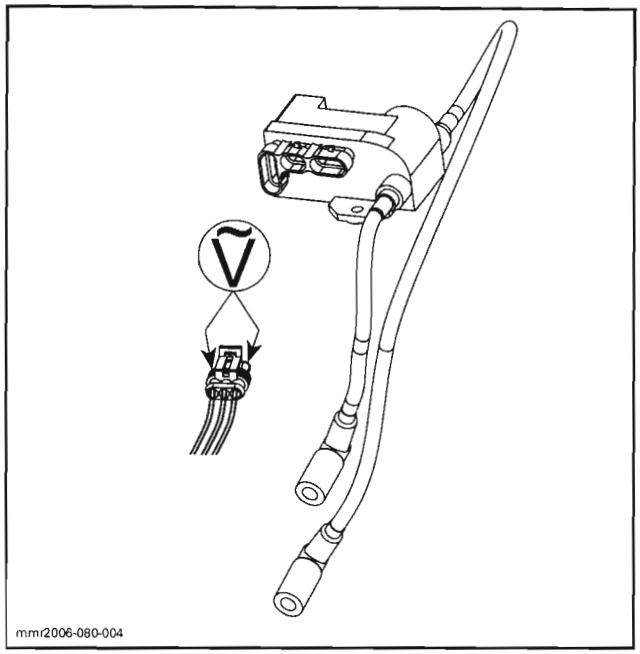


IGNITION GENERATOR COIL — RESISTANCE TEST

Dynamic Test

Take measurements and compare readings with the following table.

TEST PROBES	RED and BLACK/RED wires
VOLTAGE	7.0 to 15.0 Vac
NOTE	When manually cranking the engine with the spark plug installed, the engine will tend to accelerate beyond the compression point. This will result in higher magneto output. Always repeat the procedure 3 times.



IGNITION GENERATOR COIL — VOLTAGE TEST

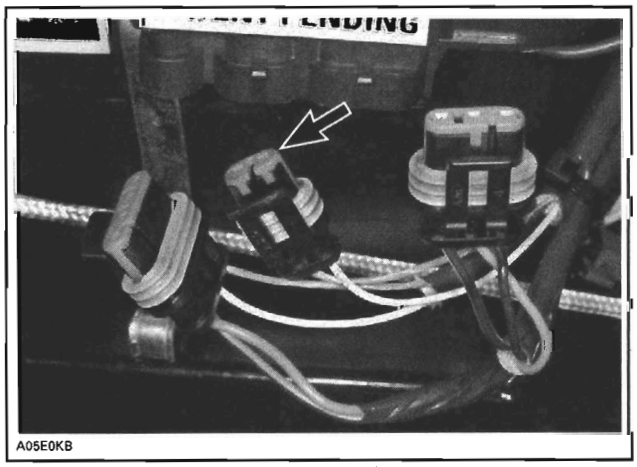
If generator coil is out of specification, replace it.

TRIGGER COIL

NOTE: RER trigger coil is used only when engine is in reverse operation. For testing, refer to *ROTAX ELECTRONIC REVERSE*.

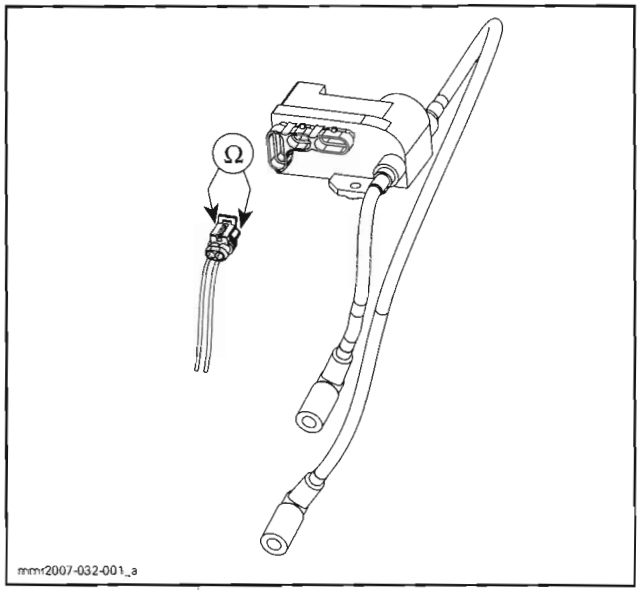
Static Test

Disconnect 2-pin connector from MPEM.



Check the resistance of the forward trigger coil.

TEST PROBES	BLUE/YELLOW and WHITE/YELLOW wires
RESISTANCE	160 to 180 Ω



FORWARD TRIGGER COIL CONNECTOR — RESISTANCE TEST

Dynamic Test

Check the voltage of the forward trigger coil.

TEST PROBES	BLUE/YELLOW and WHITE/YELLOW wires
VOLTAGE	0.15 to 0.35 Vac
NOTE	Manually crank engine with the spark plug installed. Always repeat the procedure 3 times.

If trigger coil is out of specification, replace it.

MPEM

When other components have been tested above and are good, the electronic module can be suspected.

ADJUSTMENT

IGNITION TIMING

If for any reason, ignition timing accuracy is suspected, it can be verified as follows.

PROCEDURE OVERVIEW
Verify timing mark position
Scribe a new mark if existing mark was not good
Check ignition timing with a timing light

Verifying Timing Mark Position

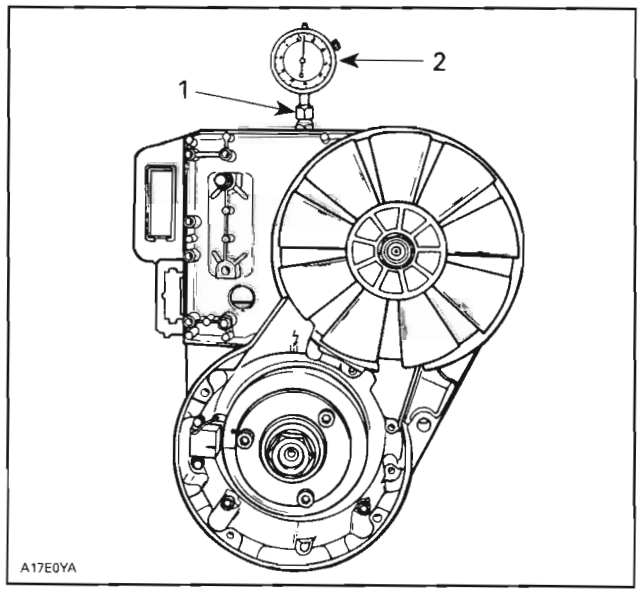
General

Verification of the position of the timing mark on the magneto flywheel is required for the following reasons:

- To detect a missing or broken magneto flywheel Woodruff key.
- To correctly locate and mark a timing mark on a new service magneto flywheel.
- To verify the correct location of the factory timing mark.
- To detect a wrong magneto flywheel corresponding to a different engine type.

TDC Gauge Installation

- Clean the area around the spark plugs, and remove them.
- Remove the rewind starter from the engine.
- Install the TDC gauge in the MAG spark plug hole, and adjust as follows:
  - Position the magneto flywheel at approximately TDC.



TYPICAL — INSTALLATION OF TDC GAUGE
1. Adaptor lock nut
2. Gauge on MAG side cylinder

  - Assemble the gauge to the adaptor and tighten the roller lock nut. Do not tighten the adaptor lock nut.
  - Screw the adaptor into the spark plug hole and tighten to prevent movement in the plug hole.

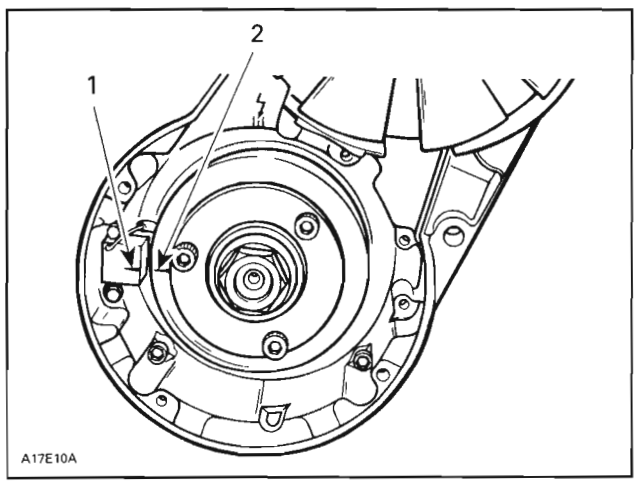
- Position the dial face toward the MAG side. Move the gauge down until the needle just begins to move, then move down a further 5 or 6 mm (approximately 1/4 in). Tighten adaptor lock nut by hand.

• Locate the piston TDC position as follows:
- Slowly rotate the magneto flywheel back and forth across TDC while observing the needle. Note that the needle stops moving only as the piston is changing direction.
- Rotate the dial face so that «0» is in line with the needle when it stops moving.
- Again, slowly rotate the magneto flywheel back and forth across TDC and adjust the dial face to «0», until the needle always stops exactly at «0» before changing direction.
- «0» now indicates exact TDC.

Verification of Timing Mark

NOTE: When checking timing, certain procedures require that the magneto flywheel be turned in a clockwise direction, viewed facing the MAG side. If it is necessary to turn back (counterclockwise) for any reason, rotate the magneto flywheel at least one-quarter turn counterclockwise, and then rotate it clockwise to ensure the slack in engine moving parts is taken-up.

- Rotate the magneto flywheel counterclockwise, one-quarter turn then carefully rotate it clockwise until the needle indicates the specified measurement. Refer to *TECHNICAL SPECIFICATIONS*.
- Verify that the magneto flywheel mark perfectly aligns with the mark on the trigger coil, refer to illustration.



TYPICAL
1. *Trigger coil mark*
2. *Magneto flywheel mark*

- If the marks align, check ignition timing using those marks.
- If the marks do not align, check magneto flywheel and trigger coil part numbers and check Woodruff key condition. If all parts are good continue procedure to scribe a new mark.

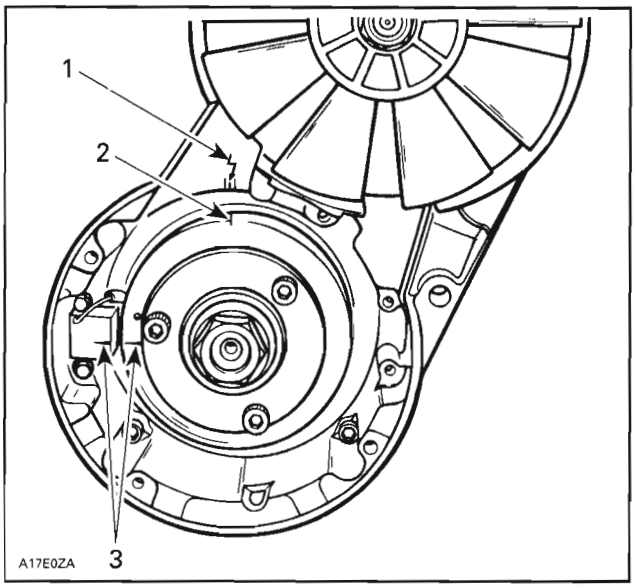
NOTE: If marks were not aligned, do not use them to check ignition timing with a timing light.

Scribing a Mark on Magneto Flywheel

- Remove the fan cover from the engine.
- Maintain magneto flywheel so that previous marks remain aligned.
- Scribe or punch a mark on magneto flywheel so that it perfectly aligns with the arrow on crankcase, refer to illustration.

NOTE: This new timing mark should be used for future timing checks (dynamic timing).

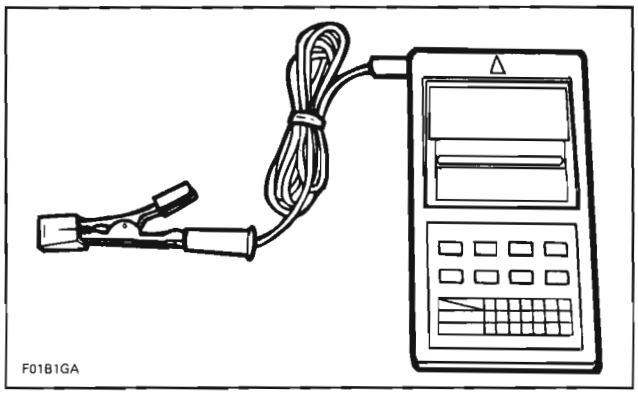
- Reinstall rewind starter.
- Check the timing with a timing light.



TYPICAL
1. *Crankcase arrow*
2. *Scribe a mark here*
3. *Maintain verified timing marks aligned (static timing)*

Checking Ignition Timing

Use a timing light and the digital inductive type tachometer (P/N 529 014 500).



TACHOMETER

To check the ignition timing, refer to illustration and proceed as follows:

- Place ski tips against a wall, raise rear of vehicle on a stand, so that track does not contact the ground.

⚠ WARNING

Do not allow anyone in front of or behind the vehicle while engine is running. Keep clear of track and do not wear loose clothing which can get caught in moving parts.

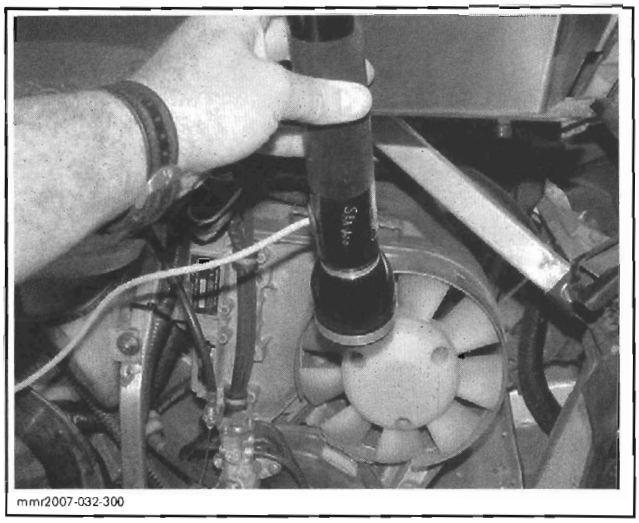
- Connect the timing light pick-up to a spark plug cable.

NOTE: To avoid an incorrect reading due to parallax, view the magneto flywheel and the crankcase timing marks in a straight line.

- Connect tachometer wire to spark plug wire or aim tachometer toward spark plug wire without using any connection wire.
- Start the engine and raise the engine speed within 3000 - 4000 RPM while observing the timing marks, refer to illustration.

The magneto flywheel mark and the crankcase arrow must be perfectly aligned.

NOTE: If a mark was scribed previously, use it.



- If marks are not aligned, timing is incorrect. Since there is no adjustment, a faulty trigger coil (check proper grounding of coil), a faulty flywheel, a faulty Woodruff key, a misaligned (twisted) crankshaft or a faulty MPEM could be the cause. Substitute one part at a time and recheck timing marks.

IGNITION SYSTEM (V800)

SERVICE TOOLS

Description	Part Number	Page
ECM adapter	420 277 010	381
multimeter Fluke 111	529 035 868	381

GENERAL

NOTE: It is a good practice to check for fault codes using B.U.D.S. software as a first troubleshooting step. Refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS.*

The EMS controls the ignition system. For more information, refer to *ENGINE MANAGEMENT.*

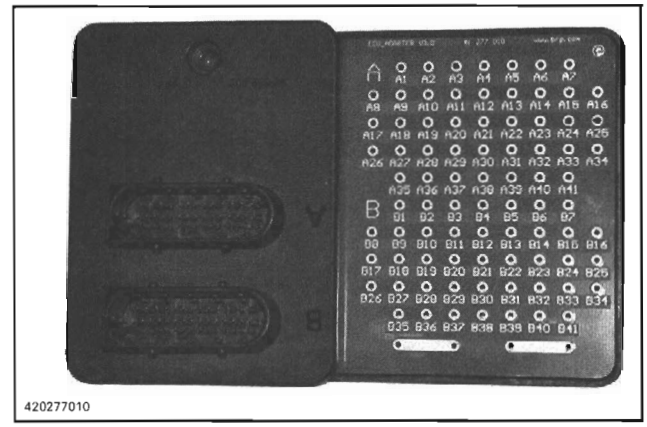
The battery supplies the primary side of ignition coil through a relay (R1) while the ECM completes the circuit for each cylinder by switching it to the ground at the right moment. Upon engine starting, the ECM can detect open and short circuit in the primary winding but it does not check the secondary winding.

Diagnostic Tools

For most accurate measurements, use the multimeter Fluke 111 (P/N 529 035 868).

529 035 868

NOTE: To probe the ECM connector terminals, use the ECM adapter (P/N 420 277 010) to prevent damaging terminals. Refer to *ENGINE MANAGEMENT* for more information.



420277010

PROCEDURES

IGNITION SWITCH

Quick Test

Set engine cut-out switch to STOP or remove tether cap to prevent engine cranking.

NOTE: Ensure hood connector is connected.

In the OFF position no light should be on.

To check if ignition switch functions properly, turn it to the START position.

NOTE: Turning ignition switch to ON will not wake up the ECM. Key must be turned to START.

If speedometer turns on, the ignition switch is good.

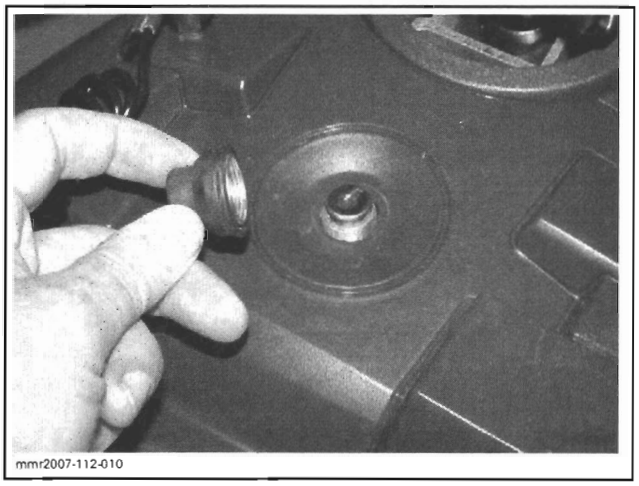
NOTE: On models without an electronic speedometer, the oil pressure lamp should turn ON.

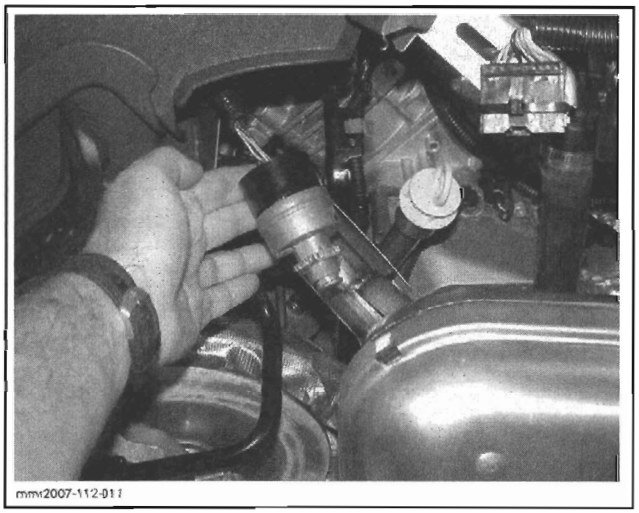
Otherwise, check the charging system fuse. If fuse is in good condition, proceed with the following tests.

Switch Resistance Test

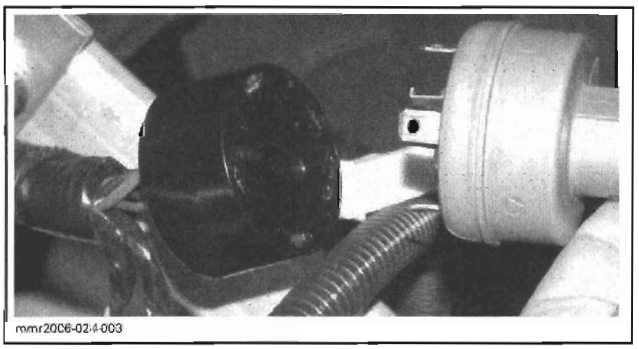
Remove RH panel. Refer to *BODY.*

Unscrew switch nut and remove switch from underneath dashboard.



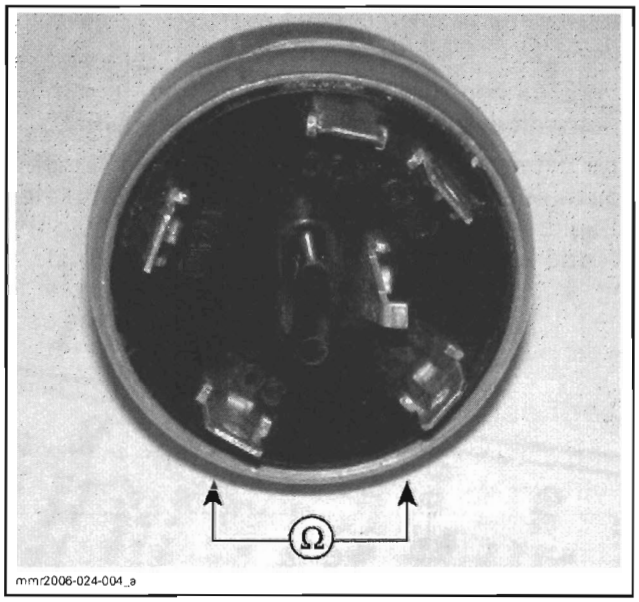


Unplug ignition switch connector.



Check switch as follows.

POSITION	TERMINAL		RESISTANCE
OFF	MAG	GRD	0.2 Ω (closed)
	BAT	ACC	Infinite (0L)
	BAT	SOL	
ON	MAG	GRD	Infinite (0L)
	BAT	ACC	0.2 Ω (closed)
	BAT	SOL	Infinite (0L)
START	BAT	SOL	0.2 Ω (closed)
	MAG	GRD	Infinite (0L)
	BAT	ACC	0.2 Ω (closed)



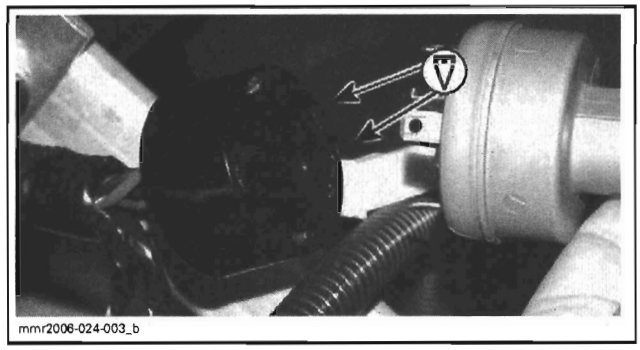
If switch is out of specification, replace with a new one.

Switch Wiring Test (ignition functions)

Battery and Ground Wires

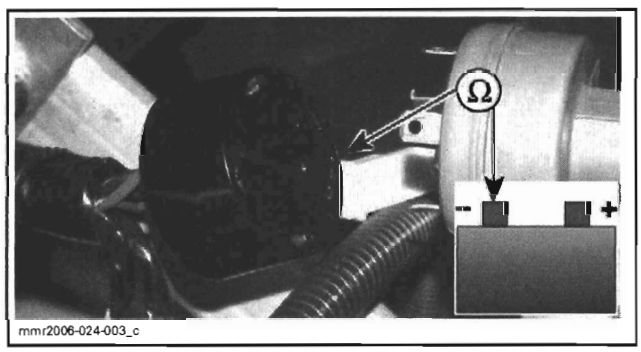
Check as follows.

IGNITION SWITCH CONNECTOR		VOLTAGE
Pin 9	Pin 5	Battery voltage



If test is out of specification, check ground wire as follows.

IGNITION SWITCH CONNECTOR	BATTERY	VOLTAGE (VDC)
Pin 5	Ground	Battery voltage



If ground wire is out of specification, repair wiring/connector.

If ground wire is good, repair BAT wiring/connector.

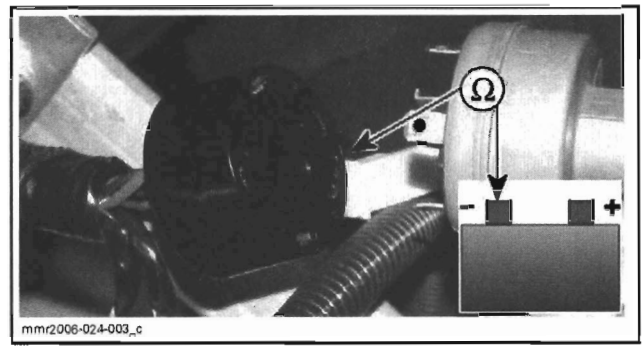
Engine Cut-Out Wire

IMPORTANT: Set cut-out switch to RUN and install tether cord to its post.

Disconnect ECM connector "B".

Check if wire is inappropriately grounded.

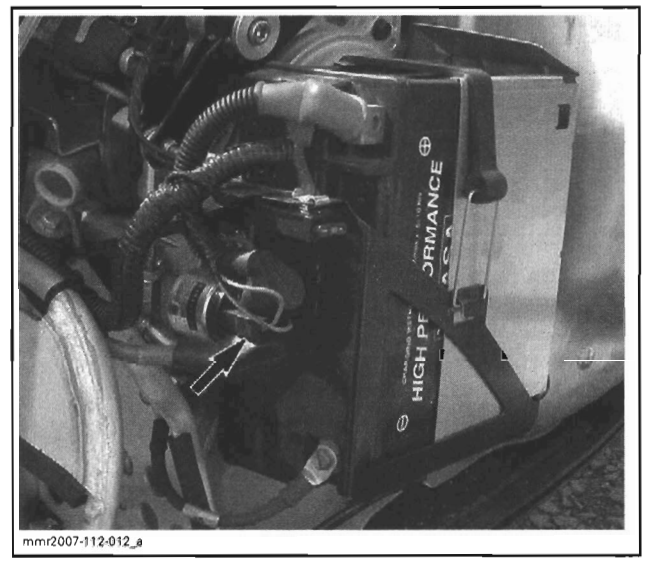
IGNITION SWITCH CONNECTOR	BATTERY	RESISTANCE @ 20°C (68°F)
Pin 2	Ground	Open circuit (OL)



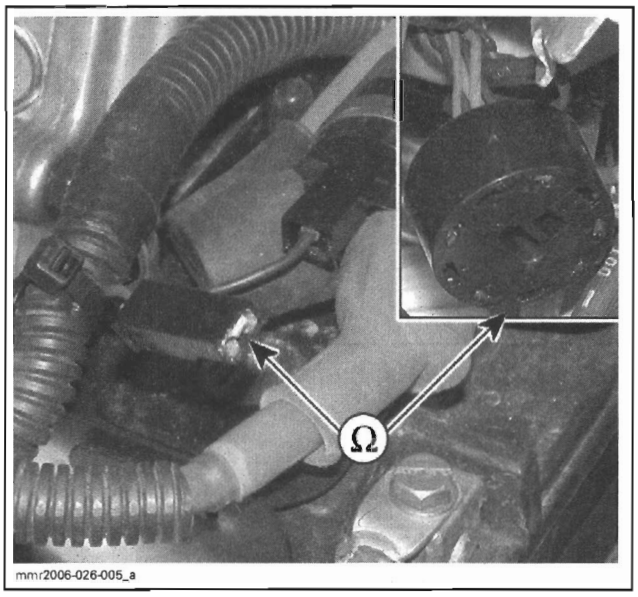
If out of specification, repair wiring/connector.

Start Wire

Disconnect specified wire from starting solenoid and check as follows.

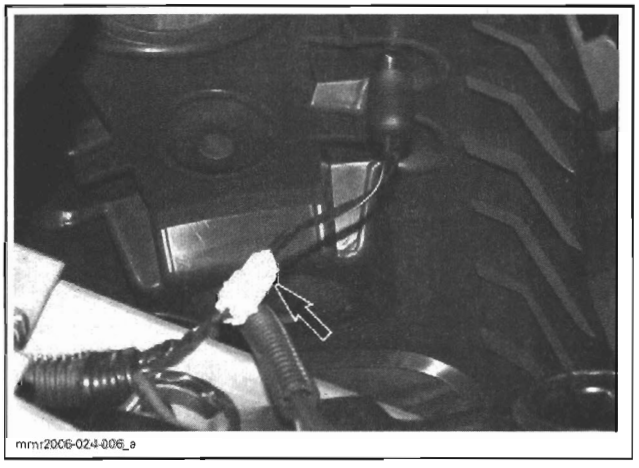


IGNITION SWITCH CONNECTOR	STARTING SOLENOID WIRE	RESISTANCE @ 20°C (68°F)
Pin 4	BEIGE	Close to 0 Ω



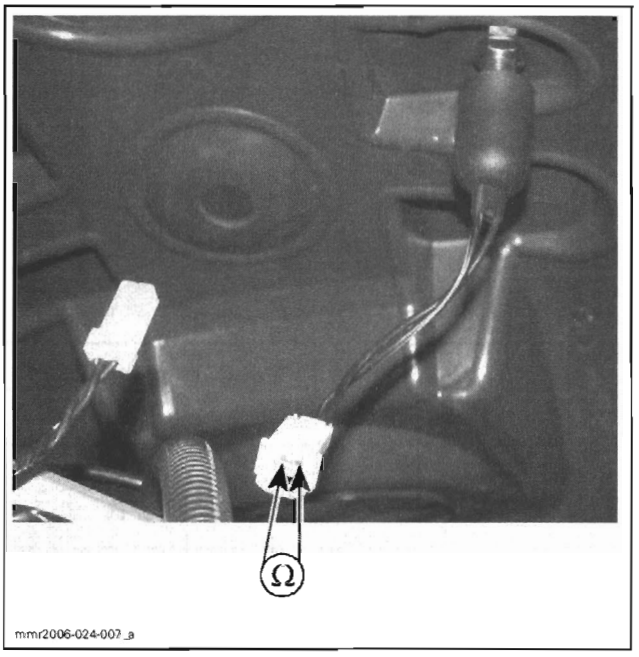
TETHER CUT-OUT SWITCH

Unplug tether cut-out switch connector behind dashboard.



Check switch as follows.

SWITCH POSITION	RUN	STOP
TEST PROBES	BLACK and BLACK wires	BLACK and BLACK wires
RESISTANCE	Open circuit (OL)	0 to 0.5 Ω

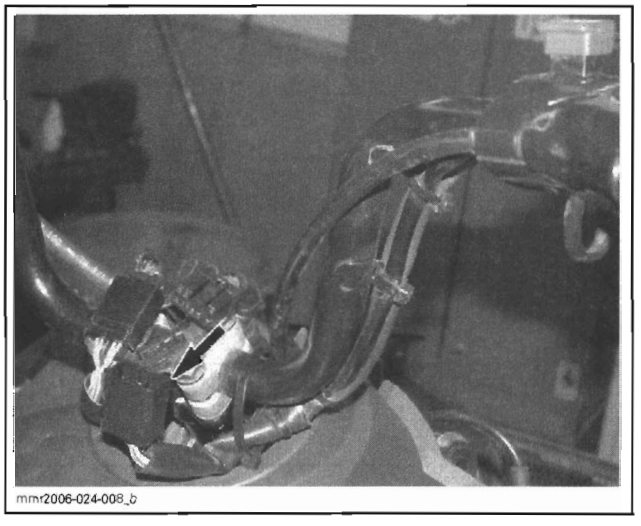


NOTE: When checking switch in the RUN position, use the tether cap. This validates its ability to remain on switch to make proper electrical contact.

If readings do not correspond to the above specifications, replace switch.

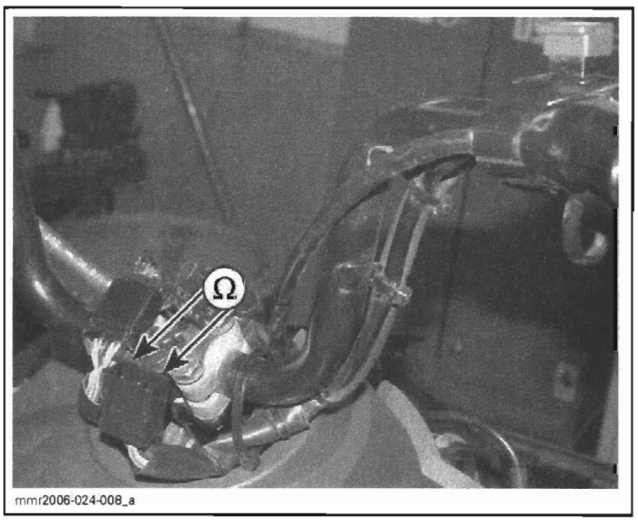
ENGINE CUT-OUT SWITCH

Unplug connector under steering cover.



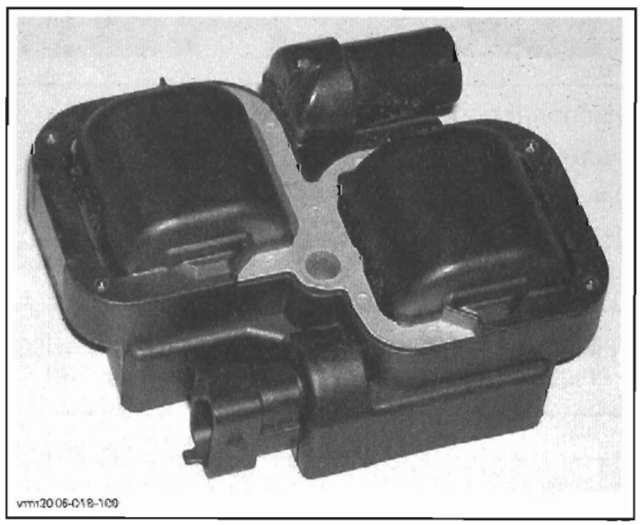
Check the condition of engine cut-out switch as follows.

SWITCH POSITION	RUN	STOP
TEST PROBES	BLACK/YELLOW and BLACK wires	
RESISTANCE	Open circuit (OL)	0 to 0.5 Ω



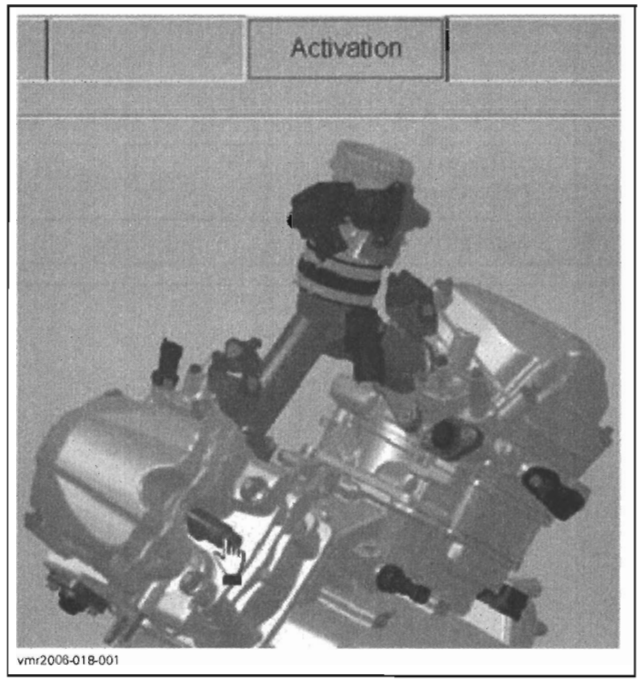
If readings do not correspond to the above-mentioned indications, check switch wires and connector. If good, replace switch.

IGNITION COIL



Quick Test with B.U.D.S.

Using the B.U.D.S. software, energize the ignition coil for each spark plug.



You should hear the spark occurring. In doubt, use an inductive spark tester. If there is no spark, perform the following checks.

NOTE: Keep in mind that even if there is a spark during this static test, voltage requirement is higher to produce a spark in the combustion chamber when engine is running. Ignition coil could be not working in real operation. Replacing ignition coil may be necessary as a test.

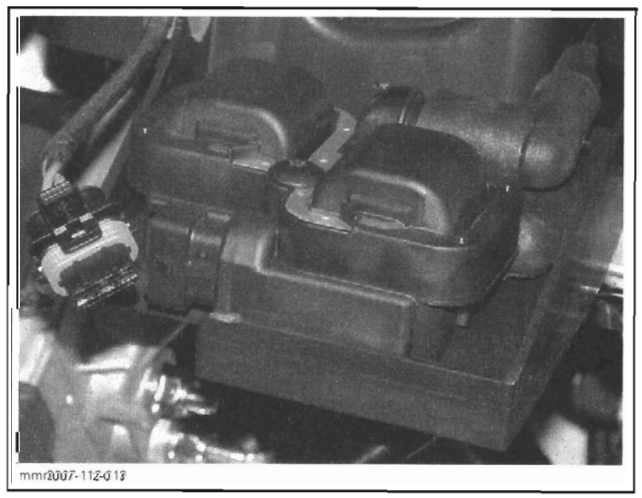
NOTE: Ensure spark plug cable is on the appropriate cylinder.

Ignition Coil Power Supply

Ensure ignition coil is properly powered as follows.

Remove hood. Refer to *BODY*.

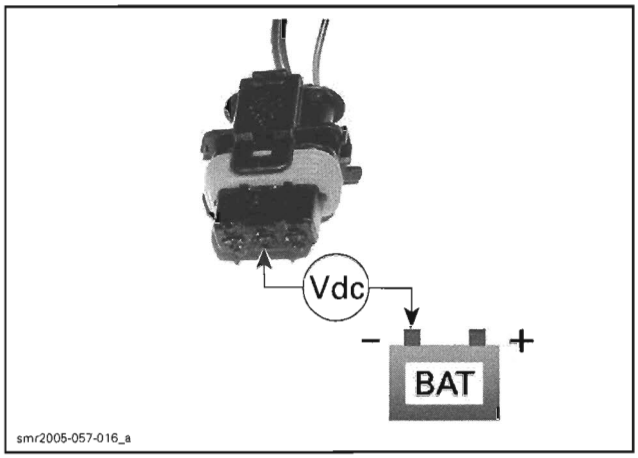
Disconnect the 3-pin connector from the ignition coil and check the voltage supplied by the relay R1.



Briefly turn ignition switch to START to wake up ECM.

Using a multimeter, read voltage.

IGNITION COIL CONNECTOR	VOLTAGE
Pin 2 with battery ground	12 Vdc

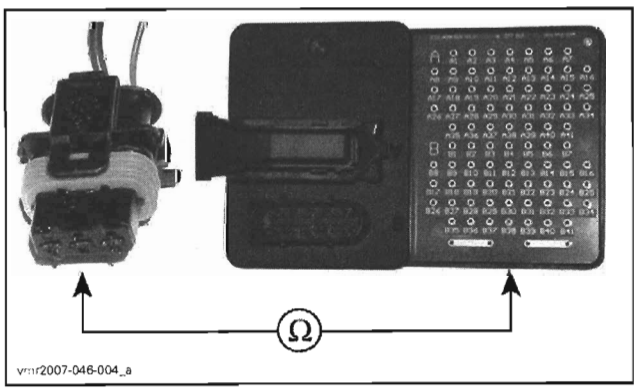


TYPICAL

If proper voltage is NOT read, check continuity of ignition coil supply circuit (charging system fuse, relay R1 and fuse F2 and wiring/connectors).

If adequate voltage is read, disconnect the ECM connector "A" and check the continuity of appropriate circuit.

COMPONENT	CIRCUIT NUMBER (ignition coil connector)	CIRCUIT NUMBER (ECM connector)
Cylinder 1 (front)	1	A-1
Cylinder 2 (rear)	3	A-41



If wiring harness is defective, repair the connector or replace the wiring harness between ECM connector and the ignition coil.

If wiring harness is good, refer to ECM in *ENGINE MANAGEMENT*.

Resistance Test

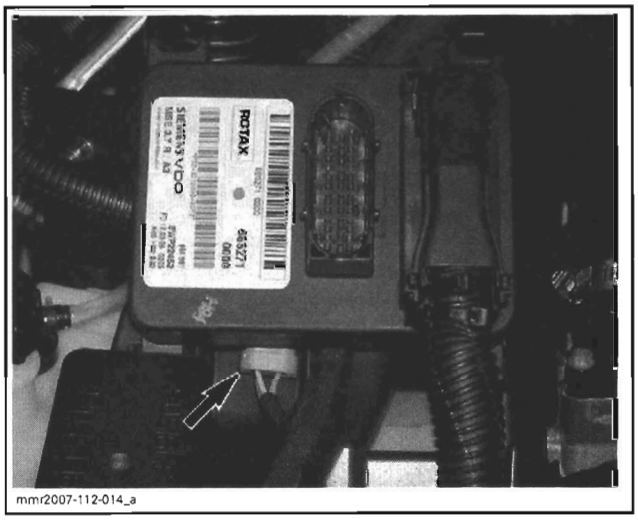
An ignition coil with good resistance measurement can still be faulty. Voltage leak can occur at high voltage level which is not detectable with an ohmmeter. Replacing the ignition coil may be necessary as a test.

Disconnect ignition cable from spark plug.

Primary Windings

Reconnect connector to ignition coil.

Locate engine connector under ECM.



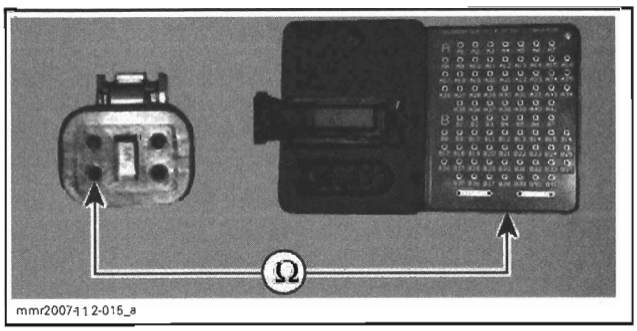
Disconnect connector "A" from ECM.

Raise ECM.

Disconnect engine connector.

Using a multimeter, check resistance in primary windings as follows.

PRIMARY CIRCUIT	ENGINE CONNECTOR	ECM CONNECTOR "A"	RESISTANCE @ 20°C (68°F)
Front	Pin 2	A-1	.3 - .6 Ω
Rear		A-41	



If any resistance is not good, replace ignition coil.

If the windings test good, check wiring/ connectors and if adequate, try a new ECM.

Reinstall ECM and plug connectors.

Secondary Windings

Due to the integrated diode, it is not possible to take any resistance measurement of the secondary winding.

IGNITION TIMING

Ignition timing is not adjustable.

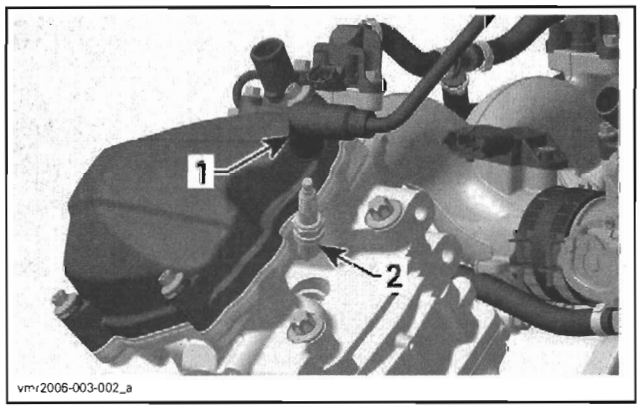
SPARK PLUG

Spark Plug Removal

Unplug the spark plug cable.

Clean the spark plug area with pressurized air.

Unscrew spark plug.

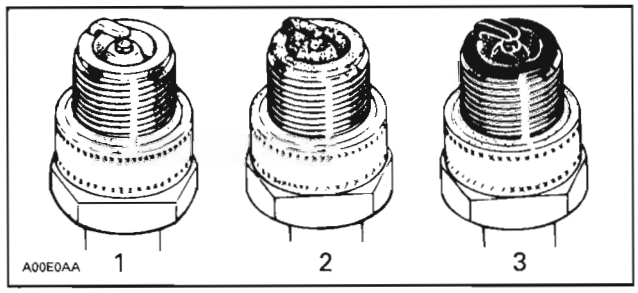


TYPICAL
1. *Spark plug cable*
2. *Spark plug*

Troubleshooting Fouled Spark Plug

Fouling of the spark plug is indicated by irregular running of the engine, decreased engine speed due to misfiring, reduced performance, and increased fuel consumption. This is could due to a loss of compression. Other possible causes are: a clogged air filter, incorrect spark plug gap, lubricating oil entering the combustion chamber, or too cold spark plug. The plug face of a fouled spark plug has either a wet black deposit or a black carbon fouling. Such coatings form a conductive connection between the center electrode and ground.

Spark Plug Analysis



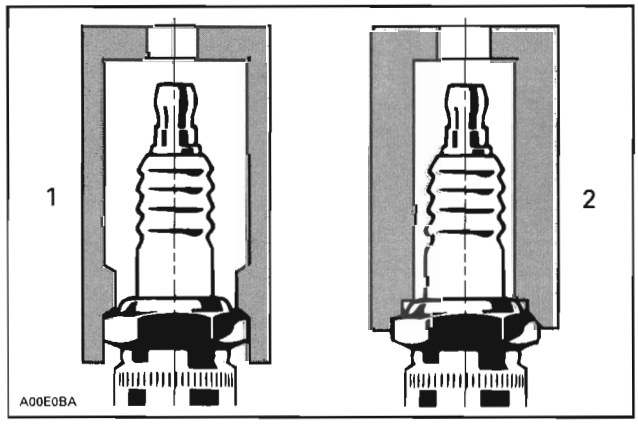
TYPICAL
1. *Overheated (light grey, white)*
2. *Normal (light brown, brown)*
3. *Fouled (black, wet or dry, dark deposits, grey, melted coating)*

The plug face reveals the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber).

Spark Plug Installation

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

- Using a wire feeler gauge, set electrode gap as per *TECHNICAL SPECIFICATIONS*.
- Apply antiseize lubricant over the spark plug threads to prevent possible seizure.
- Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



1. *Proper socket*
2. *Improper socket*

- Torque spark plug to 20 N•m (15 lbf•ft).

CHARGING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
magneto harness adapter	529 036 062	392, 394
multimeter Fluke 111	529 035 868	389

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Snap-on inductive ammeter	MT110	390

SERVICE PRODUCTS

Description	Part Number	Page
silicone dielectric grease	293 550 004	396–397

GENERAL

Voltage measurements are always taken upon engine cranking. Readings when the engine is running would be higher than specified range. Part temperature must be approximately 20°C (68°F) (room temperature), otherwise readings could be distorted.

CAUTION: When taking measurements, it is useless to try to run the engine since readings would then be distorted.

When testing the different magneto components, it is important to take into consideration that reading vary according to the force applied onto the manual starter. It is therefore important to employ enough force upon each trial.

It is recommended to proceed 3 times with the test. Each reading must be within the range indicated in the corresponding table. If the reading is too low, the part is considered to be defective and must be replaced.

For best results, use the multimeter Fluke 111 (P/N 529 035 868).

529 035 868

Place the selector switch of the multimeter to the appropriate position for the tests.

It is difficult to make a diagnostic in the case of intermittent ignition problems. Thus, problems occurring only when the engine operating temperature is normal must be checked in similar conditions.

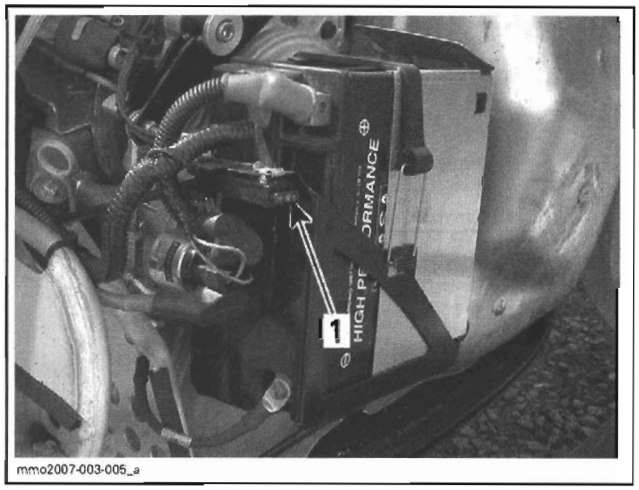
In most cases when problems are caused by temperature or vibrations, these can only be solved by replacing parts. Most problems cannot be detected when the engine is stopped.

As a matter of fact, more than one component can be defective. As a result, if the problem remains although a part was replaced, start over the whole verification from the beginning in order to identify the other defective component.

PROCEDURES

FUSE

Make sure the charging system fuse besides battery is in good condition. If the fuse tests good, continue with the next tests.



1. Charging system fuse

NOTE: The solenoid or the regulator/rectifier may be the cause of a burnt charging system fuse. To check, disconnect one at the time each component from the circuit. If fuse does not burn anymore with one of the component disconnected, replace defective part. If the fuse still burns, check for a defective accessory or wire in harness.

CAUTION: With the regulator/rectifier disconnected, do not race engine to avoid damage to lights and accessories.

VOLTAGE REGULATOR/ RECTIFIER

Continuity Test

Due to internal circuitry, there is no static test available to check continuity.

DC Current Test

300F, 550F Electric Start Models and V800 Models

Use an Snap-on inductive ammeter (P/N MT110) and place it over the RED wire going to charging system fuse.

Proceed as follows:

- Start engine.
- Read current.

MODELS	TEST ENGINE SPEED	CURRENT
300F and 550F	5000 RPM	approx. 2 - 4 A
V800	4000 RPM	approx. 3 - 7 A

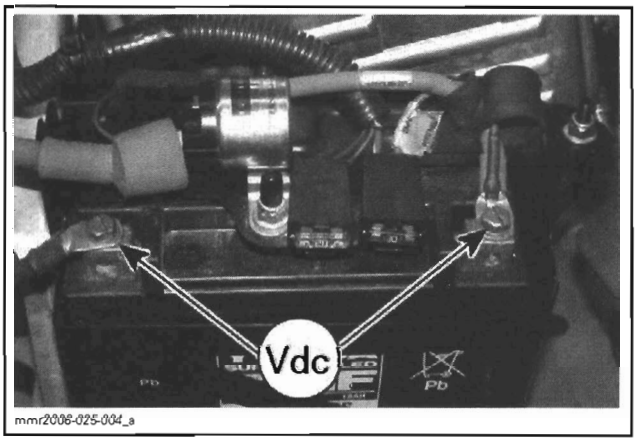
- If current is below specification, check magneto (stator) output prior to concluding that rectifier is faulty.

DC Voltage Test

300F and 550F Electric Start Models

Proceed as follows:

- Set multimeter to Vdc scale.
- Connect multimeter to battery posts.



- Start engine.
- Read voltage.

TEST ENGINE SPEED	VOLTAGE
5000 RPM	Max. 14.7 Vdc

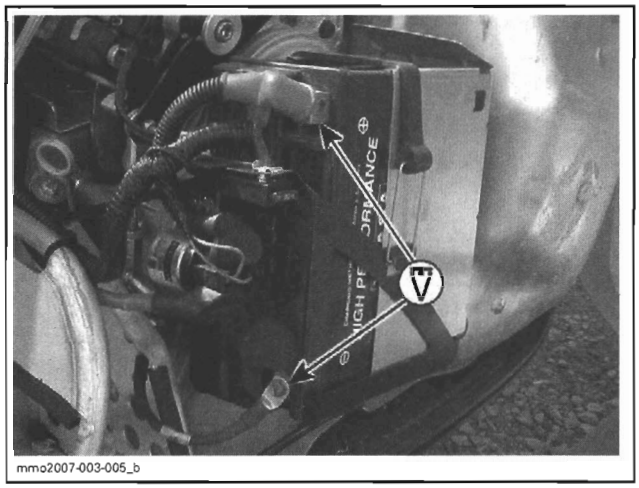
- If voltage is above specification, replace voltage regulator/rectifier.
- If voltage is below specification, check ignition switch, charging generator coil and wiring/connections.

NOTE: If the battery will not stay charged and charging system components test good, try a new voltage regulator/rectifier.

V800 Models

Proceed as follows:

- Set multimeter to Vdc scale.
- Connect multimeter to battery posts.



- Start engine.
- Read voltage.

TEST ENGINE SPEED	VOLTAGE
4000 RPM	Max. 14.4 - 15.2 Vdc

- If voltage is above specification, replace voltage regulator/rectifier.
- If voltage is below specification, check ignition switch, charging generator coil and wiring/connections.

NOTE: If the battery will not stay charged and charging system components test good, try a new voltage regulator/rectifier.

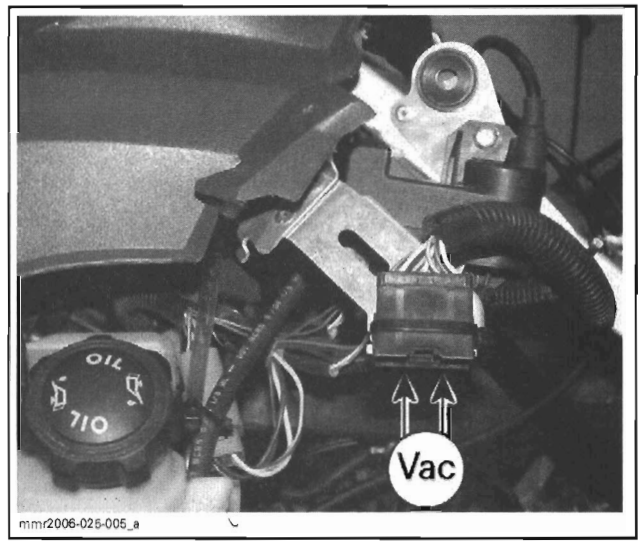
AC Voltage Test

300F and 550F Manual Start Models

NOTE: There is no rectifier in the voltage regulator on manual start models.

Proceed as follows:

- Set multimeter to Vac scale.
- Disconnect connector from hood.
- Connect multimeter to connector.



- Start engine.
- Read voltage.

TEST ENGINE SPEED	WIRE COLOR		VOLTAGE
5000 RPM	YELLOW	YELLOW/ BLACK	Max. 13.8 Vac

- If voltage is above specification, replace voltage regulator.
- If voltage is below specification, check lighting generator coil and wiring/connections. If good, try a new voltage regulator.

Regulator/Rectifier Removal

Disconnect battery (if so equipped).

Unplug the voltage regulator/rectifier connector.

Remove retaining screws.

Regulator/Rectifier Installation

The installation is the reverse of the removal procedure.

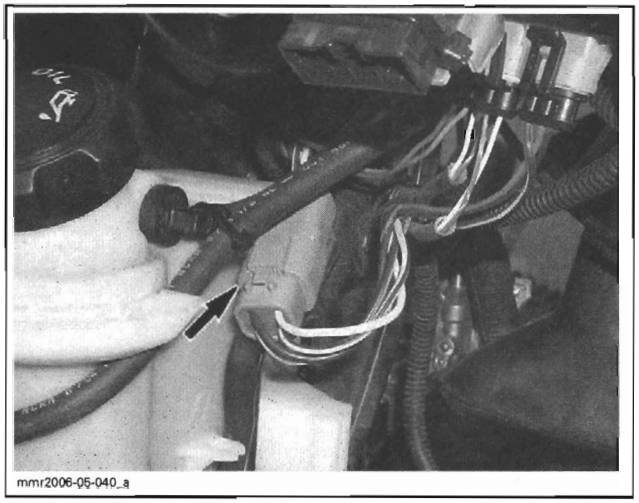
Torque voltage regulator/rectifier screws to 5 N•m (44 lbf•**in**).

CHARGING GENERATOR COIL (stator)

Continuity Test

300F and 550F Models

Disconnect engine connector.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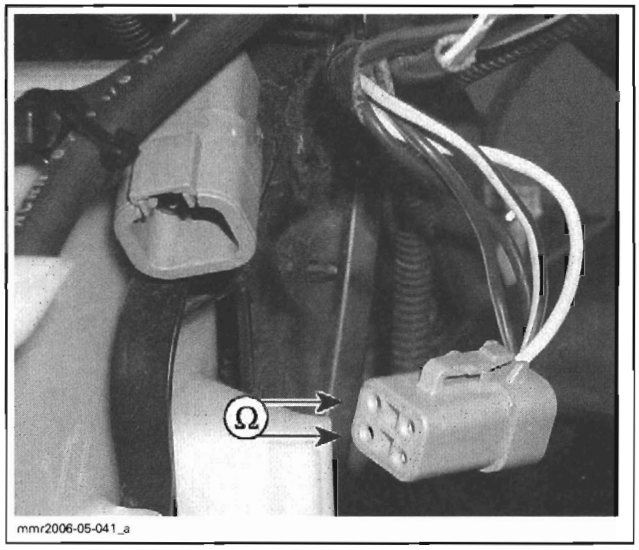
Set multimeter to Ω.

Read the resistance as follows.



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WIRE COLOR		RESISTANCE @ 20°C (69°F)
YELLOW	YELLOW/BLACK	0 - 0.6 Ω

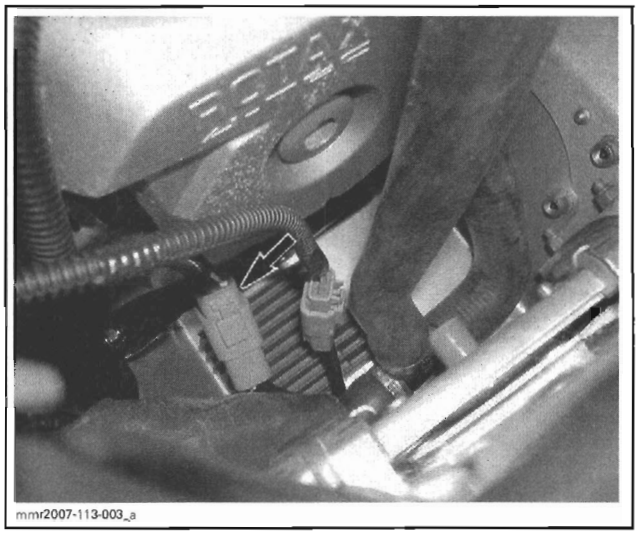
If resistance is out of specification, replace stator.

Re-plug connector properly.

V800 Models

NOTE: To ease access, muffler may be removed.

Disconnect magneto wiring harness connector.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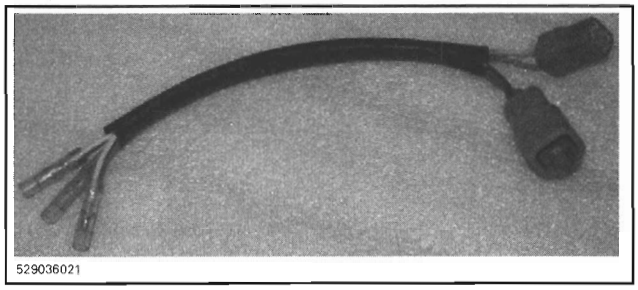
Install the magneto harness adapter (P/N 529 036 062) on magneto connector. Leave the other connector unplugged.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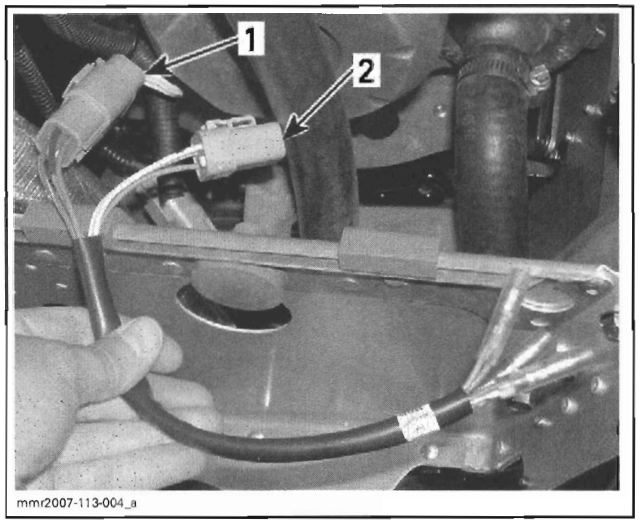

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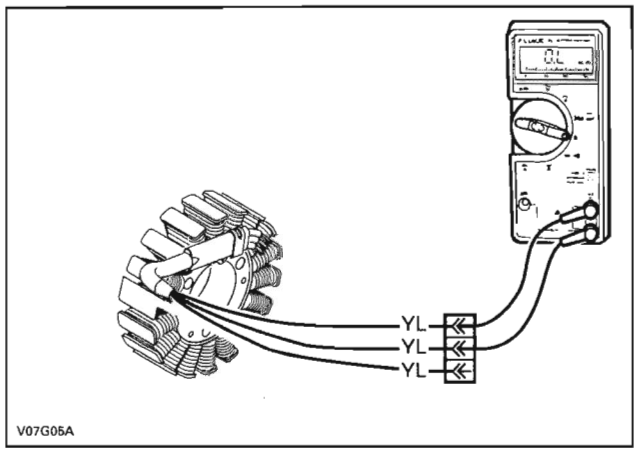
1. *Magneto connector*
2. *Leave this tool connector unplugged*

Set multimeter to Ω.

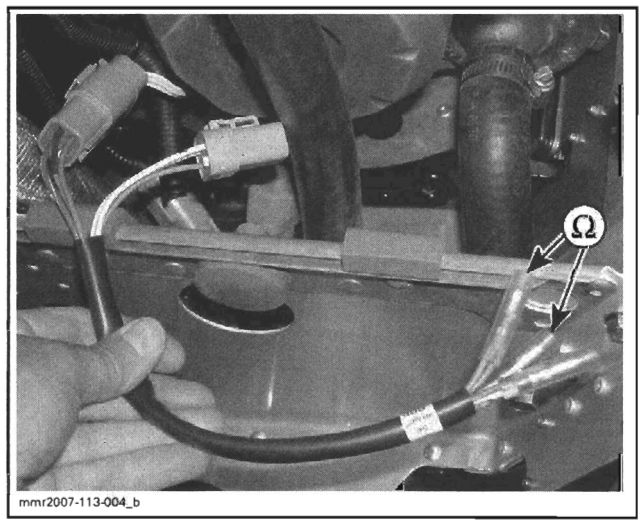
Connect multimeter between YELLOW wires.

Read resistance as follows.

TERMINAL	RESISTANCE @ 20°C (69°F)
1 and 2	0.1 - 1 Ω
1 and 3	
2 and 3	



TYPICAL

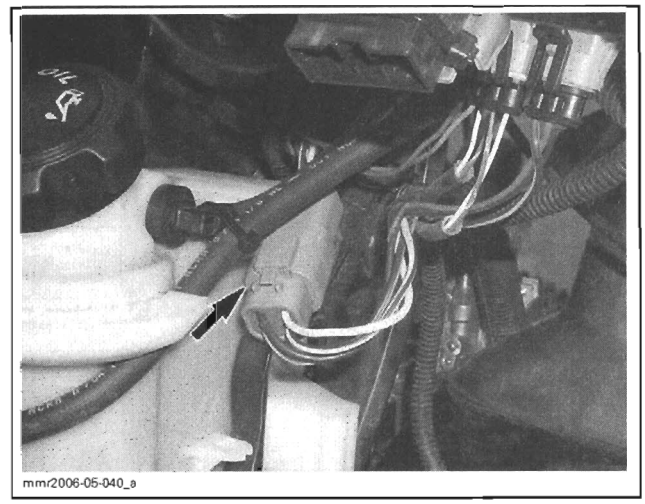


If any reading is out of specification, replace stator.

Insulation and Ground Continuity Test

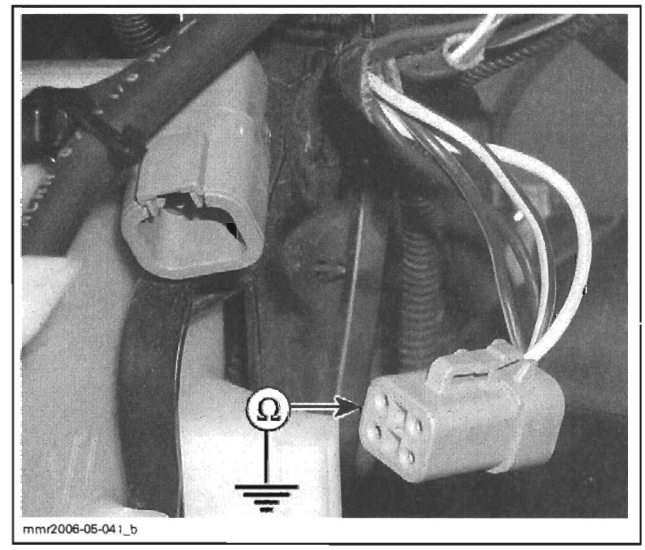
300F and 550F Models

Disconnect engine connector.



Set multimeter to Ω.

Read resistance as follows.



MULTIMETER PROBE LOCATION		RESISTANCE @ 20°C (69°F)
YELLOW wire	Engine ground	0L (open circuit)
BLACK wire		0 - 0.5 Ω

- If results are out of specification, the generator coil and/or the wiring need to be repaired/replaced.
- Re-plug connector properly.

V800 Models

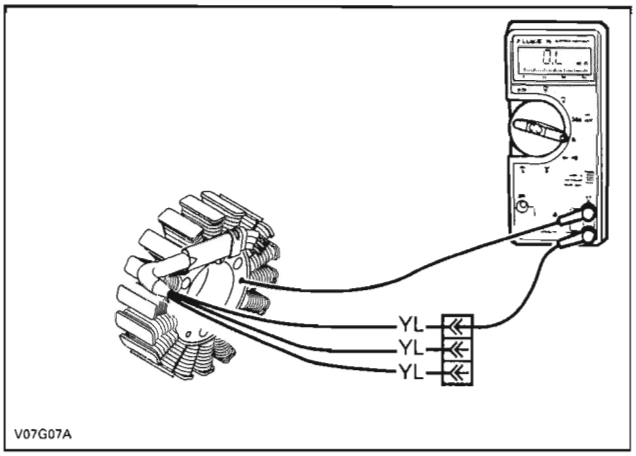
Install the magneto harness adapter. See *CONTINUITY TEST* above for procedure.

Set multimeter to Ω.

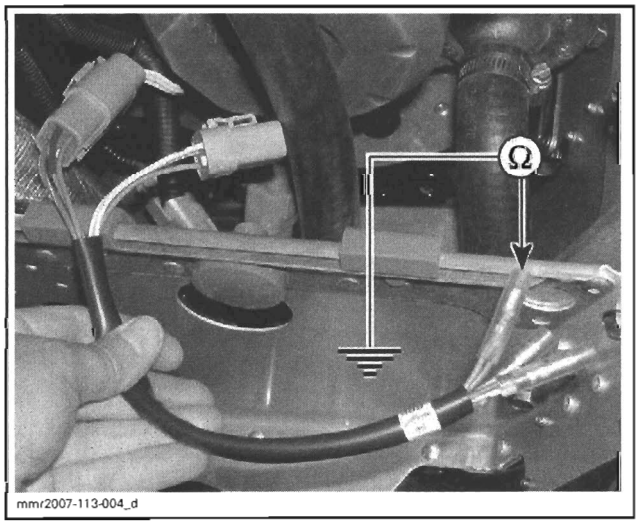
Connect multimeter between any YELLOW wire and engine ground.

Read resistance.

PROBE	RESISTANCE @ 20°C (69°F)
Any YELLOW wire and engine ground	Infinity (open circuit)



TYPICAL



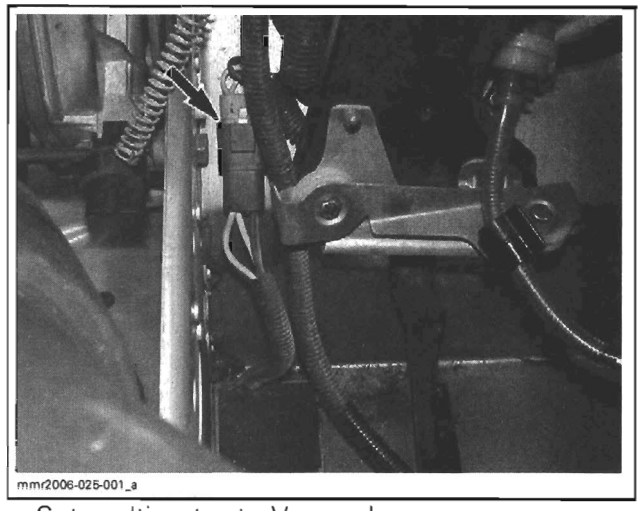
If there is a resistance or continuity, the stator coils and/or the wiring is grounded and need to be repaired or replaced.

Re-plug connectors properly.

AC Voltage Test

300F and 550F Models

– Disconnect the voltage regulator/rectifier connector.



– Set multimeter to Vac scale.
– Manually crank engine and read the voltage as follows. Repeat the test 3 times.

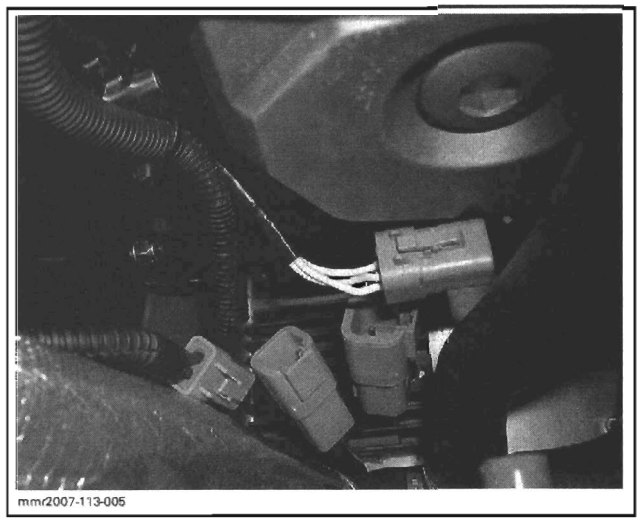
CAUTION: Do not start engine with voltage regulator/rectifier disconnected. Lights and accessories might be damaged.

WIRE COLOR		VOLTAGE
YELLOW	YELLOW/BLACK	3 - 7 Vac

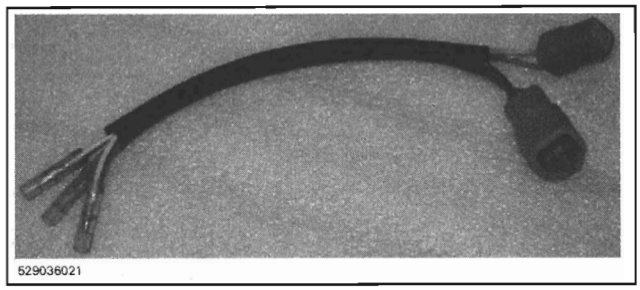
– If voltage is lower than specification, replace generator coil.
– Re-plug connector properly.

V800 Models

Disconnect voltage regulator/rectifier connectors.

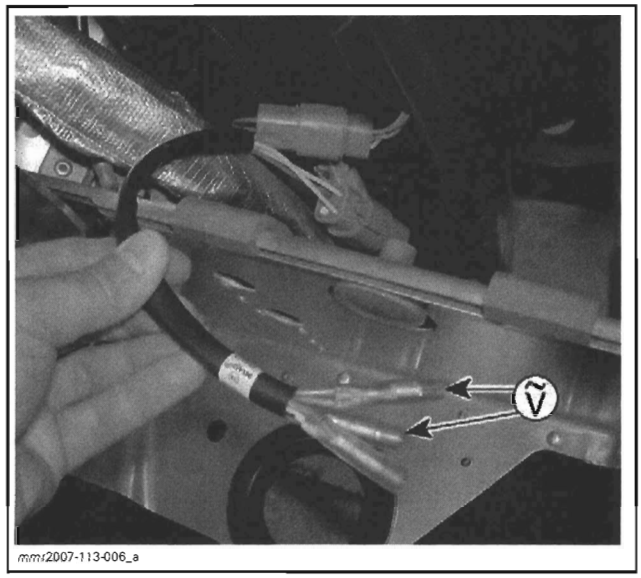


Install the magneto harness adapter (P/N 529 036 062) on magneto connector. Leave the other connector unplugged.


529036021

Set multimeter to Vac scale.

Connect multimeter between YELLOW wires.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MUFFLER REMOVED FOR CLARITY PURPOSE ONLY

Start engine.

Read voltage as follows.

TEST ENGINE SPEED	TERMINAL	VOLTAGE
4000 RPM	1 and 2	Approx. 10 - 25 Vac
	1 and 3	
	2 and 3	

If voltage is lower than specification, replace stator.

Reconnect voltage regulator/rectifier connectors.

BATTERY

General

Sealed valve regulated lead acid (VRLA) battery are used. They are non-spillable and maintenance reduced — no electrolyte level to be checked and readjusted. No ventilation tube is attached to the battery.

MODEL	SUPPLIER P/N	BRP P/N
300F/550F	YTX20L-BS	515 175 642
V800	YTX24L-BS	515 175 895

Removal

⚠ WARNING

Battery BLACK (–) cable must always be disconnected first and connected last.

⚠ WARNING

Never charge or boost battery while installed on vehicle.

Open right side panel of vehicle.

Disconnect BLACK (–) cable end from the terminal.

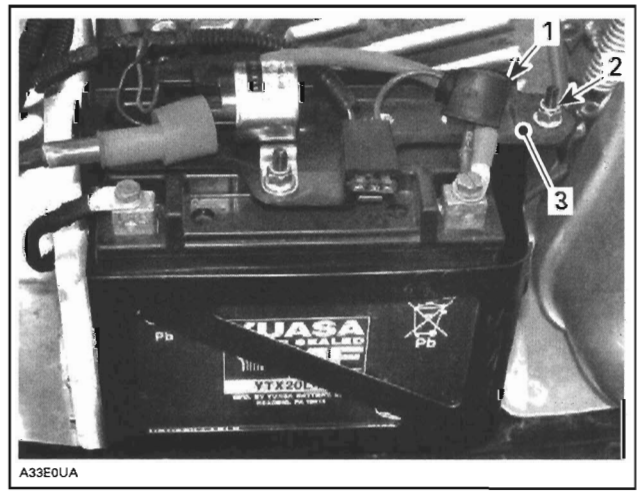
Slide off rubber boot from RED (+) cable and disconnect it.

300F and 550F Models

Unscrew the bracket retaining nut and lift bracket to remove it.

Put bracket aside.

Remove battery.



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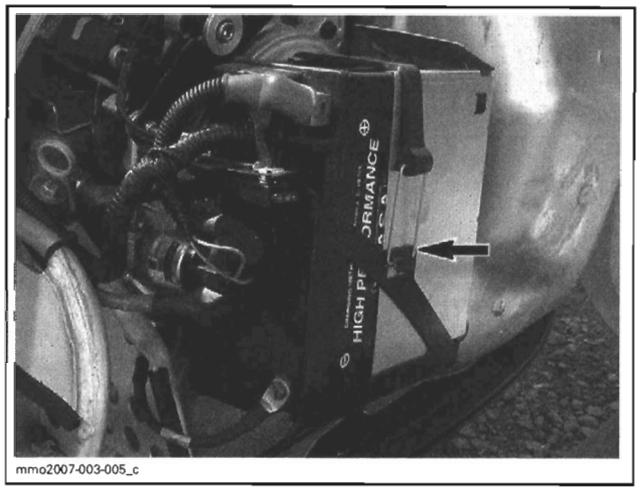
1. *Rubber boot of RED (+) cable terminal*
2. *Bracket retaining nut*
3. *Battery bracket*

V800 Models

Unfasten strap.



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Remove battery.

All Models

CAUTION: Should any electrolyte spillage occur, immediately wash off with a solution of baking soda and water to prevent damage to vehicle components.

Cleaning

Clean the battery, battery casing, cables and battery posts using a solution of baking soda and water.

Remove corrosion from battery cable terminals and battery posts using a firm wire brush. Battery top should be cleaned by soft brush and any grease-cutting soap or baking soda solution.

Inspection

Visually inspect battery casing for cracks, leaks or other possible damage. Discoloration, warping or raised top, indicates that battery has overheated or been overcharged. If casting is damaged, replace battery and thoroughly clean battery tray and close area with water and baking soda.

⚠ WARNING

Should the battery casing be damaged, wear a suitable pair of non-absorbent gloves when removing the battery by hand.

Inspect battery posts for security of mounting.

Battery Charge Testing

Voltmeter Test

NOTE: To determine the battery state of charge, these sealed batteries have to be tested with a voltmeter. They also need to be tested when their voltage is stabilized. Disconnect battery to have open connectors and wait 1 - 2 hours prior to reading the voltage. The same condition is required after a battery has been charged.

Batteries with a voltage above 12.8 V do not need to be charged.

Batteries with a voltage of 12.8 V and below need to be charged. Refer to *BATTERY CHARGING* below.

Battery Storage

CAUTION: A discharged battery will freeze and it may damage its casing. A damaged casing will allow electrolyte spillage that may damage surrounding parts.

Disconnect and remove battery from the vehicle.

The battery must always be stored in fully charged condition.

Clean battery terminals and cable connections using a wire brush. Apply a light coat of silicone dielectric grease (P/N 293 550 004) or petroleum jelly on terminals.

Clean battery casing using a solution of baking soda and water. Rinse battery with clear water and dry well using a clean cloth.

Charge the battery every month if stored at temperature **below** 15°C (60°F).

Charge the battery every two week if stored at temperature **above** 15°C (60°F).

Activation of New Battery

Refer to the instructions provided with the battery.

Battery Charging

⚠ WARNING

Always wear safety glasses and charge in a ventilated area. Never charge or boost battery while installed on vehicle. Do not open the sealed caps during charging. Do not place battery near open flame.

CAUTION: If battery becomes hot, stop charging and allow it to cool before continuing.

NOTE: Sealed VRLA batteries have an internal safety valve. If battery pressure increases due to overcharging, the valve opens to release excess pressure, preventing battery damage.

Perform *BATTERY CHARGE TESTING* above then proceed as described here.

An automatic charger is the fastest and most convenient way for error-proof charging.

When using a constant current charger, charge battery according to the chart below.

Battery Voltage Below 12.8 V and Above 11.5 V

STANDARD CHARGING (recommended)		
BATTERY TYPE	TIME	CHARGE
YTX20L-BS	4 - 9 hours	2 A
YTX24L-BS	5 - 10 hours	

QUICK CHARGING		
BATTERY TYPE	TIME	CHARGE
YTX20L-BS	50 minutes	10 A
YTX24L-BS	60 minutes	

Battery Voltage Below 11.5 V

Batteries with voltage below 11.5 V requires special procedures to recharge and are not prone to accept charging. In charging an over discharged battery, its internal resistance may be too high to charge at a normal charging voltage. Therefore, it may be necessary to raise the voltage of the battery initially to 25 V as a maximum, and charge for approximately 5 minutes.

If the charger ammeter shows no change in current after 5 minutes, you need a new battery. Current flowing into the battery at high voltage can become excessive. Monitor amperage and adjust voltage as necessary to keep current at the battery's standard amp rating. Charge for approximately 20 hours.

Installation

Reinstall battery and secure bracket properly (strap on V800 models).

Connect RED (+) cable it to positive battery terminal. Also connect RED wire (on electric start models).

Connect BLACK (–) cable LAST.

⚠ WARNING

Battery BLACK (–) cable must always be disconnected first and connected last.

⚠ WARNING

Never charge or boost battery while installed on vehicle.

Cover the RED (+) terminal with rubber boot.

Apply silicone dielectric grease (P/N 293 550 004) on battery posts and connectors.

STARTING SYSTEM (300F/550F)

SERVICE TOOLS

Description	Part Number	Page
multimeter Fluke 111	529 035 868	401

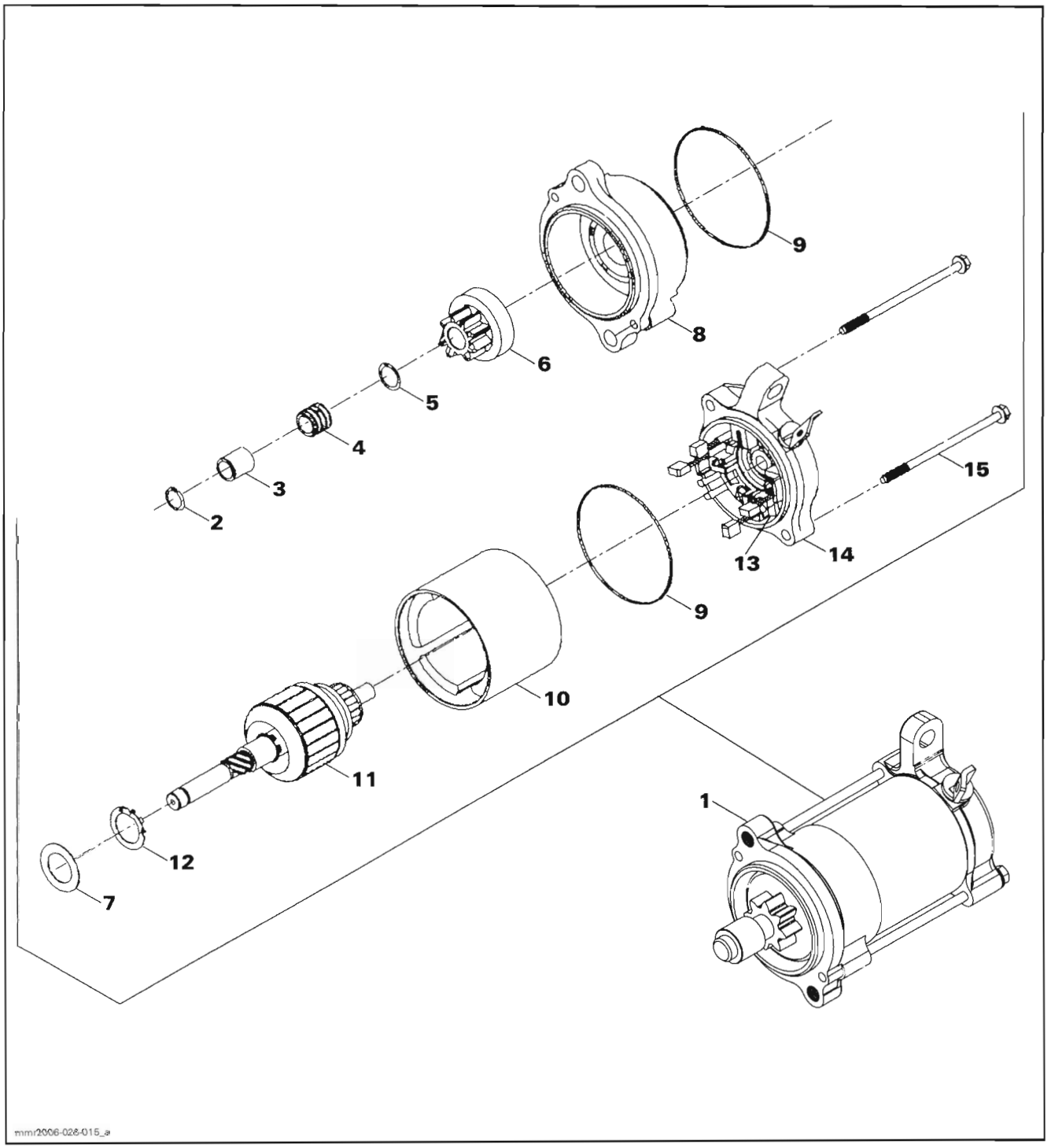
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Snap-on remote starter solenoid switch	MT302A	401

SERVICE PRODUCTS

Description	Part Number	Page
synthetic grease	413 711 500	405, 408

STARTER



GENERAL

For best testing results, use the multimeter Fluke 111 (P/N 529 035 868).

When the ignition switch is turned to start, a current is sent to the starting solenoid. The battery then supplies current to the starter through the starting solenoid to crank the engine.

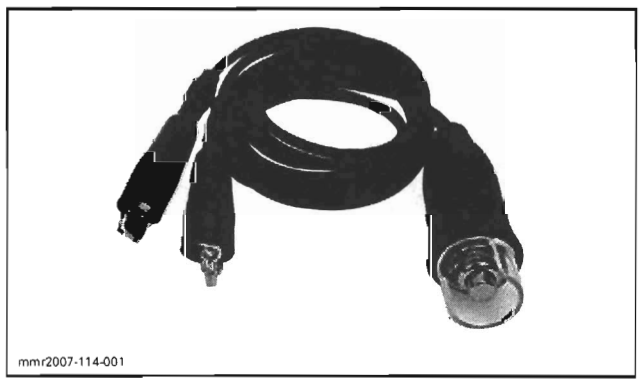
In case of problems, first ensure the problem is not related to engine mechanical components. If not, test the starting system.

Causes of problems are not necessarily related to starter but may be due to a burnt fuse, faulty battery, ignition switch, starting solenoid and electrical cables and connections. Check all connections, harnesses and wires. Tighten any loose connections. Replace any chafed wires.

DIAGNOSTIC

STARTING SYSTEM TEST

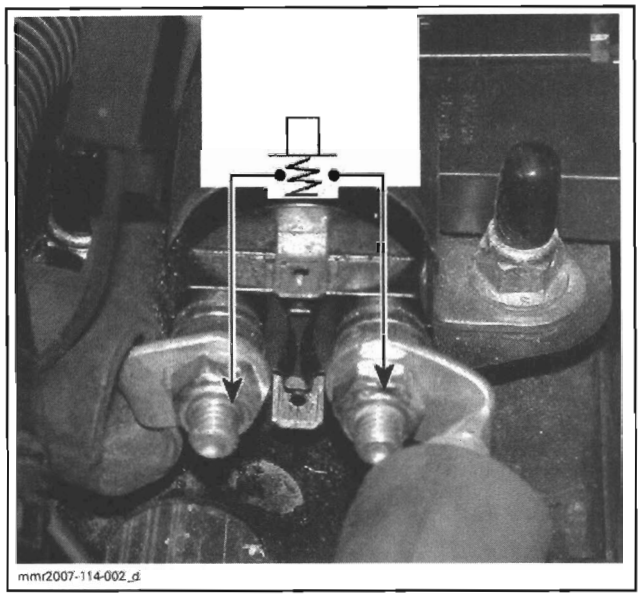
Use a Snap-on remote starter solenoid switch (P/N MT302A).



Carefully connect clips to solenoid posts.

⚠ WARNING

Pay attention to avoid sparks.



Press and hold switch.

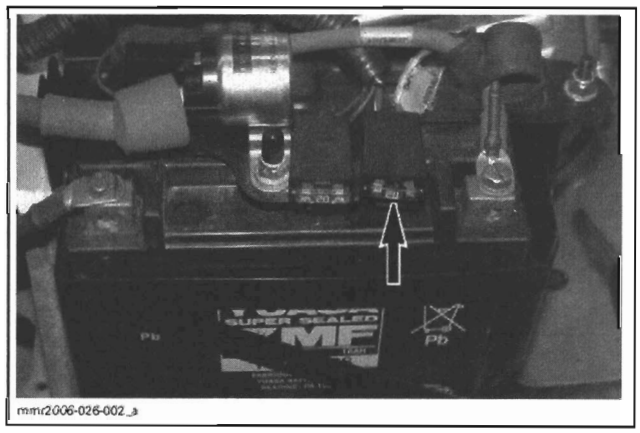
If engine does not crank or crank slowly, check the following:
- battery
- starter and battery cables/connections
- electric starter.

If engine does crank, check the following:
- charging system fuse
- ignition switch
- starting solenoid.

PROCEDURES

FUSES

Make sure the charging system fuse (with RED wires) on battery is in good condition. If the fuse tests good, continue with the next tests.



NOTE: The solenoid may be the cause of a burnt fuse. If the solenoid tests good, one of the accessory may be defective.

BATTERY

Refer to *CHARGING SYSTEM* to check battery condition. If the test is good, continue with the next tests.

IGNITION SWITCH

Refer to *IGNITION SYSTEM.*

If the switch works correctly, continue with the next tests.

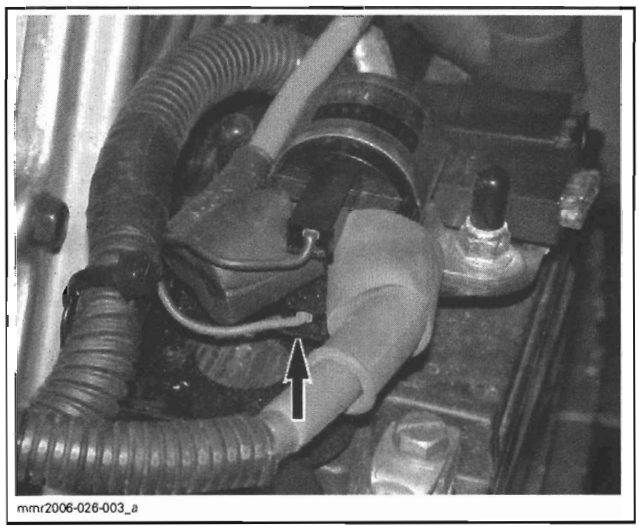
STARTING SOLENOID

General

Inspect connections and clean as necessary.

Solenoid Winding Power Supply

Disconnect connector with RED/GREEN wire from solenoid.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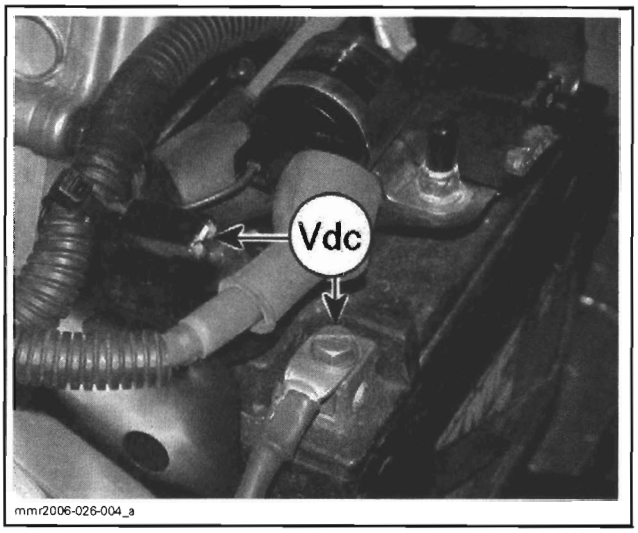
Check voltage as follows.

Either set engine cut-out switch to STOP or remove tether cord to prevent engine to run.

Turn ignition key to START and hold to take the measurement.

Read voltage.

SOLENOID CONNECTOR (harness side)	VOLTAGE
RED/GREEN with battery ground	12 Vdc



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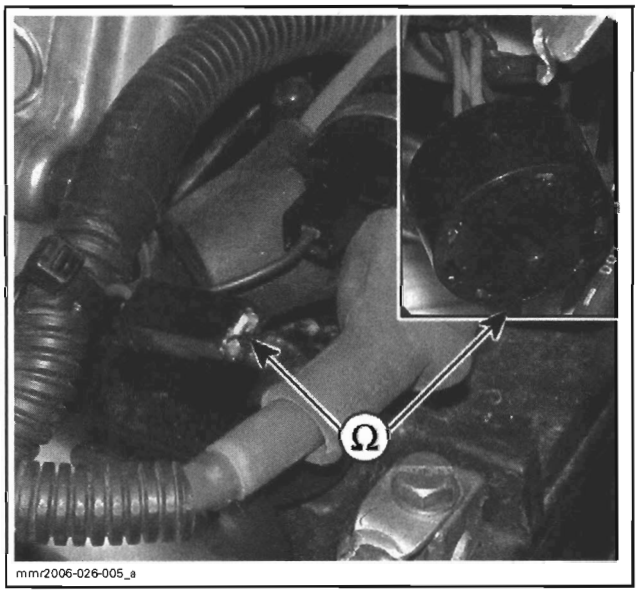
If voltage is not adequate, check continuity of wiring as follows.

Disconnect ignition switch connector.

CONNECTIONS		RESISTANCE
RED/GREEN wire at solenoid	RED/GREEN wire at ignition switch connector	Close to 0 Ω
RED/WHITE wire at ignition switch connector	RED wire (small wire) at battery post	



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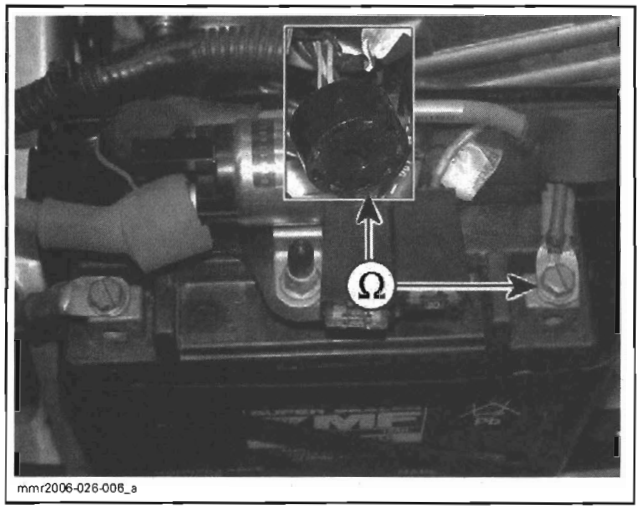
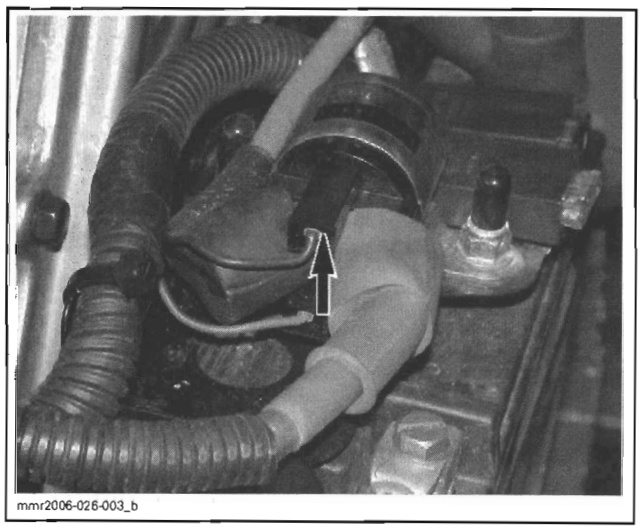

mmr2006-026-006_a

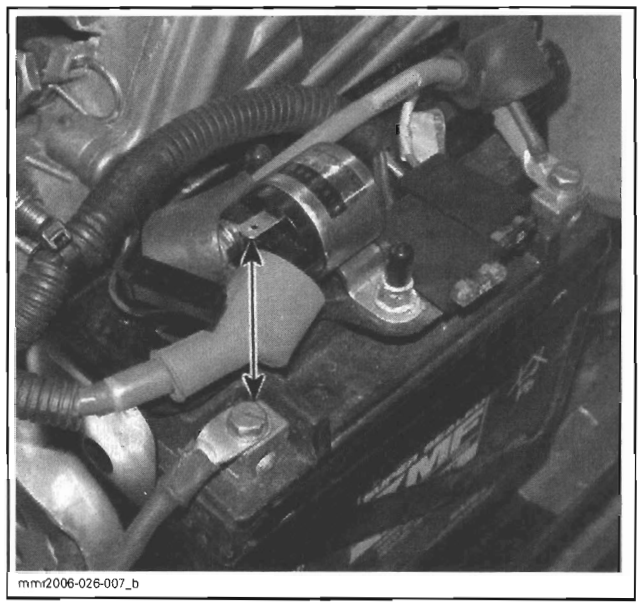
If wiring is good, do the following test.

Reconnect RED/GREEN terminal to solenoid and ignition switch connector.

Disconnect BLACK terminal from solenoid.


mmr2006-026-003_b

Connect a jumper wire between solenoid terminal and battery ground.


mmr2006-026-007_b

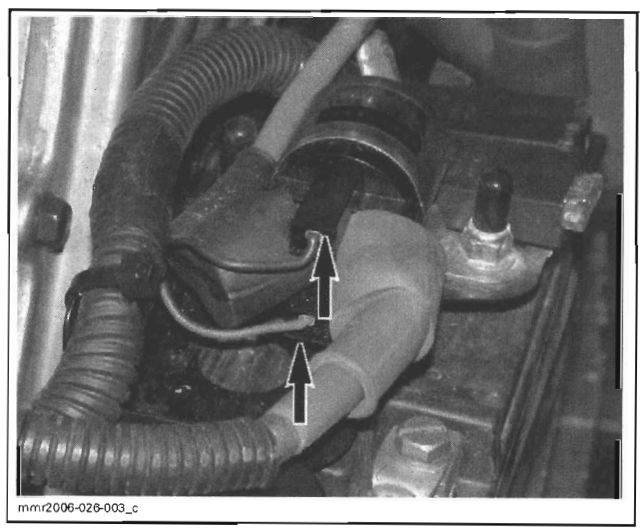
If solenoid works, check wiring/connectors for continuity of BLACK wire.

Reconnect BLACK wire to solenoid.

If solenoid does not work, test solenoid.

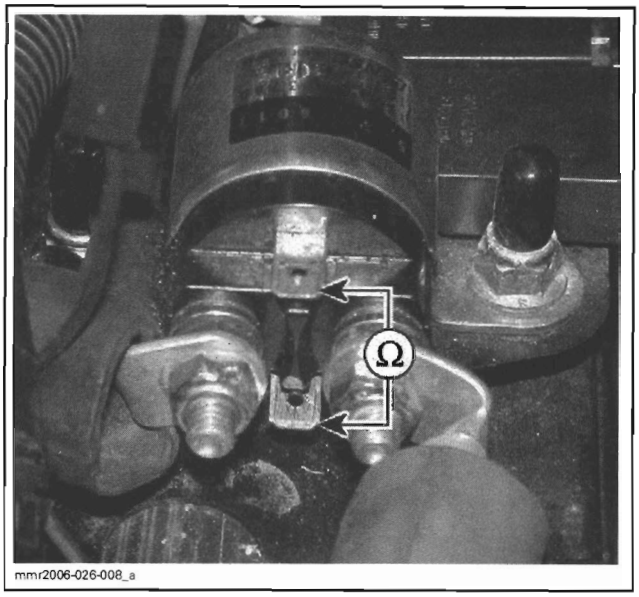
Static Test: Continuity

Disconnect terminals from solenoid.


mmr2006-026-003_c

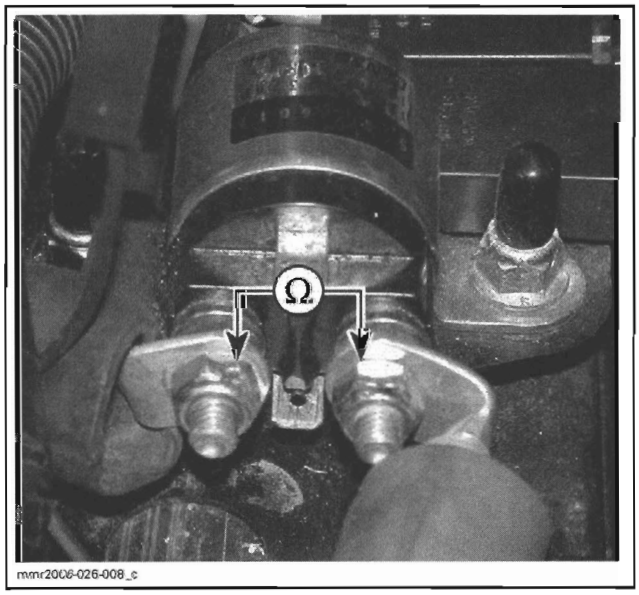
With a multimeter, check primary winding resistance as follows.

SOLENOID		MEASUREMENT
PRIMARY WINDING		RESISTANCE @ 20°C (68°F)
Terminal A	Terminal B	Approximately 7.5 Ω



Check for stuck solenoid plunger. Disconnect battery ground cable and measure resistance as follows.

SOLENOID		MEASUREMENT
PLUNGER		RESISTANCE @ 20°C (68°F)
Battery post	Starter post	Open circuit



If any measurement is out of specification, replace solenoid.

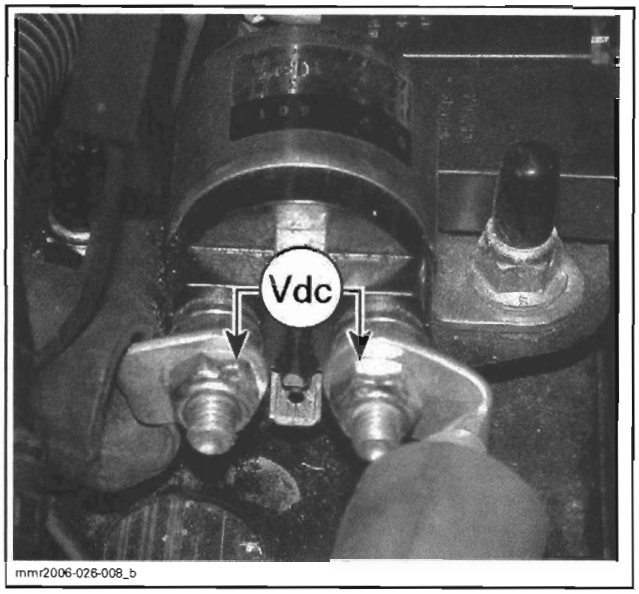
Reconnect battery ground cable and solenoid connectors.

Dynamic Test

Either set engine cut-out switch to STOP or remove tether cord to prevent engine to run.

Turn ignition key to START and hold. While engine is cranking, measure the voltage drop as follows.

SOLENOID		MEASUREMENT
Battery post	Starter post	0.2 Vdc max.



If voltage is out of specification, replace solenoid.

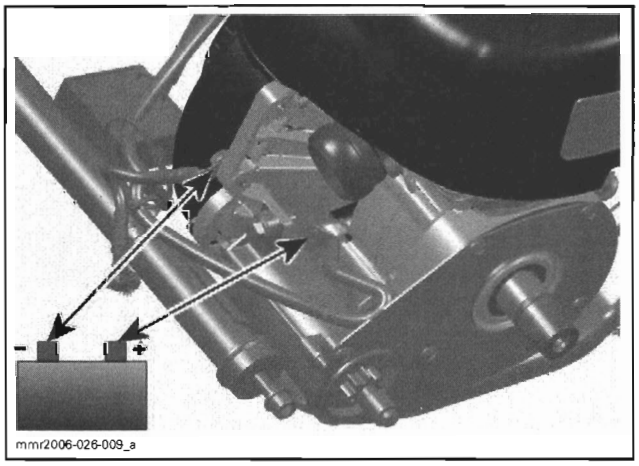
If solenoid tests good, check the electric starter.

ELECTRIC STARTER

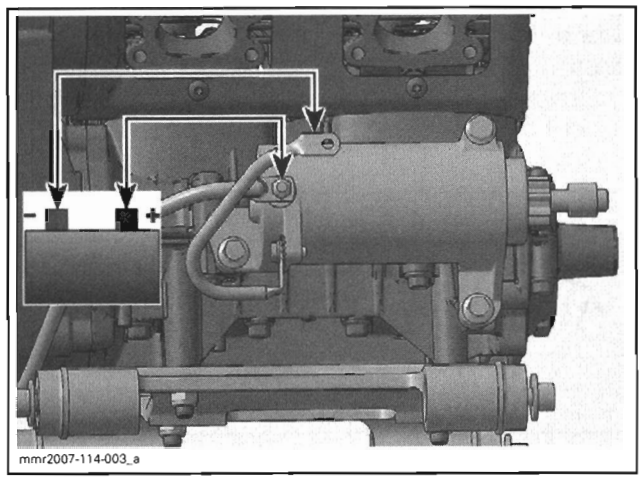
Test

Either set engine cut-out switch to STOP or remove tether cord to prevent engine to run.

Using booster cables, carefully supply current from the battery directly to the starter. Connect the RED cable first to starter. Connect the remaining booster cable from the starter then to the battery.



300F MODELS



550F MODELS

If the starter turns, check wiring harness and connectors between battery and starter are in good condition.

If the starter does not turn, check for mechanical problem in the starter.

Removal

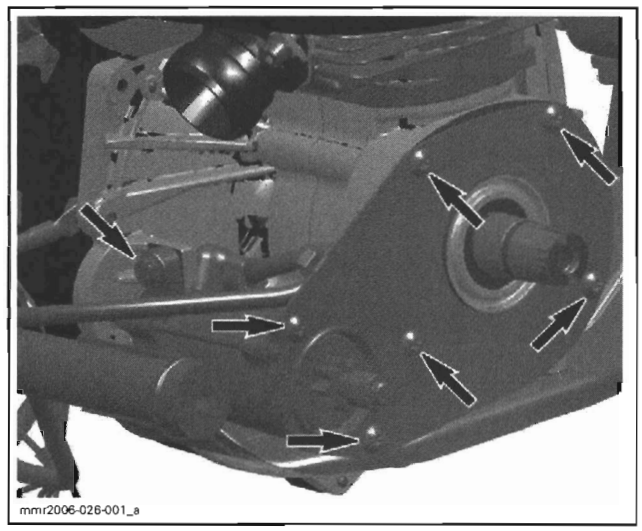
- Disconnect BLACK (-) cable from battery.
- Disconnect RED (+) cable from battery.

⚠ WARNING

Always disconnect BLACK (-) cable first and connect last.

300F Models

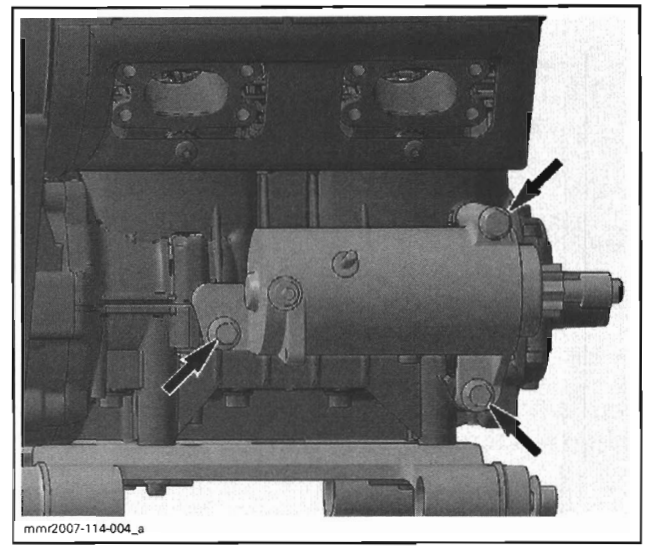
- Remove drive pulley. Refer to *DRIVE PULLEY.*
- Disconnect RED cable from starter.
- Remove screws as shown.



- Pull starter out.

550F Models

- Remove tuned pipe. Refer to *EXHAUST SYSTEM.*
- Disconnect cables from starter.
- Remove starter screws.



- Pull starter out.

Dissassembly

Before disassembling, trace index marks on starter housing **no. 10** and starter end housing **no. 8** to ease further assembly.

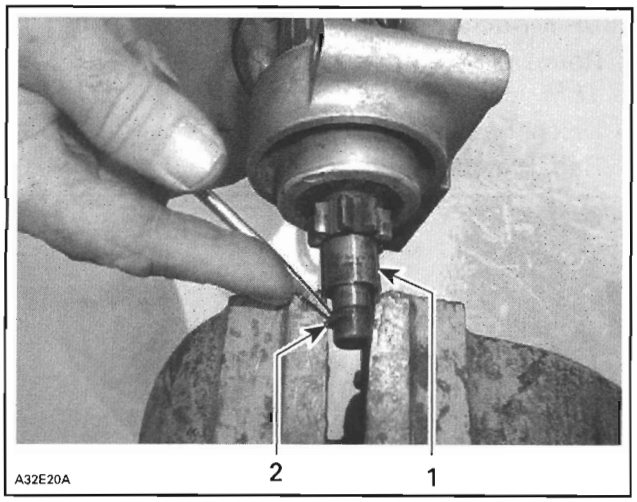
Remove starter through bolts **no. 15**. Separate end frame housing **no. 14** from starter housing **no. 10**. Withdraw starter housing from armature **no. 11**.

Brush holder **no. 13** can be removed from end frame housing **no. 14** by disconnecting the end frame attached brush from brush holder **no. 13**.

Check the radial play between the armature shaft and end frame bearing. Replace the end frame bearing or replace starter. If parts are in good condition then coat with synthetic grease (P/N 413 711 500) before reinstalling them.

Push back the collar **no. 3** using a screwdriver.

Remove snap ring **no. 2**. Remove collar **no. 3** and spring **no. 4**.



1. *Collar*
2. *Snap ring*

Turn starter clutch **no. 6** clockwise to remove it from armature assembly **no. 11**.

Pull housing from armature.

Cleaning

CAUTION: Yoke assembly and drive unit assembly must not be immersed in cleaning solvent.

Clean brushes and holders with a clean cloth soaked in solvent. Brushes must be dried thoroughly with a clean cloth.

Blow brush holders clean using compressed air.

⚠ WARNING

Always wear safety glasses when using compressed air.

Remove dirt, oil or grease from commutator using a clean cloth soaked in suitable solvent. Dry well using a clean and dry cloth.

Clean engine ring gear teeth and drive unit (clutch).

NOTE: Bushings or bearings must not be cleaned with grease dissolving agents.

Immerse all metal components in cleaning solution. Dry using a clean and dry cloth.

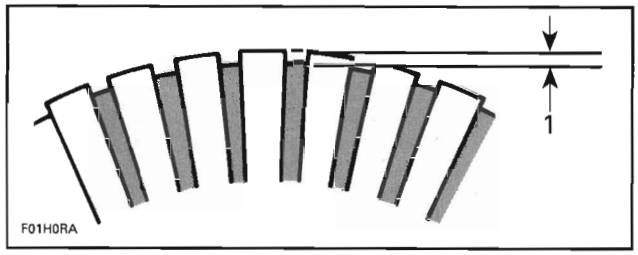
Inspection

Armature

NOTE: An ohmmeter may be used for the following testing procedures, except for the one concerning the shorted windings in the armature.

Check the commutator for roughness, burnt or scored surface. If necessary, turn the commutator on a lathe, enough to remove grime only.

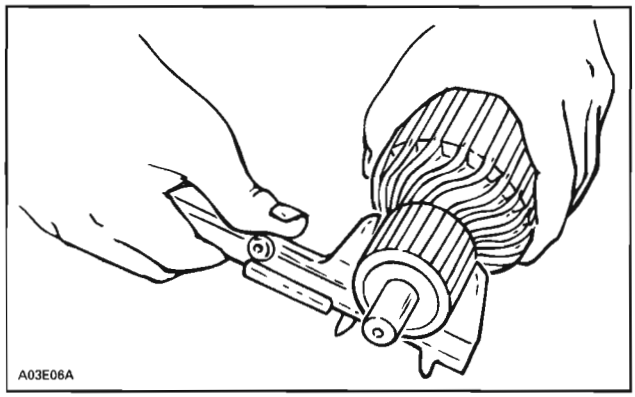
Check the commutator for mica depth. If the depth is less than 0.20 mm (.008 in), undercut the mica. Be sure that no burrs are left and no copper dust remains between the segments after the undercutting operation is completed.



1. *Commutator undercut 0.20 mm (.008 in)*

Check the commutator out-of-round condition with V Blocks and an indicator. If the commutator out-of-round is more than 0.40 mm (.016 in), the commutator should be turned on a lathe.

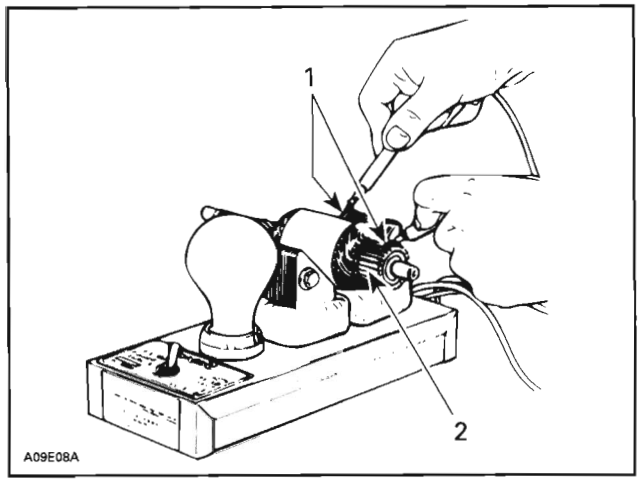
Check commutator outer diameter. If less than specified value, replace.



MODEL	WEAR LIMIT
All models	27 mm (1.063 in)

Test for Ground Circuit in the Armature

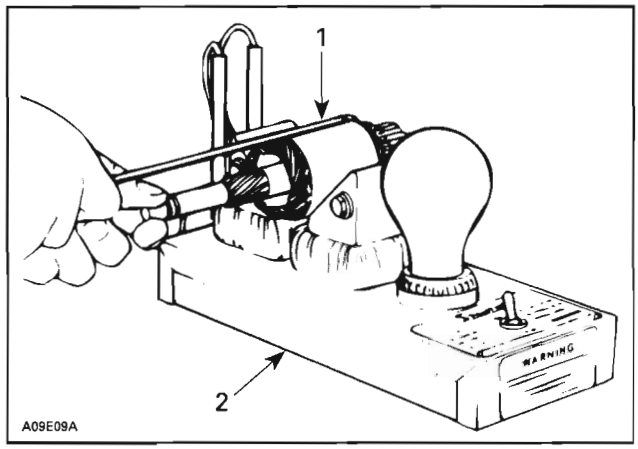
Use growler test probes. Check between armature core and the commutator bars. If growler lamp turns on, bars are grounded. If so, replace armature.



1. Test probes
2. Commutator bars

Test Armature for Shorted Winding

When the armature is rotated in the growler with a steel strip (hacksaw blade) held above it, the strip will vibrate over that area of the armature which has short circuit. Replace armature if so.



1. Steel strip (hack-saw blade)
2. Growler

Test the Armature for Open Circuit

Use growler test probes. Place one test probe on a commutator bar and the other test probe on the neighboring bar. Repeat this operation for all bars, moving one test probe at a time. If the growler lamp does not turn on, the armature circuit between these 2 bars is opened. The armature should be replaced or repaired; open circuits most often occur at the commutator riser where coils are soldered. (Burnt commutator bars are usually an indication of an open-circuit armature coil).

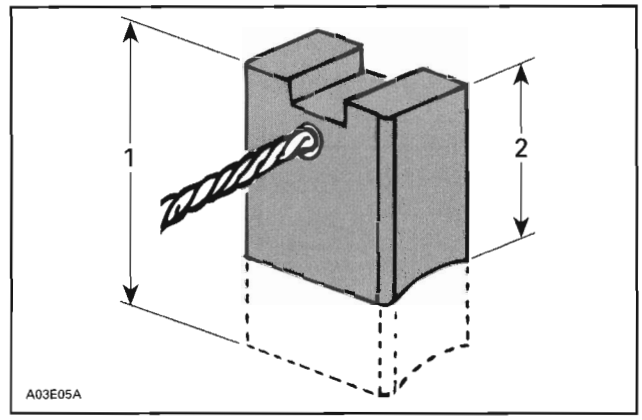
Brush Holder

Check the brush holder for insulation using growler test probes. Place one test probe on the insulated brush holder and the other test probe on the brush holder plate. If the growler lamp turns on, the brush holder has to be repaired or replaced.

Brush Length

Measure brush length. If less than the specified value, replace them.

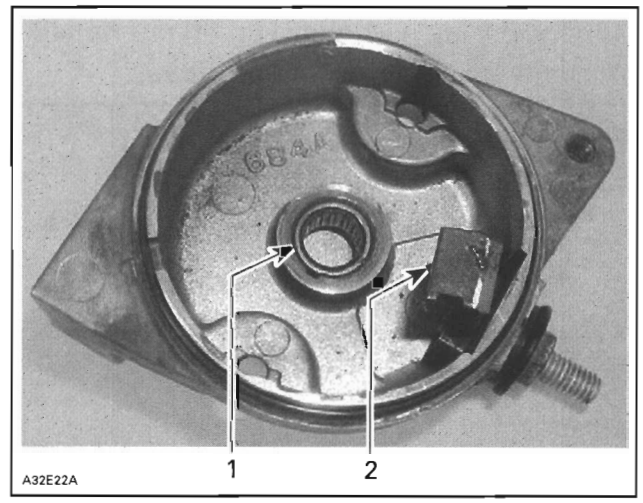
MODEL	LENGTH	
	NEW	WEAR LIMIT
All	10 mm (.400 in)	6 mm (.236 in)



TYPICAL
1. New
2. Wear limit

End Housing

Check the mica insulation of the positive brush and also the roller bearing condition. Replace, if necessary.



1. Roller bearing
2. Positive brush

Overrunning Clutch

The pinion of the overrunning clutch should turn smoothly in a clockwise direction, and should not slip in a counterclockwise direction. If defective, replace.

Check the pinion teeth for wear and damage. If defective, replace.

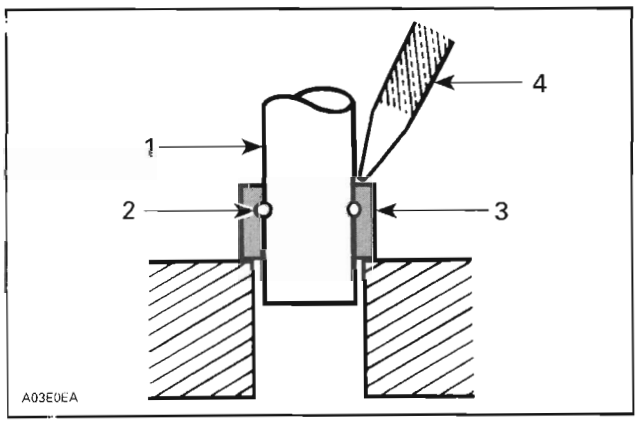
Assembly

Reverse the order of disassembly to reassemble starter. However, attention should be paid to the following operations.

Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch and bushing with synthetic grease (P/N 413 711 500).

After placing collar **no. 3** on armature shaft **no. 11**, fit new snap ring **no. 2** on armature shaft, then make sure that it is properly secured.

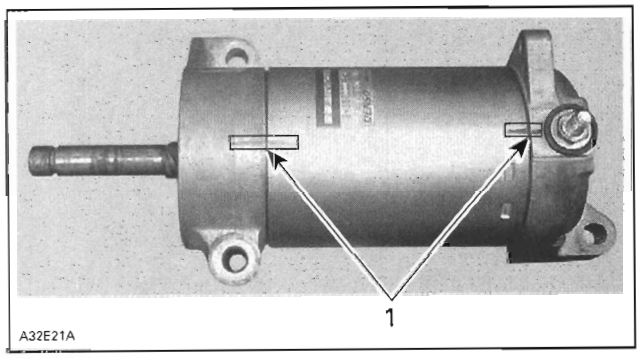
Slide collar **no. 3** over snap ring **no. 2** and secure in place by punching it at two or three places.



1. *Armature shaft*
2. *Snap ring*
3. *Collar*
4. *Punch*

Starter Housing Assembly and Starter Housing

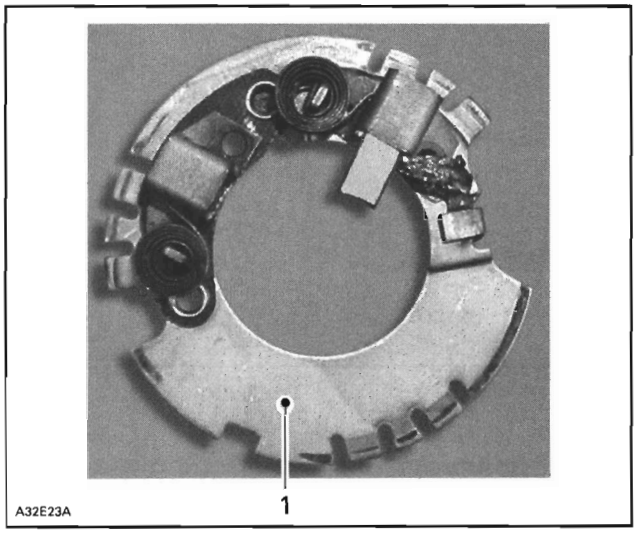
Align previously traced indexing marks.



TYPICAL
1. *Aligned indexing marks*

Open brushes and slide over commutator.

Align end frame locating notch with yoke locating protrusion and properly sit brush holder **no. 13** into housing **no. 14**.



1. *Brush holder*

To ease end frame installation, retain brush holder with a small screwdriver while installing armature assembly.

CAUTION: Make sure to place two end housings on a flat surface before tightening the through bolts.

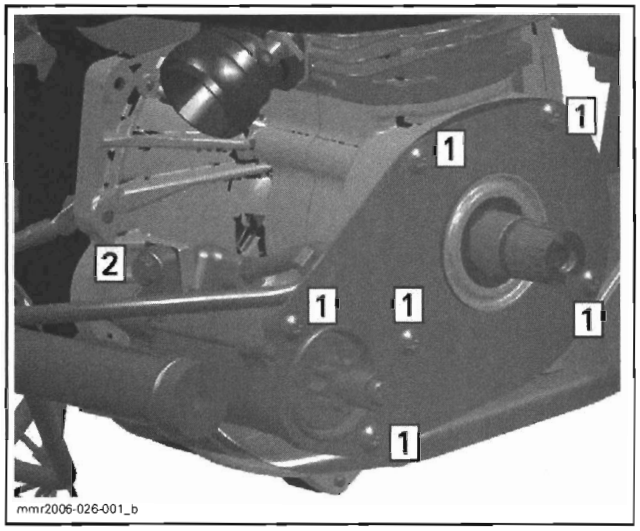
CAUTION: Make sure end frame fits perfectly on yoke.

Installation

Torque screws as shown.

300F Models

– Make sure that starter/support plate and engine mating surfaces are free of grime. Serious trouble may arise if starter is not properly aligned.



*Step 1: Torque to 16 N•m (142 lbf•**in**)*
*Step 2: Torque to 15 N•m (133 lbf•**in**)*

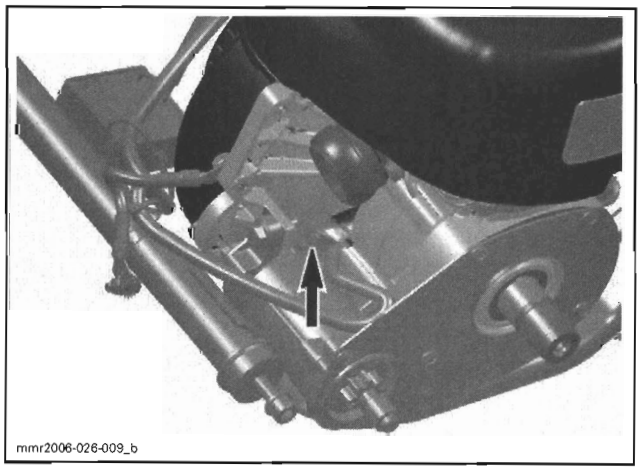
All Models

– Connect the RED battery cable to the large terminal of the starter.

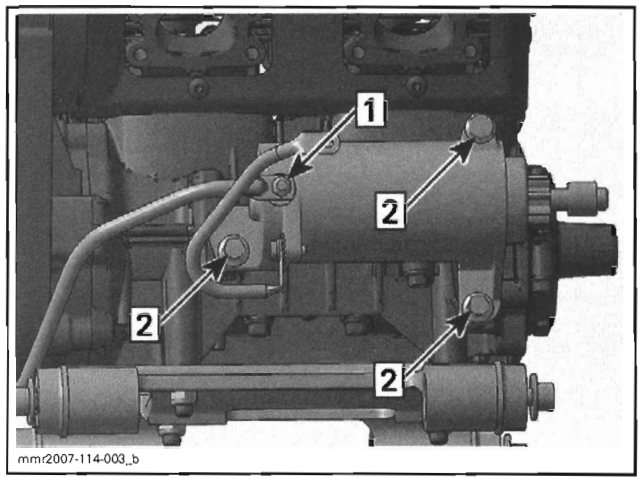
⚠ WARNING

Always disconnect ground cable first and connect last.

– Torque large terminal nut as shown.



*300F MODELS— TORQUE TO 7 N•M (62 LBF•**IN**)*



550F MODELS
1. *Torque to 7 N•m (62 lbf•**in**)*
2. *Torque to 15 N•m (133 lbf•**in**)*

STARTING SYSTEM (V800)

SERVICE TOOLS

Description	Part Number	Page
ECM adapter	420 277 010	411
engine lifting tool	529 036 022	417
multimeter Fluke 111	529 035 868	411

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Snap-on remote starter solenoid switch	MT302A	412

SERVICE PRODUCTS

Description	Part Number	Page
dielectric grease	293 550 004	417

GENERAL

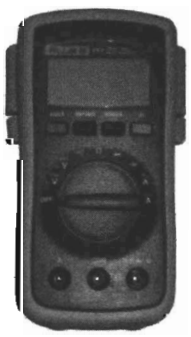
First ensure the problem is not related to engine mechanical components. If not, test the starting system.

Causes of problems are not necessarily related to starter but may be due to a burnt fuse, faulty battery, relay, ignition switch, engine stop switch, starting solenoid, electrical wires, connections or the ECM.

Check all connections, cables and wires. Tighten any loose connections. Replace any chafed wires/cables.

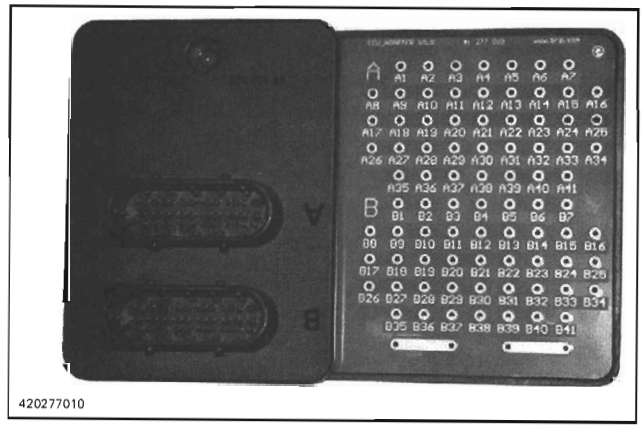
Tools

For most accurate measurements, use the multimeter Fluke 111 (P/N 529 035 868).



529 035 868

To probe the ECM connector terminals, use the ECM adapter (P/N 420 277 010) to prevent damaging terminals. Refer to *ENGINE MANAGEMENT* for more information.



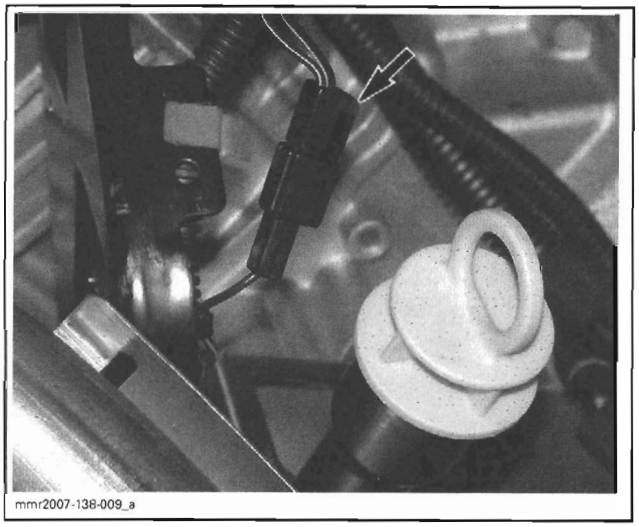
420277010

TROUBLESHOOTING

ENGINE CRANKING CONDITIONS

The following conditions must be met to allow engine cranking:

- engine stop switch in RUN position
- tether cap is on its post
- ECM is powered
- EMS tracking connector is connected



CONNECTOR BESIDES OIL DIPSTICK

– ignition switch turned to START and held.

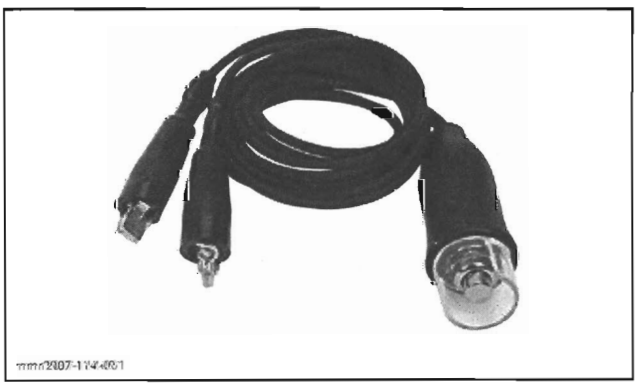
STARTING SYSTEM TEST

First check battery condition. Refer to *CHARGING SYSTEM*.

Power Circuit Test

To quickly bypass starting solenoid and test the electric starter circuit (battery, cables and electric starter), do the following.

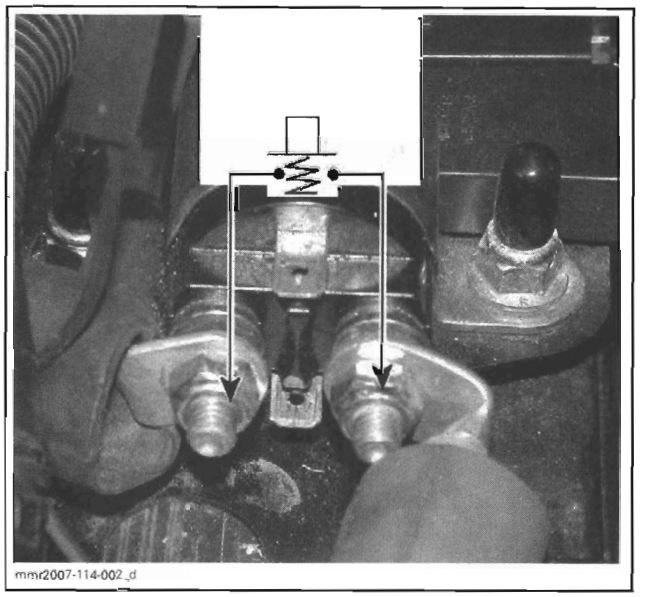
Use a Snap-on remote starter solenoid switch (P/N MT302A).



Carefully connect clips to of solenoid posts.

⚠ WARNING

Pay attention to avoid sparks.



Press and hold tool switch.

If engine does not crank (or slowly cranks), check the following:
– starter and battery cables/connections
– electric starter.

If engine normally cranks, perform the *CONTROL CIRCUIT TEST*.

Control Circuit Test

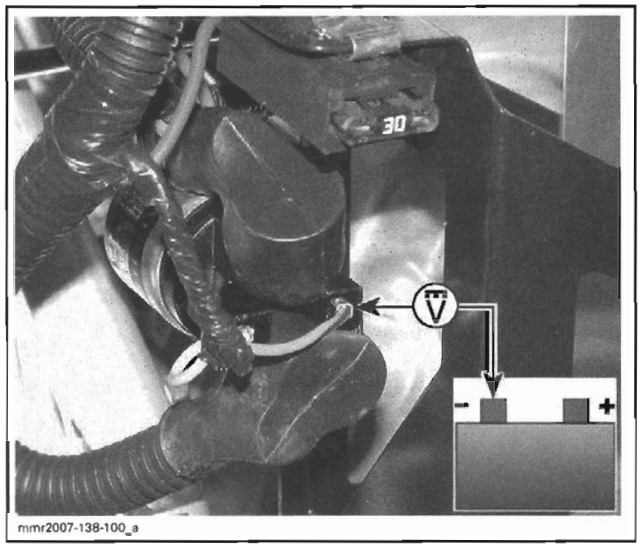
Ensure both connectors are plugged to solenoid.

Install tether cord on its post and set cut-out switch to RUN.

Turn ignition key to START and hold it for the measurement.

Read voltage.

SOLENOID CIRCUIT TEST		VOLTAGE
ORANGE/BLACK wire (connected to solenoid)	Battery ground	Battery voltage



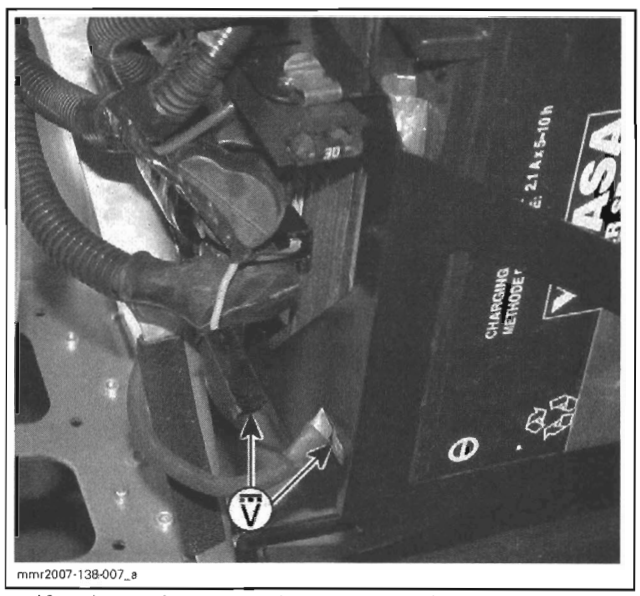
If voltage is adequate:

- It validates the supply circuit and solenoid winding are good.
- Ensure tether cord switch and cut-out switch are good. Refer to *IGNITION SYSTEM*.
- Perform the *ECM GROUND SWITCHING TEST* below.

If voltage is NOT adequate, disconnect the indicated wire from solenoid.

Read voltage as before.

SOLENOID CIRCUIT TEST		VOLTAGE
BEIGE wire	Battery ground	Battery voltage



- If voltage is now adequate, replace solenoid.
- If voltage is NOT adequate, check supply circuit (relay R1, ignition switch and wiring/connectors).

ECM Ground Switching Test

NOTE: Tether cord and cut-out switch position do not matter for this test.

⚠ WARNING

Engine is likely to crank but will not run in this test. Pay attention to rotating parts.

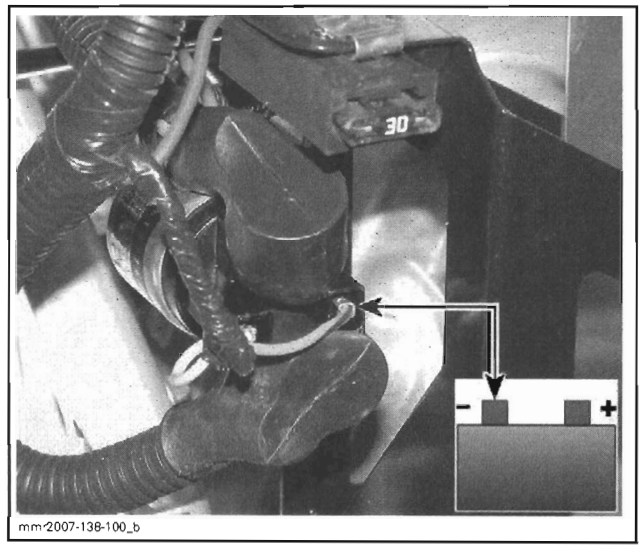
Ensure both connectors are plugged to solenoid.

Install a jumper as indicated.

Turn ignition key to START and hold it for the measurement.

Read voltage.

JUMPER	
ORANGE/BLACK wire (connected to solenoid)	Battery ground



If starter turns, try a new ECM. Refer to *ENGINE MANAGEMENT*.

If solenoid does not engage, perform a solenoid dynamic test.

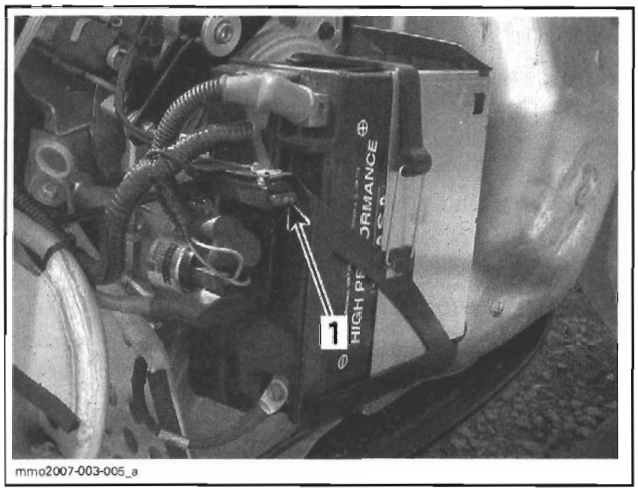
PROCEDURES

BATTERY

To check battery condition, refer to *CHARGING SYSTEM* section.

FUSES

Make sure the charging system fuse besides battery is in good condition. If the fuse tests good, continue with the next tests.



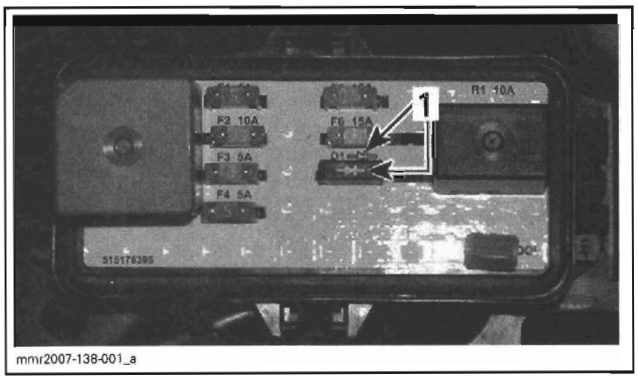
1. Charging system fuse

NOTE: The solenoid may be the cause of a burnt fuse. If the solenoid test good, one of the accessory may be defective.

DIODE

Diode Installation

First ensure diode is not reverted. If so, engine will not crank.



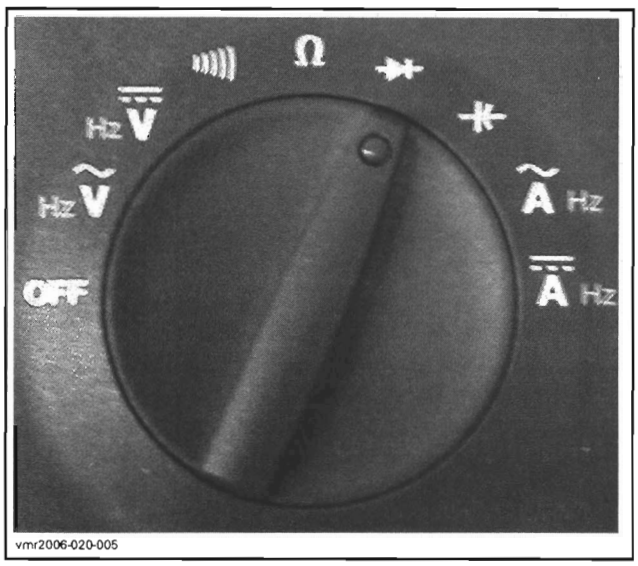
1. Symbol on diode in same direction as symbol on fuse holder

Diode Test

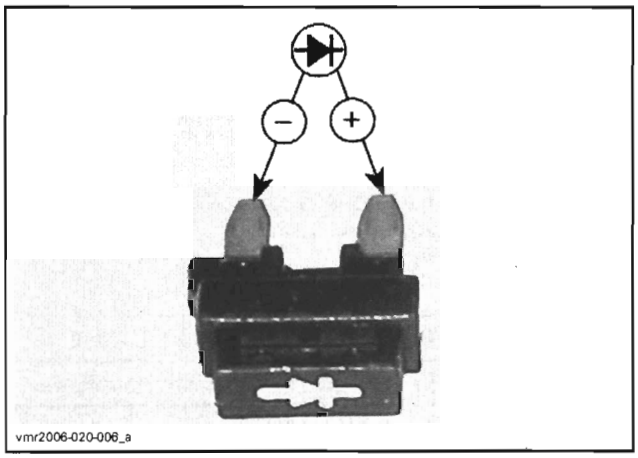
Test diode as follows.

Remove diode and lay down on a non-metallic table.

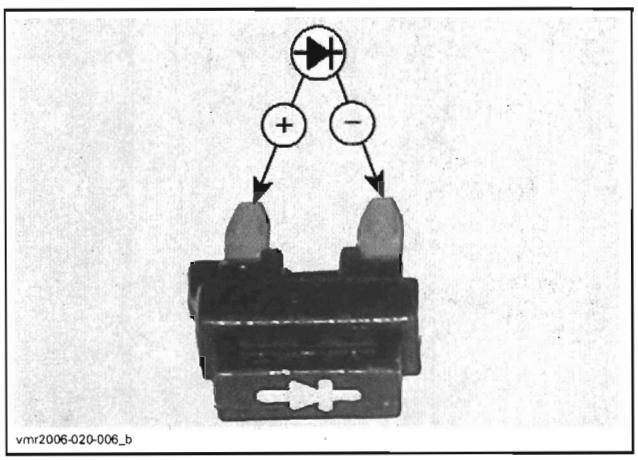
Set multimeter as shown.



Probe diode paying attention to proper polarity.



MUST BE OPEN CIRCUIT



MUST BE AROUND 0.5 V

If diode fail any test, replace it.

NOTE: Ensure to install diode in the proper position.

ENGINE CONTROL MODULE (ECM)

ECM Initialization

To validate ECM initializes (turns on), refer to ignition switch in *IGNITION SYSTEM*.

TETHER CORD SWITCH AND ENGINE CUT-OUT SWITCH

Refer to *IGNITION SYSTEM*.

IGNITION SWITCH

If engine does not crank when turning it to START, test the switch. Refer to *IGNITION SYSTEM*.

STARTING SOLENOID

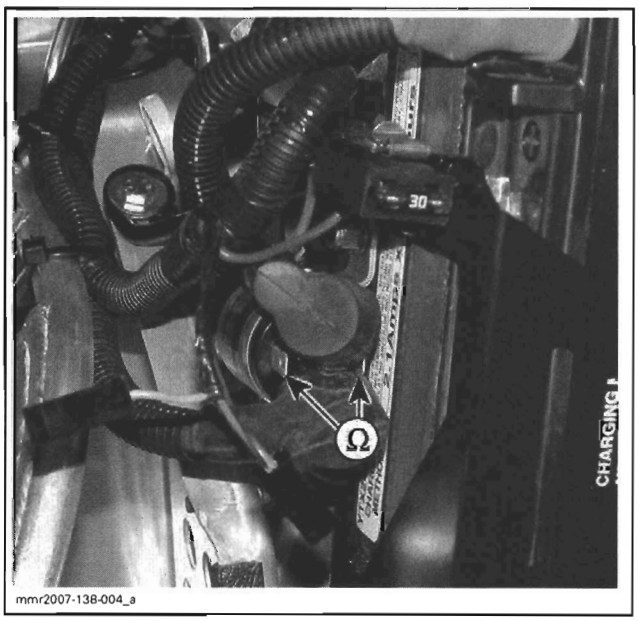
Inspect connections and clean as necessary.

Static Test: Continuity

Disconnect terminals from solenoid.

With a multimeter, check primary winding resistance as follows.

SOLENOID PRIMARY WINDING		RESISTANCE @ 20°C (68°F)
Terminal A	Terminal B	Approximately 7.5 Ω



Check for stuck solenoid plunger. Disconnect battery ground cable and measure resistance as follows.

SOLENOID PLUNGER		RESISTANCE
Battery post	Starter post	Open circuit (0L)

If any measurement is out of specification, replace solenoid.

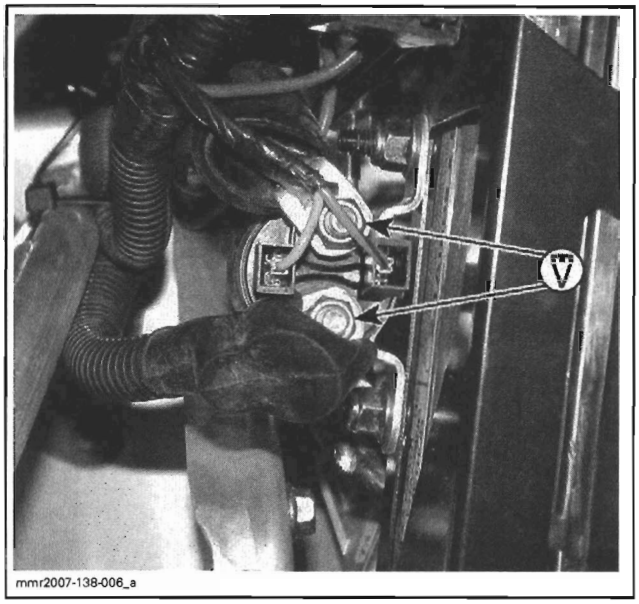
Reconnect battery ground cable and solenoid connectors.

Dynamic Test

To prevent engine to run in the following test, fully squeeze and hold throttle to set engine in drowned mode.

Turn ignition key to START and hold. While engine is cranking, measure the voltage drop as follows.

SOLENOID		MEASUREMENT
Battery post	Starter post	0.2 Vdc max.



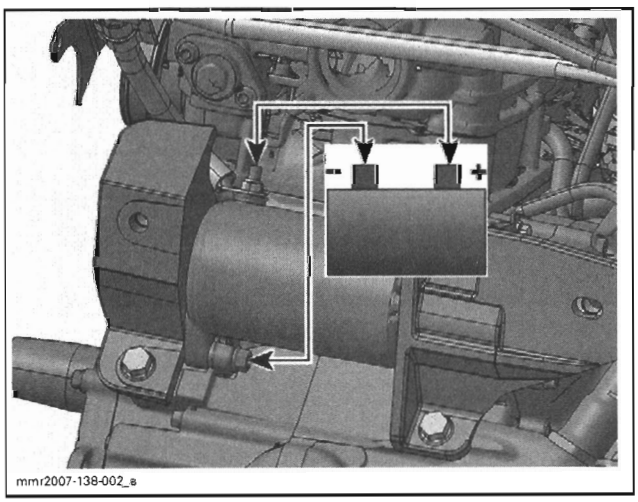
If voltage is out of specification, replace solenoid.

If solenoid tests good, check the electric starter.

ELECTRIC STARTER

Starter Test

Using booster cables, carefully supply current from the battery directly to the starter. Connect the BLACK (-) cable first. Then connect the remaining jumper cable from the battery then to the starter.



If starter turns ensure the cables/connections from solenoid to starter are in good condition.

If starter does not turn, replace starter.

Starter Removal

Turn OFF ignition switch.

Remove RH side panel. Refer to *BODY*.

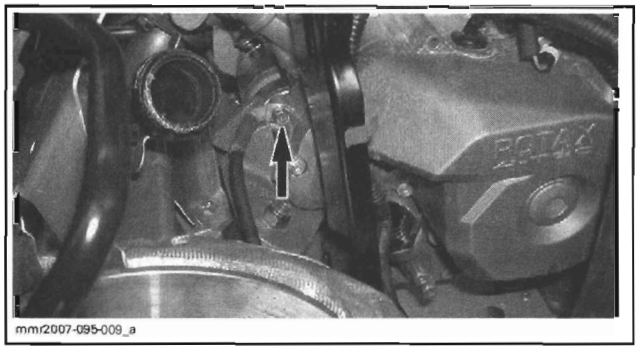
Remove muffler. Refer to *EXHAUST SYSTEM*.

Disconnect BLACK (-) cable from battery.

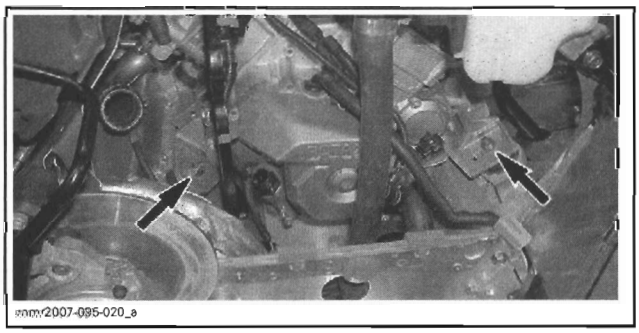
⚠ WARNING

Always disconnect BLACK (-) cable first and reconnect last.

Disconnect ground cable from engine.



Unscrew engine support nuts.

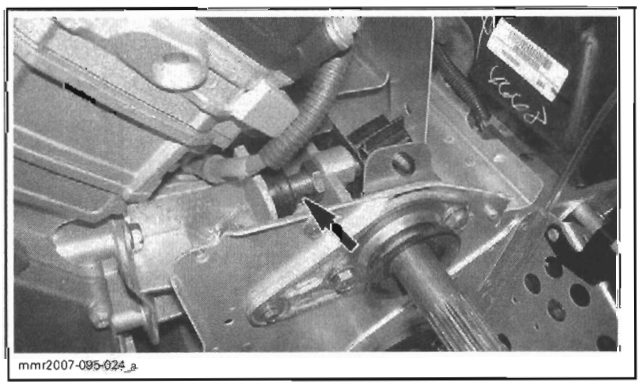


Remove LH side panel and hood.

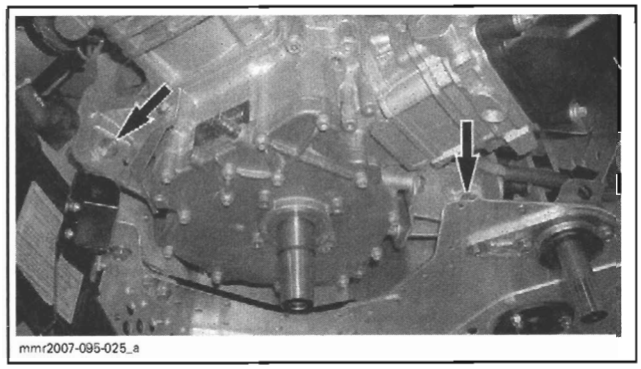
Remove air intake silencer. Refer to *AIR INTAKE SYSTEM*.

Remove drive and driven pulleys. Refer to *DRIVE SYSTEM*.

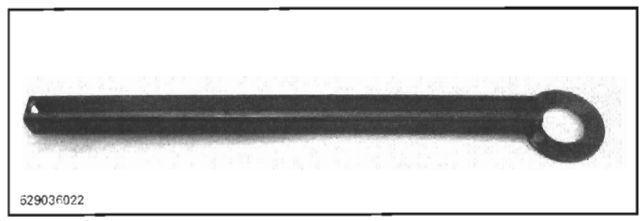
Unscrew engine stopper.



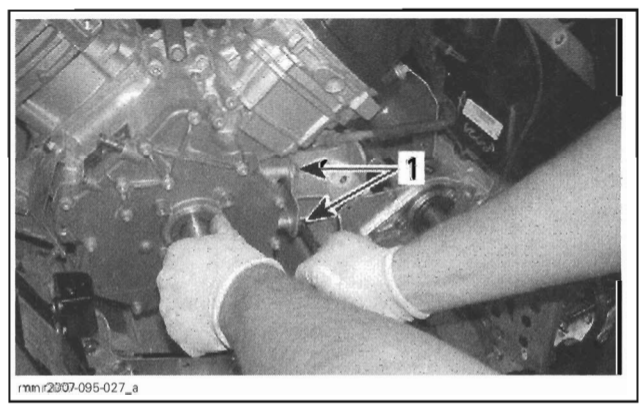
Unscrew engine support nuts.



Install engine lifting tool (P/N 529 036 022). Refer to *ENGINE REMOVAL AND INSTALLATION.*



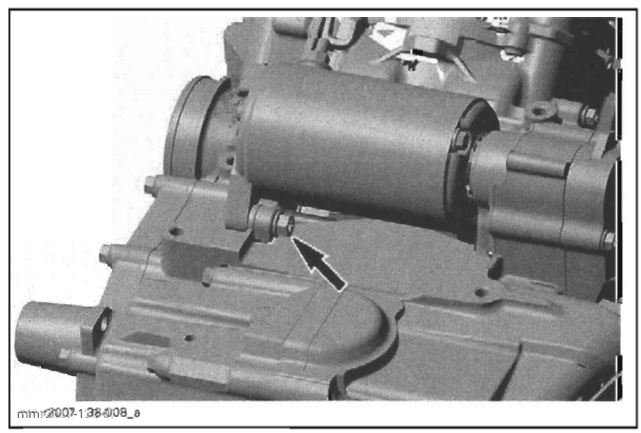
Remove LH rear engine support.



1. LH rear engine support screws

Clean starter area.

Remove starter mount screw.



TYPICAL — SOME PARTS REMOVED FOR CLARITY PURPOSE ONLY

Slightly lift engine to allow starter removal. Pull starter out.

Disconnect RED cable from starter.

Starter Installation

Installation is the reverse of removal procedure. However, pay particular attention to the following.

Make sure that starter and engine mating surfaces are free of debris. Serious problem may arise if the starter is not properly aligned.

Connect the RED (+) cable to the starter and torque nut to 6 N•m (53 lbf•**in**). Apply dielectric grease (P/N 293 550 004) on terminal and nut.

Push starter in place and align mounting ear to install screw.

Torque starter screw to 25 N•m (18 lbf•ft).

Properly torque engine support screws. Refer to *ENGINE REMOVAL AND INSTALLATION.*

Last connect BLACK cable to battery.

⚠ WARNING

Always connect BLACK (-) cable last. Whenever connecting the RED (+) cable to the starter motor, make sure the battery cables are disconnected to prevent electric shock.

Test starter operation.

ROTAX ELECTRONIC REVERSE (300F/550F)

SERVICE TOOLS

Description	Part Number	Page
multimeter Fluke 111	529 035 868	419

GENERAL

For best results, use the multimeter Fluke 111 (P/N 529 035 868).

529 035 868

There is 3 main components used for the RER system : the RER switch, the MPEM and the RER trigger coil.

The MPEM receives signals from the trigger coils for the following functions:

- Forward engine rotation.
- Reverse engine rotation.

The MPEM recognizes a signal sent by the RER switch.

When switch is activated and engine is running, MPEM cuts off ignition. Therefore, engine RPM gradually drops. When engine reaches a low threshold RPM, MPEM sends an ignition spark at a great advance creating a thrust which reverses engine rotation.

In reverse operation, the RER trigger coil is used to give the ignition signal to the MPEM.

Under a threshold low RPM or above drive pulley engagement speed, the RER function is disabled.

TROUBLESHOOTING

RER Does Not Respond When Depressing RER Button

- Check if engine RER switch works properly.
- Check main wiring harness (resistor/capacitor).

Engine Stops After Pressing RER Button

- This confirms that RER switch works.
- Check RER trigger coil.

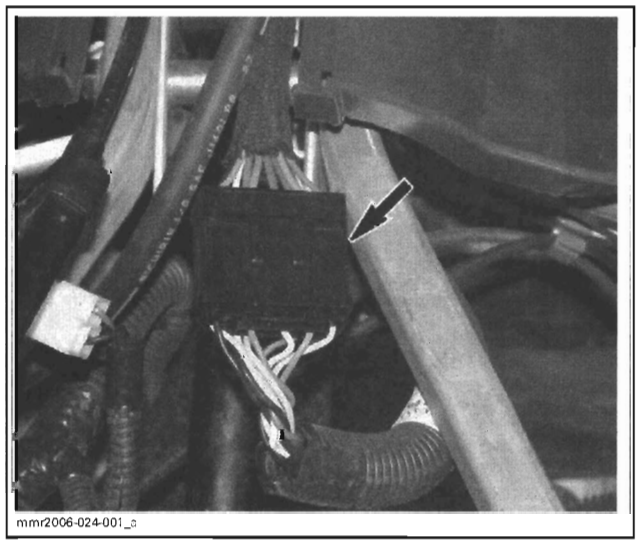
RER Works Erratically

- Check engine compression. A low compression engine may result in RER working erratically making you think the problem is an electronic problem.
- Check piston condition. Remove exhaust system and carburetor. Verify piston condition through the intake and exhaust ports. Look for scoring on piston skirt. Scored piston skirt may result in RER working erratically making you think the problem is an electronic problem.
- Check RER switch.
- Faulty capacitor/resistor in wiring harness.

TESTING PROCEDURES

RER Switch

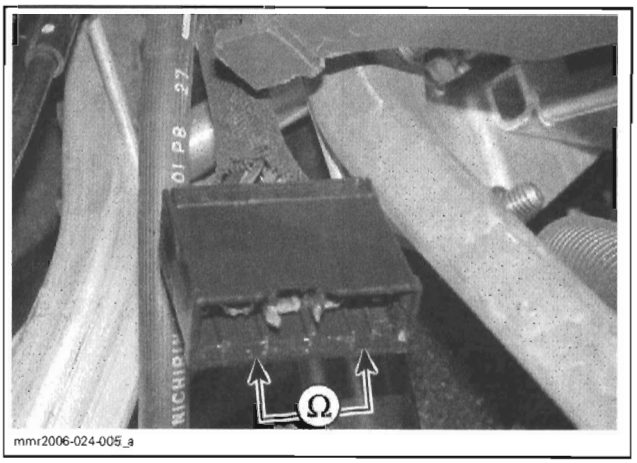
Unplug steering connector.



mmr2006-024-001_a

Check switch as follows.

SWITCH	WIRE	RESISTANCE
Released	RED/GREY and BEIGE	High value or infinite (0L)
Pushed and held		0.2 Ω (closed)



mmr2006-024-005_a

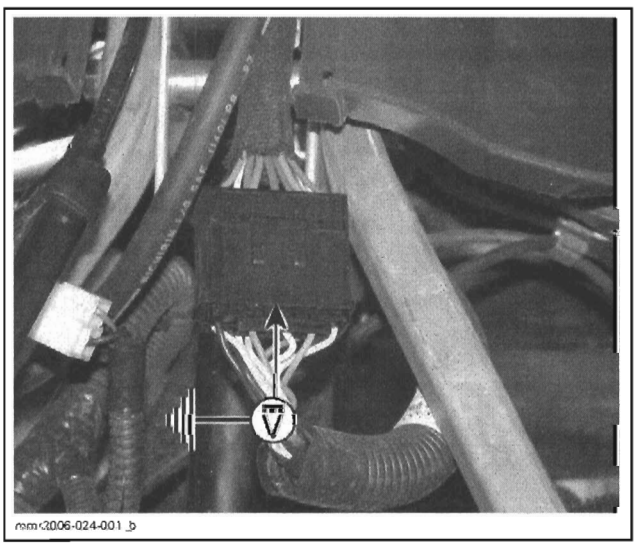
If readings are out of specification, check switch wiring/terminals and if good, replace switch.

A switch may pass the test and still cause erratic or no operation of RER because of moisture/water in switch. To check, perform the following test.

Reconnect steering harness connector.

Start engine and check voltage as follows.

WIRE		VOLTAGE
BEIGE	Engine ground	5 Vdc



mmr2006-024-001_b

If voltage is within specification, there is no moisture/water in switch.

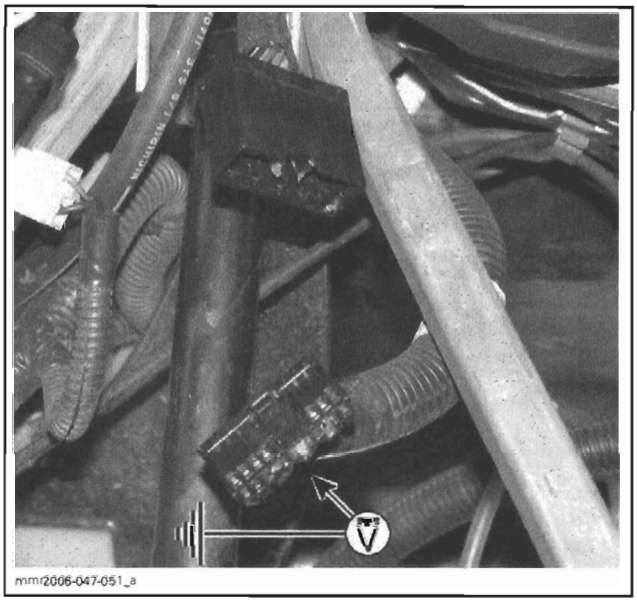
If voltage is lower than specification, there is moisture/water in the switch.

NOTE: If voltage is less than approximately 3.5 Vdc the RER system will not work.

Unplug steering connector and restart engine to read voltage again.

⚠ WARNING

Engine cut-out switch is not operational when steering harness connector is unplugged. Use ignition switch or tether cord to stop engine. Never use vehicle with this connector unplugged.



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If voltage is now within specification, problem is in switch or wiring/connectors going to switch. Try blowing compressed air in several directions into switch housing.

mmr2006-047-050

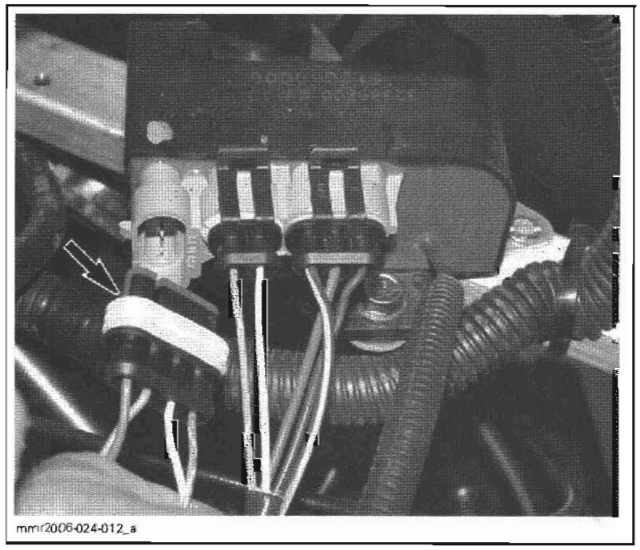
Reconnect connectors.

If voltage is still under specification, check RER switch and its wiring. If good, check main wiring harness as described further in this section.

RER Trigger Coil

NOTE: RER trigger coil is used only when engine is in reverse operation.

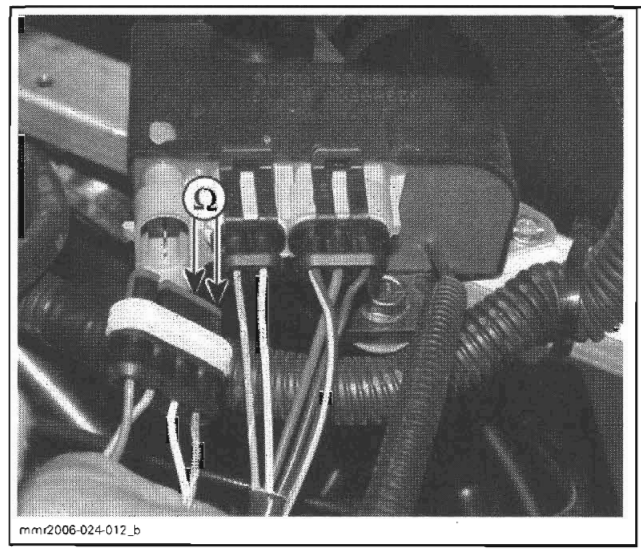
Disconnect 4-pin connector from MPEM.



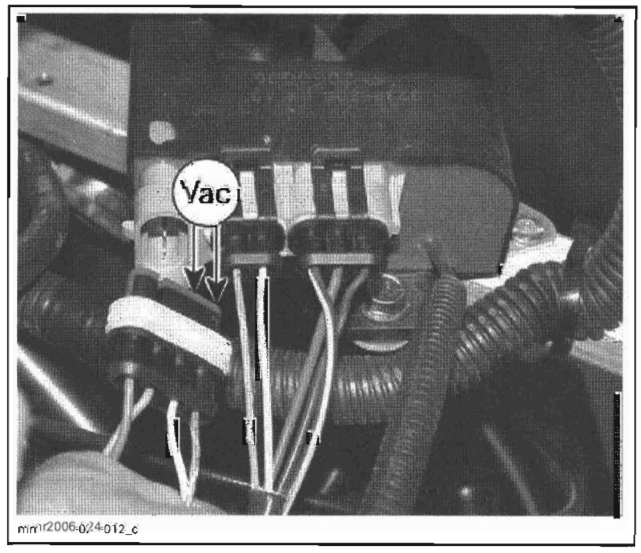
RER TRIGGER COIL CONNECTOR

Check the resistance and the voltage for RER trigger coil.

TEST	CONTINUITY	OUTPUT
TEST PROBES	BLUE/YELLOW and WHITE/YELLOW wires	BLUE/YELLOW and WHITE/YELLOW wires
RESISTANCE	160 to 180 Ω	—
VOLTAGE	—	0.15 to 0.35 Vac
BLUE/YELLOW and WHITE/YELLOW wires	Voltage testing: Manually crank engine with the spark plug installed. Always repeat the procedure 3 times.	



RER TRIGGER COIL — RESISTANCE TEST



RER TRIGGER COIL — VOLTAGE TEST

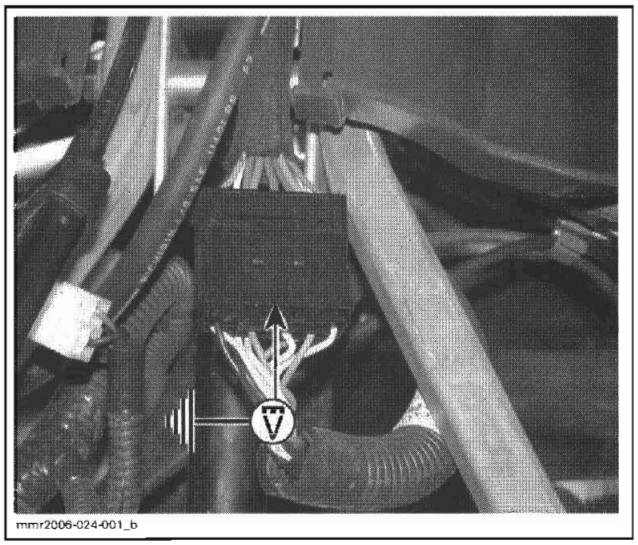
If trigger coil is out of specification, replace it.

Main Wiring Harness

When testing wiring harness for continuity or short circuit, be aware there is a capacitor/resistor inside main wiring harness on BEIGE wire (refer to *WIRING DIAGRAMS*). Therefore, its continuity cannot be checked as usual. Check as described here.

Start engine and check voltage as follows.

WIRE		VOLTAGE
BEIGE	Engine ground	5 Vdc



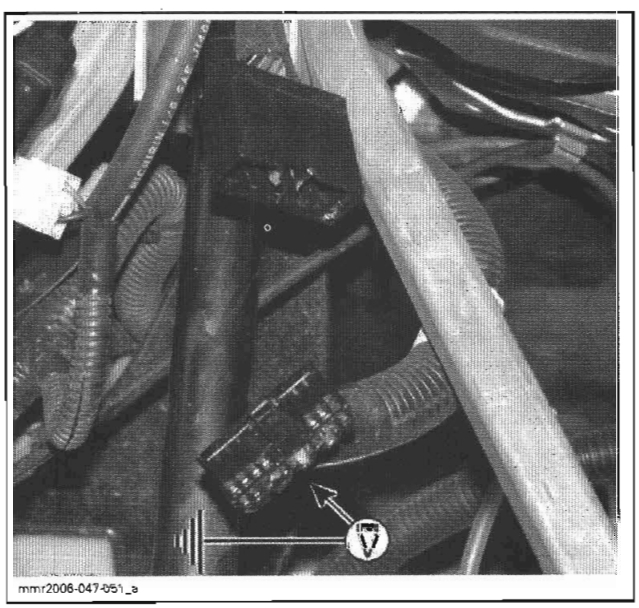
If there is no voltage, MPEM can be suspected.

While engine is still running, press and HOLD RER switch for at least 5 seconds then release switch. Voltage should begin somewhere close to 1.5 Vdc and gradually increase to 5 Vdc within approximately 10 seconds. If so, harness, resistor and capacitor are in good condition.

If voltage does not reach 5 Vdc, or goes to 5 Vdc quite faster than 10 seconds, unplug steering connector and restart engine to read voltage again.

⚠ WARNING

Engine cut-out switch is not operational when main harness connector is unplugged. Use ignition switch or tether cord to stop engine. Never use vehicle with this connector unplugged.



If voltage is now within specification, problem is in switch or wiring/connectors going to switch. See *RER SWITCH* above.

Reconnect connectors.

LIGHTS, INSTRUMENTS AND ACCESSORIES

SERVICE TOOLS

Description	Part Number	Page
multimeter Fluke 111	529 035 868	423
supply harness	529 035 869	428–429, 432–433, 437, 439–440

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Fluke rigid back probe	TP88	423

GENERAL

NOTE: On applicable models, it is a good practice to check for fault codes using B.U.D.S. software as a first troubleshooting step. Refer to *EMS DIAGNOSTIC AND COMMUNICATION TOOLS*.

⚠ WARNING

It is recommended to always disconnect the battery (if so equipped) when replacing any electric or electronic parts. Always disconnect battery exactly in the specified order, BLACK (-) cable first. Do not place tools on battery.

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

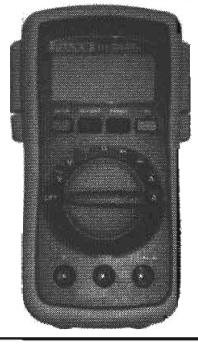
Clean threads before applying a threadlocker. Refer to SELF-LOCKING FASTENERS and LOCTITE APPLICATION at the beginning of this manual for complete procedure.

⚠ WARNING

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

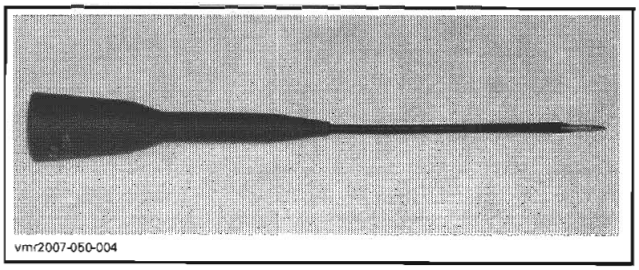
Diagnostic Tools

For best results, use the multimeter Fluke 111 (P/N 529 035 868).

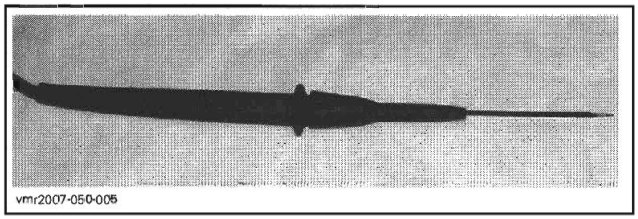


529 035 868

To easily probe wire terminals through the back of their connectors, Fluke rigid back probe (P/N TP88) or an equivalent can be used.



They can be inserted at the end of the standard probes of the Fluke 111 multimeter.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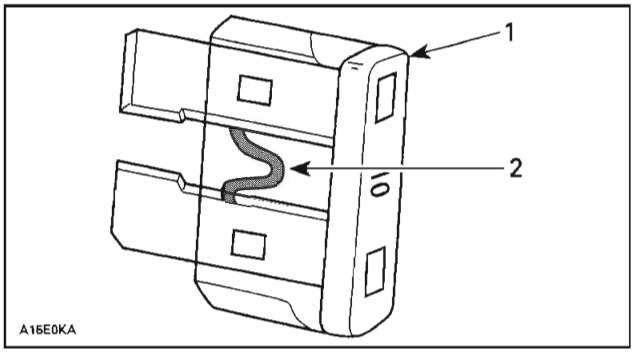
FUSES

Check fuse condition and if filament is melted.



1. Fuse
2. Check if melted

CAUTION: When replacing a fuse, do not use a higher rated fuse as this can cause severe damage to electric components and/or fire.

⚠ WARNING

If fuse has burnt out, source of malfunction should be determined and corrected before restarting.

Fuse Description

300F and 550F Models

MODEL	FUSE	DESCRIPTION	LOCATION
Manual start	20 A	Ground protection	Behind RH footrest
Electric start	30 A	Charging system	Top of battery
	20 A	Ground protection	

V800 Models

FUSE	DESCRIPTION	LOCATION
30 A	Charging system	On battery support

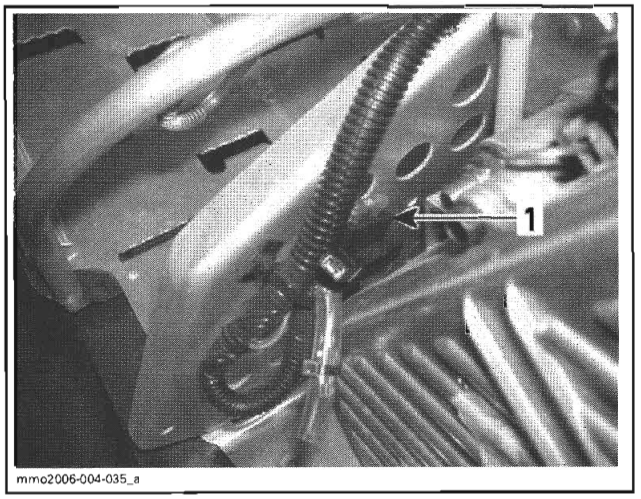
FUSE	DESCRIPTION	LOCATION	
5 A	Fuel injectors	F1	Fuse box
10 A	Fuel pump/ignition coil	F2	
5 A	Engine Control Module (ECM)/Crankshaft Position Sensor (CPS)	F3	
5 A	Cluster/reverse alarm/ speed sensor/relay	F4	
15 A	Heated grips and thumb/power outlet/ visor outlet/taillight	F5	
15 A	Headlamp	F6	

Fuse Location

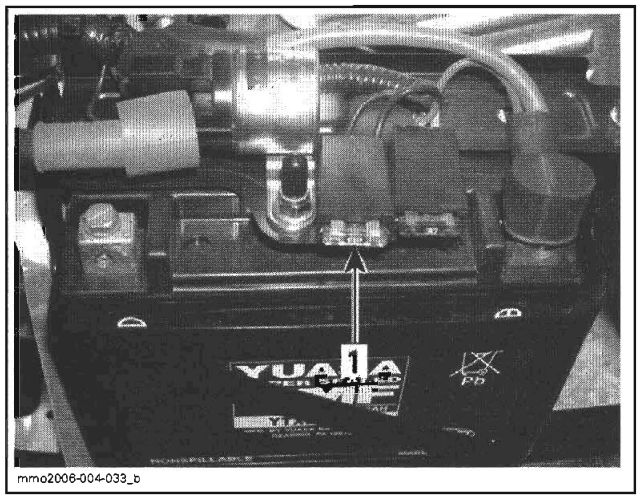
300F and 550F Models

Ground Protection Fuse

CAUTION: This fuse should always be disconnected before doing any maintenance under the hood. This is to prevent any unexpected electrical activation.

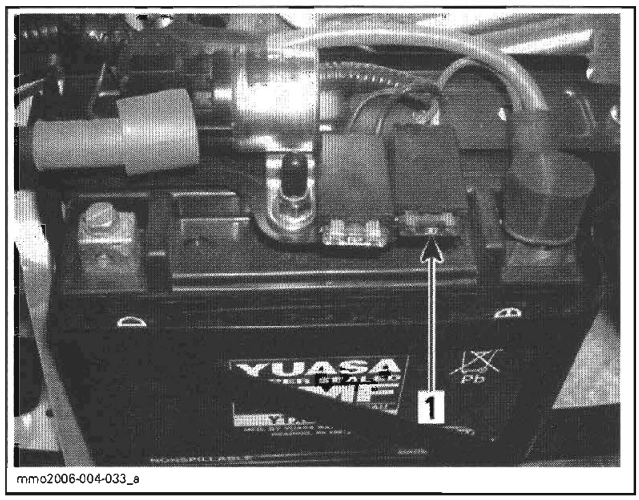


MANUAL START MODELS — BEHIND RH FOOTREST
1. Ground protection fuse



ELECTRIC START MODELS
1. Ground protection fuse

Charging System Fuse



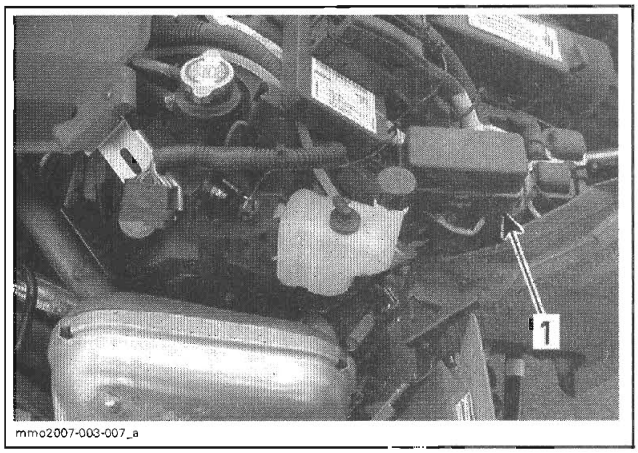
ELECTRIC START MODELS
1. Charging system fuse

V800 Models

Fuse Box

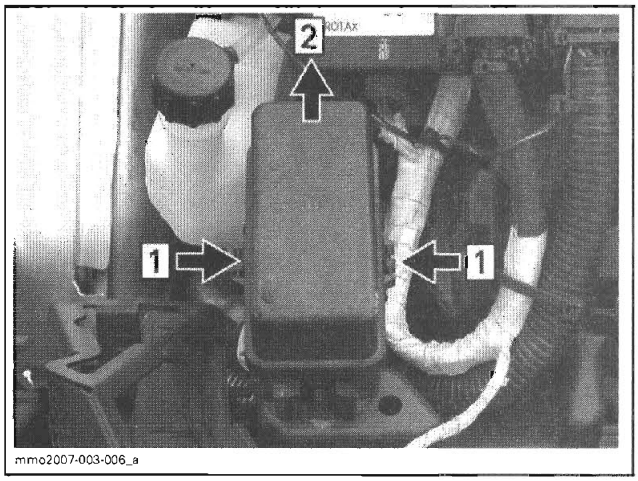
Open side panels.

Open and remove front hood.

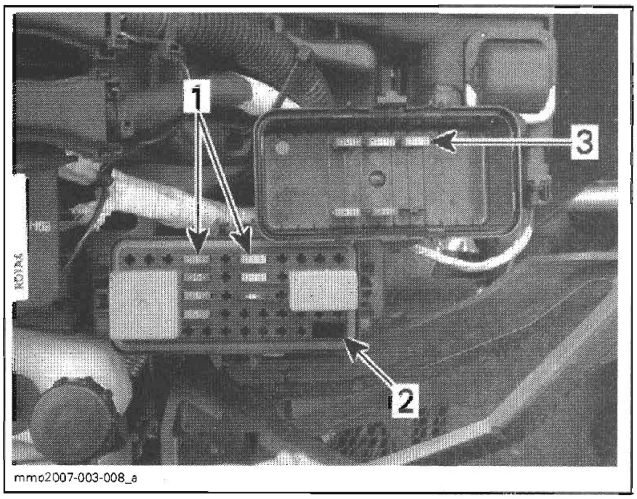


RH SIDE OF VEHICLE
1. Fuse box

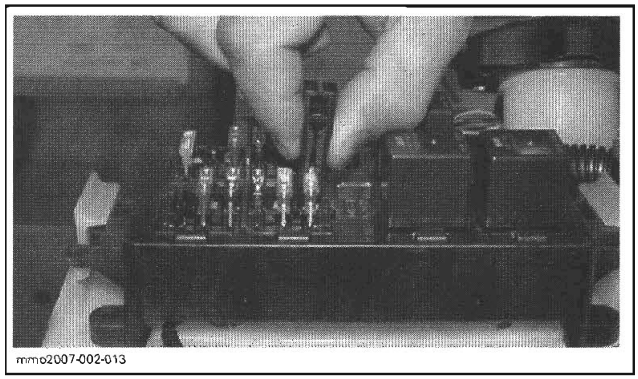
To open fuse box push on cover tabs and pull cover.



FUSE BOX COVER
Step 1: Push on tabs
Step 2: Pull cover



1. Fuses
2. Fuse remover/installer tool
3. Spare fuses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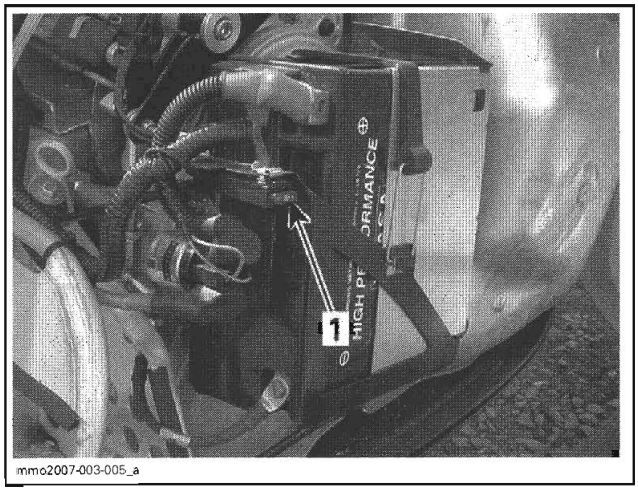
TYPICAL — REMOVE FUSE USING TOOL

Charging System Fuse

CAUTION: This fuse should always be disconnected before doing any maintenance under the hood. This is to prevent any unexpected electrical activation.



mmo2007-003-005_a

1. Charging system fuse

DIAGNOSTIC

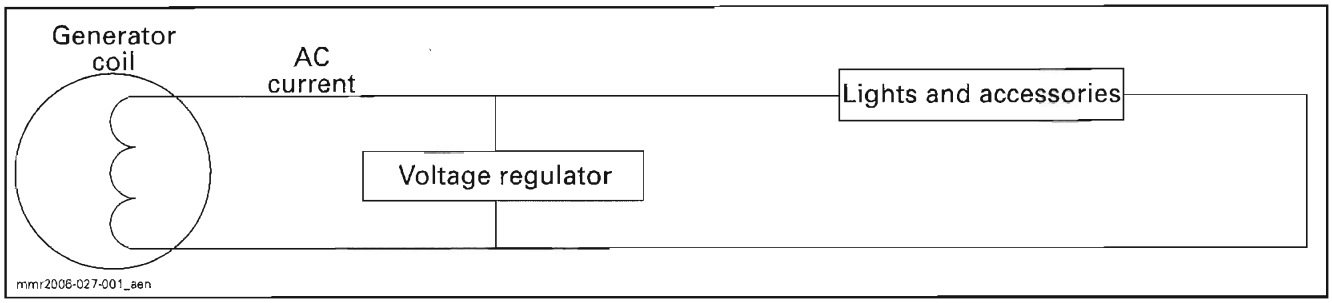
POWER DISTRIBUTION

NOTE: The following diagrams show how the electrical current is distributed to the lights and accessories.

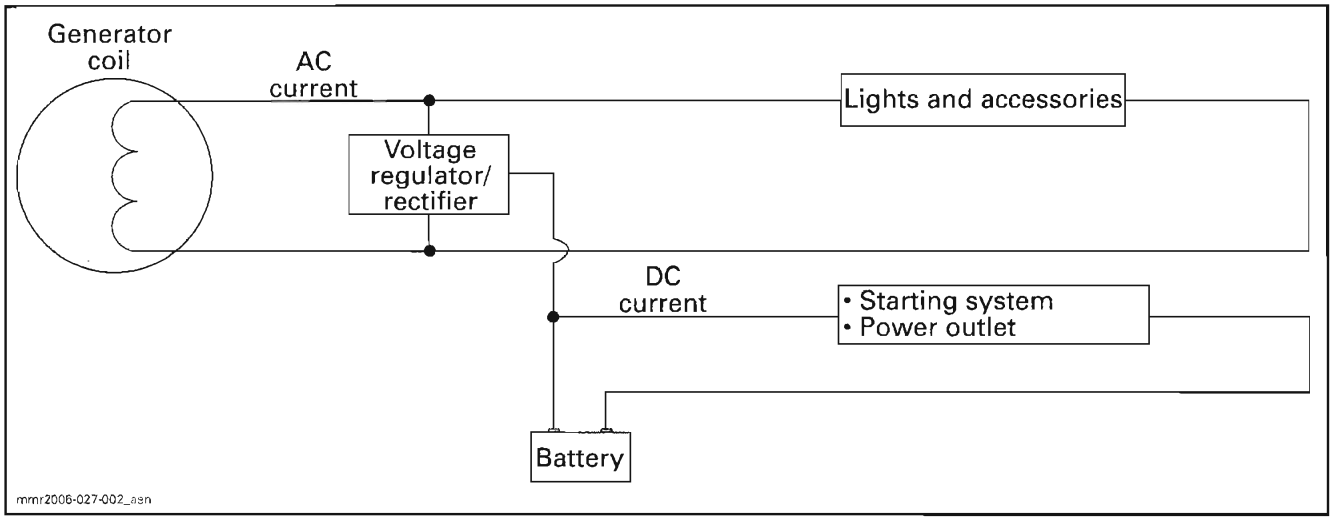
When there is no power, check:
- fuse(s)
- battery (electric start models)
- charging generator coil
- voltage regulator
- wiring harness.

Also ensure to check the circuit ground wires. Refer to *CHARGING SYSTEM* and *WIRING DIAGRAMS*.

300F and 550F Models

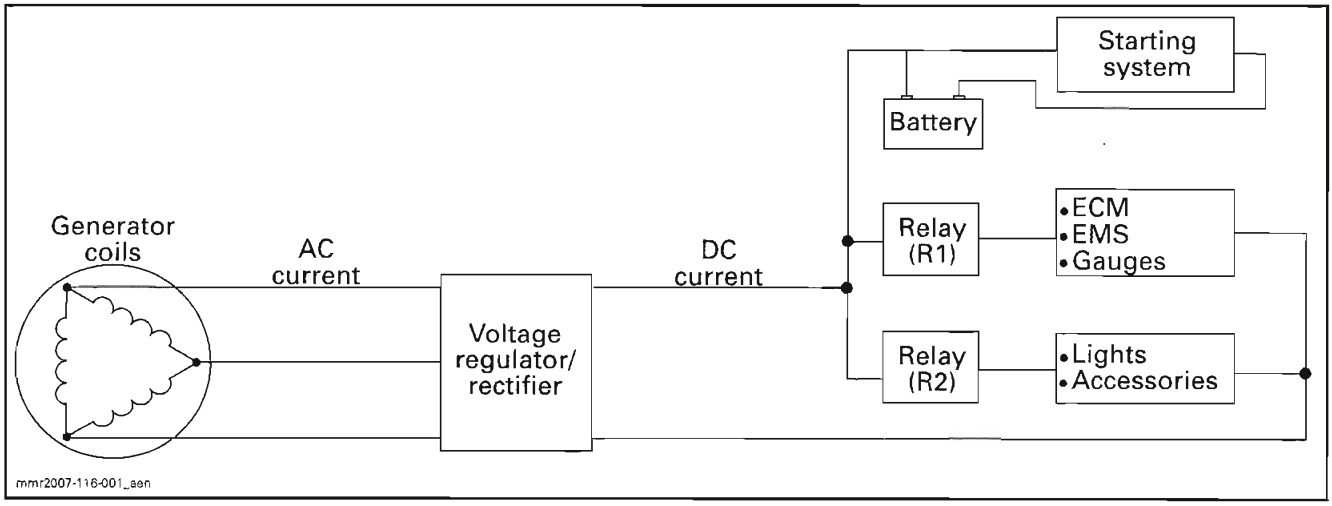


MANUAL START MODELS



ELECTRIC START MODELS

V800 Models



LIGHTING AND ACCESSORIES SYSTEM TESTING

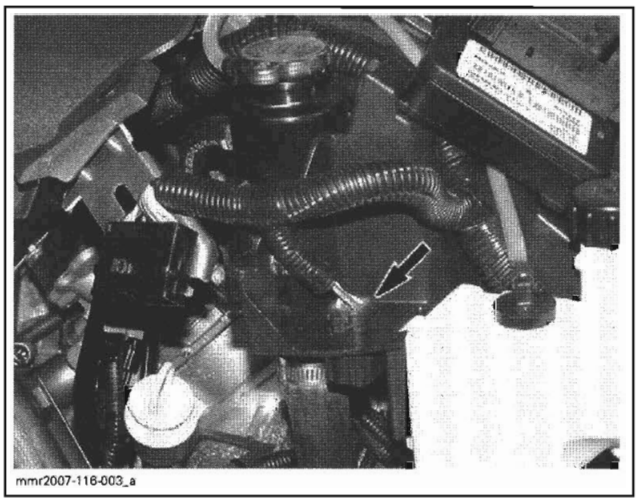
300F and 550F Models

To provide power to lighting and accessories systems, it is necessary to start engine.

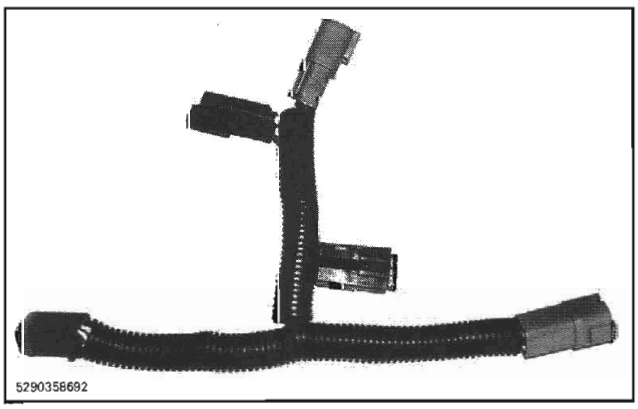
V800 Models

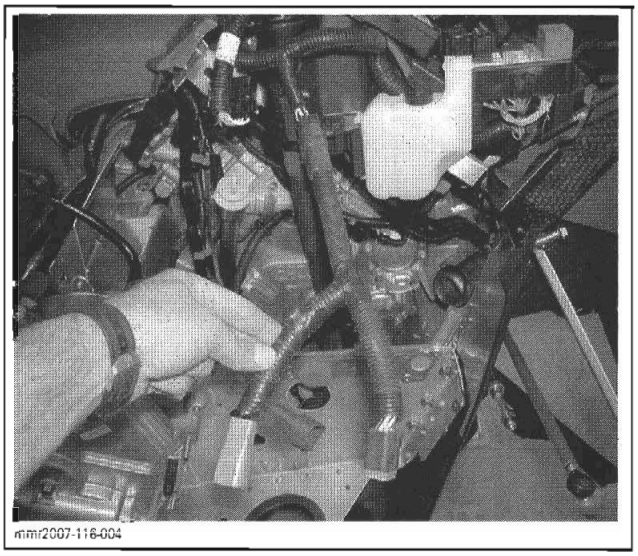
To provide power to lighting and accessories systems, do the following.

Remove the 6-pin diagnostic connector from protective cap on vehicle.


mmr2007-116-003_a

Connect supply harness (P/N 529 035 869) to the 6-pin connector of vehicle.


5290358692


mmr2007-116-004

NOTE: The use of the supply harness will keep the ECM ON to give you more time to work. Not using it will make the ECM shuts-off after approximately 30 seconds.

Use the wiring diagram in *WIRING DIAGRAMS* section to troubleshoot lighting and accessories systems.

Once testing is done, disconnect supply harness from vehicle. Reconnect the 6-pin connector in its cap.

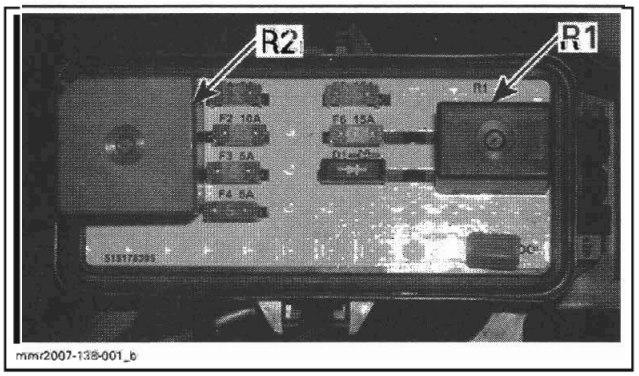
PROCEDURES

RELAY

V800 Models

See illustration below for relays identification as used in this manual and the *WIRING DIAGRAMS*.

NOTE: Relays may be inverted by 180° at installation and they will work correctly. Ensure to align tabs of relay with terminals of fuse holder at installation.

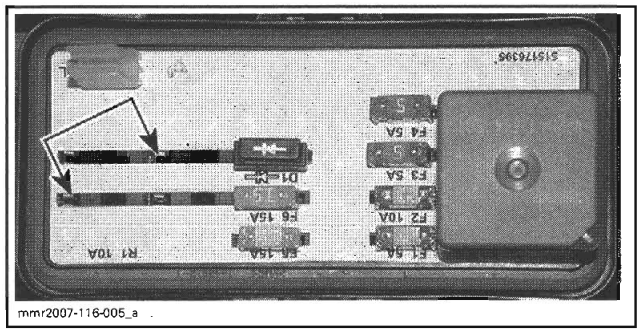


mmr2007-138-001_b

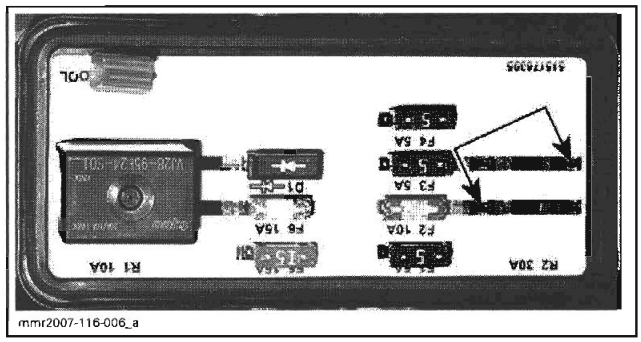
R1: ECM, EMS and gauges
R2: Lights and accessories

A quick way to check a relay is to remove it and bypass it with a jumper. If the components then work, relay is likely to be faulty. Try a new relay. See illustrations to find where to bypass the relays.

NOTE: Keep in mind that the wiring going to the relay winding or going to the ECM can be faulty.



RELAY R1 (ECM, EMS AND GAUGES)



RELAY R2 (LIGHTS AND ACCESSORIES)

HEADLAMP

Test

Disconnect headlamp connector.

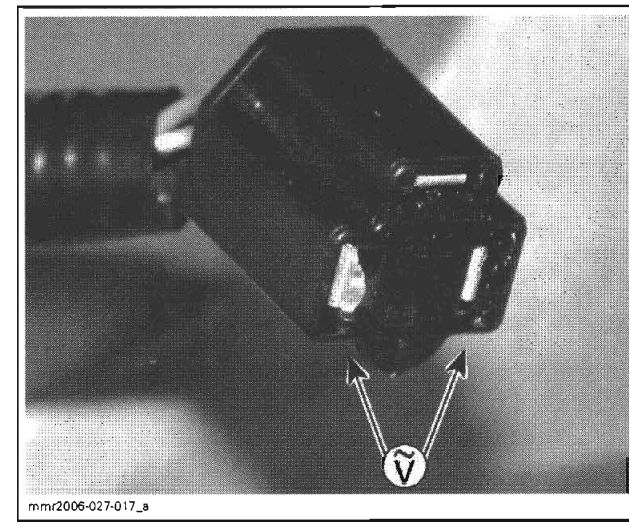
Using a multimeter, measure the voltage on headlamp connector as follows.

300F and 550F Models

Start engine and rev to approximately 5000 RPM to read voltage.

Read voltage at headlamp connector as follows.

SWITCH POSITION	WIRE COLOR (HEADLAMP CONNECTOR)		VOLTAGE
LO beam	GREY/VIOLET	YELLOW/BLACK	13.8 Vac
HI beam	GREY	YELLOW/BLACK	

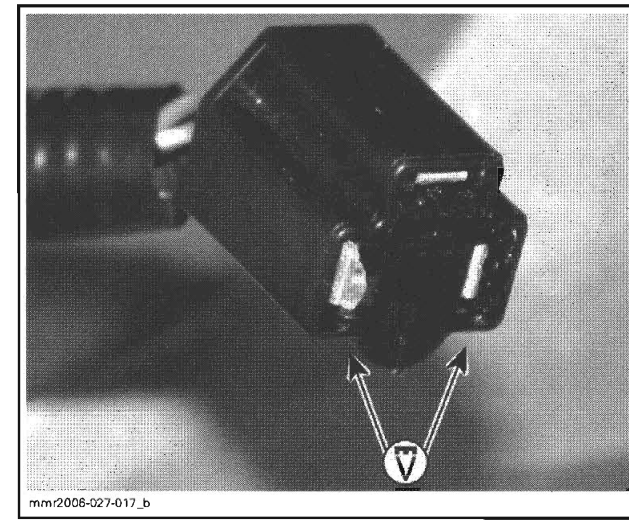


V800 Models

Install the supply harness (P/N 529 035 869) (refer to *LIGHTING AND ACCESSORIES SYSTEM TESTING* for detailed instructions) to continuously feed the electrical system.

Read voltage at headlamp connector as follows.

SWITCH POSITION	WIRE COLOR (HEADLAMP CONNECTOR)		VOLTAGE
LO beam	GREY/VIOLET	YELLOW/BLACK	Battery voltage (Vdc)
HI beam	GREY	YELLOW/BLACK	



All Models

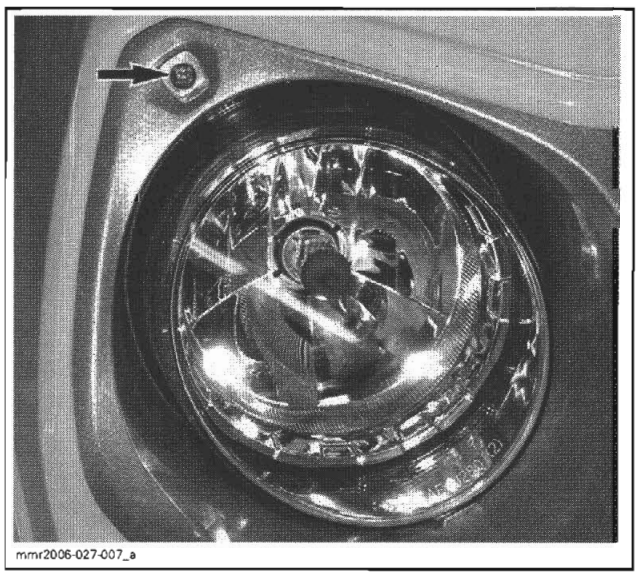
- Voltage is good:
  - Change headlamp bulb(s).
- No voltage: do the following until problem is solved.
  - Check appropriate fuse. Refer to *WIRING DIAGRAMS*.
  - Check battery (electric start models)

- Check appropriate relay (if applicable). Refer to *POWER DISTRIBUTION* above.
- Check headlamp dimmer switch.
- Check wiring harness and connectors.
- Check voltage regulator/rectifier. Refer to *CHARGING SYSTEM*.
- Check generator/stator coils. Refer to *CHARGING SYSTEM*.

Removal

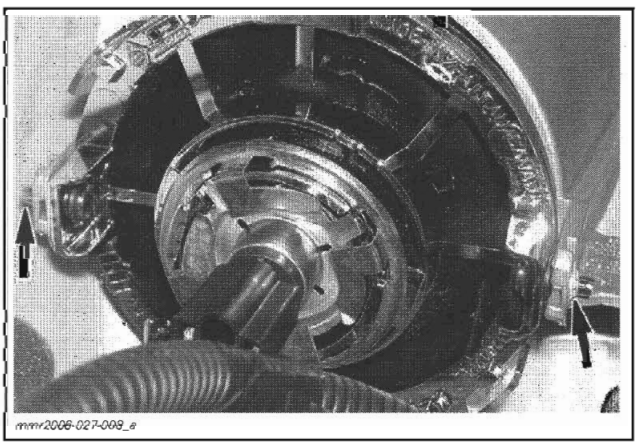
Remove hood.

Remove adjustment screw.



Disconnect headlamp.

Remove push nuts then pull out headlamp housing.



Installation

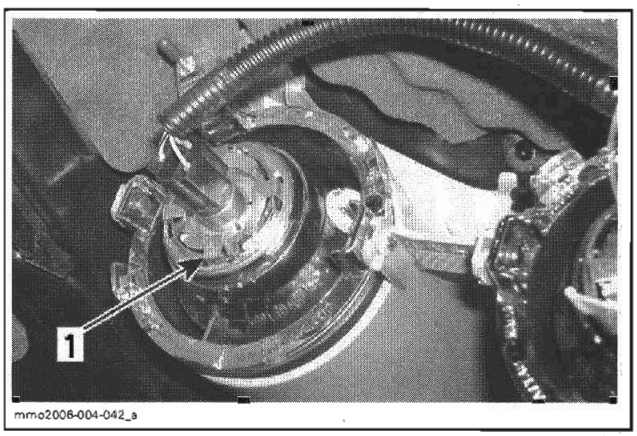
Reverse the removal procedure.

Ensure to install new push nuts.

Bulb Replacement

Unplug burnt bulb connector.

Turn bulb retainer ring counterclockwise to unlock. Detach the bulb and replace.



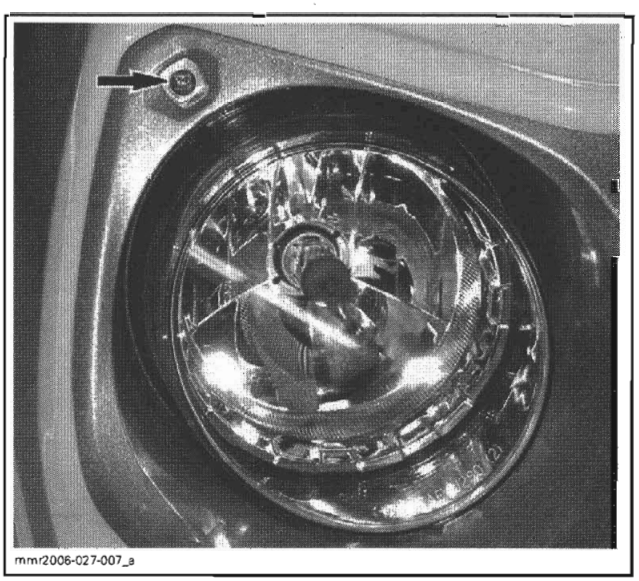
1. Locking ring

CAUTION: Never touch glass portion of an halogen bulb with bare fingers, as it shortens its operating life. If by mistake glass is touched, clean it with isopropyl alcohol which will not leave a film on the bulb. After locking ring installation, ensure bulb is properly secured in place.

Properly reinstall removed parts.

Headlamp Beam Aiming

Turn screw (on each headlamp) as necessary to adjust beam height.



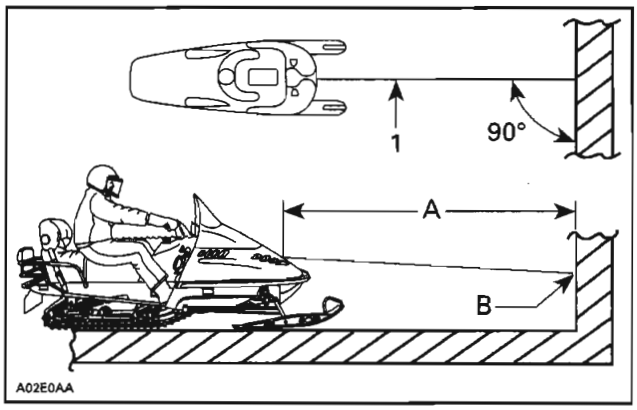
Beam aiming is correct when center of high beam is 25 mm (1 in) below the headlamp horizontal center line, scribed on a test surface, 381 cm (12 ft 6 in) away.

Place the vehicle on a flat surface perpendicular to test surface (wall or screen) and 381 cm (12 ft 6 in) away from it.

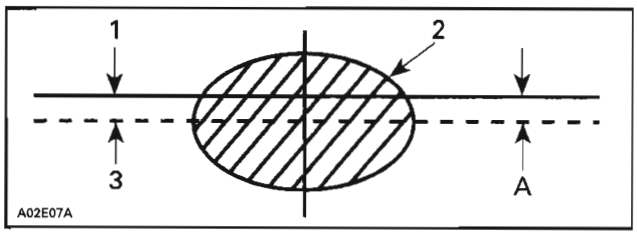
Rider or equivalent weight must be on the vehicle.

Select **high** beam.

Measure headlamp center distance from ground. Scribe a line at this height on test surface (wall or screen). Light beam center should be 25 mm (1 in) below scribed line.



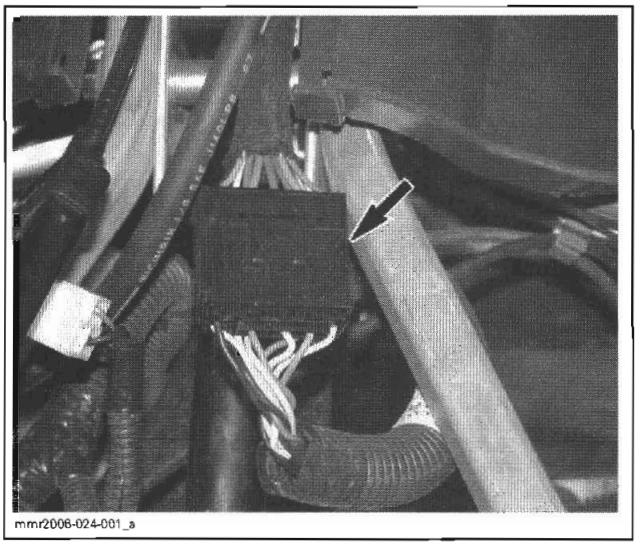
TYPICAL
1. Headlamp center line
A. 381 cm (12 ft 6 in)
B. 25 mm (1 in) below center line



1. Headlamp horizontal
2. Light beam (high beam) (projected on the wall)
3. Light beam center
A. 25 mm (1 in)

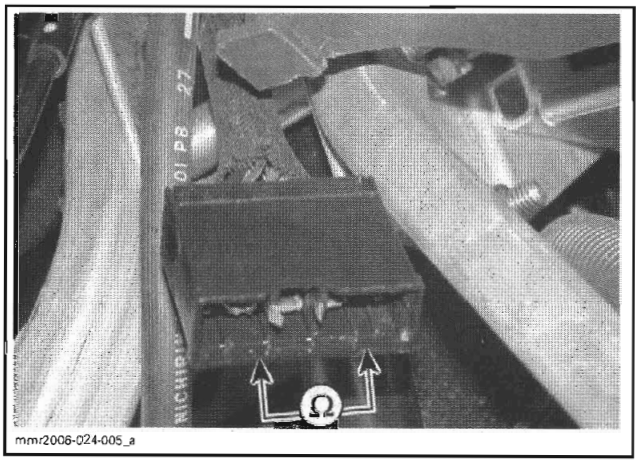
HEADLAMP DIMMER SWITCH

Disconnect steering connector.



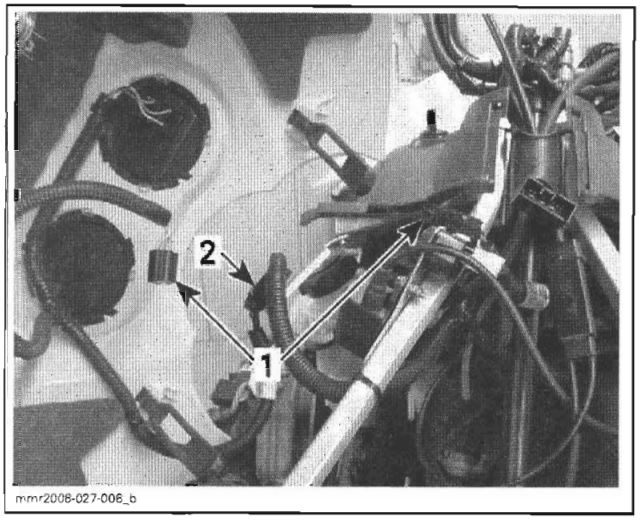
Check switch continuity.

LIGHT SWITCH POSITION	WIRE COLOR		RESISTANCE @ 20°C (68°F)
LO beam	GREY/ VIOLET	RED/ ORANGE	0.5 Ω max.
HI beam	GREY		



If any value is out of specification, check wiring/connectors going to switch. If they are good, replace switch.

If switch tests good, ensure wiring/connector is good from steering connector through hood connector then to headlamp.

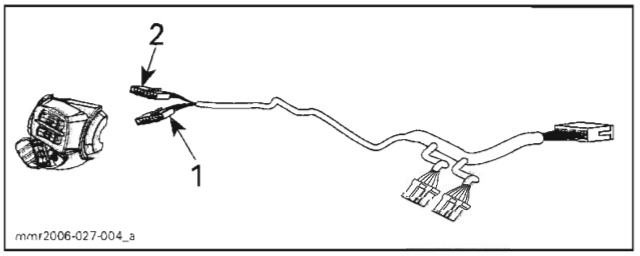


1. Steering connector and headlamp connector
2. Hood connector

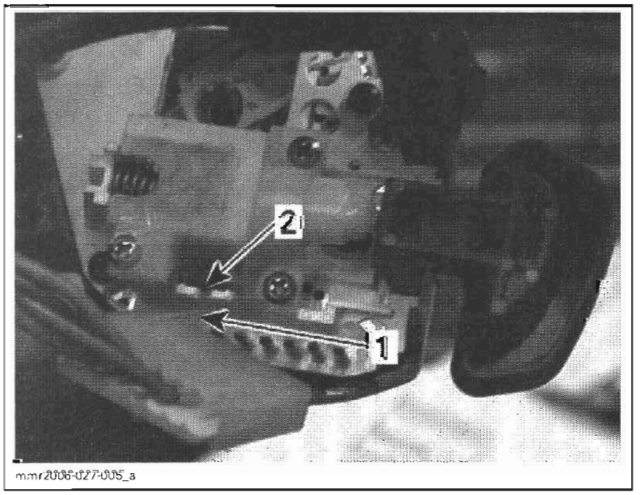
If their wiring/connectors are good, refer to *POWER DISTRIBUTION*.

NOTE: When replacing switch, ensure to properly position connectors on switch as shown.

CAUTION: Black and white could be installed at the wrong position. Also pay attention that the white connector could be installed in the reverse position. Refer to illustrations.



1. WHITE connector
2. BLACK connector



ALIGN RIDGE BETWEEN TABS
1. Ridge
2. Tabs

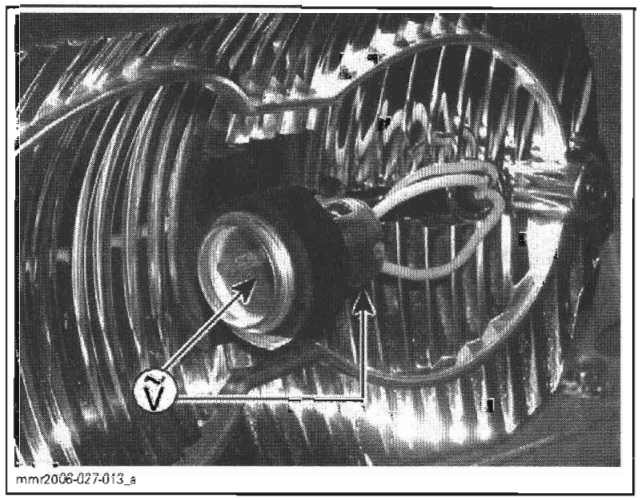
TAILLIGHT/BRAKE LIGHT

Test

NOTE: For the brake light, verify first the condition of the brake light switch prior to proceed with the following tests. Refer to *COUNTERSHAFT AND BRAKE* section.

Remove taillight bulb. Refer to *BULB REPLACEMENT*.

Using a multimeter, measure the voltage in bulb socket as follows.



NOTE: For the brake light, ensure to depress brake lever to read voltage.

300F and 550F Models

Start engine and rev to approximately 5000 RPM to read voltage.

TAILLIGHT		VOLTAGE
YELLOW wire terminal	Socket shell (YELLOW/BLACK)	13.8 Vac
BRAKE LIGHT		
WHITE wire terminal	Socket shell (YELLOW/BLACK)	

V800 Models

Install the supply harness (P/N 529 035 869) (refer to *LIGHTING AND ACCESSORIES SYSTEM TESTING* for detailed instructions) to continuously feed the electrical system and to prevent ECM to automatically shut down after approximately 30 seconds of its activation.

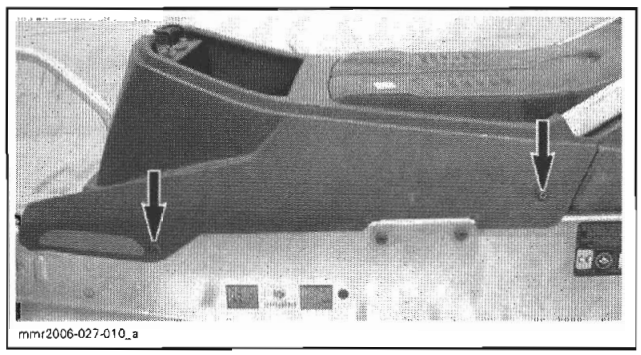
TAILLIGHT		VOLTAGE
YELLOW wire terminal	Socket shell (YELLOW/BLACK)	Battery voltage (Vdc)
BRAKE LIGHT		
WHITE wire terminal	Socket shell (YELLOW/BLACK)	

All Models

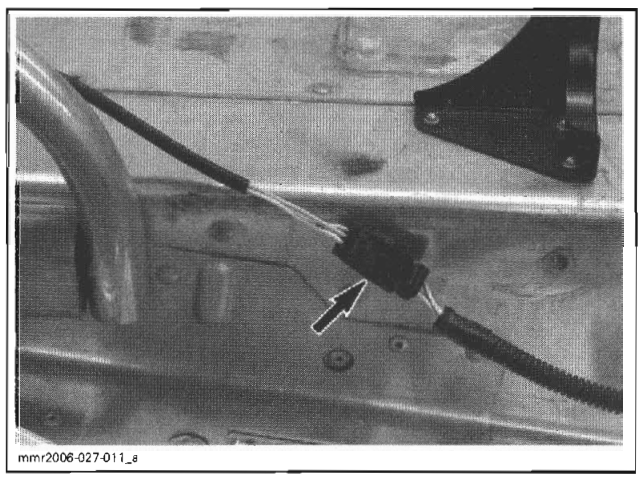
– Voltage is good:
  • Change taillight bulb.
– No voltage:

1-Up Seat Models

• Remove seat and and lift RH side of trunk.

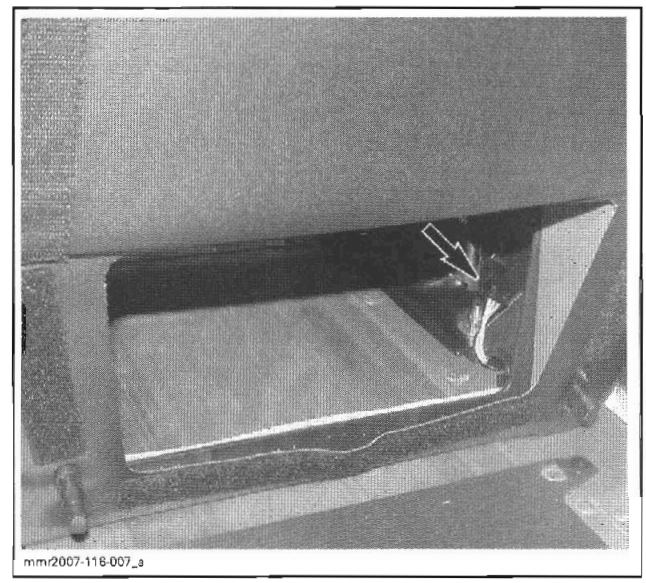


• Disconnect taillight connector.



2-Up Seat Models

• Open seat storage compartment cover.
• Disconnect taillight connector.

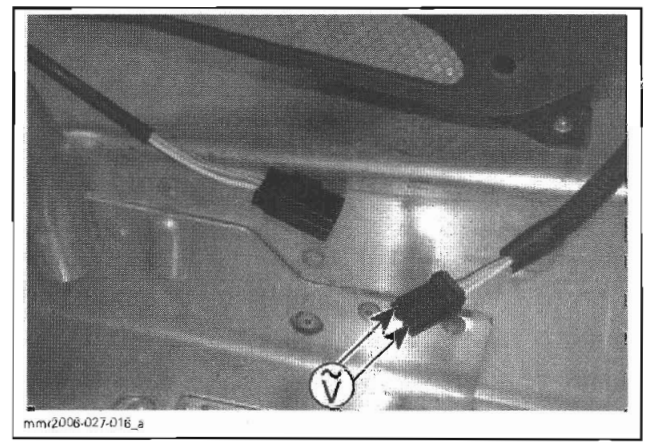


300F and 550F Models

• Start engine and rev to approximately 5000 RPM to read voltage on connector from main harness.

NOTE: For the brake light, ensure to depress brake lever to read voltage.

TAILLIGHT		VOLTAGE
YELLOW	YELLOW/BLACK	13.8 Vac
BRAKE LIGHT		
WHITE	YELLOW/BLACK	

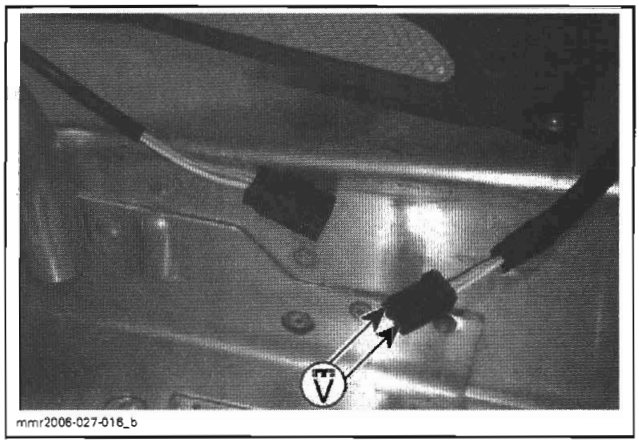


V800 Models

• Install the supply harness (P/N 529 035 869) (refer to *LIGHTING AND ACCESSORIES SYSTEM TESTING* for detailed instructions) to continuously feed the electrical system and to prevent ECM to automatically shut down after approximately 30 seconds of its activation.

NOTE: For the brake light, ensure to depress brake lever to read voltage.

TAILLIGHT		VOLTAGE
YELLOW	YELLOW/BLACK	Battery voltage (Vdc)
BRAKE LIGHT		
WHITE	YELLOW/BLACK	



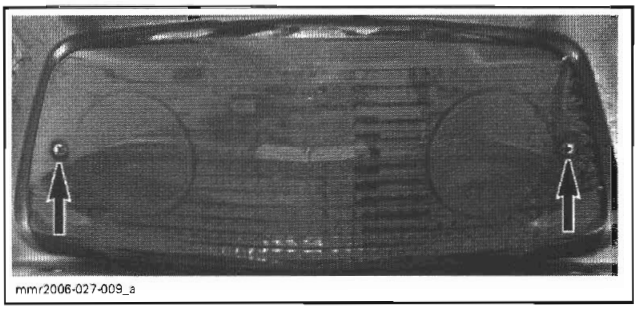
TYPICAL

All Models

- If voltage is good, check rear light wiring/connector going to taillight and if adequate, replace rear light. If voltage is not good, refer to *POWER DISTRIBUTION.*

Bulb Replacement

Unscrew lens screws to expose bulb.



Push the bulb in and hold while turning counterclockwise to release.

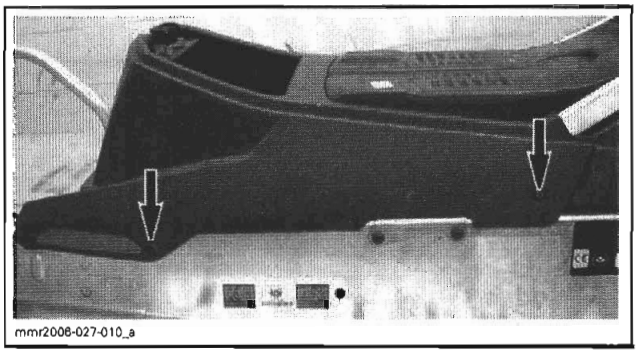
Install the new bulb by first pushing in while turning clockwise.

Reinstall lens.

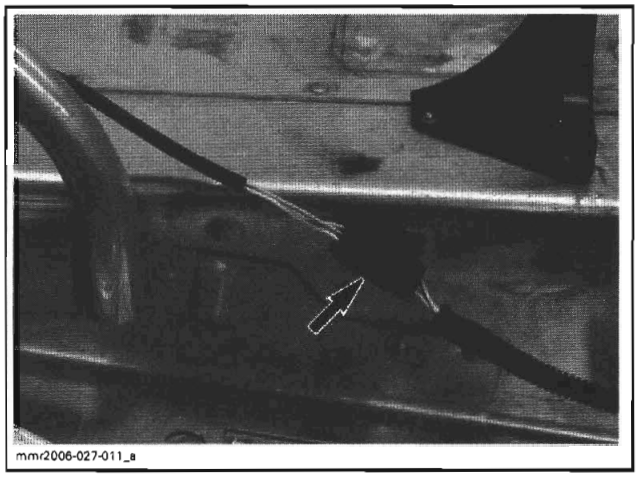
Removal

1-Up Seat Models

Remove seat and lift RH side of trunk.



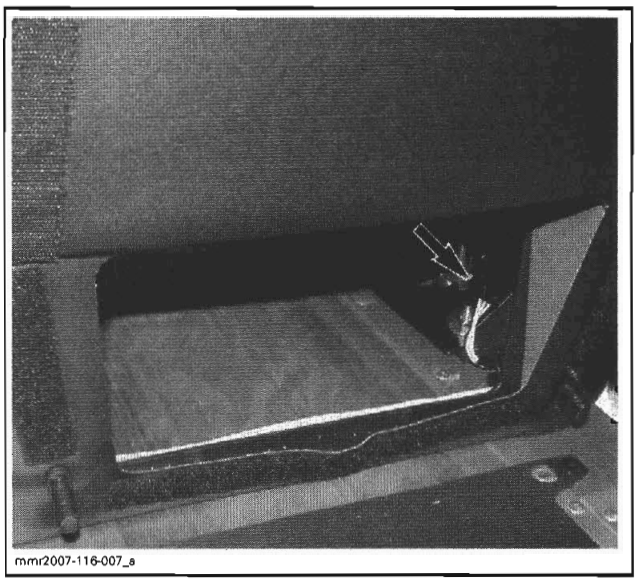
Disconnect taillight connector.



2-Up Seat Models

Open seat storage compartment cover.

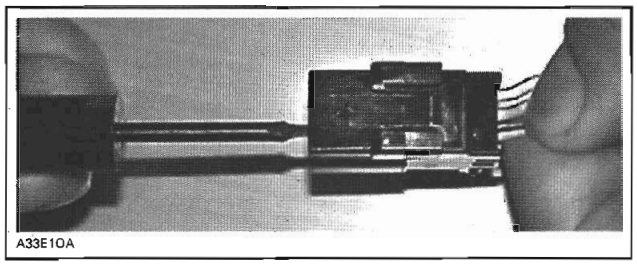
Disconnect taillight connector.



Remove seat.

All Models

Remove the wires from connector. Use a small tool extract the wires from the connector.

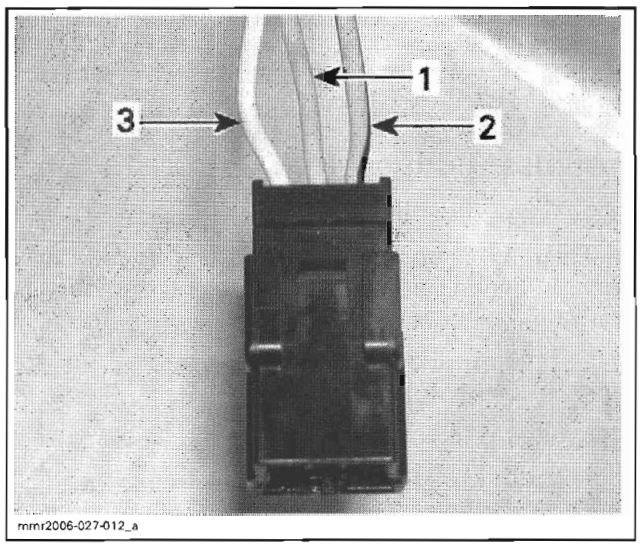


Unscrew taillight lens and pull the wires out.

Installation

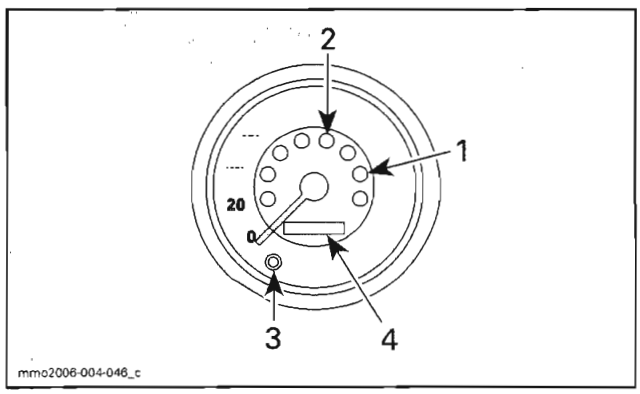
The installation is the reverse of the removal procedure.

Reconnect wires as follows.

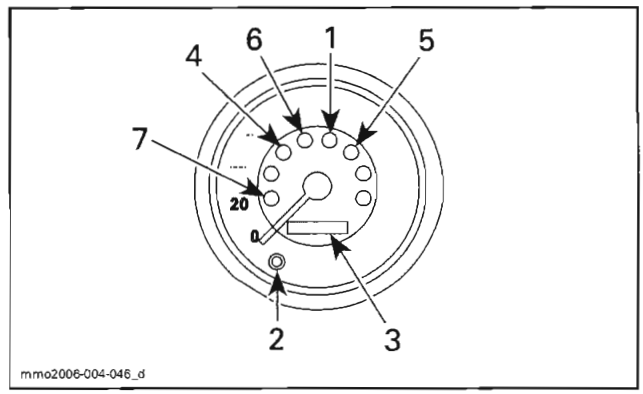


1. YELLOW/BLACK
2. YELLOW
3. WHITE

SPEEDOMETER (if so equipped)



300F AND 550F MODELS
1. Reverse (RER) pilot lamp
2. High beam pilot lamp
3. Mode button
4. Multifunction display



V800 MODELS
1. High beam pilot lamp
2. Mode button
3. Multifunction display
4. Engine oil pressure pilot lamp
5. Low battery voltage pilot lamp
6. Engine overheat pilot lamp
7. Check engine pilot lamp

Speedometer Overview

Unit Selection (MPH vs km/h)

The speedometer is factory preset in miles but it is possible to change it to kilometer reading, refer to the following procedure.

NOTE: Speedometer, odometer and trip meter will have their units (kilometer or miles) changed all together.

Stop engine.

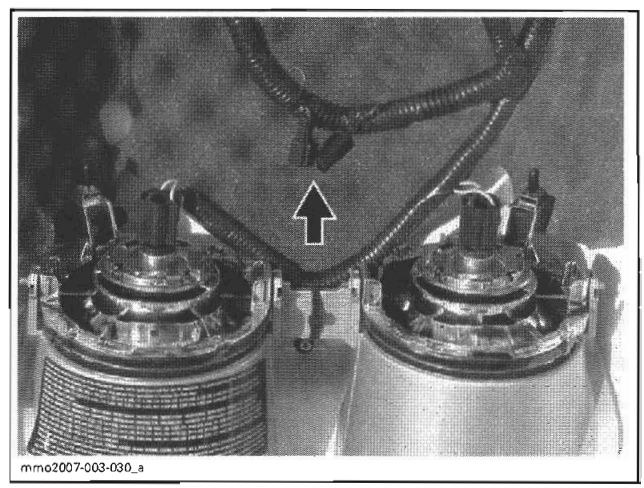
Open LH and RH side panels.

Unplug hood harness.

Open hood.

Underneath hood, look for:

- 1 circuit male connector housing with BLACK/GREY wire
- 1 circuit female connector housing with YELLOW/BLACK wire.



CONNECTOR LOCATION

Plug connectors together to change units from miles to kilometers.

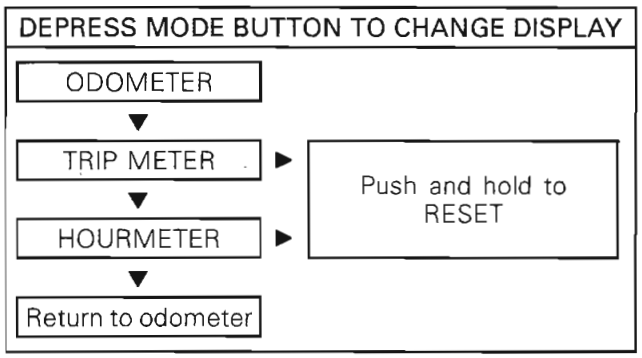
Unplug to return to miles reading.

Mode Button

Depress mode button to change multifunction display.

Multifunction Display

NOTE: Each time engine is started, display shows odometer.



Speedometer Pinout

300F and 550F Models

FUNCTION	PIN
Power 12 Vac (+)	8
Ground	10, 11, 23
RER signal	22
Speed sensor supply (+)	7
Speed sensor signal	6
MPH/Km/h setting	5
Tachometer RPM signal	4
Power supply to tachometer	9
Tachometer control wires	18, 19, 20, 21
HI beam signal	15
Not used	16

V800 Models

FUNCTION	PIN
Power 12 Vdc (+)	8
Ground	11
Speed sensor signal	6
MPH/Km/h setting	5
Tachometer RPM signal	7
Tachometer control wires	18, 19, 20, 21
HI beam signal	15
EMS signal	1
Engine overheat signal	2
Engine oil pressure signal	14
Low battery voltage signal	12

Troubleshooting

SCALE Appears in Multifunction Display

The display selector button is stuck in the down position or was depressed while the engine was started.

Stop engine and press/release button several times to unstick it.

Start engine to retry.

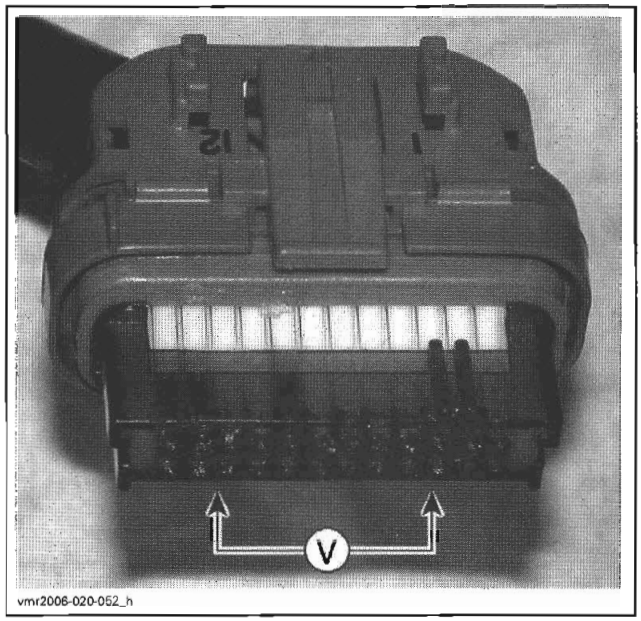
NO LIGHTS in Speedometer and Needle Does Not Move

OBSERVATION	POSSIBLE CAUSE
Speedometer does not turn on	Defective lighting generator coil
	Wiring/connectors
	Defective speedometer

Disconnect speedometer connector.

Start engine and read voltage from vehicle harness as follows.

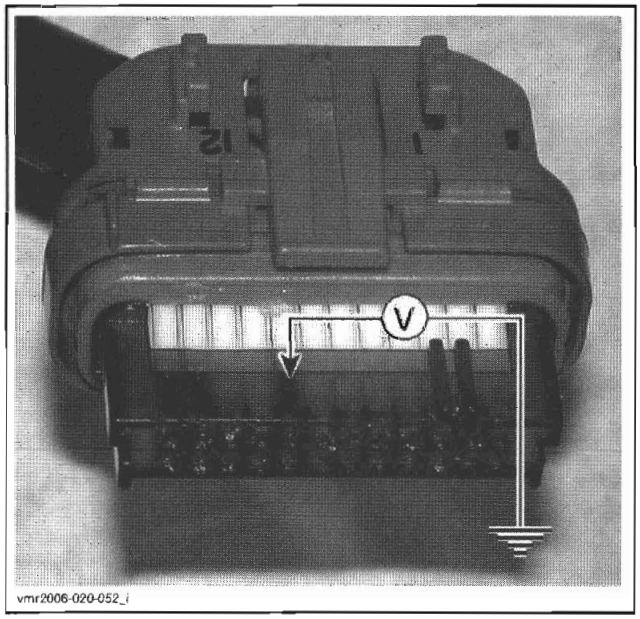
SPEEDOMETER CONNECTOR (harness side)		VOLTAGE
Pin 8	Pin 11	**300F/550F:** 13.8 Vac **V800:** Battery voltage (Vdc)



If there is voltage, replace speedometer.

If there is no voltage, recheck voltage as follows.

SPEEDOMETER CONNECTOR (harness side)		VOLTAGE
Pin 8	Engine ground	**300F/550F:** 13.8 Vac **V800:** Battery voltage (Vdc)



If voltage is not good, check/repair wiring/or connectors from magneto. If good, check lighting generator coil.

If voltage is good, check ground circuit (pin 11) wiring/connectors.

LIGHTS ARE LIT in Speedometer and Needle Does Not Move

Check speed sensor. See below.

If speed sensor tests good, replace speedometer.

Reconnect connector.

Calibration of a New Speedometer

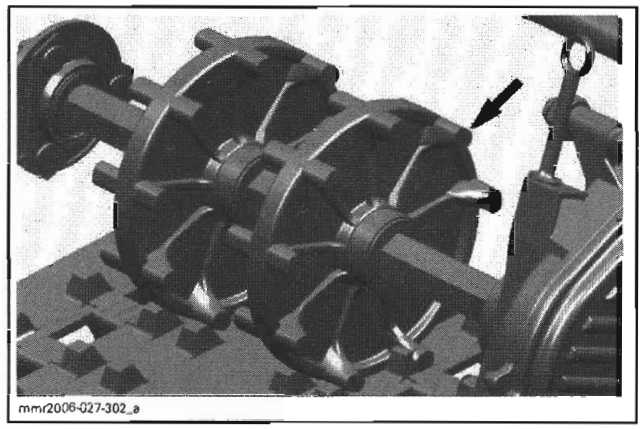
When installing a new speedometer, it is necessary to set it in accordance with the drive axle sprocket used on the vehicle.

CAUTION: If the following operation is not done right the first time, it cannot be repeated. Speedometer calibration can be set only once. Learn the procedure thoroughly before doing it.

Proceed as follows:

IMPORTANT: The following illustrations are examples only. Enter the exact value required for the specific model you are working on.

- First count number of teeth on sprocket and note it.



- Ensure speedometer connector is installed.

300F and 550F Models

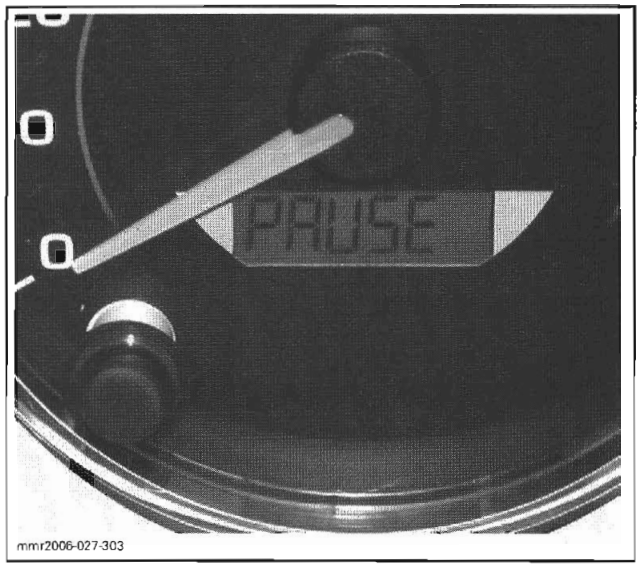
- Start engine.

V800 Models

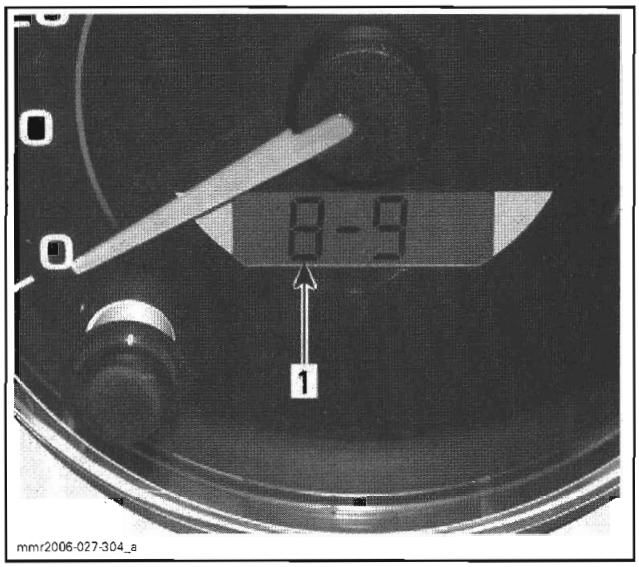
- Install the supply harness (P/N 529 035 869) (refer to *LIGHTING AND ACCESSORIES SYSTEM TESTING* for detailed instructions) to continuously feed the electrical system.

All Models

- Look at speedometer ► Speedometer lights flash and PAUSE appears.

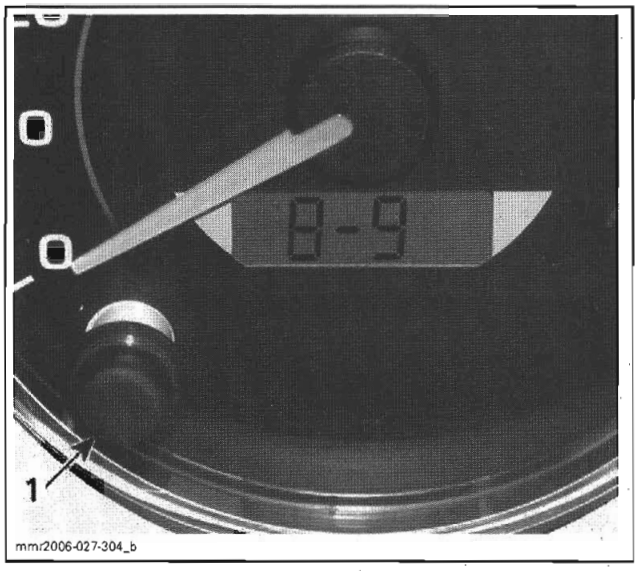


– Available values will scroll automatically. ► 1st digit indicates the number of teeth on sprocket.



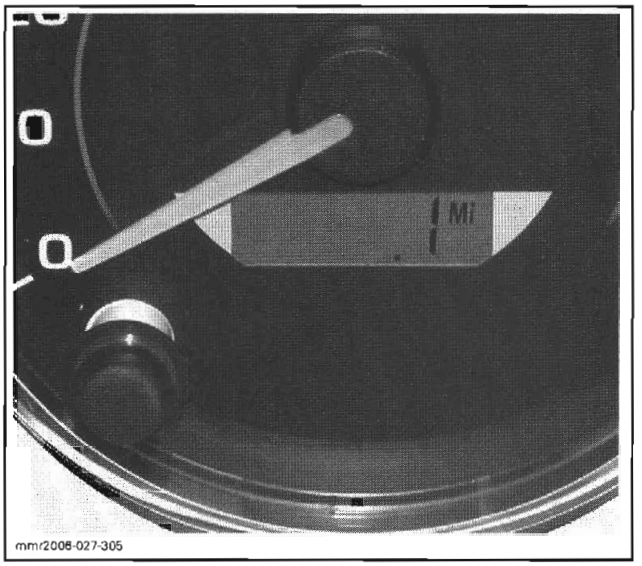
1. Number of teeth on sprocket

– When the proper number is displayed. ► Press MODE button and HOLD 5 seconds to set that value.



1. HOLD 5 seconds to set

– Lights flashing will stop. ► Speedometer now begins to operate normally.



– Procedure is over.
– Stop engine.

NOTE: At some point, 0-0 will be displayed. Do not use, it is intended for manufacturer only. If inadvertently used, speedometer will exit programming mode without causing problems. Restart procedure.

Speedometer Calibration Display

To know the actual calibration of a speedometer, proceed as follows.

– Ensure speedometer connector is installed.

300F and 550F Models

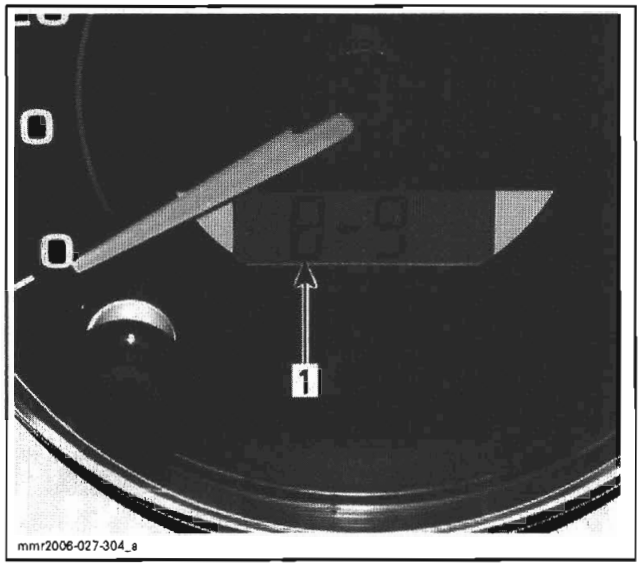
– Start engine.

V800 Models

– Install the supply harness (P/N 529 035 869) (refer to *LIGHTING AND ACCESSORIES SYSTEM TESTING* for detailed instructions) to continuously feed the electrical system.

All Models

– Look at speedometer. ▶ The calibration will be visible a brief moment.



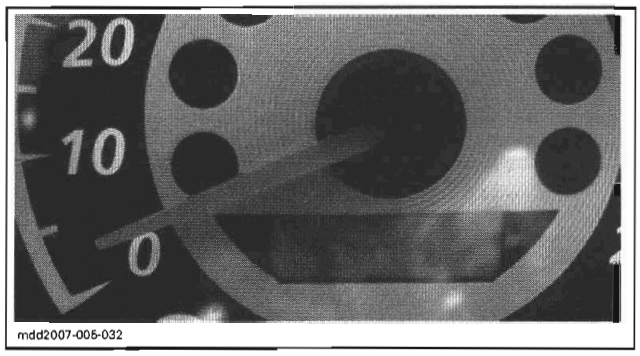
1. Number of teeth on sprocket

– Stop engine.

NOTE: Speedometer calibration cannot be set to a different value.

Zeroing Needle on Electronic Speedometer or Tachometer

If needle is not pointing to zero on any electronic speedometer or tachometer, adjust it as follows.



MISALIGNED NEEDLE

IMPORTANT: First ensure gauges are OFF.

300F and 550F Models

Push and hold MODE button on speedometer **while** starting engine.

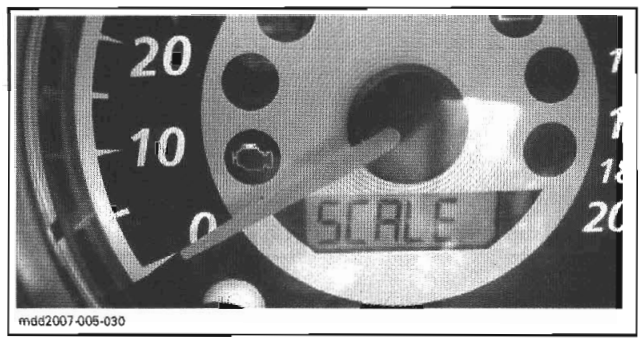
V800 Models

Push and hold MODE button on speedometer **while** installing supply harness (P/N 529 035 869).

Push and hold MODE button on speedometer **while** pressing start/RER button.

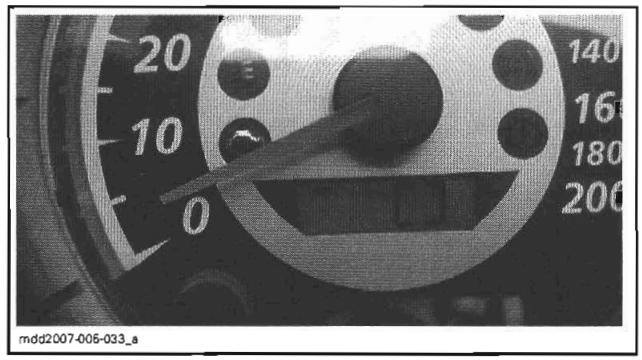
All Models

In a few seconds "SCALE" should be displayed on gauge.

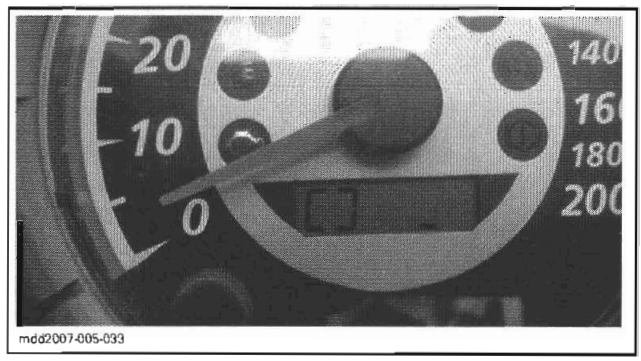


Release mode button then, SCALE will disappear.

A set of brackets will be displayed along with a dash going in a circle clockwise then counterclockwise.

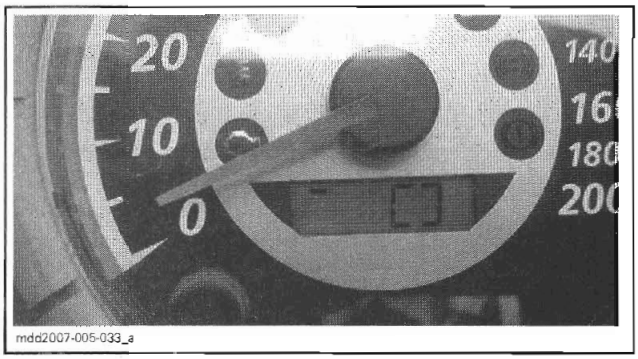


Then, the brackets and moving dash will revert their position. The moving dash will go clockwise then counterclockwise.



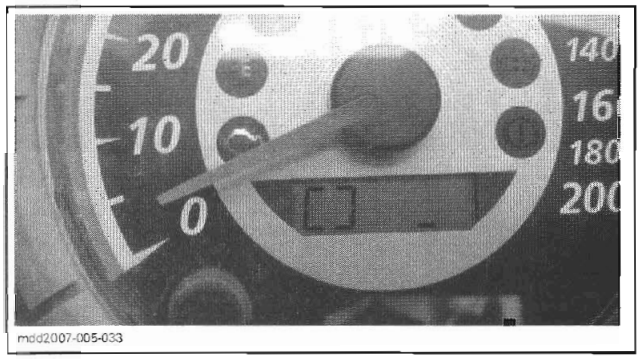
This cycle will repeat.

To adjust the **speedometer** needle, push MODE button while the moving dash is on left side.



TO ADJUST SPEEDOMETER NEEDLE

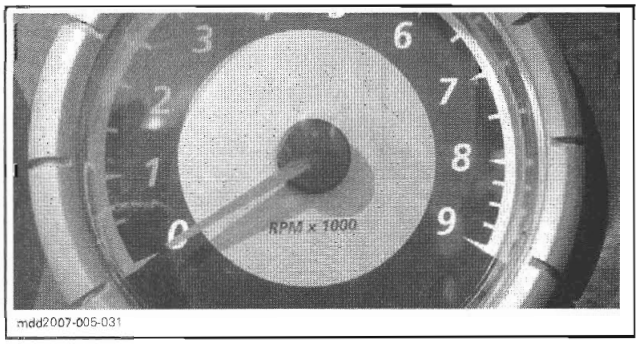
To adjust the **tachometer** needle, push MODE button while the moving dash is on right side.



TO ADJUST TACHOMETER NEEDLE

To move needle **clockwise**, wait until the moving dash is going clockwise then push and hold mode button until needle is properly aligned.

To move needle **counterclockwise**, wait until the moving dash is going counterclockwise then push and hold mode button until needle is properly aligned.



PROPERLY ALIGNED NEEDLE

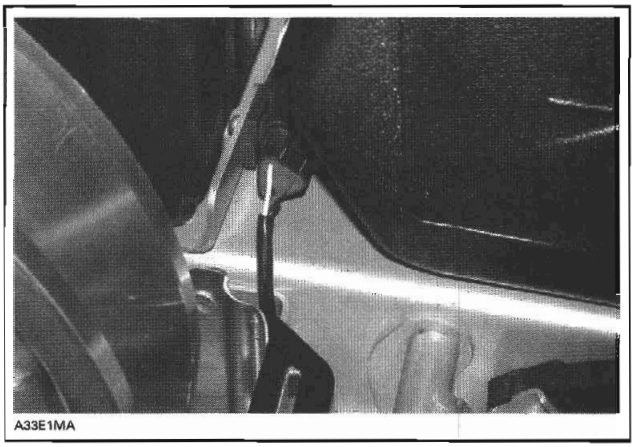
Release mode button. After a few seconds, gauge will return to normal operation. The new needle position is now set.

Remove supply harness.

SPEED SENSOR

Static Test

Locate speed sensor.



TYPICAL

300F and 550F Models

Start engine for the procedure.

⚠ WARNING

Be very careful when working besides the rotating driven pulley.

V800 Models

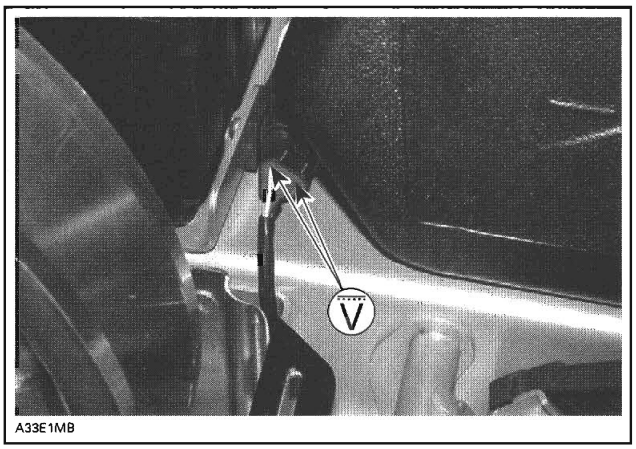
Install the supply harness (P/N 529 035 869) (refer to *LIGHTING AND ACCESSORIES SYSTEM TESTING* for detailed instructions) to continuously feed the electrical system.

All Models

Use a multimeter and set it to Vdc.

Back-probe connector and read voltage as follows.

MODEL	SPEED SENSOR CONNECTOR (sensor side)		VOLTAGE
All	RED	BLACK	Battery voltage



If voltage is not good, check fuses, relay (if applicable) and wiring/connectors.

NOTE: On 300F and 550F models, the speedometer receives AC from magneto, converts it to DC and then supplies Vdc to the speed sensor. When the related wiring tests good and there is still no voltage to speed sensor, try a new speedometer.

If voltage is good, do the following test.

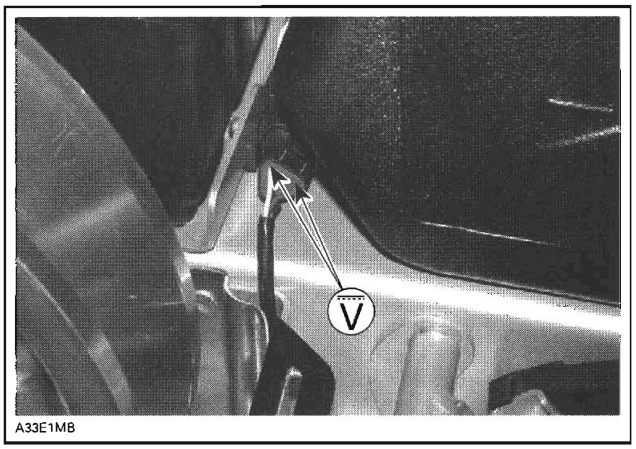
Lift rear of vehicle and safely block.

⚠ WARNING

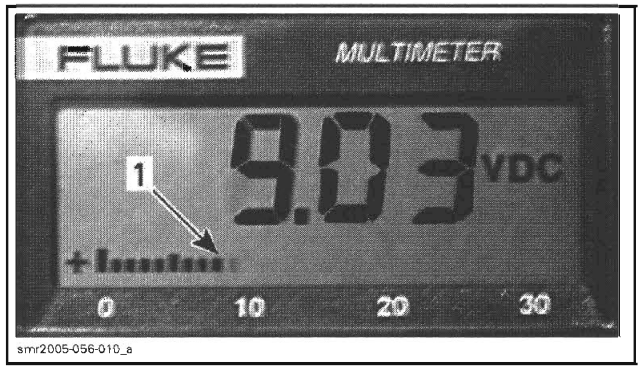
Before starting engine, ensure track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure no one is standing in close proximity to the vehicle. Never rotate at high speed.

Start engine and slightly accelerate engine so that track rotates SLOWLY. Back-probe connector and read voltage.

SPEED SENSOR CONNECTOR (harness side)		VOLTAGE
RED	WHITE	Alternate reading of: battery voltage, approx. 0 Vdc, battery voltage and so on



NOTE: Since we measure pulsating voltage, the numeric display will continuously change. The analog display may be easier to follow.



1. Analog display

If voltage is appropriate, check/repair wiring/connector between sensor and Speedometer. If it is good, try a new speedometer.

If voltage is wrong, try a new sensor.

TACHOMETER (if so equipped)

Tachometer Pinout

300F and 550F Models

FUNCTION	PIN
Power 12 Vdc (+) from speedometer	9
Ground	10
Control wires from speedometer	18, 19, 20, 21

V800 Models

FUNCTION	PIN
Power 12 Vdc (+)	9
Ground	10
Control wires from speedometer	18, 19, 20, 21

Test

No Light but the Needle Moves

300F and 550F Models

The tachometer power is supplied from the speedometer. The speedometer receives AC from magneto, converts it to DC and then supplies Vdc to the tachometer. Check the voltage between pins 9 and 10 of tachometer.

The obtained value should be 12 Vdc. If not, check connections and wiring harness. Also refer to *POWER DISTRIBUTION*.

When the related wiring tests good and there is still no voltage to tachometer, try a new speedometer.

V800 Models

The tachometer power is supplied through the main wiring harness. Check the voltage between pins 9 and 10 of tachometer.

The obtained value should be 12 Vdc. Otherwise, check connections and wiring harness. Also refer to *POWER DISTRIBUTION*.

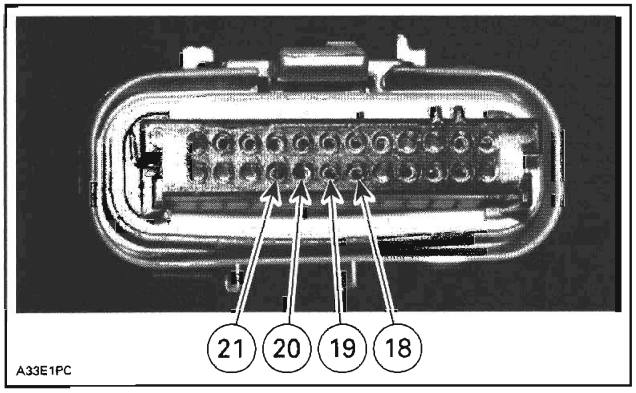
All Models

If the voltage is good, replace the tachometer.

The Needle Does not Move

No lights in tachometer, see above

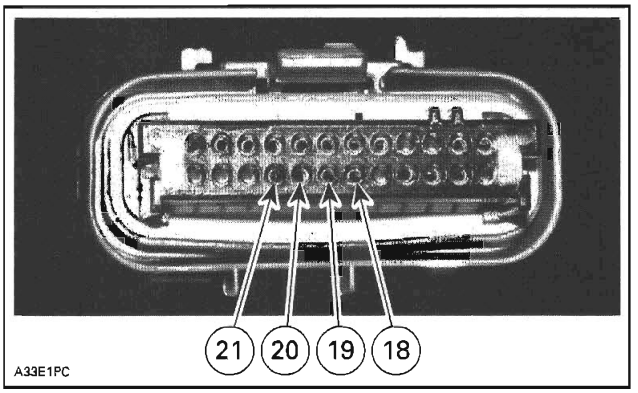
With lights in tachometer, check wire connections on pin 18, 19, 20 and 21.



If they test good, try a new tachometer.

Crazy Needle

Check wire connections on pin 18, 19, 20 and 21.



If they test good, try a new tachometer.

Zeroing Needle on Electronic Tachometer

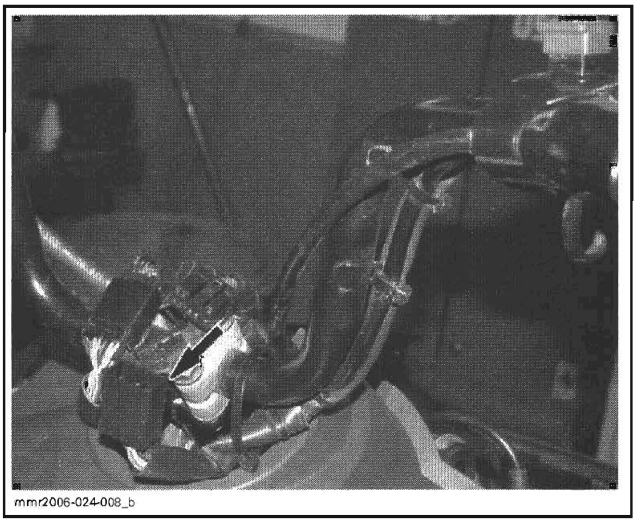
Refer to procedure in *SPEEDOMETER* above.

HEATING ELEMENTS

NOTE: All measurements must be performed at 21°C (70°F).

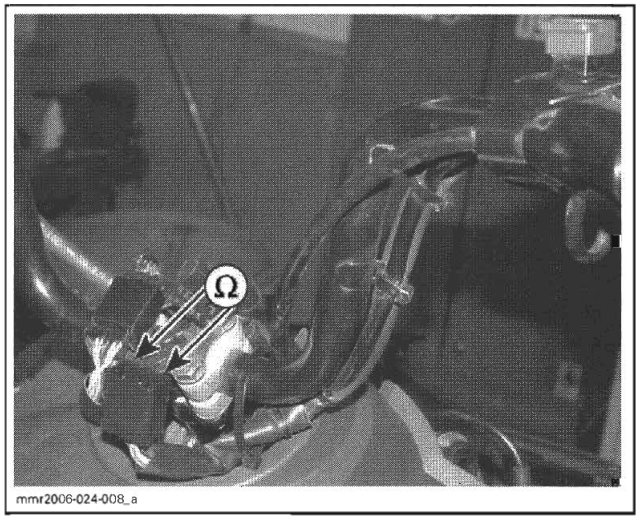
Throttle Lever

Unplug connector under steering cover.



Check heating element as follows.

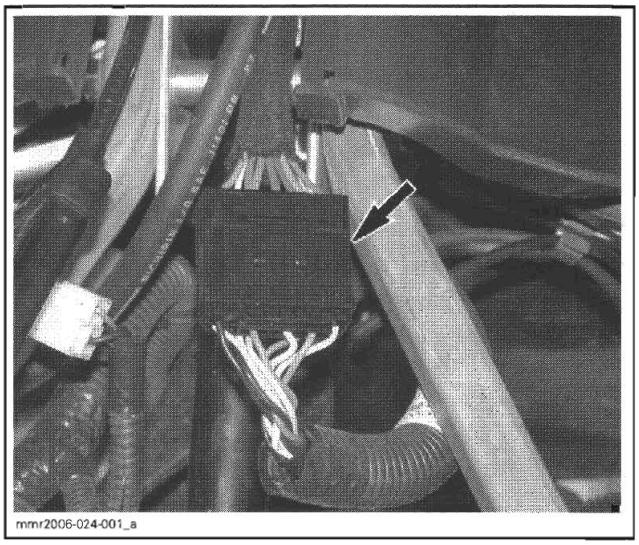
INTENSITY	ELEMENT TERMINAL		RESISTANCE @ 20°C (68°F)
LOW	BROWN/ YELLOW	YELLOW	18.5 Ω
HIGH	BROWN		4.2 Ω


mmr2006-024-008_a

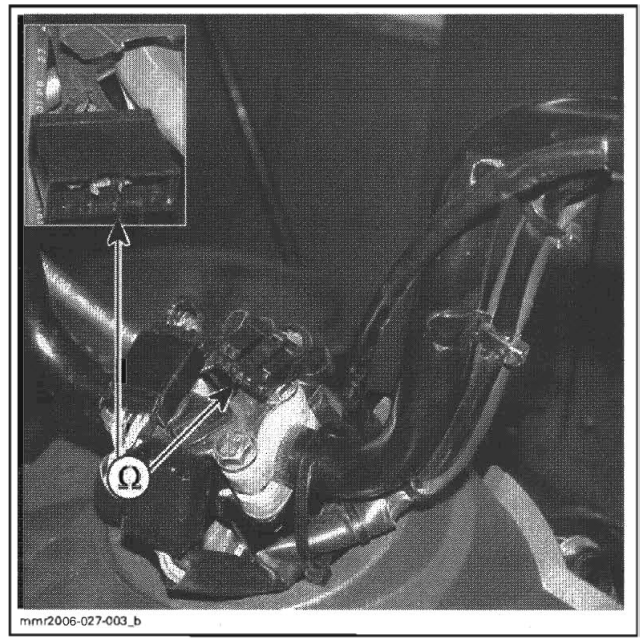
If readings are out of specifications, check/repair wiring and if good, replace throttle lever.

If readings are within specifications, check switch continuity as follows.

Disconnect steering connector.


mmr2006-024-001_a

SWITCH POSITION	LARGE CONNECTOR	SMALL CONNECTOR	RESISTANCE @ 20°C (68°F)
LOW	RED/ YELLOW	BROWN/ YELLOW	0.5 Ω max.
HIGH		BROWN	


mmr2006-027-003_b

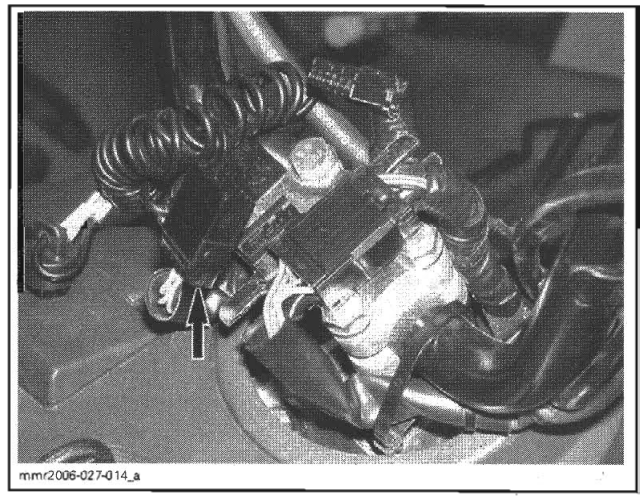
If switch is out of specifications, replace switch.

If switch test good, refer to *POWER DISTRIBUTION.*

Reconnect connectors.

Handlebar Grip

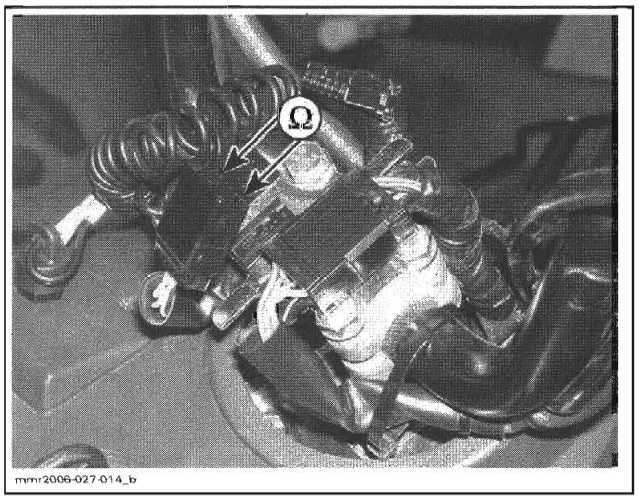
Unplug connector under steering cover.


mmr2006-027-014_a

Check heating element as follows.

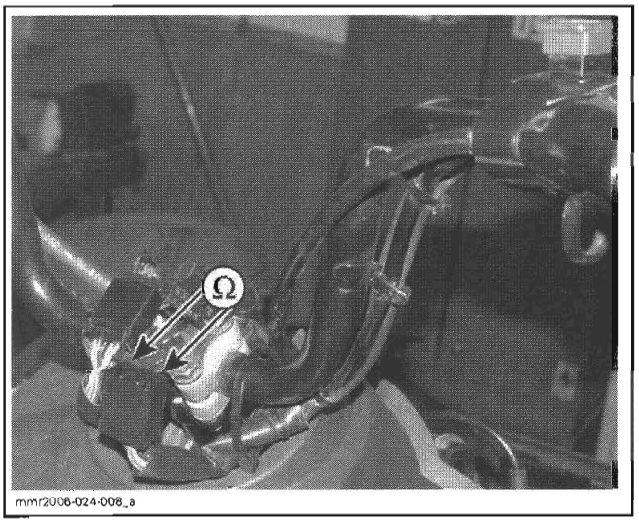
LH Heating Grip

INTENSITY	WIRE OF ELEMENT CONNECTOR		RESISTANCE @ 20°C (68°F)
LOW	ORANGE/ VIOLET	BLACK	15.2 Ω
HIGH	ORANGE	BLACK	7.6 Ω



RH Heating Grip

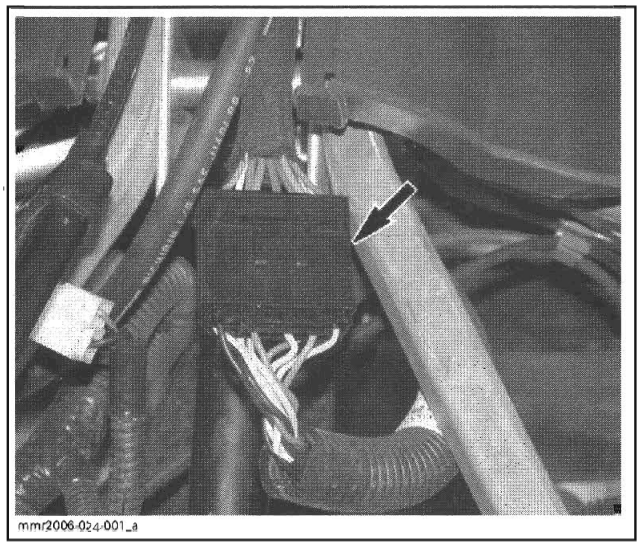
INTENSITY	WIRE OF ELEMENT CONNECTOR		RESISTANCE @ 20°C (68°F)
LOW	ORANGE/ VIOLET	BLACK	15.2 Ω
HIGH	ORANGE	BLACK	7.6 Ω



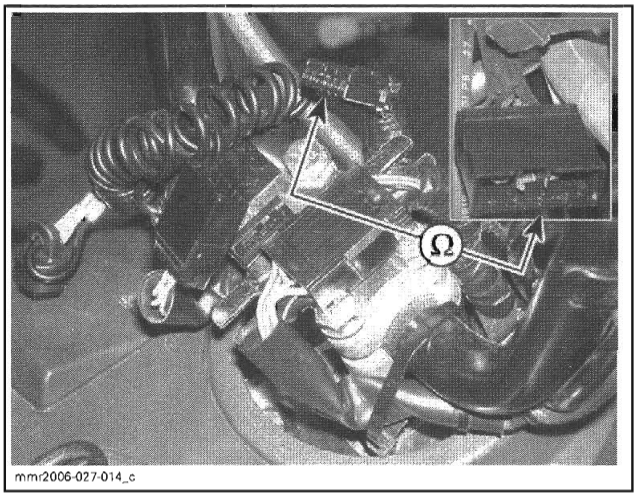
If readings are out of specifications, check/repair wiring going to heating grip and if good, replace handlebar grip.

If readings are within specifications, check switch continuity as follows.

Disconnect steering connector.



SWITCH POSITION	WIRE IN LARGE CONNECTOR	PIN IN SMALL CONNECTOR	RESISTANCE @ 20°C (68°F)
LOW	RED/ YELLOW	ORANGE/ VIOLET	0.5 Ω max.
HIGH		ORANGE	



If switch is out of specifications, check wiring/ connectors going to switch. If they are good, replace switch.

If switch test good, refer to *POWER DISTRIBUTION* in this section.

Reconnect connectors.

BEEPER

Test

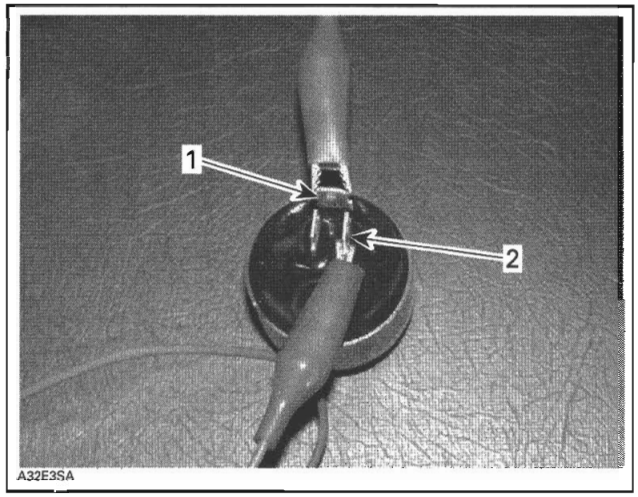
Unplug connector from beeper.

Using jumper wires, connect battery positive post to beeper positive tab.

NOTE: On manual start models, use any external 12 V battery.

Connect battery negative post to beeper negative tab.

CAUTION: To avoid beeper damage, ensure that polarity is respected.



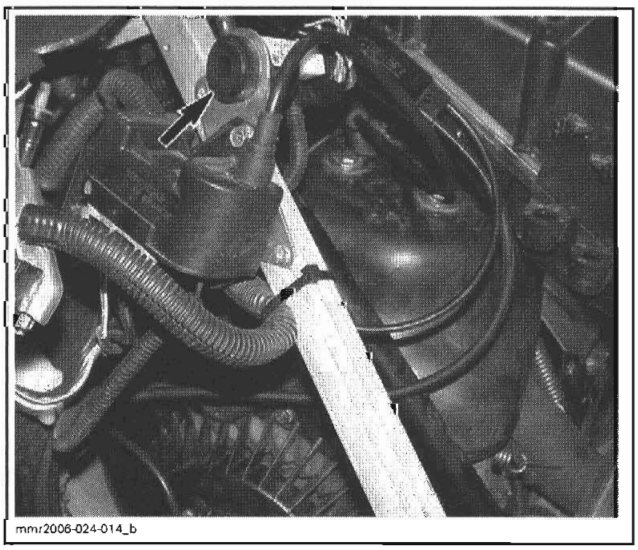
TYPICAL — 12-VOLT BATTERY PLUGGED TO BEEPER
1. Beeper positive tab
2. Beeper negative tab

A continuous sound should be heard. Otherwise, replace beeper.

If the beeper is good, check accessory fuse, connectors/wiring harness (from MPEM and also beeper ground wires). If everything tests good, MPEM can be suspected.

Removal

The beeper is located near the ignition coil.



Unplug connector from beeper.

Unscrew retaining ring then remove beeper.

Installation

To install beeper, reverse the removal procedure.

PILOT LAMPS (models without speedometer)

Identification

High Beam

This pilot lamp will light up when headlamp is on HIGH beam.

300F and 550F Models

Reverse (RER)

This pilot lamp will light up when reverse is selected.

V800 Models

Engine Oil Pressure

This pilot lamp will light up when engine oil pressure is too low. Stop vehicle in a safe place then, check oil level and replenish as described in *ENGINE OIL LEVEL*.

Restart engine, oil pilot lamp must turn off after few seconds. If oil pilot lamp still lights up, inspect lubrication system.

Engine Overheat

If this lamp blinks (1 short and 1 long beep will also be heard), the engine is overheating, reduce snowmobile speed and run snowmobile in loose snow or stop engine immediately and allow engine to cool. Check cooling system.

Engine Management System (EMS)

If this lamp is blinking, it indicates that an engine fault code is present.

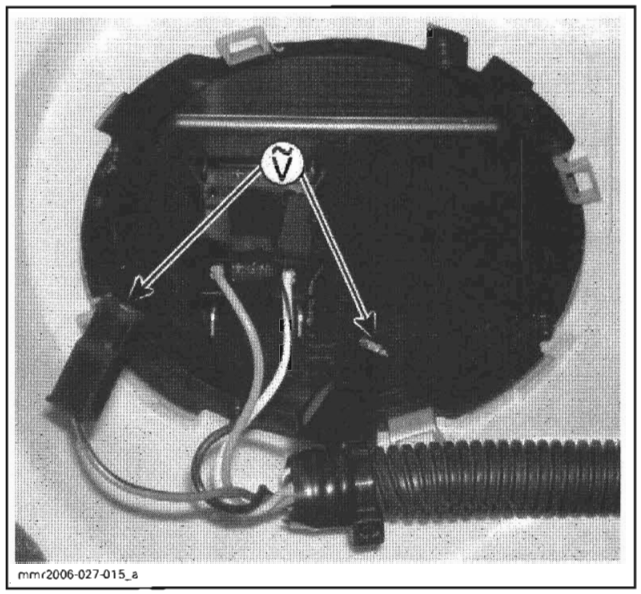
Test

Disconnect appropriate pilot lamp connectors.

NOTE: Some lamps need to be manually set so that they turn on. For example, set headlamp to high beam to supply its pilot lamp.

Start engine and rev to approximately 5000 RPM to read voltage on connectors. On V800 models turn ignition key briefly to START.

PILOT LAMP CONNECTORS	VOLTAGE
	300F/550F: 13.8 Vac **V800:** Battery voltage (Vdc)



– Voltage is good:
  • Change pilot lamp.
– No voltage:
  • Check wiring/connectors of the appropriate circuit.

12-VOLT POWER OUTLET

Test

First, try another accessory (DC current), if it does not work, check power outlet.

Remove power outlet.

Unplug the power outlet connectors.

Turn ignition key to ON. On V800 models, start engine.

Measure the voltage as follows.

MODELS	WIRES		VOLTAGE
300F/550F	RED/BLUE	BLACK	12 - 14.5 Vdc
V800	RED/YELLOW		

– No voltage:
  • Check appropriate fuse(s) and relays 1 and 2 (if applicable), connectors and wiring harness.
– Voltage is good:
  • After checking the accessories, change the visor outlet.

VISOR OUTLET (if so equipped)

Test

First, try another accessory, if it does not work, check visor outlet.

NOTE: Pay attention that 300F and 550F models supply AC while V800 models supply DC.

Unplug the visor connector.

Start engine.

Check voltage as follows.

WIRES		VOLTAGE
RED/YELLOW	BLACK	**300F/550F:** 12 - 14.5 Vac **V800:** 12 - 14.5 Vdc

– No voltage:
  • Check fuse(s) and relays 1 and 2 (if applicable), connectors and wiring harness.
– Voltage is good:
  • Replace power outlet.

DRIVE BELT

SERVICE TOOLS

Description	Part Number	Page
belt tension tester	414 348 200	450
driven pulley opening tool	529 017 200	447

APPLICATION CHART

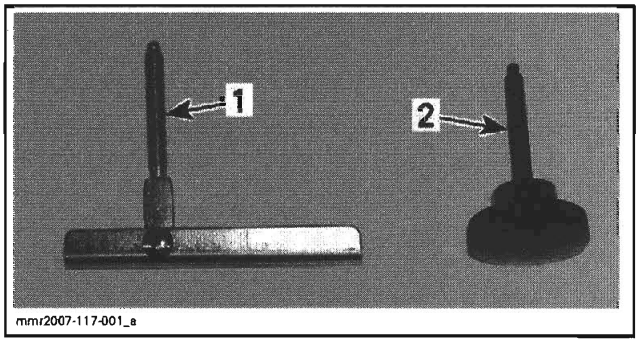
MODEL	P/N	MINIMUM WIDTH (wear limit)
300F	417 300 326	32.80 mm (1.291 in)
550F	415 060 600	32.30 mm (1.272 in)
V800	417 300 197	34.90 mm (1.374 in)

DRIVE BELT

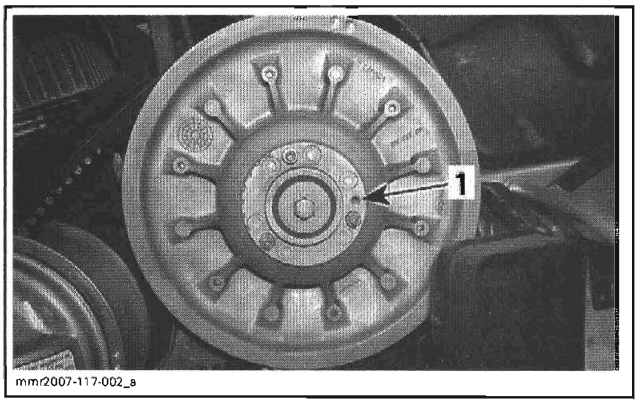
Drive Belt Removal

Open the LH side panel and remove the belt guard.

Screw the driven pulley opening tool (P/N 529 017 200) or the drive belt installer/expander (included in the tool box) in any threaded holes of driven pulley and tighten to fully open the pulley.

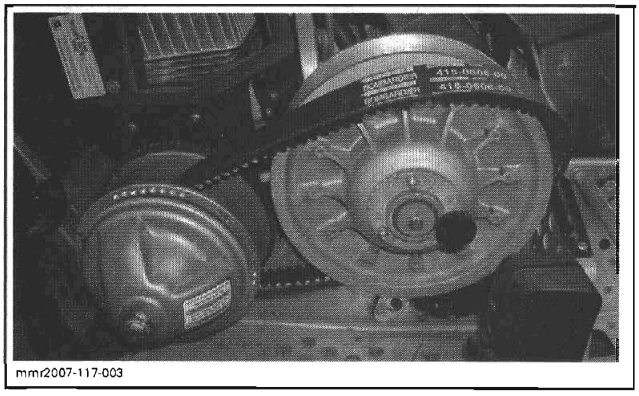


1. Drive belt installer/expander
2. Driven pulley opening tool



TYPICAL
1. Threaded hole

To remove belt, slip the belt over the top of driven pulley.



TYPICAL

Drive Belt Inspection

Inspect belt for cracks, fraying or abnormal wear (uneven wear, wear on one side, missing cogs, cracked fabric). If abnormal wear is noted, probable cause could be pulley misalignment, excessive RPM with frozen track, fast starts without warm-up period, burred or rusty sheave, oil on belt or distorted spare belt.

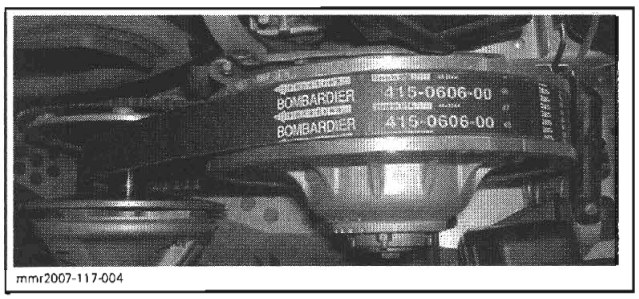
Check drive belt width. Replace the drive belt if width is under minimum recommended width (see *APPLICATION CHART* above).

Drive Belt Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

NOTE: The drive belt height and deflection must be checked each time a new drive belt is installed and should be rechecked after 50 km (30 miles).

The maximum drive belt life span is obtained when the drive belt is installed as shown. This will ensure that correct direction of rotation is respected.



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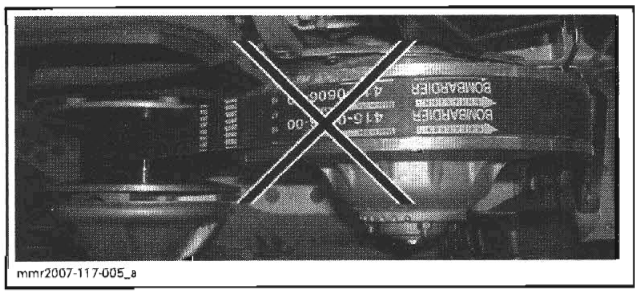
CORRECT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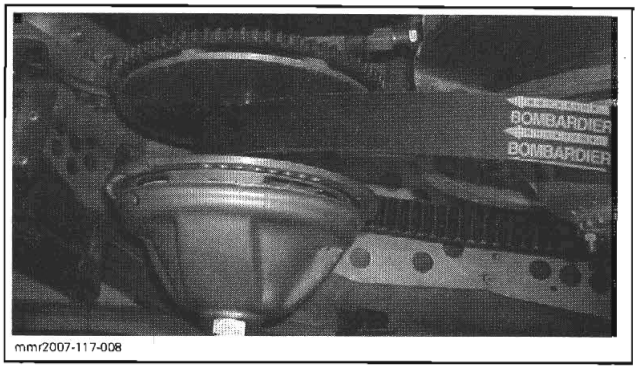
INCORRECT

CAUTION: Do not force or use tools to pry the belt in place, as this could cut or break the cords in the belt.

Install the drive belt between drive pulley sheaves.



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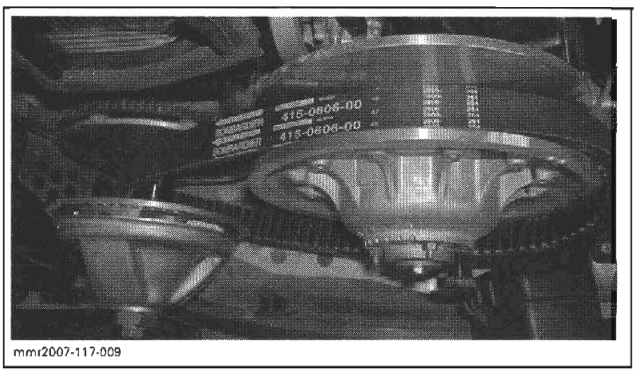
TYPICAL

Insert, by the top, the belt between driven pulley sheaves. Finish with the bottom.



mmr2007-117-009

TYPICAL

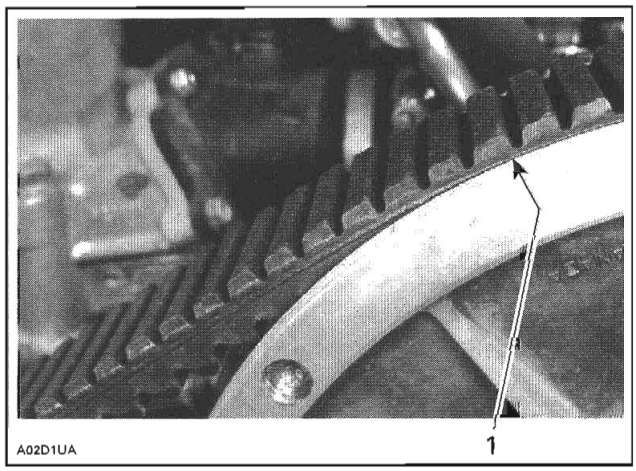
Adjust belt then install belt guard and close LH side panel.

Drive Belt Height Adjustment

Before checking the belt height, ensure that a good-condition proper belt (refer to the *APPLICATION CHART*) is installed.

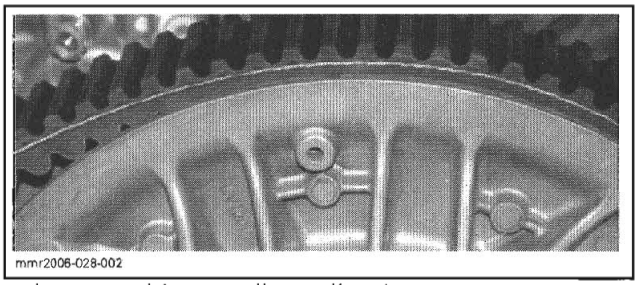
Check pulley alignment. Refer to *PULLEY ALIGNMENT.*

To obtain maximum vehicle performance, the drive belt cord should be flush with driven pulley edge. Adjust as required.

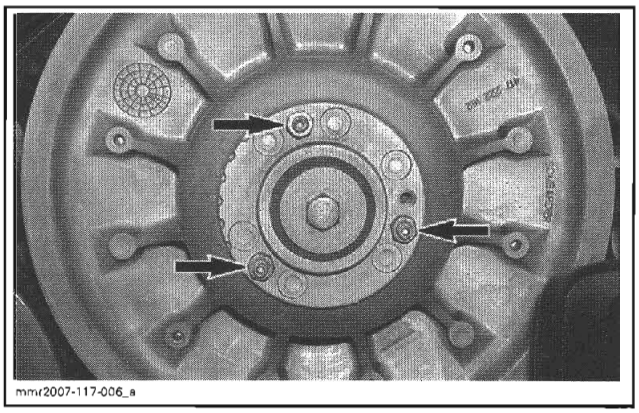


TYPICAL
1. Flush

To Lower Drive Belt In the Driven Pulley:



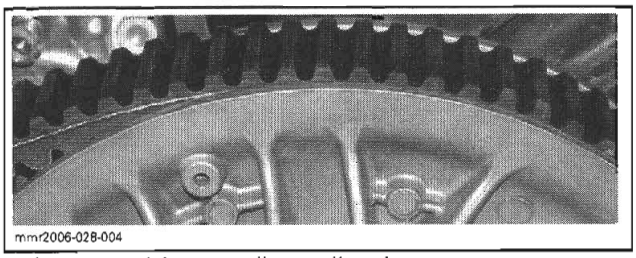
– Loosen driven pulley adjusting nuts.



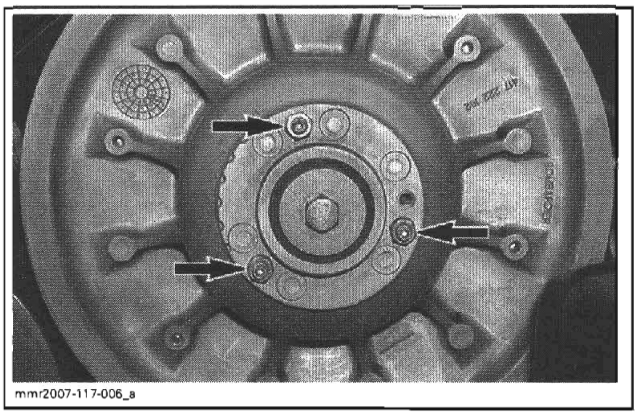
300F AND 500F MODELS

– Turn Allen screws clockwise. Turn Allen screws 1/4 turn at a time, then rotate driven pulley to allow drive belt to settle in pulley. Check height, repeat as required.
– Torque adjusting nuts to 7.5 N•m (66 lbf•**in**).

To Raise Drive Belt In the Driven Pulley:



– Loosen driven pulley adjusting nuts.



300F AND 500F MODELS

– Turn Allen screws counterclockwise. Turn Allen screws 1/4 turn at a time, then rotate driven pulley to allow drive belt to settle in pulley. Check height, repeat as required.
– Torque adjusting nuts to 10 N•m (89 lbf•**in**).

Drive Belt Deflection (reference only)

Before checking the belt deflection, ensure vehicle has the proper belt (refer to the *APPLICATION CHART*).

Adjust pulley belt height. Refer to *DRIVE BELT HEIGHT*.

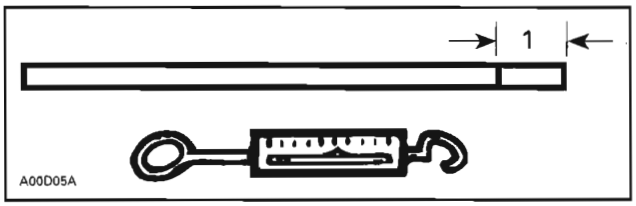
To obtain maximum vehicle performance, the belt deflection must be adjusted according to specifications shown in the accompanying chart.

MODEL	DEFLECTION† mm (in)	FORCE kg (lb)
All models	32 ± 5 (1.260 ± .197)	11.3 (25)

† FOR REFERENCE ONLY

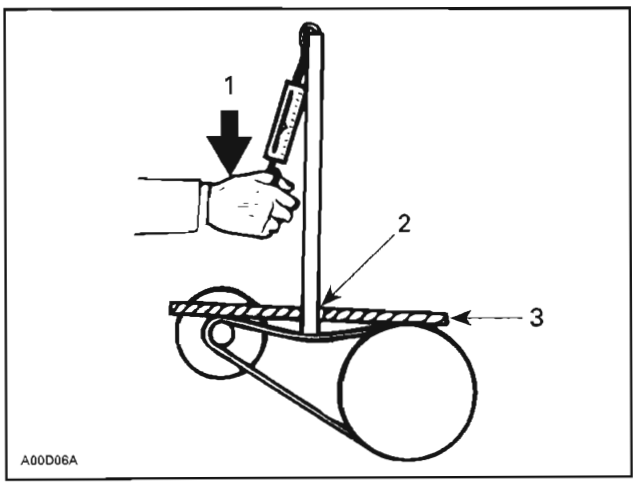
Wooden Stick and Spring Scale Method

Position a reference rule on drive belt.



1. Mark specified deflection

Using spring scale and stick, apply specified force on drive belt halfway between pulleys as shown.

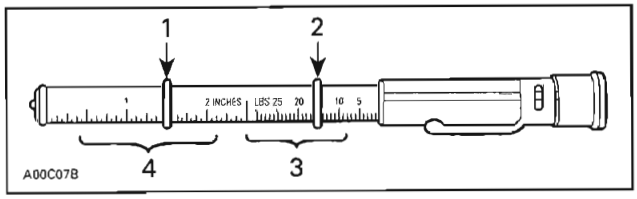


1. Force
2. Read deflection here
3. Reference rule

Belt Tension Tester Method

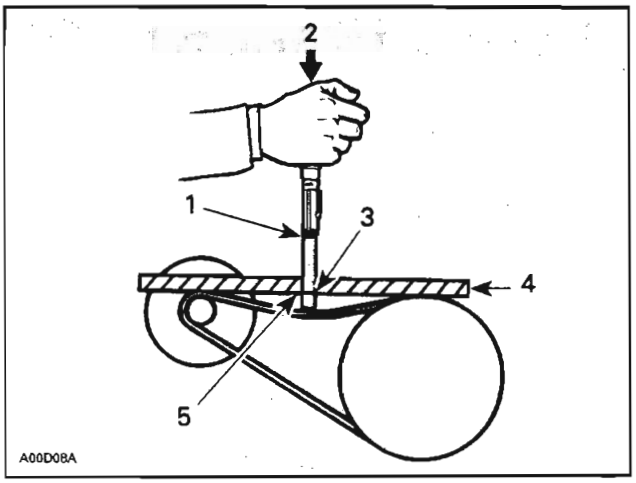
Position a reference rule on drive belt.

Use the belt tension tester (P/N 414 348 200).



1. Lower O-ring
2. Upper O-ring
3. Force (read down)
4. Deflection (read up)

1. Slide lower O-ring of deflection scale to specified measure.
2. Slide upper O-ring to 0 (zero) on the force scale.
3. Apply pressure until lower O-ring is flush with edge of rule and read force on the upper scale at top edge of O-ring.



1. Upper O-ring — force
2. Force
3. Lower O-ring — deflection
4. Reference rule
5. Deflection

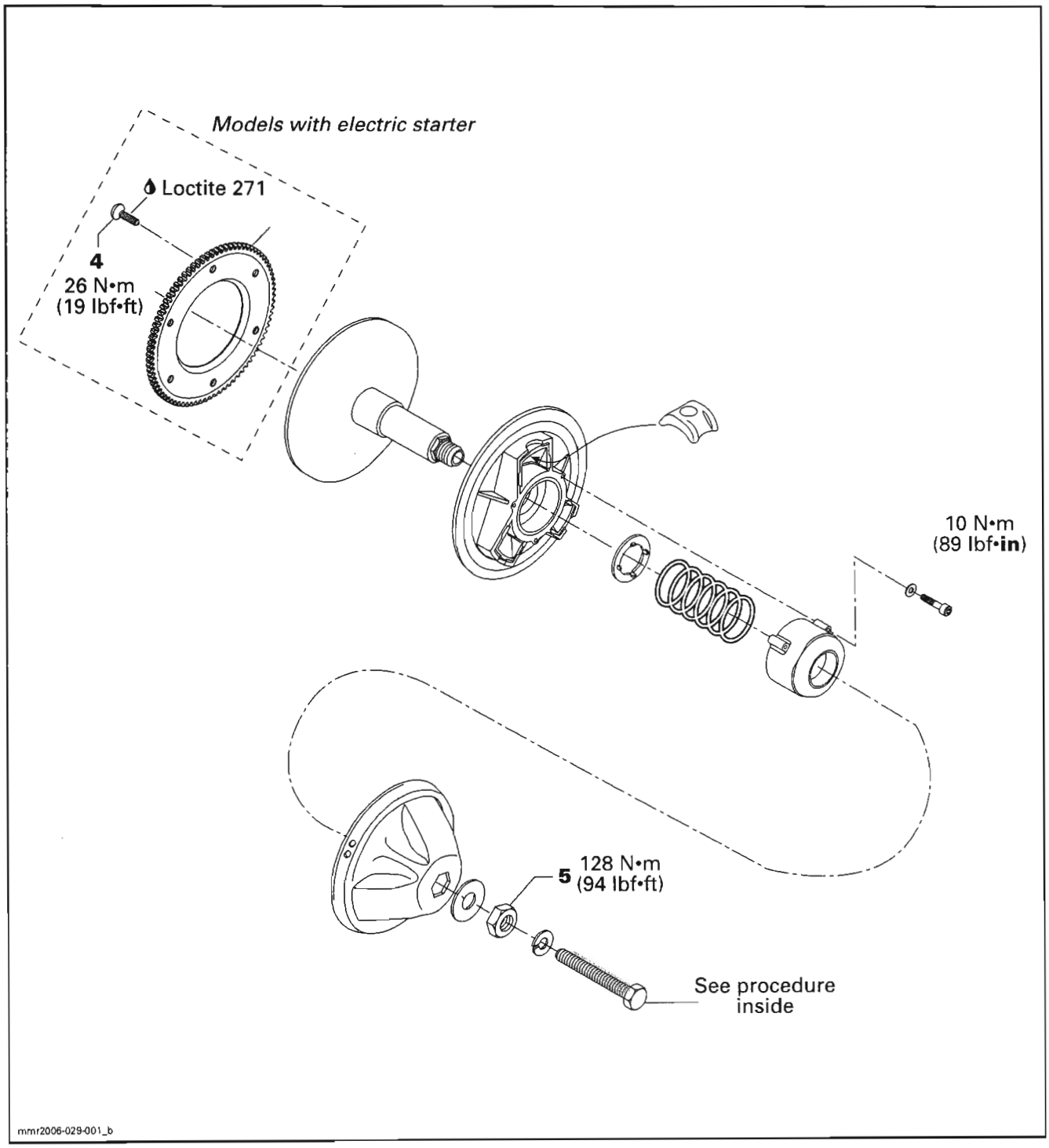
DRIVE PULLEY (BOMBARDIER LITE)

SERVICE TOOLS

Description	Part Number	Page
drive pulley holder	529 027 600	453–455
drive pulley puller	529 022 400	454–456
pulley holder	529 035 826	454–455
spring cover tool	529 027 300	456

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 271 (red)	293 800 005	457
pulley flange cleaner	413 711 809	454–455


Models with electric starter
Loctite 271
4
26 N•m
(19 lbf•ft)
10 N•m
(89 lbf•in)
5
128 N•m
(94 lbf•ft)
See procedure
inside
mmr2006-029-001_b

GENERAL

NOTE: Refer to *TECHNICAL SPECIFICATIONS* to identify the snowmobile drive pulley type.

⚠ WARNING

Never start engine when the pulley guard is removed.

Some drive pulley components (return spring, calibration disk) can be changed to improve vehicle performance in high altitude regions. A service bulletin gives information about calibration according to altitude.

CAUTION: Such modifications should only be performed by experience mechanics since they can greatly affect vehicle performance.

⚠ WARNING

Any drive pulley repairs must be performed by an authorized Ski-Doo dealer. Subcomponent installation and assembly tolerances require strict adherence to procedures detailed.

⚠ WARNING

Never use an impact wrench to remove or install the drive pulley.

⚠ WARNING

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

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

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

⚠ WARNING

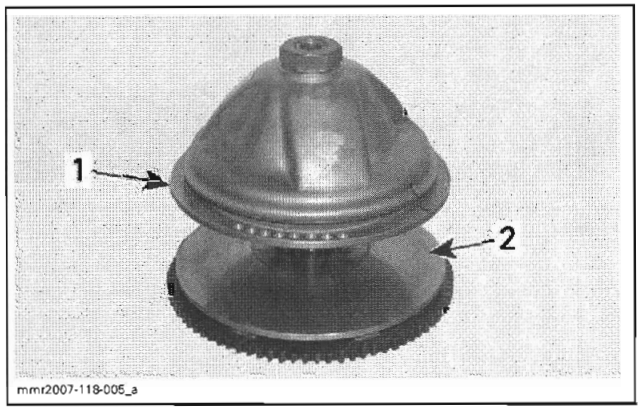
Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

PROCEDURES

FIXED AND SLIDING SHEAVES

Sheave Inspection

Check surface of sliding sheave and fixed sheave for scratches, excessive wear or other damages. Replace if necessary.



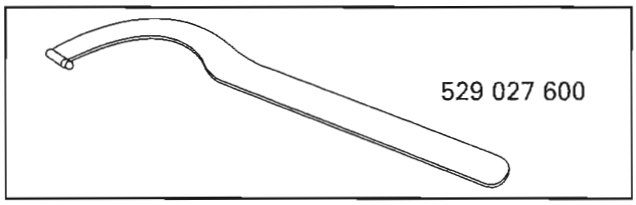
1. *Sliding sheave*
2. *Fixed sheave*

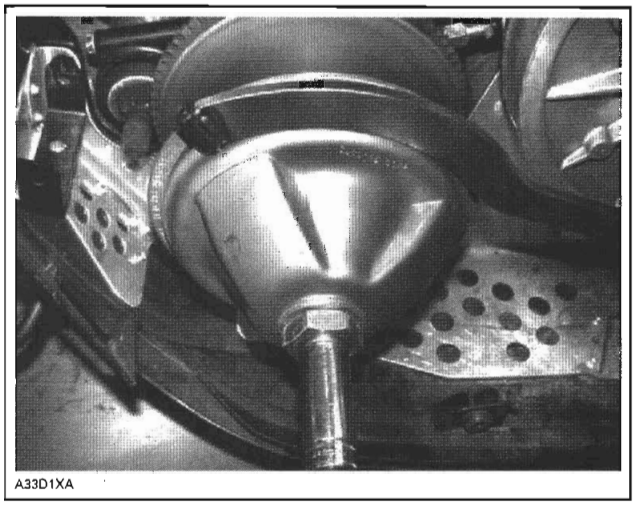
Check sliding half for excessive lateral play and fixed half shaft for scratches. Replace as required.

Sheave Removal (drive pulley)

Open the LH side panel to remove the belt guard and the drive belt.

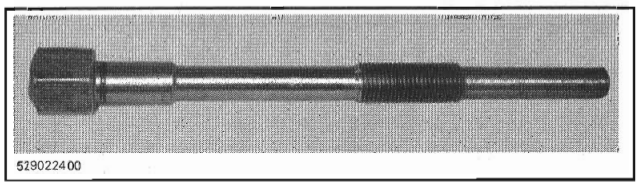
Using the drive pulley holder (P/N 529 027 600), hold the drive pulley to remove the drive pulley bolt and its lock washer.



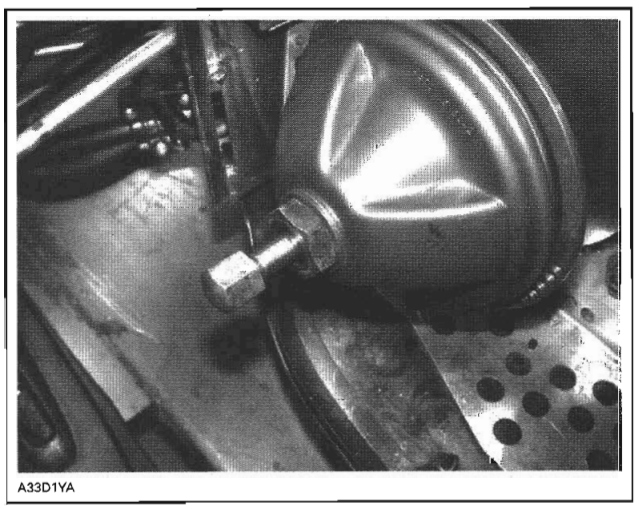

A33D1XA

TYPICAL

With the drive pulley holder still installed, install the drive pulley puller (P/N 529 022 400) through the drive pulley.


529022400

Hold the drive pulley and screw in the puller then remove drive pulley.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TYPICAL

Sheave Cleaning

Clean pulley faces and shaft with fine steel wool and clean dry cloth. Clean sliding sheave bushing with clean dry cloth.

Remove grease or oil with pulley flange cleaner (P/N 413 711 809).

Sheave Installation (drive pulley)

Clean crankshaft taper and inner pulley taper with pulley flange cleaner (P/N 413 711 809).

Install the drive pulley bolt and its lock washer.

Hold the drive pulley with the drive pulley holder (P/N 529 027 600) then torque bolt to 90 N•m (66 lbf•ft).

Install drive belt and belt guard.

Raise and block the rear of the vehicle and support it with a mechanical stand.

⚠ WARNING

Make sure the track is free of particles that could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure nobody is standing near the vehicle.

Accelerate the vehicle at low speed (maximum 30 km/h (20 MPH)) and apply the brake, repeat 5 times.

Retorque bolt to 95 N•m (70 lbf•ft).

⚠ WARNING

After 10 hours of operation the transmission system of the vehicle must be inspected to ensure the retaining screw is properly torqued.

GOVERNOR CUP

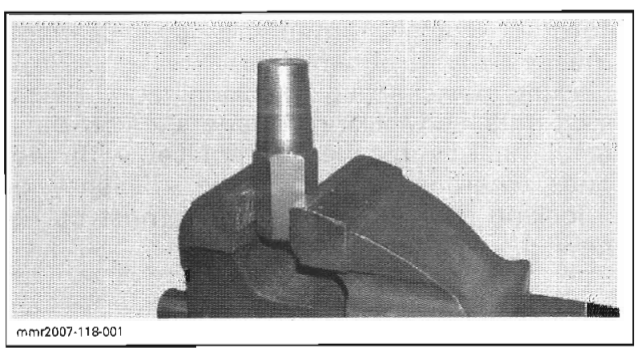
Governor Cup Removal

Remove drive pulley from engine. Refer to *FIXED AND SLIDING SHEAVES*.

Remove governor cup nut. Two methods can be used to unscrew the nut.

With pulley holder:

– Install the pulley holder (P/N 529 035 826) in a vice.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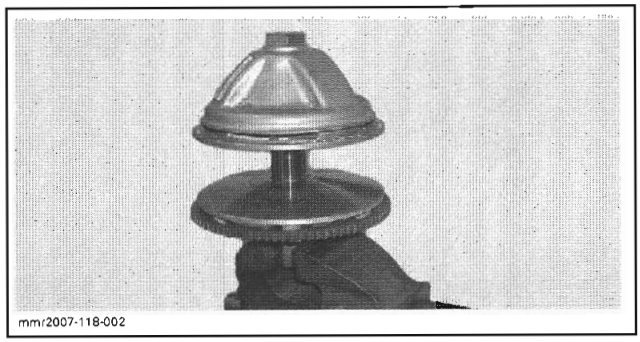
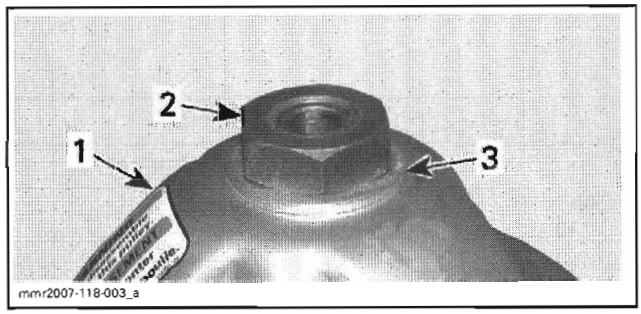
– Install the drive pulley on it.



– Unscrew nut on the top of drive pulley. Remove washer.

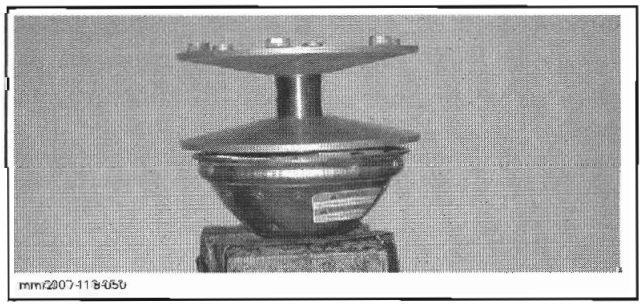


1. *Governor cup*
2. *Nut*
3. *Washer*

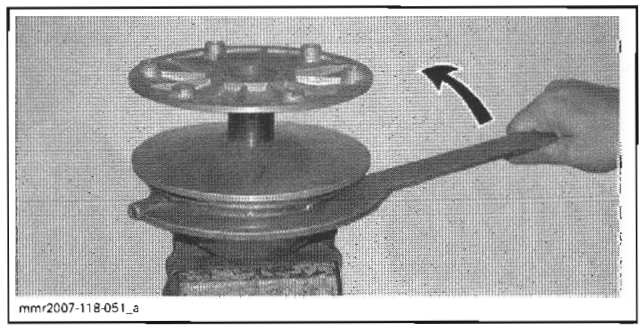
– To remove the pulley holder from fixed sheave, use the drive pulley puller (P/N 529 022 400).

Without pulley holder:

– Install the governor cup nut in a vice.



– Use the drive pulley holder (P/N 529 027 600) to loosen nut.



Remove the governor cup.

Governor Cup Inspection

Check the hexagonal opening of governor cup for excessive wear or looseness.

Governor Cup Installation

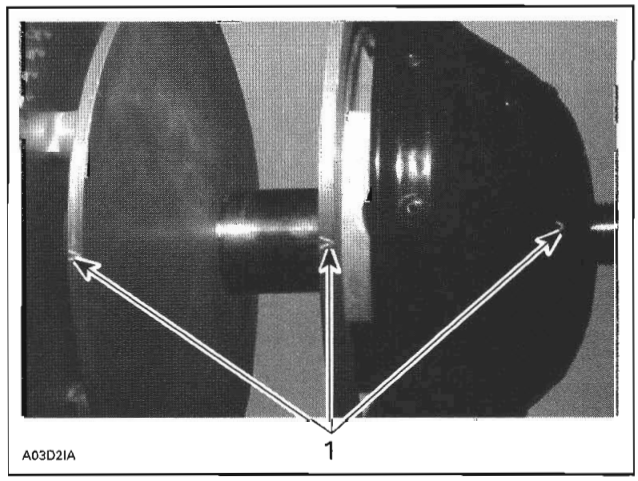
NOTE: Even if two methods can be used to unscrew the governor cup nut, the following procedure is the only one (the one and only) method to tighten governor cup nut properly.

Install the pulley holder (P/N 529 035 826) in a vice.

Clean pulley holder taper and the inner taper of fixed sheave with pulley flange cleaner (P/N 413 711 809).

Install fixed sheave on tool and sliding sheave on fixed sheave shaft.

When assembling pulleys, align marks on governor cup and pulley sheaves.



1. *Alignment marks*

Install washer and nut.

Tighten nut to 128 N•m (94 lbf•ft).

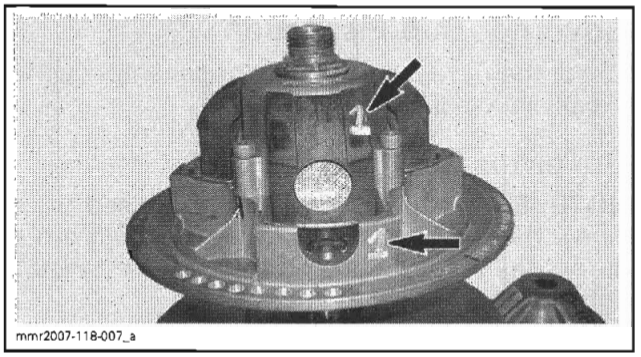
To remove the pulley holder from fixed sheave, use the drive pulley puller (P/N 529 022 400).

CENTRIFUGAL WEIGHT

Centrifugal Weight Removal

Remove governor cup, see above for procedure.

Identify blocks and their respective positive positions for reassembly.



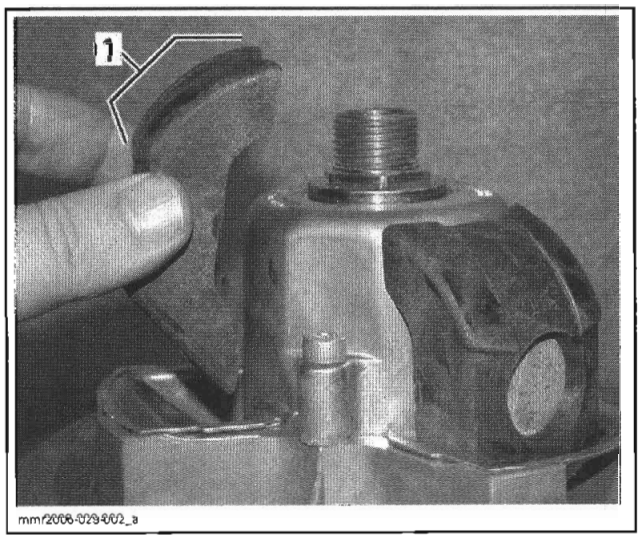
MARK EACH WITH A MARKER

Remove blocks with their calibration weights.

Centrifugal Weight Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

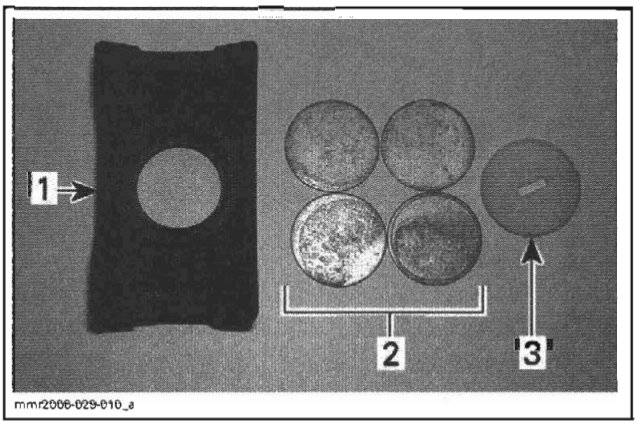
Make sure to install blocks at their original position and with their curved end toward governor cup. See following illustration.



1. *Curved end of block*

Centrifugal Weight Calibration

Use the following table to calibrate this drive clutch properly.



1. *Block*
2. *Weights*
3. *Cap*

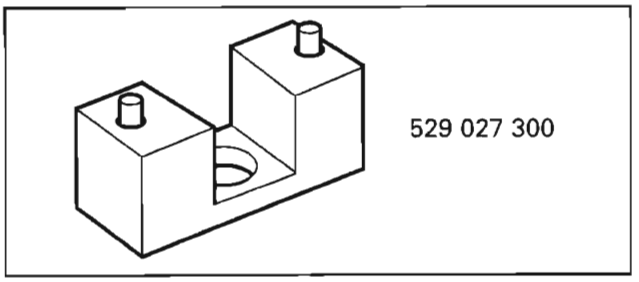
FACTORY CALIBRATION			
ENGINE TYPE	CALIBRATION WEIGHT		
	WASHERS BY BLOCK	WASHER PART NUMBER	WEIGHT PER WASHER
300F	5	417 114 400	3.4 gr
550F	1	417 120 400	21 gr
	3	417 114 400	3.4 gr

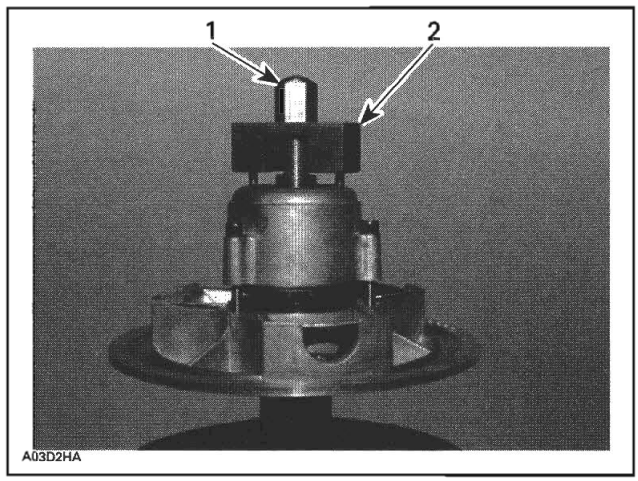
SPRING

Spring Removal

Remove governor cup and centrifugal weights.

Install the spring cover tool (P/N 529 027 300) with the drive pulley puller (P/N 529 022 400) on spring cover.





1. Drive pulley puller tool
2. Spring cover tool

Screw puller (hand tight) to hold spring cover and remove screws holding spring cover.

Slowly unscrew puller to release spring pressure.

Remove spring cover, spring and spring seat.

Spring Installation

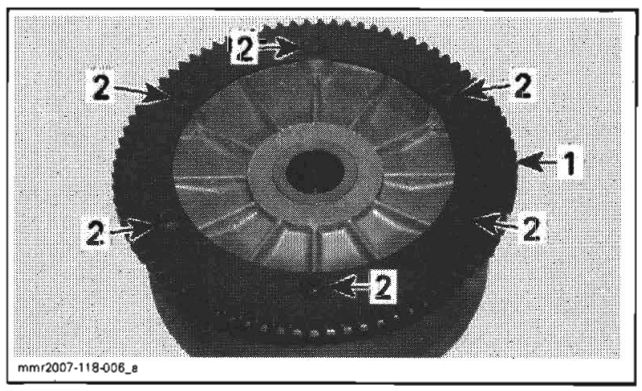
Install spring seat then the spring and its cover.

RING GEAR

Ring Gear Removal

Remove drive pulley from engine. Refer to *FIXED AND SLIDING SHEAVES*.

To remove the ring gear, use a heat gun to break the threadlocker on ring gear screws before unscrewing.



1. Ring gear
2. Ring gear screws

CAUTION: If a tool other than a heat gun is used, do not exceed 150°C (300°F).

Unscrew ring gear screws.

Ring Gear Installation

To assemble ring gear on drive pulley, clean threads on back of fixed sheave and threads of screws.

Apply Loctite 271 (red) (P/N 293 800 005) on screw threads and torque them to 26 N•m (19 lbf•ft).

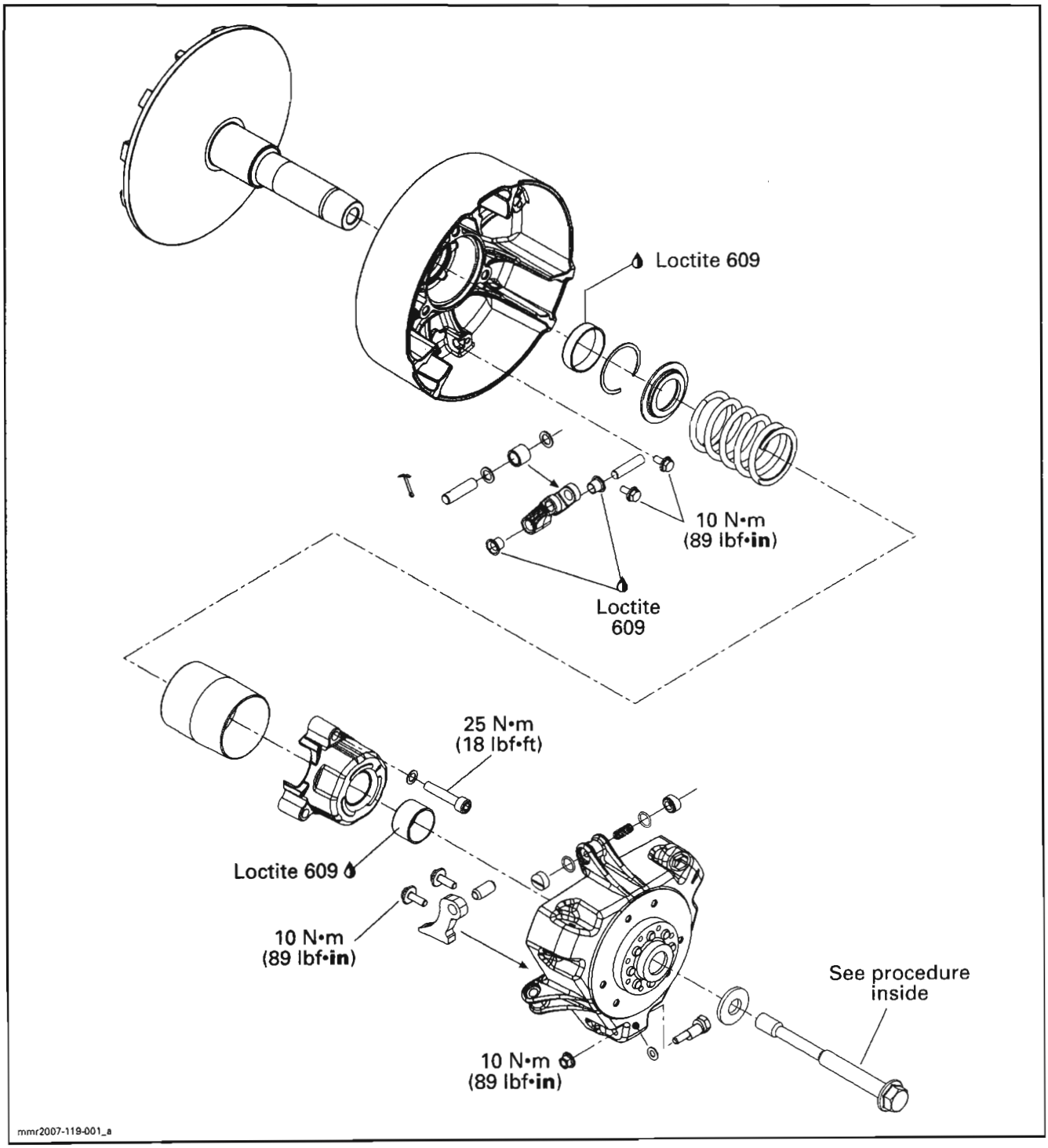
DRIVE PULLEY (TRA IV)

SERVICE TOOLS

Description	Part Number	Page
bushing installer	529 031 200	468
digital inductive tachometer	529 014 500	461
drive pulley holder	529 035 674	462–464
drive pulley puller	529 022 400	463
large bushing extractor tool	529 035 931	468
slider shoe fork	529 005 500	464
spring compressor	529 036 012	466, 468

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 609	413 703 100	468
pulley flange cleaner	413 711 809	464, 468


Loctite 609
10 N•m
(89 lbf•in)
Loctite
609
25 N•m
(18 lbf•ft)
Loctite 609
10 N•m
(89 lbf•in)
See procedure
inside
10 N•m
(89 lbf•in)
mmr2007-119-001_a

GENERAL

NOTE: Refer to *TECHNICAL SPECIFICATIONS* to identify the snowmobile drive pulley type.

⚠ WARNING

Never start engine when the pulley guard is removed.

TRA drive pulley stands for Total Range Adjustable drive pulley.

NOTE: This is a lubrication free drive pulleys. Always refer to appropriate *PARTS CATALOG* for replacement part. Most parts of TRA IV are not interchangeable with those of the other TRA pulley type.

Some drive pulley components (return spring, ramp) can be changed to improve vehicle performance in high altitude regions. A service bulletin will give information about calibration according to altitude.

⚠ WARNING

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

CAUTION: Such modifications should only be performed by experienced mechanics since they can greatly affect vehicle performance. Verify spring specifications before installation. Do not only refer to the spring color code.

⚠ WARNING

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

⚠ WARNING

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

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

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

⚠ WARNING

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

PROCEDURES

CALIBRATION SCREWS

Calibration Screw Adjustment

The drive pulley is factory calibrated to transmit maximum engine power at a predefined RPM. Factors such as ambient temperature, altitude or surface condition may vary this critical engine RPM thus affecting snowmobile efficiency.

This adjustable drive pulley allows setting maximum engine RPM in the vehicle to maintain maximum power.

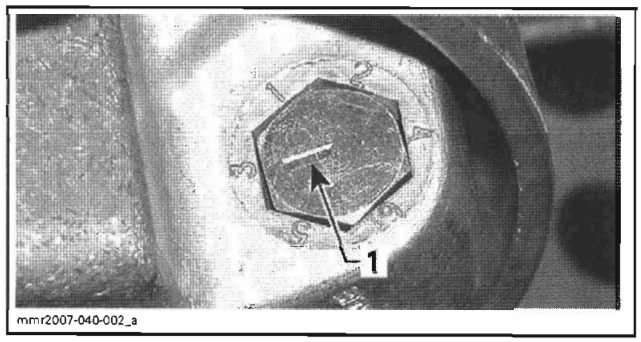
NOTE: Use the digital inductive tachometer (P/N 529 014 500) for engine RPM adjustment.

Calibration screws should be adjusted so that actual maximum engine RPM in vehicle matches the maximum horsepower RPM given in *TECHNICAL SPECIFICATIONS*.

NOTE: The adjustment has an effect on high RPM only.

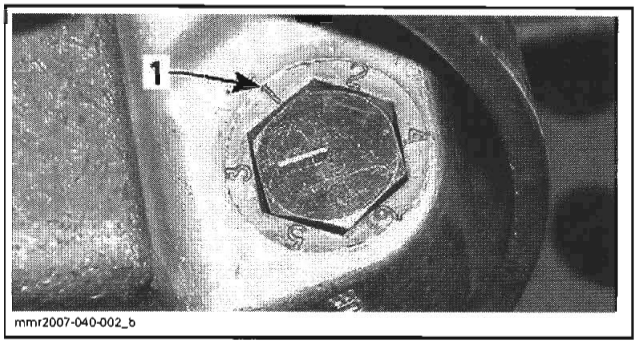
To adjust, modify ramp end position by turning calibration screws.

Calibration screw has a notch on top of its head.



1. Notch

Governor cup has 6 positions numbered 1 to 6.



1. Position 1

Each number modifies maximum engine RPM by about 200 RPM.

Lower numbers decrease engine RPM in steps of 200 RPM and higher numbers increase it in steps of 200 RPM.

Example:

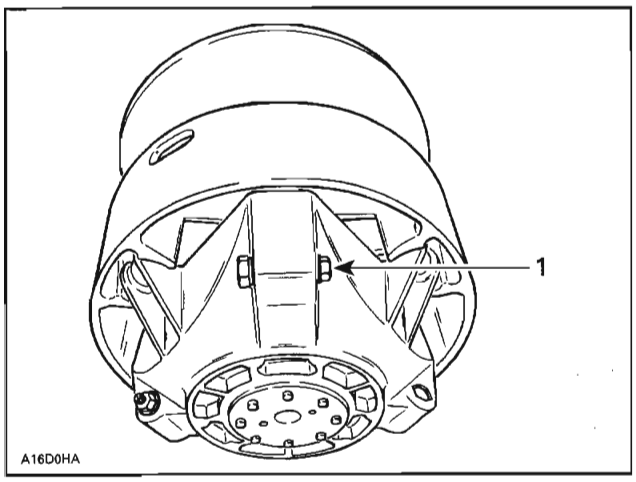
Calibration screw is set at position 3 and is changed to position 5. So maximum engine RPM is increased by about 400 RPM.

To Adjust:

Just loosen locking nut enough to pull calibration screw **partially** out and adjust to desired position. Do not completely remove the locking nut. Torque locking nuts to 10 N•m (89 lbf•**in**).

CAUTION: Do not completely remove calibration screw otherwise its inside washer will fall off.

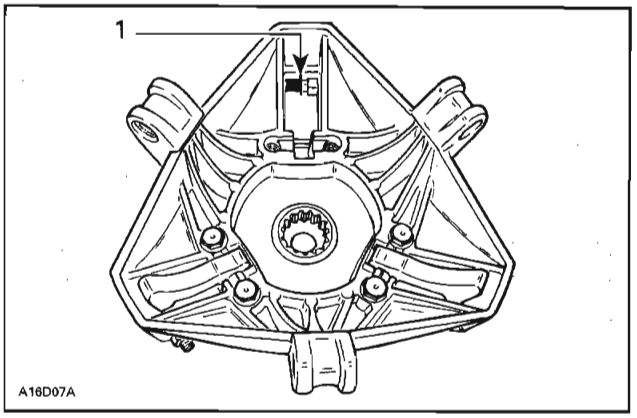
CAUTION: Always adjust all 3 calibration screws and make sure they are all set at the same number.



TYPICAL
1. Loosen just enough to permit rotating of calibration screw

Calibration Screw Replacement

When installing calibration screw, make sure to install washer as shown.



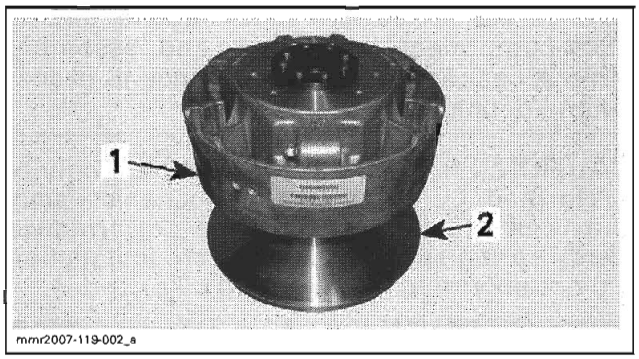
TYPICAL
1. Washer

Torque locking nut to 10 N•m (89 lbf•**in**).

FIXED AND SLIDING SHEAVES

Sheave Inspection

Check surface of sliding sheave and fixed sheave for scratches, excessive wear or other damages. Replace if necessary.



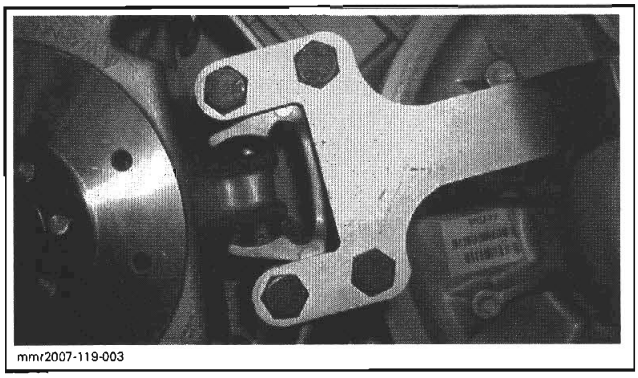
1. Sliding sheave
2. Fixed sheave

Check fixed sheave shaft for scratches. Replace as required.

Sheave Removal (drive pulley)

Open the LH side panel to remove the belt guard and the drive belt.

Secure drive pulley holder (P/N 529 035 674) over a sliding half tower.

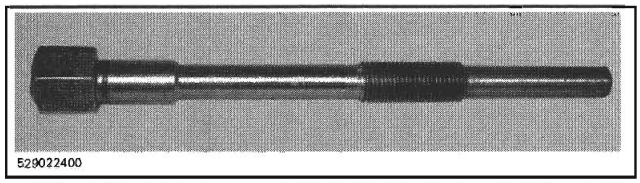

mmr2007-119-003

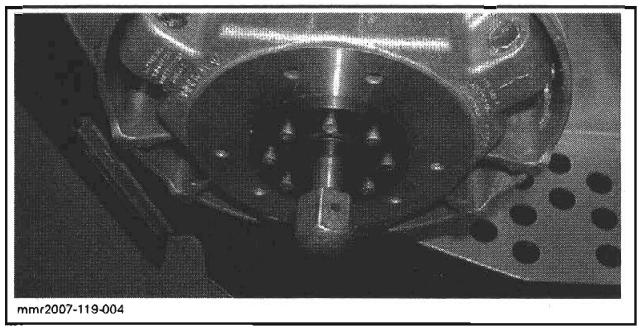
Remove drive pulley screw.

⚠ WARNING

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

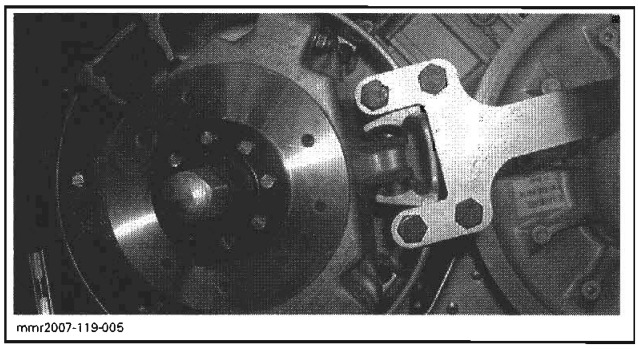
Install the drive pulley puller (P/N 529 022 400).


529022400


mmr2007-119-004

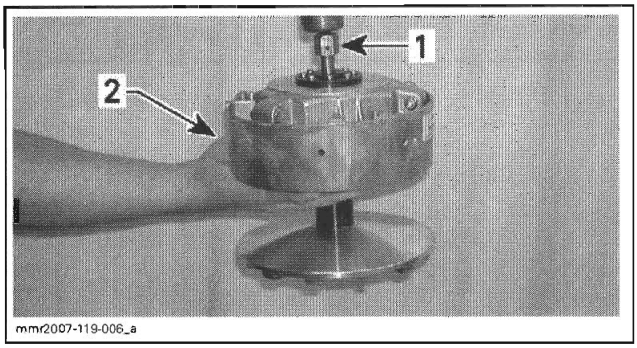
CAUTION: These pulleys have metric threads. Do not use imperial threads puller. Always tighten puller by hand to ensure that the drive pulley has the same type of threads (metric vs imperial) prior to fully tightening.

Retain drive pulley with the drive pulley holder (P/N 529 035 674) and screw in the puller then remove drive pulley.


mmr2007-119-005

Sheave Disassembly

To separate fixed sheave from sliding sheave, screw puller into fixed sheave shaft about 13 mm (1/2 in). Raise drive pulley and hold it by the sliding sheave while knocking on puller head to disengage fixed sheave.



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TYPICAL
1. Puller
2. Holding sliding sheave

NOTE: If the separation of fixed sheave from sliding sheave is hard, use a heat gun and slightly heat the governor cup to expand its taper.

CAUTION: Never use any type of torch to heat governor cup.

Sheave Cleaning

Clean pulley sheaves and shaft with fine steel wool and dry cloth.

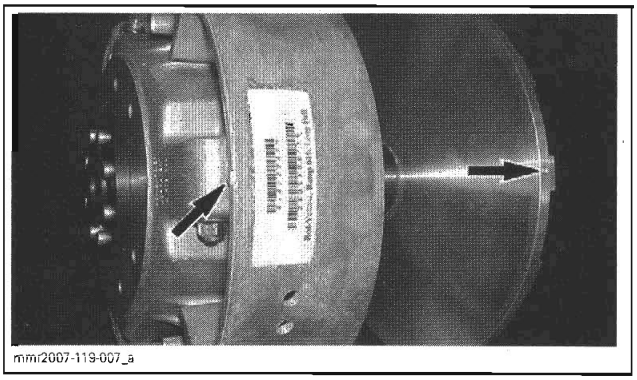
Remove all hardened oil deposits that have baked on crankshaft and pulley tapered surfaces with coarse or medium steel wool and/or sand paper no. 600.

CAUTION: Do not use any other type of abrasive.

Sheave Assembly

The assembly is the reverse of the disassembly procedures. However pay attention to the following.

Make sure to align the sliding sheave mark with the fixed sheave mark.


mmr2007-119-007_a

Using a plastic hammer, strike hub firmly 2 or 3 times to ensure proper seating of cones.

Sheave Installation (drive pulley)

⚠ WARNING

Do not apply antiseize or any lubricant on crankshaft and drive pulley tapers.

Parts must be at room temperature before cleaning.

Using a paper towel with pulley flange cleaner (P/N 413 711 809), clean crankshaft tapered end and the taper inside the fixed sheave of the drive pulley, crankshaft threads and retaining screw threads.

Before installation of drive pulley, clean also crankshaft threads and retaining screw threads.

CAUTION: Avoid contact between cleaner and crankshaft seal because damage may occur.

Reclean mounting surfaces with paper towel and cleaning solvent.

Wipe off the mounting surfaces with a clean, dry paper towel.

CAUTION: Mounting surfaces must be free of any oil, cleaner or towel residue.

Install drive pulley on crankshaft extension.

Install a new conical spring washer with its concave side towards drive pulley then install screw.

⚠ WARNING

Never substitute conical spring washer and/or screw with jobber ones. Always use BRP genuine parts for this particular case.

Using the drive pulley holder (P/N 529 035 674), torque screw to 90 N•m (66 lbf•ft).

Install drive belt and guard.

Raise and block the rear of the vehicle and support it with a mechanical stand.

⚠ WARNING

Ensure that the track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure nobody is standing near the vehicle.

Accelerate the vehicle at low speed (maximum 30 km/h (20 MPH)) and apply the brake, repeat 5 times.

Retorque screw to 95 N•m (70 lbf•ft).

⚠ WARNING

After 10 hours of operation the transmission system of the vehicle must be inspected to ensure the retaining screw is properly torqued.

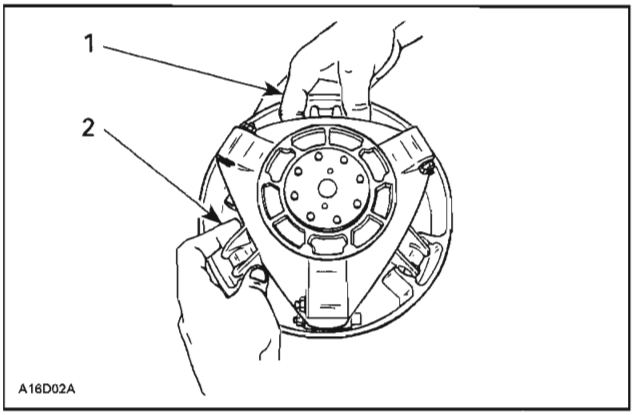
GOVERNOR CUP

Governor Cup Removal

Remove drive pulley. Refer to *FIXED AND SLIDING SHEAVES* at the beginning of this section.

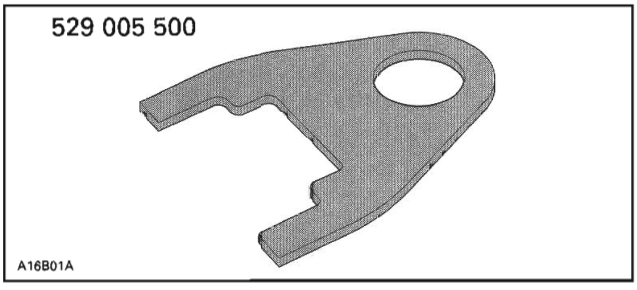
Carefully lift governor cup until slider shoes come to their highest position into guides.

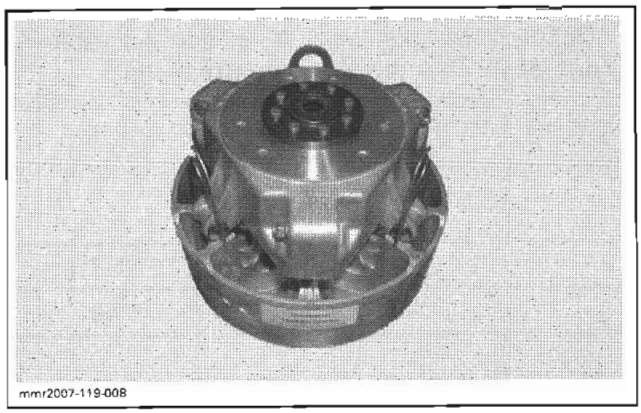
Hold a slider shoe set then carefully lift its housing and



1. Hold slider shoes
2. Lift one housing at a time

Install a slider shoe fork (P/N 529 005 500). Proceed the same way for other housings lifting one at a time.





When all slider shoes are held with the forks, remove the governor cup.

Governor Cup Inspection

Check the governor cup for cracks or other visible damages. Replace if necessary.

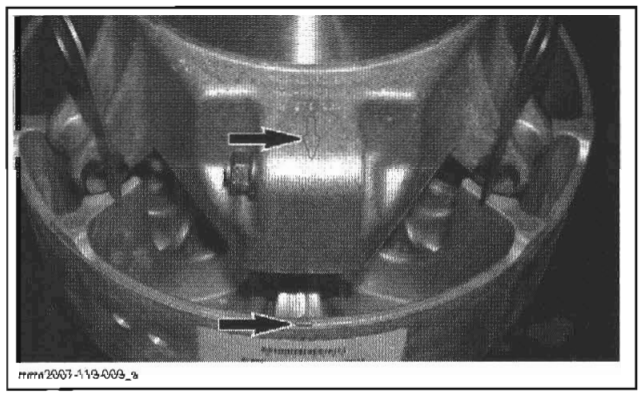
Check slider shoes for wear. Replace if groove is not apparent on top.

Check if O-rings are cracked, cut or crushed. Replace as required.

Governor Cup Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Align governor cup mark with the one on the sliding sheave.



RAMPS

Ramp Removal

Remove the drive pulley. Refer to *FIXED AND SLIDING SHEAVES*.

Remove governor cup from sliding sheave.

Unscrew bolts holding ramps on governor cup.

Ramp Inspection

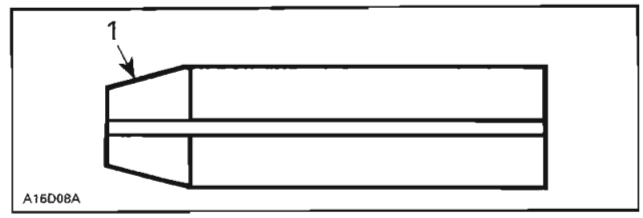
Check ramps for wear. Replace as required.

Ramp Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

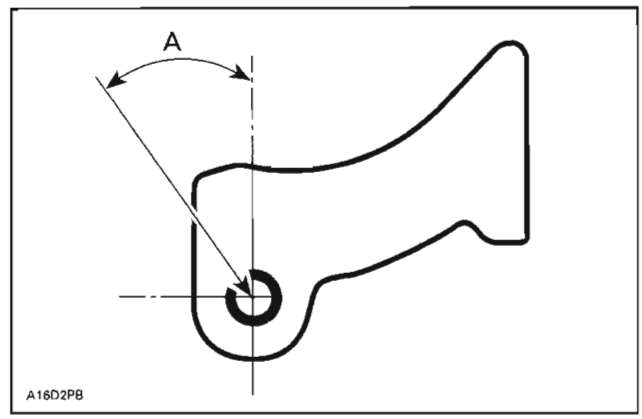
CAUTION: Always replace all ramps and all dowel tubes at the same time and make sure to use identical ramps.

Insert dowel tube from chamfered side. Make sure ramp is centered on dowel tube.

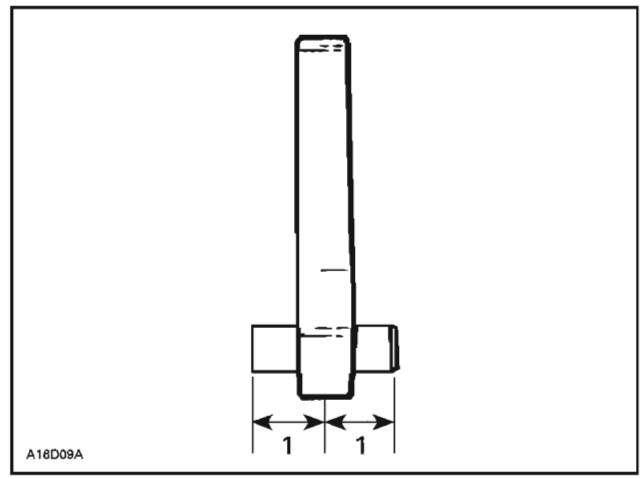


1. Chamfered side

Position dowel tube split at the angle A.



MODEL	ANGLE (A)
TRA IV	45 ± 3°



1. Equal distance

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

SPRING

Spring Removal

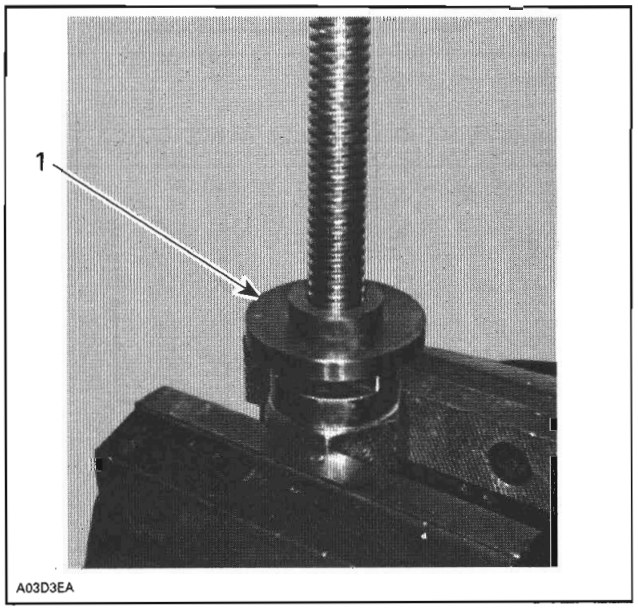
Remove drive pulley and separate sliding sheave and fixed sheave.

⚠ WARNING

Clutch spring is very strong. Never attempt to remove spring cover without the recommended tools.

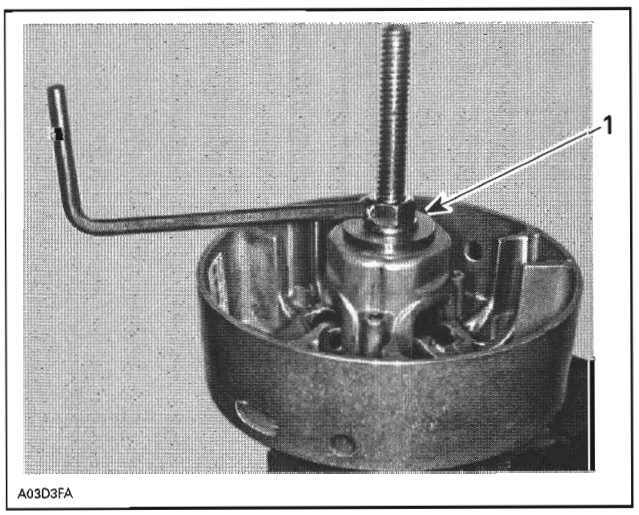
Use spring compressor (P/N 529 036 012).

Install support guide.



1. Support guide

Install sliding sheave then a second support guide. These support guides will prevent bushing damages.



1. Support guide

Completely remove all 3 Allen screws retaining spring cover then unscrew compressor.

Spring Inspection

Check spring color code and its free length. Replace if necessary.

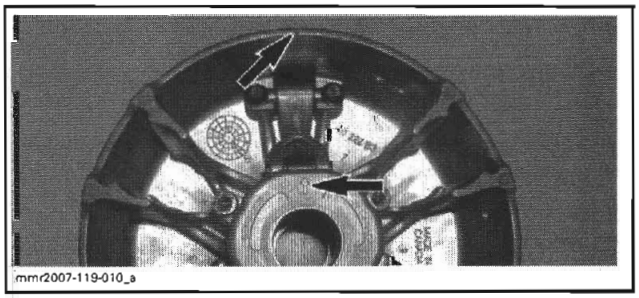
COLOR CODE	FREE LENGTH
RED/YELLOW	87.90 mm (3.461 in)

Spring Installation

For installation, reverse the removal procedure.

To install spring cover, use the spring compressor (P/N 529 036 012).

Align balance marks before installing spring cover.



ALIGN BALANCE MARKS

Tighten screws to proper torque as mentioned in exploded view.

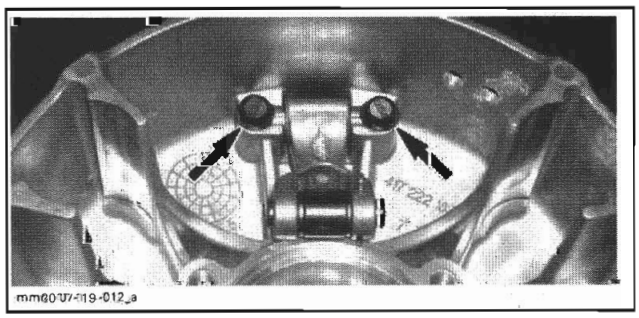
CENTRIFUGAL LEVERS

Lever Removal

Remove the drive pulley. Refer to *FIXED AND SLIDING SHEAVES*.

Remove governor cup from sliding sheave.

Remove screws securing centrifugal levers on sliding sheave.



Lever Inspection

Check centrifugal lever for crack, distortion or other damages.

Check roller for roundness of external diameter.

Check if the roller turns freely.

Check thrust washers for wear (thickness).

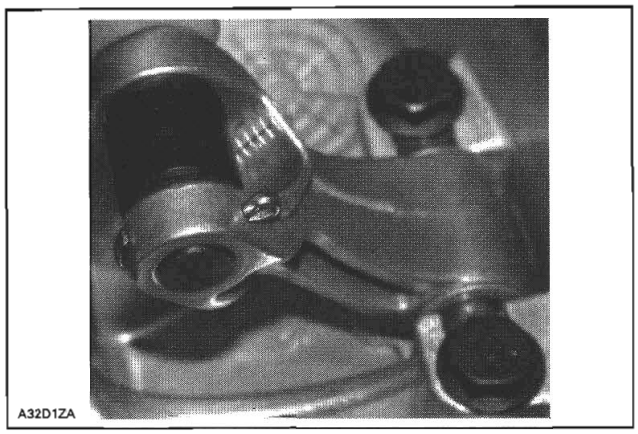
Check lever screw heads for wear.

Check ramp bushings for wear.

Lever Installation

Always use the same roller pin as originally installed when servicing. Different types have different weights for calibration purpose. Refer to *TECHNICAL SPECIFICATIONS*.

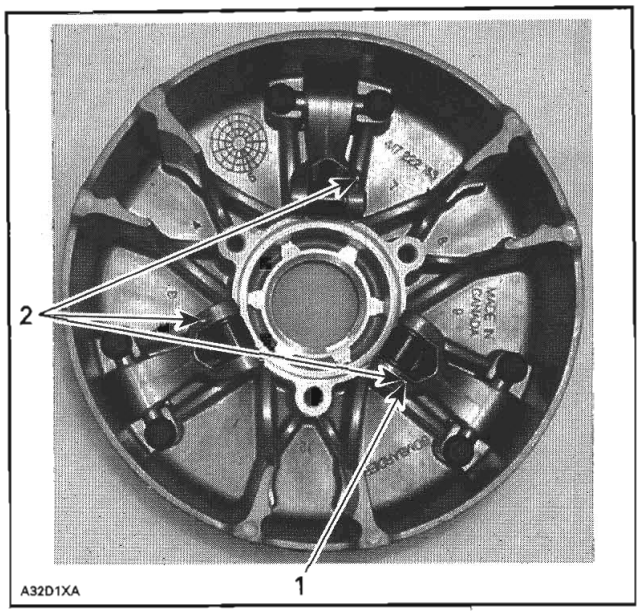
While installing levers, make sure that the curved sides of the levers are outwards as shown.



Always install levers so that cotter pins are on the side shown here. Besides install cotter pin head on top when lever is sat at bottom of sliding half. Bend cotter pin ends to sit perfectly against lever.

⚠ WARNING

Whenever replacing centrifugal levers, always replace all 3 at the same time. Otherwise, the drive pulley will be unbalanced (because of lever differences).



1. Head on top
2. All on the same side

CAUTION: Lever assemblies must be installed so that cotter pins are on the same side.

Torque screws as per the exploded view.

CAUTION: Lever and rollers must move easily after installation.

BUSHING

Bushing Cleaning

Only use petroleum based cleaner when cleaning bushings.

CAUTION: Do not use acetone to clean bushing.

Bushing Inspection

Visually inspect coating. Replace if worn.

Bushing Removal

Spring Cover Bushing

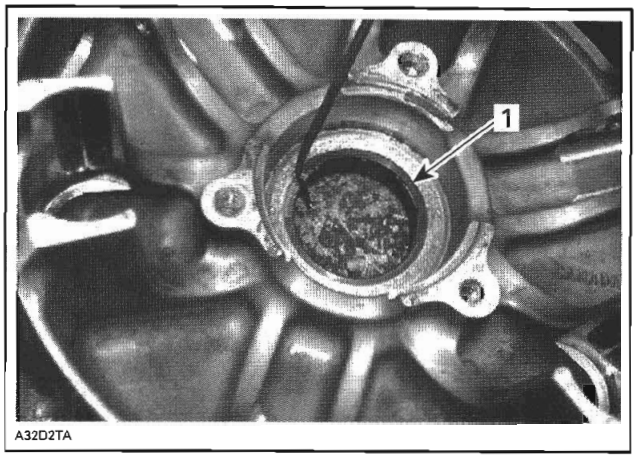
Under normal use there is no need to replace this bushing.

In case of replacement, it's recommended to replace spring cover.

Sliding Half Bushing

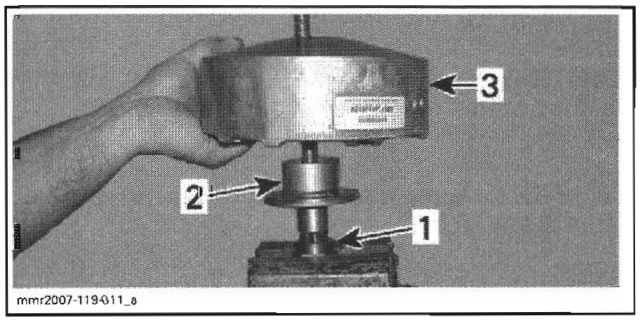
NOTE: In case of worn out bushing, it is advisable to replace complete whole sliding sheave assembly as replacing just the bushing may reduce the drive pulley performance.

Remove circlip from the sliding sheave.



1. Circlip

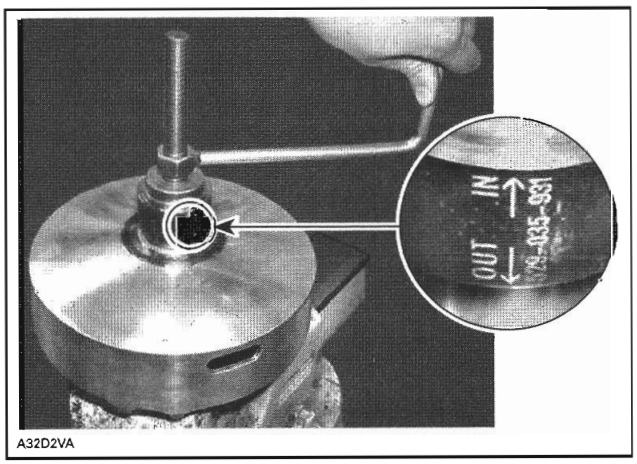
Secure the spring compressor (P/N 529 036 012) in a vise, place the bushing installer (P/N 529 031 200) and the sliding sheave on it.



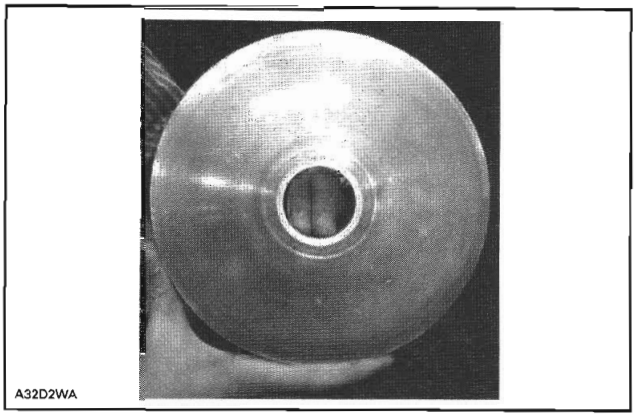
1. Spring compressor
2. Bushing installer
3. Sliding sheave

Use the large bushing extractor tool (P/N 529 035 931) to press out old bushing.

NOTE: Make sure to use the large bushing extractor tool (P/N 529 035 931) as marked; to remove the bushing press using the side marked "OUT", as shown below in the picture.



Use a soft sand paper to clean sliding half bushing mounting surface.



Clean sliding half bushing mounting surface with pulley flange cleaner (P/N 413 711 809).

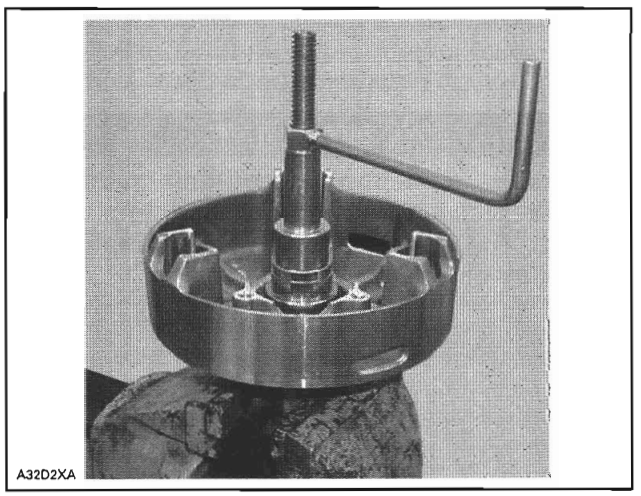
Bushing Installation

To install a new bushing, secure the spring compressor (P/N 529 036 012) in a vise and mount the sliding sheave.

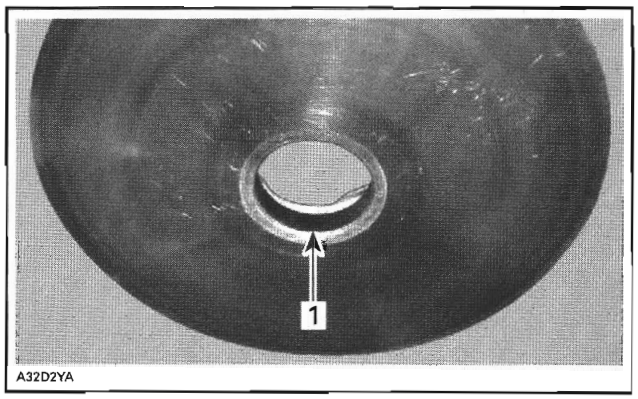
Coat bushing outside diameter with Loctite 609 (P/N 413 703 100).

Insert the bushing from inner side of sliding sheave.

Mount the large bushing extractor tool (P/N 529 035 931) with side marked "IN" to press in a new bushing.

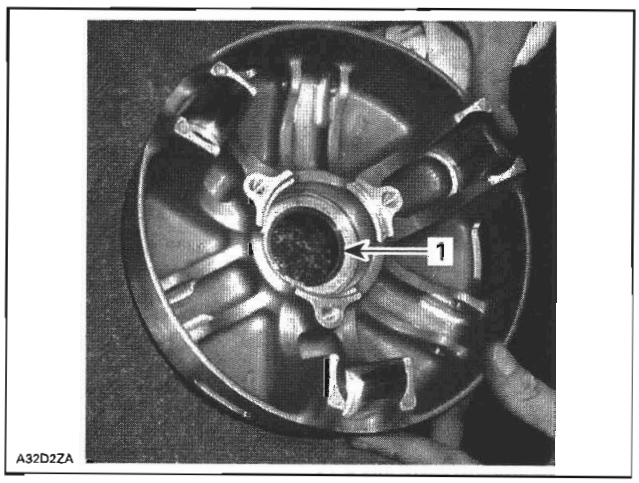


NOTE: Make sure that the bushing is well seated on the sliding sheave.



1. Bushing

Install the circlip.



1. Circlip

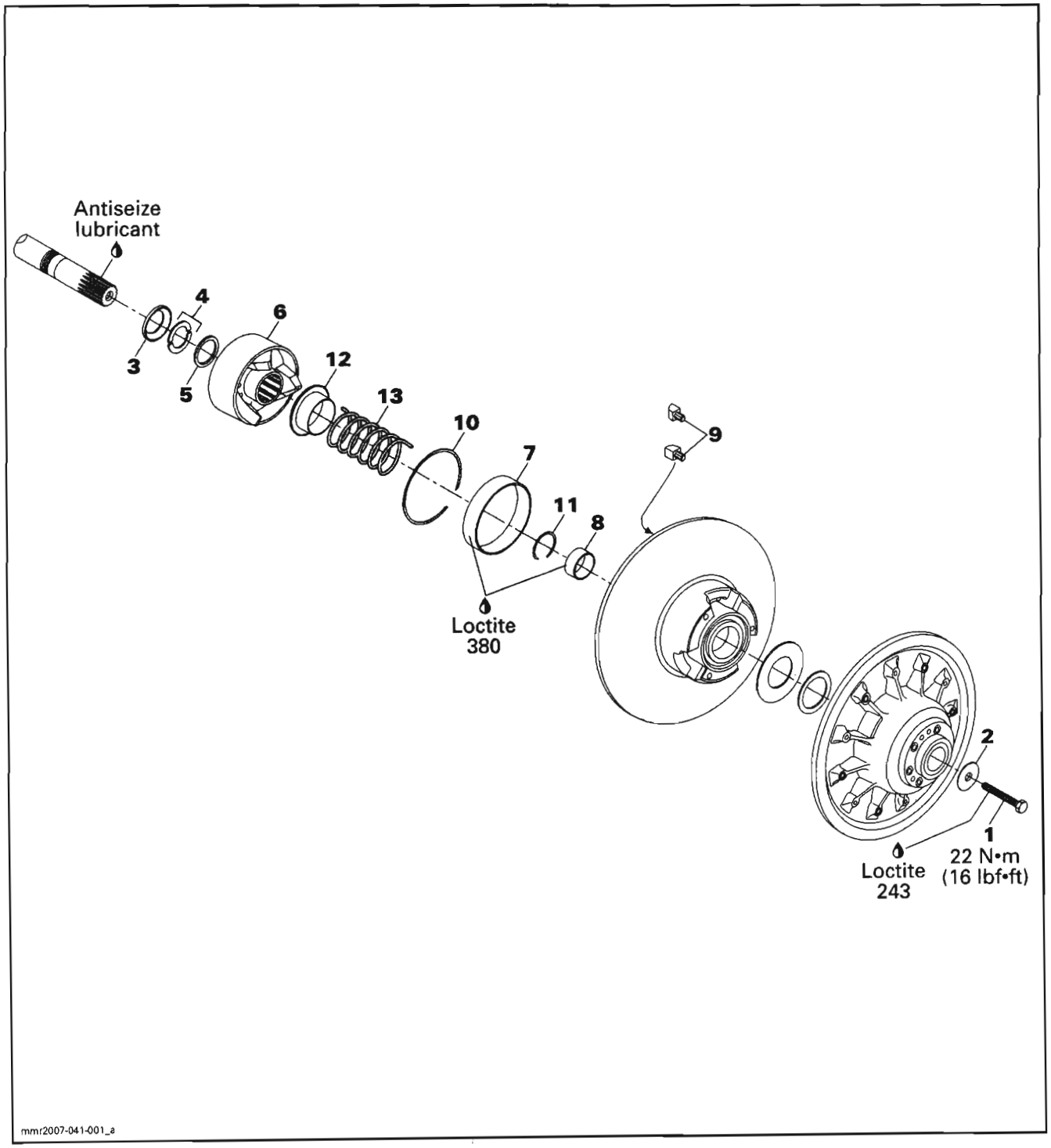
DRIVEN PULLEY (LPV 27 AND LPV VSA)

SERVICE TOOLS

Description	Part Number	Page
bushing extractor/installer	529 031 300	477
clutch spring compressor	529 036 012	473–477
crankshaft protector	420 876 552	477
large bushing extractor	529 031 100	476
large bushing extractor	529 035 575	476–477

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 380 (Black Max)	413 408 300	477
Loctite 767 (antiseize lubricant)	293 800 070	475
pulley flange cleaner	413 711 809	473, 477


Antiseize lubricant
4
6
3
5
12
13
10
7
11
8
9
Loctite 380
2
1
22 N•m (16 lbf•ft)
Loctite 243
mmr2007-041-001_a

GENERAL

During assembly/installation, use the torque values and the service products as 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 strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

⚠ WARNING

Never start engine when the pulley guard is removed.

⚠ WARNING

The driven pulley is a precisely balanced unit. Never replace parts with used parts from another driven pulley.

Driven Pulley Application

MODEL	PULLEY TYPE
300F and 550F	LPV 27
V800	LPV VSA

PROCEDURES

FIXED AND SLIDING SHEAVES

Sheave Cleaning

Use pulley flange cleaner (P/N 413 711 809) to clean pulley sheaves.

Sheave Removal (driven pulley)

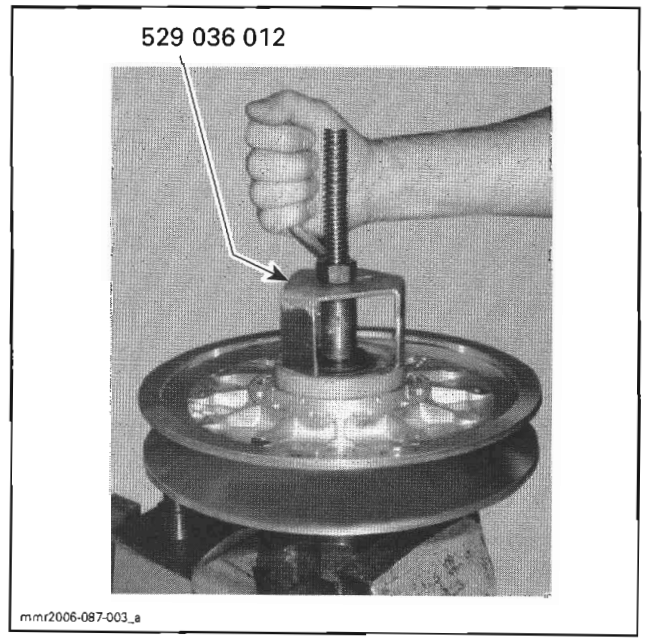
Remove guard and drive belt from vehicle.

Remove pulley retaining screw **no. 1** and shouldered washer **no. 2** then pull the driven pulley from the countershaft.

Take care not to lose spacer **no. 3**.

Sheave Disassembly

Use clutch spring compressor (P/N 529 036 012).



TYPICAL

⚠ WARNING

Driven pulley cam is spring loaded, use above mentioned tool. Make sure the cam follows the compressor while unscrewing. If cam gets stuck, leave 1 mm (1/32 in) gap between cam and compressor and carefully free up cam by rotating the sliding sheave back and forth. Resume unscrewing once the cam is free to follow the compressor.

Remove half keys **no. 4** and spacer **no. 5** to disassemble the cam **no. 6** and pulley sheaves.

Sheave Inspection

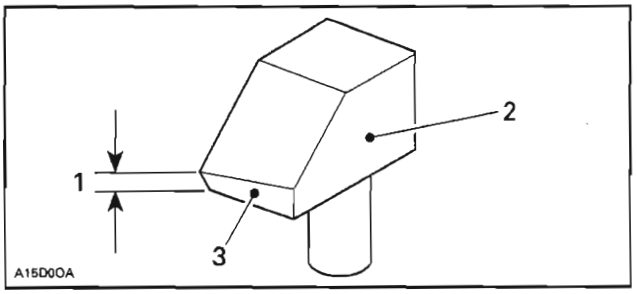
Inspect sheaves for abnormal wear or cracks.

Slider Shoe

BLACK slider shoe = forward.

RED slider shoe = reverse.

Check cam slider shoes **no. 9** for wear. Replace when inside edge thickness of cam slider shoe slope base is worn to 1 mm (.039 in) or less.



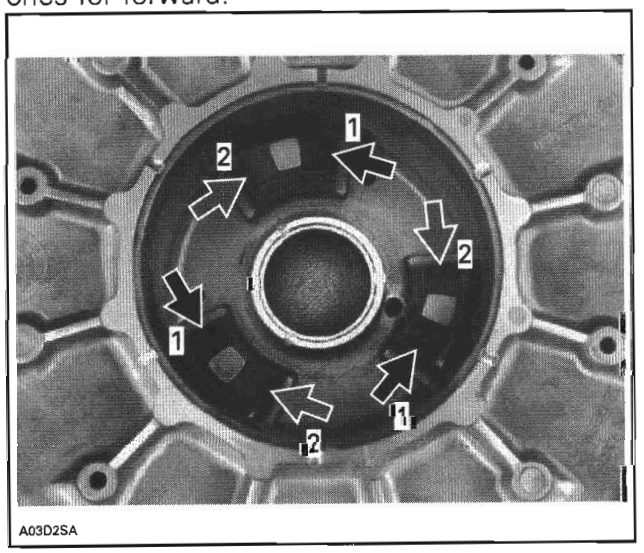
1. Measure thickness of slope base here
2. Sliding pulley side
3. Slope base

Sheave Assembly

Slider Shoe

When replacing slider shoes **no. 9**, always install a new set (3 shoes) to maintain equal pressure on the cam.

Install slider shoes as per following photo. RED slider shoes are being used for reverse and BLACK ones for forward.

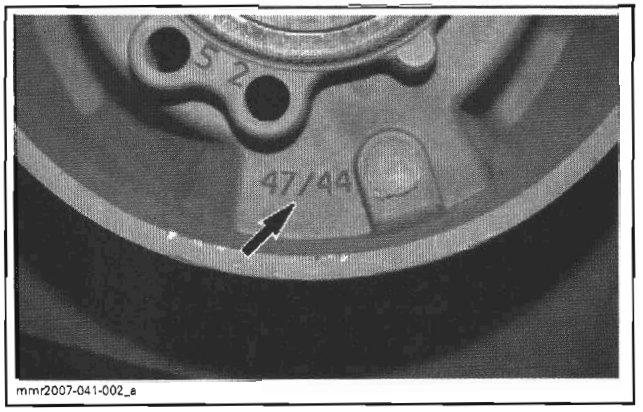


1. BLACK slider shoe
2. RED slider shoe

Cam and Spring

Make sure to install proper cam. Refer to *TECHNICAL SPECIFICATIONS.*

Cam angle is identified on cam.



Install the recommended spring.

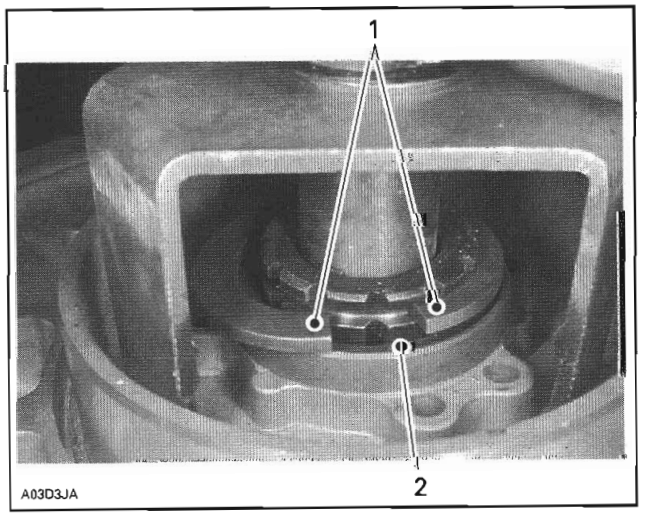
Single-Stud Spring

If a single-stud spring is used, the stud must be inserted in one of the 3 sliding sheave's holes.

Enter the other end of the spring in the sliding sheave location hole.

Compress cam using the clutch spring compressor (P/N 529 036 012).

Install spacer **no. 5** then secure cam with half keys **no. 4**, as shown in the next photo.

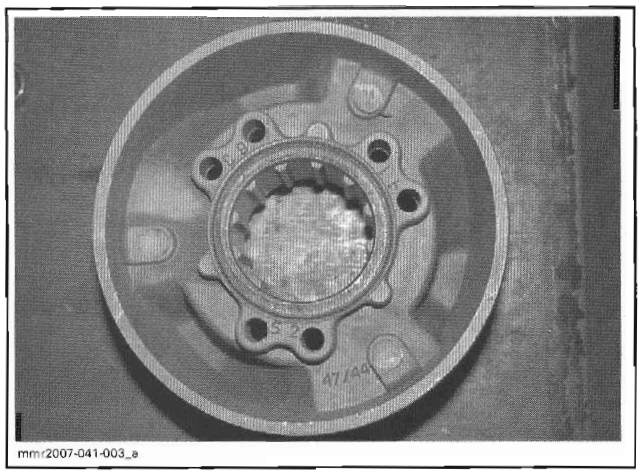


1. Half keys inserted into shaft groove
2. Spacer recess facing half keys

Double Opened Ends Spring

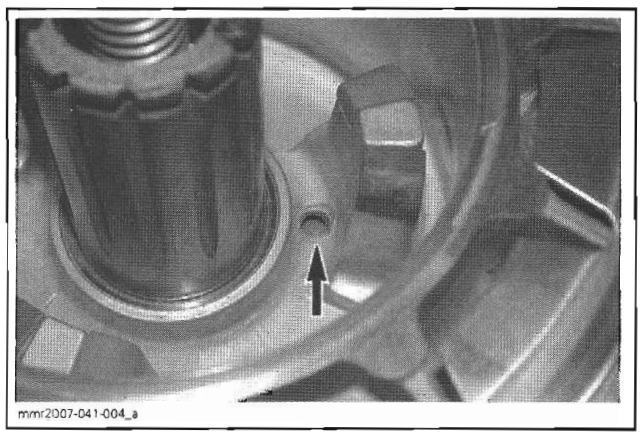
If a spring opened at both ends is used, do the following:

1. Select the appropriate spring locating hole on the cam to enter one end of the spring.

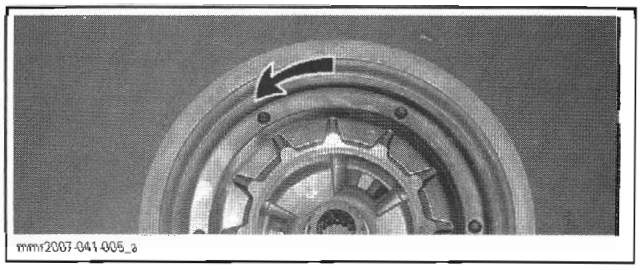


NOTE: When no preload is required, use hole no. 6 and DO NOT rotate the sheave (skip operation no. 3). When applying 6.8 kg (15 lb) of preload on a PINK spring, use hole no. 4 and DO rotate the sheave (perform operation no. 3).

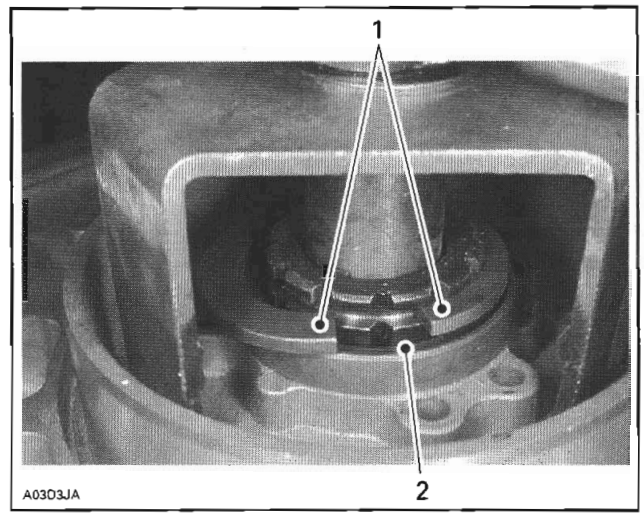
2. Enter the other end of the spring in the sliding sheave location hole.



3. When torsion preload is required, turn the sliding sheave exactly 120° (1/3 turn) counterclockwise.



4. Insert cam in driven pulley while still holding preload, using the clutch spring compressor (P/N 529 036 012).
5. Install spacer **no. 5** then secure cam with half keys **no. 4**, as shown in the next photo.



1. Half keys inserted into shaft groove
2. Spacer recess facing half keys

6. Using a fish scale hooked to a sliding sheave balancing hole, measure the force required to turn the sliding sheave counterclockwise. Also measure the force required by the sheave to return to its original position. Calculate the average of both forces.
7. If preload is too low, use a higher number. If preload is too high, use a smaller number.

Sheave Installation (driven pulley)

Apply Loctite 767 (antiseize lubricant) (P/N 293 800 070) on countershaft splines.

Reinstall the pulley on the countershaft by reversing the removal procedure.

Torque pulley retaining screw **no. 1** to 22 N•m (16 lbf•ft).

Sheave Adjustment (driven pulley)

Refer to *PULLEY ALIGNMENT* and *DRIVE BELT* to perform adjustments.

CAUTION: Drive belt and pulley alignment must always be checked whenever pulleys have been removed, replaced or disassembled.

BUSHING

Bushing Cleaning

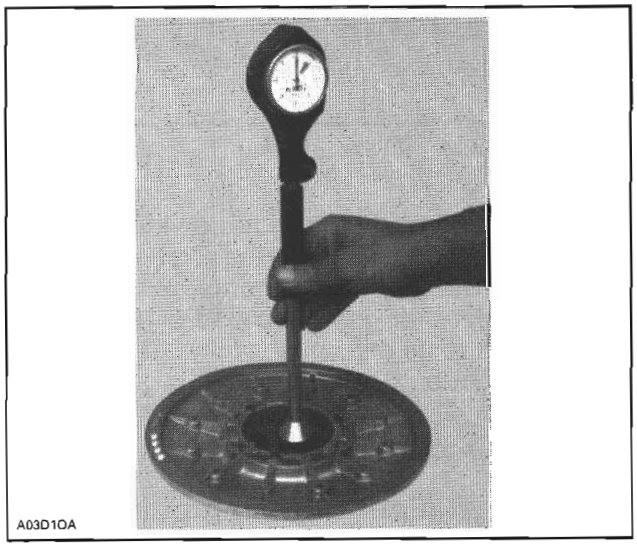
During break-in period (about 10 hours of use), teflon from bushing **no. 7** and **no. 8** moves to cam or shaft surface. A teflon over teflon running condition occurs, leading to low friction. So it is normal to see gray teflon deposit on cam or shaft. Do not remove that deposit, it is not dust.

When a dust deposit has to be removed from the cam or the shaft, use dry cloth to avoid removing transferred teflon.

Bushing Inspection

Check the bushings **no. 7** and **no. 8** for cracks, scratch and for free movement when assembled to fixed sheave **no. 12**.

Using a dial bore gauge measure bushing diameter. Measuring point must be at least 5 mm (1/4 in) from bushing edge.



Replace bushing(s) if worn more than specified.

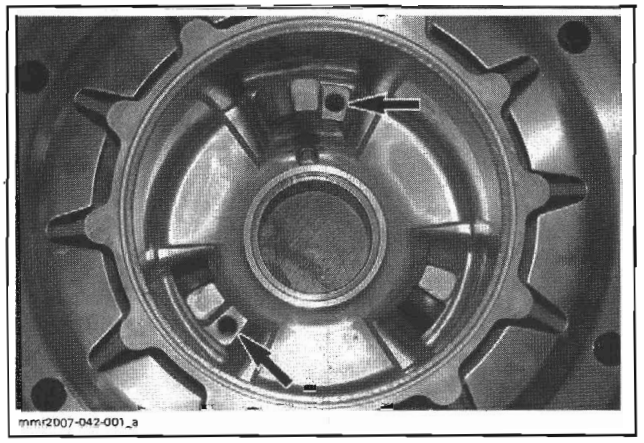
DRIVEN PULLEY BUSHING WEAR LIMIT mm (in)	
Small bushing	38.30 (1.508)
Large bushing	108.2 (4.260)

Bushing Replacement

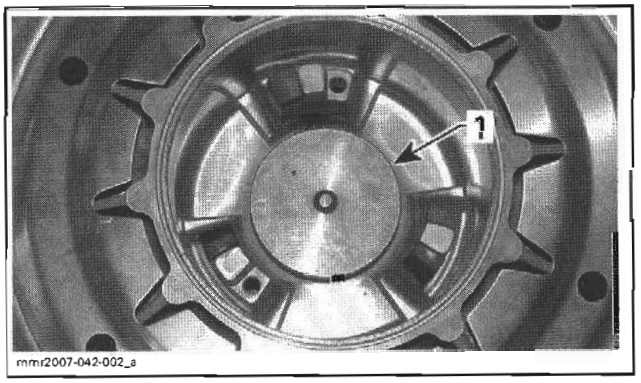
Large Bushing

Remove circlip **no. 10**.

Remove two slider shoes.

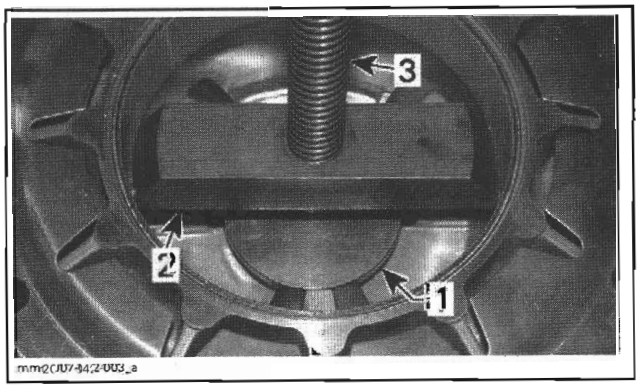


Install the support plate included in the large bushing extractor (P/N 529 031 100) inside sliding sheave.



1. Support plate

Place the large bushing extractor (P/N 529 035 575) below bushing and screw the threaded rod of the clutch spring compressor (P/N 529 036 012) in the large bushing extractor hole until the end of threaded rod reaches against the support plate.



TYPICAL
1. Support plate
2. Large bushing extractor
3. Threaded rod of spring compressor

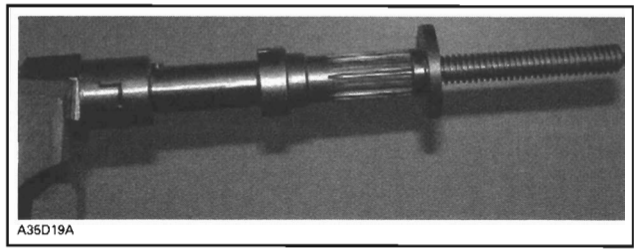
Mount the clutch spring compressor head in a vise.

Using a heat gun, heat bushing to break the adhesive product.

Turn pulley sheave by hand to extract old bushing.

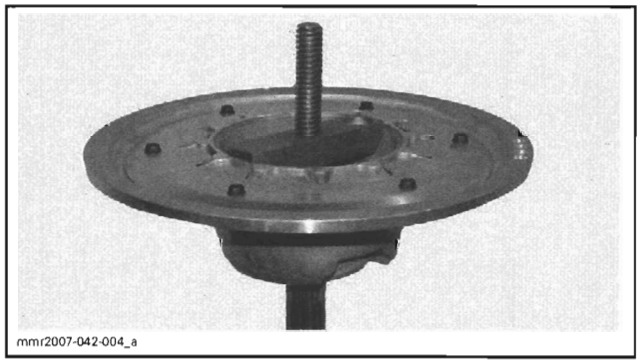
Before bushing installation, clean residues of adhesive product by using pulley flange cleaner (P/N 413 711 809).

On threaded rod install both sleeves and one spacer included with the clutch spring compressor (P/N 529 036 012).


A35D19A

Coat bushing outside diameter with Loctite 380 (Black Max) (P/N 413 408 300). Place new bushing on sliding sheave and slightly tap to engage squarely the bushing in the sliding.

Install the sliding pulley on threaded rod and screw in the large bushing extractor (P/N 529 035 575).


mmr2007-042-004_a

Turn pulley sheave by hand to insert the new bushing.

IMPORTANT: Change the position of extractor often to push the bushing straight.

Install circlip.

Small Bushing

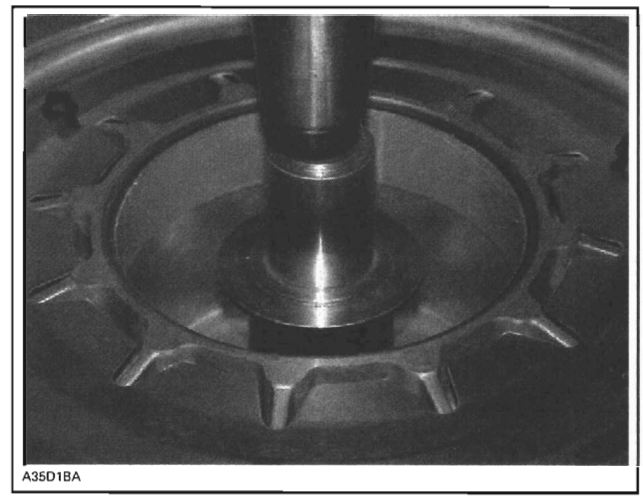
Remove circlip **no. 11**.

Using a press, extract the small bushing. Push the bushing out of its location by using a pipe with proper diameter.

Clean residues of adhesive product by using pulley flange cleaner (P/N 413 711 809).

Coat bushing outside diameter with Loctite 380 (Black Max) (P/N 413 408 300).

Using a press and the bushing extractor/installer (P/N 529 031 300) with crankshaft protector (P/N 420 876 552), insert small bushing in its location.


A35D1BA

Install circlip.

PULLEY ALIGNMENT

SERVICE TOOLS

Description	Part Number	Page
alignment bar	529 035 831	480
driven pulley opening tool	529 017 200	480

GENERAL

Pulley alignment must be seasonally checked to ensure the highest efficiency of the transmission system. Furthermore, optimum drive belt operation and minimal wear will be obtained only with proper pulley alignment.

⚠ WARNING

Failure to correctly perform pulley alignment may cause the vehicle to creep forward at idle.

PROCEDURES

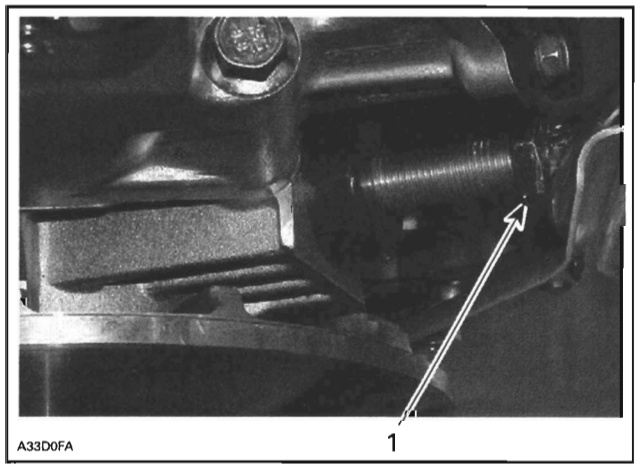
W AND Z MEASUREMENTS

W = Distance between both pulley shafts (center to center).

Z = Distance between both pulleys.

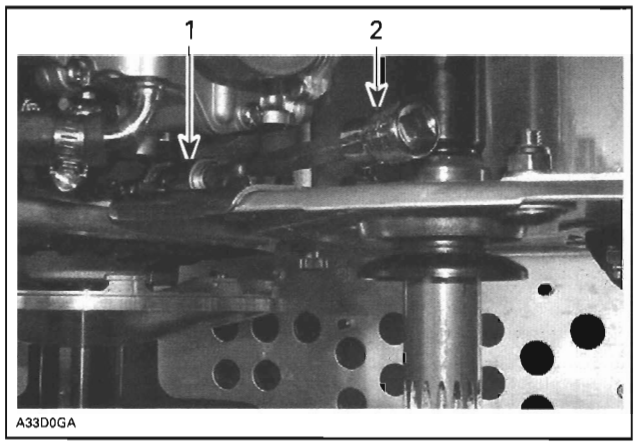
Remove guard, drive belt and air silencer.

Loosen lock nut.



1. Lock nut

Untighten torque rod using a long 8 mm Allen key.

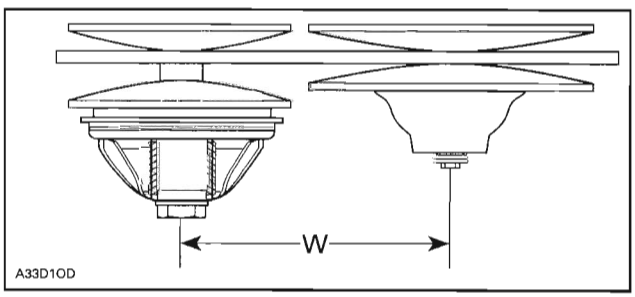


TYPICAL
1. Torque rod
2. 8 mm Allen key

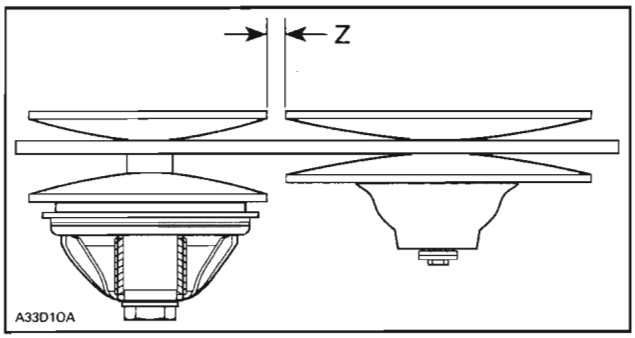
Measure the distance between both pulleys to know if the engine and the frame are positioned correctly.

NOTE: The pulley distance is not adjustable.

MEASUREMENT		
MODELS	W mm (in)	Z mm (in)
300F	250.0 ± 0.5 (9.84 ± .02)	18.75 (0.738)
550F	257.5 ± 0.5 (10.138 ± .02)	26.25 (1.033)
V800		20.00 (.787)



TYPICAL
W = Distance between both pulley shaft (center to center)

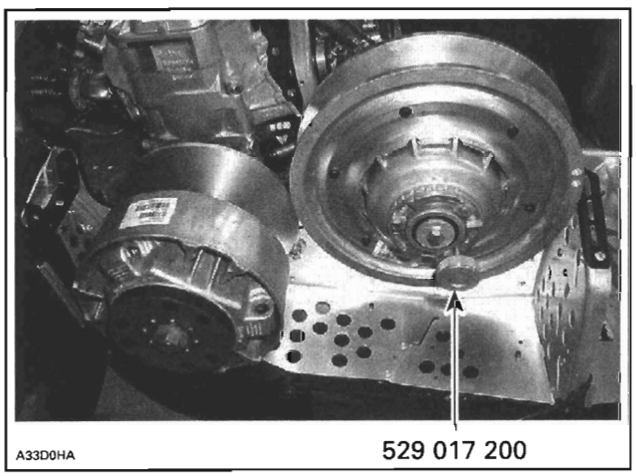


TYPICAL
Z = Distance between both pulleys

X MEASUREMENT

X = Distance between alignment bar and drive pulley fixed sheave edge, measured between pulleys.

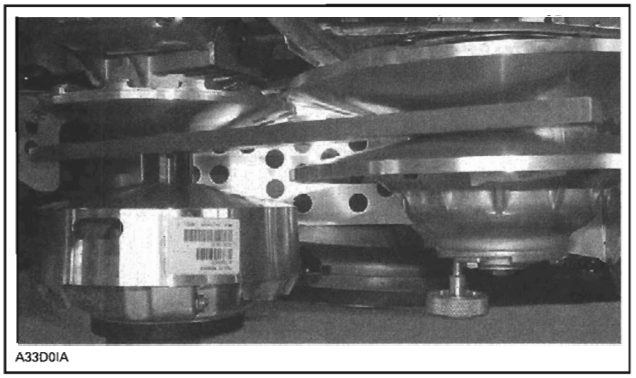
By using driven pulley opening tool (P/N 529 017 200) push the sliding half to open the driven pulley.



DRIVEN PULLEY OPENING TOOL

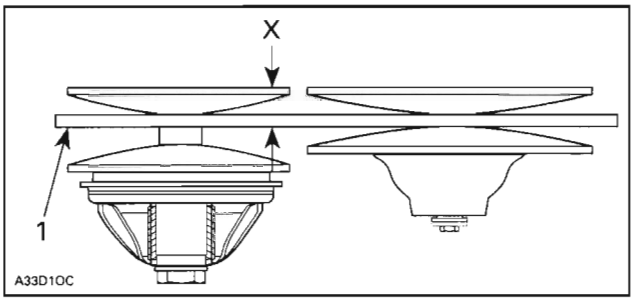
Insert the alignment bar (P/N 529 035 831) into the pulleys as shown.

NOTE: Driven pulley must be in open position. Use the same tool as for belt removal.



TYPICAL — ALIGNMENT BAR IN PULLEYS

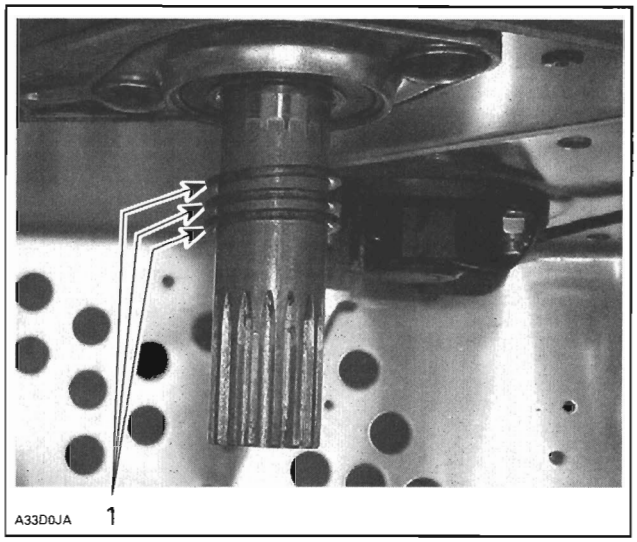
Always measure distances X from the farther alignment bar side (including its thickness to the fixed sheave inner edge).



TYPICAL
1. Alignment bar

MEASUREMENT (X)		
MODELS	DISTANCE mm (in)	
	MINIMUM	MAXIMUM
300F	32.9 (1.295)	33.9 (1.335)
550F	32.9 (1.295)	33.9 (1.335)
V800	36.5 (1.44)	37.5 (1.48)

If an alignment is necessary, remove driven pulley and add or remove shim(s) as required to obtain the specified alignment.



1. Shims

CAUTION: The total shim thickness should never be less than 2 mm (.079 in).

Use the following table to choose the proper shim(s).

SHIM CHART	
P/N	SHIM THICKNESS mm (in)
504 112 000	0.42 ± 0.05 (.017 ± .002)
417 300 265	1.02 ± 0.10 (.040 ± .004)
417 300 252	2.06 ± 0.15 (.081 ± .006)

After alignment, hand tighten the torque rod so it slightly contacts engine crankcase. Do not over tighten, it will modify pulley alignment.

When the alignment is done, refer to *DRIVE BELT* to adjust the drive belt.

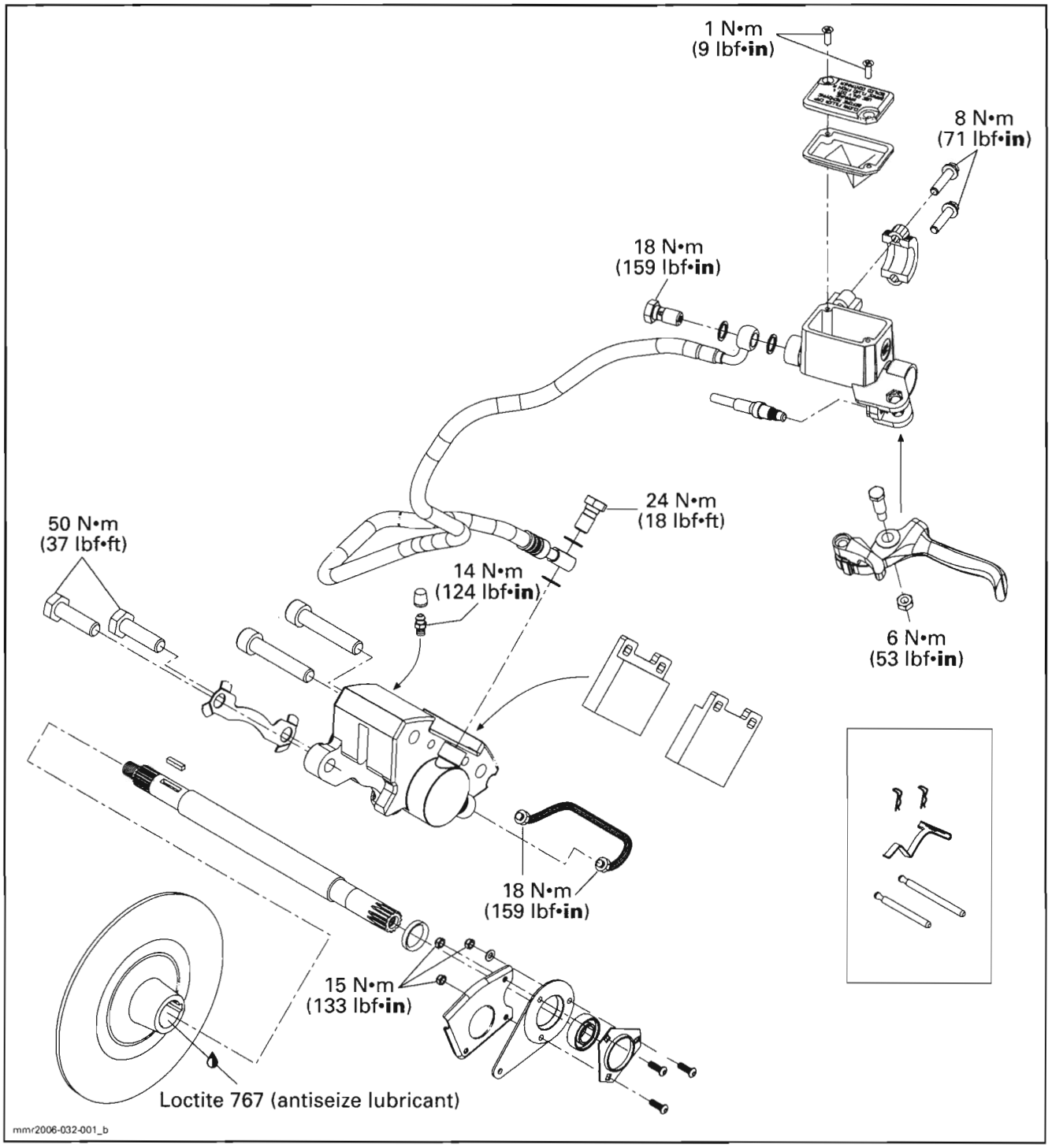
COUNTERSHAFT AND BRAKE

SERVICE TOOLS

Description	Part Number	Page
countershaft bearing remover/installer	529 035 699	491

SERVICE PRODUCTS

Description	Part Number	Page
DOT 4 brake fluid GTLMA	293 600 062	485
DOT 4 brake fluid SRF	293 600 063	485
Loctite 609	413 703 100	490
Loctite 767 (antiseize lubricant)	293 800 070	487


1 N•m
(9 lbf•in)
8 N•m
(71 lbf•in)
18 N•m
(159 lbf•in)
24 N•m
(18 lbf•ft)
50 N•m
(37 lbf•ft)
14 N•m
(124 lbf•in)
6 N•m
(53 lbf•in)
18 N•m
(159 lbf•in)
15 N•m
(133 lbf•in)
Loctite 767 (antiseize lubricant)
mmr2006-032-001_b

GENERAL

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

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

⚠ WARNING

A contaminated brake disc or pad reduces stopping power. Discard contaminated pads and clean contaminated disc with a high quality brake degreasing agent.

CAUTION: Avoid spilling brake fluid on plastic, rubber or painted parts. Protect these parts with a rag when servicing brake system.

CAUTION: To avoid serious damage to the brake system, use only DOT 4 brake fluid from a sealed container. Do not use brake fluid taken from old or already opened containers, nor mix different fluids for topping off.

CAUTION: Sealing washers must be discarded and replaced with new ones every time a Banjo fitting is unscrewed.

PROCEDURES

BRAKE FLUID

The brake fluid must be changed in accordance with the maintenance chart.

Recommended Fluid

Always use brake fluid meeting the specification DOT 4 such as DOT 4 brake fluid GTLMA (P/N 293 600 062) or DOT 4 brake fluid SRF (P/N 293 600 063) sold by BRP.

Fluid Level

With the vehicle on a level surface, position steering in straight-ahead position to ensure reservoir is level. Check brake fluid level, the reservoir is full when the fluid reaches the top of window.

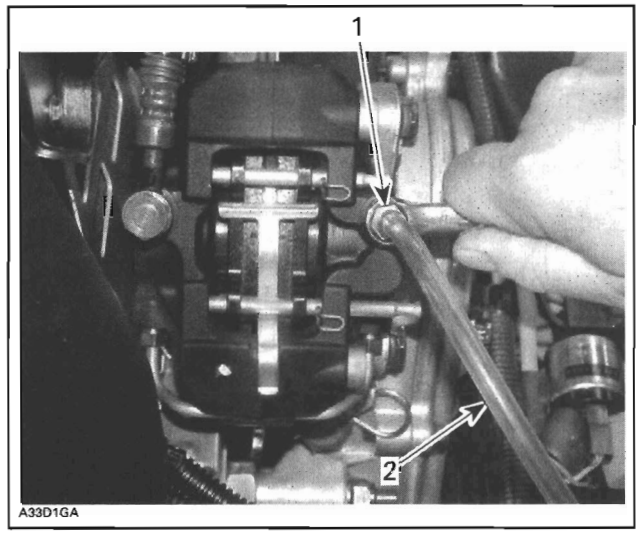
Brake Fluid Replacement

Draining

Remove reservoir cover with its diaphragm.

Connect a clear hose to caliper bleeding screw.

Loosen bleeding screw and pump brake lever until no more fluid flows out of bleeding screw.



TYPICAL
1. *Open bleeding screw*
2. *Clear hose to catch used brake fluid*

Filling and Bleeding

Close bleeding screw.

Fill reservoir with DOT 4 brake fluid.

Unscrew bleeding screw until brake fluid freely flows out of hose. Close bleeding screw. Refill reservoir when the fluid level is low to prevent air into system.

Pump up system pressure with brake lever until resistance is felt.

Squeeze brake lever and open bleeding screw. When lever touches the handlebar, do not release lever and close bleeding screw.

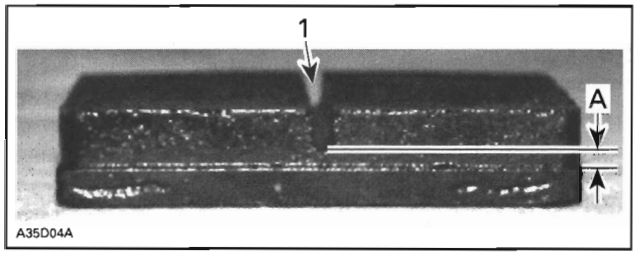
Repeat the procedure until no more air bubbles appear in the hose and brake lever is not spongy.

BRAKE PADS

Inspection

Brake pads must be replaced when lining is 1 mm (1/32 in) thick or less or if the groove, on lining pad, is not visible.

CAUTION: Brake pads must always be replaced in pairs.



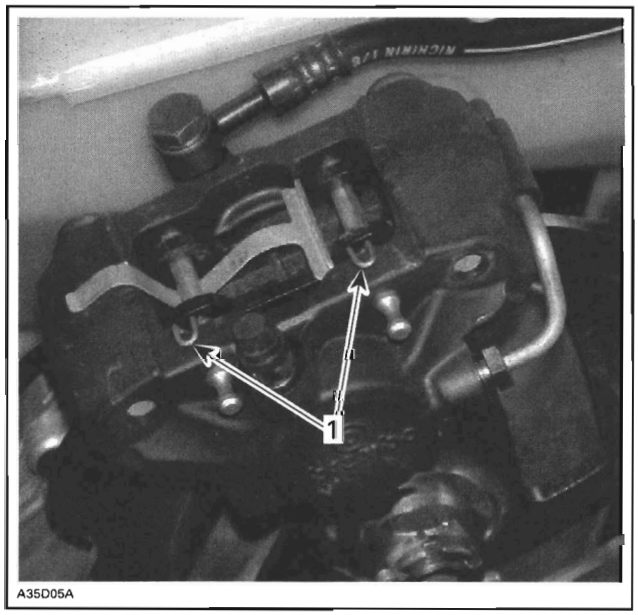
1. Groove on pad lining
A. Brake pad minimum thickness 1 mm (1/32 in)

Inspect brake disc at the same time.

Removal

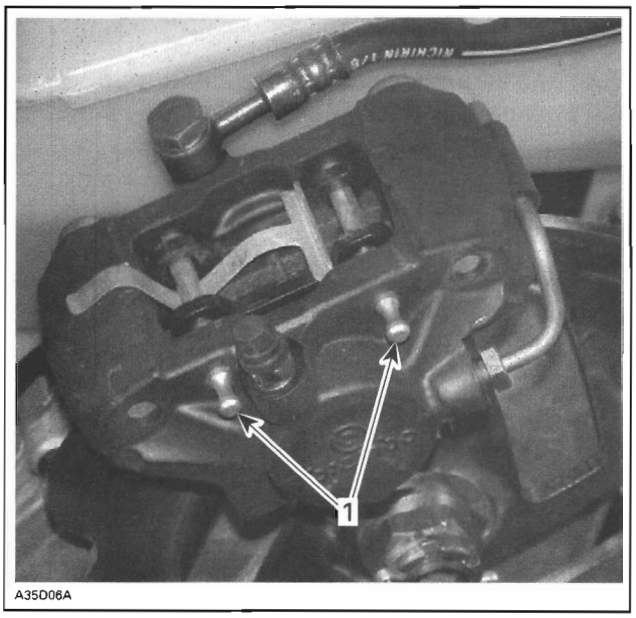
Brake pads removal procedure is as follows:

– Remove clips that retain pad pins.



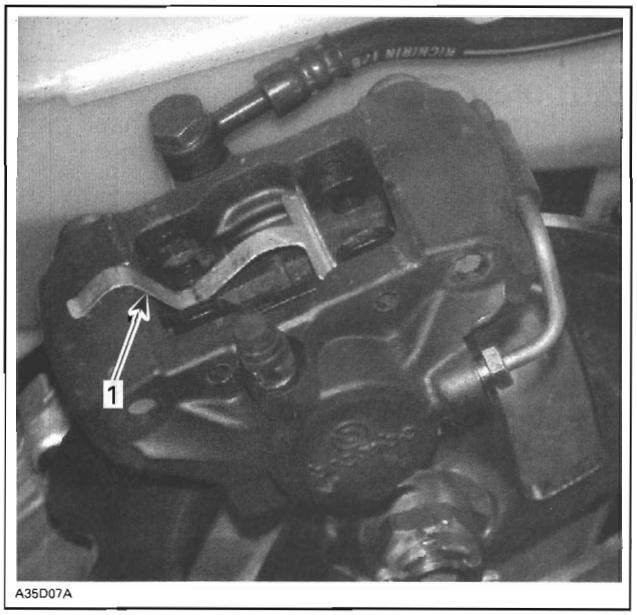
TYPICAL
1. Clips

– Hold pad spring and pull pad pins out of caliper.



TYPICAL
1. Pad pins

– Remove pad spring.



TYPICAL
1. Pad spring

– Insert a flat screwdriver between brake disc and brake pad to compress caliper piston. Pay attention to avoid scratching brake disc.
– Remove the brake pads.

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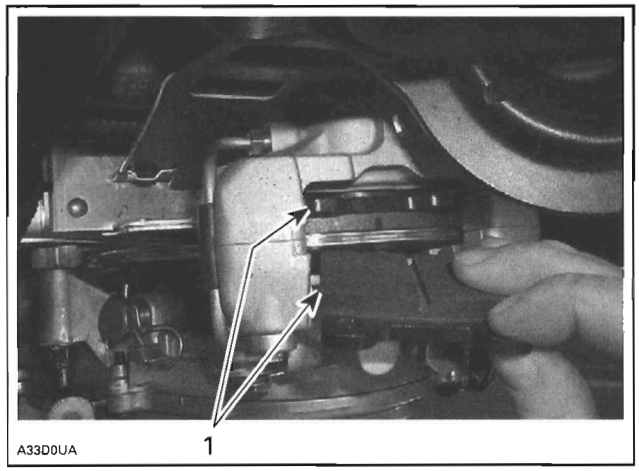


TYPICAL
1. Brake pad

Installation

Install:
- new brake pads
- pad spring and push 2 pins to lock the brake pads
- both clips in the pin holes.

⚠ WARNING

Avoid getting fluid, oil or grease on brake pads. Contaminated brake pads can affect stopping capacities.

Press the brake lever until both new pads are touching the brake disc.

Center the brake disc into the caliper. Refer to *CALIPER*.

BRAKE DISC

Inspection

The brake disc can be inspected without removing it from the vehicle.

Check for scoring, cracking or bending, replace as required.

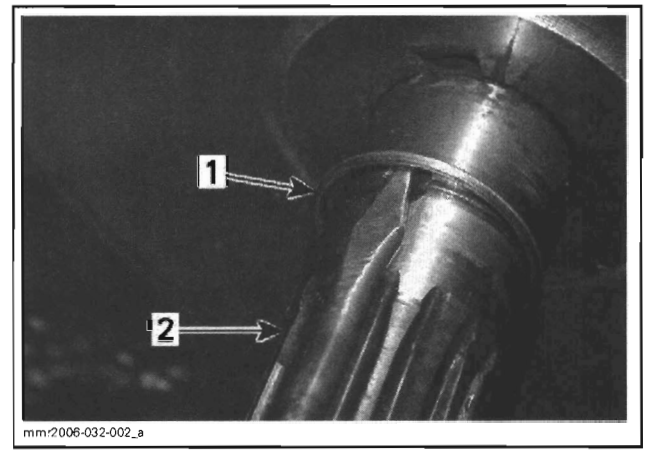
Measure brake disc thickness. The minimum thickness should be 4.3 mm (.169 in). If the brake disc is out of specification, replace it with a new one.

CAUTION: Brake disc should never be machined.

Removal

Remove chaincase. Refer to *CHAINCASE*.

Using a small tool, remove the circlip on countershaft.



TYPICAL
1. Circlip
2. Countershaft

Remove brake disc from countershaft. Pay attention not to lose the Woodruff key.

Installation

Apply Loctite 767 (antiseize lubricant) (P/N 293 800 070) on shaft.

The disc hub exceeds the disc more from one side than from the other. Install disc with the longer exceeding portion toward driven pulley.

Reinstall all removed parts.

CALIPER

Removal

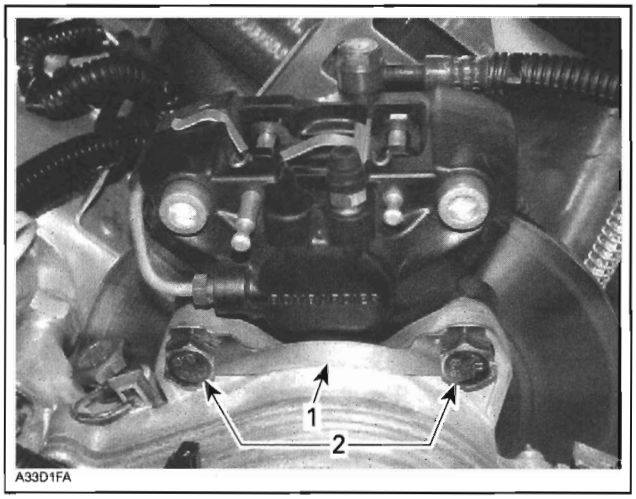
300F and 550F Models

Place a container under caliper. Unscrew the bleeding screw and drain the brake system. Do not remove the bleeding screw completely during draining.

To completely drain the brake fluid, continuously press the brake lever until all fluid has escaped.

When the system is empty, remove the Banjo fitting. Discard the sealing washers.

Unscrew screws and remove locking tab to pull out caliper from chaincase.



TYPICAL
1. *Locking tab*
2. *Screws*

CAUTION: Do not let the caliper hang by the hose and do not stretch or twist the hose.

V800 Models

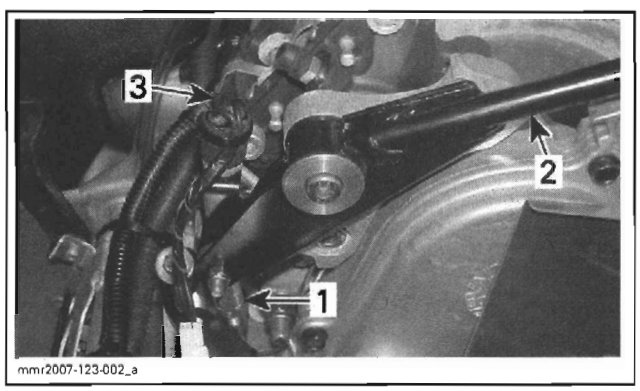
Remove battery. Refer to *CHARGING SYSTEM*.

Place a container under caliper. Unscrew the bleeding screw and drain the brake system. Do not remove the bleeding screw completely during draining.

To completely drain the brake fluid, continuously press the brake lever until all fluid has escaped.

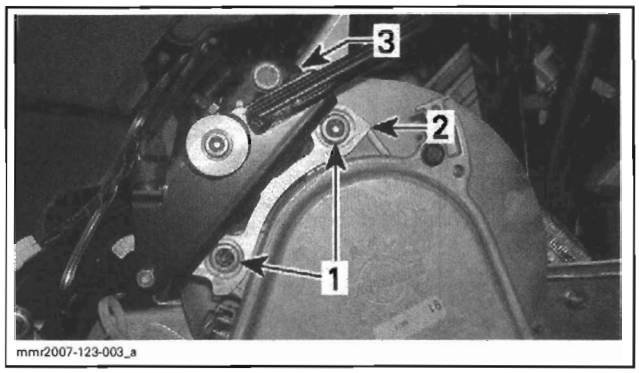
When the system is empty, remove the Banjo fitting. Discard the sealing washers.

Unscrew bolt that attach the link rod to reverse lever.



1. *Link rod*
2. *Reverse lever*
3. *Chaincase*

Unscrew bolts retaining reverse lever support and caliper to chaincase.



1. *Retaining bolts*
2. *Reverse lever support*
3. *Caliper*

Remove caliper.

CAUTION: Do not let the caliper hang by the hose and do not stretch or twist the hose.

Inspection

Check pistons for scratches, rust or other damages. If so, replace the caliper as an assembly.

NOTE: Only brake pads are available as spare parts.

Installation

Push pistons all the way in to allow caliper installation over brake disc.

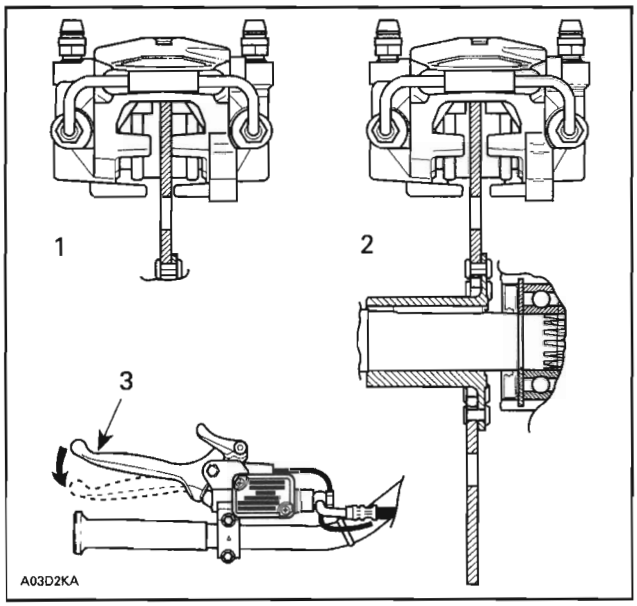
Install the Banjo fitting with two new sealing washers.

Fasten caliper on chaincase. Do not forget to install and fold locking tab over caliper bolt (**300F and 550F models**).

Fill the brake system and bleed it. Refer to *MAINTENANCE* in this section.

The brake disc must be centered in caliper. Apply brake then check for proper brake disc positioning.

Push on appropriate caliper piston in order to move pad inward allowing proper brake disc positioning.



TYPICAL
1. *Brake disc not centered*
2. *Brake disc centered*
3. *Apply brake before checking*

Apply brake then recheck.

MASTER CYLINDER

Removal

The master cylinder is located on the LH side of handlebar. To remove it, unscrew both screws retaining the brake lever to the handlebar.

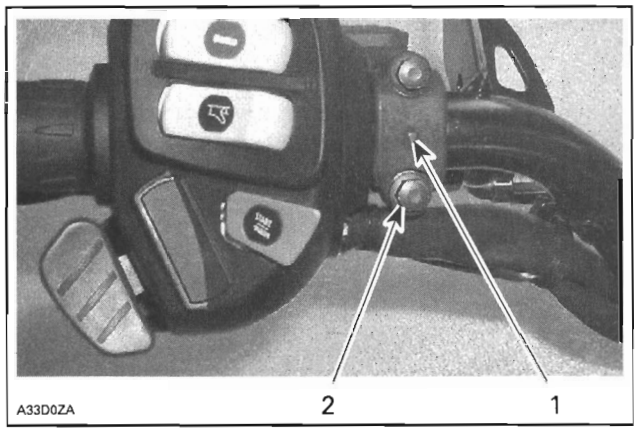
Place a container under Banjo fitting then unscrew it. Discard the sealing washers.

Installation

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

Always use new sealing washers during installation.

Install clamp with its arrow pointing at downwards. Tighten to 8 N•m (71 lbf•**in**) lower screw before upper one.



TYPICAL
1. *Arrow on upper clamp pointing downwards*
2. *Tighten lower screw first*

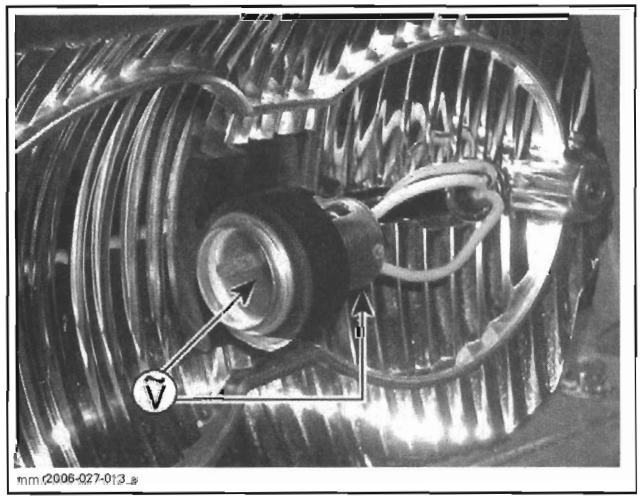
Bleed the brake system. Refer to *MAINTENANCE* in this section.

BRAKE LIGHT SWITCH

Switch Voltage Test

Remove taillight bulb.

Using a multimeter, measure the voltage in bulb socket as follows.



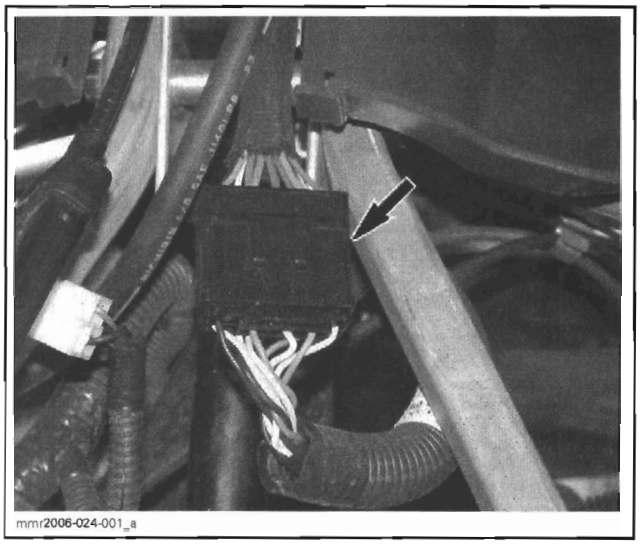
Start engine and read voltage. Apply brake and hold for measurement.

TAILLIGHT SOCKET		VOLTAGE
WHITE wire terminal	Socket shell (YELLOW/BLACK)	12 Vac

- Voltage is good:
  - Brake switch is in good condition.
- No voltage:
  - Check brake light switch resistance.

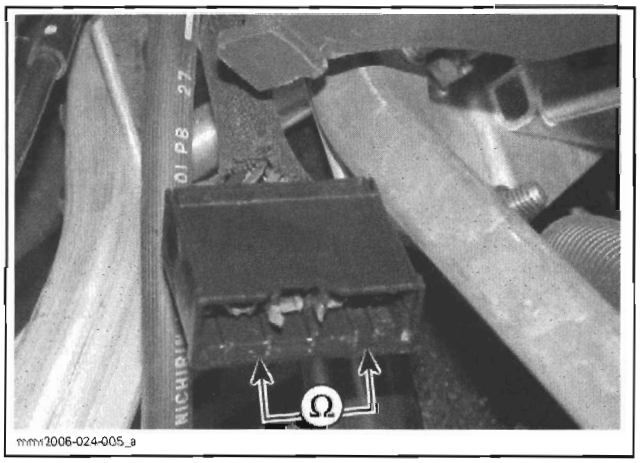
Switch Resistance Test

Disconnect steering connector.



Validate switch operation with an ohmmeter.

SWITCH	TERMINAL		RESISTANCE
Released	WHITE	RED/YELLOW (small terminal)	Infinite (0L)
Pushed and held			0.2 Ω (closed)



If readings do not correspond to the above specifications, check wiring/connectors going to switch. If they are good, replace switch.

If resistance test is good and the voltage test failed, there is a wire/connection problem between brake switch and taillight.

Removal

The brake light switch is located near the brake lever. To remove the switch, do the following.

Disconnect the switch.

Take out the master cylinder from the handlebar.

Fix the master cylinder in a rigid way preferably in a vise.

Pull out the switch wire and rubber cover.

Activate the parking brake.

Unscrew the switch body pay attention to apply a torque in axial direction with steps of little torque angles and pay attention to not apply a force in radial direction (flexion). The switch is delicate and can be easily snapped.

NOTE: In case of accidental breakage while removing switch body from master cylinder ensure to thoroughly restore and clean threads as needed before installing new switch.

Installation

NOTE: The brake light switch is not adjustable.

Remove the glue remaining with alcohol on a piece of cotton and then clean the seat threads.

Put the switch on the seat, rotating it only for 1 or 1.5 turns.

Put one drop of Loctite 609 (P/N 413 703 100) on the free switch threads.

Screw the switch by hand until it is in a correct position.

For safety reasons, check the activation of the switch by pulling the brake lever. In case of no switch activation, repeat all the procedure replacing a new switch.

NOTE: If parking brake release during the mounting operations, set the master cylinder in a sloping position (with lever on the top) and hold the master cylinder lever for 45 minutes.

Reinstall the master cylinder on the handlebar taking it in a horizontal position avoiding the risk of glue contamination for the switch rod.

Release the parking brake.

Wait 24 hours to allow glue to set.

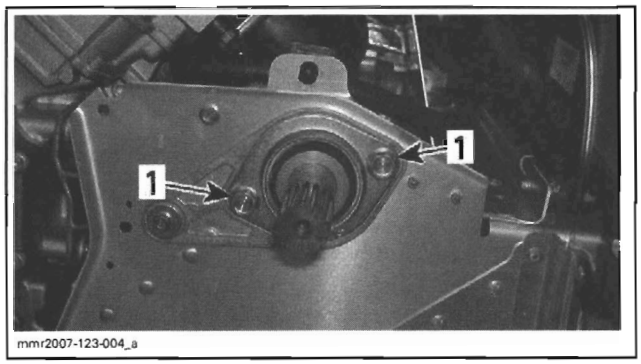
Recheck if switch is working properly.

COUNTERSHAFT

Removal

Remove the driven pulley, refer to *DRIVEN PULLEY*.

Unbolt bearing support.



TYPICAL
1. Bearing support bolts

Release tension of drive chain

Remove chaincase cover, cotter pin, castle nut, upper sprocket and countershaft spacer.

By the LH side of vehicle, pull the countershaft with its bearing out of vehicle.

Inspection

Check countershaft for bending, rust or other damages. Replace if necessary.

Check condition of countershaft splines and threads. Replace countershaft if necessary.

Installation

The installation is the reverse of removal procedure.

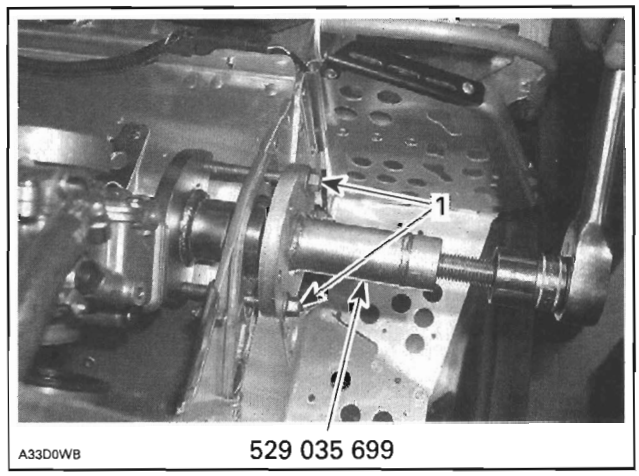
NOTE: Always install a new bearing when countershaft is removed. Refer to *COUNTERSHAFT BEARING*.

COUNTERSHAFT BEARING

Removal

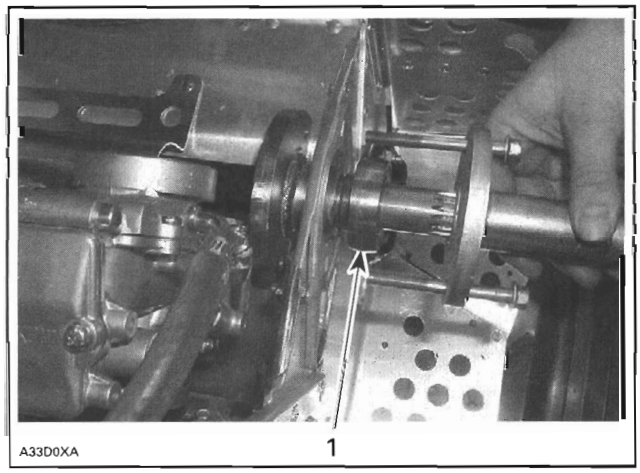
Remove the driven pulley, refer to *DRIVEN PULLEY*.

Unbolt bearing support. Install the countershaft bearing remover/installer (P/N 529 035 699).



TYPICAL
1. Screws replacing bearing support screws

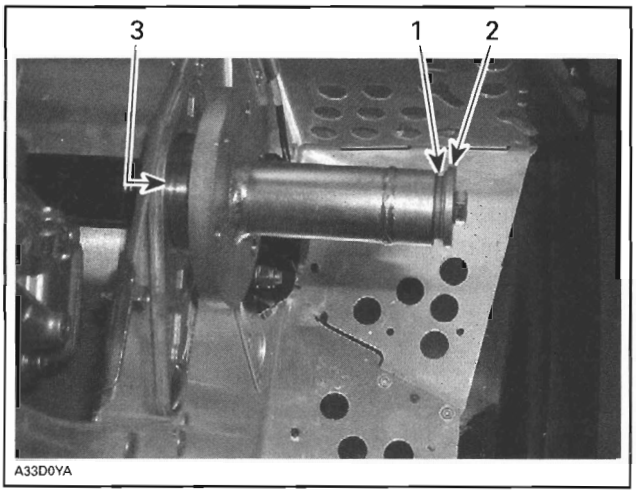
Tighten the countershaft bearing remover/installer bolt to pull the bearing out of it housing.



TYPICAL
1. Bearing

Installation

To install bearing on countershaft, use the countershaft bearing remover/installer (P/N 529 035 699) and some flat washers of 3 mm (1/8 in) total thickness. Using original retaining screw and shouldered washer tighten until bearing rests against circlip.



TYPICAL
1. *Washers use as a 3 mm (1/8 in) spacer*
2. *Original retaining screw and shouldered washer*
3. *Bearing against circlip*

Ensure that countershaft is properly aligned, then tighten 3 retaining screws.

NOTE: A misaligned countershaft will result in difficulty to center the bearing in its support.

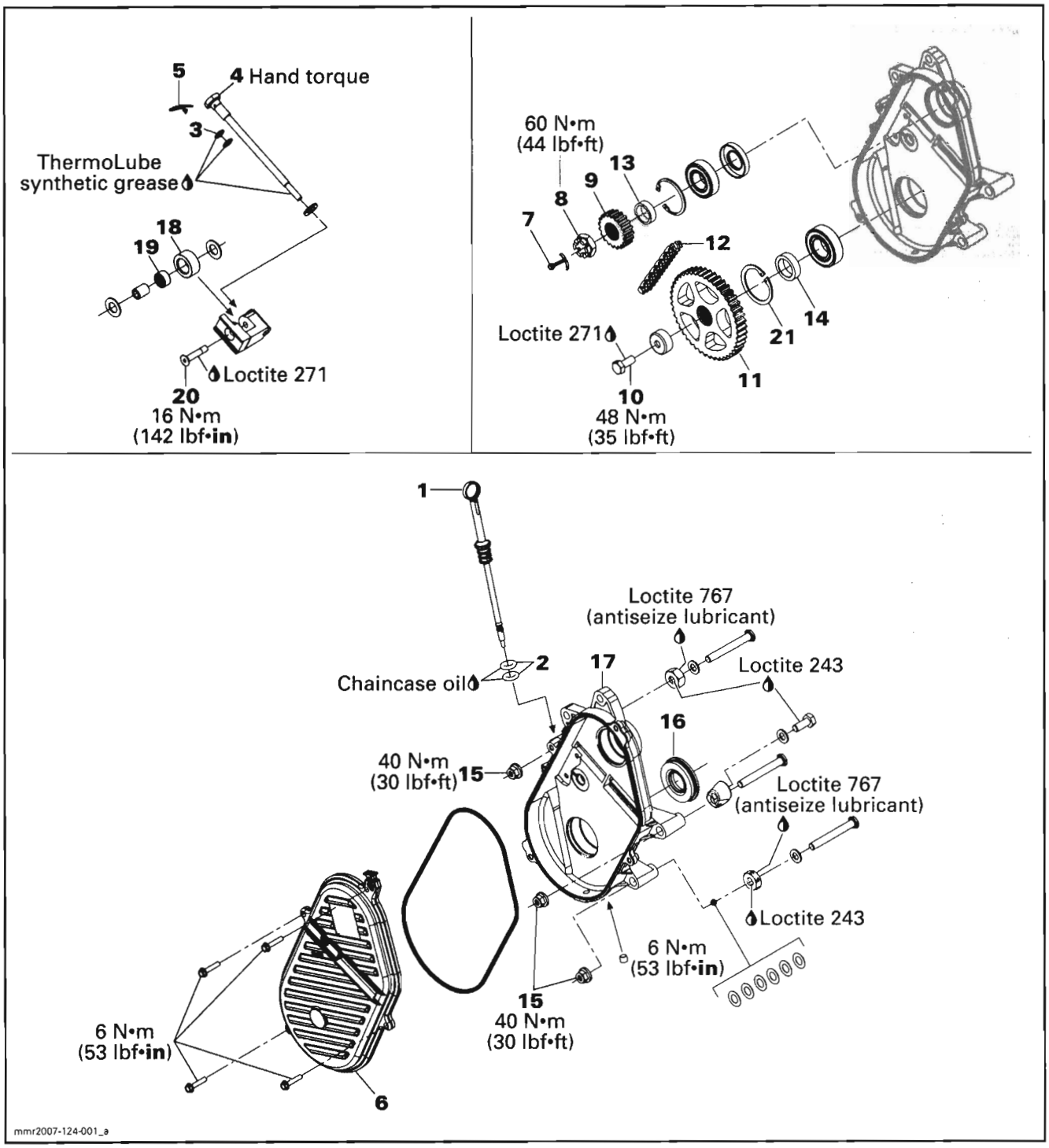
CHAINCASE (300F AND 550F)

SERVICE TOOLS

Description	Part Number	Page
drive axle holder	529 007 200	498

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 271 (red)	293 800 005	499–500
ThermoLube synthetic grease	293 700 417	500
XP-S chaincase oil	413 801 900	495
XP-S synthetic chaincase oil	413 803 300	495


5
4 Hand torque
3
ThermoLube
synthetic grease
18
19
Loctite 271
20
16 N•m
(142 lbf•in)
60 N•m
(44 lbf•ft)
13
9
8
7
12
14
21
Loctite 271
11
10
48 N•m
(35 lbf•ft)
1
Loctite 767
(antiseize lubricant)
2
17
Loctite 243
Chaincase oil
16
40 N•m
(30 lbf•ft)
15
Loctite 767
(antiseize lubricant)
Loctite 243
6 N•m
(53 lbf•in)
15
40 N•m
(30 lbf•ft)
6 N•m
(53 lbf•in)
6
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GENERAL

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

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 strictly be adhered to.
Locking devices (e.g.: 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.

MAINTENANCE

CHAINCASE OIL

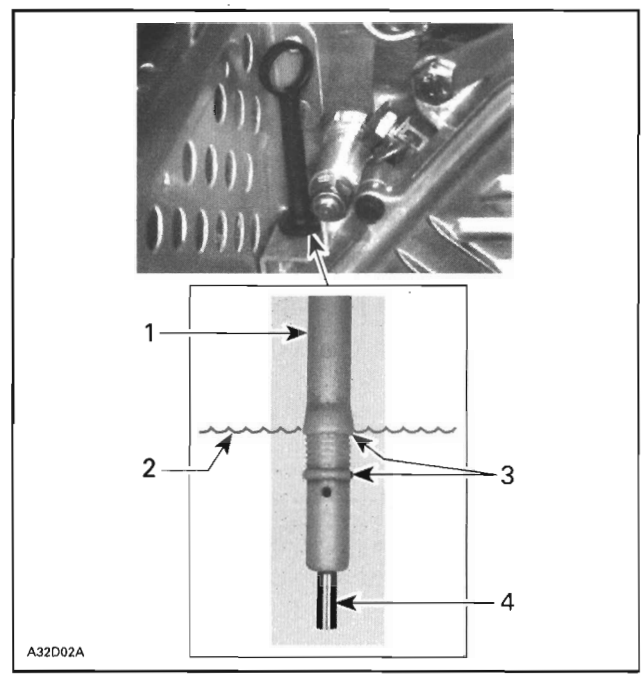
Recommended Oil

NOTE: Do not mix different oil (mineral and synthetic) for topping off.

Use XP-S chaincase oil (P/N 413 801 900) or XP-S synthetic chaincase oil (P/N 413 803 300).

Oil Level Verification

With the vehicle on a level surface, check the oil level by removing dipstick **no. 1**. Oil level must be between lower and upper marks.



TYPICAL
1. *Dipstick*
2. *Oil level*
3. *Level between marks*
4. *Magnet*

NOTE: It is normal to find metallic particles stuck to dipstick magnet. If bigger pieces of metal are found, remove the chaincase cover and inspect the chaincase parts.

Remove metal particles from magnet.

Refill to upper mark. See *RECOMMENDED OIL* for the proper chaincase oil to use.

CAUTION: Use only the recommended types of oil when servicing. Do not mix synthetic oil with other types of oil.

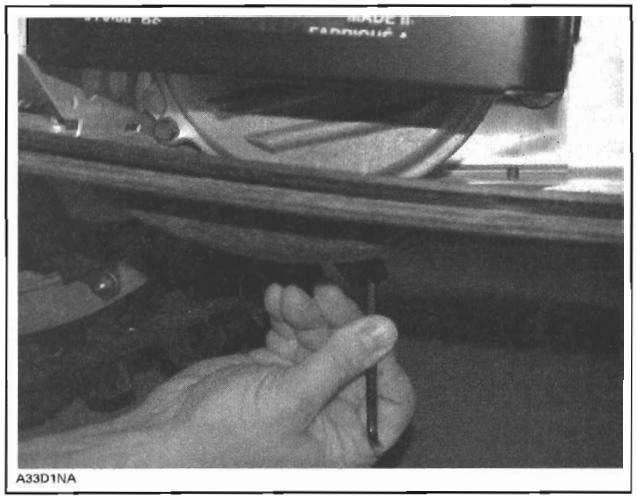
Check O-rings **no. 2**. If the O-rings are brittle, hard or otherwise damaged, replace them.

Draining Procedure

Place a drain pan under chaincase drain plug area.

Remove dipstick **no. 1**.

Using an Allen key, remove the drain plug.



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

Install drain plug and torque it to 6 N•m (53 lbf•**in**).

Filling Procedure

Place the vehicle on a level surface.

Using a funnel, pour 250 mL (8.5 U.S. oz) of chaincase oil.

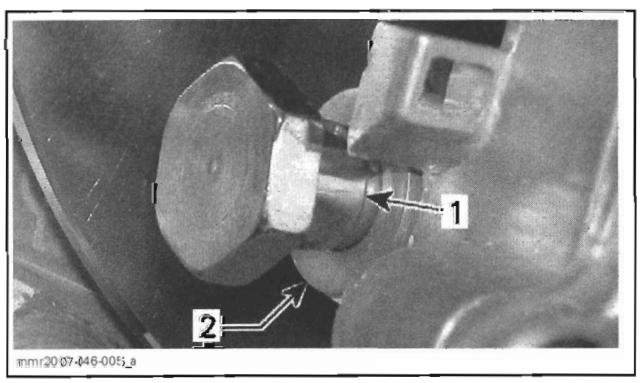
Check oil level with the dipstick and add oil if necessary. The level must be between lower and upper dipstick's marks.

DRIVE CHAIN ADJUSTMENT

NOTE: Brake disc key must be in good condition before checking if chain is loose.

Before performing the drive chain adjustment, check the tensioner adjustment screw O-ring(s) **no. 3** and replace if necessary.

Fully tighten tensioner adjustment screw **no. 4 BY HAND**. The tensioner adjustment screw shoulder and the washer must be in contact with the chaincase housing.



1. Shoulder of tensioner adjustment screw
2. Washer

When done, back off only far enough for hair pin **no. 5** to engage in locking hole.

This initial adjustment should provide 3 - 5 mm (1/8 - 13/64 in) free-play when measured at the outer circumference of the brake disc.

CAUTION: Free-play must not exceed 5 mm (13/64 in), readjust if necessary.

⚠ WARNING

If the specified free-play is not reached with the tensioner screw fully tightened, replace chain and check the condition of sprockets.

PROCEDURES

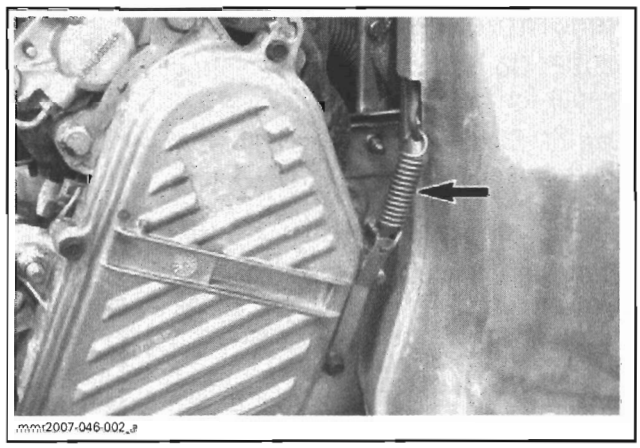
CHAINCASE

Removal

Drain chaincase oil.

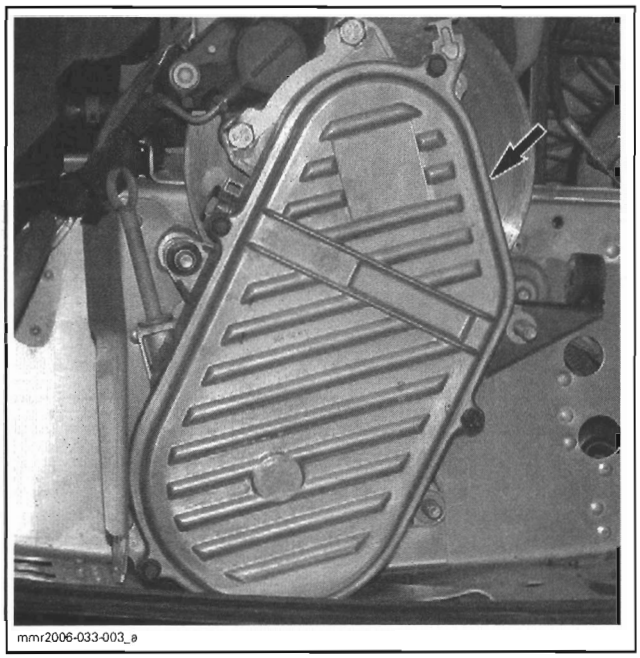
Remove battery and battery rack (if so equipped) to gain access, refer to *STARTING SYSTEM*.

Remove the muffler spring locates on the RH side of chaincase.

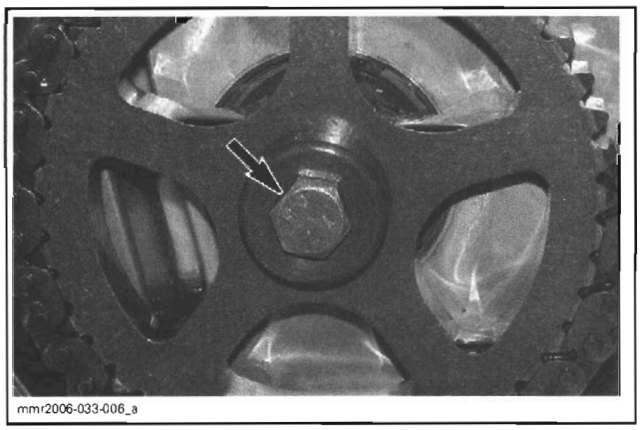


Apply parking brake.

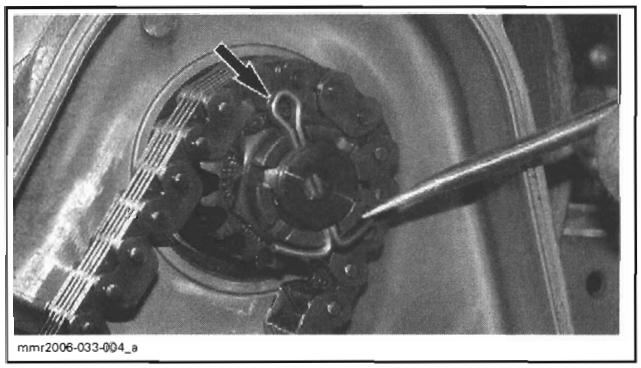
Remove chaincase cover **no. 6**.



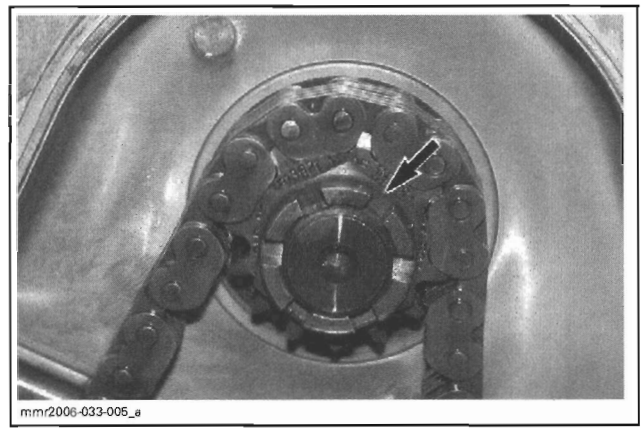
Remove the lower sprocket bolt **no. 10**.



Remove cotter pin **no. 7**.



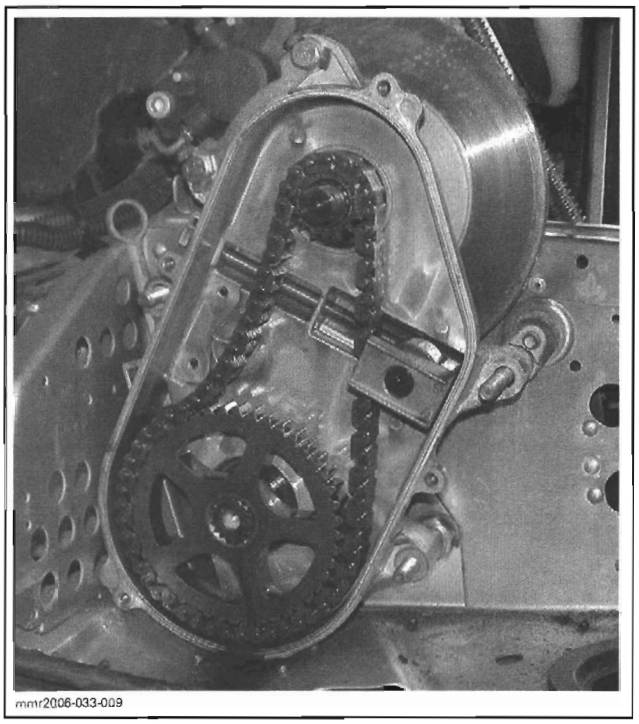
Upper sprocket nut **no. 8**.



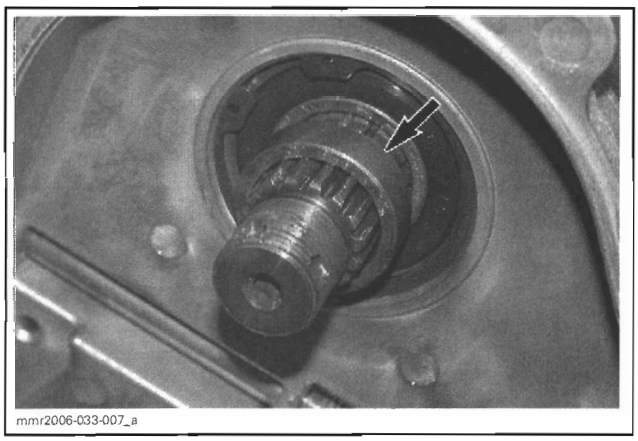
Remove hair pin **no. 5** from tensioner adjustment screw.

Release drive chain tension by unscrewing tensioner adjustment screw **no. 4**.

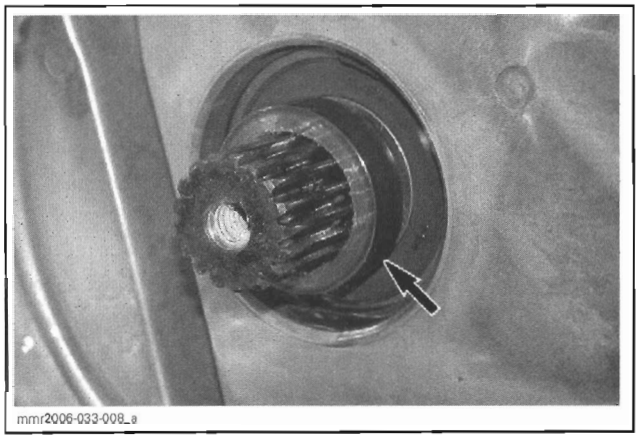
Remove the upper socket **no. 9** and the lower sprocket **no. 11** as well as chain **no. 12** simultaneously.


mmr2006-033-009

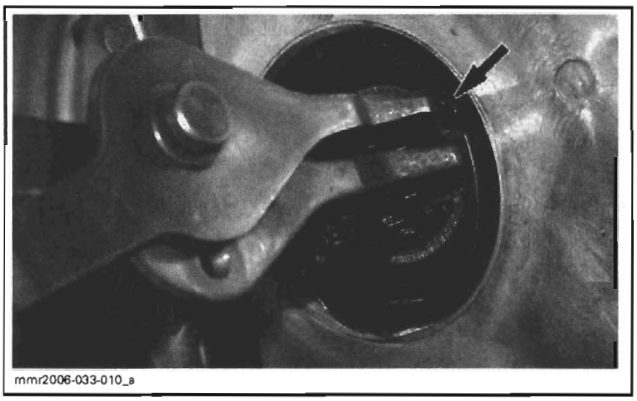
Remove the countershaft spacer **no. 13**.


mmr2006-033-007_a

Then remove the drive axle spacer **no. 14**.


mmr2006-033-008_a

Near drive axle, remove the circlip **no. 21** from chaincase housing.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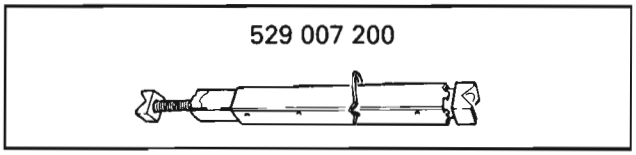
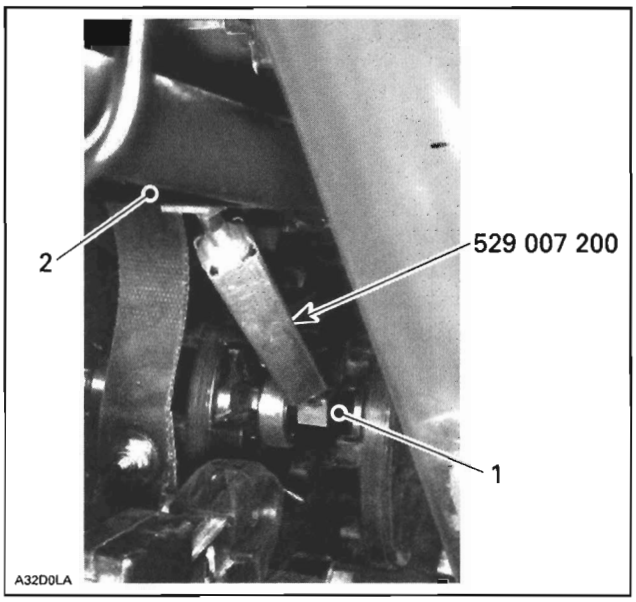
Release parking brake.

Remove nut(s) **no. 15** that retain chaincase to frame.

Unfold locking tab then remove caliper retaining screws.

Hold the drive axle in place by using the drive axle holder (P/N 529 007 200).



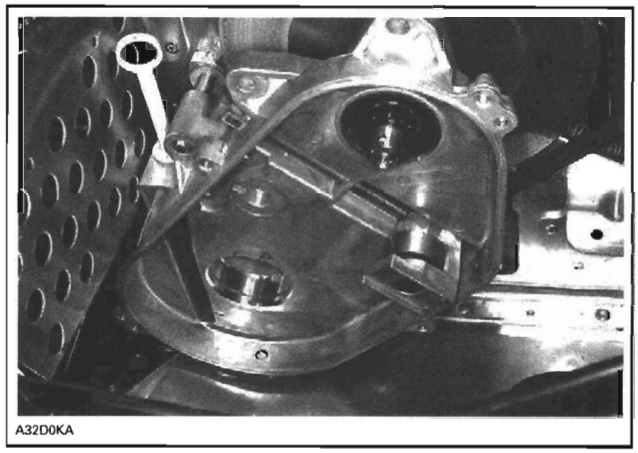


TYPICAL
1. Drive axle
2. Suspension front arm

Pry out drive axle oil seal **no. 16** from chaincase.

Pull chaincase from drive axle and countershaft.

Using 2 large prybars inserted between chaincase housing **no. 17** and frame, pry complete assembly from vehicle.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TYPICAL — CHAINCASE HOUSING REMOVAL

Inspection

Visually inspect the chain and sprockets for wear, cracked, damaged or missing links. If a problem is detected, replace drive chain and sprockets as an assembly.

Check the drive chain deflection. If the deflection is greater than 38 mm (1-1/2 in) without the chain tensioner, replace the chain.

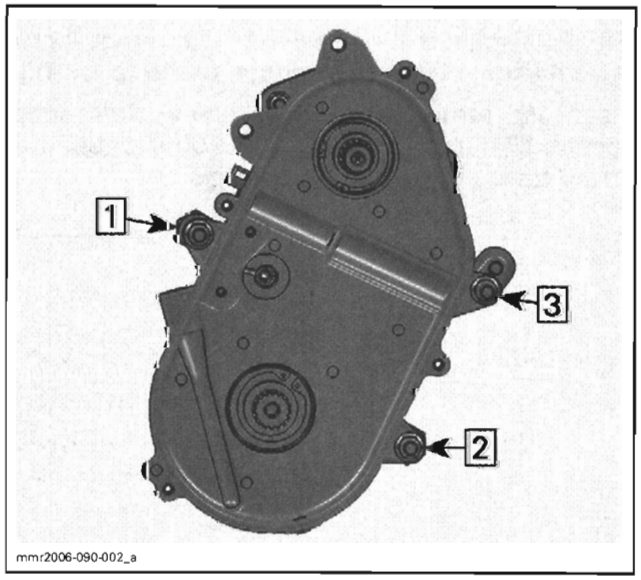
Check for worn or defective bearings.

Check chain tensioner roller **no. 18** for wear or other damages. If the roller does not turn smoothly, replace the needle bearing **no. 19**.

Installation

Reverse removal procedure and pay attention to the following.

When installing chaincase housing, use the following sequence to tighten chaincase nuts.



mmr2006-090-002_a

Using an appropriate pusher, press the oil seal **no. 16** into chaincase hub. Oil seal must fit flush with the chaincase edge.

Install the circlip **no. 21** in chaincase housing.

CAUTION: It is of the utmost importance to install the circlip otherwise damage to the chaincase components may occur.

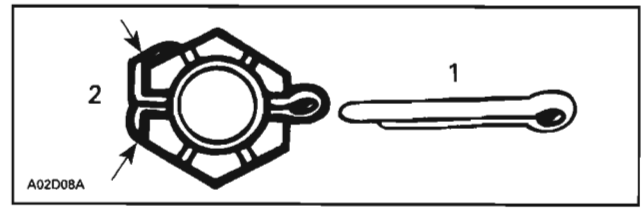
Position the sprockets **no. 9** and **no. 11** with the backside of writing facing the chaincase cover. Sprocket hub faces toward chaincase.

Install the castellated nut **no. 8** and torque to 60 N•m (44 lbf•ft).

Apply Loctite 271 (red) (P/N 293 800 005) on lower sprocket screw threads and torque to 48 N•m (35 lbf•ft).

Install new cotter pin **no. 7** in the position shown.

CAUTION: When removing a cotter pin always replace with a new one. Cotter pin will rub on chaincase cover if installed otherwise.



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1. *New*
2. *Fold cotter pin over castellated nut flats only*

Check if chain tensioner screw is screwed correctly.

Install chaincase cover and torque its screws to 6 N•m (53 lbf•**in**).

Adjust drive chain. Refer to *DRIVE CHAIN ADJUSTMENT* at the beginning of this section.

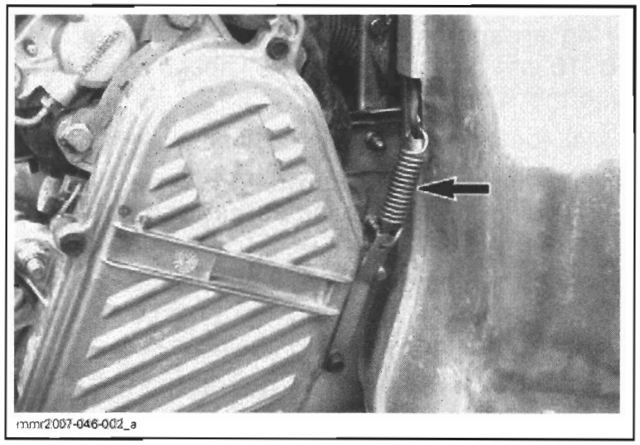
CHAIN TENSIONER

Removal

Drain chaincase oil.

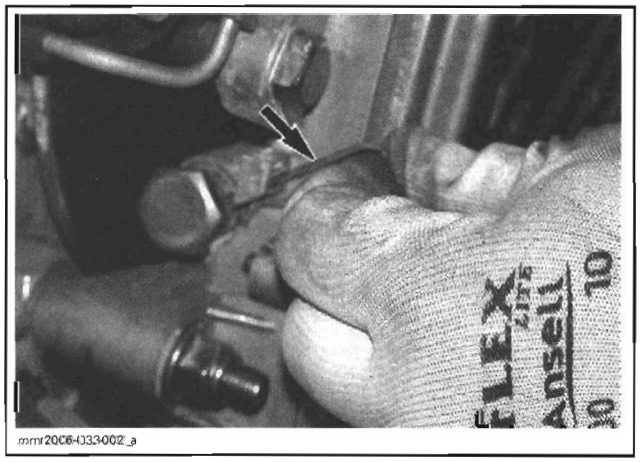
Remove battery and battery rack (if so equipped) to gain access, refer to *STARTING SYSTEM*.

Remove the muffler spring located on the RH side of chaincase.



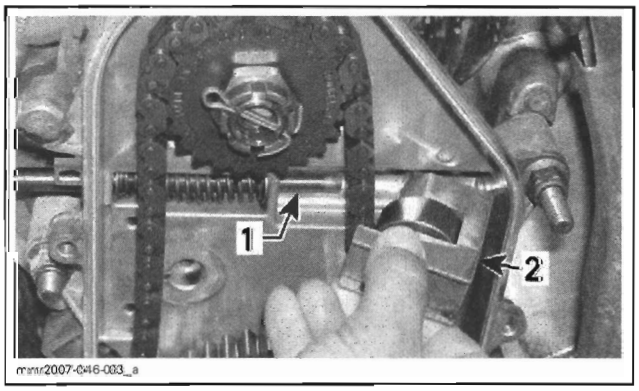
Remove chaincase cover **no. 6**.

Remove hair pin **no. 5**.



Unscrew tensioner adjustment screw **no. 4** completely.

Pull the tensioner adjustment screw to separate it from tensioner.



TYPICAL
1. Tensioner adjustment screw
2. Tensioner

Inspection

Check chain tensioner roller **no. 18** for wear or other damages. If the roller does not turn smoothly, replace the needle bearing **no. 19**. See procedure further.

Check O-rings **no. 3** on tensioner adjustment screw. Replace them if necessary.

Check threads of tensioner adjustment screw for damages or wear. Replace the screw if necessary and check chaincase housing for damages.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Apply ThermoLube synthetic grease (P/N 293 700 417) on threads and O-rings of tensioner adjustment screw.

Check if chain tensioner screw is screwed correctly.

Adjust drive chain tension. Refer to *DRIVE CHAIN ADJUSTMENT* at the beginning of this section.

Install all removed parts.

CHAIN TENSIONER ROLLER BEARING

Removal

Remove the chain tensioner, see procedure above.

Heat the roller screw **no. 20** to break the threadlocker.

Remove the needle bearing from the roller.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Clean and remove grease on screw then apply Loctite 271 (red) (P/N 293 800 005) under the screw head only, **none on threads**.

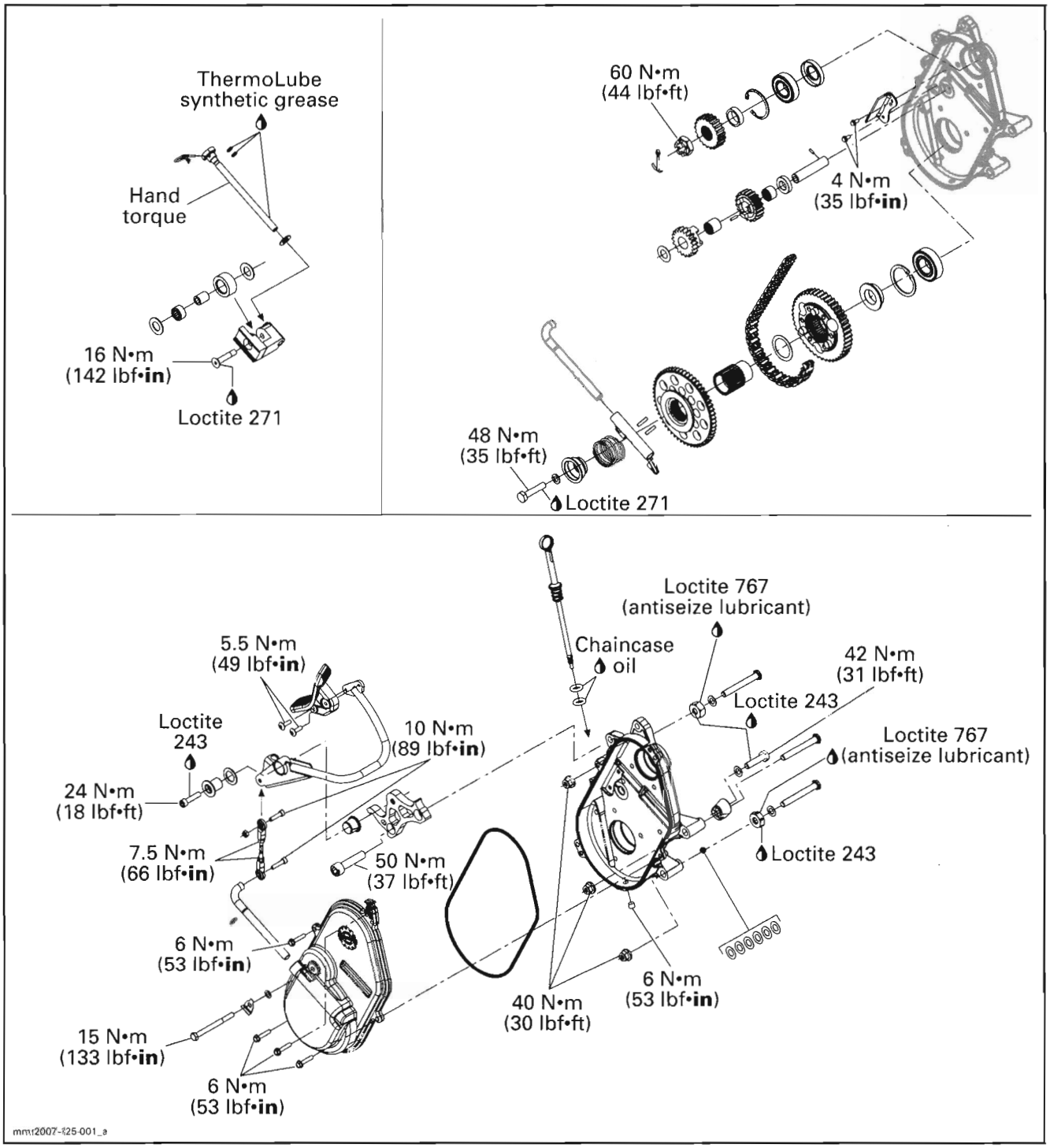
CHAINCASE (V800)

SERVICE TOOLS

Description	Part Number	Page
drive axle holder	529 007 200	508

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 271 (red)	293 800 005	511
ThermoLube synthetic grease	293 700 417	511
XP-S synthetic chaincase oil	413 803 300	503


ThermoLube synthetic grease
Hand torque
16 N•m (142 lbf•in)
Loctite 271
60 N•m (44 lbf•ft)
4 N•m (35 lbf•in)
48 N•m (35 lbf•ft)
Loctite 271
Loctite 767 (antiseize lubricant)
Chaincase oil
5.5 N•m (49 lbf•in)
Loctite 243
10 N•m (89 lbf•in)
24 N•m (18 lbf•ft)
7.5 N•m (66 lbf•in)
50 N•m (37 lbf•ft)
6 N•m (53 lbf•in)
15 N•m (133 lbf•in)
6 N•m (53 lbf•in)
40 N•m (30 lbf•ft)
6 N•m (53 lbf•in)
42 N•m (31 lbf•ft)
Loctite 243
Loctite 767 (antiseize lubricant)
Loctite 243
mmr2007-125-001_a

GENERAL

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

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 strictly be adhered to.
Locking devices (e.g.: 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.

MAINTENANCE

CHAINCASE OIL

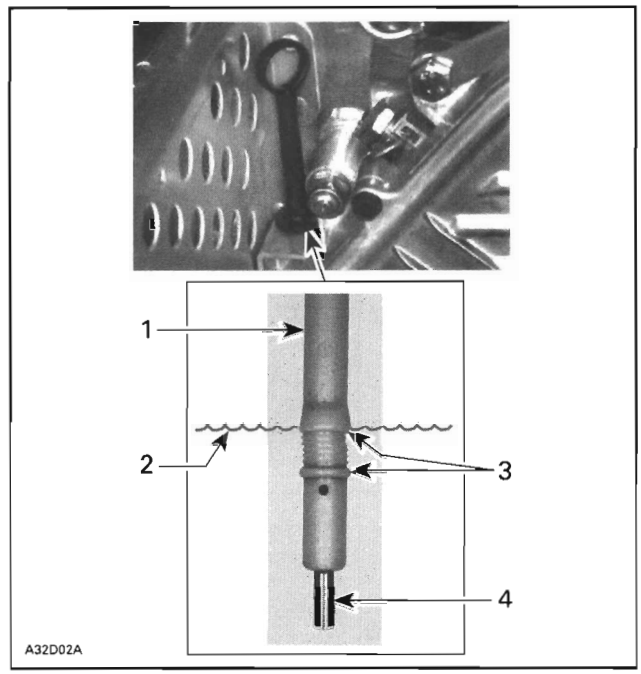
Recommended Oil

NOTE: Do not mix different oil (mineral and synthetic) for topping off.

Use XP-S synthetic chaincase oil (P/N 413 803 300).

Oil Level Verification

With the vehicle on a level surface, check the oil level by removing dipstick. Oil level must be between lower and upper marks.



TYPICAL
1. *Dipstick*
2. *Oil level*
3. *Level between marks*
4. *Magnet*

NOTE: It is normal to find metallic particles stuck to dipstick magnet. If bigger pieces of metal are found, remove the chaincase cover and inspect the internal parts.

Remove metal particles from magnet.

Refill to upper mark. See *RECOMMENDED OIL* for the proper chaincase oil to use.

CAUTION: Use only the recommended type of oil when servicing. Do not mix synthetic oil with other types of oil.

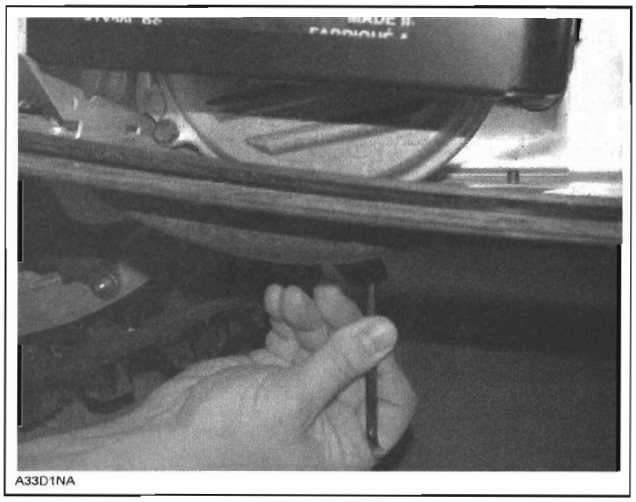
Check O-rings. If the O-rings are brittle, hard or otherwise damaged, replace them.

Draining Procedure

Place a drain pan under chaincase drain plug area.

Remove dipstick.

Using an Allen key, remove the drain plug.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Wait a while to allow oil to flow out of chaincase.

Install drain plug and torque it to 6 N•m (53 lbf•**in**).

Filling Procedure

Place the vehicle on a level surface.

Using a funnel, pour 250 mL (8.5 U.S. oz) of chaincase oil.

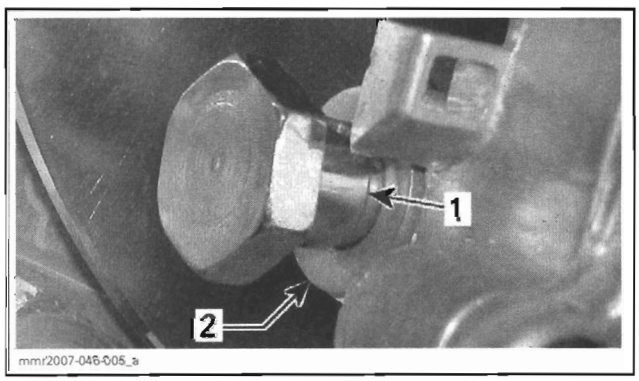
Check oil level with the dipstick and add oil if necessary. The level must be between lower and upper dipstick's marks.

DRIVE CHAIN ADJUSTMENT

NOTE: Brake disc key must be in good condition before checking if chain is loose.

Before performing the drive chain adjustment, check the tensioner adjustment screw O-ring(s) and replace if necessary.

Fully tighten tensioner adjustment screw **BY HAND**. The tensioner adjustment screw shoulder and the washer must be in contact with the chaincase.



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1. *Shoulder of tensioner adjustment screw*
2. *Washer*

When done, back off only far enough for hair pin to engage in locking hole.

This initial adjustment should provide 3 - 5 mm (1/8 - 13/64 in) free-play when measured at the outer circumference of the brake disc.

CAUTION: Free-play must not exceed 5 mm (13/64 in), readjust if necessary.

⚠ WARNING

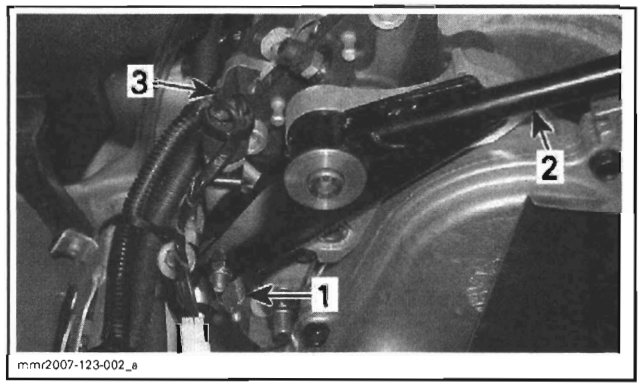
If the specified free-play is not reached with the tensioner screw fully tightened, replace chain and check the condition of sprockets.

PROCEDURES

REVERSE LEVER

Removal

Remove bolt and nut that attach the link rod to reverse lever.



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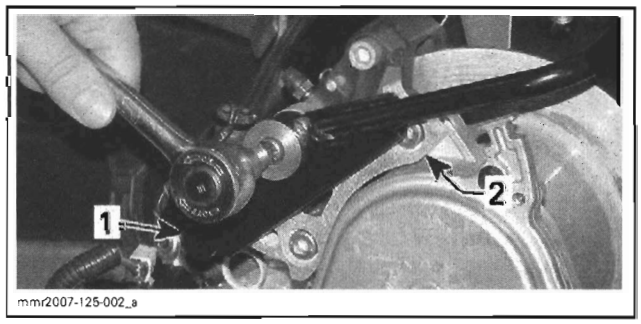
1. *Link rod*
2. *Reverse lever*
3. *Chaincase*

Loosen screw retaining reverse lever to support.



mmr2007-125-002_a

1. *Reverse lever*
2. *Support*

Inspection

Check the bushing between reverse lever and its support for wear. Replace as required.

Installation

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

To connect the link rod to reverse lever, refer to *LINK ROD* below.

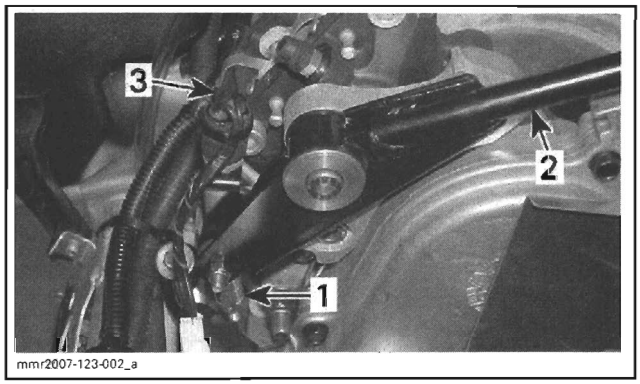
LINK ROD

Inspection

Check link rod for excessive play, bent or other damages. Replace as required.

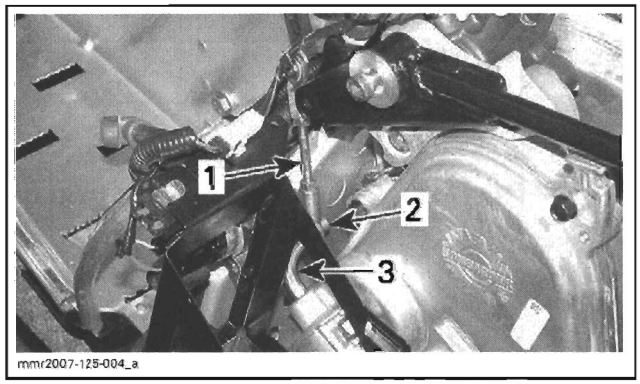
Removal

Loosen socket screw that attach the link rod to reverse lever.



1. Link rod
2. Reverse lever
3. Chaincase

Remove the lower socket screw securing link rod to reverse fork arm.



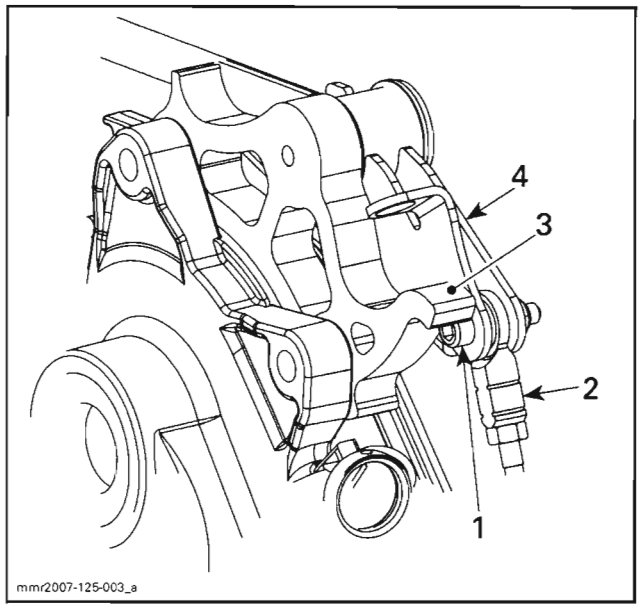
1. Link rod
2. Lower socket screw
3. Reverse fork arm

Remove the link rod.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

CAUTION: The bolt that attach link rod to reverse lever must be installed with it head facing tunnel. Otherwise, the reverse lever support will be damaged and the reverse system will not work correctly.



LINK ROD BOLT INSTALLATION
1. Head of bolt facing tunnel
2. Link rod
3. Reverse lever support
4. Reverse lever

Perform a link rod adjustment if one of these components is changed:
- chaincase cover
- chaincase
- reverse lever
- reverse fork arm
- link rod.

Adjustment

Place the reverse lever in forward position.

Unscrew both jam nuts.

Screw link rod until the head of socket screw comes into contact with the stop of reverse lever support. A gap of 0 to 0.3 mm (0 to .012 in) should be obtained between the socket screw head and the stop.

Torque jam nuts to 7.5 N•m (66 lbf•**in**).

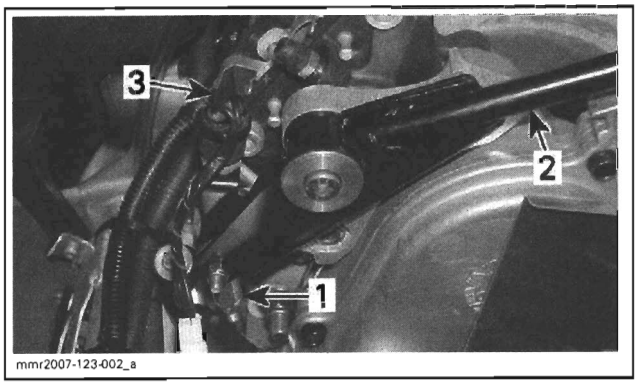
CHAINCASE COVER

Removal

Drain chaincase oil. Refer to *DRAINING PROCEDURE* in *MAINTENANCE*.

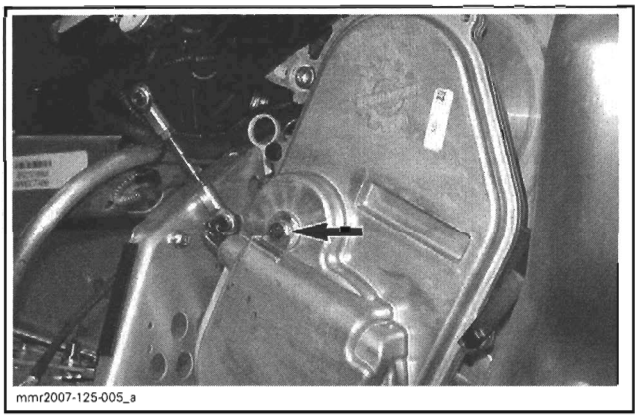
Remove the battery and its rack.

Unscrew bolt and nut that attach the link rod to reverse lever.

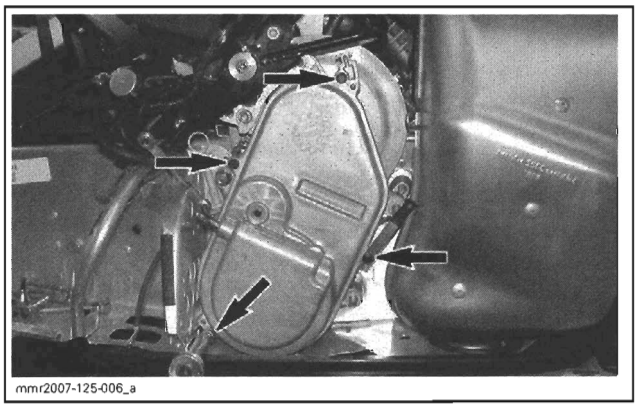


1. *Link rod*
2. *Reverse lever*
3. *Chaincase*

Unlock locking tab and unscrew the reverse axle screw.



Remove the chaincase cover screws.



Pull cover and move it upwards to disengage reverse fork from sliding gear.

Inspection

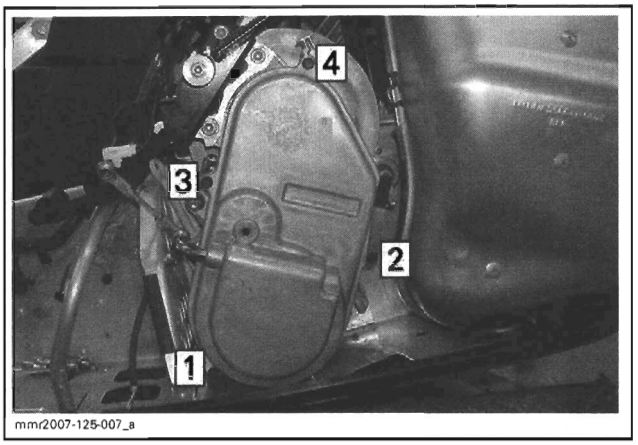
Check cover for cracks or other damages. Replace if necessary.

Installation

Install cover. Make sure reverse fork tabs are inserted in the sliding gear groove.

If the cover is properly installed, a gap of 1 mm (.039 in) should be left between cover and chaincase (chaincase cover gasket space).

Tightening sequence for cover screws is as per following illustration.



Install all other removed parts.

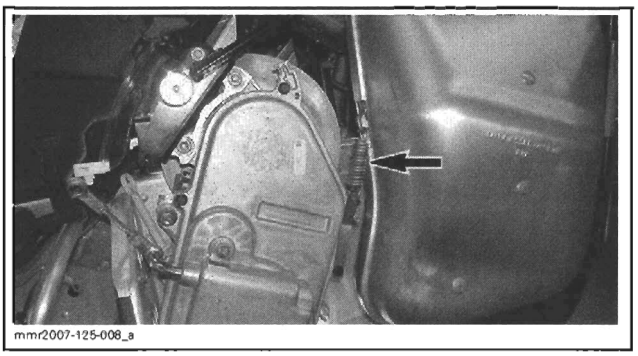
CHAINCASE

Removal

Drain chaincase oil.

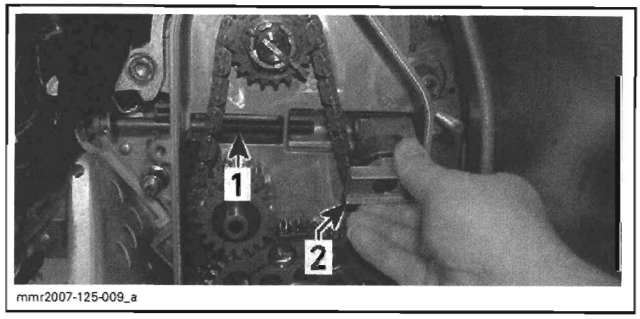
Remove battery and battery rack (if so equipped) to gain access, refer to *STARTING SYSTEM*.

Remove the muffler spring located on the RH side of chaincase.



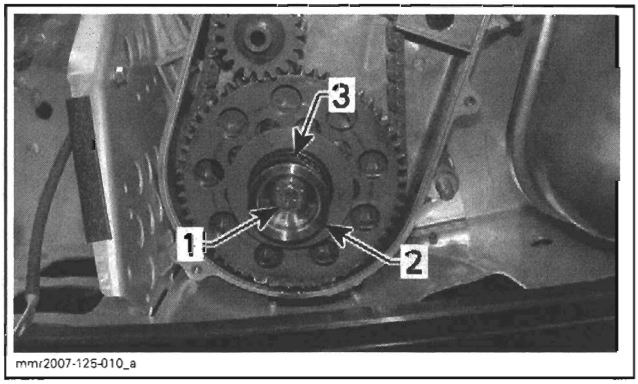
Apply parking brake.

Remove chaincase cover.



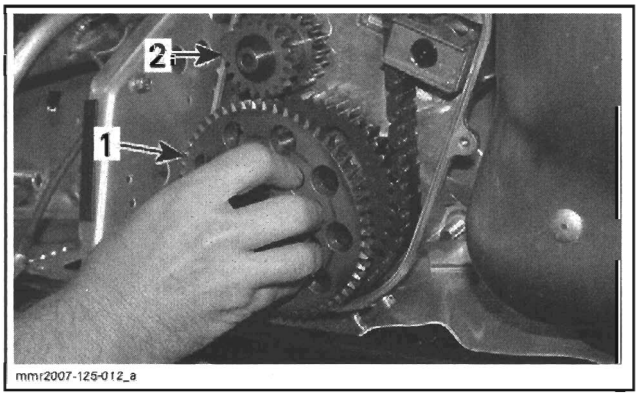
TYPICAL
1. *Tensioner adjustment screw*
2. *Tensioner*

Remove the lower sprocket bolt, cup and spring.



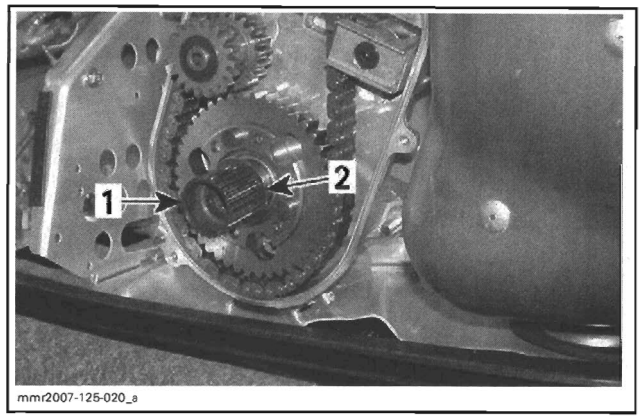
1. *Lower sprocket bolt*
2. *Cup*
3. *Spring*

Remove the sliding gear.



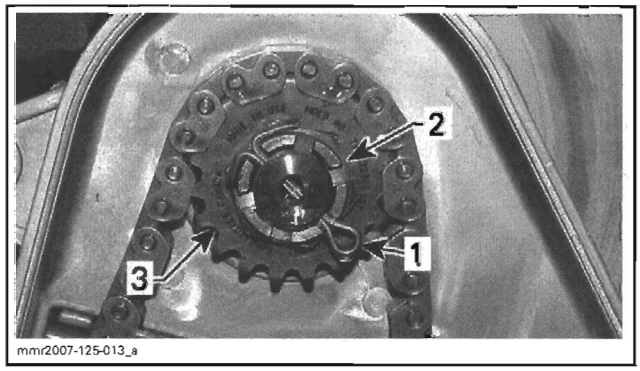
1. *Sliding gear*
2. *Reverse axle*

Remove the coupling shaft and its washer.



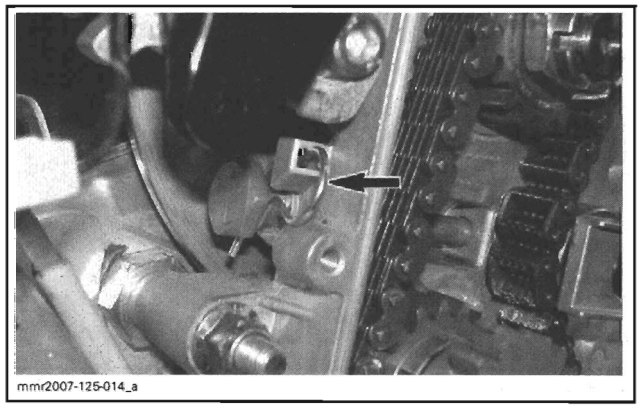
1. *Coupling shaft*
2. *Washer*

At the top, remove cotter pin and sprocket nut.



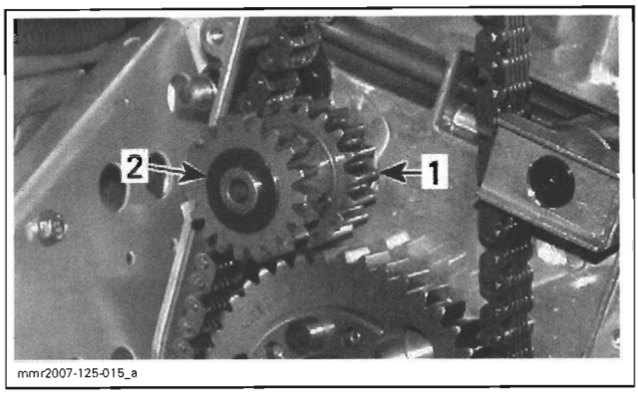
1. *Cotter pin*
2. *Sprocket nut*
3. *Sprocket*

Remove hair pin from tensioner adjustment screw.



Release drive chain tension by unscrewing tensioner adjustment screw.

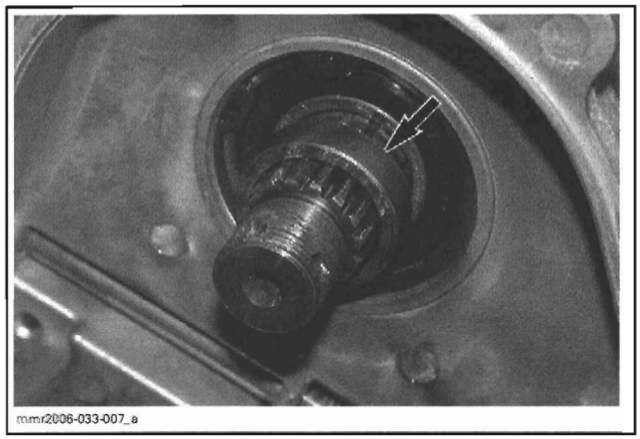
Remove the reverse axle assembly. Do not loose washer.



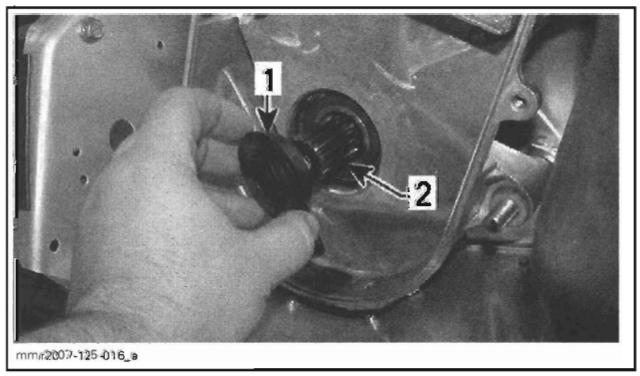
1. Reverse axle assembly
2. Washer

Remove the upper socket and the lower fixed sprocket as well as chain simultaneously.

Remove the countershaft spacer.

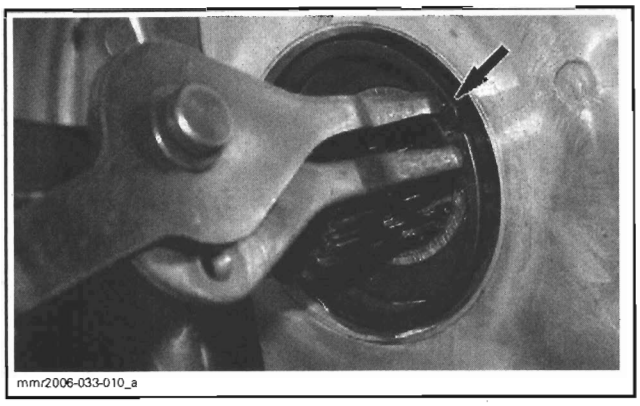


Then remove the drive axle spacer.



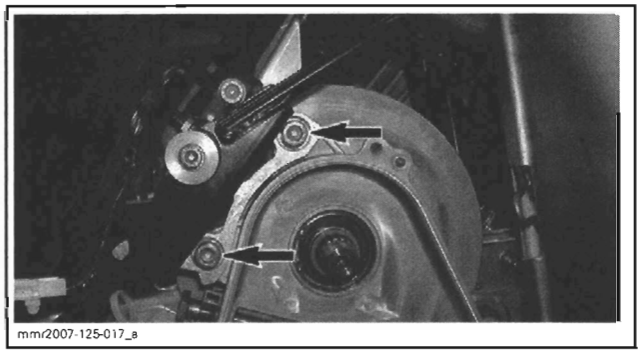
1. Drive axle spacer
2. Drive axle

Near drive axle, remove the circlip from chaincase.



Release parking brake.

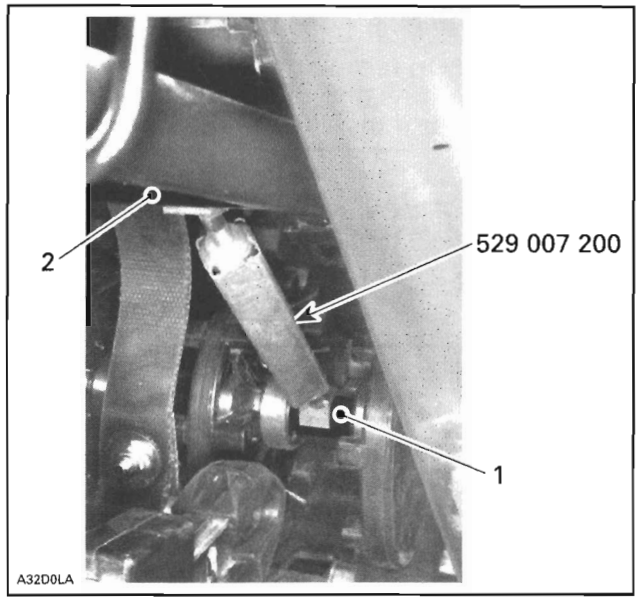
Remove socket screws that attach reverse lever support and caliper to chaincase.



Remove nut(s) that retain chaincase to frame.

Hold the drive axle in place by using the drive axle holder (P/N 529 007 200).

529 007 200

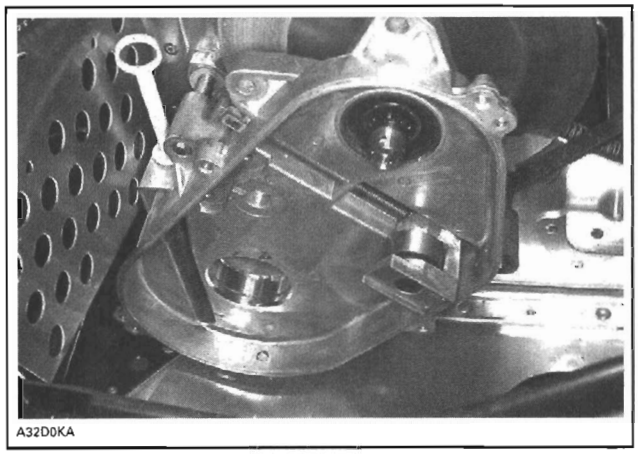


TYPICAL
1. *Drive axle*
2. *Suspension front arm*

Pry out drive axle oil seal from chaincase.

Pull chaincase from drive axle and countershaft.

Using 2 large prybars inserted between chaincase and frame, pry complete assembly from vehicle.



TYPICAL — CHAINCASE REMOVAL

NOTE: When removing chaincase, do not remove shims. If their removal is necessary, note package shim thickness for each stud.

Inspection

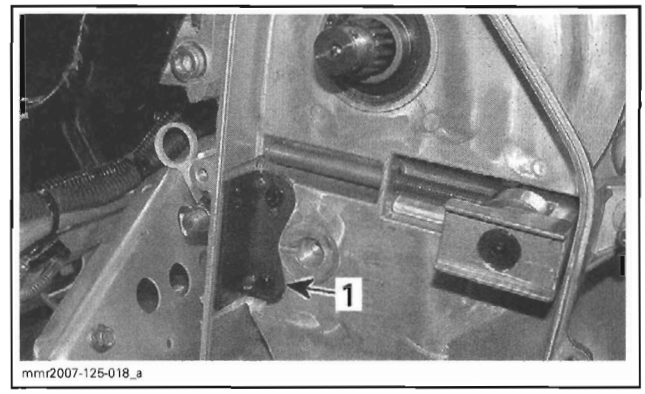
Visually inspect the chain and sprockets for wear, cracked, damaged or missing links. If a problem is detected, replace drive chain and sprockets as an assembly.

Check the drive chain deflection. If the deflection is greater than 38 mm (1-1/2 in) without the chain tensioner, replace the chain.

Check for worn or defective bearings.

Check chain tensioner roller for wear or other damages. If the roller does not turn smoothly, replace the needle bearing.

Check the chain slider for wear. Replace chain slider if maximum wear is 1.0 mm (.039 in) at contact point on slider.

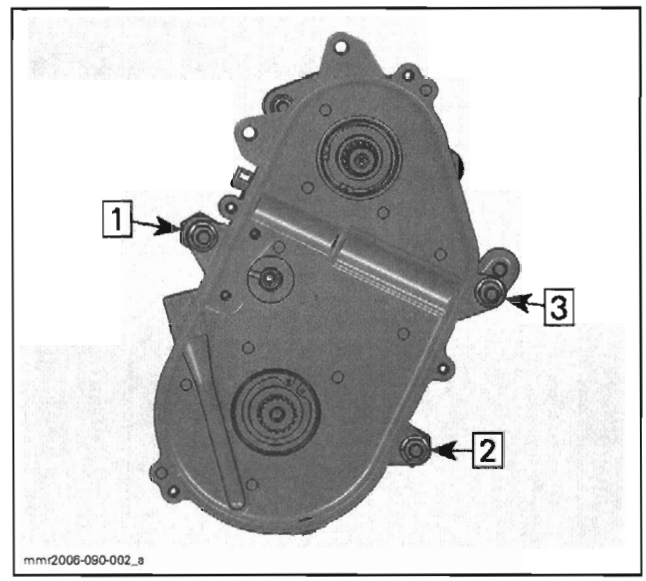


1. *Chain slider*

Installation

Reverse removal procedure and pay attention to the following.

When installing chaincase, use the following sequence to tighten chaincase nuts. Reinstall the same thickness of shims on each stud.

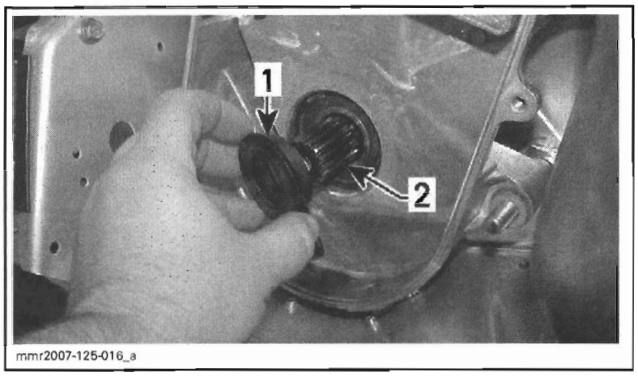


Using an appropriate pusher, press the oil seal into chaincase hub. Oil seal must fit flush with the chaincase edge.

Install the circlip in chaincase.

CAUTION: It is of the utmost importance to install the circlip otherwise damage to the chaincase components may occur.

Install the drive axle spacer with its large outer diameter outside.

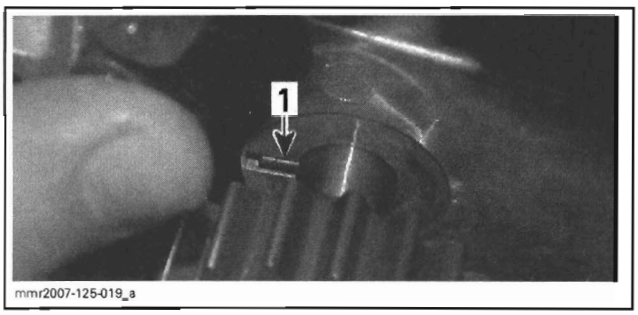


1. Drive axle spacer
2. Drive axle

Position the sprockets with the backside of writing facing the chaincase cover. Sprocket hub faces toward chaincase.

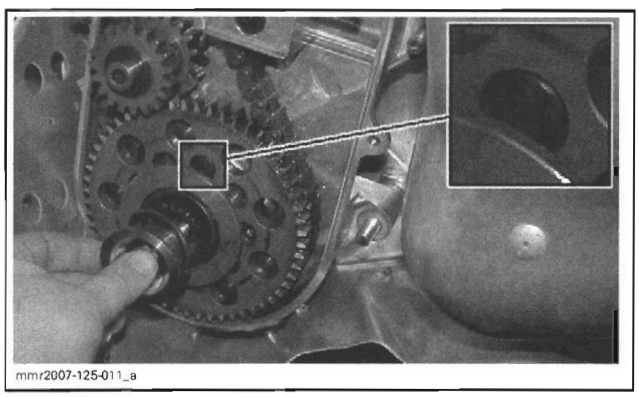
Install upper and lower fixed sprockets with chain.

Install the reverse axle. Make sure to properly position the axle pin in chaincase slot.



1. Axle pin in chaincase slot

Position the sliding gear and install spring, cup and lower sprocket bolt. Make sure position pins of fixed gear are inserted in position holes of sliding gear.

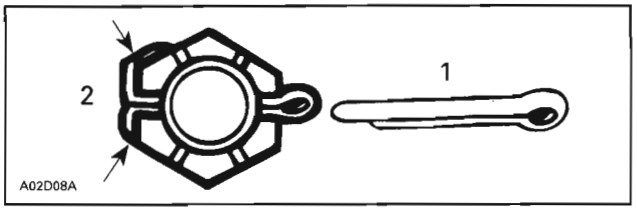


Torque lower sprocket bolt to 48 N•m (35 lbf•ft).

Install the upper sprocket nut and torque to 60 N•m (44 lbf•ft).

Install **new** cotter pin in the position shown.

CAUTION: When removing a cotter pin always replace with a new one. Cotter pin will rub on chaincase cover if installed otherwise.



1. New
2. Fold cotter pin over upper sprocket nut flats only

Check if the bearing screw on chain tensioner is tightened correctly.

Install chaincase cover. Refer to *CHAINCASE COVER* above for proper procedure.

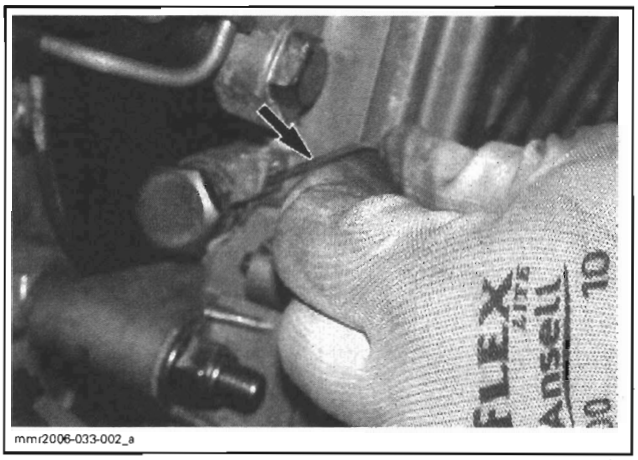
Adjust drive chain. Refer to *DRIVE CHAIN ADJUSTMENT* at the beginning of this section.

CHAIN TENSIONER

Removal

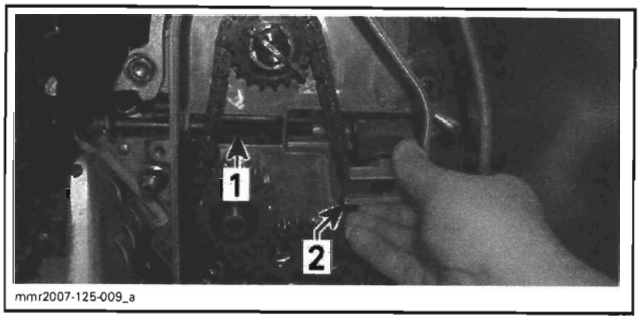
Remove chaincase cover.

Remove hair pin.



Unscrew tensioner adjustment screw completely.

Pull the tensioner adjustment screw to separate it from tensioner.



TYPICAL
1. *Tensioner adjustment screw*
2. *Tensioner*

Inspection

Check chain tensioner roller for wear or other damages. If the roller does not turn smoothly, replace the needle bearing. See procedure further.

Check O-rings on tensioner adjustment screw. Replace them if necessary.

Check threads of tensioner adjustment screw for damages or wear. Replace the screw if necessary and check chaincase for damages.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Apply ThermoLube synthetic grease (P/N 293 700 417) on threads and O-rings of tensioner adjustment screw.

Check if chain tensioner screw is screwed correctly.

Adjust drive chain tension. Refer to *DRIVE CHAIN ADJUSTMENT* at the beginning of this section.

Install all removed parts.

CHAIN TENSIONER ROLLER BEARING

Removal

Remove the chain tensioner, see procedure above.

Heat the roller screw to break the threadlocker.

Remove the needle bearing from the roller.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Clean and remove grease on screw then apply Loctite 271 (red) (P/N 293 800 005) under the screw head only, **none on threads**.

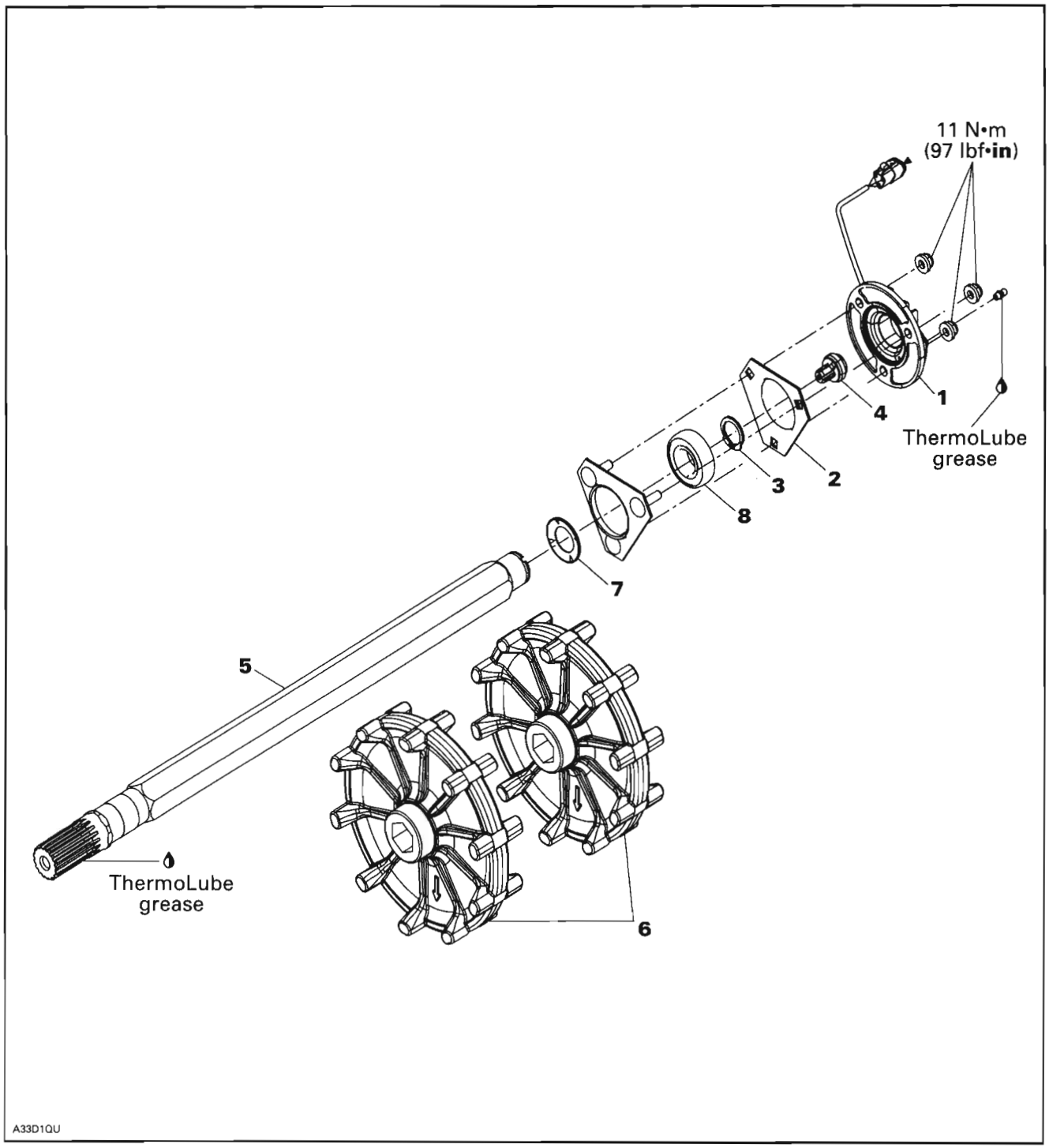
DRIVE AXLE

SERVICE TOOLS

Description	Part Number	Page
drive axle sprocket adjuster kit	861 725 700	515

SERVICE PRODUCTS

Description	Part Number	Page
ThermoLube synthetic grease	219 700 417	515


11 N•m
(97 lbf•in)
1
4
ThermoLube
grease
3
2
8
7
5
ThermoLube
grease
6
A33D1QU

GENERAL

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

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

⚠ WARNING

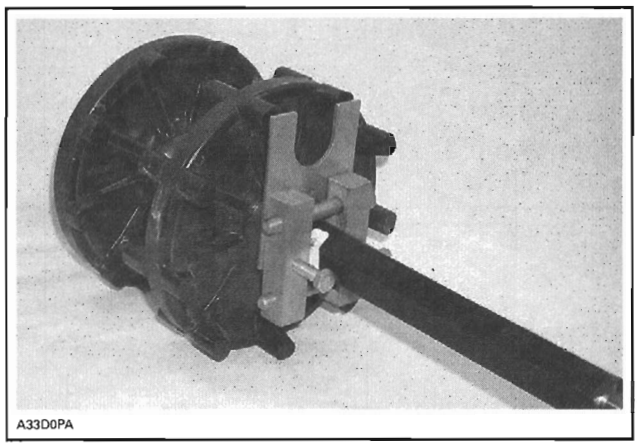
Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

Sprocket/Track Alignment

CAUTION: Do not tamper with sprocket/track alignment if frame or suspension is damaged.

Sprockets may be repositioned to fit lugs without removing drive axle.

Use drive axle sprocket adjuster kit (P/N 861 725 700).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PROCEDURES

DRIVE AXLE

Removal

Remove battery (if so equipped) to gain access.

Drain oil from chaincase.

Raise and block rear of vehicle off the ground.

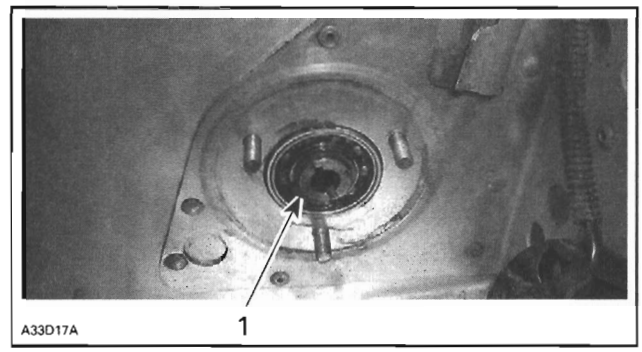
Remove rear suspension. Refer to *REAR SUSPENSION*.

Remove driven pulley. Refer to *DRIVEN PULLEY*.

Remove speedometer sensor **no. 1**, outer flange **no. 2** and speedometer adapter **no. 4** from drive axle **no. 5**.

On models without speedometer, remove plastic cover and bearing outer flange **no. 2**.

Remove circlip **no. 3**.



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1. Circlip

Apply parking brake.

Remove chaincase cover, chain and sprockets then the circlip on drive axle. Refer to *CHAINCASE (300F AND 550F)* or *CHAINCASE (V800)*.

Release drive axle sprocket from track and at the same time, push the drive axle **no. 5** toward the right side. Drive axle bearing in chaincase will fall off.

Remove bearing and move the drive axle towards the left side to remove it from vehicle.

Inspection

Check drive axle for bending, wear or other damages. Replace as required.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

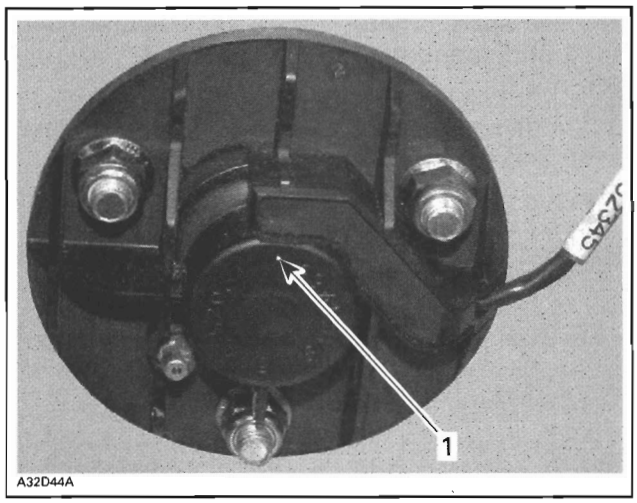
On models with speedometer, index speedometer magnetic adapter **no. 4** in drive axle and push until it is completely inserted in its hole.

The drive axle bearing in chaincase must have its seal facing cover.

Fill chaincase with recommended chaincase oil. Refer to the appropriate section.

Lubrication

Lubricate end housing bearing with ThermoLube synthetic grease (P/N 219 700 417). Continue lubricating until grease flows out of the pilot hole on speedometer sensor or plastic cover.



SPEEDOMETER SENSOR SHOWN
1. Lubricate until grease flows out here

DRIVE AXLE BEARING

Removal

Remove drive axle from vehicle.

Using a suitable puller, remove bearing **no. 8** from drive axle.

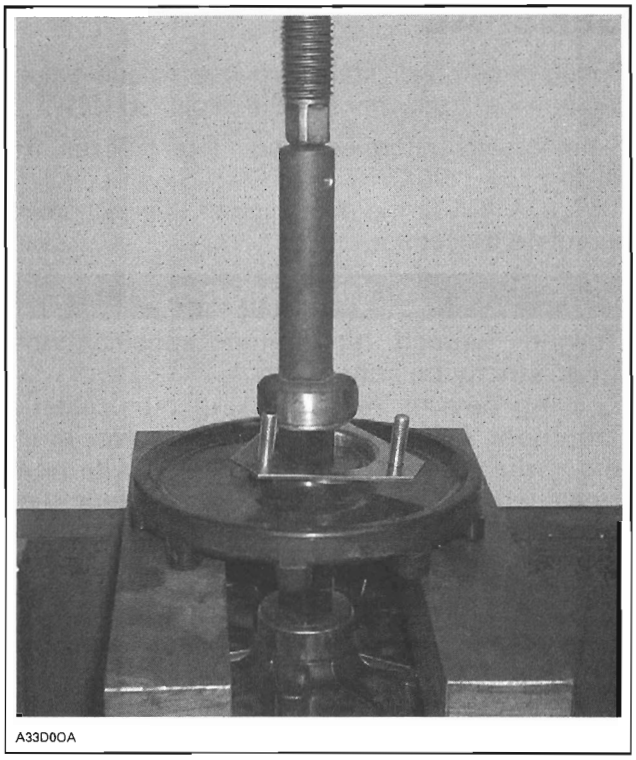
Inspection

Before removing bearing from drive axle, check if it turns smoothly and freely. Replace if necessary.

Installation

Install bearing protector **no. 7** and one bearing flange **no. 2** on drive axle. Install bearing protector so that its flat side is against bearing.

Using a press and a suitable pipe, push the bearing. Always push bearing by inner race. Push bearing until it leans on its protector.



TYPICAL

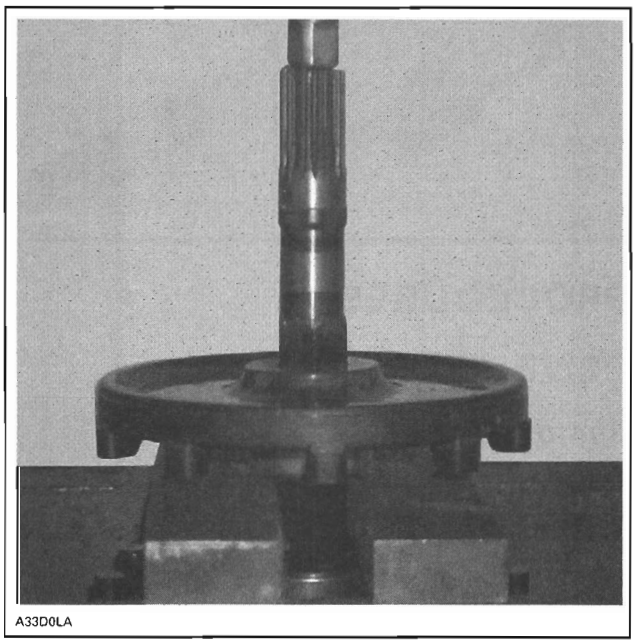
Install drive axle and all other removed parts.

SPROCKETS

Removal

Remove drive axle from vehicle.

To remove press fit sprockets **no. 6**, use a press as illustrated.



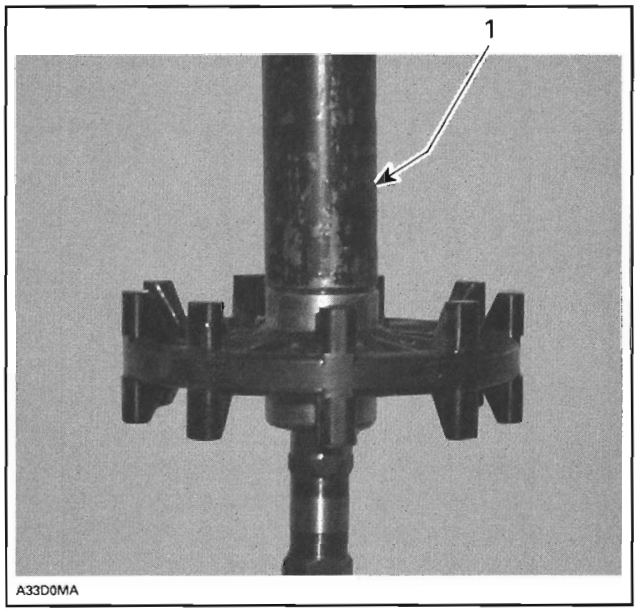
TYPICAL — SUPPORT SPROCKET NEAR HUB

Installation

CAUTION: The same sprocket must not be pressed twice on the axle.

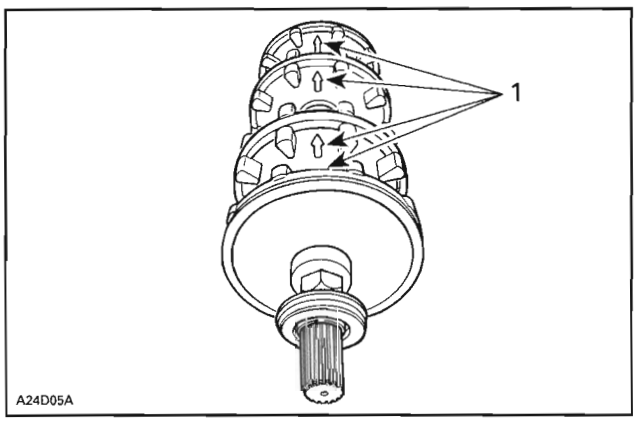
To assemble press fit sprockets no. 6, use a press and a suitable pipe as illustrated.

CAUTION: Never allow sprockets to contact the press plates and never support sprockets with blocks. Always press on center hub with appropriate pipe.



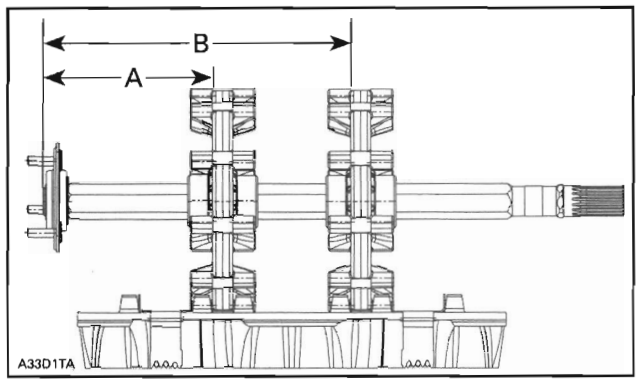
TYPICAL
1. Pipe

Ensure to align indexing marks of each sprocket when assembling.



TYPICAL
1. Indexing marks aligned

Sprockets must be assembled according to the following dimensions measured from drive axle end.



MEASURE FROM END OF DRIVE AXLE
A. 150.8 mm (5.937 in)
B. 273.8 mm (10.790 in)

TRACK

SERVICE TOOLS

Description	Part Number	Page
belt tension tester	414 348 200	520
cleat remover	529 028 700	519
narrow-cleat installer	529 028 800	519

TRACK

Track Inspection

Visually inspect track for:
- cuts and abnormal wear
- broken rods
- broken or missing track cleats.

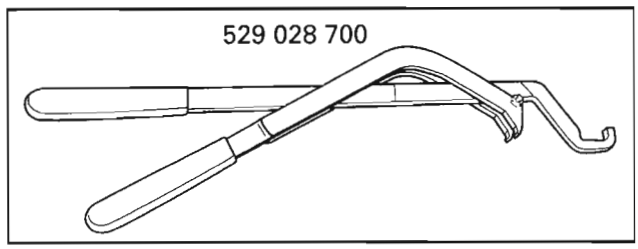
If track is damaged or rods are broken, replace track. For damaged or missing cleats, replace by new ones.

⚠ WARNING

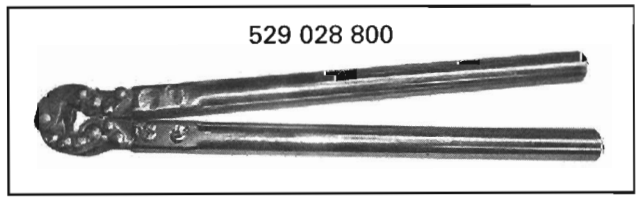
Do not operate a snowmobile with a cut, torn or damaged track.

Track Cleat Replacement

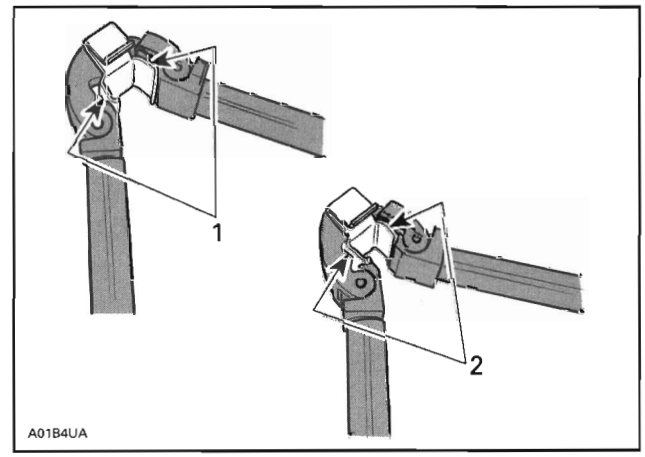
- Raise rear of vehicle off the ground and lift snow guard then hand rotate track to expose a cleat to be replaced.
- Use track cleat remover (P/N 529 028 700) for all models.



- Place new cleat in position on the track and using the narrow-cleat installer (P/N 529 028 800) bend cleat then push tabs into rubber.



- Re-open installer, then position cleat tabs on open end of tool and squeeze tabs until they are indented in rubber.



TYPICAL
1. Position cleat
2. Push tabs into rubber

Track Removal

Remove the following parts:
- rear suspension (refer to *SUSPENSION*)
- drive axle (refer to *DRIVE AXLE*)
- track.

Track Installation

Reverse the removal procedure.

NOTE: When installing the track, respect rotation direction indicated by an arrow on track thread.

Check sprocket/track alignment as described in *DRIVE AXLE*.

Track Adjustment

Track tension and alignment are interrelated. Do not adjust one without checking the other. Track tension procedure must be carried out prior to track alignment.

Tension

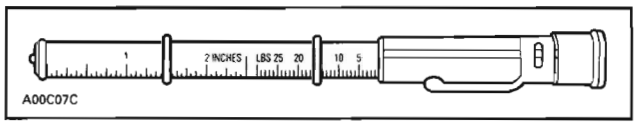
NOTE: Ride the snowmobile in snow about 15 to 20 minutes prior to adjusting track tension.

Lift snowmobile by a rope, chain or lift strap hooked to rear bumper.

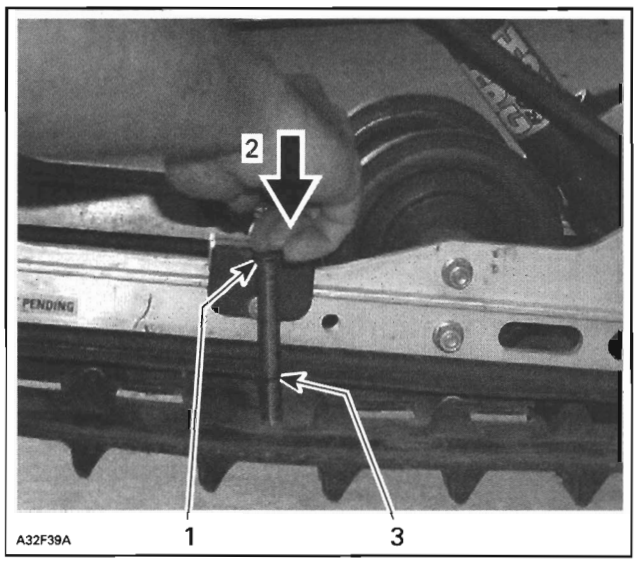
Allow the rear suspension to fully extend and check gap halfway between front and rear idler wheels. Measure between slider shoe bottom and inside of track. The gap should be as given in the following table. If the track tension is too loose, track will have a tendency to thump.

TRACK ADJUSTMENT	
TRACK ADJUSTMENT FORCE	7.3 kgf (16 lbf)
TRACK MINIMUM DEFLECTION	30.00 mm (1.181 in)
TRACK MAXIMUM DEFLECTION	35.00 mm (1.378 in)

The belt tension tester (P/N 414 348 200) may be used to measure deflection as well as force applied.



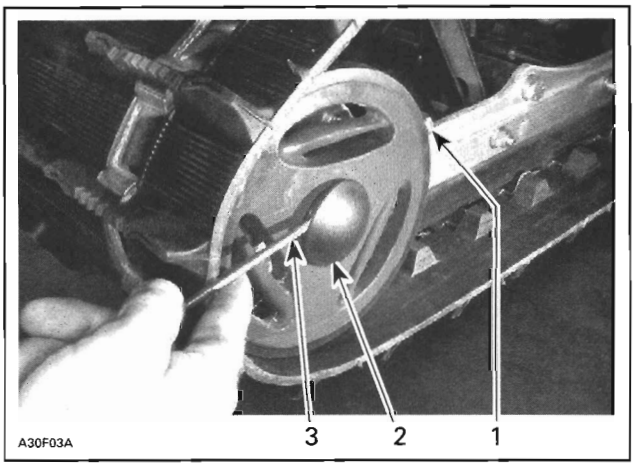
BELT TENSION TESTER



1. *Tool top O-ring positioned at 7.3 kgf (16 lbf)*
2. *Apply pressure on tool until it contacts the upper O-ring*
3. *Measured track deflection*

CAUTION: Too much tension will result in power loss and excessive stresses on suspension components.

To adjust tension, do the following:
- Remove wheel caps.
- Loosen the rear idler wheel retaining screws.
- Turn adjustment screws to adjust.



TYPICAL
1. *Adjustment screw*
2. *Retaining screw*
3. *Wheel cap removal*

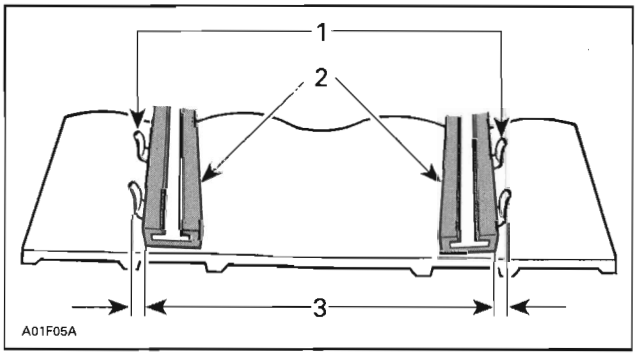
Alignment

⚠ WARNING

Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure no one is standing in close proximity to the vehicle. Never rotate at high speed.

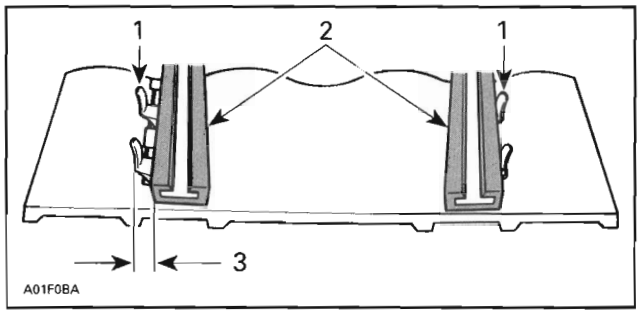
Start the engine and accelerate slightly so that track barely turns. This must be done in a short period of time (1 to 2 minutes).

Check that the track is well centered; equal distance on both sides between edges of track guides and slider shoes.



1. *Guides*
2. *Slider shoes*
3. *Equal distance*

To correct, stop engine, loosen rear wheel screws, then tighten the adjustment screw on side where the slider shoe is the farthest from the track insert guides.



1. Guides
2. Slider shoes
3. Tighten on this side

Restart engine, rotate track slowly and recheck alignment. If the satisfactory alignment is achieved, then tighten the idler wheel retaining screws to 48 N•m (35 lbf•ft). Reinstall the wheel caps.

TRACTION ENHANCING PRODUCTS (studs)

Important Safety Rules

⚠ WARNING

To prevent serious injury to individuals near the snowmobile:

- **NEVER stand behind or near a moving track.**
- **ALWAYS use a wide-base snowmobile stand with a rear deflector panel.**
- **When the track is raised off the ground, only run it at lowest possible speed.**

Centrifugal force could cause debris, damaged or loose studs, pieces of torn track, or an entire severed track to be violently thrown backwards out of the tunnel with tremendous force, possibly resulting in the loss of a leg or other serious injury.

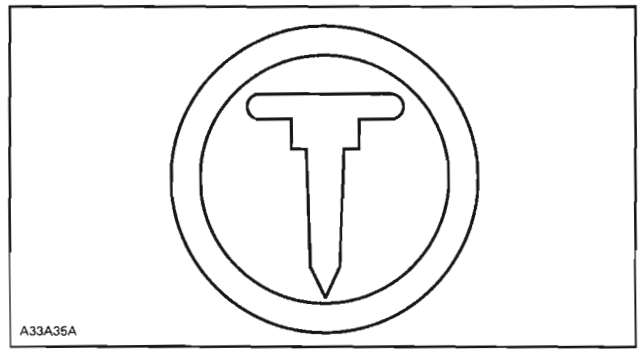
Effects of Studding on the Life of the Snowmobile

The use of traction enhancing products can increase the load and the stress on certain snowmobile components, as well as the vibration level. This can cause premature wear on parts such as belts, brake lining, bearings, chain, and chaincase sprockets, and shorten track life. For this reason, it is even more important to follow the detailed maintenance program given in the *MAINTENANCE CHART.*

Studs can also cause serious damage to the snowmobile if it is not equipped with the tunnel protectors designed for the particular model. Damage to the electrical wiring or perforation of the heat exchangers are potential hazards, that could cause the engine to overheat and be severely damaged.

⚠ WARNING

If tunnel protectors are excessively worn or not installed, the gas tank could be punctured, causing a fire.



APPROVED TRACKS CAN BE IDENTIFIED BY THIS SYMBOL

Maintenance/Replacement

A visual inspection of the track should be performed before each use.

Look for any defects, such as:

- perforations in the track
- tears in the track (particularly around traction product holes)
- lugs that are broken or torn off, exposing portion of rods
- delamination of the rubber
- broken rods
- broken studs
- bent studs
- studs that are torn off the track
- missing track guide(s).

Replace broken or damaged studs immediately. If the track shows signs of deterioration, it must be replaced immediately. In doubt, replace the track.

⚠ WARNING

Riding with a damaged track or studs could lead to loss of control, resulting in a risk of serious injury or death.

Stud Installation

To install studs, refer to the manufacturer's instructions.

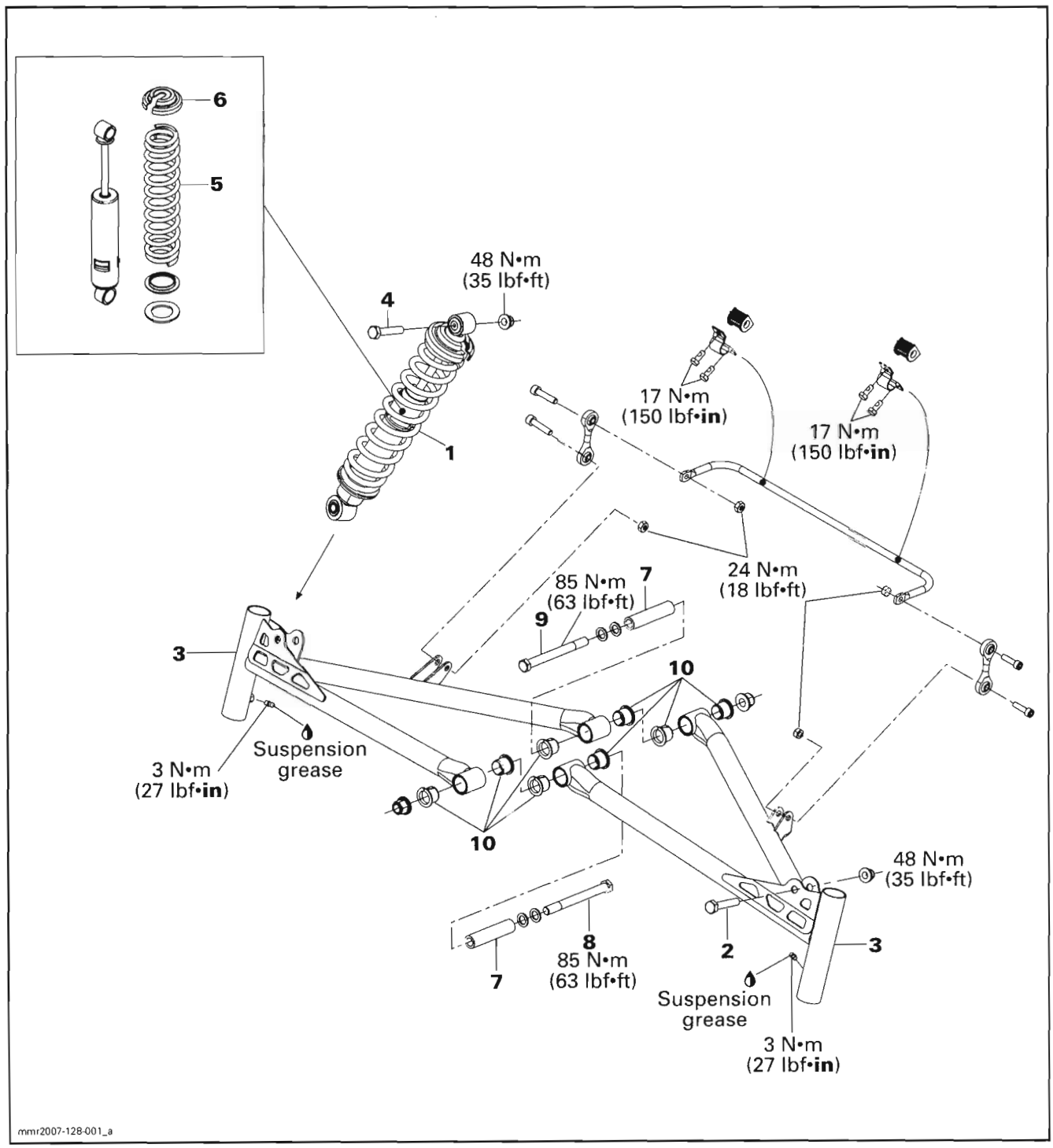
The installation of tunnel protector kit is necessary when installing studs. Use the following table to determine the proper kit.

PROTECTOR KIT			
TRACK	PROFILE HEIGHT	Up to 31.8 mm (1.25 in)	
	TRACK LENGTH	3.07 and 3.45 m (121 and 136 in)	
MODELS		300F and 550F	V800
KIT NUMBER		860 200 010	860 200 013

FRONT SUSPENSION

SERVICE TOOLS

Description	Part Number	Page
spring compressor tool	529 036 007	524



GENERAL

The procedure explained below is the same for the RH and LH sides unless otherwise noted.

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

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

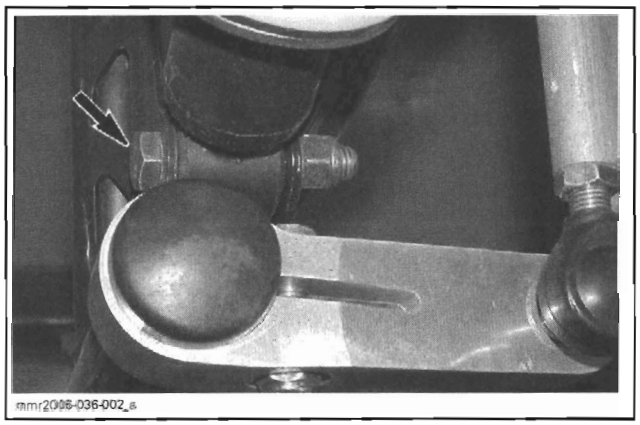
PROCEDURES

SHOCK ABSORBER AND SPRING

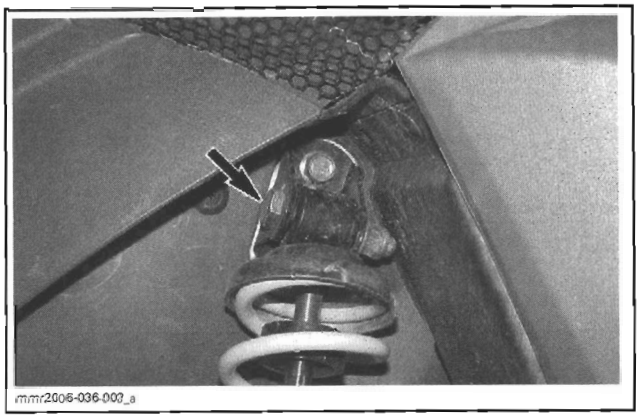
Removal

Lift front of vehicle until shock absorbers **no. 1** are fully extended and skis are off the ground.

Remove bolt **no. 2** that attach the shock absorber to the suspension arm **no. 3**.

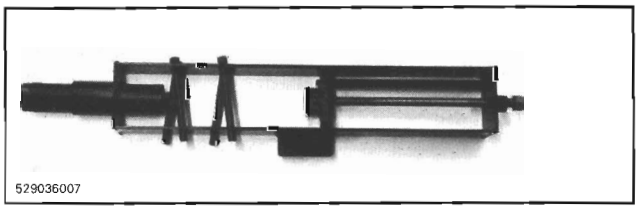


Remove the upper shock absorber bolt **no. 4** retaining shock absorber to frame.

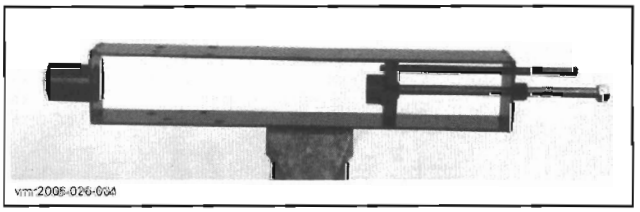


Disassembly

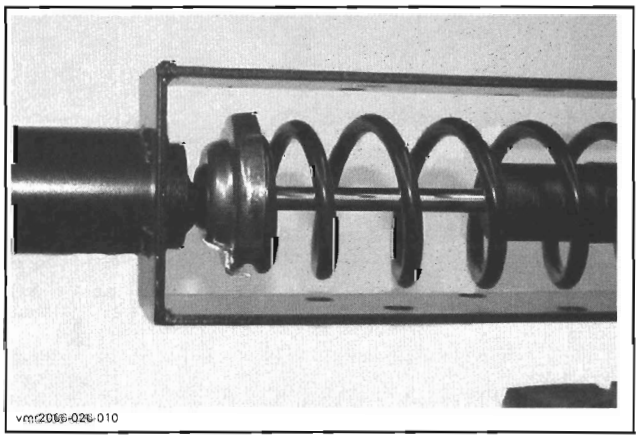
To remove spring **no. 5** from the shock absorber, use the spring compressor tool (P/N 529 036 007).



Place the tool in a vise.



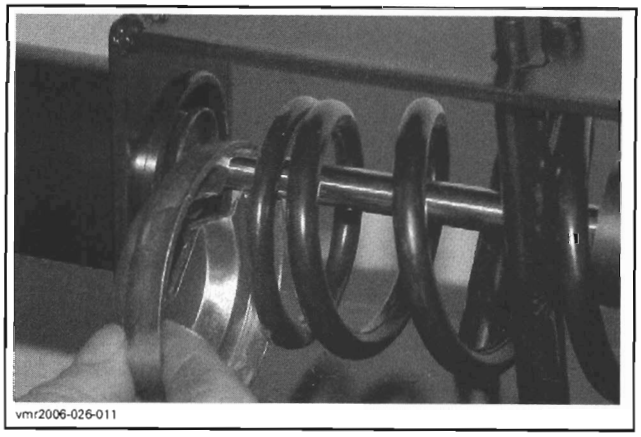
Position the shock absorber in the tool and install the spring compressor pins.



TYPICAL

Tighten the spring tool screw until the spring **no. 5** is sufficiently compressed to remove spring locking devices.

Remove spring stopper **no. 6** then release the spring compressor tool screw.



TYPICAL

Inspection

Inspect the spring **no. 5** for damage. Replace if necessary.

Inspect shock for oil leakage. Extend and compress the piston several times over its entire stroke. Check that it moves smoothly and with uniform resistance with rod up. Any of the following conditions will denote a defective shock:

- A skip or hang up when reversing stroke at mid travel.
- Seizing or binding conditions except at extreme end of either stroke.
- A gurgling noise after completing one full compression and extension stroke.

Replace shock if any of these conditions are found.

Assembly and Installation

For assembly and installation, reverse the disassembly and removal procedures.

SUSPENSION ARM

Inspection

Check suspension arm **no. 3** for distortion or damage. Replace if necessary.

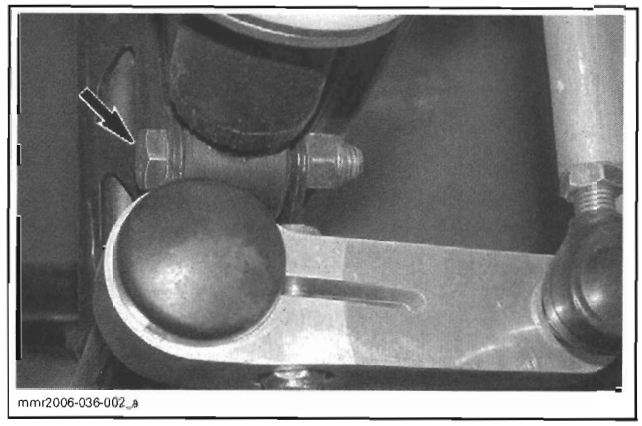
Move suspension arm from side to side then up and down. There should be no noticeable loose. Replace bushings **no. 10** and/or sleeves **no. 7** if necessary.

NOTE: A play of 1 or 2 mm (.039 or .079 in) is acceptable when the suspension arm is moved forward and backward.

Check sleeves **no. 7** inside suspension arm attachments for wear or damage. These sleeves can be checked only when the suspension arm is removed.

Removal

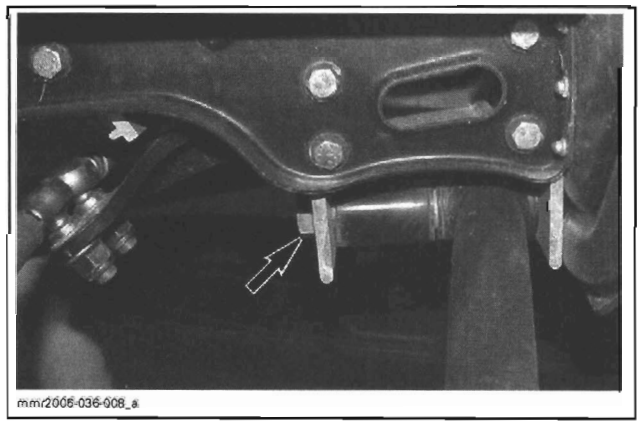
Remove the bolt **no. 2** that attach the shock absorber **no. 1** to the suspension arm **no. 3**.



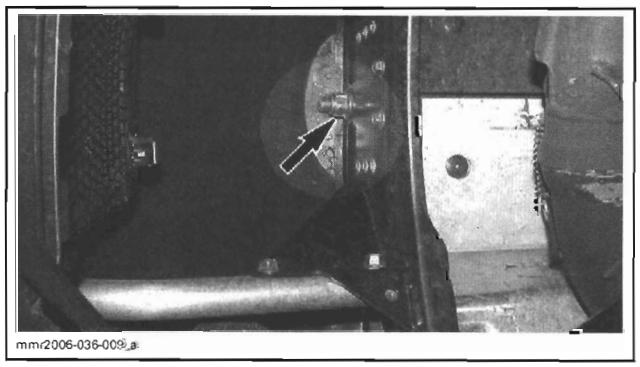
If applicable, detach stabilizer bar from lower suspension arm. Refer to *STABILIZER BAR* further in this section.

Remove ski leg from suspension arm.

Unscrew the front bolt **no. 8** retaining suspension arm to frame. Open the front cover to reach the nut.

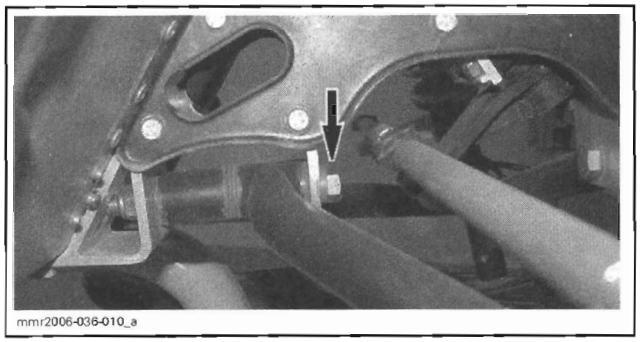


FRONT SUSPENSION ARM BOLT



NUT INSIDE FRONT COMPARTMENT

Remove the rear suspension arm bolt **no. 9**.

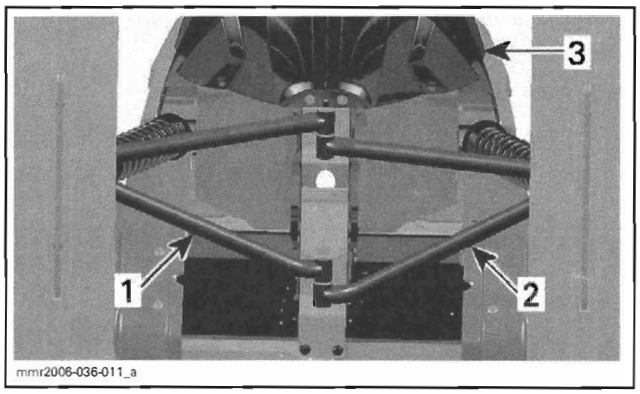


Remove suspension arm from vehicle.

Installation

Install suspension arms in accordance with the following illustration.

NOTE: The RH arm must be installed in front of LH arm.



UNDERNEATH BOTTOM PAN
1. *RH suspension arm*
2. *LH suspension arm*
3. *Bottom pan*

Torque suspension arm bolts to 85 N•m (63 lbf•ft).

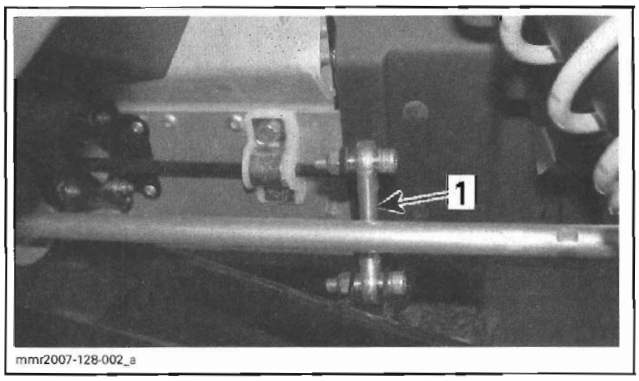
Install all other removed parts.

STABILIZER BAR

Removal

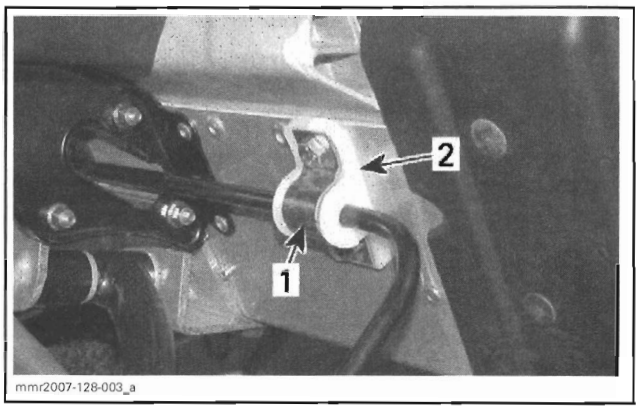
Remove shock absorbers.

Unscrew the upper bolt of double ball joint.



LH SIDE SHOWN
1. *Double ball joint*

Remove clamps holding stabilizer bar bushings from frame.



1. *Clamp*
2. *Bushing*

Lift front of vehicle enough so that stabilizer bar can be rotated downward to allow to slide it out.

Installation

Ensure to properly position stabilizer bar before insertion in frame.

Before attaching double ball joint to stabilizer bar, verify if all ball joints move smoothly and freely. Replace if necessary.

Secure double ball joints to stabilizer bar.

Install shock absorbers.

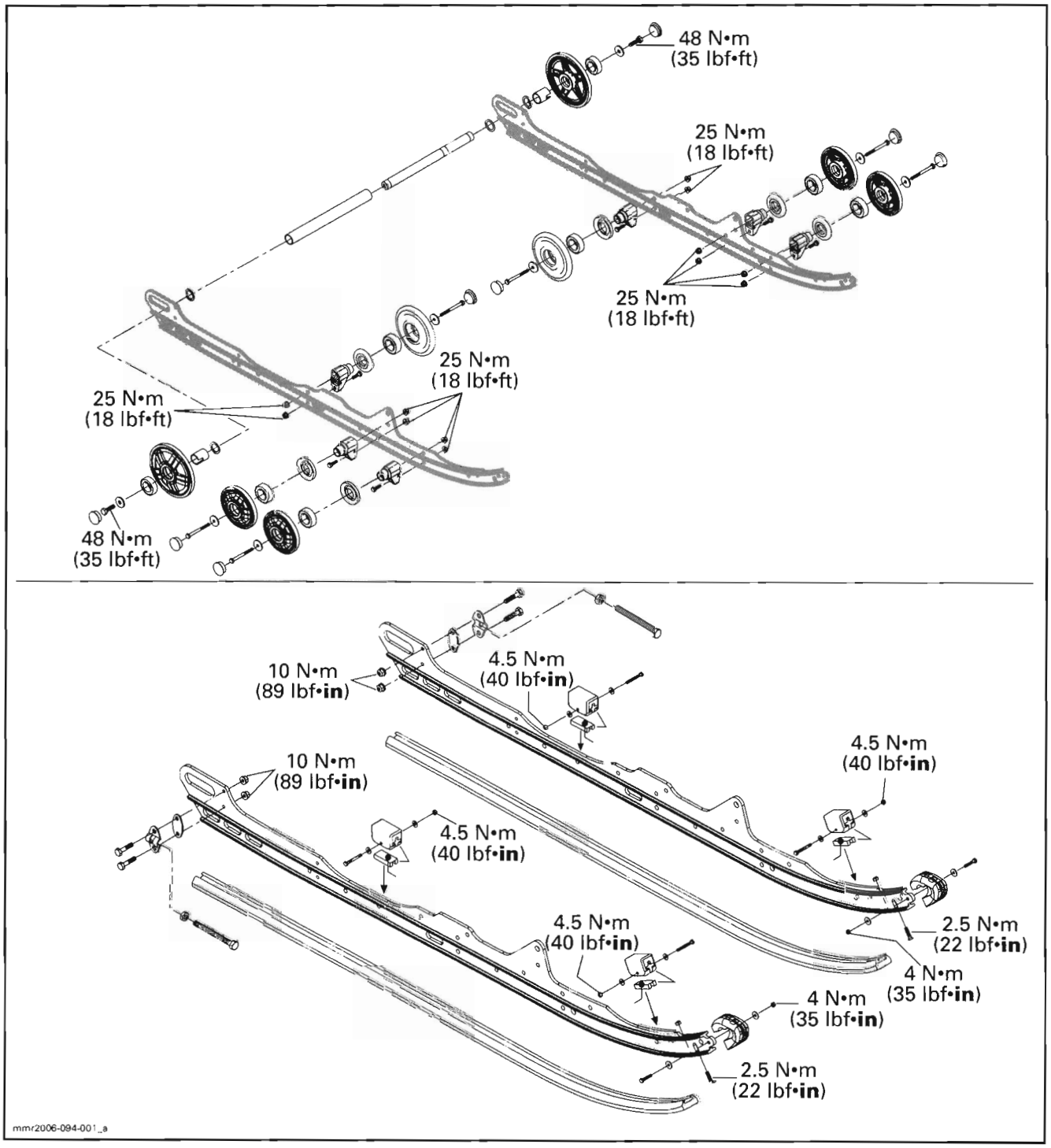
REAR SUSPENSION (SC)

SERVICE PRODUCTS

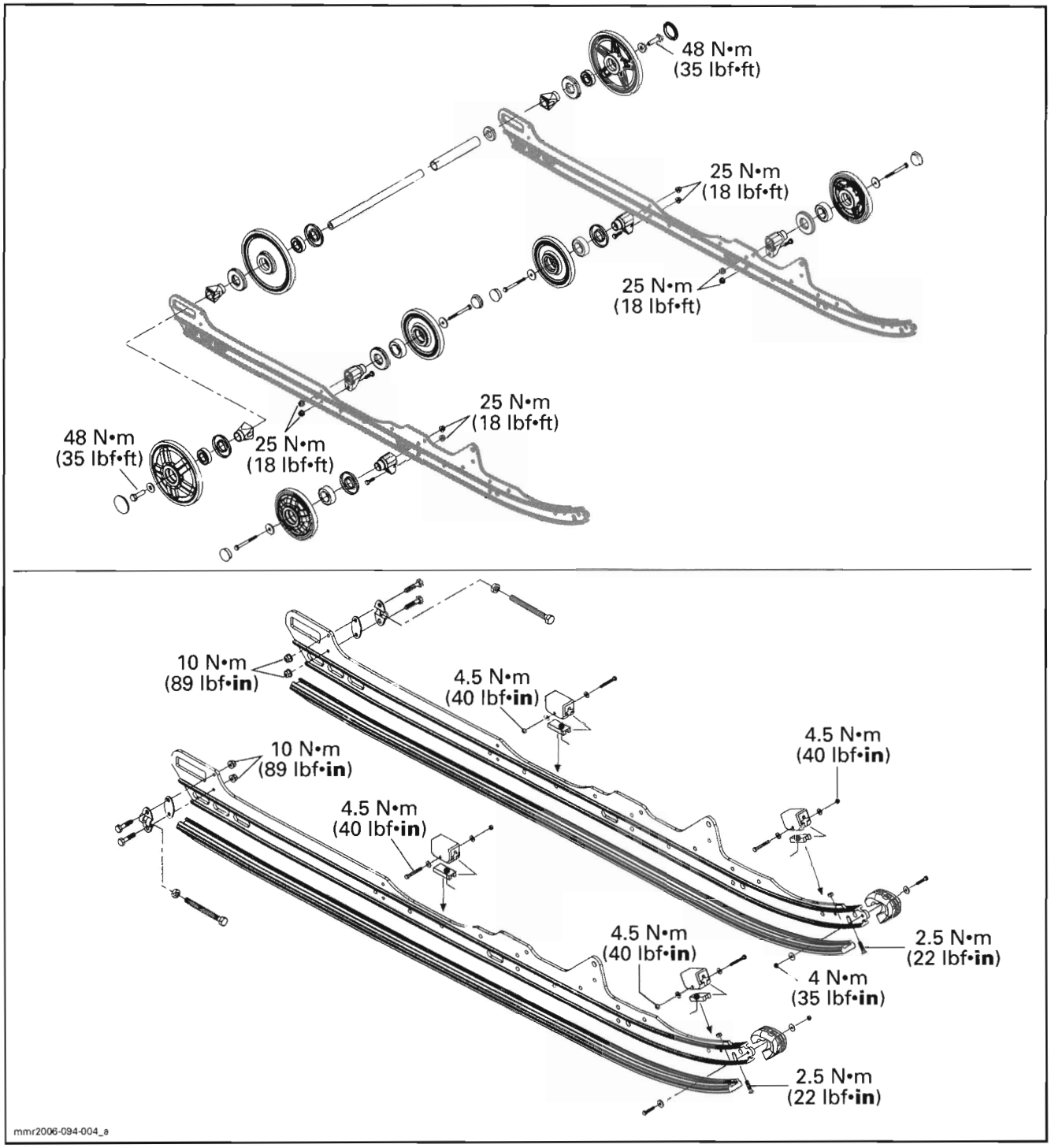
Description	Part Number	Page
Loctite 243 (blue)	293 800 060	540
suspension synthetic grease	293 550 033	537–538

RAILS AND IDLER WHEELS

All Models except Tundra



Tundra only


48 N•m
(35 lbf•ft)
25 N•m
(18 lbf•ft)
25 N•m
(18 lbf•ft)
25 N•m
(18 lbf•ft)
48 N•m
(35 lbf•ft)
25 N•m
(18 lbf•ft)
10 N•m
(89 lbf•in)
4.5 N•m
(40 lbf•in)
4.5 N•m
(40 lbf•in)
10 N•m
(89 lbf•in)
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4.5 N•m
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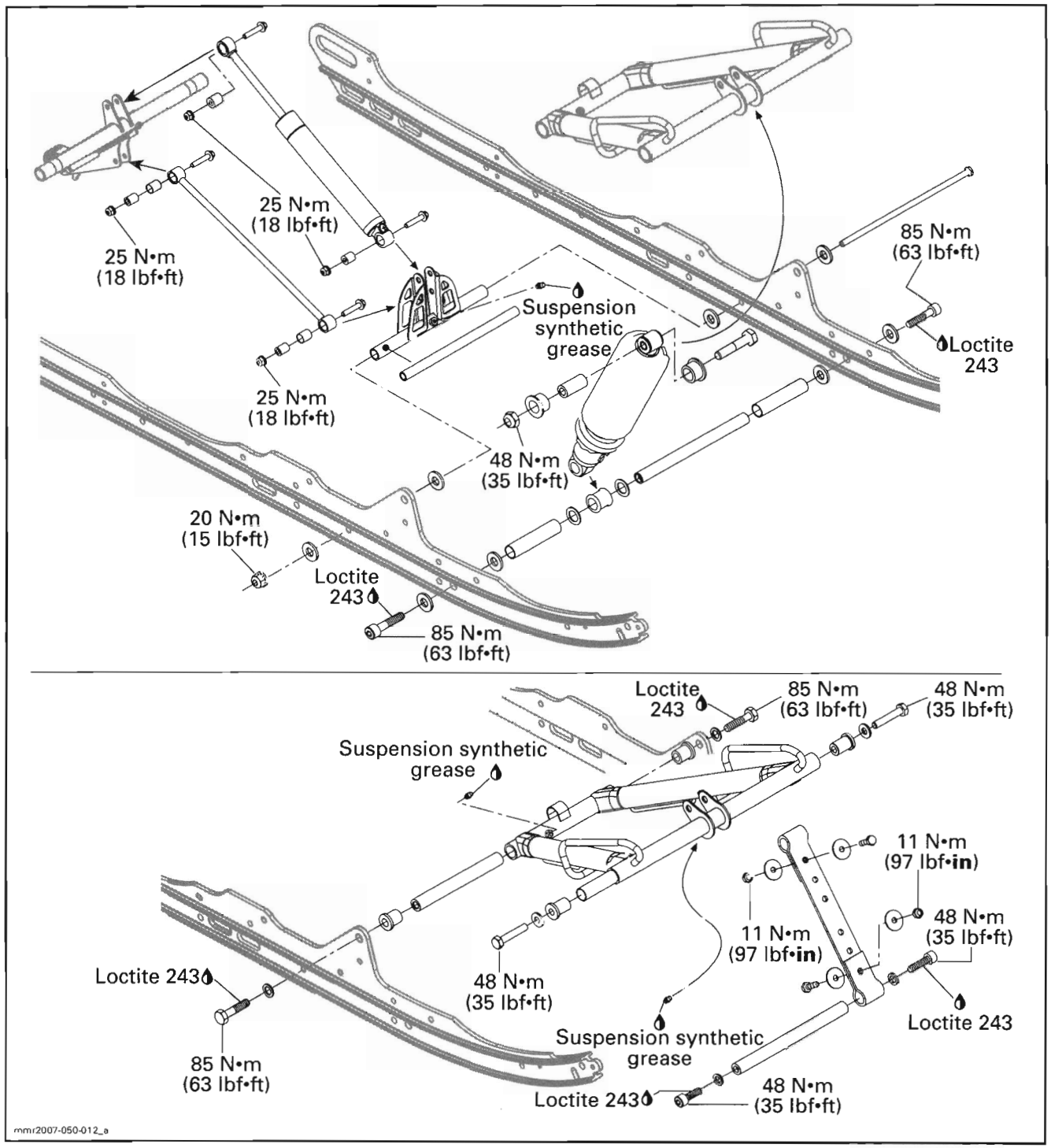
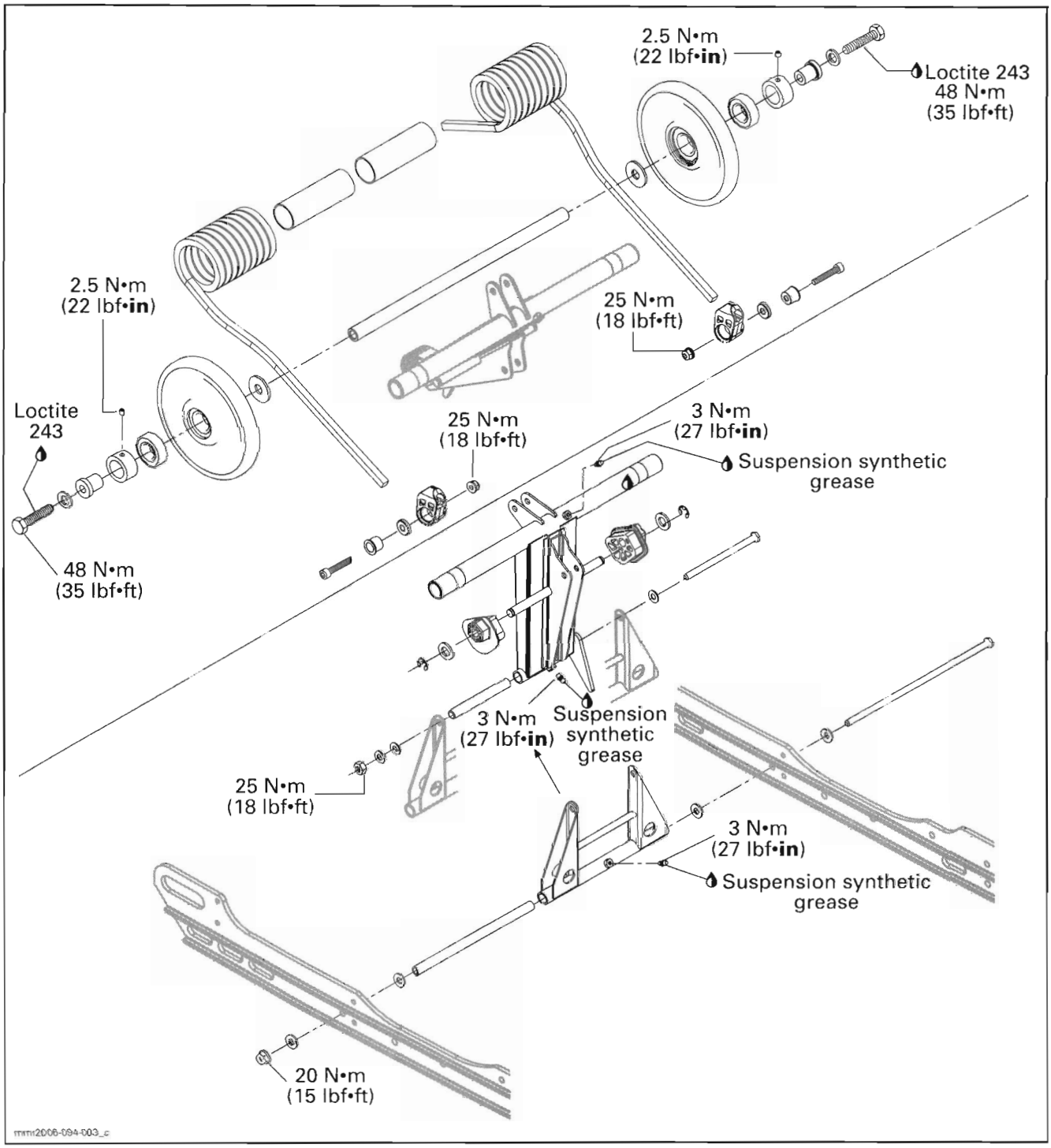
2.5 N•m
(22 lbf•in)
4 N•m
(35 lbf•in)
2.5 N•m
(22 lbf•in)
mmr2006-094-004_a

ARMS AND SHOCK ABSORBERS



REAR ARM, SPRINGS AND TOP IDLER WHEELS



GENERAL

NOTE: Refer to *TECHNICAL SPECIFICATIONS* to identify the snowmobile suspension type.

During assembly/installation, use torque values and service products as in the exploded view(s).

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

Suspension Adjustment

To adjust the rear suspension, refer to the appropriate *OPERATOR'S GUIDE*.

PROCEDURES

NOTE: The following components can be removed with suspension in place. For suspension assembly removal, refer to *SUSPENSION ASSEMBLY* further in this section.

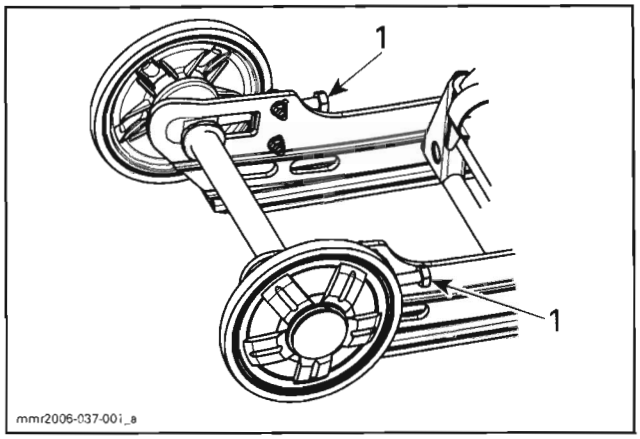
REAR AXLE

Removal

Lift rear of vehicle and support it off the ground.

Remove rear idler wheel screws on rear axle.

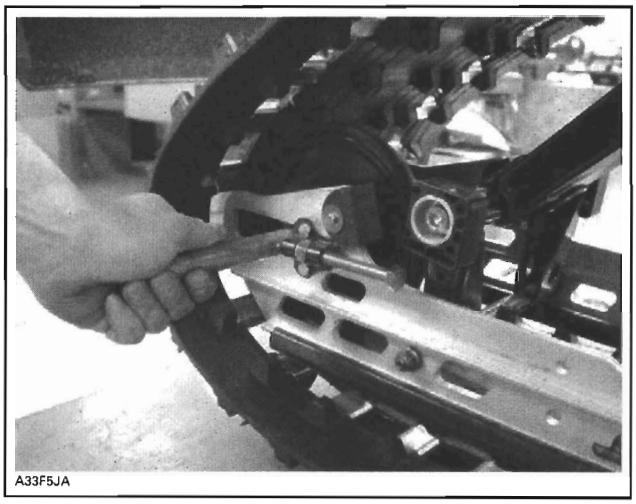
Completely loosen track tension by unscrewing both adjustment screws.



1. Adjustment screws

Remove rear idler wheel screws on rear axle.

Pull out rear axle from RH side of vehicle.



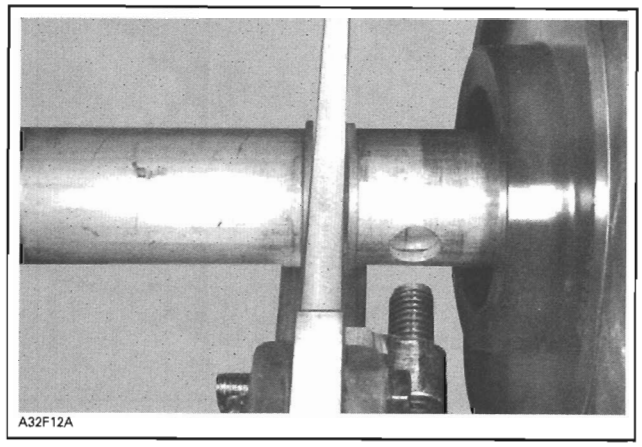
TYPICAL — PULL OUT REAR AXLE

Installation

Installation is the reverse of removal procedure. Pay attention to the following details.

Hole of outer bushing must face adjustment screw.

Make sure to reinstall washer on each side of runner.



OUTER BUSHING POSITION

Adjust track tension. Refer to *TRACK* section.

REAR SHOCK ABSORBER

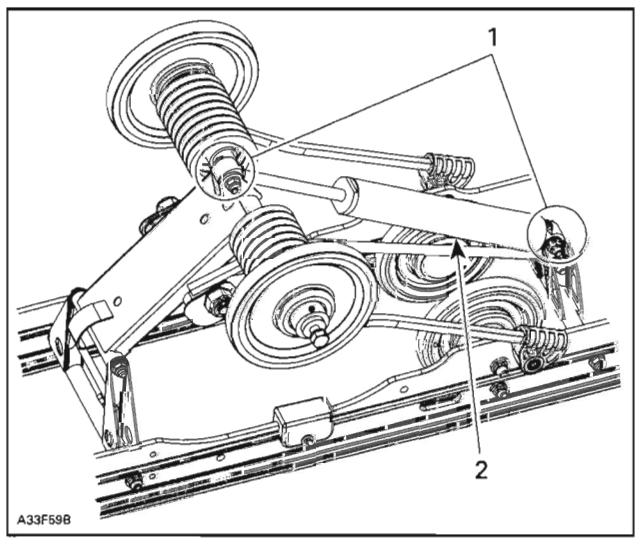
Removal

Lift rear of vehicle and support it off the ground.

Remove shock upper and lower bolt and nut.

NOTE: If necessary, to ease shock removal, unfasten one end of stopper strap to release shock pressure.

Remove rear shock absorber.



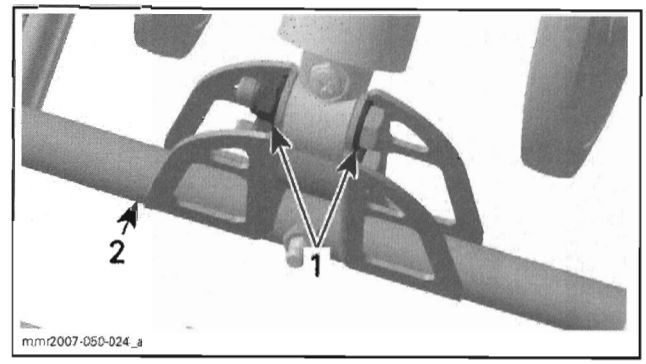
TYPICAL
1. *Upper/lower bolt and nut*
2. *Rear shock absorber*

Installation

Installation is the reverse of removal procedure.

CAUTION: Take care not to damage grease fitting.

When installing the lower bolt of shock, do not forget washers on both sides.



1. *Flat washers*
2. *Pivot arm*

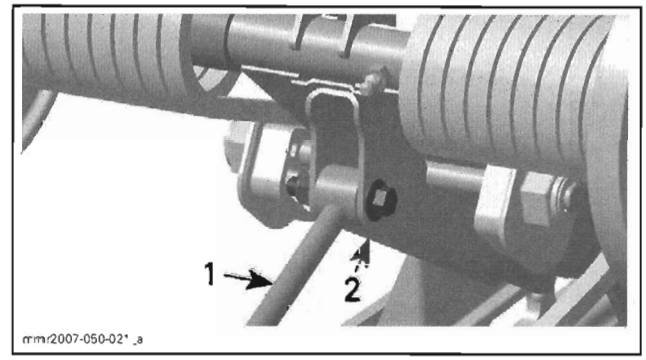
THROTTLE ROD

Removal

Lift rear of vehicle and support it off the ground.

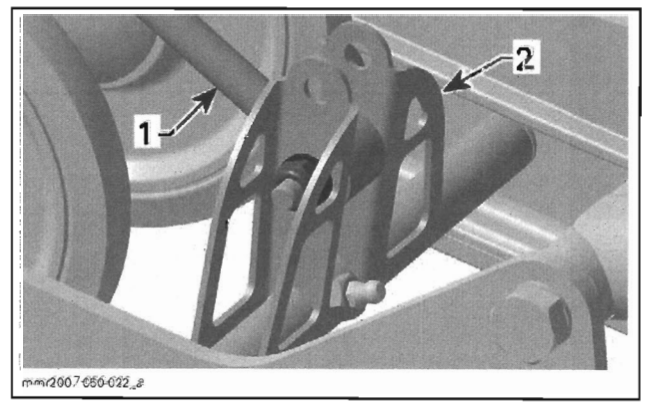
Remove the rear shock absorber.

Unscrew the upper bolt securing throttle rod to rear arm.



1. *Throttle rod*
2. *Rear arm*

Remove the lower bolt, both washers and nut.



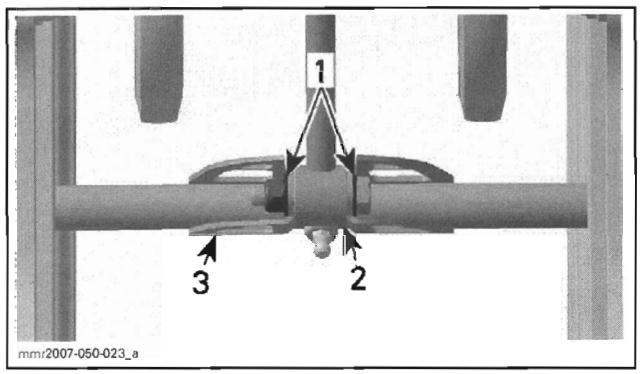
1. *Throttle rod*
2. *Pivot arm*

Remove the throttle rod.

Installation

Installation is the reverse of removal procedure.

When installing the lower bolt of throttle rod, do not forget washers on both sides.



1. *Flat washers*
2. *Throttle rod*
3. *Pivot arm*

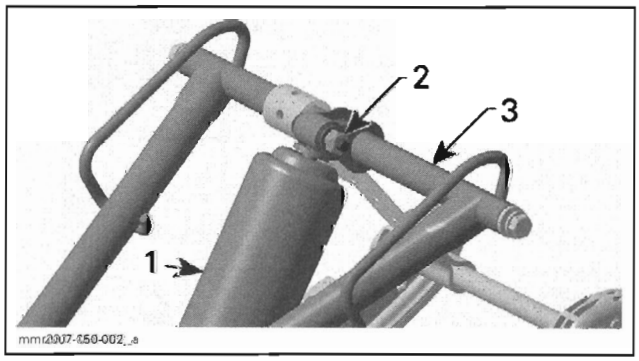
FRONT SHOCK ABSORBER

Removal

Lift rear of vehicle and support it off the ground.

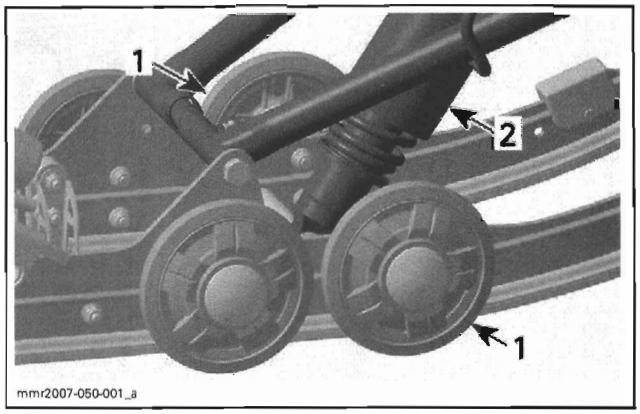
Unfasten one end of stopper strap to release shock pressure.

Unbolt front shock from the top.



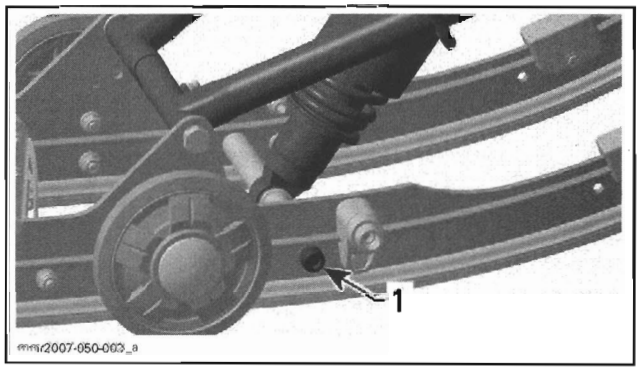
TYPICAL
1. *Front shock*
2. *Top shock bolt and nut*
3. *Front arm*

Remove the front idler wheels to gain access to the axle retaining self-locking screws.



TYPICAL
1. *Front idler wheels*
2. *Front shock*

Unbolt axle screws and slide out axle to remove shock.



TYPICAL
1. *Axle screw*

Installation

Installation is the reverse of removal procedure.

REAR SPRING

Removal

Lift rear of vehicle and support it off the ground.

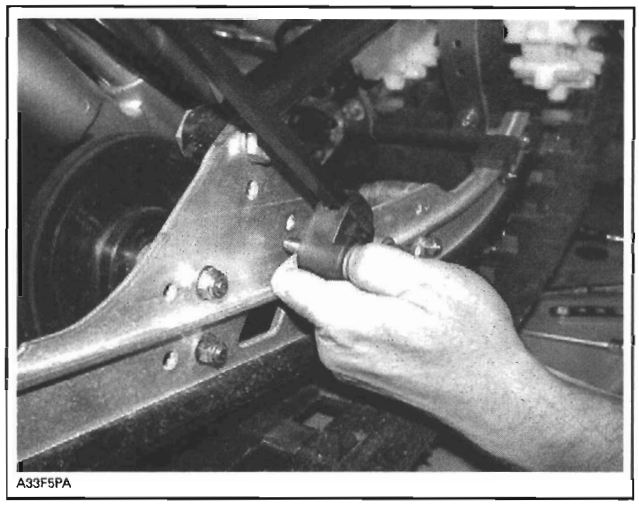
Decrease spring preload by turning cams accordingly.

Unbolt rear arm top axle from chassis.

Remove spring supports.

⚠ WARNING

Supports are spring loaded.



TYPICAL — REMOVE SPRING SUPPORTS

Loosen set screw from locking rings.

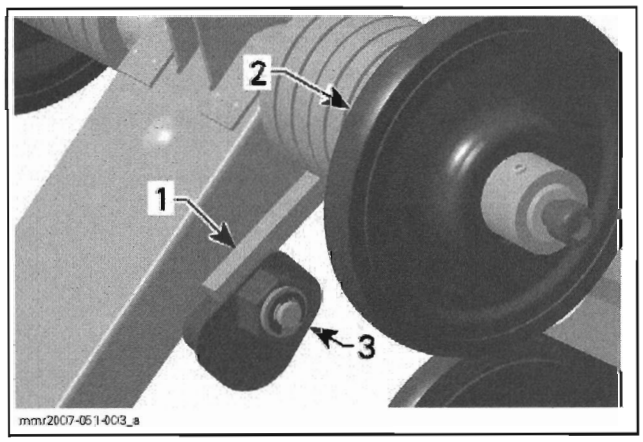
Remove the following on both sides:
- locking ring
- top idler wheel
- spring.

Installation

Installation is the reverse of removal procedure. Pay attention to the following details.

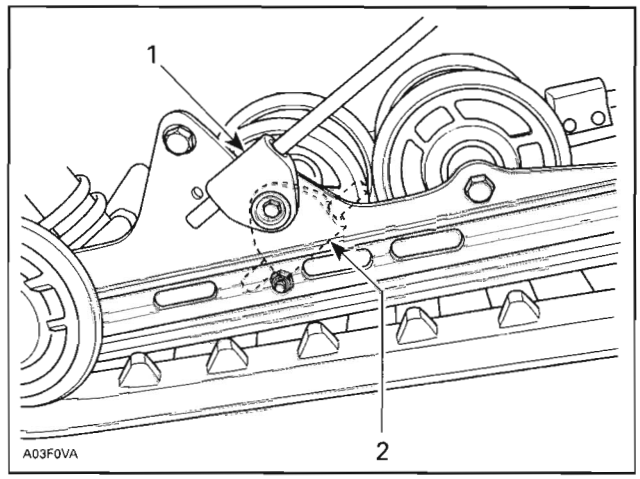
At assembly, respect THIS SIDE OUT inscription on top idler wheels.

At assembly, make sure that spring end is in cam adjuster.



RH SIDE SHOWN
1. *Spring end*
2. *Top idler wheel*
3. *Cam adjuster*

CAUTION: To avoid track damage, spring supports must be mounted upward.

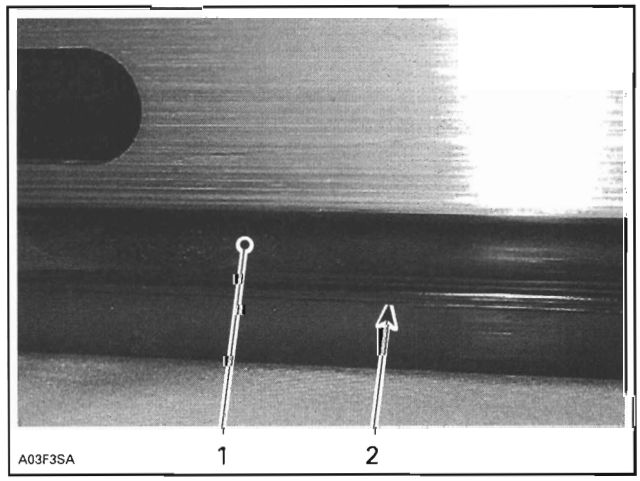


TYPICAL — RIGHT SIDE SHOWN
1. *Right position: upward*
2. *Wrong position*

SLIDER SHOE

Inspection

Replace slider shoes when the wear reach 1 - 2 mm (.040 - .079 in) beyond the moulding line.



TYPICAL
1. *Slider shoe*
2. *Molding line*

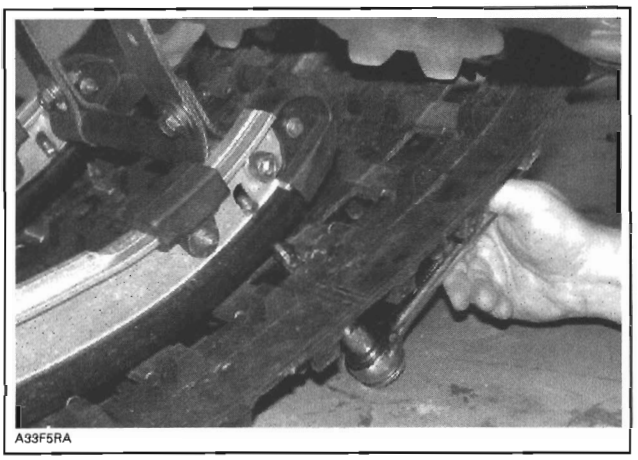
CAUTION: Slider shoes must always be replaced in pairs.

Removal

Lift rear of vehicle and support it off the ground.

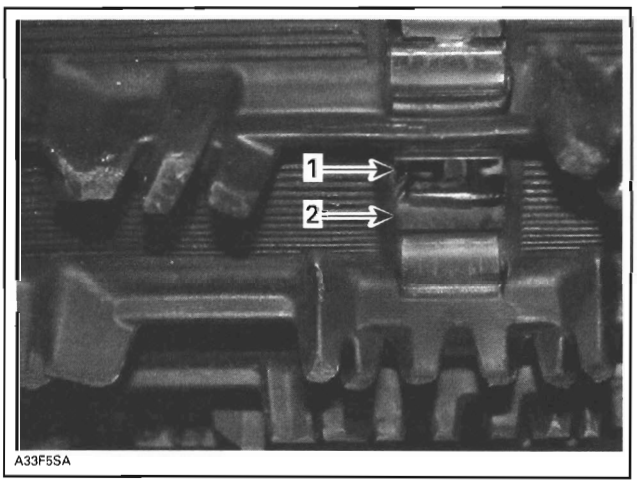
Completely loosen track tension.

Remove front runners nut and screw.



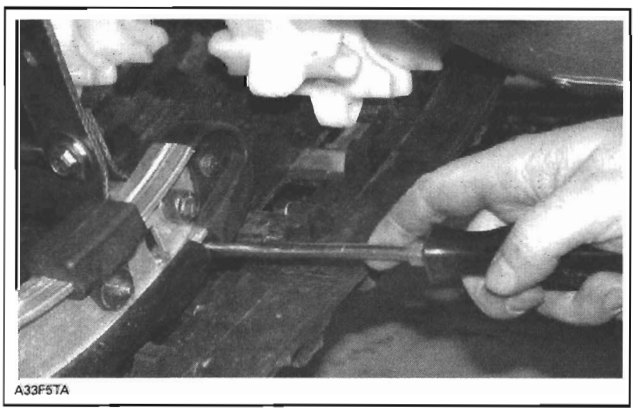
TYPICAL — REMOVE NUT AND SCREW

Align track window with slider shoe.



TYPICAL
1. *Track window*
2. *Slider shoe*

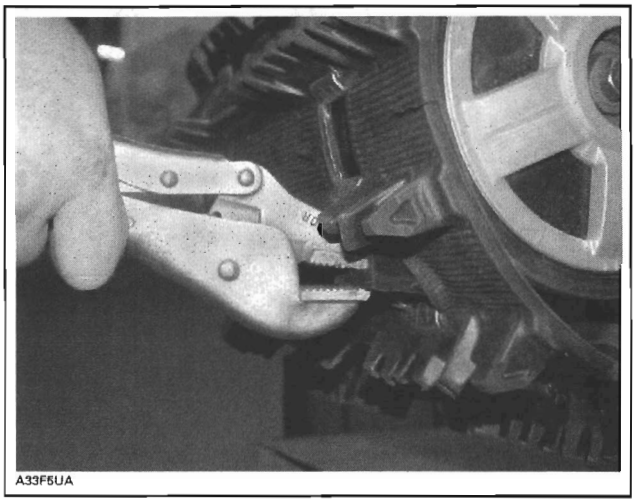
Using a pry bar or screw driver, push slider shoe until it comes in contact with track.



TYPICAL — PUSH ON SLIDER SHOE

Using locking pliers, pull slider shoe through track window to remove.

NOTE: If necessary, lubricate track window to facilitate slider shoe removal.



TYPICAL — PULL ON SLIDER SHOE TO REMOVE

Installation

Installation is reverse of removal procedure. Pay attention to the following details.

Make sure to insert slider shoe end with hole first.

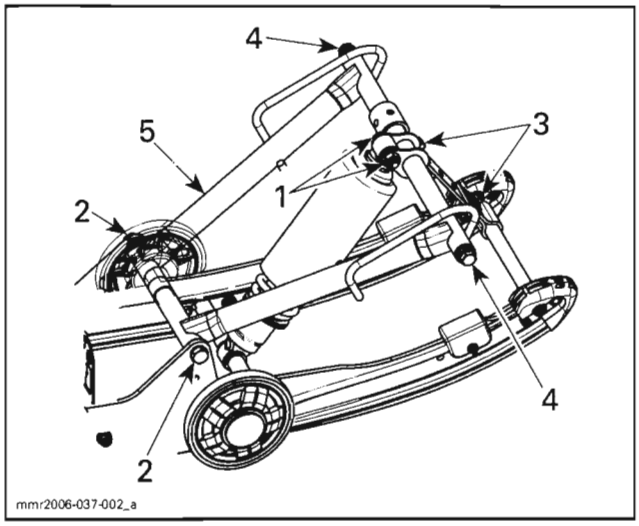
FRONT ARM

Removal

Lift rear of vehicle and support it off the ground.

Remove the following:
- shock upper bolt and nut
- front arm lower bolts and washers
- unfasten one end of stopper strap
- remove front arm upper bolts, nuts and washers.

Remove front arm.



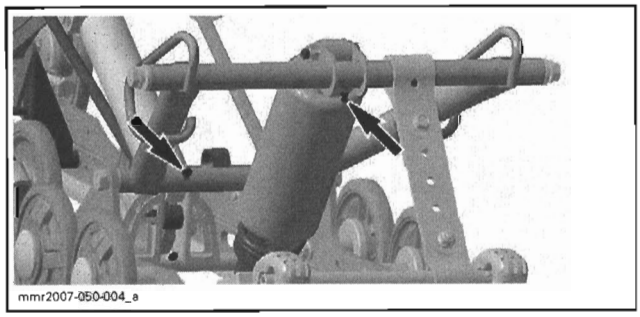
1. *Shock upper bolt and nut*
2. *Front arm lower bolts and washers*
3. *Unfasten one end of stopper strap*
4. *Front arm upper bolts, nuts and washers*
5. *Front arm*

Installation

Installation is reverse of removal procedure.

Lubrication

Lubricate front arm at grease fittings using suspension synthetic grease (P/N 293 550 033).

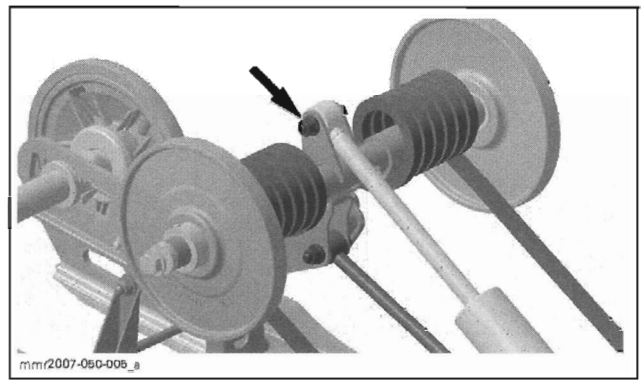


REAR ARM

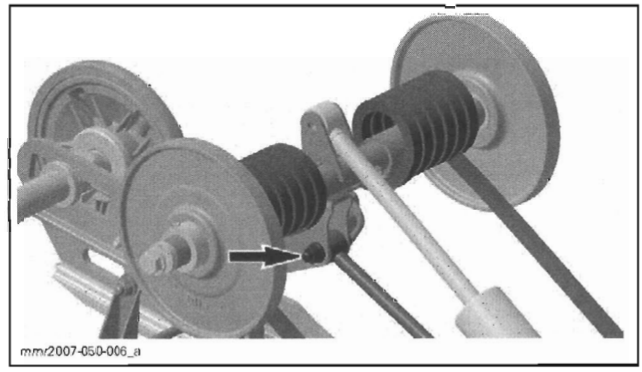
Removal

For rear arm removal, remove the following:

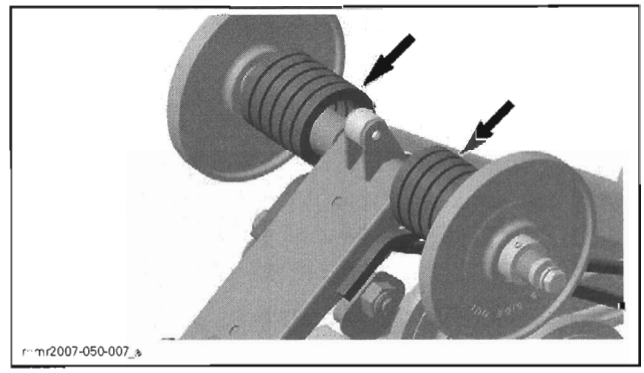
- shock upper bolt and nut



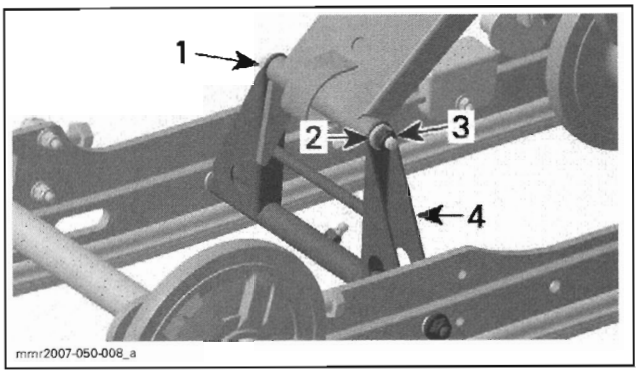
- throttle rod upper bolt and nut



- rear springs (refer to procedure above in this section)



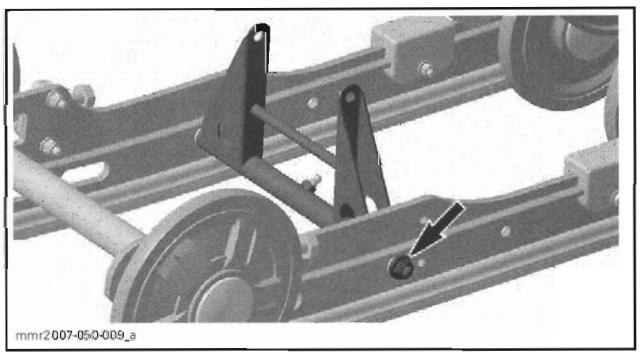
- screws, washers and nuts holding rear arm to pivot arm.



1. *Screw with washer*
2. *Washers (2)*
3. *Nut*
4. *Pivot arm*

Remove rear arm.

For pivot arm removal, remove bolt, nut and washers holding pivot arm to runners.

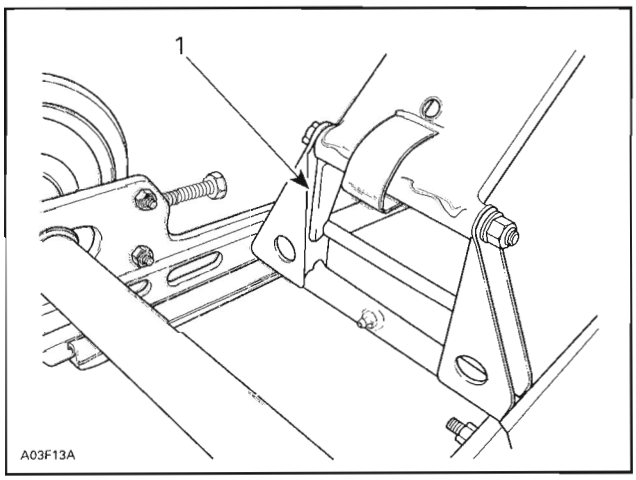


Remove pivot arm.

Installation

Installation is reverse of removal procedure. Pay attention to the following details.

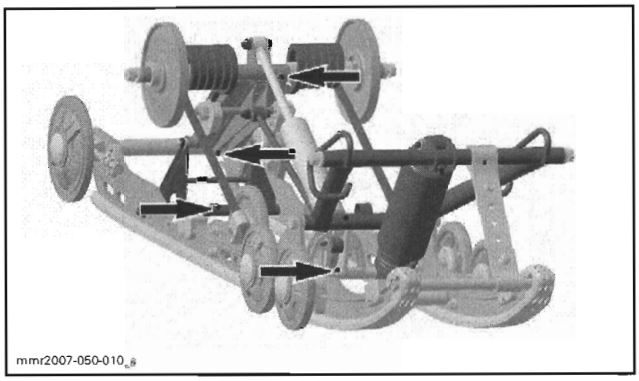
At installation, rear arm stroke limiter must be on rear side.



1. *Stroke limiter on rear side*

Lubrication

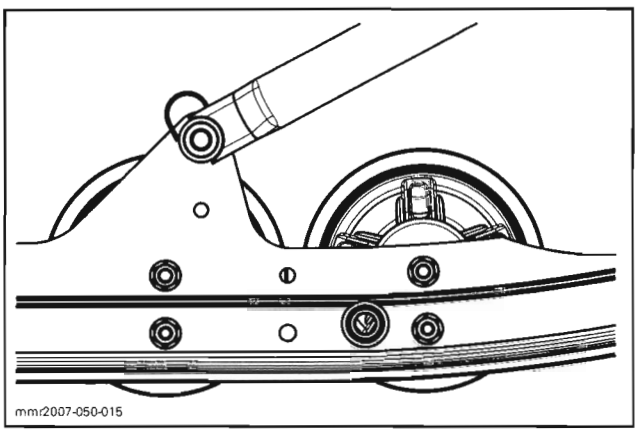
Lubricate rear arm at grease fittings using suspension synthetic grease (P/N 293 550 033).



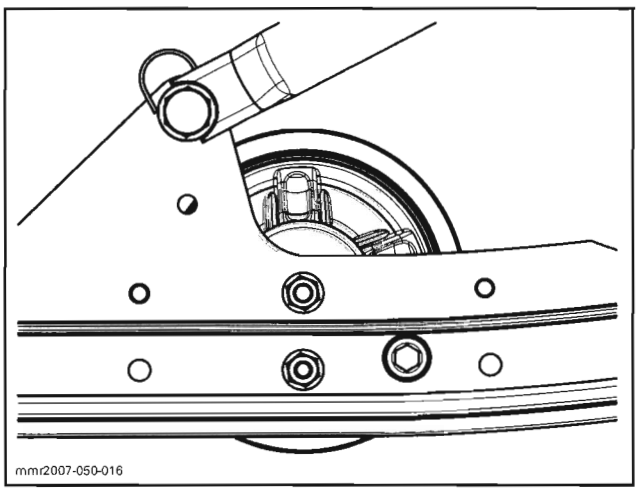
IDLER WHEELS

Refer to illustration for idler wheels position at installation.

All Models except Tundra



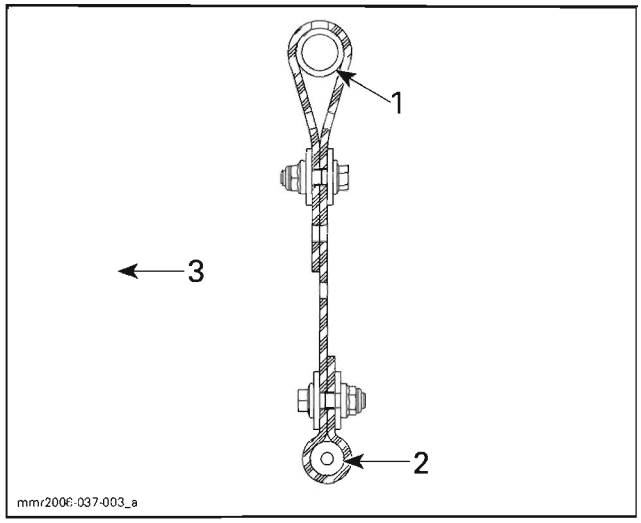
Tundra Only



STOPPER STRAP

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required.

Make sure it is attached through proper hole from the end.



POSITION 3-2
1. *Front arm (top)*
2. *Front axle*
3. *Rear of vehicle*

SUSPENSION ASSEMBLY

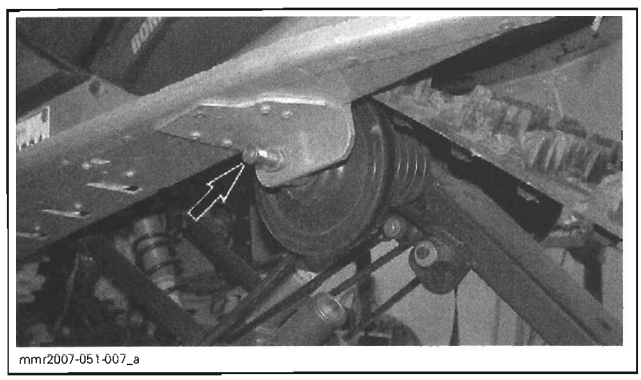
Removal

Lift rear of vehicle and support it off the ground.

Completely loosen track tension.

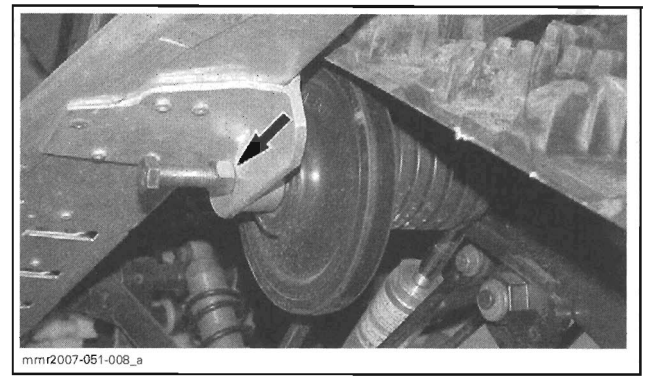
Remove rear arm top axle bolts from chassis, using the following procedure.

- Unscrew one of the socket screws securing the rear arm top axle to frame.



TYPICAL

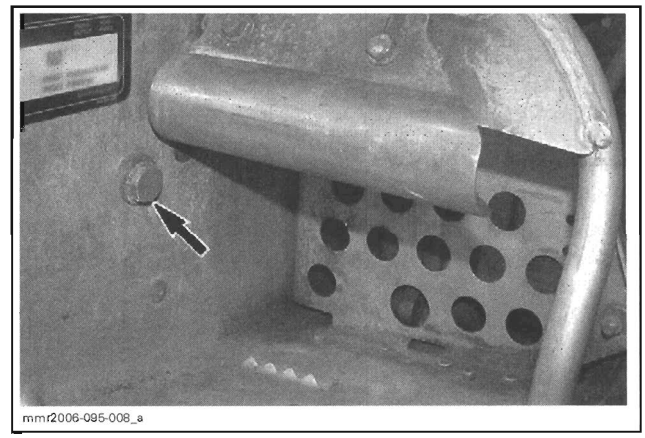
- Replace this socket screw with an hexagonal bolt (longer than socket screw) and a nut.
- Screw the hexagonal bolt completely and lock it with the nut.



TYPICAL

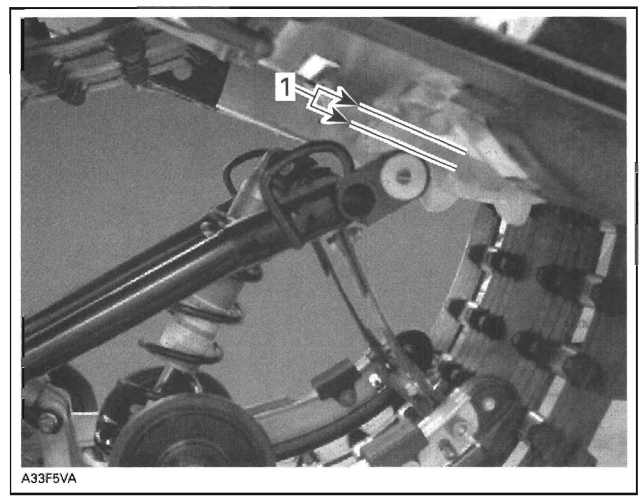
- Unscrew the socket screw on the other side then unlock nut and remove the hexagonal bolt.

Remove bolts retaining front arm to tunnel.

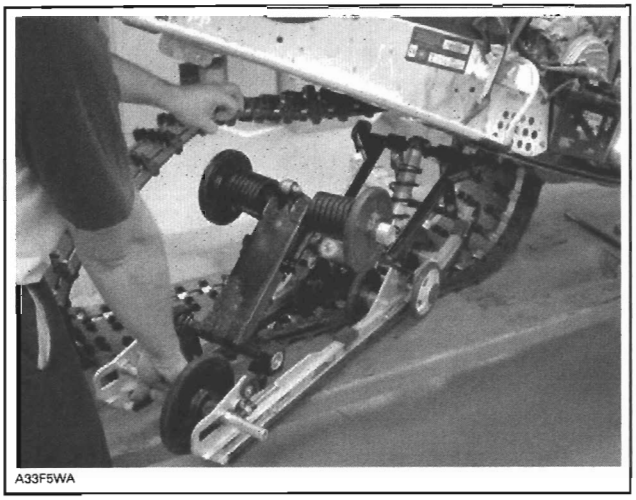


TYPICAL

Lift rear of vehicle until front arm as enough clearance to pass underneath tunnel.



TYPICAL
1. *Enough clearance*



TYPICAL — REMOVE SUSPENSION

Installation

Installation is the reverse of removal procedure. Pay attention to the following details.

Inspect track thoroughly before reinstalling suspension. Refer to *TRACK*.

Install suspension into track with front portion first.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of socket screws and torque them to 85 N•m (63 lbf•ft).

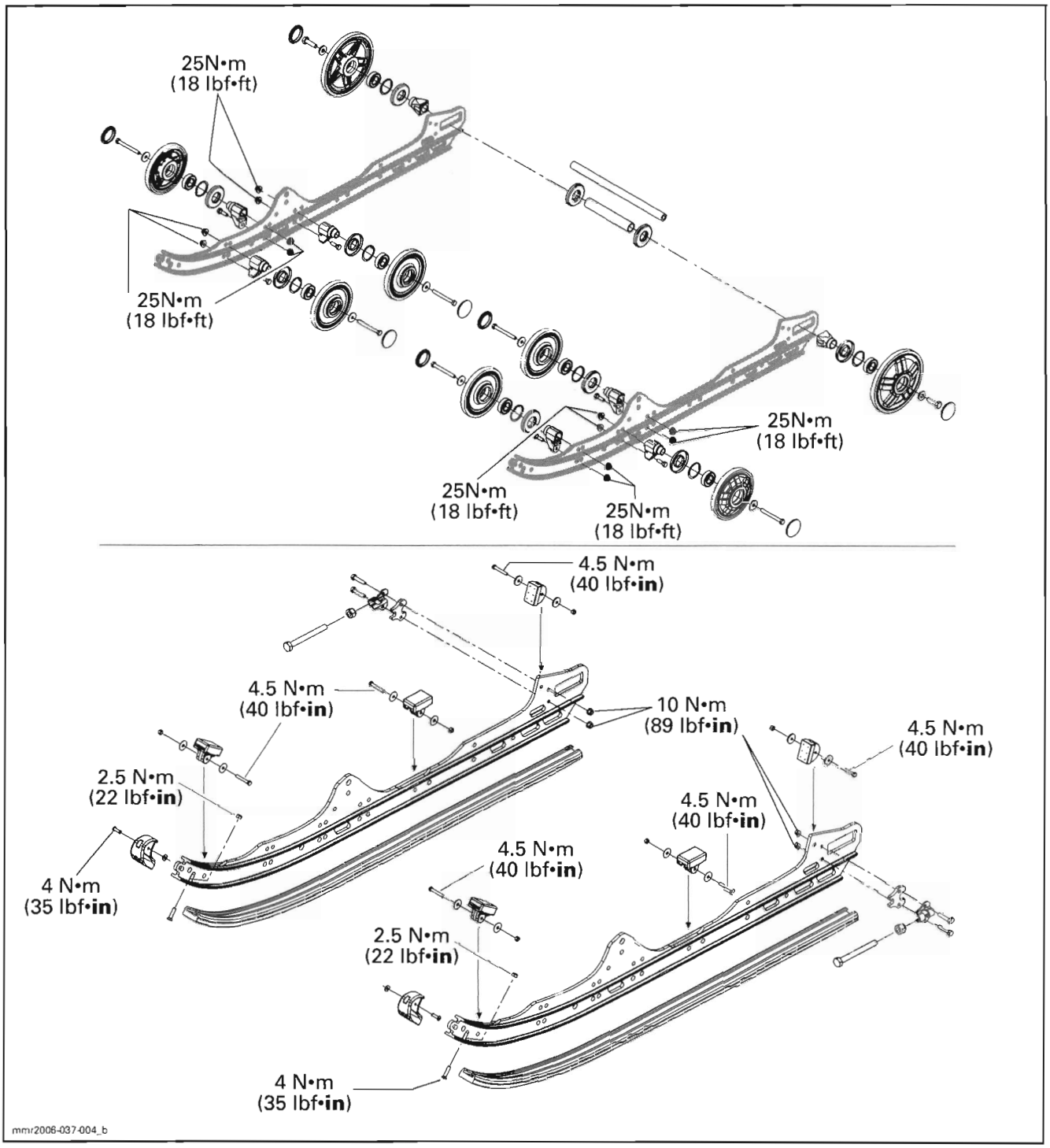
Adjust track tension.

REAR SUSPENSION (SC-4)

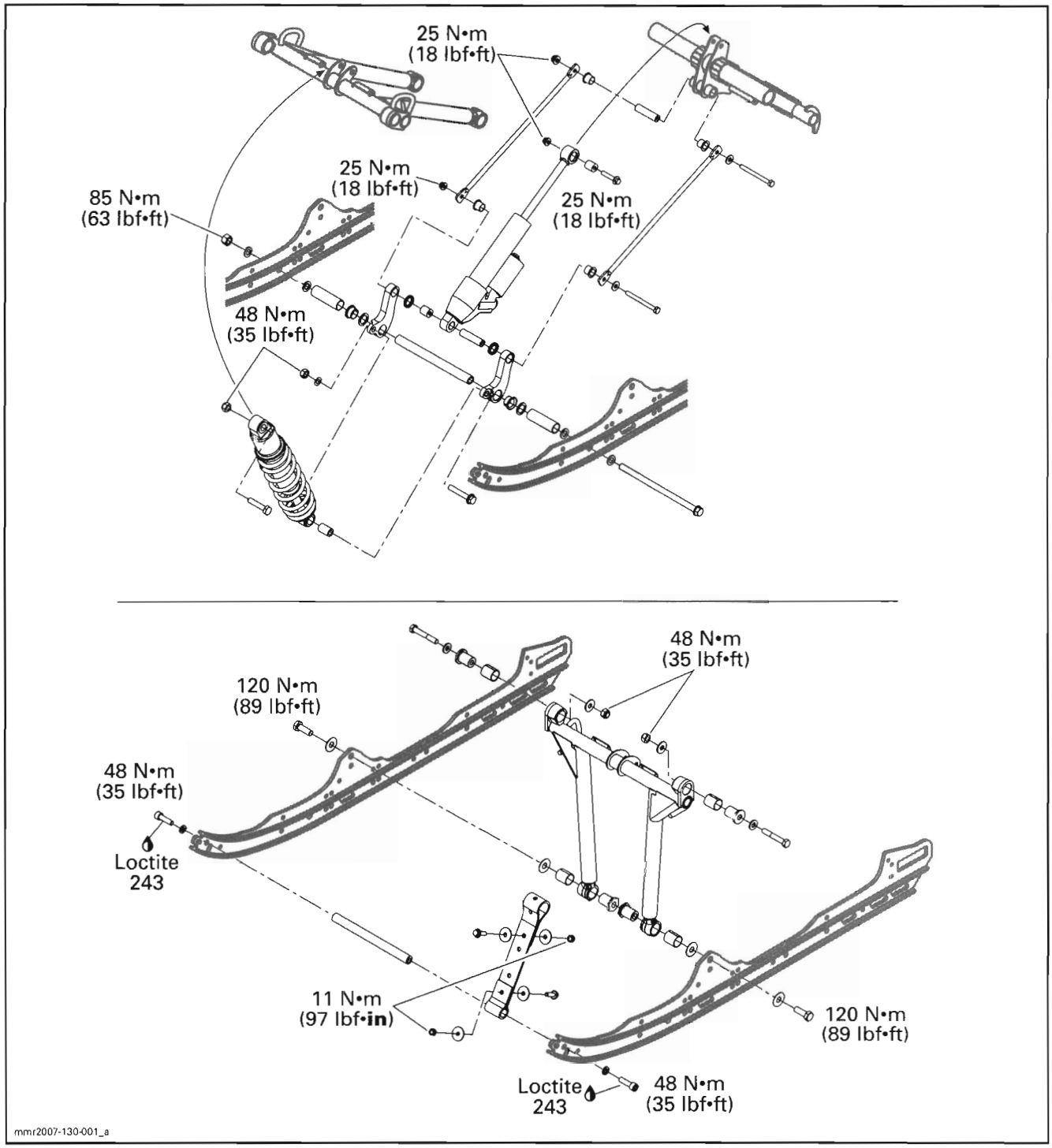
SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	552
suspension synthetic grease	293 550 033	550

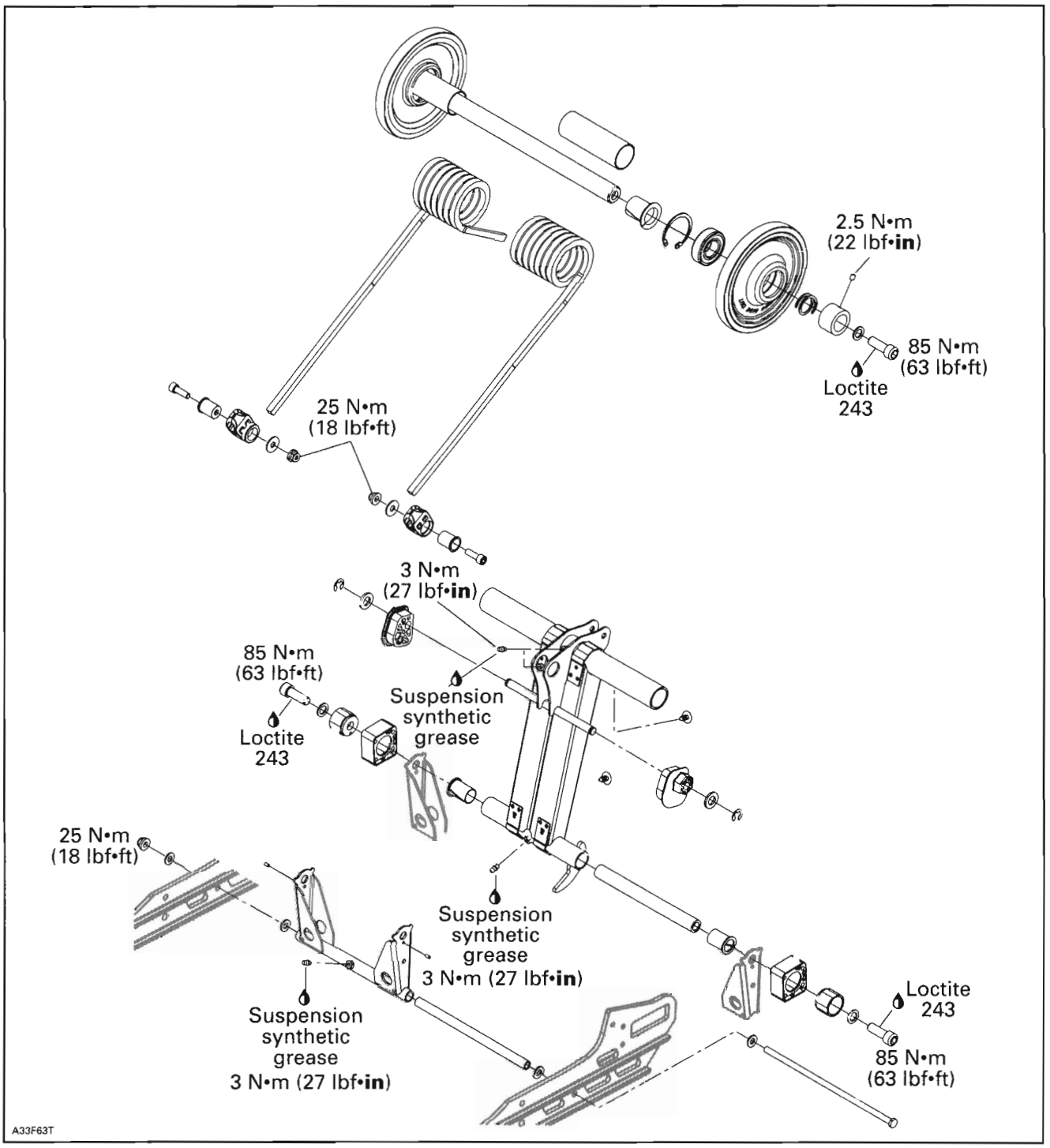
RAILS AND IDLERS WHEELS



FRONT ARM AND SHOCK ABSORBERS



REAR ARM, SPRINGS AND IDLER WHEELS



GENERAL

NOTE: Refer to *TECHNICAL SPECIFICATIONS* to identify the snowmobile suspension type.

During assembly/installation, use torque values and service products as in the exploded view(s).

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

Suspension Adjustment

To adjust the rear suspension, refer to the appropriate *OPERATOR'S GUIDE*.

PROCEDURES

NOTE: The following components can be removed with suspension in place. For suspension assembly removal, refer to *SUSPENSION ASSEMBLY* further in this section.

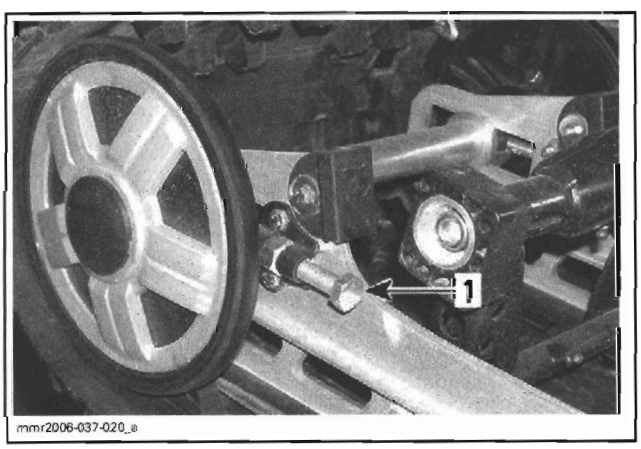
REAR AXLE

Removal

Lift rear of vehicle and support it off the ground.

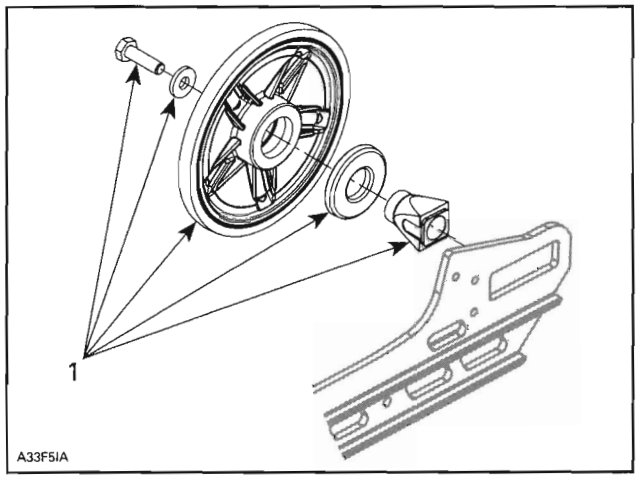
Remove screws on rear axle.

Completely loosen track tension.

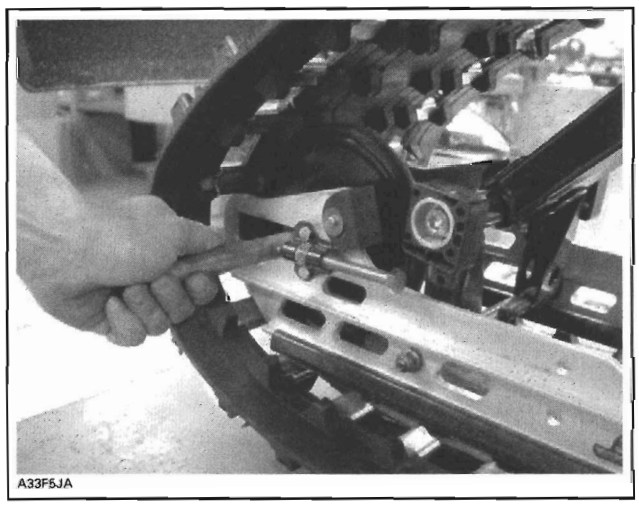


1. Completely loosen track tension

Remove the following:
- rear idler wheels
- idler wheels bearing protector
- idler wheels spacer.



ON BOTH SIDES
1. Remove the following



TYPICAL — PULL OUT REAR AXLE

Installation

Installation is reverse of removal procedure.

REAR SHOCK ABSORBER

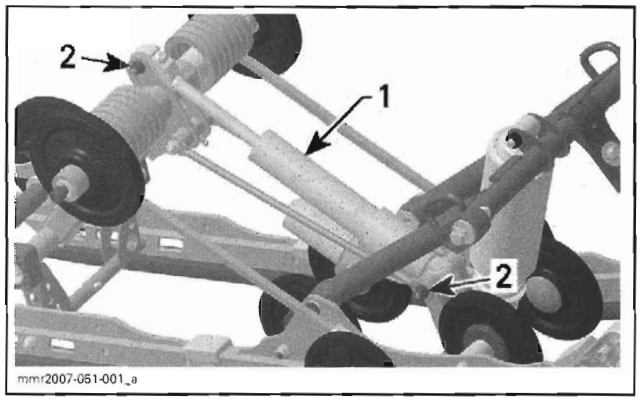
Removal

Lift rear of vehicle and support it off the ground.

NOTE: If necessary, to ease shock removal, unfasten one end of stopper strap to release shock pressure.

Remove bolts and nuts from shock.

NOTE: If necessary, remove idler wheel(s) to ease lower shock component removal.

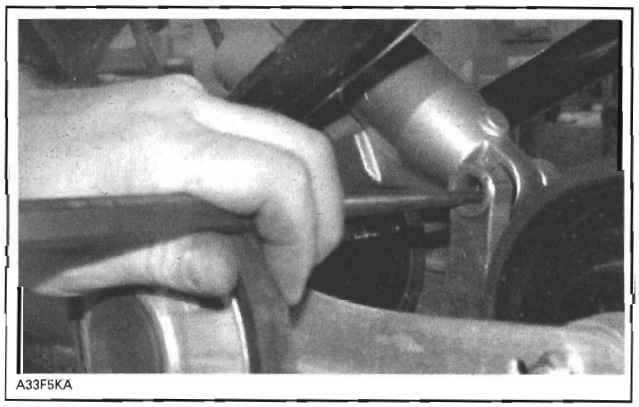


TYPICAL
1. *Rear shock absorber*
2. *Remove bolts and nuts*

Using a punch, remove lower shock bar axle.

Pay attention to plastic spacers.

Remove shock.



REMOVE BAR AXLE

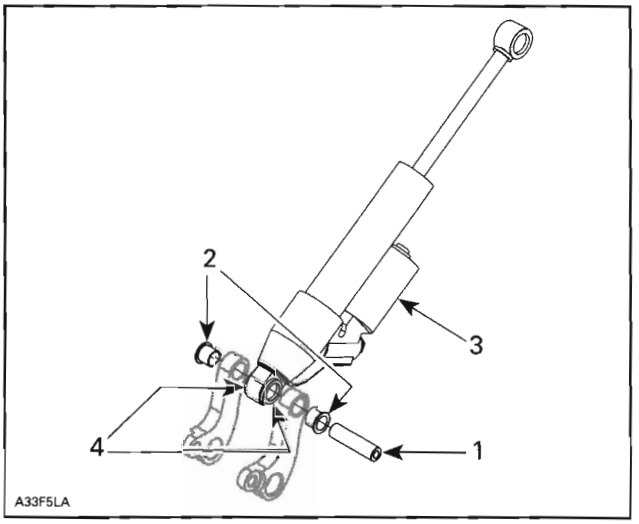
Installation

Installation is reverse of removal procedure. Pay attention to the following details.

To ease shock installation, secure upper shock first.

CAUTION: Make sure shock bar axle is aligned with swivel bushings before inserting it.

If the shock absorber has a remote reservoir, make sure to install the shock so that reservoir is facing down.



TYPICAL
1. *Bar axle*
2. *Swivel bushings*
3. *Shock reservoir position*
4. *Plastic spacers*

FRONT SHOCK ABSORBER

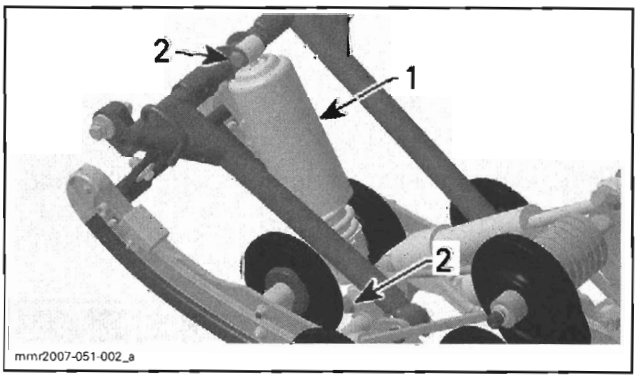
Removal

Lift rear of vehicle and support it off the ground.

Unfasten one end of stopper strap.

Remove bolts and nuts from shock.

NOTE: If necessary, remove idler wheel(s) to ease lower shock component removal.



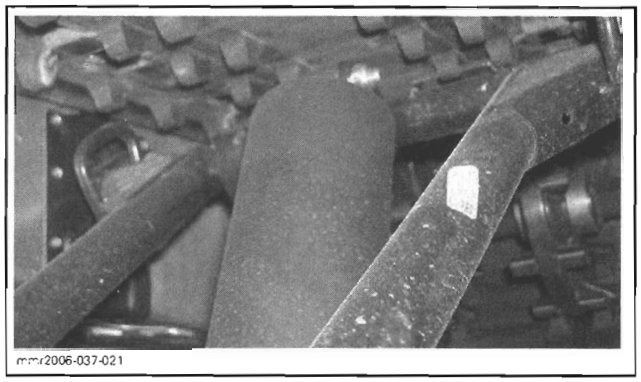
TYPICAL
1. *Front shock absorber*
2. *Remove bolts and nuts*

Installation

Installation is reverse of removal procedure. Pay attention to the following details.

Shock absorber nuts should be on the RH side.

Install shock rod upwards.



TYPICAL

REAR SPRING

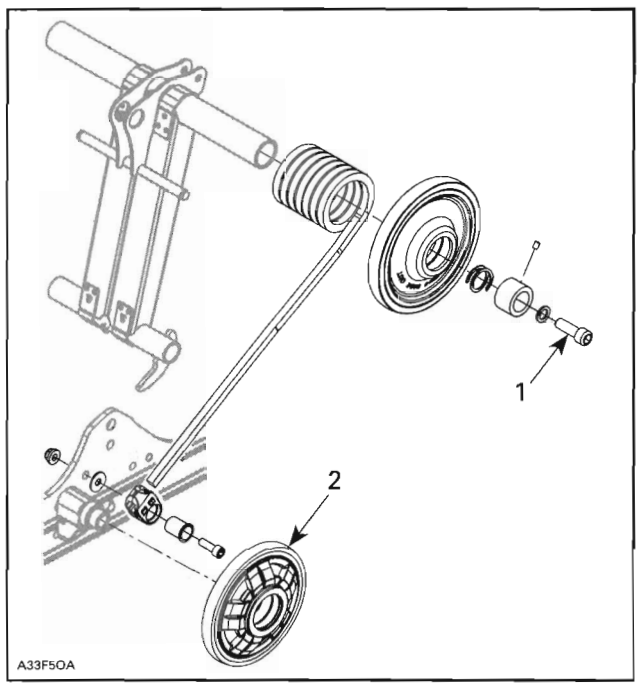
Removal

Lift rear of vehicle and support it off the ground.

Decrease spring preload by turning cams accordingly.

Loosen rear arm top axle from chassis.

Remove idler wheels to have access to spring support screws.

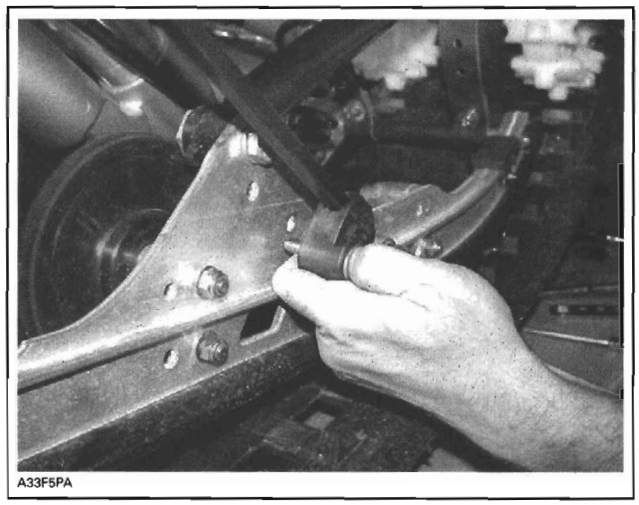


1. Loosen rear arm top axle from chassis
2. Remove idler wheels

Remove spring supports.

⚠ WARNING

Supports are spring loaded.

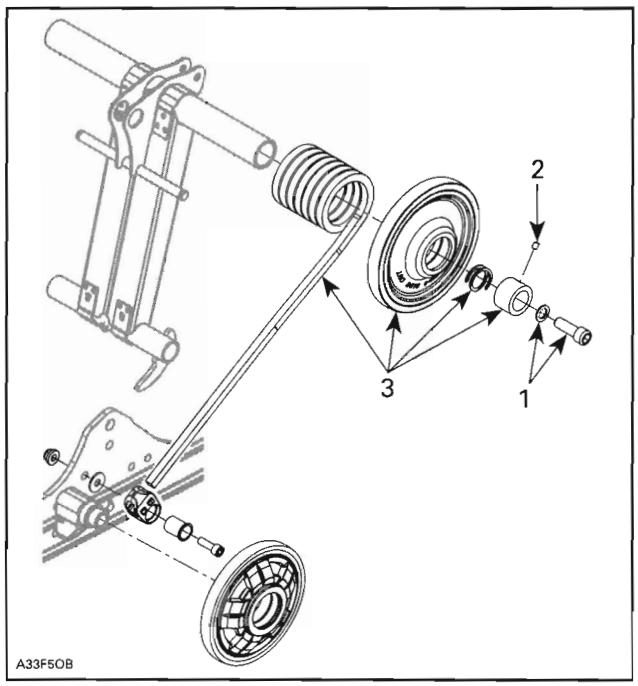


TYPICAL

Remove screws and washers from rear arm top axle.

Loosen set screw from locking rings.

Remove the following on both sides:
- locking ring
- axle spring
- top idler wheel
- rear spring.



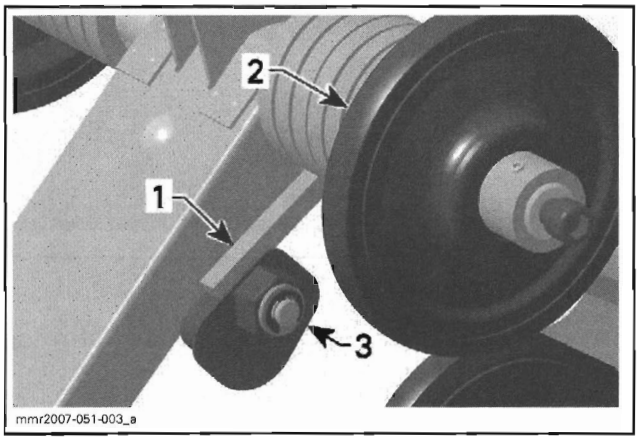
ON BOTH SIDES
1. Remove screws
2. Loosen set screw
3. Remove the following

Installation

Installation is reverse of removal procedure. Pay attention to the following details.

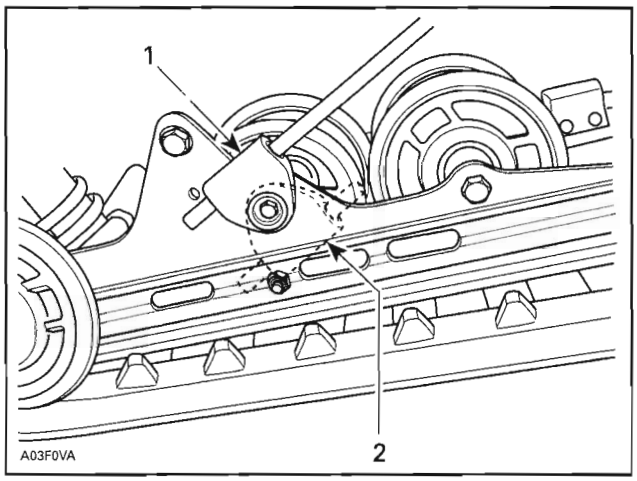
Respect THIS SIDE OUT inscription on top idler wheels.

Make sure that spring end is in cam adjuster.



RH SIDE SHOWN
1. *Spring end*
2. *Top idler wheel*
3. *Cam adjuster*

CAUTION: To avoid track damage, spring supports must be mounted upward.

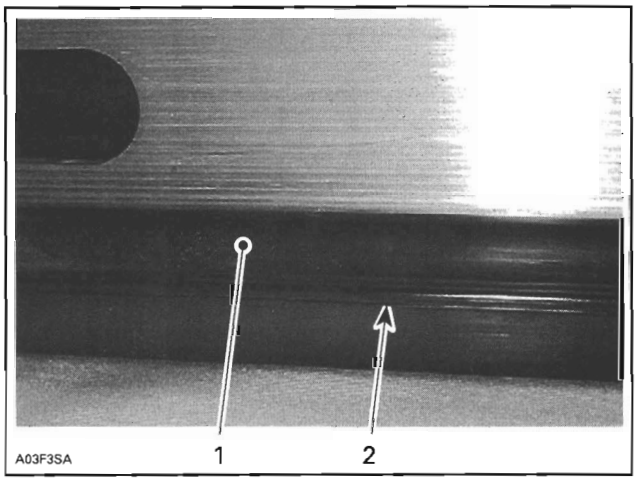


TYPICAL — RIGHT SIDE SHOWN
1. *Right position: upward*
2. *Wrong position*

SLIDER SHOE

Inspection

Replace slider shoes when the wear reach 1 - 2 mm (.040 - .079 in) beyond the moulding line.



TYPICAL
1. *Slider shoe*
2. *Molding line*

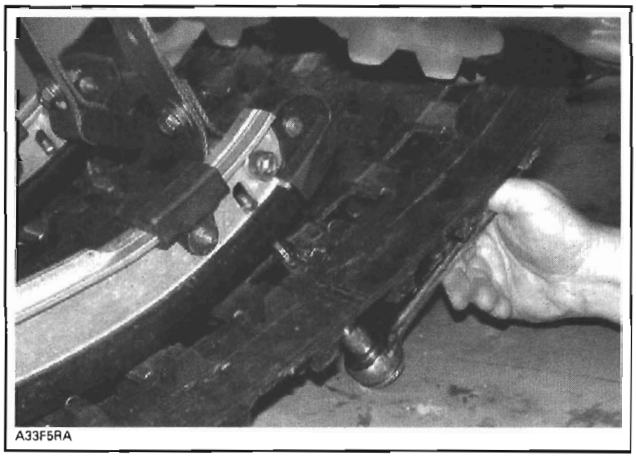
CAUTION: Slider shoes must always be replaced in pairs.

Removal

Lift rear of vehicle and support it off the ground.

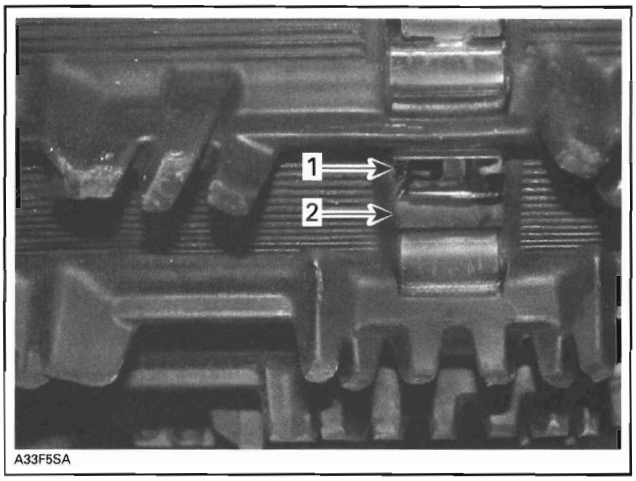
Completely loosen track tension.

Remove nut and screw of each runner.



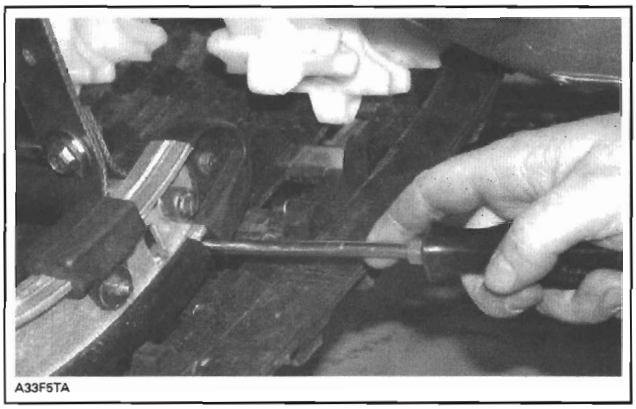
REMOVE NUT AND SCREW OF EACH RUNNER

Align track window with slider shoe.



TYPICAL
1. *Track window*
2. *Slider shoe*

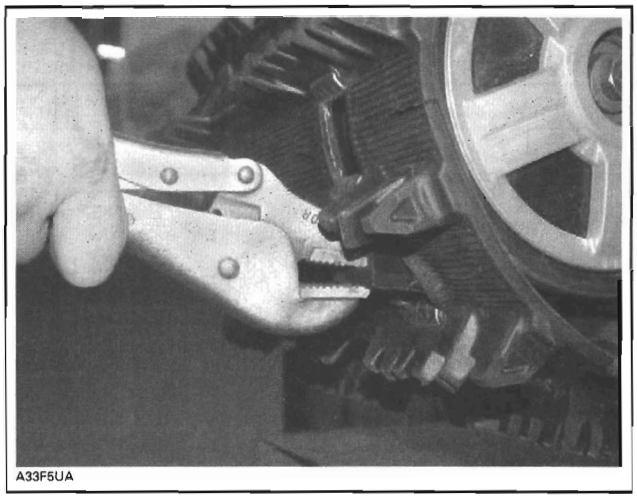
Using a pry bar or screwdriver, push slider shoe until it comes in contact with track.



PUSH ON SLIDER SHOE

Using locking pliers, pull slider shoe thru track window to remove.

NOTE: If necessary, lubricate track window to facilitate slider shoe removal.



PULL ON SLIDER SHOE TO REMOVE

Installation

Installation is reverse of removal procedure. Pay attention to the following details.

Make sure to insert slider shoe end with hole first.

FRONT ARM

Removal

Lift rear of vehicle and support it off the ground.

Remove the shock upper bolt and its nut.

Remove both front idler wheels.

To gain access to the front arm lower bolts, remove the spring supports.

⚠ WARNING

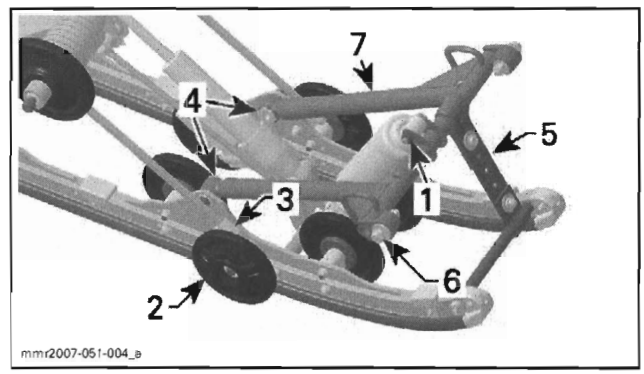
Supports are spring loaded.

Unscrew and remove the front arm lower bolts and washers.

Unfasten one end of the stopper strap(s).

Remove front arm upper bolts, nuts and washers.

Remove front arm.



SUSPENSION REMOVED FOR CLARITY
1. *Shock upper bolt and nut*
2. *Front idler wheels*
3. *Spring supports*
4. *Front arm lower bolts and washers*
5. *Unfasten one end of stopper straps*
6. *Front arm upper bolts, nuts and washers*
7. *Front arm*

Installation

Installation is reverse of removal procedure. Pay attention to the following details.

To properly hold front arm axles when applying tightening torque to front arm lower bolts, it may be necessary to remove idle wheels.

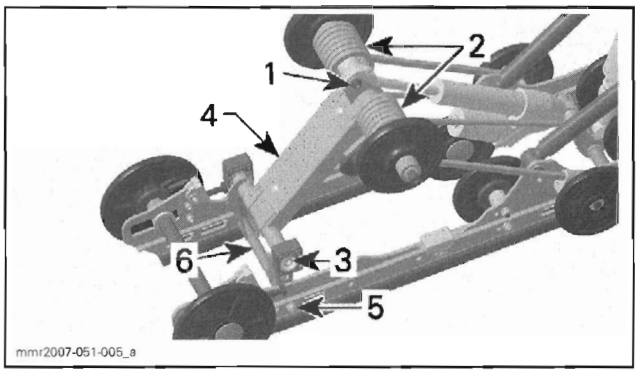
REAR ARM

Removal

NOTE: Rear arm can be removed with suspension assembly in place.

For rear arm removal, remove the following:
- shock upper bolt and nut
- rear springs (refer to procedure above in this section)
- screws and washers holding rear arm to pivot arm.

For pivot arm removal, remove bolts, nuts and washers holding pivot arm to runners.



SUSPENSION REMOVED FOR CLARITY
1. *Shock upper bolt and nut*
2. *Rear springs*
3. *Rear arm/pivot arm screws and washers*
4. *Rear arm*
5. *Pivot arm/runner bolts, nuts and washers*
6. *Pivot arm*

Installation

Installation is reverse of removal procedure. Pay attention to the following details.

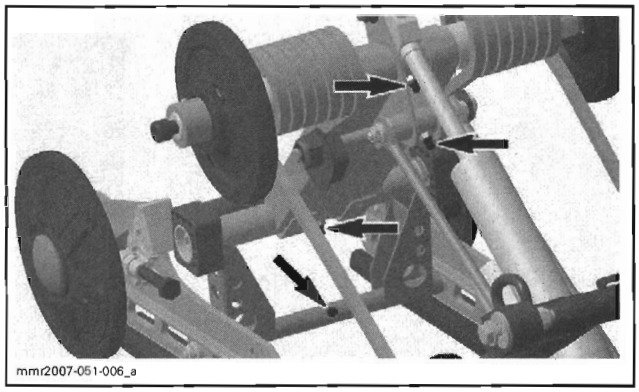
Pivot arm grease fitting must be towards the front of the vehicle.

At installation, rear arm stroke limiter must be on rear side.

Insert dowel pin into pivot arm hole, dowel pin must exceed block guide by 2 to 2.3 mm (.079 to .091 in).

Lubrication

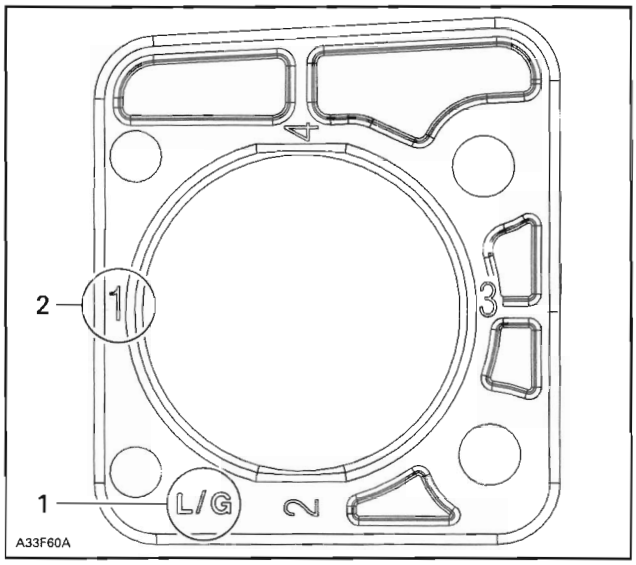
Lubricate pivot arm and rear arm at grease fittings using suspension synthetic grease (P/N 293 550 033).



TYPICAL

COUPLING BLOCK

Both coupling blocks are identified R or L (right or left) and have position number (from 1 to 4). At installation make sure to install proper block on proper side with the same adjustment position on both sides.

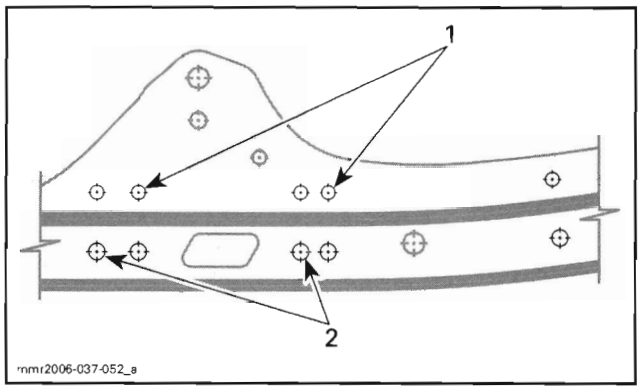


TYPICAL
1. *Blocks are identified R or L (right or left)*
2. *Blocks position number (from 1 to 4)*

MODELS	BLOCK POSITION
Freestyle Session (300F)	1
Freestyle Session (550F) Freestyle Park Legend Trail	4

IDLER WHEELS

Refer to illustration for idler wheels position at installation.



1. RH side wheels position
2. LH side wheels position

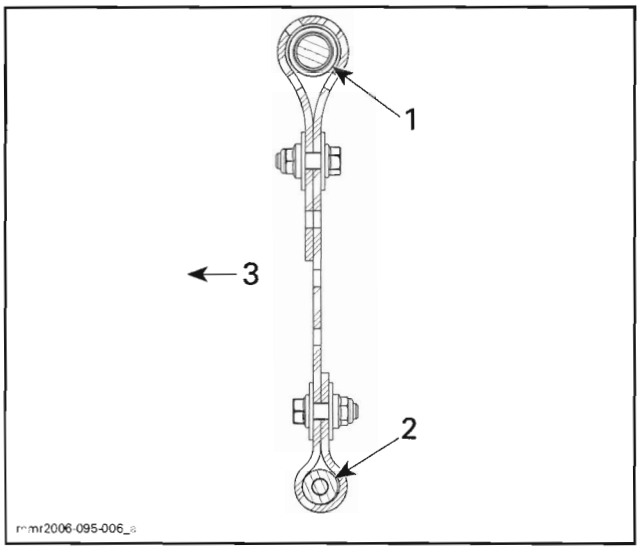
STOPPER STRAP

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required.

Make sure it is attached through proper hole from the end.

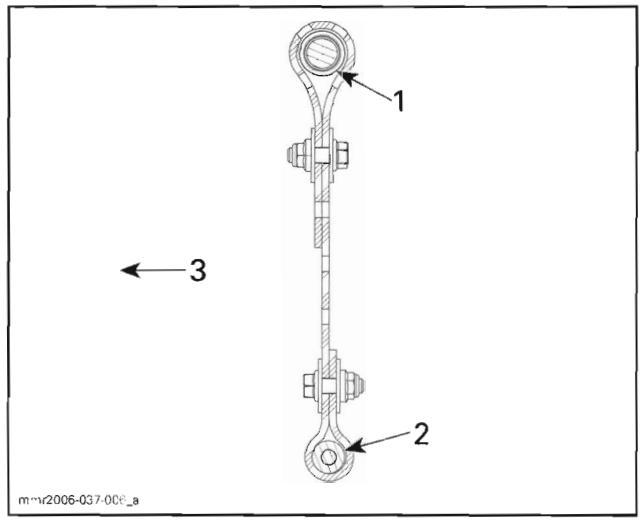
Torque nut to 11 N•m (97 lbf•**in**).

Freestyle Session (300F)



POSITION 4-2
1. Front arm (top)
2. Front axle
3. Rear of vehicle

All Other Models



1. Front arm (top)
2. Front axle
3. Rear of vehicle

SUSPENSION ASSEMBLY

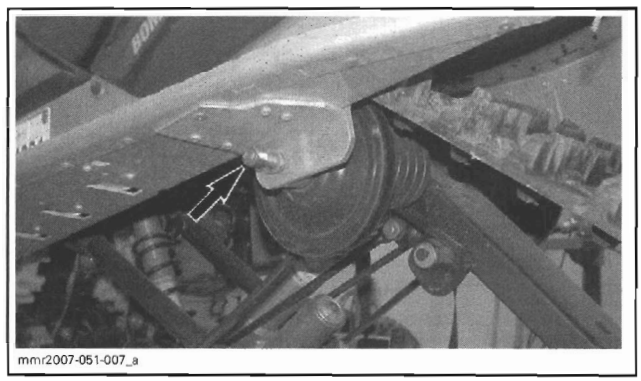
Removal

Lift rear of vehicle and support it off the ground.

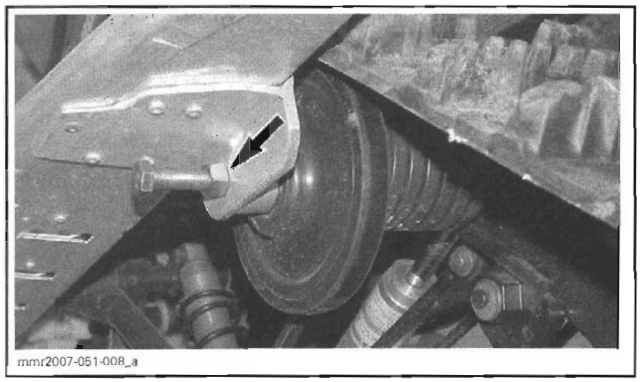
Completely loosen track tension.

Remove rear arm top axle bolts from chassis. Use the following procedure to remove bolts easily.

- Unscrew one of the socket screws securing the rear arm top axle to frame.

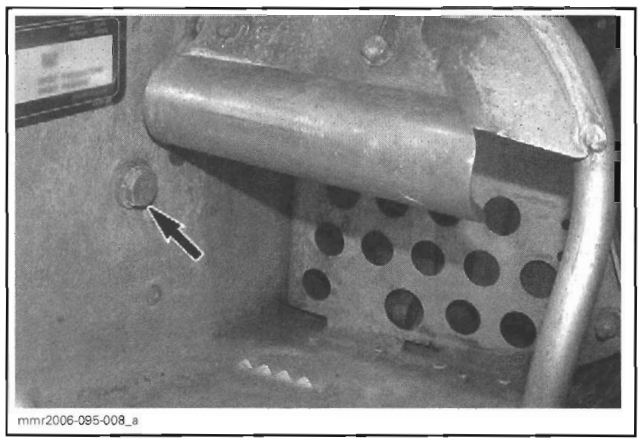


- Replace this socket screw with an hexagonal bolt (longer than socket screw) and a nut.
- Screw the hexagonal bolt completely and lock it with the nut.



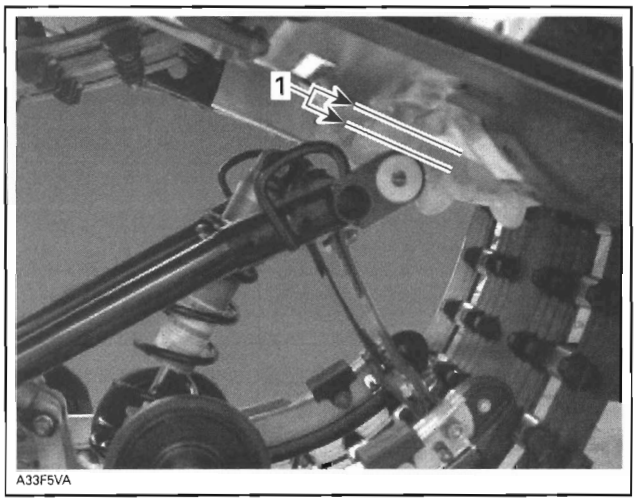
– Unscrew the socket screw on the other side then unlock nut and remove the hexagonal bolt.

Remove bolts retaining front arm to tunnel.

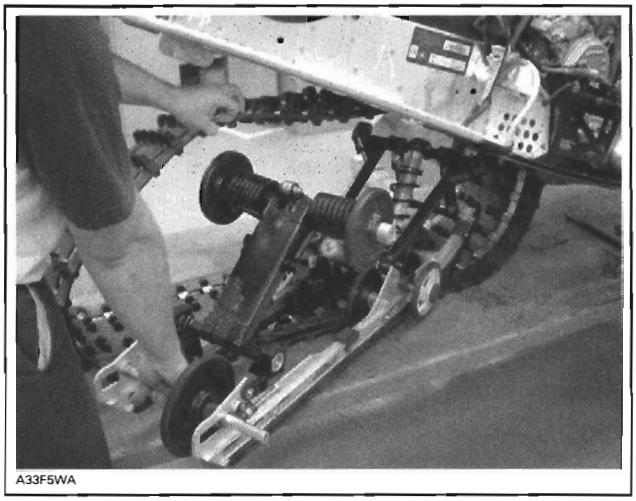


TYPICAL

Lift rear of vehicle until front arm as enough clearance to pass underneath tunnel.



TYPICAL
1. Enough clearance



TYPICAL — REMOVE SUSPENSION

Installation

Installation is the reverse of removal procedure. Pay attention to the following details.

Inspect track thoroughly before reinstalling suspension. Refer to *TRACK*.

Install suspension into track with front portion first.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of socket screws and torque them to 85 N•m (63 lbf•ft).

Adjust track tension.

SHOCK ABSORBER INSPECTION AND SERVICING

HYDRAULIC SHOCK ABSORBER

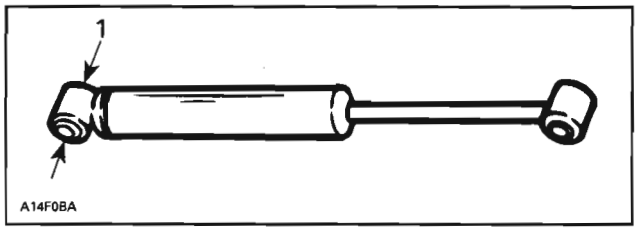
Shock Absorber Removal

Remove shock absorber from vehicle and spring from shock. Refer to the appropriate subsection.

Shock Absorber Inspection

Secure the shock body end in a vise with its rod upward.

CAUTION: Do not clamp directly on shock body.



1. Clamp

Examine shock for leaks. Extend and compress the piston at least 5 complete strokes with its rod upward.

After, check that shock moves smoothly and with uniform resistance over its entire stroke.

NOTE: For the first 5 complete strokes, it could be normal to note uneven resistance.

Check the following conditions that will denote a defective shock:

- A skip or a hang back when reversing stroke at mid travel.
- Seizing or binding condition except at extreme end of either stroke.
- Oil leakage.
- A gurgling noise, after completing one full compression and extension strokes.

If suspecting a shock is freezing, proceed as follows:

Place shock in a freezer (temperature below 0°C (32°F)) for 4 hours.

Push down on rod and note its resistance. If shock is frozen it will be much more difficult to compress than one in normal condition.

Renew if any faults are present.

GAS SHOCK ABSORBER (HPG type)

Shock Absorber Removal

Remove shock absorber from vehicle and spring from shock. Refer to the appropriate subsection.

Shock Absorber Inspection

Because of gas pressure, strong resistance is felt when compressing shock.

To inspect shock operation, or if suspecting an internal leak between oil chamber and gas chamber, check shock as follows:

Install shock in a vise clamping on its bottom eyelet with its rod upward. Verify the compression stroke when the rod is fully extended.

Completely push down the shock rod then release.

The shock should extend unassisted. Rod must come out at a steady speed. If speed suddenly increases particularly at end of extension, replace shock.

If suspecting a shock is freezing, proceed as follows:

Place shock in a freezer (temperature below 0°C (32°F)) for 4 hours.

Push down on rod and note its resistance. If shock is frozen it will be much more difficult to compress than one in normal condition.

STEERING AND HANDLEBAR

SERVICE TOOLS

Description	Part Number	Page
insertion tool	529 035 897	561

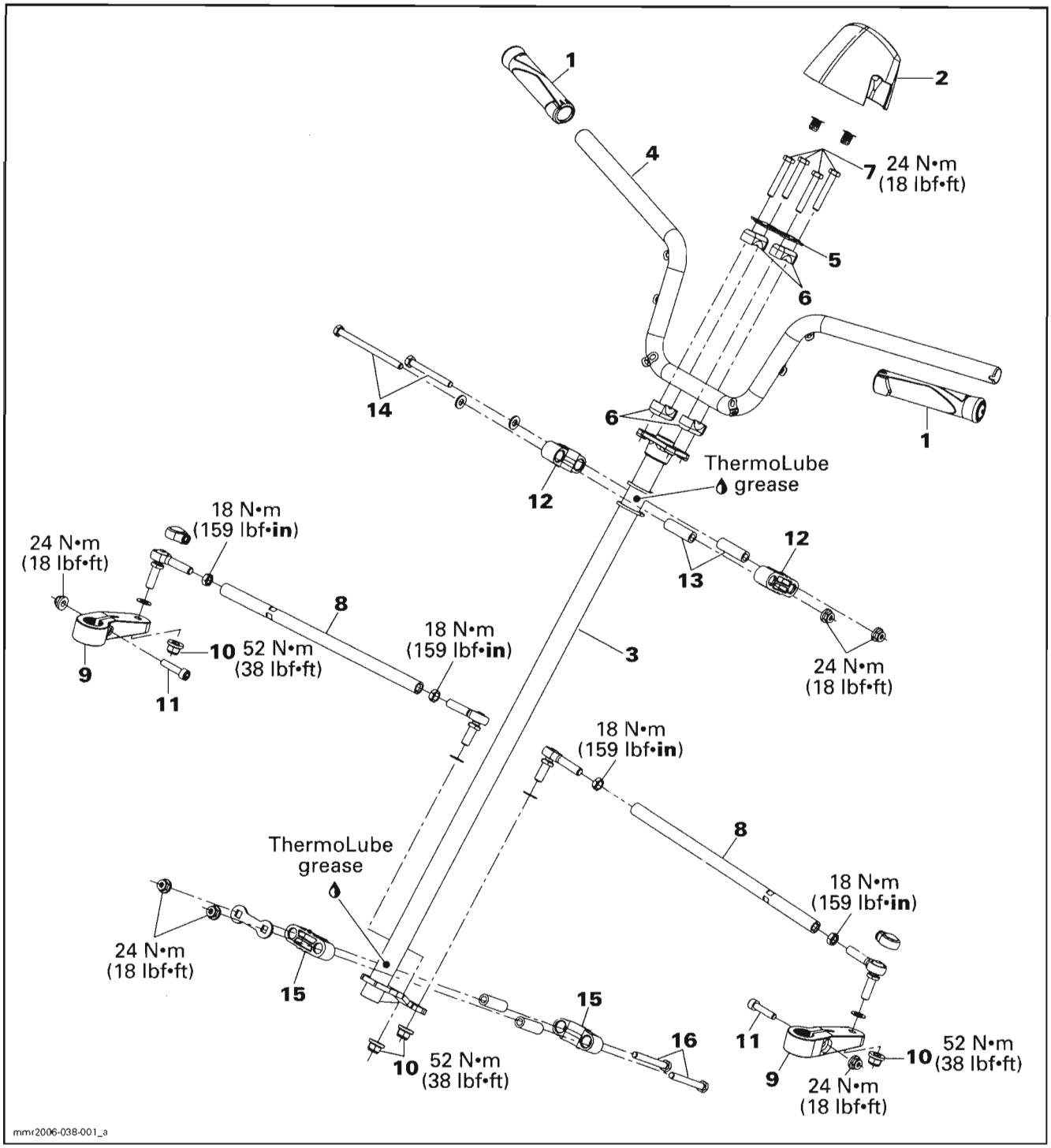
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
AMP multilock-terminal housing extraction tool	755430-2	560

SERVICE PRODUCTS

Description	Part Number	Page
ThermoLube synthetic grease	219 700 417	566

300F Models


1
2
4
7 24 N•m (18 lbf•ft)
5
6
14
6
1
ThermoLube grease
12
18 N•m (159 lbf•in)
24 N•m (18 lbf•ft)
12
13
8
18 N•m (159 lbf•in)
10 52 N•m (38 lbf•ft)
9
11
3
24 N•m (18 lbf•ft)
18 N•m (159 lbf•in)
8
ThermoLube grease
18 N•m (159 lbf•in)
24 N•m (18 lbf•ft)
15
15
16
11
10 52 N•m (38 lbf•ft)
9
10 52 N•m (38 lbf•ft)
24 N•m (18 lbf•ft)
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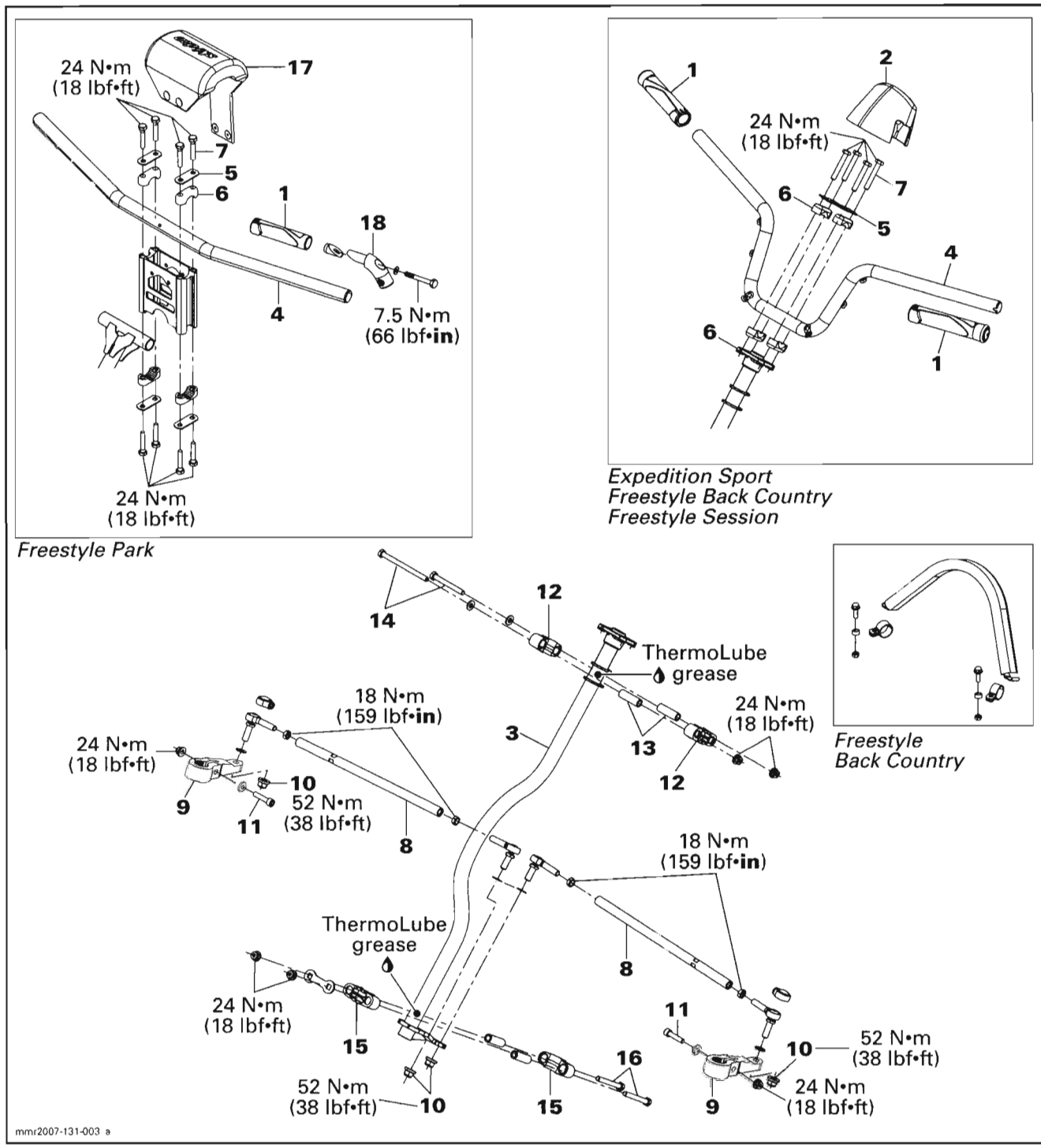
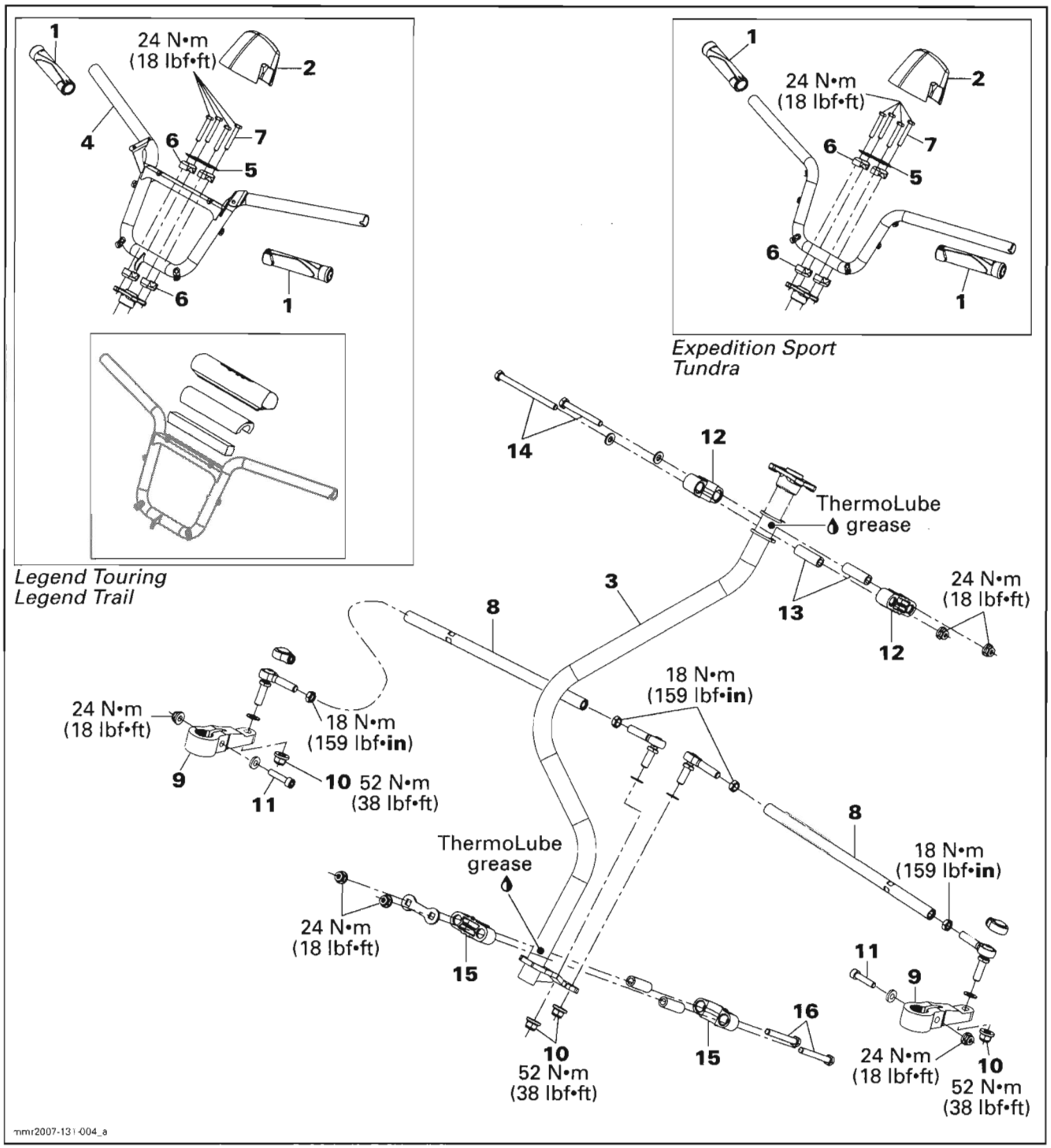
550F Models


24 N•m
(18 lbf•ft)
17
7
5
6
1
18
4
7.5 N•m
(66 lbf•in)
24 N•m
(18 lbf•ft)
Freestyle Park
1
2
24 N•m
(18 lbf•ft)
7
6
5
4
6
1
Expedition Sport
Freestyle Back Country
Freestyle Session
14
12
ThermoLube
grease
18 N•m
(159 lbf•in)
24 N•m
(18 lbf•ft)
3
13
24 N•m
(18 lbf•ft)
12
9
10
52 N•m
(38 lbf•ft)
11
8
18 N•m
(159 lbf•in)
ThermoLube
grease
8
24 N•m
(18 lbf•ft)
15
11
10
52 N•m
(38 lbf•ft)
16
52 N•m
(38 lbf•ft)
10
15
9
24 N•m
(18 lbf•ft)
Freestyle
Back Country
mmr2007-131-003 a

V800 Models


1
24 N•m
(18 lbf•ft)
2
4
6
7
5
6
1
Legend Touring
Legend Trail
1
24 N•m
(18 lbf•ft)
2
6
7
5
6
1
Expedition Sport
Tundra
14
12
ThermoLube
grease
3
8
13
24 N•m
(18 lbf•ft)
12
18 N•m
(159 lbf•in)
24 N•m
(18 lbf•ft)
18 N•m
(159 lbf•in)
9
10 52 N•m
(38 lbf•ft)
11
8
ThermoLube
grease
18 N•m
(159 lbf•in)
24 N•m
(18 lbf•ft)
15
11
9
16
10
52 N•m
(38 lbf•ft)
15
24 N•m
(18 lbf•ft)
10
52 N•m
(38 lbf•ft)
mmr2007-13 I-004_a

GENERAL

During assembly/installation, use the torque values and service products as in the exploded view(s).

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

PROCEDURES

HANDLEBAR GRIP

NOTE: To verify heating elements, refer to *LIGHTS, INSTRUMENTS AND ACCESSORIES*.

Removal

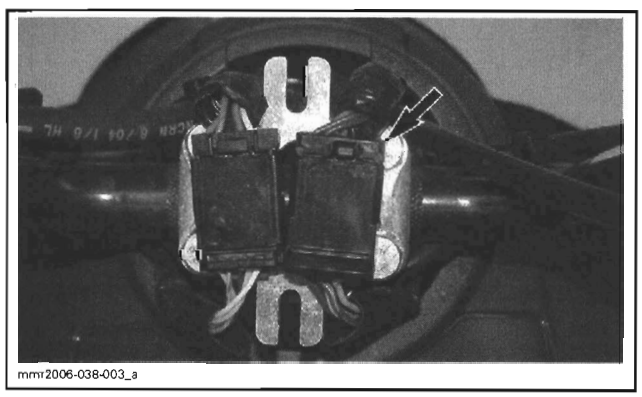
To easily remove a worn or defective grip **no. 1**, cut it with a kife.

NOTE: If grip is to be reused, use the following procedure.

CAUTION: Removing grip from handlebar might damage the heating element. Do not remove needlessly.

Throttle Side:

Remove handlebar cap **no. 2** or steering padding **no. 17** then unplug RH harness on top of steering column **no. 3**. Cut locking ties retaining RH harness to handlebar **no. 4**.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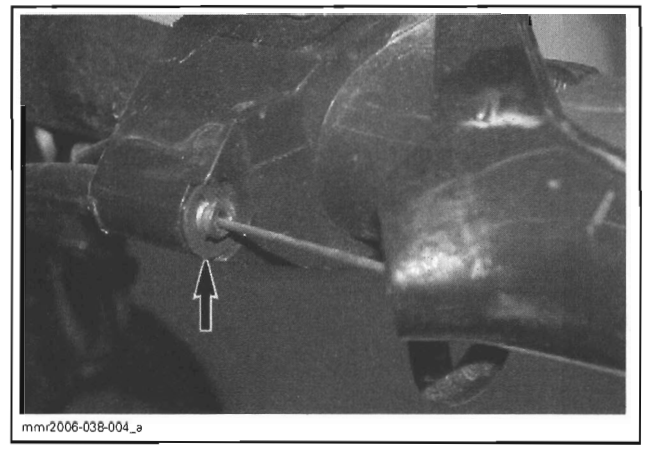
TYPICAL

Remove circlip from throttle cable.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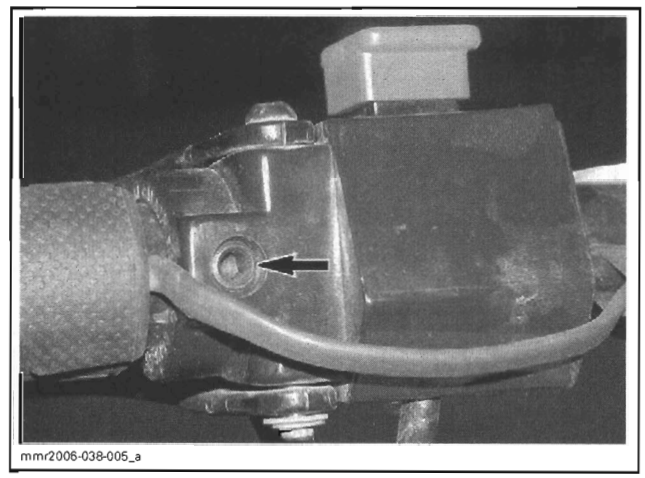
TYPICAL

Unfasten throttle cable from throttle lever, then pull out cable from throttle lever housing.

Loosen set screw retaining throttle lever housing to handlebar.

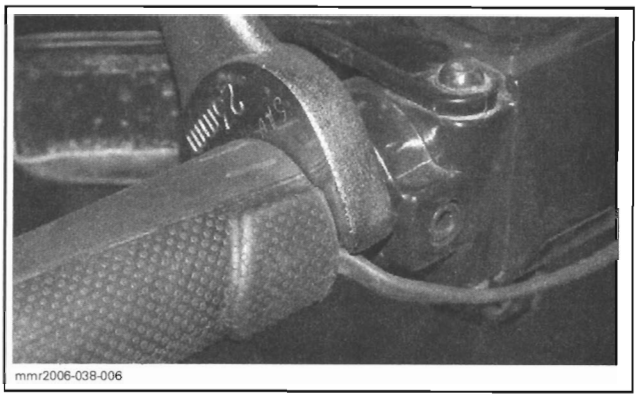

mmr2006-038-005_a

TYPICAL

Move throttle lever housing to create a gap with grip.

On **FREESTYLE Park**, remove J-hook **no. 18** from the end of grip.

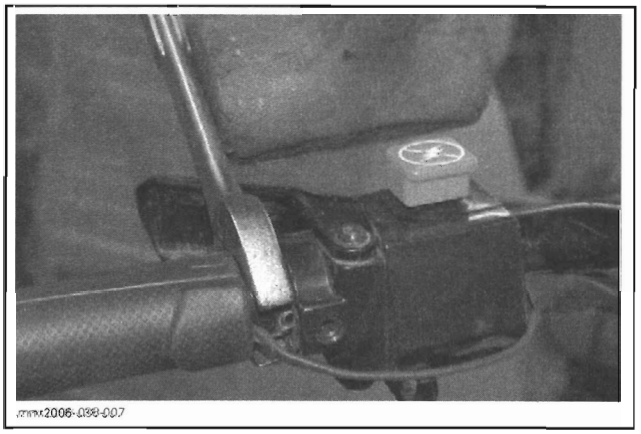
Insert the open side of a 23 mm (7/8 in) wrench against the inner end of grip.



TYPICAL

CAUTION: Pay attention not to damage wires with the wrench.

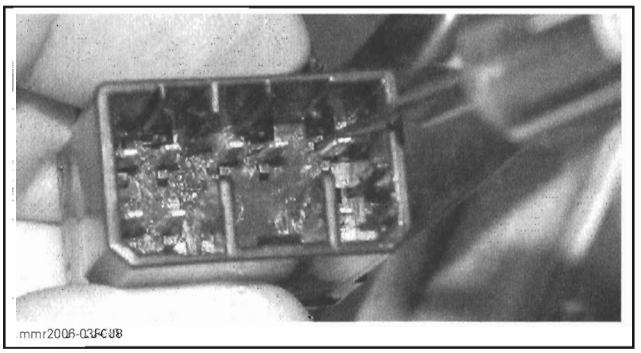
Using a plastic hammer, tap on the side of the wrench end to make the grip slide out.



TYPICAL

Cut locking ties on harness.

Using a tool such as the AMP multilock-terminal housing extraction tool (P/N 755430-2), push the 3 wires of the grip harness out of connector housing. Note the position of the wires for reinstallation.

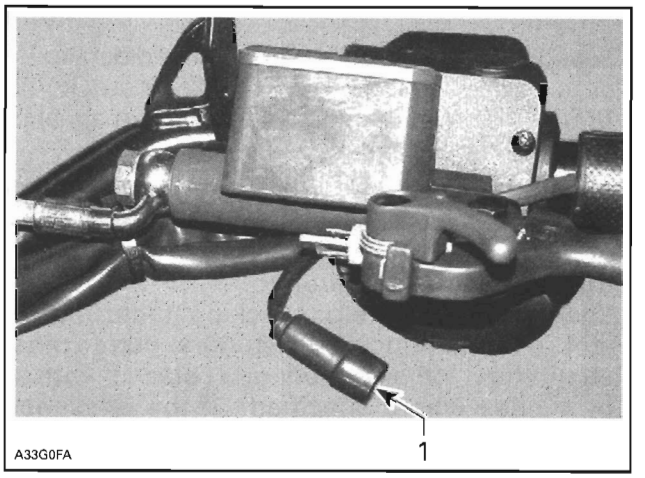


TYPICAL

Pull grip harness out of throttle lever housing.

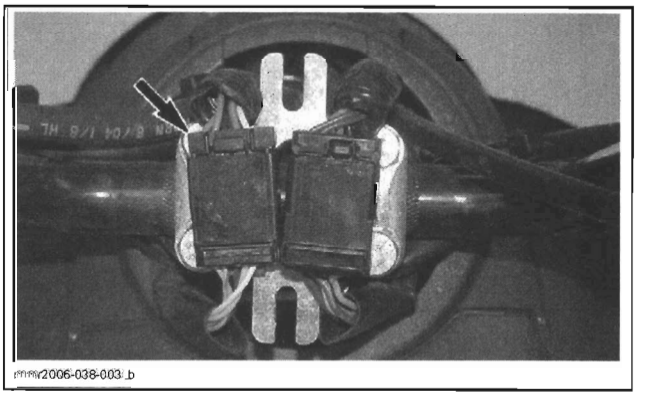
Brake Side:

Unplug connector from brake light switch located on master cylinder.



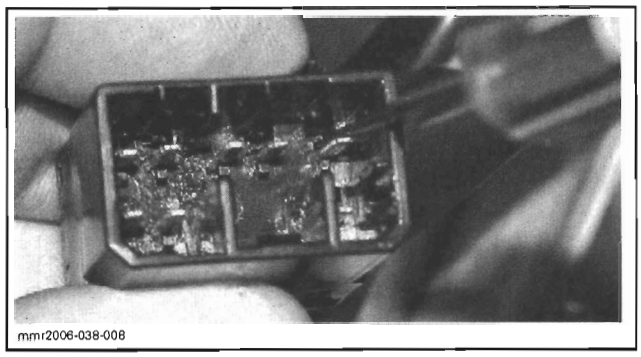
TYPICAL
1. Connector unplugged

Remove handlebar cap **no. 2** then unplug LH harness on top of steering column. Cut locking ties retaining brake light switch/grip harness to handlebar.



TYPICAL

Using a tool such as the AMP multilock-terminal housing extraction tool (P/N 755430-2), push the 3 wires of the grip harness out of connector housing. Note the position of the wires for reinstallation.



TYPICAL

Pull grip wires out of brake light switch/grip harness.

On **FREESTYLE Park**, remove J-hook **no. 18** from the end of grip.

Insert the open side of a 23 mm (7/8 in) wrench against the inner end of grip.

CAUTION: Pay attention not to damage wires with the wrench.

Using a plastic hammer, tap on the side of the wrench end to make the grip sliding out.

Installation

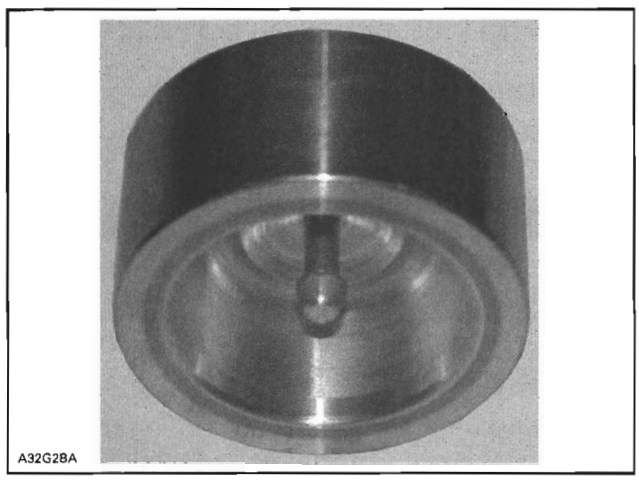
Installation is the opposite procedure of the removal but pay attention to the following.

Clean handlebar ends and inside of grip with isopropyl alcohol. Let dry before installation.

CAUTION: Handlebar end and inside of grip must be clean and dry before installing grip to ensure proper adhesion.

Position grip on handlebar with its harness aligned towards the front of the vehicle.

Use the insertion tool (P/N 529 035 897) to properly install grip.



CAUTION: Installing grip without the insertion tool is likely to damage its heating element.

Position the insertion tool at the outside end of grip.

Using a plastic hammer, tap on tool to push grip on. Continue to tap until grip bottoms.

Properly route harness then reinstall removed parts.

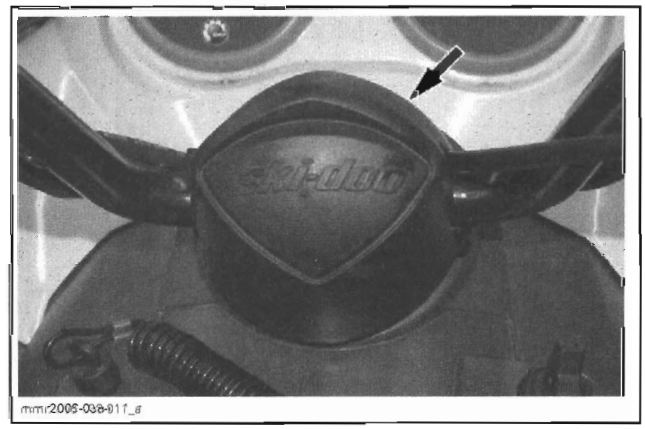
Reinstall terminals and replug connectors. Test grips to ensure they heat properly.

HANDLEBAR

Removal

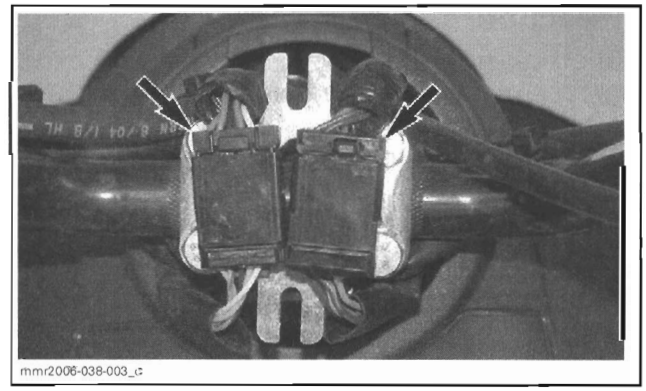
NOTE: If the handlebar **no. 4** must be changed, remove all components (handle grip, throttle lever housing, etc.) before removing it from vehicle.

Remove handlebar cover **no. 2** or steering padding **no. 17**.



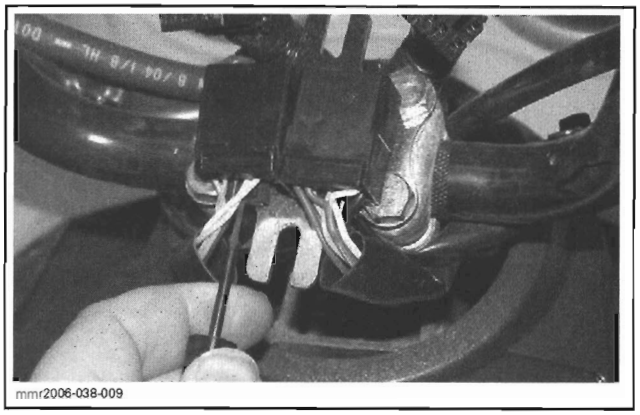
TYPICAL — HANDLEBAR COVER SHOWN

Unplug connectors.



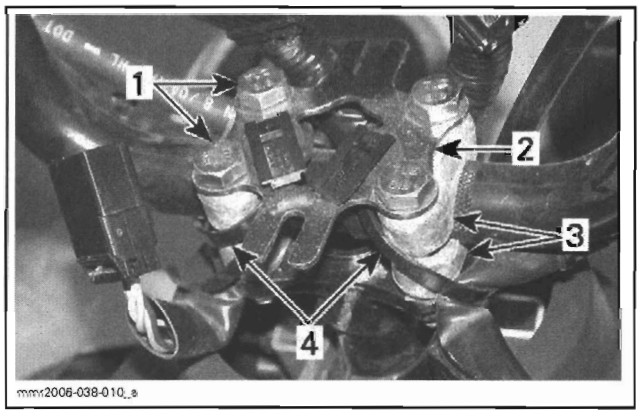
TYPICAL

Using a small tool, unclip connector housings from the reinforcement plate **no. 5**.



TYPICAL

Remove handlebar bolts, reinforcement plate and handlebar clamps. Cut locking ties retaining harness to handlebar.



TYPICAL
1. *Handlebar bolts*
2. *Reinforcement*
3. *Handlebar clamps*
4. *Cut these locking ties*

Inspection

Inspect the handlebar for damage, cracks or bending, replace if any of these problems is detected.

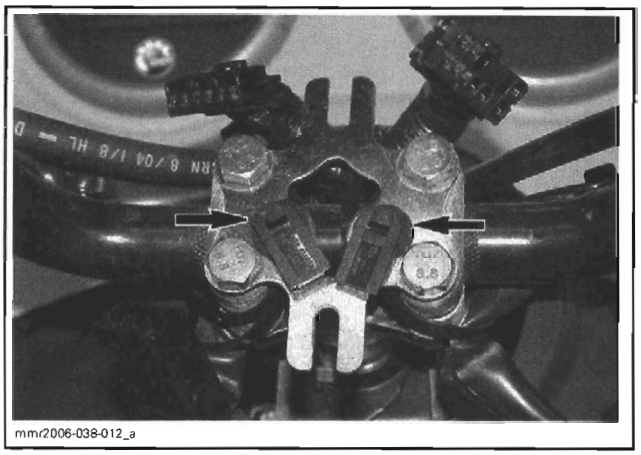
Check handlebar clamps **no. 6** for cracks or distortion, replace if necessary.

Installation

The installation is the reverse of the removal procedure. However pay attention to the following.

Install all handlebar bolts **no. 7** before torquing them. Torque to 24 N•m (18 lbf•ft).

NOTE: When installing the reinforcement plate, position its holes or the connector supports rearward.



TYPICAL

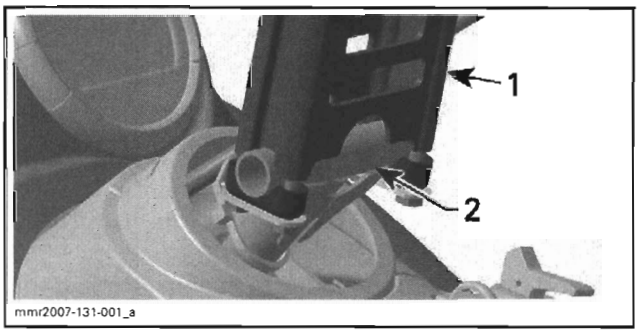
HANDLEBAR EXTENSION

FREESTYLE Park

Removal

Remove handlebar from handlebar extension.

Unscrew bolts retaining the extension to steering column.



TYPICAL
1. *Handlebar extension*
2. *Steering column*

Remove handlebar extension from vehicle.

Inspection

Check handlebar extension for cracks, bend or other damages. Replace defective parts.

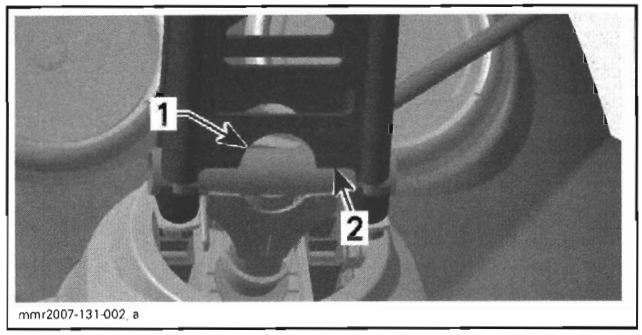
⚠ WARNING

Do not try to repair a defective handlebar extension.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

When installing handlebar extension, ensure to position the rounded opening at the bottom and to tilt the extension so that it rests against steering support stopper.



1. Opening here
2. Extension against stopper

TIE-ROD

NOTE: Use same procedure for RH and LH side.

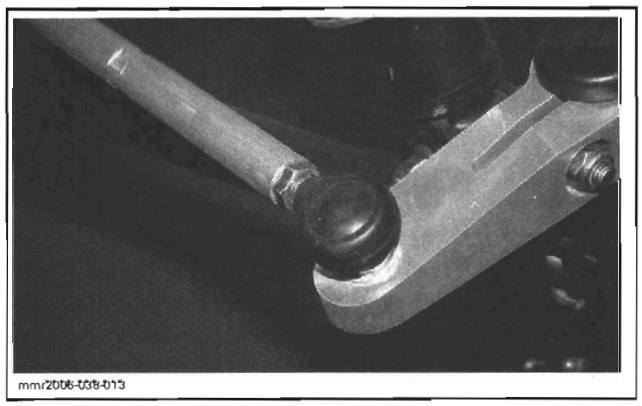
Inspection

Check tie-rod ends for looseness. If play is excessive, replace tie-rod **no. 8**.

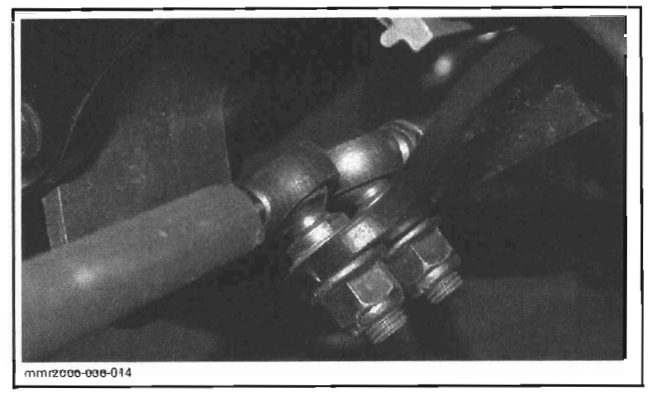
Check if the tie-rod is bent, cracked or otherwise damaged. Replace if necessary.

Removal

Separate the tie-rod end from steering arm **no. 9**.

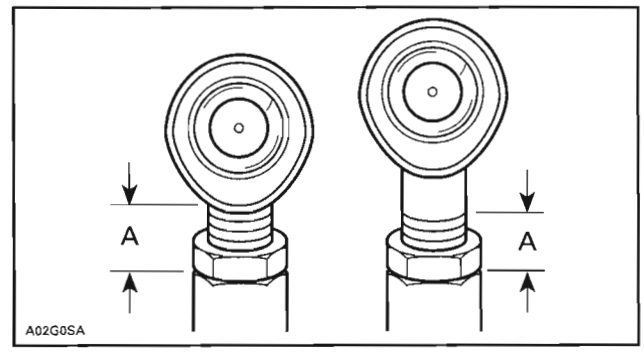


Then separate the other end of tie-rod from steering column **no. 3**.



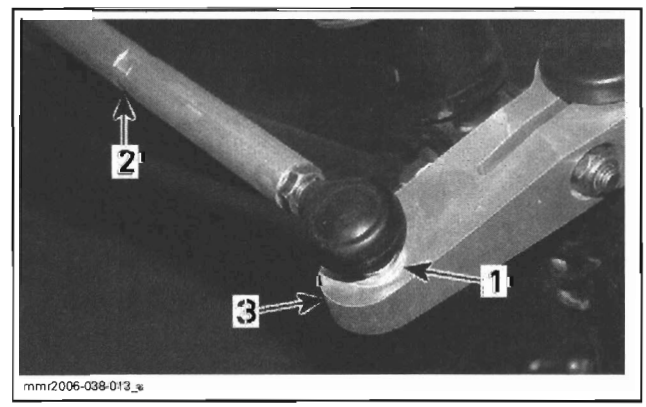
Installation

The maximum external threaded length not engaged in the tie rod must not exceed 20 mm (25/32 in).



A. 20 mm (25/32 in)

Install tie-rod with the groove on steering arm side. Do not forget to place a hardened washer between tie-rod end and steering arm as well as tie-rod end and steering column.



1. Hardened washer
2. Tie-rod groove
3. Steering arm

Install nuts **no. 10** retaining tie-rod. Torque them to 52 N•m (38 lbf•ft).

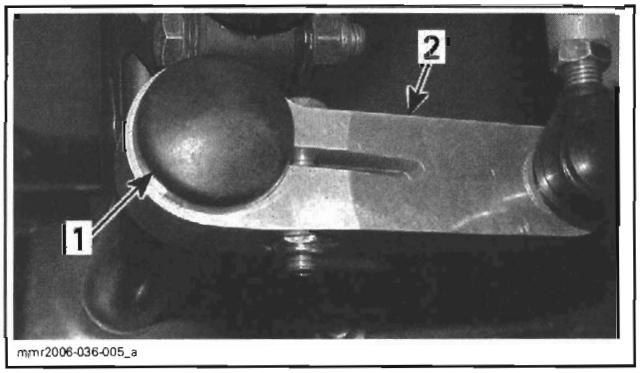
Complete the procedure by performing the steering alignment, refer to *SKI AND STEERING ALIGNMENT*.

STEERING ARM

Removal

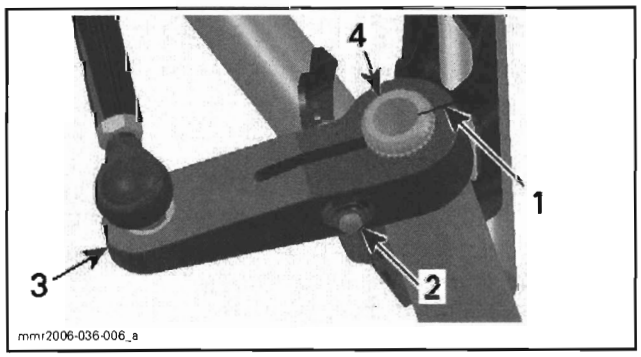
Separate tie-rod **no. 8** from steering arm **no. 9**.

Remove ski leg cap.



1. Ski leg cap
2. Steering arm

To maintain correct steering alignment when reassembly, scribe a mark on the steering arm and ski leg before disassembly.



1. Scribed mark
2. Steering arm bolt
3. Steering arm
4. Ski leg

Remove steering arm from ski leg.

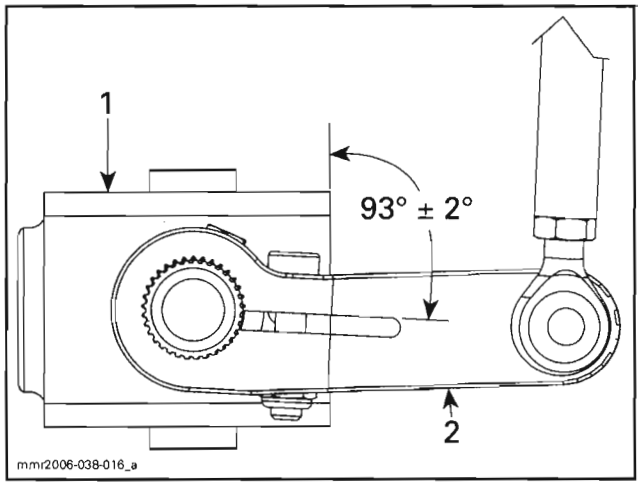
Inspection

Check splines on steering arm and on ski leg. If a worn spline is found, replace the part with a new one.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

If a new part is installed, use the following illustration to position the steering arm correctly.



1. Ski leg base
2. Steering arm

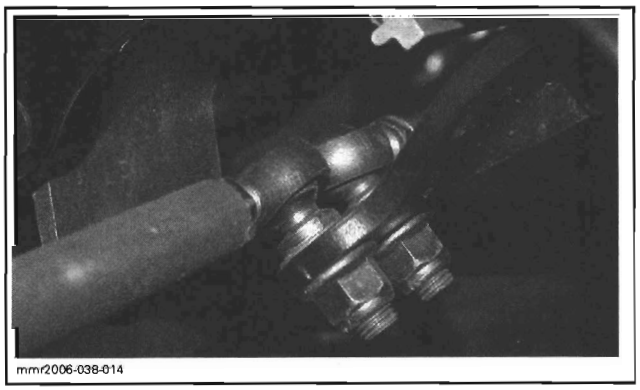
Torque steering arm bolt **no. 11** to 24 N•m (18 lbf•ft).

STEERING COLUMN

Removal

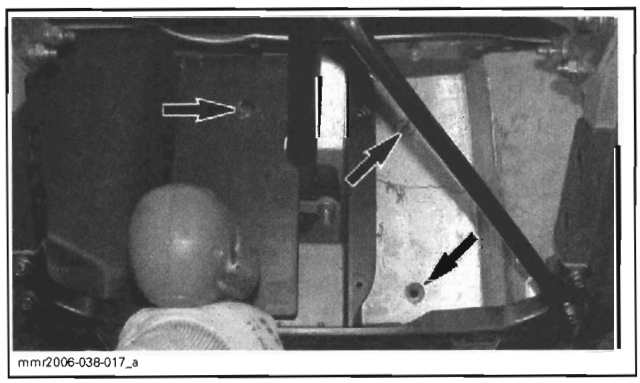
Lower Section

Separate both tie-rods from steering column.



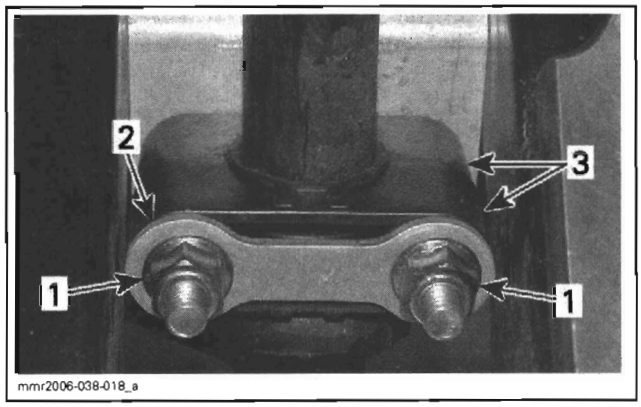
Remove hood, muffler and exhaust pipe.

Drill rivets (4) that attach right and left bottom pans to lower cross member arms.



Move both bottom pan on the side to allow an access to the lower section of steering column.

Remove nuts, stopper plate, halves housings with bushings and bolts.

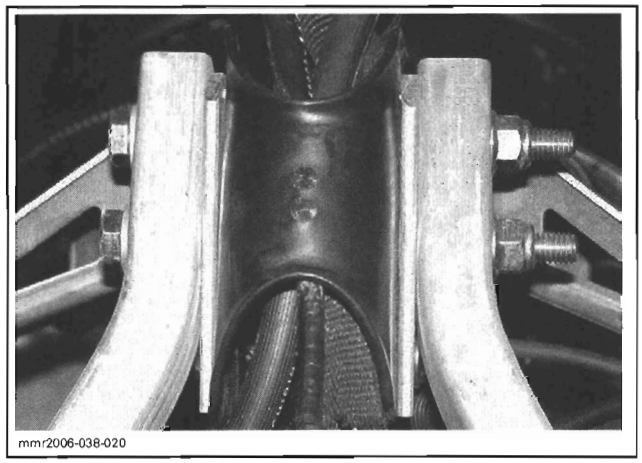


1. Nuts
2. Stopper plate
3. Halves housing with bushings

Upper Section

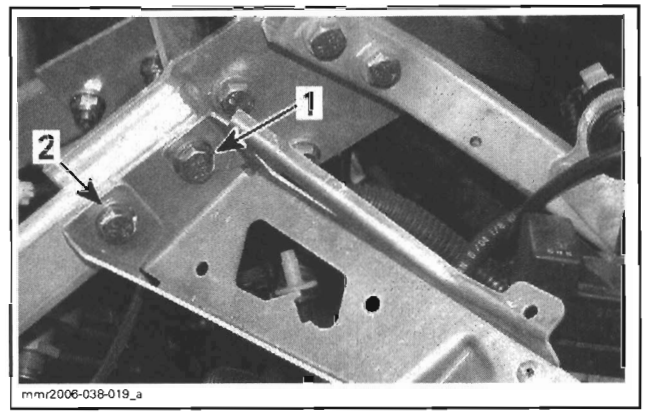
Remove console, refer to *BODY*.

Remove cable protector by pulling it.



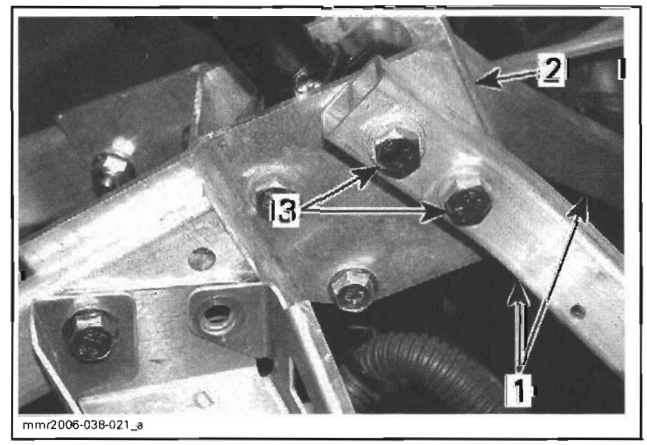
Remove handlebar **no. 4** from steering column **no. 3**, refer to *HANDLEBAR*.

On RH side of vehicle, remove the front bolt of console support and loosen the rear one.



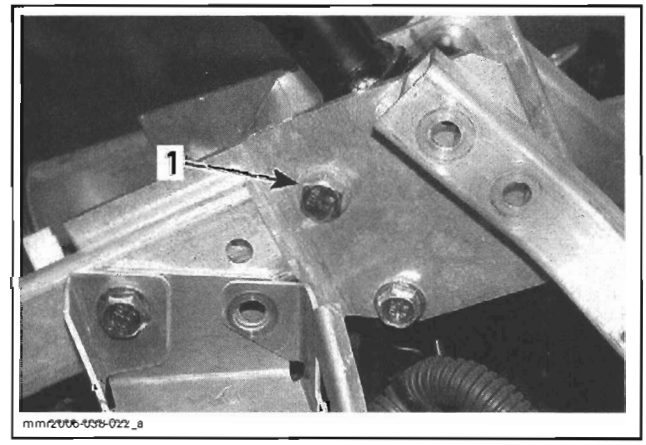
1. To remove
2. Loosen this bolt

Remove bolts retaining the both upper cross member arms to the retaining block.



1. Upper cross member arms
2. Retaining block
3. Bolts to remove

Remove the rear bolt holding halves housings and steering column.



1. Remove this bolt

Remove halves housings **no. 12** and bushings **no. 13** from steering column then pull steering column downward.

Inspection

Check steering column for crack, bend or other damage. Replace if necessary.

Installation

The installation is the reverse of the removal procedure. However, pay attention to the following.

Upper Section

Apply ThermoLube synthetic grease (P/N 219 700 417) on steering column before installing halves housings **no. 12**.

Torque retaining block bolts **no. 14** to 24 N•m (18 lbf•ft).

Lower Section

Apply ThermoLube synthetic grease (P/N 219 700 417) on steering column before installing halves housings **no. 15**.

Torque bolts **no. 16** to 24 N•m (18 lbf•ft).

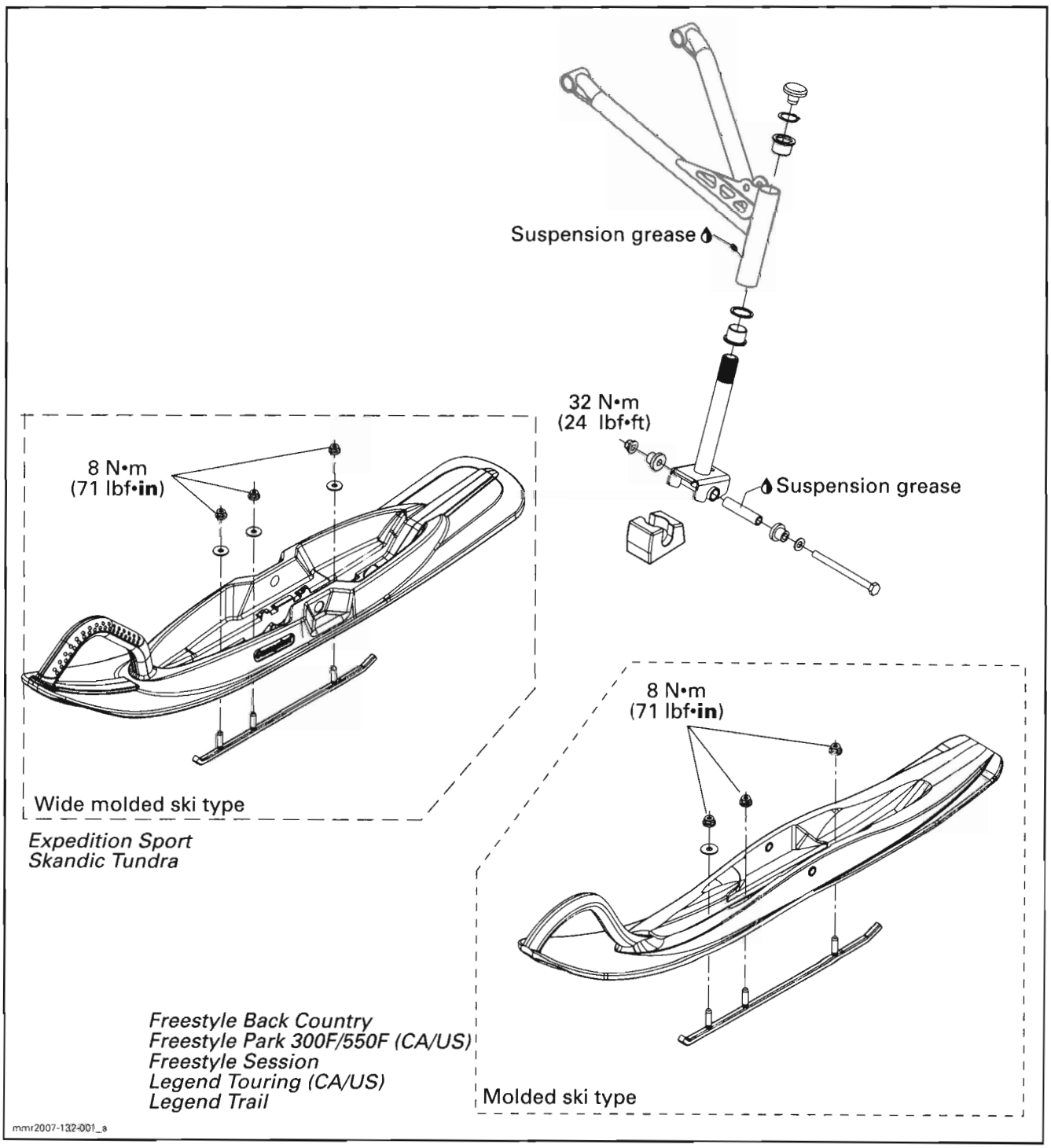
Install tie-rods, refer to *TIE-ROD* above in this section.

SKIS AND STEERING ALIGNMENT

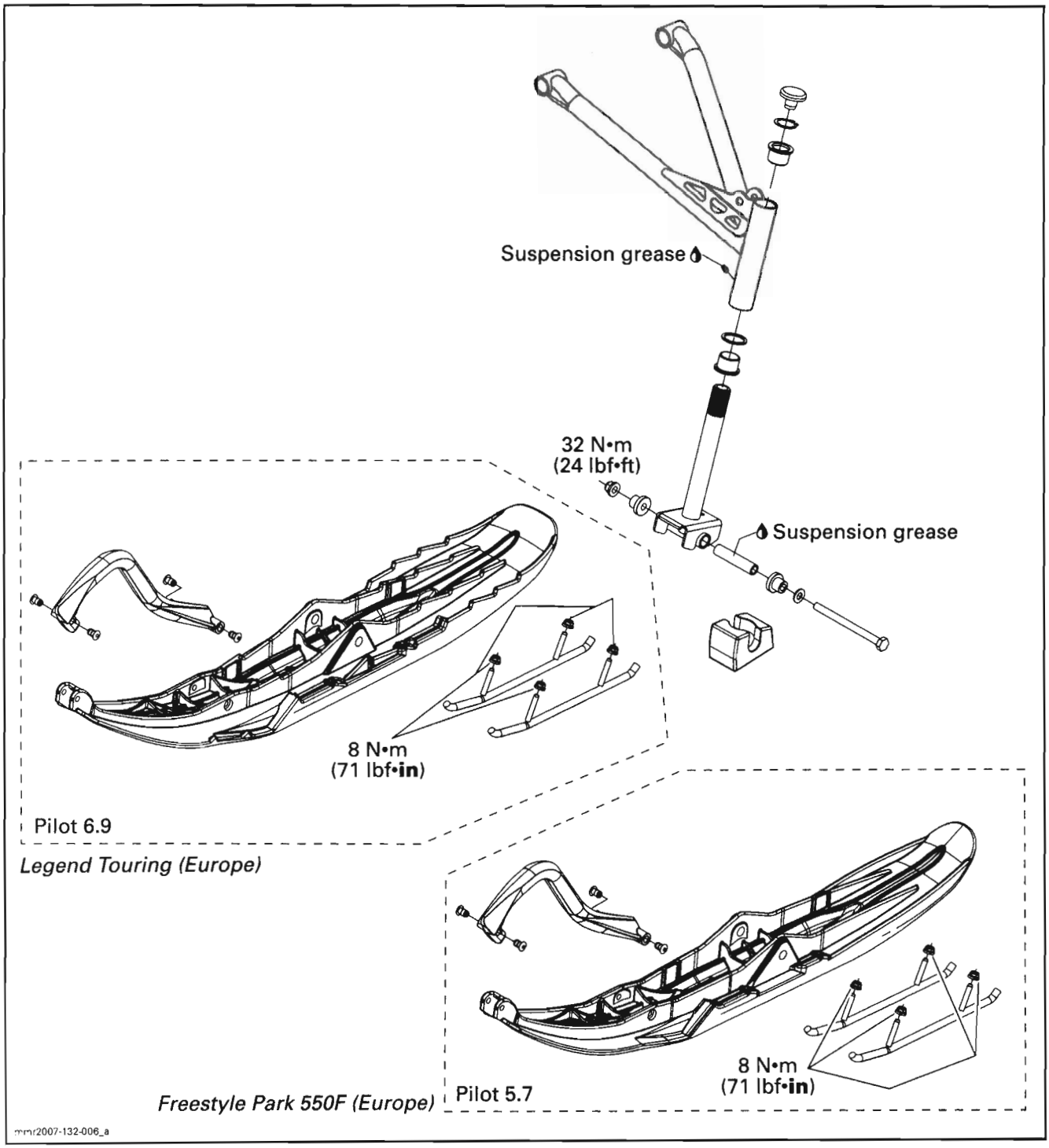
SERVICE PRODUCTS

Description	Part Number	Page
suspension grease	293 550 033	570–571

Molded Ski Type



Pilot Ski Type



GENERAL

During assembly/installation, use the torque values and service products as in the exploded view(s).

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

PROCEDURES

SKI RUNNER

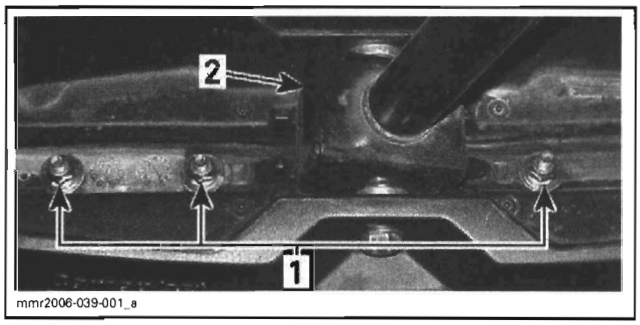
Inspection

Lift the front of vehicle and check ski runners for wear or damages (missing or broken carbide). Replace if necessary.

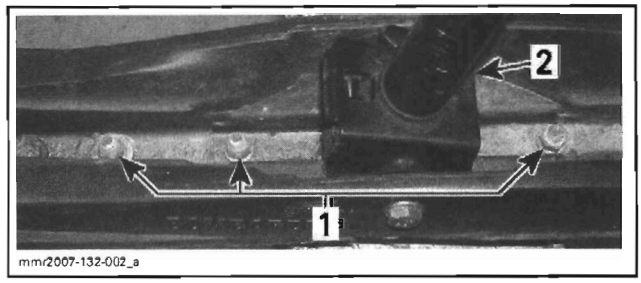
Removal

Lift the front of vehicle and support it off ground.

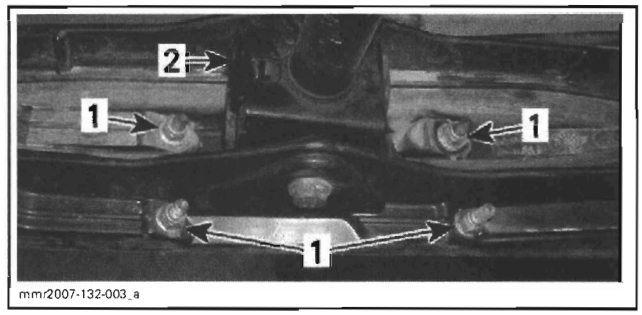
Unscrew the ski runner nuts then remove ski runners.



TYPICAL — WIDE MOLDED SKI TYPE
1. *Ski runner nuts*
2. *Ski leg*



TYPICAL — MOLDED SKI TYPE
1. *Ski runner nuts*
2. *Ski leg*

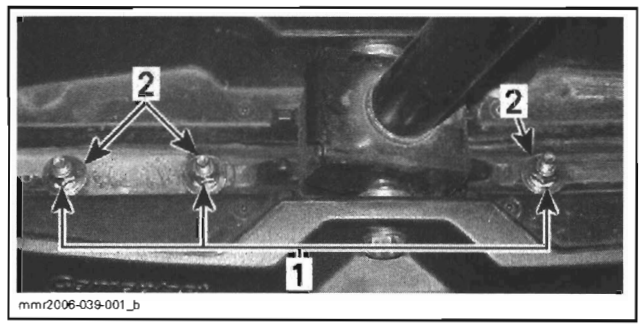


TYPICAL — PILOT SKI TYPE
1. *Ski runner nuts*
2. *Ski leg*

Installation

The installation is the reverse of the removal procedure.

NOTE: On **Tundra and Expedition models**, do not forget washers between ski and ski runner nuts.



1. *Ski runner nuts*
2. *Washers*

Torque ski runner nuts to 8 N•m (71 lbf•**in**).

SKI

Inspection

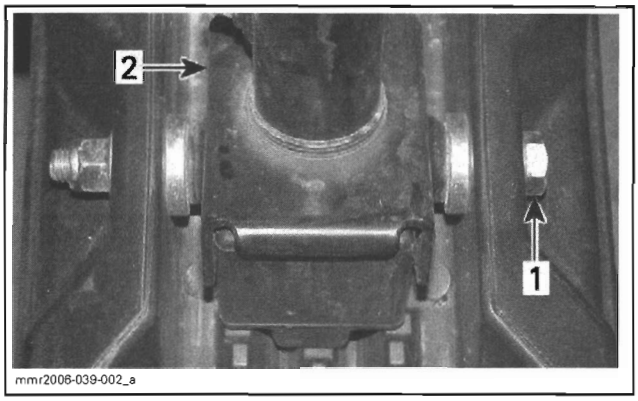
Check skis and runners for wear, replace as necessary.

Check condition of ski stopper. Replace it when deteriorated.

Removal

Lift front of vehicle and support it off ground.

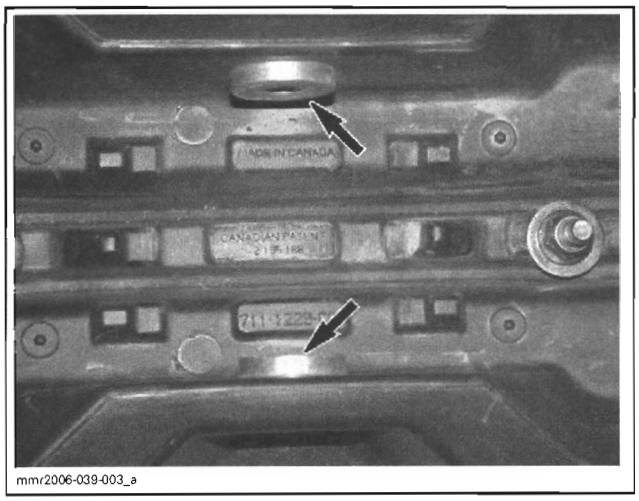
Unscrew nut then pull ski bolt out. Remove ski from vehicle.



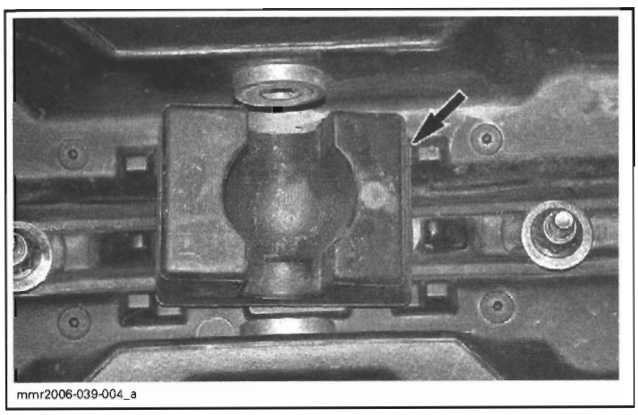
TYPICAL
1. *Ski bolt*
2. *Ski leg*

Installation

Make sure bushings are installed in ski holes.

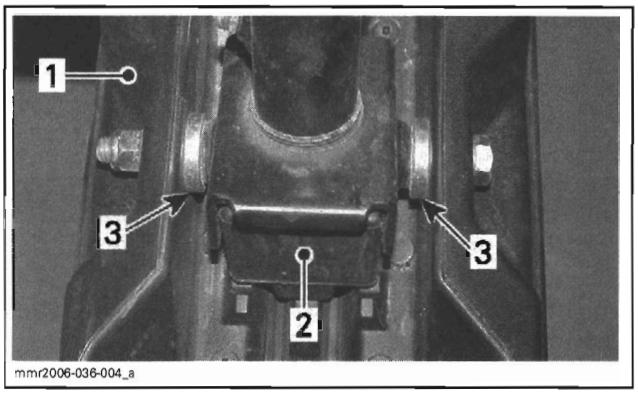


Position the ski stopper. The higher part of ski stopper must be installed towards the front of vehicle.



Apply suspension grease (P/N 293 550 033) on spacers and also on inner tube of ski leg.

Place bushings into ski holes.



1. *Ski*
2. *Ski leg*
3. *Bushings*

Install ski bolt and torque it to 32 N•m (24 lbf•ft).

Legend Touring (EUROPE)

It is possible to change the ski stance from narrow to wide or vise versa, follow the procedure as given below.

Ensure ski leg bushings are still on ski legs.

Install ski stopper.

Determine the ski stance. Install the spacer inside for a narrow adjustment and outside for a wide adjustment.

⚠ WARNING

Ensure to place spacer on proper side of ski leg on both skis.

Install ski bolt and torque it to 32 N•m (24 lbf•ft).

SKI HANDLE (for Pilot ski types)

Removal

Remove ski from vehicle.

Using a 9 mm (3/8 in) bit, remove ski handle rivets. Drill the head of rivet only off, do not try to drill all the way through the rivet. Angle the drill bit to reduce the chance of spinning the rivet in the ski.

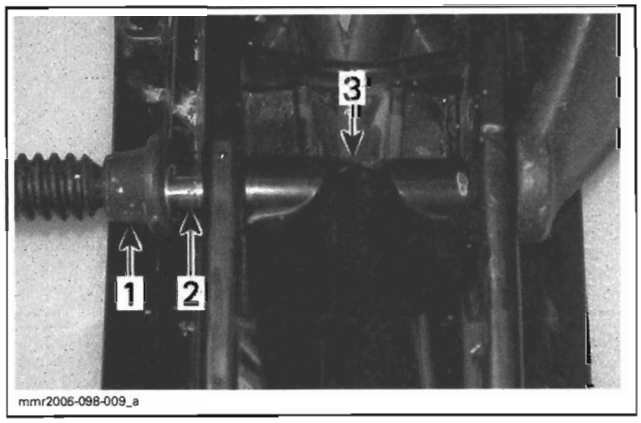
Remove handle from ski.

Place handle in hot water for 10 minutes then using a punch, drive the inner part of rivet out of handle.

Installation

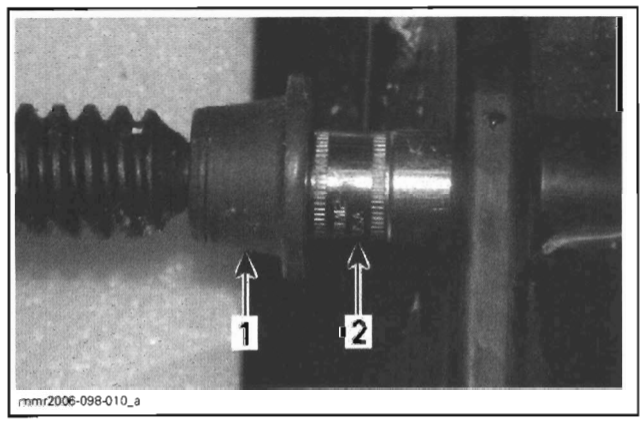
To install rivets, use a C-clamp and a short 10 mm socket.

Place a rivet in position and insert it into ski and ski handle. Repeat the procedure for the other side.



1. *C-clamp*
2. *Rivet*
3. *Handle*

When both rivets are installed, use a short 10 mm socket to push rivet heads against ski.



1. *C-clamp*
2. *10 mm socket*

SKI LEG

Inspection

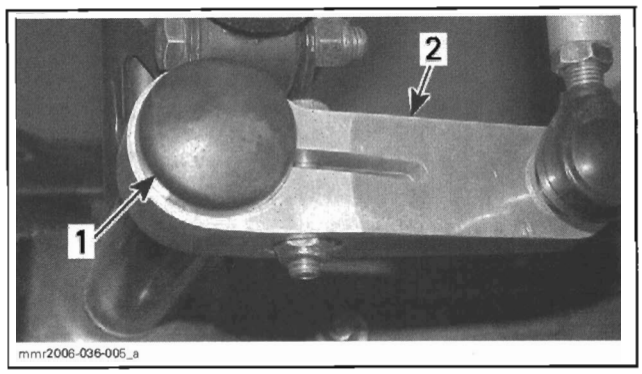
Check ski legs for cracks, bend or other damages. Replace if necessary.

Move ski legs to feel bushings wear. If the play appears important, remove ski legs and check bushings visually. Replace them if necessary.

Removal

Remove ski from ski leg.

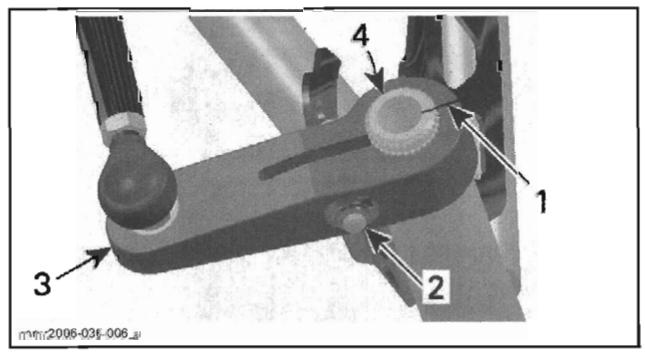
Remove cap and circlip.



1. *Ski leg cap*
2. *Steering arm*

Scribe marks on steering arm and ski leg before separating them.

Loosen steering arm bolt and pull up steering arm.



1. *Scribed mark*
2. *Steering arm bolt*
3. *Steering arm*
4. *Ski leg*

Installation

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

Lubricate the ski leg with suspension grease (P/N 293 550 033).

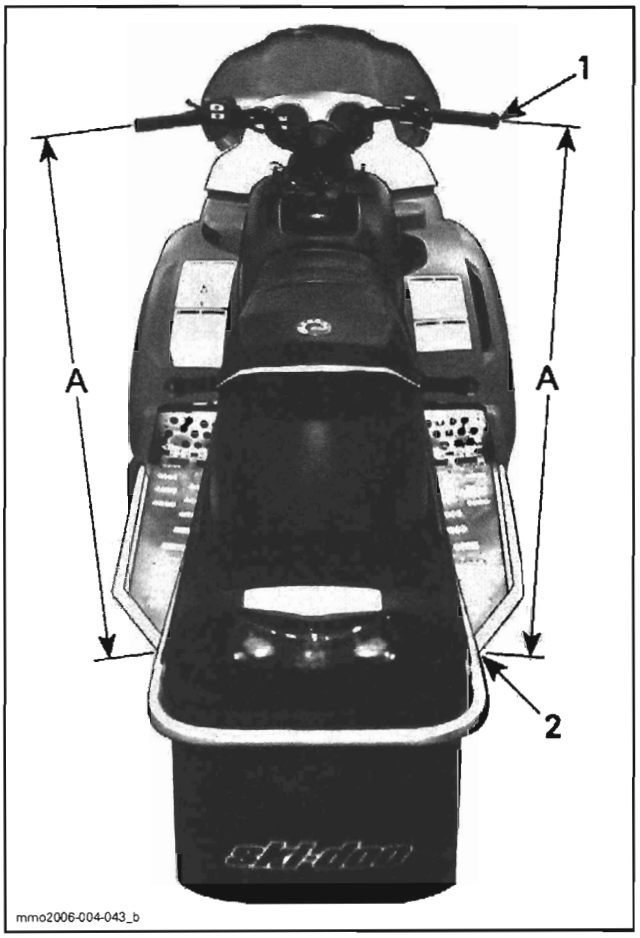
Torque steering arm bolt to 24 N•m (18 lbf•ft).

STEERING ALIGNMENT

Ski alignment is performed by adjusting length of left and right tie-rods. To do this, use the following procedure:

- Leave the vehicle on the ground.
- Position handlebar so that it is straight ahead position by measuring from the extremities of the grips to the rear most edge of the tunnel, as shown.

NOTE: The reference point must be the same to each side.



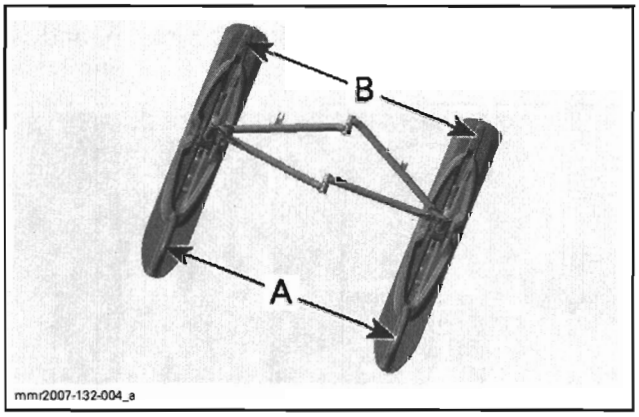
1. *Equal distance "A" on each side*
2. *Same reference point*

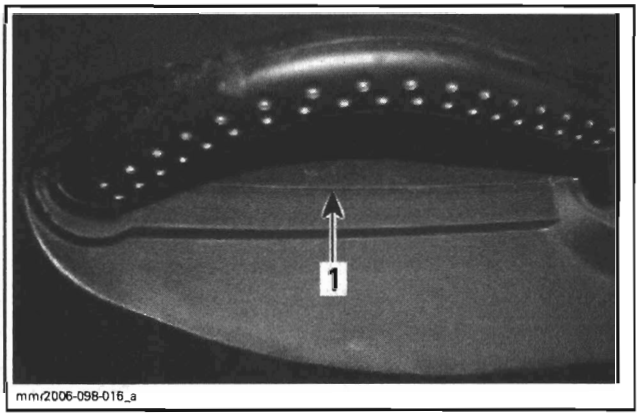
- Verify if skis are in straight-ahead position, place a straight edge against pre-adjusted track and measure distance between front and rear ski runner nuts and straight edge.
- When skis are in straight ahead position, adjust the toe-out. Use the following illustration and this equation to determine the perfect steering alignment.

A – B = C

C = 5 mm (.197 in).

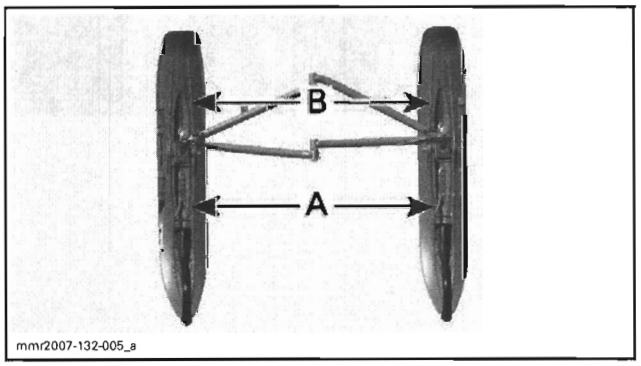
For **molded ski type**: The moulding line at the center of ski is used as reference point. Always use this line to align skis.

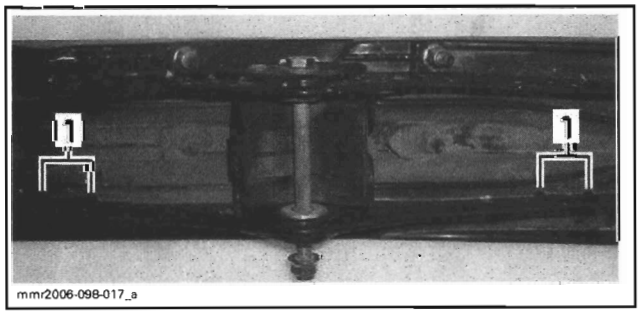




1. *Moulding line*

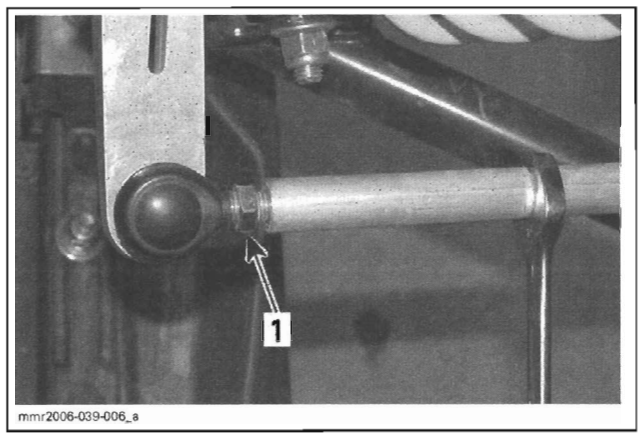
For **Pilot ski type**: Use the recesses to measure the difference between skis.





RH SKI SHOWN
1. *Recesses*

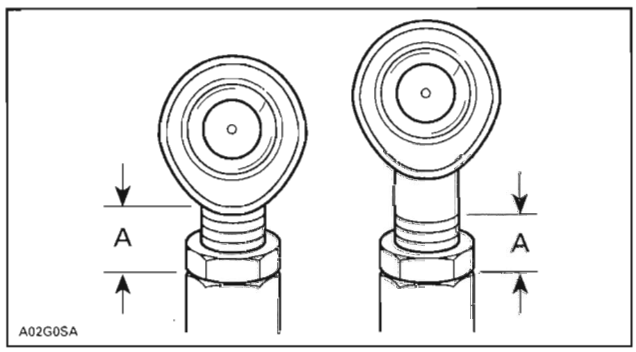
If adjustment is needed, loosen tie-rod jam nuts then turn tie-rods to change its length. Retighten jam nuts and torque them to 18 N•m (159 lbf•**in**).



1. Jam nut

⚠ WARNING

Never lengthen tie-rod so that the external unengaged threaded portion of tie-rod end exceed 20 mm (25/32 in).



A. 20 mm (25/32 in) maximum

BODY

SERVICE TOOLS

Description	Part Number	Page
adjustment wrench	529 035 891	577
Supertanium™ drill bit	529 031 800	576

SERVICE TOOLS – OTHER SUPPLIER

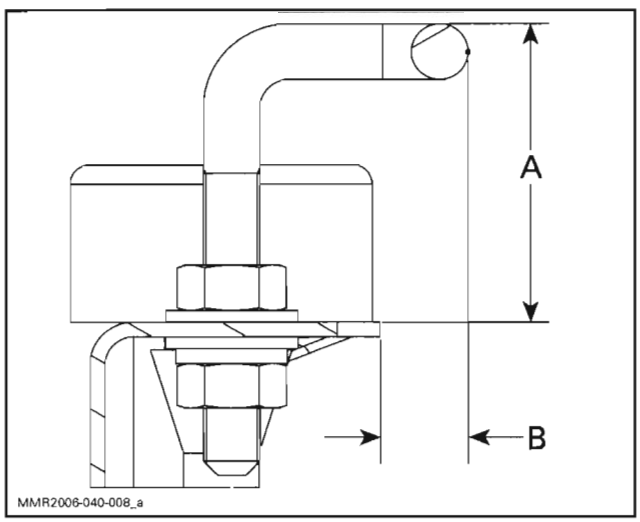
Description	Part Number	Page
Arrow tacker	T-50	578

ADJUSTMENT

SEAT LATCH

All Models except Expedition Sport and Legend Touring

Position the seat latch in accordance with the following illustration.



A. 31.7 mm (1.248 in)
B. 9.3 mm (.366 in)

Torque nuts to 7.5 N•m (66 lbf•**in**).

PARTS REPLACEMENT

DECAL

To remove a decal; heat old decal with a heat gun and peel off slowly.

Using isopropyl alcohol, clean the surface and dry thoroughly.

Apply liquid soap to new decal and carefully position the decal. Using a sponge or a squeegee, remove the air bubbles and surplus water working from the center toward the edges. Allow to air dry.

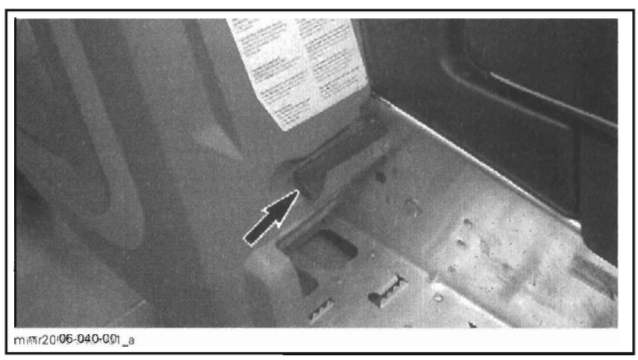
CAUTION: Do not apply isopropyl alcohol or solvent directly on decals. Use only in a well ventilated area.

SIDE PANEL

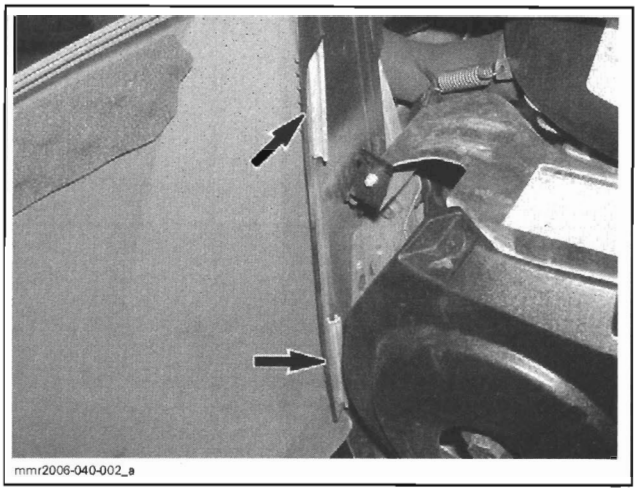
Removal

NOTE: Use same procedure on RH or LH side.

Unlatch side panel.



Remove both hinge locks.



Remove side panel.

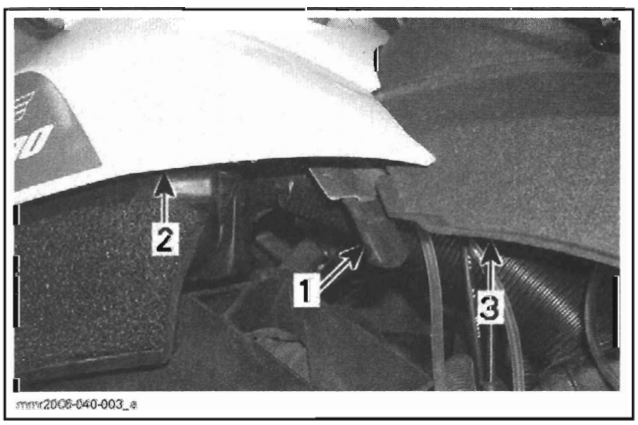
Installation

The installation is the reverse of the removal procedure.

HOOD

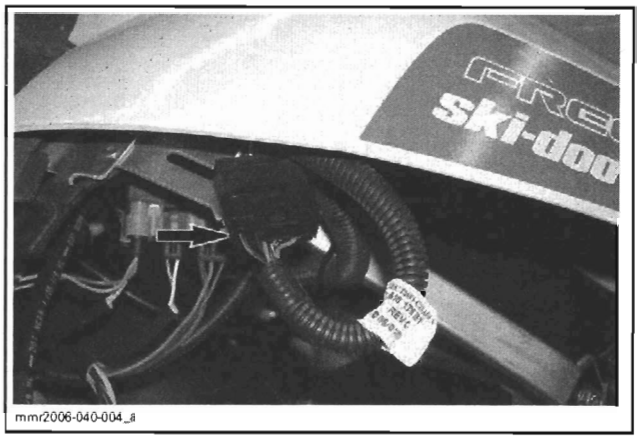
Removal

Open side panels and unlatch hood.



1. *Hood latch*
2. *Hood*
3. *Console*

On RH side, unplug hood harness.



Remove hood.

Installation

The installation is the reverse of removal procedure.

BOTTOM PAN

Removal

Remove hood and front bumper.

Using Supertanium™ drill bit (P/N 529 031 800), drill all rivets retaining bottom pan.

Remove bottom pan.

Installation

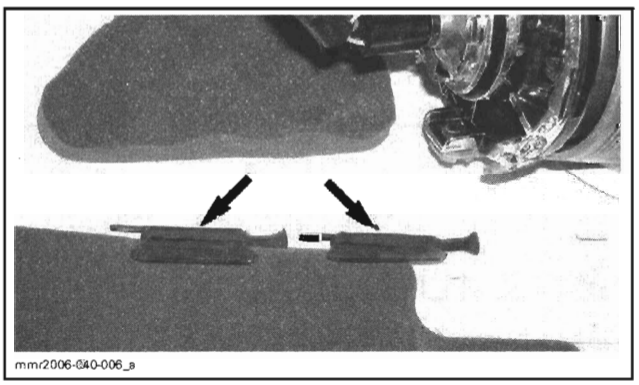
The installation is the reverse of removal procedure.

WINDSHIELD

Removal

Remove hood.

Inside hood, remove windshield latches.



Pull the bottom part of windshield until its pins come out of rubber grommets.

Installation

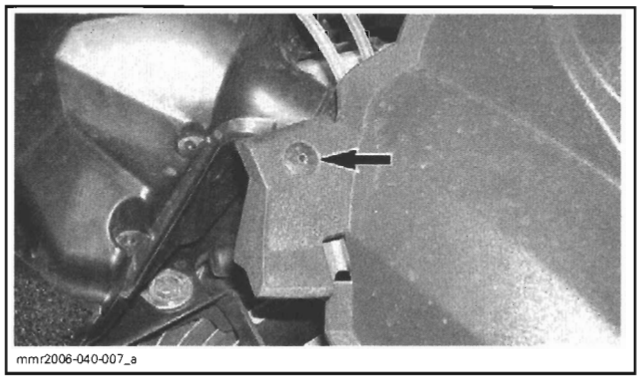
The installation is the reverse of removal procedure.

CONSOLE

Removal

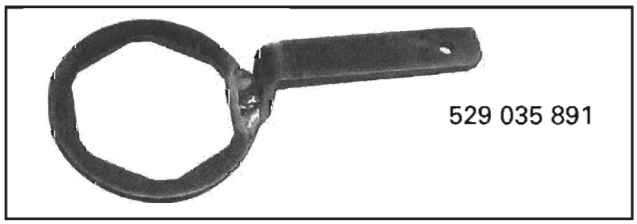
Remove hood.

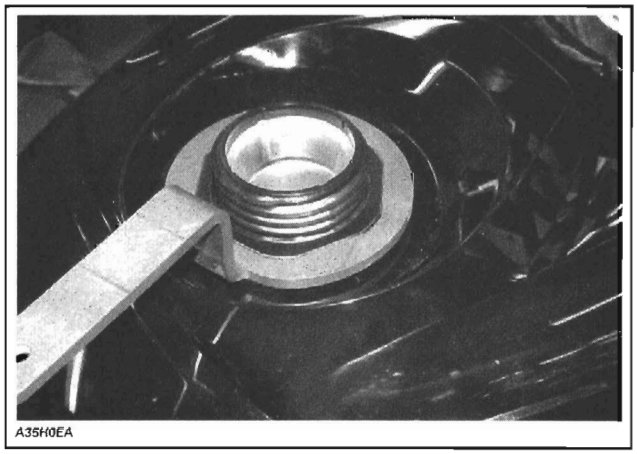
Drill both rivets retaining console to console supports.



Remove fuel tank cap.

Using the adjustment wrench (P/N 529 035 891), unscrew the fuel tank nut.





TYPICAL

Lift up the console.

Remove choke lever and ignition switch then unplug the tether cut-out switch.

Remove console.

Install fuel tank cap.

Installation

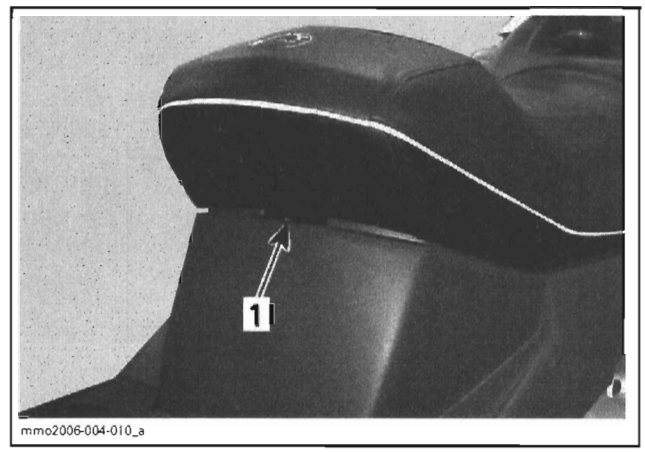
The installation is the reverse of removal procedure.

SEAT

Removal

All Models except Expedition Sport and Legend Touring

Push seat latch while gently lifting rear of seat.

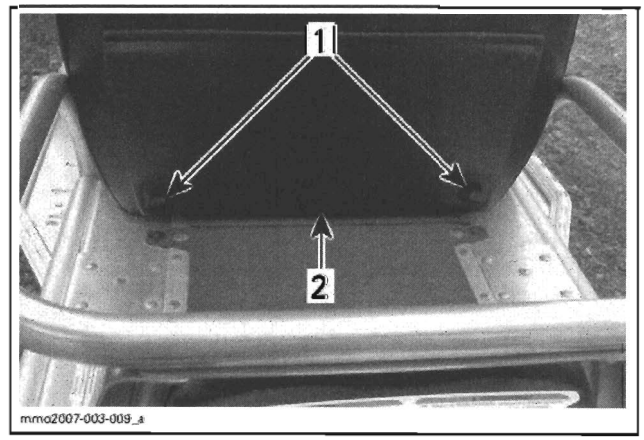


1. Seat latch

Pull seat backwards.

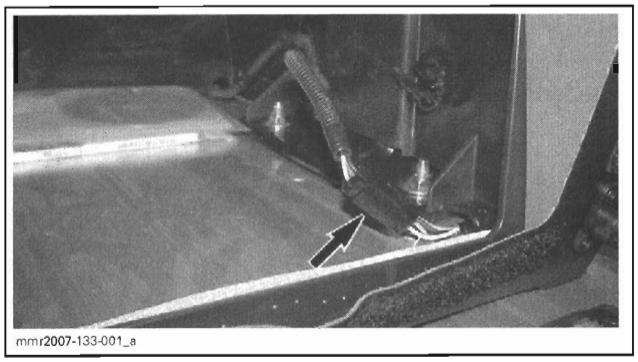
Expedition Sport and Legend Touring

Unfasten bucklets then pull on seat panel.

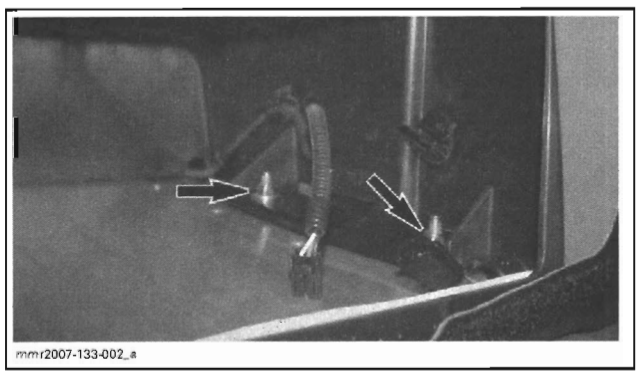


1. Bucklets
2. Seat panel

Disconnect the brake light/taillight connector.



Unscrew and remove 4 nuts securing seat to frame.



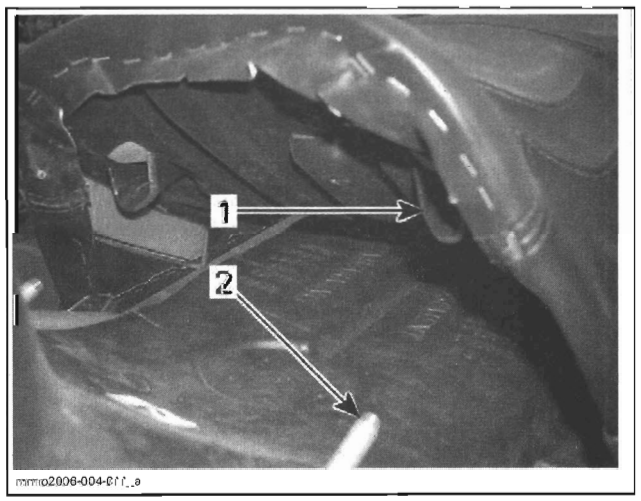
RH SIDE SHOWN

Lift the rear of seat and move it backwards.

Installation

All Models except Expedition Sport and Legend Touring

Insert front tabs into seat hooks. When seat rests in its position, firmly push seat down to latch.



1. Front tab
2. Seat hook

NOTE: A distinctive snap will be felt. Double check that seat is secure by giving it a tug to confirm proper latching.

Expedition Sport and Legend Touring

Insert front and side tabs into seat hooks.

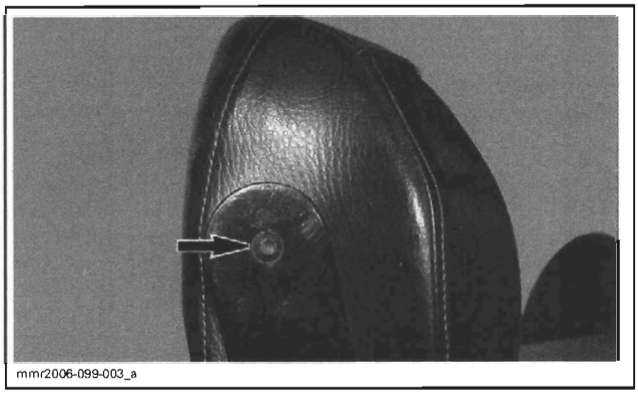
Install washers and nuts securing seat to frame and tighten nuts to 11 N•m (97 lbf•**in**).

Connect the brake light/taillight connector.

BACKREST

Removal

Remove screws retaining backrest to backrest arms.



TYPICAL

Move away backrest arms to remove backrest.

Installation

The installation is the reverse of the removal procedure.

SEAT COVER

Replacement

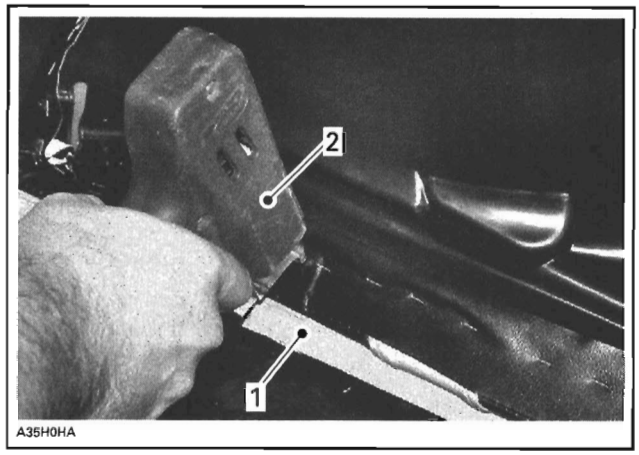
Remove seat.

Remove the old seat cover. Check the foam and replace it if necessary.

Install staples with an electric tacker such as Arrow tacker ETN-50 or with a manual tacker such as Arrow tacker (P/N T-50).

NOTE: For an easier installation, it is highly recommended to use an electric tacker.

Ensure that the seat rest firmly against a hard surface such as a piece of wood. This is done to get the staples completely pushed in place.



TYPICAL
1. *Piece of wood*
2. *Tacker*

After seat cover installation, cut all around the excess of material.

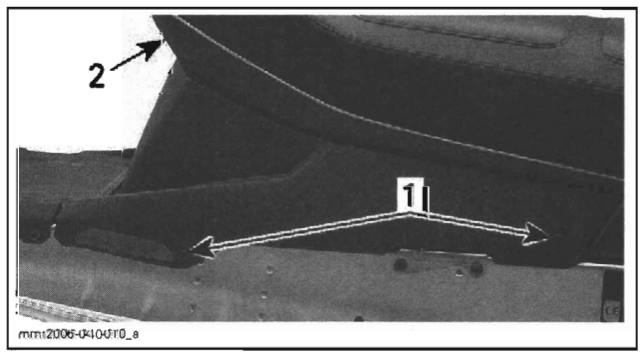
TRUNK

All Models except Expedition Sport and Legend Touring

Removal

Remove seat.

Remove screws retaining trunk to frame.



1. *Trunk screws (two on each side)*
2. *Seat*

Unsnap wiring harness from rear RH corner.

Remove trunk.

Installation

The installation is the reverse of the removal procedure.

CLEANING

Seat

It is recommended to clean the seat with a solution of warm soapy water, using a soft clean cloth.

CAUTION: Avoid use of harsh detergents such as strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc. that may cause damage to the seat cover.

Plastic

Clean the vehicle thoroughly, removing all dirt and grease accumulation.

To clean use a soft clean cloth and either soapy water or isopropyl alcohol.

To remove grease, oil or glue use isopropyl alcohol.

CAUTION: Do not apply isopropyl alcohol or acetone directly on decals.

CAUTION: The following products must not be used to clean or wax any of the plastic components used on the vehicles:

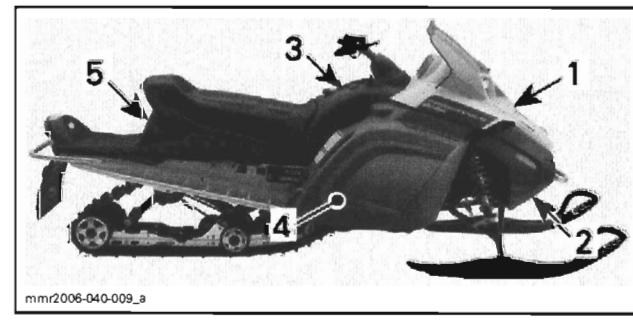
- gasoline
- brake fluid
- kerosene
- diesel fuel
- lighter fluid
- varsol
- naphtha
- acetone
- strong detergents
- abrasive cleaners
- waxes containing an abrasive or a cleaning agent in their formula.

Apply wax on glossy finish only. Protect the vehicle with a cover to prevent dust accumulation during storage.

CAUTION: If for some reason the snowmobile has to be stored outside, it is preferable to cover it with an opaque tarpaulin. This will prevent the sun rays from affecting the plastic components and the vehicle finish.

REPAIR

The very first step before repairing plastic materials is to find out exactly which type of material is involved.



PLASTIC PARTS		
PARTS		MATERIAL
1	Hood	Polyethylene HDPE
2	Bottom pan	Polypropylene
3	Console	Polyethylene HDPE
4	Side panel	Polyethylene HDPE
5	Trunk	Polypropylene

CAUTION: Some repair products are not compatible with certain plastics.

⚠ WARNING

Windshields must never be repaired by welding or otherwise.

For repair, refer to a specialized shop.

The following company provides a complete line of products to repair plastic materials:

CREST INDUSTRIES, INC.
Trenton, MI 48183
Phone: (734) 479-4141
Toll Free: 1 800 822-4100
Fax: (734) 479-4040
E-Mail: info@crestauto.com
www.crestauto.com

FRAME

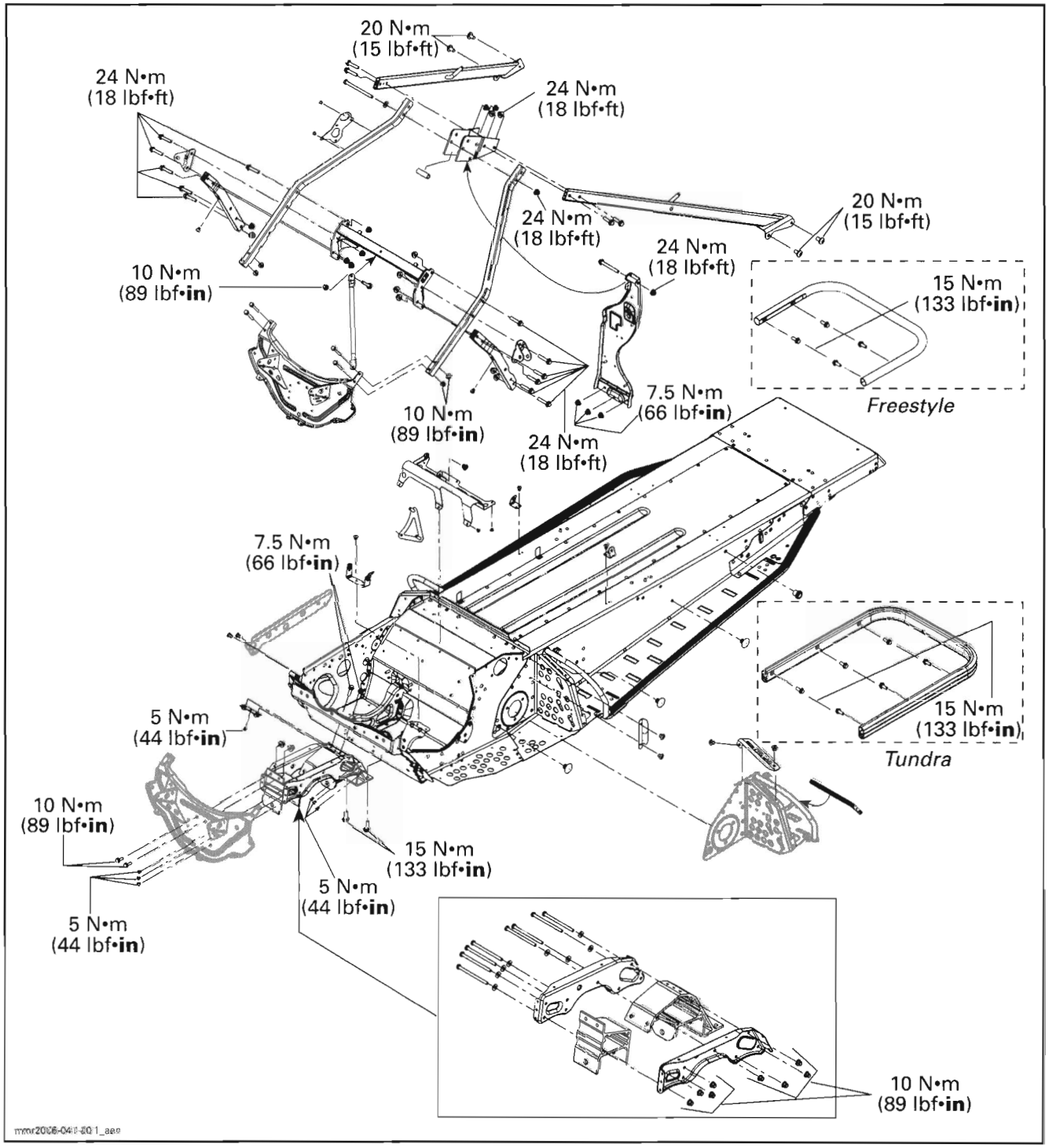
SERVICE TOOLS

Description	Part Number	Page
Supertanium drill bit	529 031 800	585

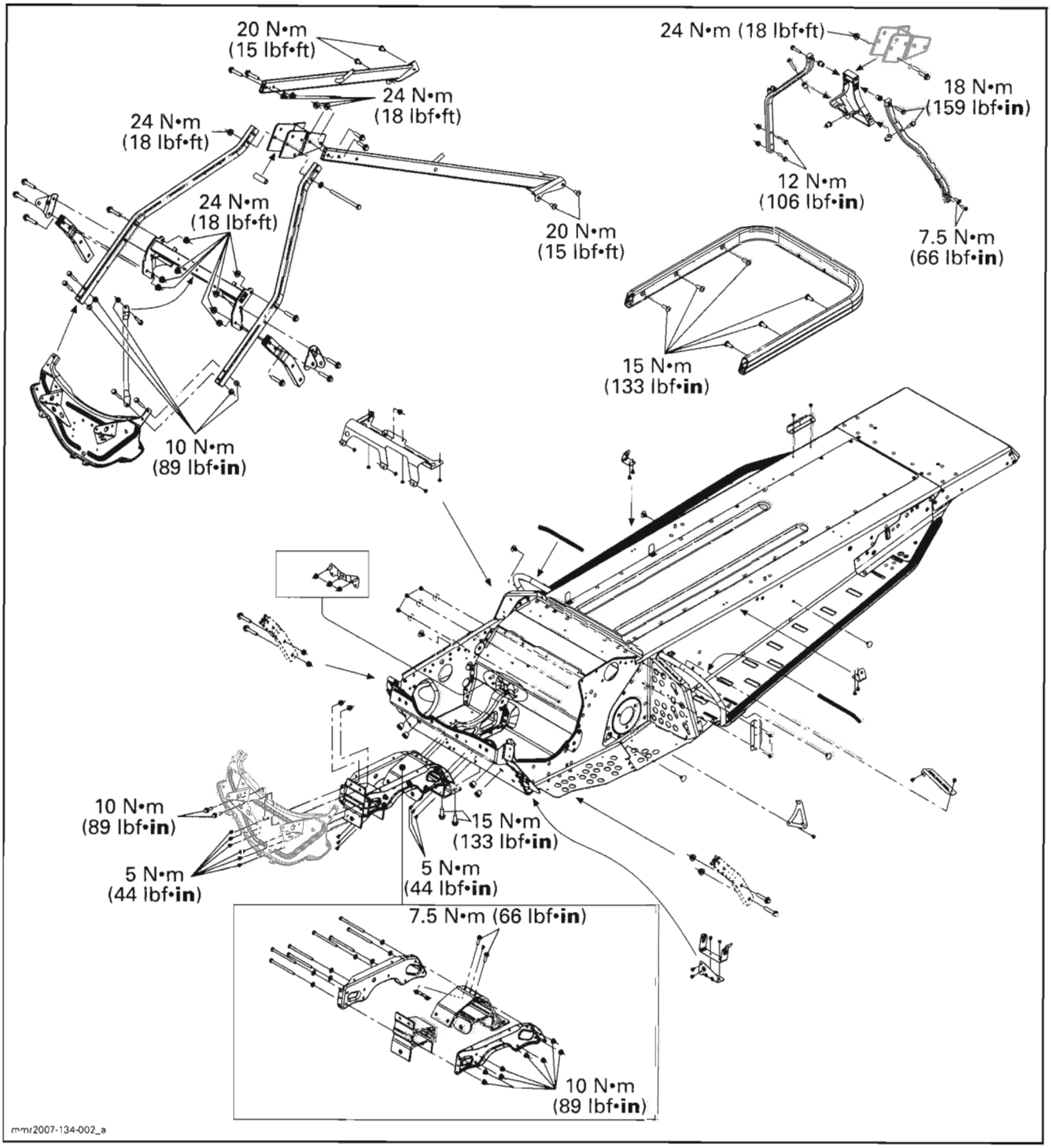
SERVICE PRODUCTS

Description	Part Number	Page
XP-S synthetic chaincase oil	413 803 300	585

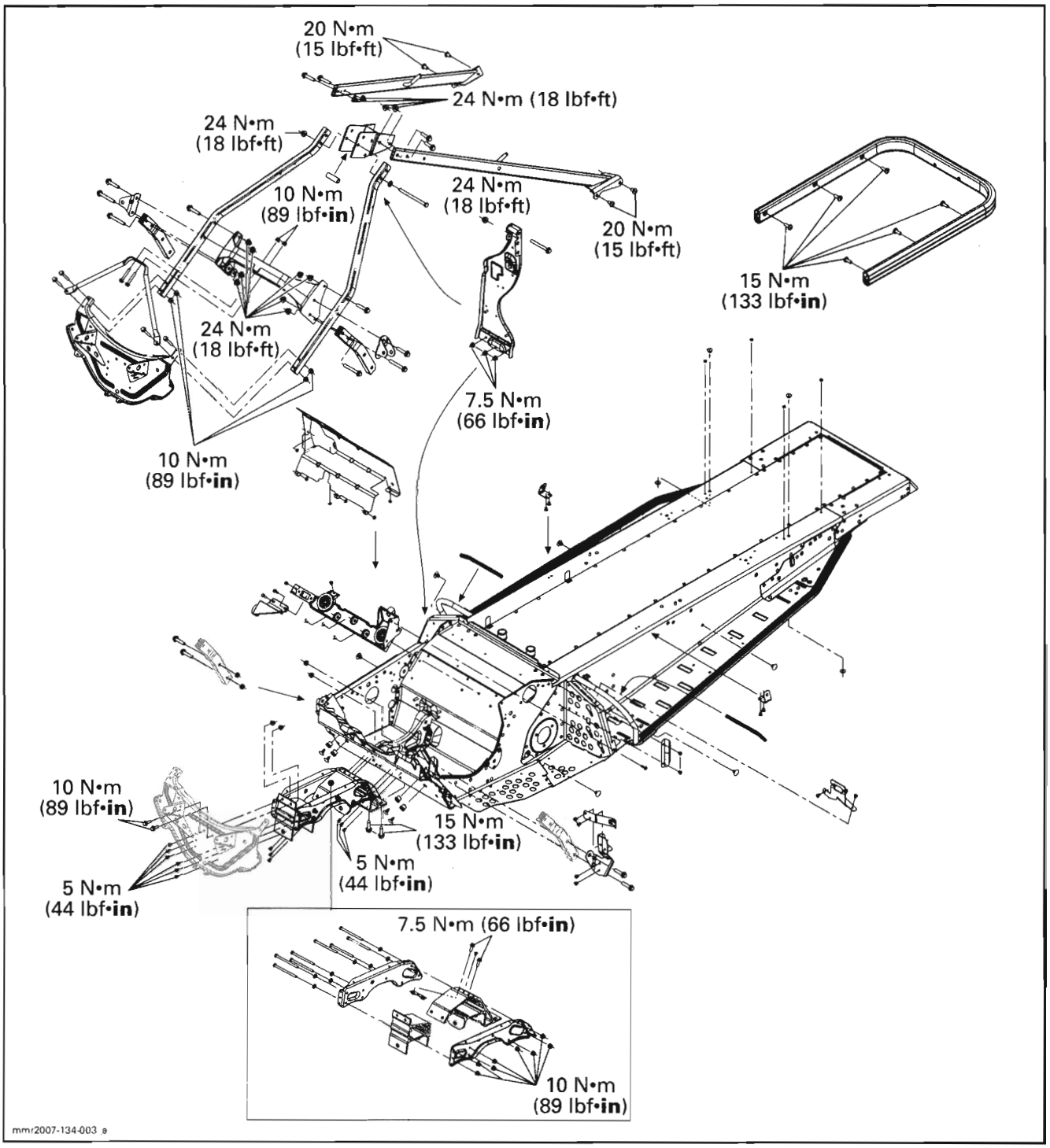
300F Equipped Models



500F Equipped Models



V800 Equipped Models



GENERAL

RIVET DRILLING PROCEDURE

Self-Piercing Rivets

When drilling self-piercing rivets, use the Supertanium drill bit (P/N 529 031 800), available in a 5 mm (3/16 in) size and shipped in packs of 2.

For proper drilling instructions and to prevent premature wear, follow the procedure below.

- Always use a variable speed drill.
- Maintain a slow to medium speed at all times when drilling. The proper speed is attained when a constant chip is ejected.

NOTE: To increase bit life, use XP-S synthetic chaincase oil (P/N 413 803 300) as a cutting oil.

CAUTION: High speed drilling will cause excessive heat which may destroy the cutting edge of the bit; therefore, avoid using pneumatic drills.

- Cut rivet using a chisel.
- Remove riveted part.
- Drive out remaining rivet head using a punch.

Pop Rivets

- Always drill rivet head.
- When rivet is located on plastic part, use pliers to avoid rivet turning and heating plastic.
- Use a small punch to push the rivet end.

PROCEDURES

FRAME

Cleaning

Clean frame and tunnel with appropriate cleaners and rinse with high pressure hose.

NOTE: For bare aluminum frames use only aluminum cleaner and follow instructions on container.

CAUTION: Never direct high-pressure water jet towards decals. They will peel off.

Touch up all metal spots where paint has been scratched off. Spray all bare metal parts of vehicle with metal protector.

Welding

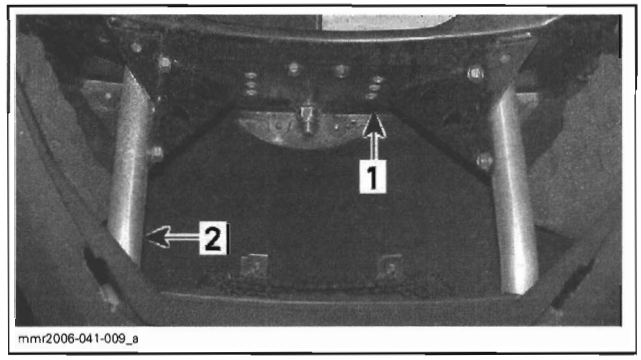
CAUTION: No welding should be done on aluminum frame except if mentioned or required on a BRP bulletin.

FRONT BUMPER

Removal

Open the front compartment cover.

Remove bolts that attach front bumper to front plate.



1. Front plate
2. Front bumper

Pull bumper to remove it from vehicle.

Installation

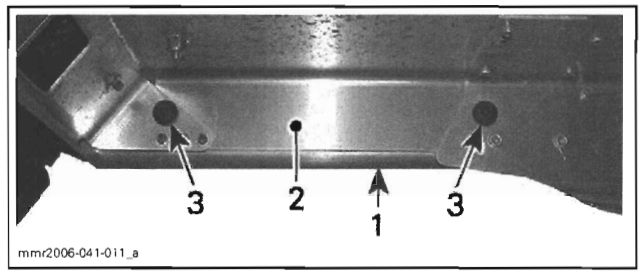
Insert bumper through the front bottom pan opening.

Install all bolts before torquing them to 8 N•m (71 lbf•**in**).

REAR BUMPER

Removal

Underneath the rear portion of frame, remove screws retaining rear bumper to tunnel.



TYPICAL
1. Rear bumper
2. Tunnel
3. Rear bumper screws

NOTE: Some models use 4 screws and other models 6 screws to secure the rear bumper.

Remove rear bumper from vehicle.

Installation

The installation is the reverse of the removal procedure.

Torque screws to 15 N•m (133 lbf•**in**).

FRONT PLATE

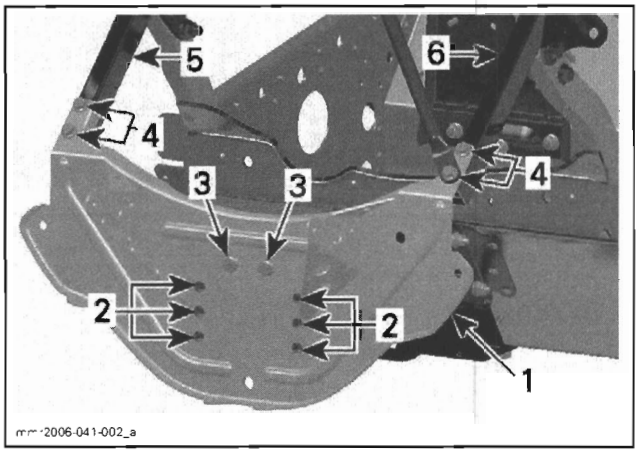
Removal

Remove the bottom pan. Refer to *BODY*.

Drill the 6 rivets retaining the front plate to suspension arm front support.

Remove bolts retaining the front plate to suspension arm front support.

Remove bolts retaining the front plate to upper tubes.



1. *Front plate*
2. *Rivets to be drilled*
3. *Suspension arm support bolt*
4. *Upper tube bolts*
5. *Right upper tube*
6. *Left upper tube*

Installation

Install suspension arm front support bolts and upper tube bolts. Do not torque yet.

Replace rivets with the following fasteners:

QUANTITY	FASTENERS DESCRIPTION
6	Hexagonal bolt M5 x 14 (P/N 207 151 444)
6	Elastic flanged nut M5 (P/N 233 251 414)

NOTE: Install new bolts with their heads outside.

Torque all bolts to 5 N•m (44 lbf•**in**).

Install all other removed parts.

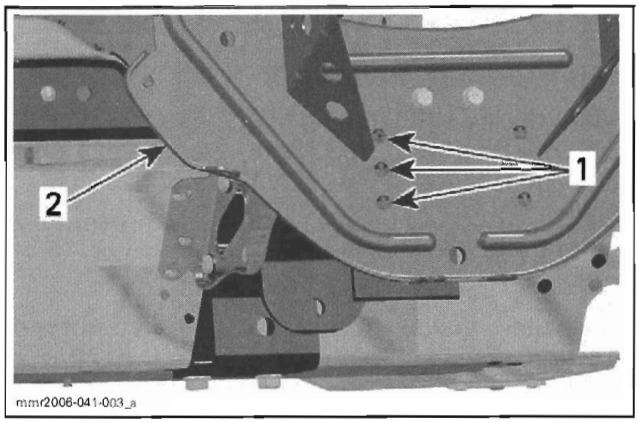
SIDE PLATE

Removal

NOTE: Use the same procedure for both sides.

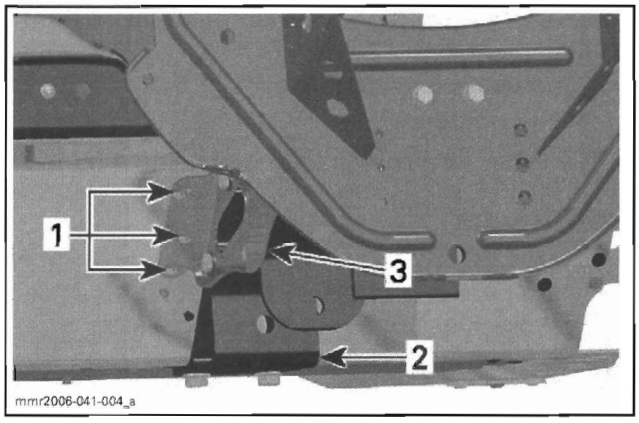
Remove shock absorber, suspension arm and bottom pan.

Drill rivets retaining the cross member side plate to front plate.



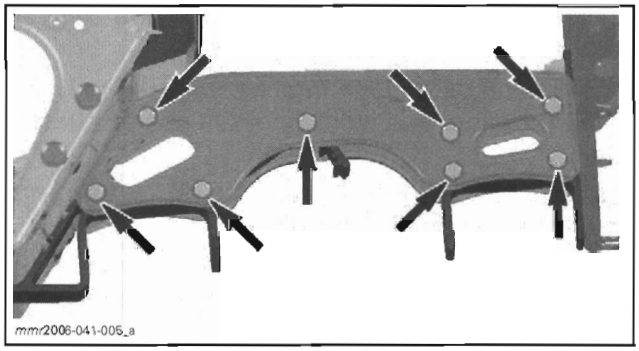
1. *Rivets to drill*
2. *Front plate*

Drill rivets that attach the side plate to the frame.



1. *Rivets to drill*
2. *Suspension arm rear support*
3. *RH side plate*

Remove all side plate bolts. Pay attention not to lose washers on both sides.



Installation

Install side plate bolts with washers, do not torque yet.

Attach the side plate to the frame. Replace rivets with the following fasteners:

QUANTITY	FASTENERS DESCRIPTION
3	Hexagonal bolt M5 x 14 (P/N 207 151 444)
3	Elastic flanged nut M5 (P/N 233 251 414)

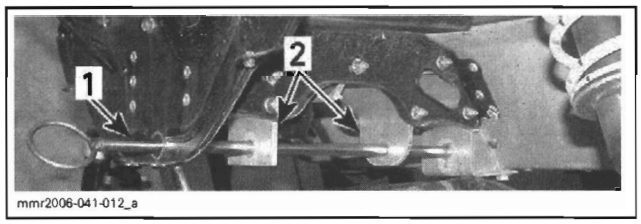
NOTE: Install new bolts with their heads pointing towards the front of vehicle.

Install the side plate to the front plate. Replace rivets with the following fasteners:

QUANTITY	FASTENERS DESCRIPTION
3	Hexagonal bolt M5 x 14 (P/N 207 151 444)
3	Elastic flanged nut M5 (P/N 233 251 414)

NOTE: Install new bolts with their heads pointing towards the front of vehicle.

For alignment purpose, install a straight steel rod of 13 mm dia. x 40 cm (1/2 in dia. x 16 in) through front plate and suspension arm supports.



1. Straight steel rod
2. Suspension arm supports

Torque all bolts to 5 N•m (44 lbf•**in**).

Remove steel rod.

Install all other removed parts.

SUSPENSION ARM SUPPORT

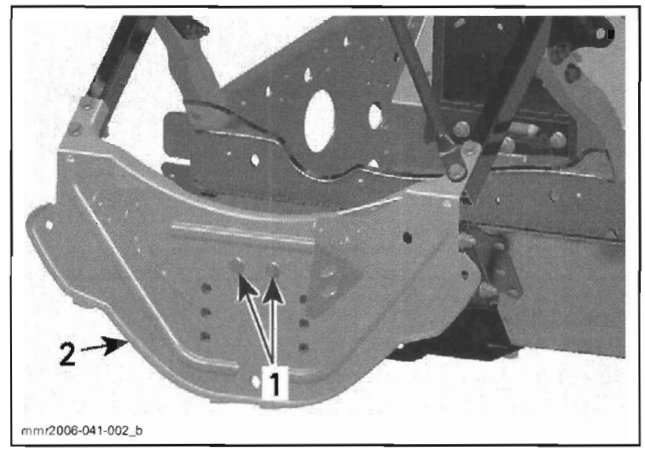
Removal

Remove suspension arms. Refer to *FRONT SUSPENSION*.

Remove the bottom pan. Refer to *BODY*.

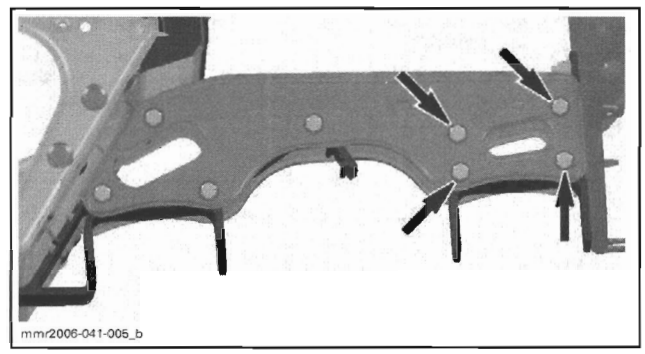
Front Support

Unscrew and remove bolts retaining suspension arm support to front plate.



1. Suspension arm support bolts
2. Front plate

Remove side plate bolts that attach suspension arm support. Pay attention not to lose washers.

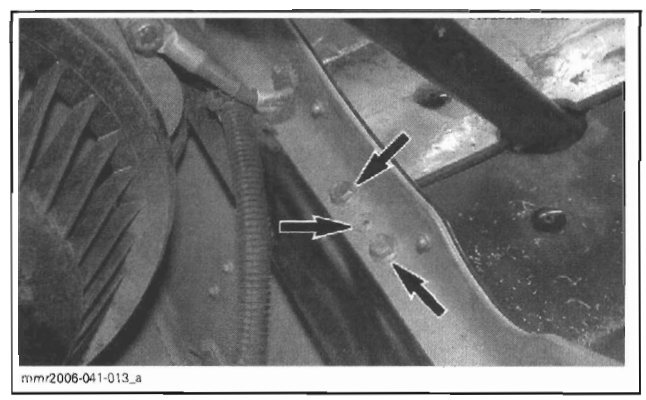


Remove suspension arm support.

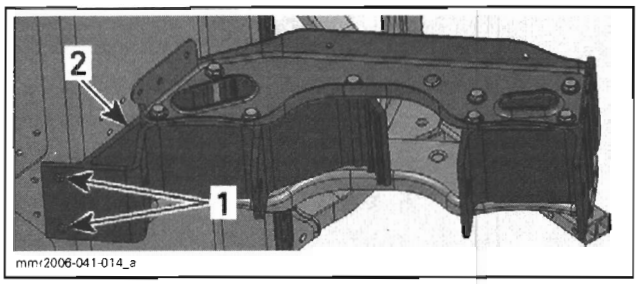
Rear Support

Detach steering column from suspension arm support.

Inside engine compartment, remove both screws and drill the rivet that attach the top of suspension arm support to frame (between steering column and engine).

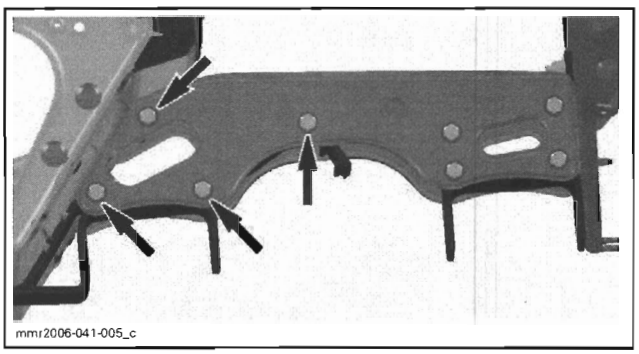


Underneath vehicle, remove bolts retaining the rear part of suspension arm support to frame.



1. Remove bolts locate here
2. Suspension arm support

Remove side plate bolts that attach suspension arm support. Pay attention not to lose washers.



Remove suspension arm support.

Installation

Front Support

Install all bolts but do not torque yet.

For alignment purpose, install a straight steel rod of 13 mm dia. x 40 cm (1/2 in dia. x 16 in) through front plate and suspension arm supports.

Torque all bolts.

Remove steel rod and install all removed parts.

Rear Support

Install all bolts. Do not torque yet.

Replace the rivet with an hexagonal bolt M5 x 14 (P/N 207 151 444) and an elastic flanged nut M5 (P/N 233 251 414).

For alignment purpose, install a straight steel rod of 13 mm dia. x 40 cm (1/2 in dia. x 16 in) through front plate and suspension arm supports.

Torque all bolts.

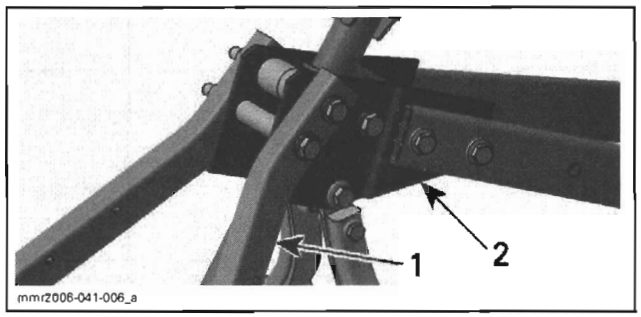
Remove steel rod and install all removed parts.

UPPER TUBE

NOTE: Use the same procedure for the RH and LH upper tubes.

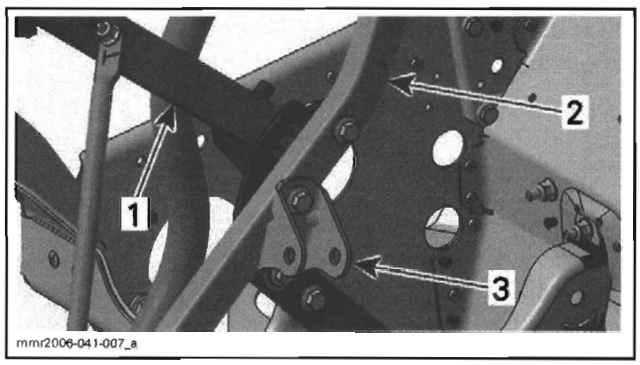
Removal

Remove bolts that attach the cross member arm to the retaining block.



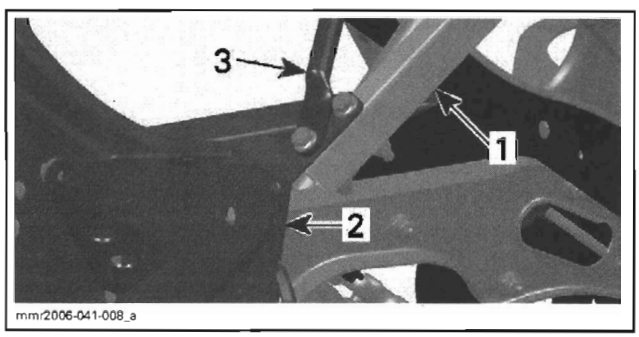
1. LH upper tube
2. Retaining block

Unscrew bolts retaining upper cross member to upper tube.



1. Upper cross member
2. LH upper tube
3. LH shock absorber attachment

Remove bolts retaining the upper tube to the front plate.



1. LH upper tube
2. Front plate
3. Brace (s)

Installation

Install all bolts before torquing them. Refer to exploded views at the beginning of this section.

Install all other removed parts.

300F MODELS

MODEL			FREESTYLE SESSION / TUNDRA
ENGINE			
Engine type			277
Number of cylinder			1
Bore	Standard	mm (in)	72 (2.835)
	1er oversize	mm (in)	72.25 (2.844)
	2nd oversize	mm (in)	72.50 (2.854)
Stroke		mm (in)	66.00 (2.598)
Displacement		cm³ (in³)	268.70 (16.397)
Compression ratio			11.2 ± 0.5
Maximum power engine speed		± 100 RPM	6950
Combustion chamber volume		cc	25.35 to 27.35
Piston ring type		1st	Semi-trapezoidal
		2nd	Rectangular
Ring end gap	New	mm (in)	Semi-trapezoidal: 0.250 to 0.400 (.0098 to .0157) Rectangular: 0.200 to 0.350 (.0079 to .0138)
	Wear limit	mm (in)	1.0 (.039)
Ring/piston groove clearance	New	mm (in)	0.030 to 0.700 (.0012 to .0276)
	Wear limit	mm (in)	0.2 (.0079)
Piston/cylinder wall clearance	New	mm (in)	0.080 ± 0.020 (.0031 ± .0008)
	Wear limit	mm (in)	0.2 (.0079)
Piston skirt wear	Wear limit	mm (in)	0.15 (.006)
Cylinder head warpage	Wear limit	mm (in)	0.5 (.02)
Cylinder taper	New (max.)	mm (in)	0.05 (.0020)
	Wear limit	mm (in)	0.10 (.0039)
Cylinder out of round	New (max.)	mm (in)	0.01 (.0004)
	Wear limit	mm (in)	0.08 (.0031)
Maximum crankshaft end play	New (max.)	mm (in)	0.3 (.012)
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)
Connecting rod big end axial paly	New	mm (in)	0.200 to 0.527 (.0079 to .0208)
	Wear limit	mm (in)	1.2 (.0472)
COOLING SYSTEM			
Type			Fan cooled
Axial fan belt adjustment	Deflection	mm (in)	9.5 ± 1.5 (.374 ± .059)
	Force	kgf (lbf)	5.0 (11.0)
LUBRICATION SYSTEM			
Injection oil	Type		XP-S mineral injection oil
	Quantity	L (U.S. oz)	3.5 (118.4)

MODEL			FREESTYLE SESSION	TUNDRA
FUEL SYSTEM				
Carburetor type			VM34	
Main jet			200	
Needle jet			O-6	
Pilot jet			40	
Jet needle identification and clip position			6DH4 – 3	
Slide cut-away			2.5	
Idle throttle slilde height			1.6 ± 0.1 (.063 ± .004)	
Float adjustment		mm (in)	24.90 ± 1 (.980 ± .040)	
Air or pilot screw adjustment		± 1/16 turn	2	
Idle speed		± 200 RPM	1650	
Gas type			Unleaded	
Pump octane number	Inside North America ((R+M)/2)		87 or higher	
	Outside North America (RON)		92 or higher	
Fuel tank capacity		L (U.S. gal)	34 (9)	
Gas/oil ratio			Injection	
ELECTRICAL SYSTEM				
Magneto generator output			340 W @ 6000 RPM	
Ignition type			CDI	
Spark plug	Make and type		NGK BR9ES	
	Gap	mm (in)	0.40 to 0.50 (.016 to .020)	
Ignition timing BTDC		mm (in)	3.61 (.142) @ 3500 RPM	
Trigger coil		Ω	160 to 180	
Generating coil	Low speed	Ω	6.3	
	High speed	Ω	7.7	
Lighting coil		Ω	0.145 to 0.175	
High tension coil	Primary		N.A.	
	Secondary		N.A.	
Battery			12 V, 18 A•h (if applicable)	
Headlamp		W	60/55 (H4)	
Taillight and stoplight		W	8/26	
Fuse	Starter solenoid	A	30 (if applicable)	

MODEL			FREESTYLE SESSION	TUNDRA
DRIVE SYSTEM				
Chaincase oil	Type		XP-S synthetic chaincase oil	
	Quantity	mL (U.S. oz)	250 (8.5)	
Chain drive ratio			15/45	
Chain	Pitch	in	3/8	
	Type/links qty/plate qty		Silent 72/13	
Drive pulley type			Bombardier Lite	
Drive pulley calibration	Clutch engagement	± 100 RPM	3300	
	Spring color		Pink/Yellow	
	Spring free length	mm (in)	—	
	Weight 417 120 400 = 21 g 417 114 400 = 3.4 g		5 x 3.4 g	
	Block		1 x 417 118 100	
	Cap		1 x 417 114 500	
Driven pulley	Type		LPV 27	
	Spring color		Brown	
	Cam angle		44°	
Pulley distance	Z	mm (in)	18.75 (0.738)	
Offset	X	mm (in)	33.4 ± 0.5 (1.315 ± 0.2)	
Drive belt part number		P/N	417 300 326	
Drive belt	Width	mm (in)	35.20 (1.386)	
	Wear limit	mm (in)	32.80 (1.291)	
Drive belt adjustment	Deflection	mm (in)	32 ± 5 (1.260 ± .197)	
	Force	kgf (lbf)	11.34 (25)	
Track	Width	mm (in)	381 (15)	406.4 (16)
	Length	m (in)	3.08 (121)	3.46 (136)
	Profile height	mm (in)	18.4 (.725) (EUR): 22.2 (.875)	31.8 (1.25)
Track adjustment	Deflection	mm (in)	30 to 35 (1.181 to 1.378)	
	Force	kgf (lbf)	7.3 (16)	
BRAKE SYSTEM				
Brake lining thickness	Service limit	mm (in)	1 (.039)	
Brake fluid	Type		DOT 4	
	Quantity	mL (U.S. oz)	60 (2.0)	

MODEL		FREESTYLE SESSION	TUNDRA
SUSPENSION			
FRONT			
Suspension type		Single A-arm	
Suspension maximum travel	mm (in)	160 (6.3)	
Shock absorber type		Motion control	
Sway bar type		—	
REAR			
Suspension type		SC-4	SC-136
Suspension maximum travel	mm (in)	381 (15)	330 (13)
Shock absorber type	Center	Motion control	
	Rear	Motion control (EUR): H.P.G.	H.P.G.
Stroke limiter standard position		4–2	3–2
STEERING SYSTEM			
Ski type		Blow mold (EUR): Blow mold (wide)	Blow mold (wide)
Toe-out	mm (in)	5 (.197)	
Camber		0°	
VEHICLE INFORMATIONS			
Mass (dry)	kg (lb)	167 (368)	172 (379)
Length	m (in)	2.85 (112)	3.03 (119) (EUR): 3.09 (122)
Width	m (in)	0.97 (38)	1.00 (39.4)
Height	m (in)	1.17 (46)	1.30 (51)
Ski stance (carbide to carbide)	m (in)	0.82 (32)	
MATERIAL			
Frame		Aluminum	
Bottom pan		Polypropylene	
Hood		Polyethylene HDPE	
Side panels		Polyethylene HDPE	
Console		Polyethylene HDPE	
Trunk		Polypropylene	

550F MODELS

MODEL			FREESTYLE			EXPEDITION
			PARK	SESSION	BACK COUNTRY	SPORT
ENGINE						
Engine type			552			
Number of cylinder			2			
Bore	Standard	mm (in)	76 (2.992)			
	1er oversize	mm (in)	76.25 (3.002)			
	2nd oversize	mm (in)	76.5 (3.012)			
Stroke		mm (in)	61.00 (2.402)			
Displacement		cm³ (in³)	553.40 (33.771)			
Compression ratio			10.50 ± 0.5			
Maximum power engine speed		± 100 RPM	6900			6950
Combustion chamber volume		cc	35.54			
Piston ring type		1st	Semi-trapezoidal			
		2nd	Rectangular			
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)			
	Wear limit	mm (in)	1.0 (.039)			
Ring/piston groove clearance	New	mm (in)	0.04 to 0.08 (.0016 to .0030)			
	Wear limit	mm (in)	0.2 (.0079)			
Piston/cylinder wall clearance	New	mm (in)	0.150 ± 0.030 (.0059 ± .0012)			
	Wear limit	mm (in)	0.2 (.0079)			
Piston skirt wear	Wear limit	mm (in)	0.15 (.006)			
Cylinder head warpage	Wear limit	mm (in)	0.5 (.02)			
Cylinder taper	New (max.)	mm (in)	0.05 (.0020)			
	Wear limit	mm (in)	0.10 (.0039)			
Cylinder out of round	New (max.)	mm (in)	0.01 (.0004)			
	Wear limit	mm (in)	0.08 (.0031)			
Maximum crankshaft end play	New (max.)	mm (in)	0.3 (.012)			
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)			
Connecting rod big end axial paly	New	mm (in)	0.200 to 0.530 (.0079 to .0209)			
	Wear limit	mm (in)	1.2 (.0472)			
COOLING SYSTEM						
Type			Fan cooled			
Axial fan belt adjustment	Deflection	mm (in)	9.5 ± 1.5 (.374 ± .059)			
	Force	kgf (lbf)	5.0 (11.0)			
LUBRICATION SYSTEM						
Injection oil	Type		XP-S mineral injection oil			
	Quantity	L (U.S. oz)	3.5 (118.4)			

MODEL			FREESTYLE			EXPEDITION
			PARK	SESSION	BACK COUNTRY	SPORT
FUEL SYSTEM						
Carburetor type			VM30			
Main jet			190			
Needle jet			P-7			
Pilot jet			45			
Jet needle identification and clip position			MY			
Slide cut-away			2.5			
Idle throttle slilde height			1.5 ± 0.1 (.059 ± .004)			
Float adjustment		mm (in)	23.90 ± 1 (.941 ± .040)			
Air or pilot screw adjustment		± 1/16 turn	2			
Idle speed		± 200 RPM	1650			
Gas type			Unleaded			
Pump octane number	Inside North America ((R+M)/2)		87 or higher			
	Outside North America (RON)		92 or higher			
Fuel tank capacity		L (U.S. gal)	34 (9)			
Gas/oil ratio			Injection			
ELECTRICAL SYSTEM						
Magneto generator output			340 W @ 6000 RPM			
Ignition type			CDI			
Spark plug	Make and type		NGK BR9ES			
	Gap	mm (in)	0.40 to 0.50 (.016 to .020)			
Ignition timing BTDC		mm (in)	2.77 (.109) @ 3500 RPM			
Trigger coil		Ω	160 to 180			
Generating coil	Low speed	Ω	6.3			
	High speed	Ω	7.7			
Lighting coil		Ω	0.145 to 0.175			
High tension coil	Primary		N.A.			
	Secondary		N.A.			
Battery			12 V, 18 A•h (if applicable)			
Headlamp		W	60/55 (H4)			
Taillight and stoplight		W	8/26			
Fuse	Starter solenoid	A	30 (if applicable)			

MODEL			FREESTYLE			EXPEDITION
			PARK	SESSION	BACK COUNTRY	SPORT
DRIVE SYSTEM						
Chaincase oil	Type		XP-S synthetic chaincase oil			
	Quantity	mL (U.S. oz)	250 (8.5)			
Chain drive ratio			21/43		19/43	
Chain	Pitch	in	3/8			
	Type/links qty/plate qty		Silent 74/13		Silent 72/13	
Drive pulley type			Bombardier Lite			
Drive pulley calibration	Clutch engagement	± 100 RPM	3300		2700	
	Spring color		Purple/Yellow		Yellow/Green	
	Spring free length	mm (in)	158 (6.22)		—	
	Weight 417 120 400 = 21 g 417 114 400 = 3.4 g		1 x 21 g + 3 x 3.4 g			
	Block		1 x 417 118 100			
	Cap		1 x 417 114 500			
Driven pulley	Type		LPV 27			
	Spring color		Brown			
	Cam angle		44°			
Pulley distance	Z	mm (in)	26.25 (1.033)			
Offset	X	mm (in)	33.4 ± 0.5 (1.315 ± 0.2)			
Drive belt part number		P/N	415 060 600			
Drive belt	Width	mm (in)	34.70 (1.366)			
	Wear limit	mm (in)	32.30 (1.272)			
Drive belt adjustment	Deflection	mm (in)	32 ± 5 (1.260 ± .197)			
	Force	kgf (lbf)	11.34 (25)			
Track	Width	mm (in)	381 (15)		406.4 (16)	
	Length	m (in)	3.08 (121)		3.46 m (136 in)	
	Profile height	mm (in)	31.8 (1.25)	22.2 (.874)	31.8 (1.25)	
Track adjustment	Deflection	mm (in)	30 to 35 (1.181 to 1.378)			
	Force	kgf (lbf)	7.3 (16)			
BRAKE SYSTEM						
Brake lining thickness	Service limit	mm (in)	1 (.039)			
Brake fluid	Type		DOT 4			
	Quantity	mL (U.S. oz)	60 (2.0)			

MODEL		FREESTYLE			EXPEDITION
		PARK	SESSION	BACK COUNTRY	SPORT
SUSPENSION					
FRONT					
Suspension type		Single A-arm			
Suspension maximum travel	mm (in)	160 (6.3)			
Shock absorber type		H.P.G.	Motion Control	H.P.G.	Motion Control
Sway bar type		Link	—	Link	—
REAR					
Suspension type		SC-4		SC-136	
Suspension maximum travel	mm (in)	381 (15)		330 (13)	
Shock absorber type	Center	H.P.G.	Motion Control	H.P.G.	Motion Control
	Rear	H.P.G.	Motion Control	H.P.G.	
Stroke limiter standard position		4–2		3–2	
STEERING SYSTEM					
Ski type		Blow mold (EUR): Pilot 5.7	Blow mold		Blow mold (wide)
Toe-out	mm (in)	5 (.197)			
Camber		0°			
VEHICLE INFORMATIONS					
Mass (dry)	kg (lb)	186 (410)		188 (414)	218 (481)
Length	m (in)	2.85 (112)		3.03 (119) (EUR): 3.09 (122)	
Width	m (in)	1.13 (44.6)			
Height	m (in)	1.14 (45)	1.17 (46)	1.14 (45)	1.30 (51)
Ski stance (carbide to carbide)	m (in)	0.99 (39) (EUR): 0.96 (37.7)	0.99 (39)	0.99 (39) (EUR): 0.96 (37.7)	
MATERIAL					
Frame		Aluminum			
Bottom pan		Polypropylene			
Hood		Polyethylene HDPE			
Side panels		Polyethylene HDPE			
Console		Polyethylene HDPE			
Trunk		Polypropylene			

V800 MODELS

MODEL				LEGEND		SKANDIC	EXPEDITION
				TOURING	TRAIL	TUNDRA	SPORT
ENGINE							
Engine type				ROTAX 810			
				4-stroke, Single Over Head Camshaft (SOHC), liquid cooled			
Number of cylinders				2			
Number of valves				8 valves (mechanical adjustment)			
Bore			mm (in)	91 (3.58)			
Stroke			mm (in)	61.5 (2.42)			
Displacement				800 cm³ (48.82 in³)			
Compression ratio				10.3:1			
Decompressor type				N.A.			
Maximum HP RPM			RPM	7250			
Intake valve opening				5° BTDC			
Intake valve closing				45° ABDC			
Exhaust valve opening				50° BBDC			
Exhaust valve closing				0° ATDC			
Valve clearance	Intake		mm (in)	0.06 to 0.14 (.0024 to .0055)			
	Exhaust		mm (in)	0.11 to 0.19 (.0043 to .0075)			
Valve stem diameter	Intake	New	mm (in)	4.966 to 4.980 (.1955 to .1960)			
		Service limit	mm (in)	4.930 (.1941)			
	Exhaust	New	mm (in)	4.956 to 4.970 (.1951 to .1957)			
		Service limit	mm (in)	4.930 (.1941)			
Valve guide diameter		New	mm (in)	5.006 to 5.018 (.1971 to .1976)			
		Service limit	mm (in)	5.050 (.1988)			
Valve spring free length		New	mm (in)	40.81 (1.607)			
		Service limit	mm (in)	39.00 (1.535)			
Valve seat contact width	Intake	New	mm (in)	1.05 to 1.35 (.041 to (.053)			
		Service limit	mm (in)	1.8 (.070)			
	Exhaust	New	mm (in)	1.25 to 1.55 (.049 to .061)			
		Service limit	mm (in)	2 (.078)			
Rocker arm bore diameter		New	mm (in)	12.036 to 12.050 (.4739 to .4744)			
		Service limit	mm (in)	12.060 (.4748)			
Rocker arm shaft diameter		New	mm (in)	12.000 to 12.018 (.4724 to .4731)			
		Service limit	mm (in)	11.990 (.4720)			
Piston measurement		New	mm (in)	90.950 to 90.966 (3.5807 to 3.5813)			
Piston/cylinder clearance		New	mm (in)	0.027 to 0.057 (.0011 to .0023)			
		Service limit	mm (in)	0.100 (.0040)			
Piston ring type		1st		Upper compression ring, rectangular			
		2nd		Lower compression ring, tapered face			
		3rd		Oil scraper ring			

MODEL				LEGEND		SKANDIC	EXPEDITION
				TOURING	TRAIL	TUNDRA	SPORT
ENGINE (cont'd)							
Ring end gap	Rectangular	New	mm (in)	0.20 to 0.40 (.008 to .016)			
	Taper-face	New	mm (in)	0.20 to 0.40 (.008 to .016)			
	Oil scraper ring	New	mm (in)	0.20 to 0.70 (.008 to .028)			
	All	Service limit	mm (in)	1.5 (.059)			
Ring/piston groove clearance	Rectangular	New	mm (in)	0.030 to 0.070 (.0012 to .0028)			
		Service limit	mm (in)	0.150 (.0059)			
	Taper-face	New	mm (in)	0.020 to 0.060 (.0008 to .0024)			
		Service limit	mm (in)	0.150 (.0059)			
	Oil scraper ring	New	mm (in)	0.010 to 0.180 (.0004 to .0071)			
		Service limit	mm (in)	0.250 (.0098)			
Cylinder bore		New	mm (in)	90.993 to 91.007 (3.5823 to 3.5829)			
Cylinder taper		Maximum New	mm (in)	0.038 (.0015)			
		Service limit	mm (in)	0.090 (.0035)			
Cylinder out of round		Maximum New	mm (in)	0.015 (.0006)			
		Service limit	mm (in)	0.020 (.0008)			
Camshaft main bearing journal	Timing chain side	New	mm (in)	34.959 to 34.975 (1.3763 to 1.3770)			
		Service limit	mm (in)	34.950 (1.3760)			
	Spark plug side	New	mm (in)	21.959 to 21.980 (.8645 to .8654)			
		Service limit	mm (in)	21.950 (.8642)			
Camshaft main bearing journal bore	Timing chain side	New	mm (in)	35.000 to 35.025 (1.3780 to 1.3789)			
		Service limit	mm (in)	35.040 (1.3795)			
	Spark plug side	New	mm (in)	22.000 to 22.021 (.8661 to .8670)			
		Wear limit	mm (in)	22.040 (.8677)			
Camshaft lobe	Intake valve	New	mm (in)	32.11 to 32.31 (1.2642 to 1.2721)			
		Service limit	mm (in)	32.09 (1.2634)			
	Exhaust valve	New	mm (in)	31.94 to 32.14 (1.2575 to 1.2654)			
		Service limit	mm (in)	31.92 (1.2567)			
Crankshaft main journal diameter MAG/PTO side		New	mm (in)	42.024 to 42.040 (1.6545 to 1.6551)			
		Service limit	mm (in)	42.000 (1.6535)			
Crankshaft radial play MAG/PTO side		Service limit	mm (in)	0.07 (.0031)			
Crankshaft main journal diameter PTO support bearing		New	mm (in)	34.024 to 34.040 (1.3395 to 1.3402)			
		Service limit	mm (in)	34.010 (1.3390)			
Crankshaft radial play PTO support bearing		Service limit	mm (in)	0.10 (.0039)			
Crankshaft pin diameter		New	mm (in)	40.009 to 40.025 (1.5752 to 1.5758)			
		Service limit	mm (in)	39.990 (1.5744)			
Crankshaft deflection	MAG/PTO	New	mm (in)	0.050 (.002)			
Crankcase plain bearing	MAG/PTO	Service limit	mm (in)	42.100 (1.658)			
PTO cover plain bearing		Service limit	mm (in)	34.120 (1.343)			
Connecting rod big end diameter		Service limit	mm (in)	40.100 (1.579)			
Connecting rod big end radial play		Service limit	mm (in)	0.09 (.0035)			

MODEL			LEGEND		SKANDIC	EXPEDITION
			TOURING	TRAIL	TUNDRA	SPORT
ENGINE (cont'd)						
Connecting rod big end axial play	New	mm (in)	0.200 to 0.500 (.008 to .020)			
	Service limit	mm (in)	0.600 (.024)			
Connecting rod small end diameter	New	mm (in)	20.010 to 20.020 (.7878 to .7882)			
	Service limit	mm (in)	20.060 (.7898)			
Piston pin diameter	New	mm (in)	19.996 to 20.000 (.7872 to .7874)			
	Service limit	mm (in)	19.980 (.7866)			
Connecting rod small end radial play	Service limit	mm (in)	0.080 (.0035)			
COOLING SYSTEM						
Coolant	Type		Ethyl glycol and distilled water (50%/ 50%). Use premix coolant from BRP (P/N 219 700 362) or coolant specifically formulated for aluminum engines			
	Quantity	L (U.S. gal.)	4.00 (1.06)	3.8 (1)	4.00 (1.06)	
Thermostat opening temperature		°C (°F)	75 (167)			
Radiator cap opening pressure		kPa (PSI)	110 (16)			
LUBRICATION SYSTEM						
Lubrication	Type		Wet sump. Replaceable oil filter			
	Oil filter		BRP Rotax paper type, replaceable			
	Engine oil pressure	Minimum	350 kPa (51 PSI) at 6000 RPM			
	Engine oil	Capacity (oil change with filter)	2 L (2.11 quarts)			
		Recommended	XP-S 0W40 synthetic oil or an equivalent			
FUEL SYSTEM						
Throttle body type			Dell'Orto			
Idle speed		± 200 RPM	1400			
Gas type			Unleaded			
Pump octane number	Inside North America ((R+M)/2)		87 or higher			
	Outside North America (RON)		92 or higher			
Fuel tank capacity		L (U.S. gal)	34 (9)			
ELECTRICAL SYSTEM						
Magneto generator output		W	420 @ 6000 RPM			
Ignition type			CDI (Capacity Discharge Ignition)			
Spark plug	Make and type		NGK DCPR8E			
	Gap	mm (in)	0.75 (.0303)			
Ignition timing			Not adjustable			
Crankshaft position sensor (CPS)		Ω	774 to 946 @ 20°C (68°F)			
		Vac	2.3 @ 20°C (68°F)			
Battery			12 V, 21 A•h			
Headlamp		W	60/55 (H4)			
Taillight and stoplight		W	8/26			
Fuse	Starter solenoid	A	30 (if applicable)			

MODEL			LEGEND		SKANDIC	EXPEDITION
			TOURING	TRAIL	TUNDRA	SPORT
DRIVE SYSTEM						
Chaincase oil	Type		XP-S synthetic chaincase oil			
	Quantity	mL (U.S. oz)	250 (8.5)			
Chain drive ratio			21/44 (forward) 21/56 (reverse)		19/44 (forward) 19/56 (reverse)	
Chain	Pitch	in	3/8			
	Type/links qty/plate qty		Silent 74/13			
Drive pulley type			TRA IV			
Drive pulley calibration	Clutch engagement	± 100 RPM	2100			
	Spring color		Red/Yellow			
	Spring length	mm (in)	87.9 (3.461)			
	Pin		Hollow (P/N 417 222 594)			
	Ramp		607			
	Screw position		3			
Driven pulley type	Type		LPV VSA			
	Spring preload		0			
	Cam angle		44°			
Pulley distance Offset	Z	mm (in)	20.0 (.787)			
	X	mm (in)	37.0 ± 0.5 (1.457 ± 0.2)			
Drive belt part number		P/N	417 300 197			
Drive belt	Width	mm (in)	37.3 (1.469)			
	Wear limit	mm (in)	34.9 (1.374)			
Drive belt adjustment	Deflection	mm (in)	32 ± 5 (1.260 ± .197)			
	Force	kgf (lbf)	11.30 (24.91)			
Track	Width	mm (in)	381 (15) (EUR): 406.4 (16)	381 (15)	406.4 (16)	
	Length	m (in)	3.46 (136)	3.07 (121)	3.46 (136)	
	Profile height	mm (in)	22.2 (.874) (EUR): 31.8 (1.25)	22.2 (.874)	31.8 (1.25)	
Track adjustment	Deflection	mm (in)	30 to 35 (1.181 to 1.378)			
	Force	kgf (lbf)	7.3 (16)			
BRAKE SYSTEM						
Brake lining thickness		mm (in)	1 (.039)			
Brake fluid	Type		DOT 4			
	Quantity	mL (U.S. oz)	60 (2.0)			

MODEL		LEGEND		SKANDIC	EXPEDITION
		TOURING	TRAIL	TUNDRA	SPORT
SUSPENSION					
FRONT					
Suspension type		Single A-arm			
Suspension maximum travel	mm (in)	160 (6.3)			
Shock absorber type		Motion control			
Sway bar type		Link		—	
REAR					
Suspension type		SC-136	SC-4	SC-136	
Suspension maximum travel	mm (in)	330.7 (13)	381 (15)	330.7 (13)	
Shock absorber type	Center	Motion control			
	Rear	H.P.G.	Motion control	H.P.G.	
Stroke limiter standard position		3–2			
STEERING SYSTEM					
Ski type		Blow mold (EUR): Pilot 6.9	Blow mold	Blow mold (wide)	
Toe-out	mm (in)	5 (.197)			
Camber		0°			
VEHICLE INFORMATIONS					
Mass (dry)	kg (lb)	231 (509)	222 (489)	222 (489)	231 (509)
Length	m (in)	3.03 (119) (EUR): 3.09 (122)	2.85 (112)	3.03 (119)	
Width	m (in)	1.13 (44.6) (EUR): 1.17 (45.9)	1.13 (44.6)		
Height	m (in)	1.30 (51)	1.245 (49)	1.30 (51)	
Ski stance (carbide to carbide)	m (in)	0.99 (39)		0.82 (32)	0.99 (39)
MATERIAL					
Frame		Aluminum			
Bottom pan		Polypropylene			
Side panels		Polyethylene HDPE			
Hood		Polyethylene HDPE			
Console		Polyethylene HDPE			
Trunk		Polypropylene			

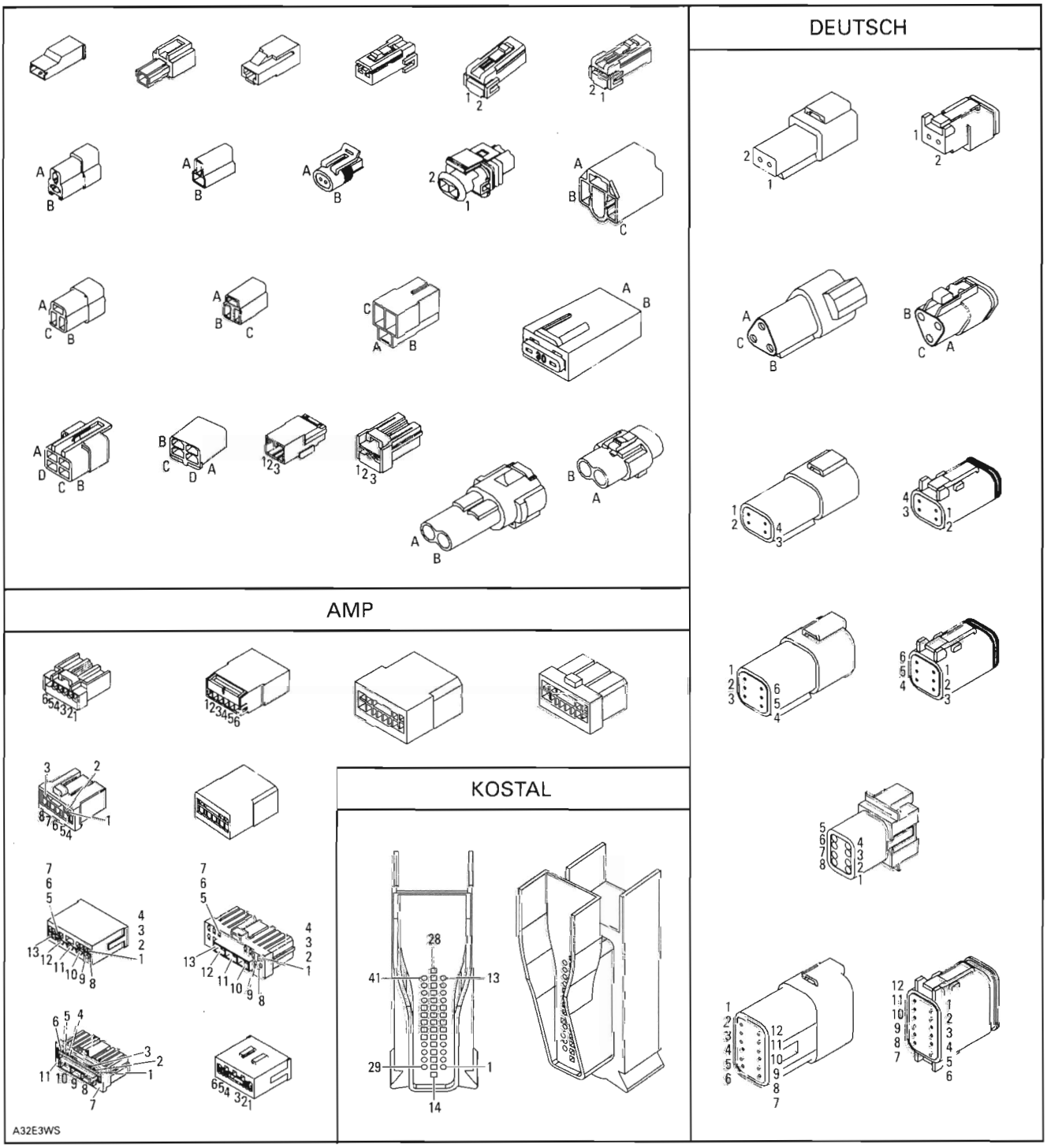
ELECTRICAL CONNECTORS

SERVICE TOOLS

Description	Part Number	Page
crimp pliers	529 035 730	612
crimper die	529 035 906	610
crimping tool	529 035 909	610

SERVICE TOOLS – OTHER SUPPLIER

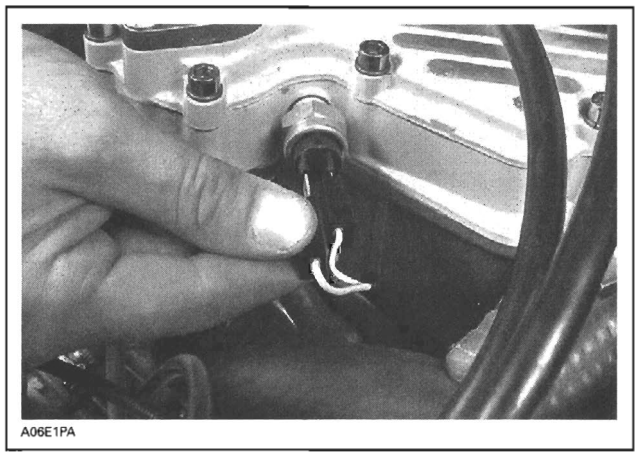
Description	Part Number	Page
Snap-on screwdriver	TT600-4	607
Snap-on screwdriver	TT600-5	605–606
Snap-on terminal remover	TT600-1	609
tool AMP	755430-2	607–608


DEUTSCH
AMP
KOSTAL
A32E3WS

PROCEDURES

TAB AND RECEPTACLE CONNECTORS

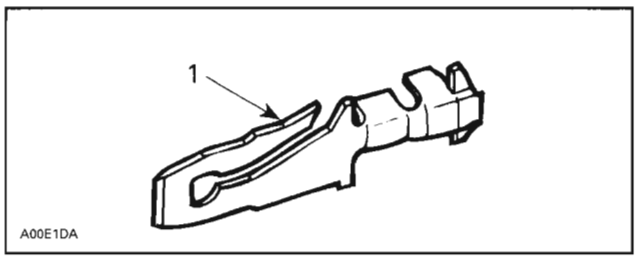
Always unplug connectors by pulling on housing not on wire.



TYPICAL

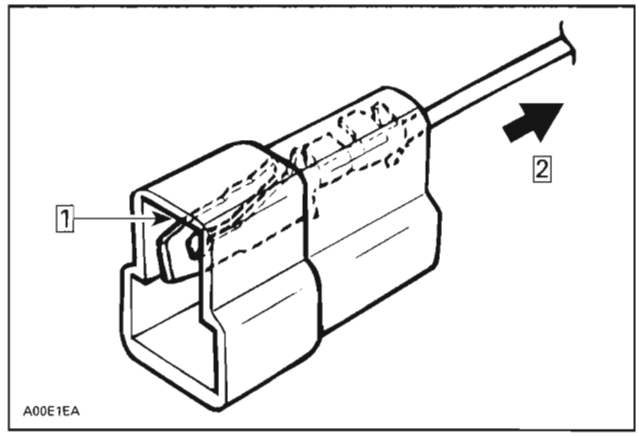
Removal

It is locked in its housing by a spring tab on its side.



TAB CONNECTOR
1. Locking tab

- Insert Snap-on screwdriver (P/N TT600-5) from opposite side of wire and pry locking tab.
- While holding locking tab pried, pull connector toward wire side.

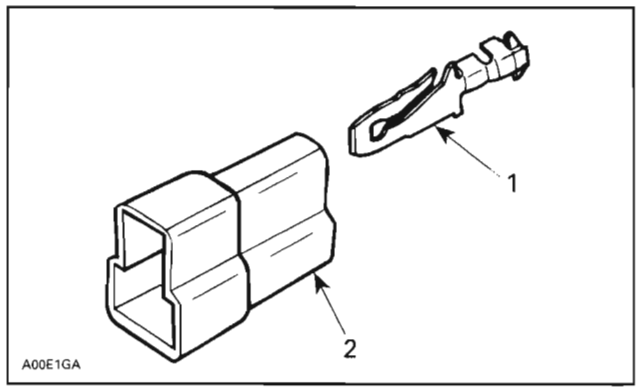


Step 1: Insert screwdriver here
Step 2: Pull this side

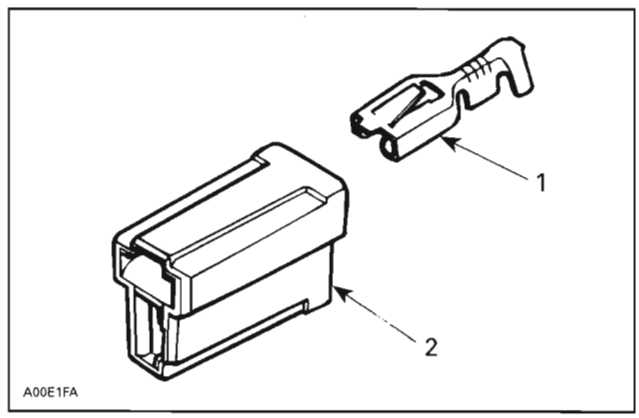
Installation

Prior to installing, make sure locking tab is sufficiently lifted to properly lock.

Insert tab and receptacle connectors in their respective housings as shown in following illustrations. Push sufficiently so that they snap. Try pulling wire to ensure they are properly locked.



1. Tab
2. Housing



TYPICAL
1. Receptacle
2. Housing

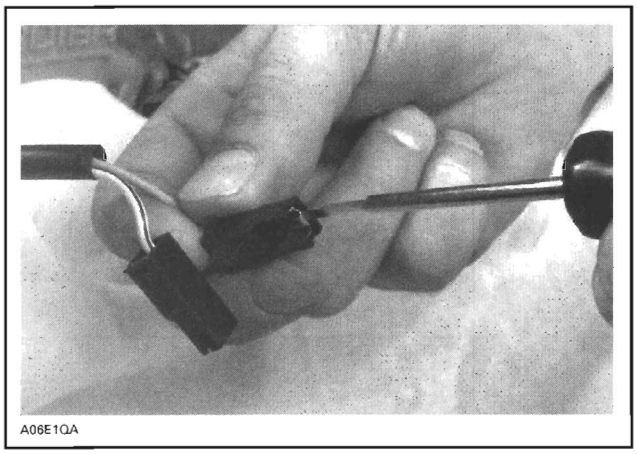
⚠ WARNING

Keep wires away from any rotating, moving, heating, vibrating or sharp edge. Use proper fastening devices as required.

LOCKING RECEPTACLE CONNECTOR

Removal

– Insert Snap-on screwdriver (P/N TT600-5) in access opening then pull housing toward wire side.

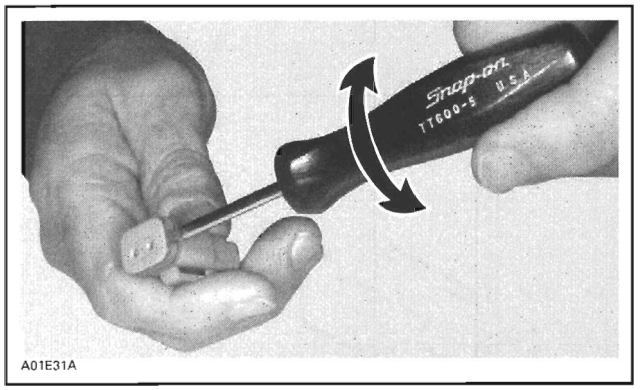

A06E1QA

DEUTSCH CONNECTORS

Female Housing

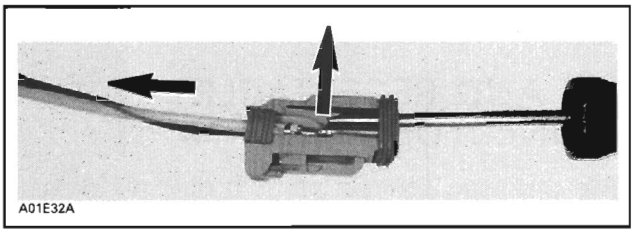
To remove:

– Insert Snap-on screwdriver (P/N TT600-5) under lock and twist to lift it.



A01E31A

– Pry tab to free connector then pull wire out of housing.

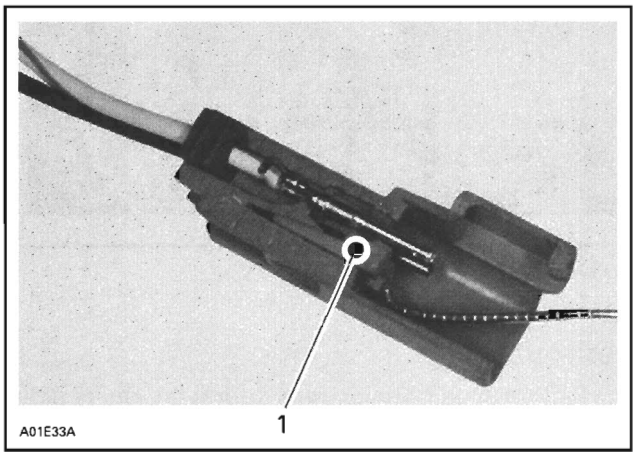

A01E32A

FEMALE CONNECTOR HOUSING — CUT-AWAY

Male Housing

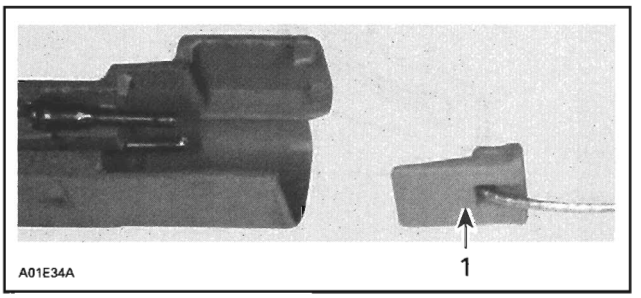
To remove:

– Using a small hook, pull out the lock.



A01E33A

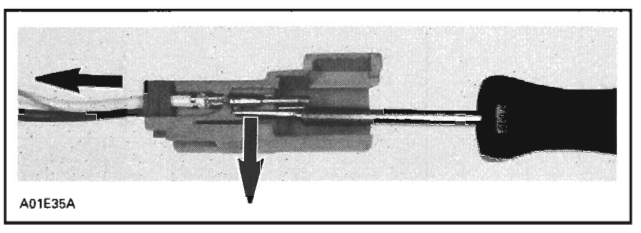
1. Lock



A01E34A

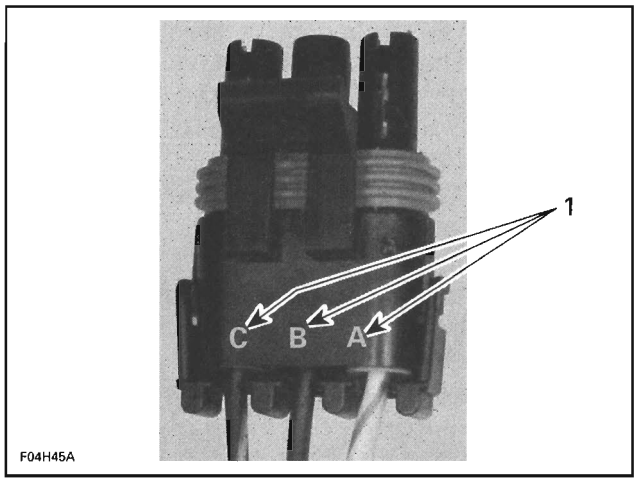
1. Lock

– Pry tab to free connector then pull wire out of housing.


A01E35A

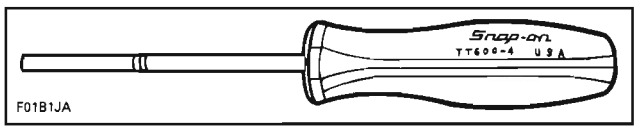
MALE CONNECTOR HOUSING — CUT-AWAY

PACKARD CONNECTOR



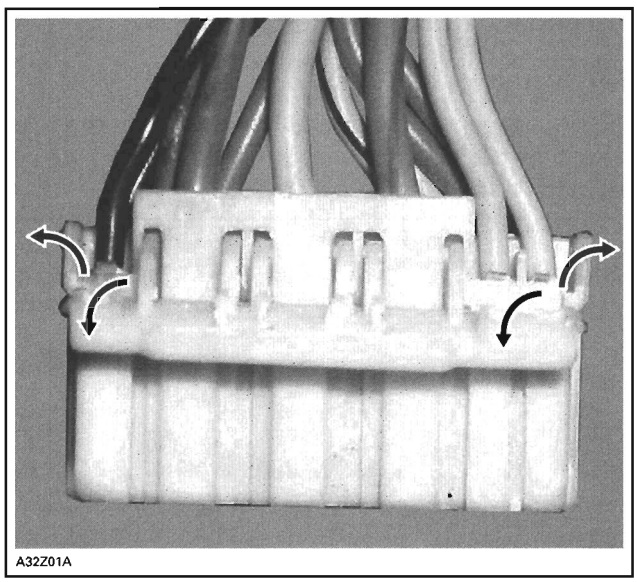
VIEW OF A 3-PIN PACKARD CONNECTOR
1. Identification letters

To remove terminal from Packard connector, use Snap-on screwdriver (P/N TT600-4) tool.

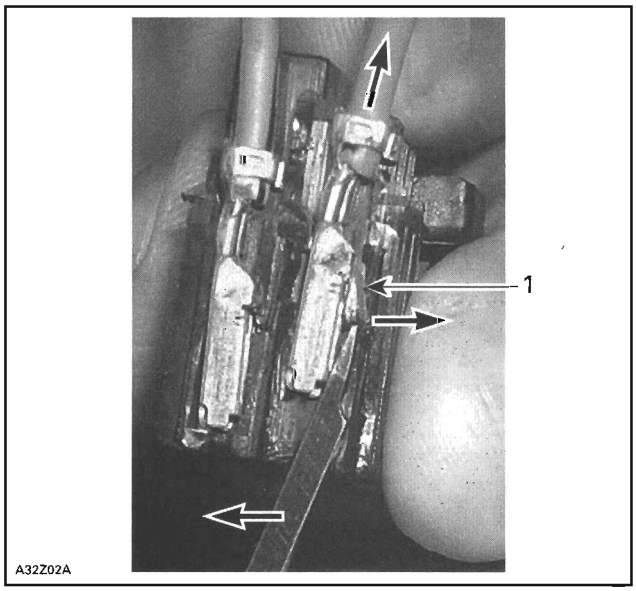


AMP MULTILOCK CONNECTOR

Female Terminal Housing



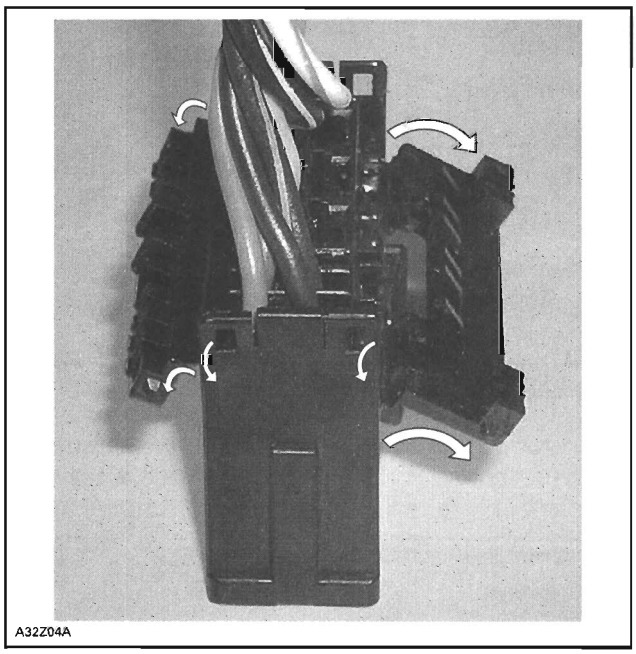
To remove:
- Insert tool AMP (P/N 755430-2) under lock and twist to lift it.



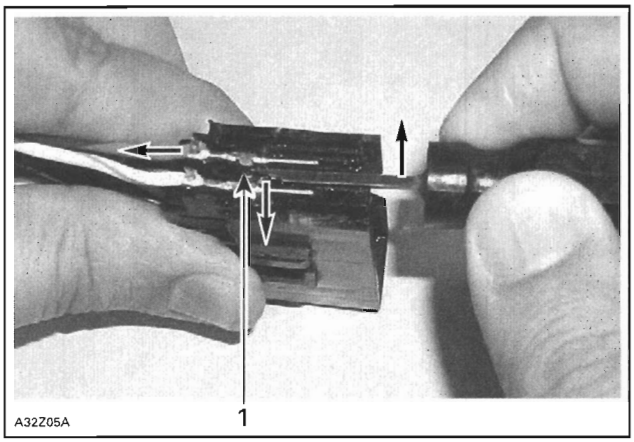
FEMALE TERMINAL HOUSING — CUT-AWAY
1. Lock

Female terminals can be removed from housing with sharp head pin.

Male Terminal Housing



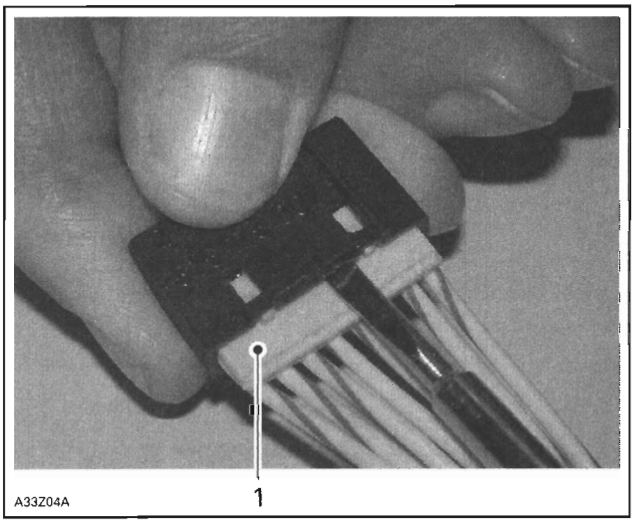
To remove:
- Insert tool AMP (P/N 755430-2) under lock and twist to lift it.



MALE TERMINAL HOUSING — CUT-AWAY
1. Lock

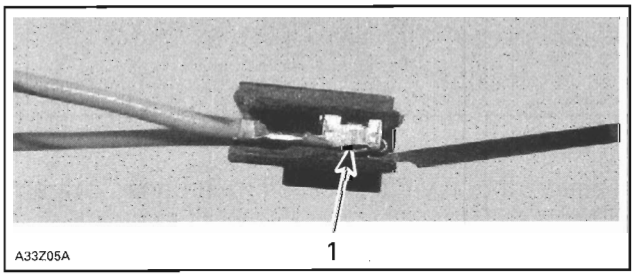
AMP 8-CIRCUIT CONNECTOR

Pry housing to release lock.



1. Lock

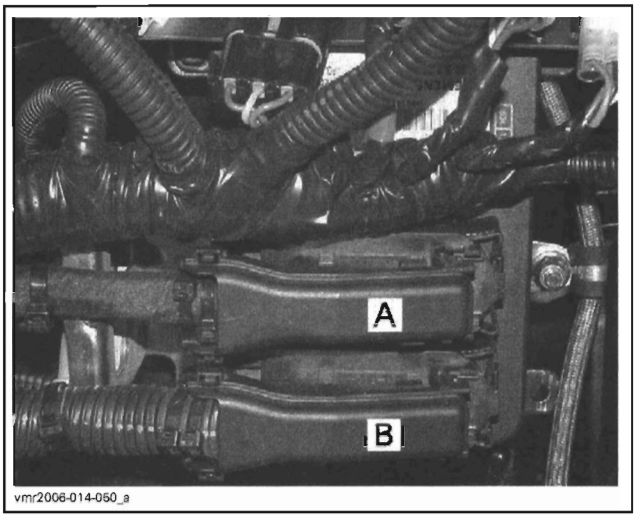
Insert tool AMP (P/N 755430-2) under tab and pry it to free connector. Pull on the female terminal wire to remove female terminal from housing.



AMP 8-CIRCUIT CONNECTOR — CUT-AWAY
1. Tab

ECM CONNECTORS

There are two ECM connectors used and they are connected on the ECM. The engine harness female connector is connected on the module male connector "A" and the vehicle system control harness female connector is connected to the module male connector "B". The ECM connectors have 41 pins.

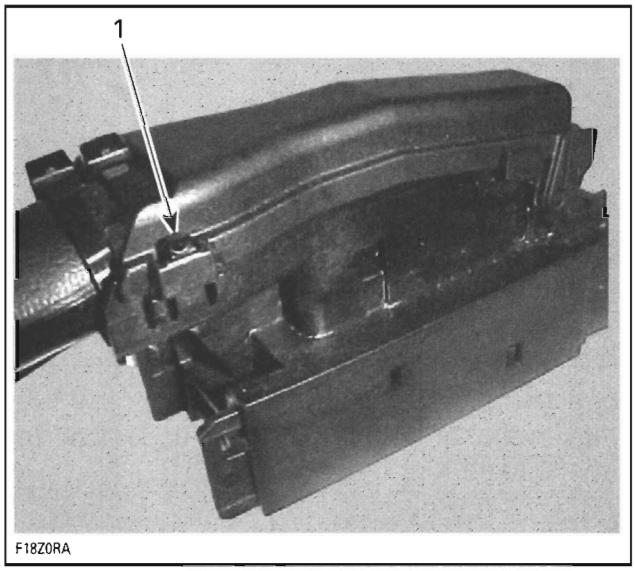


For probing techniques and tool, refer to *ENGINE MANAGEMENT*.

CAUTION: Do not disconnect the ECM connectors needlessly. They are not designed to be disconnected/reconnected frequently.

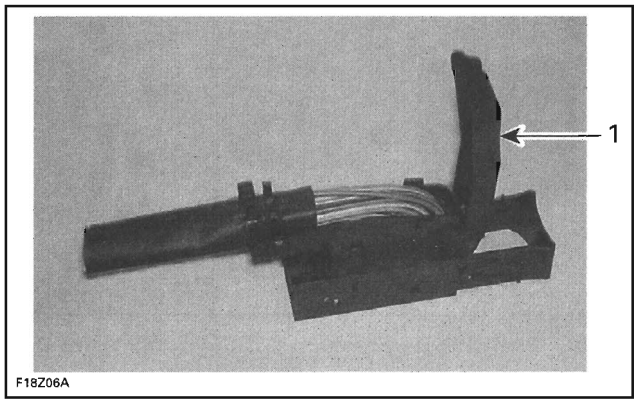
Terminal Removal

Unlock the connector cover by pushing in the tabs on top of the connector with a flat screwdriver to be able to flip the top cover up.



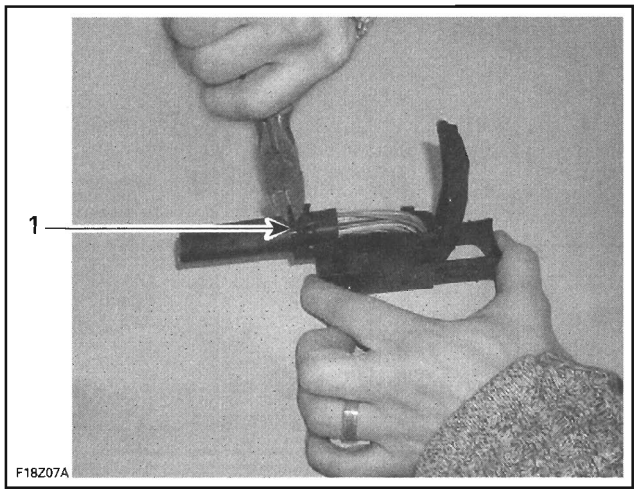
1. Push in tab

Lift the cover by pushing it forward.



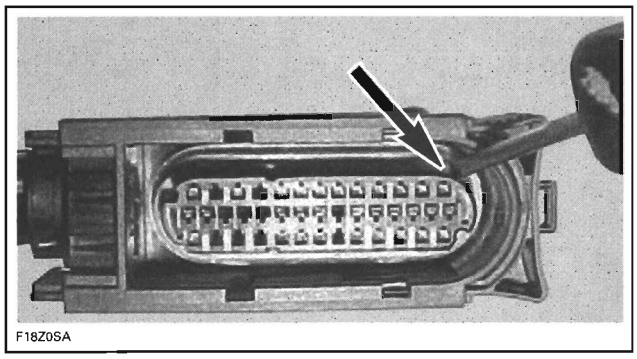
1. Cover

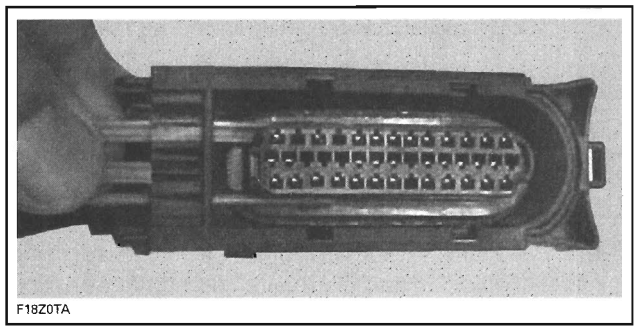
Cut both tie raps that secure the harness to the connector.



1. Tie raps

Turn the connector over and remove the orange locking tab by pushing and then pulling toward the wire harness.

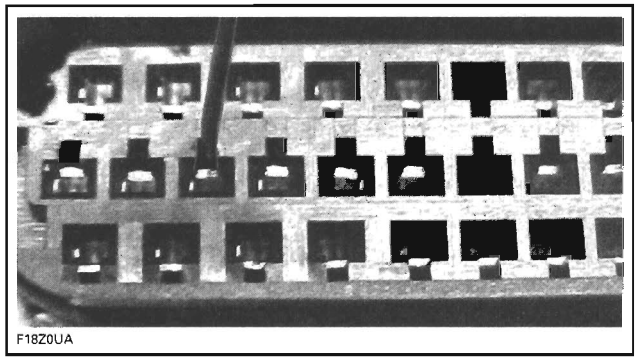


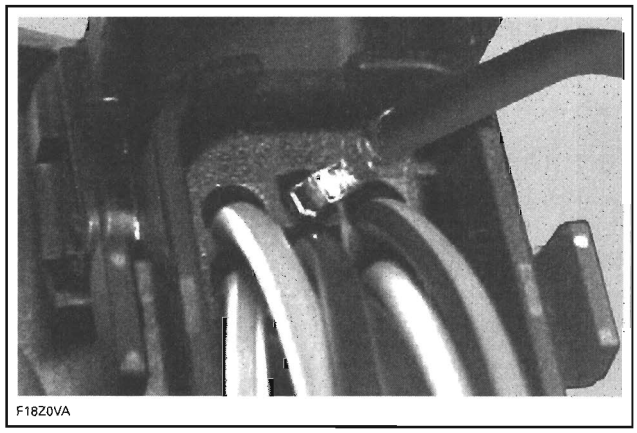


Use a Snap-on terminal remover (P/N TT600-1) tool (or a 0.76 mm (.030 in) oxyacetylene torch tip cleaner or a no. 68 drill bit) must be inserted into the terminal cavity to release the locking tab from the connector.

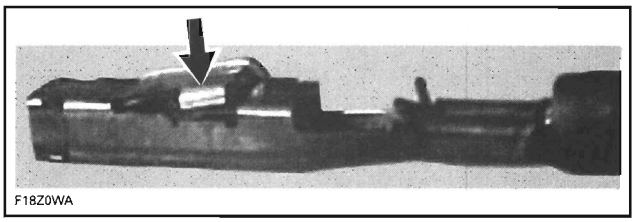
CAUTION: Using a tool tip larger than 0.76 mm (.030 in) may damage the terminal.

Insert the tool tip into the terminal cavity as shown, and locate its wire in the back of the connector. You may have to pry the tool tip against the locking tab to release it, then remove the terminal from the connector.





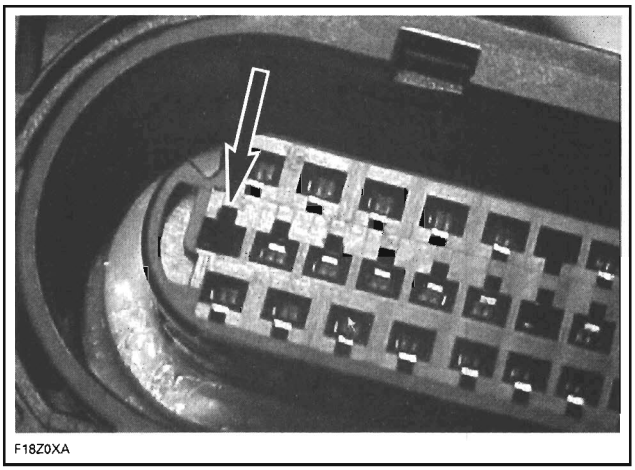
Check the locking tab on the terminal, it may have to be bent out a little so it will lock in its cavity when it is re-inserted.


F18Z0WA

If the wire is in good condition but the terminal is rusted or corroded, remove defective terminal and crimp a new one. If wire and terminal are defective, replace with a new genuine wire and new terminal and crimp them together as explained below.

IMPORTANT: Use genuine wires only. Otherwise wires will not fit properly.

When re-inserting the terminal, the locking tab must be installed facing the smaller cutout of the terminal cavity.

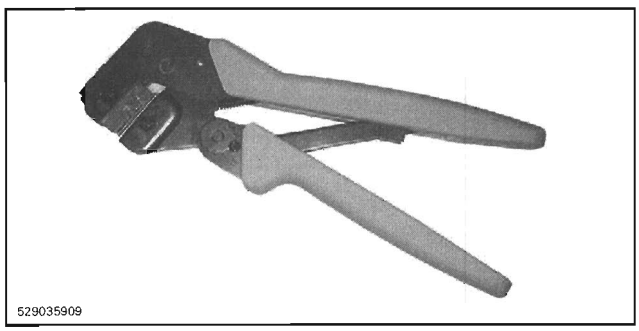

F18Z0XA

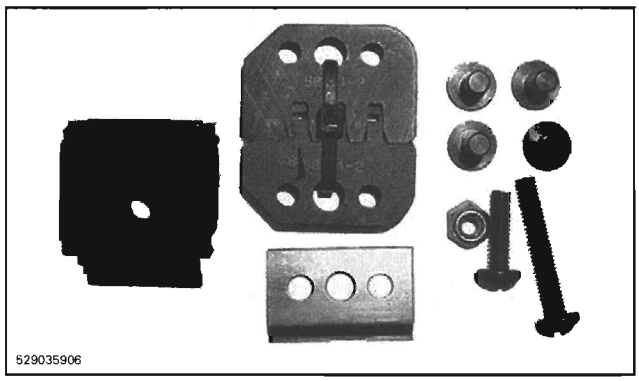
Insert the terminal, ensuring the locking tab snaps into its cavity.

Re-install the orange locking tab, attach the 2 tie raps, and close the connector cover.

Terminal Crimping (Kostal)

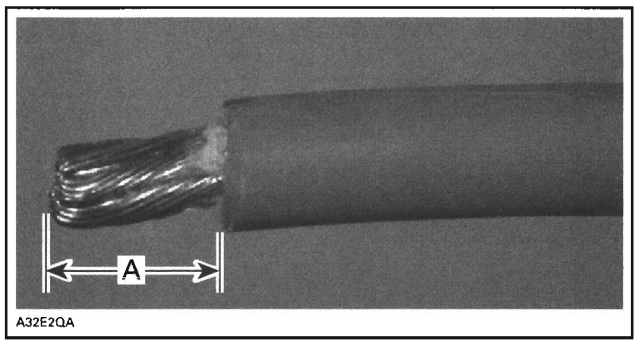
To crimp a new connector terminal, use the crimping tool (P/N 529 035 909) and the crimper die (P/N 529 035 906).


529035909


529035906

To properly crimp the wires, strictly follow this procedure.

Strip the wire to a maximum of 3 mm (1/8 in).

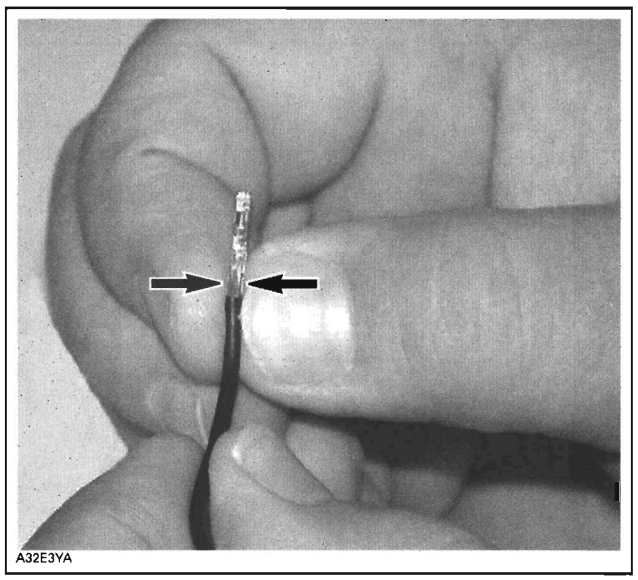


A32E2QA

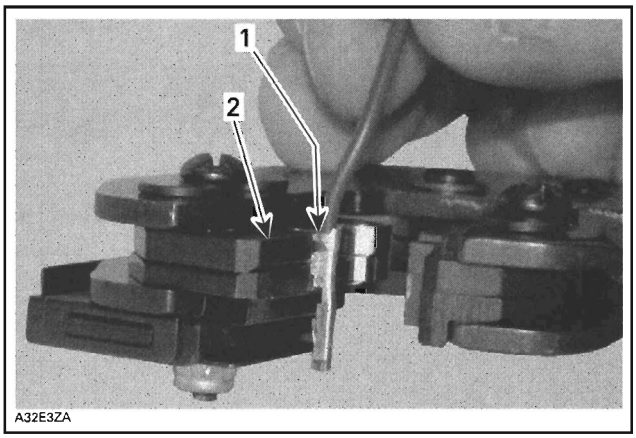
TYPICAL
A. 3 mm (1/8 in) max.

Position wire in terminal.

Squeeze the terminal tabs with your fingers to temporarily retain terminal in place.


A32E3YA

Insert terminal with wire in crimping pliers and position so that top of terminal tabs are flush with pliers edge or a little bit lower as shown.



1. Top of terminal tabs
2. Align tabs with pliers edge

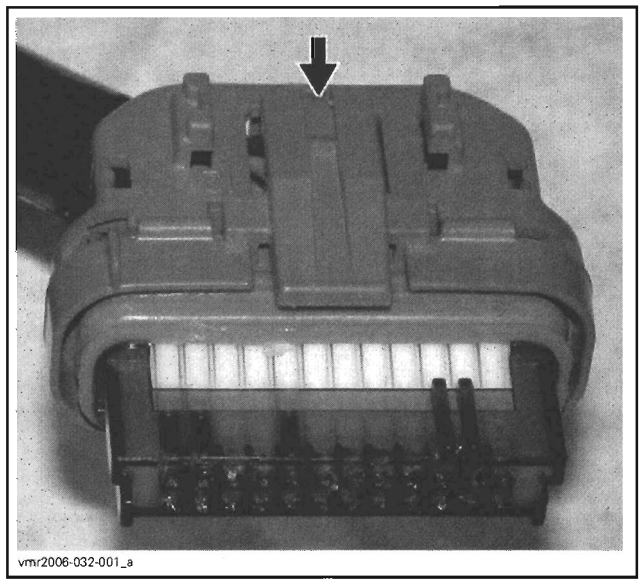
Crimp terminal. Ensure no tiny wire goes out of terminal. This might cause strange problems of the electrical system.

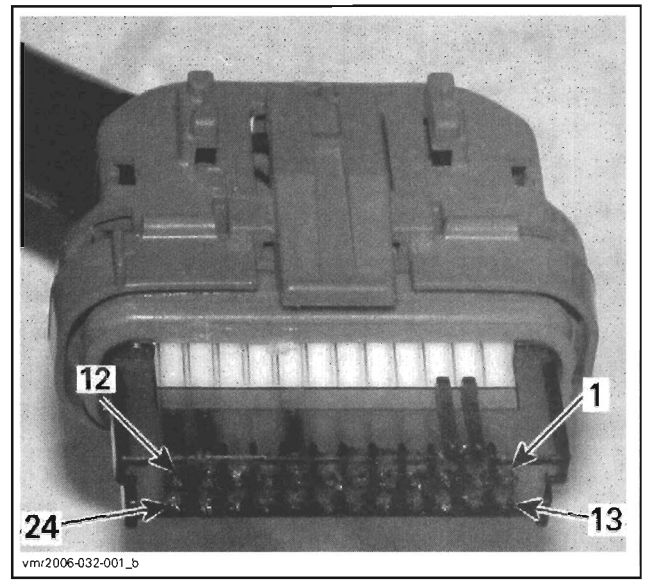
Lubrication

Do not apply any product to the pins of the connector on the ECM.

MULTIFUNCTION SPEEDOMETER CONNECTOR

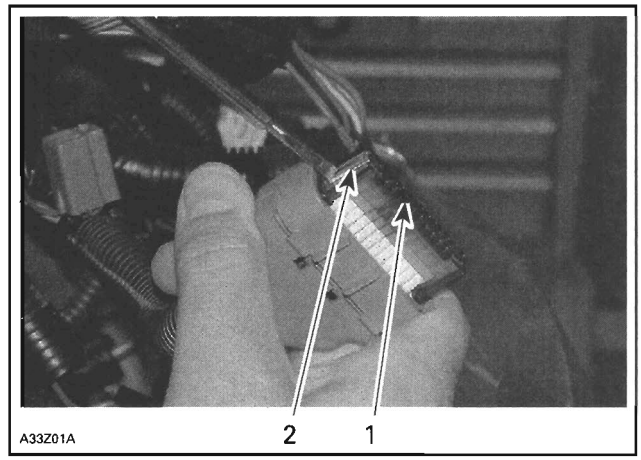
Firmly push down tab and hold to unlock connector while pulling it out.





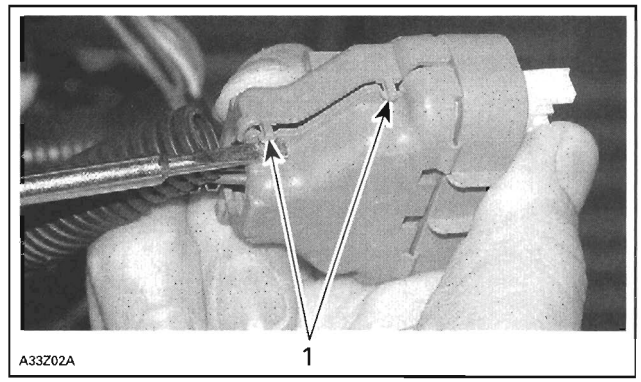
CONNECTOR PINOUT

Push on both tabs to remove retainer.



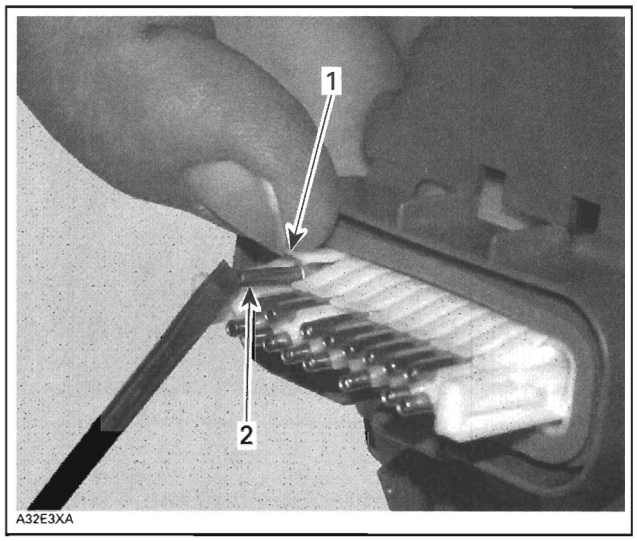
TYPICAL
1. Retainer
2. Tab (one on each side)

Open housing by lifting 4 tabs.



TYPICAL
1. Tabs (2 on each side)

Lift the top plastic lock of the female terminal to be removed and hold in position. Lift the female terminal to unlock from the housing and push out of housing.

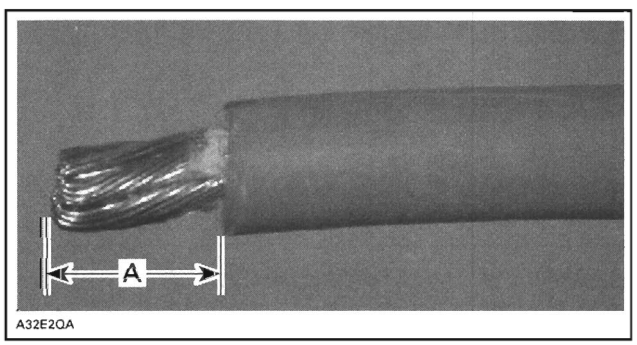


TYPICAL
1. *Lift and hold plastic lock*
2. *Lift to unlock and push out*

BATTERY CABLE TERMINAL

Terminal Installation

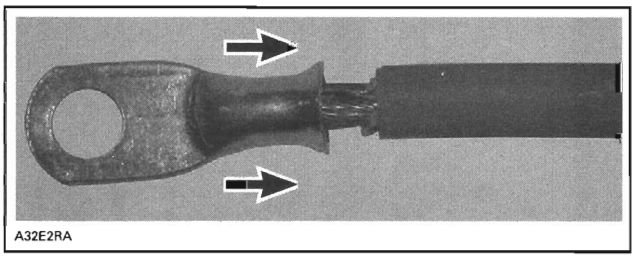
Carefully strip the wire approximately to 10 mm (1/2 in) in length, using a wire stripping tool or sharp blade/knife.



A. 10 mm (1/2 in)

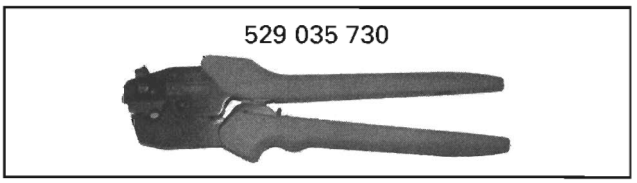
NOTE: Make sure not to cut wire strands while stripping the wire.

Install the appropriate terminal on the wire according to the requirement. Refer to appropriate *PARTS CATALOG*.

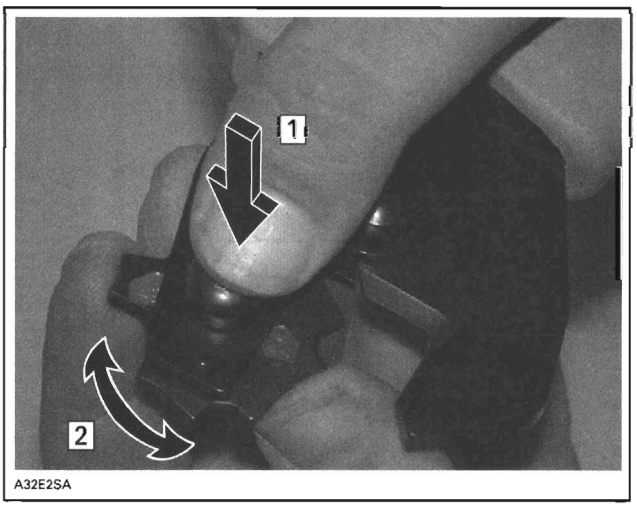


INSTALLATION OF TERMINAL

Follow the instructions provided with the crimp pliers (P/N 529 035 730) to select the proper position of the tool.

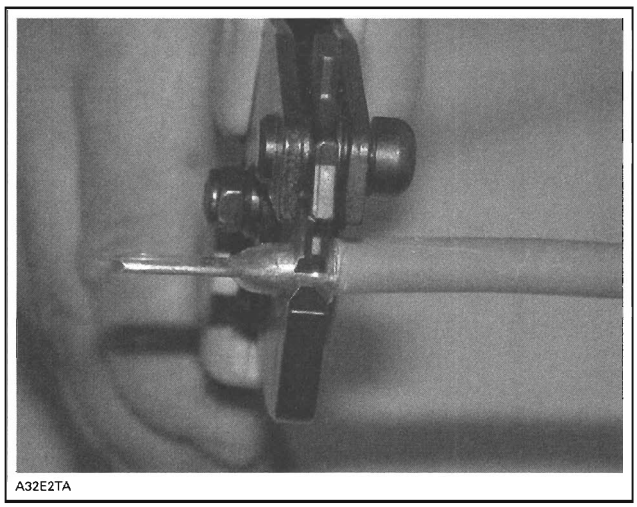


NOTE: Different wires require different crimp pliers settings, so make sure to follow the instruction supplied with the tool.

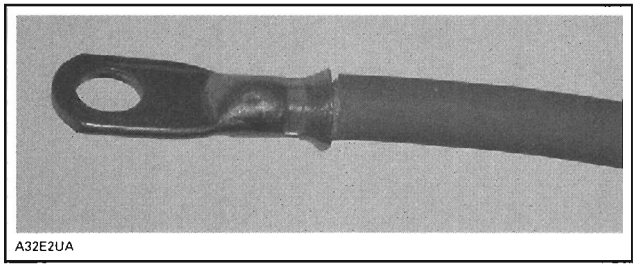


POSITIONING THE CRIMP PLIERS
Step 1: Press
Step 2: Rotate

After positioning the crimp pliers, crimp the terminal already installed on wire.



CRIMPING OF WIRE



PROPERLY CRIMPED WIRE

To verify, if the wire is properly crimped, apply some pulling force on wire and the terminal at the same time from both directions.

CAUTION: Never solder the wire to the terminal. Soldering can change the property of the wire and it can become brittle and break.

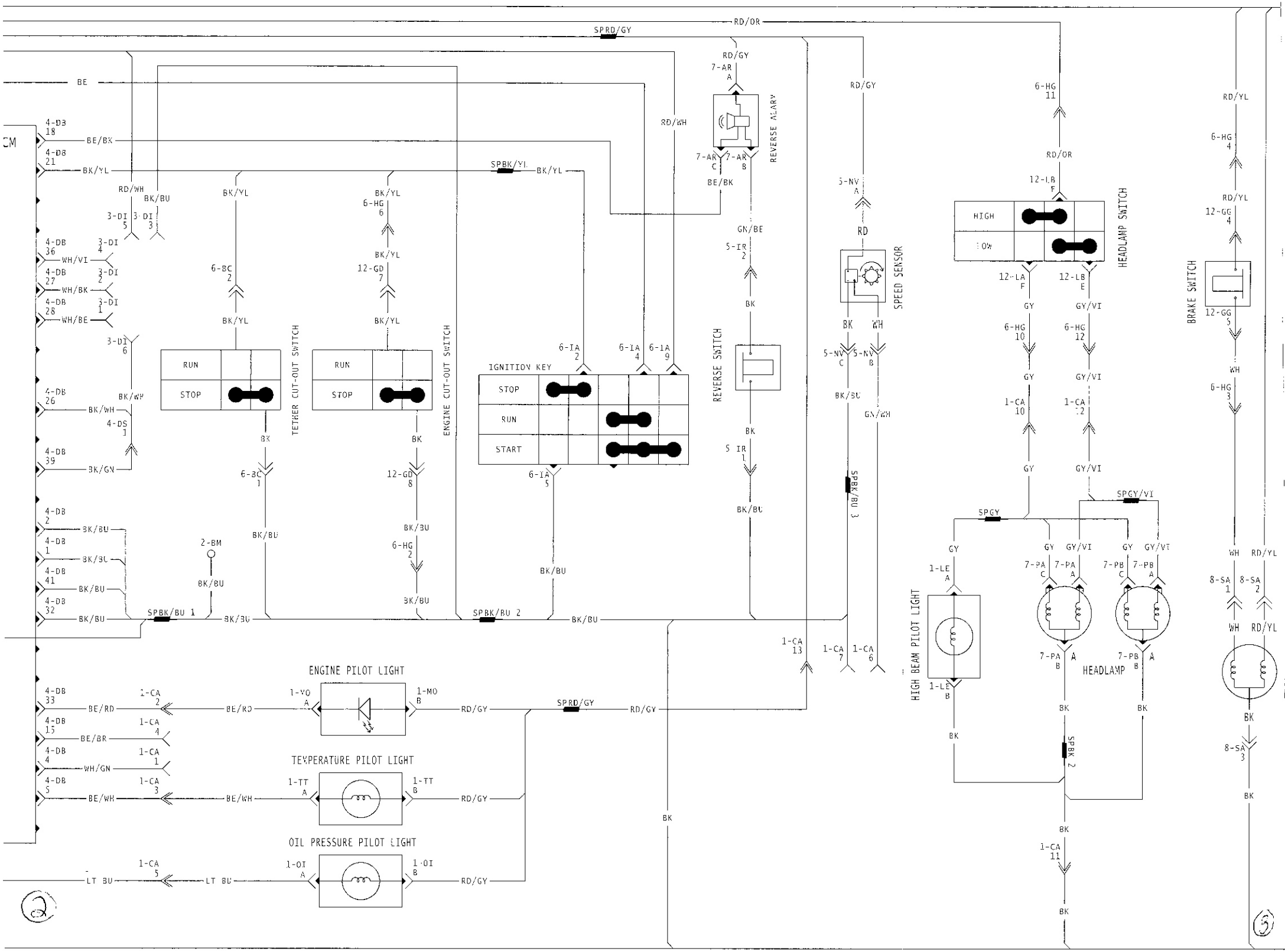
Install the protective heat shrink rubber tube on the terminal. Heat the heat shrink rubber tube using the heat gun so that it grasps the wire and the terminal.

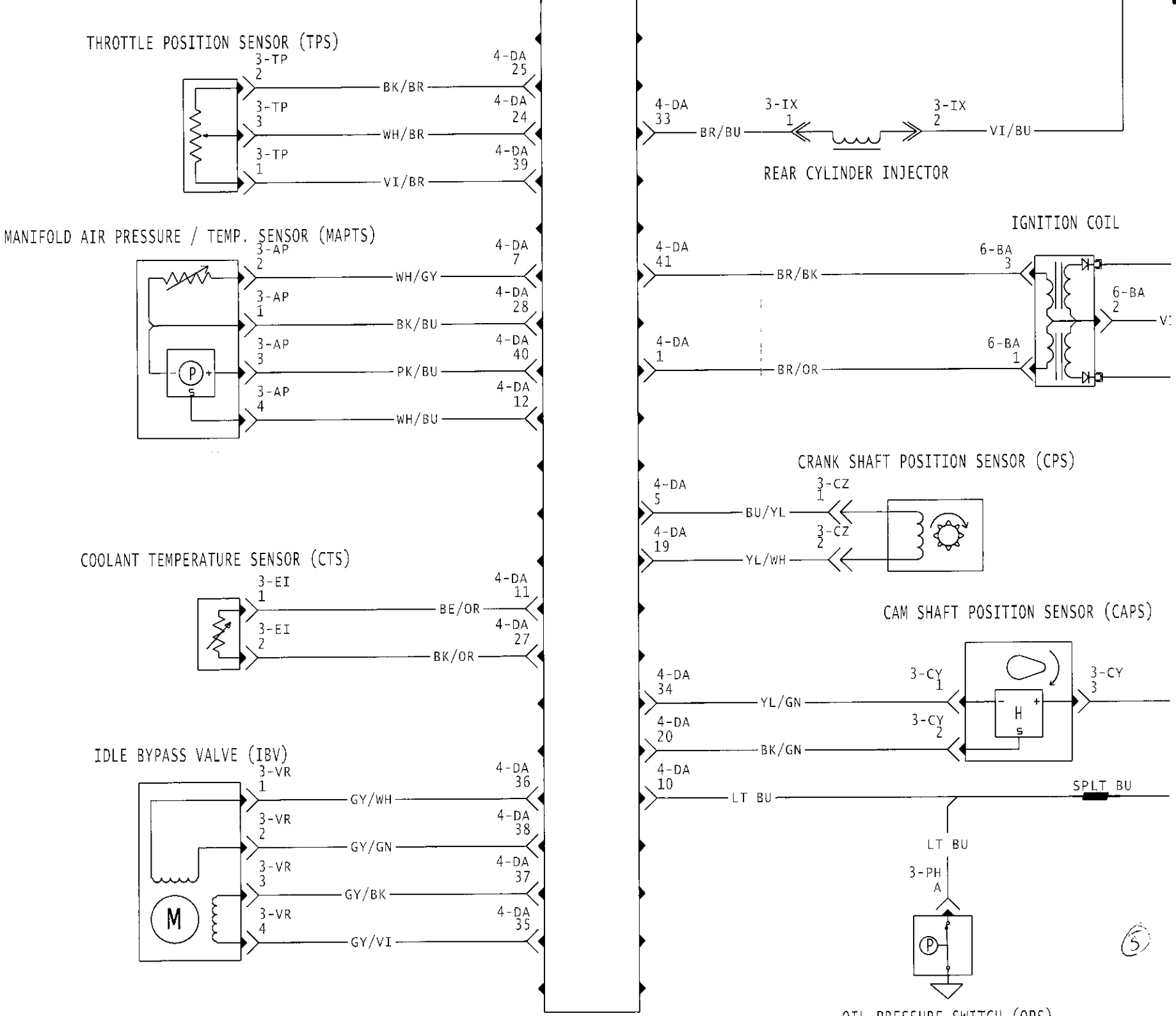
CAUTION: Make sure that the protective heat shrink rubber tube has been properly installed and no part of wire is exposed.

2007 LEGEND/TUNDRA (V800)

SPRD/WH 2
RD/WH
RD/WH
3-R1 RELAY
VI/RD
OR/BU
RD/GN
2-RE
RD/BU
MAGNETO
YL
YL
YL
REGULATOR
8K
2-RE
BK
SPRD/GN
RD/GN RD/GN RD/GN RD/GN
11-F1 11-F2 3-F3 11-F4
5A 10A 5A 5A
VI/BU VI/GY VI/PK RD/GY
RD/WH
RELAY
3-R2
RD/GY
OR/GN
11-F5 11-F6
20A 20A
RD/BU RD/BU
SPRD/BU
RD/BU
SPBE
OR/BU
1000µF
11-CD
VI/PI
BK/BL
25V
OR/GN
VI/PK
BR/PK
FUEL PUMP
6-CJ2 1 VI/BL
6-CJ2 2 VI/GY
6-CJ2 3 VI/PK
SPVI/GY
SPVI/PK
6-PE
VI/GY
VI/PK
BR/PK
11-D1
D1
OR/BK
SPOR/BK
4-SD
4-BP
SOLENOID
STARTER
SPVI/RD
VI/RD
11-FA
30A
RD
FRAME
FRAME
6-CJ2 4 LT BU

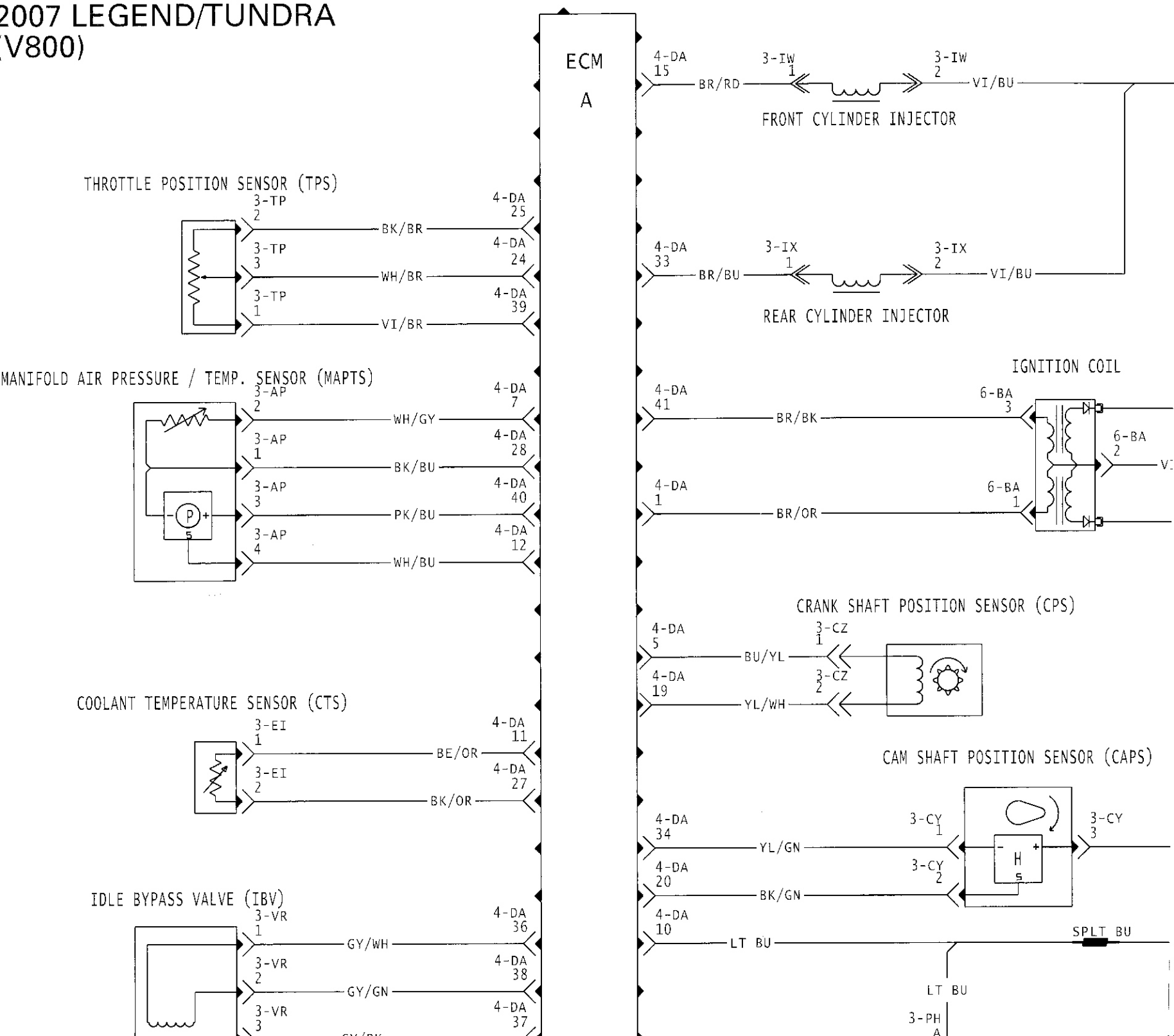
See back page

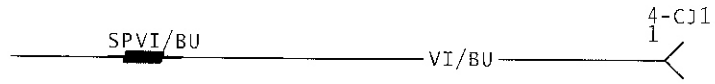

RD/OR
SPRD/GY
BE
RD/GY
7-AR A
REVERSE ALARM
7-AR C
7-AR B
BE/BK
RD/WH
4-D3 18
BE/BK
4-D8 21
BK/YL
SPBK/YL
BK/YL
RD/WH
BK/BU
3-DI 5
3-DI 3
BK/YL
6-HG 6
BK/YL
12-GD 7
GN/BE
5-IR 2
BK
4-DB 36
WH/VI
3-DI 4
4-DB 27
WH/BK
3-DI 2
4-DB 28
WH/BE
3-DI 1
6-BC 2
BK/YL
BK/YL
TETHER CUT-OUT SWITCH
ENGINE CUT-OUT SWITCH
RUN
STOP
RUN
STOP
IGNITION KEY
STOP
RUN
START
6-IA 2
6-IA 4
6-IA 9
6-IA 5
REVERSE SWITCH
BK
5 IR 1
BK/BU
5-NV A
RD
SPEED SENSOR
BK
WH
5-NV C
5-NV B
BK/BU
GN/WH
SPBK/BU 3
3-DI 6
BK/WH
4-DB 26
BK/WH
4-DS 1
4-DB 39
BK/GN
BK
6-BC 1
BK/BU
BK
12-GD 8
BK/BU
6-HG 2
BK/BU
2-BM
BK/BU
4-DB 2
BK/BU
4-DB 1
BK/BU
4-DB 41
BK/BU
4-DB 32
BK/BU
SPBK/BU 1
BK/BU
SPBK/BU 2
BK/BU
BK/BU
1-CA 13
1-CA 7
1-CA 6
6-HG 11
RD/OR
12-LB F
HIGH
LOW
HEADLAMP SWITCH
12-LA F
12-LB E
GY
GY/VI
6-HG 10
6-HG 12
GY
GY/VI
1-CA 10
1-CA 12
GY
GY/VI
SPGY/VI
SPGY
GY
GY
GY/VI
GY
GY/VI
1-LE A
7-PA C
7-PA A
7-PB C
7-PB A
HIGH BEAM PILOT LIGHT
HEADLAMP
1-LE B
7-PA B
7-PB B
BK
BK
BK
SPBK 2
BK
1-CA 11
BK
RD/YL
6-HG 4
RD/YL
12-GG 4
BRAKE SWITCH
12-GG 5
WH
6-HG 3
WH
RD/YL
8-SA 1
8-SA 2
WH
RD/YL
BK
8-SA 3
BK
ENGINE PILOT LIGHT
4-DB 33
BE/RD
1-CA 2
BE/RD
1-VO A
1-MO B
RD/GY
SPRD/GY
RD/GY
4-DB 15
BE/BR
1-CA 4
4-DB 4
WH/GN
1-CA 1
TEMPERATURE PILOT LIGHT
4-DB 5
BE/WH
1-CA 3
BE/WH
1-TT A
1-TT B
RD/GY
BK
OIL PRESSURE PILOT LIGHT
1-CA 5
LT BU
LT BU
1-OI A
1-OI B
RD/GY

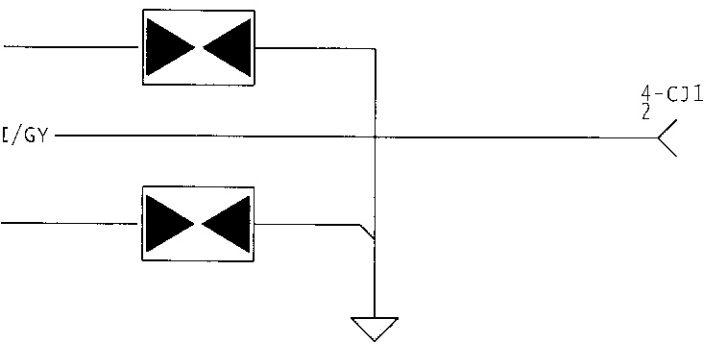


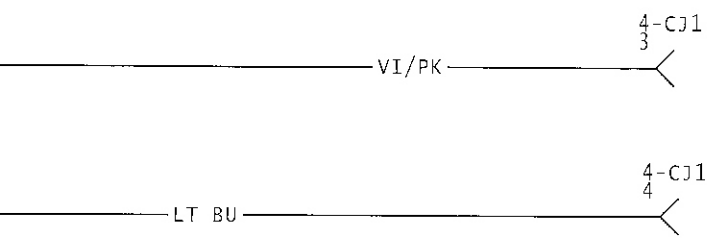
mmr2007-137-003

2007 LEGEND/TUNDRA
(V800)

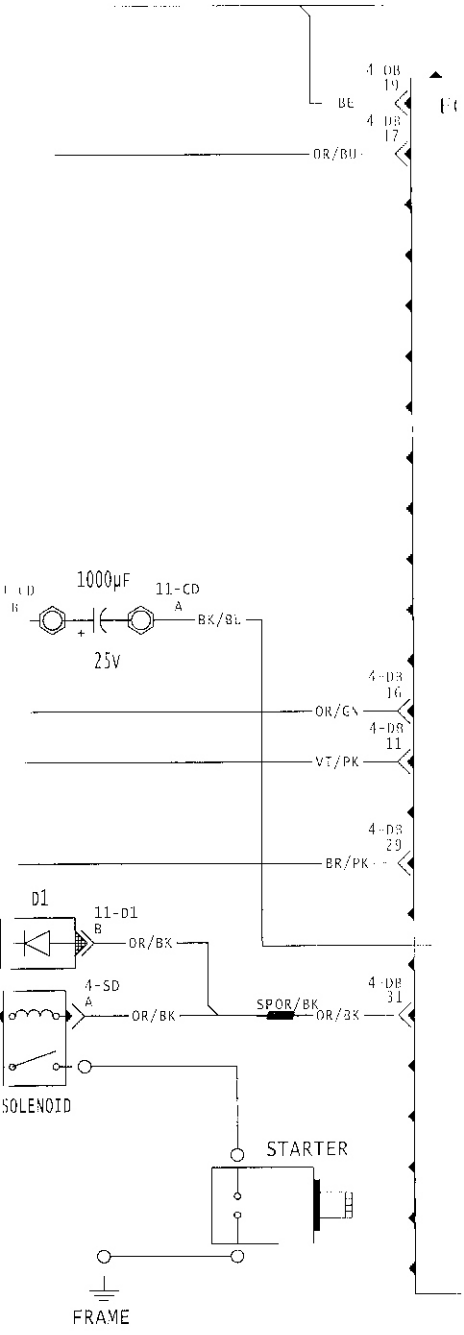




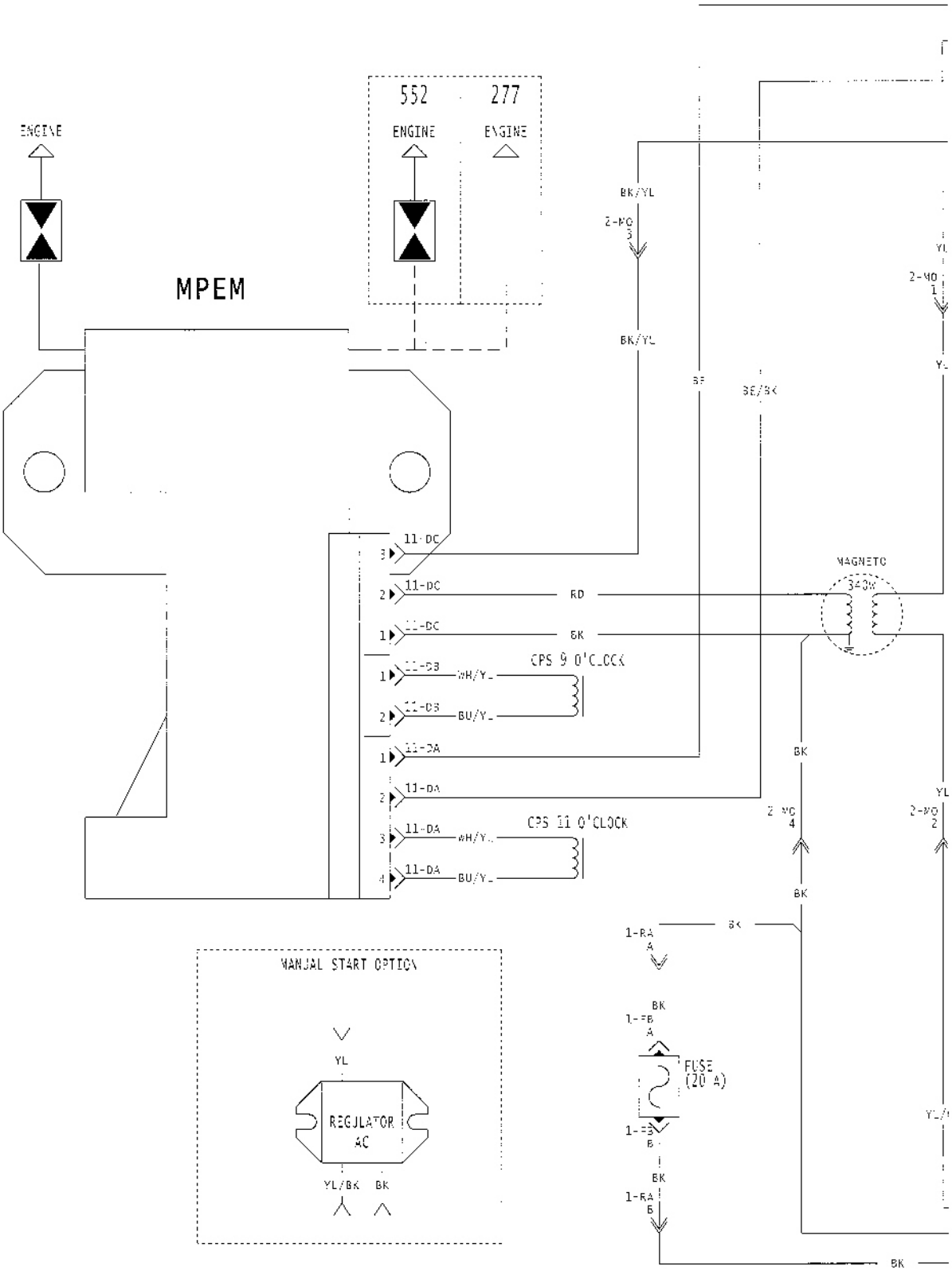


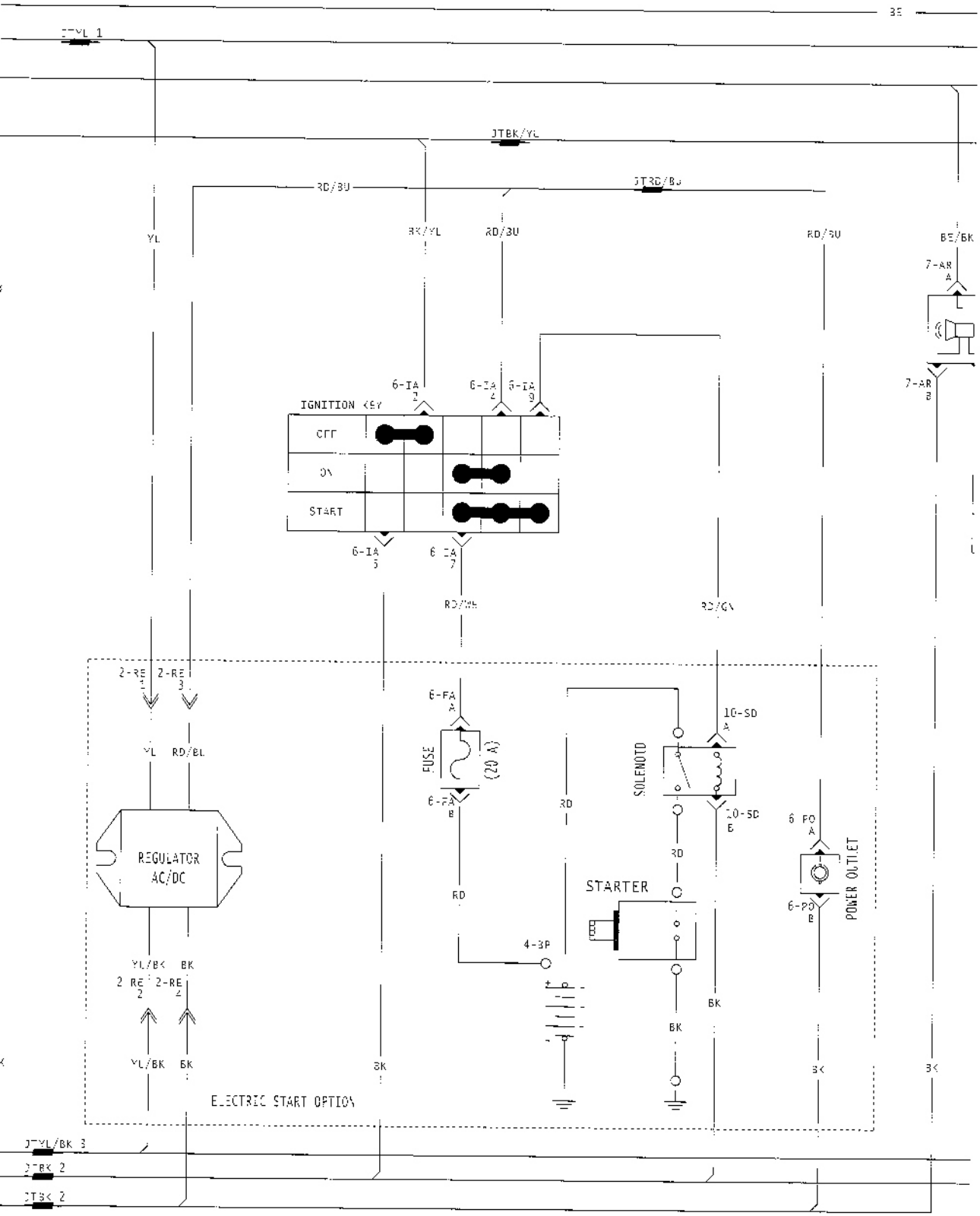


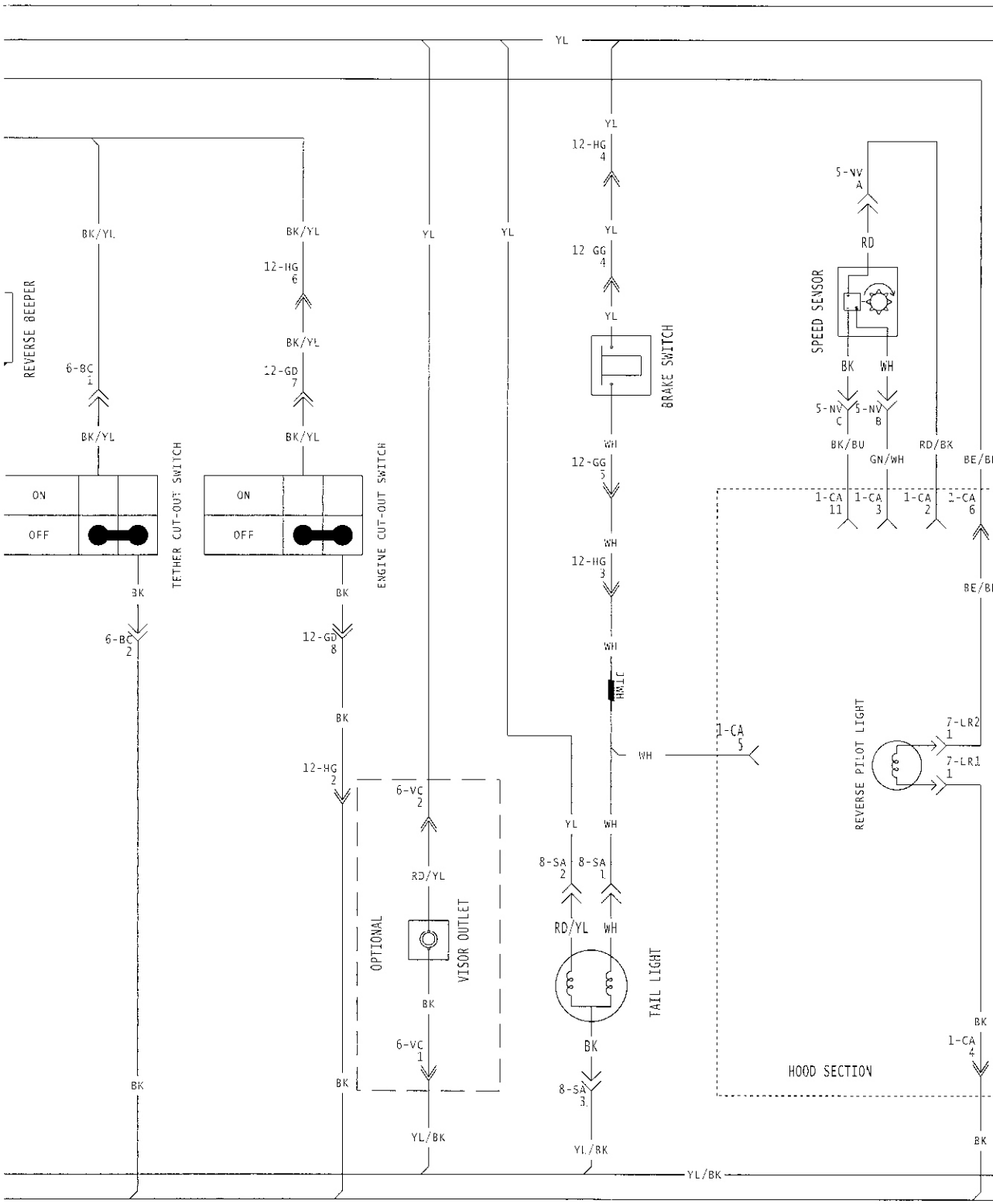
(6)

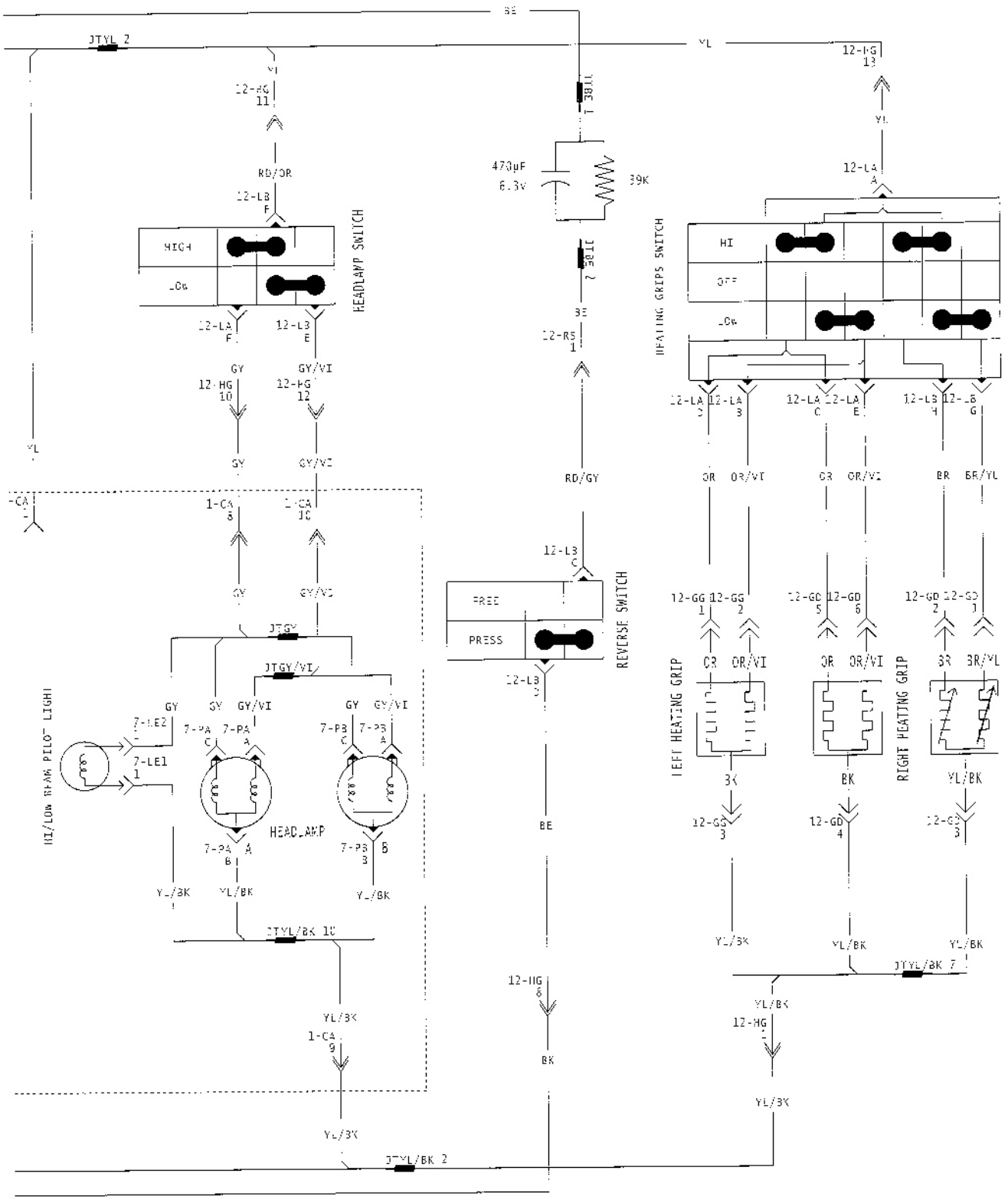

4-DB
19
BE
4-DB
17
OR/BU
1000µF
11-CD
A
BK/BL
25V
4-DB
16
OR/GN
4-DB
11
VT/PK
4-DB
29
BR/PK
D1
11-D1
B
OR/BK
4-SD
A
OR/BK
SPOR/BK
OR/BK
4-DB
31
SOLENOID
STARTER
FRAME

2007 FREESTYLE/TUNDRA/EXPEDITION (300F/550F)



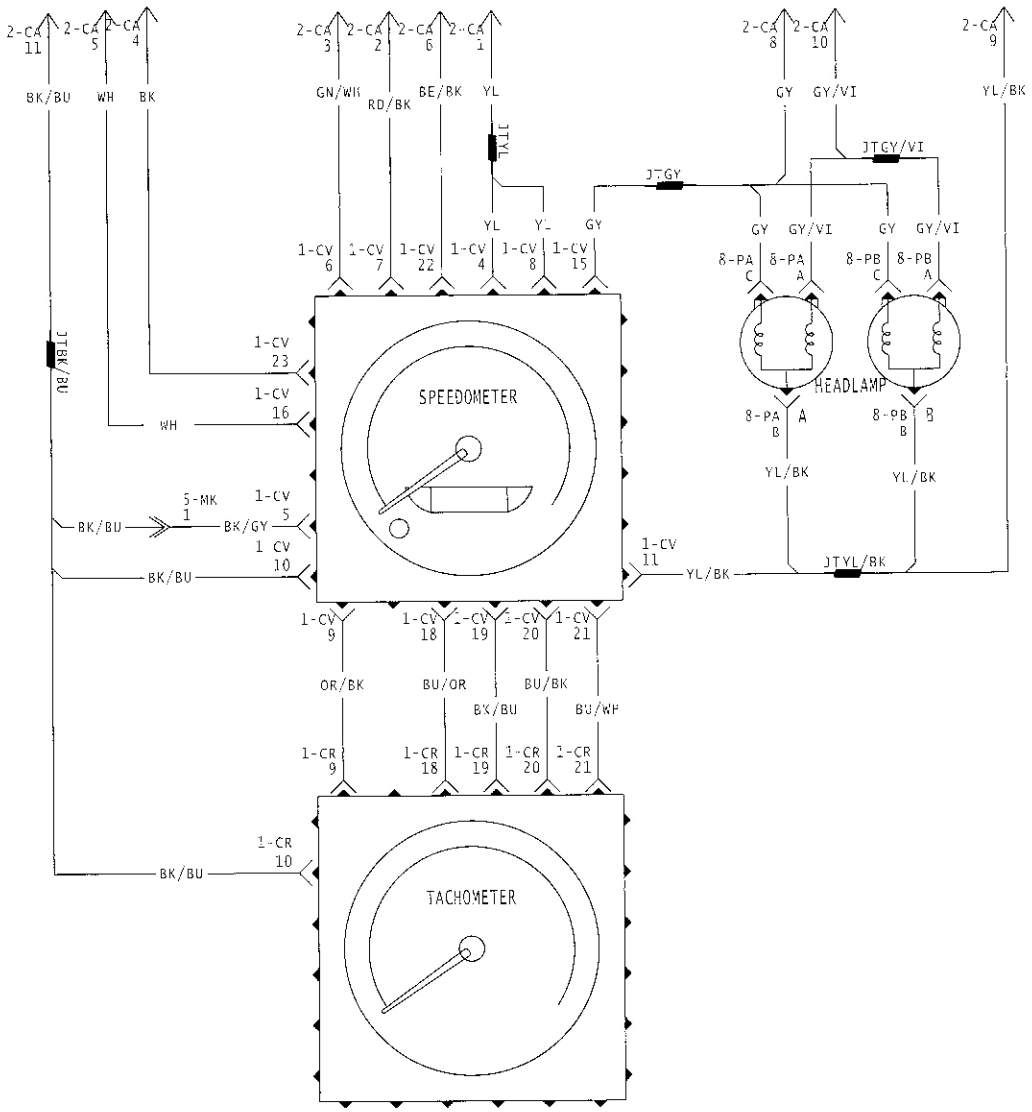

IGNITION KEY
OFF
ON
START
FUSE
(20 A)
SOLENOID
STARTER
REGULATOR
AC/DC
POWER OUTLET
ELECTRIC START OPTION


YL
REVERSE BEEPER
BK/YL
6-8C 1
BK/YL
TETHER CUT-OUT SWITCH
ON
OFF
BK
6-8C 2
BK/YL
12-HG 6
BK/YL
12-GD 7
BK/YL
ENGINE CUT-OUT SWITCH
ON
OFF
BK
12-GD 8
BK
12-HG 2
6-VC 2
RD/YL
OPTIONAL
VISOR OUTLET
BK
6-VC 1
YL/BK
YL
YL
12-HG 4
YL
12 GG 4
YL
BRAKE SWITCH
WH
12-GG 5
WH
12-HG 3
WH
1 KHM
WH
1-CA 5
YL
WH
8-SA 2
8-SA 1
RD/YL
WH
TAIL LIGHT
BK
8-SA 3
YL/BK
5-NV A
RD
SPEED SENSOR
BK
WH
5-NV C
5-NV B
BK/BU
GN/WH
RD/BK
BE/BL
1-CA 11
1-CA 3
1-CA 2
1-CA 6
BE/BL
REVERSE PILOT LIGHT
7-LR2 1
7-LR1 1
BK
1-CA 4
HOOD SECTION
BK
YL/BK


BE
JTYL 2
YL
12-HG 13
YL
12-HG 11
RD/OR
12-LB F
HIGH
LOW
HEADLAMP SWITCH
12-LA F
12-LB E
GY
GY/VI
12-HG 10
12-HG 12
GY
GY/VI
YL
1-CA 8
1-CA 10
GY
GY/VI
JTGY
JTGY/VI
GY
GY
GY/VI
GY
GY/VI
7-LE2
7-LE1 1
7-PA C
7-PA A
7-PB C
7-PB A
HI/LOW BEAM PILOT LIGHT
HEAD LAMP
7-PA B
7-PB B
YL/BK
YL/BK
YL/BK
JTYL/BK 10
YL/BK
1-CA 9
YL/BK
JTYL/BK 2
470μF 6.3V
39K
1 38LL
1 38LL
BE
12-RS 1
RD/GY
12-LB C
FREE
PRESS
REVERSE SWITCH
12-LB A
BE
12-HG 8
BK
12-LA A
HI
OFF
LOW
HEATING GRIPS SWITCH
HEATING LEVER SWITCH
12-LA 5
12-LA 3
12-LA C
12-LA E
12-LB 4
12-LB G
OR
OR/VI
OR
OR/VI
BR
BR/YL
12-GG 1
12-GG 2
12-GD 5
12-GD 6
12-GD 2
12-GD 1
OR
OR/VI
OR
OR/VI
BR
BR/YL
LEFT HEATING GRIP
RIGHT HEATING GRIP
BK
BK
YL/BK
12-GG 3
12-GD 4
12-GD 3
YL/BK
YL/BK
YL/BK
JTYL/BK 7
YL/BK
12-HG 7
YL/BK

4

SPEEDOMETER / TACHOMETER OPTION



HEATING LEVER

2007 REV POWER TEK ELECTRIC START