JOHN DEERE
WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION

Trail Buck Utility ATV
500, 650, 650EX and 650EXT

TM2160 MAY 2004

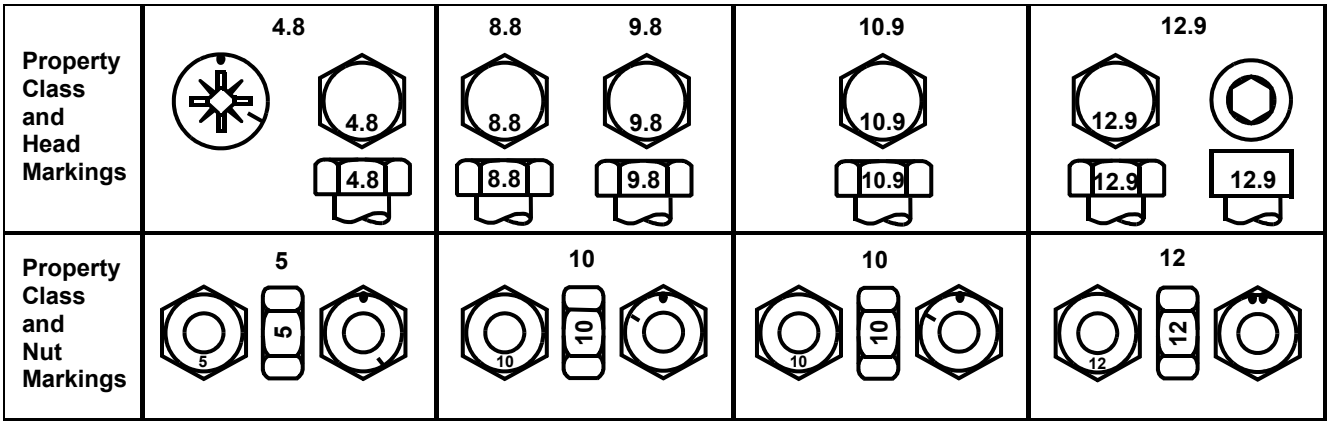
TECHNICAL MANUAL

JOHN DEERE

North American Version
Litho in U.S.A.

Fastener Torques

Metric Fastener Torque Values



MIF

	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated a		Dry a		Lubricated a		Dry a		Lubricated a		Dry a		Lubricated a		Dry a	
SIZE	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	109
M16	100	73	125	92	190	140	240	175	275	200	350	225	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a ±10% variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque values should be applied to the NUT instead of the bolt head.

Tighten toothed or serrated-type lock nuts to the full torque value.

a *“Lubricated” means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. “Dry” means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication*.

Reference: JDS - G200.

Camshaft Bore Magneto Side (New minimum)	39.984 mm (1.5742 in.)
Camshaft Bore Magneto Side (New maximum)	40.000 mm (1.5748 in.)
Camshaft Bore Magneto Side (Wear limit)	40.020 mm (1.5756 in.)
Cam Lobe Intake (New minimum)	31.369 mm (1.235 in.)
Cam Lobe Intake (New maximum)	31.569 mm (1.243 in.)
Cam Lobe Intake (Wear limit)	31.300 mm (1.232 in.)
Cam Lobe Exhaust (New minimum)	31.147 mm (1.226 in.)
Cam Lobe Exhaust (New maximum)	31.347 mm (1.234 in.)
Cam Lobe Exhaust (Wear limit)	31.100 mm (1.224 in.)

Crankshaft

Crankshaft Axial Clearance (New minimum)	0.2 mm (0.0078 in.)
Crankshaft Axial Clearance (New maximum)	0.5 mm (0.0196 in.)
Crankshaft Pin Diameter (New minimum)	45.017 mm (1.7723 in.)
Crankshaft Pin Diameter (New maximum)	45.033 mm (1.7729 in.)
Crankshaft Pin Diameter (Wear limit)	44.990 mm (1.7710 in.)
Crankshaft Journal Diameter MAG Side (New minimum)	54.976 mm (2.1644 in.)
Crankshaft Journal Diameter MAG Side (New maximum)	54.995 mm (2.1651 in.)
Crankshaft Journal Diameter MAG Side (Wear limit)	54.950 mm (2.1634 in.)
Crankshaft Journal Diameter PTO Side (New minimum)	45.974 mm (1.8099 in.)
Crankshaft Journal Diameter PTO Side (New maximum)	45.990 mm (1.8102 in.)
Crankshaft Journal Diameter PTO Side (Wear limit)	45.940 mm (1.8086 in.)
Crankshaft Radial Clearance MAG Side (Service limit)	0.07 mm (0.0028 in.)
Crankshaft Radial Clearance PTO Side (Service limit)	0.07 mm (0.0028 in.)

Connecting Rod

Connecting Rod Big End Diameter (Service limit)	45.080 mm (1.774 in.)
Connecting Rod Big End Clearance (Service limit)	0.09 mm (0.0035 in.)
Connecting Rod Big End Axial Play (New minimum)	0.150 mm (0.06 in.)
Connecting Rod Big End Axial Play (New maximum)	0.302 mm (0.01 in.)
Connecting Rod Big End Axial Play (Wear limit)	0.5 mm (0.02 in.)
Connecting Rod Small End Diameter (New minimum)	23.01 mm (0.9059 in.)
Connecting Rod Small End Diameter (New maximum)	23.02 mm (0.9063 in.)
Connecting Rod Small End Diameter (Wear limit)	23.07 mm (0.9080 in.)

Piston Pin

Piston Pin Diameter (New minimum)	22.996 mm (0.9053 in.)
Piston Pin Diameter (New maximum)	23.000 mm (0.9055 in.)
Piston Pin Diameter (Wear limit)	22.990 mm (0.9051 in.)
Piston Pin Bore Clearance (Wear limit)	0.080 mm (0.0035 in.)

Drive Belt (New nominal)	32.00 mm (1.260 in.)
Drive Belt (Service limit)	30.00 mm (1.181 in.)

Governor Cup Roller Diameter (New minimum)	13.70 mm (0.539 in.)
Governor Cup Roller Diameter (New maximum)	13.90 mm (0.547 in.)
Governor Cup Roller Diameter (New minimum)	13.20 mm (0.519 in.)

Centrifugal Lever

Centrifugal Lever Pivot Bolt Diameter (New minimum)	6.078 mm (0.239 in.)

ENGINE SPECIFICATIONS

Specifications

Engine Specifications - 500

Stroke (500 cc Engine)	63 mm (2.5 in.)
Displacement (500 cc Engine)	498 cc (30.4 cu in.)
Horsepower @ 7200 rpm (500 cc Engine)	27.6 kW (37 hp)

Engine Specifications - 650

Stroke (650 cc Engine)	82 mm (3.2 in.)
Displacement (650 cc Engine)	644 cc (39.3 cu in.)
Horsepower @ 7100 rpm (650 cc Engine)	31.3 kW (42 hp)

Engine Specifications - 500 and 650

General Specifications

Make	Rotax 4-TEC, 4 stroke Over Head Camshaft (OHC), Liquid cooled
Starting System	Electric with Optional Recoil
Number of Cylinder(s)	1
Number of Valves	4 valves
Decompressor Type	Automatic
Bore (Standard)	100 mm (3.9 in.)
Compression Ratio	9.5:1
Maximum HP RPM	7000 ± 100 rpm
Lubrication	Wet sump with replaceable oil filter (lubrication of engine and transmission simultaneously)
Oil Filter	Full flow
Air Filter Type	2 stage foam filter
Exhaust System Type	Nelson, stainless steel
Exhaust System Spark Arrester	USDA approved

Valves

Intake Valve Opening	10.0° BTDC
Intake Valve Closing	55.0° ABDC
Exhaust Valve Opening	50.0° BBDC
Exhaust Valve Closing	5.0° ATDC
Intake Valve Stem Diameter (New minimum)	5.961 mm (0.2347 in.)
Intake Valve Stem Diameter (New maximum)	5.975 mm (0.2352 in.)
Intake Valve Stem Diameter (Wear limit)	5.930 mm (0.2330 in.)
Exhaust Valve Stem Diameter (New minimum)	5.946 mm (0.2341 in.)
Exhaust Valve Stem Diameter (New maximum)	5.960 mm (0.2346 in.)
Exhaust Valve Stem Diameter (Wear limit)	5.930 mm (0.2330 in.)
Valve Guide Diameter (Wear limit)	6.060 mm (0.2386 in.)
Valve Spring Free Length (New)	45.45 mm (1.789 in.)
Valve Spring Free Length (Wear limit)	43.00 mm (1.693 in.)
Intake Valve Seat Contact Width (New)	1.10 to 1.30 mm (0.043 to 0.051 in.)
Intake Valve Seat Contact Width (Wear limit)	1.8 mm (0.07 in.)
Exhaust Valve Seat Contact Width (New)	1.25 to 1.55 mm (0.049 to 0.061 in.)
Exhaust Valve Seat Contact Width (Wear limit)	2.0 mm (0.078 in.)

Symptom: Gear(s) Is (Are) Hard To Shift

(10) Isolating washer located on the shift drum is worn and/or damaged?

Yes - Replace isolating washer.

No - Go to next step.

(11) Shift fork(s) is (are) worn out and/or engagement pins are damaged?

Yes - Replace shift fork(s).

No - Go to next step.

(12) Shift fork(s) is (are) worn out and/or fork(s) is (are) damaged?

Yes - Replace shift fork(s).

No - Go to next step.

(13) Shift gear(s) is (are) worn out?

Yes - Replace shift gear(s).

CVT

Symptom: The UATV Accelerates Slowly, Especially When It Is Stopped

(1) Check for possible water/dirt intrusion. Water/dirt inside CVT area?

Yes - Unscrew drain screw and/or remove CVT cover and clean CVT area from contamination.

No - Go to next step.

(2) Oil leakage out of crankcase PTO and/or oil seal(s) (slipping belt)?

Yes - Replace damaged part(s) (refer to “Gearbox”).

No - Go to next step.

(3) Check drive belt condition. Belt is too narrow (drive belt engagement RPM is higher than normal)?

Yes - Replace belt if width is less than specified (refer to “CVT” and/or Specifications" section).

No - Go to next step.

(4) Check roller(s) on governor cup and/or lever condition on drive pulley sliding half. Roller(s) is (are) worn and/or damaged (refer to CVT)?

Yes - Replace governor cup assembly.

No - Go to next step.

(5) Lever(s) on drive pulley sliding half is (are) worn and/or damaged (refer to CVT)?

Yes - Replace governor cup assembly.

Symptom: The UATV Accelerates Slowly, Especially When It Is Stopped

No - Go to next step.

(6) Check drive pulley sliding half for free axial movement. Sliding half is stuck (refer to CVT)?

Yes - Replace damaged part(s).

No - Go to next step.

(7) Check condition of drive/driven pulley spring. Drive pulley spring tension is too smooth and/or damaged (refer to CVT)?

Yes - Replace spring.

No - Go to next step.

(8) Driven pulley spring tension is too stiff (refer to CVT)?

Yes - Replace spring.

No - Go to next step.

(9) Check carburetor adjustment and/or high altitude calibration. Carburetor is not adjusted according to specified values and/or high altitude calibration?

Yes - Readjust carburetor/

Symptom: Engine Maximum RPM Is Too High And Top Speed Is Not Reached

(1) Check items 1 to 4 of “The UATV Accelerates Slowly, Especially When It Is Stopped”. Check drive/driven pulley spring tension. Drive pulley spring tension is too stiff?

Yes - Replace spring (recommended spring).

No - Go to next step.

(2) Driven pulley spring tension is too smooth and/or damaged (refer to CVT)?

Yes - Replace spring.

Symptom: Drive Pulley Noise In Idle Speed

(1) Check slider shoes (drive pulley). Worn slider shoes (increased clearance between governor cup and drive pulley sliding half)?

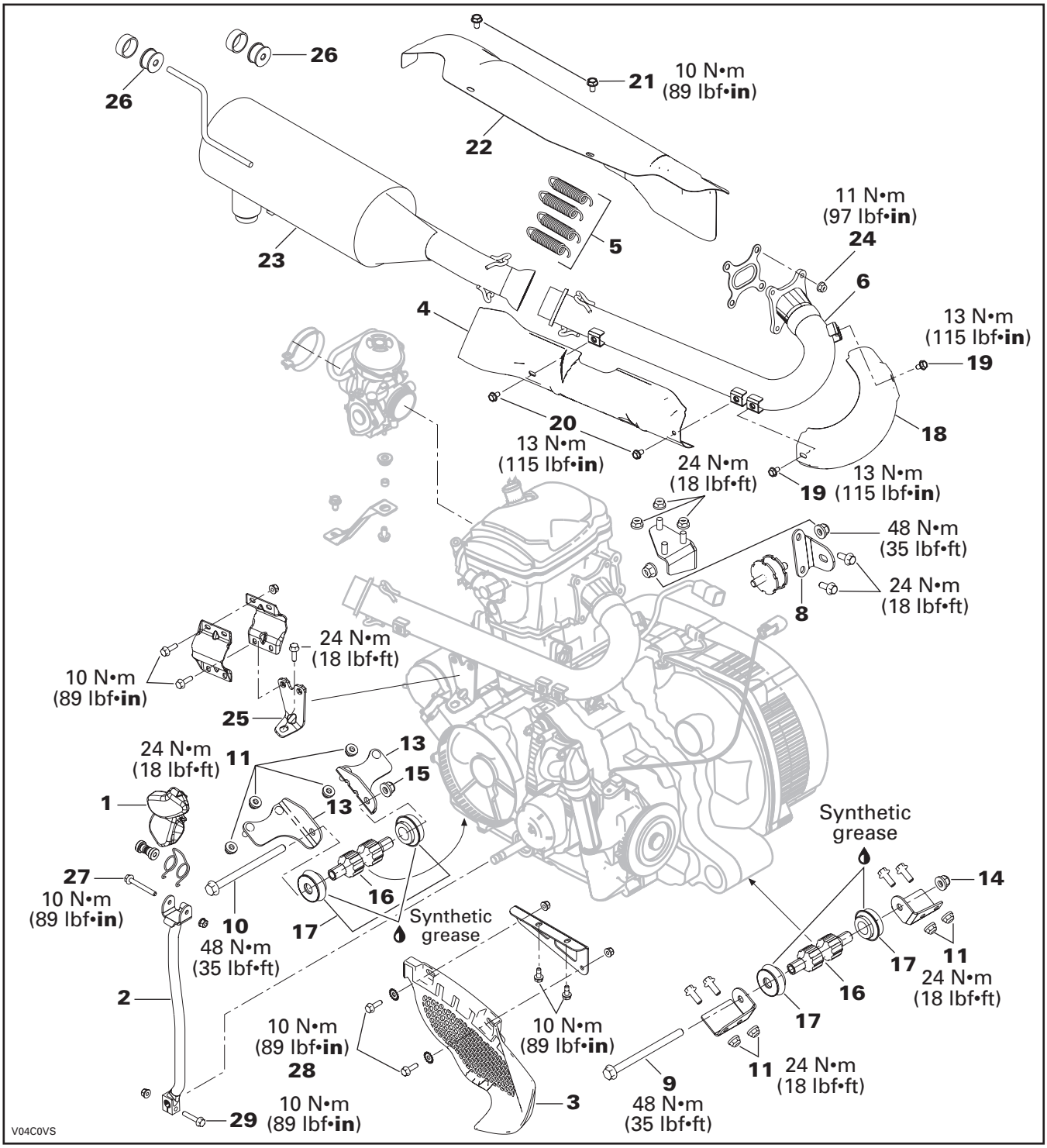
Yes - Replace all slider shoes at the same time (slider shoes kit).

No - Go to next step.

(2) Check drive pulley sliding mechanism (between drive pulley outer and inner half). Mechanism is stuck and/or damaged?

Yes - Replace drive pulley assembly.

Repair **Component Location**



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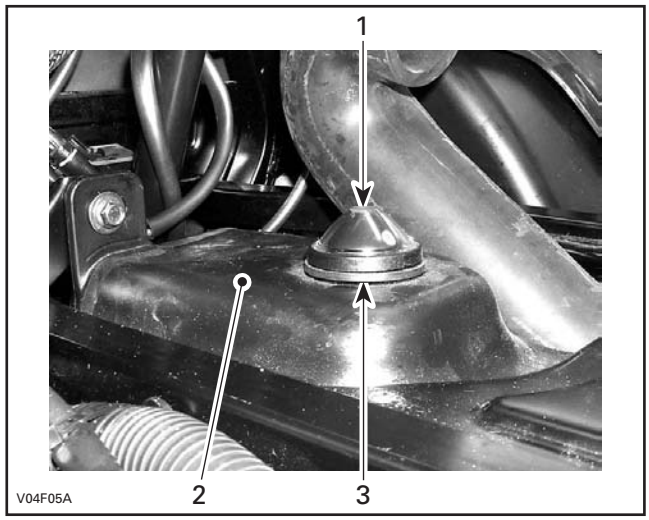
Engine Removal

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 seat.

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



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Typical

A - Fuel Gauge (1)
B - Fuel Tank (2)
C - Fuel Gauge Gasket (3)

Installation:

The installation is the reverse of the removal procedure.

NOTE: Check gasket for crack or other damage. Change if necessary.

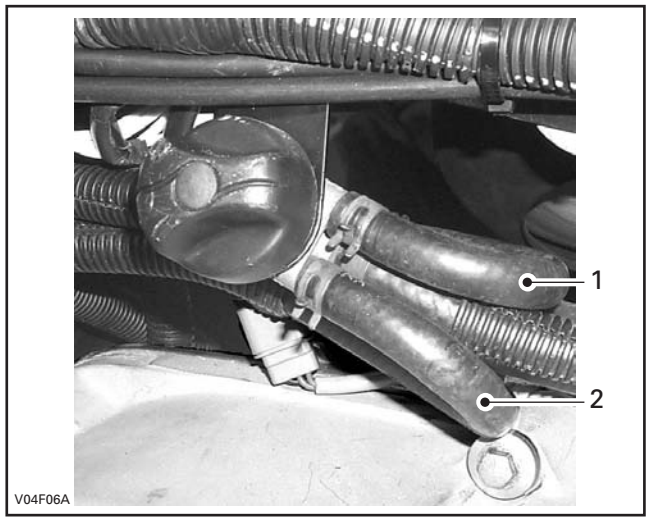
Fuel Tank Draining

Turn fuel valve OFF.

Remove:

- Engine skid plate
- LH engine side panel.

Install hose pincher (P/N JDG 295 000 076) on reserve fuel hose.



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Typical

A - Reserve Fuel Hose (1)
B - Main Fuel Hose (2)

Disconnect the reserve fuel hose no. 4 from fuel tank.

Place an approved fuel container under engine then bring the reserve fuel hose into the container.

Remove the hose pincher to drain the fuel tank.

NOTE: To accelerate fuel tank draining and ensure complete draining, remove cap no. 5.

Fuel Tank Strainer

NOTE: The fuel tank has two fuel hose strainers. Use the following procedure for both fuel lines.

Removal:

Close fuel valve no. 6.

Remove:

- console
- RH and LH engine side panels
- RH foot rest.

Drain fuel tank, refer to FUEL TANK DRAINING.

Manually pull grommet no. 7 out of fuel tank.

NOTE: In the case that grommet is too tight, use a flat screwdriver and carefully pull out grommet, as shown in the next photo.

V01n02a2.EPS

Typical - Use screwdriver only if grommet is too tight

Inspection:

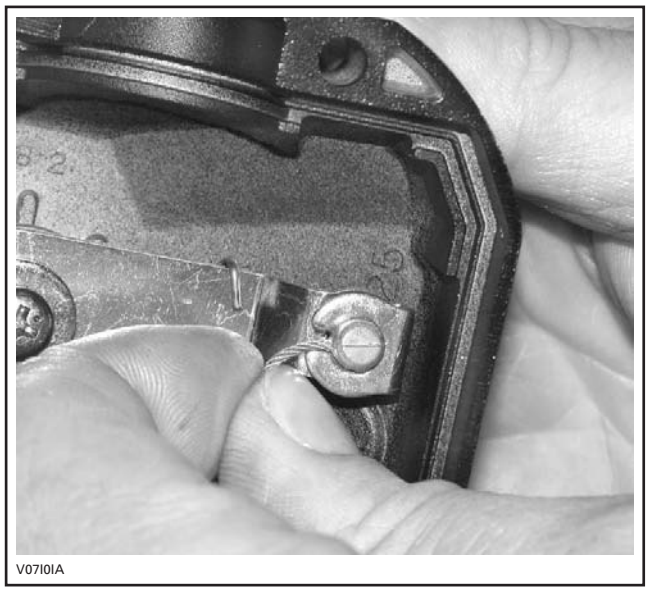
Ensure that fuel tank strainer no. 8 and fuel line are clean and not damaged, as per following photo.

V07i0hA3.EPS

Inner Housing Protector (1)

- inner housing protector
- the cable from the throttle lever housing.

NOTE: Slide cable in clip slot and remove the end of cable from clip.



V07i0iA3.EPS

Remove the carburetor side cover.

Insert the needle of spray can in the end of throttle cable adjuster.

CAUTION: Avoid Injury! Always wear eye protection and gloves when lubricating cables.

NOTE: NOTE: Place a rag around cable luber to prevent lubricant splash.

Put lubricant until it passes through the cable.

Clean lubricant surplus in carburetor housing.

Reinstall carburetor cover and cable in throttle housing.

Adjust cable, see below.

Installation:

For installation, reverse the removal procedure.

Adjustment:

CAUTION: Avoid Injury! Ensure the key is turned OFF, prior to perform the throttle cable adjustment.

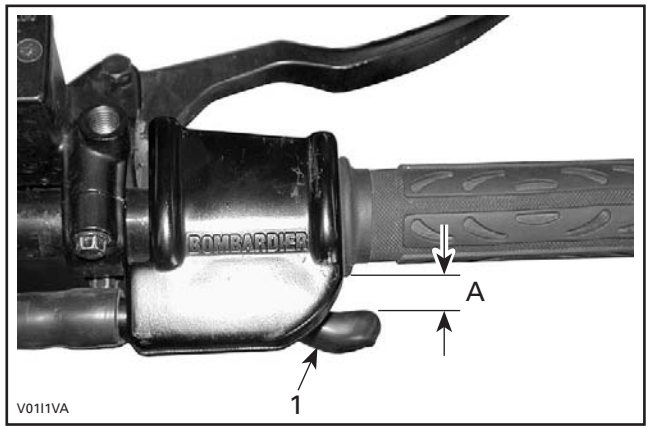
Before adjusting the throttle cable, adjust idle speed (preliminary adjustment) and choke.

Slide rubber protector back to expose throttle cable adjuster.

Loosen lock nut then turn the adjuster to obtain correct throttle lever free play.

NOTE: Measure throttle free play at the tip of throttle lever.

Tighten lock nut and reinstall protector.



V01i1VA3.EPS

A - Throttle Lever (1)

B - 3 to 6 mm (1/8 to 7/32 in.) (A)

With the transmission lever on PARK position, start the engine. Check if the throttle cable is adjusted correctly by turning handlebar fully right then fully left. If the engine RPM increases, readjust the throttle lever free play. Before readjusting, check the cable routing.

Choke Cable

Removal:

NOTE: To ease reinstallation, take note cable routing.

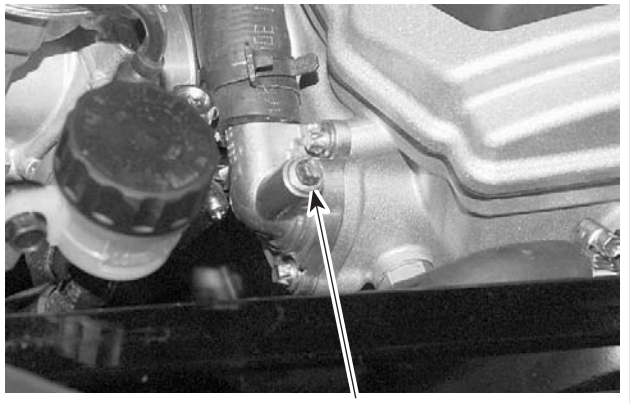
Carburetor Side:

Remove the LH side panel.

Unscrew choke plastic nut from carburetor.

Pull choke cable to remove choke plunger from carburetor.

Remove the choke plunger and its spring.



R610motr26a2.EPS

A - Bleeding Screw (1)

With vehicle on a flat surface, engine cold, refill radiator no. 18. When the coolant comes out by the thermostat housing hole, install the bleeding screw and remove the hose pincher. Install the radiator cap.

NOTE: Do not forget gasket ring when bleeding screw is installed. Torque bleeding screw to 10 N•m (89 lb-in.).

Refill coolant tank no. 16 up to cold level mark. Install the coolant tank cap. Run engine until thermostat opens then stop engine.

When engine has completely cooled down, recheck coolant level in radiator and coolant tank and top off if necessary.

Every 100 hours or once a year, check coolant concentration (freezing point) with proper tester.

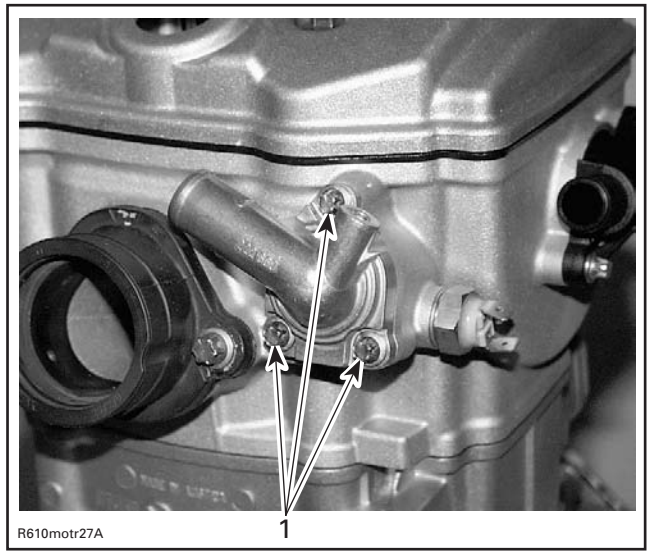
Thermostat

The thermostat is a single action type and it is located on top of cylinder head, on intake side.

Removal:

Remove:

- bleeding screw on thermostat cover
- thermostat housing screws and pull thermostat cover.



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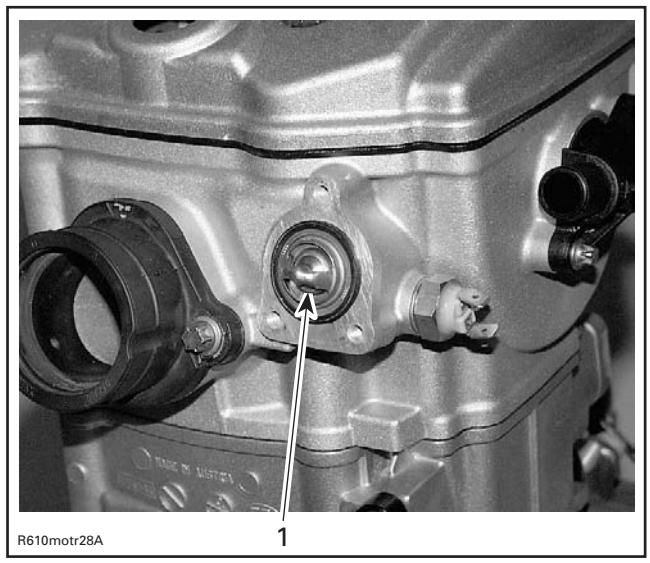
A - 3 Screws (1)

- thermostat with gasket out of the hole.



R610motr28a2.EPS

A - Thermostat with Gasket (1)

Test:

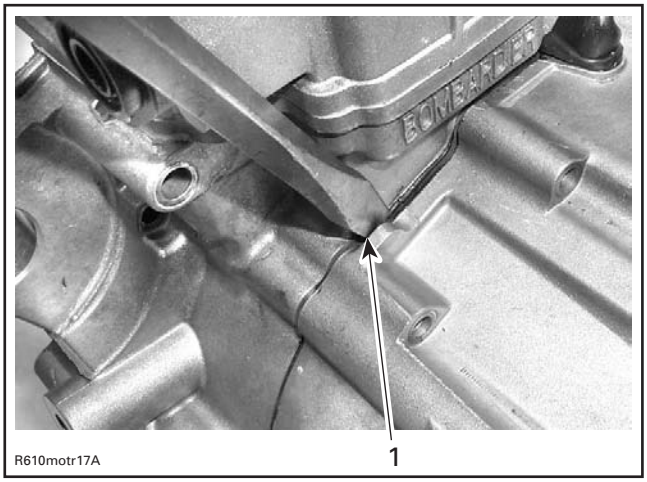
To check thermostat, put in water and heat water. Thermostat should open when water temperature reaches 85°C (185°F).

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

Installation:

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

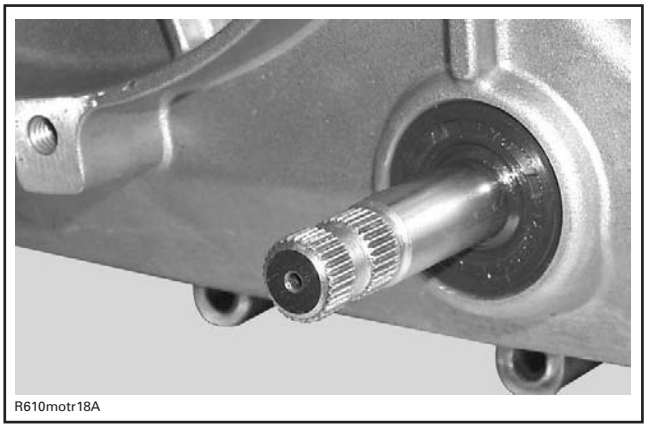
Install the thermostat cover then torque screws to 10 N•m (89 lb-in.).



R610motr17a2.EPS

A - Special Area for Removal of MAgneto Housing Cover (1)

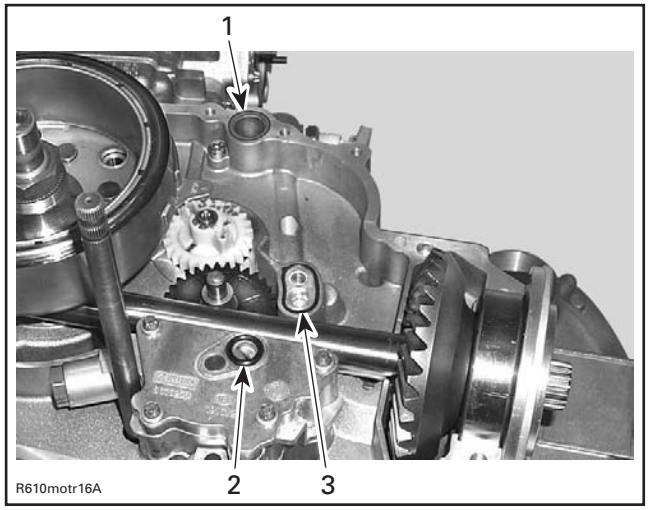
IMPORTANT: Avoid damage! Ensure to use prying lugs to separate magneto housing cover to prevent damaging contact surface. During lifting be careful that splines on the shifter shaft do not damage the oil seal no. 8. Use grease on the splines.



R610motr18a2.EPS

Grease splines to avoid future leaking on the shifter shaft

IMPORTANT: Avoid damage! Be careful not to lose the sealing rings located on the crankcase mag side.



R610motr16a2.EPS

A - O-ring for Water Circulation (1)

B - O-ring for Oil Circulation (2)

C - Sealing Ring for Oil Circulation (3)

Inspection:

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

NOTE: Output shaft and cylinder holes are machined while crankcase MAG/PTO and magneto housing cover are assembled. In case of a damage, the whole crankcase assembly must be replaced.

Installation:

NOTE: Clean all metal component in a non-ferrous metal cleaner. Use gasket remover, or suitable equivalent. To remove remaining Loctite 5910 on the contact surface, use a copper brush.

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

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

IMPORTANT: Avoid damage! When beginning the application of the crankcase sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

NOTE: It is recommended to apply this specific sealant as described here to get a uniform application without lumps. If you do not use the roller method, you may

B - O-ring Placed on Mating surface (2)

C - Oil Filter Cover (3)

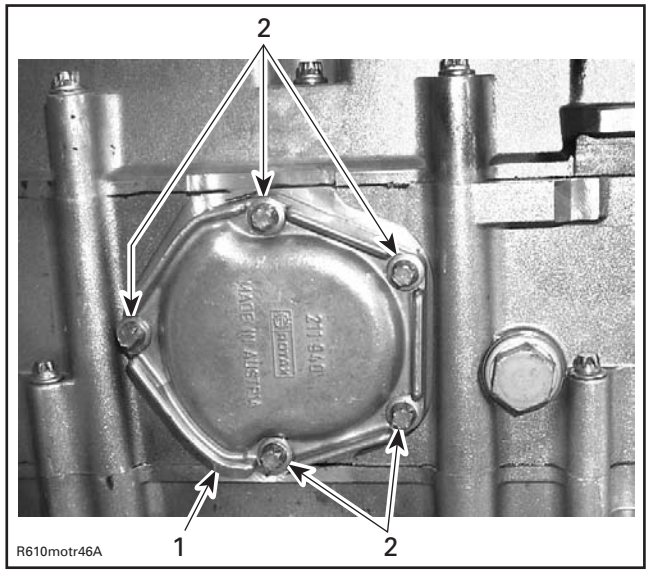
Torque oil filter screw to 10 N•m (89 lb-in.).

Oil Strainer

Removal:

Remove:

- engine oil (refer to OIL CHANGE)
- engine skid plate (Refer to BODY/FRAME)
- screws no. 12 retaining oil strainer cover no. 11

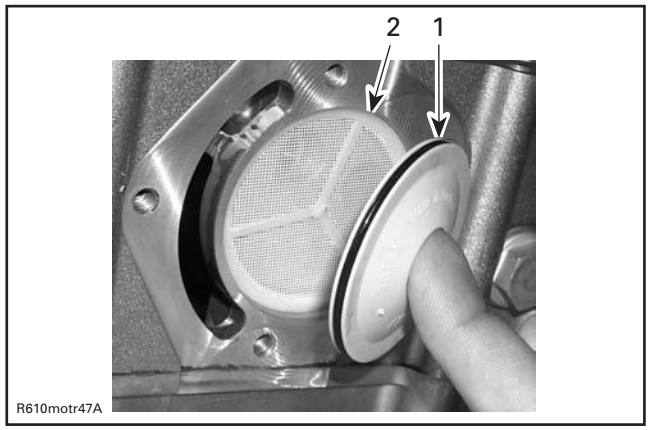


R610motr46a2.EPS

A - Oil Strainer Cover (1)

B - 5 Screws (2)

- oil collector no. 9 and O-ring no. 8
- oil strainer no. 7.



R610motr47a2.EPS

A - Oil Collector with O-ring (1)

B - Oil Strainer (2)

Cleaning and Inspection:

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

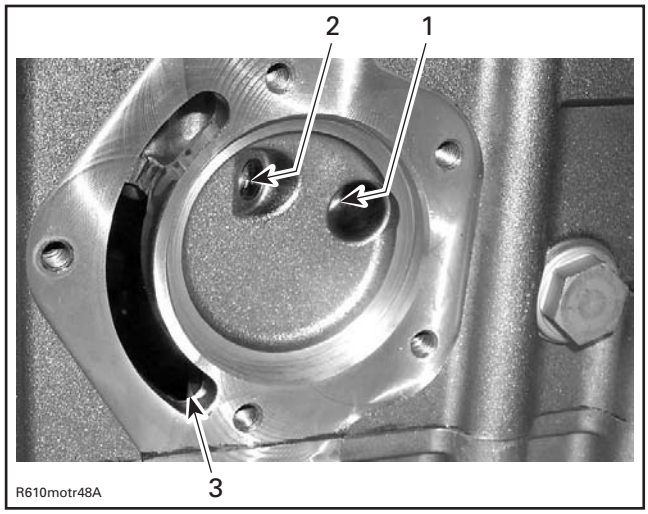
CAUTION: Avoid Injury! always wear eye protector. Chemicals can cause a rash break out and an injury to your eyes.

Inspect O-ring no. 8 and rubber ring no. 10.

If O-ring and rubber ring are brittle, cracked or hard, replace them.

Clean both contact surfaces (oil strainer cover and crankcase).

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



R610motr48a2.EPS

A - Oil Inlet to the Oil Pump (1)

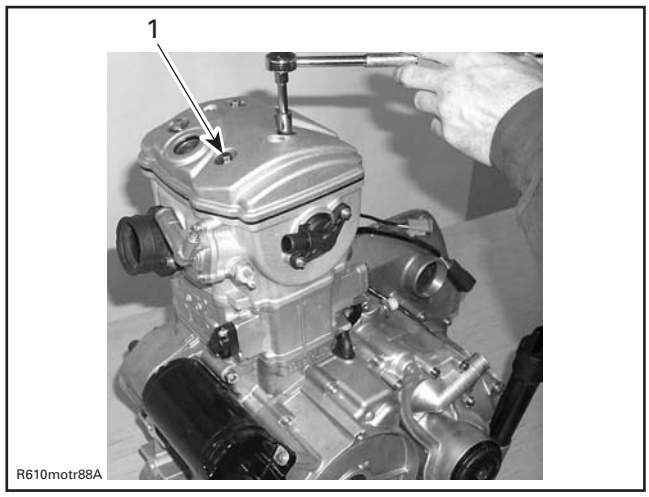
B - Oil Return from the Oil Pressure Regulator System (2)

C - Oil Return from the Engine Oil Circulation (3)

Installation:

For installation, reverse the removal procedure.

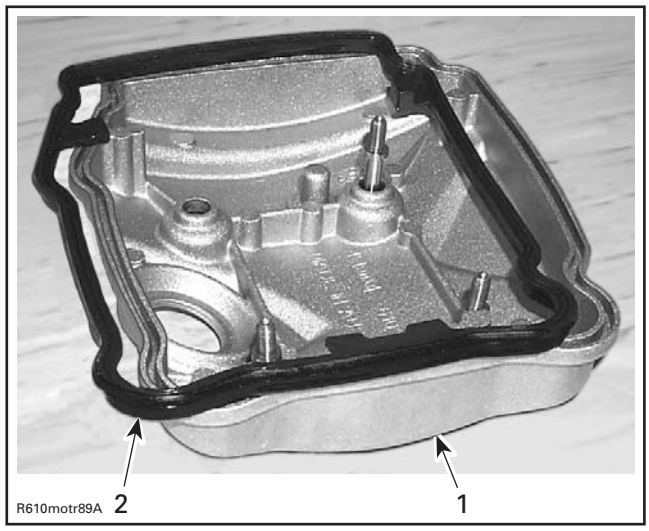
Reinstall oil strainer with sealing edge towards engine.



R610motr88a2.EPS

A - Valve Cover Screws (1)

- valve cover no. 5 and profile sealing ring no. 6.



R610motr89a2.EPS

A - Valve Cover (1)

B - Profile Sealing Ring (2)

Inspection:

Check the profile sealing ring on the valve cover and the rubber bushing on the valve cover screws if they are brittle, cracked or hard. If so, replace the profile sealing ring or the valve cover screw accordingly.

Installation:

For installation, reverse the removal procedure.

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

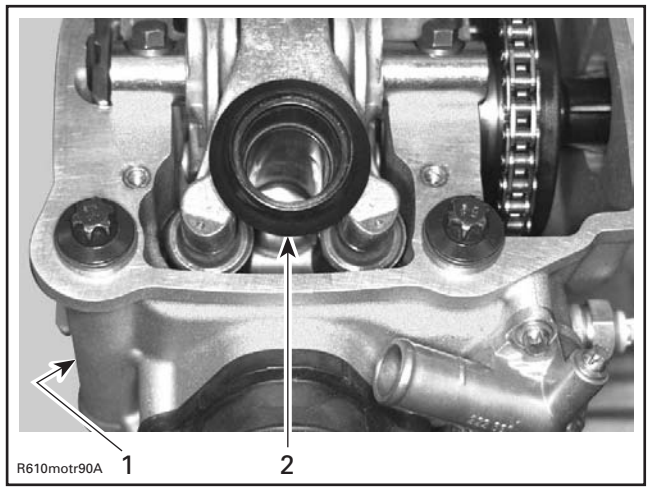
Rocker Arm

Removal:

Lock crankshaft with crankshaft locking bolt (P/N JDG 529 035 617), refer to CRANKSHAFT AND BALANCER SHAFT.

Remove:

- spark plug
- valve cover
- spark plug tube no. 7

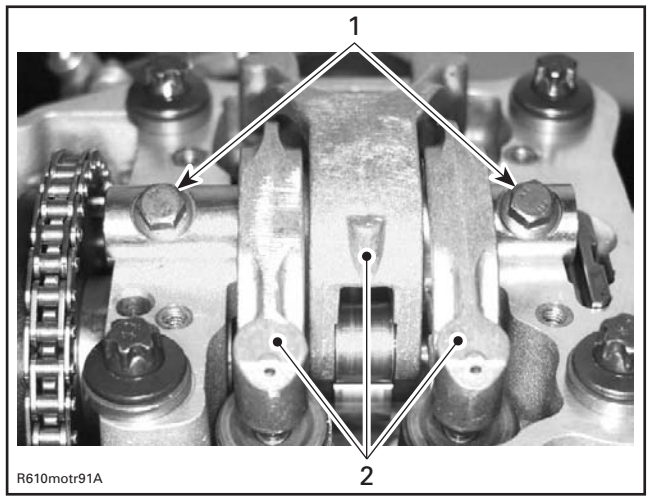


R610motr90a2.EPS

A - Cylinder Head (1)

B - Spark Plug Tube (2)

- rocker arm shaft screws no. 8 (discard screws)

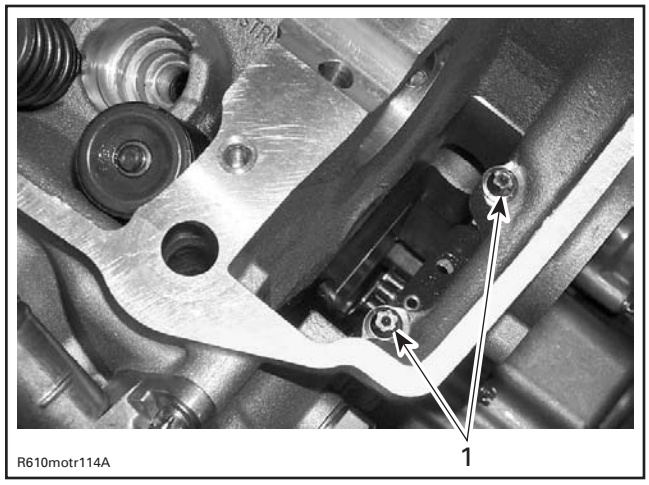


R610motr91a2.EPS

A - Rocker Arm Shaft Screws (1)

B - Rocker Arms (2)

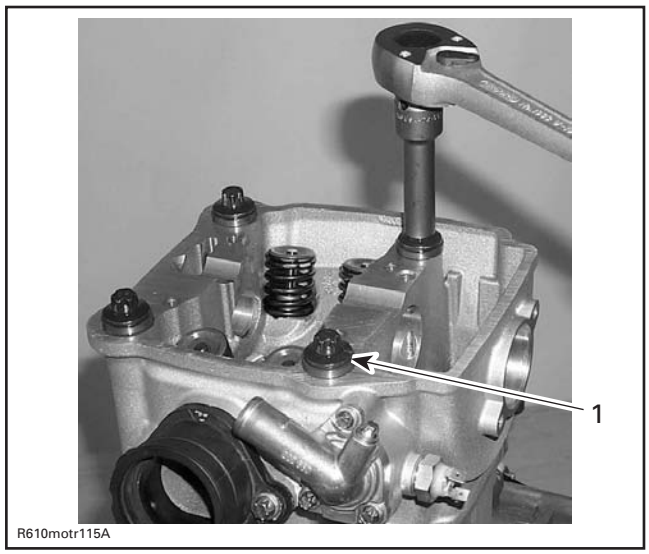
- rocker arm shaft no. 9 with rocker arm assembly (exhaust side no. 10 and intake side no. 11).



R610motr114a2.EPS

A - Cylinder Head Screws M6 (1)

• cylinder head screws M11 no. 31 retaining cylinder head and cylinder to cylinder base.



R610motr115a2.EPS

A - Cylinder Head Screws M11 (1)

Disconnect the temperature switch.

Pull up cylinder head no. 33.

Remove:

• chain guide no. 27

• gasket no. 34.

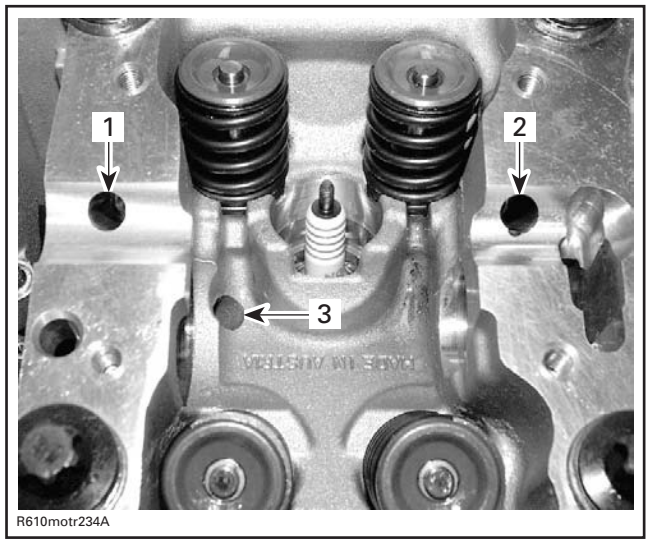
Inspection:

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

• Check gasket for cracks or other damages.

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

• Check oil supply through the cylinder head for contamination.



R610motr234a2.EPS

A - Oil Supply to Camshaft Bearing Journal MAG Side (1)

B - Oil Supply to Camshaft Bearing Journal PTO Side (2)

C - Oil Backflow Through Chain Compartment to Engine Bottom (3)

Installation:

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

Ensure dowel pins are in place.

Install cylinder head screws M11 no. 31. Torque screws as per following procedure.

IMPORTANT: Avoid damage! This assembly use stretch screws. As the screws have been stretched from the previous installation, it is very important to measure each screw at assembly. If screw is out of specification, replace by a new one. Failure to replace screws and to strictly follow the torque procedure may cause screws to loosen and lead to engine damage.

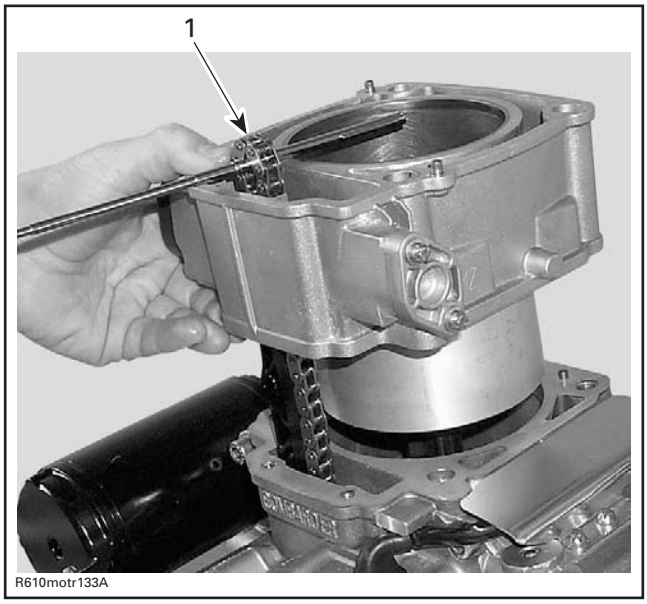
Cylinder Head Screw M11	
Service Limit	216.5 mm (8.524 in.)

Torque screws in criss-cross sequence at half of the recommended torque value in the exploded view.

Torque screws no. 31 criss-cross with the recommended values in the exploded view.

Finish tightening screws turning an additional 90° rotation

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



R610motr133a2.EPS

A - Timing Chain (1)

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

Piston

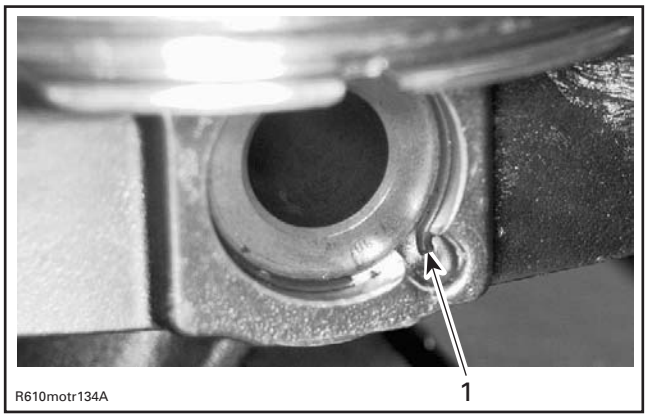
Removal:

Remove:

- cylinder head
- cylinder.

Place a rag under piston.

Remove one piston circlip no. 47 and discard it.

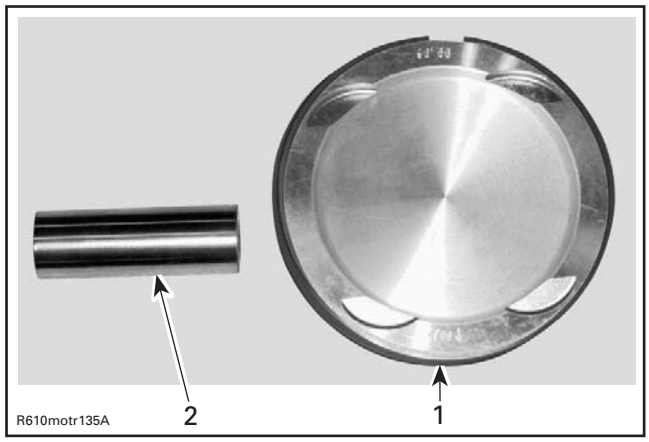


R610motr134a2.EPS

A - Piston Circlip (1)

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

Push piston pin no. 48 out of piston.



R610motr135a2.EPS

A - Piston (1)

B - Piston Pin (2)

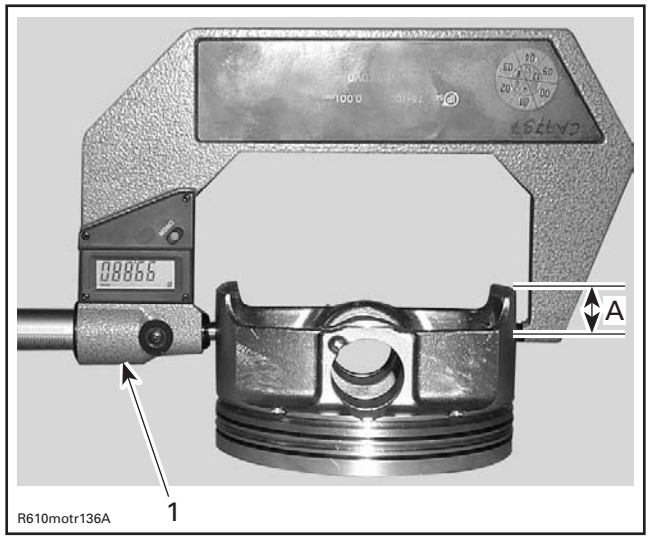
Detach piston no. 49 from connecting rod.

Inspection:

Piston:

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

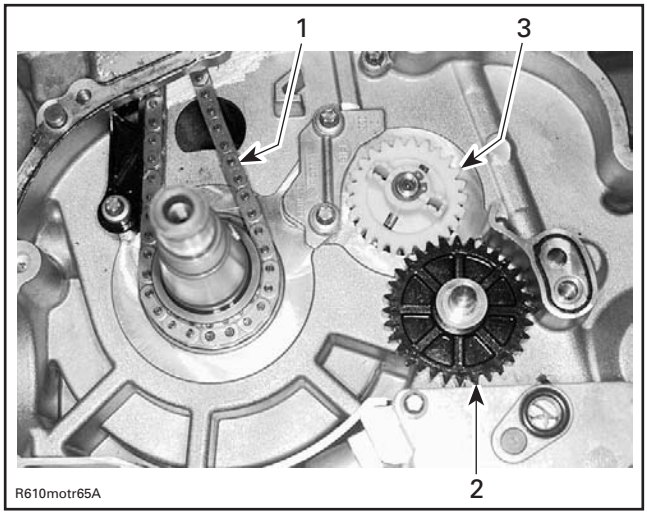
Using a micrometer, measure piston at 18 mm (0.709 in.) perpendicularly (90°) to piston pin.



R610motr136a2.EPS

A - Measuring Perpendicular (90°) to Piston Pin (1)

B - 18mm (0.709 in.) (A)



R610motr65a2.EPS

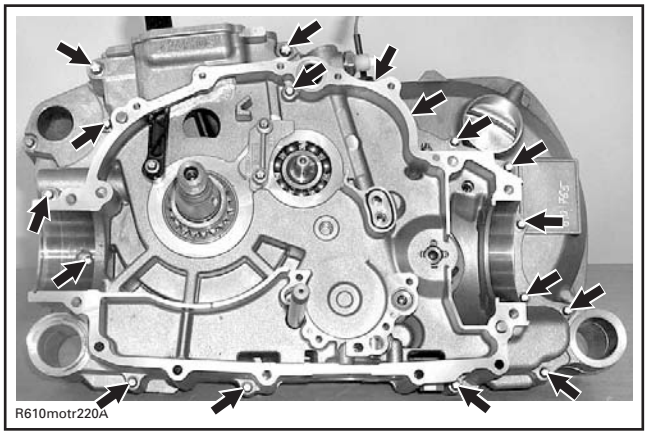
A - Timing Chain (1)

B - Intermediate Gear (2)

C - Drive Gear (3)

Disassembly:

Remove screws retaining crankcase MAG.



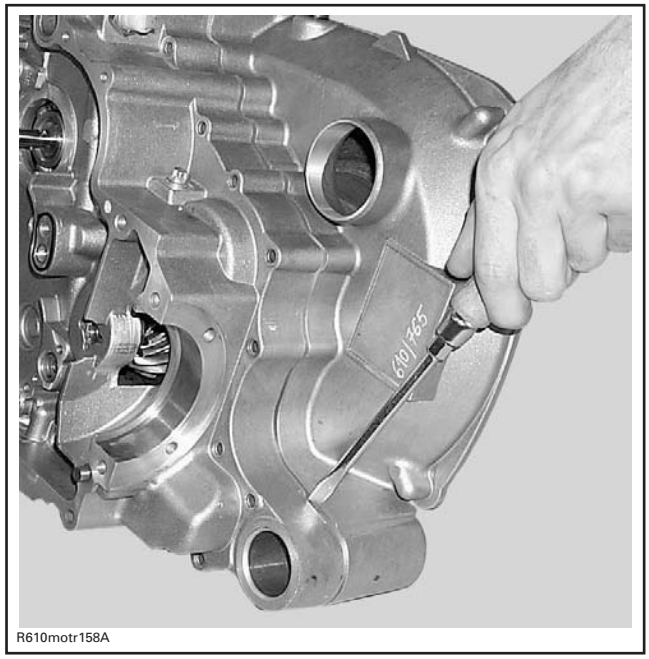
R610motr220a2.EPS

17 Screws

Split crankcase housings.

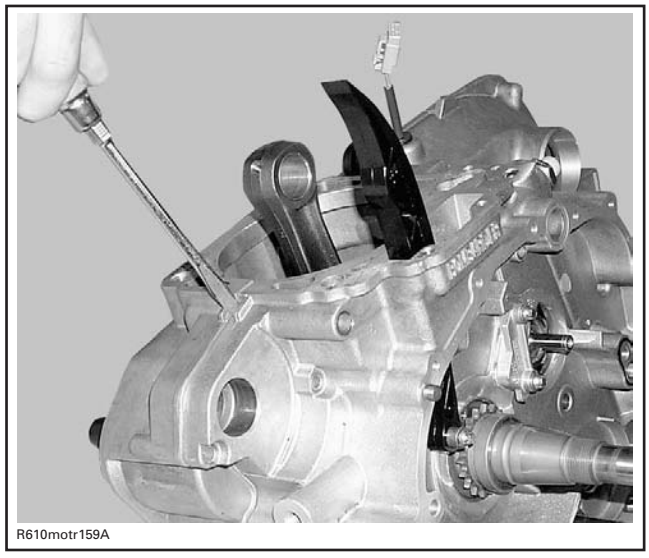
NOTE: Hit with a soft hammer to ease lifting crankcase MAG.

Lift crankcase housings with two flat screwdrivers.



R610motr158a2.EPS

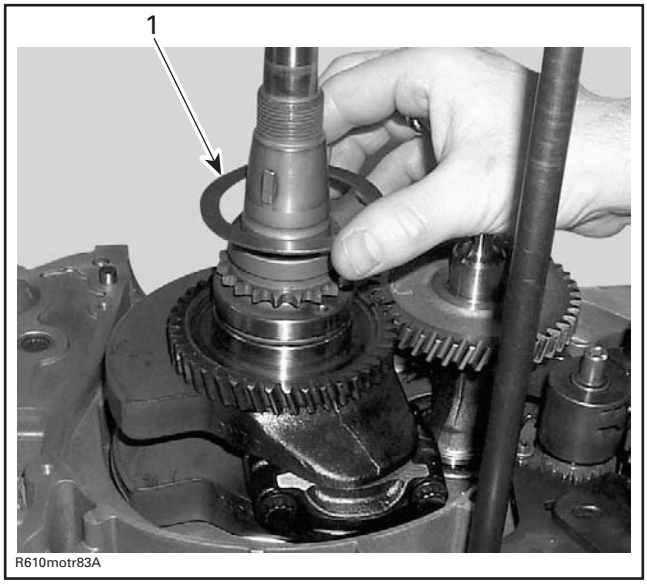
Position for Big Flat Screwdriver



R610motr159a2.EPS

Position for Big Flat Screwdriver

IMPORTANT: Avoid damage! Do not lose the O-ring for oil circulation during lifting of crankcase half.



R610motr83A2.EPS

A - Shim for MAG Side (1)

Align the marks of crankshaft and balancer shaft.

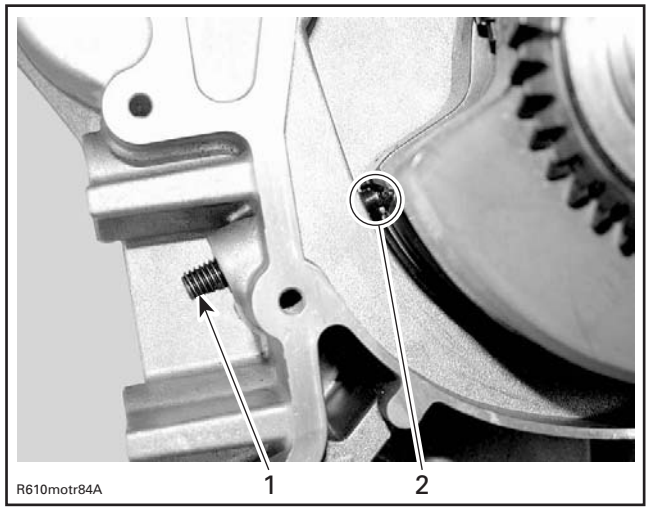
R610motr67A2.EPS

A - Punched Marks Located in the Gears (1)

After reinstalling of crankcase MAG, measure axial clearance of crankshaft with a feeler gauge on the PTO side between PTO crankcase and shim no. 2.

NOTE: Install crankshaft locking bolt right away after crankcase is screwed, to put crankshaft in TDC position before installing the camshaft and rockers (refer to CYLINDER AND HEAD).

NOTE: The following illustration shows an unscrewed crankcase to have a better view of crankshaft locking bolt function.



R610motr84A2.EPS

A - Crankshaft Locking Bolt (1)

B - Engagement Groove for TDC Position of the Piston (2)

Refer to GEARBOX for proper procedure to clean mating surfaces, apply Loctite 5910 and proper torquing sequence.

NOTE: Always degrease tapers on both sides of the crankshaft before reinstalling rotor or CVT.

IMPORTANT: Avoid damage! Make sure the woodruff key on crankshaft MAG is present and correctly in place.

Check bearings no. 42, no. 48 and no. 49 as well as needle bearings no. 40 and no. 41 for excessive play and smooth operation. Replace if necessary.

Check plain bearings no. 43, no. 44, no. 45 and no. 46 for scoring or other damages.

Measure plain bearing inside diameter. Replace if the measurement is out of specification (refer to CRANKSHAFT/BALANCER SHAFT, see CRANKCASE).

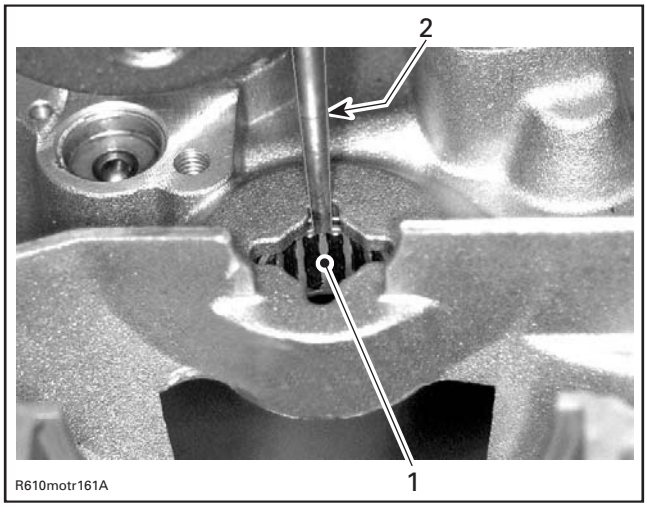
Bearing Removal Procedure:

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

CAUTION: Avoid Injury! Clean oil, outside and inside, from housing before heating.

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

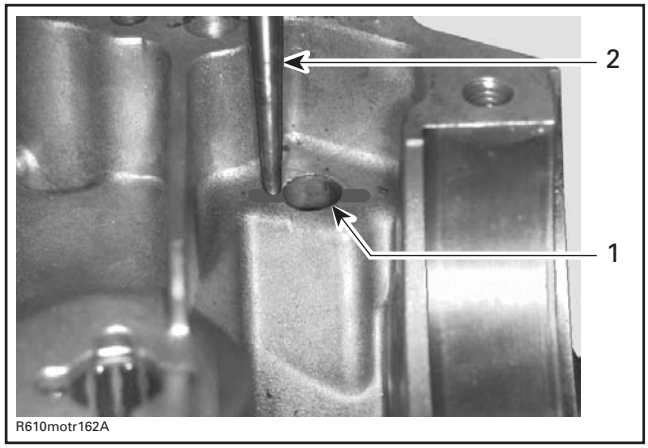
To remove bevel gear needle bearing no. 40 and main shaft needle bearing no. 41, use a punch.



R610motr161a2.EPS

A - Bevel Gear Needle Bearing (1)

B - Punch (2)



R610motr162a2.EPS

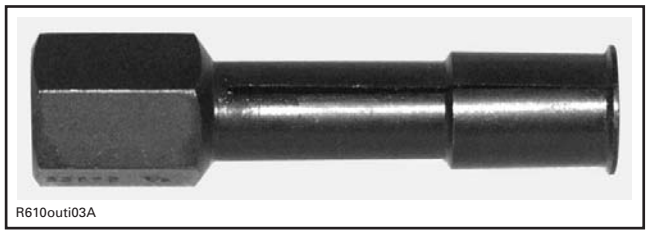
A - Main Shaft Needle Bearing Location (1)

B - Punch (2)

The balancer shaft ball bearing no. 42 on MAG housing is removed with a suitable puller from outside in.

Remove plain bearings no. 43, no. 44, no. 45 and no. 46 with the proper plain bearing remover (refer to CRANKSHAFT/BALANCER SHAFT, see PLAIN BEARING REMOVAL PROCEDURE).

To remove ball bearings no. 48 and no. 49, use a blind hole bearing puller.

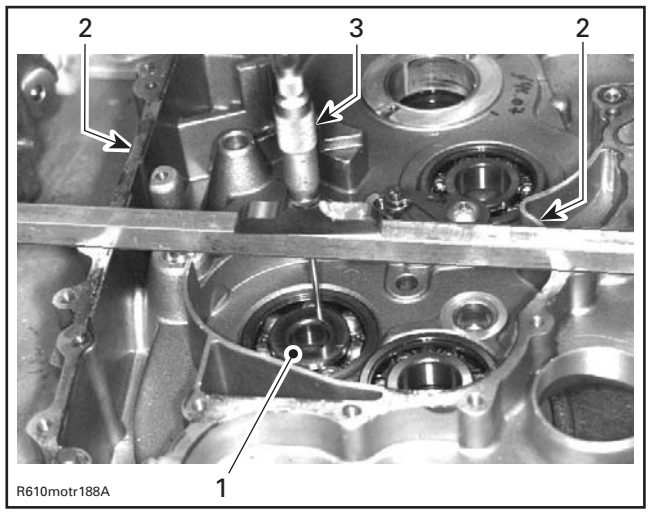


R610outi03a2.EPS

NOTE: The oil seals no. 62 and no. 63 are removed easily with a flat screwdriver.

NOTE: To remove oil seals no. 7, no. 36, no. 65 and no. 67, the engine removal/disassembly is NOT necessary (see Oil SealS above).

For ball bearing no. 64, remove screw no. 47 then push bearing from outside in with a punch.



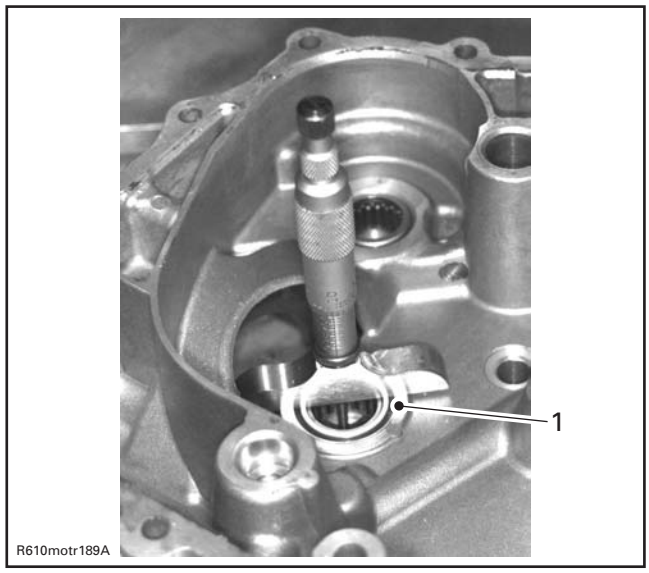
R610motr188a2.EPS

A - Ball Bearing Inner Race (1)

B - Mating Surface of Crankcase PTO (2)

C - Depth Gauge (3)

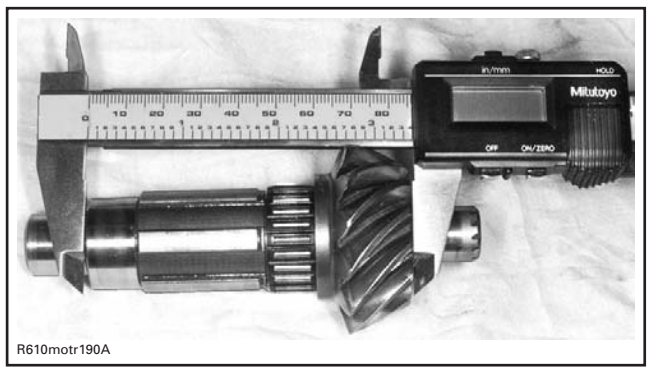
- G = Distance between mating surface of crankcase MAG and butting face.



R610motr189a2.EPS

A - Butting Surface (1)

- H = Distance between butting faces of bevel gear shaft.



R610motr190a2.EPS

- I = Theoretical shim thickness.
- J = Select shim in accordance with I.

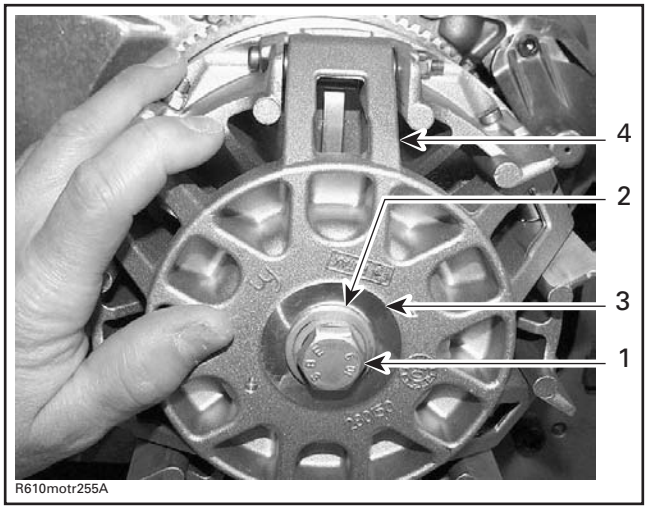
Use following course of calculation to get the theoretical thickness I for washer no. 30.

I = F + G - H - A - E

NOTE: Take theoretical value I and choose shim J (PTO side shim) from the below table.

Calculated thickness (I)	Shim number (J)
1.22 mm to 1.26 mm (0.0480 to 0.0496 in.)	120
1.27 mm to 1.31 mm (0.0499 to 0.0516 in.)	125
1.32 mm to 1.36 mm (0.0519 to 0.0535 in.)	130
1.37 mm to 1.41 mm (0.0539 to 0.0555 in.)	135
1.42 mm to 1.46 mm (0.0559 to 0.0575 in.)	140
1.47 mm to 1.51 mm (0.0579 to 0.0594 in.)	145
1.52 mm to 1.56 mm (0.0598 to 0.0614 in.)	150
1.57 mm to 1.61 mm (0.0618 to 0.0634 in.)	155
1.62 mm to 1.66 mm (0.0638 to 0.0654 in.)	160
1.67 mm to 1.71 mm (0.0657 to 0.0673 in.)	165
1.72 mm to 1.76 mm (0.677 to 0.0693 in.)	170

NOTE: For example, if the measured thickness is 1.53 mm (0.0602 in.), choose the shim 150.



R610motr255a2.EPS

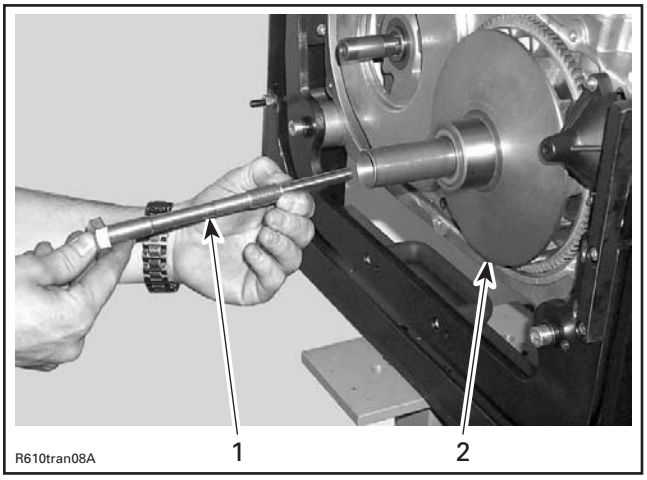
A - Drive Pulley Screw (1)
B - Spring Washer (2)
C - Thrust Washer (3)
D - Drive Pulley (4)

CAUTION: Avoid Injury! Sliding half of drive pulley is spring loaded.

Push with your hand the sliding half no. 9 of the drive pulley then remove the screw completely.

Slowly release sliding half.

Screw clutch puller (P/N JDG 529 035 746) in fixed half no. 10 then remove fixed pulley.



R610tran08a2.EPS

A - Clutch Pulley (1)
B - Fixed Half (2)

Disassembly of Drive Pulley:

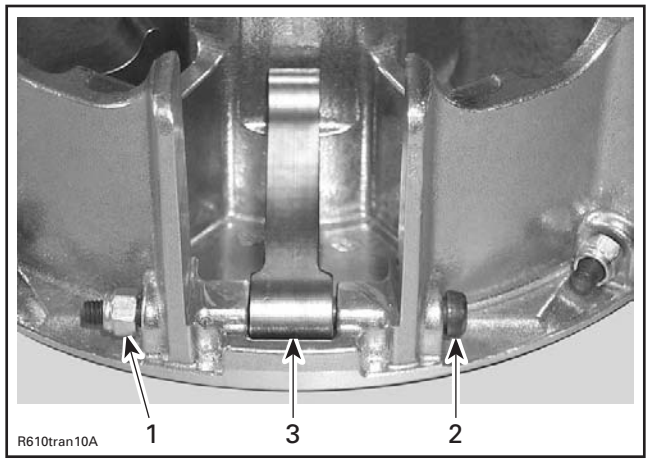
Governor Cup:

Carefully lift governor cup no. 11 until slider shoes no. 12 come at their highest position into guides.

Sliding Half:

Unscrew lock nut no. 13 and remove centrifugal lever pivot bolt no. 14.

Remove centrifugal lever no. 15.



R610tran10a2.EPS

A - Lock Nut (1)
B - Centrifugal Lever Pivot Bolt (2)
C - Centrifugal Lever (3)

Fixed Half:

CAUTION: Avoid Injury! Always wear safety glasses to remove spring sleeve.

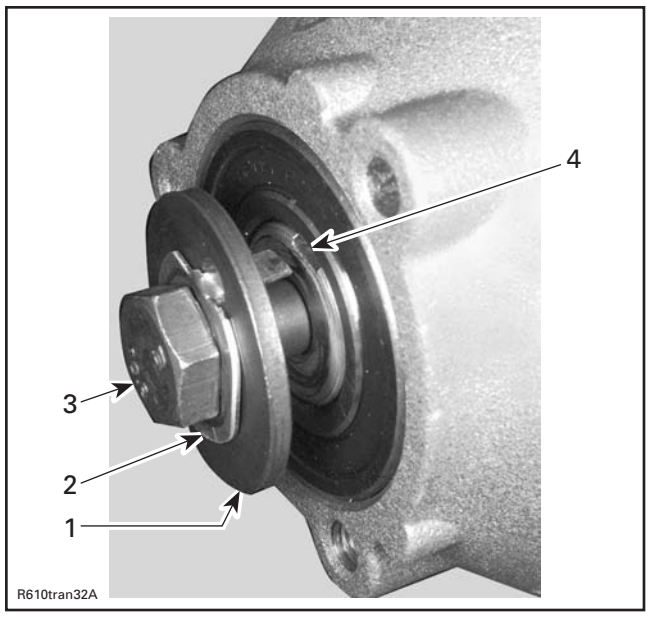
Pull one-way clutch no. 16 slowly until the half of spring sleeves no. 17 are visible.

compress the spring. Install the driven pulley screw no. 22, lock tab no. 23 and washer no. 24.

CAUTION: Avoid Injury! Driven pulley is a spring loaded system.

IMPORTANT: Avoid damage! Always use a new lock tab no. 27 at the time of driven pulley installation.

NOTE: Align lock tab with the groove on shaft.



R610tran32a2.EPS

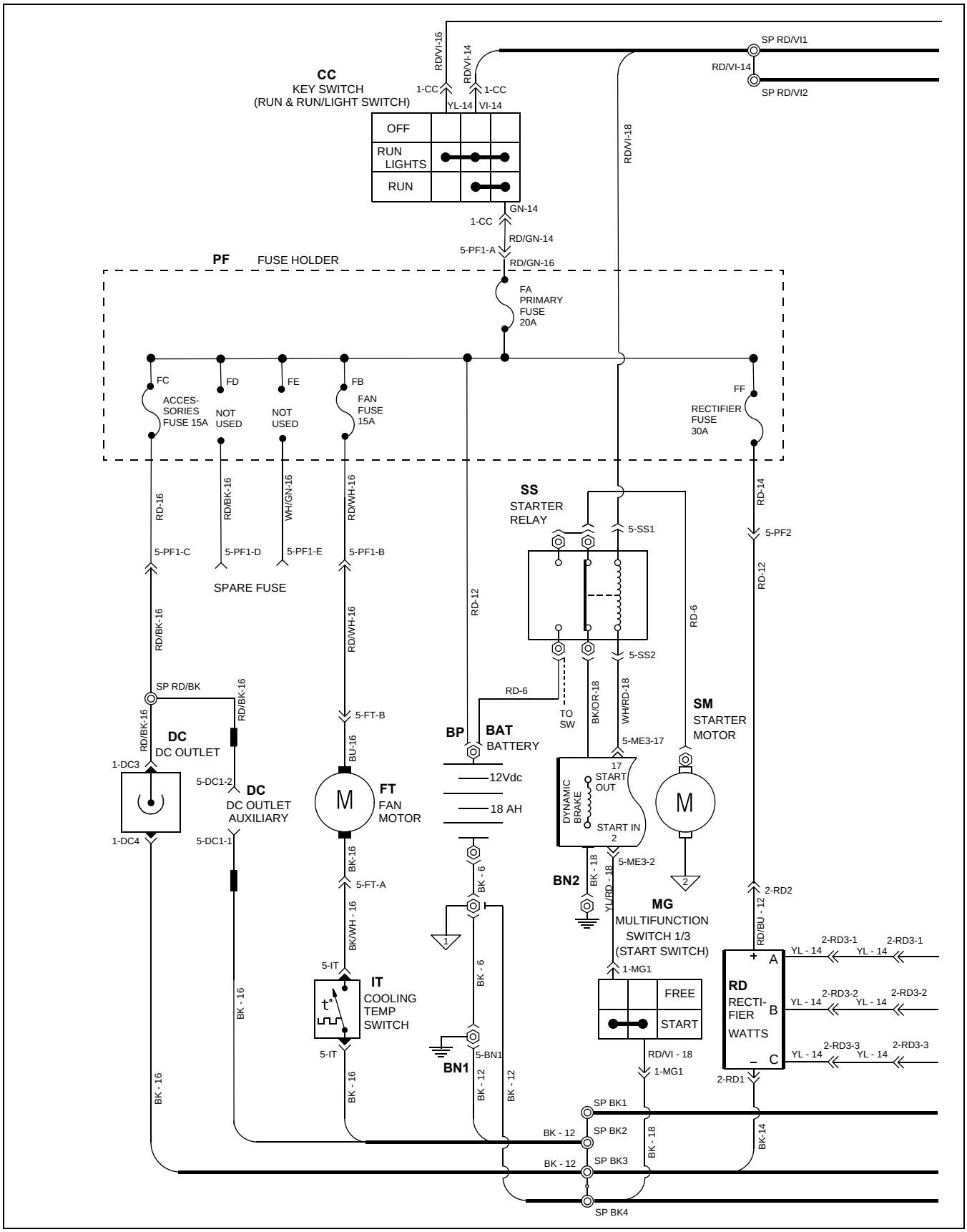
A - Washer (1)
B - Lock Tab (2)
C - Driven Pulley Screw (3)
D - Groove on Shaft (4)

NOTE: Driven pulley end-play is 0 (zero).

Torque driven pulley screw.

Trail Buck Main Schematic

1 of 3



Battery Overview

Battery

Troubleshooting

Symptom: Discharged or Weak Battery	
CAUSE	REMEDY
Battery posts and/or cable terminal oxidized.	Clean and coat with dielectric grease.
Loose or bad connections.	Check wiring and connector cleanliness, damaged or short circuit.
Faulty battery (sulfated, doesn't keep a full charge, damaged casing, loose rectifier).	Replace.
Charging system fuse burnt or faulty voltage regulator/rectifier.*	First check charging system generator coil. If it is in good condition replace fuse or rectifier.
Faulty charging system generator coil.*	Replace.

To test charging system, refer to CHARGING SYSTEM.

Battery Testing

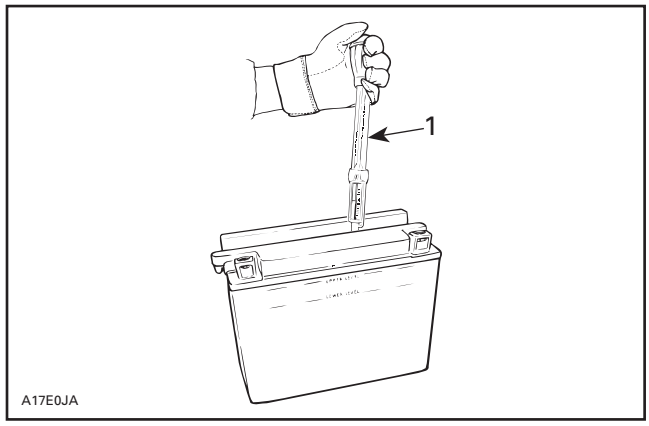
There are 2 types of battery tests: unloaded and loaded. An unloaded test is made on a battery without discharging current. It is the simplest and commonly used. However, be aware that the voltage test can be good while the battery has not enough power to start the engine. A load test gives more accuracy of the battery condition.

Unload Test

Check charge condition using either a hydrometer or a multimeter.

With a multimeter, voltage readings appear instantly to show the state of charge. Always respect polarity. A fully charged battery will have a reading of 12.6 Vdc.

A hydrometer more accurately measures the charge of a battery in terms of specific gravity of the electrolyte. A fully charged battery will have a specific gravity between 1.265 to 1.280.



A17e0ja2.EPS

Typical

A - Specific Gravity 1.265 (1)

A hydrometer measures the charge of a battery in terms of specific gravity of the electrolyte. Most hydrometers give a true reading at 21°C (70°F).

In order to obtain correct readings, adjust the initial reading by adding 0.004 points to the hydrometer readings for each 5.5°C (10°F) above 21°C (70°F) and by subtracting 0.004 point for every 5.5°C (10°F) below 21°C (70°F).

This chart will be useful to find the correct reading.

Electrolyte Temperature		Operation To Perform		
°C	°F			
38	100	add	.012	to the reading
32	90		.008	
27	80		.004	
21	70	correct reading		
16	60	subtract	.004	from the reading
10	50		.008	
4	40		.012	
- 1	30		.016	

Example No. 1

Temperature below 21°C (70°F):

Hydrometer reading: 1.250

Electrolyte temperature: -1°C (30°F)

Subtract 0.016 Sp. Gr.

Corrected Sp. Gr. is 1.234

A - New (1)

B - Wear Limit 8.5 mm (0.335 in.) (2)

Assembly:

Reverse the order of disassembly to reassemble starter.

Installation:

Installation is essentially 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 trouble may arise if starter is not properly aligned.

Apply grease Isoflex on O-rings of starter.

Install starter.

NOTE: If starter does not mesh properly, try to pull it out and slightly rotate the starter gear; then reinstall starter. One could also temporarily remove both O-rings, properly mesh gears then remove starter to reinstall O-rings, being careful not to rotate gear to keep its position, to finally reinstall starter.

Properly torque starter screws to 10 N•m (89 lb-in.).

Connect the RED (+) battery cable to the starter and torque nut to 7 N•m (62 lb-in.). Apply dielectric grease on terminal and nut.

First connect RED (+) cable to battery then connect the BLACK (-) cable.

Ensure to slide protector over nut to hide metallic parts.

CAUTION: Avoid Injury! Always connect RED (+) cable first then 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.

Ignition System

Ignition System Testing Procedure

Ignition Problems

When dealing with ignition problems, the following items should be checked in this order. After one item has been checked and it is found not to be the problem, continue with the next item:

1. Main fuse condition.
2. Spark occurrence
3. Battery condition
4. Ignition switch
5. Trigger coil
6. Ignition coil
7. Electronic module.

Intermittent Ignition Problems

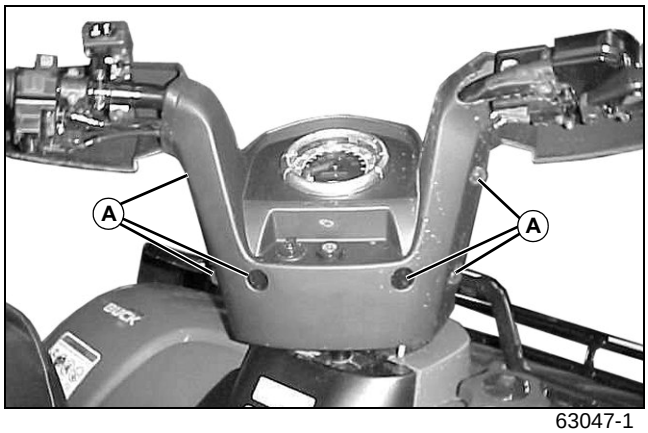
In dealing with intermittent problems there is no easy diagnosis. For example, problems that occur only at normal engine operating temperature have to be tested under similar conditions.

In most cases of temperature and/or vibration failure, only parts replacement might solve the problem as most of these failures return to normal when engine is not running.

Multiple Problems

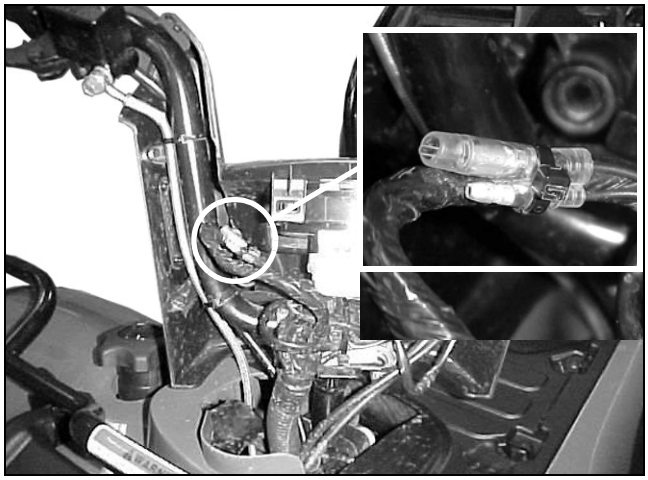
There is always the possibility of more than one faulty part. If after a component has been replaced, the problem still persists, carefully repeat the complete test procedure to find the other faulty part.

Converting Odometer from Miles to Kilometers:



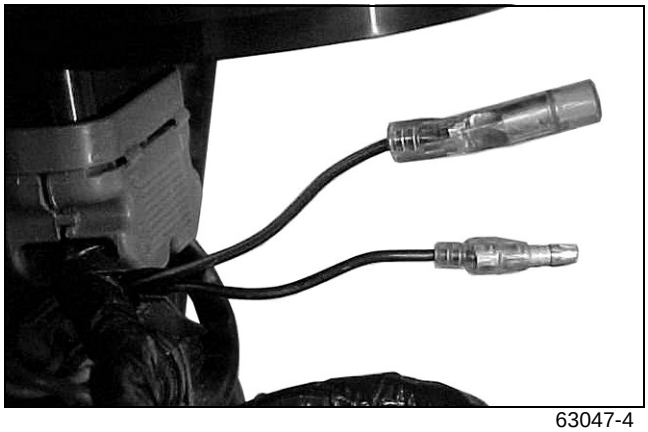
63047-1

1. Remove six screws (A) that secure instrument trim panels together.
2. Remove front instrument trim panel.



63047-2

3. Locate black wire and black/red wire with bullet connectors that are tied to speedometer wiring harness.
4. Remove tie strap that retains wires to speedometer harness.



63047-4

5. Attach the black wire and black/red wire to each other.
6. Reinstall instrument trim panel.

Odometer will now read in kilometers. To convert back to miles, disconnect black and black/red wires.

Winch

EX Models

Removal:

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

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

Disconnect the winch power cables.

NOTE: Identify the position of the power cables for the installation.

Remove:

- fairlead
- front skid plate
- lower bolts retaining the front bumper
- upper frame bolts.

Loose the top bolts that are attached to the rack.

Swing out the whole bumper.

Remove the lower winch bolts.

Remove winch.

Installation:

For the installation, reverse the removal procedure.

Winch Control Switch

EX Models

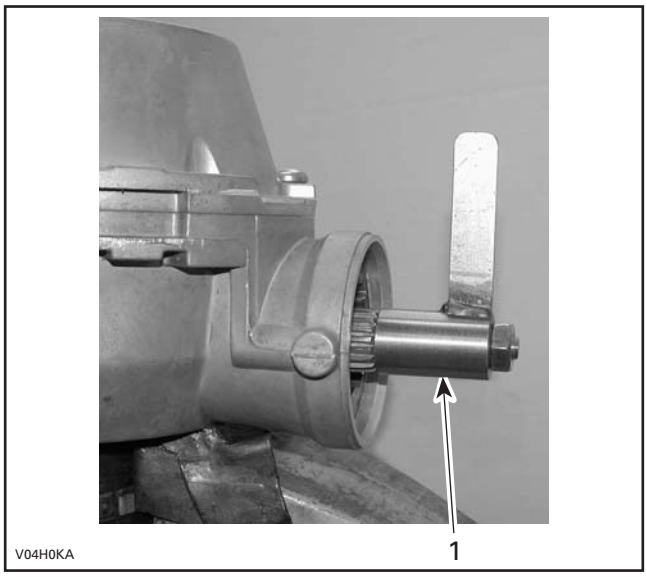
Test:

Refer to TESTS section.

Removal:

Remove screw retaining winch control switch to handlebar.

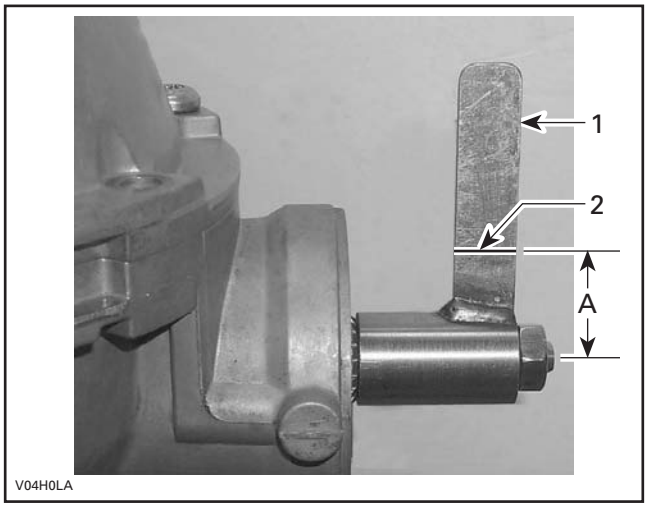
gear.



V04h0kA2.EPS

A - Backlash Measurement Tool (1)

From center of bolt, measure 25.4 mm (1 in) and scribe a mark on the tab.



V04h0lA2.EPS

A - Tab of Backlash Measurement Tool (1)

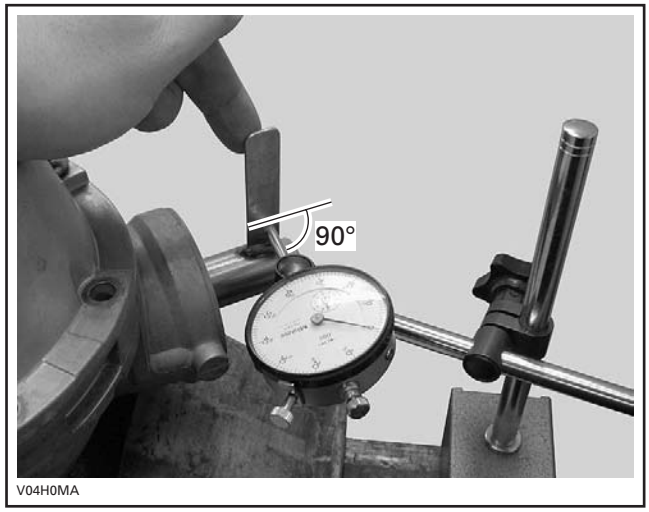
B - Mark on Tab (2)

C - 25.4 mm (1 in.) (A)

NOTE: This measure is equal to the radius of pinion gear and is used where no specification is available.

Position the dial indicator tip against the tab at a 90-degree angle and right on the previously scribed mark.

Gently move the pinion shaft back and forth.



V04h0mA2.EPS

The reading on the dial indicator gives the backlash.

To be acceptable, the backlash must be between 0.102 and 0.356 mm (0.004 and 0.014 in).

If the backlash is not within specifications, disassemble the differential and reposition the shims of the ring gear carrier accordingly in order to move it either closer to or further away from the pinion.

The backlash is adjusted by moving shims from one end of the ring gear carrier to the other as required.

IMPORTANT: Avoid damage! Never eliminate any shims, simply move them from one end to the other to be able to move the ring gear carrier either closer to or further away from the pinion in order to get the correct backlash.

Moving ring gear carrier closer to the pinion will decrease backlash. Moving it further away from the pinion will increase backlash.

Re-assemble the differential and check the backlash again. Repeat the procedure until the backlash is within specifications.

After obtaining the proper backlash, do the final re-assembly.

Disassembly:

Ring Gear Carrier/Ring Gear Removal:

To change ring gear carrier no. 21 or ring gear no. 22:

- Unscrew the drain plug no. 23 and empty differential.
- Unscrew the TORX screws no. 24, then separate half housings.
- Extract ring gear carrier with ring gear out of half housing.
- Unscrew Allen socket screws no. 25 then separate ring

Rear Axle Assembly

Removal:

Lift rear of the vehicle until rear shock absorbers are fully extended. Install jack stands under frame to support vehicle.

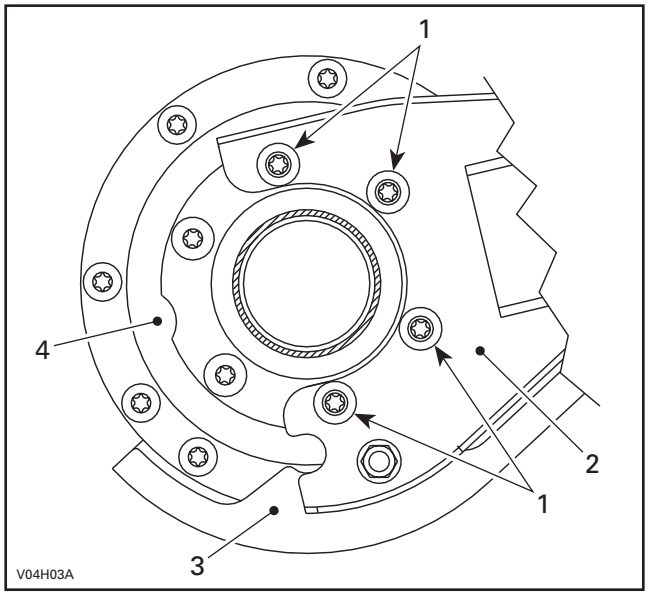
Remove rear wheels.

Remove lower shock absorber bolts.

Remove rear brake caliper and detach brake hose from bracket on rear axle.

IMPORTANT: Avoid damage! Don't let caliper hang by the hose and don't stretch or twist brake hose.

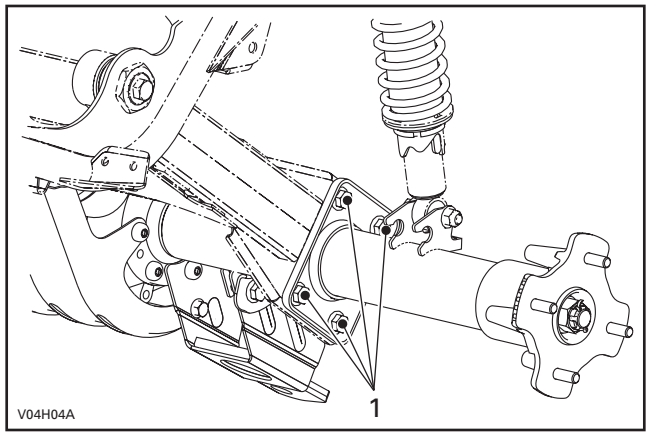
Unscrew bolts no. 6 and no. 9 retaining rear axle assembly to swing arm. See the following illustrations.



V04h03a2.EPS

RH Side

A - Remove these bolts (1)
B - Swing Arm (2)
C - Differential Protector (3)
D - Rear Differential (4)



V04h04a2.EPS

LH Side

A - Remove these bolts (1)

Detach rear axle assembly from swing arm.

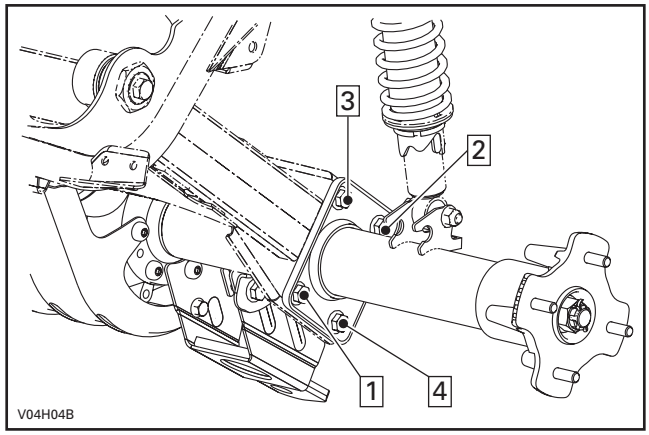
Installation:

Installation is essentially the reverse of removal procedure. Paying attention to the following details.

Apply grease on the end of propeller shaft.

Install all bolts before torquing.

On the LH side, torque the hexagonal bolts no. 9 in a criss-cross sequence. See the following illustration.



V04h04b2.EPS

Torque to 48 N•m (35 lb-ft)

RH Axle

RH Axle Housing Removal:

Lift rear of the vehicle. Install jack stands under swing arm.

Remove:

- wheel and wheel cap
- cotter pin no. 13

Specifications

Steering Control Specifications

Turning Radius 2-Wheel Drive . . . . . 2130 mm (84 in.)
Turning Radius 4-Wheel Drive . . . . . 2100 mm (83 in.)
Total Toe (vehicle on ground) Each Side . . . . . 8 ± 4 mm (0.315 ± 0.157 in.)
Camber Angle . . . . . 0°
Tie-Rod Maximum Length Unengaged . . . . . 20 ± 5 mm (0.787 ± 0.197 in.)

Recommended Tools

Special or Required Tools

Tool Name	Tool No.	Tool Use
Shock Absorber Tool		
Shock Absorber Spring Compressor		

Repair

General

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

IMPORTANT: Avoid damage! Torque wrench tightening specifications must be strictly adhered to.

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

Clean threads before applying a thread locker.

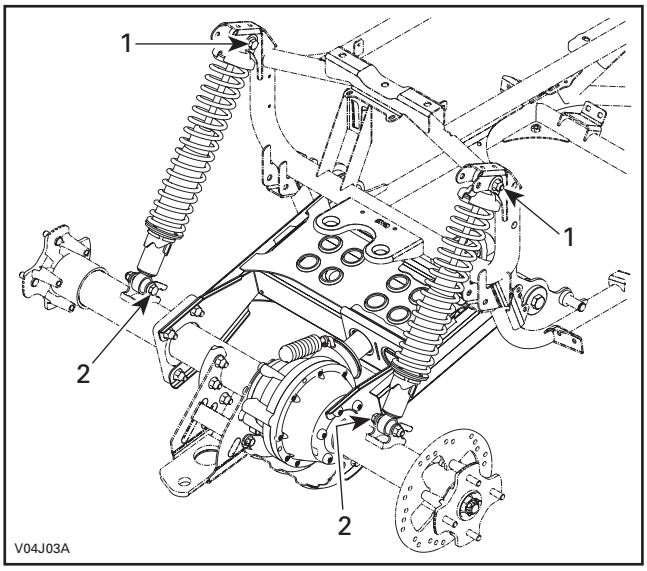
Rear Shock

Removal:

Lift rear of vehicle until rear shock absorbers no. 1 are fully extended.

Install jack stands or blocks under the frame to support the vehicle.

Remove upper no. 4 and lower no. 5 bolts and nuts no. 6 retaining shock absorbers each side.

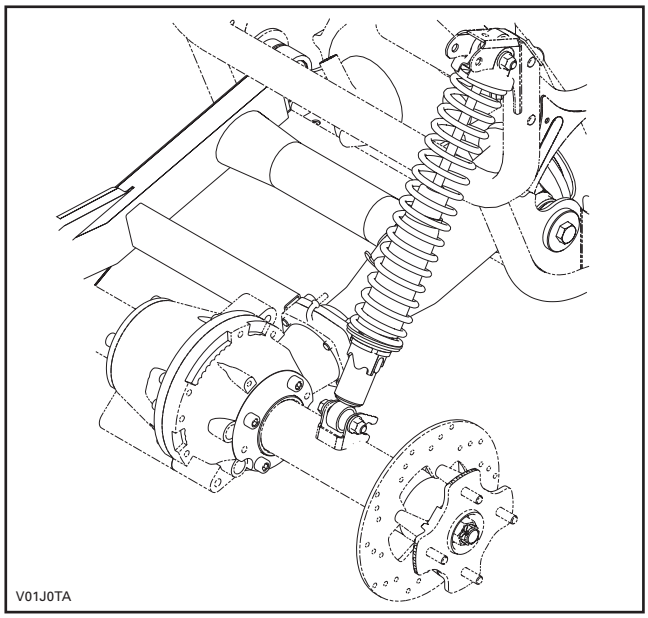


V04j03a2.EPS

Typical

A - Upper Bolts (1)

B - Lower Bolts (2)



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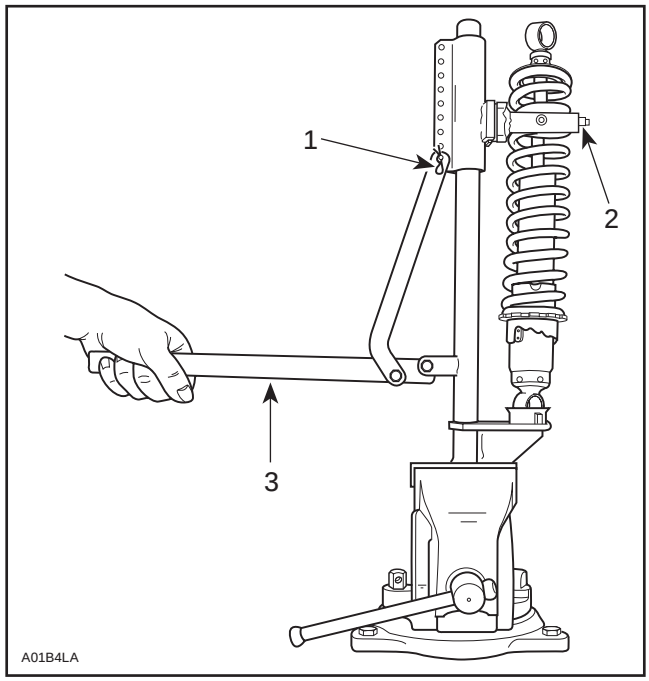
Disassembly:

Use shock spring remover and put it in a vise. Mount shock in it and turn shock so that spring coils no. 3 match spring compressor.

Close and lock bar. Adjust handle horizontal by changing position of clevis pin.

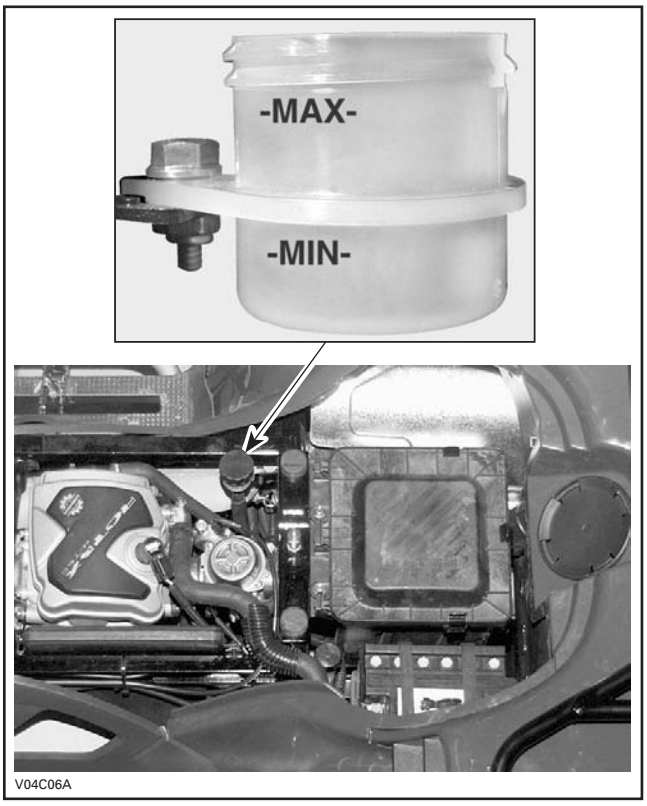
Push down on handle until it locks. Remove spring stopper and cap then release handle.



A01b4la.eps

Typical

A - Clevis Pin (1)



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Brake Fluid Replacement:

CAUTION: Avoid Injury! A contaminated brake disc or pas reduces stopping power. Discard contaminated pads and clean a contaminated disc with high quality brake degreasing agent.

IMPORTANT: Avoid damage! Avoid spilling brake fluid on plastic, rubber or painted parts. Protect these parts with a rag when servicing brake system.

Brake Fluid Draining:

Remove reservoir cover.

On caliper, connect bleed hose to bleed valve no. 17.

Loosen bleed valve and pump brake lever no. 4 or brake pedal no. 38 until no more fluid flows out of bleed valve.

Brake Fluid Filling and Bleeding:

Close bleed valve.

Fill reservoir with DOT 4 brake fluid.

IMPORTANT: Avoid damage! Do not mix different types of brake fluid. Use only DOT 4 brake fluid.

Bleed system as per the following procedure.

With vacuum pump:

- Install a vacuum pump to bleed valve. See the manufacturer's operating instructions.
- Pump vacuum pump and loosen bleed valve. Close bleed valve and refill reservoir when the fluid level is low.

NOTE: Check fluid level often to prevent air from being pumped into the system.

- Repeat the procedure until no more air bubbles appear in bleed hose.

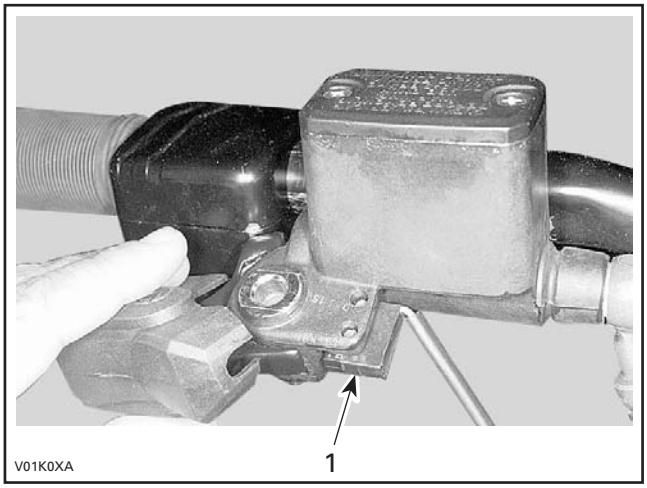
NOTE: For the front brake system, switch to LH and RH caliper. Turn handlebar to full RH side when bleeding right caliper and turn to the LH side for the left caliper. This helps the bleeder to reach air into the caliper.

- Close bleed valve and operate brake lever no. 4 or brake pedal no. 38. If it still feels spongy, bleed system again.
- Repeat the procedures until air bubbles don't appear in tube and lever or pedal is stiff.
- Fill reservoir to the upper level with DOT 4 brake fluid.
- Install diaphragm and cover on reservoir.
- Without vacuum pump:
- If vacuum pump is not available, use the following procedure.
- Install a tube to bleed valve.
- Open bleeder. Fill reservoir and pump brake lever or brake pedal until fluid freely flows out of the tube.
- Close bleed valve.
- Pump up system pressure with brake lever or brake pedal until lever or pedal resistance is felt.
- Squeeze brake lever or depress brake pedal, open bleed valve and then close it.

NOTE: Do not release brake lever or brake pedal until bleed valve has been closed. For the front brake system, switch to LH and RH caliper. Turn handlebar to full RH side when bleeding right caliper and turn to the LH side for the left caliper. This helps to reach air into the caliper.

NOTE: Release brake lever or brake pedal slowly.

NOTE: Repeat the procedures until air bubbles do not appear in tube and lever or pedal is stiff.



V01k0xa2.EPS

A - Front Brake Light Switch (1)

Rear Brake Light Switch:

The rear brake switch no. 24 is located on the top of rear master cylinder.

The rear brake light switch cannot be adjusted.

Disconnect switch connectors.

Unscrew rear brake light switch from Banjo bolt and remove switch. Catch spilled fluid with a rag.

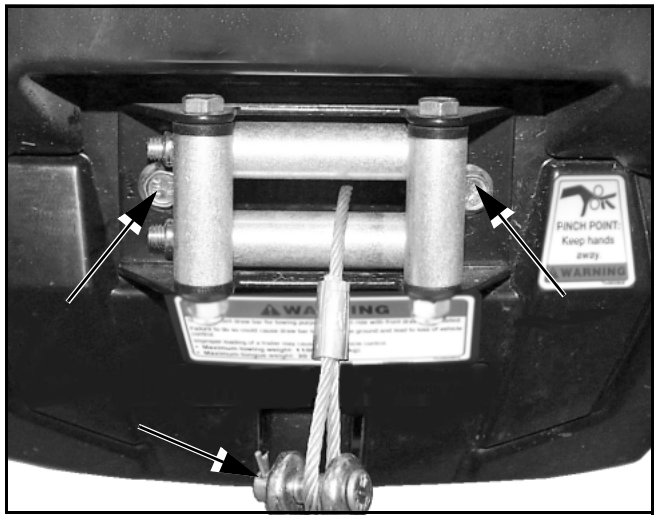
Inspection and Installation:

Check switch for dirt or corrosion. Make sure it is operating properly.

Turn ignition switch ON then depress brake pedal and check for brake light to turn on.

For installation, reverse the removal procedure.

NOTE: Apply pipe sealant on threads of rear brake light switch.



MX30926a

Trail Buck EX Model:

Remove:

- hitch hook no. 14
- fairlead no. 15
- screws no. 13.

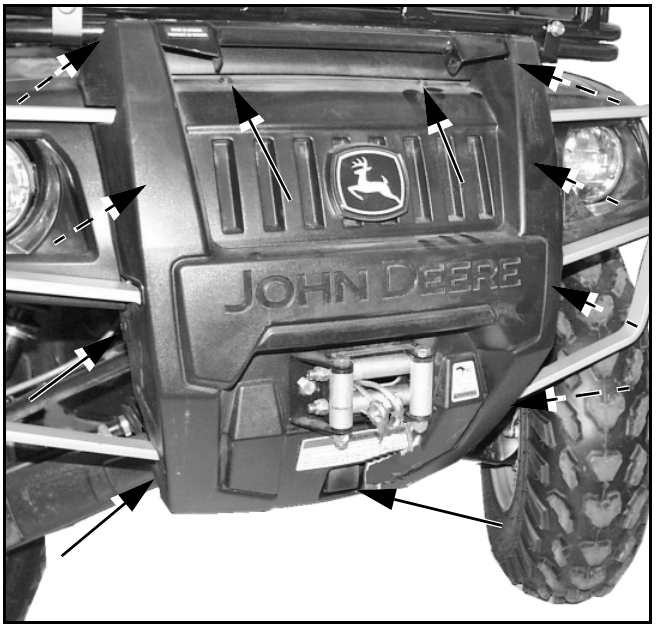
Withdraw front skid plate.

Front Bumper:

NOTE: The attachments of front bumper no. 16 are located at the same place for all models even if the bumper shape is different.

Remove front skid plate.

Remove plastic anchors and bolts securing front panel.

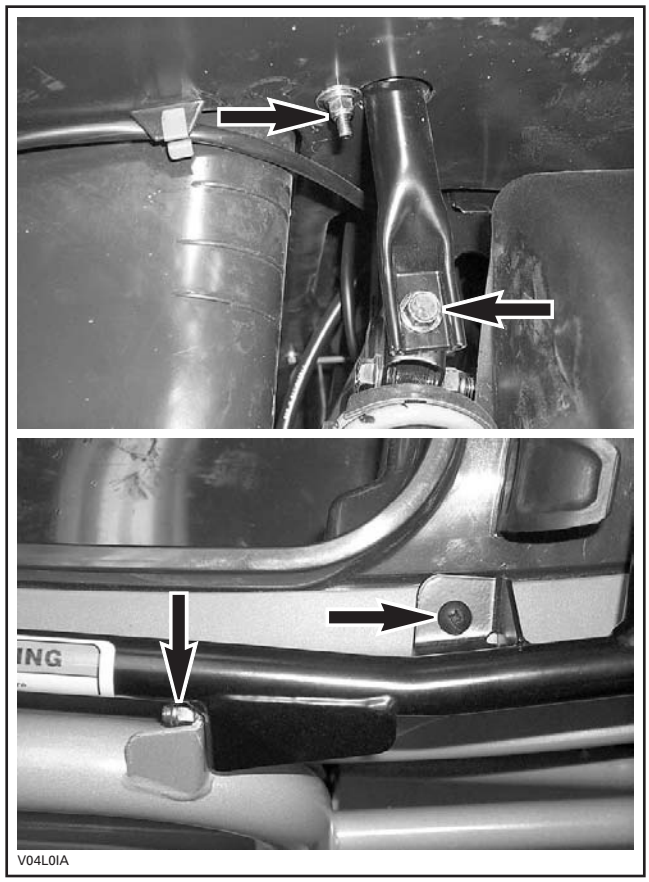


MX31573a

Front Luggage Rack:

Remove bolts no. 18, no. 19 and no. 20.

NOTE: Remove headlight to reach nut. Refer to INSTRUMENTS AND ACCESSORIES.



V04L0IA

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Detach the headlight harness.

Pull front luggage rack no. 21 upward.

Installation:

Installation is in the reverse order of removal.

Front Fender/Mudguard/ Facia

Removal:

Front Fender:

Unscrew steering cover bolts then lift it.

Remove front luggage rack.

NOTE: To remove front fender no. 22 with luggage rack, do not remove screws no. 20.

Remove screws no. 23 and no. 24 on each side.