SERVICE MANUAL

2015



ZR/XF/M/Pantera
5000/7000/9000

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FOREWORD

This Arctic Cat Service Manual contains service and maintenance information for certain Model Year 2015 Arctic Cat Snowmobiles (see cover). The manual is designed to aid service personnel in service-oriented applications.

This manual is divided into sections. The sections cover specific snowmobile components or systems and, in addition to the standard service procedures, includes assembling, disassembling, and inspecting instructions. When using this manual as a guide, the technician should use discretion as to how much disassembly is needed to correct any given condition.

The service technician should become familiar with the operation and construction of the components or systems by carefully studying the complete manual. This will assist the service technician in becoming more aware of and efficient with servicing procedures. Such efficiency not only helps build consumer confidence but also saves time and labor.

All Arctic Cat publications and snowmobile decals display the words Warning, Caution, and Note to emphasize important information. The symbol ⚠ **WARNING** identifies personal safety-related information. Be sure to follow the directive because it deals with the possibility of severe personal injury or even death. A **CAUTION** identifies unsafe practices which may result in snowmobile-related damage. Follow the directive because it deals with the possibility of damaging part or parts of the snowmobile. The symbol ■ **NOTE:** identifies supplementary information worthy of particular attention.

At the time of publication, all information, photographs, and illustrations were technically correct. Some photographs and illustrations used in this manual are used for clarity purposes only and are not designed to depict actual conditions. Because Arctic Cat Inc. constantly refines and improves its products, no retroactive obligation is incurred.

All materials and specifications are subject to change without notice.

Keep this manual accessible in the shop area for reference.

Product Service and Warranty Department
Arctic Cat Inc.

ISMA
International Snowmobile Manufacturers Association

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General Information

■**NOTE: General specifications for each 2015 Arctic Cat Snowmobile can be accessed from the Arctic Cat Cat Tracker Dealer Communication System online.**

■**NOTE: Some illustrations and photographs used in this manual are used for clarity purposes only and are not designed to depict actual conditions.**

Snowmobile Identification

The Arctic Cat Snowmobile has two important identification numbers. The Vehicle Identification Number (VIN) is stamped into the tunnel near the right-side footrest or on top of the tunnel. The decal also displays pertinent production information. The Engine Serial Number (ESN) is stamped into the crankcase of the engine.

These numbers are required to complete warranty claims properly. No warranty will be allowed by Arctic Cat if the engine serial number or VIN is removed or mutilated in any way.

Recommended Gasoline and Oil

CAUTION

Do not use white gas or gasoline containing methanol. Only Arctic Cat approved gasoline additives should be used.

CAUTION

Any oil used in place of the recommended oil may cause serious damage.

RECOMMENDED GASOLINE (5000/7000)

The recommended gasoline to use in these snowmobiles is 87 octane regular unleaded. In many areas, oxygenates are added to the gasoline. Oxygenated gasolines containing up to 10% ethanol are acceptable gasolines.

When using ethanol blended gasoline, adding a gasoline antifreeze is not necessary since ethanol will prevent the accumulation of moisture in the fuel system.

RECOMMENDED GASOLINE (9000)

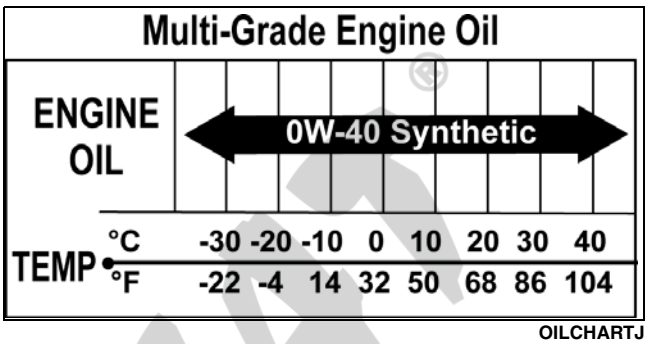
The recommended gasoline to use in these snowmobiles is 91 octane (minimum).

■**NOTE: If a situation arises in which 91 octane gasoline is not available, 87 octane gasoline can be substituted; however, do not prolong the usage of 87 octane gasoline as it will cause poor engine performance.**

In many areas, oxygenates are added to the gasoline. Oxygenated gasolines containing up to 10% ethanol are acceptable gasolines. Do not use gasolines containing methanol.

RECOMMENDED OIL (5000/9000)

The recommended oil to use is Synthetic 0W-40 Oil in all temperatures and conditions.



OILCHARTJ

After the engine break-in period, the engine oil should be changed every 2500-3000 miles (5000) or 1500-2000 miles (9000) and before prolonged storage.

RECOMMENDED OIL (7000)

The recommended oil to use is Synthetic C-TEC4 Oil (p/n 6639-529 - gal.).

After the engine break-in period, the engine oil should be changed every 2500 miles before prolonged storage and the oil filter should be changed every 12,000 miles.

Engine Break-In

5000/9000

The Arctic Cat 4-stroke engine (when new or rebuilt) requires a short break-in period before the engine is subjected to heavy load conditions.

This engine does not require any pre-mixed fuel during the break-in period.

CAUTION

DO NOT use premixed fuel in the snowmobile gas tank. Engine damage will occur.

To ensure trouble-free operation, careful adherence to the following break-in guidelines will be beneficial.

0-200 miles	1/2 Throttle (45 MPH-max)
200-400 miles	1/2-3/4 Throttle
400-600 miles	1/2-3/4 Throttle *

* With occasional full-throttle operation.

To ensure proper engine break-in, Arctic Cat recommends that the engine oil and filter be changed after 500 miles or after one month, whichever comes first. This service is at the discretion and expense of the snowmobile owner.

7000

The engine (when new or rebuilt) requires a short break-in period before the engine is subjected to heavy load conditions.

This engine does not require any pre-mixed fuel during the break-in period.

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There is never a more important period in the life of the engine than the first 500 km (300 miles).

Since the engine is brand new, do not put an excessive load on it for the first 500 km (300 miles). The various parts in the engine wear and polish themselves to the correct operating clearances. During this period, prolonged full throttle operation or any condition that might result in engine overheating must be avoided.

Operating your snowmobile for the first time: Start the engine and let it idle for 15 minutes.

0-160 km (0–100 miles): Avoid prolonged operation above 6000 RPM.

160-500 km (100–300 miles): Avoid prolonged operation above 8000 RPM.

500 km (300 miles) and beyond: The snowmobile can now be operated normally.

■NOTE: After 800 km (500 miles) of operation, the engine oil must be changed and the oil filter replaced. If any engine trouble should occur during the engine break-in period, immediately have an Arctic Cat dealer check the snowmobile.

Drive Belt Break-In

Drive belts require a break-in period of approximately 25 miles. Drive the snowmobile for 25 miles at 3/4 throttle or less. By revving the engine up and down (but not exceeding 60 mph), the exposed cord on the side of a new belt will be worn down. This will allow the drive belt to gain its optimum flexibility and will extend drive belt life.

■NOTE: Before starting the snowmobile in extremely cold temperatures, the drive belt should be removed and warmed up to room temperature. Once the drive belt is at room temperature, install the drive belt (see Drive Belt sub-section in the Drive Train/Track/Brake Systems section of this manual).

CAUTION

Running the engine with the drive belt removed could result in serious engine damage and drive clutch failure.

Genuine Parts

When replacement of parts is necessary, use only genuine Arctic Cat parts. They are precision-made to ensure high quality and correct fit.

Varying Altitude Operation

Operating a snowmobile at varying altitudes requires recalibration of drive system components.

The altitude information decal is located beneath the hood of the snowmobile on the belt guard on the 5000 models. Consult the appropriate specification sheet on Cat Tracker Online.

Following are basic altitude theories for clutching, engine, suspension, and track.

CLUTCHING

On a normally-aspirated engine as altitude changes, engine horsepower changes with it. As you go up in altitude, the engine loses horsepower. Because of this, the continuously variable transmission (CVT) system needs to be calibrated to compensate for the horsepower loss.

At altitudes above 5000 ft, the engine loses peak horsepower but will also lose horsepower at engagement speed. For this reason, calibrating the drive system is usually needed in order to attain acceptable performance. Changing drive clutch engagement speed can be done several ways. Some of the methods will affect other characteristics of CVT operation, so you must be careful what you change. Drive clutch springs are the most common way to increase engagement speed; however, by simply changing the cam arms to a lighter weight from the heavier sea level cam arm, you will gain some engagement speed.

Other more complicated methods exist such as engagement notches and changing the position of the cam arm center of gravity in relation to the roller. This is called “tucking the weight” and can be used, but, like the engagement notch, it can hurt belt life.

The driven clutch will also play a part in CVT tuning for high altitude operation. A steeper helix (torque bracket) angle in the driven clutch will mean a quicker up-shift. A shallower angle will mean a slower up-shift. If the up-shift is too quick, due to a very steep helix, RPM will be pulled down under the peak operating RPM of the engine (where the horsepower is) and performance will suffer. The engine may even bog. If you have a helix that is too shallow, the engine may over-rev or have poor acceleration. Usually, angles shallower than the sea level calibrations work best. The driven spring will also affect driven clutch tuning. Tighten the spring, and RPM will increase. Loosen the spring, and RPM will decrease. The spring should be used to fine-tune and complement the helix selection.

Carburetor calibration changes for high altitude operation will have an effect on the CVT system and how it operates. Understanding the basics of CVT operation is important in order to make the correct high altitude CVT calibration changes.

ENGINE

A normally aspirated engine will generate more horsepower at sea level than it does at higher altitudes. The reason is that the higher you go, less oxygen is available for the engine to use during its combustion process. Less oxygen means it needs less fuel to obtain the correct air/fuel ratio to operate properly. This is why the fuel ratio has to be recalibrated. High altitude engines operate as though they have a lower compression ratio. This, along with less oxygen and less fuel, means that the engine generates less horsepower. All of these characteristics will become more evident the higher the altitude.

TURBOCHARGING

Turbocharging is one method of compensating for loss of air density that works extremely well when applied to four-cycle internal combustion engines.

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Exhaust gasses are directed through the turbocharger turbine wheel which is attached to the compressor through a common shaft. As the exhaust gasses spin the turbine, the compressor is spun at very high RPM. Inlet air is drawn into the compressor, compressed, and routed to the intake manifold of the engine. Intake pressure, therefore, is maintained at the optimum level as altitude or temperature increases.

The turbocharger output must be regulated to maintain the optimum manifold pressure throughout the designed operating range. This is accomplished by regulating the volume of exhaust gasses passing through the turbine by controlling a diverter valve (waste gate) at the turbocharger turbine inlet. At lower altitudes/temperatures, excessive exhaust gasses are diverted past the turbine and into the exhaust downstream of the turbocharger thus limiting the compressor output to maintain correct manifold pressure.

As altitude increases, the manifold pressure is held constant by diverting less exhaust past the turbine, thus increasing compressor speed. This will continue until the waste-gate is completely closed at which time manifold pressure will start to decrease much the same as a normally aspirated engine.

The waste gate is controlled by a spring/diaphragm mechanism that is connected to the intake manifold by an air line. A mechanical linkage connects the diaphragm to the waste gate control arm.

Air is heated by friction and compression through the turbocharger and air density is lost by heating the air; therefore, an after-cooler is installed between the turbocharger compressor and the intake manifold. This is an air-to-air after-cooler that uses outside air directed through a radiator-type cooler to cool the compressed air prior to entering the intake manifold.

SUSPENSION

The different riding styles of the individual operator, the varying snow conditions, and the type of terrain are all factors that affect the suspension at high altitude. Trail riding versus powder snow riding versus combination riding will all require different suspension settings.

The normal setting for front ski suspension is as little spring pre-load tension as possible for powder snow riding allowing the skis to float across the snow with the least amount of resistance. Trail riding will require more spring tension to carry the varying load more effectively. Many different settings and spring tensions to consider exist when adjusting for riding style and snow conditions.

The rear suspension has a number of spring settings that produce different riding characteristics.

The front arm spring and shock will also affect the ride and handling when either on a trail or in powder snow. A strong spring setting on this shock will cause the snowmobile to tend to "dig" more when riding in the powder snow rather than climbing up on top of the snow. But, it will work more effectively when riding on a trail. A softer spring setting will allow the front of the rear suspension to collapse much quicker and change the angle of the track to the snow. A more gradual angle will tend to raise the snowmobile up on the snow rather than digging into it.

Many possible variables and adjustments to the rear suspension exist depending on snow conditions, riding style, and type of terrain. These adjustments can be made to individualize the snowmobile to the riding style of the operator.

As snow cover and riding conditions change, several different adjustments can be made to change the ride and handling characteristics for operator preference. Located on the front suspension arm are limiter straps. They limit the amount of "fallout" the front arm can have. These straps may be adjusted in or out due to conditions and riding style. The more the straps are brought up, the more steering power the operator has due to the amount of ski pressure.

Another adjustment that can be made on the rear suspension is the front arm shock spring tension. As trail conditions change, the spring pre-load may be used to decrease the chance of the front end "bottoming out." With a stiffer spring pre-load, the ride of the snowmobile will improve on the trail but will affect the performance in the deep powder snow. In deep powder snow, the stiffer spring pre-load will cause the front-end to "dig" and possibly take longer for it to plane off. Several different-rate springs are available for different riding styles and terrain conditions.

On the standard models, the front shock springs are also individually adjustable for the terrain conditions and driving style of the operator. The spring adjuster has been set at the factory so the correct amount of threads are exposed between the spring adjuster and the shock housing as an initial setting. Additional ski pressure can be obtained by tightening the spring tension; ski pressure can be decreased by relaxing spring tension. Springs with different spring rates are available for operator choice and snow conditions.

A limit exists as to how far you can pre-load the springs before "coil bind" takes effect where the wire on the spring actually runs into itself and causes binding. Equal adjustments should be maintained on both sides of the snowmobile. On the Sno Pro models with air shocks, they are individually adjustable for the terrain conditions and driving style of the operator. The shocks are preset at the factory (see chart) as an initial setting; however, it is possible to "fine tune" the shocks to match the operator's weight, riding style, and terrain conditions.

Initial Setting Chart

Model	Front Shock (Ski)	Rear Arm Shock
ZR Sno Pro	5.3 kg/cm^2 (75 psi)	N/A
M Sno Pro	6.3 kg/cm^2 (90 psi)	10.2-10.6 kg/cm^2 (145-150 psi)
XF Cross Country	5.3 kg/cm^2 (75 psi)	10.19 kg/cm^2 (145 psi)
XF CrossTour	N/A	10.19 kg/cm^2 (145 psi)
RR	250 psi (nitrogen) 25/225 psi (air)	250 psi (nitrogen)

Checking and adjusting air pressure must be done at riding temperature (outside) and shocks are at full extension with no weight on the shock. Also, it is advisable to check air pressure when the outside temperature varies more than 25°.

■NOTE: Care should be taken to have equal pressure in the ski shocks before operating the snowmobile.

Finally, track tension should be looked at to make sure that it is within recommended specifications to affect the efficiency of the snowmobile. On models with the torque sensing link, the track is actually tightening as the suspension moves through its range of motion causing the track to sag in the middle and rub on the top part of the rear suspension arm.

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TRACK

Carefully matching the riding requirements to the type of track will ensure the maximum use of all available engine power. Lug height and track durometer are the two main concerns when selecting a track for various riding styles.

Tracks exist with lug heights from 0.750" up to 2.6" to accommodate various snow conditions. Generally, the deeper the snow, the taller the lug. It must be noted that the installation of any deep-lug track may reduce top end speed and promote premature wear strip wear in marginal snow conditions.

Durometer is a measurement of how hard a rubber is. The lugs on most tracks range between 60 and 85 durometer. On the durometer scale, the higher the number, the harder the lugs. For riding in deep powder snow, a softer durometer track works best. The softer rubber allows the track to "give" a little and pack the snow creating lift rather than digging its way straight down. When hill-climbing, the harder lug of an 80 durometer track works the best due to penetrating the hard snow creating more bite.

Some tracks come with a dual durometer rating, such as a track with a 80/60 durometer rating. The lugs on this track are 80% 80 durometer rubber, and the top 20% is made of the softer 60 durometer rubber. This track is designed to be a good all-around track for riding mostly in deep powder snow but can climb the occasional hard snow hill.

Preparation For Storage

Prior to storing the snowmobile, it must be properly serviced to prevent corrosion and component deterioration.

1. Clean the seat cushion with a damp cloth and Arctic Cat Vinyl Protectant.
2. Clean the snowmobile thoroughly by hosing dirt, oil, grass, and other foreign matter from the skid frame, tunnel, hood, and belly pan. Allow the snowmobile to dry thoroughly. DO NOT get water into any part of the engine.
3. Change the engine oil and replace the air filter on the 9000 if necessary.
4. Fill the gas tank to its rated capacity; then add Arctic Cat Fuel Stabilizer to the gas tank following directions on the container for the stabilizer/gasoline ratio. Tighten the gas tank cap securely.
5. With the snowmobile level, check the lubricant level in the chain case. If low, add chain lube through the fill plug hole.
6. Remove the drive belt from the drive clutch/driven clutch. Lay the belt on a flat surface or slide it into a cardboard sleeve to prevent warping or distortion during storage; then clean and inspect the drive clutch and driven clutch.
7. Apply light oil to the upper steering post bushings and to the shafts of the shock absorbers; then lubricate the rear suspension with an all-temperature grease.
8. Tighten all nuts, bolts, and cap screws making sure all calibrated nuts, bolts, and cap screws are tightened to specifications. Make sure all rivets holding the components together are tight. Replace all loose rivets.
9. Clean and polish the hood, console, and chassis with Cat Cleaner. DO NOT USE SOLVENTS. THE PROPELLENT WILL DAMAGE THE FINISH.
10. On electric start models, disconnect the battery cables making sure to disconnect the negative cable first; then clean the battery posts and cables.

CAUTION

Sealed batteries require charging if left for extended non-start periods. Arctic Cat recommends trickle charging once a month. Follow the manufacturer's instructions and cautions.

CAUTION

On models with remote start, make sure to leave the battery cables disconnected. Failure to disconnect the battery cables when storing the snowmobile for a prolonged period of time (six weeks or more) will result in a discharged or damaged battery.

11. If possible, store the snowmobile indoors. Raise the track off the floor by blocking up the back end making sure the snowmobile is secure. Loosen the track adjusting bolts to reduce track tension. Cover the snowmobile with a machine cover or a heavy, ventilated tarpaulin to protect it from dirt and dust.
12. If the snowmobile must be stored outdoors, position the snowmobile out of direct sunlight; then block the entire snowmobile off the ground making sure the snowmobile is secure. Loosen the track adjusting bolts to reduce track tension. Cover with a machine cover or a heavy, ventilated tarpaulin to protect it from dirt, dust, and rain.

CAUTION

Avoid storing in direct sunlight and using a plastic cover as moisture may collect on the snowmobile causing corrosion.

Preparation After Storage

Taking the snowmobile out of storage and correctly preparing it for another season will assure many miles and hours of trouble-free snowmobiling. Arctic Cat recommends the following procedure:

1. Clean the snowmobile thoroughly. Polish the exterior of the snowmobile.
2. Clean the engine. Remove the cloth from the exhaust system. Check exhaust system and air silencer for obstructions.
3. Inspect all control wires and cables for signs of wear or fraying. Replace if necessary. Use cable ties or tape to route wires and cables away from hot or rotating parts.
4. Inspect the drive belt for cracks and tears. Check belt specifications. Replace if damaged or worn. Install the drive belt (see the Drive Train/Track/Brake Systems section).

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■**NOTE: If the old belt is worn but in reasonable condition, retain it with the snowmobile as a spare in case of emergency.**

5. Adjust the throttle cable. Inspect all fuel hoses and oil hoses for deterioration or cracks; replace if necessary. Make sure all connections are tight.
6. Tighten all nuts, bolts, and cap screws making sure all calibrated nuts, bolts, and cap screws are tightened to specifications.
7. If not done during preparation for storage, lubricate the rear suspension with an all-temperature grease.
8. Check the coolant level and all coolant hoses and connections for deterioration or cracks. Add properly mixed coolant as necessary.
9. On electric start models, charge the battery; then connect the battery cables making sure to connect the positive cable first. Test the electric start system.
10. Inspect the entire brake system, all controls, headlight, taillight, brake light, ski wear bars, and headlight aim; adjust or replace as necessary.
11. Adjust the track to the proper tension and alignment.

After Break-In Checkup/ Checklist

Certain areas require adjustment after the break-in period in order to obtain peak performance. These areas are the following.

DRIVE BELT DEFLECTION — Drive belt deflection is very important to the snowmobile. Even if it is checked and is correct when the snowmobile is set up, it does change (more so during the break-in period). This is because the rubber engine mounts and the rubber snubber on the torque link will all take a "set" during the first 100 miles allowing the distance between the drive clutch and driven clutch to shorten. When this happens, the snowmobile will appear to have a too long drive belt. To add to this, the drive belt itself wears and stretches somewhat leading to a low-end performance problem and, if not corrected, causes premature drive belt wear.

After the break-in period, drive belt deflection should be checked according to the instructions given in the Drive Train/Track/Brake Systems section of this manual.

DRIVE CLUTCH/DRIVEN CLUTCH ALIGNMENT — The alignment between the drive clutch and driven clutch are set at the factory. Normally, no adjustment is necessary; however, if premature drive belt wear or poor performance is experienced, the drive clutch/driven clutch alignment must be checked.

TRACK TENSION AND ALIGNMENT — A certain amount of stretch occurs on all tracks during the first 500 miles. The track must be inspected/adjusted after the first 50 to 100 miles to the specifications given in the Track Specifications sub-section of this section and periodically thereafter. If these adjustments aren't performed, the track may "derail" which leads to track and slide rail damage.

Along with these major areas, other areas should be checked and adjusted.

Below is a list of items to check after the break-in period. The recommended mileage for this inspection is between 100 and 300 miles.

- ❑ Check drive belt deflection - drive clutch/driven clutch alignment
- ❑ Adjust track tension and alignment
- ❑ Check throttle cable tension
- ❑ Check engine idle
- ❑ Check coolant level
- ❑ Check chain case lubricant level
- ❑ Check engine oil
- ❑ Check lights (high/low beam, brakelight)
- ❑ Check safety switch operation
- ❑ Check engine compartment for any rubbing components
- ❑ Check steering hardware for tightness
- ❑ Check skid frame and A-arm mounting hardware for tightness
- ❑ Check brake lever travel and adjustment
- ❑ Grease all lubrication points

Engine Specifications

5000/9000

ITEM		
Engine Model Number	(5000) (9000)	AA11L5 AB11L5
Displacement		1056 cc
Bore x Stroke		98 x 70 mm (3.85 x 2.75')
Cooling System		Liquid
Spark Plug (NGK)		MR8AI-9
Spark Plug Gap		0.035"
Piston Skirt/Cylinder Clearance	(5000) (9000)	0.0011-0.0016" 0.0006-0.0010"
Piston Pin Diameter	(5000) (9000)	0.8658-0.8661" 0.9447-0.9449"
Piston Pin Bore Diameter	(5000) (9000)	0.8662-0.8664" 0.9449-0.9451"
Piston Pin/Connecting Rod Small End Clearance	(5000) (9000)	0.0004-0.0010" 0.0004-0.0009"
Piston Ring End Gap	(1st) (2nd) (Oil)	0.0059-0.0138" 0.0118-0.0177" 0.0078-0.0275"
Piston Ring/Groove Clearance	(1st - Top) (1st - Bottom) (2nd) (Oil)	0.0059-0.0074" 0.0008-0.0035" 0.0008-0.0024" 0.0024-0.0059"
Piston Diameter (10 mm from skirt edge)	(5000) (9000)	3.8568-3.8574" 3.8574-3.8580"
Cylinder/Head Distortion (max)		0.002"
Connecting Rod Small End Bore Inside Diameter	(5000) (9000)	0.866-0.867" 0.945-0.946"
Cam Lobe Height (Int)	(5000) (9000)	1.487-1.489" 1.436-1.437"
Cam Lobe Height (Exh)	(5000) (9000)	1.432-1.433" 1.417-1.418"
Camshaft Journal Outside Diameter		0.8650-0.8658"
Camshaft Journal Bore Diameter		0.8666-0.8670"
Camshaft Journal Clearance		0.0007-0.0020"
Crank Pin Diameter		1.7707-1.7720"
Crankshaft Runout		0.002"

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ITEM	
Crankshaft Main Bearing Clearance	0.0007-0.0015”
Crankshaft/Rod Bearing Clearance	0.0016-0.0025”
Crankshaft Thrust Runout (max)	0.0043”
Crankshaft Main/Rod Journals (Bearing Surfaces)	0.0012”
Valve Guide Inside Diameter	0.2165-0.2170”
Valve Guide/Stem Clearance (max) (Int) (Exh)	0.0015” 0.0022”
Valve Face Width	0.0197”
Valve Clearance - Cold (59°-77° F) (Int) (Exh - 5000) (Exh - 9000)	0.0039-0.0078” 0.0078-0.0118” 0.0118-0.0157”
Valve Seat Contact Width (Int/Exh)	0.0354-0.0433”
Valve Stem Diameter (Int) (Exh)	0.2155-0.2161” 0.2147-0.2153”

7000

ITEM	
Engine Model Number	8JK
Displacement	1049 cc
Compression Ratio	11:1
Bore x Stroke	82.04 x 66.29 mm (3.23 × 2.61”)
Cooling System	Liquid
Spark Plug (NGK)	CR9E
Spark Plug Gap	0.028-0.031”
Piston Skirt/Cylinder Clearance	0.0014-0.0024”
Piston Pin Diameter	0.7477-0.7480”
Piston Pin Bore Diameter	0.7482-0.7486”
Piston Pin to Piston Pin Bore Clearance	0.0002-0.0009”
Connecting Rod: Small End Diameter	0.7482-0.7491”
Crankshaft Pin/Connecting Rod Big End Clearance	0.0013-0.0020”
Connecting rod: Big End Diameter	1.6142-1.6149”
Piston Ring End Gap (Top) (2nd) (Oil)	0.013-0.018” 0.028-0.033” 0.008-0.024”
Piston Ring/ (1st - Top) Groove Clearance (2nd) (Oil)	0.0012-0.0028” 0.0008-0.0024” 0.0016-0.0043”
Piston Diameter (11 mm from bottom edge)	3.2264-3.2270”
Cam Lobe Height (Intake)	1.3484”
Cam Lobe Height (Exhaust)	1.3327”
Cam Lobe Width (Intake/Exhaust)	0.9783”
Camshaft Journal Diameter	0.9630-0.9635”
Camshaft Journal Clearance	0.0011-0.0024”
Crank Pin Diameter	1.4951-1.4961”
Crankshaft Runout (max)	0.012”
Crankshaft Main Bearing Clearance	0.0011-0.0018”
Crankshaft/Rod Bearing Clearance	0.0013-0.0020”
Valve Guide Inside Diameter (Intake)	0.1762-0.1768”
Valve Guide Inside Diameter (Exhaust)	0.1772-0.1776”
Valve Guide/Stem Clearance (Intake)	0.0004-0.0015”
Valve Guide/Stem Clearance (Exhaust)	0.0010-0.0020”
Valve Face Width (Intake)	0.0315-0.0472”
Valve Face Width (Exhaust)	0.0197-0.0354”

Electrical Specifications

Component	Test Value	+ Test Connections -	
5000/9000 (Normally Closed Ignition)			
Magneto Coil (3 tests)	0.2-0.4 ohm	yellow	yellow
Ignition Coil (1)	1.4 ohms	red/green	gray/green
Ignition Coil (2)	1.4 ohms	red/green	brown/green
Fuel Injector	9-12 ohms (5000) 10.5-13 ohms (9000)	lead lead	lead lead
Crankshaft Position Sensor	173-211 ohms	blue/white	green/white
Injection Coil	3.6 ohms	black/yellow	black
Voltage Regulator/Rectifier*	12-14.5 DC Volts	terminal	terminal
Magneto Coil (no load) (3 tests)	36-44 AC Volts	yellow	yellow
Spark Plug Cap	4000-6000 ohms	cap end	cap end
Ignition Switch	Less than 1 ohm (key in ON position)	terminal	terminal
7000 (Normally Closed Ignition)			
Magneto Coil (3 tests)	0.15-0.23 ohm	white	white
Ignition Coil (1)	1.19-1.61 ohm	orange	gray/red
Ignition Coil (2)	1.19-1.61 ohm	orange	brown/pink
Ignition Coil (3)	1.19-1.61 ohm	orange	gray/brown
Fuel Injector	86.4-105.6 ohms	lead	lead
Crankshaft Position Sensor	336-504 ohms	gray	black
Injection Coil (1)	86.4-105.6 ohms	red/blue	red/black
Injection Coil (2)	86.4-105.6 ohms	red/blue	green/black
Injection Coil (3)	86.4-105.6 ohms	red/blue	blue/black
Voltage Regulator/Rectifier*	12-14.5 DC Volts	terminal	terminal
Magneto Coil (no load) (3 tests)	40 AC Volts at idle	white	white
Ignition Switch	Less than 1 ohm (key in ON position)	terminal	terminal
Spark Plug Cap	5.8-11.5 ohm	cap end	cap end

* Harness plugged in

■**NOTE: Lighting coil output is unregulated voltage.**

⚠ WARNING

Most voltages generated by the ignition system are sufficient to interrupt pacemakers! All technicians, especially those using pacemakers, must avoid contact with all electrical connections.

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Drive System Specifications

Model	Altitude	Drive Clutch Spring	Cam Arm	Driven Clutch Spring	Torque Bracket	Drive Belt	Engagement RPM	Peak RPM	Top Gear	Bottom Gear	Chain Pitch
ZR 5000	0-5000	Black/Gold	60g	Black/Blue	42°/36°	0627-081	28-3000	85-8600	22T	48T	90
ZR 9000	0-5000	Yellow/White	85g	Black/Blue	44°/40°	0627-082	38-4000	76-7800	22T	37T	84
ZR 7000	0-5000	Black/Gold	57g	Black/Blue	42°/36°	0627-070	38-4000	85-8600	21T	49T	90
XF 7000	0-5000	Black/Gold	60g	Black/Blue	42°/36°	0627-070	38-4000	85-8600	21T	49T	90
Pantera 7000	0-5000	Black/White	58.5 g	Black/Blue	42°/36°	0627-070	30-3200	85-8600	21T	49T	90
XF 7000 High Country	0-5000	Black/Gold	53g	Black/Blue	36°	0627-070	38-4000	85-8600	21T	49T	90
M 7000	0-5000	Black/Gold	53g	Black/Blue	36°	0627-070	38-4000	85-8600	21T	49T	90
M 9000	0-5000	Yellow/White	85g	Black/Blue	42°/40°	0627-082	38-4000	76-7800	21T	49T	90
XF 9000	0-5000	Yellow/White	85g	Black/Blue	44°/40°	0627-082	38-4000	76-7800	21T	41T	86
XF 9000 High Country	0-5000	Yellow/White	85g	Black/Blue	42°/40°	0627-082	38-4000	76-7800	21T	49T	90

Drive Clutch/Driven Clutch-Related Specifications

ALIGNMENT BAR			
OFFSET P/N	CENTER-TO-CENTER	OFFSET	FLOAT
0644-428	(5000/9000) 11.567” ± 0.020”	1.485”	None
0644-428	(7000) 10.30”	1.485”	None

Drive System Components

A list of Drive System components that are available through the Arctic Cat Service Parts Department can be found in the Quick Reference Guide. This information will be useful when doing any fine-tuning on the drive system.

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Chain Case Performance Calibrations

Drive Sprocket	Gear Ratio		Ratio	Chain	Engine RPM													
	Top	Btm			6200	6400	6600	6800	7000	7200	7400	7600	7800	8000	8200	8400	8600	8800	9000
					Vehicle Speed (mph)														
7 Tooth (3.0" pitch)	21	49	0.429	90	59	61	63	65	67	69	71	73	74	76	78	80	82	84	86
	20	46	0.435	88	60	62	64	66	68	70	72	74	75	77	79	81	83	85	87
	23	51	0.451	92	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90
	22	48	0.458	90	63	65	67	69	71	73	76	78	80	82	84	86	88	90	92
	24	50	0.480	92	66	68	71	73	75	77	79	81	83	85	88	90	92	94	96
	21	41	0.512	86	71	73	75	78	80	82	84	87	89	91	93	96	98	100	103
	21	38	0.553	84	76	79	81	84	86	89	91	93	96	98	101	103	106	108	111
	20	35	0.571	82	79	81	84	87	89	92	94	97	99	102	104	107	109	112	114
	23	40	0.575	86	79	82	84	87	90	92	95	97	100	102	105	108	110	113	115
	22	37	0.595	84	82	85	87	90	93	95	98	101	103	106	109	111	114	116	119
	24	39	0.615	86	85	88	90	93	96	99	101	104	107	110	112	115	118	121	123
	23	36	0.639	84	88	91	94	97	100	102	105	108	111	114	117	119	122	125	128
	24	35	0.686	84	95	98	101	104	107	110	113	116	119	122	125	128	131	134	137
8 Tooth (2.86" pitch)	21	49	0.429	90	64	67	69	71	73	75	77	79	81	83	85	87	89	91	94
	20	46	0.435	88	65	67	70	72	74	76	78	80	82	84	86	89	91	93	95
	23	51	0.451	92	68	70	72	74	77	79	81	83	85	88	90	92	94	96	98
	22	48	0.458	90	69	71	73	76	78	80	82	84	87	89	91	93	96	98	100
	24	50	0.480	92	72	75	77	79	81	84	86	88	91	93	95	98	100	102	105
	21	41	0.512	86	77	80	82	84	87	89	92	94	97	99	102	104	107	109	112
	21	38	0.553	84	83	86	88	91	94	97	99	102	105	107	110	113	115	118	121
	20	35	0.571	82	86	89	91	94	97	100	103	105	108	111	114	116	119	122	125
	23	40	0.575	86	86	89	92	95	98	100	103	106	109	112	114	117	120	123	126
	22	37	0.595	84	89	92	95	98	101	104	107	110	112	115	118	121	124	127	130
	24	39	0.615	86	93	96	99	101	104	107	110	113	116	119	122	125	128	131	134
	23	36	0.639	84	96	99	102	105	108	112	115	118	121	124	127	130	133	136	139
	24	35	0.686	84	103	106	110	113	116	120	123	126	130	133	136	140	143	146	150
8 Tooth (3.0" pitch)	21	49	0.429	90	68	70	72	74	76	79	81	83	85	87	89	92	94	96	98
	20	46	0.435	88	69	71	73	75	77	80	82	84	86	88	91	93	95	97	100
	23	51	0.451	92	71	73	76	78	80	83	85	87	89	92	94	96	99	101	103
	22	48	0.458	90	72	75	77	79	82	84	86	89	91	93	96	98	100	103	105
	24	50	0.480	92	76	78	81	83	85	88	90	93	95	98	100	103	105	107	110
	21	41	0.512	86	81	83	86	89	91	94	96	99	102	104	107	109	112	115	117
	21	38	0.553	84	87	90	93	96	98	101	104	107	110	112	115	118	121	124	127
	20	35	0.571	82	90	93	96	99	102	105	108	110	113	116	119	122	125	128	131
	23	40	0.575	86	91	94	97	99	102	105	108	111	114	117	120	123	126	129	132
	22	37	0.595	84	94	97	100	103	106	109	112	115	118	121	124	127	130	133	136
	24	39	0.615	86	97	100	103	106	110	113	116	119	122	125	128	132	135	138	141
	23	36	0.639	84	101	104	107	111	114	117	120	124	127	130	133	137	140	143	146
	24	35	0.686	84	108	112	115	119	122	126	129	133	136	140	143	147	150	154	157
9 Tooth (2.52" pitch)	21	49	0.429	90	64	66	68	70	72	74	76	78	80	82	84	87	89	91	93
	20	46	0.435	88	65	67	69	71	73	75	77	79	82	84	86	88	90	92	94
	23	51	0.451	92	67	69	72	74	76	78	80	82	85	87	89	91	93	95	98
	22	48	0.458	90	68	71	73	75	77	79	82	84	86	88	90	93	95	97	99
	24	50	0.480	92	72	74	76	78	81	83	85	88	90	92	95	97	99	102	104
	21	41	0.512	86	76	79	81	84	86	89	91	94	96	99	101	103	106	108	111
	21	38	0.553	84	82	85	88	90	93	96	98	101	104	106	109	112	114	117	120
	20	35	0.571	82	85	88	91	93	96	99	102	104	107	110	113	115	118	121	124
	23	40	0.575	86	86	88	91	94	97	100	102	105	108	111	113	116	119	122	124
	22	37	0.595	84	89	91	94	97	100	103	106	109	112	114	117	120	123	126	129
	24	39	0.615	86	92	95	98	101	104	107	109	112	115	118	121	124	127	130	133
	23	36	0.639	84	95	98	101	104	108	111	114	117	120	123	126	129	132	135	138
	24	35	0.686	84	102	106	109	112	115	119	122	125	129	132	135	138	142	145	148

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Drive Sprocket	Gear Ratio		Ratio	Chain	Engine RPM													
	Top	Btm			6200	6400	6600	6800	7000	7200	7400	7600	7800	8000	8200	8400	8600	8800	9000
					Vehicle Speed (mph)														
9 Tooth (2.86" pitch)	21	49	0.429	90	73	75	77	80	82	84	87	89	91	94	96	98	101	103	105
	20	46	0.435	88	74	76	78	81	83	85	88	90	93	95	97	100	102	104	107
	23	51	0.451	92	76	79	81	84	86	89	91	94	96	98	101	103	106	108	111
	22	48	0.458	90	78	80	83	85	88	90	93	95	98	100	103	105	108	110	113
	24	50	0.480	92	81	84	86	89	92	94	97	100	102	105	107	110	113	115	118
	21	41	0.512	86	87	89	92	95	98	101	103	106	109	112	115	117	120	123	126
	21	38	0.553	84	93	97	100	103	106	109	112	115	118	121	124	127	130	133	136
	20	35	0.571	82	97	100	103	106	109	112	115	118	122	125	128	131	134	137	140
	23	40	0.575	86	97	100	104	107	110	113	116	119	122	126	129	132	135	138	141
	22	37	0.595	84	101	104	107	110	114	117	120	123	127	130	133	136	140	143	146
	24	39	0.615	86	104	107	111	114	118	121	124	128	131	134	138	141	144	148	151
	23	36	0.639	84	108	112	115	119	122	126	129	132	136	139	143	146	150	153	157
	24	35	0.686	84	116	120	123	127	131	135	138	142	146	150	153	157	161	165	168
9 Tooth (3.0" pitch)	21	49	0.429	90	76	79	81	83	86	88	91	93	96	98	101	103	105	108	110
	20	46	0.435	88	77	80	82	85	87	90	92	95	97	100	102	105	107	110	112
	23	51	0.451	92	80	83	85	88	90	93	96	98	101	103	106	108	111	114	116
	22	48	0.458	90	81	84	87	89	92	94	97	100	102	105	108	110	113	115	118
	24	50	0.480	92	85	88	91	93	96	99	102	104	107	110	113	115	118	121	124
	21	41	0.512	86	91	94	97	100	103	106	108	111	114	117	120	123	126	129	132
	21	38	0.553	84	98	101	104	108	111	114	117	120	123	127	130	133	136	139	142
	20	35	0.571	82	101	105	108	111	114	118	121	124	128	131	134	137	141	144	147
	23	40	0.575	86	102	105	109	112	115	118	122	125	128	132	135	138	142	145	148
	22	37	0.595	84	106	109	112	116	119	123	126	129	133	136	140	143	146	150	153
	24	39	0.615	86	109	113	116	120	123	127	130	134	137	141	144	148	151	155	159
	23	36	0.639	84	113	117	121	124	128	132	135	139	143	146	150	154	157	161	165
	24	35	0.686	84	122	126	130	133	137	141	145	149	153	157	161	165	169	173	177
10 Tooth (2.52" pitch)	21	49	0.429	90	71	73	76	78	80	82	85	87	89	92	94	96	98	101	103
	20	46	0.435	88	72	74	77	79	81	84	86	88	91	93	95	98	100	102	105
	23	51	0.451	92	75	77	80	82	84	87	89	92	94	96	99	101	104	106	108
	22	48	0.458	90	76	78	81	83	86	88	91	93	96	98	100	103	105	108	110
	24	50	0.480	92	80	82	85	87	90	92	95	97	100	103	105	108	110	113	115
	21	41	0.512	86	85	88	90	93	96	99	101	104	107	109	112	115	118	120	123
	21	38	0.553	84	92	94	97	100	103	106	109	112	115	118	121	124	127	130	133
	20	35	0.571	82	95	98	101	104	107	110	113	116	119	122	125	128	131	134	137
	23	40	0.575	86	95	98	101	104	108	111	114	117	120	123	126	129	132	135	138
	22	37	0.595	84	98	102	105	108	111	114	118	121	124	127	130	133	137	140	143
	24	39	0.615	86	102	105	108	112	115	118	122	125	128	132	135	138	141	145	148
	23	36	0.639	84	106	109	113	116	119	123	126	130	133	137	140	143	147	150	154
	24	35	0.686	84	114	117	121	125	128	132	136	139	143	147	150	154	158	161	165

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Track Specifications

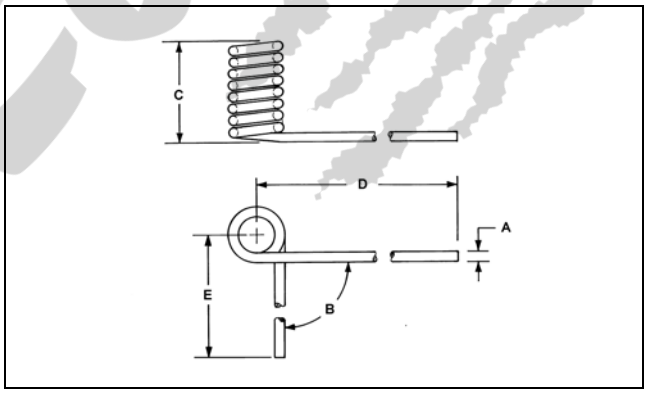
Model	Length	Lug Height	Track Tension	
			Setup	After Break-in
ZR LXR	129"	1"	1.75-2"	2-2.25"
ZR Sno Pro	129"	1.25"	1.75-2"	2-2.25"
M Standard	153"/162"	2.25"	2-2.25"	2-2.25"
M Sno Pro/HCR/LTD	153"/162"	2.6"	2-2.25"	2-2.25"
Pantera	146”	1.25”	2-2.25"	2-2.25"
XF Standard	137"	1.25"	1.75-2"	2-2.25"
XF CrossTour	141”	1.25”	1.75-2"	2-2.25"
XF Cross Country	141"	1.60"	1.75-2”	2-2.25"
XF High Country	141"	2.25"	1.75-2"	2-2.25"
XF Sno Pro	141"	1.50"	1.75-2"	2-2.25"

■**NOTE: The track tension on 129”, 137”, and 146” models should be 2-in. @ 20 lb. The track tension on 141”, 153”, and 162” models should be 2-in. @ 12-15 lb.**

Suspension Specifications

SPRINGS

SKI SHOCK (*Active, **Total)					
Model	Wire Diameter	Free Length	Rate	Coils	Tab
ZR LXR/M (STD)/XF LXR/Pantera	0.331”	13.00”	120 lb/in.	9.6	NO
FRONT ARM					
Model	Wire Diameter	Free Length	Rate	Coils	Tab
ZR LXR/XF LXR	0.312”	8.25”	90/250 lb/in.	9.8	NO
Pantera	0.312”	7.75”	110 lb/in.	7	NO
REAR ARM					
Model	Wire Diameter	Free Length	Rate	Coils	Tab
M STD/XF 137”	0.375”	13.00”	175 lb/in.	10.5	NO
REAR ARM (See Illustration Below)					
Model	Wire Diameter (A)	Angle (B)	Coil Width (C)	Coils	Length (D)
ZR/XF 137”	.405"	90°	3.65"	6.75	18.50”
Pantera	.405”	80°	3.65”	6.75	18.50”



0730-218

IFP SHOCK ABSORBERS

Below is a list of IFP shock absorbers used on the front and rear suspensions of Arctic Cat snowmobiles. If replacing a shock absorber, always select a shock absorber with the same length, both collapsed and extended.

SKI				
Model	Collapsed Length	Extended Length	Stroke	Piston Depth
ZR/XF/Pantera	12.59”	18.38”	5.79”	7.63”
M	11.31”	17.17”	6.09”	7.63”
FRONT ARM				
Model	Collapsed Length	Extended Length	Stroke	Piston Depth
ZR	8.16”	11.76”	3.71”	5.14”
XF/Pantera	8.56”	12.50”	3.93”	3.97”
M Standard	8.10”	11.25”	3.15”	5.01”
REAR ARM				
Model	Collapsed Length	Extended Length	Stroke	Piston Depth
ZR LXR	10.08”	14.37”	4.48”	0.90”
XF LXR/Pantera	10.32”	15.12”	4.79”	0.89”
M Standard	11.10”	16.00”	5.10”	5.01”

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Torque Conversions

ft-lb	N-m	ft-lb	N-m	ft-lb	N-m	ft-lb	N-m
1	1.4	26	35.4	51	69.4	76	103.4
2	2.7	27	36.7	52	70.7	77	104.7
3	4.1	28	38.1	53	72.1	78	106.1
4	5.4	29	39.4	54	73.4	79	107.4
5	6.8	30	40.8	55	74.8	80	108.8
6	8.2	31	42.2	56	76.2	81	110.2
7	9.5	32	43.5	57	77.5	82	111.5
8	10.9	33	44.9	58	78.9	83	112.9
9	12.2	34	46.2	59	80.2	84	114.2
10	13.6	35	47.6	60	81.6	85	115.6
11	15	36	49	61	83	86	117
12	16.3	37	50.3	62	84.3	87	118.3
13	17.7	38	51.7	63	85.7	88	119.7
14	19	39	53	64	87	89	121
15	20.4	40	54.4	65	88.4	90	122.4
16	21.8	41	55.8	66	89.8	91	123.8
17	23.1	42	57.1	67	91.1	92	125.1
18	24.5	43	58.5	68	92.5	93	126.5
19	25.8	44	59.8	69	93.8	94	127.8
20	27.2	45	61.2	70	95.2	95	129.2
21	28.6	46	62.6	71	96.6	96	130.6
22	29.9	47	63.9	72	97.9	97	131.9
23	31.3	48	65.3	73	99.3	98	133.3
24	32.6	49	66.6	74	100.6	99	134.6
25	34	50	68	75	102	100	136

Torque Specifications

■NOTE: Torque specifications have the following tolerances:

Torque (ft-lb)	Tolerance
0-15	±20%
16-39	±15%
40+	±10%

DRIVE SYSTEM		
Item	**Secured to**	**Torque ft-lb**
Drive Clutch***	Engine	51
Drive Clutch Cover	Movable Sheave	120 in.-lb
Cam Arm Pin Lock Nut	Cam Arm Pin	11
Cam Arm Set Screw	Cam Arm	19 in.-lb
Driven Clutch**	Driven Shaft	20
Movable Sheave	Torque Bracket	72 in.-lb
Chain Case (Cap Screw)	Chassis	96 in.-lb
Chain Case (Torx-Head Screw)	Chassis	12
Chain Case Cover	Chain Case	12
Shift Actuator	Chain Case Cover	36 in.-lb
Brake Caliper**	Chassis	25
Outside Caliper Housing	Inside Caliper Housing	25
Brakeline	Caliper	25
Brakeline	Master Cylinder	25
Brake Caliper	Shield Cover	96 in.-lb

STEERING/FRONT SUSPENSION/CHASSIS		
Item	**Secured to**	**Torque ft-lb**
Ski	Spindle	35
Ski	Wearbar	8
Ski	Ski Handle	54 in.-lb
Handlebar Adjuster Block (Standard)	Post	15
Handlebar Adjuster (Sno Pro)	Post	15
Steering Support	Mounting Block	8
Steering Tie Rod Link	Steering Post	35
Steering Tie Rod Link	Steering Arm	20
Steering Post Cap	Riser Block	15
Steering Post	Chassis	55
Steering Tie Rod	Steering Arm	20
Tie Rod	Spindle Arm	32
Steering Support	Spar	20
Steering Support	Upper Console	30 in.-lb
Steering Arm	Chassis	8
A-Arm (Upper) (M)	Chassis	9
A-Arm (Upper)	Chassis	23
A-Arm (Lower)	Chassis (Front)	65
A-Arm (Lower)	Chassis (Rear)	45
A-Arm	Spindle	45
Shock Absorber (ZR, XF)	Spindle	32
Shock Absorber (ZR, XF)	Chassis	32
Shock Absorber (M)	Spindle	24
Shock Absorber (M)	Chassis	24
Sway Bar Link	A-Arm/Sway Bar Link	23
Sway Bar Mounting Bracket	Chassis	9
REAR SUSPENSION		
M/XF 141”		
Wear Strip	Rail	50 in.-lb
End Cap	Rail	80 in.-lb
Mounting Block	Rail	12
Rear Wheel Axle	Rail	34
Rear Arm	Rail	20
Idler Arm (M)	Rear Arm	20
Idler Arm (XF)	Rear Arm	40
Front Shock	Rail	50
Rear Shock (M)	Front Arm/Idler Arm	24
Rear Shock (XF)	Front Arm/Idler Arm	40
Rail Support	Rail	20
Front Shock (M)	Front Arm	24
Front Shock (XF)	Front Arm	40
Limiter Strap	Rail Support	72 in.-lb
Rail (M/HCR)	Rail Brace	12
Rear Tri Hub Wheel	Rear Tri Hub Wheel	50 in.-lb
Rear Shock Link (M)	Front Arm/Idler Arm	24
Rear Shock Link (XF)	Front Arm/Idler Arm	40
Front Arm	Rail	52
Skid Frame	Tunnel	45
ZR/XF 137”/Pantera		
Wear Strip	Rail	50 in.-lb
End Cap	Rail	80 in.-lb
Mounting Block	Rail	12
Rear Arm	Rail	45
Rear Arm	Idler Arm	55
Spring Slide	Rail	20
Front Arm	Rail	52
Coupler Block Axle	Rail	40
Limiter Strap	Rail Support	72 in.-lb
Rear Tri Hub Wheel	Rear Tri Hub Wheel	50 in.-lb
Rear Wheel Axle	Rail	34
Skid Frame	Tunnel	55**
Front Shock	Rail	50
Rail Support	Rail	20
Limiter Strap	Front Arm	72 in.-lb

* w/Green Loctite #609
** w/Blue Loctite #243
*** w/Oil

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Steering and Body

This section has been organized into sub-sections for servicing steering and body components; however, some components may vary from model to model. The technician should use discretion and sound judgment when removing and installing components.

■NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

SPECIAL TOOLS

A special tool must be available to the technician when servicing the steering and body systems.

Description	p/n
Shock Spring Removal Tool	0644-057
Handlebar Stand	5639-152
Steering Post Stand	5639-946

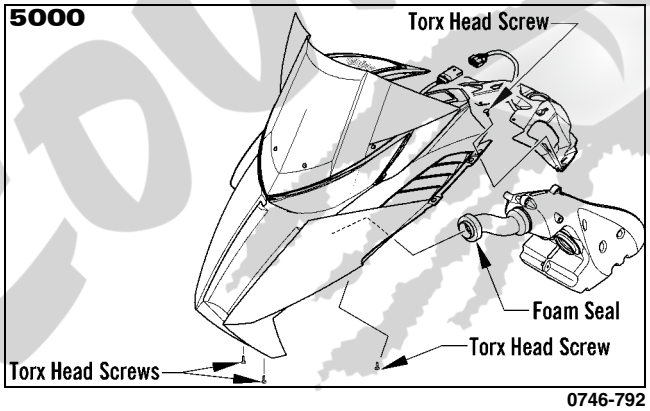
■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

Steering Post

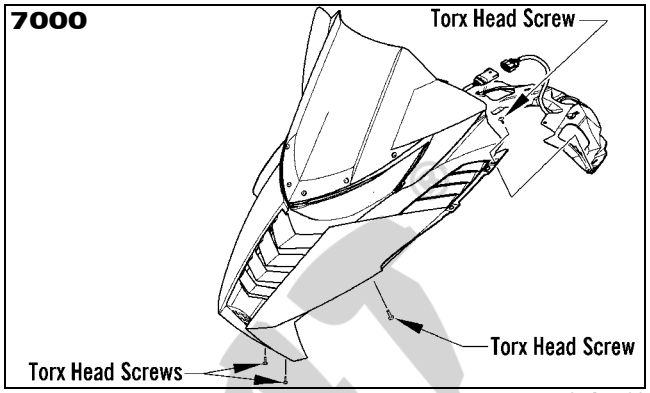
REMOVING (Standard)

To remove the access panel and hood, use the following procedure:

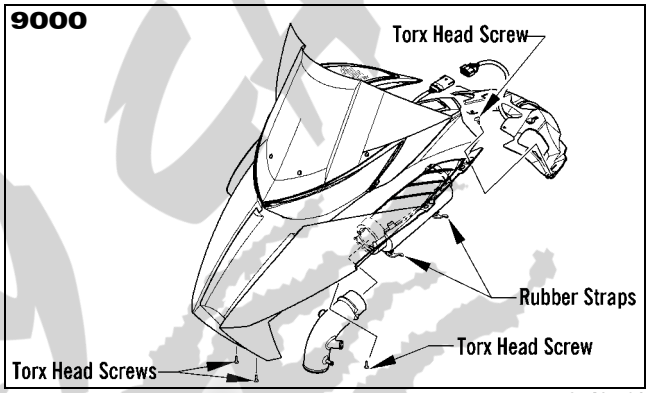
1. Remove the hairpin clip from the pin located at the front of the access panel. Move the panel up and off the pin; then swing the panel all the way out and unhinge the panel from the lower console.
2. Remove all six torx-head screws securing the hood.



0746-792



0747-529

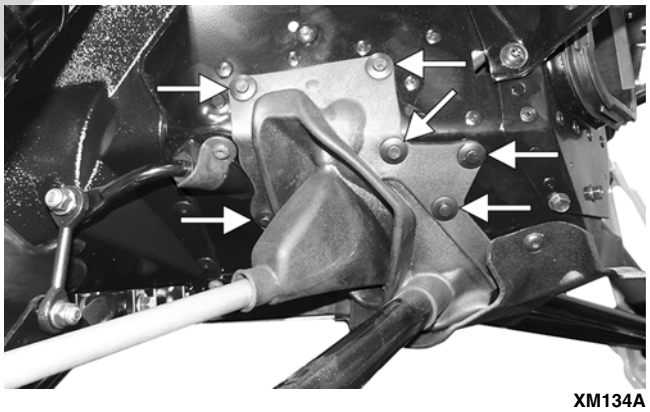


0746-791

3. Locate the hood harness connector (located under the center vent between the intake vents) and unplug the connector; then move the hood slightly forward and remove the hood.

■NOTE: On the 9000, first unhook the rubber straps securing the air filter housing to the intake plenum of the hood; then move the hood slightly forward and remove the hood.

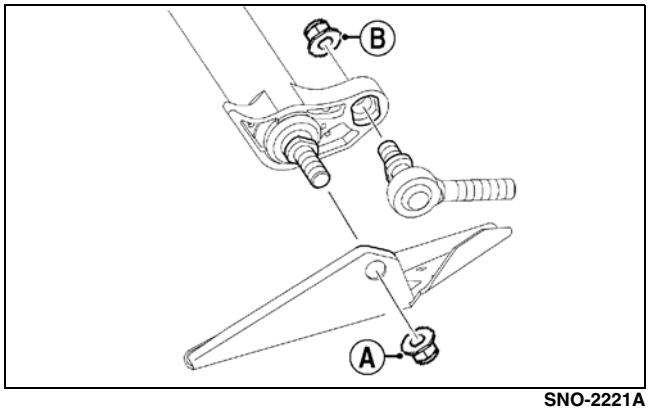
4. Remove the push rivets securing the right-side steering boot to the chassis. This allows access to the two nuts securing the bottom of the steering post.



XM134A

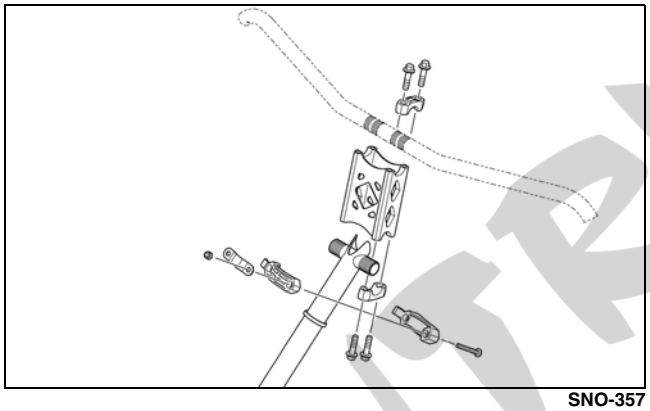
5. Remove the nut (A) securing the bottom of the existing steering post to the steering stop bracket; then remove the nut (B) securing the steering tie rod assembly to the steering post. Discard both nuts.

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SNO-2221A

6. Remove the cap screws and handlebar caps securing the handlebar to the top of the handlebar riser; then remove the two torx-head screws and nuts securing the top of steering post to the chassis. Account for both steering post blocks and retaining plate.



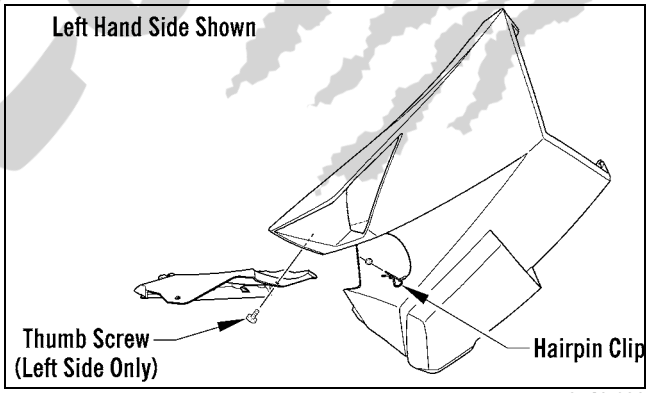
SNO-357

7. Carefully remove the steering post from the snowmobile.

REMOVING (Vertical)

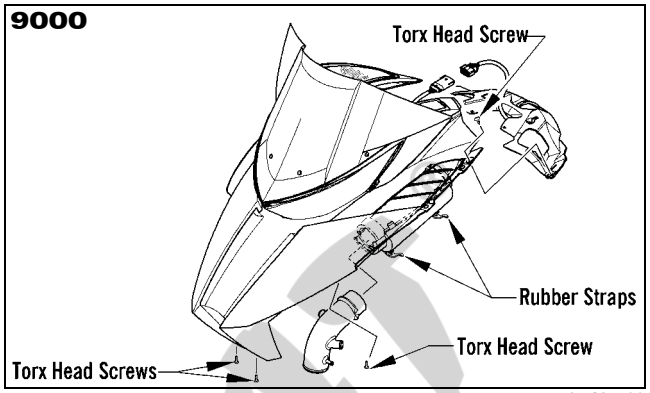
To remove the access panel and hood, use the following procedure:

1. Remove the hairpin clip from the pin located at the front of the access panel; then unscrew the thumb screw. Move the panel up and off the pin; then swing the panel all the way out and unhinge the panel from the lower console.



0746-800

2. Remove all six torx-head screws securing the hood.

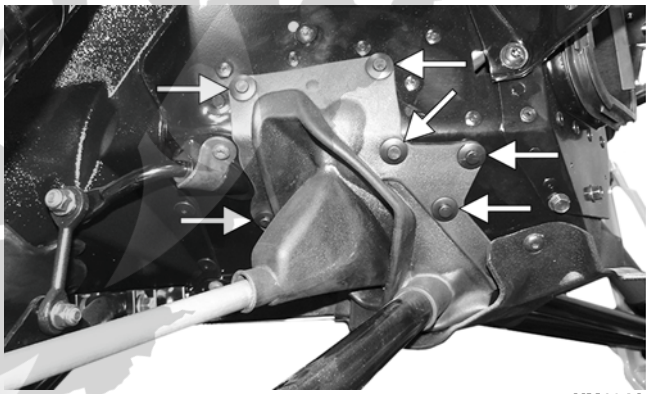


0746-792

3. Locate the hood harness connector (located under the center vent between the intake vents) and unplug the connector; then move the hood slightly forward and remove the hood.

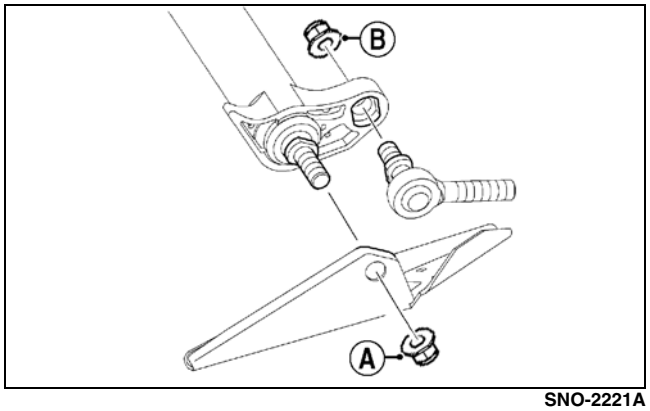
■NOTE: On the 9000, first unhook the rubber straps securing the air filter housing to the intake plenum of the hood; then move the hood slightly forward and remove the hood.

4. Remove the five push rivets securing the right-side steering boot to the chassis. This allows access to the two nuts securing the bottom of the steering post.



XM134A

5. Remove the nut (A) securing the bottom of the existing steering post to the steering stop bracket; then remove the nut (B) securing the steering tie rod assembly to the steering post. Discard both nuts.



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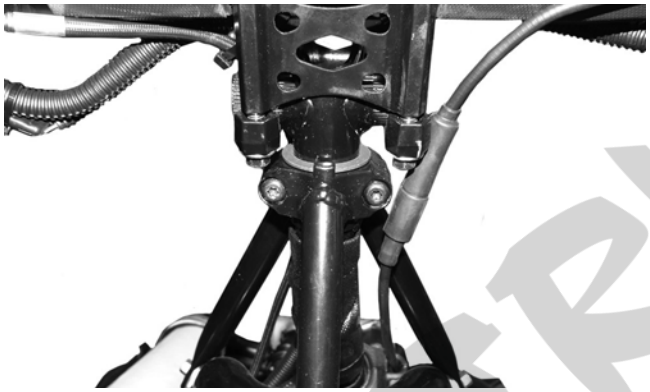
6. Remove the torx-head screws and handlebar caps securing the handlebar to the top of the handlebar riser.

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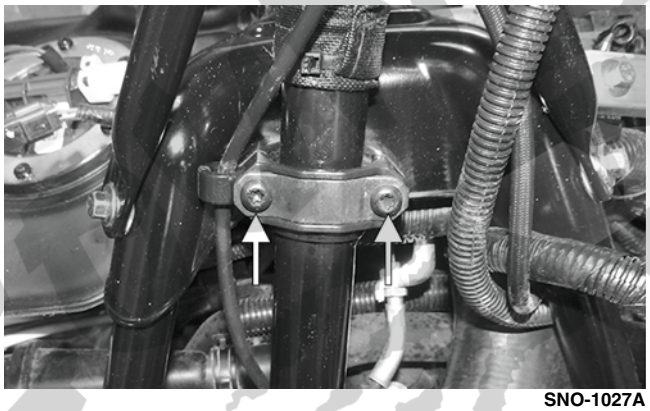
SNO-1025

7. Remove the two machine screws and nuts securing the front and rear steering supports around the steering post.



SNO-817

8. Remove the two torx-head screws and nuts securing the top of steering post to the chassis. Account for both steering post blocks and retaining plate.



SNO-1027A

9. Remove both cap screws and flat washers securing the front steering support to the chassis. Remove the support.



SNO-1026A

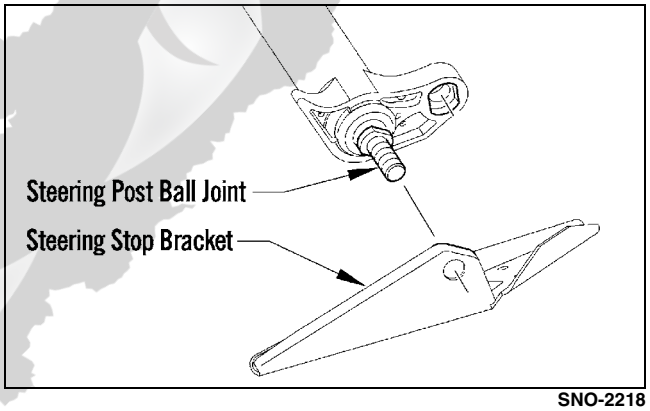
10. Remove the steering post.

INSPECTING

1. Inspect all welded areas for cracks or deterioration.
2. Inspect the steering post and steering-post retaining plate for cracks, bends, or wear.
3. Inspect the adjuster caps and mounting block for cracks or wear.

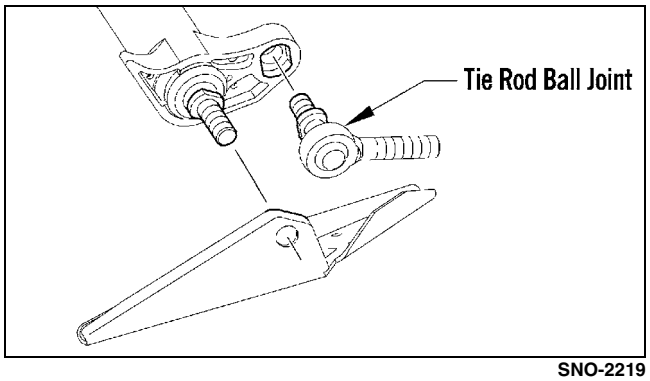
INSTALLING (Standard)

1. Install steering post into position and secure to the steering stop bracket with a new M10 nut. **Be sure to align the steering post ball joint alignment tab with the steering stop bracket.** Tighten to 43 ft-lb.



SNO-2218

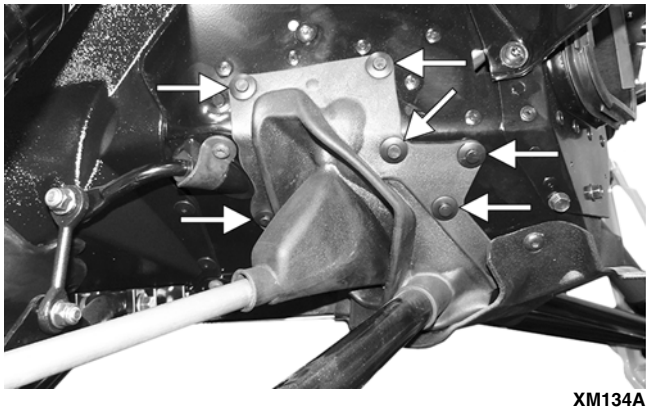
2. Secure the tie rod assembly to the steering post using a new M10 nut. **Be sure to align the tie rod ball joint alignment tab with the steering post.** Tighten to 35 ft-lb.



SNO-2219

3. Secure the right-side steering boot to the chassis using the existing push rivets.

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XM134A

4. Secure the top of the steering post to the steering support using the existing retaining plate and nuts. Tighten to 96 in.-lb.
5. Install the expansion chamber using the existing springs; then connect the exhaust temperature sensor to the main harness.
6. Position the hood onto the snowmobile and connect the hood harness connector.

■NOTE: On the 9000 prior to securing the hood, make sure the air filter is seated properly into the air silencer and secured using the two rubber straps.

7. Secure the hood with the six torx-head screws and tighten securely.

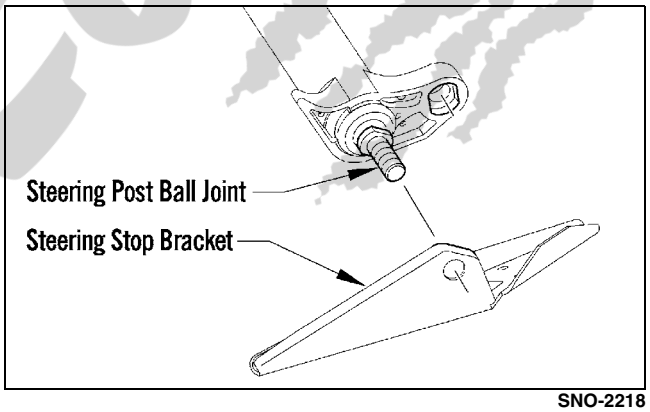
■NOTE: On the 5000, make sure the foam seal is in place on the air intake.

■NOTE: On the 9000, make sure the air filter housing is properly connected and secured with the rubber straps to the intake plenum of the hood and turbo-charger.

8. Install the access panels onto the lower console; then close the access panels and secure with the clip.

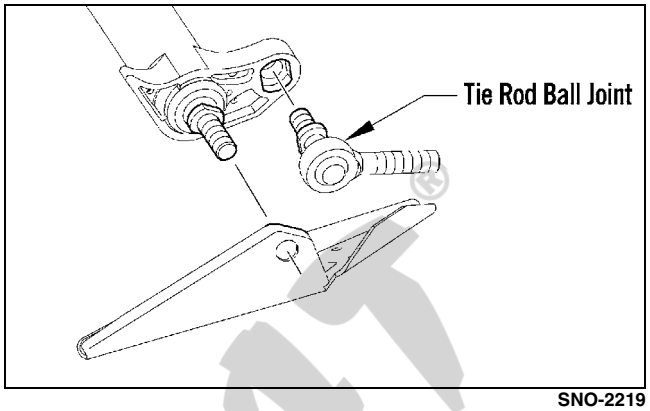
INSTALLING (Vertical)

1. Install steering post into position and secure to the steering stop bracket with a new M10 nut. **Be sure to align the steering post ball joint alignment tab with the steering stop bracket.** Tighten to 43 ft-lb.



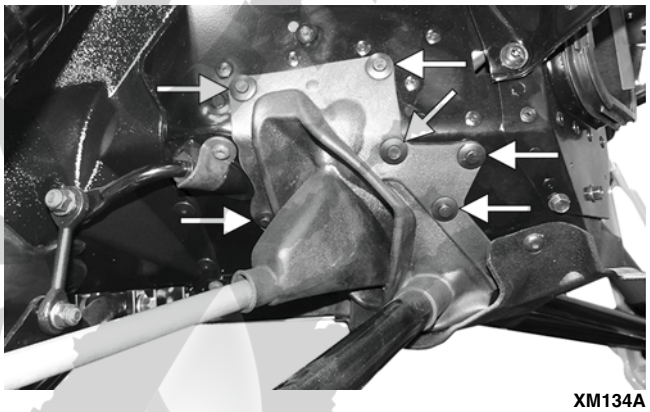
SNO-2218

2. Secure the tie rod assembly to the steering post using a new M10 nut. **Be sure to align the tie rod ball joint alignment tab with the steering post.** Tighten to 35 ft-lb.



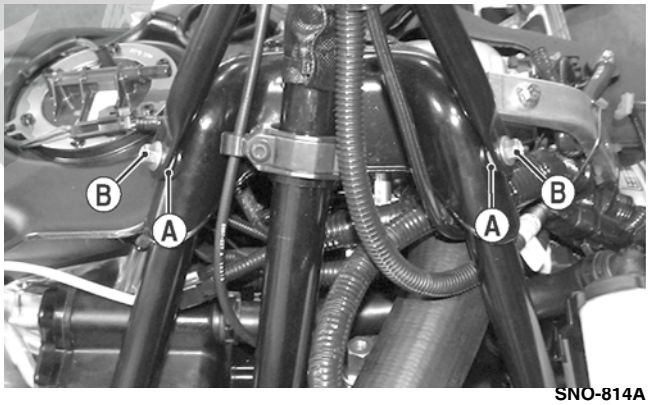
SNO-2219

3. Secure the right-side steering boot to the chassis using the existing push rivets.



XM134A

4. Secure the top of the steering post to the steering support using the existing retaining plate, blocks, machine screws, and nuts. Tighten to 96 in.-lb.
5. Using two aluminum washers (A) and cap screws (B), loosely secure front steering support to the steering support. Finger tighten only at this time.

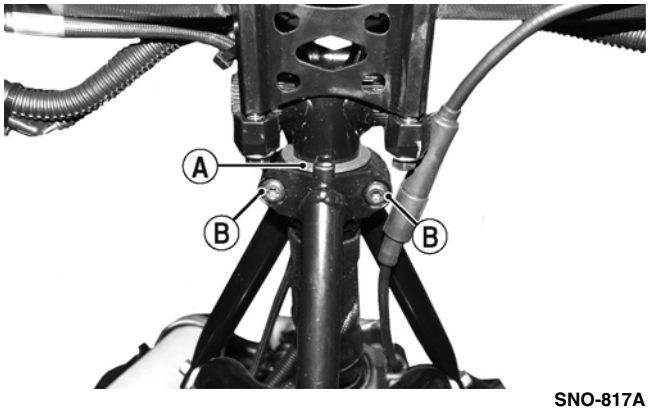


SNO-814A

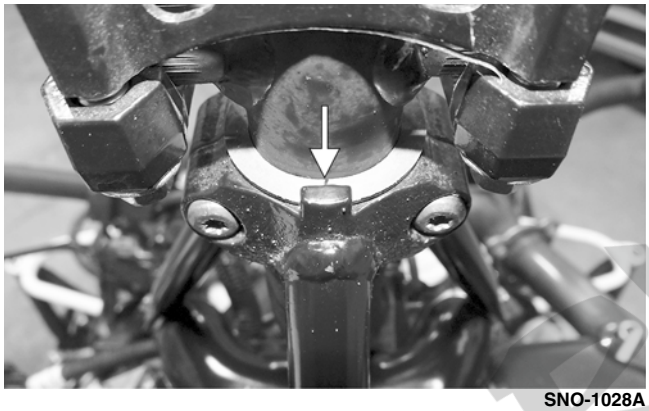
■NOTE: The aluminum washers must be installed between the steering support and the front steering support tubes.

6. Secure handlebar riser to the steering post and the handlebar using the existing handlebar caps and cap screws. Finger tighten only at this time.
7. Position front steering support around the steering post making sure the bearing lip (A) is on top of the front and rear steering supports **and is aligned with the notch in the rear steering support**. Secure using existing machine screws (B) and nuts. Finger tighten only at this time.

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SNO-817A



SNO-1028A

8. Tighten the four cap screws securing the front and rear support tubes to 25 ft-lb; then tighten the two machine screws securing the front and rear support tubes around the steering post to 8 ft-lb.
9. Secure the handlebar harness to the handlebar riser using two cable ties.
10. Position the handlebar to the desired position; then tighten all eight screws evenly to 15 ft-lb.
11. Install the upper and lower console; then install the seat using the existing hardware.
12. Install the hood and both access panels.

■NOTE: Prior to securing the hood, make sure the air filter is seated properly into the air silencer and secured using the two rubber straps.

■NOTE: Make sure the air filter housing is properly connected and secured with the rubber straps to the intake plenum of the hood and turbocharger.

Ski

REMOVING

1. Elevate the front of the snowmobile and secure on a support stand.
2. Remove and discard the cotter pin; then remove the nut and cap screw securing the ski to the spindle.

■NOTE: Note the orientation of the damper for installation purposes.

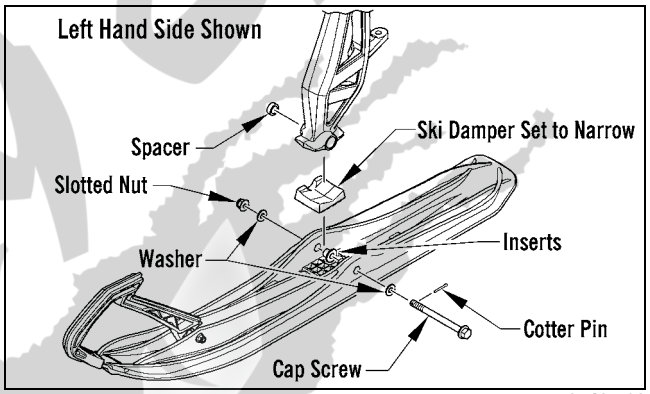
3. Remove the ski. Account for the rubber damper and washers.

INSPECTING

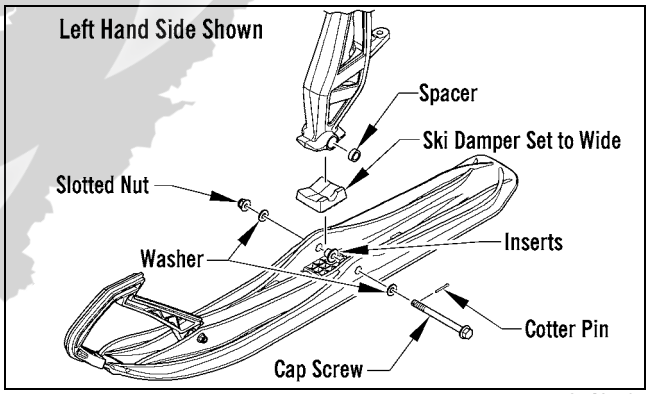
1. Inspect the ski for cracks or deterioration.
2. Inspect the ski for abnormal bends or cracks.
3. Inspect the wear bar for wear.
4. Inspect all hardware and the spindle bushings for wear and damage.
5. Inspect the rubber damper for damage or wear.

INSTALLING

1. Slide a washer onto the cap screw used to secure the ski; then apply all-temperature grease to the shaft portion of the cap screw and spindle axle.
2. Install the spindle axle into the spindle; then position the ski damper into the bottom of the ski making sure the damper is properly positioned for the desired ski stance.



0746-796



0746-797

■NOTE: The ski damper must be positioned in the ski so it is directly under the spindle.

3. With the cap screw hole of the ski centered with the spindle axle, slide the cap screw with washer through the outside of the ski and spindle assemblies.

■NOTE: Local laws and/or regulations as to maximum width of the ski stance may be applicable. Always comply with the maximum width laws and/or regulations when adjusting ski stance.

■NOTE: Install the cap screw so the lock nut will be located to the inside of the ski and the cotter pin slot in the cap screw will be horizontal with the ski.

4. Install the remaining washer and lock nut; then tighten the lock nut to 35 ft-lb.

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■NOTE: Assure that the cotter pin slot in the cap screw is still horizontal with the ski (see illustration); then proceed to step 5.

5. Install a new cotter pin from the back side of the ski cap screw and spread the pin.

Ski Wear Bar

The ski wear bar is a replaceable bar attached to the underside of the ski. If the snowmobile is operated primarily in deep snow, ski wear bar wear will be minimal; however, if the snowmobile is operated on terrain where the snow cover is minimal, the ski wear bar will wear faster. Arctic Cat recommends that the ski wear bars be replaced if worn to 1/2 of original diameter.

REMOVING

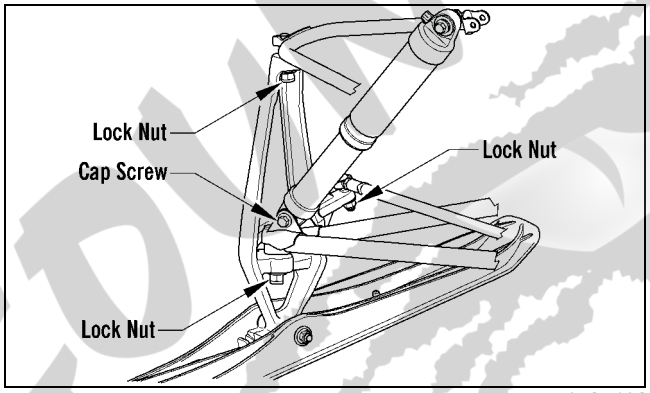
1. Raise the front of the snowmobile and secure with a suitable stand.
2. Remove the lock nuts securing the wear bar to the ski; then remove the wear bar.

INSTALLING

1. Install the wear bar into the ski making sure it is fully seated using a rubber mallet.
2. Secure the wear bar with lock nuts. Tighten to 96 in.-lb.

Spindle

REMOVING



0747-904

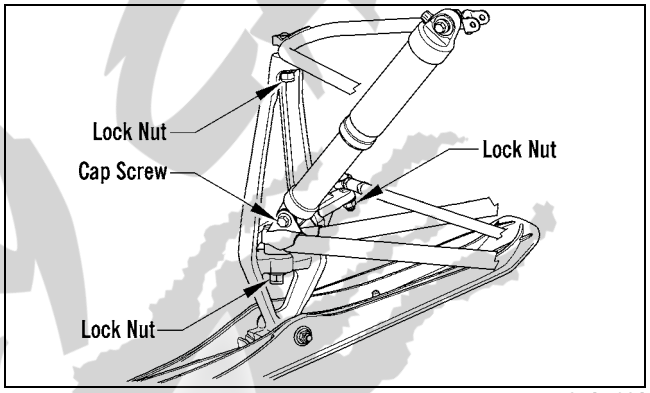
1. Position the front of the snowmobile on a safety stand; then remove the ski.
2. Remove the cap screw and lock nut securing the shock absorber to the spindle.
3. Remove the lock nut securing the tie rod to the spindle arm. Account for the washer on the top side.
4. Remove the two lock nuts securing the spindle to the upper and lower A-arms; then using a rubber mallet, remove the arms from the spindle.
5. Remove the spindle.

INSPECTING

1. Inspect the spindle for excessive wear, cracks, bends, or imperfections.
2. Inspect the A-arm bushings and axle area for wear.
3. Inspect the ski spindle axle and bearings for wear, damage, or loose fit. Replace the bearings as a set.

■NOTE: Replacing the ski bolt bushings is difficult. The existing bushings will be damaged during removal. Be careful, however, not to damage the spindle when removing the bushings. Press the new bushings into the spindle.

INSTALLING



0747-904

1. Place the shock absorber into position on the spindle. Secure with the cap screw and lock nut. Tighten to 32 ft-lb.
2. Install the upper and lower A-arms into the spindle; then remove the snowmobile from the support stand. Secure with new lock nuts. Tighten to 45 ft-lb.

■NOTE: The weight of the snowmobile will allow the ball joints to seat into the spindle before tightening the nuts.

3. Place the tie rod with washer into position on the spindle arm. Secure with a new lock nut. Tighten to 32 ft-lb.
4. Install the ski.
5. Turn the handlebar fully to the right and then to the left to verify the steering moves freely.

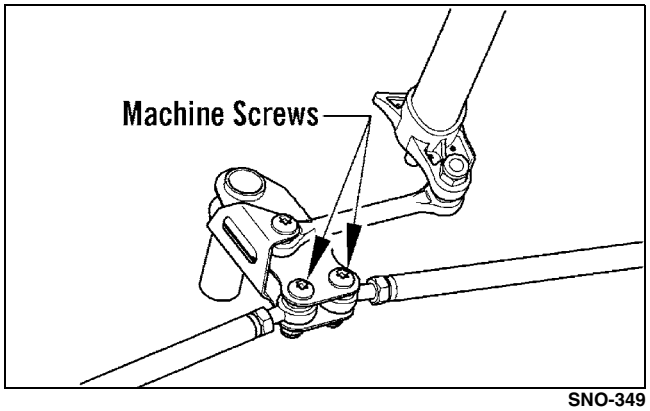
Steering Tie Rod

■NOTE: To access the steering arm, the steering tie rods must be removed.

REMOVING

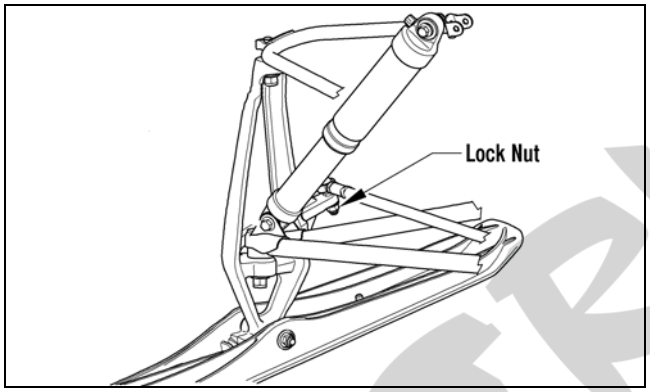
1. Remove both machine screws and nyloc nuts securing the steering tie rod ends to the steering arm. Discard both nuts.

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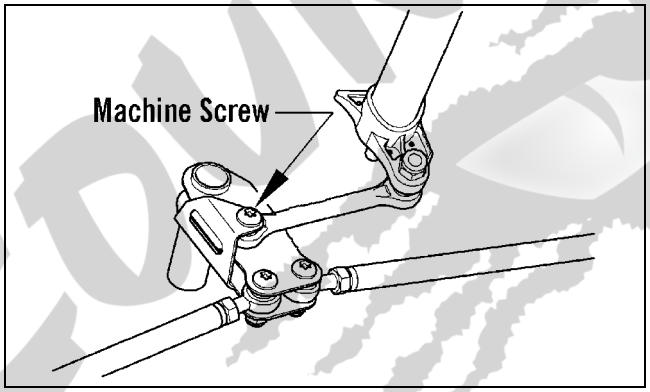
SNO-349

2. Remove the nyloc nuts securing the steering tie rod ends to the spindle arms. Account for the washers and discard both nuts.



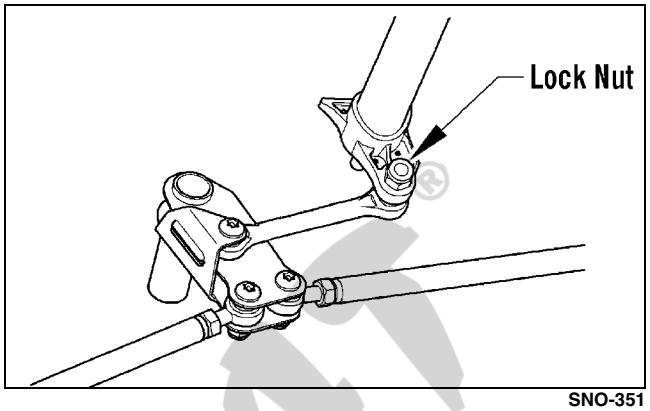
SNO-353

3. Slide the steering tie rod out of the steering boot and out of the snowmobile.
4. Remove the screw and lock nut securing the steering tie rod end to the steering arm. Discard the nut.



SNO-350

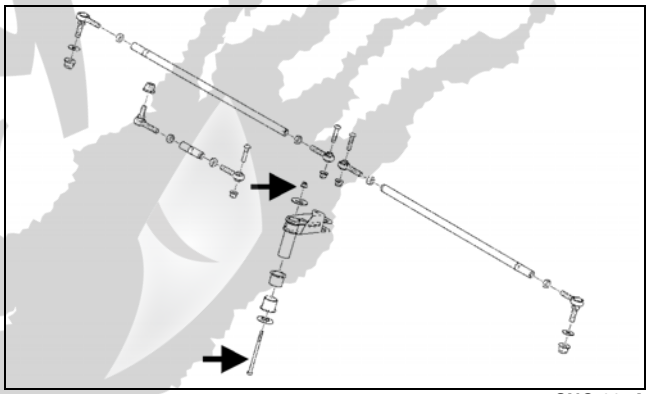
5. Remove the lock nut securing the steering tie rod to the steering post. Discard the nut.



SNO-351

■NOTE: At this point if the technician's objective is to remove the steering arm, the reinforcement bracket will need to be removed by drilling out the appropriate rivets.

6. Remove all torx-head screws securing the front skid plate to the chassis; then remove the cap screw and nut securing the steering arm to the chassis. Account for two washers and two bushings.



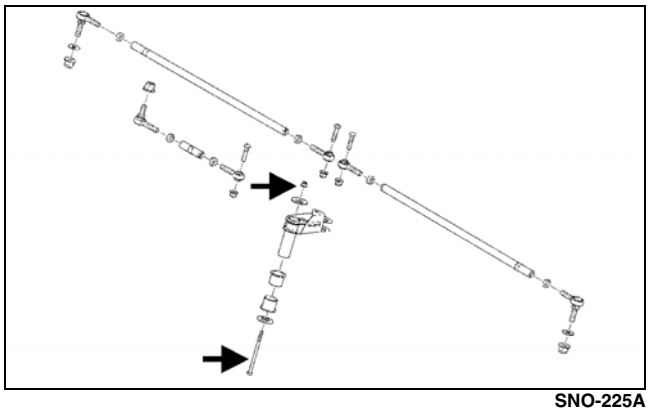
SNO-225A

INSPECTING

1. Inspect the ball joints for damaged threads or wear.
2. Inspect the tie rod for damage, unusual bends, or wear.

INSTALLING

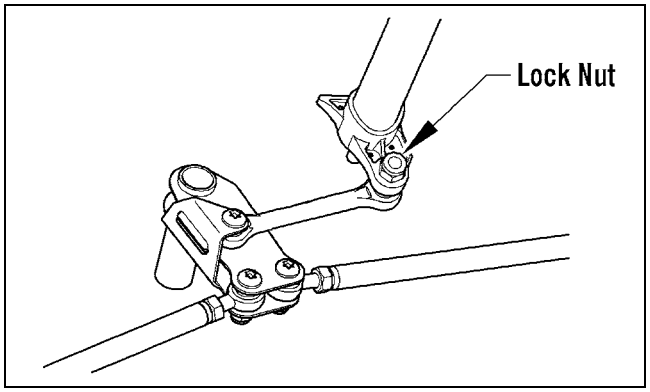
1. Secure steering arm into position and secure using the existing cap screw, flat washers, and nut. Tighten to 96 in.-lb.



SNO-225A

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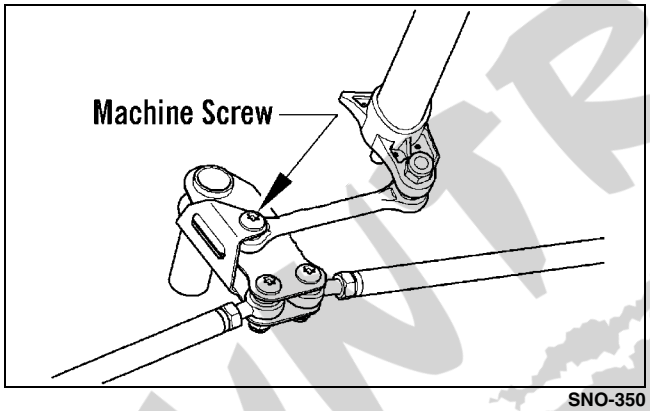
2. Place the steering tie rod into position on the steering post. Secure with a new nyloc nut. Tighten to 35 ft-lb.



SNO-351

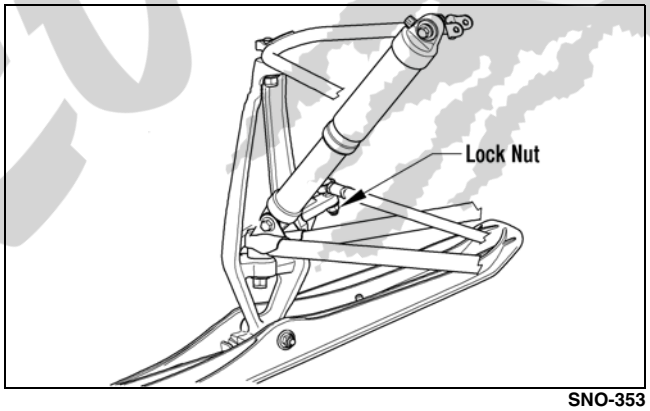
■NOTE: Make sure the tie rod tab is fully seated into the steering post and threads of the ball joint are above the nut when tightened correctly.

3. Place the tie rod end into position on the steering tie rod bracket. Secure with a new nyloc nut. Tighten to 20 ft-lb.



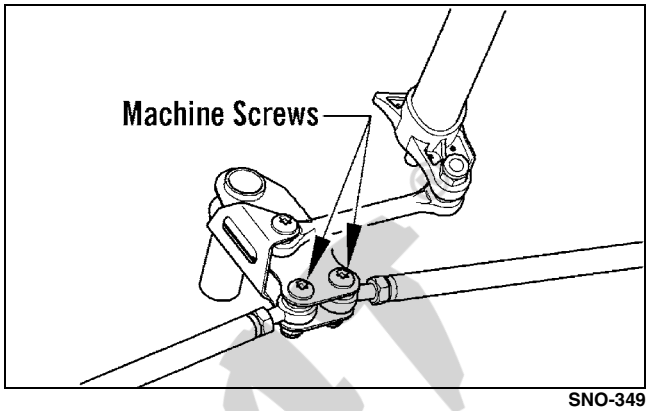
SNO-350

4. Slide the steering tie rod through the steering boot and into the snowmobile; then place the steering tie rod into the spindle arm with the washer. Secure with a new nyloc nut. Tighten to 32 ft-lb.



SNO-353

5. Secure the steering tie rod to the steering tie rod bracket with the screw and new nyloc nut. Tighten to 20 ft-lb.



SNO-349

Ski Alignment

CHECKING

■NOTE: Track tension and alignment must be properly adjusted prior to checking or adjusting ski alignment. Ski alignment must be performed on a flat, level surface. Ski toe-out must fall within the range of 1/16-1/4 in.

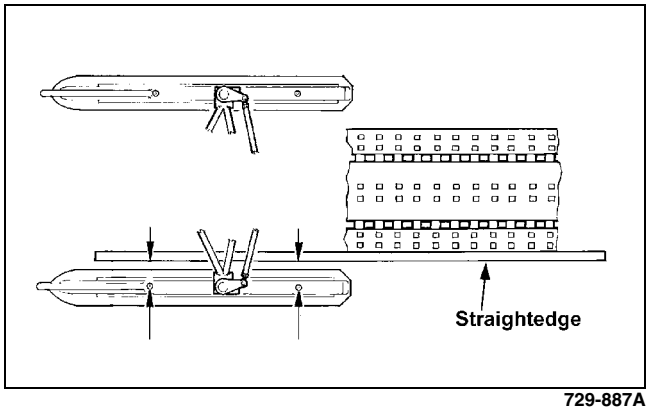
1. Raise the front end of snowmobile just high enough to keep the skis from contacting the floor.
2. Turn the handlebar to the straight-ahead position. Visually inspect the handlebar for being centered and in the straight-ahead position.
3. With the handlebar in the straight-ahead position, secure the handlebar to prevent the alignment from becoming disturbed during the remainder of the alignment procedure.

■NOTE: Track tension and alignment must be properly adjusted prior to placing the straightedge against the outside edge of the track.

4. Place a long straightedge against the outside edge of the track so it lies near the inside edge of the left-side ski.

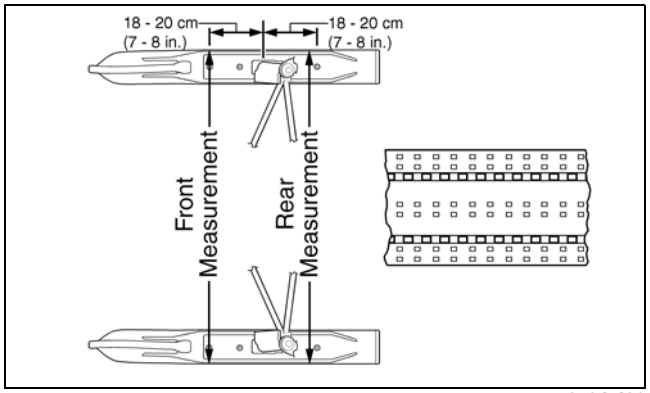
■NOTE: The straightedge should be long enough to extend from the back of the track to the front of the ski.

5. Measure the distance from the straightedge to the left-side ski wear bar bolts in two places: approximately 7-8 in. in front of the spindle and 7-8 in. behind the spindle. Record the measurements taken for the left side.



729-887A

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0734-408

6. Place the straightedge against the outside edge of the track so it lies near the inside edge of the right-side ski.
7. Measure the distance from the straightedge to the right-side ski wear bar bolts in two places: 7-8 in. in front of the spindle and 7-8 in. behind the spindle. Record the measurements taken for the right side.

⚠ WARNING

The measurement from the front and rear wear bar bolts to the straightedge can be equal (ski parallel to the track), but the front measurement must never be less (ski toed-in) or poor handling will be experienced. The front wear bar bolt measurement to the straightedge must not exceed the measurement from the rear wear bar bolt to the straightedge (ski toed-out) by more than 5/32 in.

8. If ski alignment is not as specified, adjust the alignment of the ski(s) not parallel to the straightedge.

ADJUSTING

■NOTE: The following procedure can be used to adjust the alignment of either ski.

■NOTE: The rivets securing the steering boots will have to be removed in order to adjust the inner tie rod ends.

1. Secure the steering tie rod in the centered position.
2. Loosen both spindle tie rod jam nuts on the same side as the ski to be aligned.
3. Using a wrench on the spindle tie rod "flats," rotate the spindle tie rod until recommended specification is attained.
4. Apply blue Loctite #243 to each jam nut thread area; then tighten the jam nuts against the spindle tie rod.

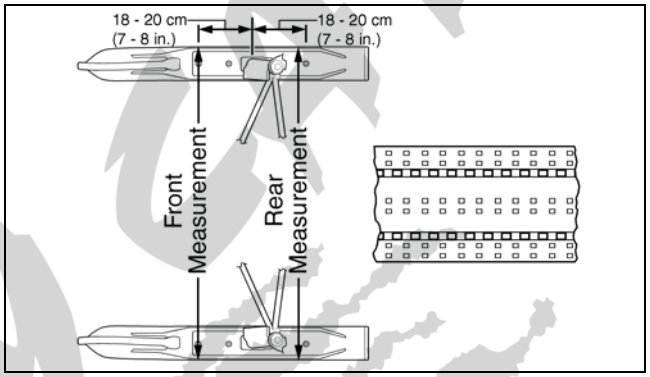
■NOTE: Repeat this procedure on each side (if necessary) until ski toe-out is within specification.

⚠ WARNING

Neglecting to lock the tie rod by tightening the jam nuts may cause loss of snowmobile control and possible personal injury.

VERIFYING

1. With the handlebar in the straight-ahead position, verify ski alignment by measuring across from the outside edge of the left-side wear bar bolts to the outside edge of the right-side wear bar bolts (without using the straightedge) in two places: approximately 7-8 in. in front of the spindle and 7-8 in. behind the spindle.
2. The measurement from in front of the spindle to the outer edge of the wear bar bolts (without using the straightedge) must not exceed the rear measurement by more than 1/16-1/4 in. toe-out.



0734-408

⚠ WARNING

The measurement taken in front of the spindle must never be less than the measurement taken behind the spindle or poor handling will be experienced. Neglecting to lock the tie rod by tightening the jam nuts may cause loss of snowmobile control and possible personal injury.

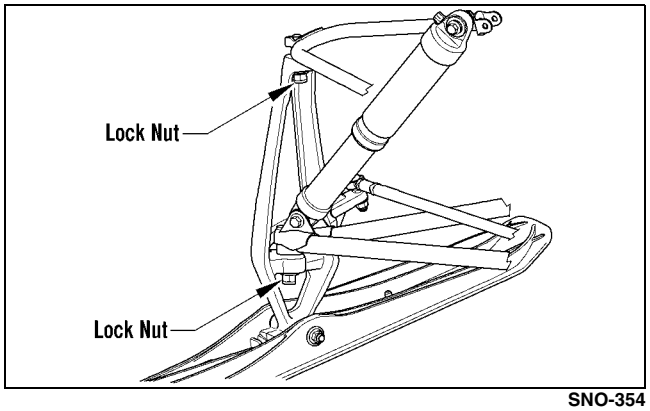
A-Arms

REMOVING

■NOTE: On the 9000, the front bumper must be removed.

1. Elevate the front of the snowmobile and secure using a suitable support stand.
2. Remove the push rivets securing the steering boot to the chassis; then slide the boot away from the snowmobile.
3. Remove the torx-head screws securing the front skid plate to the chassis; then remove the front skid plate.
4. Remove the ski shock absorber.
5. Remove the two lock nuts securing the spindle to the A-arms; then using a rubber mallet, remove the arms from the spindle. Discard the nuts.

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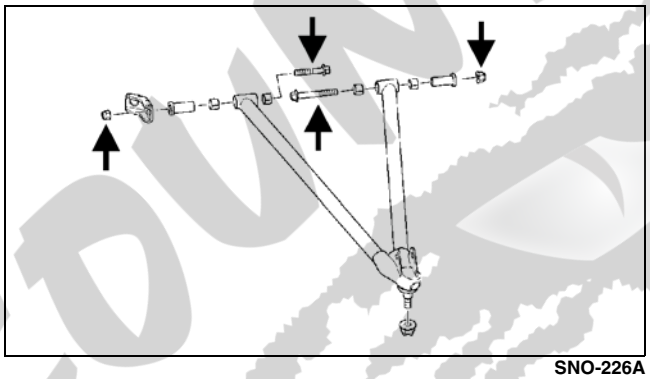


SNO-354

6. Remove the cap screw and lock nut securing the sway bar link to the lower arm. Discard the nut.


XM135

7. Remove the two cap screws and nyloc nuts securing the lower arm to the chassis; then slide the boot from the arm and remove the arm.


SNO-226A

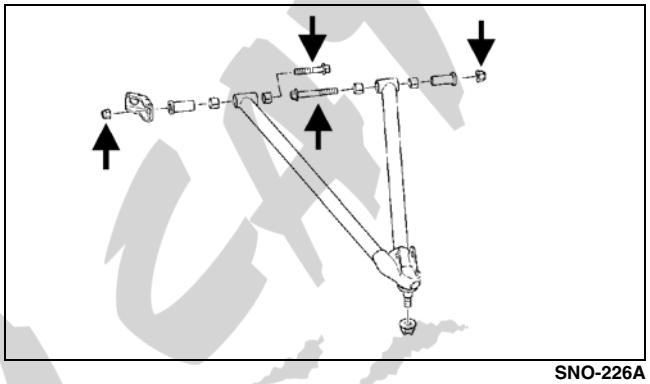
8. Remove the two cap screws and lock nuts securing the upper arm to the chassis. Discard the nuts.

INSPECTING

1. Inspect the arm welded areas for cracks or any signs of deterioration.
2. Inspect the bearings and axles for wear or damage.
3. Inspect the arm tubing for signs of twisting or bending.
4. Inspect mounting location of the chassis for cracks or wear.

INSTALLING

1. Place the upper arm into position on the chassis and secure with the cap screws and new nyloc nuts. Tighten to 23 ft-lb.
2. Slide the lower arm into the boot; then place the arm into position on the chassis. Secure with the cap screws and new nyloc nuts and tighten to 55 ft-lb (front) and 45 ft-lb (rear).


SNO-226A

3. Secure the sway bar link to the lower arm with the cap screw and new nyloc nut. Tighten to 23 ft-lb.


XM135

4. Secure the A-arms to the spindle.
5. Install the ski shock absorber.
6. Place the front skid plate into position; then secure with the torx-head screws.

■NOTE: On the 9000, install the front bumper.

Ski Shock Absorber

REMOVING

1. Position the front of the snowmobile on a safety stand taking all pressure off the skis.
2. Remove the cap screws securing the shock absorber to the chassis and spindle; then remove the shock absorber. Account for all mounting hardware.

■NOTE: Note the number of threads exposed between the spring adjuster and shock housing for installing purposes.

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3. Using the Shock Spring Removal Tool, remove the spring from the shock body by compressing the spring; then remove the spring retainer from the top of the spring. Inspect the shock absorber by quickly compressing and extending the shock plunger while firmly holding the shock body. Resistance must be felt in both directions.

CLEANING AND INSPECTING

1. Inspect the shock absorber seal area for signs of excessive oil leakage.
2. Inspect the shock absorber mounting eyelet, bushings, and sleeve for wear or damage.
3. Inspect the threaded shock sleeve for damage or wear. Clean the sleeve and apply a light coat of grease to the threads before installing.

INSTALLING

1. Using the shock spring tool, place the spring on the shock absorber and secure with the retainer.
2. Adjust the retainer nut (spring adjuster) (if applicable) until the specified amount of threads are exposed between the spring adjuster and the shock housing (noted in removing) as an initial setting.
3. Install the bushings, sleeves, and spacers into each shock end; then place the shock absorber into position and secure with the cap screws and lock nuts. Tighten the lock nuts to 32 ft-lb.

Sway Bar

REMOVING

1. Remove the nyloc nuts and cap screws securing the sway bar link to the lower A-arm and the sway bar.



XM135

2. Remove the torx-head screws securing the sway bar mounting brackets; then pull the sway bar out of the snowmobile.

INSPECTING

1. Inspect the sway bar for any signs of twisting, fatigue, or wear.
2. Inspect the sway bar arms for cracks or damage.
3. Inspect the links, bushings, bushing retainers, and hardware for damage or wear.

INSTALLING

1. Place the sway bar into the sway bar mounting brackets; then install the sway bar into the snowmobile. Secure with the torx-head screws and tighten to 96 in.-lb.
2. Secure the sway bar links to the sway bar and lower A-arm with the cap screws and new nyloc nuts. Tighten to 23 ft-lb.



XM135

Front Bumper

REMOVING/INSTALLING

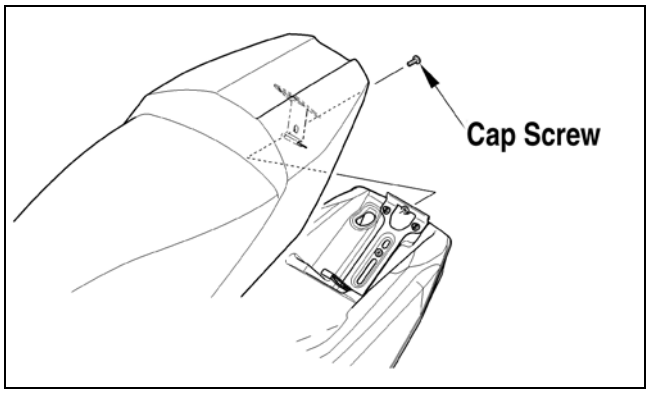
1. Remove all torx-head screws securing the front bumper; then remove the bumper.
2. With the bumper in position, install all torx-head screws. Tighten securely.

Seat Assembly

ZR/XF/M

■NOTE: On models with heated seats, be sure to disconnect the seat heater harness before removing the seat.

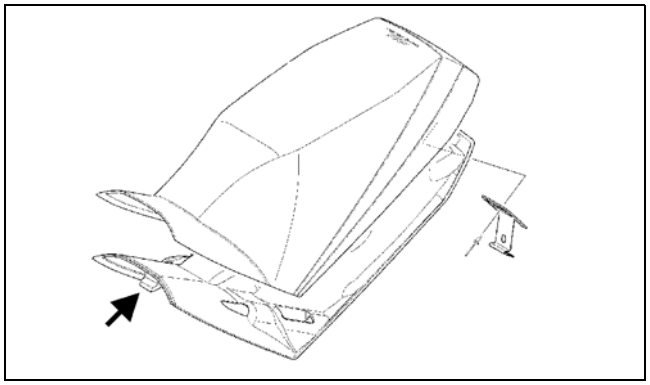
1. Remove the cap screw securing the rear of the seat; then remove the seat.



SNO-261A

2. Route the front tab on the seat through the seat-base hold-down bracket; then install the seat and secure using the cap screw.

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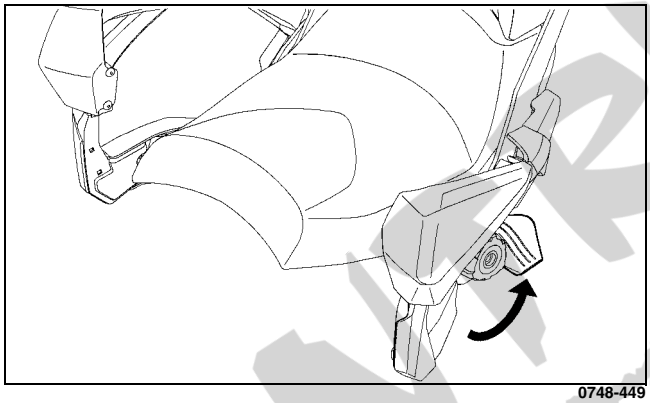


SNO-227A

■**NOTE: On models with heated seats prior to lowering and securing the seat, connect the seat heater harness connector.**

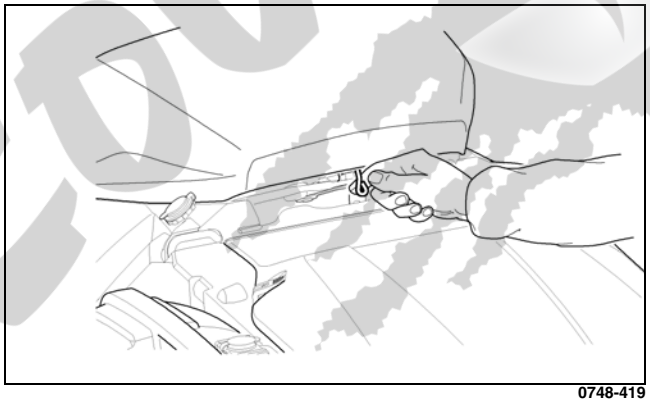
PANTERA

1. Lift up both seat latches and hold them in that position; then lift and remove the passenger seat. Make sure to disconnect the accessory harness.



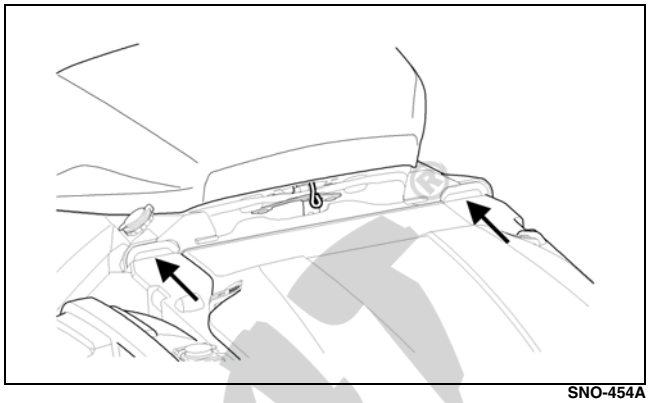
0748-449

2. Release the lever securing the operator seat; then lift up and remove the front seat. Make sure to disconnect the seat heater harness. Remove the operator seat.



0748-419

3. To install the operator seat, route the front tab on the operator seat through the seat-base hold-down bracket; then secure the rear of the operator seat using the lever.
4. To install the passenger seat, position the front of the seat base tabs under the loops in the seat frame; then press down and secure using the two seat latches.



SNO-454A

■ **NOTE: Be sure to connect the accessory harness.**

Seat Cushion

REMOVING

1. Remove the seat assembly.
2. Using a sharp tool, pry out all staples securing the seat cover to the plastic seat base.
3. From beneath the seat foam, remove the seat wire from the two elastic loops; then remove the cover from the seat base and seat foam.

INSTALLING

1. Position the cover over the seat foam and seat base; then pull the two elastic loops through the slots in the seat foam and secure with the seat wire. Check to make sure it is positioned straight.
2. Fold the rear edge of the cushion down and around the plastic base. Using a staple gun and 1/4 in. staples, staple the rear flap of the cushion to the plastic base in the same areas as the original staples were located. Position staples 1 in. apart.
3. Fold the sides of the cushion down around the bottom edge of the plastic seat base. Position the staples in the same area as the original staples were located.

■**NOTE: Note the cushion fit. If any wrinkles are noted, remove by pulling the cushion material in the appropriate direction before securing with staples.**

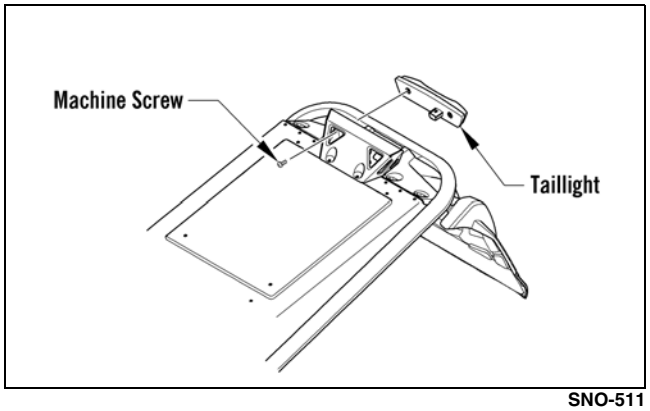
4. Fold the front cushion material back and onto the plastic seat base. Check for wrinkles and secure with staples and two screws.
5. Install the seat assembly.

Taillight/Brakelight Assembly

ZR/XF/M

1. Remove the two machine screws securing the taillight to the taillight support; then disconnect the taillight harness connector.

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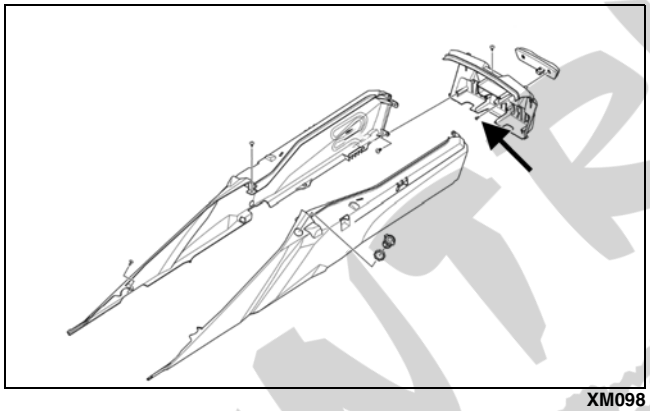


SNO-511

2. Connect the taillight harness connector; then secure the taillight to the taillight support with the two machine screws. Tighten to 48 in.-lb.

PANTERA

1. Remove the storage box lid; then remove the machine screws securing the taillight to the rear rack facia. Disconnect the taillight harness connector.


XM098

2. Connect the taillight harness connector; then secure the taillight to the rear rack facia with the screws. Tighten to 48 in.-lb. Install the storage box lid.

Rear Bumper/Snowflap

REMOVING BUMPER

1. Remove and retain only the two machine screws securing the rear of the skid frame assembly.
2. Place cardboard or a suitable substitute on the floor to protect the snowmobile from being scratched; then install Steering Post Stand for the standard steering models or Handlebar Stand for the adjustable steering models into the lower holes in the handlebar riser (from the left-side) and tip the snowmobile onto its left side.
3. Swing the skid frame assembly away from the chassis; then using a 3/16-in. drill bit, remove all rivets securing the left-side of the bumper; then repeat for opposite side.
4. Remove and retain the two machine screws and nuts securing the front of the existing bumper to the chassis.
5. Remove the two rivets securing the snowflap to the bumper. Remove the bumper.

INSTALLING BUMPER

1. Align the holes in the bumper with the existing holes in the tunnel; then using new rivets, secure rear bumper to the tunnel; then secure the snowflap to the rear bumper using new rivets.
2. Secure the front of the bumper to the chassis using the existing machine screws and nuts. Tighten securely.
3. Install skid frame assembly using two existing machine screws. Tighten securely.

REMOVING SNOWFLAP

1. Drill out the rivets securing the snowflap to the tunnel; then remove the snowflap.

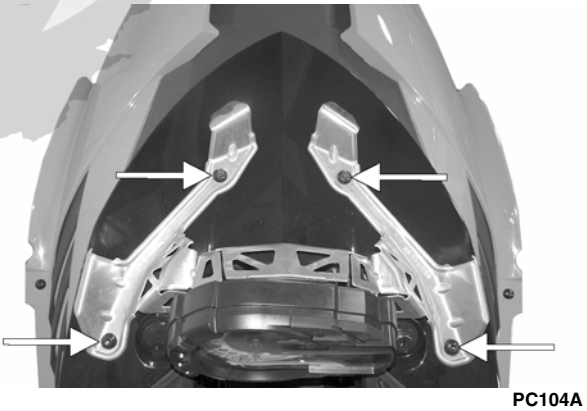
INSTALLING SNOWFLAP

1. Secure the snowflap to the tunnel using the appropriate rivets.

Windshield/Console/ Headlight

REMOVING (5000/9000)

1. Remove and retain all machine screws securing the hood; then disconnect the console harness and carefully remove the hood assembly.
2. Remove the four screws securing the windshield to the console; then remove the windshield.
3. Remove the four screws securing the windshield brace to the console. Disconnect the gauge; then remove the windshield brace assembly.

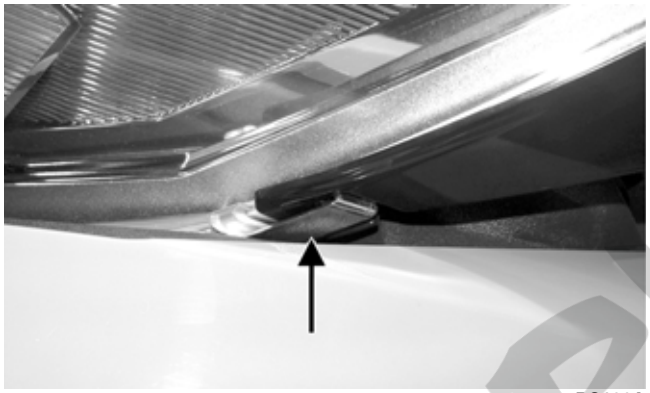

PC104A

4. Disconnect the electrical accessory wires and ignition switch.
5. Remove the two screws securing the rear of the console to the hood.
6. Lift the front of the console from the headlight assembly; then disengage the side console tabs and remove the console.

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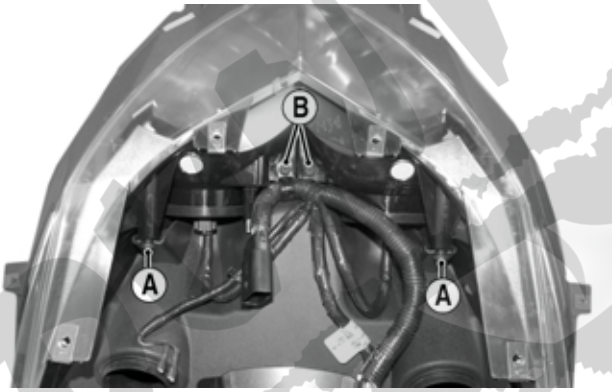


PC108



PC106A

7. Loosen the two side headlight assembly screws (A); then remove the two front headlight assembly screws (B).

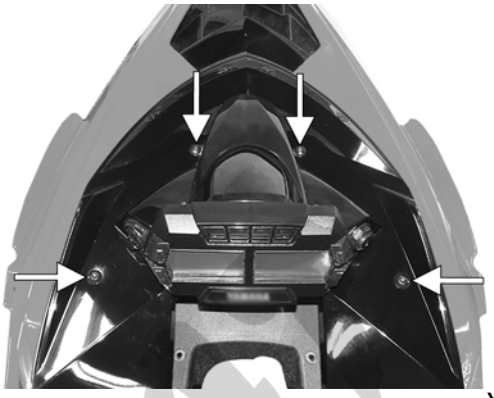


PC107A

8. Remove the headlight assembly.

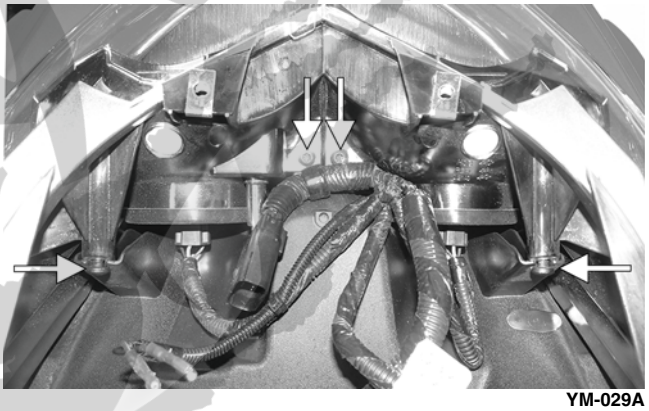
REMOVING (7000)

1. Remove and retain all machine screws securing the hood; then disconnect the console harness and remove the hood assembly.
2. Remove the eight screws securing the windshield to the console; then remove the windshield.
3. Remove the four screws securing the console.



YM-028A

4. Disconnect the gauge, electrical accessory wires, and the ignition switch.
5. Remove the two screws securing the rear of the console to the hood (on the underside of the hood).
6. Loosen the two side headlight assembly screws; then remove the two front headlight assembly screws.



YM-029A

7. Remove the headlight assembly.

INSTALLING

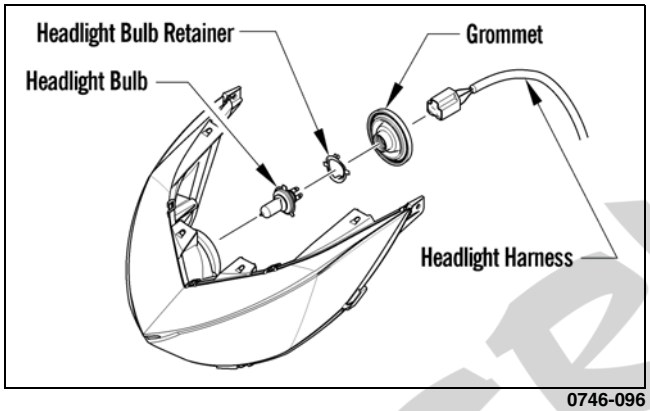
1. With the headlight assembly in position, install the front headlight assembly screws. Engage the side headlight screws in the slots and tighten until snug.
2. Engage the side console tabs on the headlight assembly; then place the front of the console over the headlight assembly and press down until it snaps in place.
3. Install the two screws securing the rear of the console to the hood. Tighten only until snug.
4. Place the windshield brace assembly into position and secure to the console with the four screws. Tighten until snug.
5. Connect the gauge; then connect the electrical accessory wires and the ignition switch.
6. With the windshield in position, secure the windshield to the frame using the four screws. Tighten securely.
7. Connect the console harness; then install the hood assembly and secure with the screws.

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Headlight Bulb

■NOTE: The bulb portion of the headlight is fragile. HANDLE WITH CARE. When replacing the headlight bulb, the bulb assembly must first be removed from the housing. Do not touch the glass portion of the bulb. If the glass is touched, it must be cleaned with a dry cloth before installing.

1. Disconnect the headlight harness connector from the bulb; then remove the rubber grommet from the headlight housing.
2. Rotate the bulb retainer counterclockwise until it unlocks from the housing; then remove the bulb.



0746-096

3. Install the bulb and retainer; then rotate the retainer clockwise until it properly locks in place.
4. Install the rubber grommet; then connect the headlight harness connector to the bulb.
5. Check headlight aim (see Adjusting Headlight Aim in this sub-section).

⚠ WARNING

Do not operate the snowmobile unless headlight beam is adjusted properly. An incorrectly adjusted beam will not provide the operator the optimum amount of light.

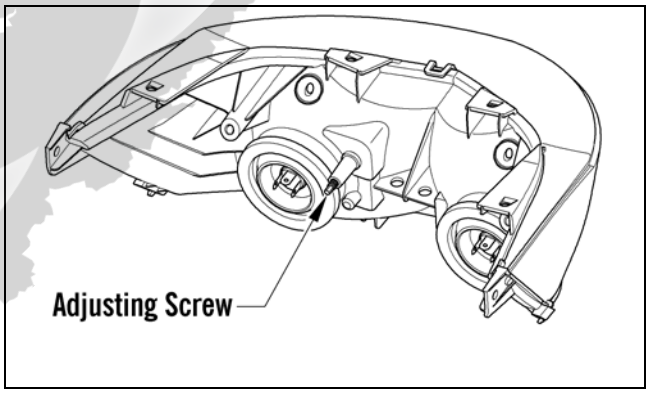
Adjusting Headlight Aim

The headlight can be adjusted for vertical aim of the HIGH/LOW beam. The geometric center of HIGH beam zone is to be used for vertical aiming.

1. Position the snowmobile on a level floor so the headlight is approximately 25 ft from an aiming surface (wall or similar surface).

■NOTE: There should be an "average" operating load on the snowmobile when adjusting headlight aim.

2. Measure the distance from the floor to midpoint of the headlight.
3. Using the measurement obtained in step 2, make a horizontal mark on the aiming surface.
4. Make a vertical mark intersecting the horizontal mark on the aiming surface directly in front of the headlight.
5. Engage the brake lever lock and start the engine. Select the headlight dimmer switch HIGH beam position. DO NOT USE LOW BEAM.
6. Observe the headlight beam aim. Proper aim is when the most intense beam is centered on the vertical mark 5 cm (2 in.) below the horizontal mark on the aiming surface.
7. Adjust the headlight using the adjusting screw on the backside of the headlight housing until correct aim is obtained. Shut the engine off; then disengage the brake lever lock.



0746-807

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Engine

■**NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.**

SPECIAL TOOLS

A number of special tools must be available to the technician when performing service procedures in this engine section.

Description	p/n
Drive Clutch Bolt Tool	0644-281
Drive Clutch Puller	0744-062
Drive Clutch Spanner Wrench	0644-136
Engine Lift Plate	0744-073
Hood Harness Extension	1686-659

■**NOTE: Special tools are available from the Arctic Cat Service Parts Department.**

CAUTION

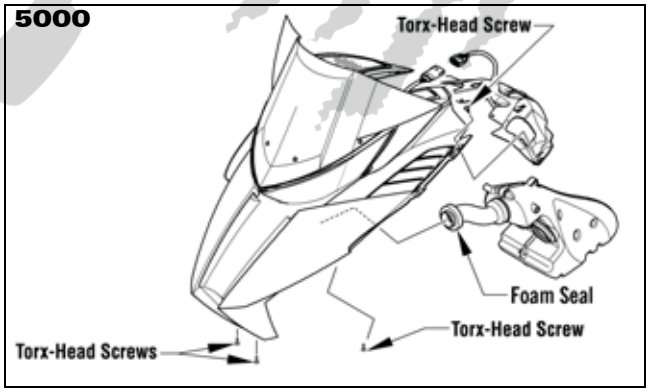
Never attempt to substitute any other drive clutch puller for the recommended puller or severe clutch or crankshaft damage will occur.

Engine Removing Installing - 5000/9000

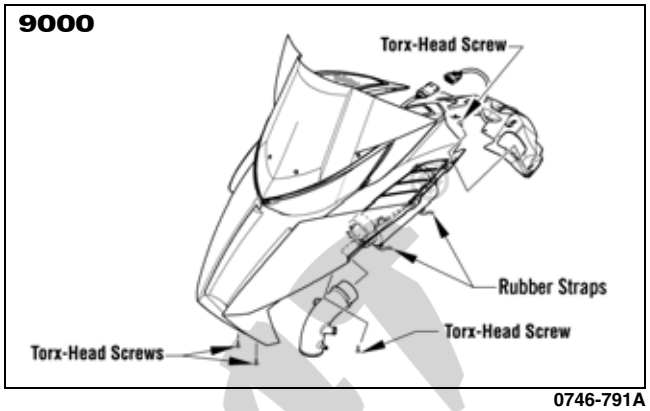
This engine sub-section has been organized to show a progression for the removing/installing of the Arctic Cat 1100 cc engine. For consistency purposes, this sub-section shows a complete and thorough progression; however, for efficiency it may be preferable to remove only those components needing to be addressed. Also, some components may vary from model to model. The technician should use discretion and sound judgment.

Removing

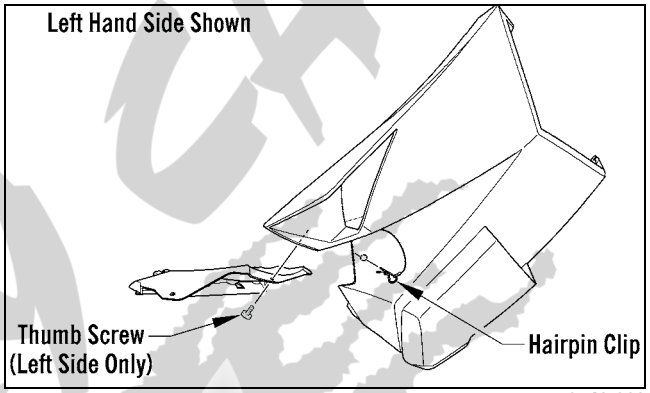
■**NOTE: Prior to removing the engine, disconnect the hood harness and the air intake connector from the air silencer; then remove the cables and pins securing the hood to the front end, remove the hood, and remove the access panels.**



0746-792A



0746-791A



0746-800

■**NOTE: At this point if the technician's objective is to service Top-Side Components, the engine does not have to be removed from the chassis. Proceed to Servicing Top-Side Components.**

1. Remove the seat; then disconnect the battery cables (negative cable first) and solenoid harness.

■**NOTE: On the LXR/LTD models, disconnect the seat heater harness connector.**

2. Remove the retaining nut from the neck of the gas tank and the two screws securing the upper console and disconnect the wires from the reverse alarm; then loosen the quarter turn screws securing the lower console to the skid plate and remove both upper and lower consoles.

■**NOTE: On the LXR/LTD models, disconnect the seat heater harness from the seat heater switch.**

3. Remove the gas tank (see the Fuel Systems section).
4. Disconnect the two harness connectors from the ECM; then remove the ECM.

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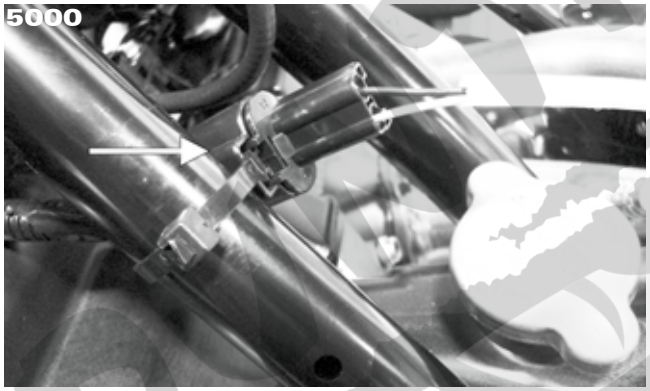


PC027A

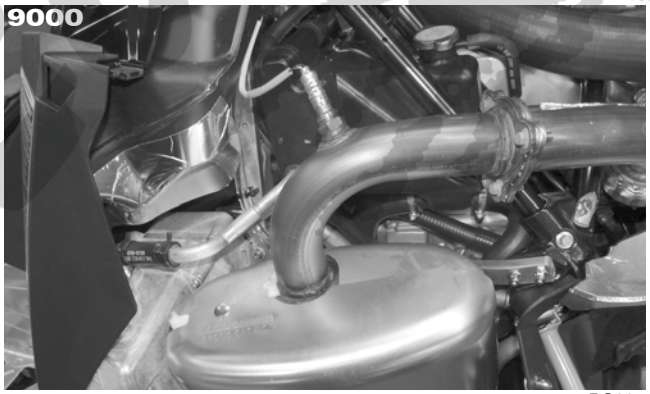
5. Remove the cap screw from the driven clutch and slide the driven clutch (along with the drive belt) off the driven shaft. Account for alignment washers and sheave adjuster.
6. Using Drive Clutch Bolt Tool, remove the cap screw and high-collar washer securing the drive clutch to the crankshaft.
7. Using Drive Clutch Puller Drive Clutch Spanner Wrench, tighten the puller. Remove the drive clutch.

■NOTE: If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases.

8. Disconnect the oxygen sensor and remove the spring securing the resonator to the chassis.



PC024A

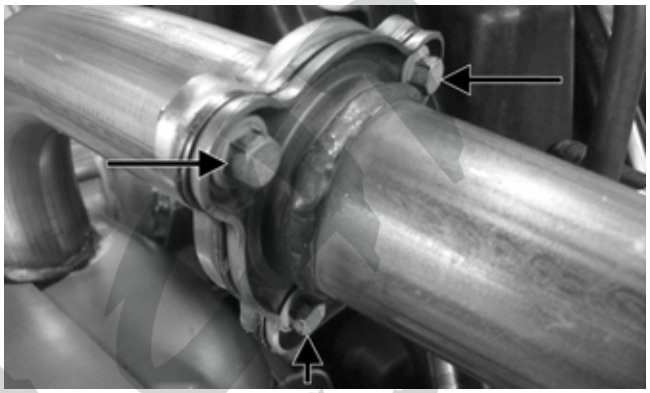


PC227

■NOTE: Before removing the cap screws and nuts securing the resonator, be sure to apply a small amount of penetrating oil to the threads of the cap screws.

9. On the 5000, remove the flange nuts securing the MAG- and PTO-side exhaust pipes to the engine and remove the exhaust and resonator pipes from the chassis.

■NOTE: On the 9000, remove the three cap screws and lock nuts securing the exhaust resonator to the exhaust pipe; then remove the resonator.



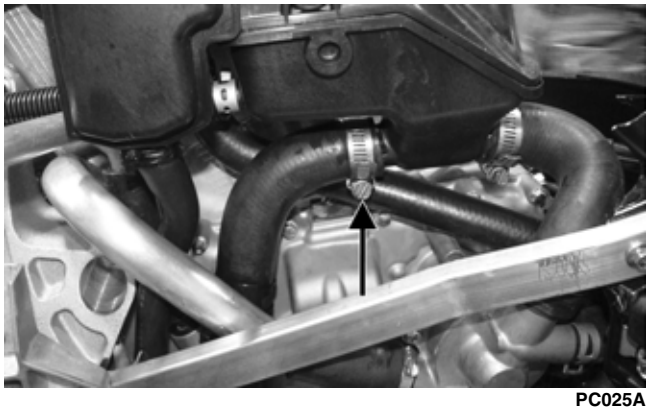
PC050A

10. With a funnel in position between the oil reservoir and the exhaust opening of the skid plate, remove the drain plug from the oil reservoir. After the oil has drained, install the drain plug with a new O-ring (if necessary) and tighten to 15 ft-lb.



PC065

11. Using a suitable vacuum pump, remove the coolant from the coolant/oil separator tank; then loosen the clamp and remove the hose from the tank and the lower heat exchanger. Remove the coolant from the lower exchanger.

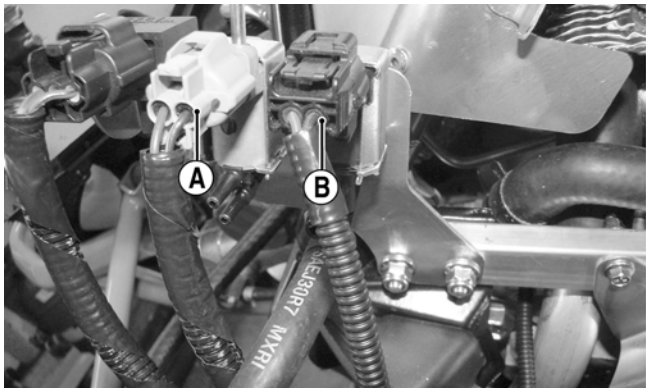


PC025A

■NOTE: Steps 12-16 are for the 9000 only.

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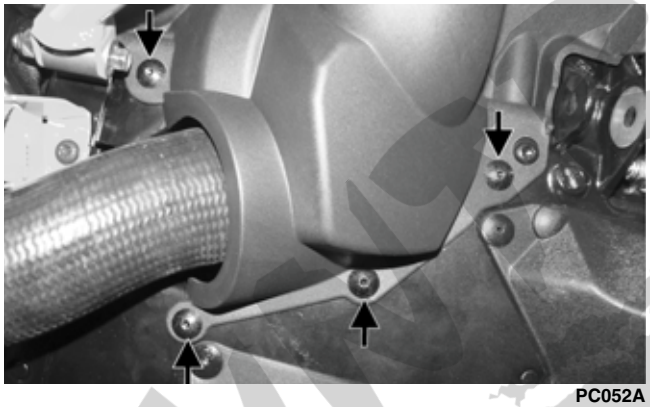
12. Disconnect the harness connectors and hoses from the air bypass control valve (A) and waste gate control valve (B).



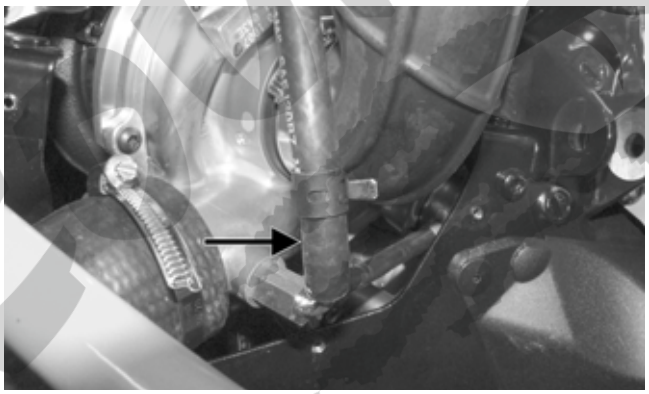
PC051A

■**NOTE: For installing purposes, note the location and routing of the harness connectors and hoses.**

13. Remove the screws and turbocharger cover; then remove the waste gate control valve hose from the turbocharger noting the location of the clamp for installing purposes.

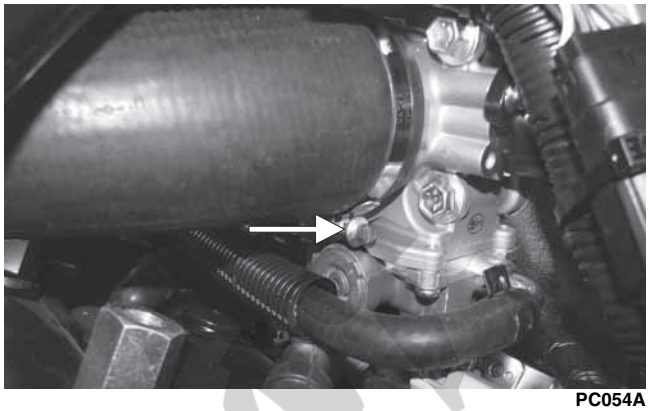


PC052A

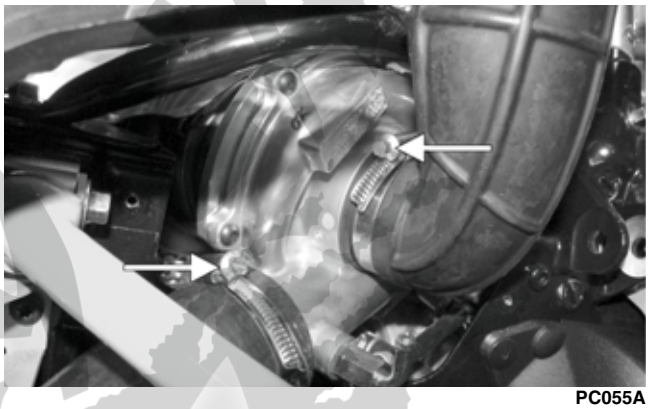


PC053A

14. Loosen the clamp securing the intercooler hose to the throttle body; then loosen the clamps securing the air intake and intercooler hose to the turbocharger.



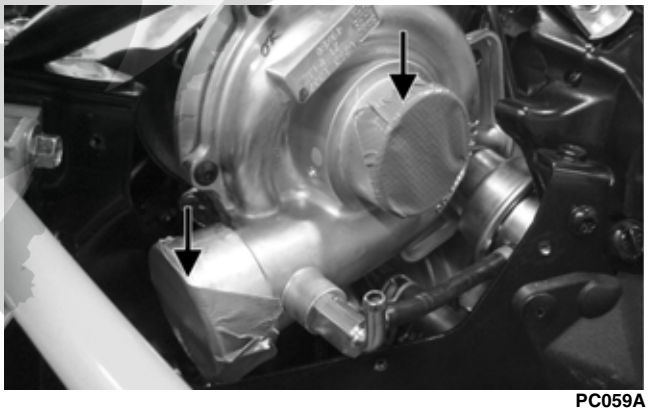
PC054A



PC055A

CAUTION

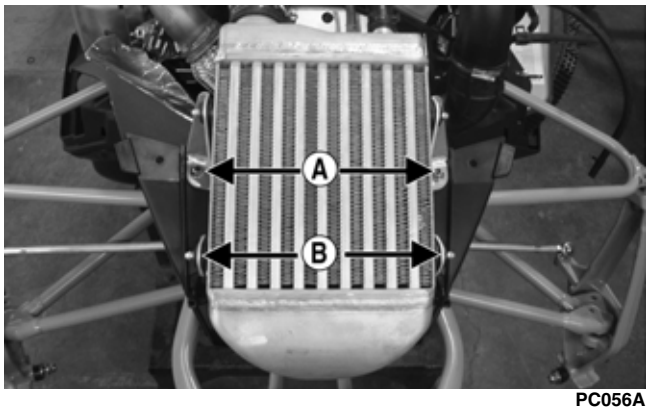
Seal the turbocharger with tape to avoid any dirt or foreign objects from falling into the turbocharger.



PC059A

15. Remove the lock nuts and screws (A) securing the rear intercooler brackets to the chassis and remove the brackets from the intercooler; then carefully pry the intercooler out from the front brackets (B) and remove the intercooler with the air bypass valve and hoses.

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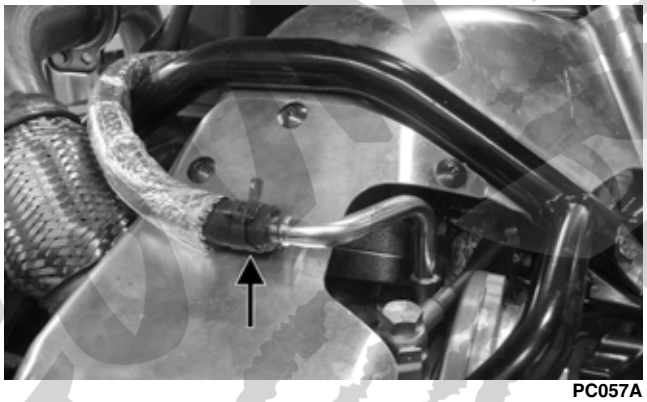
PC056A

■NOTE: At this point, removing the front fascia will aid in engine removal.

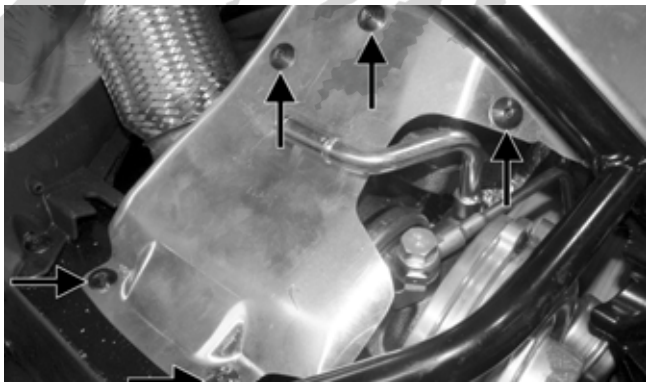


PC540A

16. Remove the coolant return hose from the turbocharger; then remove the screws securing the front heat shield to the chassis and rear heat shield.

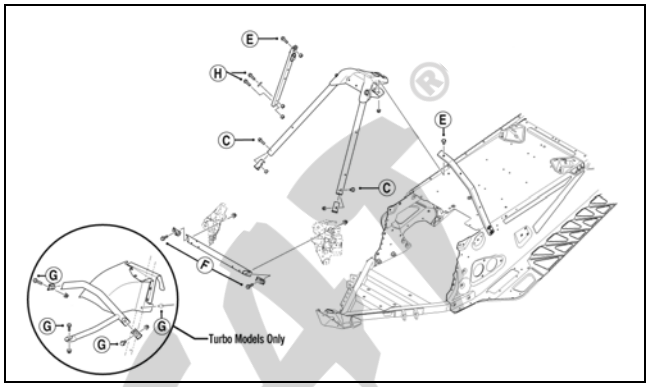


PC057A



PC058A

17. Remove the cap screws (E) and (H) securing the side supports; then remove the supports noting the position of the cable ties and harnesses.



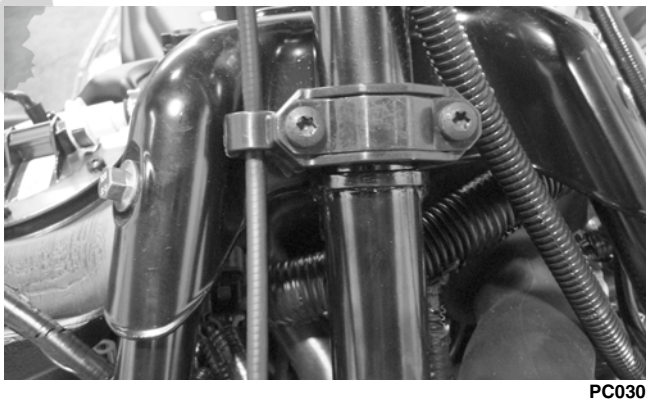
746-292C

■NOTE: On the 5000 before removing the MAG-side support, the MAP sensor must be removed and the cable ties securing the wire harness and vent hose must be removed.



PC029A

18. Remove the cap screws and nuts securing the front spars to the steering support; then remove the torx-head screws securing the steering post bracket to the steering support. Remove the steering support.



PC030

19. Remove the cap screws (F) or (G) securing the shock mounting bracket support to the shock mounting brackets; then remove the cap screws (C) securing the lower front spars to the shock mounting brackets. Remove the shock mounting bracket support and front spars accounting for the spar inserts.

■NOTE: On the 9000, the shock mounting bracket support, left front spar, and heat shield are removed as an assembly.

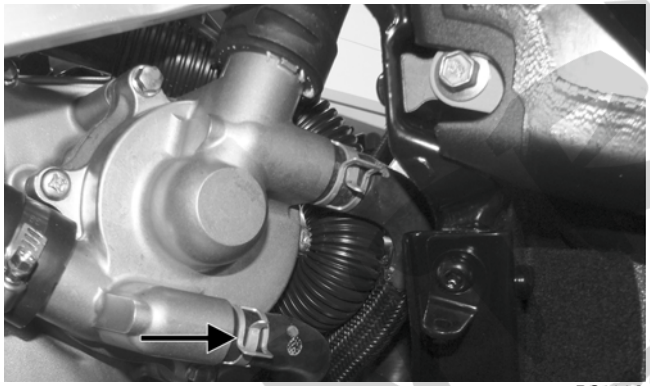
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20. Remove the MAG-side chassis support. Account for and note the location and orientation of the resonator spring tab and resonator support bracket.



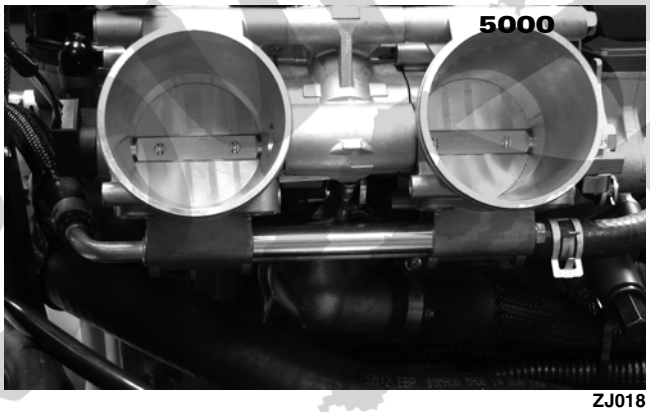
PC210A

21. Clamp off the coolant bypass hose and remove the hose from the water pump; then add a length of hose to the bypass hose and route the hose out of the exhaust opening of the skid plate. Drain the remaining coolant.

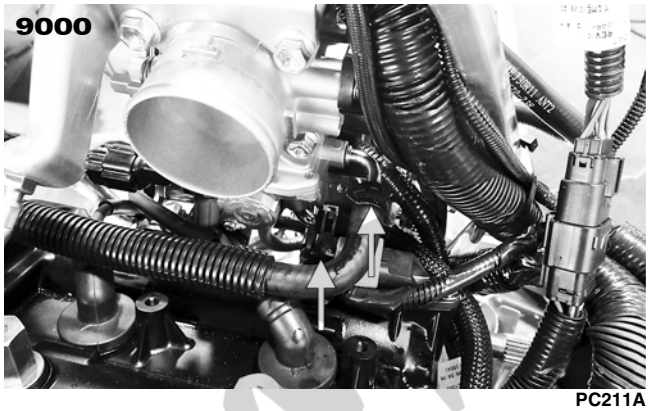


PC026A

22. Remove the throttle body coolant hoses.

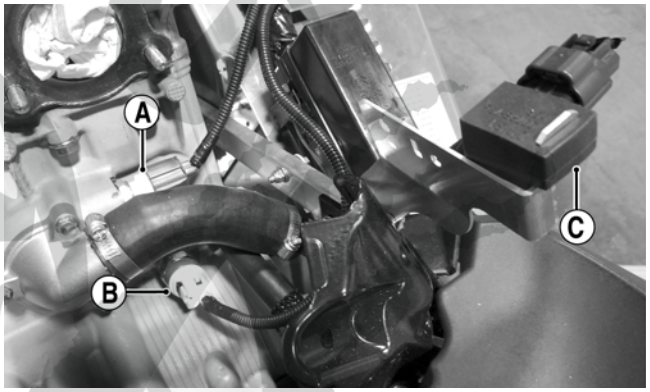


ZJ018



PC211A

23. Disconnect the harness connectors from the coolant temperature sensor (A), oil pressure switch (B), and air pressure sensor (C).



PC028A

24. Loosen the clamps and remove the drain and vent hoses and the throttle body coolant hose from the coolant/oil separator tank; then remove the tank from the bracket on the engine.

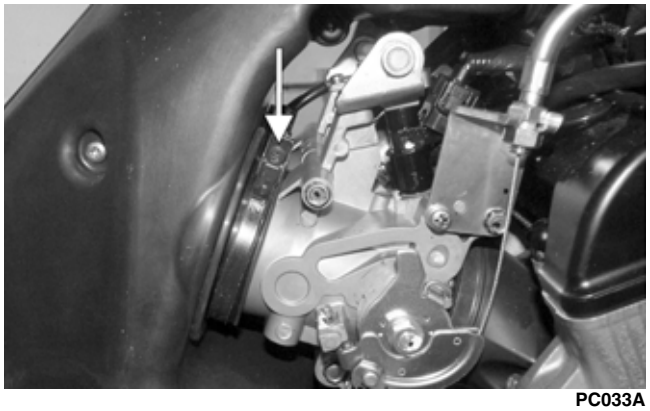


PC032

■**NOTE: Steps 25-27 are for the 5000 only.**

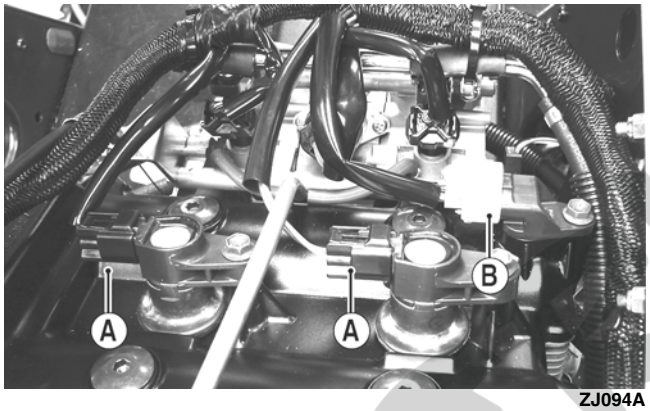
25. Loosen the clamps securing the air silencer to the throttle bodies; then disconnect the harness connector from the air temperature sensor and remove the air silencer.

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PC033A

26. Disconnect the harness plug-ins from the ignition coils (A) and camshaft timing sensor (B).



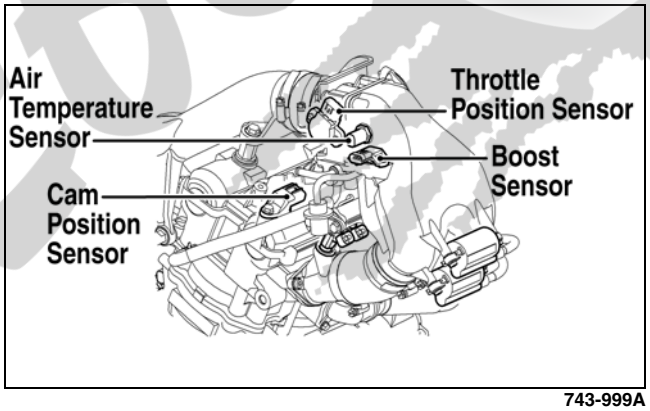
ZJ094A

■NOTE: With the main harness plug-ins disconnected, secure the harness up and out of the way from the engine.

27. Loosen the clamps securing the throttle body assembly to the intake flanges; then remove the assembly and allow it to lie on the tunnel.

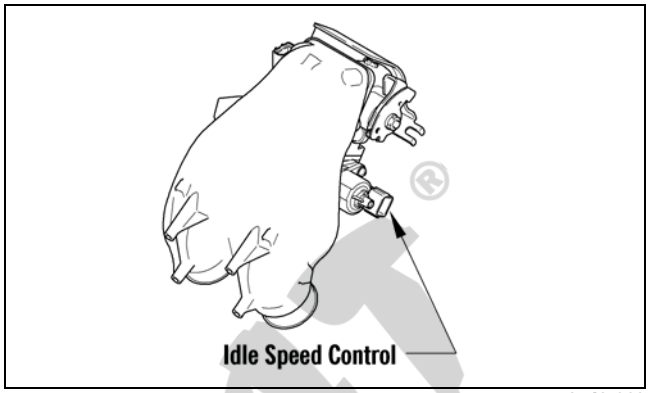
■NOTE: Steps 28-30 are for the 9000 only.

28. Disconnect the throttle position sensor, air temperature sensor, boost sensor, and cam position sensor.



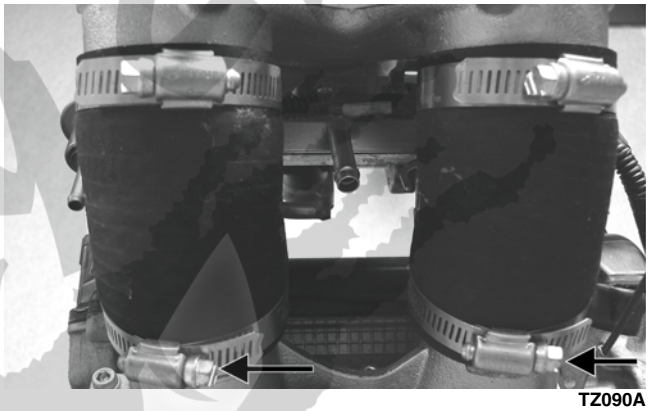
743-999A

29. From the opposite side of the throttle body, disconnect the idle speed control and the throttle cable; then remove the spark plug caps from the spark plugs.



0743-992

30. Loosen the flange clamps securing the intake manifold to the cylinder head; then remove the manifold and throttle body assembly along with the two flanges.

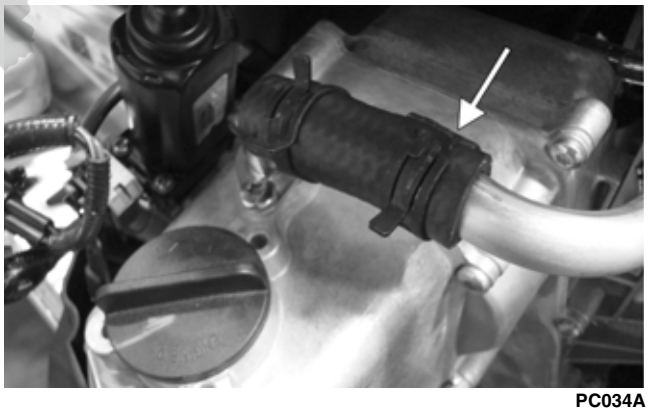


TZ090A

CAUTION

Seal the intakes with tape to avoid any dirt or foreign objects from falling into the intakes.

31. Loosen and remove the oil tank/engine breather hose; then remove the cap screws securing the oil return hose from the engine. Remove the oil return hose.



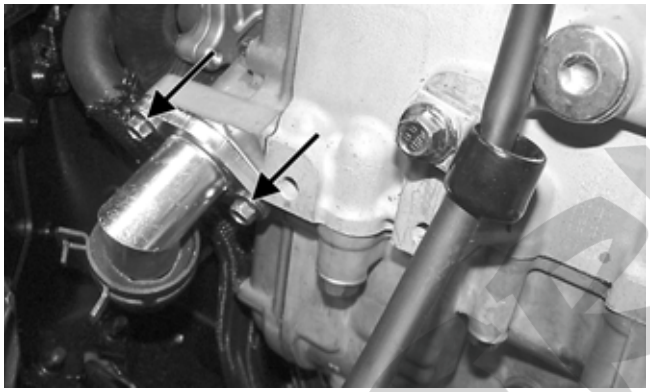
PC034A

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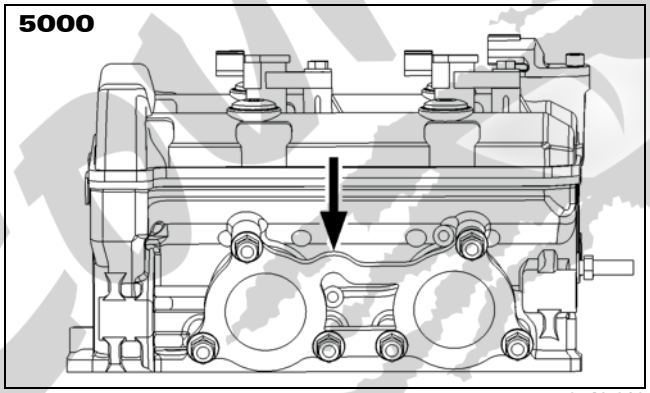
PC243

32. Remove the two cap screws securing the elbow fitting of the oil supply hose to the engine; then secure the hose and fitting up and out of the way.

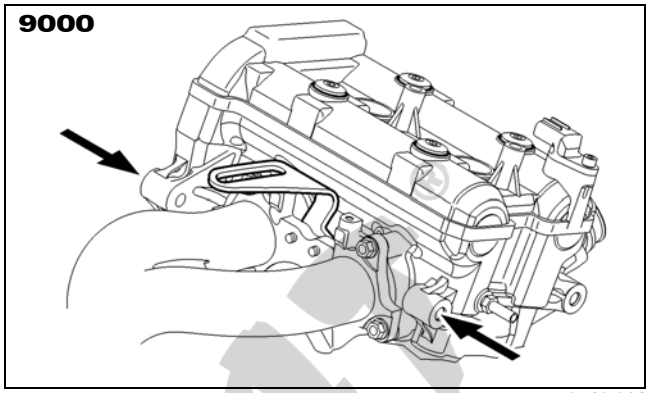


PC036A

■NOTE: On the 5000, install Engine Lift Plate. On the 9000, secure a suitable length of chain of adequate strength to each side of the cylinder head with two 10 mm cap screws threaded through the mounting hole of the cylinder head.



0746-313



0746-314

■NOTE: Before removing the mounting hardware securing the engine to the chassis, remove the weight of the engine from the chassis using a suitable lift or hoist.

33. On the 9000, remove the front bumper.

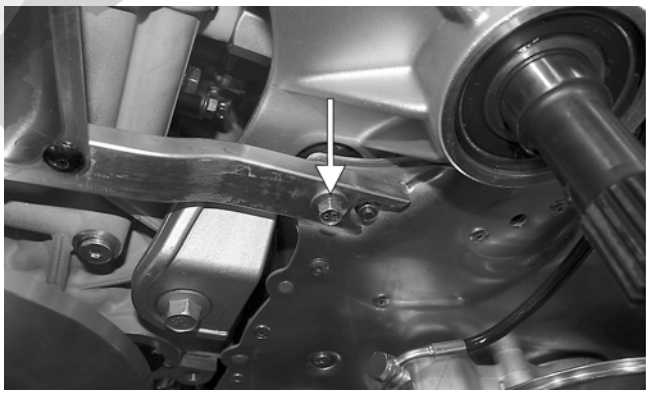
34. Remove the front belly pan cap screws; then remove the belly pan. Remove the cap screws securing the access panel to the chassis; then remove the access panel.

35. Remove the two lock nuts securing the front engine mount to the chassis.

36. Remove the cap screws securing the MAG-side rear engine to chassis mount; then remove the mount.

37. Remove the screw securing the front belt guard to the skid plate, then remove the cap screws, lock nuts, and carriage bolt securing the PTO-side chassis support. With the fuse block out of the bracket, remove the support with the front belt guard.

■NOTE: After removing the PTO-side chassis support, re-install the cap screw securing the rear PTO-side engine to chassis mount (bearing bracket) to secure the bearing.

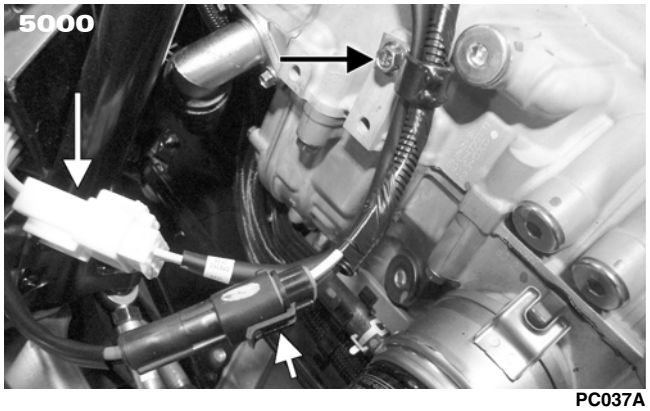


PC209A

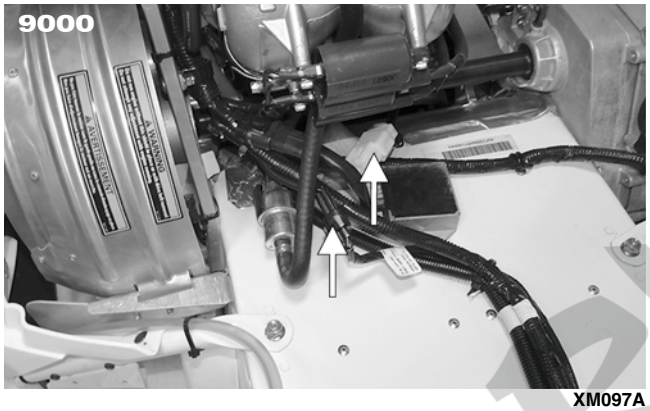
38. Remove the cap screws securing the PTO-side engine to chassis mount (bearing bracket).

39. Disconnect the harness connectors from the regulator/rectifier and magneto; then remove the cap screws securing the routing clamp to the engine (5000 models) and secure the wire harness up and out of the way.

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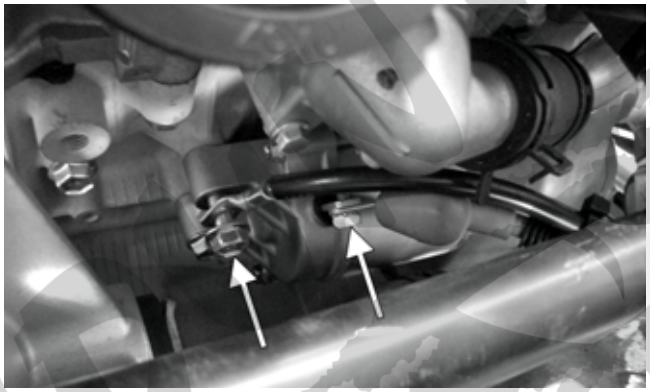


PC037A



XM097A

40. Raise the engine up and tip the engine forward enough to remove the cables from the starter motor and the rear engine/heat exchanger coolant hose.



PC038A



PC039A

■NOTE: At this time, verify all components connecting the engine to the chassis are disconnected and out of the way.

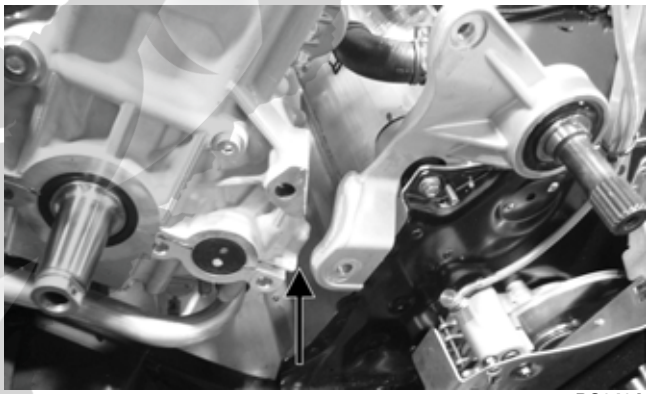
41. Raise the engine until the studs of the lower front engine to chassis mount clear the chassis; then rotate the engine clockwise enough to clear the PTO-side engine to chassis mount and carefully lift the engine up and out of the chassis.



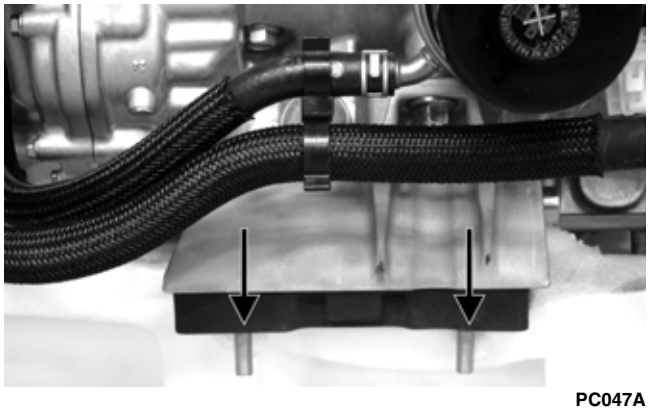
PC040A

Installing

1. Carefully lower the engine into the chassis positioning the engine so it clears the PTO-side rear engine/chassis mount and on the 9000, the turbocharger clears the front of the chassis; then lower the engine until the studs of the lower front engine/chassis mount are into the mounting holes of the chassis.



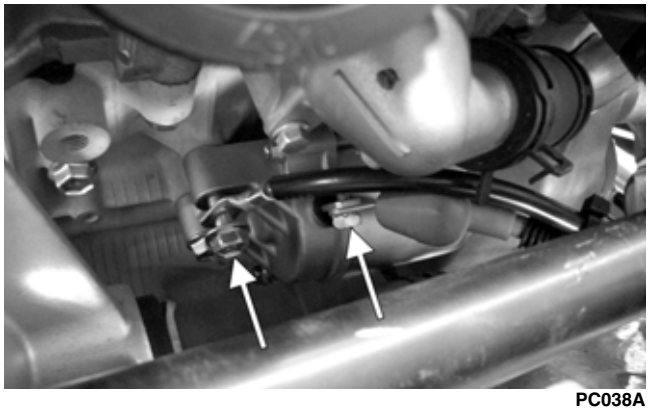
PC040A



PC047A

2. Tip the engine forward enough to install the cables to the starter motor and tighten the ground cable to 19 ft-lb and the positive cable to 42 in.-lb.

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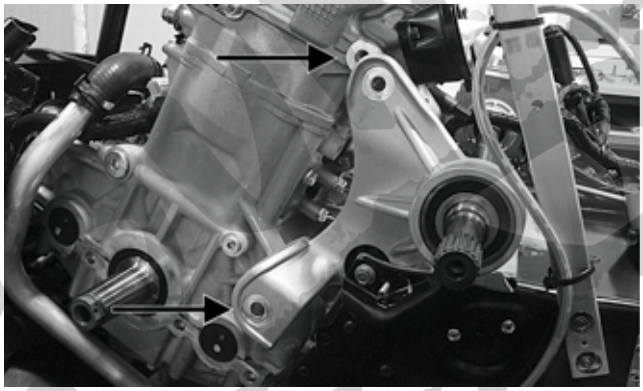
PC038A

3. Install the coolant hose and clamp to the tunnel heat exchanger and secure the clamp.



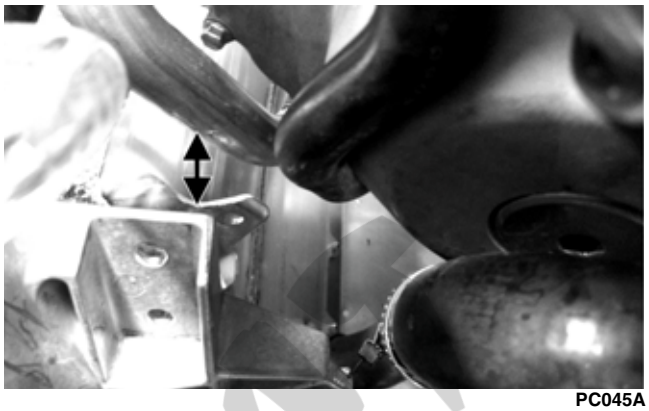
PC039A

4. With the front engine/chassis mount into position, lower the engine back until the engine is in line with the PTO-side engine/chassis mount (bearing bracket).



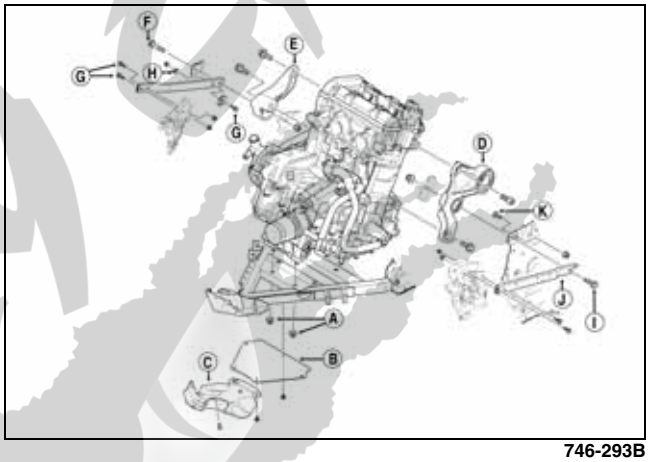
PC044A

■NOTE: When lowering the engine back, make sure the engine/heat exchanger coolant tube is to the inside of the MAG-side engine mount bracket of the chassis.



PC045A

■ NOTE: To secure the engine to the chassis, use steps 5-9 and the following illustration.

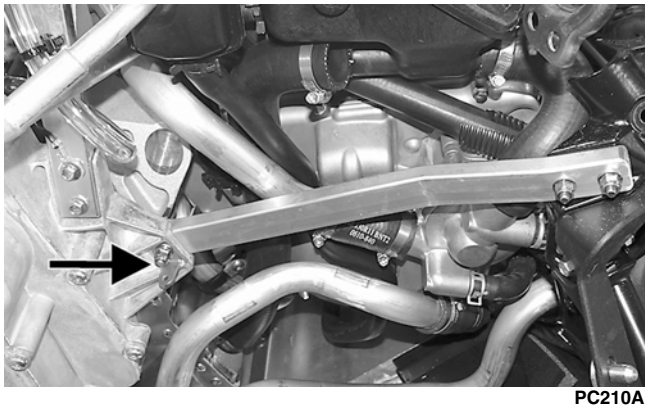


746-293B

5. Secure the lower front engine mount to the chassis using new lock nuts (A) and tighten to 25 ft-lb; then secure the access panel to the chassis with the three screws (B). Tighten securely.
6. Install the belly pan and secure with four screws (C) tightened securely; then secure the PTO-side engine to chassis mount (bearing bracket) with two new "patch-lock" screws (D). Tighten the both screws to 100 ft-lb.
7. Secure the MAG-side engine to chassis mount using the two cap screws (coated with blue Loctite #243) (E). Tighten the upper screw to 40 ft-lb and the lower screw to 50 ft-lb.
8. Install the MAG-side chassis support and secure with the cap screws (coated with blue Loctite #243) (F) (G) (H). Tighten the rear cap screws to 25 ft-lb and the front cap screws to 12 ft-lb.

■NOTE: Note the location and orientation of the resonator spring tab and bracket support.

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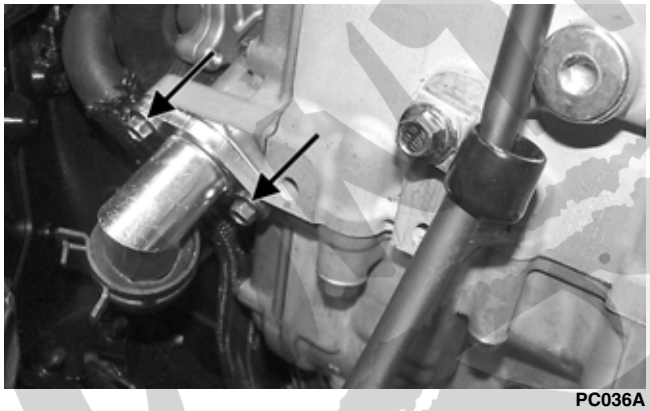


PC210A

9. Secure the PTO-side chassis support to the chassis using the cap screws (I), carriage bolt (K), and lock nuts (J). Tighten the cap screws to 25 ft-lb and the carriage bolt and lock nuts to 12 ft-lb.

■NOTE: It may be necessary to pry against the backside of the carriage bolt until the nut becomes snug.

10. With the engine installed, remove the hardware used to remove and install the engine.
11. Install the screw securing the front belt guard to the skid plate.
12. Install the oil supply elbow fitting and cap screws to the engine and tighten the cap screws to 96 in.-lb; then install and secure the oil return hose and oil breather hose to the engine.



PC036A



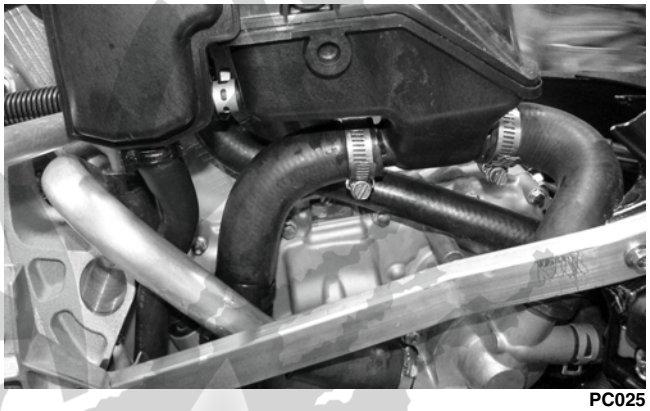
PC243

■NOTE: Make sure the O-rings are in place before installing the oil hoses.

13. Install the coolant/oil separator tank to the bracket on the engine; then install the hoses with clamps to the coolant/oil separator tank and secure the clamps.

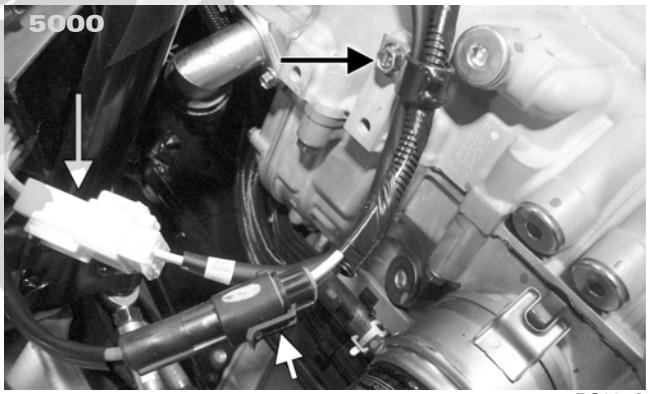


PC032B

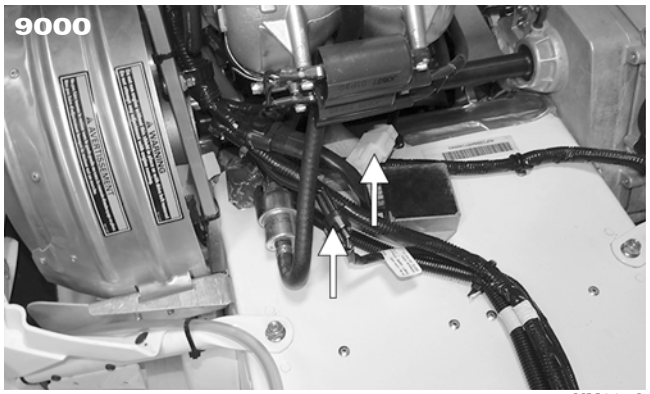


PC025

14. Connect the harness connectors to the regulator/rectifier and magneto and with the harness properly routed, secure the harness to the engine with cap screw and routing clamp; then tighten the cap screw securely.



PC037A

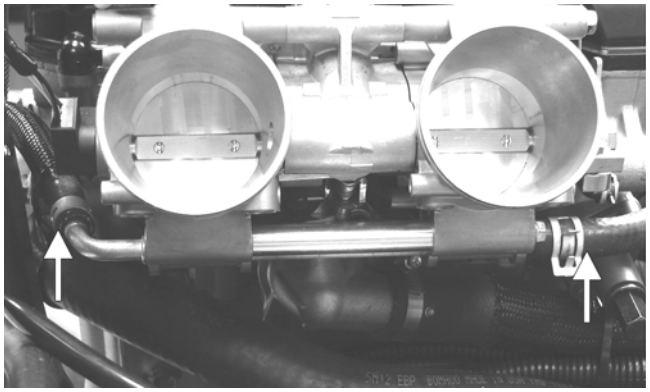


XM097A

■NOTE: Steps 15-17 are for the 5000 only.

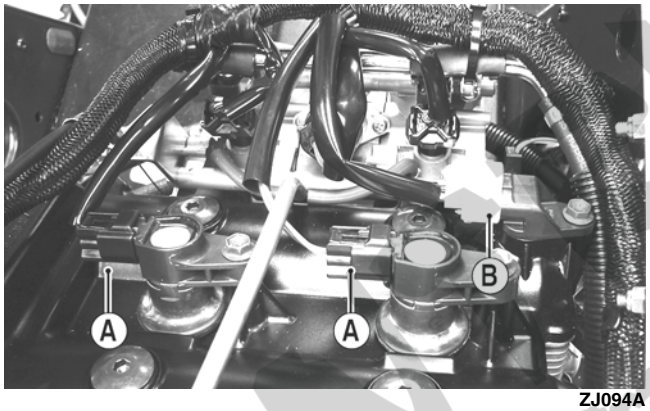
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15. Install the throttle bodies and secure with the clamps; then install and secure the throttle body/coolant tank and the throttle body/cylinder head hoses.



ZJ018A

16. Connect the harness plug-ins to the ignition coils (A) and camshaft sensor (B); then route the main harness to the proper connector locations and secure with cable ties as noted during removing.

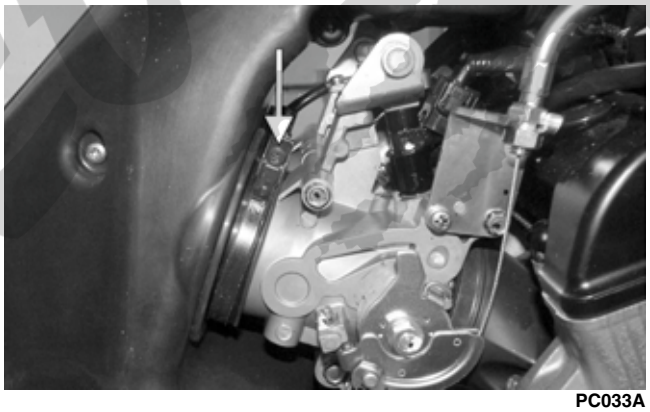


ZJ094A

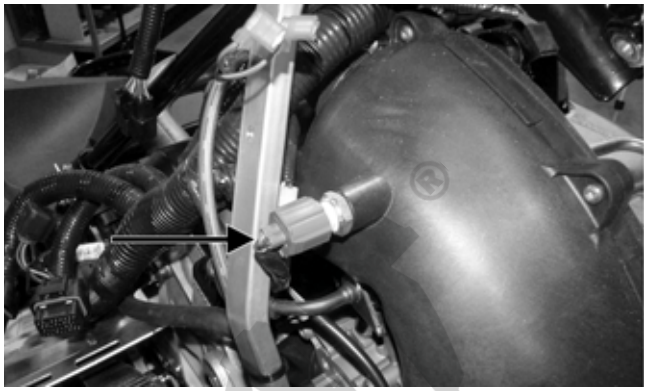
CAUTION

Make sure the harness is routed away from the exhaust or any moving parts.

17. Install and secure air silencer and clamps to the throttle bodies; then connect the air temperature sensor to the air silencer.



PC033A



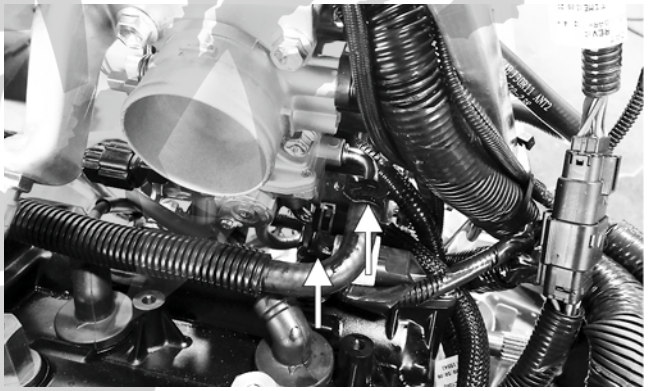
PC046A

■NOTE: Steps 18-22 are for the 9000 only.

18. Install the flanges to the manifold adapter assembly and secure with the clamps; then install the manifold and throttle body assembly and secure with the two upper clamps.

■NOTE: Remove any tape sealing the intakes.

19. Install and secure the throttle body coolant hoses to the coolant tank and cylinder head.



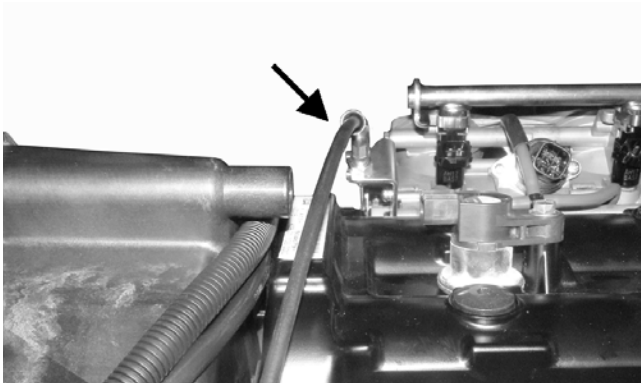
PC211A

20. With the spark plug wires routed properly, install the spark plug caps to the spark plugs.

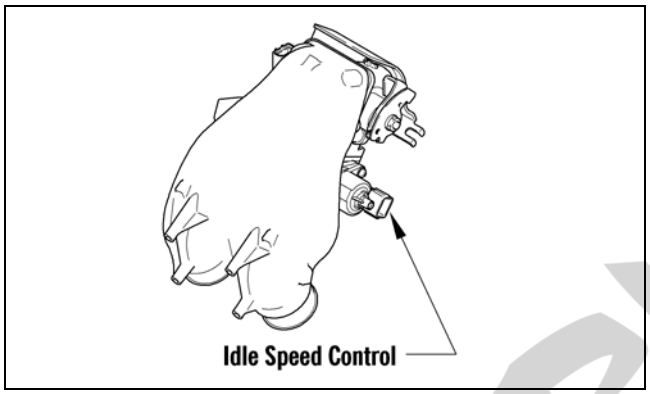
■NOTE: Make sure the caps are firmly seated on the plugs.

21. Install and secure the throttle cable to the bracket and clutch noting the routing of the cable; then connect the idle speed control.

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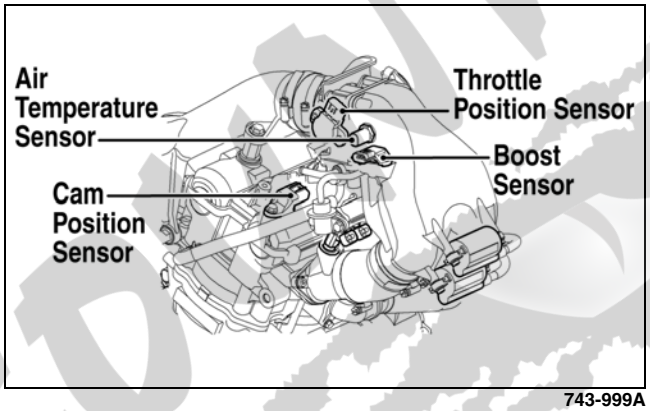


SNO-741A



0743-992

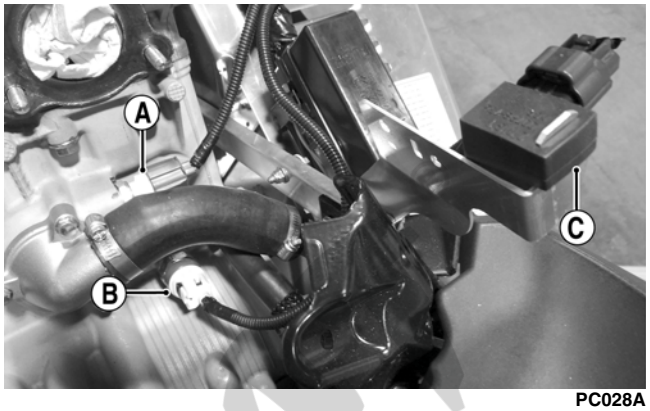
22. With the wire harness properly routed, install the harness connectors to the throttle position sensor, air temperature sensor, boost sensor, and cam position sensor.



743-999A

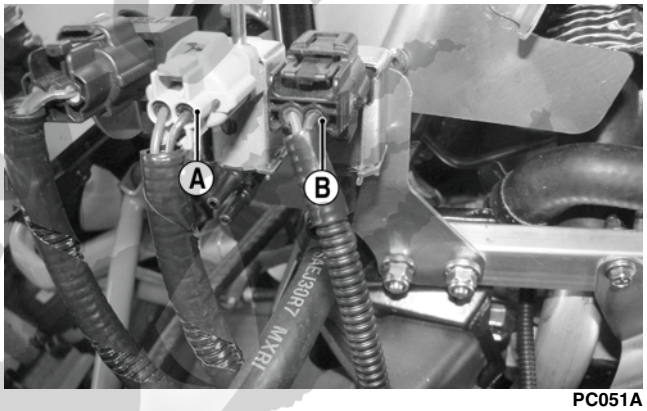
■NOTE: At this time, secure the wire harness to the locations noted during disassembly.

23. Secure the harness connectors to the oil pressure switch (A) and the coolant temperature sensor (B) and install the air pressure sensor (C) to the bracket of the side support.

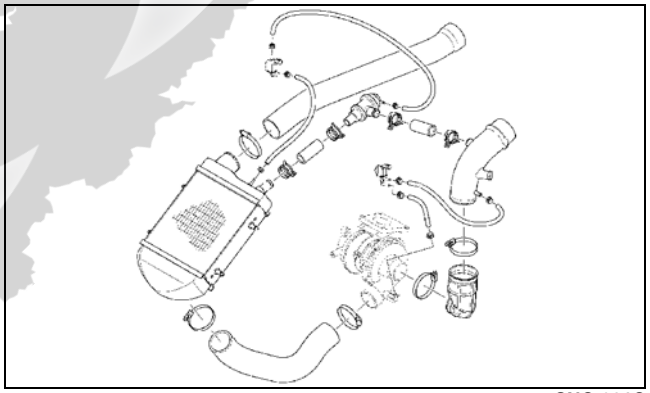


PC028A

■NOTE: On the 9000, install the harness connectors and vacuum hoses to the air bypass control valve (A) and the waste gate control valve (B) to the bracket of the PTO-side chassis support.



PC051A

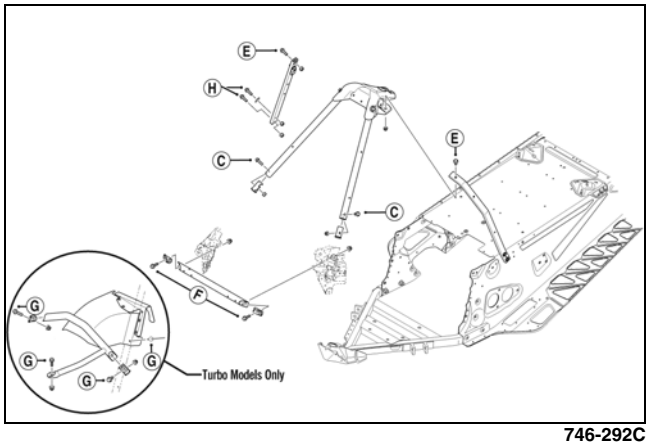


SNO-231C

24. With the battery cables and solenoid harness properly positioned in the channel of the gas tank assembly, install the gas tank (see the Fuel Systems section).

25. Install the upper chassis components using the following sequence and illustration:

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746-292C

■NOTE: For assembling purposes apply a small amount of silicone or tape to keep the inserts secured into the spar tubes and use new lock nuts and cap screws when securing the spars to the chassis.

A. Secure the front spars with the steering bracket to the shock mounting brackets using two cap screws, inserts, and new lock nuts. Tighten to 23 ft-lb.

■NOTE: On the 9000, install the PTO-side front spar with heat shield and shock mounting bracket as an assembly. Tighten the shock mounting bracket cap screws (G) to 20 ft-lb.

B. PTO-side steering support to the steering bracket = 1 cap screw and lock nut. Tighten to 23 ft-lb.

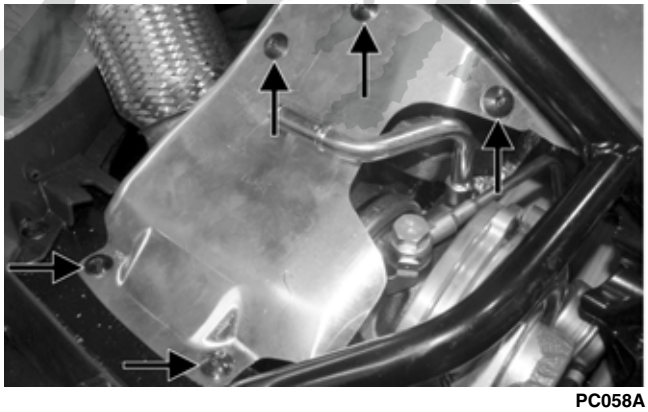
C. MAG-side steering support to chain case. Tighten to 12 ft-lb.

■NOTE: Install the ground wire to the upper cap screw (C) when securing the steering support to the chain case.

E. MAG-side steering support to the steering bracket = 1 cap screw and lock nut. Tighten to 23 ft-lb.

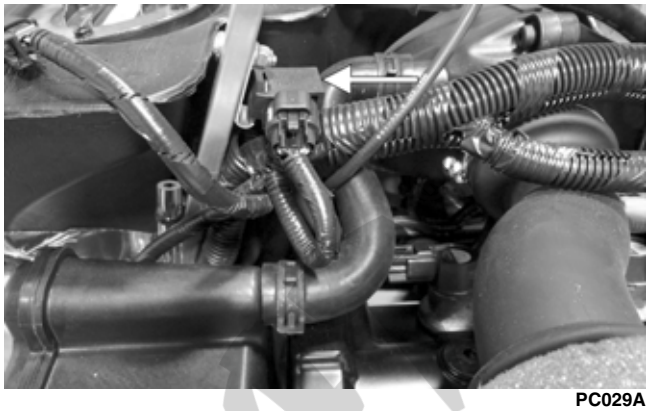
F. Shock mounting bracket support to shock mounting brackets (5000) = 2 cap screws, inserts, and 2 lock nuts. Tighten to 20 ft-lb.

■NOTE: On the 9000, secure the front heat shield to the chassis with the screws.



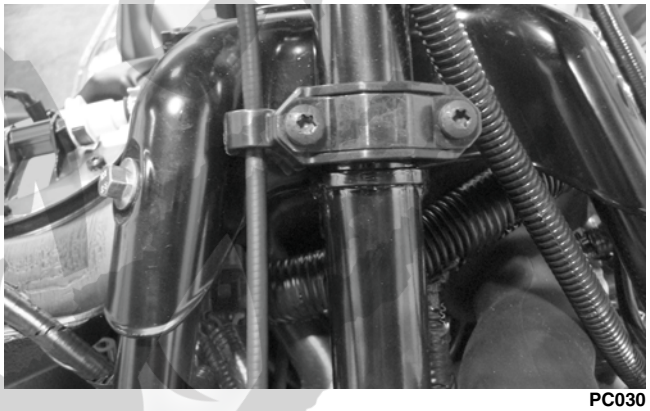
PC058A

■NOTE: On the 5000, install the MAP sensor to the bracket on the MAG-side steering support.



PC029A

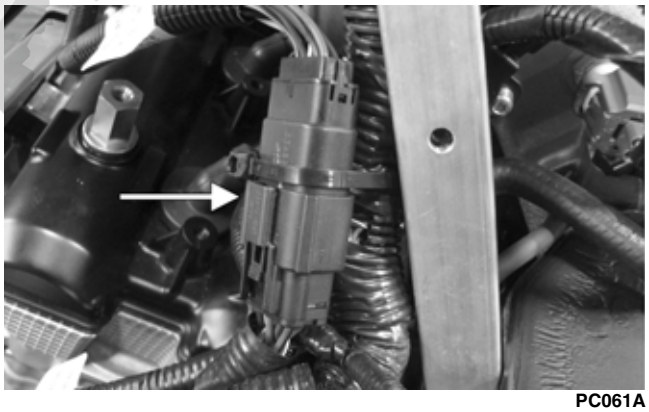
26. With the throttle cable in place, install and secure the steering post to the steering bracket with the mounting blocks, cap screws, and lock nuts. Tighten to 96 in.-lb.



PC030

27. Install and secure the handlebar to the steering post with the caps and four cap screws. Tighten the cap screws to 15 ft-lb.

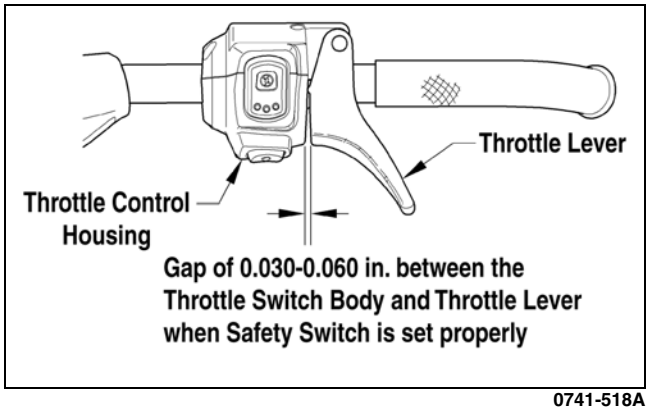
■NOTE: Connect the handlebar harness to the main harness connector and secure the connectors to the harness at the PTO-side steering support.



PC061A

28. Install the throttle cable into the lever; then verify the throttle lever free-play is within specification.

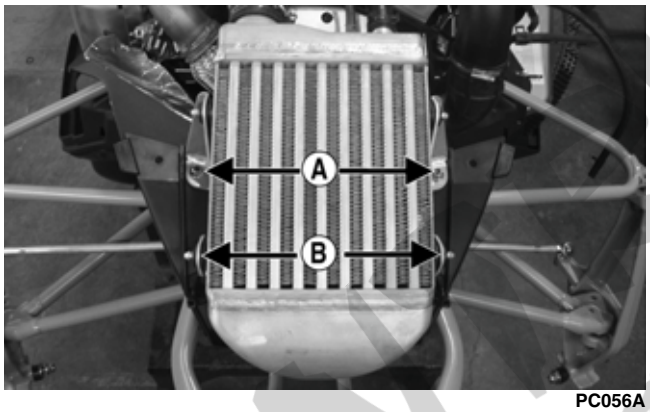
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0741-518A

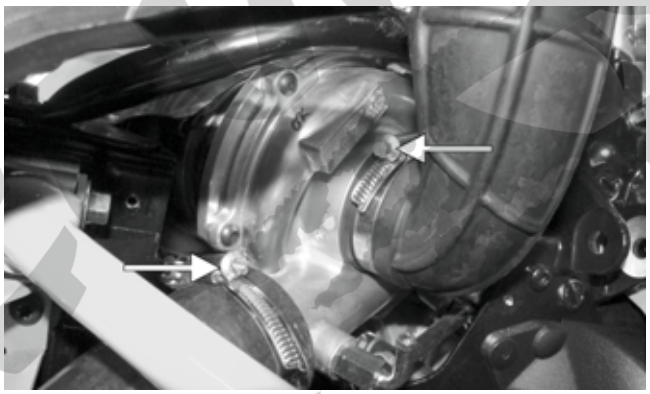
■**NOTE: Steps 29-32 are for the 9000 only.**

29. Install the fascia and install the front pins (B) of the intercooler into the brackets; then install the rear brackets (A) to the pins of the intercooler and secure the brackets to the chassis with cap screws and lock nuts. Tighten securely.

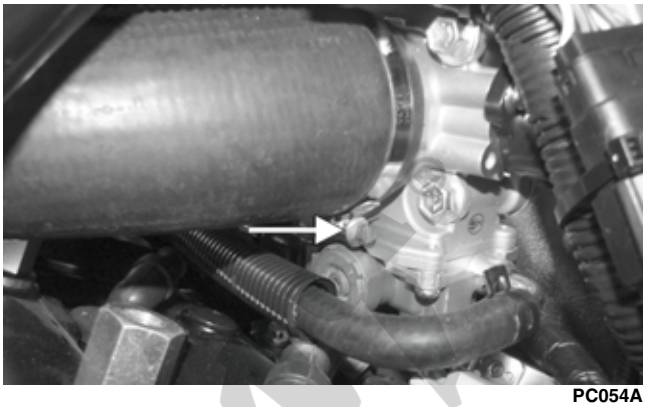


PC056A

30. Install and secure the turbocharger/intercooler hose and air intake hose; then secure the intercooler hose to the throttle body.



PC055A



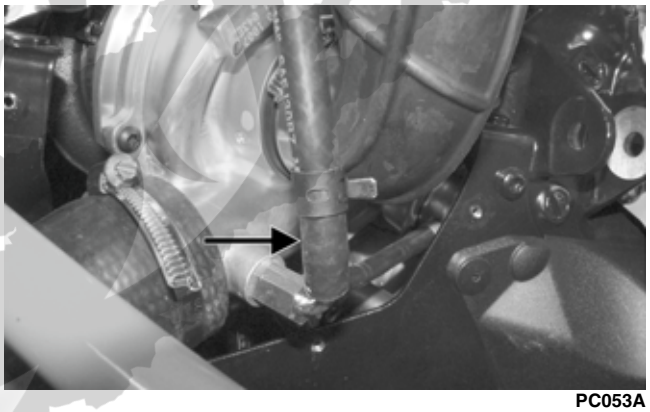
PC054A

■**NOTE: Remove any tape sealing the turbocharger.**

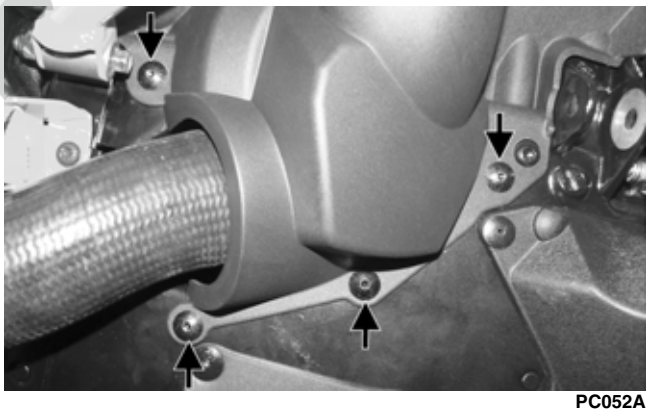
CAUTION

Make sure there are no obstructions in the intake and intercooler side of the turbocharger before installing the intercooler hose.

31. Install the waste gate control valve hose to the turbocharger and install the clamp as noted during removing; then install the side cover and secure with the screws.



PC053A



PC052A

32. Install the exhaust resonator to the chassis support and secure with the spring; then secure the resonator to the exhaust pipe and tighten the cap screws and flange nuts to 12 ft-lb.

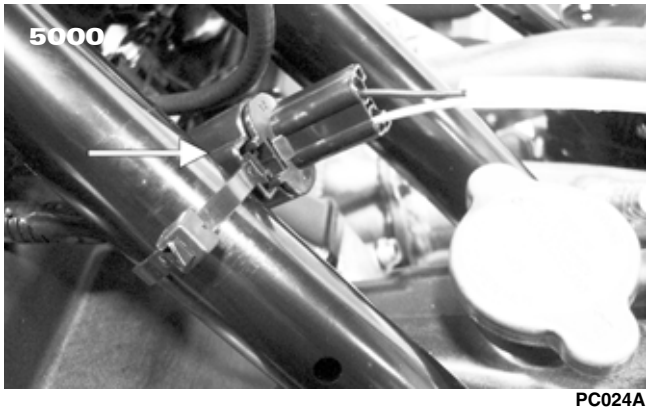
■**NOTE: Steps 33-34 are for the 5000 only.**

33. Position the exhaust pipes and resonator into the chassis and install and secure the MAG and PTO exhaust flanges (with new gaskets) to the cylinder head with the flange nuts. Tighten evenly to 17 ft-lb.

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34. With the resonator properly installed to the chassis support, install the spring securing the resonator to the mounting tab.

■NOTE: With the exhaust system installed, connect the oxygen sensor to the harness connector.



PC024A



PC241

35. Install and secure the drive clutch with the cap screw (lightly coated with oil); then tighten the cap screw to 51 ft-lb.

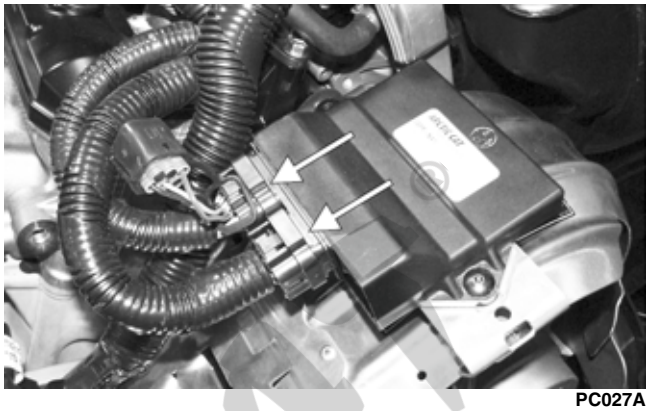
CAUTION

When installing the drive clutch, do not tighten the clutch cap screw with any kind of impact tool. Tighten cap screw using a hand torque wrench only. Failure to do so could result in stationary sheave damage.

36. Install the drive belt (see the Drive Train/Track/Brake Systems section); then install and secure the driven clutch (see the Drive Train/Track/Brake Systems section).

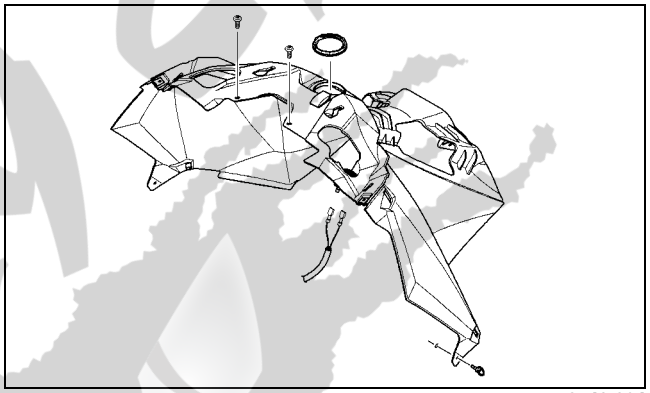
37. Connect the two harness connectors to the ECM; then lock the fuse block into the bracket of the front belt guard.

38. Install the gas tank (see the Fuel Systems section).



PC027A

39. Install and secure the lower console to the skid plate with the ¼ turn screws; then install the upper console over the gas tank and install and tighten the retaining nut to the neck of the gas tank.

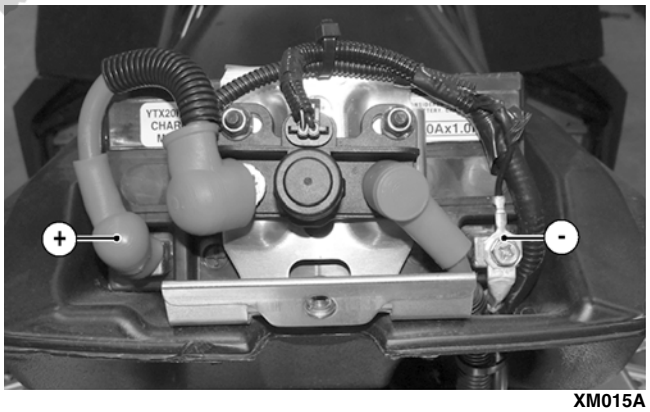


0746-324

40. Connect the wires to the reverse alarm; then install the two screws securing the console to the steering bracket.

■NOTE: On the LXR/LTD models, connect the harness connector to the seat heater switch before securing the upper console.

41. Connect the battery cables (positive first) and the ground wire to the battery; then connect the solenoid harness to the solenoid.



XM015A

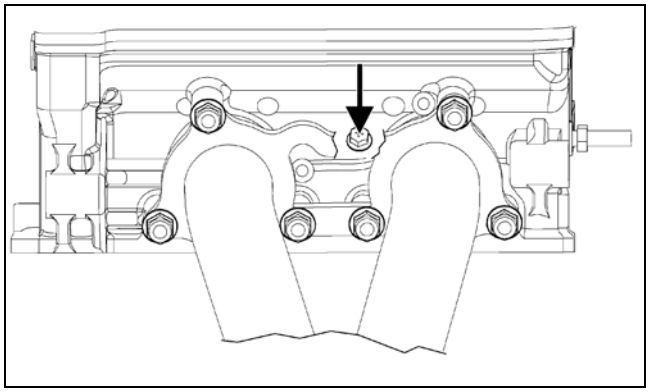
■NOTE: On the LXR/LTD models, connect the seat heater harness connector.

42. Install the seat (see the Steering and Body section).

43. Elevate the front of the snowmobile until the tunnel heat exchangers are angled upward towards the engine.

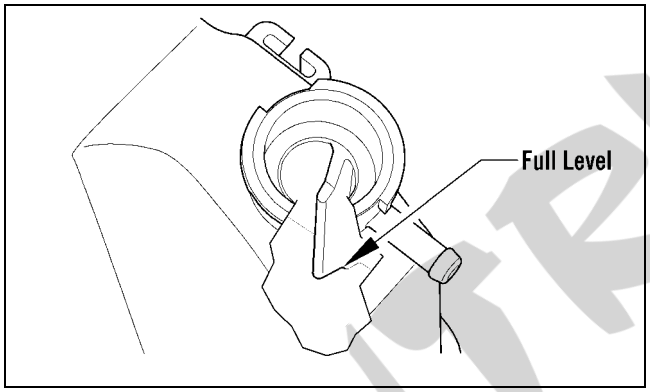
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44. Open the coolant bleed screw on the cylinder head; then add coolant to the reservoir until coolant is visible at the bleed screw.



744-032A

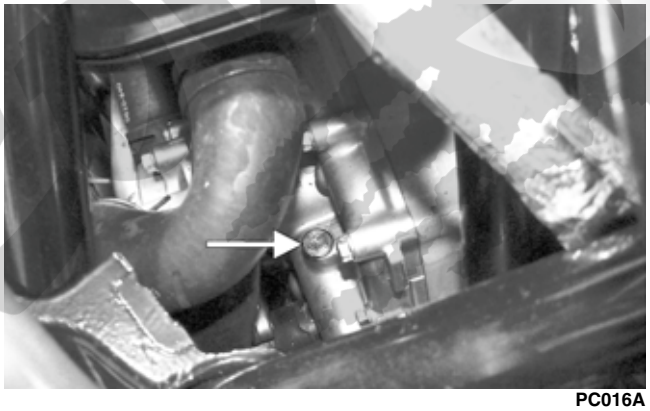
45. Tighten the bleed screw; then add coolant until coolant is at the tab of the coolant tank.



0746-117

46. With the oil filter installed and tightened to 15 ft-lb, pour the recommended quantity of the recommended oil into the oil reservoir.

47. Open the air bleed screw until no air is heard purging from the oil pump. Tighten the bleed screw to 96 in.-lb.



PC016A

CAUTION

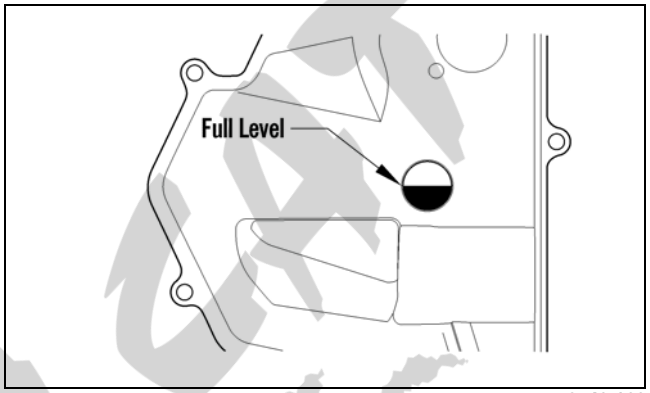
Never start the engine with the bleed screw open.

48. Place the emergency stop switch in the RUN position and the ignition switch to the ON position. Start the engine. The warning icon should go out within five seconds.

■NOTE: If the warning icon does not go out, shut the engine off immediately and repeat step 47; then repeat step 48.

49. Start the engine and allow it to run to operating temperature; then shut the engine off and allow it to cool.

50. Add oil to the oil reservoir until oil is visible halfway up in the sight glass.



0746-166

■NOTE: At this time, connect Hood Harness Extension to the hood and connect the main harness connector to the extension.

CAUTION

After running the engine to the proper operating temperature, shut the engine off; then inspect for any signs of coolant, gasoline, or oil leakage.

51. With the engine cool, loosen the bleed screw and allow the coolant level in the filler neck to drop; then with the bleed screw loose, add coolant into the filler neck until no air is visible or heard at the bleed screw. Tighten the bleed screw and add coolant to the reservoir if necessary.

■NOTE: If the coolant level in the filler neck suddenly drops when the bleed screw is loosened, an air-lock occurred in the cylinder head. Add coolant to the filler neck until full before starting the engine.

52. Start the engine and allow it to run for five minutes. Inspect for any signs of coolant leaks in the engine compartment; then shut the engine off and allow it to cool.

53. Repeat steps 51-52 (at least two more two times) until no air is in the cooling system.

CAUTION

Operating the snowmobile with air in the cooling system will cause severe damage to the engine.

54. Disconnect the hood harness extension; then install the hood and side panels.

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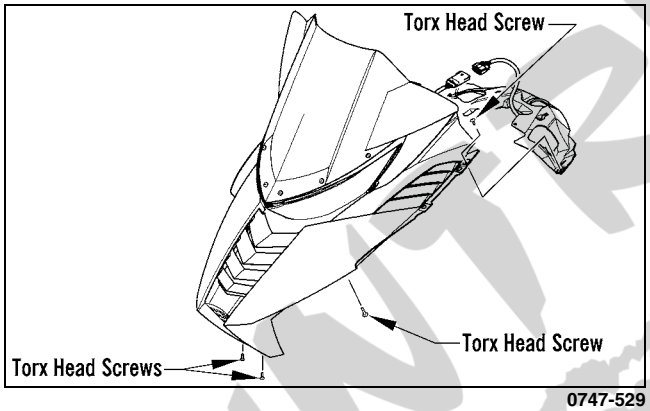
Engine Removing Installing - 7000

This engine sub-section has been organized to show a progression for the removing/installing of the Arctic Cat 1049 cc (ZR/XF) engine. For consistency purposes, this sub-section shows a complete and thorough progression; however, for efficiency it may be preferable to remove only those components needing to be addressed. Also, some components may vary from model to model. The technician should use discretion and sound judgment.

Removing

■NOTE: While removing the engine, note all cable tie locations.

■NOTE: Prior to removing the engine, disconnect the hood harness; then remove the torx-head screws securing the hood, remove the hood, and remove the access panels.



0747-529

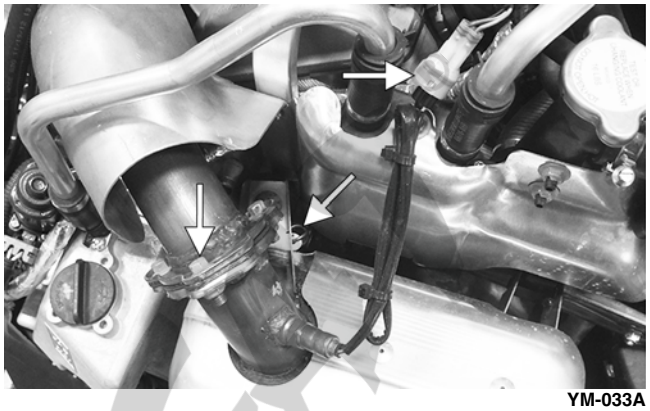
1. Remove the seat; then disconnect the battery cables (negative cable first) and solenoid harness.
2. Remove the retaining nut from the neck of the gas tank and the two screws securing the upper console. Disconnect the wires from the reverse alarm; then loosen the 1/4 turn screws securing the lower console to the skid plate and remove both upper and lower consoles.

■NOTE: On the LXR/LTD models, disconnect the seat heater harness from the seat heater switch.

3. Remove the gas tank.
4. Remove the cap screw from the driven clutch and slide the driven clutch (along with the drive belt) off the driven shaft. Account for alignment washers and sheave adjuster.
5. Remove the cap screw and washer securing the drive clutch to the crankshaft.
6. Using Drive Clutch Puller, tighten the puller. Remove the drive clutch.

■NOTE: If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases.

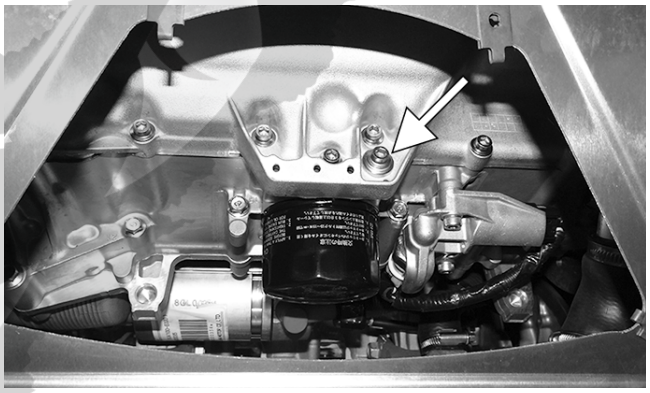
7. Disconnect the oxygen sensor and remove the spring and the cap screws and nuts securing the resonator to the chassis. Remove the resonator.



YM-033A

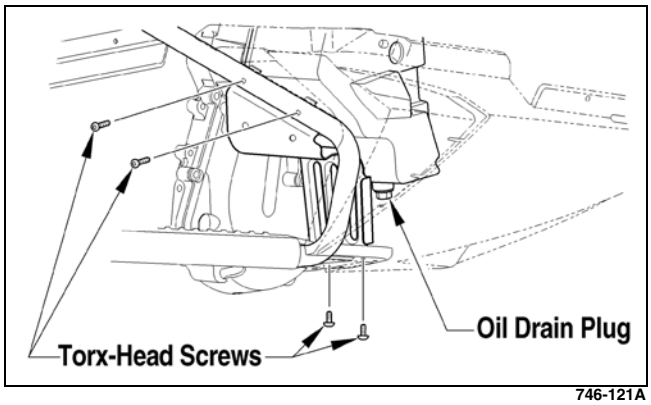
■NOTE: Before removing the cap screws and nuts securing the resonator, be sure to apply a small amount of penetrating oil to the threads of the cap screws.

8. Remove the torx-head screws and both access plates from beneath the snowmobile.
9. Place a drain pan beneath the engine oil drain screw; then remove the screw and allow the oil to drain completely. After the oil has drained, install a new drain screw with new washer and tighten to 7.2 ft-lb.



XM125A

10. Remove the four torx-head screws securing the right-side footrest to the tunnel and the support; then with a drain pan in position, remove the oil drain plug from the oil tank.

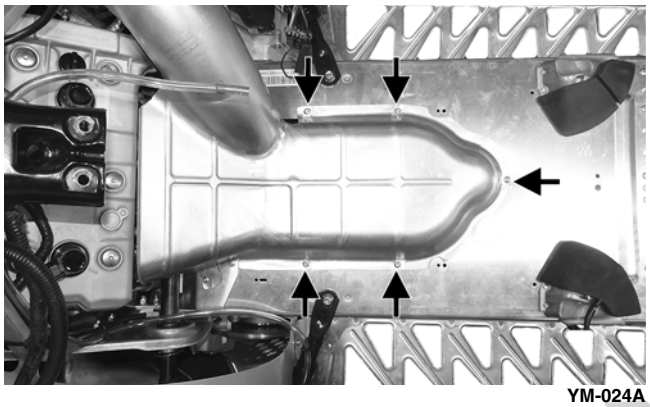


746-121A

■ NOTE: To aid in draining the oil from the tank, position a funnel between the tank and the opening of the tunnel running board.

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11. After the oil has drained completely, install a new drain plug with a new O-ring and tighten to 16 ft-lb.
12. Using a suitable vacuum pump, remove the coolant from the coolant filler neck and the reservoir tank.
13. Remove the screws securing the exhaust heat shield to the tunnel, then remove the screw and nut securing the shield to the right-side support. Account for two mounting plates and two washers.



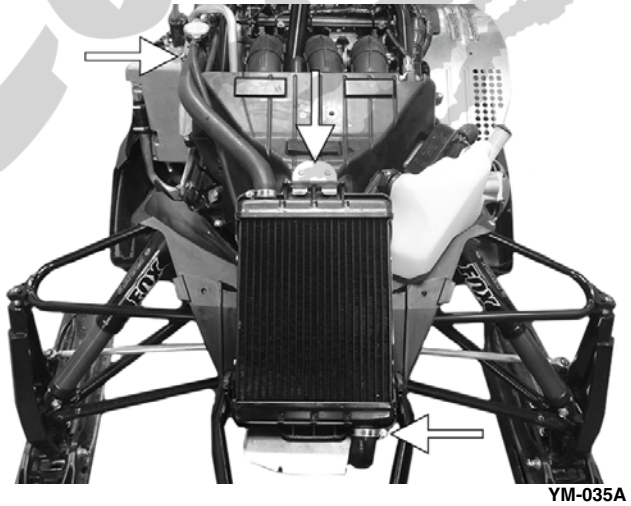
YM-024A

14. Remove the cap screws securing the exhaust pipe assembly to the engine. Remove the assembly and account for a gasket.



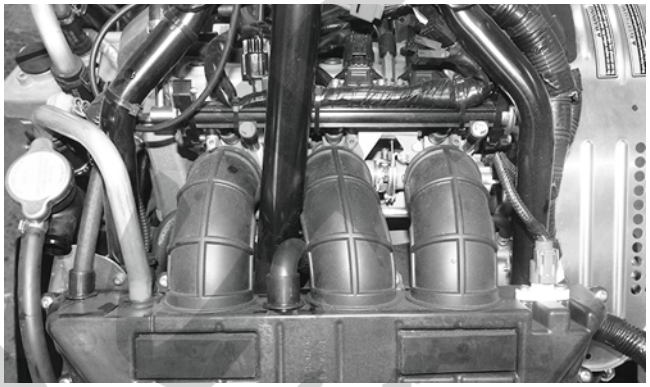
YM-034

15. Loosen both clamps securing the coolant hoses to the filler neck and the lower radiator connection; then remove the two screws and the hold down bracket securing the air intake to the radiator. Disconnect the cooling fan and remove the radiator assembly.



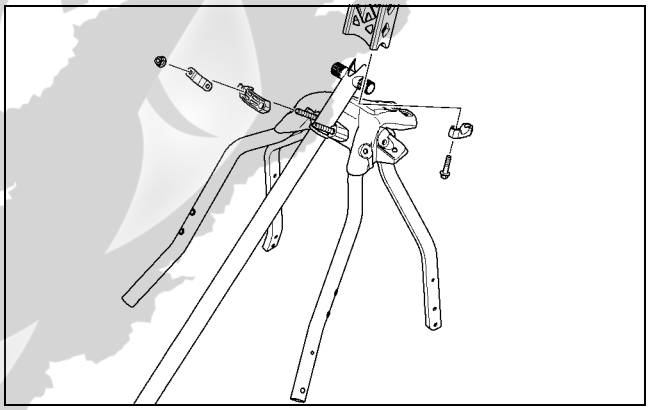
YM-035A

16. Remove the fuse block from the coolant tank and move it out of the way; then remove the screws securing the right- and left-side facia to the chassis.
17. Loosen all three hose clamps securing the intake boots to the throttle body; then disconnect the air temperature sensor and remove the two screws securing the front of the air intake to the chassis. Remove the air intake assembly.



YM-036

18. Remove the steering post assembly from the chassis and from the steering support.
19. Remove all four cap screws securing the front spars to the steering support and the front shock mount.



0747-939

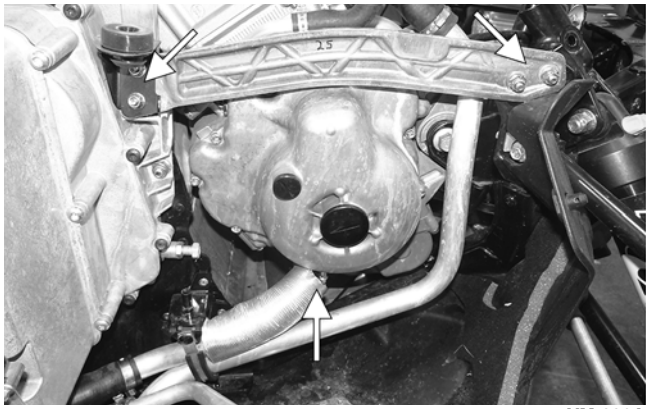
20. Remove the two cap screws securing the right side support to the steering support. Remove the steering support.
21. Disconnect the throttle body harness from the main harness; then remove the three clamps securing the throttle body to the intake boots. Remove both coolant hoses. Remove the throttle body.



YM-037A

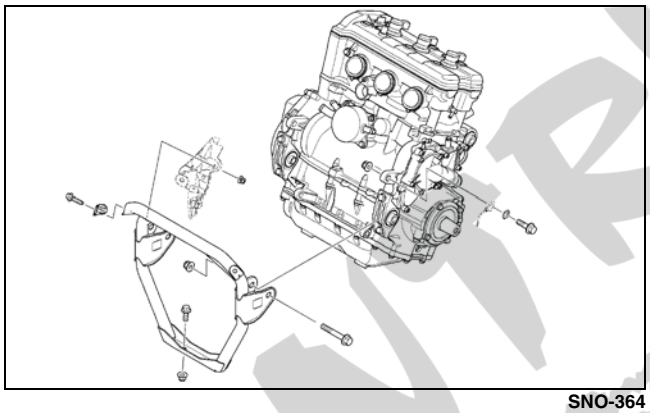
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22. Remove the four nuts securing the right-side chassis support; then remove the oil hose from the right side of the engine.



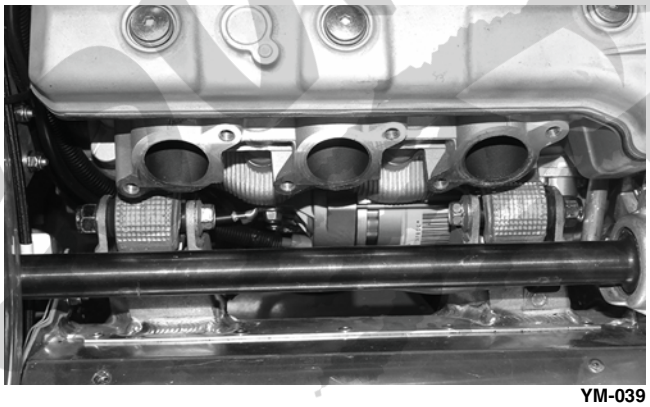
YM-038A

23. Remove all six cap screws and nuts securing the front engine bracket; then remove the bracket. Remove the cap screw and nut securing the ground cable to the engine.



SNO-364

24. Remove the two cap screws and nuts securing the rear of the engine to the chassis.



YM-039

25. Remove the clamp securing the MAG-side coolant hose to the engine; then disconnect the oil pressure switch, oil pressure sensor, and the crankshaft position sensor.

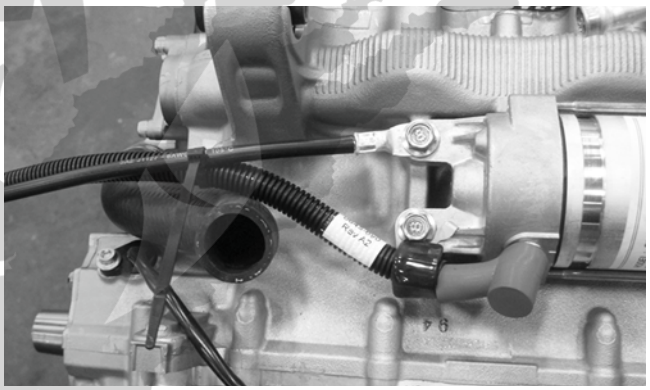


YM-066A

26. With all hoses and wires disconnected from the engine, move the engine forward and out the right-side of the chassis.

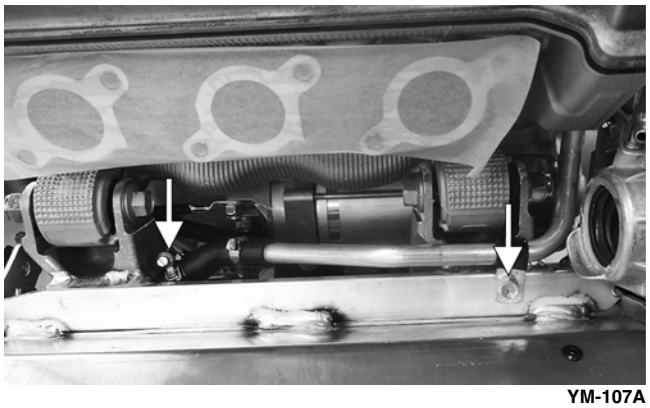
Installing

■NOTE: Before installing the engine, be sure the starter motor and cables are installed and secured to the engine.



YM-041

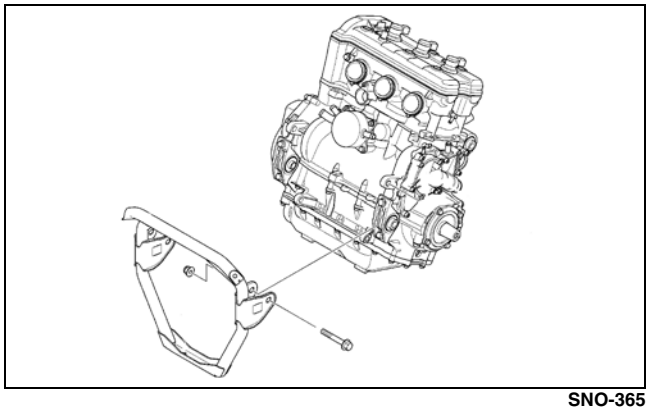
■NOTE: If the thermostat-to-heat exchanger coolant hose was removed, make sure is it properly routed just below the driveshaft and secure using the clamp and cap screw.



YM-107A

1. Position the front engine bracket with the front engine mounts; then loosely secure using the existing cap screws and nuts.

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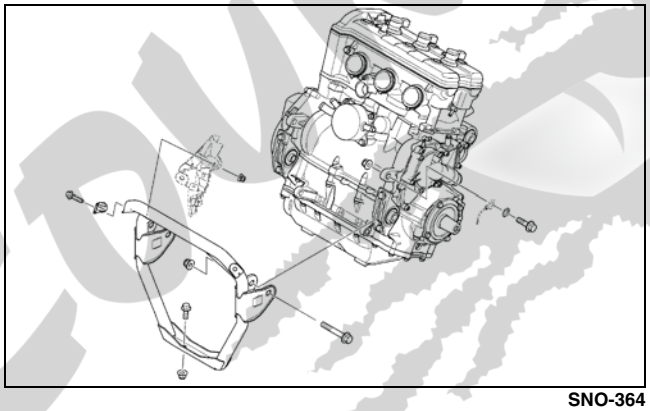
SNO-365

2. Carefully lower the engine into the chassis aligning the rear engine mounts with the chassis mounts; then loosely secure using the existing cap screws and nuts.



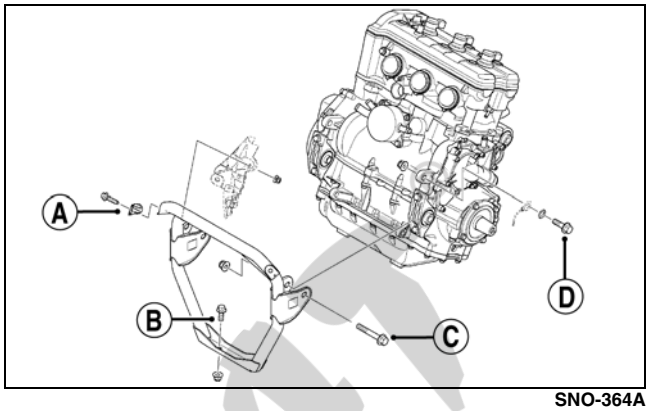
YM-039

3. Loosely secure the front engine mounting bracket to the chassis using the existing cap screws and nuts; then loosely secure the ground cable to the engine using the existing cap screw and nut.



SNO-364

4. Tighten the rear engine cap screws and nuts to 93 ft-lb.
5. Tighten the cap screws (A and B) to 25 ft-lb. Tighten cap screws (C) to 65 ft-lb. Tighten cap screw (D) to 30 ft-lb.



SNO-364A

6. Connect the PTO-side coolant hose to the heat exchanger using the existing clamps; then connect the oil pressure switch, oil pressure sensor, and the crankshaft sensor to the main harness. Tighten coolant hose clamps to 30 in.-lb.

■NOTE: All wires must be installed on the inside of the PTO-side coolant hose.

CAUTION

Make sure the top clamp is routed as shown so the clamp does not come in contact with the drive clutch.



YM-066A

■NOTE: Route the positive and negative battery cables up and over the rear engine mounts.

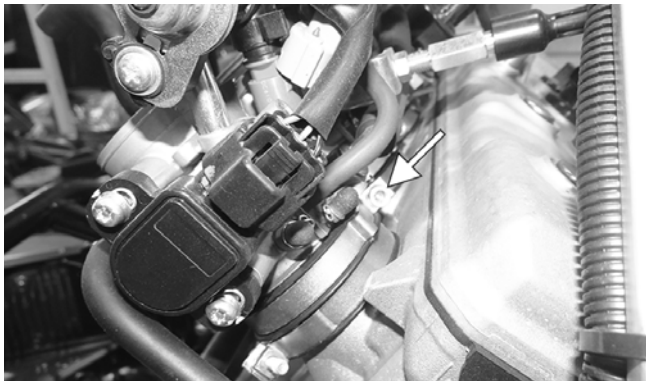
7. Secure the upper mounting bracket, right-side chassis support, and the right-side steering support to the chassis using the existing cap screws and nuts. Tighten to 20 ft-lb. Install the oil hose to the right side of the engine.



YM-038A

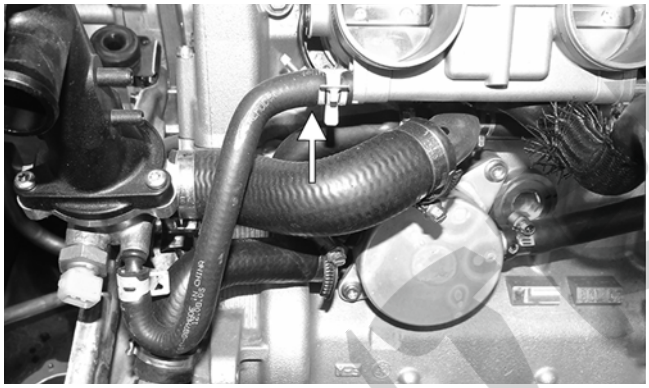
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8. Install the throttle body assembly into the intake boots on the engine. Secure using the existing clamps. Tighten to 26.4 in.-lb.



YM-037A

9. Install the coolant hoses to the throttle body and secure using the existing clamps.



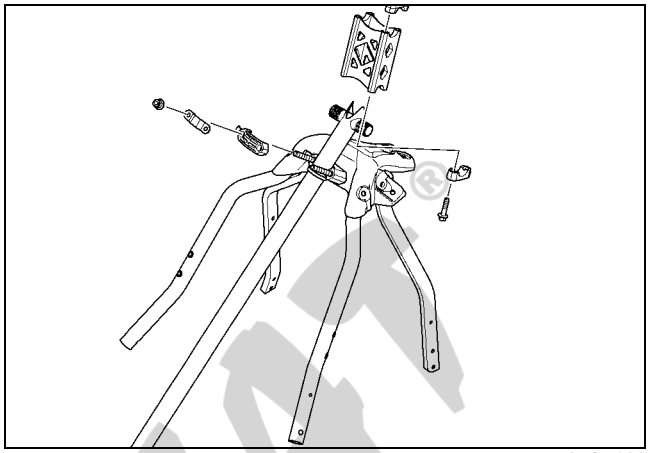
YM-042A

10. Connect the throttle body harness to the main harness (large gray connector); then install the main harness up and over the engine and secure into the C-clamps.



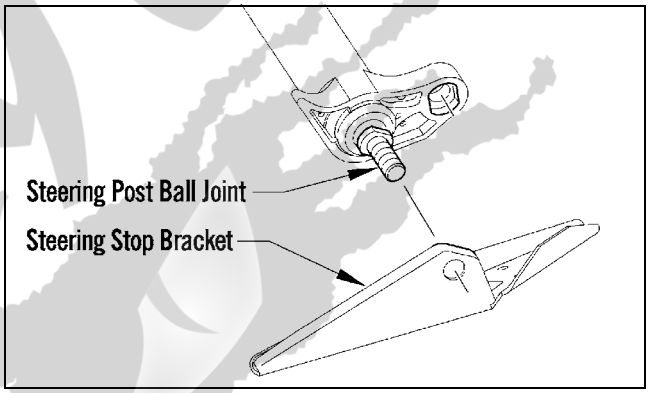
YM-049

11. Install both front spars and secure to the shock mounts using the existing cap screws and nuts; then position the steering support over the side supports and both spars. Secure using existing cap screws and nuts. Tighten all cap screws to 25 ft-lb.



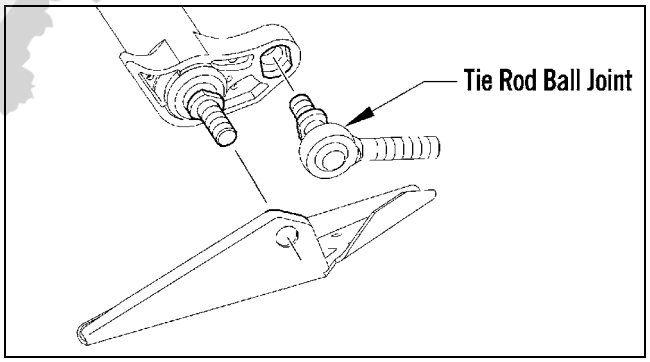
0747-939

12. Install steering post into position and secure to the steering stop bracket with a new M10 nut. **Be sure to align the steering post ball joint alignment tab with the steering stop bracket.** Tighten to 43 ft-lb.



SNO-2218

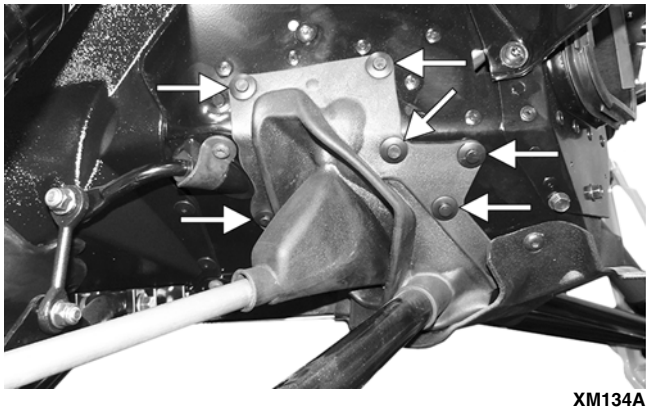
13. Secure the tie rod assembly to the steering post using a new M10 nut. **Be sure to align the tie rod ball joint alignment tab with the steering post.** Tighten to 35 ft-lb.



SNO-2219

14. Secure the right-side steering boot to the chassis using the existing push rivets.

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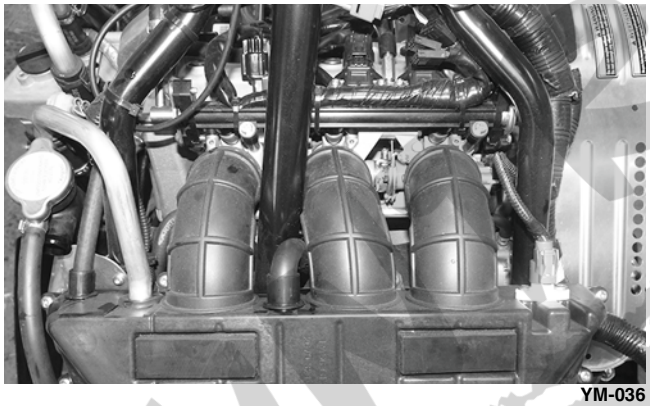


XM134A

15. Secure the top of the steering post to the steering support using the existing retaining plate and nuts making sure the throttle cable is routed between the steering bushings. Tighten to 96 in.-lb.

16. Install the air intake assembly and secure the intake boots to the throttle body using the existing clamps. Tighten to 11 in.-lb.

17. Install the vent hoses into the air intake; then connect the air temperature sensor.

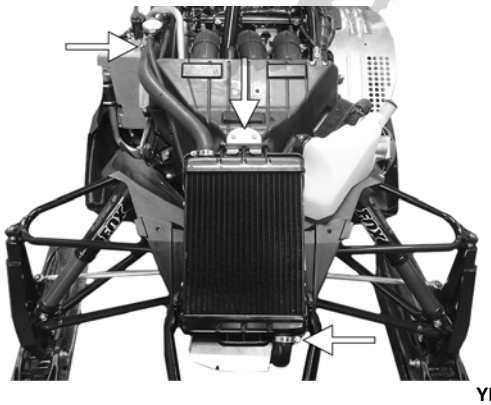


YM-036

18. Install the fuse block onto the coolant tank; then secure the front facia to the chassis using the existing screws.

19. Install the radiator assembly into the lower radiator hose; then install the upper radiator hose to the filler neck. Secure using existing clamps.

20. Connect the radiator fan to the main harness; then secure the top of the radiator to the air intake using the hold down bracket and both screws. Tighten securely.



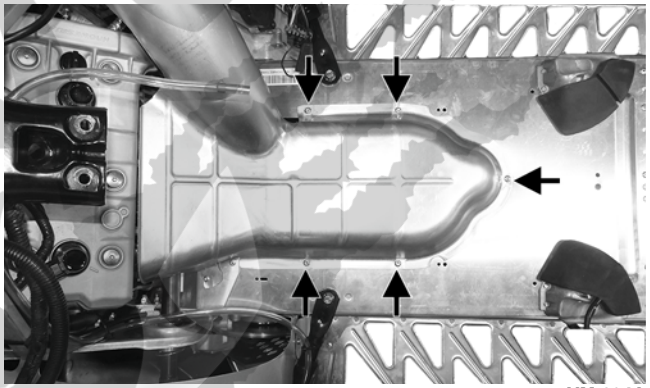
YM-035A

21. Position the exhaust gasket between the engine and the exhaust manifold; then secure the manifold to the engine using the existing screws. Tighten to 16 ft-lb.



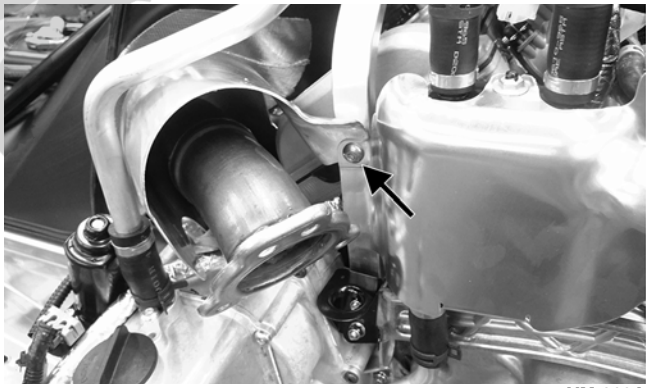
YM-034

22. Secure the heat shield over the manifold using the existing brackets, two flat washers, and all five screws. Tighten to 8 ft-lb.



YM-024A

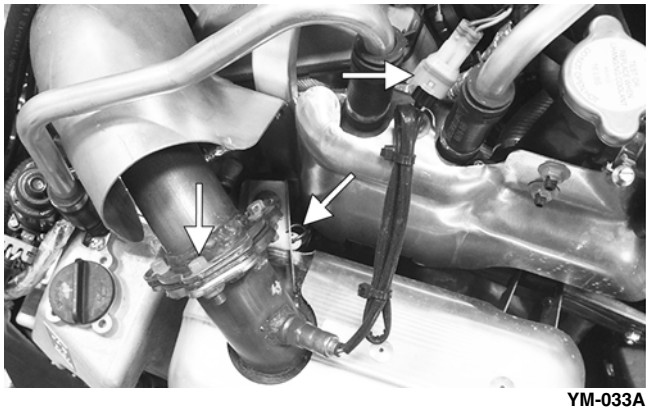
23. Secure the front of the heat shield to the side support using the existing cap screw and nut. Tighten securely.



YM-063A

24. Install the resonator into the rubber mounts on the chassis; then secure to the manifold using a new gasket and three new caps screws and nuts. Tighten to 16 ft-lb. Connect the oxygen sensor and install the spring securing the resonator to the chassis.

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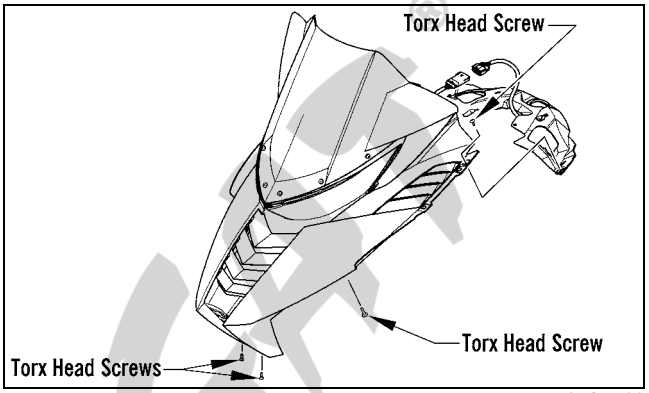


YM-033A

25. Install the gas tank assembly and connect the battery; then install the upper and lower console making sure to connect the reverse alarm.
26. Install the drive clutch, drive belt, and the driven clutch.
27. Install the seat and secure using the screw.

■NOTE: On the LXR models, connect the seat heater harness connector.

28. Install the hood and both access panels.



0747-529

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Engine Servicing - 5000/ 9000

This engine sub-section has been organized to show a progression for servicing of the Arctic Cat 1100 cc engines. For consistency purposes, this sub-section shows a complete and thorough progression; however, for efficiency it may be preferable to disassemble only those components needing to be addressed. Also, some components may vary from model to model. The technician should use discretion and sound judgment.

■NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

SPECIAL TOOLS

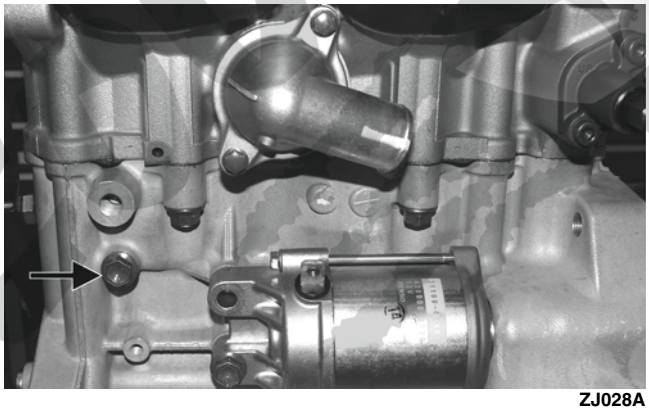
A number of special tools must be available to the technician when performing service procedures in this engine section.

Description	p/n
Ball Hone	0644-532
Flywheel Spanner Wrench	0144-007
Flywheel Puller	0644-480
Piston Pin Puller	0644-328
V Blocks	0644-535
Drive Clutch Spanner Wrench	0644-136
Ring Compressor	0644-378

■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

Disassembling

1. With the engine secured to a suitable engine stand, remove the coolant drain plug allowing the remaining coolant to drain from the engine.

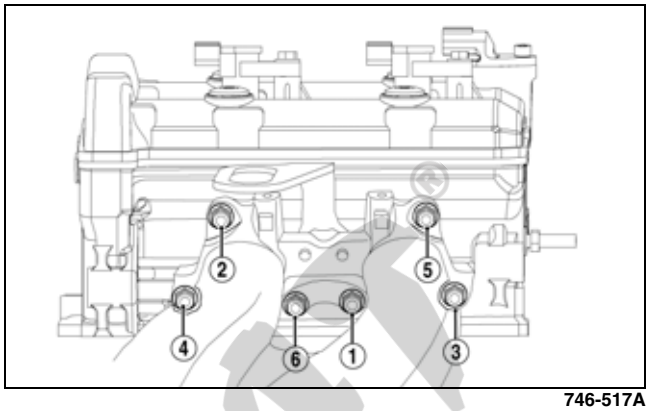


ZJ028A

2. Remove the remaining coolant hoses; then remove the clamps and hoses connecting the oil reservoir to the engine.

■NOTE: For assembling purposes, note the location of the oil and coolant hoses.

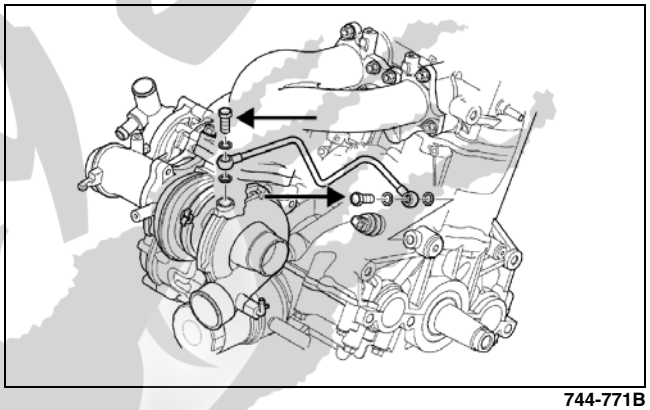
3. Remove the six flange nuts securing the exhaust pipes to the cylinder head; then remove the pipes and discard the gaskets.



746-517A

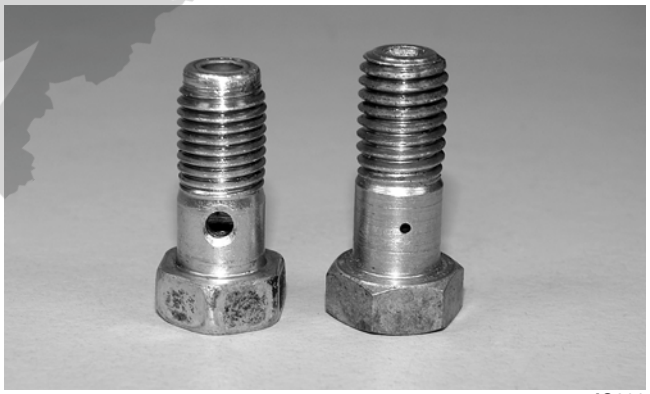
■NOTE: Steps 4-6 are for the 9000 only.

4. Remove the banjo bolts securing the oil feed pipe to the turbocharger and engine. Discard the crush washers.



744-771B

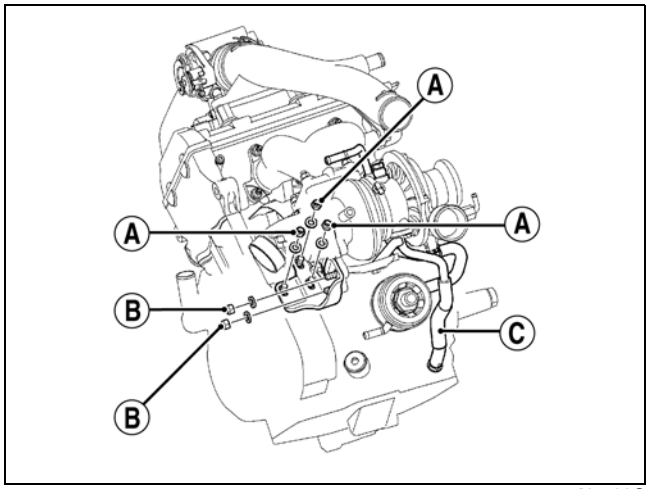
■NOTE: For assembling purposes, note the size of the oil port and thread taper of the banjo bolts.



IO028

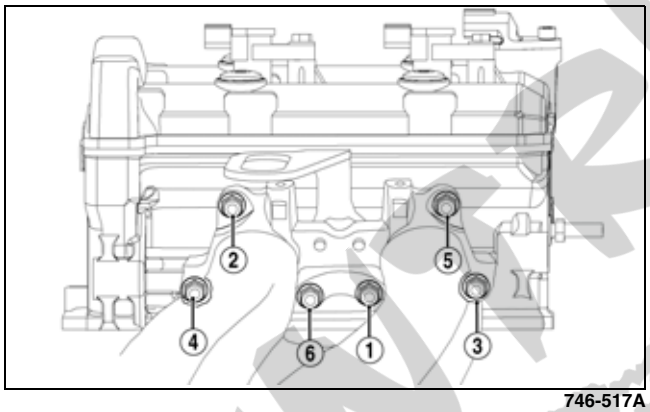
5. Remove the three lock nuts and washers (A) securing the bracket of the turbocharger to the engine; then loosen the lock nuts (B) securing the bracket to the turbocharger. Remove the oil drain hose (C).

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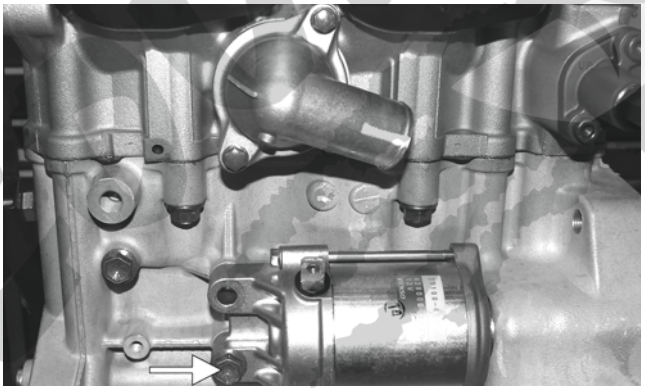
743-780C

6. Remove the lock nuts and washers securing the exhaust pipes to the cylinder head; then carefully remove the turbocharger and exhaust pipes assembly. If needed remove the cap screws securing the lower heat shield to the exhaust pipes and turbocharger.



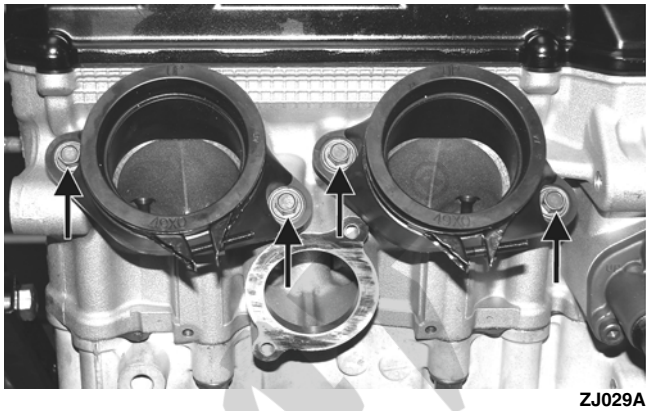
746-517A

7. Remove the cap screws securing the starter motor to the engine. Remove the starter motor.



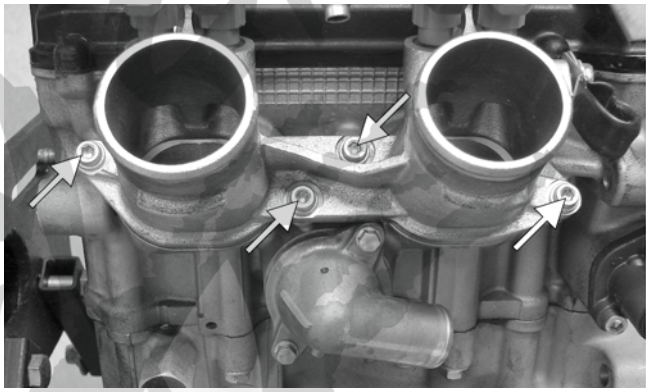
ZJ028C

8. On the 5000, remove the cap screws securing the two intake flanges to the cylinder head; then remove the flanges.



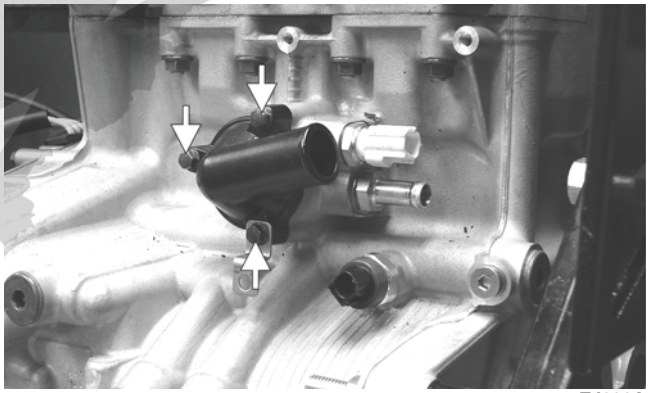
ZJ029A

9. On the 9000, remove the four cap screws securing the manifold adapter assembly; then remove the manifold.



TZ087A

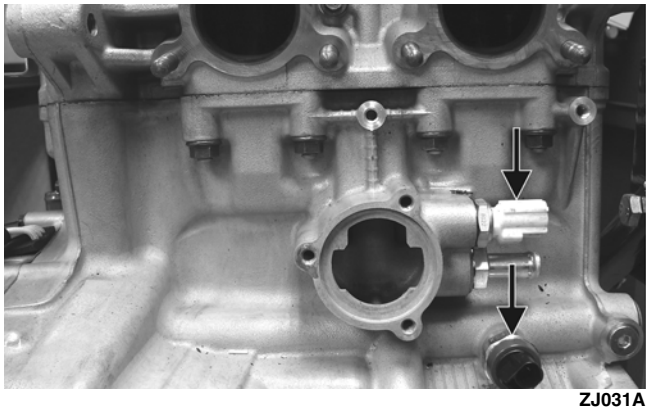
10. Remove the three cap screws securing the thermostat cap to the engine; then remove the cap and thermostat.



ZJ030A

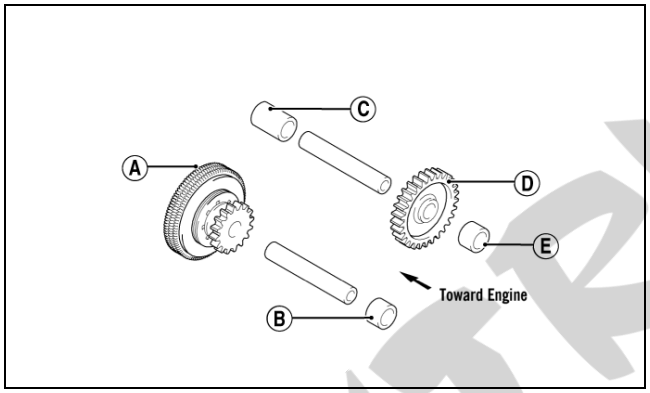
■**NOTE: If engine case cleaning or replacing is necessary, remove the coolant and oil sensors from the engine case.**

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ZJ031A

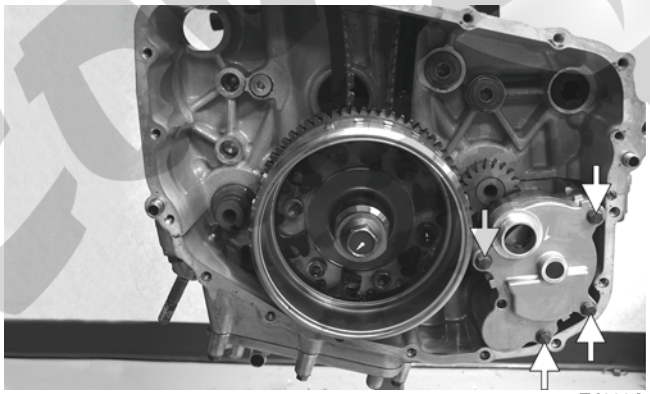
11. Remove the eighteen cap screws securing the magneto cover to the engine; then remove the cover and account for the starter torque limiter (A), spacer (B), idler gear (D), inner spacer (C), and outer spacer (E).



742-002A

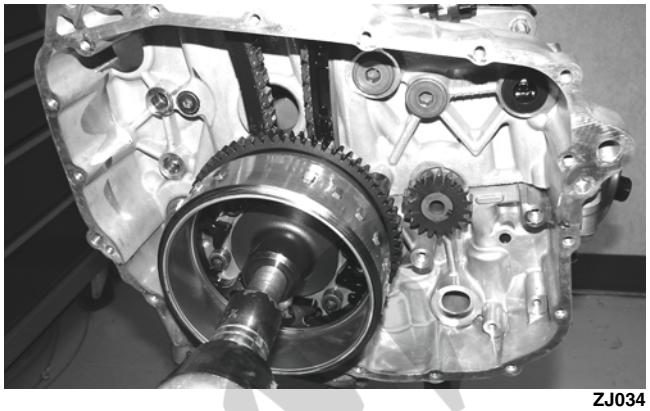
■NOTE: Care must be taken when removing the magneto cover not to tip the cover downward. Tipping the cover downward will allow the starter torque limiter/idler gear assembly to slide out of the cover.

12. Remove the four cap screws securing the oil scavenge pump to the engine; then remove the pump and account for the remaining oil seal.



ZJ033A

13. To remove the flywheel, first remove the cap screw and washer securing the flywheel to the crankshaft; then using Flywheel Puller, remove the flywheel.



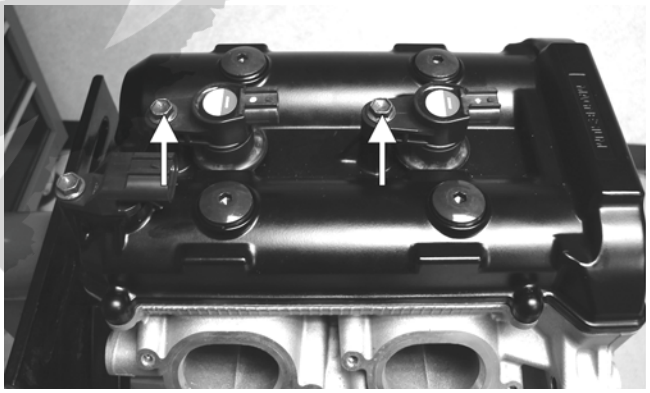
ZJ034

14. Remove the flywheel key from the crankshaft; then remove the starter gear.



ZJ036A

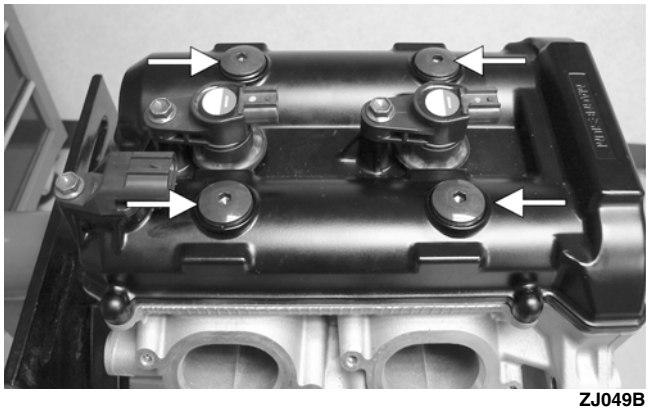
15. On the 5000, remove the cap screws securing the two cylinder ignition coils to the cylinder head cover and remove the coils.



ZJ049A

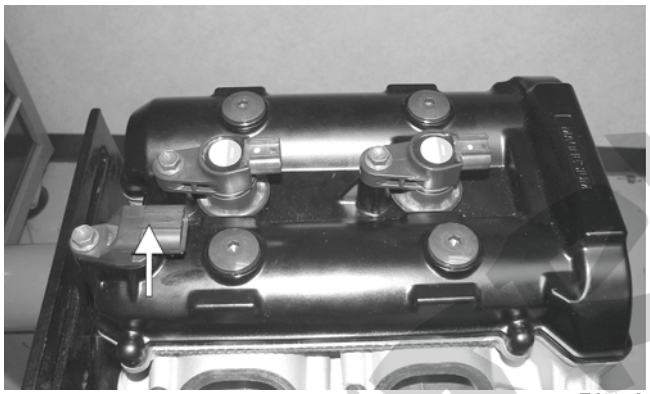
16. Remove the four cap screws securing the cylinder head cover to the cylinder head; then remove the cover.

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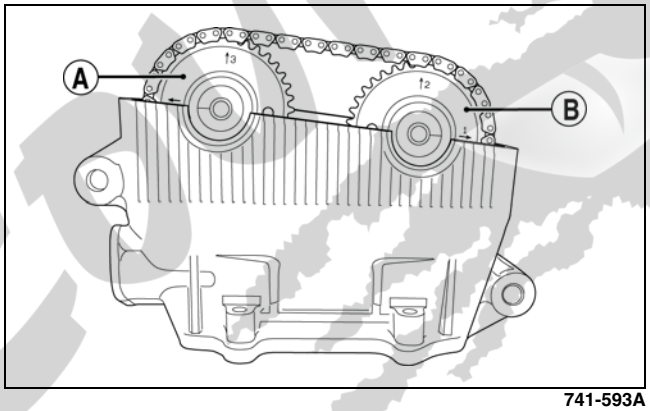
ZJ049B

■**NOTE: If cleaning or replacing the cylinder head cover is necessary, the cam position sensor must be removed.**



ZJ037A

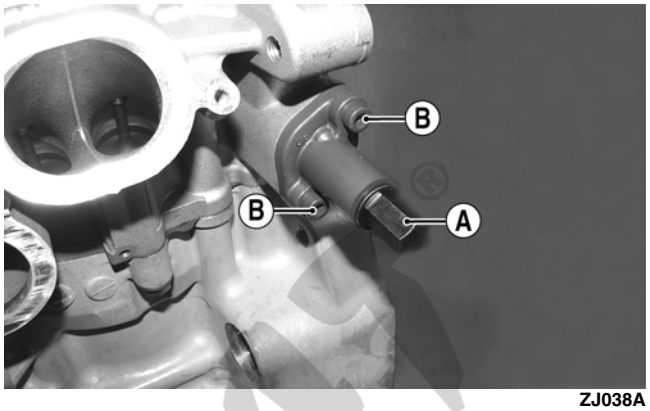
17. Obtain top-dead-center by rotating the crankshaft until the arrows on the intake camshaft face (A) are in the 12 o'clock and 9 o'clock positions and the arrows on the exhaust camshaft face (B) are in the 12 o'clock and 3 o'clock positions.



741-593A

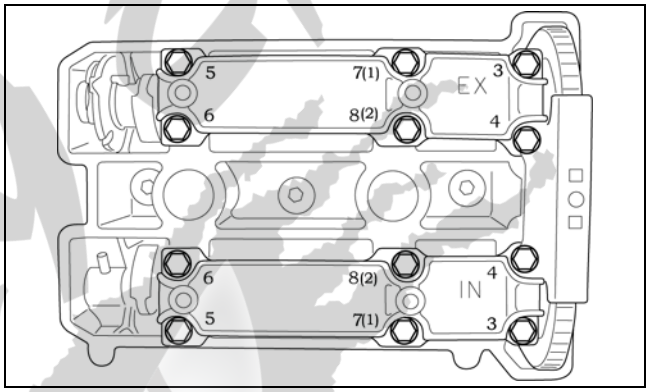
■**NOTE: At this point if the technician's objective is to service the valves, see Servicing Components - Valves in this sub-section.**

18. Loosen but do not remove the tension adjuster bolt and washer (A) from the chain tensioner assembly. Remove the two cap screws (B) securing the assembly to the engine. Remove the assembly.



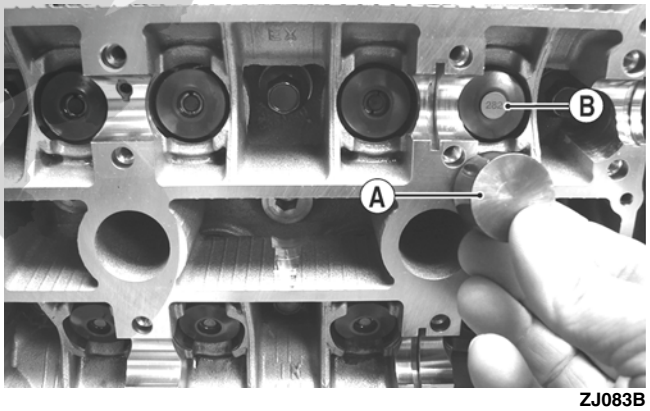
ZJ038A

19. Remove the cap screws securing the camshaft covers to the cylinder head; then remove the covers. Remove both camshafts. Account for the dowel pins.



741-624A

20. Using a magnet or needle-nose pliers, carefully remove the tappets (A) from the cylinder head and account for the shims (B).



ZJ083B

CAUTION

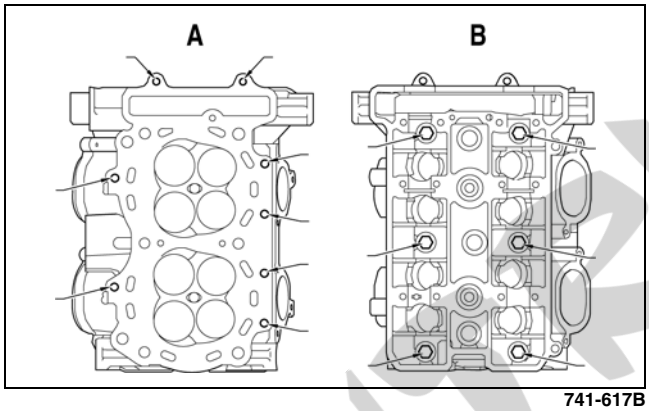
When removing the tappets, note the location of the tappet, the valve from which the tappet was removed, and the shim number of the tappet or severe engine damage may occur.

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ZJ051B

21. Remove the six nuts and two cap screws (A) from outside the cylinder head; then remove the six cap screws (B) from inside the cylinder head. Remove the head and account the gasket and two dowel pins.



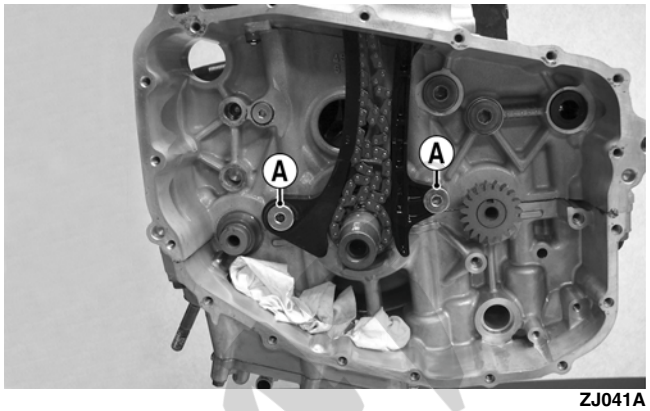
741-617B

■NOTE: If removing the oil cooler, remove the union bolt securing the cooler to the engine; then remove the oil cooler and account for a washer and an O-ring.



ZJ040

22. Remove the Allen-head cap screws (A) securing the front and back timing chain tension guides to the engine; then remove the guides and account for the timing chain and the washers located between the tension guides and engine.



ZJ041A

23. Remove the fourteen cap screws securing the oil pan to the engine; then remove the oil pan and note the location of the different-length cap screws for assembling purposes.

24. Tip the engine upside down; then remove the 28 cap screws securing the upper and lower crankcase halves. Using a soft hammer, gently tap around the bottom half until it separates.

■NOTE: Note the location of the different-length cap screws for assembling purposes.

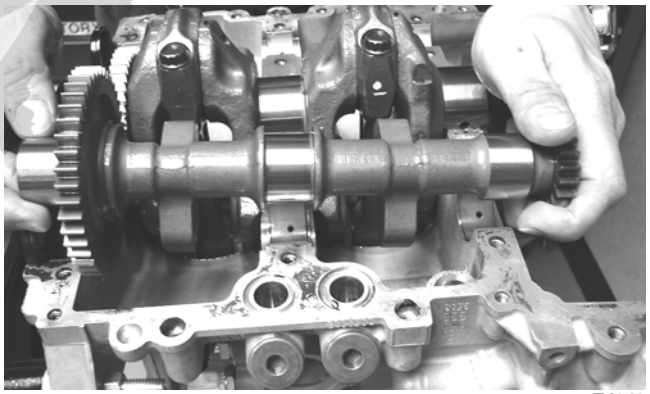
CAUTION

DO NOT drive any tool between halves to separate the crankcase. Damage to the sealing surfaces will result.

25. After separating the crankcase halves, account for two O-rings and three dowel pins.

26. For easier access to components, rotate the crankshaft to the bottom-dead-center position (connecting rod caps straight up).

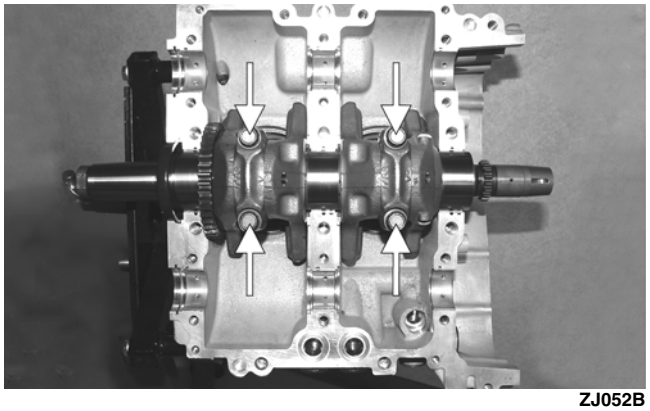
27. Remove the front and rear crank balancers from the engine and account for the two end seals.



ZJ043

28. On each connecting rod, remove the two connecting rod cap screws; then remove the connecting rod cap. Account for the two connecting rod bearings.

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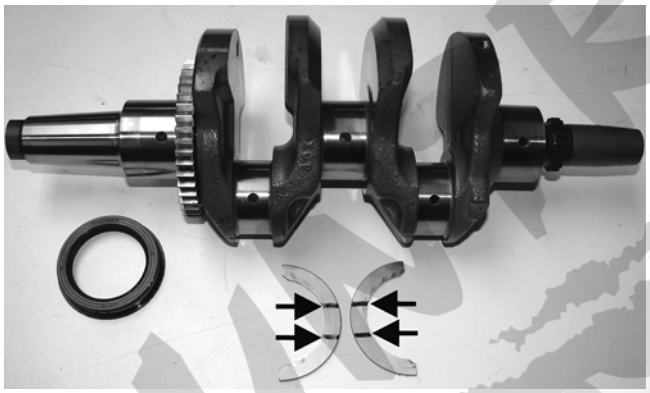


ZJ052B

■**NOTE: Because the connecting rods and connecting rod caps are unique, note the I.D. marks and keep all associated parts together for assembling purposes.**

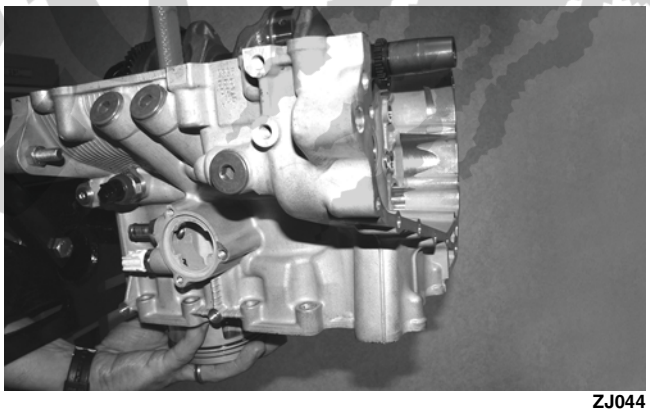
29. Carefully remove the crankshaft from the engine; then account for the PTO-side end seal, the two thrust bearings, and three bearing halves.

■**NOTE: For assembling purposes, note the oil grooves of the thrust bearings face the counterweights of the crankshaft. Mark the MAG-side bearing for assembly purposes.**



ZJ046A

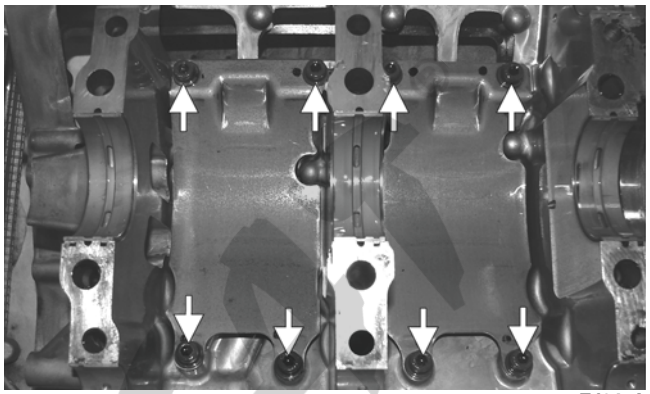
30. Reinstall the connecting rod caps with cap screws into the rods; then using a soft hammer, gently tap the piston assembly out the top side of the cylinder.



ZJ044

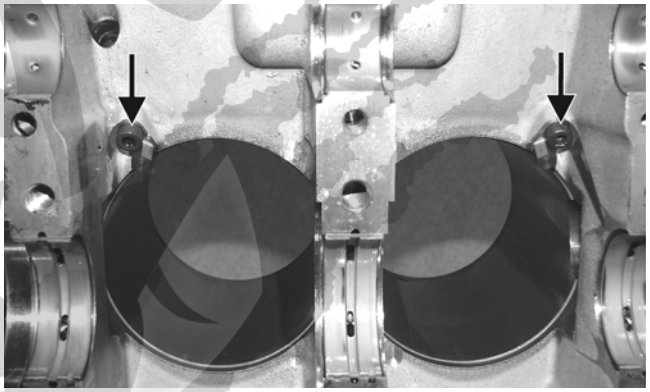
CAUTION
Pistons can be removed from the top side of the cylinder only.

31. Remove the oil separator plates for the lower crankcase half and account for the eight Allen-head cap screws.

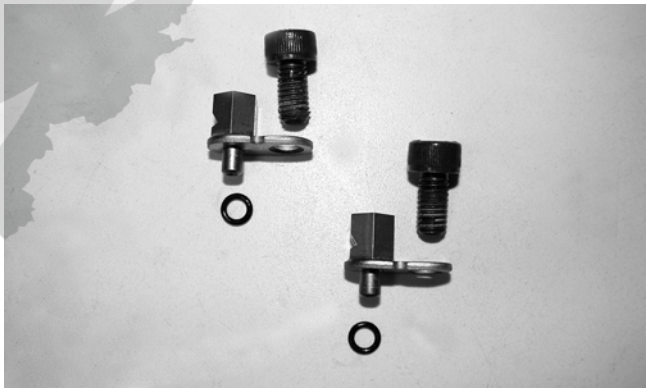


ZJ047A

32. Remove the Allen-head cap screws securing the piston cooling jets to the upper crankcase half; then remove the jets and account for the O-rings.



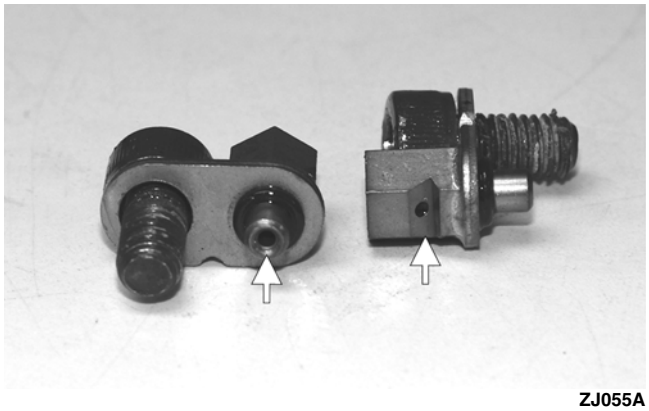
ZJ054A



ZJ035

■**NOTE: For assembling purposes, ensure the orifices in the piston cooling jets are cleared of any dirt and/or debris.**

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ZJ055A

Servicing Components

Thoroughly clean all non-electrical components in parts-cleaning solvent; then remove any carbon buildup from the cylinder head and piston dome.

Visually inspect all engine components for wear or damage.

VALVES

CAUTION

If any valve is discolored or pitted or if the seating surface is worn, the valve must be replaced. Do not attempt to grind a valve or severe engine damage may occur.

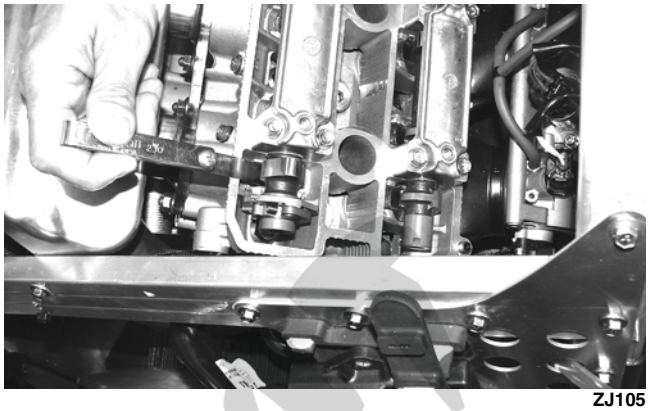
If valves, valve guides, or valve seats require servicing or replacement, Arctic Cat recommends the components be taken to a qualified machine shop for servicing.

1. Install the drive clutch; then using Drive Clutch Spanner Wrench, rotate the engine two full revolutions.

■NOTE: Rotating the engine two full revolutions will ensure that any oil trapped in the tappet/shim is purged to maintain an accurate clearance reading.

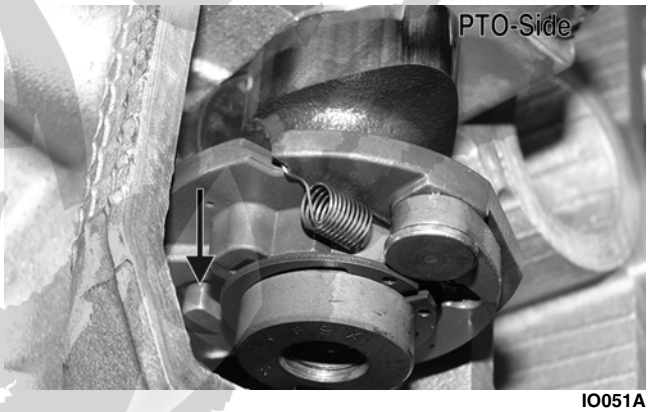
2. Rotate the engine until the camshaft lobe of the valve being measured is directly away from the tappet.
3. Using an appropriate thickness gauge, measure and record the intake and exhaust valve clearance of the cylinder that is on the compression stroke; then rotate the engine 360° and measure and record the valve clearance of the other cylinder. Valve clearance must be within specifications.

Valve Clearance (Cold)	
15°-25° C (59°-77° F)	Intake: 0.0039-0.0078 in.
	Exhaust: 0.0078-0.0118 in. (5000)
	Exhaust: 0.0118-0.0157 in. (9000)

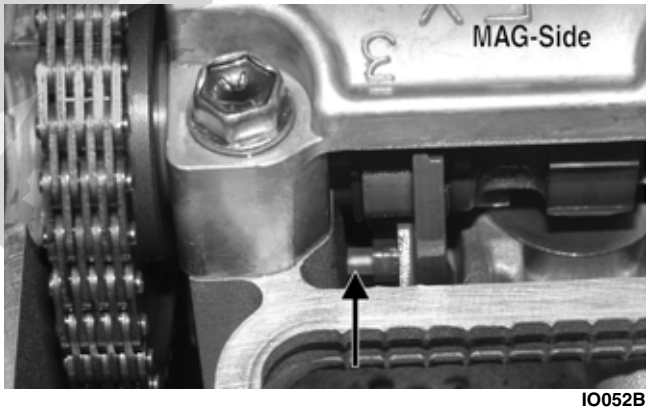


ZJ105

■NOTE: When measuring valve/tappet clearance on the exhaust valves, rotate the engine until the decompression pin of the valve/tappet is activated; then using a flat-nosed punch, carefully tap the decompression arm until the decompression pin releases the tappet.



IO051A



IO052B

■NOTE: At this point if valve/tappet clearances are within specifications, servicing is complete. If any valve/tappet clearance is not within specifications, complete steps 18-20 of Disassembling before proceeding to step 4.

4. To select the correct replacement shim for an out-of-specification clearance, note the three-digit number on the surface of the existing shim; then refer to the appropriate Tappet Shim Selection Table (Exhaust or Intake) in this sub-section and use this procedure:

   A. Find the Measured Tappet Clearance (from step 3) in the left-side vertical column of the table.

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TAPPET SHIM SELECTION TABLE (EXHAUST)

MEASURED TAPPET CLEARANCE (mm) \ SUFFIX NO. / PRESENT SHIM SIZE (mm)	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
0.00–0.04					2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30
0.05–0.09				2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35
0.10–0.14			2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
0.15–0.19		2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
0.20–0.30	SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED																								
0.31–0.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	
0.36–0.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50		
0.41–0.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50			
0.46–0.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50				
0.51–0.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50					
0.56–0.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50						
0.61–0.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50							
0.66–0.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50								
0.71–0.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50									
0.76–0.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50										
0.81–0.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50											
0.86–0.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50												
0.91–0.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50													
0.96–1.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50														
1.01–1.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50															
1.06–1.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																
1.11–1.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																	
1.16–1.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																		
1.21–1.25	3.30	3.35	3.40	3.45	3.50	3.50																			
1.26–1.30	3.35	3.40	3.45	3.50	3.50																				
1.31–1.35	3.40	3.45	3.50	3.50																					
1.36–1.40	3.45	3.50	3.50																						
1.41–1.45	3.50	3.50																							
1.46–1.50	3.50																								

How to use this chart:

I. Measure tappet clearance when the engine is cold.
II. Measure present shim size.
III. Match clearance in vertical column with present shim size in horizontal column.

Example:

Tappet clearance is	0.38 mm
Present shim size	2.90 mm
Shim size to be used	3.05 mm

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TAPPET SHIM SELECTION TABLE (INTAKE)

MEASURED TAPPET CLEARANCE (mm) \ SUFFIX NO.	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
PRESENT SHIM SIZE (mm)	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
0.00–0.04			2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
0.05–0.09		2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
0.10–0.20	SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED																								
0.21–0.25	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	
0.26–0.30	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50		
0.31–0.35	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50			
0.36–0.40	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50				
0.41–0.45	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50					
0.46–0.50	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50						
0.51–0.55	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50							
0.56–0.60	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50								
0.61–0.65	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50									
0.66–0.70	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50										
0.71–0.75	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50											
0.76–0.80	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50												
0.81–0.85	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50													
0.86–0.90	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50														
0.91–0.95	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50															
0.96–1.00	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																
1.01–1.05	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																	
1.06–1.10	3.25	3.30	3.35	3.40	3.45	3.50	3.50																		
1.11–1.15	3.30	3.35	3.40	3.45	3.50	3.50																			
1.16–1.20	3.35	3.40	3.45	3.50	3.50																				
1.21–1.25	3.40	3.45	3.50	3.50																					
1.26–1.30	3.45	3.50	3.50																						
1.31–1.35	3.50	3.50																							
1.36–1.40	3.50																								

How to use this chart:

I. Measure tappet clearance when the engine is cold.
II. Measure present shim size.
III. Match clearance in vertical column with present shim size in horizontal column.

Example:

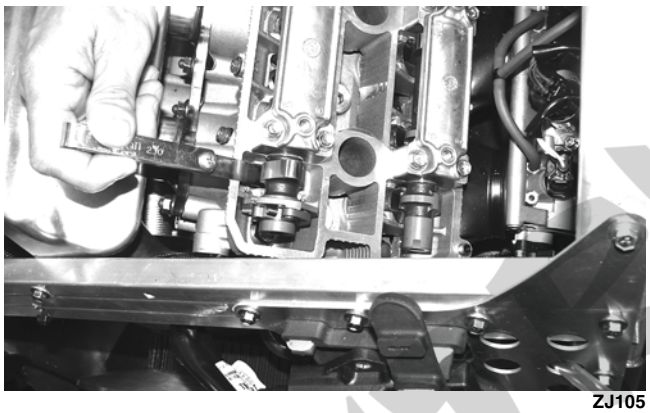
Tappet clearance is	0.23 mm
Present shim size	2.70 mm
Shim size to be used	2.80 mm

B. Find the Present Shim Size (three-digit-number) at the top-side horizontal column of the table.

C. Match the clearance in the vertical column with the present shim size to obtain the recommended replacement shim.

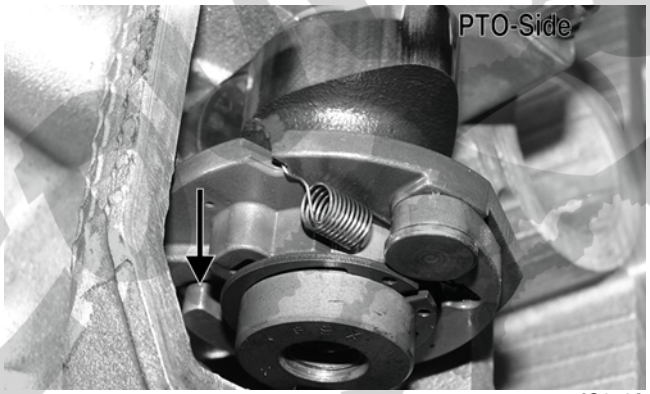
■NOTE: At this point, complete steps 33-40 of Assembling in this sub-section before proceeding to step 5.

5. Rotate the engine until the camshaft lobe of the valve being measured is directly away from the tappet.
6. With the engine at top-dead-center, measure the valve/tappet clearance of the cylinder that is on the compression stroke; then rotate the engine another 360° and measure the clearances of the other cylinder.

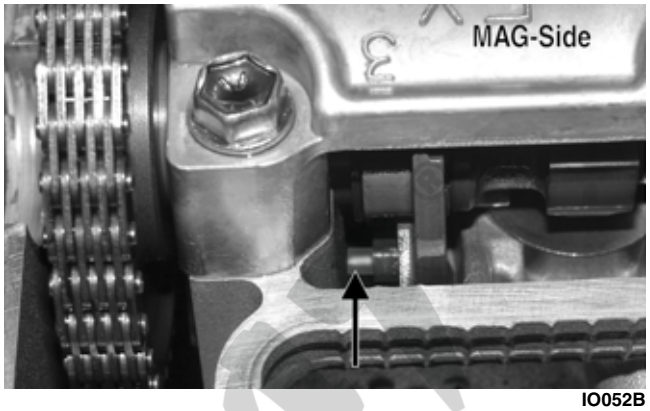


ZJ105

■NOTE: When measuring valve/tappet clearance on the exhaust valves, rotate the engine until the decompression pin of the valve/tappet is activated; then using a screwdriver, carefully tap the decompression arm until the decompression pin releases the tappet.



IO051A



IO052B

7. After verifying proper valve/tappet clearance, install the timing inspection plug to the magneto case and tighten to 22 ft-lb.

■NOTE: At this time, remove the items used to close off the intake ports of the cylinder head.

PISTON ASSEMBLY

■NOTE: Whenever a piston, rings, or pins are out of tolerance, they must be replaced.

Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. Inspect the piston for seizure marks or scuffing.

■NOTE: If seizure marks or scuffing is detected, the piston must be replaced.

4. Inspect the perimeter of each piston for signs of excessive "blowby." Excessive "blowby" indicates worn piston rings or an out-of-round cylinder.

Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring-groove.
2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

■NOTE: If the existing rings will not be replaced with new ones, note the location of each ring for proper installation. When installing new rings, install as a complete set only.

Cleaning/Inspecting Piston Ring Grooves

Using a ring groove cleaning tool, clean carbon from the ring grooves. Be sure to position the ring with the letter side up.

CAUTION
Improper cleaning of the ring grooves by the use of the wrong type of ring groove cleaner will result in severe damage to the piston.

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Measuring Piston-Ring End Gap (Installed)

1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.

■NOTE: Remove any carbon; then clean the top of the cylinder bore before inserting the piston rings.

2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within the following specifications.

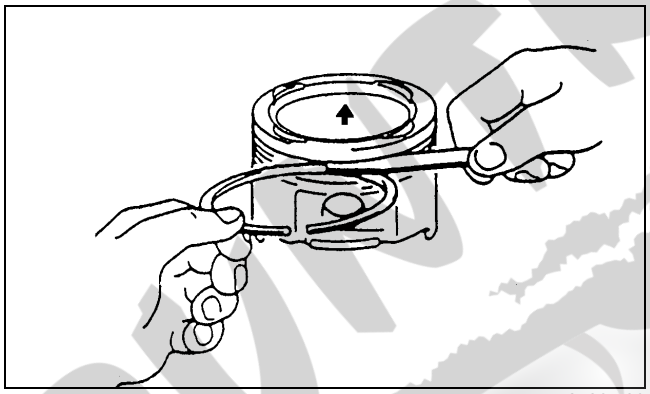
1st Ring	0.0059-0.0138 in.
2nd Ring	0.0118-0.0177 in.
Oil Rings	0.0078-0.0275 in.

Piston Ring/Groove Clearance

■NOTE: Before checking, piston grooves must be clean, dry, and free of carbon.

Fit new piston ring into piston groove and measure clearance between ring and ringland by using feeler gauge. Measurement must be within the following specifications. If clearance is out of specification, replace piston.

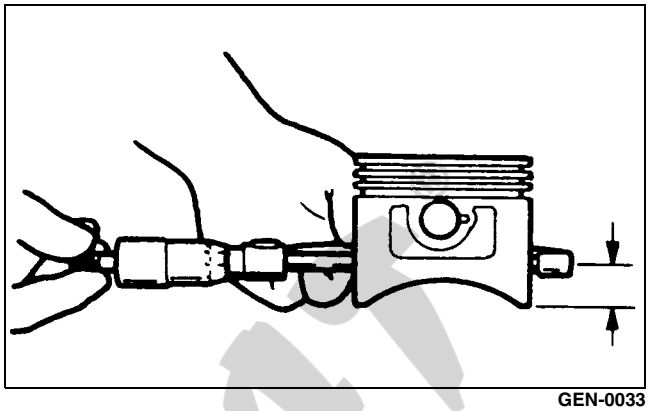
1st Ring	0.0008-0.0035 in.
2nd Ring	0.0008-0.0024 in.
Oil Rings	0.0024-0.0059 in.



0738-532

Measuring Piston Skirt/Cylinder Clearance

1. Measure the cylinder front to back in six places using a cylinder bore gauge. Record the largest number.
2. Measure the diameter of the corresponding piston at a point 10 mm from the piston skirt edge at a right angle to the piston-pin bore. Piston diameter must be within 3.8568-3.8574 in. for the 5000 and 3.8574-3.8580 in. for the 9000. If not, the piston must be replaced. Subtract this measurement from the measurement in step 1. Measurement must be within 0.0011-0.0016 in. for the 5000 and 0.0006-0.0010 in. for the 9000. If the determined wear exceeds the limit indicated and the piston is within tolerance, the cylinder block must be replaced.

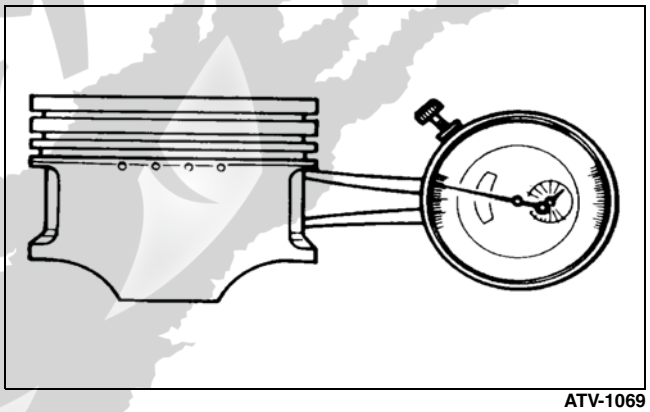


GEN-0033

Measuring Piston Pin Bore Diameter

■NOTE: It may be necessary to use Piston Pin Puller to remove the piston pins.

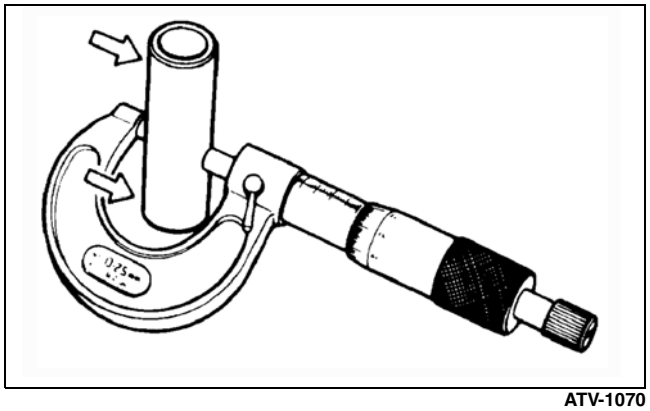
1. Insert an inside dial indicator into the piston-pin bore. Take two measurements to ensure accuracy.
2. Piston pin bore must be within 0.8662-0.8664 in. for the 5000 and 0.9449-0.9451 in. for the 9000.



ATV-1069

Measuring Piston Pin Diameter

Measure the piston pin diameter at each end and in the center. Measurement must be within 0.8658-0.8661 in. for the 5000 and 0.9447-0.9449 in. for the 9000. If measurement is not within specifications, the piston pin must be replaced.

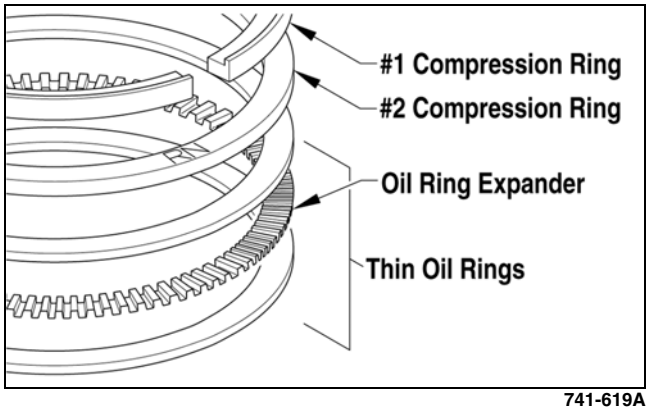


ATV-1070

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Installing Piston Rings

1. Install a thin oil ring, oil ring expander, and thin oil ring in the bottom groove of the piston. Stagger the end gaps of the upper and lower thin oil rings until they are on directly opposite sides of the piston.



741-619A

2. Install the #2 compression ring so the letters on the top surface of the ring face the dome of the piston.
3. Install the #1 compression L-ring into the top groove with the face of the ring directed upward.
4. Rotate the rings until the ring end gaps are 120° from one another.

CAUTION

Incorrect installation of the piston rings will result in engine damage.

MEASURING CONNECTING ROD SMALL END BORE INSIDE DIAMETER

1. Using a small bore gauge, measure the connecting rod small end bore inside diameter.
2. Measurement must be within 0.866-0.867 in. for the 5000 and 0.945-0.946 in. for the 9000.

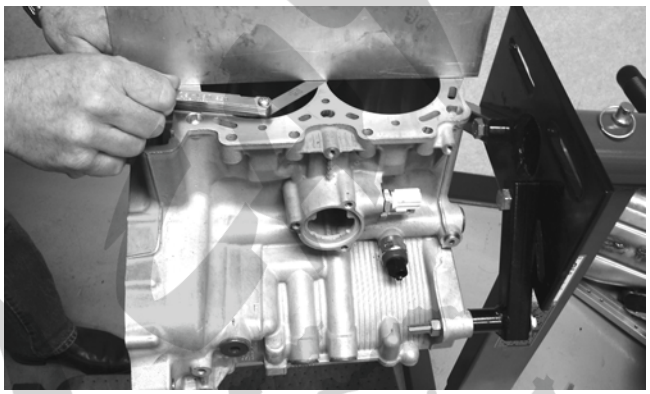


ZJ057

■NOTE: Check piston pin, connecting rod small end bore, and piston bore for wear or damage paying particular attention to condition of small end bore bushing. If pin, connecting rod small end bore, or piston bore is badly worn or damaged, replace pin, connecting rod, or piston.

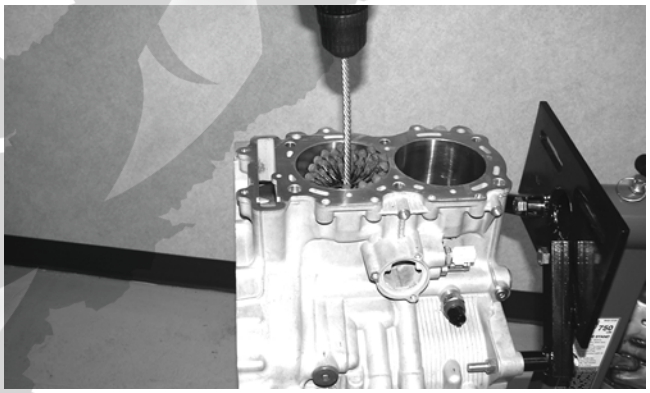
Cleaning/Inspecting/Measuring Cylinder Block

1. Wash the cylinder block in parts-cleaning solvent.
2. Check the head gasket surface of the cylinder for distortion.
3. Using a straightedge and feeler gauge, check surface at a total of 6 locations. If distortion limit exceeds 0.002 in., replacement of the block will be necessary.



ZJ056

4. Inspect the cylinder bore for minor scoring or scuffing.
5. Hone the cylinder to produce a 45° crosshatch using the appropriate Ball Hone and honing oil.



ZJ059

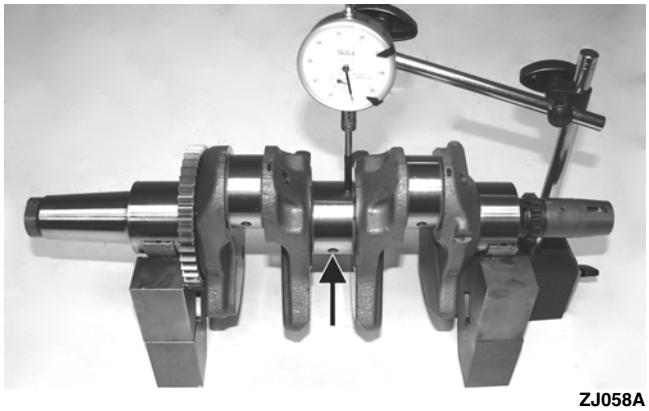
6. Wash the cylinder block thoroughly with hot soapy water; then rinse with hot water.
7. Blow dry the cylinder block with compressed air and immediately apply oil to all of the cylinder surfaces.

CRANKSHAFT RUNOUT

1. Support the crankshaft using a set of V Blocks; use a dial indicator to read crankshaft runout.

■NOTE: The contact point of the dial indicator should be on either side of the oil port hole of the center crankshaft journal and to the outside of the oil port hole on the MAG and PTO end of the crankshaft.

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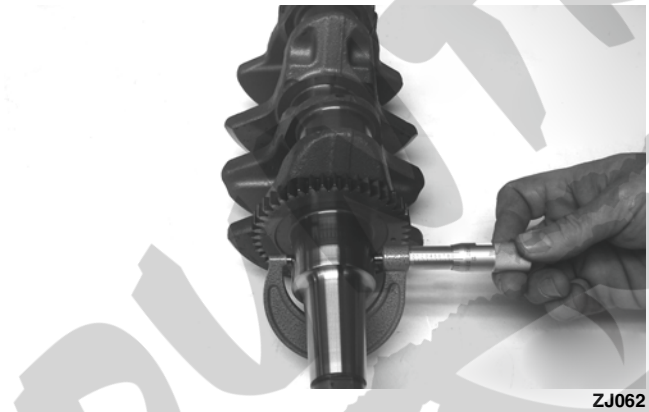


ZJ058A

2. Rotate the crankshaft slowly.
3. The reading must be 0.002 in. or crankshaft repairing/replacing will be necessary.

MEASURING CRANKSHAFT MAIN/ ROD JOURNALS (Bearing Surfaces)

1. Using a micrometer, measure each main and connecting rod bearing journal from along its length and 90° from the first measurement. Measurement must be within 0.0012 in.
2. If any journal is badly damaged or has wear that is not within specifications, the crankshaft must be replaced.



ZJ062

MAIN BEARINGS

Check the main bearings for signs of pitting, scratches, wear, or damage. If any of these conditions are found, the bearings must be replaced.

CAUTION

Always replace the bearings as a set; never replace one side only or severe engine damage will occur

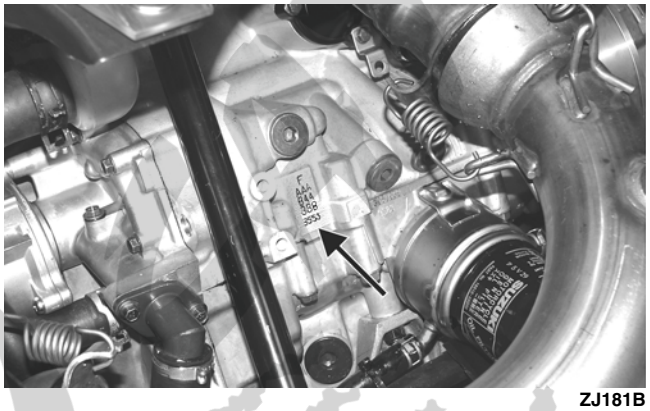
CONNECTING ROD/MAIN BEARING SELECTION

■NOTE: This information is needed only if the crankshaft or the engine cases have been replaced or if the connecting rod and main bearings are out of specifications.

Bearing Selection Charts

To select the correct main or balancer shaft bearing insert, read the letter stamped for the bearing location on the crankcase; then read the letter stamped on the crankshaft or balancer shaft corresponding to the same bearing location.

■NOTE: The corresponding letters on the upper engine case are located to the upper-left of the oil filter.



ZJ181B

■NOTE: Always correspond the letters of the engine case with the case right-side-up and from left to right (MAG to PTO). Each row of letters is to be referred to the following:

Top Row	Front Balancer Shaft
Center Row	Crankshaft
Bottom Row	Rear Balancer Shaft

Crankcase Stamping

Right Front Balancer (A or B)	Center Front Balancer (A or B)	Left Front Balancer (A or B)
Right Main (A or B)	Center Main (A or B)	Left Main (A or B)
Right Rear Balancer (A or B)	Center Rear Balancer (A or B)	Left Rear Balancer (A or B)

Crankshaft Stamping

Left Rod Journal (1, 2, or 3)		Right Rod Journal (1, 2, or 3)
Left Main Journal (A or B)	Center Main Journal (A or B)	Right Main Journal (A or B)

Balancer Shaft Journal Stamping

L	Left Journal (A or B)	Center Journal (A or B)	Right Journal (A or B)	R

Refer to the proper chart and select the correct bearing.

Main Bearing Selection

Crankcase Mark	Crankshaft Mark	
	A	B
A	Green p/n 3007-121	Black p/n 3007-122
B	Black p/n 3007-122	Brown p/n 3007-123

Balancer Shaft Bearing Selection

Crankcase Mark	Balancer Mark	
	A	B
A	Green p/n 3007-135	Black p/n 3007-136
B	Black p/n 3007-136	Brown p/n 3007-137

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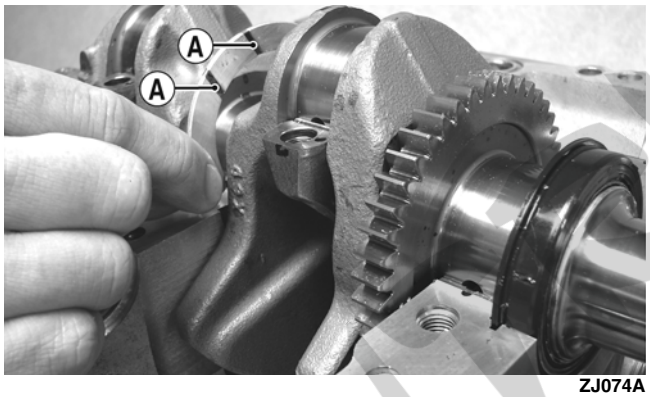
To select the correct rod bearing insert, read the number stamped on the crankshaft counterweight; then read the number stamped on the connecting rod cap. Refer to the following chart to select the correct bearing.

Connecting Rod Bearing Selection

Rod	Crankshaft		
	1	2	3
1	Green p/n 3007-109	Black p/n 3007-110	Brown p/n 3007-111
2	Black p/n 3007-110	Brown p/n 3007-111	Yellow p/n 3007-112

To select the correct thrust bearing for proper crankshaft end clearance, use the following procedure.

1. Install the main bearing upper half inserts in the crankcase; then place the crankshaft into position.
2. Select a thrust bearing (blue or green) and install making sure the oil relief (A) is directed toward the crankshaft.



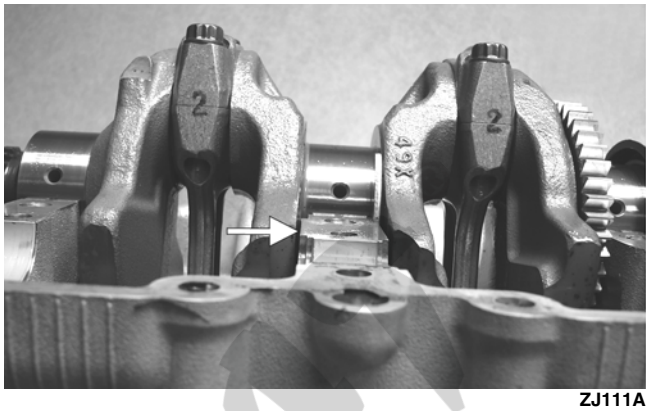
ZJ074A

■NOTE: Always install the correct thrust bearing (from above) on MAG-side; then use proper bearing from the following chart on the PTO-side of the main bearing journal to obtain clearance.

Thrust Bearing Selection

Feeler Gauge Reading	Color
0.100-0.102 in.	White
0.099-0.100 in.	Yellow
0.098-0.099 in.	Green
0.097-0.098 in.	Blue
0.096-0.097 in.	Black
0.095-0.096 in.	Red

3. Using a feeler gauge, measure between the crankcase and crankshaft on the side opposite the thrust bearing.


ZJ111A

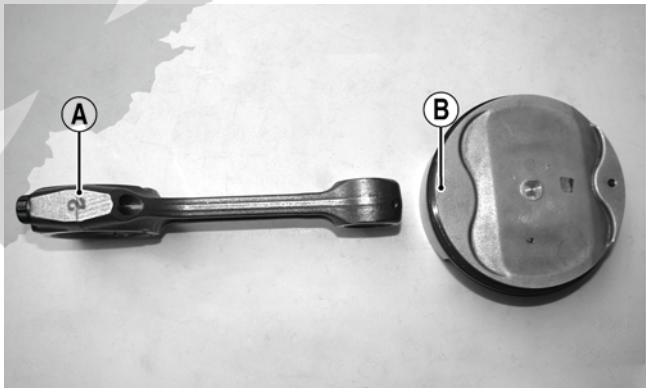
4. Use the reading obtained to select the correct thrust bearing from the chart.
5. Install the selected thrust bearing; then using a feeler gauge, check that the clearance is as specified.

Assembling

■NOTE: Arctic Cat recommends that new gaskets, seals, and O-rings be installed whenever assembling the engine.

■NOTE: For assembling purposes, use oil-dissolvable molybdenum disulfide grease as engine-assembly grease.

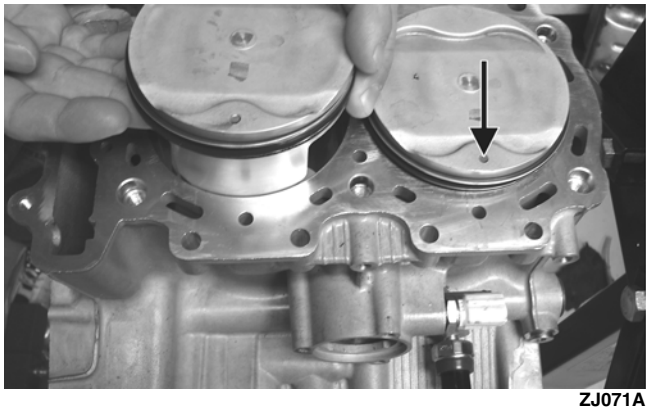
1. Install one piston pin circlip into one of the pistons making sure the open end is directed either up or down. Place the connecting rod in position making sure the identification number on the rod cap (A) is aligned with the intake side of the piston (B).



ZJ070A

2. Install the piston pin and piston pin circlip making sure the open end is directed either up or down. Repeat for the other piston/connecting rod assembly.
3. With the piston rings installed, lubricate each piston and cylinder with engine oil; then with the dots on the top of the pistons directed towards the exhaust side of the engine, install the piston assemblies into the cylinder.

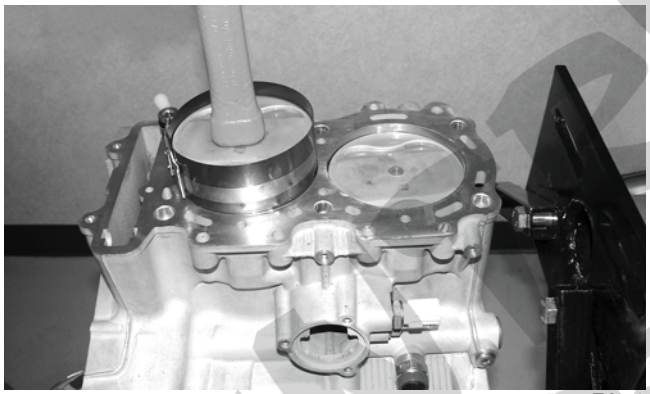
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ZJ071A

■NOTE: Prior to installing the pistons, make sure the oil ring end gaps are on directly opposite sides of the piston, and the compression ring end gaps are 90° from one another.

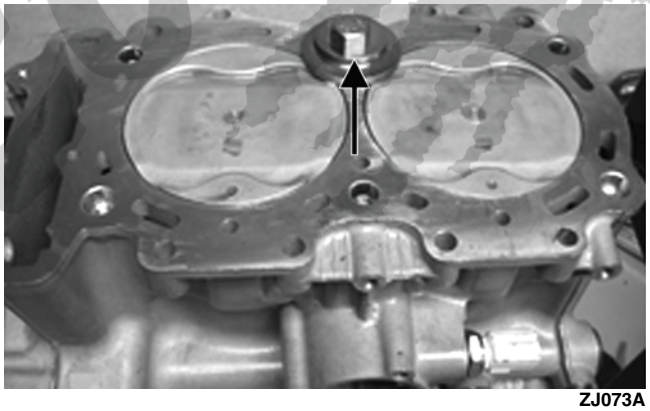
4. Using Ring Compressor and a soft hammer/hammer handle, carefully drive each piston into the cylinder until the top of the piston is flush with the engine case.



ZJ072

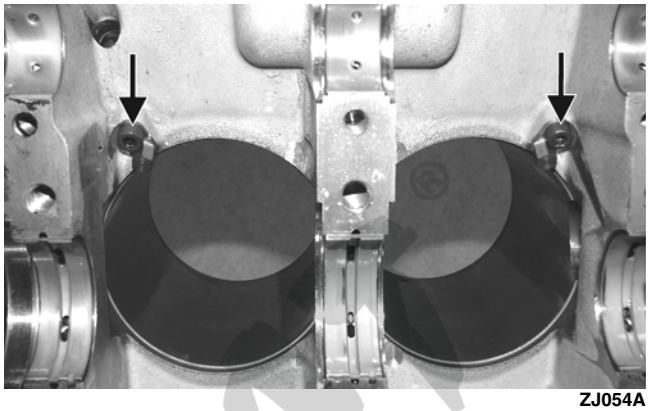
5. Rotate the engine to the upside down position for installing the crankshaft and counterbalancers.

■NOTE: Install a cap screw and large washer to the cylinder head cap screw hole between pistons to avoid any chance of the pistons sliding out of the cylinder.



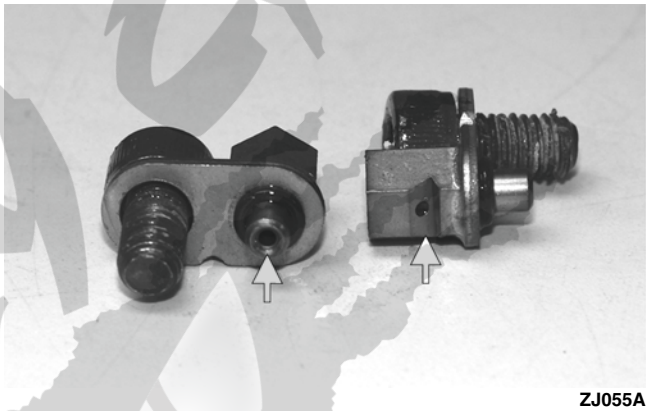
ZJ073A

6. With new O-ring, install the piston cooling jets with Allen-head cap screws; then tighten to 84 in.-lb.



ZJ054A

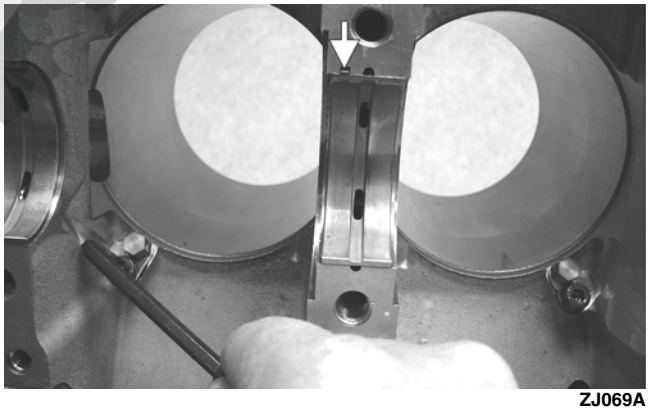
■NOTE: Prior to installing the jets, make sure the orifices are clear of any debris or contaminants.



ZJ055A

7. With the proper bearings selected, install the half-bearings into the upper engine case; then lubricate the bearing faces liberally with engine-assembling grease taking care not to get any grease between the engine case and bearing.

■NOTE: Make sure the tabs of the bearings are properly seated to the notches in the upper engine case.



ZJ069A

CAUTION

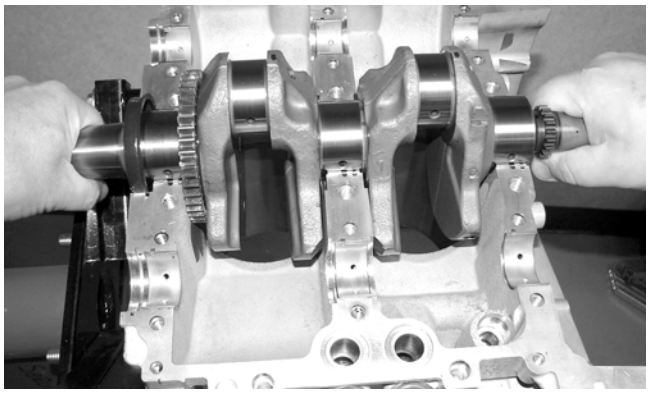
Prior to lubricating the bearings and journals, make sure all surfaces are cleaned thoroughly and dried with compressed air to avoid contaminants between the bearings and shaft surface.

■NOTE: At this point, remove the connecting rod caps.

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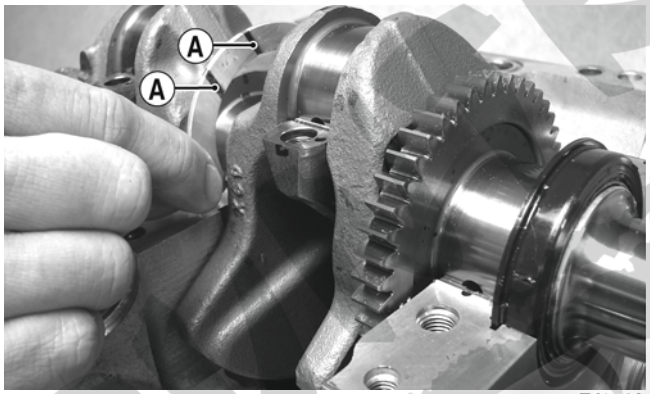
8. Lubricate the lips of the crankshaft seal with grease and install the crankshaft seal over the PTO end of the crankshaft with the spring side of the seal directed toward the crankshaft; then install the crankshaft.

■NOTE: Position the crankshaft at bottom-dead-center for assembling purposes.



ZJ053

9. Lubricate the thrust bearings with engine oil; then with the grooved side of the bearings (A) facing outward towards the crankshaft counterweights, install the first bearing and roll it into place. Push the crankshaft towards the installed bearing and install the remaining bearing.



ZJ074A

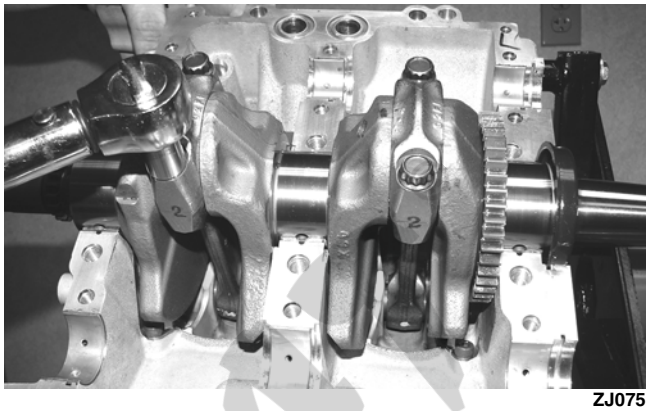
CAUTION

Failure to install the crankshaft thrust bearings properly could result in severe engine damage.

10. Install the bearing halves to the connecting rods and caps; then lubricate the bearing surfaces and connecting rod journals of the crankshaft.

11. Seat the connecting rods to the crankshaft; then install the rod caps and cap screws and tighten only until snug.

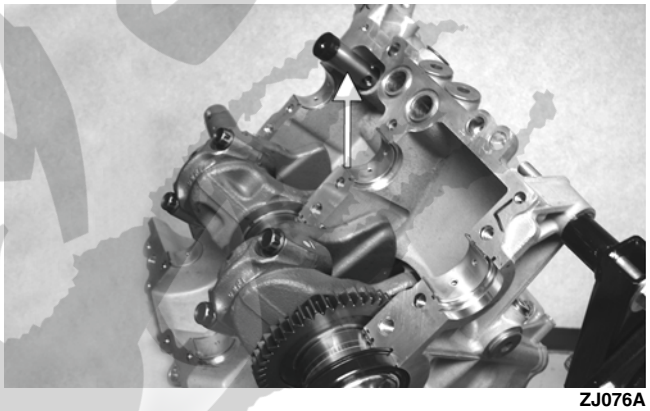
12. Alternately, tighten each of the connecting rod cap screws evenly to 25 ft-lb; then in turn tighten each cap screw an additional 90° turn to obtain the final recommended torque value.



ZJ075

■NOTE: Rotate the crankshaft one revolution to verify free movement.

13. With the O-ring lubricated with engine oil, install the oil-relief valve.



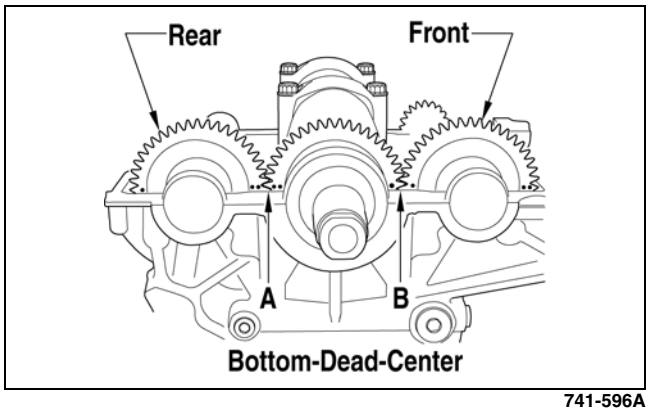
ZJ076A

■NOTE: Prior to installing the oil-relief valve, make sure the valve is free and clear of any contaminants.

14. With proper bearings selected, install the counterbalancer bearing halves into the upper engine case; then apply a light film of engine-assembly grease to the bearing surfaces.

15. Rotate the crankshaft to the bottom-dead-center position; then install the rear counterbalancer with the two dots (A) on the face of the crankshaft and balancer gears directly in line with each other at the sealing surface of the engine case.

■NOTE: The front counterbalancer has the oil pump drive gear.

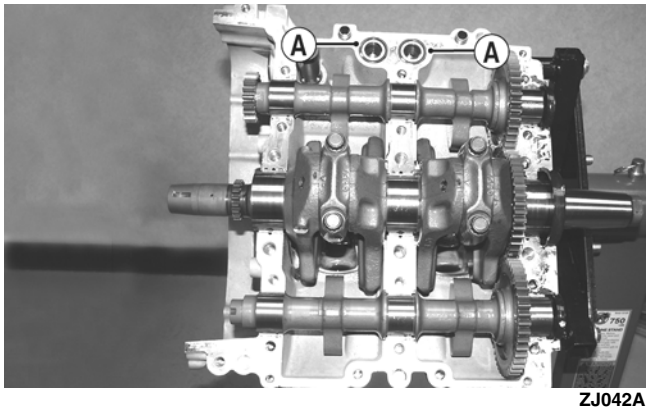


741-596A

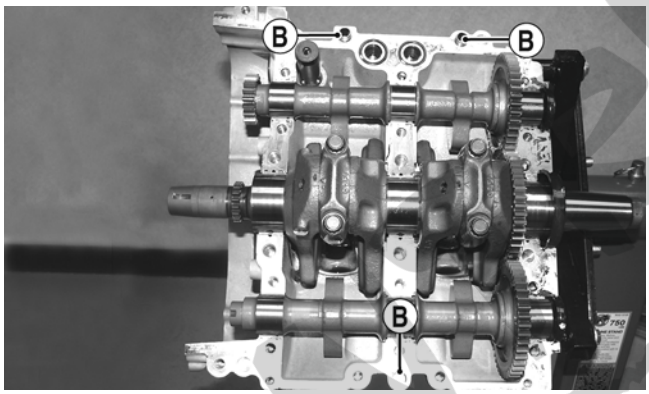
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16. With the crankshaft at bottom-dead-center, install the front counterbalancer with the single dot (B) on the face of the crankshaft and balancer gears directly in line with each other at the sealing surface of the engine case.

17. Place the oil-passage O-rings (A) into place in the upper engine case; then install the three alignment pins (B) into the case.

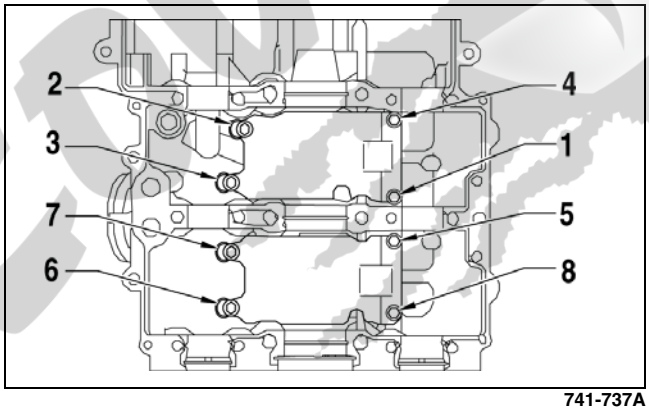


ZJ042A



ZJ042B

18. Secure the separator plates to the lower crankcase using the cap screws (coated with blue loctite #243); then using the pattern shown, tighten to 84 in.-lb.



741-737A

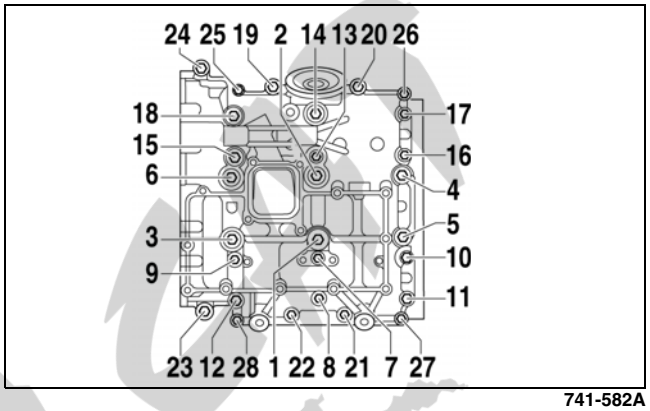
19. Install the crankshaft and counterbalancer bearing halves to the lower crankcase; then apply a light film of engine-assembly grease to the bearing surfaces.

■NOTE: Make sure the bearings are properly seated to the grooves of the crankcase.

20. Using Three Bond Sealant, apply a light film of sealant onto the sealing surfaces of the upper and lower engine cases.

21. Install the lower crankcase half to the upper engine case; then verify the cases are properly seated together.

22. Install the 10 mm, 8 mm, and 6 mm cap screws into the proper locations in the crankcase; then with the torque pattern shown as numbered on the case, tighten the cap screws only until snug.



741-582A

23. For initial tightening of the engine case cap screws, use this sequence:

    A. Cap screws 1-6 (10 mm) to 13 ft-lb.

    B. Cap screws 7-24 (8 mm) to 120 in.-lb.

    C. Cap screws 25-28 (6 mm) to 96 in.-lb.

24. For final tightening of the engine case cap screws, use this sequence:

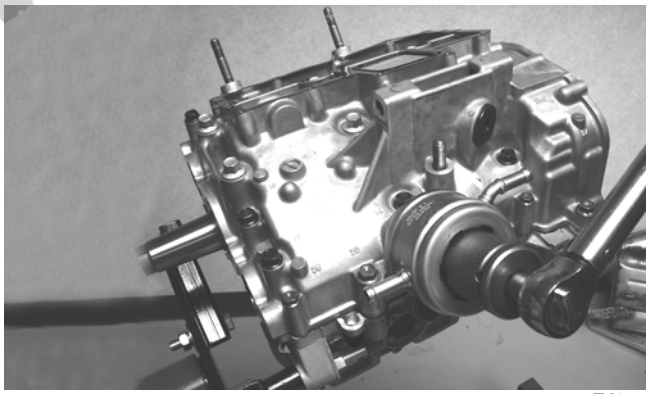
    A. Cap screws 1-6 to 33 ft-lb.

    B. Cap screws 7-24 to 19 ft-lb.

■NOTE: Cap screws 25-28 have only the one torque value.

■NOTE: After the tightening sequence, rotate the crankshaft one revolution to verify free movement.

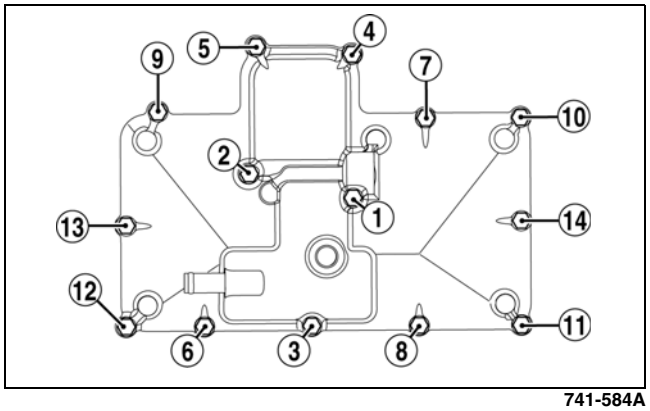
25. With a new O-ring, install the oil cooler, washer, and the union bolt; then tighten to 52 ft-lb.



ZJ077

26. With a new gasket, install the oil pan and install the different-length cap screws (as noted in disassembling). Using the pattern shown, tighten the cap screws to 84 in.-lb.

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741-584A

■NOTE: Prior to installing the oil pan, ensure the oil strainer is cleaned thoroughly.

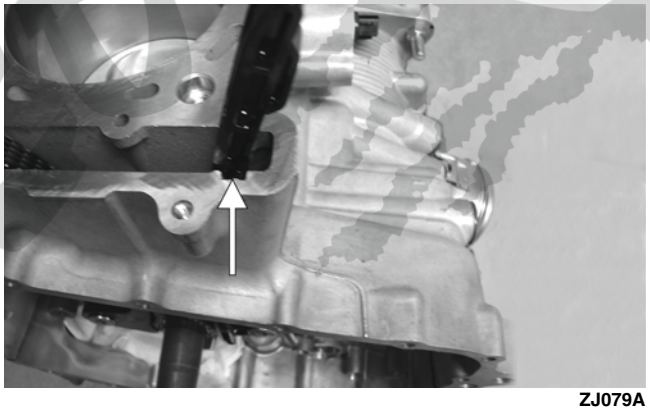


ZJ078A

■NOTE: If the oil pan drain plug was removed, always install new drain plug and reservoir washers.

■NOTE: Rotate the engine to the upright position; then, if applicable, remove the cap screw and washer securing the pistons in the cylinder.

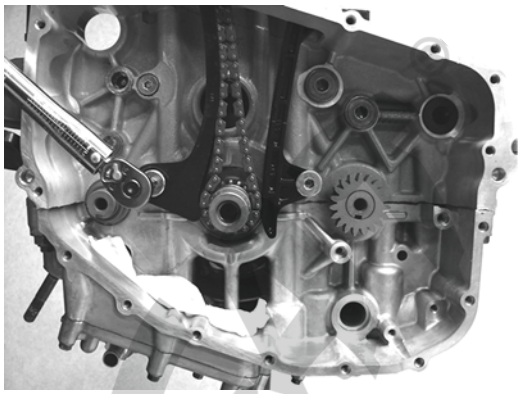
27. Install the cam chain onto the sprocket on the crankshaft and route the chain up through the engine case; then install the front-side cam chain guide number one properly seating it into the groove in the engine case.



ZJ079A

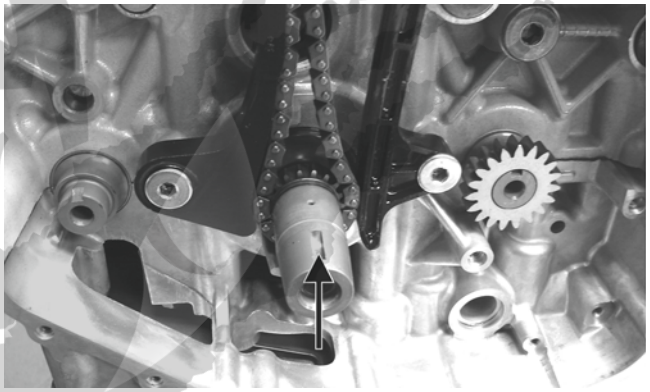
■NOTE: Prior to installing the cam chain tensioner, assure the chain is properly seated to the gear on the crankshaft.

28. Install the cam chain tensioner; then install the washers between the engine case and guide/tensioner and secure with two Allen-head cap screws (coated with blue Loctite #243). Tighten to 84 in.-lb.



ZJ080

29. Position the pistons at the top-dead-center position by rotating the crankshaft until the keyway on the crankshaft is directed upward and aligned with the cylinder.

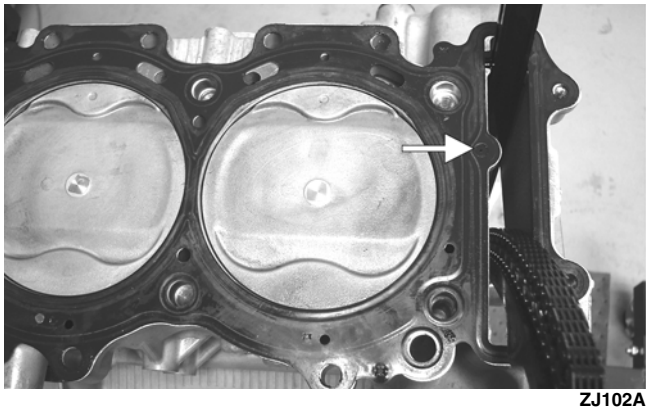


ZJ081A

30. Install the alignment pins into the top of the engine; then install the new head gasket.

CAUTION

Make sure the oil-port hole of the head gasket is unrestricted or severe engine damage may occur.



ZJ102A

31. With the head gasket and dowel pins in place, install the cylinder head by carefully tilting the head to the front side of the engine allowing the cam chain guide to slide into the passage in the cylinder head; then work the head back and forth until the head is properly seated to the engine.

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32. Install the flange nuts and cap screws (cap screws 1-6 threads coated with oil); then using the pattern shown, tighten in the following sequence:

    A. Cap screws 1-6 initially to 18 ft-lb.

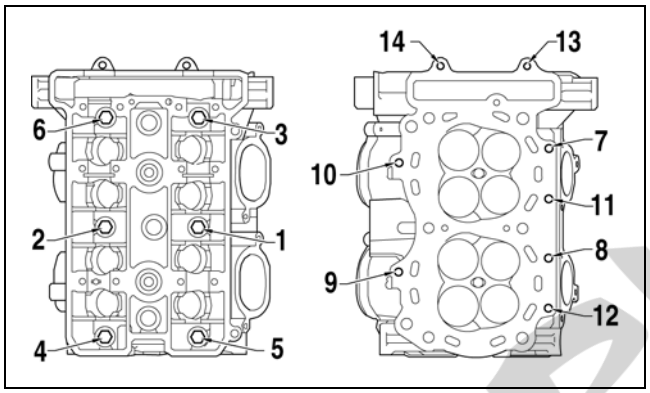
    B. Flange nuts 7-8 to 18 ft-lb.

    C. Flange nuts 9-10 to 10 ft-lb.

    D. Flange nuts 11-12 to 18 ft-lb.

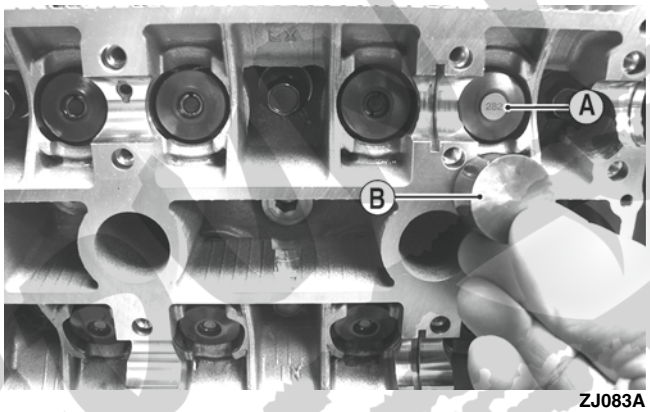
    E. Cap screws 13-14 to 96 in.-lb.

    F. Cap screws 1-6 in two steps from 18 ft-lb to 43 ft-lb.



741-617A

33. With a light film of engine-assembly grease applied to the tappets, install the correct shim (A) and tappet (B) to each valve of the cylinder head as noted during disassembling.

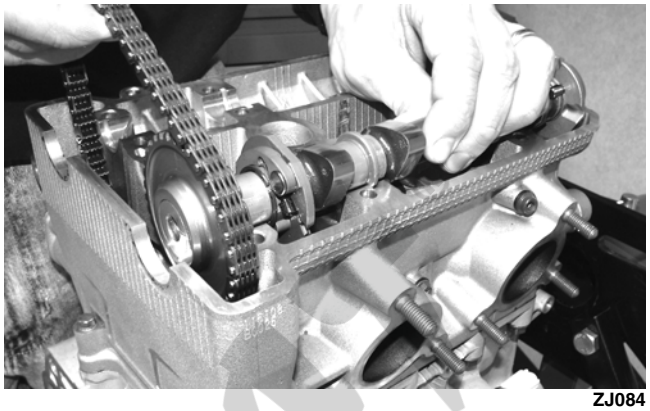


ZJ083A

■NOTE: Prior to installing the camshaft, apply engine-assembling grease to the camshaft journals and lobes.

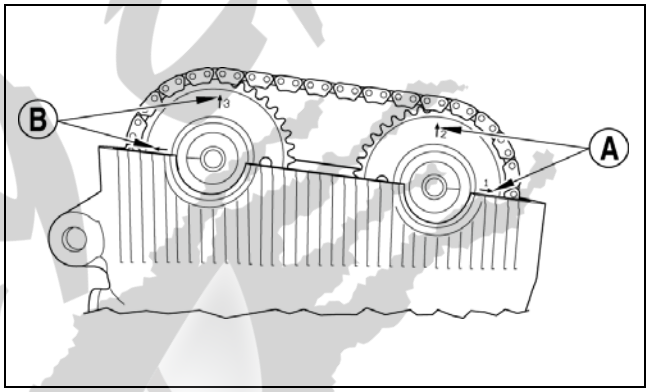
34. With the crankshaft rotated to the top-dead-center position, place the cam chain over the sprocket of the exhaust camshaft.

■NOTE: The exhaust camshaft must be installed first. When installing the cam chain to the gear of the exhaust camshaft, position the chain so no slack between the crankshaft gear and exhaust camshaft exists when the camshaft is installed. All slack in cam chain must be on the side of the tension adjuster.



ZJ084

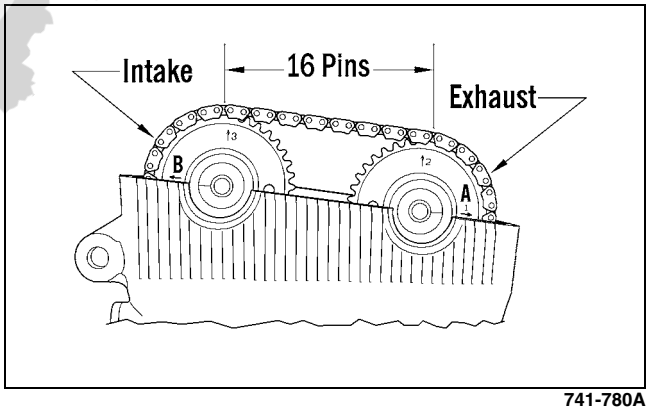
35. With the timing marks (A) on the face of the camshaft gear properly aligned, place the camshaft into position on the cylinder head.



741-801A

36. With the cam chain properly seated to the gears of the crankshaft and exhaust camshaft, install the intake camshaft noting the timing marks (B) are properly aligned.

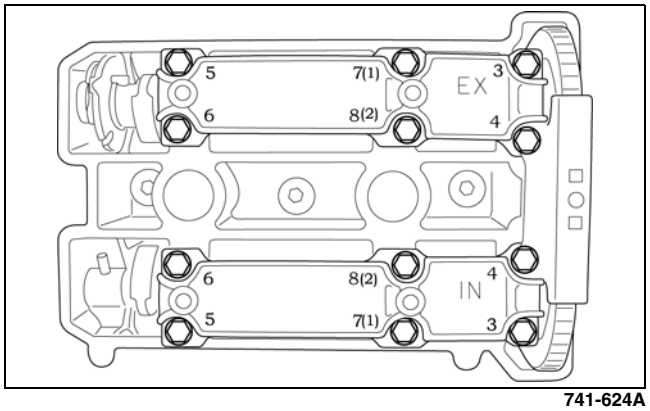
■NOTE: With the camshafts and cam chain in place, there should be exactly 16 pins from intake cam mark 3 to exhaust cam mark 2.



741-780A

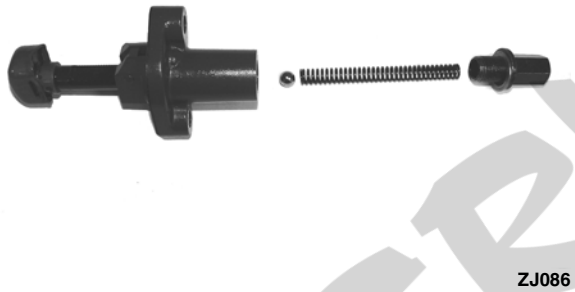
37. With the camshafts in position and properly timed and the dowel pins in place, install the camshaft covers along with cam chain tensioner guide number two; then using the pattern shown, tighten the twelve cap screws to 84 in.-lb.

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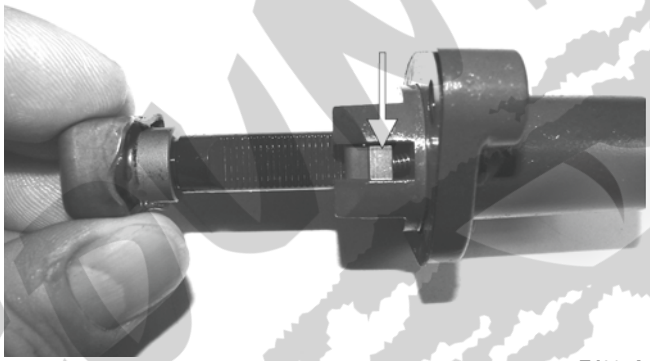
741-624A

38. Remove the tensioner ball, spring, and bolt.



ZJ086

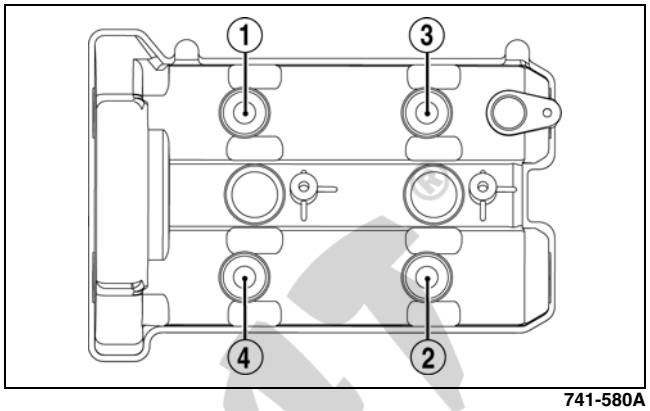
39. Install the cam chain tensioner adjuster by first compressing the locking clip; then by pushing in the tensioner shaft until completely compressed.



ZJ085A

40. Install the tensioner and secure with two Allen-head cap screws; then tighten to 84 in.-lb. Install the ball, spring, and tensioner bolt and tighten to 18 ft-lb.

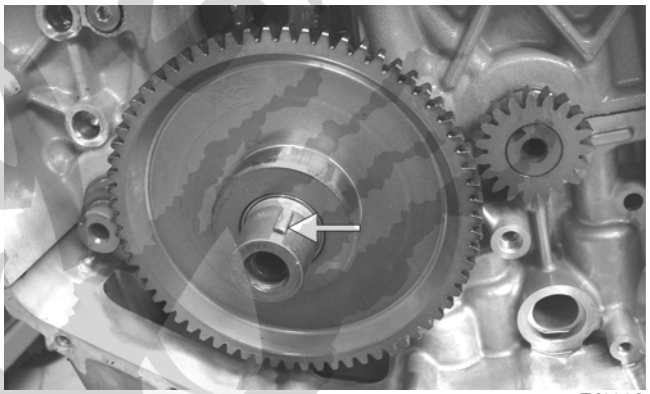
41. Install the engine cover alignment pins; then install the engine cover and secure with four cap screws and plastic washers. Using the pattern shown, tighten the cap screws to 120 in.-lb.



741-580A

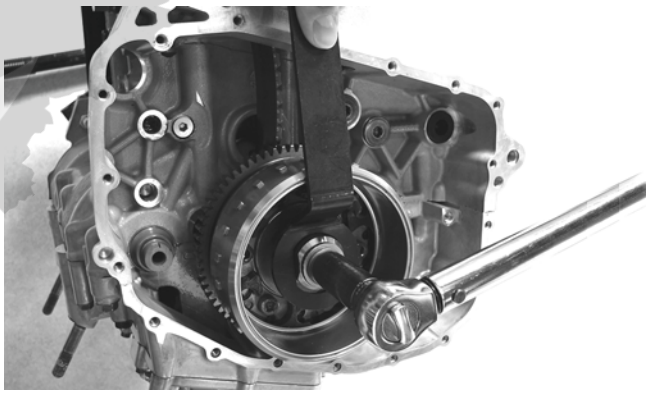
■**NOTE: At this point, install the spark plugs.**

42. Place the starter gear on the crankshaft; then install the flywheel key.



ZJ036A

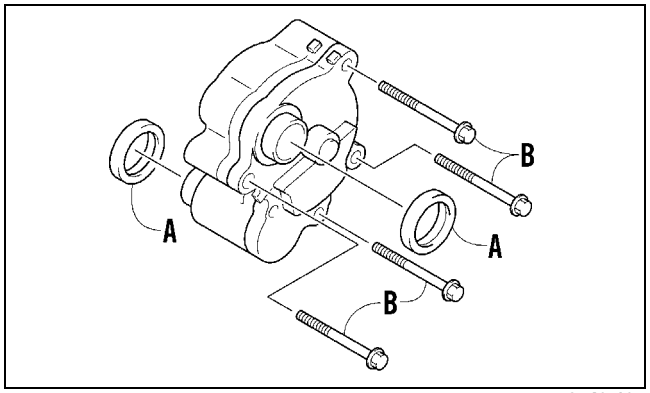
43. Install the flywheel with the cap screw and washer. Using the flywheel holder wrench from Flywheel Puller, tighten the cap screw to 88 ft-lb.



ZJ087

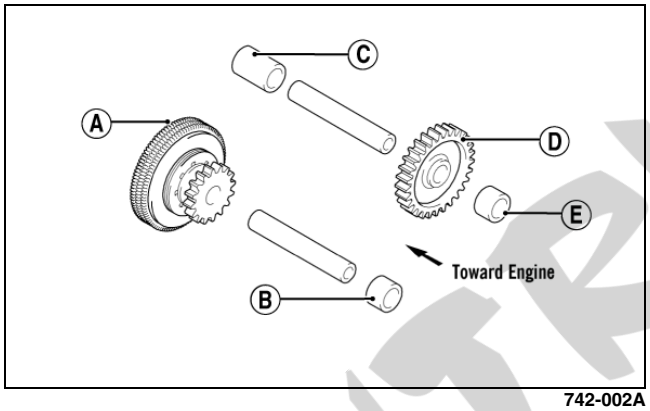
44. Install the oil scavenge pump alignment pins in the engine case; then with the inner and outer seals (A) in place on the pump, install the pump and secure with the four cap screws (B). Tighten to 84 in.-lb.

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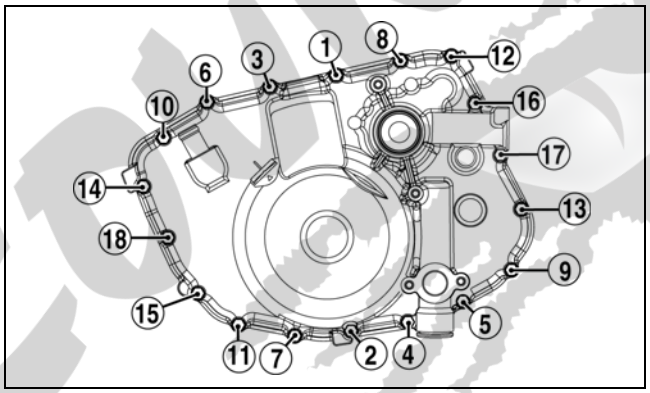
0742-125

45. With the two pins installed in the engine case, first install the starter torque limiter (A) and spacer (B); then install the inner spacer (C), idler gear (D), and outer spacer (E).



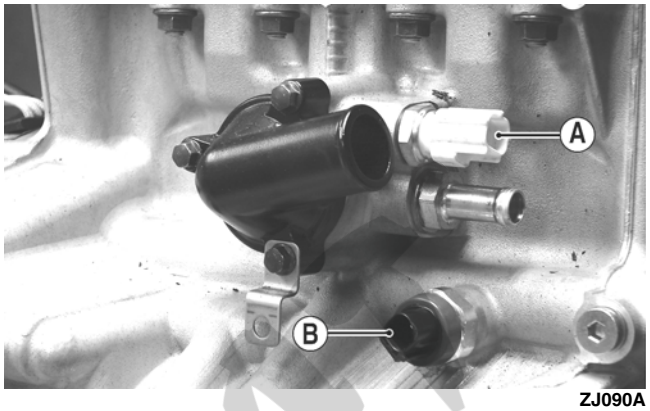
742-002A

46. Install the two alignment pins in the engine for the magneto cover; then with a new gasket, install the cover and with the pattern shown, tighten the 18 cap screws to 84 in.-lb.



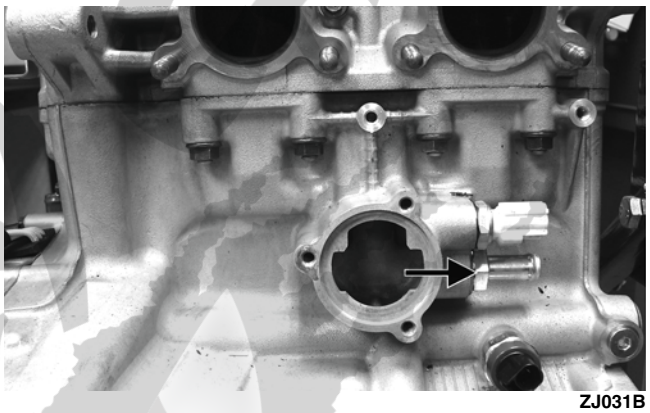
741-583A

■NOTE: If the coolant temperature and oil pressure sensors were removed, install the sensors and tighten in the following sequence: (A) coolant temperature sensor to 15 ft-lb and (B) oil pressure sensor to 10 ft-lb.



ZJ090A

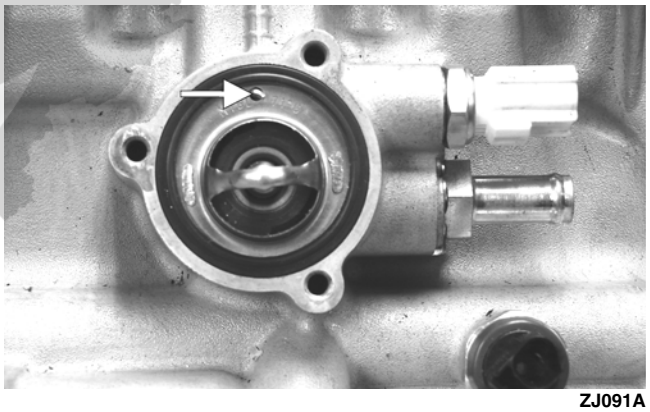
47. Install the coolant hose inlet fitting and secure with the two cap screws. Tighten to 84 in.-lb.



ZJ031B

48. Install a new thermostat; then install the cover and secure with the two cap screws. Tighten to 84 in.-lb.

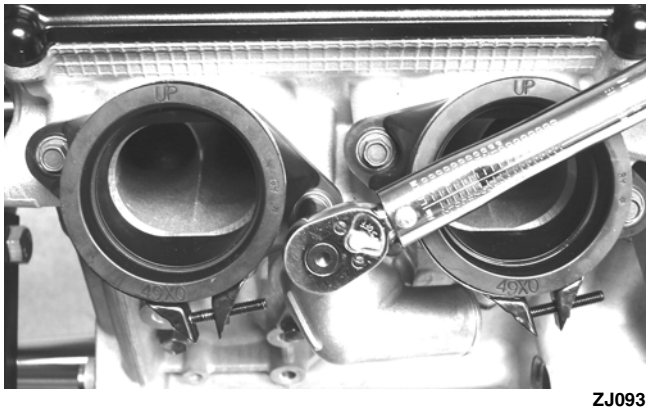
■NOTE: Make sure to install the thermostat with the bypass/check valve directed in the up position.



ZJ091A

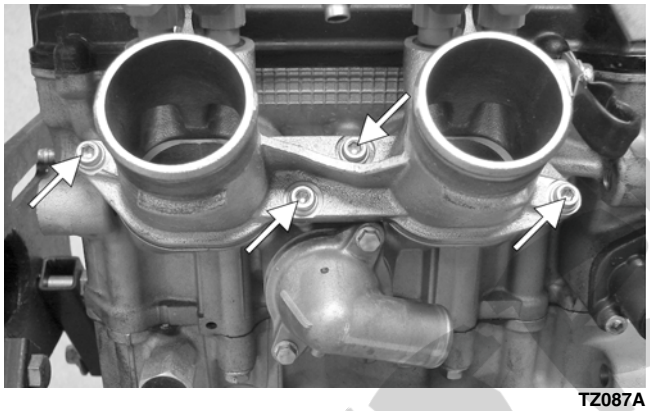
49. On the 5000, install the two intake flanges; then secure with the four cap screws. Tighten to 60 in.-lb.

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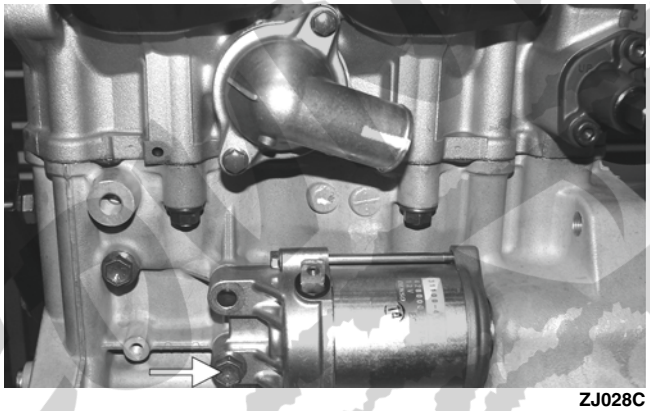
ZJ093

■**NOTE: On the 9000, install the intake flange assembly; then tighten the cap screws evenly to 96 in.-lb.**



TZ087A

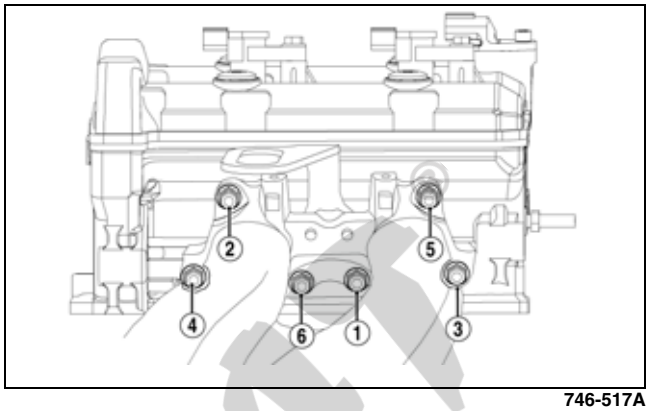
50. Install the starter motor; then secure with the cap screw. Tighten to 19 ft-lb.



ZJ028C

51. Install the coolant hoses onto the proper inlets/outlets of the engine; then install the oil hoses/oil reservoir onto the proper inlets/outlets. Secure with clamps.

52. On the 5000, install the exhaust pipes; then using the pattern shown, secure the pipes with the six flange nuts. Tighten to 18 ft-lb.



746-517A

■**NOTE: At this point, assembly of the 5000 engine is complete. Steps 53-59 are for the 9000 only.**

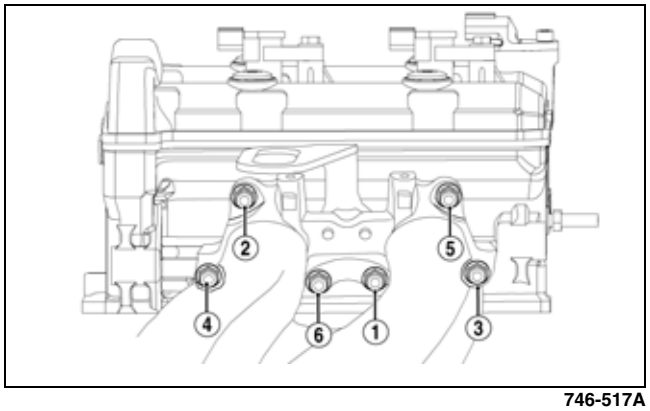
53. If removed, install the mounting bracket to the turbocharger; then with the backing plate properly positioned as noted during disassembling, secure the bracket to the 9000 with the lock nuts and finger tighten only.



TZ063A

54. Install the lower heat shield onto the turbocharger and exhaust manifold with the cap screws. Tighten to 60 in.-lb.

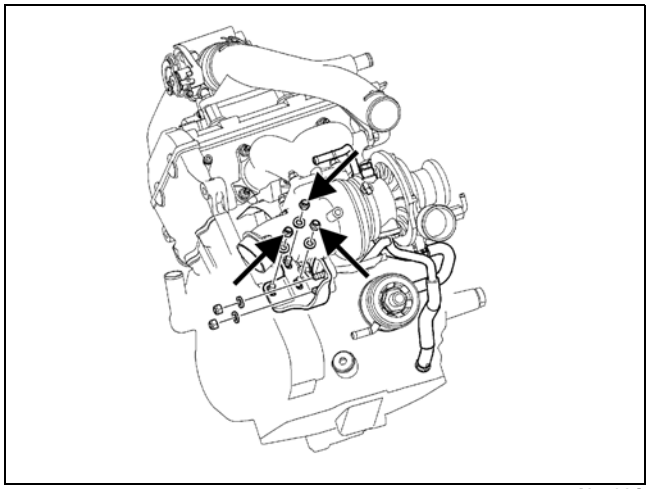
55. With the gaskets in place, install the exhaust pipes and turbocharger assembly to the engine; then using the pattern shown, tighten the exhaust pipes to 19 ft-lb.



746-517A

56. Install the three lock nuts securing the turbocharger mounting bracket to the engine and tighten to 30 ft-lb. Bend the washer tabs to secure the nuts.

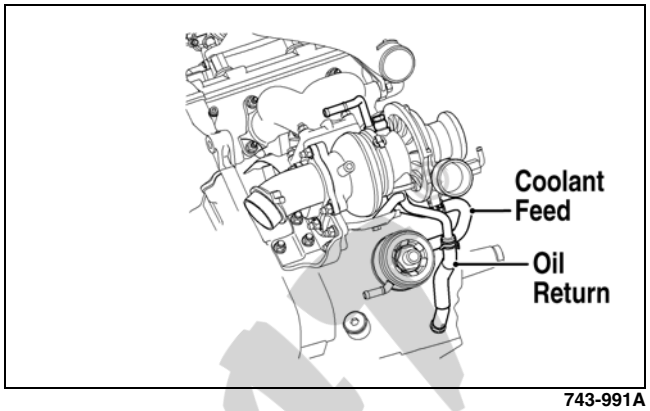
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743-780A

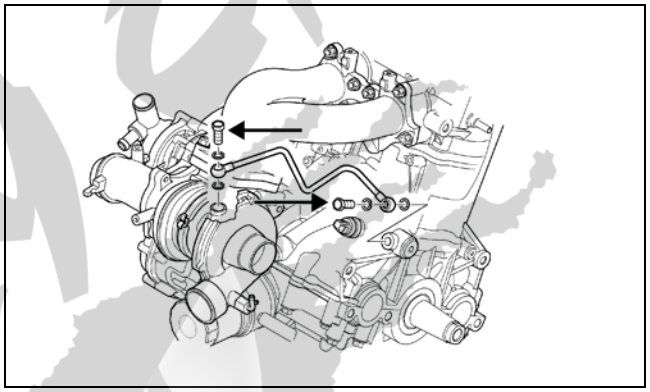
57. Tighten the two lock nuts (from step 53) to 30 ft-lb.

58. Connect the coolant feed hose and oil return hose to the turbocharger, release the clamps, and secure the hoses with the hose clamps.



743-991A

59. With the turbocharger secured, install the oil feed pipe with the banjo bolts and two new crush washers on each side of the union. Tighten to 11 ft-lb.



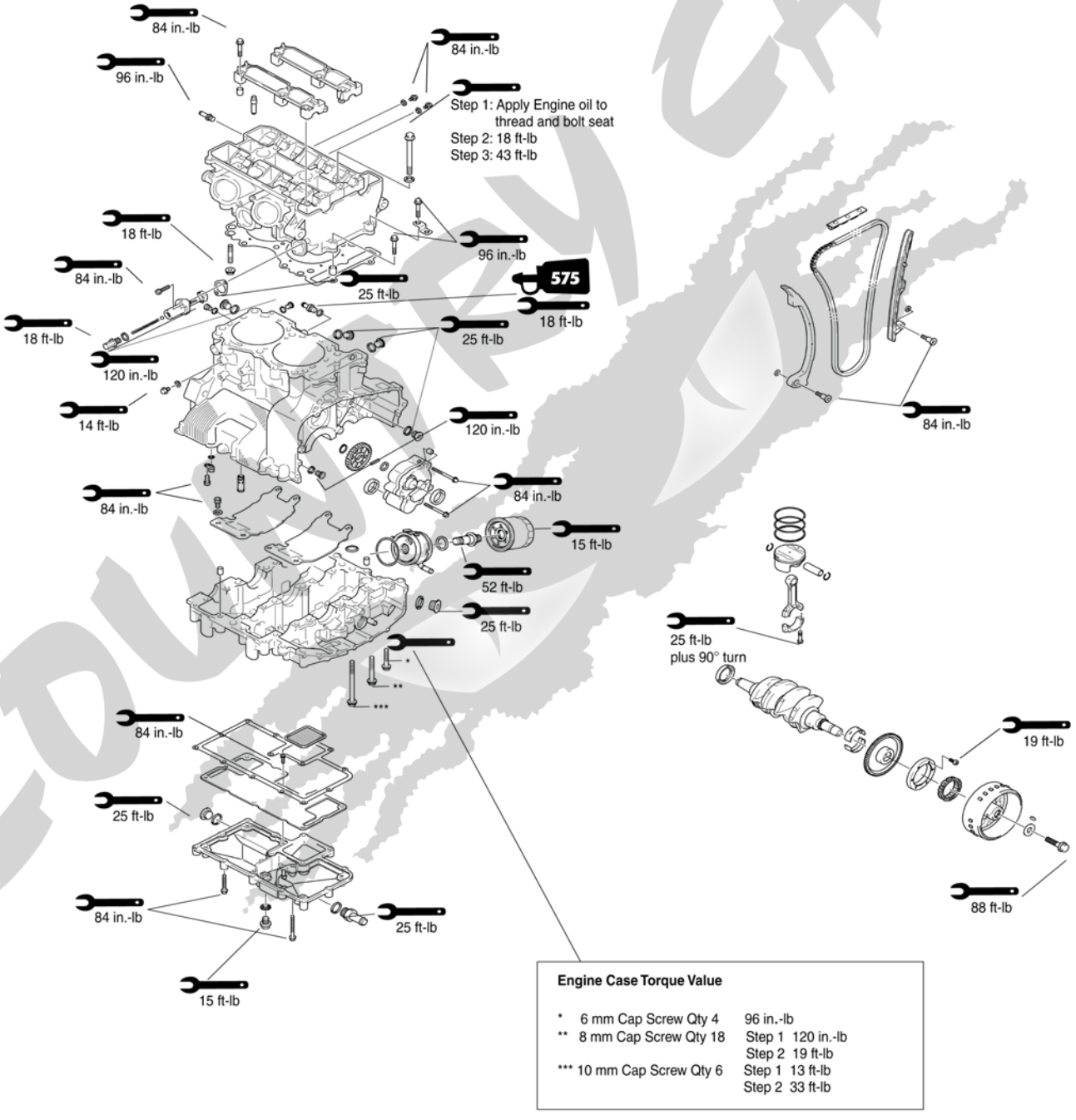
744-771B

■**NOTE: Make sure when installing the oil feed pipe that the correct banjo bolt is securing the pipe to the engine and turbocharger (as noted in disassembling).**

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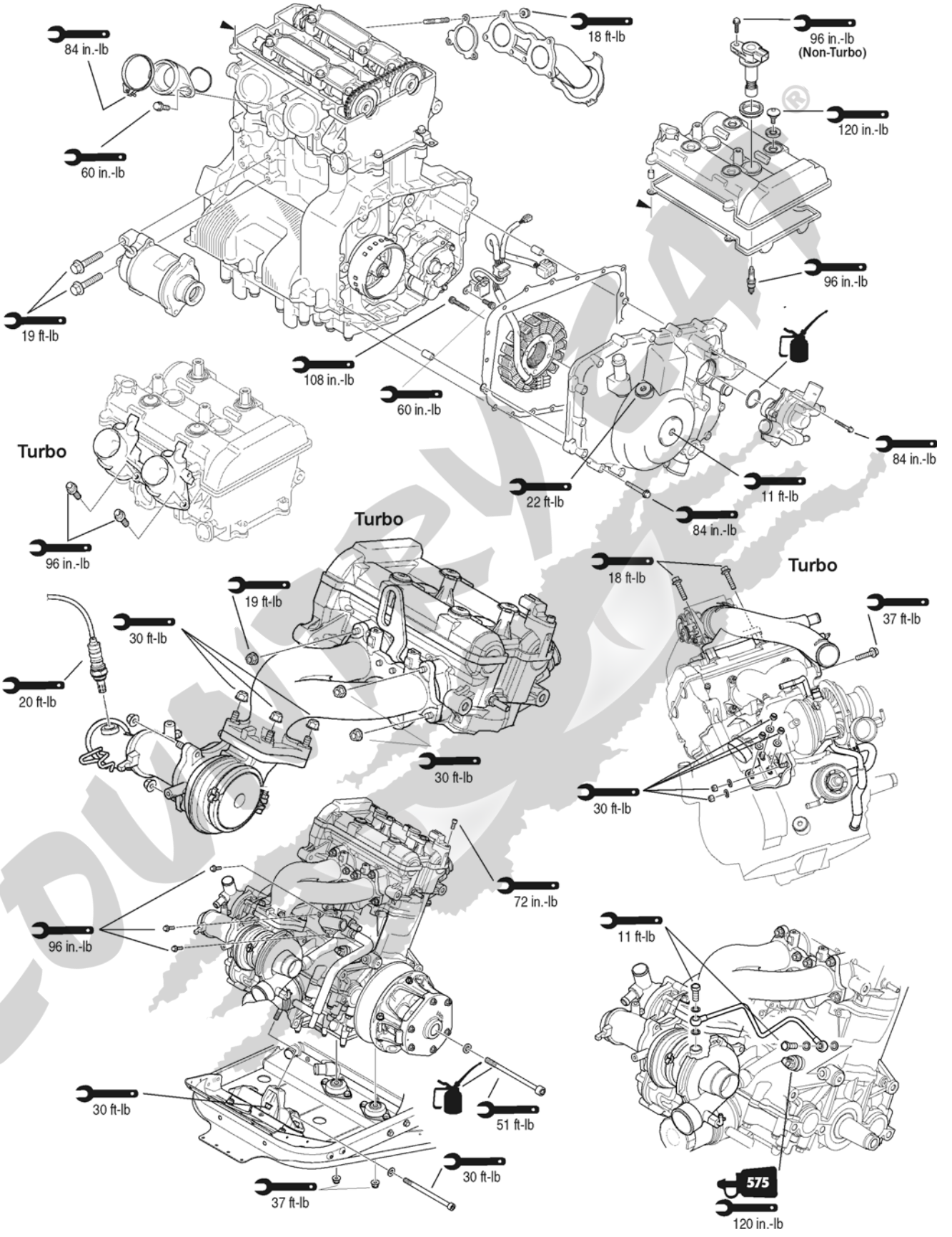
Assembly Schematic - 5000/9000

Torque Specification Tolerances	
Torque (ft-lb)	**Tolerance**
0-15	±20%
16-39	±15%
40+	±10%



1100ccJAG12

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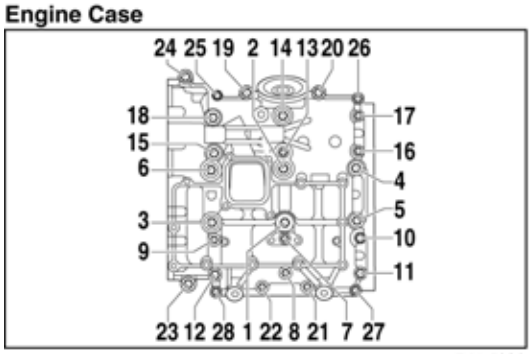


1100ccZ1RV10

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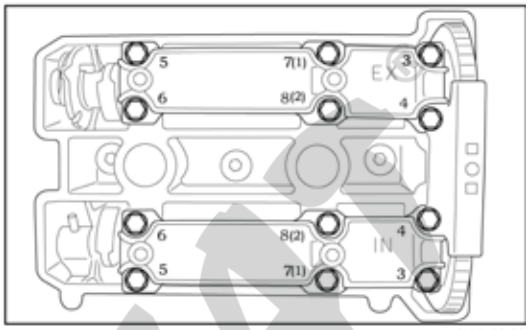
Engine Torque Patterns (5000/9000)

Engine Case



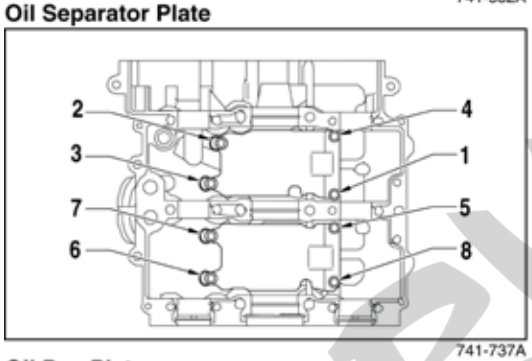
741-582A

Camshaft Cover



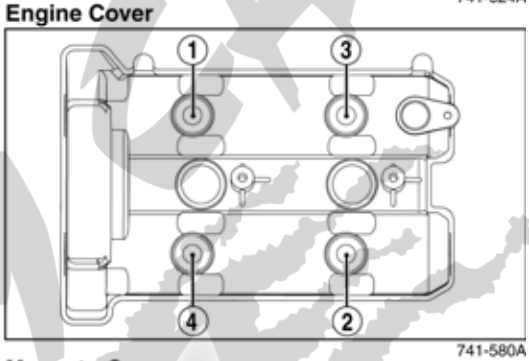
741-624A

Oil Separator Plate



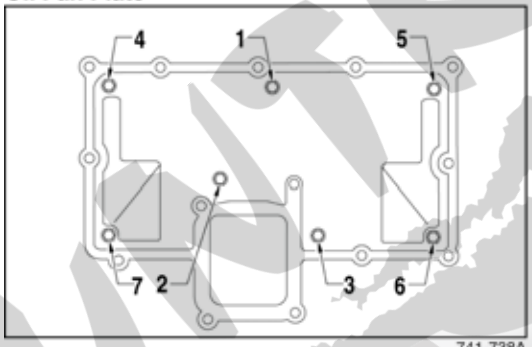
741-737A

Engine Cover



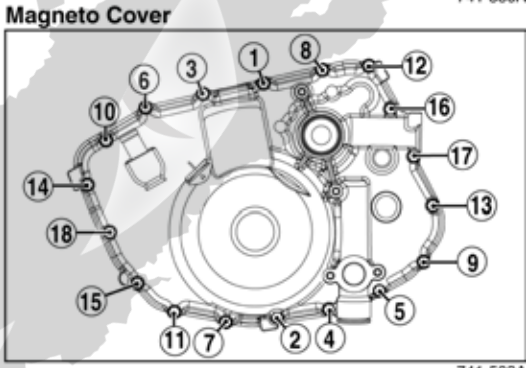
741-580A

Oil Pan Plate



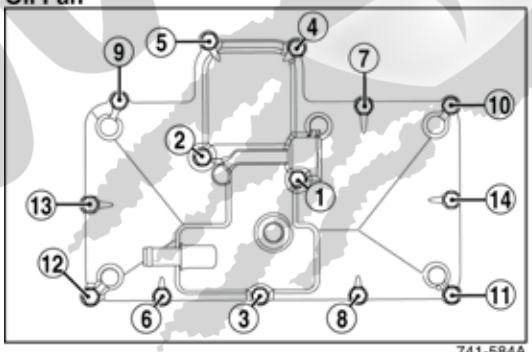
741-738A

Magneto Cover



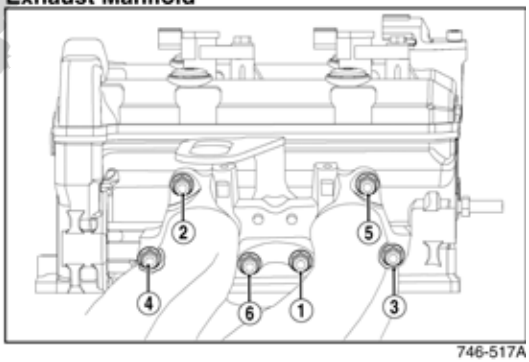
741-583A

Oil Pan



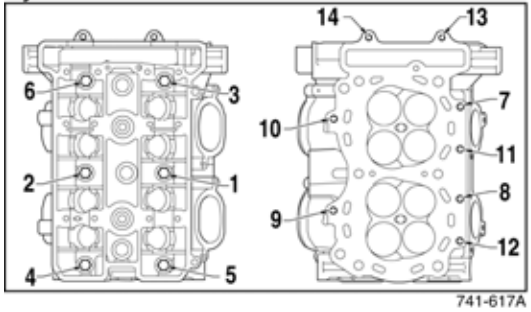
741-584A

Exhaust Manifold



746-517A

Cylinder Head



741-617A

T100TorquePattern12

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Engine Servicing - 7000

This engine sub-section has been organized to show a progression for servicing of the Arctic Cat 7000 engines. For consistency purposes, this sub-section shows a complete and thorough progression; however, for efficiency it may be preferable to disassemble only those components needing to be addressed. Also, some components may vary from model to model. The technician should use discretion and sound judgment.

SPECIAL TOOLS

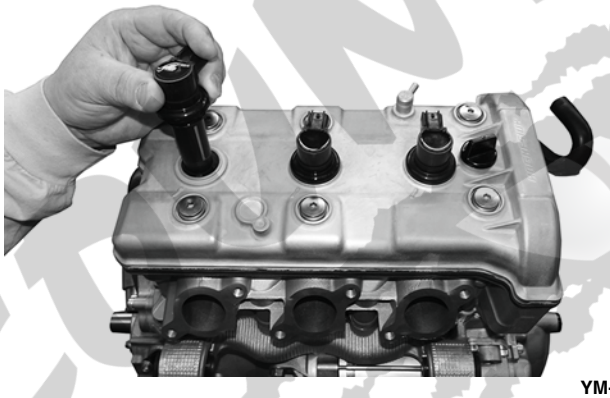
A number of special tools must be available to the technician when performing service procedures in this engine section.

Description	p/n
Ball Hone	0644-532
Flywheel Puller Kit	0744-083
Piston Pin Puller	0644-328
V Blocks	0644-535
Drive Clutch Spanner Wrench	0644-136
Ring Compressor	0644-378

■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

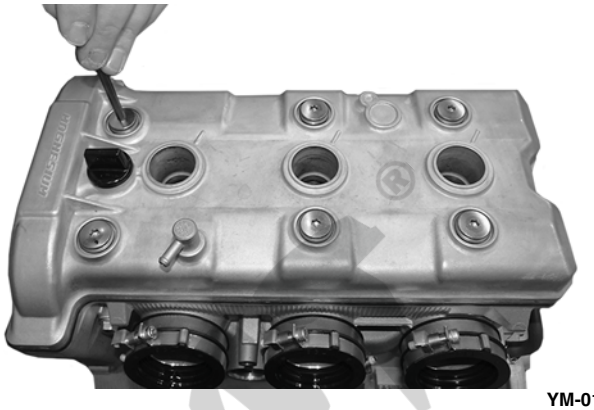
Disassembling

1. With the engine secured to a suitable engine stand, remove the ignition coils from the cylinder head cover; then remove the spark plugs.



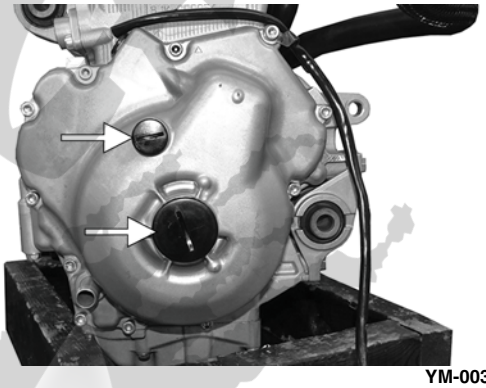
YM-002

2. Remove the six Allen-head screws securing the cylinder head cover to the cylinder head; then remove the cover. Account for the gasket.



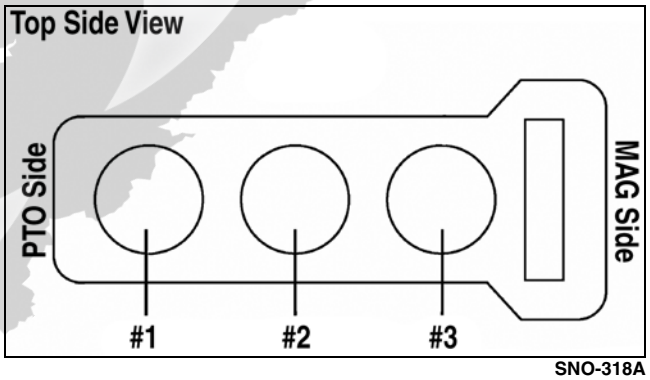
YM-010

3. Remove both plastic plugs from the MAG cover.



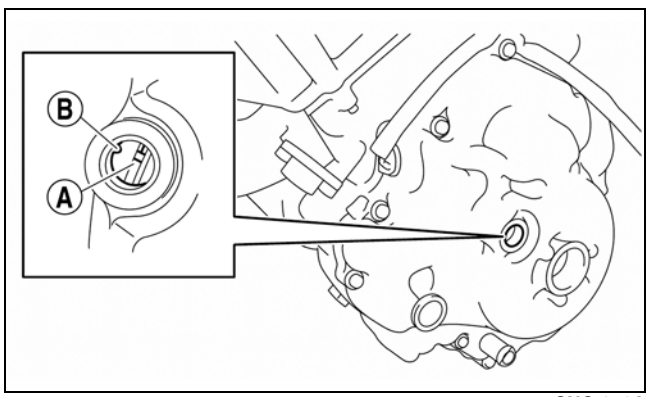
YM-003A

■NOTE: The engine cylinders are numbered #1, #2, and #3 from the PTO to the MAG.



SNO-318A

4. Obtain top-dead-center (TDC) by rotating the crankshaft (clockwise) until the mark on the magneto rotor is aligned with the pointer on the magneto cover and the #3 piston is at TDC.



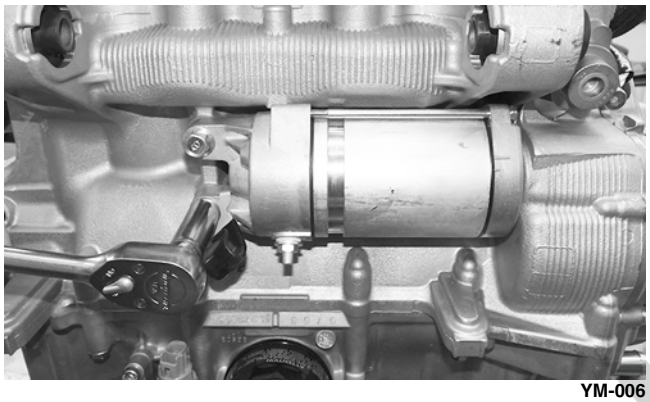
SNO-279A

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■**NOTE: TDC on the compression stroke can be found when the camshaft lobes for cylinder #3 (MAG side) are turned away from each other.**

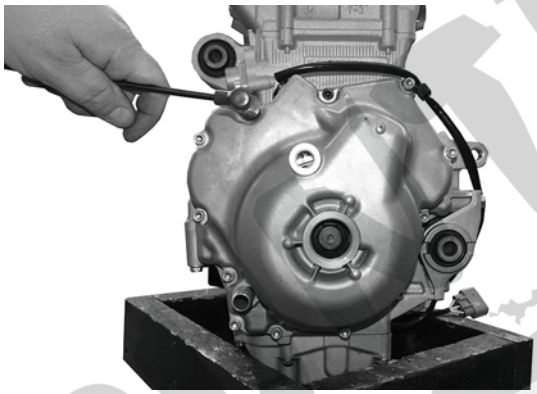
■**NOTE: At this point if the technician's objective is to service the valves, proceed to Servicing Components - Valves in this sub-section.**

5. Remove the two cap screws securing the starter motor assembly to the crankcase; then remove the starter motor.



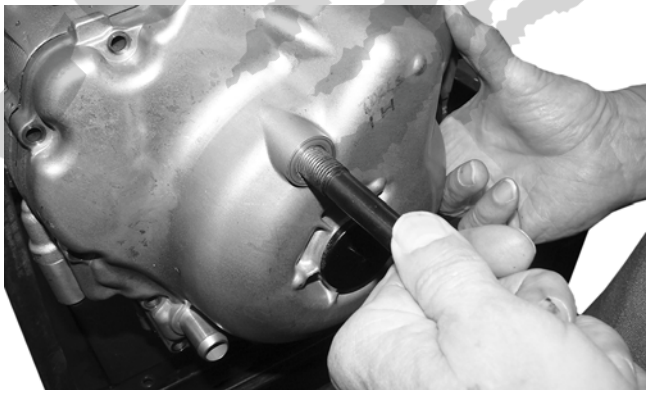
YM-006

6. Remove the Allen-head screws securing the MAG cover to the crankcase **taking note the location of the black screw.**



YM-004

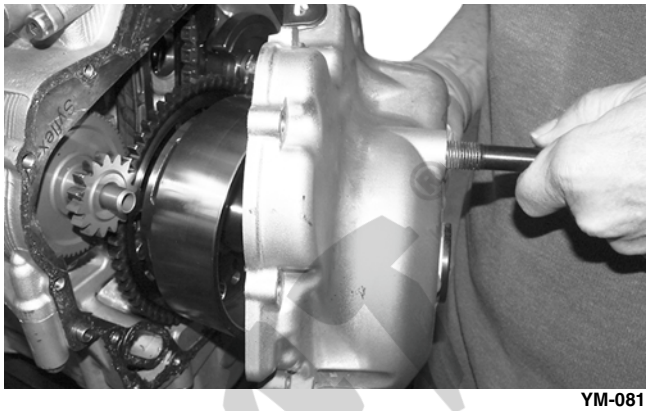
7. Thread the MAG Cover Removal Cap Screw (p/n 2623-100) into the timing mark hole; then carefully pull the MAG cover from the crankcase. Account for two dowel pins and a gasket.



YM-080

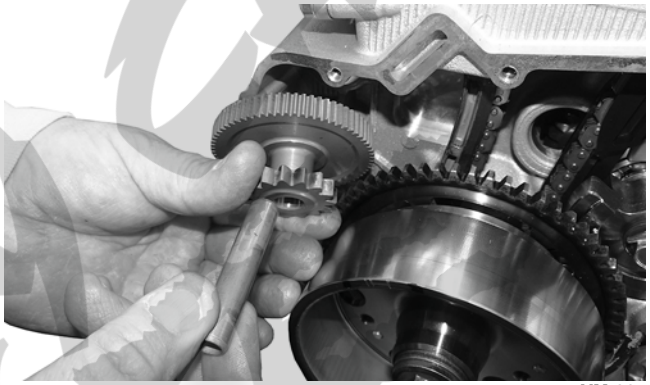
⚠ WARNING

When removing the cover be sure to keep hands away from being pinched between the cover and the case.



YM-081

8. Remove the starter gear and shaft.



YM-007

9. Remove the cap screw securing the flywheel to the crankshaft. Account for the washer and the shaft inside the cap screw.

10. Using Flywheel Puller, remove the flywheel from the crankshaft. Account for the key in the crankshaft.



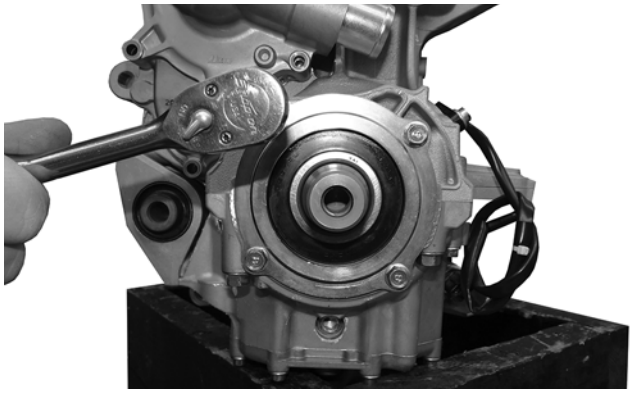
YM-082



YM-083

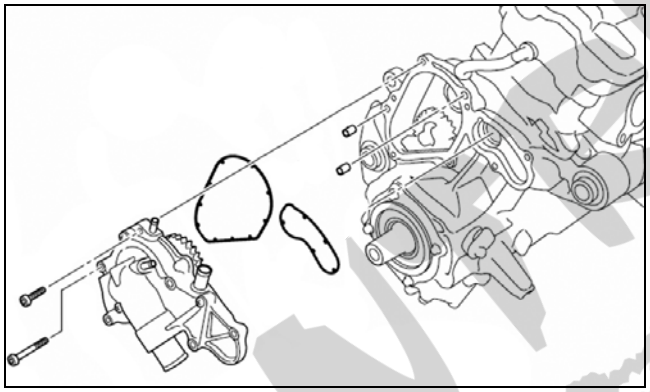
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11. Remove the four cap screws securing the output shaft assembly to the crankcase; then thread the drive clutch bolt into the end of the crankshaft and pull the output shaft assembly from the engine.



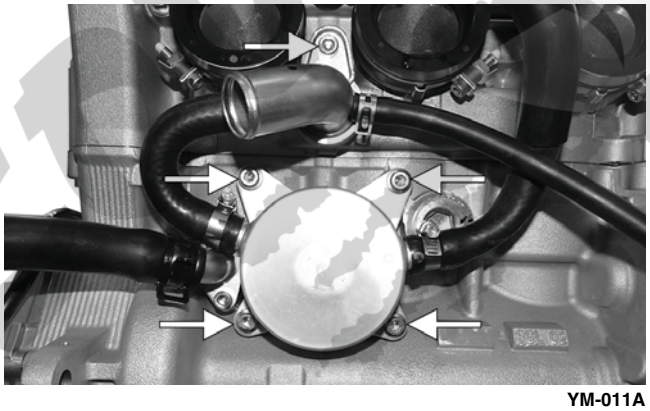
YM-009

12. Remove the Allen-head screws securing the water pump assembly to the crankcase; then remove the assembly. Account for two dowel pins and two gaskets.



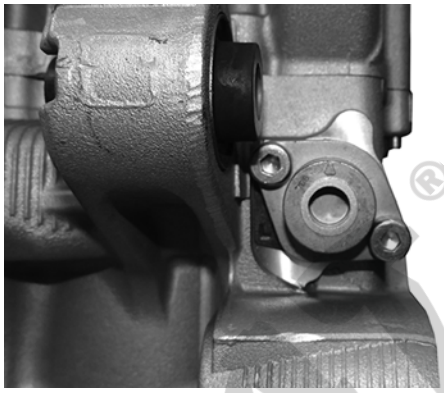
SNO-278

13. Remove the five Allen-head screws securing the oil cooler assembly to the engine. Remove the assembly.



YM-011A

14. Remove the two Allen-head screws securing the chain tensioner to the cylinder assembly. Remove the tensioner and gasket.

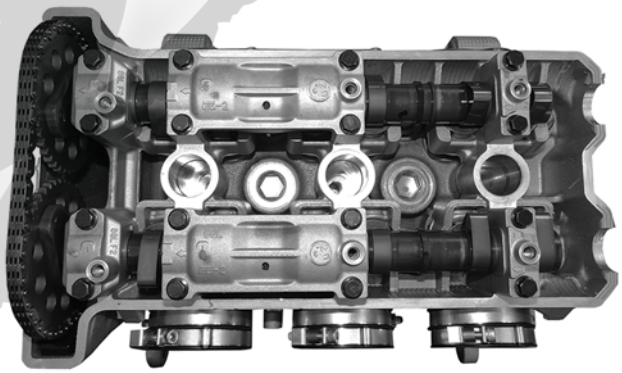


YM-012



YM-013

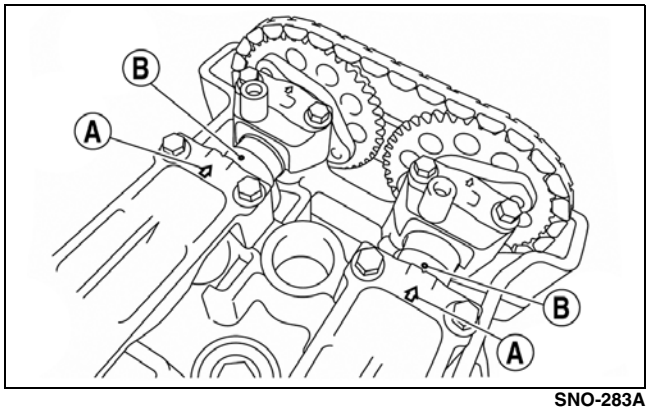
15. Remove the cap screws securing the camshaft covers to the cylinder head; then remove the covers. Remove both camshafts. Account for twelve dowel pins.



YM-014

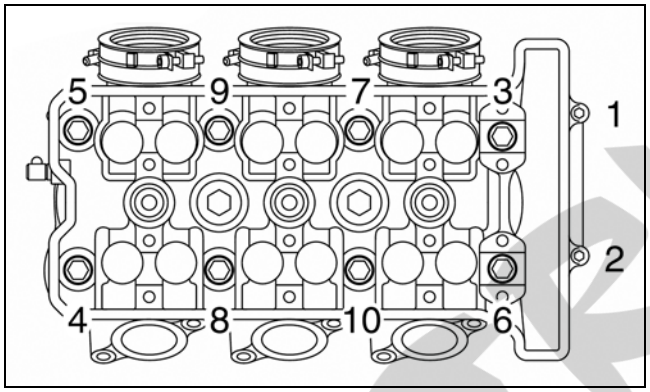
■NOTE: Keep each camshaft cover with the appropriate camshaft for installation purposes. The "I" mark refers to the intake camshaft caps and the "E" mark refers to the exhaust camshaft caps. The camshaft caps with the arrow mark (A) will always point to the MAG side of the engine. Make sure the holes (B) in the camshafts are aligned with the arrow mark (A) on the camshaft caps.

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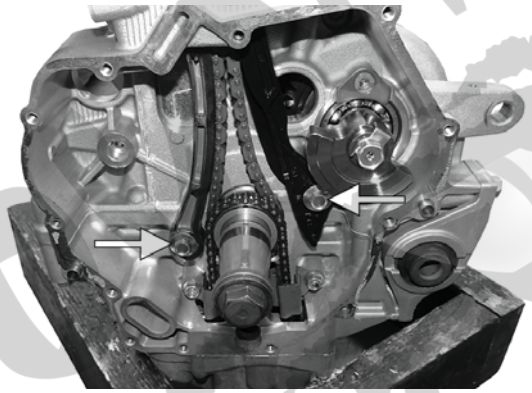
SNO-283A

16. Remove the eight cap screws (#3-10) and two Allen-head screws (#1 and #2). Remove the head and account the gasket and dowel pins.



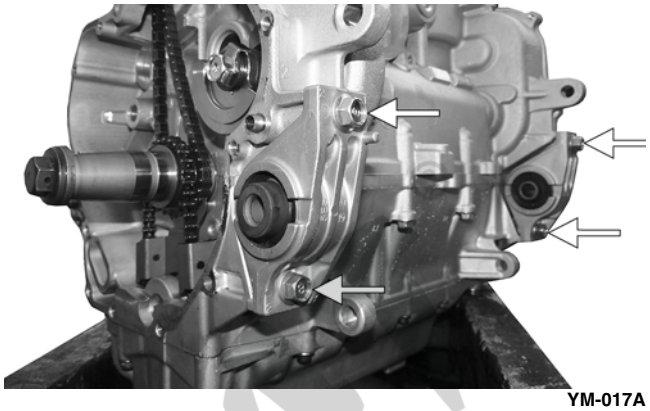
SNO-280

17. Remove the cap screws securing the timing chain tension guides to the engine; then remove the guides.



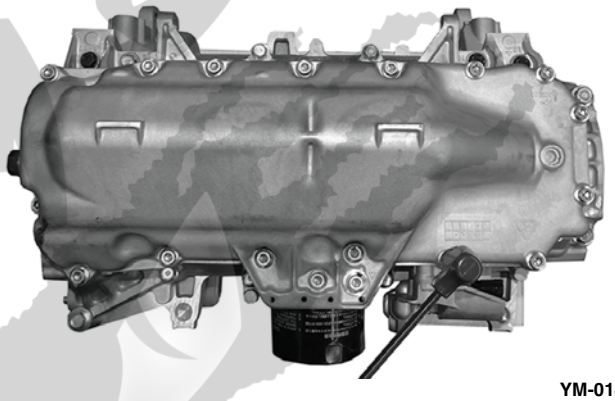
YM-016A

18. Remove the four cap screws securing the rear engine mounting brackets to the crankcase. Remove the brackets.



YM-017A

19. Tip the engine upside down; then remove the cap screws securing the oil pan to the crankcase. Using a soft hammer, gently tap around the oil pan until it separates. Account for the oil pan gasket and two dowel pins.



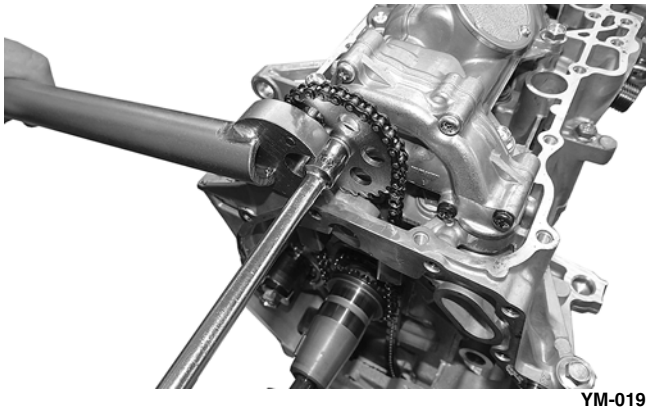
YM-018

■NOTE: Note the location of the different-length cap screws for assembling purposes.

CAUTION

DO NOT drive any tool between the halves to separate the crankcase. Damage to the sealing surfaces will result.

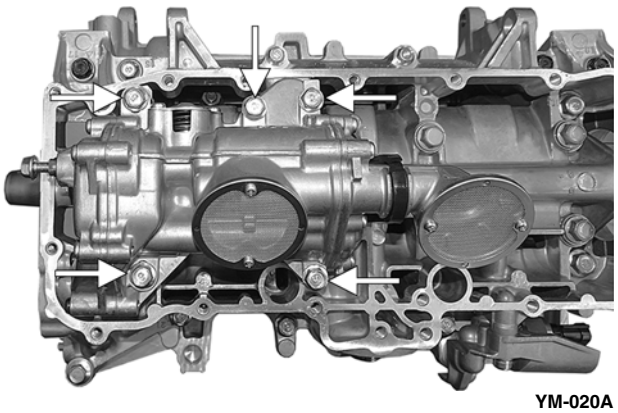
20. Remove the cap screw securing the oil pump driven gear to the oil pump; then remove the oil pump chain and timing chain from the crankshaft.



YM-019

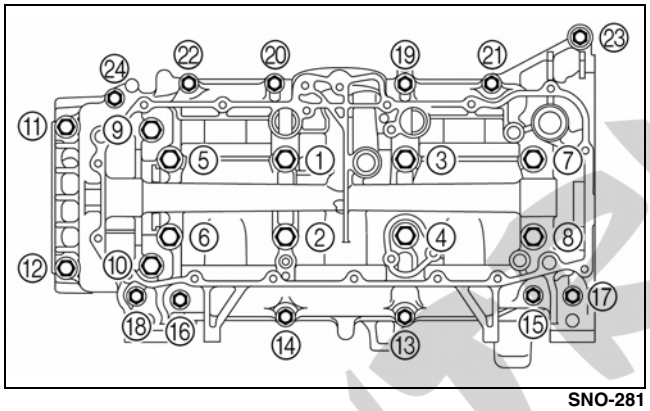
21. Remove the five cap screws securing the oil pump to the crankcase. Account for two dowel pins.

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YM-020A

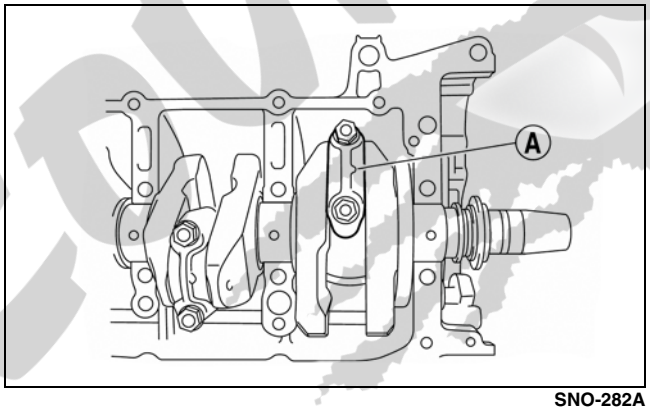
22. Loosen the cap screws in decreasing numerical order of the embossed numbers on the crankcase. Loosen each bolt 1/4 of a turn at a time. After all screws are loosened, remove the screws.



SNO-281

23. Remove and discard the nuts securing the connecting rod caps to the connecting rods.

■NOTE: The indicator mark (A) on the connecting rod cap will always point to the MAG end of the crankshaft.



SNO-282A

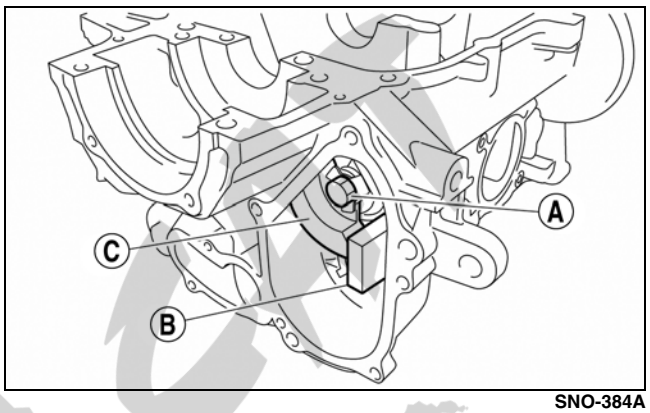
■NOTE: Because the connecting rods and connecting rod caps are unique, note the I.D. marks and keep all associated parts together for assembling purposes.

24. Remove the crankshaft and piston assembly from the crankcase.

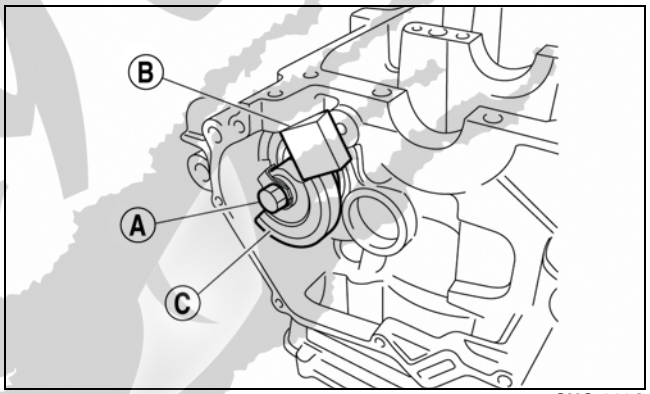
CAUTION
Pistons can be removed from the top side only.

25. Straighten the locking tabs securing the cap screws securing the balancer shaft; then remove both cap screws and both balancer weights.

■NOTE: To remove the cap screws (C), place a small piece of wood (B) between the balancer weight (C) and the crankcase.

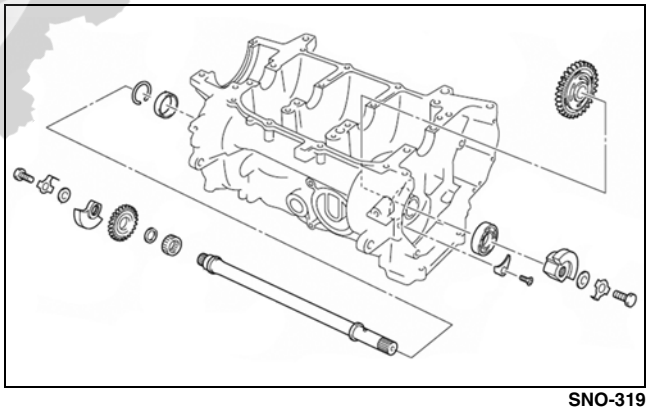


SNO-384A



SNO-383A

26. Remove the snap ring securing the water pump drive gear; then remove the gear and shaft and account for a spacer and a bearing.



SNO-319

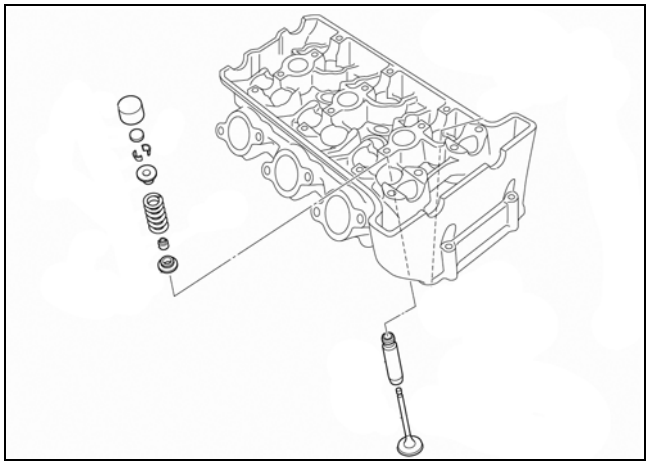
Servicing Components

Thoroughly clean all non-electrical components in parts-cleaning solvent; then remove any carbon buildup from the cylinder head and piston dome.

Visually inspect all engine components for wear or damage.

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VALVES



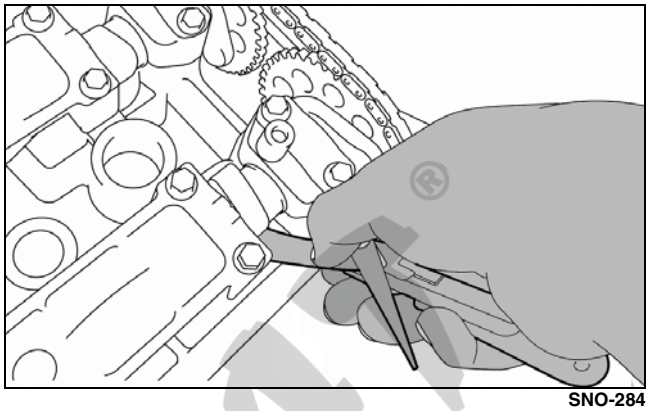
CAUTION

If any valve is discolored or pitted or if the seating surface is worn, the valve must be replaced. Do not attempt to grind a valve or severe engine damage may occur.

If valves, valve guides, or valve seats require servicing or replacement, Arctic Cat recommends the components be taken to a qualified machine shop for servicing.

1. Install the drive clutch; then using Drive Clutch Spanner Wrench, rotate the engine two full revolutions.
2. Rotate the engine until the camshaft lobe of the valve being measured is directly away from the tappet.
3. Using an appropriate thickness gauge, measure and record the intake and exhaust valve clearance of the cylinder that is on the compression stroke; then rotate the engine 360° and measure and record the valve clearance of the other cylinder. Valve clearance must be within specifications.

Valve Clearance (Cold)	
15°-25° C (59°-77° F)	Intake: 0.0059-0.0087 in.
	Exhaust: 0.0083-0.0098 in.



SNO-284

■NOTE: At this point if valve/tappet clearances are within specifications, servicing is complete. If any valve/tappet clearance is not within specifications, complete step 15 of Disassembling before proceeding to step 4.

■NOTE: Make a note of the position of each valve lifter and valve pad so that they can be reinstalled in their original place.

4. To select the correct replacement shim for an out-of-specification clearance, note the three-digit number on the surface of the existing shim; then refer to the appropriate Tappet Shim Selection Table (Exhaust or Intake) in this sub-section and use this procedure:
   A. Find the Measured Tappet Clearance (from step 3) in the left-side vertical column of the table.
   B. Find the Present Shim Size (three-digit-number) at the top-side horizontal column of the table.
   C. Match the clearance in the vertical column with the present shim size to obtain the recommended replacement shim.
5. After verifying proper valve/tappet clearance, install the timing inspection plug to the magneto case and tighten securely.

■NOTE: At this time, remove the items used to close off the intake ports of the cylinder head.

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TAPPET SHIM SELECTION TABLE (EXHAUST)

MEASURED TAPPET CLEARANCE (mm) \ SUFFIX NO.	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
PRESENT SHIM SIZE (mm)	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
0.00–0.04					2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30
0.05–0.09				2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35
0.10–0.14			2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
0.15–0.19		2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
0.20–0.30	SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED																								
0.31–0.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	
0.36–0.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50		
0.41–0.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50			
0.46–0.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50				
0.51–0.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50					
0.56–0.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50						
0.61–0.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50							
0.66–0.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50								
0.71–0.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50									
0.76–0.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50										
0.81–0.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50											
0.86–0.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50												
0.91–0.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50													
0.96–1.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50														
1.01–1.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50															
1.06–1.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																
1.11–1.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																	
1.16–1.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																		
1.21–1.25	3.30	3.35	3.40	3.45	3.50	3.50																			
1.26–1.30	3.35	3.40	3.45	3.50	3.50																				
1.31–1.35	3.40	3.45	3.50	3.50																					
1.36–1.40	3.45	3.50	3.50																						
1.41–1.45	3.50	3.50																							
1.46–1.50	3.50																								

How to use this chart:

I. Measure tappet clearance when the engine is cold.
II. Measure present shim size.
III. Match clearance in vertical column with present shim size in horizontal column.

Example:

Tappet clearance is	0.38 mm
Present shim size	2.90 mm
Shim size to be used	3.05 mm

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TAPPET SHIM SELECTION TABLE (INTAKE)

MEASURED TAPPET CLEARANCE (mm) \ SUFFIX NO.	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
PRESENT SHIM SIZE (mm)	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
0.00–0.04			2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
0.05–0.09		2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
0.10–0.20	SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED																								
0.21–0.25	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	
0.26–0.30	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50		
0.31–0.35	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50			
0.36–0.40	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50				
0.41–0.45	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50					
0.46–0.50	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50						
0.51–0.55	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50							
0.56–0.60	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50								
0.61–0.65	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50									
0.66–0.70	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50										
0.71–0.75	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50											
0.76–0.80	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50												
0.81–0.85	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50													
0.86–0.90	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50														
0.91–0.95	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50															
0.96–1.00	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																
1.01–1.05	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																	
1.06–1.10	3.25	3.30	3.35	3.40	3.45	3.50	3.50																		
1.11–1.15	3.30	3.35	3.40	3.45	3.50	3.50																			
1.16–1.20	3.35	3.40	3.45	3.50	3.50																				
1.21–1.25	3.40	3.45	3.50	3.50																					
1.26–1.30	3.45	3.50	3.50																						
1.31–1.35	3.50	3.50																							
1.36–1.40	3.50																								

How to use this chart:

I. Measure tappet clearance when the engine is cold.
II. Measure present shim size.
III. Match clearance in vertical column with present shim size in horizontal column.

Example:

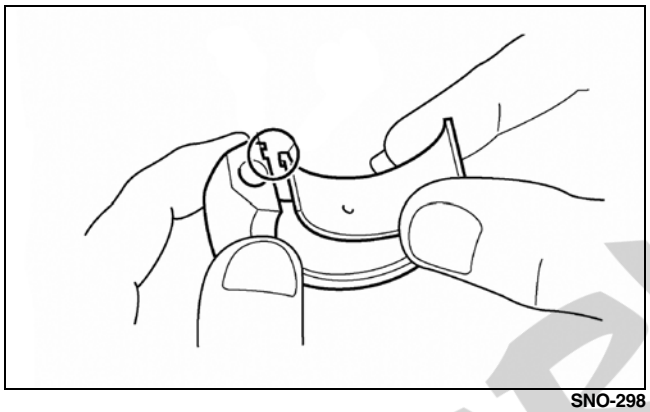
Tappet clearance is	0.23 mm
Present shim size	2.70 mm
Shim size to be used	2.80 mm

CRANKSHAFT JOURNAL BEARING

■NOTE: Do not interchange the crankshaft journal bearings. To obtain the correct crankshaft-journal-to-crankshaft-journal-bearing clearance and prevent engine damage, the crankshaft journal bearings must be installed in their original positions.

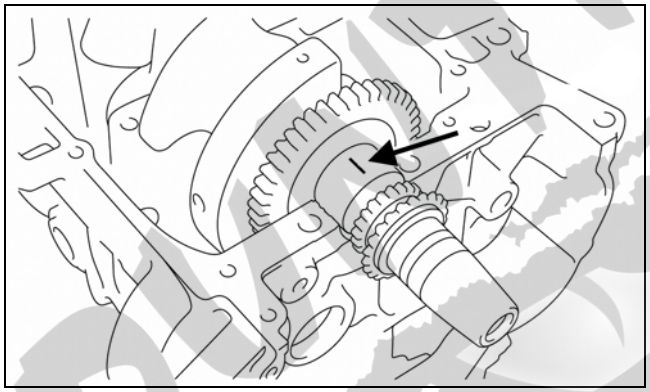
1. Clean the crankshaft journal bearings, crankshaft journals, and bearing portions of the crankcase. Place the upper crankcase upside down on a bench.
2. Install the journal bearings into the upper engine case.

■NOTE: Make sure the tabs of the bearings are properly seated to the notches in the upper engine case.



SNO-298

3. Put a piece of Plastigauge® on each crankshaft journal.



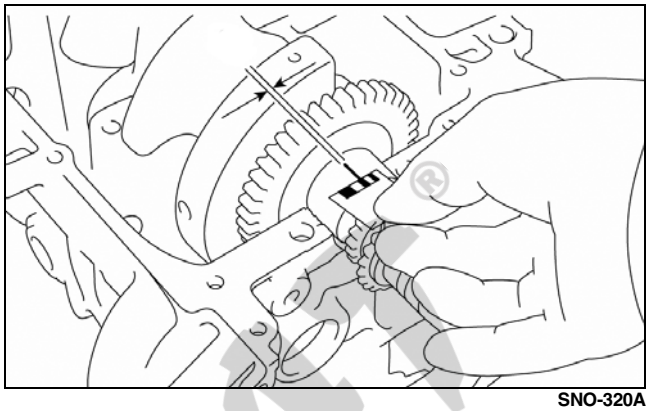
SNO-320A

■NOTE: Do not put the Plastigauge® over the oil hole in the crankshaft journal.

4. Install the crankshaft journal lower bearings into the lower crankcase and assemble the crankcase halves.

■NOTE: Do not move the crankshaft until the clearance measurement has been completed.

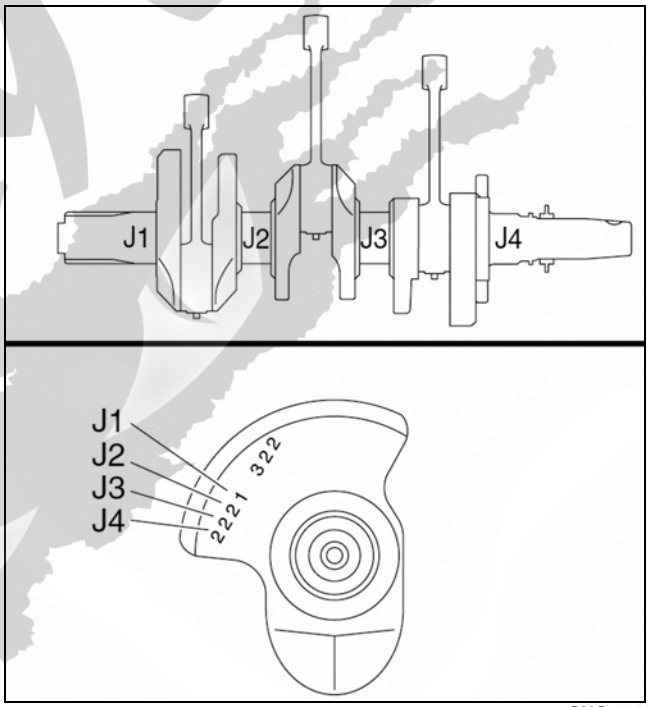
5. Tighten the cap screws in the order of the embossed numbers on the crankcase; then remove the lower crankcase and the crankshaft journal lower bearings.
6. Measure the compressed Plastigauge® width on each crankshaft journal.



SNO-320A

7. If the clearance is out of specification, select replacement crankshaft journal bearings.

■NOTE: The numbers stamped into the crankshaft web and the numbers stamped into the lower crankcase are used to determine the replacement crankshaft journal bearing sizes.



SNO-322

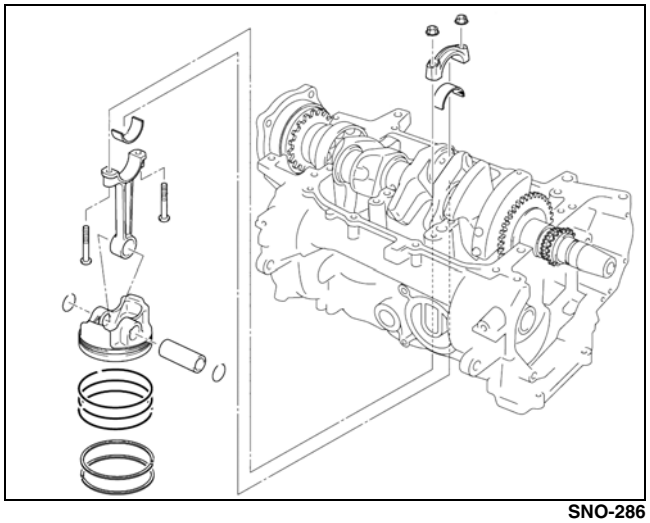
■NOTE: "J1 - J4" refer to the bearings shown in the crankshaft web and lower crankcase illustration. If "J1 - J4" are the same, use the same size for all of the bearings.

For example: if the crankcase "J1" and crankshaft web "J1" numbers are "6" and "1" respectively, the bearing size for "J1" is: J1 (crankcase) – J1 (crankshaft web) + 2 = 6 – 1 + 2 = 7.

CRANKSHAFT JOURNAL BEARING COLOR CODE	
2	Black
3	Brown
4	Green
5	Yellow
6	Pink
7	Red
8	White

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PISTON ASSEMBLY



SNO-286

■NOTE: Whenever a piston, rings, or pins are out of tolerance, they must be replaced.

Cleaning/Inspecting Piston

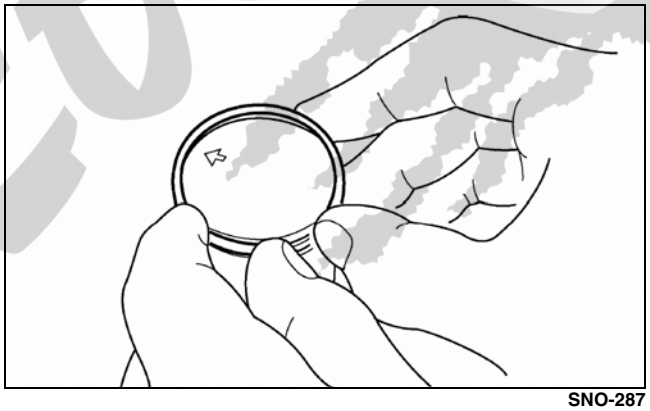
1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. Inspect the piston for seizure marks or scuffing.

■NOTE: If seizure marks or scuffing is detected, the piston must be replaced.

4. Inspect the perimeter of each piston for signs of excessive "blowby." Excessive "blowby" indicates worn piston rings or an out-of-round cylinder.

Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring groove.
2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.



SNO-287

■NOTE: If the existing rings will not be replaced with new ones, note the location of each ring for proper installation. When installing new rings, install as a complete set only.

Measuring Piston-Ring End Gap (Installed)

1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.

■NOTE: Remove any carbon; then clean the top of the cylinder bore before inserting the piston rings.

2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within the following specifications.

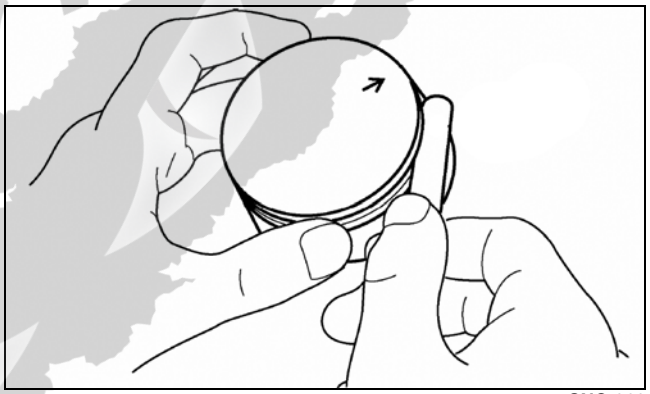
1st Ring	0.013-0.018 in.
2nd Ring	0.028-0.033 in.
Oil Rings	0.008-0.024 in.

Piston Ring/Groove Clearance

■NOTE: Before checking, piston grooves must be clean, dry, and free of carbon.

Fit new piston ring into piston groove and measure clearance between ring and ringland by using feeler gauge. Measurement must be within the following specifications. If clearance is out of specification, replace piston.

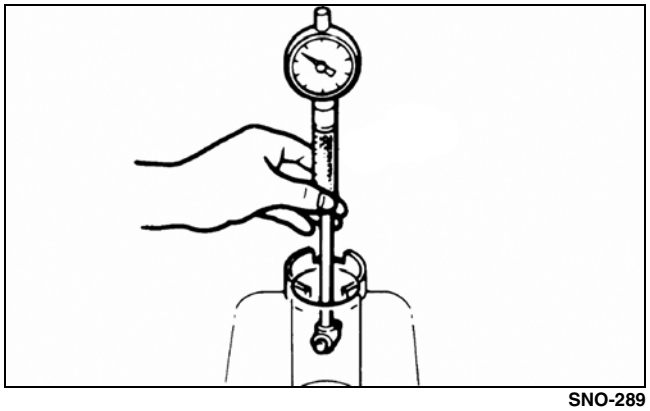
1st Ring	0.0012-0.0028 in.
2nd Ring	0.0008-0.0024 in.



SNO-288

Measuring Piston Skirt/Cylinder Clearance

1. Measure the cylinder bore using a gauge by taking side-to-side and front-to-back measurements of the cylinder. Then, find the average of the measurements.

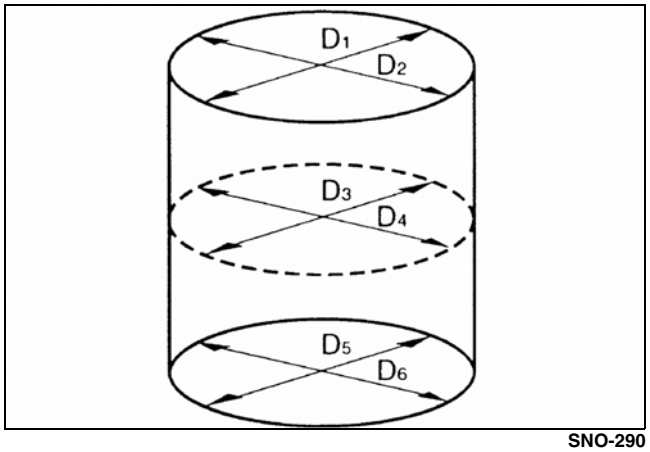


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Cylinder Bore (C)	3.2283 - 3.2287 in.

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Taper Limit (T)	0.050 mm (0.0020 in.)
Out of Round (R)	0.050 mm (0.0020 in.)



SNO-290

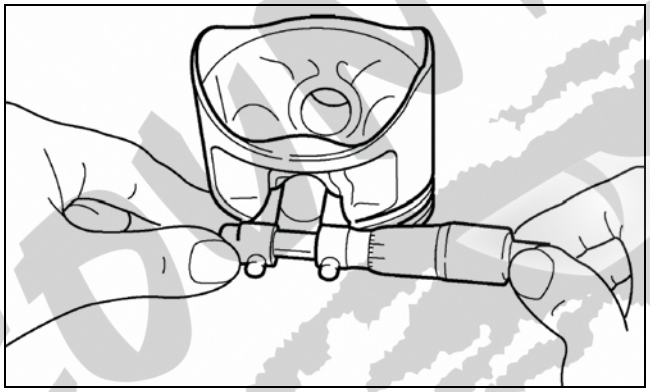
"C" = maximum of D1 - D6
"T" = maximum of D1 or D2 – maximum of D5 or D6
"R" = maximum of D1 D3 or D5 – maximum of D2, D4, or D6

■NOTE: If out of specification, replace the crankcase and the piston and piston rings as a set.

Measuring Piston Pin Bore Diameter

■NOTE: It may be necessary to use Piston Pin Puller to remove the piston pins.

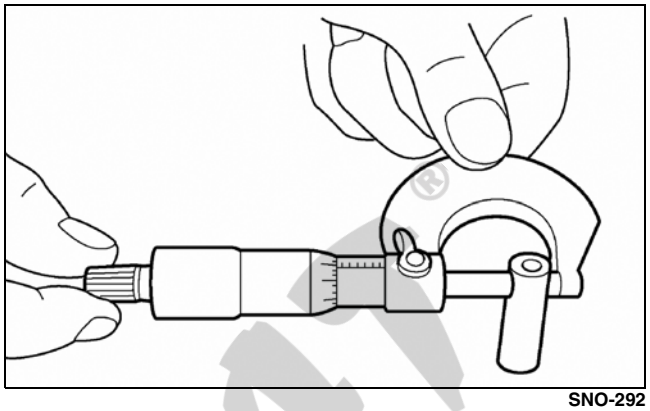
1. Insert an inside dial indicator into the piston-pin bore. Take two measurements to ensure accuracy.
2. Piston pin bore must be within 0.7482-0.7486 in.



SNO-291

Measuring Piston Pin Diameter

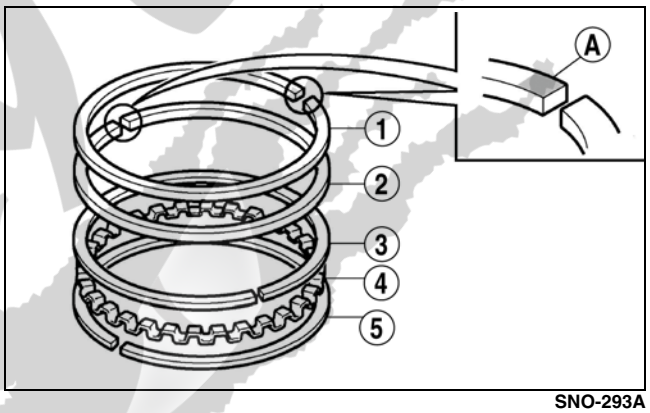
Measure the piston pin diameter at each end and in the center. Measurement must be within 0.7477-0.7480 in. If measurement is not within specifications, the piston pin must be replaced.



SNO-292

Installing Piston Rings

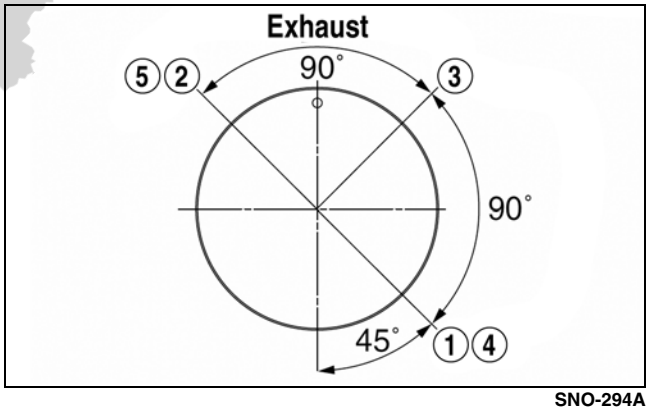
1. Install the piston rings according to the illustration below. Stagger the end gaps of the upper and lower thin oil rings until they are on directly opposite sides of the piston.



SNO-293A

■NOTE: Be sure to install the piston rings so that the manufacturer marks (A) face up.

2. Rotate the rings until the ring end gaps are 120° from one another.



SNO-294A

CAUTION

Incorrect installation of the piston rings will result in engine damage.

CRANKSHAFT RUNOUT

1. Support the crankshaft using a set of V Blocks; use a dial indicator to read crankshaft runout.

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■**NOTE: The contact point of the dial indicator should be on either side of the oil port hole of the center crankshaft journal and to the outside of the oil port hole on the MAG and PTO end of the crankshaft.**

2. Rotate the crankshaft slowly.
3. The reading must be 0.0012 in. or crankshaft repairing/replacing will be necessary.

MEASURING CRANKSHAFT MAIN/ ROD JOURNALS (Bearing Surfaces)

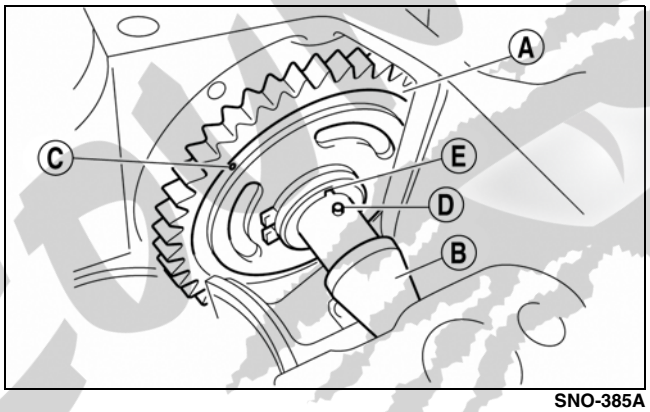
1. Using a micrometer, measure each main and connecting rod bearing journal from along its length and 90° from the first measurement. Measurement must be within 0.0011-0.0018 in.
2. If any journal is badly damaged or has wear that is not within specifications, the crankshaft must be replaced.

Assembling

■**NOTE: Arctic Cat recommends new gaskets, seals, and O-rings be installed whenever assembling the engine.**

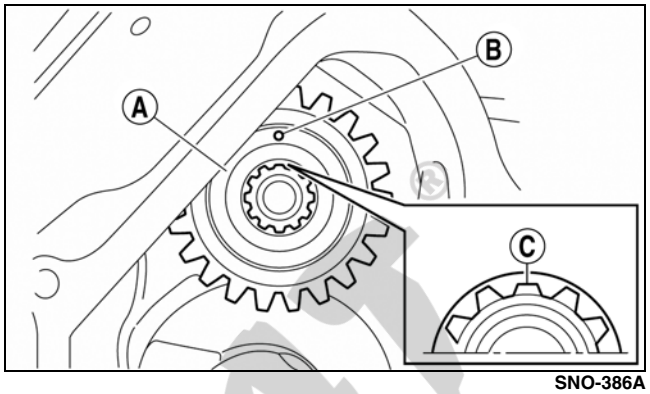
■**NOTE: For assembling purposes, use oil-dissolvable molybdenum disulfide grease as engine-assembly grease.**

1. Install the balancer driven gear (A); then install the balancer shaft (B) making sure to face the punch mark (C) on the balancer driven gear inward. Align the projection (D) on the balancer shaft with the slot (E) in the balancer driven shaft.



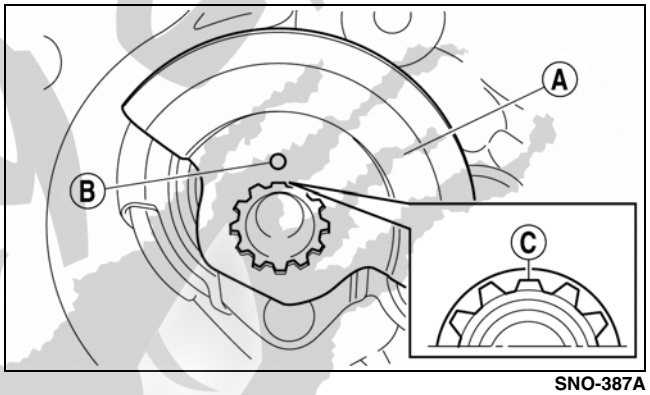
SNO-385A

2. Install the water pump drive gear (A) by aligning the punch mark (B) on the water pump gear with the shorter spline (C) on the balancer shaft end.



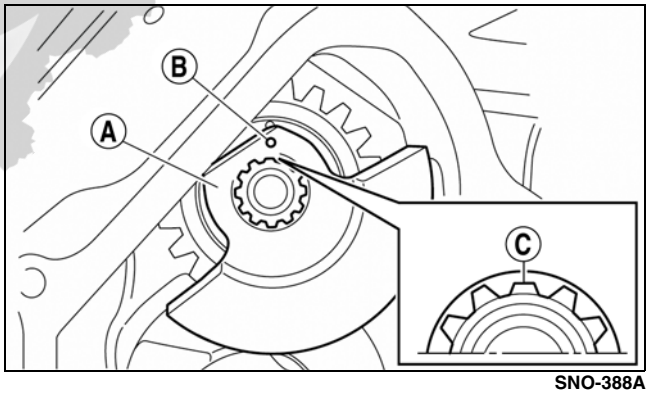
SNO-386A

3. Install the right balancer weight (A) onto the shaft; then install the washers, lock washers, and secure using the existing cap screws making sure to align the punch mark (B) on the shaft with the shorter spline (C) on the shaft end.



SNO-387A

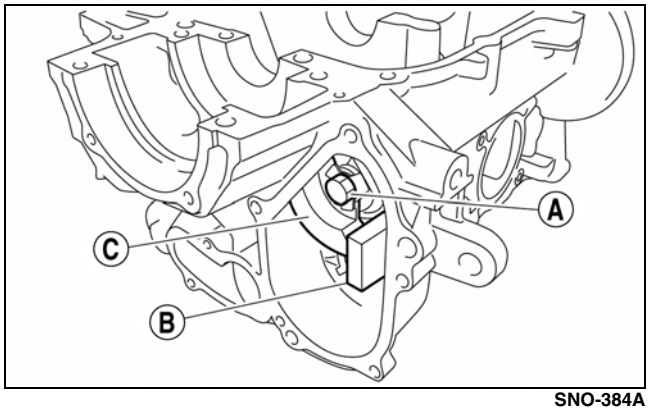
4. Install the left balancer weight (A) onto the shaft; then install the washers, lock washers, and secure using the existing cap screws making sure to align the punch mark (B) on the shaft with the shorter spline (C) on the shaft end.



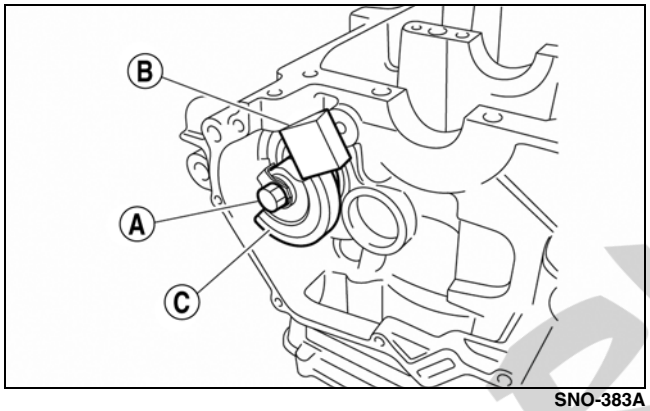
SNO-388A

5. Secure the balancer weights (C) using a small piece of wood (B). Tighten cap screws to 25 ft-lb; then bend the locking washer over the cap screw (A).

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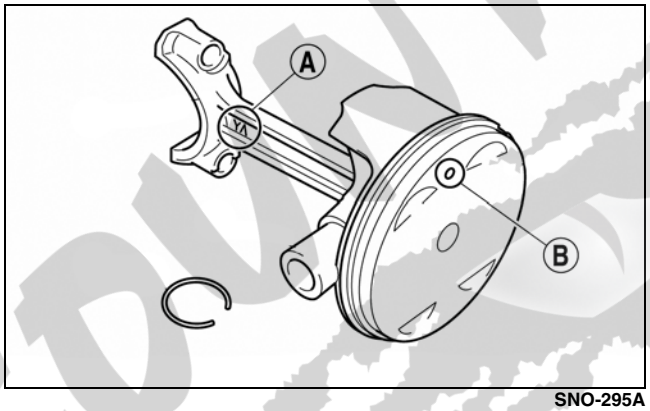


SNO-384A



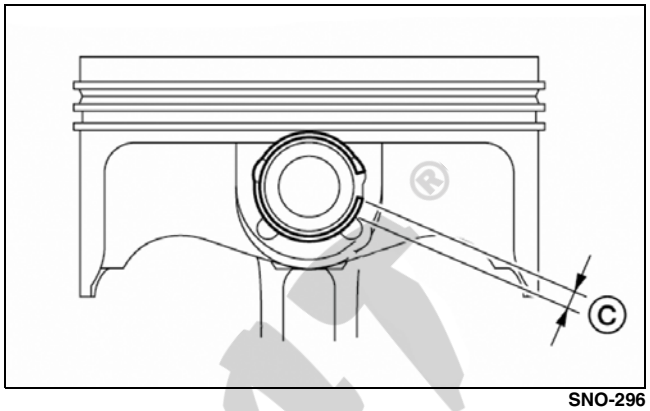
SNO-383A

6. Apply engine oil onto the piston pin. Make sure the "Y" mark (A) on the connecting rod faces to the MAG side when the punch mark (B) on the piston is pointing up.



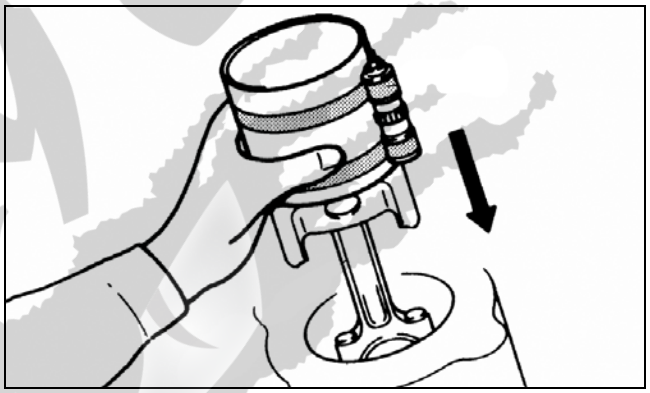
SNO-295A

7. Install the piston pin clips so the clip ends are 3 mm (0.12 in) (C) or more from the cutout in the piston. Make sure the oil ring end gaps are on directly opposite sides of the piston and the compression ring end gaps are 90° from one another.



SNO-296

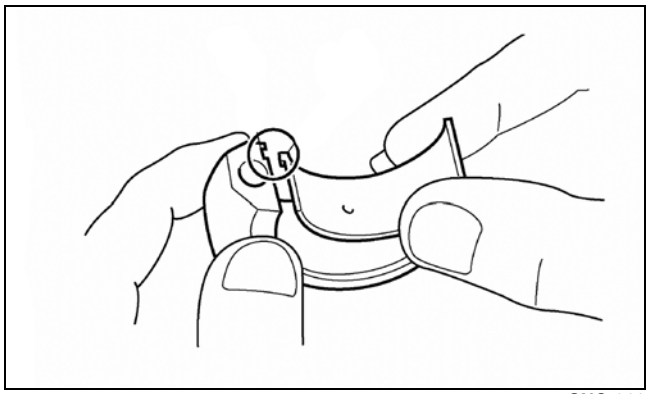
8. With the piston rings installed, lubricate each piston and cylinder with engine oil; then with the punch marks on the top of the pistons directed towards the exhaust side of the engine, install the piston assemblies into the cylinder using Ring Compressor and a soft hammer.


SNO-297

9. Rotate the engine to the upside down position for installing the crankshaft.

10. With the proper bearings selected, install the half-bearings into the upper engine case; then lubricate the bearing faces liberally with engine-assembling grease taking care not to get any grease between the engine case and bearing.

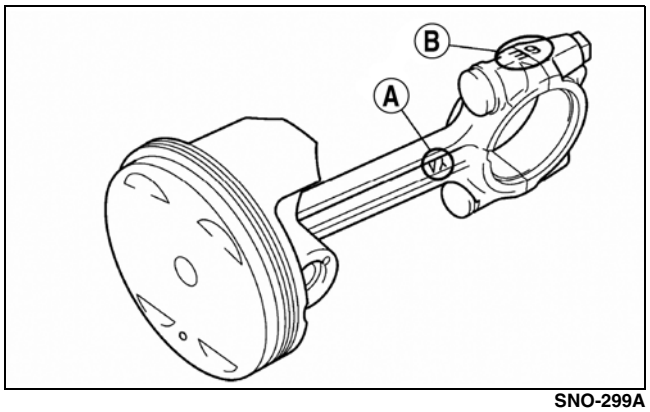
■NOTE: Make sure the tabs of the bearings are properly seated to the notches in the upper engine case.


SNO-298

11. Lubricate the lips of the crankshaft seal with grease and install the crankshaft seal over the PTO end of the crankshaft with the spring side of the seal directed toward the crankshaft; then install the crankshaft.

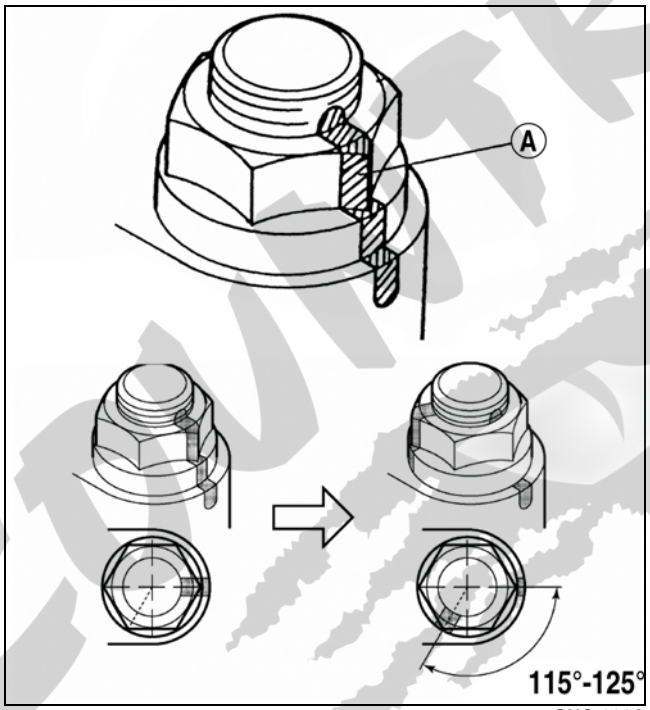
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■NOTE: Make sure the "Y" marks (A) on the connecting rods face towards the right side (MAG side) of the crankshaft. Make sure the characters (B) on both the connecting rod and connecting rod cap are aligned.



SNO-299A

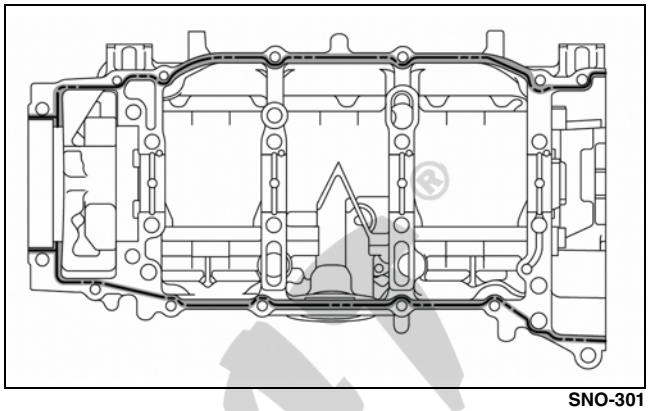
12. Seat the connecting rods to the crankshaft; then install the connecting rod caps, new cap screws, and new nuts. Tighten only until snug at this time.
13. Alternately, tighten each of the connecting rod nuts evenly to 14 ft-lb; then put a mark (A) on the corner of the connecting rod nut #1 and the connecting rod nut #2. Tighten the connecting rod nut further to reach the specified angle (115-125°).



SNO-300A

■NOTE: Rotate the crankshaft one revolution to verify free movement.

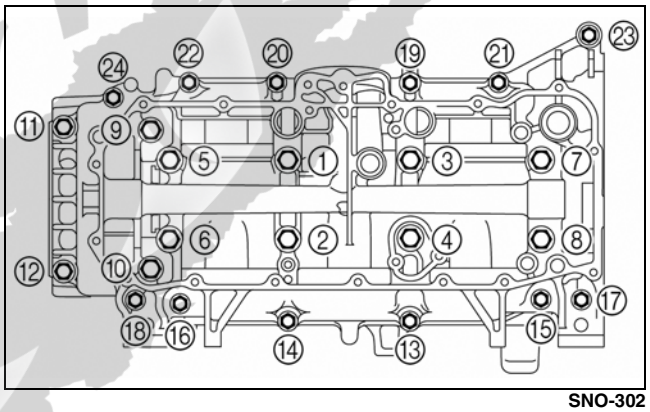
14. Using Three Bond Sealant, apply a light film of sealant onto the sealing surfaces of the upper and lower engine cases.



SNO-301

■NOTE: Do not allow any sealant to come into contact with the oil galley or crankshaft journal bearings. Do not apply sealant to within 0.08-0.12 in. of the crankshaft journal bearings.

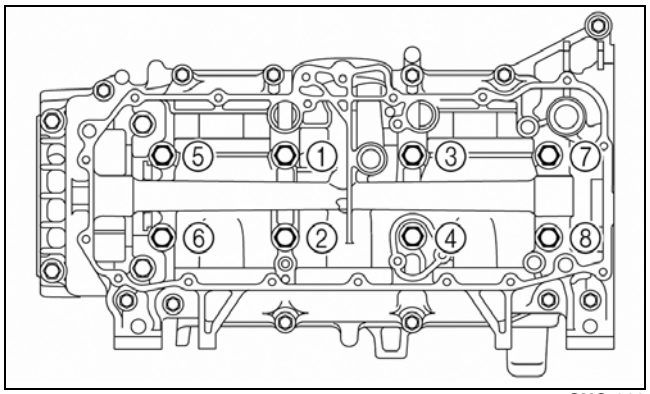
15. Install the lower crankcase half to the upper engine case; then verify the cases are properly seated together.
16. Install the cap screws into the proper locations in the crankcase; then with the torque pattern shown as numbered on the case, tighten the cap screws only until snug.



SNO-302

■NOTE: Lubricate cap screws 1-8 threads and washers with engine oil. Lubricate bolts 9-15 and 19-24 threads and mating surface with engine oil. Apply Three Bond Sealant to the threads of cap screws 16-18.

17. Tighten crankcase cap screws 1-8 to 11 ft-lb; then loosen and re-tighten to 11 ft-lb.
18. Tighten the cap screws 1-8 an additional 65°-70°.



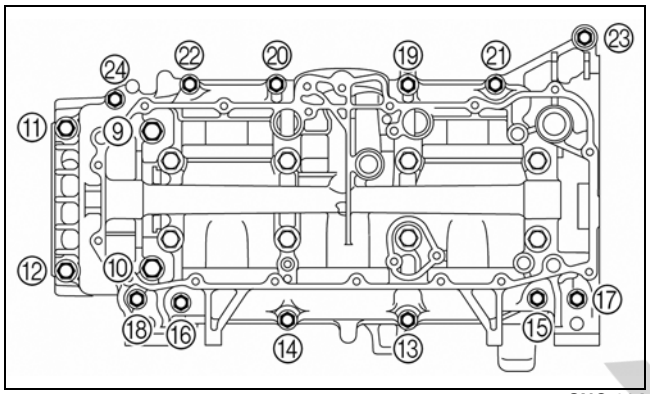
SNO-303

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■NOTE: If a cap screw is tightened more than the specified angle, do not loosen the bolt and then retighten it. Instead, replace the bolt with a new one and perform the procedure again.

■NOTE: Do not use a torque wrench to tighten the bolt to the specified angle.

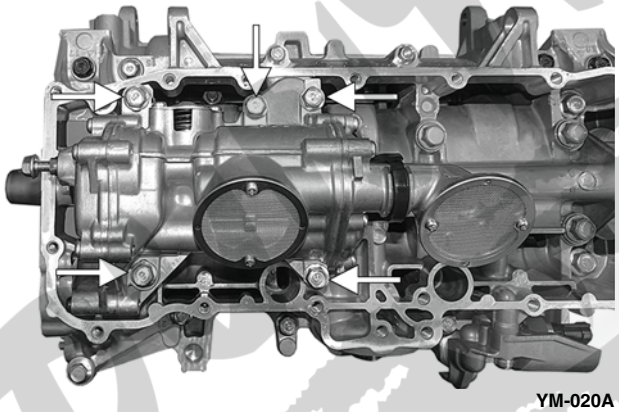
19. Tighten cap screws 9-24 in order of the embossed numbers on the crankcase. Tighten cap screws 9-12 to 17 ft-lb and cap screws 13-24 to 104 in.-lb.



SNO-304

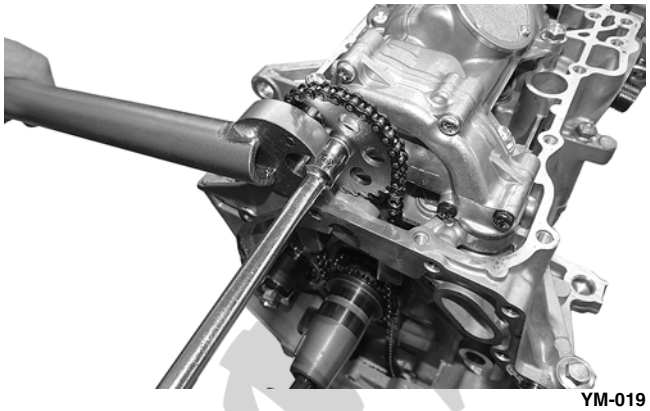
■NOTE: After the tightening sequence, rotate the crankshaft one revolution to verify free movement.

20. Place the dowel pins in place; then position the oil pump assembly on the crankcase and secure using the existing cap screws. Tighten to 11 ft-lb.

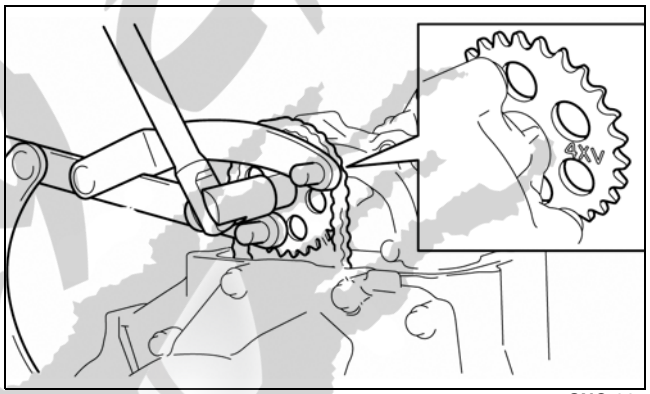

YM-020A

■NOTE: At this time, install the timing chain around the crankshaft as it must go on before the oil pump chain.

21. Position the oil pump chain around the crankshaft; then install the oil pump driven gear and secure using the existing cap screw. Tighten to 11ft-lb.

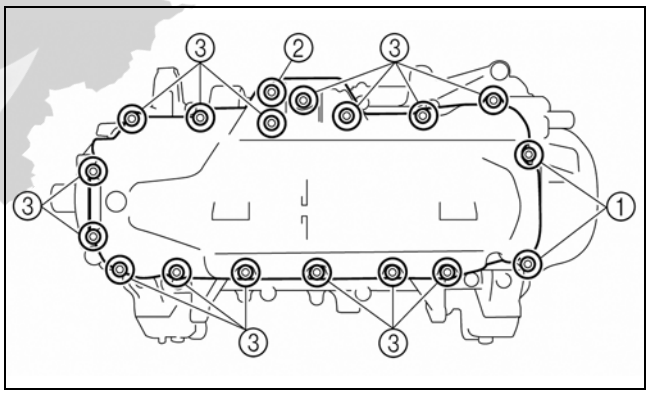

YM-019

■NOTE: Install the oil pump driven gear with the stamped mark "4XV" facing towards the oil pump assembly.



SNO-305

22. With a new gasket and the existing dowel pins in place, install the oil pan and install the different-length cap screws. Using the pattern shown, tighten the screws to 86 in.-lb.



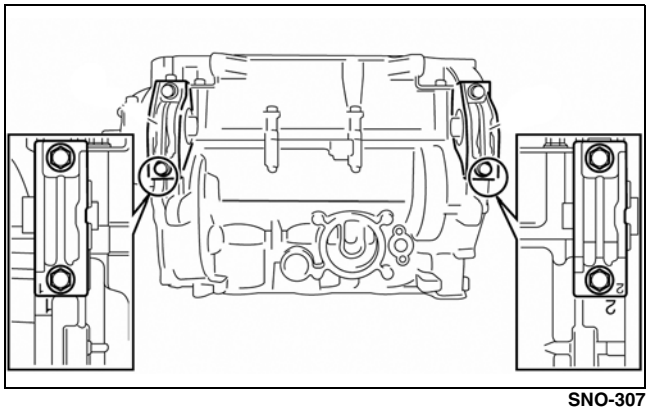
SNO-306

■NOTE: If the oil pan drain plug was removed, always install new drain plug and reservoir washers.

■NOTE: At this time, rotate the engine to the upright position.

23. Secure the rear mounting brackets to the engine case making sure the numbers on the brackets match the numbers on the case. Tighten to 18 ft-lb.

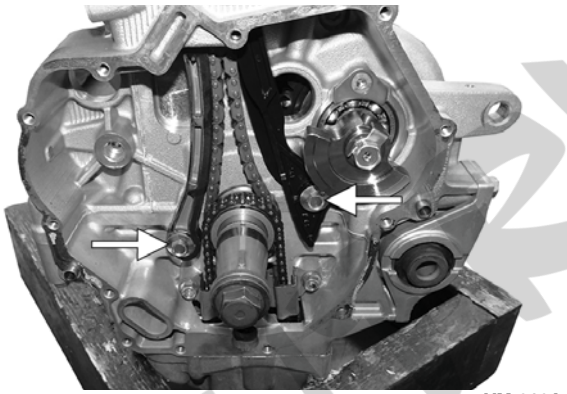
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SNO-307

■**NOTE: Prior to installing the cam chain tensioner, assure the chain is properly seated to the gear on the crankshaft.**

24. Install the chain guides and secure using the existing cap screws. Tighten to 86 in.-lb.

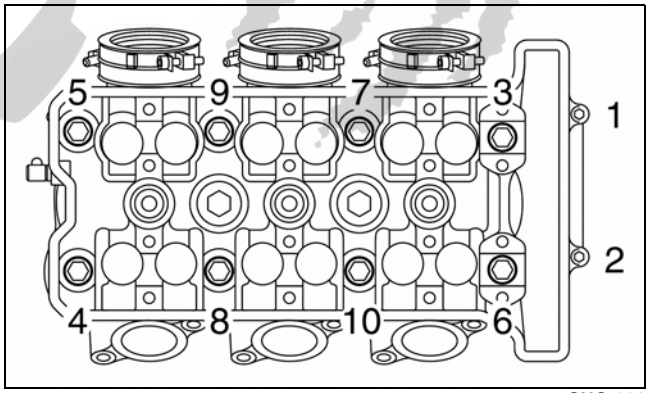


YM-016A

25. Position a new cylinder head gasket onto the crankcase; then position the existing dowel pins into the crankcase.
26. Route the timing chain through the cylinder head assembly and place the head onto the crankcase.

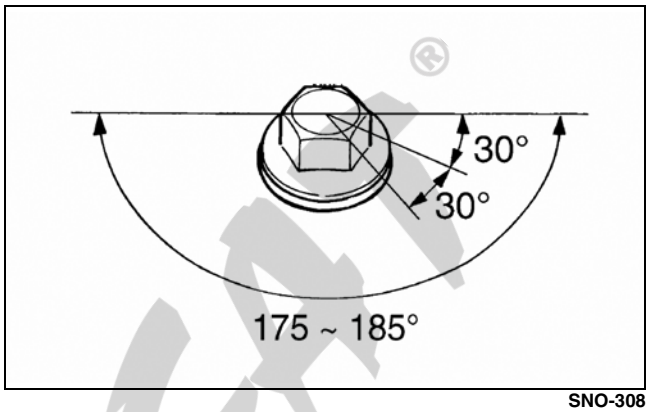
■**NOTE: Make sure to use new cap screws #3-10 when installing the head.**

27. Lubricate the new cap screws #3-10; then secure the cylinder head assembly to the crankcase using the existing cap screws. Tighten to 18 ft-lb; then loosen the cap screws and re-tighten to 18 ft-lb.



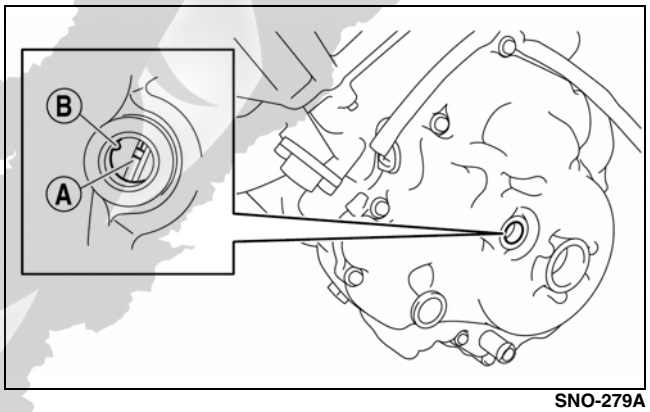
SNO-280

28. Tighten the cylinder head bolts further to reach the specified angle 175°-185° in the proper tightening sequence as shown. Do not use a torque wrench for this step.



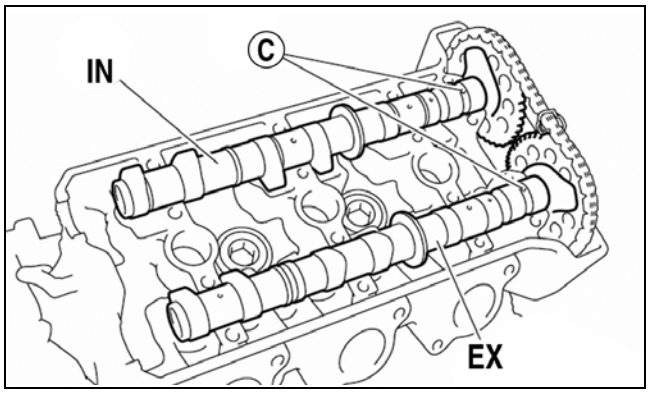
SNO-308

29. Tighten the Allen-head screws #1 and #2 to 104 in.-lb.
30. Position the intake and exhaust camshaft assemblies into the head.
31. Turn the crankshaft clockwise. When piston #3 is at TDC on the compression stroke, align the "I" mark (A) on the magneto rotor with the stationary pointer (B) on the magneto cover. Install the timing chain onto both camshaft sprockets.



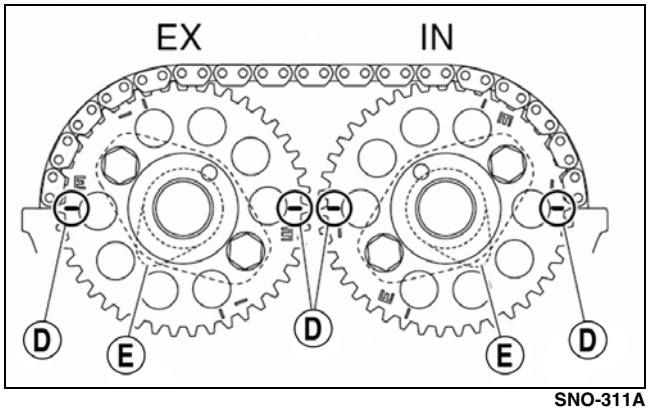
SNO-279A

32. Install the camshafts with the hole (C) in cylinder #3 (cam facing up). When installing the timing chain, start with the intake camshaft and be sure to keep the timing chain as tight as possible on the intake side. Make sure the marks (D) on the timing chain sprockets are parallel with the edge of the cylinder head. Location (E) is cylinder #3 cam location.



SNO-310A

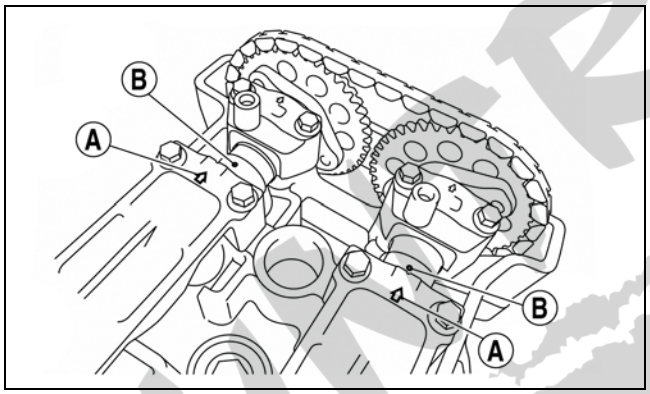
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SNO-311A

33. Install the existing dowel pins into the cylinder head; then install the intake and exhaust camshaft caps. Tighten the camshaft cap screws to 86 in.-lb in two stages and in a crisscross pattern working from the inner caps out.

■NOTE: The "I" mark refers to the intake camshaft caps and the "E" mark refers to the exhaust camshaft caps. Install the camshaft caps with the arrow mark a pointing towards the MAG side of the engine. Make sure the holes (B) in the camshaft are aligned with the arrow mark (A) on the camshaft caps.

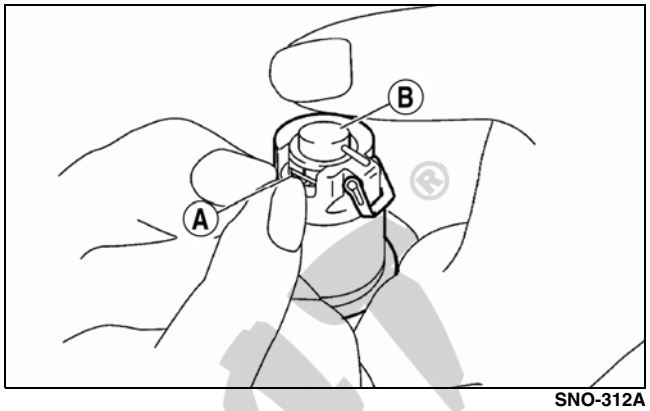


SNO-283A

CAUTION

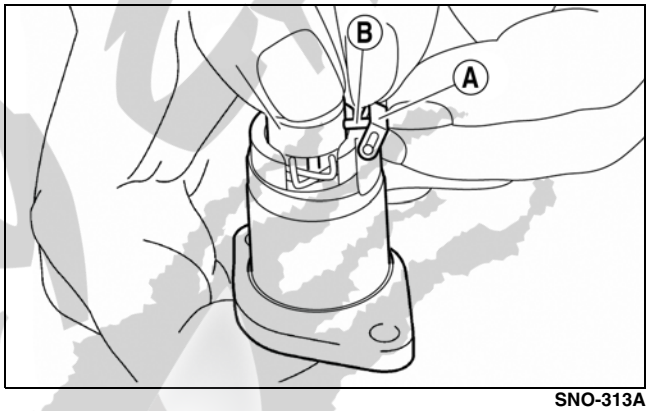
Lubricate the camshaft cap screws with engine oil. The camshaft cap screws must be tightened evenly or damage to the cylinder head, camshaft caps, and camshafts will result. Do not turn the crankshaft when installing the camshaft to avoid damage or improper valve timing.

34. Squeeze the timing chain tensioner clip (A); then push the timing chain tensioner rod (B) into the timing chain tensioner housing. Do not release the timing chain tensioner clip while pushing the rod into the housing or the rod may be ejected.



SNO-312A

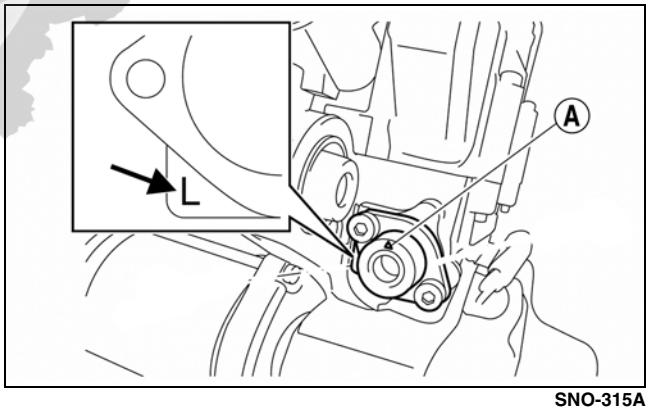
35. With the tensioner rod compressed, flip the hook (A) over the rod (B) to secure it down.



SNO-313A

36. Install the chain tensioner assembly and secure using the existing allen-head screws. Tighten to 104 in.-lb.

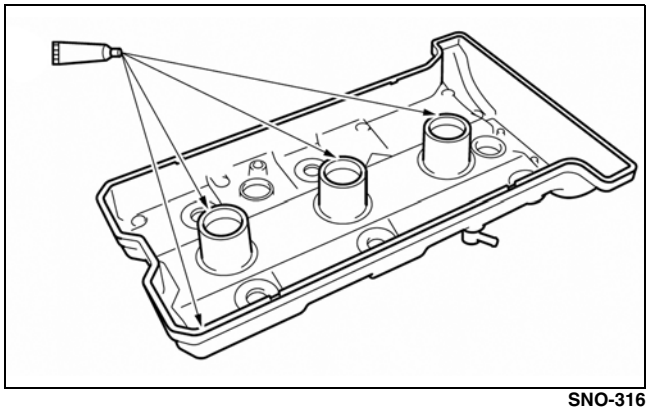
■NOTE: Be sure to install the timing chain tensioner gasket so its section with the "L" mark is protruding from the lower left side of the timing chain tensioner. The arrow mark (A) on the timing chain tensioner should face up.



SNO-315A

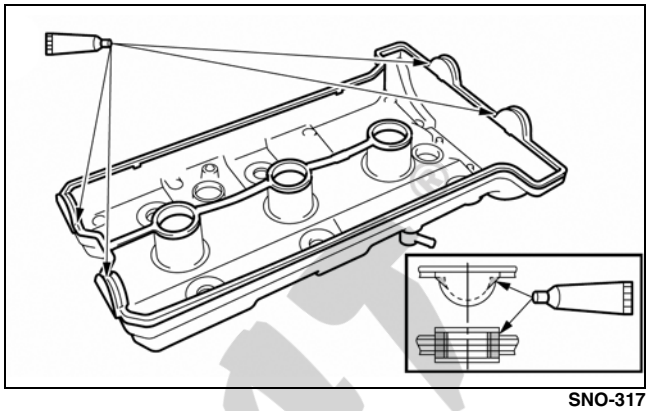
37. Apply Three Bond Sealant onto the mating surfaces of the cylinder head cover and cylinder head cover gasket.

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SNO-316

38. Apply Three Bond Sealant onto the mating surfaces of the cylinder head cover gasket. Tighten the cylinder head cover screws in a crisscross pattern to 7.2 ft-lb.



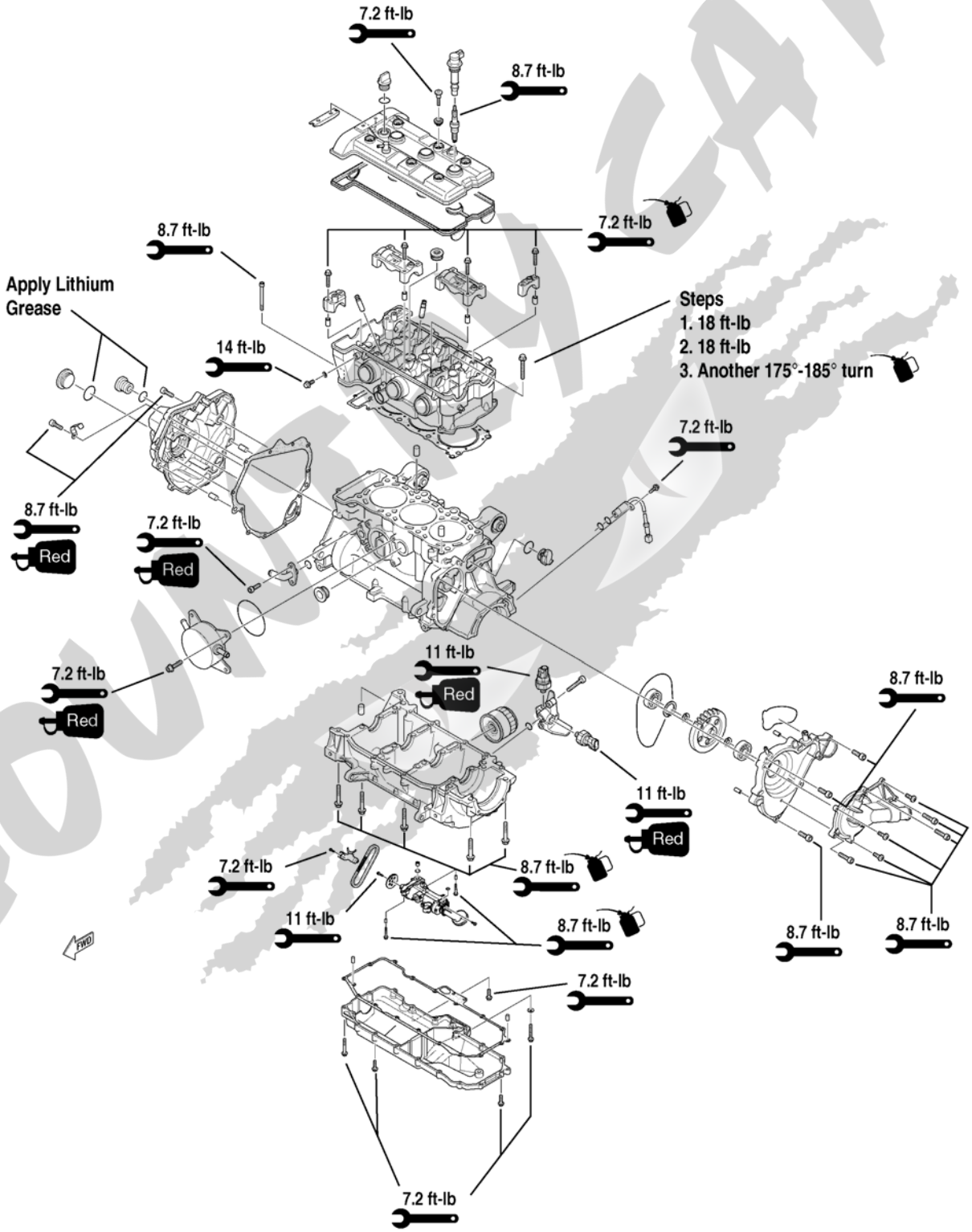
SNO-317

39. Install the spark plugs. Tighten to 8.7 ft-lb.
40. Install the ignition coils over the spark plugs making sure they are fully seated.

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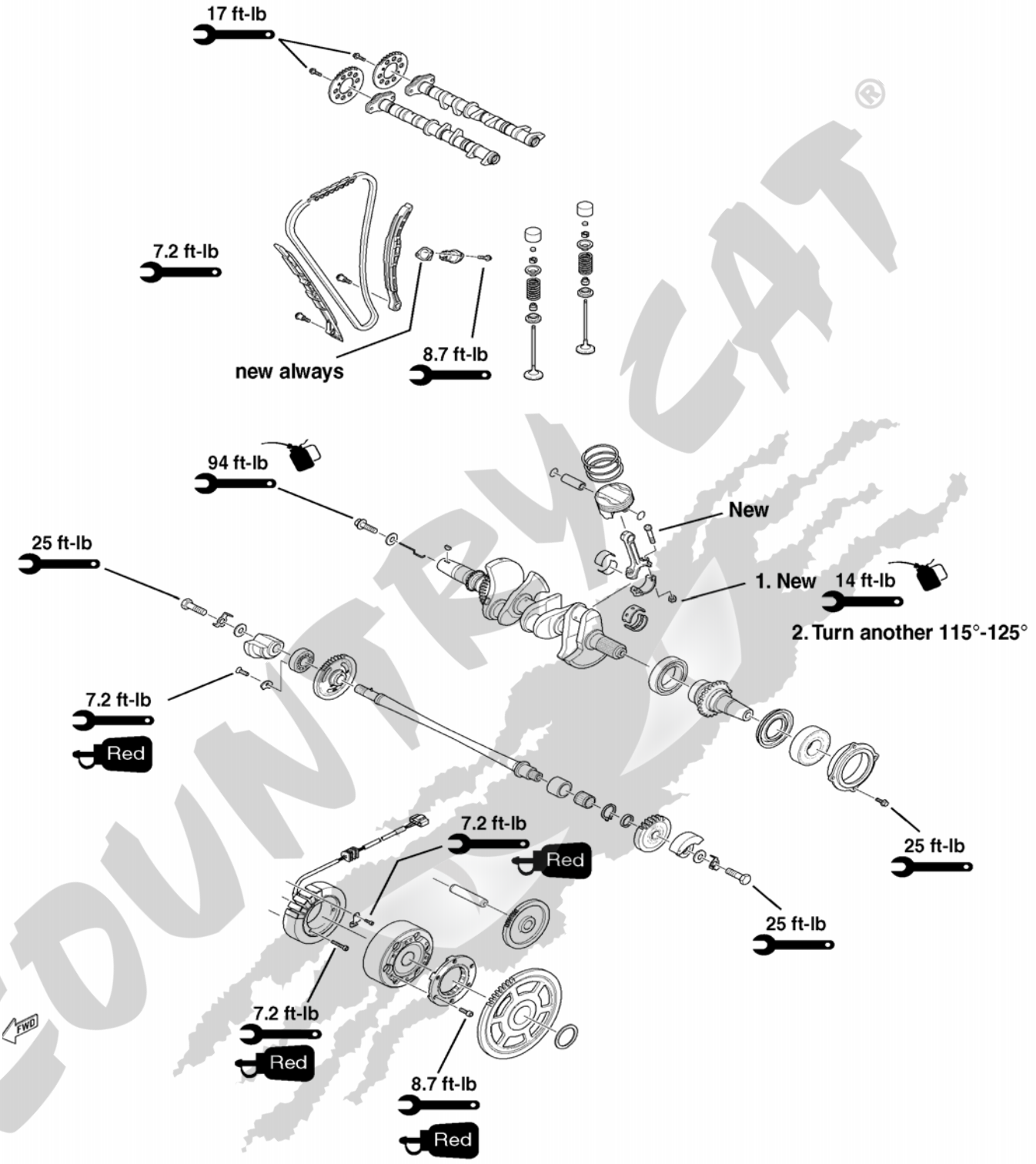
Assembly Schematic - 7000

Torque Specification Tolerances	
Torque (ft-lb)	**Tolerance**
0-15	±20%
16-39	±15%
40+	±10%



1049cc_14_2

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1049cc_14_1

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Troubleshooting Engine

Problem: Engine Does Not Start (No Spark at Spark Plugs)	
Condition	**Remedy**
1. **Ground connections** dirty — loose	1. Check all ground connections — clean and tight
2. **Wiring harness** shorting — disconnected	2. Repair — replace — connect wiring harness
3. **Emergency stop switch** in DOWN position — malfunctioning	3. Move switch to UP position — replace throttle control
4. **Throttle/ignition monitor switch** malfunctioning	4. Adjust throttle cable tension — replace throttle body assembly
5. **Spark plugs** fouled — damaged	5. Clean — replace spark plugs
6. **Idle speed control (ISC valve)** not functioning	6. Turn ignition switch ON and OFF — listen for stepping motor (ISC valve) operation
7. **ECM** faulty	7. Replace ECM
8. **Ignition timing sensor/Crank position sensor** faulty	8. Replace sensor
Problem: Engine Does Not Start (No Fuel at Cylinders)	
Condition	**Remedy**
1. **Gas tank** empty	1. Fill tank
2. **Gasoline** contaminated	2. Replace gasoline
3. **Fuel pump** faulty	3. Service — replace fuel pump — connections — wires
4. **Fuel hose** broken — pinched	4. Replace — service hose
5. **Gas-tank vent** — **hose** obstructed	5. Remove obstruction — replace vent — hose
6. **Pick-up valve(s)** obstructed — damaged	6. Remove obstruction — replace pick-up valve(s)
7. **Compression** absent	7. Repair — replace damaged — worn engine components
8. **ECM** faulty	8. Replace ECM
Problem: Engine Does Not Start (Fuel Does Not Ignite)	
Condition	**Remedy**
1. **ECM Check Engine light** failed	1. Check codes — repair as necessary
2. **Spark** absent	2. Check for spark — see No Spark at Spark Plugs sub-section
3. **Compression** low	3. Service engine
4. **Engine** flooded	4. Clear engine (hold throttle full-open)
5. **Gasoline** contaminated	5. Clean tank and entire fuel system
Problem: Engine Does Not Idle	
Condition	**Remedy**
1. **ECM** trouble code	1. Service — replace problem component
2. **Throttle cable** too tight	2. Adjust throttle cable to specifications*
3. **Injector(s)** faulty	3. Replace injector(s)
4. **Fuel pressure regulator** faulty	4. Replace regulator — hose
5. **Air silencer** obstructed	5. Clean air silencer
6. **ISC valve** faulty	6. Replace valve
Problem: Engine Loses Power	
Condition	**Remedy**
1. **Sensor** faulty	1. Check engine light for trouble code — repair — replace problem circuit or sensor
2. **Spark plug** fouled	2. Replace spark plugs
3. **External coil** faulty	3. Service — replace coil
4. **Gas tank vent — hose** obstructed	4. Service — replace vent hose
5. **Compression** low	5. Service engine
6. **ECM** faulty	6. Replace ECM
7. **Fuel pressure regulator** faulty	7. Replace regulator
8. **Check Engine light** illuminated	8. Check codes — repair as necessary
9. **Injector** faulty	9. Replace injector

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Problem: Engine Overheats	
Condition	**Remedy**
1. **Coolant** low — absent	1. Add coolant
2. **Heat exchanger** obstructed	2. Remove obstruction
3. **Drive system (drive clutch — driven clutch — track — drive belt)** adjusted incorrectly — worn — damaged	3. Troubleshoot — adjust drive system
4. **Rings/grooves** carboned	4. Clean — replace rings — pistons
5. **Exhaust** obstructed	5. Remove obstruction
6. **Compression** low — absent	6. Repair — replace damaged — worn engine components
7. **Water pump — thermostat** damaged — faulty	7. Replace water pump — thermostat
Problem: Engine Backfires	
Condition	**Remedy**
1. **Check Engine light** illuminated	1. Check codes — replace problem component
2. **Spark plugs** fouled — damaged	2. Clean — replace spark plugs
Problem: Engine Stops Suddenly	
Condition	**Remedy**
1. **Gas tank** empty	1. Fill tank
2. **Spark** absent	2. See No Spark at Spark Plugs sub-section
3. **Check Engine light** illuminated	3. Check codes — replace problem component
4. **Fuel filter(s)** obstructed	4. Replace filter(s)
5. **Fuel pressure** low	5. Replace regulator — hose
6. **Fuel pump** faulty	6. Service — replace fuel pump
7. **Fuel pump relay** faulty	7. Replace relay
8. **Gas tank vent hose** obstructed	8. Service vent hose
9. **ECM** faulty	9. Replace ECM
10. **Fuel hose** obstructed — broken — pinched	10. Remove obstruction — repair — replace fuel hose
11. **Ignition coil** faulty	11. Replace ignition coil
12. **Engine** seized	12. Overhaul engine
13. **Throttle/ignition monitor switch — throttle cable tension** faulty — adjusted incorrectly	13. Replace throttle control — adjust throttle cable
14. **Oil pressure** low	14. Check oil level/engine
15. **Engine coolant temperature** above normal	15. Inspect cooling system

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Engine-Related Items

■**NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.**

SPECIAL TOOLS

A number of special tools must be available to the technician when servicing the engine-related items.

Description	p/n
Blind-Hole Bearing Puller	0644-500
Coolant Cap	0644-156
Drive Clutch Spanner Wrench	0644-136
Valve and Spring Retainer Tool	0644-448
Fan Spanner Wrench	0644-340
Water Pump Bearing and Seal Tool Kit	0644-557
Oil Seal Protector Tool	0644-219
Engine Leak-Down Test Kit	0644-522
Vacuum Test Pump	0644-131
Hood Harness Extension	1686-659
Hood Harness Extension	1686-660
Oil Filter Wrench	0644-551

■**NOTE: Special tools are available from the Arctic Cat Service Parts Department.**

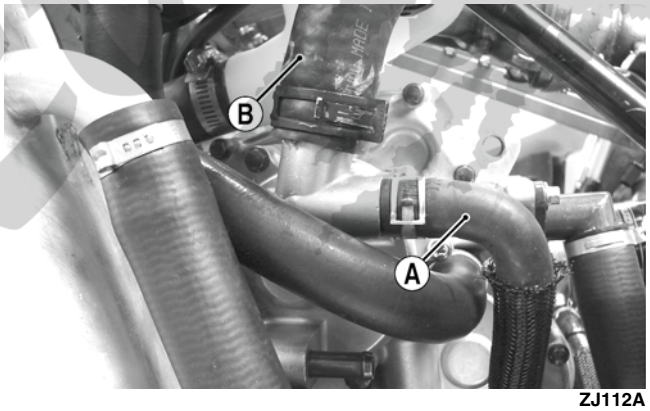
Water Pump

⚠ WARNING

When servicing the water pump, disconnect the negative battery cable to avoid injury.

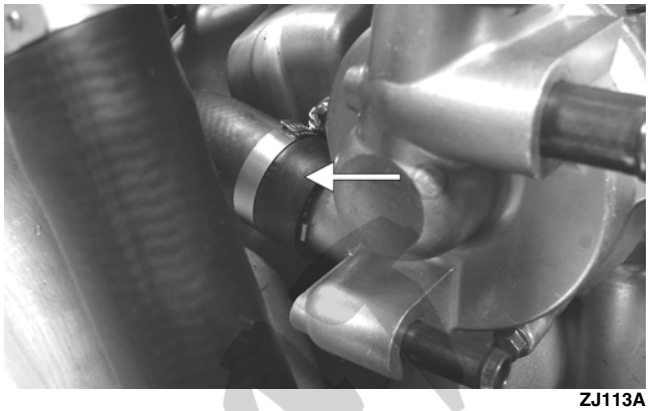
REMOVING (5000/9000)

1. Drain the engine coolant (see Liquid Cooling System in this section).
2. Remove the water bypass hose (A); then remove the coolant tank/engine hose (B).



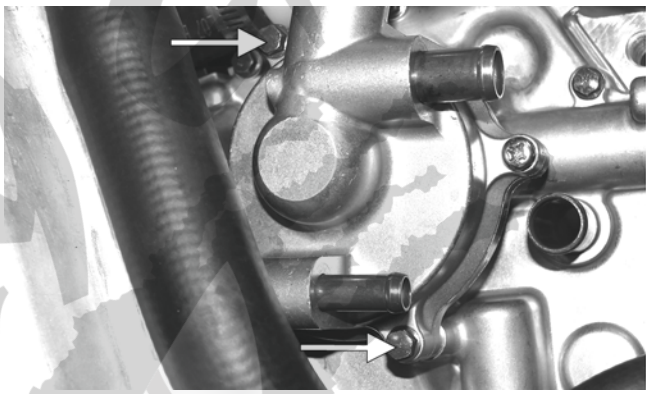
ZJ112A

3. Remove the separator tank breather hose to gain access to the water pump; then remove the water inlet hose from the water pump.



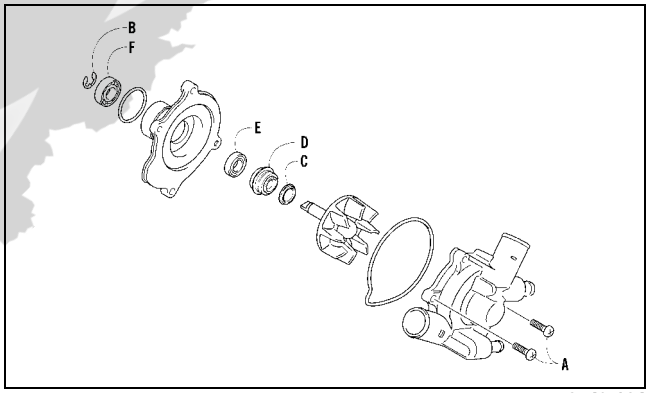
ZJ113A

4. Remove the two cap screws securing the water pump to the engine; then remove the pump and account for the O-ring.



ZJ114A

DISASSEMBLING/ASSEMBLING (5000/9000)



0742-104

1. Secure the water pump in a suitable support device; then remove the two Phillips-head screws (A) securing the inner/outer pump housings.
2. Separate the inner/outer pump housings; then remove the E-clip (B) from the impeller shaft, remove the shaft from the inner housing, and remove the ceramic seal (C) from the shaft.
3. With the inner housing secured in a suitable clamping device and using Blind-Hole Bearing Puller, remove the mechanical seal (D); then remove the oil seal (E).

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■**NOTE: Apply heat to the housing to aid in removing the seals.**

CAUTION

Do not apply excessive heat to the housing or the bushing next to the bearing may be damaged.

4. Using the bearing puller, remove the bearing (F) from the inner housing.

■**NOTE: Apply heat to the housing to aid in removing the bearing.**

CAUTION

Do not apply excessive heat to the housing or the bushing next to the bearing may be damaged.

5. Clean the inner and outer housings with parts-cleaning solvent; then dry with compressed air.

⚠ WARNING

Always wear safety glasses when drying components with compressed air.

■**NOTE: For assembly, use Water Pump Bearing and Seal Tool Kit.**

6. Using the appropriate-sized installation tool, install the bearing (F) into the inner housing.
7. Using the appropriate-sized installation tool, install the oil seal (E) with the spring side facing the bearing.
8. Place the mechanical seal (D) into the inner housing; then using the appropriate-sized installation tool, drive the seal into the housing until the lip of the seal is properly seated.
9. Install the ceramic seal (C) onto the impeller shaft with the ceramic face of the seal facing away from the impeller.
10. Install the impeller shaft into the inner housing and secure with the E-clip (B); then with a new O-ring properly positioned in the outer housing, place the water pump halves together.

■**NOTE: Apply a light coat of grease on the O-ring to aid in keeping it properly positioned.**

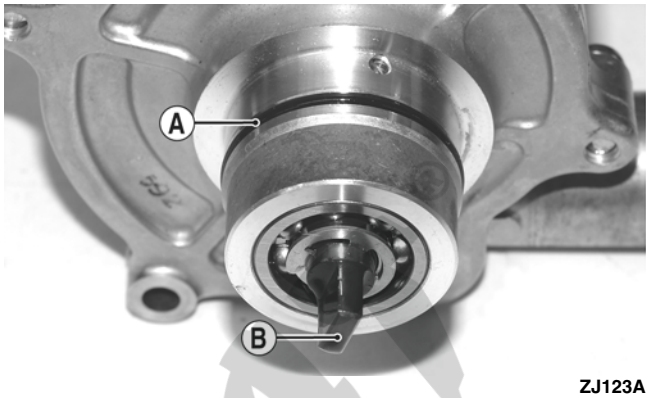
11. Secure the housings with the two Phillips-head screws (A); then tighten the screws with an impact driver.

CAUTION

Care should be taken not to over-tighten the screws with the impact driver or damage to the housings may occur.

INSTALLING (5000/9000)

1. With a new O-ring (A) in place on the inner housing and the water pump shaft (B) properly aligned with the oil-feed pump shaft, install the water pump.



ZJ123A

2. With the water pump properly positioned, secure the pump with two cap screws and tighten to 84 in.-lb.
3. Install the water inlet hose and secure with the clamp; then install the separator tank breather hose and the remaining coolant hoses. Secure with the clamps.
4. Fill the cooling system (see Liquid Cooling System in this section).

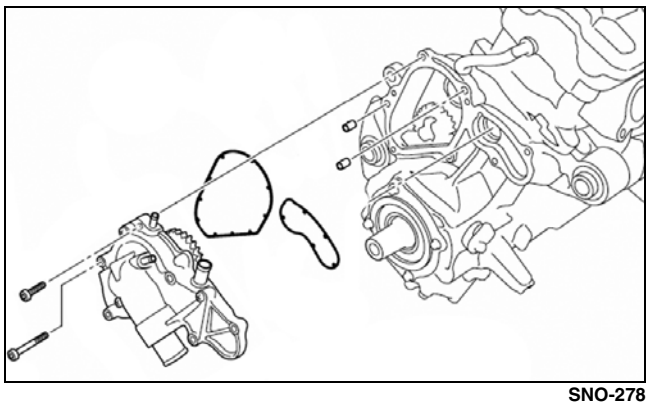
REMOVING (7000)

1. Drain the engine coolant.
2. Remove the drive clutch, drive belt, driven clutch and the clutch guard.
3. Remove the cap screws and nuts securing the left-side chassis support; then carefully tip the support up to gain clearance to the water pump.



YM-054

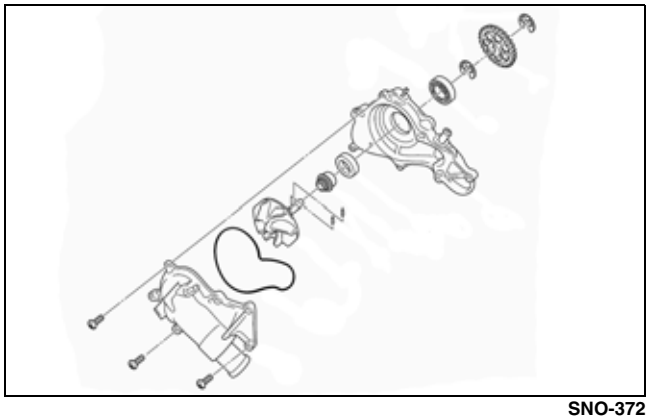
4. Disconnect all hoses from the water pump; then remove the allen-head screws securing the water pump assembly to the crankcase; then remove the assembly. Account for two dowel pins and two gaskets.



SNO-278

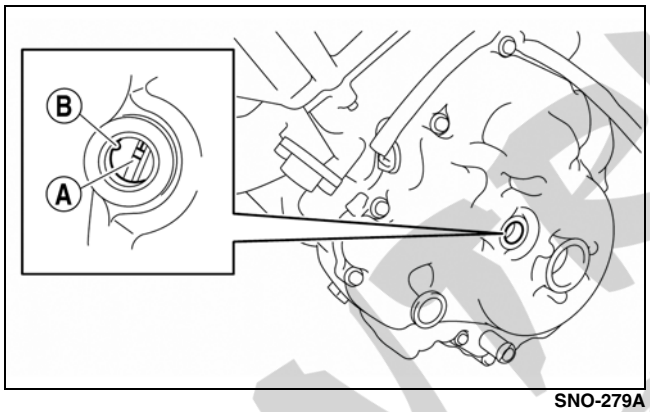
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DISASSEMBLING/ASSEMBLING (7000)



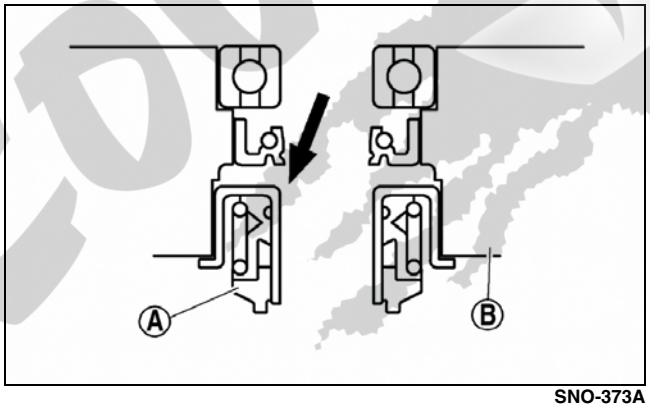
SNO-372

1. Obtain top-dead-center (TDC) by rotating the crankshaft (clockwise) until the mark on the magneto rotor is aligned with the pointer on the magneto cover and the #3 piston is at TDC.



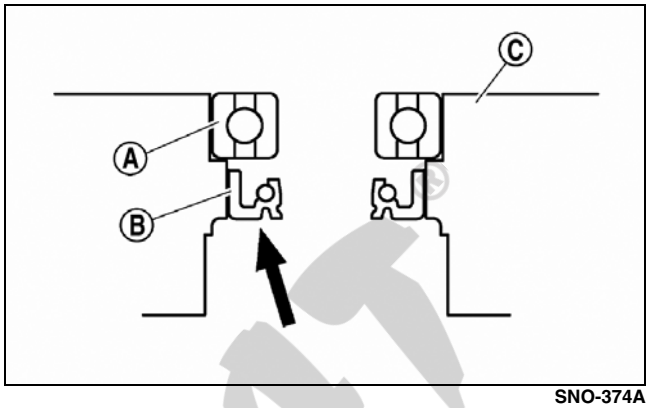
SNO-279A

2. Remove the screws securing the water pump cover to the water pump; then remove the impeller.
3. Remove the water pump seal (A) from the water pump housing (B).



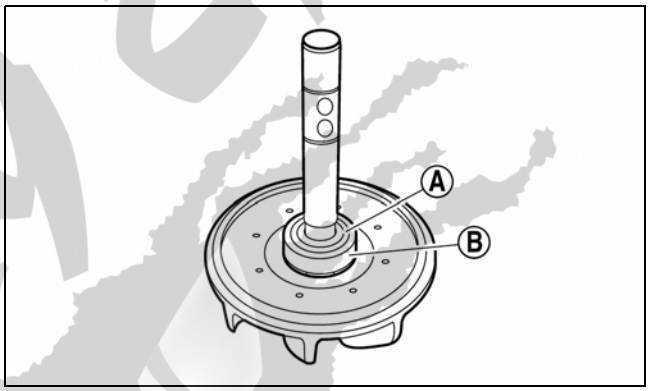
SNO-373A

4. Remove the bearing (A) and the oil seal (B) from the water pump housing (C).



SNO-374A

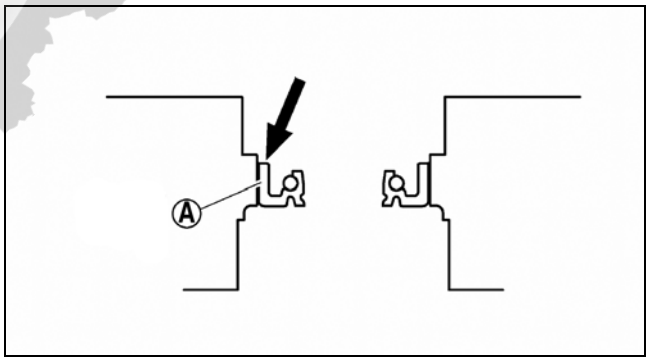
5. Remove the rubber damper holder (A) and the rubber damper (B) from the impeller using a small flat-head screwdriver making sure not to damage the impeller shaft.



SNO-375A

INSTALLING (7000)

1. Apply tap water or coolant to the outer surface of the new oil seal; then install the oil seal (A) into the water pump housing using a socket of the same diameter.



SNO-376A

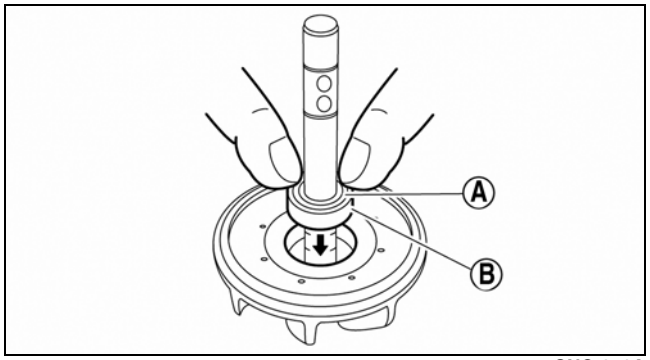
2. Install the bearing using a socket of the same diameter; then apply sealant to the water pump housing; then install the water pump seal using the mechanical seal installation tool.

CAUTION

Never apply oil or grease onto the water pump seal surface.

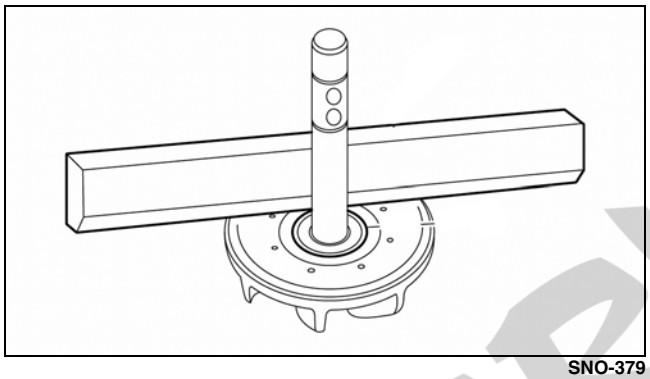
3. Apply tab water or coolant to the impeller shaft; then press the rubber damper holder (A) and rubber damper (B) onto the impeller shaft.

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SNO-378A

4. Using a straight edge, make sure the impeller is flush with the damper.



SNO-379

5. Install the impeller assembly into the housing and secure using the existing circlip.
6. With the engine still at Top-Dead-Center (TDC), install the water pump and secure using the existing screws. Tighten to 8.7 ft-lb.
7. Fill the cooling system.

Pressure Testing Engine

■NOTE: To pressure test the engine, use Engine Leak-Down Test Kit.

Checking Compression

■NOTE: Prior to this test procedure, verify the battery is fully charged and the console is positioned over the support bracket with the hood/main harness plugged in.

■NOTE: This test must be done with the engine at operating temperature and "full-cranking RPM" and the decompression system active.

5000/9000

With the spark plugs removed, install the compression tester gauge with adapter into the spark plug hole; then with the throttle valve in the full-open position, crank the engine over to get the psi reading. Compression should be 120 psi.

7000

With the spark plugs removed, install the compression tester gauge with adapter into the spark plug hole; then with the throttle valve in the full-open position, crank the engine over to get the psi reading. Compression should be 213.3 psi

CAUTION

Do not ground the spark plug on the cylinder head cover. The cover is made of magnesium and any contact with spark or electrical arc will severely pit the surface.

■NOTE: Verify both cylinder compression readings are within 10% of each other.

Changing Oil/Filter

5000/9000

⚠ WARNING

Care must be taken if a hot drain plug is removed by hand. Burning could occur.

■NOTE: For this procedure, disconnect the hood harness and the air intake connector from the air silencer; then remove the cables and pins securing the hood to the front end, remove the hood, and remove the access panels.

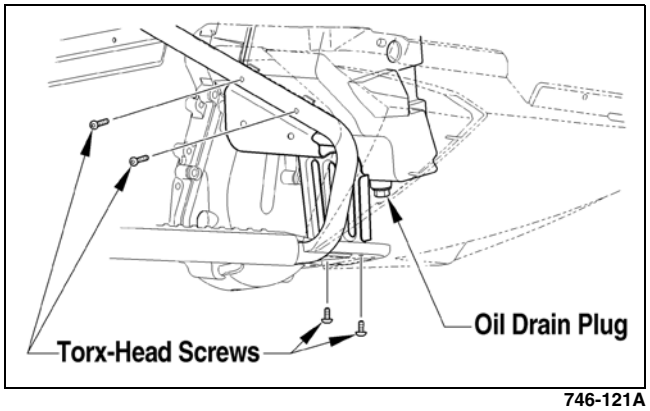
1. Park the snowmobile on a level surface; then start the engine and allow it to warm up for 5-10 minutes, or if the snowmobile was operated, allow the engine to idle for approximately 30 seconds. Shut the engine off.
2. Remove the torx-head screws and the access plate from beneath the snowmobile.
3. Place a drain pan beneath the engine oil pan drain plug; then remove the plug and allow the oil to drain completely.



PC010A

4. Install the engine oil drain plug with a new gasket; then tighten the plug to 16 ft-lb.
5. Remove the four torx-head screws securing the right-side footrest to the tunnel and the support; then with a drain pan in position, remove the drain plug from the oil reservoir.

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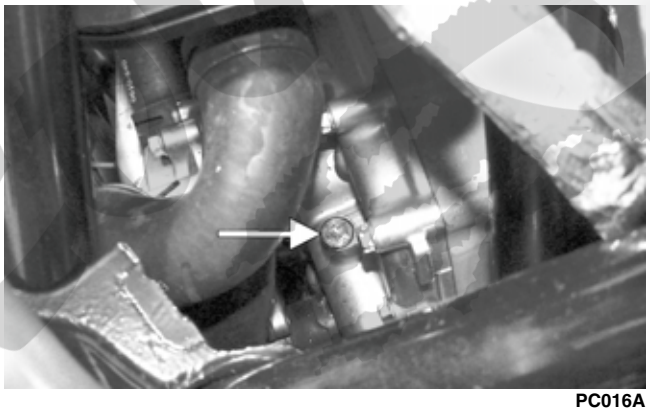
746-121A

■NOTE: To aid in draining the oil from the reservoir, position a funnel between the reservoir and the opening of the tunnel running board.

6. After the oil has drained completely, install the drain plug with a new O-ring and tighten to 16 ft-lb.
7. Using Oil Filter Wrench, loosen (but do not remove) the oil filter and allow the oil to drain from the filter into the drain pan; then remove the filter.

■NOTE: On the 9000, the oil filter is accessible between the front opening of the chassis and the lower intercooler hose.

8. Apply a light coat of fresh engine oil to the seal of the new oil filter.
9. Install the new oil filter by turning the oil filter by hand until the seal has contacted the oil filter mounting surface; then tighten the oil filter to 15 ft-lb. Remove the drain pan.
10. Pour 2.9 l (3 U.S. qt) of the recommended engine oil into the oil reservoir.
11. Open the air bleed bolt located on the oil pump (beneath the coolant tank) to purge air from the oil hose.



PC016A

■NOTE: When air can no longer be heard purging from oil pump bleed, tighten the bleed bolt to 7.5 ft-lb.

CAUTION

Do not attempt to start the engine with the bleed bolt open.

12. Without starting the engine, place the handlebar emergency stop switch to the RUN position and the ignition switch to the ON position. The Oil Pressure Warning Icon should illuminate immediately on the standard gauge or after the three seconds on the premium gauge.

■NOTE: If the warning icon does not illuminate, place the ignition switch in the OFF position and repeat step 11; then place the ignition switch in the ON position and repeat step 12.

13. If the warning icon illuminates (from step 12), start the engine. The warning icon should go out within five seconds. If it does, let the engine run for 5-10 minutes; then proceed to step 14.

■NOTE: If the warning icon does not go out, shut the engine off immediately and repeat step 11; then place the ignition switch to the ON position and repeat step 13.

14. Shut the engine off; then add oil to the oil reservoir until oil is visible halfway up in the sight glass.
15. Install the access plate and torx-head screws beneath the snowmobile; then install the hood and access panels.

7000

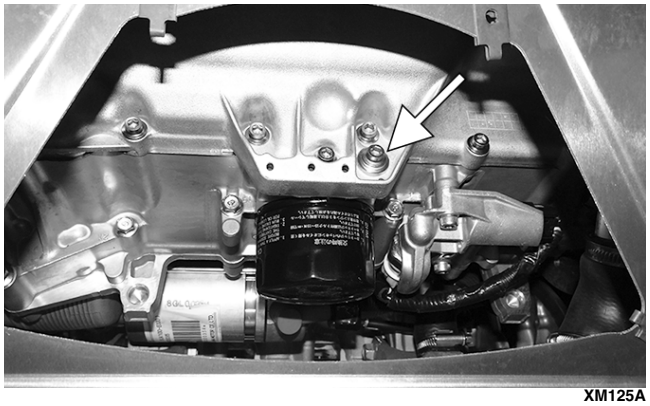
⚠ WARNING

Care must be taken if a hot drain plug is removed by hand. Burning could occur.

■NOTE: Recycle or properly dispose of the used engine oil.

■NOTE: The access panels and hood must be removed for this procedure.

1. Park the snowmobile on a level surface; then start the engine and allow it to warm up for 5-10 minutes, or if the snowmobile was operated, allow the engine to idle for approximately 30 seconds. Shut the engine off.
2. Remove the torx-head screws and the rear access plate from beneath the snowmobile.
3. Place a drain pan beneath the engine oil drain screw; then remove the screw and allow the oil to drain completely.

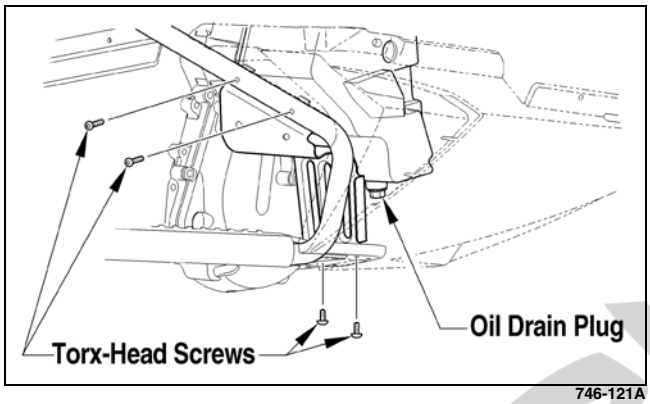


XM125A

4. Using Oil Filter Wrench (p/n 0644-551), loosen (but do not remove) the oil filter and allow the oil to drain from the filter into the drain pan; then remove the filter.

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5. Apply a light coat of fresh engine oil to the seal of the new oil filter.
6. Install the new oil filter by turning the oil filter by hand until the seal has contacted the oil filter mounting surface; then tighten the oil filter to 12 ft-lb.
7. Install a new gasket and engine oil drain screw Tighten the screw to 7.2 ft-lb.
8. Remove the four torx-head screws securing the right-side footrest to the tunnel and the support; then with a drain pan in position, remove the drain plug from the oil tank.



746-121A

■NOTE: To aid in draining the oil from the reservoir, position a funnel between the tank and the opening of the tunnel running board.

9. After the oil has drained completely, install the drain plug with a new O-ring and tighten to 16 ft-lb.
10. Pour the recommended engine oil into the oil tank.
11. Without starting the engine, place the handlebar emergency stop switch to the RUN position and the ignition switch to the ON position. The Oil Pressure Warning Icon should illuminate.

■NOTE: If the warning icon does not illuminate, take the snowmobile to an authorized Arctic Cat Snowmobile dealer for service. If not under warranty, this service is at the discretion and expense of the snowmobile owner.

12. If the warning icon illuminates (from step 11), start the engine. The warning icon should go out within five seconds. If it does, proceed to step 13.

■NOTE: If the warning icon does not go out, shut the engine off immediately and repeat step 11; then place the ignition switch to the ON position and repeat step 12. If the warning icon does not go out, take the snowmobile to an authorized Arctic Cat Snowmobile dealer for service. If not under warranty, this service is at the discretion and expense of the snowmobile owner.

13. Once the engine has reached operating temperature, shut the engine off; then add oil to the oil reservoir until oil is visible halfway up in the sight glass.

■NOTE: If the oil and engine are not at operating temperature, the oil level may read too low. Always make sure the engine is at operating temperature before checking the oil.

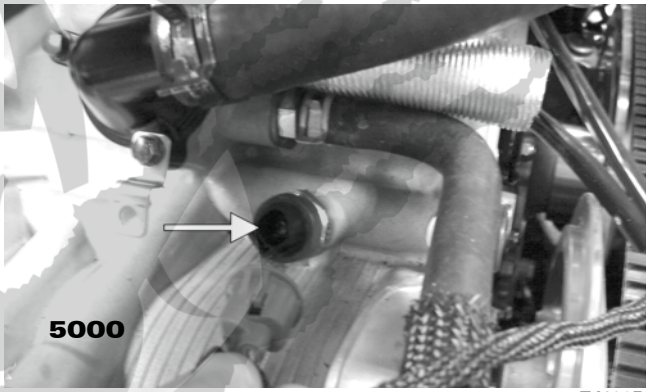
14. Install the access plate and torx-head screws beneath the snowmobile; then install the hood and access panels.

Testing Oil Pressure

The Low Oil Pressure Warning Light indicates engine oil pressure, not the oil level; however, if the oil level is low, it may affect oil pressure. The light should illuminate each time the engine is started. If the light stays illuminated or it illuminates while the engine is running, oil pressure has been lost and the engine will automatically shut off.

If oil pressure is lost, first verify oil level is correct. After adding oil, oil pressure should be normal. If not proceed to step 1.

1. On 5000 and 9000 models, locate the oil pressure sensor below the thermostat coolant hose; then disconnect the plug-in connector from the sensor.



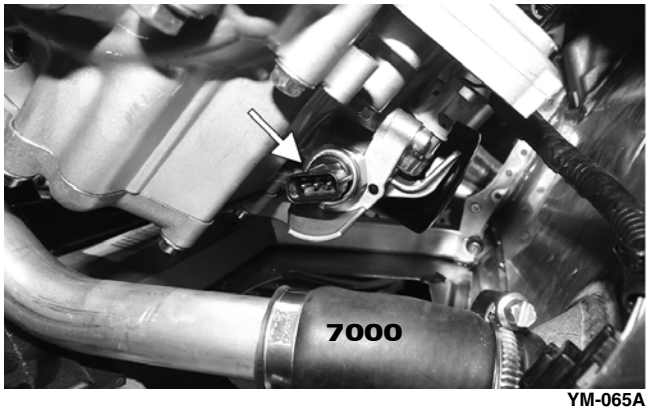
ZJ128B



PC239A

■NOTE: On 7000 models, the sensor is located near the oil filter.

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YM-065A

2. Remove the oil pressure sensor from the engine.
3. Using an oil pressure gauge and adapter, thread the adapter into the oil pressure sensor hole and tighten securely.
4. Start the engine, run at 4000 RPM, and observe the oil pressure. The engine oil pressure specification is 29 psi ± 20%.

■NOTE: This test must be done with the engine at running temperature.

5. After verifying oil pressure, remove the adapter and gauge from the engine, install the sensor, and tighten to 120 in.-lb. Start the engine and check for oil leaks.

■NOTE: Before installing the sensor, it may be necessary to apply thread sealant or teflon tape to the sensor threads.

CAUTION

Take care not to allow thread sealant or teflon tape into the oil passage or severe engine damage will occur.

Liquid Cooling System (5000/9000)

The liquid cooling system consists of a heat exchanger, water pump, and thermostat. The system should be inspected for leaks or damage whenever an overheating problem is experienced.

DRAINING COOLING SYSTEM

1. Open the right-side access panel.
2. Remove the hardware securing the exhaust resonator; then remove the resonator.
3. Remove the hose clamp from the coolant hose connecting the water pump to the right side of the oil cooler. Clamp off the coolant hose; then with a drain pan positioned under the coolant hose, remove the hose from the water pump and tip the hose downward allowing the coolant to drain completely.
4. Apply 5-8 psi to the coolant system through the coolant overflow tube and continue until the coolant stops draining from the system.

FILLING/BLEEDING COOLING SYSTEM

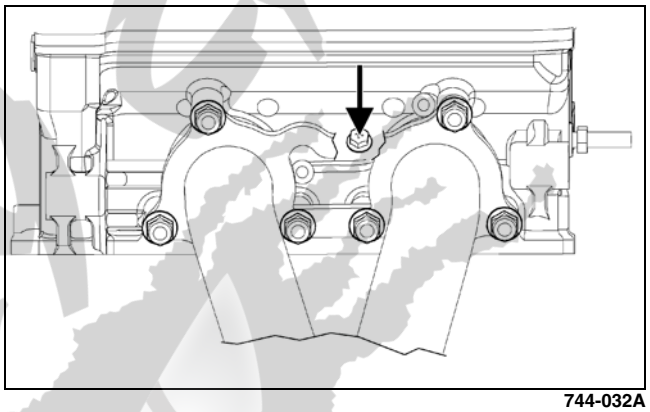
1. Remove the left- and right-side access panels and hood.

■NOTE: Place the hood along side the snowmobile; then using Hood Harness Extension, connect the hood to the main harness.

2. Loosen the bleed screw and add coolant into the filler neck until coolant is visible at the bleed screw; then tighten the bleed screw and add coolant to the coolant reservoir Full-Cold line.

CAUTION

The cooling system must be properly filled. If the system isn't properly filled, engine damage will occur.


744-032A

3. Start the engine and allow it to run for five minutes.
4. With the engine cool, loosen the bleed screw and allow the coolant level in the filler neck to drop; then with the bleed screw loose, add coolant into the filler neck until no air is visible or heard at the bleed screw. Tighten the bleed screw and add coolant to the reservoir if necessary.

■NOTE: If the coolant level in the filler neck suddenly drops when the bleed screw is loosened, an air-lock occurred in the cylinder head. Add coolant to the filler neck until full before starting the engine.

CAUTION

Running the engine with low coolant level can cause severe engine damage.

5. Start the engine and allow it to run for five minutes; then shut the engine off and allow it to cool.
6. Repeat steps 5-6 at least two more times (more if necessary) until no air is in the cooling system.

CAUTION

Operating the snowmobile with air in the cooling system will cause severe damage to the engine.

7. Install the hood and both side panels.

INSPECTING COOLANT HOSES AND CLAMPS

All coolant hoses and connections should be checked annually for deterioration, cracks, and wear.

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All coolant hoses and clamps should be replaced every four years.

INSPECTING THERMOSTAT

1. Inspect the thermostat for corrosion, wear, or spring damage.
2. Using the following procedure, inspect the thermostat for proper operation.
   A. Suspend the thermostat in a container filled with water; then heat the water and monitor the temperature with a thermometer.
   B. The thermostat should open at 75° C (167° F). Once the thermostat starts to open, and allow it to cool down verifying it has returned to the fully closed position.

CAUTION

Never heat the thermostat to the fully open position or damage to the thermostat may occur.

Liquid Cooling System (7000)

The liquid cooling system consists of a heat exchanger, water pump, and thermostat. The system should be inspected for leaks or damage whenever an overheating problem is experienced.

DRAINING COOLING SYSTEM

1. Remove both access panels and the hood.
2. Remove the cap from the coolant filler neck; then using a coolant vacuum pump, remove as much coolant as possible from the neck.
3. Remove the hose clamp securing the coolant hose to the bottom of the radiator; then remove the hose and pour coolant into a container. Using the same vacuum pump, remove coolant from the heat exchanger-to-radiator hose until all coolant is removed from the snowmobile.

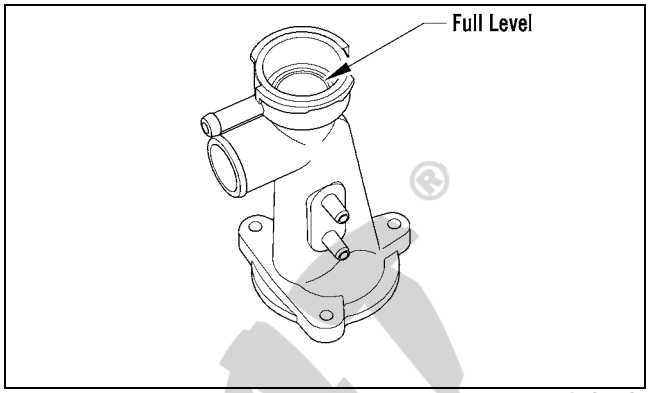
FILLING/BLEEDING COOLING SYSTEM

■NOTE: Place the hood along side the snowmobile; then using Hood Harness Extension, connect the hood to the main harness.

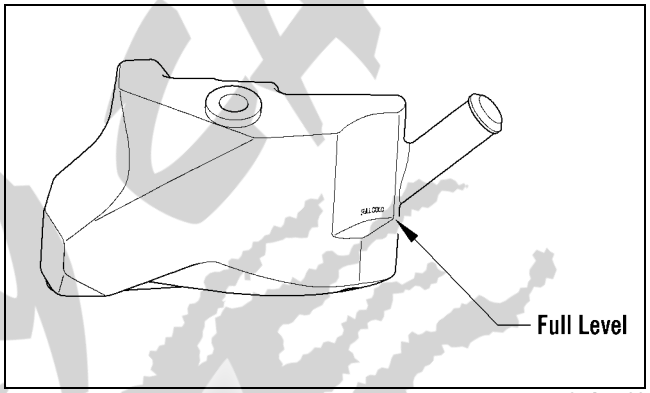
1. With all hoses and hose clamps installed, add coolant into the filler neck until coolant is visible at the bottom of the neck; then add coolant to the coolant reservoir Full-Cold line.

CAUTION

The cooling system must be properly filled. If the system isn't properly filled, engine damage will occur.



0747-547



0747-766

2. Start the engine and allow it to run until the radiator fan turns on; then turn the engine off.
3. With the engine cool, remove the coolant cap and verify the coolant is at the full level. If the coolant is not at the full level, add coolant and repeat step 3 as necessary.

CAUTION

Running the engine with low coolant level can cause severe engine damage.

4. Install the hood and both side panels.

INSPECTING COOLANT HOSES AND CLAMPS

All coolant hoses and connections should be checked annually for deterioration, cracks, and wear.

All coolant hoses and clamps should be replaced every four years.

INSPECTING THERMOSTAT

1. Inspect the thermostat for corrosion, wear, or spring damage.
2. Using the following procedure, inspect the thermostat for proper operation.
   A. Suspend the thermostat in a container filled with water; then heat the water and monitor the temperature with a thermometer.

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B. The thermostat should open at 75° C (167° F). Once the thermostat starts to open, and allow it to cool down verifying it has returned to the fully closed position.

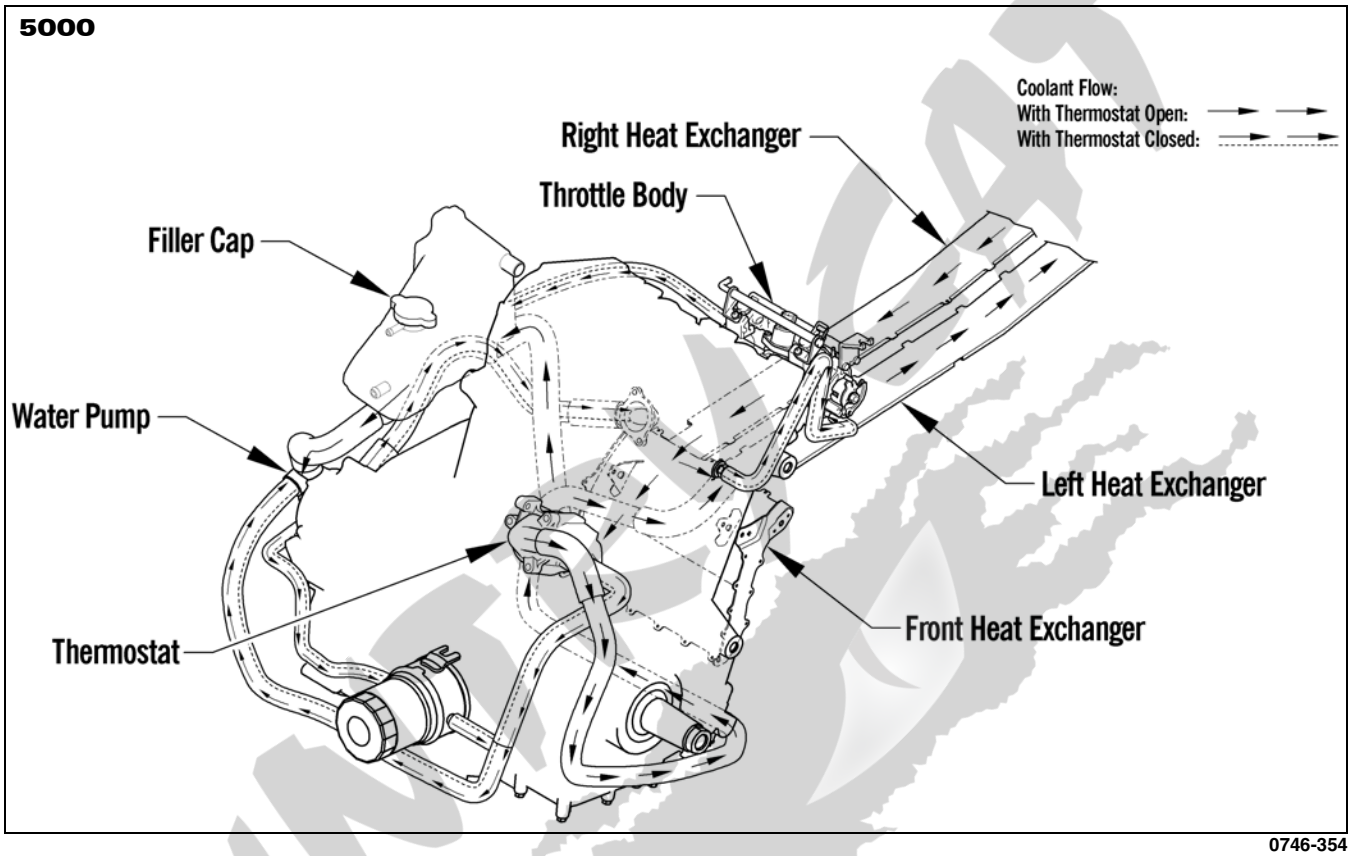
CAUTION

Never heat the thermostat to the fully open position or damage to the thermostat may occur.

Cooling System Schematics

The following schematics are representative of the different styles of cooling systems in the Arctic Cat snowmobiles.

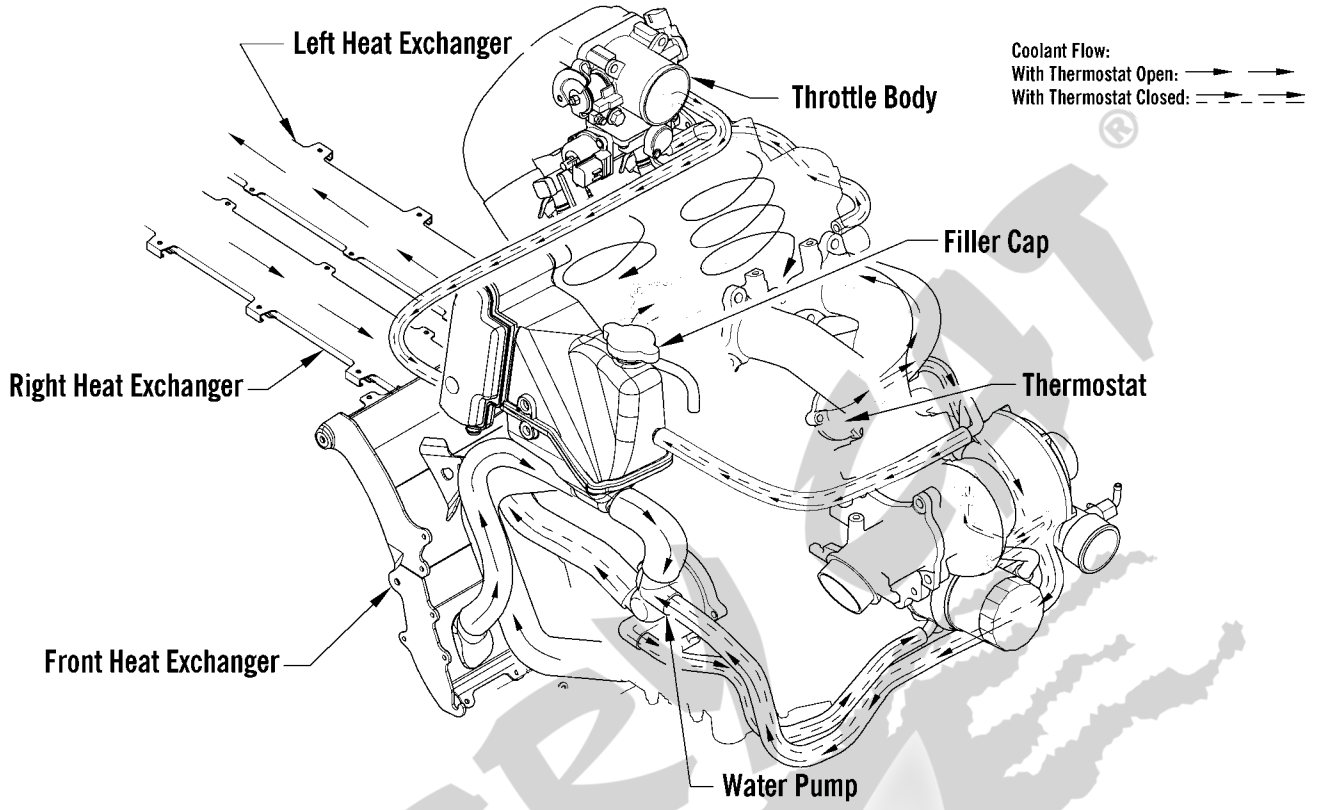
5000



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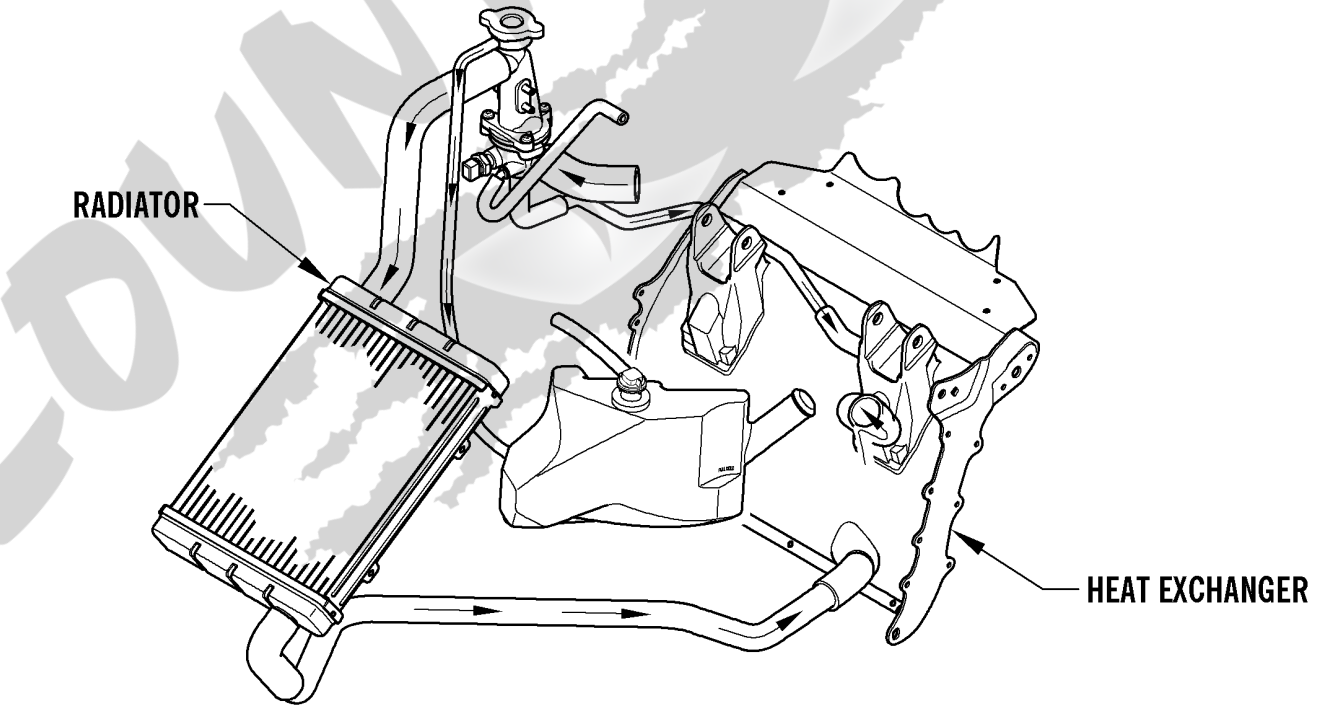
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9000



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7000



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Air Silencer (5000)

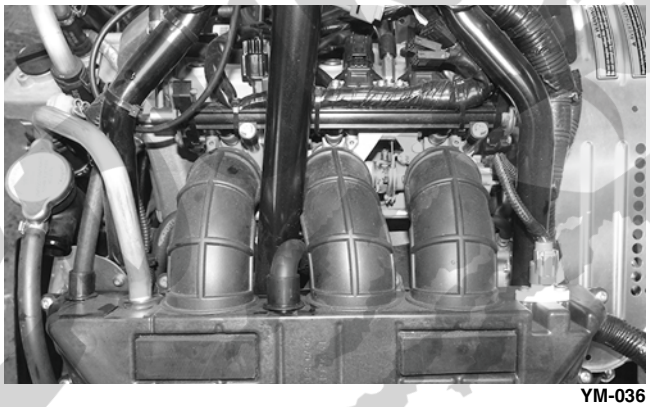
REMOVING/INSTALLING

1. Remove the right- and left-side access panels; then disconnect the hood harness and remove the hood.
2. Remove the seat and gas tank (see the Fuel Systems section).
3. Loosen both clamps securing the air silencer to the throttle bodies; then remove the air silencer assembly.
4. Install the air silencer assembly and secure to the throttle bodies using the clamps.
5. Install the gas tank (see the Fuel Systems section) and seat.
6. Install the hood, connect the hood harness, and install both access panels.

Air Silencer (7000)

REMOVING/INSTALLING

1. Remove the right- left-side access panels; then disconnect the hood harness and remove the hood.
2. Remove the two screws securing the radiator hold-down-bracket to the air intake; then move the radiator out of the way and remove the two screws securing the front of the air intake to the chassis. Account for a coolant hose routing clamp.
3. Loosen all three hose clamps securing the intake boots to the throttle body; then disconnect the air temp sensor. Remove the air intake assembly.



YM-036

4. Install the air silencer assembly and secure to the throttle bodies using the clamps; then secure the front of the air intake to the chassis using the two screws and the routing clamp. Tighten securely.
5. Install the hood, connect the hood harness, and install both access panels.

Air Silencer (9000)

REMOVING/INSPECTING

1. Remove the air cleaner cover; then remove the air filter.
2. Inspect the filter for tears or dirt and replace if necessary. Clean any debris from inside the air intake plenum.

CAUTION

Do not use compressed air to clean the filter. Damage to the filter may occur.

CAUTION

A torn air filter can cause damage to the turbocharger/engine. Contaminants may get inside the turbocharger/engine if the filter is torn. Carefully examine the filter for holes or tears. Replace the filter with a new one if torn.

INSTALLING

Place the air filter into position into the plenum; then secure the air cleaner cover onto the plenum.

CAUTION

Do not run the engine without the air filter installed. Severe damage to the turbocharger/engine will occur.

Turbocharger/Intercooler (9000)

⚠ WARNING

The rotating components in a turbocharger turn at speeds of 150,000 RPM. Any imbalance could cause rapid disintegration resulting in bodily injury or death. Always handle a turbocharger in accordance with the manufacturer's recommendations.

CAUTION

Do not drop the turbocharger. If dropped, it must be replaced.

CAUTION

Do not touch rotating parts as damage to turbine or compressor blades may occur.

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CAUTION

Do not carry the turbocharger by the hoses or by the waste gate control rod. Damage could occur.

CAUTION

Do not run a turbocharged engine with the intake hose removed from the compressor inlet. Dirt, foreign objects, or loose clothing can be ingested causing turbocharger failure and engine damage.

CAUTION

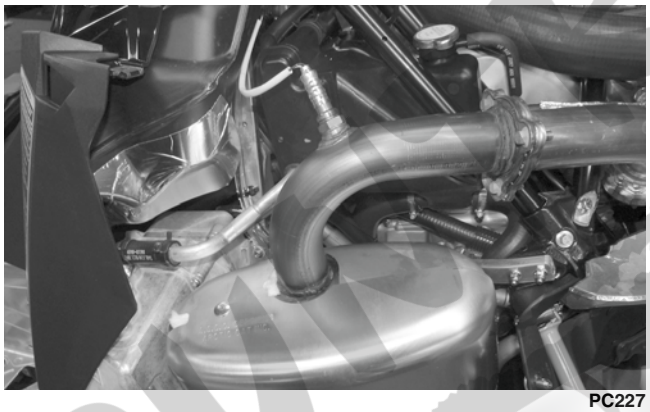
Do not spin the turbocharger with compressed air as bearings will be damaged.

CAUTION

Do not store the turbocharger vertically as oil will be lost from the bearing cavity and bearing damage on start-up could occur.

REMOVING

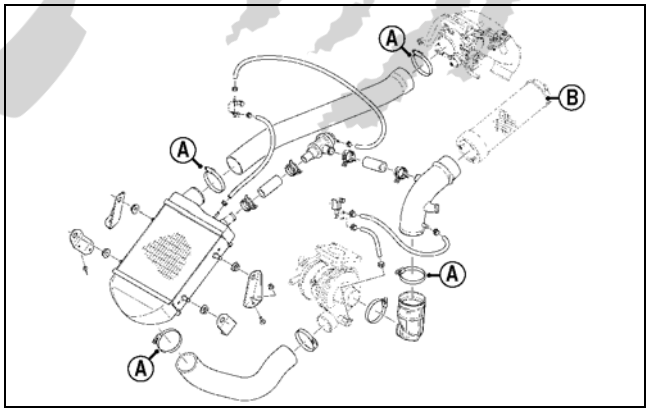
1. Remove the right- and left-side panels; then remove the hood.
2. Disconnect the oxygen sensor; then remove the cap screws, nuts, gasket, and spring securing the resonator. Remove the resonator.



PC227

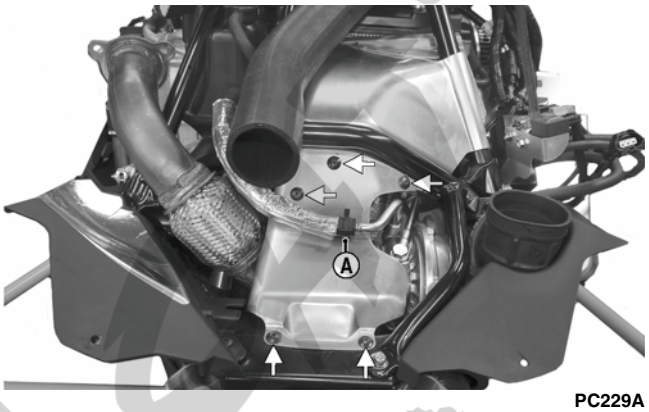
■NOTE: Be sure to mark all hoses to the corresponding locations for installation purposes.

3. Remove all clamps (A) securing the outlet hose, air duct, and intercooler; then remove the air filter (B) and all hoses connected to the intercooler.



SNO-231A

4. Remove the intercooler, air bypass valve, and air duct as an assembly by removing the intercooler from the four mounting brackets.
5. Remove the clamp securing the coolant return hose (A); then remove the five torx-head screws securing the front heat shield.

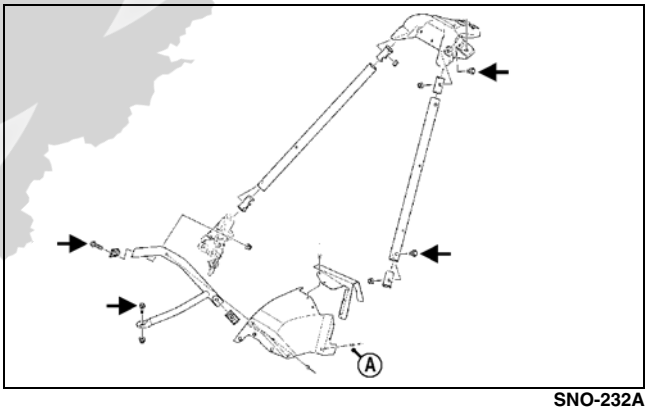


PC229A

CAUTION

If the turbocharger is not being replaced during this procedure, close off the inlet and outlet of the turbocharger to avoid any objects entering the turbocharger.

6. Remove the torx-head screws securing the front left-side facia to the chassis.
7. Remove the cap screws securing the left-side front spar to the chassis; then remove the two cap screws and nuts securing shock mount support bracket. Remove the rear heat shield, front spar, and shock mount.

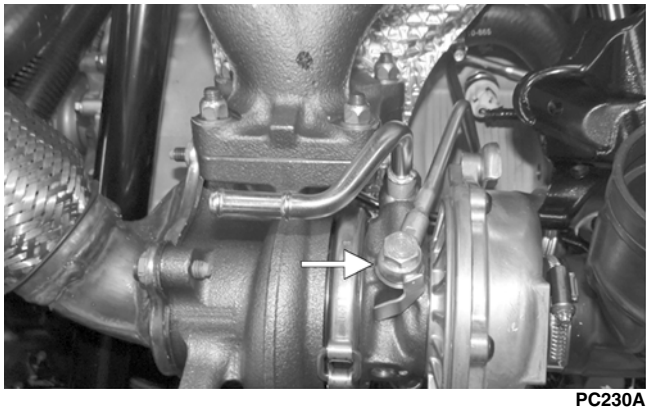


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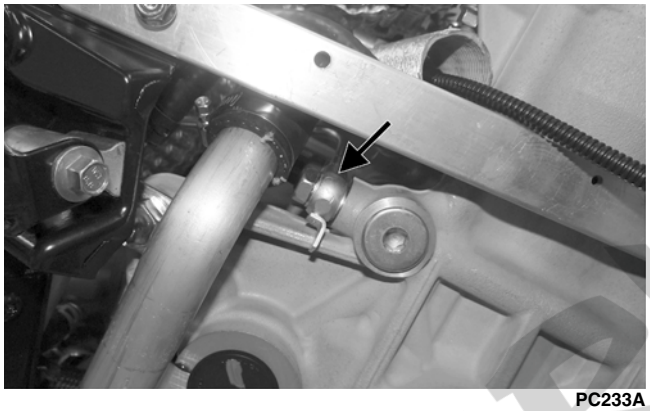
■NOTE: To aid in the removal of the assembly from step 6, drill out the rivet (A) securing the rear heat shield to the left spar tube.

8. Remove the banjo bolts with four crush washers securing the oil feed pipe to the turbocharger and to the engine. Discard the washers.

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PC230A



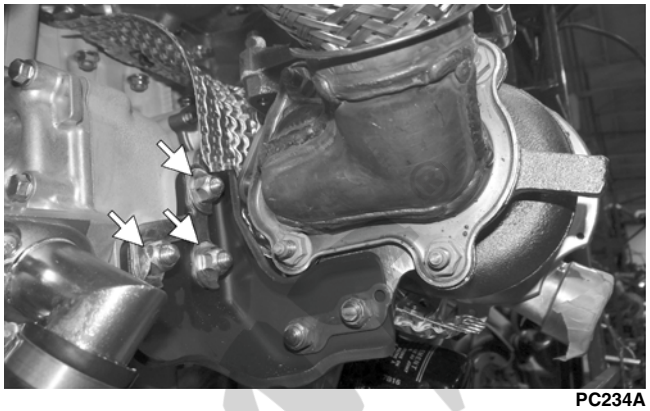
PC233A

9. Place a shop towel under the coolant feed hose and oil return hose; then using a suitable clamping device, clamp off the coolant hose. Loosen the hose clamps and disconnect the hoses from the 9000.



PC236

10. Remove the three lock nuts and washers securing the bracket of the turbocharger to the engine; then loosen the lock nuts securing the mounting bracket to the turbocharger.



PC234A

■NOTE: If the oil hose has to be removed from the engine, note the banjo bolt securing the hose to the turbocharger has the smaller feed holes.

11. Remove the lock nuts and washers securing the exhaust manifold to the cylinder head; then carefully remove the turbocharger and exhaust manifold assembly.
12. Remove the cap screws securing the lower heat shield to the exhaust manifold and turbocharger; then remove the mounting bracket.
13. Remove the lock nuts securing the turbocharger outlet; then remove the turbocharger outlet from the turbocharger and account for the gasket.
14. Remove the four lock nuts securing the turbocharger to the exhaust manifold. Account for the gasket and flat washers.

INSPECTING

1. With the exhaust pipe removed, inspect the turbine (exhaust) blades for any signs of wear or damage; then inspect the compressor (intake) blades.

■NOTE: If any damage to the compressor or turbine blades is present, the turbocharger must be replaced.



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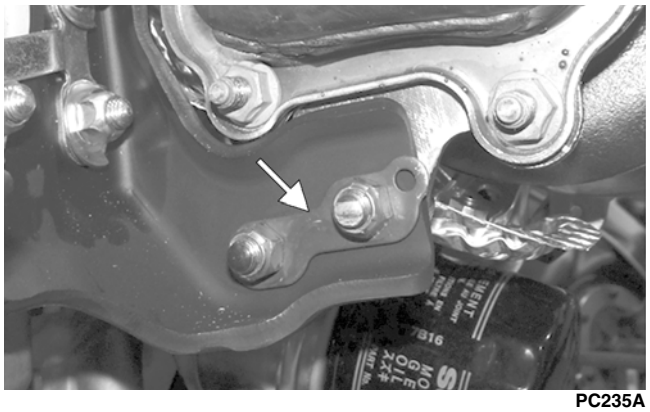
2. Inspect the waste gate linkage for signs of wear or damage.

INSTALLING

1. With the turbocharger secured in a suitable vise and the gasket in place, secure the exhaust pipe to the turbocharger with the washers and lock nuts. Tighten the lock nuts to 15 ft-lb.

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2. Install the mounting bracket to the 9000; then with the backing plate properly positioned as shown, secure the bracket to the turbocharger with the lock nuts and finger tighten only.



PC235A

3. With the gasket in place, install the turbocharger onto the exhaust manifold and secure with the flat washers and lock nuts. Tighten only until snug.

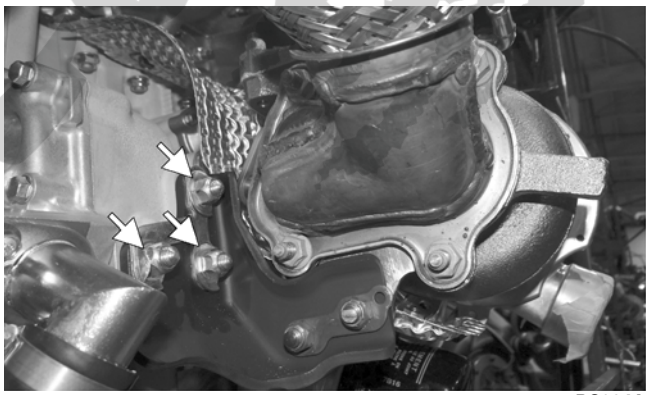
4. Install the lower heat shield onto the turbocharger and exhaust manifold with the four cap screws. Tighten to 56 in.-lb.

5. With the gaskets in place, install the exhaust manifold and turbocharger assembly to the engine; then tighten the exhaust manifold to 15 ft-lb.



PC231

6. Install the three lock nuts securing the turbocharger mounting bracket to the engine. Tighten the nuts to 30 ft-lb and bend each tab to secure the nut.



PC234A

7. Tighten the two lock nuts (from step 2) to 30 ft-lb.

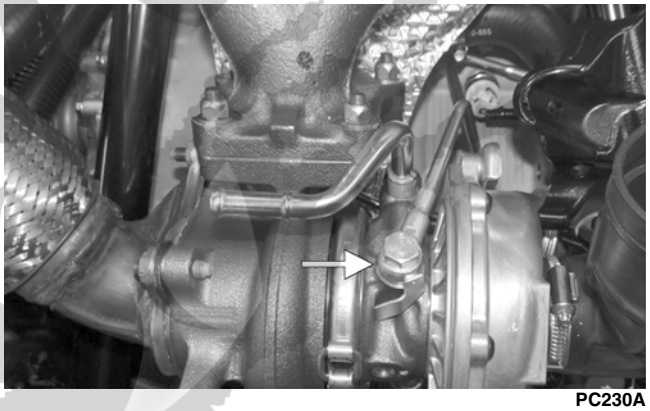
8. Using a crisscross pattern, tighten the lock nuts (from step 3) securing the turbocharger to the exhaust manifold to 30 ft-lb.

9. Connect the coolant feed hose and oil return hose to the 9000, release the clamp, and secure the hoses with the hose clamps.

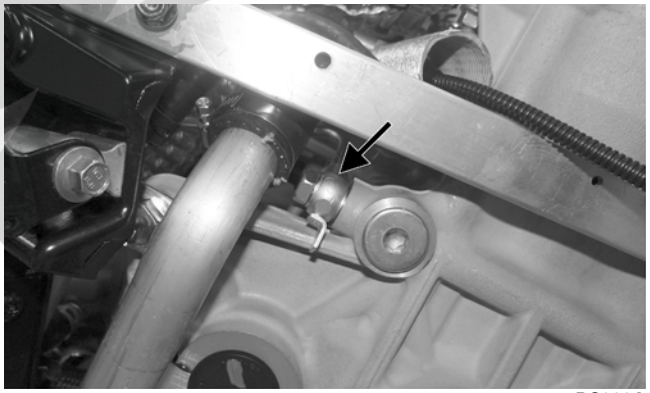


PC236

10. With the turbocharger secured, connect the oil feed hose with both banjo bolts and four new crush washers. Tighten to 11 ft-lb.



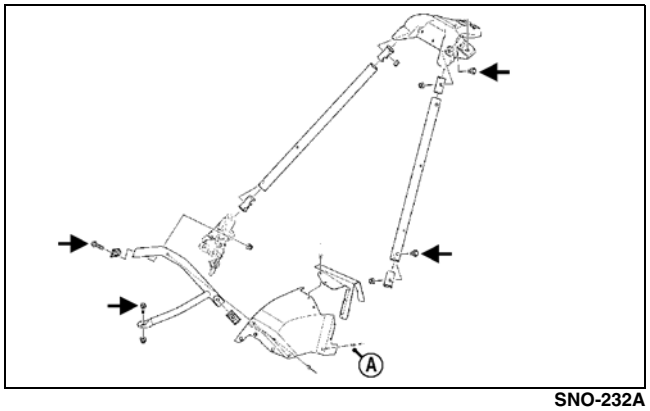
PC230A



PC233A

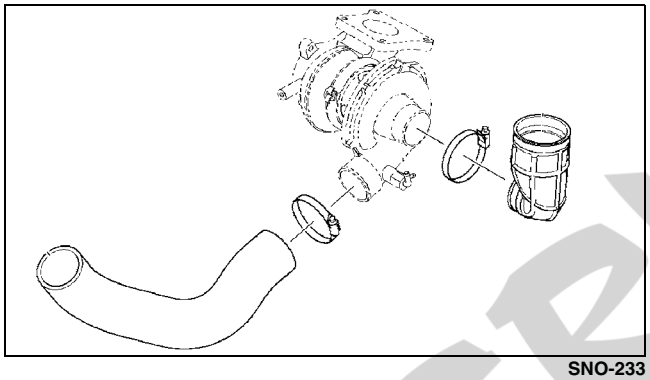
11. Secure the left-side front spar to the chassis; then install the two cap screws and nuts securing shock mount support bracket. Install rivet (A) through the heat shield and into the left-side spar. Tighten cap screws to 23 ft-lb.

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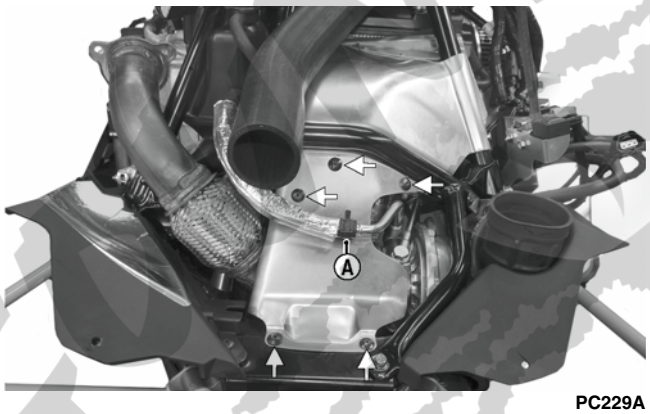
SNO-232A

12. Install the inlet boot and the inlet hose and secure using the existing clamps.



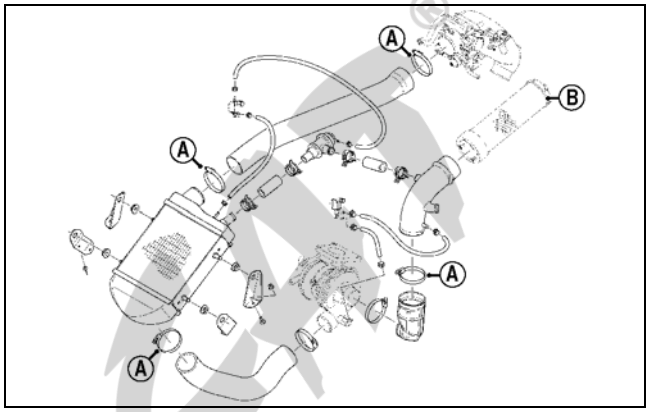
SNO-233

13. Secure the front left-side facia to the chassis using the existing torx-head screws.
14. Secure the front heat shield using the existing torx-head screws; then secure the coolant return hose (A).



PC229A

15. Install the intercooler, air bypass valve, and the air duct as an assembly into the four mounting brackets.
16. Secure the outlet hose, air duct, and intercooler using the existing clamps (A); then install the air filter (B) and all hoses connected to the intercooler.



SNO-231A

17. Connect the oxygen sensor; then install the cap screws, nuts, new gasket, and spring securing the resonator to the chassis.



PC227

■NOTE: Check the coolant level and the oil level. Add as necessary (see the Fuel Systems section).

18. Install the right- and left-side panels; then install the hood.

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Fuel Systems

This section has been organized for servicing the fuel systems; however, some components may vary from model to model. The technician should use discretion and sound judgment when removing/disassembling and assembling/installing components.

Whenever any maintenance or inspection is made on the fuel system where fuel leakage may occur, there should be no welding, smoking, or open flames in the area.

WARNING

Since the fuel supply hose may be under pressure, remove it slowly to release the pressure. Place an absorbent towel around the connection to absorb gasoline; then remove the hose slowly to release the pressure. Always wear safety glasses when removing the fuel hoses.

■NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

SPECIAL TOOLS

A number of special tools must be available to the technician when servicing the fuel systems.

Description	p/n
EFI Analyzer	0744-049
EFI Diagnostic System Manual	2257-850
EFI Diagnostic System Manual (Instructions)	2259-020
Fluke Model 77 Multimeter	0644-559
Fuel Hose Clamp Tool	0644-545
Fuel Pressure Test Kit	0644-493
Vacuum Test Pump	0644-131
Fuel Pump Installation Tool Kit	0744-074
Laptop Diagnostic Test Kit	0744-050
Laptop Diagnostic Tool	0744-060
Oil Injection Usage Tool	0644-007

■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

Fuel System

INTRODUCTION

The Arctic Cat EFI System operates off a series of coils located on the stator and is made up of the following components.

1. An engine control module (ECM) calculates input from sensors (air temperature sensor, coolant temperature sensor, throttle position sensor, and a knock sensor) to provide the engine with the correct fuel mixture and timing for optimum operation.
2. Charge coils (1 and 2), located on the stator, provide AC voltage to the ECM/regulator/rectifier where AC voltage is converted to DC voltage.
3. A fuel pump coil located on the stator operates the low voltage, high output fuel pump. At cranking speed, the high output fuel pump provides enough fuel to charge the fuel rail.
4. An injector coil located on the stator provides the injectors with DC voltage for operation through the ECM.

FLOODED ENGINE

If the engine should become flooded, set the brake lever lock, compress the throttle lever to the full-open position, and crank the engine over until it starts and clears itself. Release the brake lever lock.

FUEL SYSTEM

The fuel is first drawn into the electric fuel pump through multiple pick-up valves and hoses. The fuel is then routed through a high-pressure fuel hose to the fuel rail.

The fuel pressure is maintained in the fuel rail by the fuel regulator. With the fuel pressure maintained at a constant psi, the ECM evaluates the information it receives from the electrical sensors and opens the injectors for precise periods of time (pulse widths) to meet engine demands.

■NOTE: The entire EFI system depends on all coils functioning properly on the stator.

Individual Components

ECM

The ECM is the brain of the EFI system. It uses sensor inputs to determine the correct fuel/air ratio for the engine given the existing conditions of altitude and temperature.

If any of the sensors should fail while the engine is running, the ECM will sense a problem and go into a “fail safe” mode. This is an over-rich condition and will greatly reduce performance. However, the engine will be protected from a possible lean condition and engine damage.

The ECM is equipped with a self-diagnostic system utilizing the service icon in the speedometer/tachometer and remains illuminated when a problem exists with any of the sensors. The technician can determine the problem sensor by reading the code shown on the readout screen and applying it to the ECM Diagnostic Codes chart (see Self-Diagnostic System/Codes in this section).

■NOTE: The ECM cannot be repaired.

Removing (5000/9000)

1. Remove the left-side access panel; then remove the snap ring securing the lower console.
2. Remove the two wiring connectors from the ECM; then remove the ECM mounting bracket from the belt guard.
3. Remove the two torx-head screws securing the ECM to the mounting bracket.

Installing (5000/9000)

1. Secure the ECM to mounting bracket using the existing two torx-head screws. Tighten securely.

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2. Install the ECM with mounting bracket onto the rear belt guard until it snaps into place.
3. Connect the two wiring connectors to the ECM.
4. Secure the lower console using the snap ring; then install the left-side access panel.

■NOTE: Make sure all connectors are clean and tight. Apply dielectric grease to all connector seals.

Removing (7000)

1. Remove both access panels; then remove the hood.
2. Remove the air intake assembly from the throttle body and the radiator.
3. Press the retaining tabs on the ECM connectors in; then rotate the connector arms up while will allow the connectors to be released from the ECM.



YM-052

4. Remove the four cap screws and nuts securing the ECM to the chassis.

Installing (7000)

1. Secure the ECM to the chassis using the existing four nuts. Tighten securely; then press the two connectors into the ECM and rotate the connector arm down until it locks.

■NOTE: Make sure all connectors are clean and tight. Apply dielectric grease to all connector seals.

2. Install the air intake assembly to the throttle body and the radiator.
3. Install the hood and access panels.

AIR TEMPERATURE SENSOR

This sensor detects air temperature entering the air silencer and engine. The ECM sends current to this sensor, and (depending on the temperature) the sensor will pass a certain amount of current through the sensor to ground. The ECM measures how much current passes through the sensor to ground. From this measurement, the ECM determines the air temperature and calculates the fuel/air mixture ratio. Resistance will drop as the temperature rises.

Removing

1. Disconnect the wiring harness from the air temperature sensor.
2. Using a flat-blade screwdriver, pry the sensor end to end to remove it from the air silencer. Account for two push pins.

■NOTE: On 7000 models, the sensor is secured to the air intake assembly using two screws.

Installing

1. Place the sensor into position in the air silencer and secure with push pins.

■NOTE: On 7000 models, secure the sensor using two screws. Tighten securely.

2. Connect the wiring harness to the air temperature sensor. Secure the sensor wires with cable ties so they do not rub on any other components.

COOLANT TEMPERATURE SENSOR

This sensor detects coolant temperature. The ECM measures the current flow through the sensor to ground. From this measurement, the ECM can determine the engine coolant temperature and calculate the correct fuel/air mixture ratio.

■NOTE: If the coolant temp rises above 105°C (221° F) the temp light on the gauge will start to flash and the engine will go into a fuel cut (surging) mode to alert the rider of overheating. If the temp continues to rise and exceeds 110°C (230° F) the temp light will be on continuously. The fuel cut will not protect the engine from overheating if the operator continues to ride the snowmobile.

THROTTLE POSITION SENSOR

This sensor is a potentiometer (essentially, a resistor). This sensor transforms the throttle-valve position into output voltage to the ECM. In addition, the sensor detects the opening or closing speed of the throttle valve and feeds that rate of voltage change to the ECM.

■NOTE: The input from the throttle position sensor is one of the main inputs for the ECM calculation of fuel/air mixture ratio.

IGNITION TIMING SENSOR

This sensor is triggered by teeth precisely mounted to the flywheel flange. Each time a tooth rotates past the sensor, a signal is sent to the ECM. From this signal, the ECM determines ignition and injection timing and RPM.

BAROMETRIC PRESSURE SENSOR

This sensor reads atmospheric pressure. From this information, the ECM determines the correct fuel/air mixture ratio.

FUEL INJECTORS

A fuel injector is an electromagnetic injection valve controlled by a signal from the ECM. The coil used in the injector is a high-pressure resistance type. The ECM determines the optimum fuel injection time and duration based on signals from the sensors.

When voltage is sent to the fuel injector, it energizes the coil and opens the needle valve, thereby injecting fuel. Because the fuel pressure (pressure differential between fuel line and manifold) is kept constant, the amount of fuel injected is determined by the duration of time the valve is open and manifold pressure.

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Removing (5000/9000)

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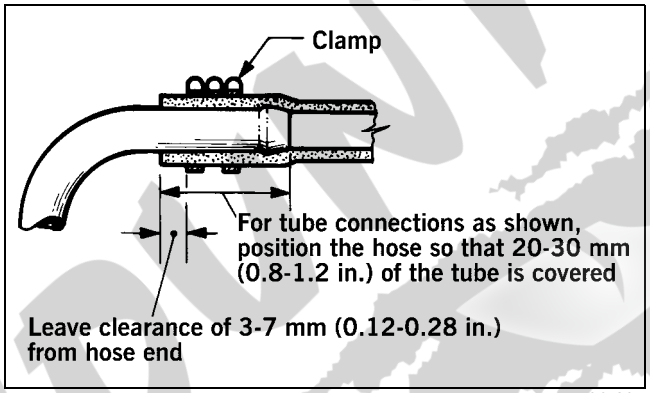
Since the fuel supply hose may be under pressure, remove it slowly to release the pressure. Place an absorbent towel around the connection to absorb gasoline; then remove the hose slowly to release the pressure. Always wear safety glasses when removing the fuel hoses.

1. Loosen the clamp securing the fuel supply hose to the fuel rail; then remove the hose from the fuel rail.
2. Disconnect the wiring harness from each injector.
3. Remove the screws securing the injector hold-down plate to the throttle body assembly; then remove the plate from the injectors.
4. Remove the fuel injectors from the throttle body/ intake manifold assembly.

Installing (5000/9000)

1. Apply a light coat of oil to all O-rings; then install the upper and lower O-rings onto each injector.
2. Install the injectors into the throttle body assembly.
3. Place the injector hold-down plate into position on top of the injectors and secure with two screws.
4. Connect the fuel delivery hose to the fuel rail and secure with a clamp.

■NOTE: When securing the fuel delivery hose, position the clamp as shown.



729-325

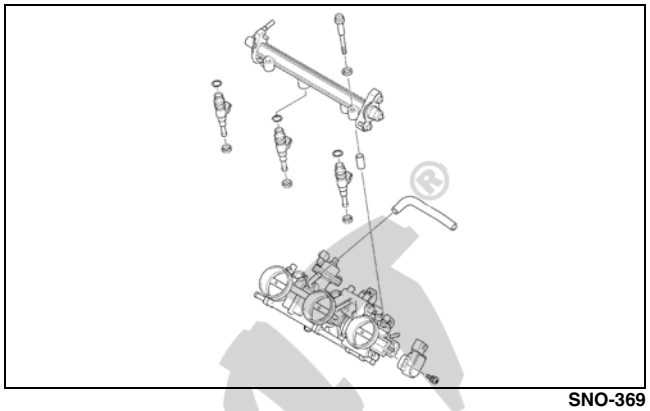
5. Connect the wiring harness to the injectors.

Removing (7000)

WARNING

Since the fuel supply hose may be under pressure, remove it slowly to release the pressure. Place an absorbent towel around the connection to absorb gasoline; then remove the hose slowly to release the pressure. Always wear safety glasses when removing the fuel hoses.

1. Remove the orange clamp securing the fuel supply hose to the fuel rail.
2. Disconnect the wiring harness from each injector.
3. Remove the cap screws and washers securing the fuel rail to the throttle body assembly; then remove the rail from the injectors. Account for two washers and two spacers.

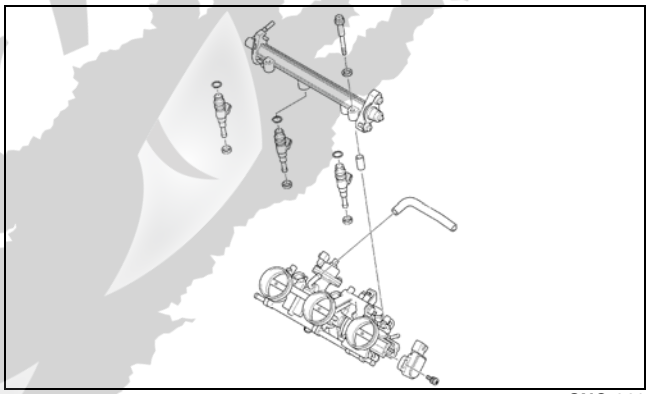


SNO-369

4. Remove the fuel injectors from the throttle body assembly. Account for six grommets.

Installing (7000)

1. Apply a light coat of oil to all six grommets; then install onto each injector.
2. Install the injectors into the throttle body assembly.
3. Place the fuel rail into position on top of the injectors and secure with existing spacers, washers and cap screws.



SNO-369

4. Connect the fuel delivery hose to the fuel rail and secure with the orange clamp.
5. Connect the wiring harness to the injectors. Cable tie as needed.

FUEL PRESSURE REGULATOR

The fuel pressure regulator maintains the fuel pressure at a constant specified level. The 9000 models maintain pressure from the manifold pressure.

EXHAUST AIR TEMPERATURE (EAT) SENSOR

This platinum, thin-film sensor detects the exhaust air temperature in the exhaust system. The ECM sends current to this sensor, and (depending on the temperature) the sensor will pass a portion of that current to ground. The ECM measures how much current passes through the sensor to ground. From this measurement, the ECM determines the exhaust air temperature and adjusts the fuel, ignition timing, and APV calibration. Resistance will increase as the temperature rises.

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CRANKSHAFT POSITION SENSOR

This sensor measures the location in degrees of rotation of the crankshaft. A 15° resolution exists between signals. The signal is triggered by teeth on the outer surface of the flywheel as they pass by the sensor. The sensor gives the ECM the location of the crankshaft at a given point in time. The ECM processes the information and uses it in many different types of calculations. For example, the sensor can be used for RPM, and it can also be used to determine the rate of acceleration of the crankshaft.

CAMSHAFT POSITION SENSOR

This sensor tells the ECM which stroke the engine is on. Because the 4-stroke engine operates on a 720° cycle, the piston is at TDC twice per cycle - once on the exhaust stroke and once on the compression stroke.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

This sensor measures pressure in the intake manifold when the engine is running. The ECM uses this sensor to aid in calculating the required fueling. For the base fuel map, the 5000 relies on the MAP sensor only for low throttle openings. After a given throttle opening is reached, the ECM switches to the TPS sensor for its main fuel map. The 9000 relies entirely on the MAP sensor and only uses the TPS for its main fuel map if the MAP sensor should fail.

The ECM uses the MAP sensor for many other calculations, but the base fuel map is the main one.

WASTEGATE CONTROL VALVE (9000)

The wastegate control valve adjusts the wastegate position based on input from the ECM. The wastegate does not require any input from the ECM to operate at base boost levels. In areas of operation where the ECM will allow the turbocharger to exceed base boost, the wastegate control valve bleeds some of the pressure that would typically be used to open the wastegate via the wastegate diaphragm port on the turbocharger. By bleeding this pressure, the wastegate is set at a lower opening thereby allowing more exhaust gas to pass by the turbine increasing the boost level.

KNOCK SENSOR

This sensor controls engine knock or detonation. The knock sensor assesses structure borne noise (vibrations) caused by rapid pressure rises (detonation) in either cylinder and performs calibration adjustments to the necessary cylinder via the ECM limiting damage to internal engine components. Detonation can be caused by many variables including poor fuel quality, lean operating conditions, or modified engine components/systems.

Self-Diagnostic System/ Codes

5000/9000

■NOTE: For testing the EFI system, refer to the EFI Diagnostic System Manual with Laptop Diagnostic Tool and Laptop Diagnostic Test Kit.

INTRODUCTION

The Service Icon is controlled by the ECM. The icon should illuminate each time the engine is started, and it should go out after a few seconds. If the icon stays illuminated while the engine is running and a code is displayed on the readout screen, the ECM is receiving input that is outside of its established parameters. Refer to the following chart.

Deluxe Gauge



FZ001D

Standard Gauge



FZ003B

Code	Trouble
1	Failure in the fuel system.
2	Failure in injector (PTO).
3	Failure in injector (MAG).
4	Failure in barometric pressure sensor circuit.
5	Open or short circuit in intake manifold air temperature sensor circuit.
6	Open or short circuit in water temperature sensor circuit.
7	Open or short circuit in throttle position sensor circuit.
8	Open or short circuit in manifold air pressure sensor circuit.
9	Failure in crankshaft position sensor circuit.
11	Failure in speed sensor circuit.
12	Failure in coil (MAG).
13	Failure in coil (PTO).
14	Failure in ISC valve.
15	Failure in oxygen sensor circuit.
19	Failure in camshaft position sensor circuit.
21	Open or short circuit and/or loose knock sensor circuit.
22*	Failure in injector (PTO secondary).
23*	Failure in injector (MAG secondary).
25	Failure in shifting system/gear position switch.
26	Malfunction in air pressure sensor circuit.
29	Malfunction in shift control switch.
OCTN*	Low octane gasoline.

*9000 only

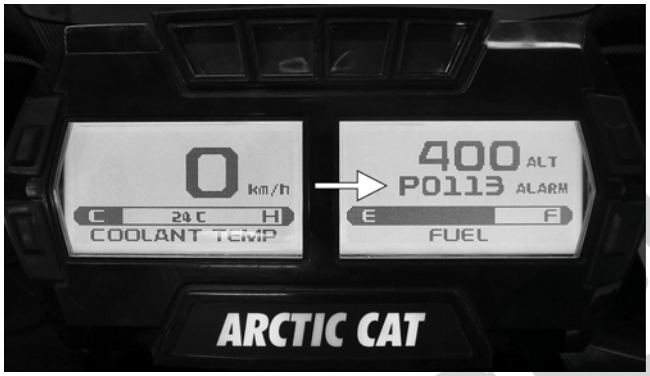
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The fuel system and the ignition system remain two separate systems. In a no-start situation, first determine if the problem is caused by lack of spark or by a fuel delivery problem or by an internal engine condition (low cylinder compression for example).

Once the problem area has been determined, check the components involved using the Fluke Model 77 Multimeter or the EFI Analyzer depending on the test being made.

7000

The Diagnostic Code Alarm is controlled by the ECM. If a code and the word ALARM illuminates while the engine is running, the ECM is receiving input that is outside of its established parameters. Refer to the following chart.



CWI-105A

Code	Trouble
P0031	O2 Heater Control Circuit Low
P0032	O2 Heater Control Circuit High
P0107	Manifold absolute pressure circuit low
P0108	Manifold absolute pressure circuit high
P0112	Intake air temp sensor circuit low
P0113	Intake air temp sensor circuit high
P0115	Engine coolant temp sensor 1 circuit
P0117	Engine coolant temp sensor 1 circuit low
P0118	Engine coolant temp sensor 1 circuit high
P0120	Throttle position sensor circuit
P0122	Throttle position sensor circuit low
P0123	Throttle position sensor circuit high
P0130	O2 sensor circuit
P0131	O2 sensor circuit low
P0132	O2 sensor circuit high
P0171	System too lean
P0172	System too rich
P0201	Injector circuit/open - cylinder 1
P0202	Injector circuit/open - cylinder 2
P0203	Injector circuit/open - cylinder 3
P0217	Engine coolant over temp condition
P0261	Cylinder 1 injector circuit low
P0264	Cylinder 2 injector circuit low
P0267	Cylinder 3 injector circuit low
P0508	Idle air control system circuit low
P0509	Idle air control system circuit high
P0511	Idle air control circuit
P0522	Engine oil pressure sensor circuit low
P0523	Engine oil pressure sensor circuit high
P0562	System voltage low
P0563	System voltage high
P0780	Shift Error
P1315	Crankshaft Position out of sync
P1338	Crankshaft spike detected
P1339	Crankshaft tooth not detected
P1685	Main relay open circuit
P1686	Main relay circuit low
P1688	Reverse relay open circuit
P1689	Reverse relay circuit low
P1691	Forward relay open circuit
P1692	Forward relay circuit low
P1694	Headlight relay open circuit
P1695	Headlight relay circuit low
P2228	Barometric pressure sensor A circuit low
P2229	Barometric pressure sensor A circuit high
P2300	Ignition coil A primary control circuit low
P2303	Ignition coil B primary control circuit low
P2306	Ignition coil C primary control circuit low
U1000	Vehicle not registered or invalid PIN
U1001	Vehicle not registered and vehicle limits enabled
U0155	Lost communication with the ECM

Fuel Pressure Regulator

1. Using the Fuel Pressure Test Kit, connect the tester to the regulator fuel inlet.

■NOTE: A short piece of 3/8 in. I.D. hose will be needed to make the above connections.

2. Pressurize the regulator to 28-31.3 psi. Turn the pressure tester shut off valve to the OFF position. Observe the gauge for several minutes and note any loss of pressure. If pressure begins to drop, the cause may be a ruptured diaphragm, worn spring, or leaking valve. If the regulator fails to build or maintain pressure, replace the regulator.

■NOTE: If the pressure drops, check the hose connections to ensure no leaks exist.

Throttle Body Assembly

REMOVING/DISASSEMBLING (5000)

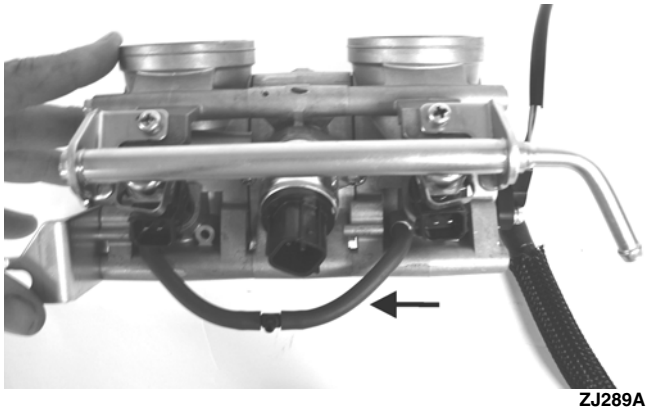
■NOTE: To remove the throttle body assembly, it is necessary to remove the air silencer. The seat and gas tank must also be removed.

1. Remove the coolant hoses and MAP sensor hoses from the throttle body.



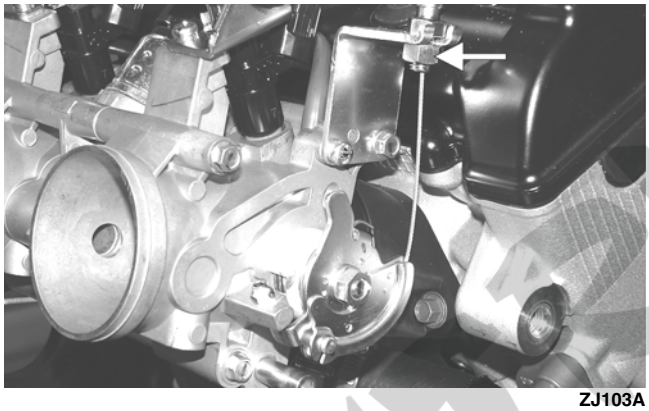
ZJ018A

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ZJ289A

2. Loosen the throttle cable jam nut; then remove the throttle cable from the bracket and the throttle valve cam.

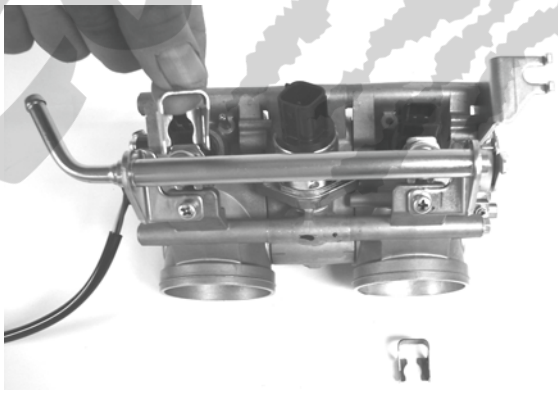


ZJ103A

3. Remove the cable ties securing the fuel injector wiring harness to the fuel rail; then disconnect the harness from the fuel injectors.

■NOTE: For installing purposes, note the location of all cable ties.

4. Loosen the clamps securing the throttle bodies to the intake boots; then remove the throttle body assembly.
5. Remove the retaining clips securing the fuel rail to the injectors; then remove the two screws securing the fuel rail to the throttle body assembly. Remove the fuel rail and injectors from the throttle body assembly.

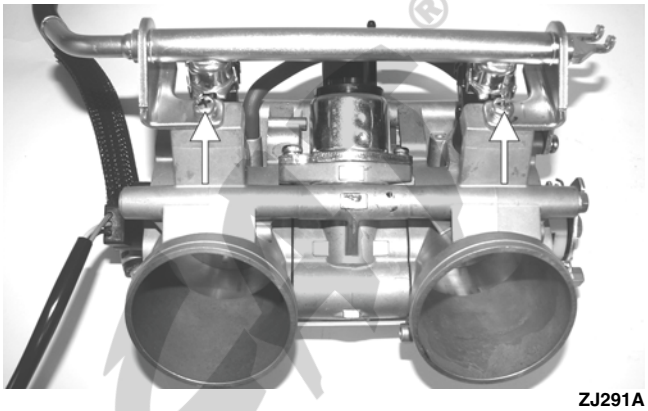


ZJ290

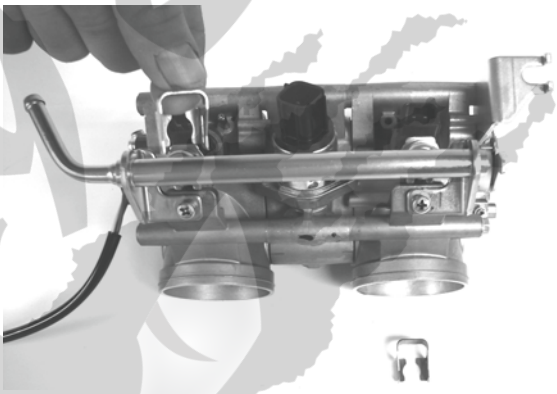
■NOTE: For assembling purposes, note from which side the fuel injectors were removed.

ASSEMBLING/INSTALLING (5000)

1. Install the fuel injectors onto the throttle body assembly; then secure the fuel rail and injectors to the throttle body assembly with the two screws and the retaining clips.

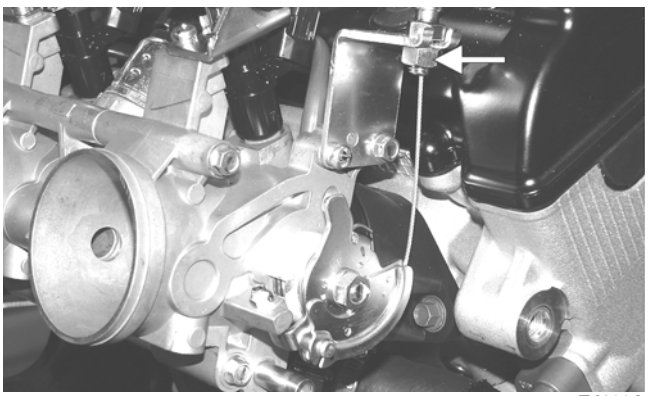


ZJ291A



ZJ290

2. Install the throttle body assembly to the intake boots and tighten the clamps; then install the coolant hoses and the MAP sensor hoses. Secure the coolant hoses with the clamps.
3. Connect the injector wiring harness to the injectors; then secure the harness to the fuel rail with cable ties in the proper locations as noted during disassembling.
4. Install the throttle cable to the bracket on the throttle body assembly and to the throttle valve cam; then secure the cable with the jam nut.



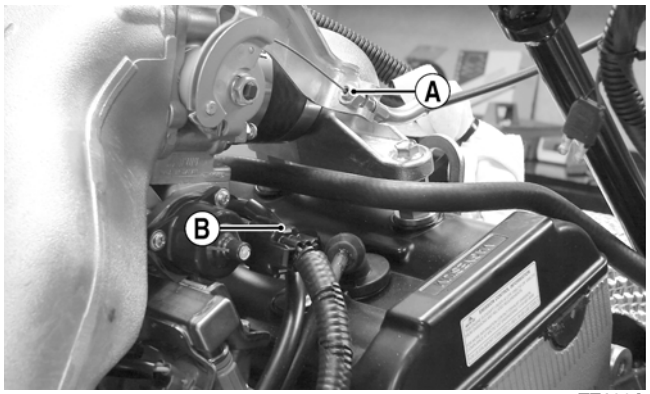
ZJ103A

■NOTE: To finalize this procedure, install the air silencer. Install the gas tank and seat.

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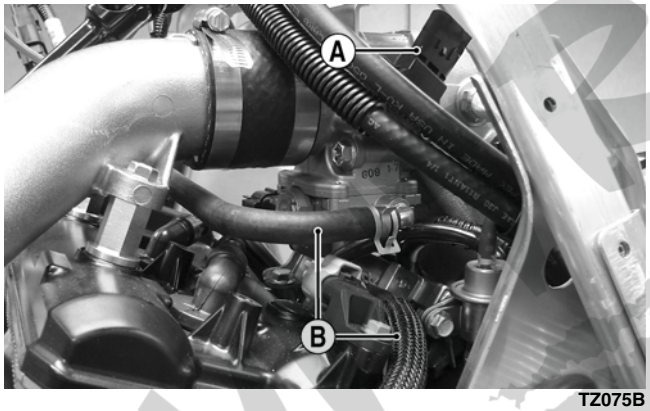
REMOVING/DISASSEMBLING (9000)

1. Remove the hood, seat, and gas tank.
2. Disconnect the throttle cable (A); then disconnect the idle speed control (B).



TZ108A

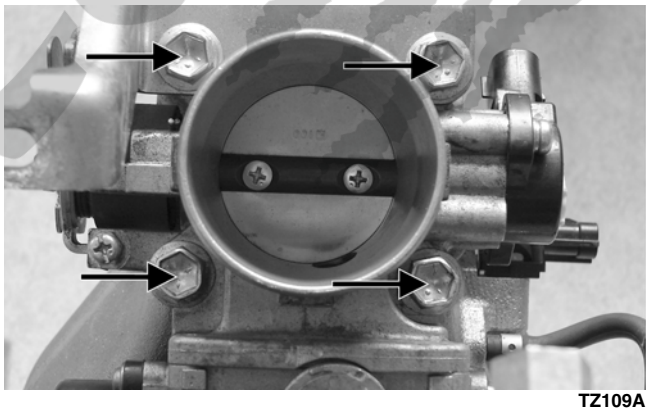
3. Remove the harness connector from the throttle position sensor (A); then place a towel under the throttle body coolant hoses (B) and with a suitable clamping device, close-off the coolant hoses and remove them from the throttle body.



TZ075B

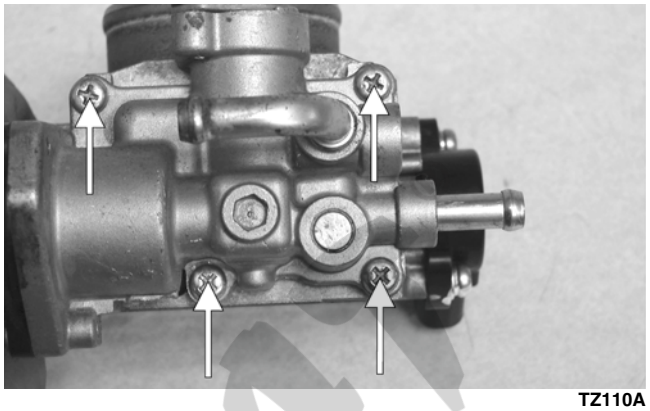
■NOTE: If the snowmobile is in warranty, breaking the seal on the idle screw jam nut or the Phillips-head screws on the TPS will void warranty.

4. Remove the four cap screws securing the throttle body to the intake manifold and account for the throttle cable support bracket.



TZ109A

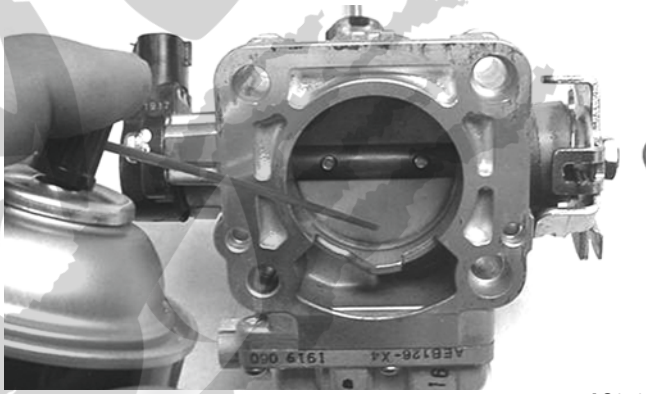
5. Remove the four screws securing the ISC valve to the throttle body.



TZ110A

■NOTE: Remove the throttle body ISC valve before using any type of cleaner to clean the throttle body.

6. Using a throttle body cleaner, spray throttle valve once and clean the venturi of carbon buildup. A fine nylon brush may be needed to clean carbon deposits.

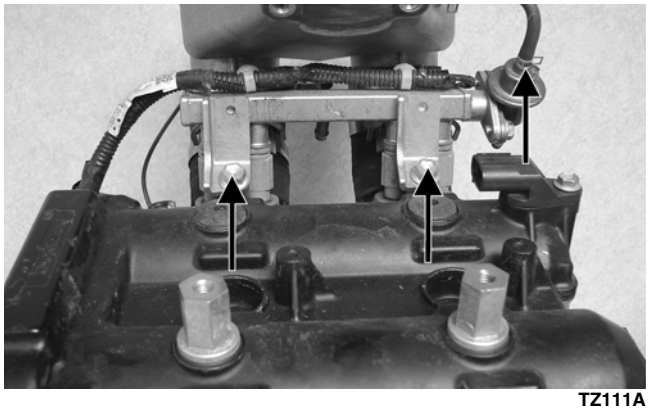


AO252

CAUTION

Never place the throttle body in cleaning solvent with the TPS secured to the throttle body or the sensor must be replaced.

7. Carefully blow-dry the throttle body and be sure that the ISC valve rubber gasket is properly placed for assembly.
8. Disconnect the injector harness and remove the hose from the fuel pressure regulator; then remove the cap screws securing the fuel rail/injectors to the intake flange.



TZ111A

■NOTE: After removing the fuel rail, account for the four injector gaskets.

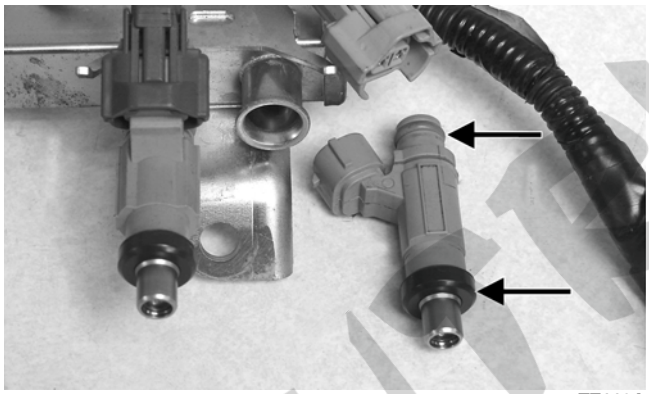
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9. Remove the four harness connectors from the injectors; then carefully remove the injectors from the fuel rail.



TZ113

■**NOTE: With the injectors removed, inspect the O-rings and gaskets for damage.**

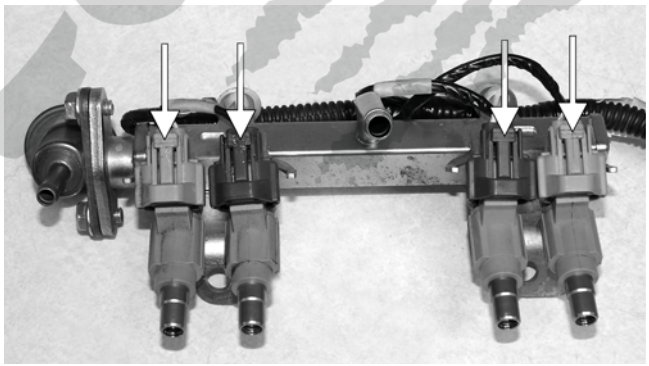


TZ113A

10. If necessary, remove the cap screws securing the fuel pressure regulator to the fuel rail and remove the regulator.

ASSEMBLING/INSTALLING (9000)

1. If removed during disassembling, install the fuel pressure regulator with a new O-ring in place and secure it to the fuel rail. Tighten to 96 in.-lb.
2. Install the injectors into the fuel rail; then install the four harness connectors to the injectors and connect the injector harness to the main harness connector.

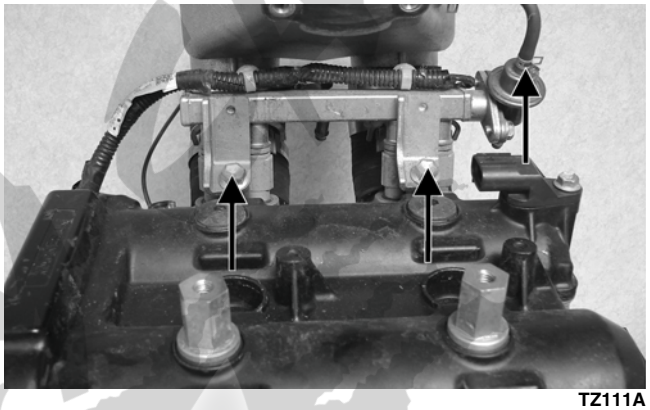


TZ116A

3. Install new injector gaskets into the intake flange and install the fuel rail/injectors. Secure with the two cap screws and tighten to 18 ft-lb; then install and secure the hose to the fuel pressure regulator.

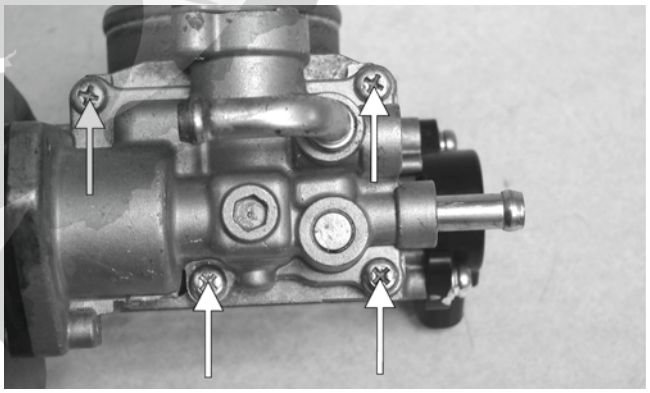


TZ117



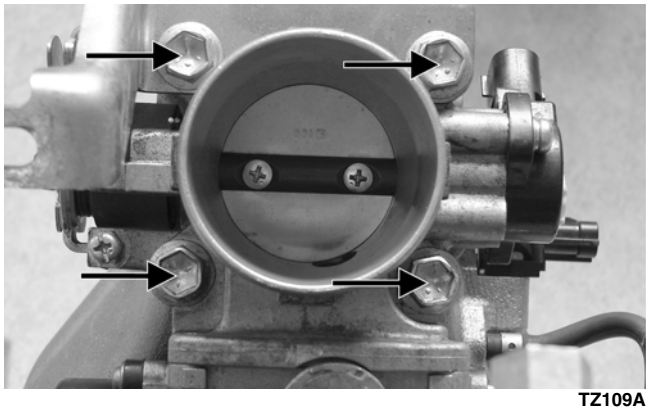
TZ111A

4. With a new gasket for the ISC valve in place, secure the ISC valve to the throttle body and tighten securely.



TZ110A

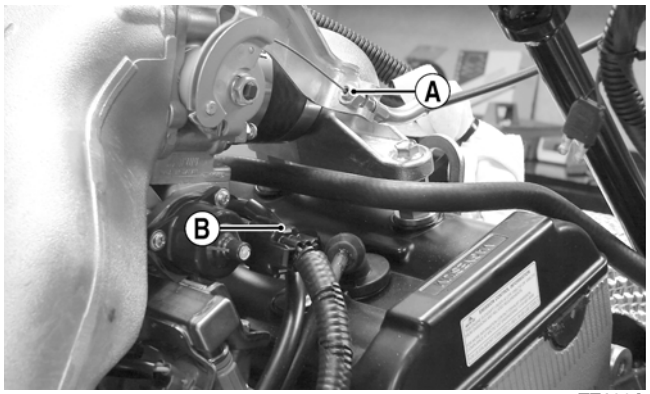
5. With a new throttle body gasket, secure the throttle body with the cable support bracket to the intake plenum with the four caps screws; then tighten to 18 ft-lb.



TZ109A

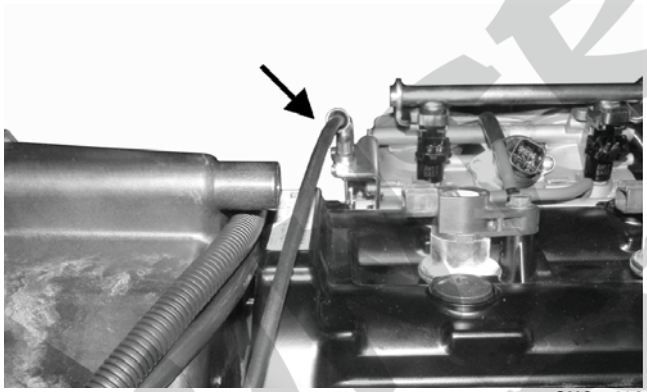
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6. Install the hose connecting the intake pipe to the throttle body and secure with the hose clamps.
7. Install the coolant hoses to the throttle body and secure with the clamps; then install the harness connector to the throttle position sensor.
8. Install the harness connector to the idle speed control (B); then install the throttle cable to the throttle body pulley and secure the cable with the jam nut (A).



TZ108A

■NOTE: Make sure the throttle cable is secured correctly so the cable does not rub on the steering post.


SNO-741A

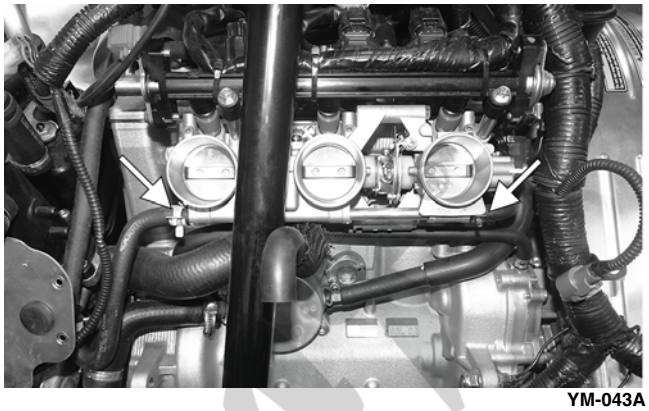
■NOTE: Make sure the throttle lever free-play is within a range of 0.030-0.060 in.

9. Install the gas tank and seat; then install the hood and side panels. Connect the hood harness.

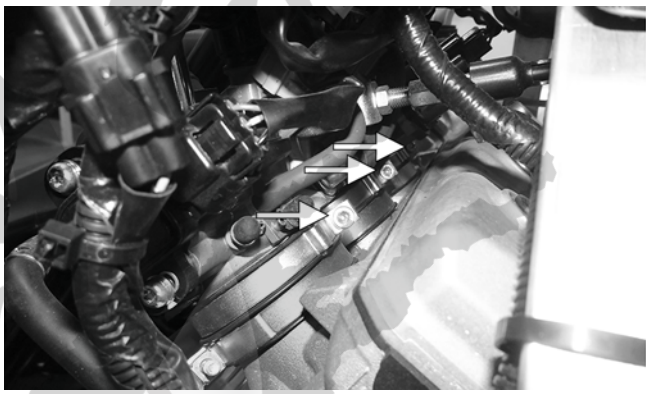
REMOVING/DISASSEMBLING (7000)

■NOTE: To remove the throttle body assembly, it is necessary to remove the access panels, hood, air intake assembly, and the two front spars.

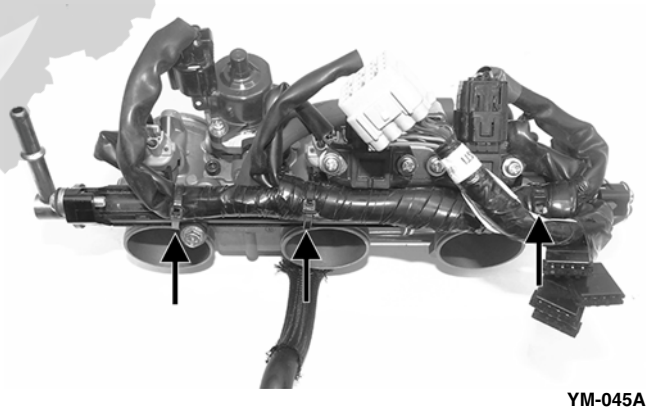
1. Remove the coolant hoses and MAP sensor hoses from the throttle body.


YM-043A

2. Disconnect the throttle body harness from the main harness; then loosen the three screws securing the throttle body to the intake boots.


YM-044A

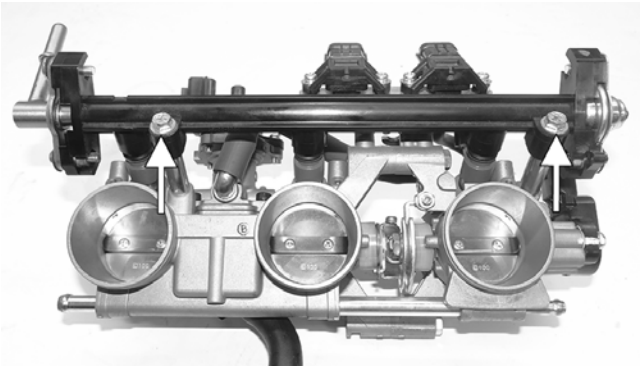
3. Loosen the throttle cable jam nut; then remove the throttle cable from the bracket and the throttle valve cam. Remove the throttle body.
4. Remove the cable ties securing the throttle body harness to the fuel rail.


YM-045A

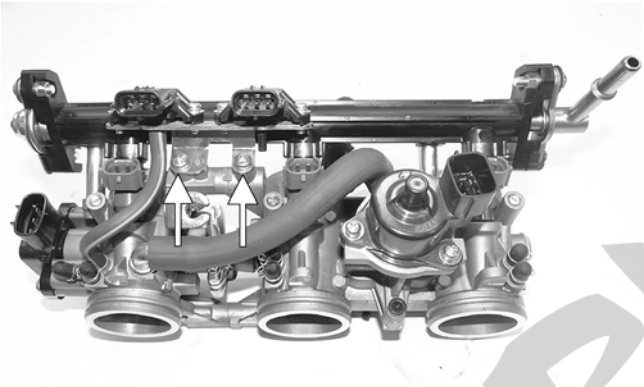
■NOTE: For installing purposes, note the location of all cable ties.

5. Remove the screws and washers securing the fuel rail to the throttle body; then remove the injectors. Account for six O-rings.

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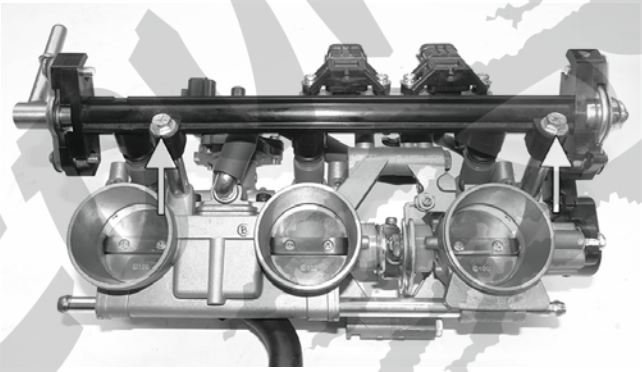


YM-048A

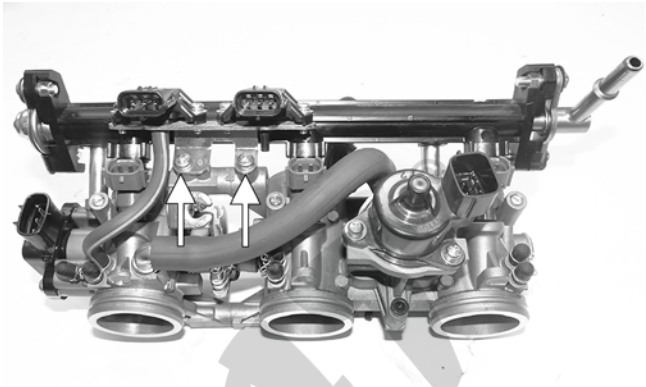
■**NOTE: For assembling purposes, note from which side the fuel injectors were removed.**

ASSEMBLING/INSTALLING (7000)

1. Install the fuel injectors onto the throttle body assembly; then secure the fuel rail and injectors to the throttle body assembly with the four screws, washers and spacers. Tighten securely.

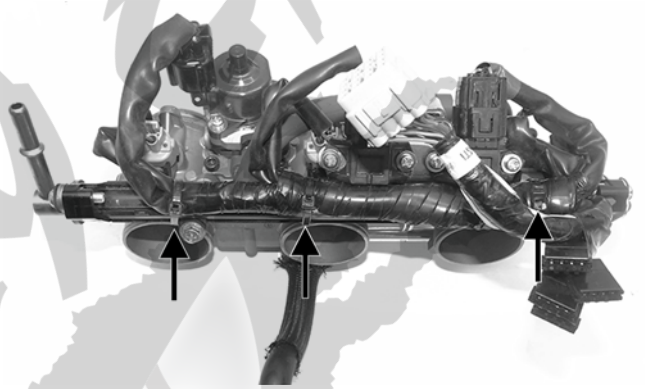


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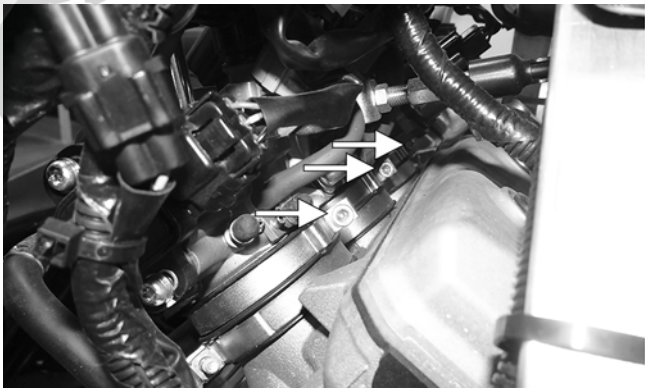
YM-048A

2. Connect all connections of the throttle body harness to the throttle body sensors. Secure the harness to the fuel rail using cable ties.



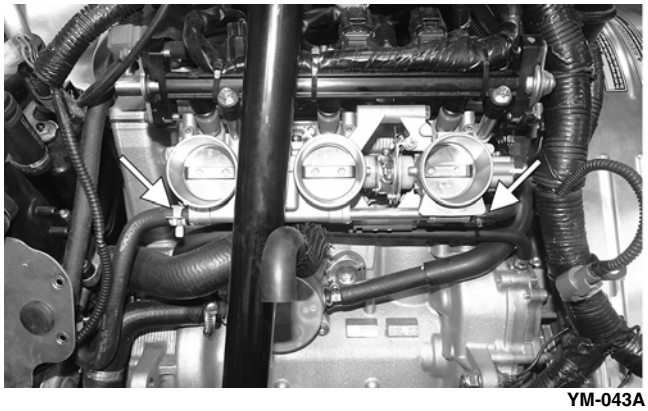
YM-045A

3. Install the throttle cable to the bracket on the throttle body assembly and to the throttle valve cam; then secure the cable with the jam nut.
4. Install the throttle body assembly to the intake boots and tighten the clamps; then install the coolant hoses and the MAP sensor hoses. Secure the coolant hoses with the clamps.



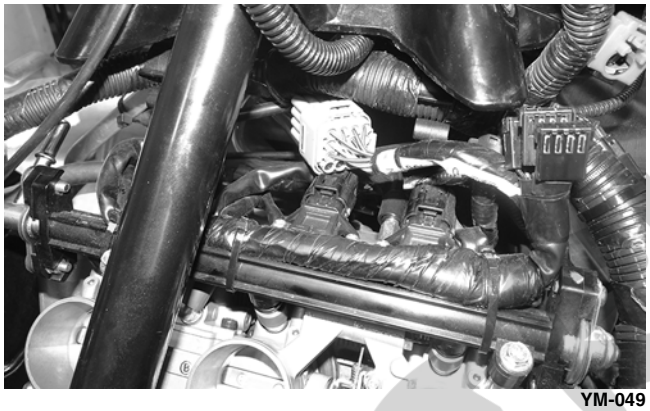
YM-044A

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YM-043A

5. Connect the large gray connector to the main harness.



YM-049

■**NOTE: To finalize this procedure, install the front spars, air silencer, hood and both access panels.**

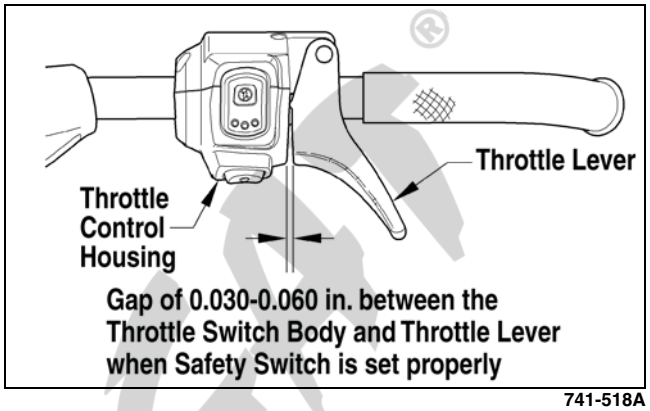
Throttle Cable

REMOVING

1. Loosen the throttle cable from the bracket; then remove the throttle cable from the pulley on the throttle body lever shaft.
2. Remove the cable ties securing the throttle cable.
3. Remove the throttle cable ends from the throttle lever and from the throttle control housing.

INSTALLING/ADJUSTING

1. Install the throttle cable into the throttle control assembly making sure the cable snaps into place.
2. Install the throttle cable end on the throttle lever.
3. Route the throttle cable from the throttle control assembly to the throttle body assembly and oil-injection pump; avoid any sharp bends or moving components.
4. Attach the throttle cable to the pulley on the throttle body shaft.
5. Secure the throttle cable to the handlebar and steering post with cable ties.
6. Adjust the throttle cable tension by turning the jam nuts in the appropriate direction until 0.030-0.060 in. free-play exists in the throttle lever and the butterfly completely opens and closes. Tighten the jam nuts securely.



741-518A

CAUTION

Compress the throttle control lever to ensure free movement. If the throttle cable sticks or binds, correct the problem before starting the engine.

7. Synchronize the oil-injection pump (see Oil-Injection Pump in this section).

Fuel Filter

■**NOTE: The fuel filter should be replaced every 5000 miles.**

WARNING

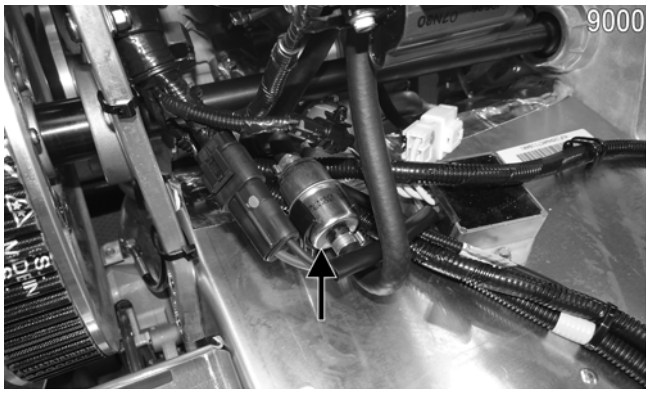
Since the fuel supply hose may be under pressure, remove it slowly to release the pressure. Place an absorbent towel around the connection to absorb gasoline; then remove the hose slowly to release the pressure. Always wear safety glasses when removing the fuel hoses.

■**NOTE: Before removing the fuel filter, take note of the filter inlet and outlet for installing purposes.**

REMOVING

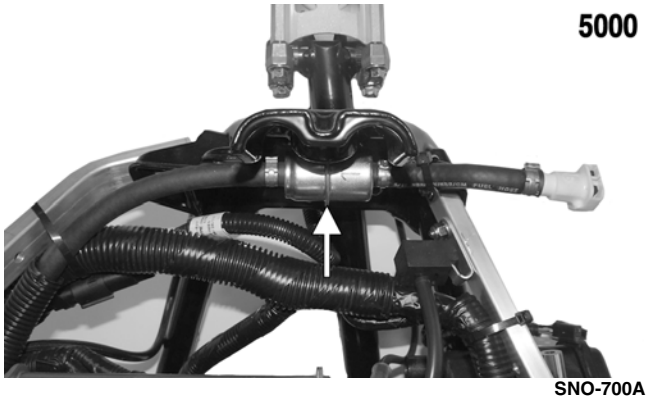
1. Remove both access panels, hood, seat(s), and both consoles to access the fuel filter.

■**NOTE: On the 9000, the gas tank must be removed.**



SNO-699A

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SNO-700A



XM184B

2. Disconnect the gasline hose from the fuel pump.
3. Remove the hose clamps and discard; then slowly remove the fuel hoses from the fuel filter. Dispose of the excess fuel from the filter properly.

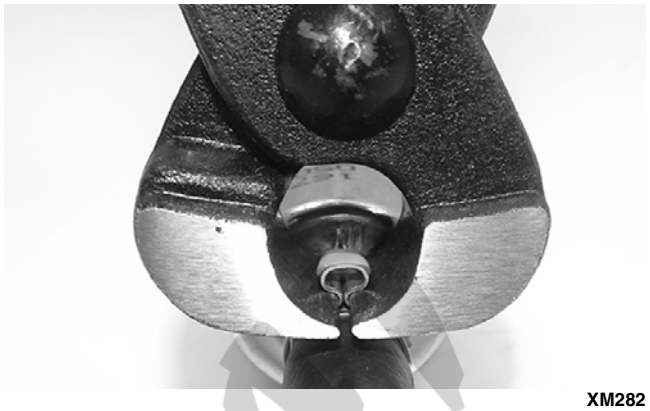
■NOTE: Inspect the hoses for any signs of cracking, cuts, or wear points. Replace if necessary.

INSTALLING

CAUTION

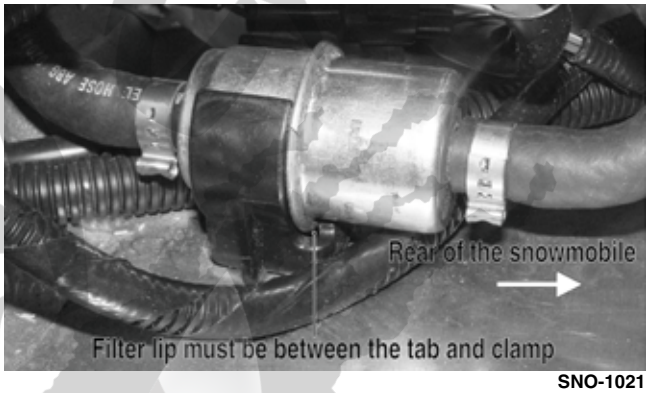
When installing the gasline hoses and clamps make sure the hoses are pressed up against the filter and the clamps are not installed over the end of the hose or the barb on the filter.

1. Place new hose clamps on the gasline hoses; press the gasline hoses onto the filter making sure they are fully pressed on.
2. Secure the gasline hoses using the clamps making sure there is no more than 9 mm between the filter and the clamps.
3. Use Fuel Hose Clamp Tool to make sure the fuel rail side hose clamp is tight by crimping the clamps until the two clamp areas touch.



XM282

■NOTE: On the 9000, insert the filter making sure the lip sits between the tab and clamp.



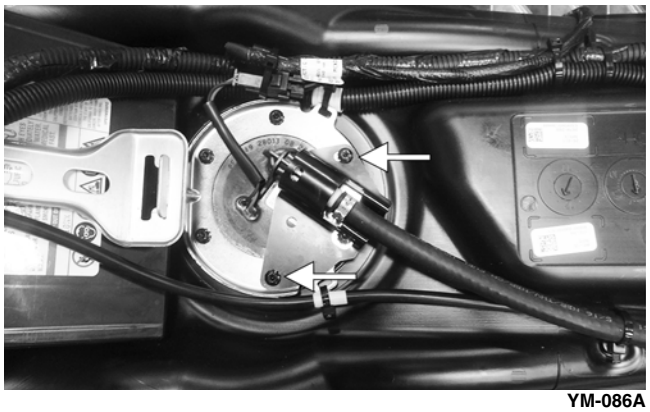
SNO-1021

4. Install the gas tank (9000), seat, and hood; then start the engine and inspect the gasline hoses and filter for any signs of leaks.
5. Secure the fuel filter to the fuel filter bracket; then install both consoles and both access panels.

Fuel Pump

TESTING

1. Remove the seat(s); then remove the upper and lower console panels.
2. On 7000 models, remove the torx screws securing the fuel pump protector to the fuel tank assembly.



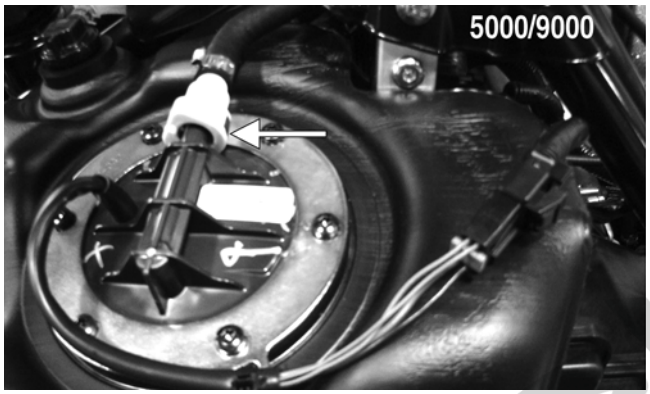
YM-086A

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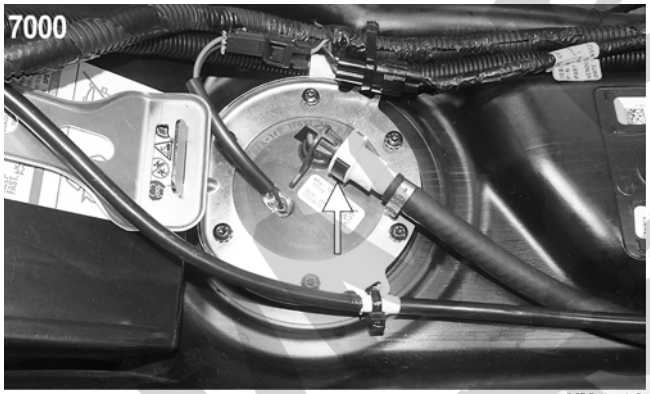
3. Disconnect the gasline hose connector hose from the outlet of the fuel pump by pressing inward on the white connector, pressing in the black release, and finally pulling back on the hose.

WARNING

Since the fuel supply hose may be under pressure, remove it slowly to release the pressure. Place an absorbent towel around the connection to absorb gasoline; then remove the hose slowly to release the pressure. Always wear safety glasses when removing the fuel hoses.



PC031B



YM-050A

3. Connect Fuel Pressure Test Kit to the fuel pump and fuel hose.
4. Turn the ignition key to the ON position. Fuel pressure should be as specified.

5000/7000	43.5 psi
9000	36.0 psi - Idle 55.0 psi - Full Boost

■NOTE: If fuel pressure is not as specified, the pump is defective and must be replaced.

5. Disconnect the fuel pump from the main wiring harness.
6. Connect the positive lead of a 12-volt power supply to the red wire and the negative lead of the 12-volt power supply to the black wire.
7. The pump should operate (it would be heard running).

■NOTE: If the fuel pump fails to operate, reverse the power supply at the fuel pump connector allowing the motor to run in the opposite direction. This will verify that nothing has entered and/or obstructed the pump.

■NOTE: If the fuel pump still fails to operate, the pump is defective and must be replaced.

REMOVING (5000/9000)

1. Remove both access panels, hood, upper and lower consoles, and seat.
2. Disconnect the fuel pump harness connector; then disconnect the gasline hose from the outlet of the fuel pump by pressing inward on the white connector, pressing in the black release, and finally pulling back on the hose.

WARNING

Since the fuel supply hose may be under pressure, remove it slowly to release the pressure. Place an absorbent towel around the connection to absorb gasoline; then remove the hose slowly to release the pressure. Always wear safety glasses when removing the fuel hoses.

3. Remove and retain the six torx-head screws securing the fuel pump in the fuel tank; then remove the snap ring.
4. Carefully remove the fuel pump and fuel pickup assembly from the gas tank noting the orientation of the fuel pump outlet for assembling purposes.



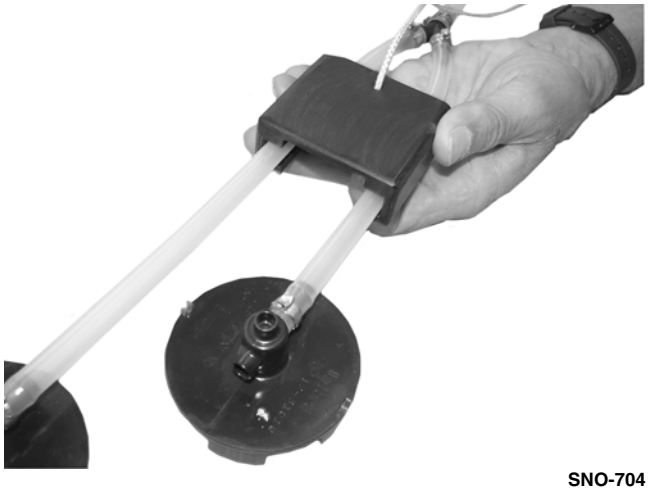
SNO-702

■NOTE: If the fuel pickup assembly is not being replaced, inspect the screens for any tears or obstructions. Also check the hoses and replace if necessary.

INSTALLING (5000/9000)

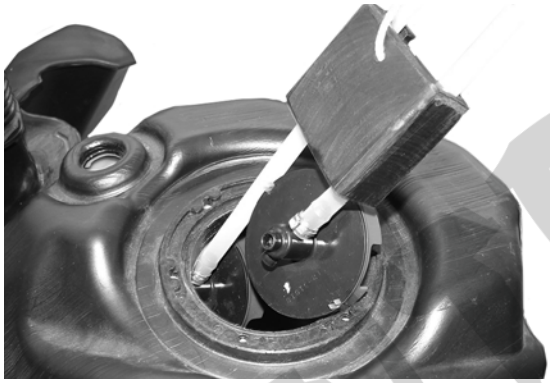
1. Slide Fuel Pump Installation Tool onto the fuel hose near the "Y" fitting until the tool touches the middle pickup. The two rear pickups should be pulled together.

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SNO-704

2. Carefully push the fuel pump assembly down and back into the fuel tank until the white fuel sensor (below the fuel pump) is flush with the fuel pump mounting surface.



SNO-705

3. While holding the fuel pump with the white fuel sensor in this position, pull the tool up to the tank opening with the retrieval cord.



SNO-744

■NOTE: Tip the fuel pump assembly to one side enough to allow the tool to be removed.

■NOTE: When the fuel pump hose assembly is installed correctly, the two rear pickups will lie flat in the rear of the fuel tank.



SNO-791

4. Make sure the front pickup will sit flat on the bottom of the tank with no kinks in the fuel hose.



SNO-706

5. Install the snap ring over the fuel pump and secure the fuel pump to the gas tank assembly using the existing torx-head screws. Tighten to 40 in.-lb.

CAUTION

Use care not to over tighten the retaining plate screws or damage to the gas tank may result.

6. Connect the fuel pump harness connector to the main harness and secure to the snap ring with a cable tie; then secure the gasline hose to the fuel pump making sure it locks into place.

7. Install the upper and lower consoles using existing machine screws; then install the seat, hood, and access panels.

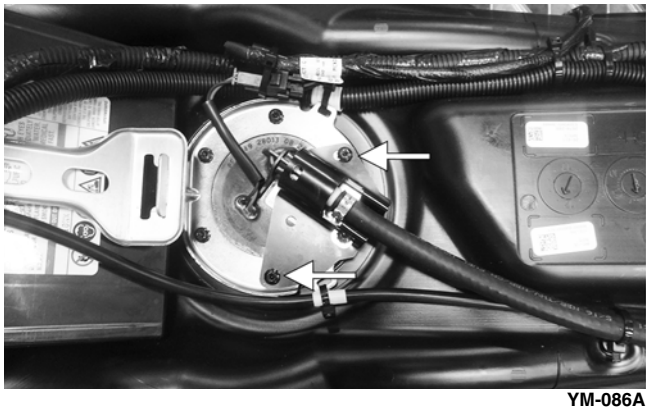
REMOVING (7000)

CAUTION

Before removing the fuel pump of fuel level sensor from the gas tank, be sure the fuel level is low or fuel may leak from the gas tank.

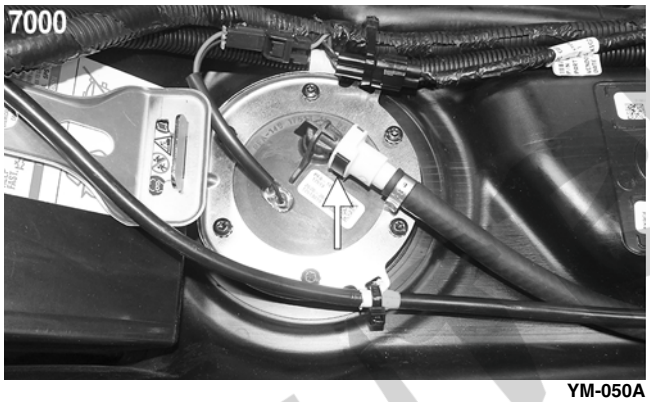
1. Remove the seat(s); then remove the torx screws securing the fuel pump protector to the fuel tank assembly.

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YM-086A

2. Disconnect the fuel pump harness connector; then disconnect the gasline hose from the outlet of the fuel pump by pressing inward on the white connector, pressing in the black release, and finally pulling back on the hose. Remove both cable ties secured to the fuel pump ring.

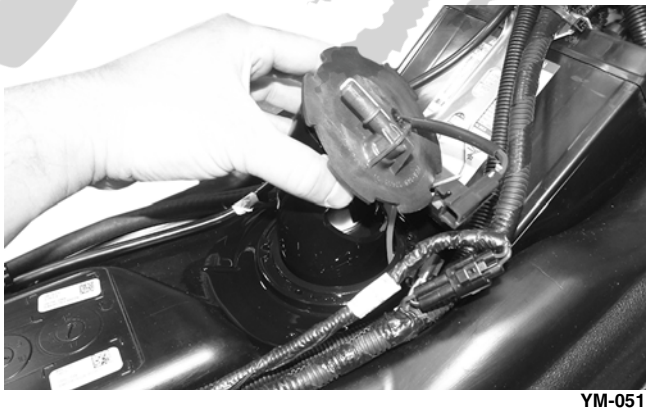


YM-050A

WARNING

Since the fuel supply hose may be under pressure, remove it slowly to release the pressure. Place an absorbent towel around the connection to absorb gasoline; then remove the hose slowly to release the pressure. Always wear safety glasses when removing the fuel hoses.

2. Remove and retain the six torx-head screws securing the fuel pump in the fuel tank; then remove the snap ring.
3. Carefully remove the fuel pump and fuel pickup assembly from the gas tank noting the orientation of the fuel pump outlet for assembling purposes.

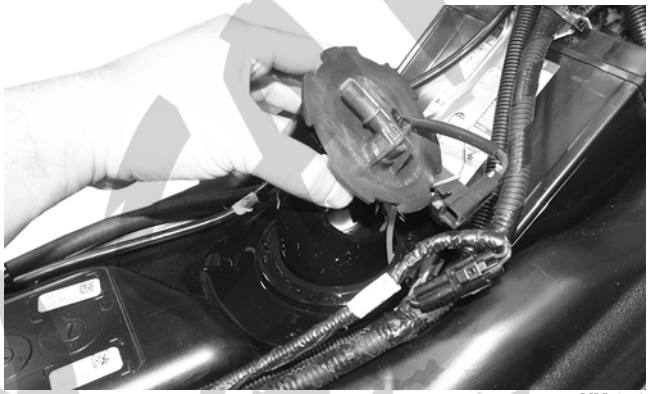


YM-051

■NOTE: If the fuel pickup assembly is not being replaced, inspect the screens for any tears or obstructions. Also check the hoses and replace if necessary.

INSTALLING (7000)

1. The two fuel pickups should be pressed together then carefully slide into the fuel pump opening in the gas tank; then install the fuel pump and orientate it so the fuel hose connection faces the front right of the snowmobile.



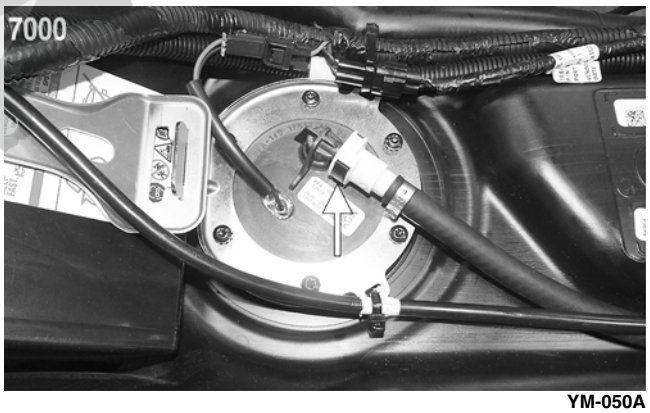
YM-051

2. Install the retaining ring over the fuel pump and secure the fuel pump to the gas tank assembly using the existing torx-head screws. Tighten to 40 in.-lb.

CAUTION

Use care not to over tighten the retaining plate screws or damage to the gas tank may result.

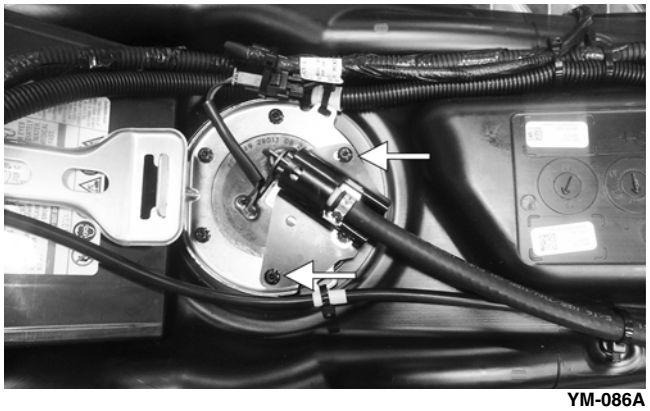
3. Connect the fuel pump harness connector to the main harness and secure to the retaining ring with a cable tie; then secure the gasline hose to the fuel pump making sure it locks into place. Secure the cables to the fuel pump ring using two cable ties.



YM-050A

4. Install the fuel pump protector using the existing screws. Tighten to 40 in.-lb.

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YM-086A

5. Install the seat(s).

Troubleshooting

Problem: Too Rich	
Condition	**Remedy**
1. **Diagnostic trouble code** activated	1. Replace problem sensor
2. **Fuel pressure** too high	2. Replace regulator
3. **Fuel return hose** obstructed	3. Service - replace hose - remove obstruction
4. **Injectors** leaking	4. Replace injectors
Problem: Too Lean	
Condition	**Remedy**
1. **Diagnostic trouble code** activated	1. Replace problem sensor
2. **Fuel pressure** too low	2. Replace regulator/fuel pump
3. **Vent hose** obstructed	3. Remove obstruction
4. **Fuel filter(s)** obstructed	4. Replace fuel filter(s)

Gas Tank

ZR/XF/M (REMOVING)

1. Remove the access panels, hood, and the seat.
2. Remove the lower console.
3. Disconnect the reverse alarm; then remove the two machine screws securing the upper console.
4. Remove and retain all four cap screws securing the rear spar tubes to the chassis and steering support.
5. Disconnect the gasline hose, vent hose, and fuel pump harness. Remove the gas tank.

■NOTE: On 7000 models, the battery cables and the battery will have to be removed.

ZR/XF/M (INSTALLING)

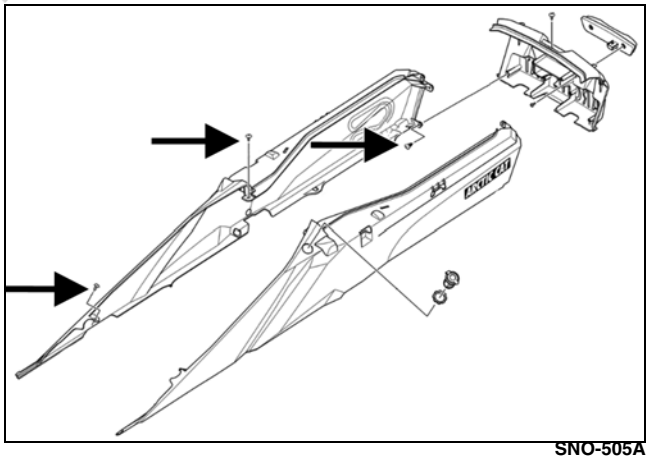
1. Install the gas tank; then connect the gasline hose, vent hose, and fuel pump harness.
2. Install the rear spar tubes and secure to the chassis and steering support using the four cap screws. Tighten to 23 ft-lb.
3. Connect the reverse alarm; then use the two machine screws to secure the upper console.
4. Install the lower console; then install the access panels, hood, and seat.

PANTERA (REMOVING)

1. Remove both access panels and hood.
2. Remove the passenger seat, operator seat, lower console, and the storage box lid.

■NOTE: On models with the rear gas tank installed, proceed to step 3. For other models, proceed to step 7.

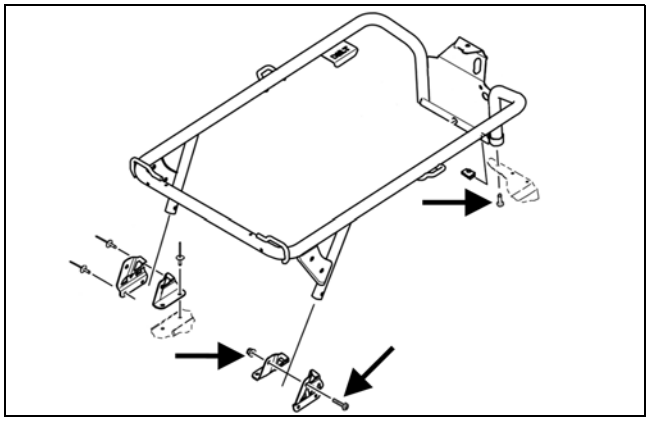
3. Remove the two machine screws securing the upper console; then disconnect the reverse alarm, heated seat switch, and the heated shield from the main harness.
4. Remove the screws securing the right- and left-side rack fascia. Remove both fascia pieces.



SNO-505A

5. Remove the four machine screws and two nuts securing the rear rack to the tunnel.

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SNO-506A

6. Remove and discard the hose clamp securing the rear fuel tank gasline hose to the elbow fitting; then remove the hose from the fitting. Remove the rear gas tank.
7. Remove and retain all four cap screws securing the rear spar tubes to the chassis and steering support.
8. Remove all battery cables and the battery from the from gas tank.
9. Disconnect the gasline hose, and fuel pump harness. Remove the front gas tank.

PANTERA (INSTALLING)

1. Install the front gas tank; then connect the gasline hose(s), vent hose, and fuel pump harness; then install the battery and connect all battery cables.
3. Connect the reverse alarm, heated seat switch, and the heated shield connectors; then use the two machine screws to secure the upper console.

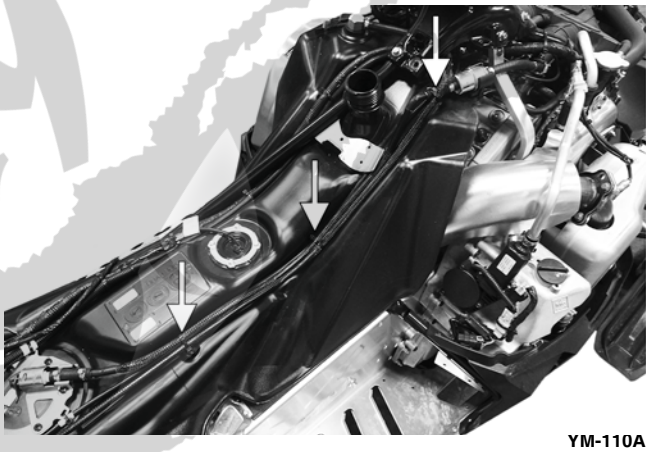
■NOTE: Steps 4-7 are for Pantera LTD models with the rear gas tank.

4. Route the gasline hose assembly through the center rear hole in the front fuel tank (if removed) and toward the elbow fitting in the rear fuel tank.
5. Install new hose clamp over the gasline hose; then press the gasline hose fully onto the fitting. **Use Fuel Hose Clamp Tool to secure the hose clamp over the gasline hose by crimping the clamps until the two clamp areas touch.**



YM-113

6. Using new cable ties, secure both gasline hoses to the fuel tank and to the negative battery cable.



YM-110A

7. Install the right- and left-side rack fascia using the existing hardware.
8. Install the rear spar tubes and secure using the existing cap screws. Tighten to 23 ft-lb.
9. Install the operator's seat, passenger's seat, and the storage box lid.

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Electrical Systems

All tests of the electrical components should be made using the digital Fluke Model 77 Multimeter. Replace any component that does not have a test value within specifications.

■NOTE: Whenever using a digital-style tester, "open (infinite resistance)" denotes an overload and the meter reading will be OL since the meter is not calibrated to register resistance values of that magnitude.

■NOTE: Always check the appropriate fuse before testing a component for failure.

■NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

SPECIAL TOOLS

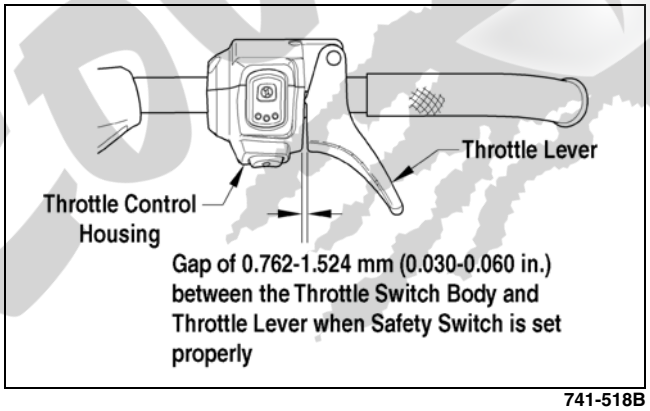
A number of special tools must be available to the technician when servicing the electrical systems.

Description	p/n
CATT II	0544-023
Arctic Cat Diagnostic System Manual	2256-974
Laptop Diagnostic Tool	0744-048
Actuator Test Harness	0644-518
Fluke Model 77 Multimeter	0644-559
MaxiClips	0744-041
Throttle Position Sensor (TPS) Adjustment Tool Kit	3639-891

■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

Ignition System

■NOTE: There must be 0.030-0.060 in. free-play between the throttle lever and the control housing.



741-518B

TROUBLESHOOTING

1. Remove the spark plugs and visually check their condition. Replace any fouled plug. Attach the spark plugs to the high tension leads and ground them to the engine.

CAUTION

Do not ground the spark plug on the cylinder head cover. The cover is made of magnesium and any contact with spark or electrical arc will severely pit the surface.

CAUTION

Before checking for spark, place all the engine switches in the deactivated position. In the event the engine could be flooded, engage the starter several times to clear the engine of excess fuel.

CAUTION

Never crank the engine over without grounding the spark plugs. Damage to coils and/or CDI/ECM may result.

■NOTE: Make sure the ignition switch and the emergency stop switch are in the ON position.

2. Crank the engine over and check for spark. If no spark is present, check to make sure the throttle cable is properly tensioned. Compress the throttle control and while holding the throttle control in this position, crank the engine over and check for spark. If spark is now present, adjust the throttle cable tension.

TESTING

Throttle Control Switch

1. Disconnect the handlebar harness connector; then connect the ohmmeter leads as shown below.

Wire	Wire
Green/Yellow	Red/Green

2. With the throttle lever in the idle position, the meter must read less than 1 ohm. If the meter reads OL (infinite resistance), replace the control assembly.

3. Move the throttle lever to the wide open position. The meter must read OL (infinite resistance). If the meter reads less than 1000 ohms, replace the control assembly.

Throttle Position Sensor

VERIFYING TPS ADJUSTMENT TOOL

Before using the TPS adjustment tool, verify its battery condition. The battery used in the tool is a 9-volt battery. To check battery condition, use a digital volt/ohmmeter set on DC volt scale. Test between the adjustment tool black and red jacks. Insert the red lead of the digital voltmeter into the red jack of the adjustment tool and the black lead of the digital voltmeter into the black jack of the adjustment tool. The green power light of the analyzer should now be illuminated. If voltage is found below 4.9 volts, replace the battery.

■NOTE: The Test Harness must be plugged into the analyzer for testing voltage. Always verify battery voltage is at least 4.9 DC volts before testing TPS.

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CHECKING TPS

■NOTE: If the snowmobile is in warranty, breaking the seal on the idle screw jam nut or the Phillips-head screws on the TPS will void warranty. If the TPS is tested out of specification, the throttle body must be replaced. If the snowmobile is out of warranty, proceed to Adjusting TPS.

■NOTE: On the 7000, the TPS should only be checked using the CATT II Tool. Instructions will be included with the tool.

1. Using Throttle Position Sensor (TPS) Adjustment Tool Kit, connect its wiring harness to the TPS.
2. Connect the red tester lead to the white adjustment tool jack; then connect the black tester lead to the black adjustment tool jack.
3. With the throttle in the idle position, compare the reading on the voltmeter to the chart. If the reading is within prescribed specification, proceed to step 6.

Model	Idle	Full-Open
5000	1.10-1.14v	4.30-4.50v
9000	0.69-1.11v	4.00-4.20v

4. Compress the throttle lever slowly to the full-open position. The meter reading should show a smooth rise in voltage all the way to the full-open position. If the voltage seems to be erratic or doesn't meet the prescribed specification, repeat this procedure several times to confirm results.

■NOTE: If at any point throughout the throttle range the meter reads no voltage (open), hold the throttle lever in that position. If the voltage does not return, the throttle body must be replaced.

5. If the full-open throttle voltage remains erratic or out of specification, proceed to the appropriate Adjusting TPS.
6. If the TPS is within the prescribed specification, disconnect the adjustment tool harness from the TPS. Connect the snowmobile TPS harness to the TPS.

■NOTE: Before installing the TPS harness connector, apply dielectric grease to the connector pins.

ADJUSTING TPS

■NOTE: Adjusting the TPS is for out of warranty snowmobiles only.

■NOTE: On the 7000, the TPS should only be adjusted using the CATT II Tool. Instructions are included with the tool.

■NOTE: The throttle shaft must be against the throttle stop for this procedure.

CAUTION

Never adjust the throttle plate stop screw and nut. The idle circuit is controlled by the ISC valve.

1. Disconnect the harness connector from the TPS.
2. Loosen the screw(s) of the throttle position sensor to allow adjustment.
3. Using Throttle Position Sensor (TPS) Adjustment Tool Kit, connect its wiring harness to the TPS. Connect the red and black digital voltmeter leads to the white and black jacks of the TPS adjustment tool.
4. While observing the digital voltmeter, slowly rotate the sensor until idle voltage specification is observed on the LCD of the multimeter. While holding the sensor in this position, tighten the screw(s) securing the sensor to the throttle body securely.
5. Gently snap the throttle open and closed several times to check the TPS voltage. If it has changed from the idle voltage specification, loosen the screw(s) securing the sensor and make necessary adjustments.
6. With the idle position set to specification, compress the throttle lever to the full-open position. The full-open specification should be observed. Gently snap the throttle lever open and closed several times and note if the reading remains within the specification.

■NOTE: If, after adjusting the Throttle Position Sensor to the IDLE specification, the FULL-OPEN is less than 4.30 volts, recheck the IDLE setting. If the IDLE setting is correct, replace the sensor.

Model	Idle	Full-Open
5000	1.10-1.14v	4.30-4.50v
9000	0.69-1.11v	4.00-4.20v

REPLACING TPS (5000/9000)

■NOTE: Replacing the TPS is for out of warranty snowmobiles only.

Removing

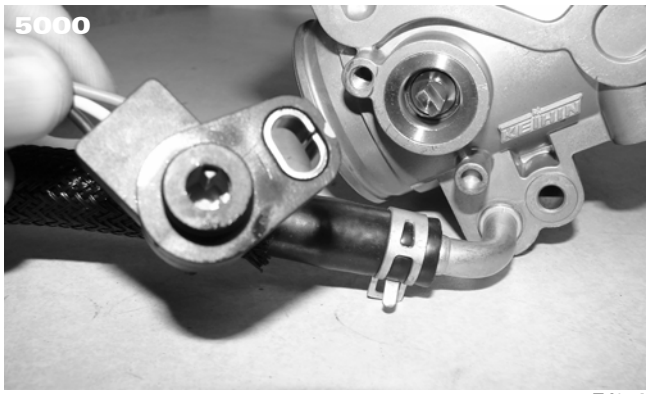
■NOTE: On the 5000, remove the hood, seat, and gas tank. On the 9000, remove the hood, upper console, and lower console.

1. Disconnect the throttle cable from the throttle clutch.
2. Disconnect TPS wiring harness from the TPS; then noting the TPS position, remove the screw(s) securing TPS to the throttle body housing and remove the sensor. Account for the O-ring fitting into the groove of throttle body.

Installing

1. Apply a light coat of silicone grease to the area around the outside of the TPS flange and into the O-ring groove. Install the O-ring into the groove.
2. Install the new TPS onto the throttle shaft by aligning the "flats" on the throttle shaft cam with the alignment points of the sensor; then rotate the sensor until properly positioned on the throttle body.

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ZJ254



TZ119

3. Install the screw(s), flat washer(s), and lock washer(s) securing the sensor to the throttle body. Do not tighten at this time.
4. Adjust the TPS (see Adjusting TPS in this sub-section).
5. Disconnect the adjustment tool harness from the TPS. Connect the snowmobile TPS harness to the newly installed or adjusted TPS.

■NOTE: Before installing the TPS harness connector, apply dielectric grease to the connector pins.

■NOTE: On the 5000, install the gas tank, seat, and hood. On the 9000, install the lower console, upper console, and hood.

REPLACING TPS (7000)

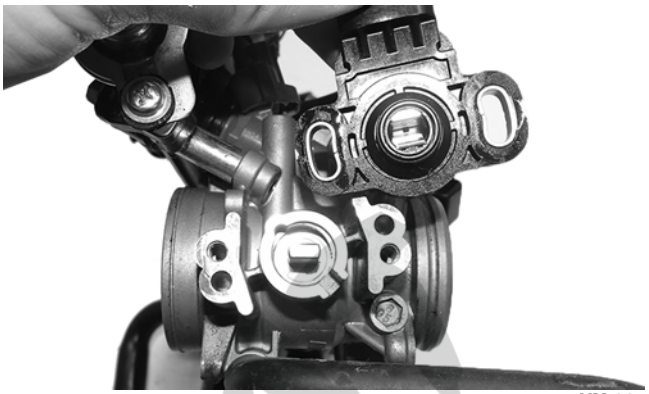
■NOTE: Replacing the TPS is for out of warranty snowmobiles only.

Removing

1. Remove the access panels, hood, air intake assembly.
2. Disconnect TPS wiring harness from the TPS; then noting the TPS position, remove the screws and washers securing TPS to the throttle body housing and remove the sensor.

Installing

1. Install the new TPS onto the throttle shaft by aligning the "flats" on the throttle shaft cam with the alignment points of the sensor; then rotate the sensor until properly positioned on the throttle body.



YM-067

2. Install the screws w/ washers securing the sensor to the throttle body. Do not tighten at this time.
3. Adjust the TPS using the CATT II Tool. Instructions will be included with the tool.

■NOTE: Before installing the TPS harness connector, apply dielectric grease to the connector pins.

Electrical Resistance Tests (5000/9000)

■NOTE: Replace any component that does not have a test value within specifications. If the component tests satisfactorily but is suspected to be faulty, connect the red meter lead to a component lead and the black meter lead to ground. Check for continuity between the component and ground. If continuity is observed, replace the component.

■NOTE: The following test should be made using MaxiClips and the Fluke Model 77 Multimeter set to OHMS scale.

CAUTION
Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

Magneto Coil

1. Disconnect the white three-yellow-wire connector.
2. Connect the red meter lead to one yellow wire; then connect the black meter lead to another yellow wire (a total of three tests).
3. Resistance must be 0.2-0.4 ohm.

Crankshaft Position Sensor

1. Disconnect the sensor.
2. Connect the red meter lead to the blue/white wire; then connect the black meter lead to the green/white wire.
3. Resistance must be 173-211 ohms.

Ignition Coil

1. Disconnect an ignition coil connector.
2. Connect the red meter lead to the red/green wire; then connect the black meter lead to the gray/green (coil 1) or brown/green (coil 2) wire.
3. Resistance must be 1.4 ohms.

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Injection Coil

1. Test between the black/yellow and black wires from the injection coil.
2. Resistance must be 3.6 ohms.

Fuel Injector

1. Disconnect the fuel injector wiring harness.
2. Test between the two injector terminals. Resistance must be 9-12 ohms (5000) or 10.5-13 ohms (9000).

Coolant Temperature Sensor

1. Disconnect the coolant temperature sensor wiring harness from the main harness.
2. Test the resistance between the two leads from the sensor.
3. Compare the resistance reading to the Voltage/Resistance Chart - Coolant Temperature in this section.

Air Temperature Sensor

■NOTE: The component temperature must be known before conducting this test. Allow the engine to reach room temperature.

1. Disconnect the wiring harness from the air temperature sensor.
2. Set the meter selector in the OHMS position and test the sensor connector. Compare with the Voltage/Resistance Chart - Air Temperature in this section.

■NOTE: The air temperature sensor utilizes a thermistor. Resistance will change as temperature varies.

Electrical Resistance Tests (7000)

■NOTE: Replace any component that does not have a test value within specifications. If the component tests satisfactorily but is suspected to be faulty, connect the red meter lead to a component lead and the black meter lead to ground. Check for continuity between the component and ground. If continuity is observed, replace the component.

■NOTE: The following test should be made using MaxiClips and the Fluke Model 77 Multimeter set to OHMS scale.

CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

Magneto Coil

1. Disconnect the three-white-wire connector.
2. Connect the red meter lead to one white wire; then connect the black meter lead to another white wire (a total of three tests).
3. Resistance must be 0.15-0.23 ohm.

Crankshaft Position Sensor

1. Disconnect the sensor.
2. Connect the red meter lead to the gray wire; then connect the black meter lead to the black wire.
3. Resistance must be 336-504 ohms.

Ignition Coil

1. Disconnect an ignition coil connector.
2. Connect the red meter lead to the orange wire; then connect the black meter lead to the other wire.
3. Resistance must be 1.19-1.61 ohms.

Injection Coil (1)

1. Test between the red/blue and the red/black wires from the injection coil.
2. Resistance must be 86.4-105.6 ohms.

Injection Coil (2)

1. Test between the red/blue and the green/black wires from the injection coil.
2. Resistance must be 86.4-105.6 ohms.

Injection Coil (3)

1. Test between the red/blue and the blue/black wires from the injection coil.
2. Resistance must be 86.4-105.6 ohms.

Fuel Injector

1. Disconnect the fuel injector wiring harness.
2. Test between the two injector terminals. Resistance must be 86.4-105.6 ohms.

Coolant Temperature Sensor

1. Disconnect the coolant temperature sensor wiring harness from the main harness.
2. Test the resistance between the two leads from the sensor.
3. Compare the resistance reading to the Voltage/Resistance Chart - Coolant Temperature in this section.

Air Temperature Sensor

■NOTE: The component temperature must be known before conducting this test. Allow the engine to reach room temperature.

1. Disconnect the wiring harness from the air temperature sensor.
2. Set the meter selector in the OHMS position and test the sensor connector. Compare with the Voltage/Resistance Chart - Air Temperature in this section.

■NOTE: The air temperature sensor utilizes a thermistor. Resistance will change as temperature varies.

Voltage Regulator Tests

■NOTE: The following test should be made using MaxiClips and the Fluke Model 77 Multimeter set to DC Volt scale.

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This test should be made at the three-pin connector of the regulator/rectifier.

⚠ WARNING

Most voltages generated by the ignition system are sufficient to interrupt pacemakers! All technicians, especially those using pacemakers, must avoid contact with all electrical connections after the engine has been started.

■NOTE: Test the connector that comes from the engine.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the positive battery post; then connect the black tester lead to the negative battery post.
3. With the engine running at 2500-3000 RPM, the meter must show 12-14.5 DC volts.
4. Set the meter selector to the AC Voltage position.
5. Test between the three yellow wires for a total of three tests.
6. With the engine running at 2500-3000 RPM, all wire tests must be within 36-44 volts.

■NOTE: If tests failed, check all connections, etc., and test again. If no voltage is present, replace the stator assembly.

Testing Fuel Gauge Sender

■NOTE: Before testing the sender, verify the harness from the sender to the gauge is satisfactory.

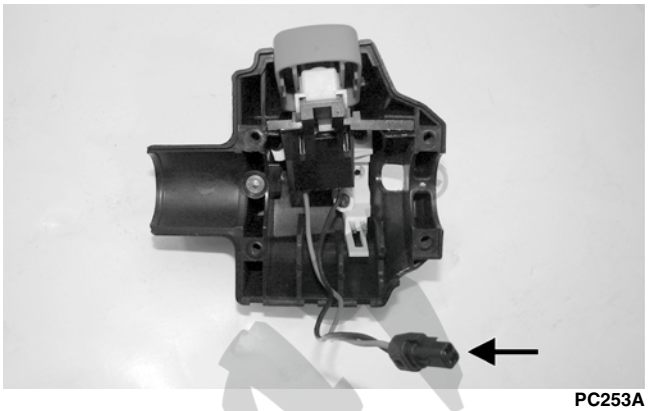
1. Remove the seat.
2. Disconnect the fuel gauge sender unit from the main wiring harness; then connect the ohmmeter leads to the two black sender wires.
3. Compare the reading to the chart following.

Full	<20 ohms
1/2	40-56 ohms
Empty	76-105 ohms

Emergency Stop Switch

RESISTANCE

1. Remove the four torx-head cap screws securing the front/rear throttle control housing assembly to the handlebar.
2. Set the selector to the OHMS position.
3. Connect one tester lead to one pin; then connect the other tester lead to the other pin.



PC253A

4. With the switch in the OFF position, the meter must read OL (infinite resistance).
5. With the switch in the RUN position, the meter must read less than 1 ohm resistance.

■NOTE: If the meter does not show as specified, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

Starter Relay Solenoid

TESTING

■NOTE: The electric start solenoid may be tested using either one of the following methods.

Method #1

1. Disconnect the solenoid connector from the main wiring harness.
2. Place the ohmmeter leads across the solenoid coil terminals. The ohmmeter must read 3-5 ohms.

■NOTE: An in-line ammeter would measure between 2 and 4 amps of solenoid coil current flow with the battery connected.

CAUTION

NEVER connect an in-line ammeter with the large starter cables because the 200 amps of current flow will instantly damage most ammeters.

Method #2

1. Using the multimeter set to the DC Voltage position, check the relay as follows.
2. Connect the red tester lead to the positive battery terminal; then connect the black tester lead to the starter cable connection on the starter relay. The meter must show battery voltage.

■NOTE: Engage the brake lever lock and place the emergency stop switch in the RUN position.

3. Engage the starter while observing the multimeter. The multimeter should drop to 0 volts and a "click" should be heard from the relay.

■NOTE: If a "click" is heard and more than 1 volt is indicated by the multimeter, replace the starter relay. If no "click" is heard and the multimeter continues to indicate battery voltage, proceed to step 4.

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4. Disconnect the two-wire plug from the starter relay; then connect the red tester lead to the green wire and the black tester lead to the black wire.
5. Depress the starter button and observe the multimeter.

■NOTE: If battery voltage is indicated, replace the starter relay. If no voltage is indicated, check fuse or relay.

Fuse

TESTING

1. Remove the fuse from the fuse holder.
2. Connect the ohmmeter across the fuse end-caps.
3. The ohmmeter must read less than 1 ohm of resistance.

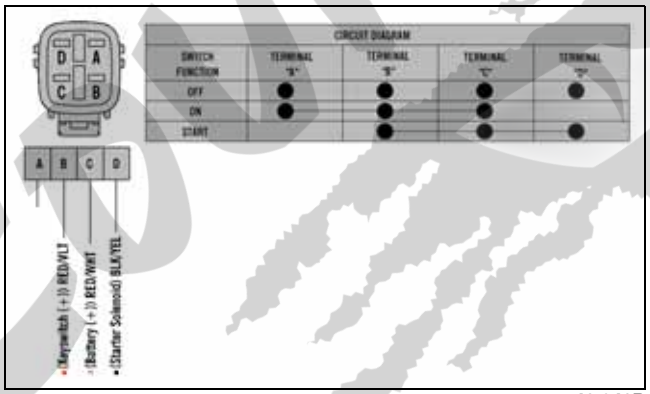
Ignition Switch

TESTING

CAUTION

To prevent ohmmeter damage when testing circuits on snowmobiles equipped with an electric start, be sure to disconnect the battery before testing.

1. Disconnect the wiring harness from the ignition switch; then remove the switch from the console.
2. Using the ohmmeter, test the connections indicated in the following chart. If the meter reads more than one ohm of resistance between connected terminals or less than 1 ohm of resistance on non-connected terminals, the switch must be replaced.



746-246B

■NOTE: If the ignition switch tests good, verify battery voltage to the harness side of the switch plug-in. If there is no voltage, troubleshoot the battery, switch fuse, or starter relay solenoid.

If battery voltage is present at the plug-in and the starter fails to activate, use the following procedure:

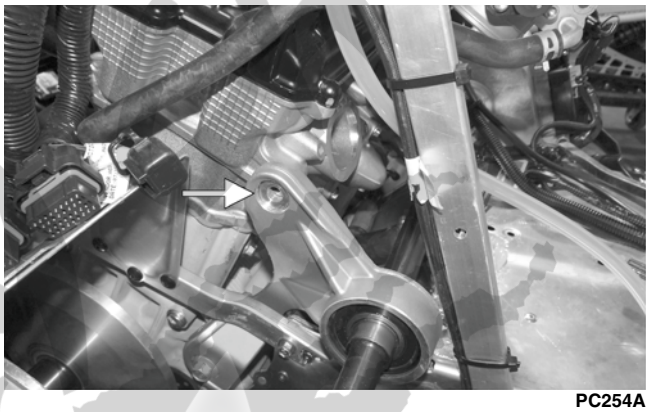
1. With the ignition switch plugged in, place the emergency stop switch to the OFF position.
2. Connect the red tester lead to the black/yellow wire; then connect the black tester lead to a suitable ground.
3. Rotate the key to the START position and verify battery voltage.

■NOTE: If no battery voltage is present, troubleshoot the harness and/or the starter relay solenoid.

Starter Motor

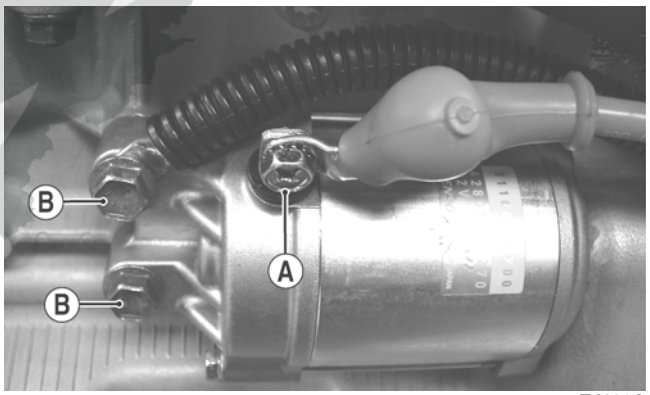
REMOVING (5000/(9000)

1. Remove the driven clutch, seat, gas tank, throttle bodies, and intake flange; then remove the cap screw securing the upper portion of the left rear engine mount to the engine.



PC254A

2. Carefully pry on the engine enough to remove the starter motor; then remove the positive cable from the battery.
3. Remove cap screw (A) securing the positive cable to the starter motor; then remove the two cap screws (B) and remove the starter motor.

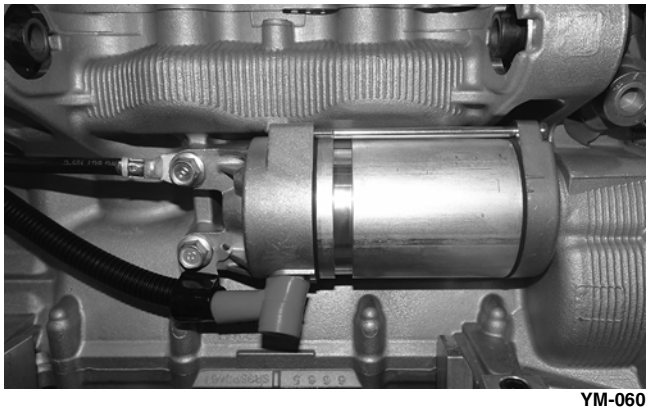


ZJ139A

REMOVING (7000)

1. Remove the access panels, hood and the seat.
2. Remove the drive clutch, drive belt, driven clutch, gas tank, and air intake assembly; then remove the two cap screws and nuts securing the rear of the engine to the chassis.
3. Carefully pry the engine enough to remove the starter motor and battery cables from the engine.

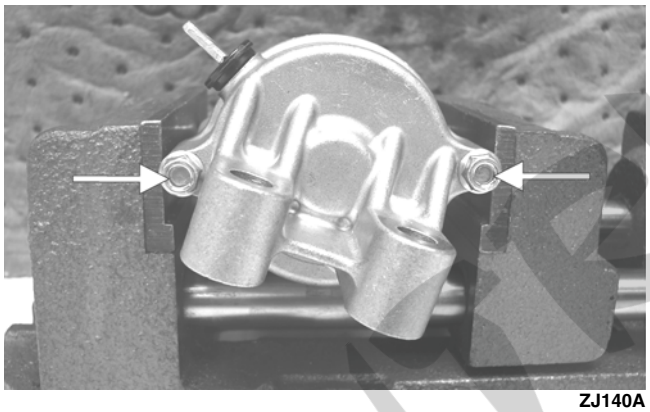
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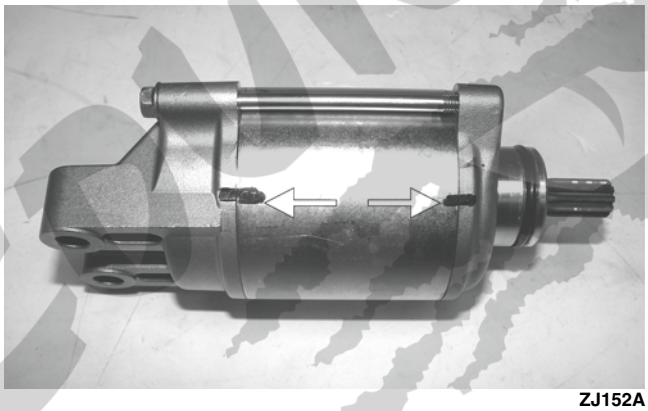
DISASSEMBLING (5000/9000)

1. Secure the starter motor in a suitable clamping device; then remove the two long cap screws from the starter motor.



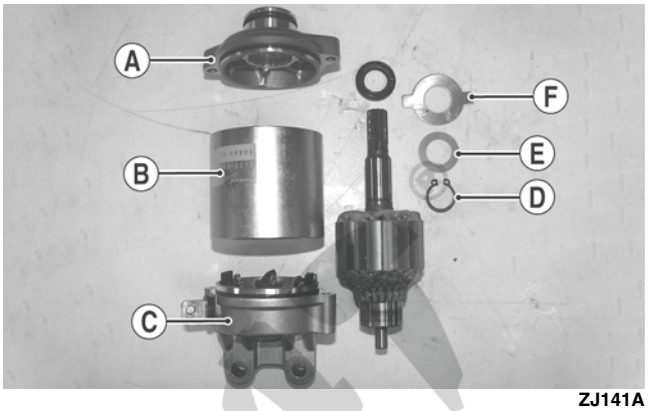
ZJ140A

2. For assembling purposes, make alignment marks on the bearing housing, magnet housing, and brush assembly.



ZJ152A

3. Remove the bearing housing (A) and the magnet housing (B) with armature from the brush assembly (C).



ZJ141A

4. With the armature removed from the magnet housing, remove snap ring (D) from the armature. Account for shim (E) and locking plate (F).
5. Using a flat-blade screwdriver, carefully remove the seal from the bearing housing.



ZJ142A

CLEANING AND INSPECTING

1. Thoroughly clean all components except the armature and brushes in parts-cleaning solvent; then dry with compressed air.

CAUTION

Do not wash the armature and brushes in any kind of solvent. Use only compressed air and clean dry, lint-free cloth in cleaning these components.

2. Inspect all threaded areas for damaged or stripped threads.
3. Inspect the brush holder assembly and brushes for damage or wear. Using a caliper, measure the length of the brushes. If brush measurement is less than 0.40 in., replace with new brushes and brush springs as a set.
4. Inspect brush leads for cracks, wear, or fraying. If any of these conditions exist, replace with new brushes along with new brush springs as a set.
5. Inspect the rear cover bushing for wear.
6. Inspect the front cover bearing for wear.

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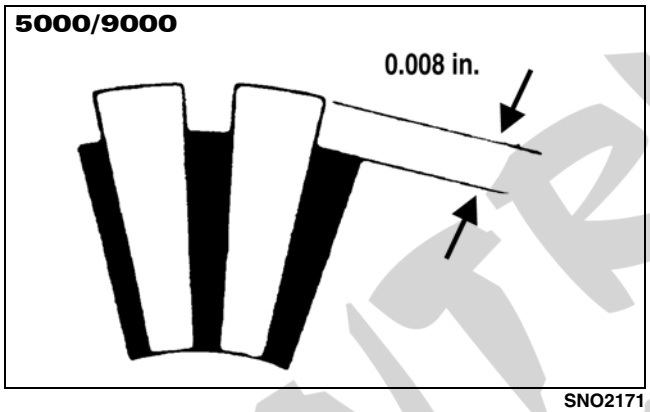
7. Inspect the brass commutator end of the armature for any discolored spots or damage. If the commutator is slightly discolored or damaged, the armature must be replaced. This is a molded commutator and no attempt to turn it down in a lathe should be attempted.

CAUTION

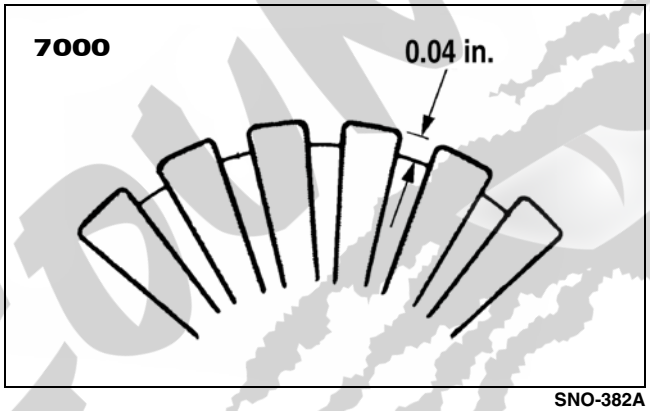
Do not use emery cloth to clean the commutator as emery particles will become imbedded in the brass commutator resulting in a short circuit. Use only #200 grit sandpaper.

8. Inspect the commutator end of the armature for buildup in the grooves. Carefully remove any buildup by undercutting using a thinly ground hack-saw blade. Do not cut any deeper than the original groove which can be seen by looking at the end of the commutator.

9. Using a caliper, measure the undercut. Maximum undercut groove must be as shown.



SNO2171



SNO-382A

CAUTION

Buildup in the grooves must be removed to prevent any chance of an electrical arc between individual sections of the commutator.

10. Inspect the commutator for shorting using a multimeter and the following procedure.

    A. Set the selector to the OHMS position.

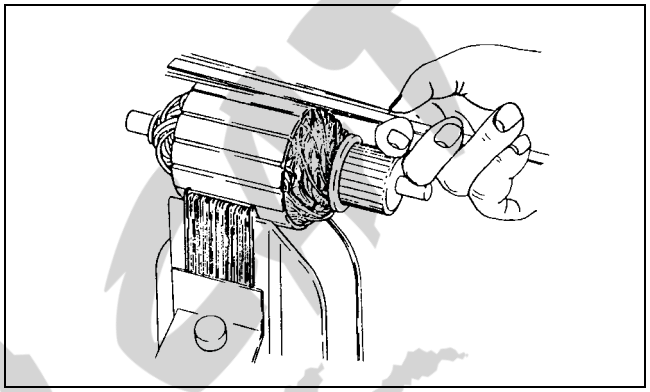
    B. Touch the black lead to the armature shaft.

    C. Using the red tester lead, probe the commutator end of the armature. The meter indicator should not change. If the indicator shows resistance, the armature is shorted and must be replaced.

11. Inspect the armature for shorting using a "growler" and the following procedure.

    A. Place the armature in the "growler."

    B. While holding a metal strip on the armature, rotate the armature an entire revolution. If the metal strip vibrates at any point on the armature, the armature is shorted and must be replaced.



0725-653

12. Inspect the ground brushes to make sure they are properly grounded. Use a multimeter and the following procedure.

    A. Set the selector to the OHMS position.

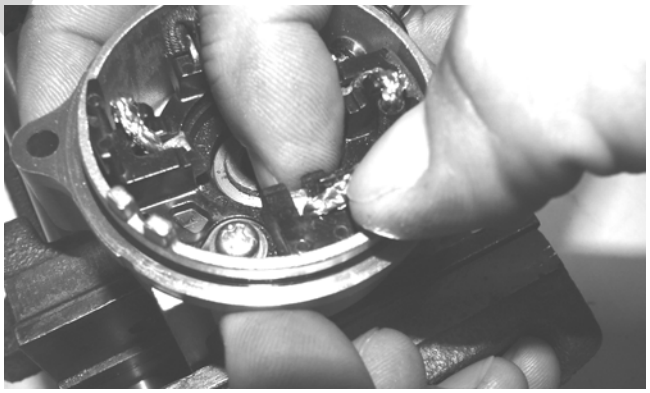
    B. Touch the black tester lead to a ground brush.

    C. Touch the red tester lead to the brush holder assembly.

■NOTE: If no resistance is indicated, check the ground connection for tightness and for cleanliness. If there is still no meter indication, replace the brush assembly.

ASSEMBLING

1. With the brush assembly secured in a vise, compress each brush all the way into the housing; then carefully push the brush wire over and down to secure the brush in the fully compressed position.

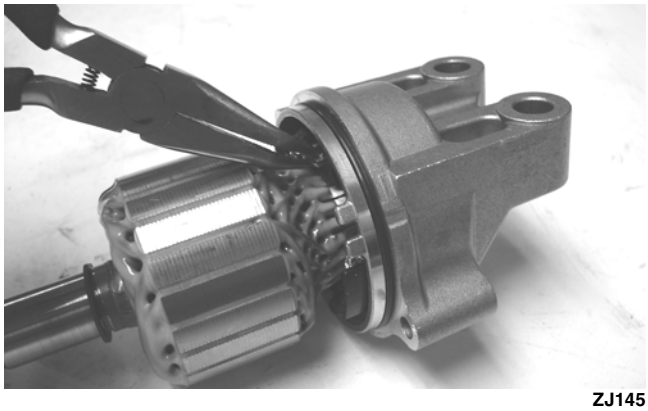


ZJ143

■NOTE: The brushes must be fully compressed to allow enough room to install the armature.

2. Install the armature into the brush assembly; then using a small needle-nose pliers, carefully move the brush wires upward allowing the brushes to fully contact the commutator.

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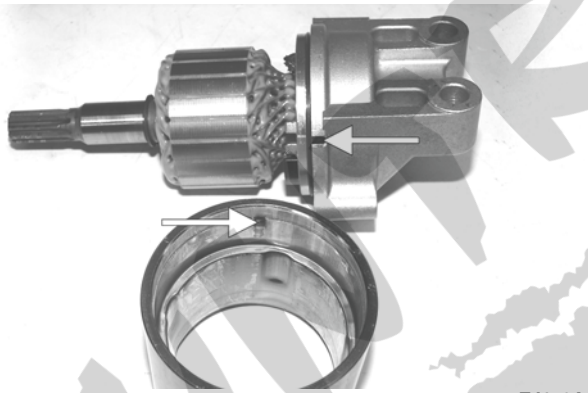


ZJ145

■**NOTE: After completing step 2, ensure that the brushes are properly seated to the commutator.**

3. Noting the alignment marks made in disassembling, install the magnet housing; then with the magnet housing properly seated to the brush assembly, install the snap ring, shim, and locking plate to the armature shaft.

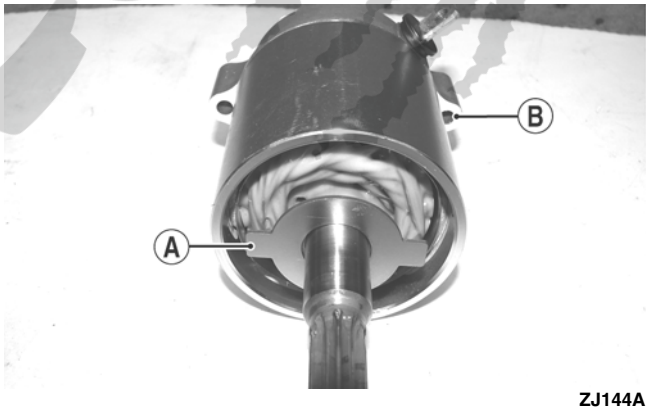
■**NOTE: If alignment marks were not made during disassembling, align properly by matching notch on the magnet housing to notch on the brush assembly.**



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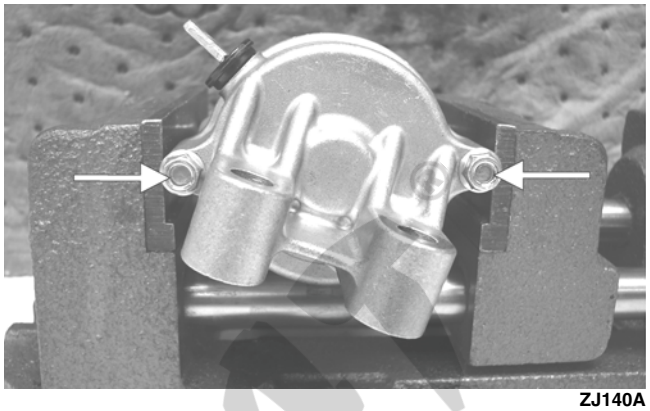
4. With a suitable driving tool, install new seal into the bearing housing; then install the bearing housing.

■**NOTE: Prior to installing the bearing housing, position the locking plate with the tabs (A) of the locking plate aligned with the cap screw ears (B) of the starter motor.**



ZJ144A

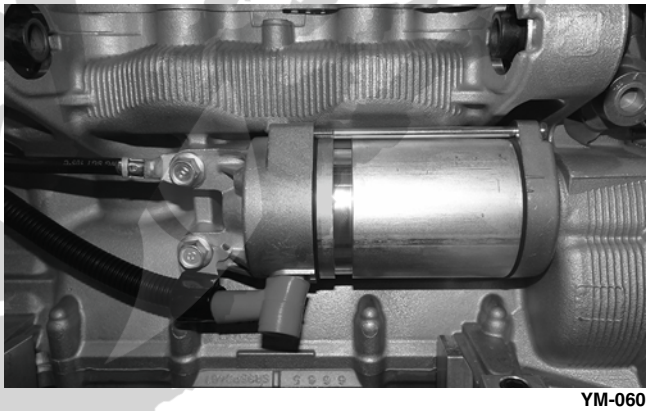
5. Install the two long cap screws securing the starter motor together; then tighten the cap screws to 108 in.-lb.



ZJ140A

INSTALLING (7000)

1. Install the starter motor into the engine; then with the negative battery cable positioned to the top mounting hole, install the two cap screws (threads coated with blue Loctite #243) and tighten to 19 ft-lb.
2. Install the positive cable to the starter motor and tighten securely. Secure the positive and negative cables with cable ties as noted during disassembling.

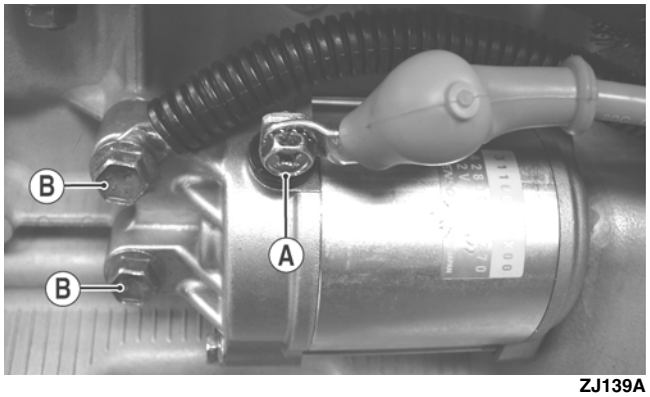


YM-060

3. Secure the rear of the engine to the chassis using the existing cap screws and nuts Tighten to 93 ft-lb.
4. Install the air intake assembly, drive clutch, drive belt, driven clutch, gas tank, hood and access panels.
5. Install the positive cable to the battery; then install the seat.

INSTALLING (5000/9000)

1. Install the starter motor to the engine; then with the ground cable positioned to the top mounting hole, install the two cap screws (B) and tighten to 19 ft-lb.



ZJ139A

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2. Install the positive cable (A) to the starter motor and tighten securely. Secure the positive and negative cables with cable ties as noted during disassembling.
3. Install the cap screw (threads coated with blue Loctite #243) securing the upper portion of the left rear engine mount to the engine; then install the intake flange, throttle bodies, driven clutch, gas tank, and seat. Tighten to 50 ft-lb.
4. Install the positive cable to the battery.

Troubleshooting Electric Start

Problem: Hot or Smoking Wires	
Condition	**Remedy**
1. **System** wired incorrectly	1. Check wiring against wiring diagram
Problem: Starter Does Not Turn Over	
Condition	**Remedy**
1. **Battery** discharged	1. Check/charge the battery
2. **Connection** loose	2. Check tightness of all connections
3. **Grounding** improper	3. Check ground connections
4. **Fuse** blown - not installed	4. Check - replace fuse

Magneto

REMOVING (5000/9000)

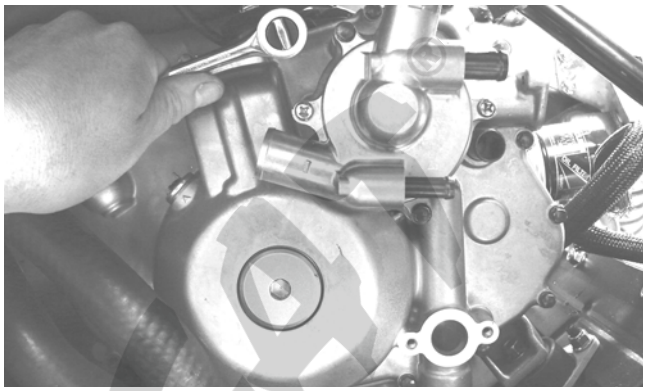
■NOTE: Prior to removing the magneto, the engine oil and cooling system must be drained.

1. Disconnect the connector for the exhaust temperature sensor; then remove the cap screws, nuts, and springs securing the and resonator.
2. Remove the cap screws and nuts securing the MAG-side chassis support; then remove all clamps and hoses to gain access to the magneto cover.



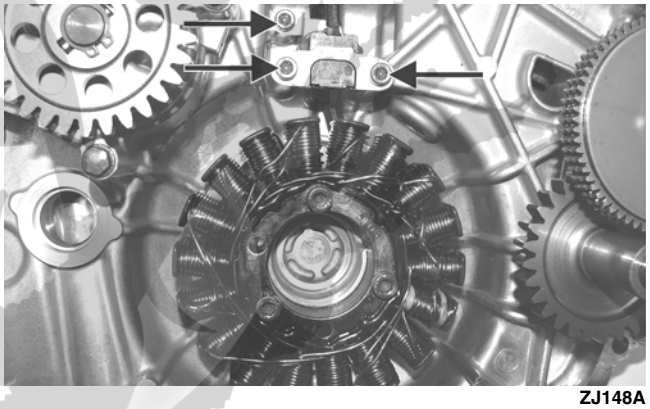
SNO-728

3. To gain access to the magneto cover, remove the remaining coolant hoses from the water pump, oil cooler, and separator tank.
4. Remove the eighteen cap screws securing the magneto cover to the engine; then remove the cover and account for the dowel pins, the oil pump seal, and the gasket.



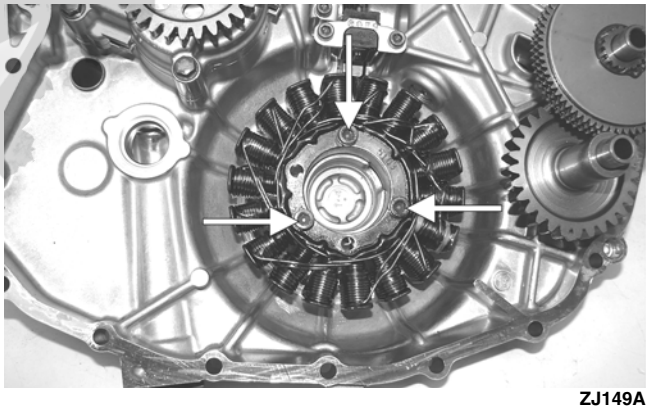
ZJ147

5. Remove the cap screws securing the harness clamp and timing sensor to the magneto cover.



ZJ148A

6. Remove the three cap screws securing the magneto to the cover; then remove the magneto assembly.

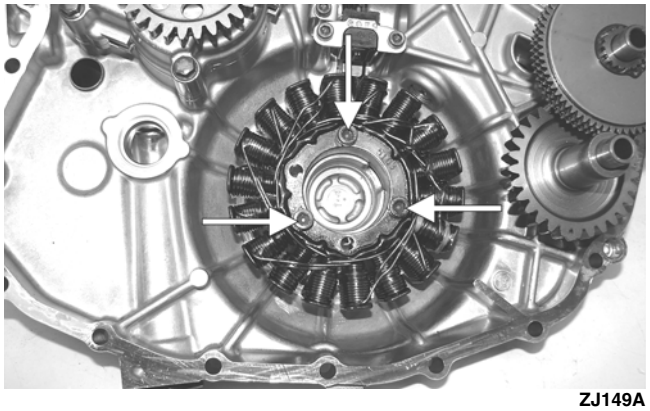


ZJ149A

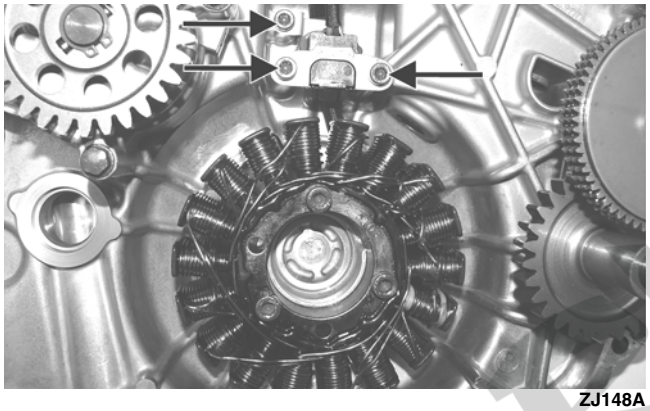
INSTALLING (5000/9000)

1. Place the magneto into position on the cover; then install and tighten the three cap screws to 84 in.-lb. With the harness routed properly, install the timing sensor and harness clamp and tighten to 84 in.-lb.

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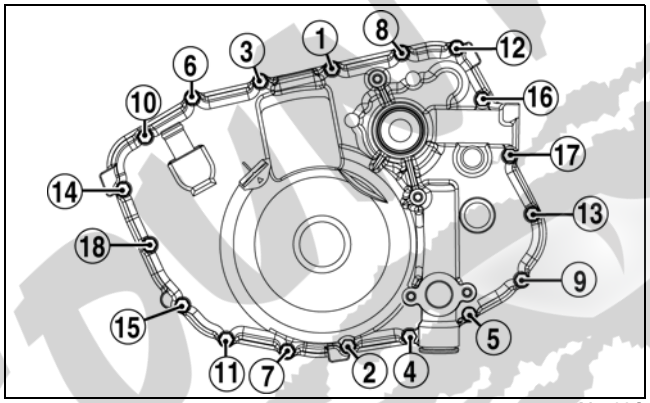


ZJ149A



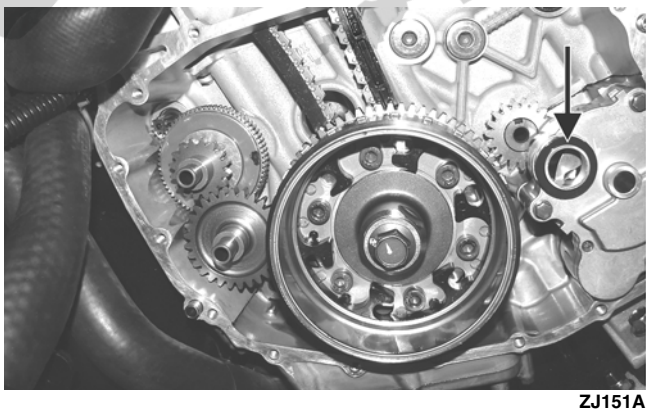
ZJ148A

2. Install the two alignment pins in the engine for the magneto cover; then with a new gasket, install the cover and with the pattern shown, tighten the 18 cap screws to 84 in.-lb.



741-583A

■NOTE: Assure the oil pump seal is in place prior to installing the magneto cover.



ZJ151A

3. Install the coolant hoses to the water pump, oil cooler, and separator tank; then secure the hoses with the clamps.
4. Secure all coolant hoses and oil hoses using the existing clamps; then secure the left-side support using the existing cap screws and nuts. Tighten securely.



SNO-728

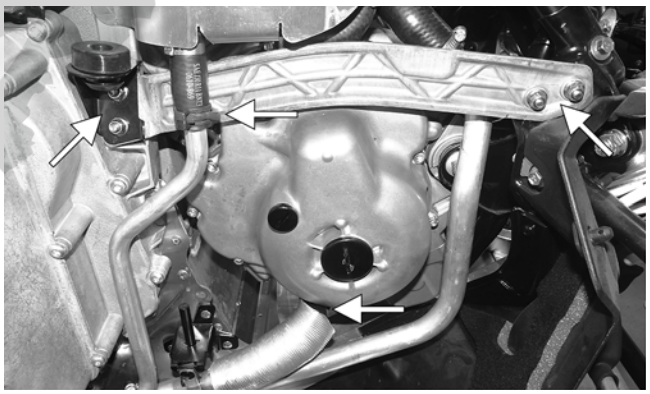
5. Install the resonator and secure using existing hardware.

■NOTE: At this point, fill and bleed the oil and cooling systems.

REMOVING (7000)

■NOTE: Prior to removing the magneto, the engine oil and cooling system must be drained.

1. Disconnect the connector for the oxygen sensor; then remove the cap screws, nuts, and springs securing the resonator.
2. Remove the cap screws and nuts securing the MAG-side chassis support; then remove all clamps and hoses to gain access to the magneto cover.

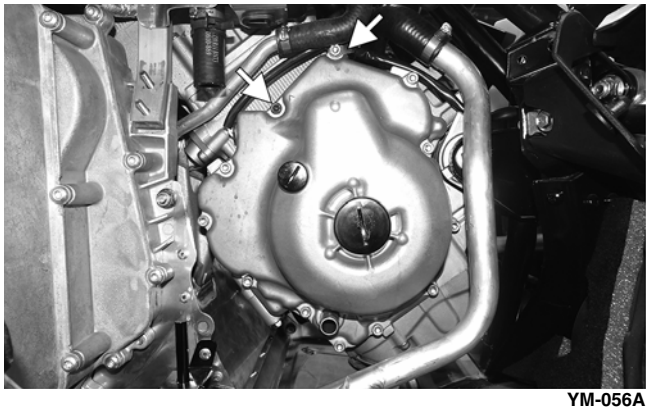


YM-055A

3. Remove the screws securing the magneto cover to the engine; then remove the cover and account for two dowel pins and the gasket. Disconnect the stator from the voltage regulator.

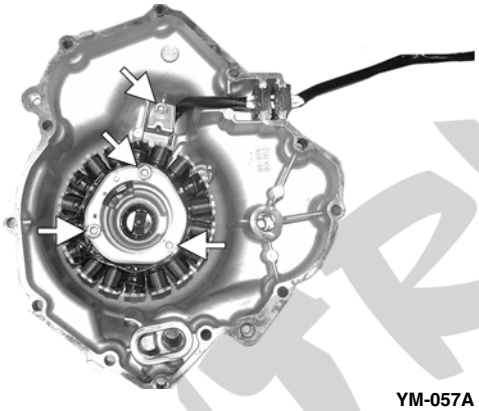
■NOTE: Note the location of the black screw and retaining clip as they must be installed in the same location as which they were removed.

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YM-056A

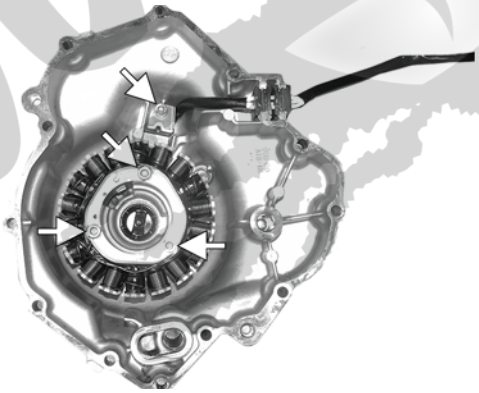
4. Remove the cap screws securing the harness clamp to the magneto cover. Remove the three cap screws securing the magneto to the cover; then remove the magneto assembly.



YM-057A

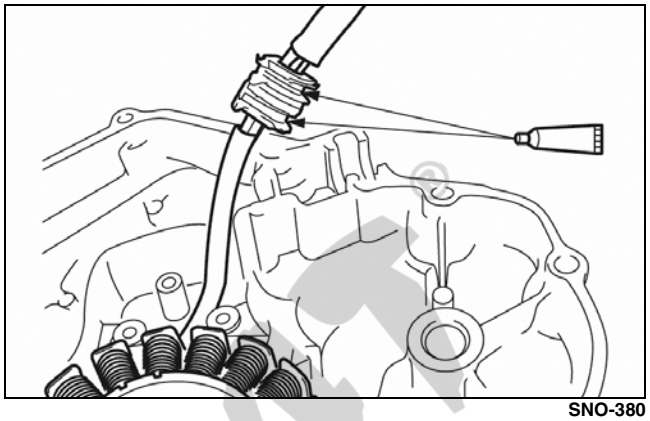
INSTALLING (7000)

1. Place the magneto into position on the cover; then install and tighten the three cap screws (threads coated with blue Loctite #243) to 7.2 ft-lb. With the harness routed properly, install the timing sensor and harness clamp and tighten (threads coated with blue Loctite #243) to 7.2 ft-lb.



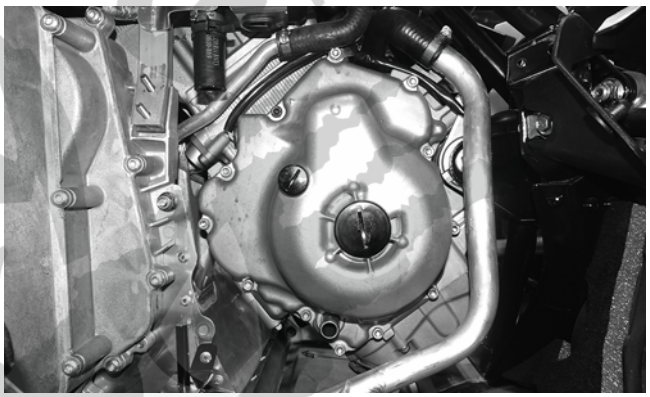
YM-057A

■NOTE: Be sure to apply a small amount of sealant to the grommet before pressing it into the cover.



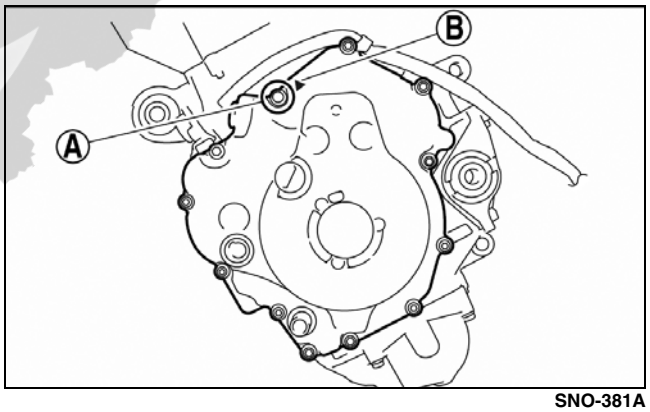
SNO-380

2. Install the two alignment pins in the engine for the magneto cover; then with a new gasket, install the cover and with a crisscross pattern, tighten the screws to 8.7 ft-lb.



YM-056

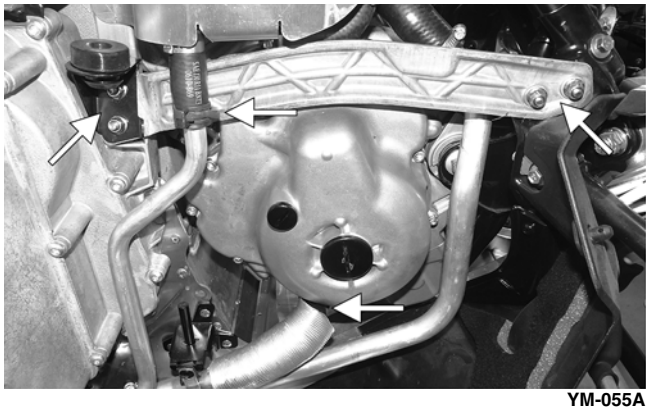
■NOTE: The black screw (A) indicated by the black arrow (B) must have blue Loctite #243 applied to the threads. Tighten to 8.7 ft-lb.



SNO-381A

3. Secure all coolant hoses and oil hoses using the existing clamps; then secure the left-side support using the existing cap screws and nuts. Tighten securely.

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YM-055A

4. Install the resonator and secure using existing hardware.

■NOTE: At this point, fill and bleed the oil and cooling systems.

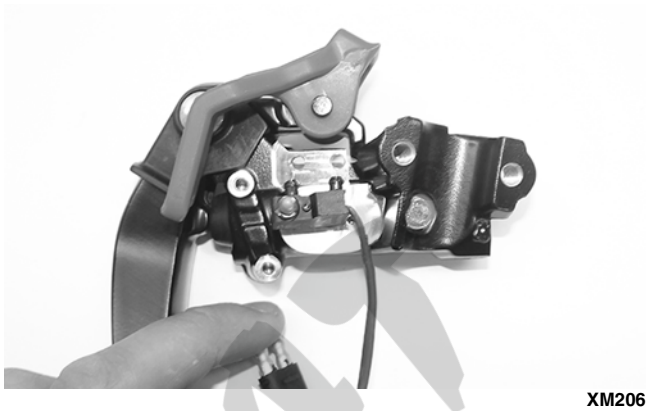
Brakelight Switch

TESTING/REMOVING

1. Disconnect the brakelight switch grey and brown two-wire connector (located near the brake lever).
2. To test the brakelight switch, connect one tester lead to the brown terminal; then connect the other lead to the black terminal.
3. With the brake lever compressed, the meter must read 1 ohm or less resistance. With the brake lever released, the meter must read OL (open). If the meter does not read as specified, the brakelight switch is defective and must be replaced.
4. To remove the switch, remove all brake fluid from the reservoir; then remove the torx-head screws securing the reservoir to the piston assembly. Pry the brake switch from the piston assembly.



XM207



XM206

INSTALLING

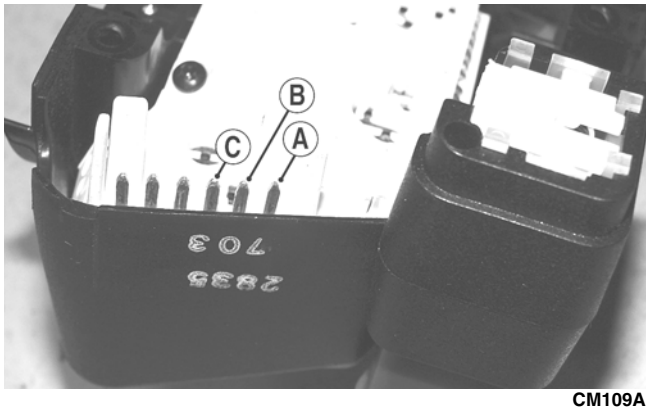
1. Press the switch into the brake lever assembly making sure it is fully seated.
2. Position the O-ring into the reservoir; then secure the reservoir to the piston assembly using the existing screws. Tighten securely.
3. Connect the switch harness to the main wiring harness. Position the wires so they will not be either pinched or come in contact with any moving components. Start the engine and check the switch for proper operation.

Headlight Dimmer Switch

■NOTE: At this point, remove the handlebar pad (if applicable).

REMOVING/TESTING

1. Remove the four screws securing the left-side handlebar control assembly; then remove the control assembly from the handlebar.
2. Disconnect the HI/LO beam harness from the switch.
3. With the switch in the LO beam position, connect one ohmmeter lead to pin (A) and the other ohmmeter lead to pin (C). The meter must read 1 ohm or less resistance.



CM109A

4. With the switch in the HI beam position, connect one ohmmeter lead to pin (B) and the other ohmmeter lead to pin (C). The meter must read 1 ohm or less resistance.

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■**NOTE: If either test does not read within specification, replace the complete control assembly.**

INSTALLING

1. Connect the HI/LO beam harness to the switch; then place the control assembly on the handlebar.
2. Secure with the four screws, then install the handlebar pad (if applicable).

Testing Handlebar Warmer Elements

■**NOTE: Resistance will vary due to temperature; therefore, this test should be made at room temperature of 20° C (68° F).**

■**NOTE: To access the element connectors, the handlebar control assembly for the side being tested must be removed.**

1. Remove the handlebar pad (if applicable); then disconnect the handlebar warmer three-wire connector.
2. In the element connector, connect one ohmmeter lead to the green/blue lead; then connect the other ohmmeter lead to the green lead.
3. The meter must read between 6.3-7.7 ohms.
4. In the element connector, connect the ohmmeter between the green/black and yellow lead wires.
5. The meter must read between 12.6 and 15.4 ohms.
6. Replace any element measuring less than or more than the specified amount.

■**NOTE: Repeat test for the other element.**

7. Connect the leads; then install the handlebar control assembly and secure the handlebar pad (if applicable).

Testing Thumb Warmer Element

■**NOTE: Resistance will vary due to temperature; therefore, this test should be made at room temperature of 20° C (68° F).**

1. Remove the handlebar pad (if applicable); then disconnect the thumb warmer three-wire connector.
2. In the element connector, connect one ohmmeter lead to the green/blue lead; then connect the other ohmmeter lead to the green lead.
3. The meter must read between 1.5 and 6.9 ohms.
4. In the element connector, connect the ohmmeter between the green/black lead and the yellow lead.
5. The meter must read between 5.5 and 23.0 ohms.

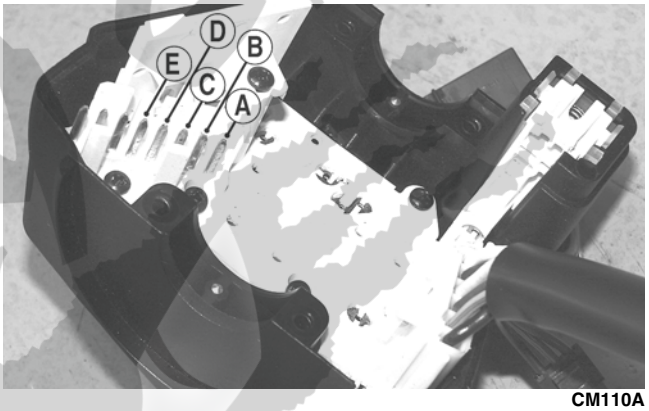
■**NOTE: If either test is not within specification, replace the thumb warmer element.**

6. Connect the leads; then install and secure the handlebar pad (if applicable).

Testing Handlebar Warmer/Thumb Warmer Switch

REMOVING/TESTING

1. Remove the handlebar pad (if applicable).
2. Remove the four screws securing the left-side handlebar control assembly; then remove the control assembly from the handlebar.
3. Disconnect the handlebar/thumb warmer harness from the switch.
4. With the thumb warmer toggle in the low position, connect one ohmmeter lead to pin (C) and the other ohmmeter lead to pin (B). The meter must read 1 ohm or less resistance.



CM110A

5. With the thumb warmer toggle in the high position, connect one ohmmeter lead to pin (C) and the other ohmmeter lead to pin (A). The meter must read 1 ohm or less resistance.

■**NOTE: If either test does not read within specification, replace the complete control assembly.**

6. With the handwarmer toggle in the low position, connect one ohmmeter lead to pin (C) and the other ohmmeter lead to pin (D). The meter must read 1 ohm or less resistance.
7. With the handwarmer toggle in the high position, connect one ohmmeter lead to pin (C) and the other ohmmeter lead to pin (E). The meter must read 1 ohm or less resistance.

■**NOTE: If either test does not read within specification, replace the complete control assembly.**

INSTALLING

1. Connect the handlebar/thumb warmer harness to the switch; then place the control assembly on the handlebar.
2. Secure with the four screws; then install the handlebar pad (if applicable).

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Testing Passenger Handwarmer Switch

1. Disconnect the lead wires from the switch.
2. With the switch in the LO position, connect one ohmmeter lead to the green/white wire at the connector; then connect the other ohmmeter lead to the red/black wire at the connector. The meter must read less than 1 ohm of resistance.
3. With the switch in the HI position, connect one ohmmeter lead to the green/blue wire at the connector; then connect the other ohmmeter lead to the red/black wire at the connector. The meter must read less than 1 ohm of resistance.

Testing Passenger Handwarmer Elements

■NOTE: During this test, resistance will vary due to temperature; therefore, this test should be made at room temperature of 20° C (68° F).

1. Disconnect the lead wires from the main wiring harness.
2. For the LO position, connect one ohmmeter lead to the green/white wire from the element; then connect the other ohmmeter lead to the green wire from the element. The meter must read between 23.8-32.2 ohms.
3. For the HI position, connect one ohmmeter lead to the green/blue wire from the element; then connect the other ohmmeter lead to the green wire from the element. The meter must read between 8.7-11.7 ohms.

Testing Seat Heater Switches

■NOTE: The seat heater elements cannot be tested.

OPERATOR HEATER SWITCH - Resistance

■NOTE: The element connectors are located at the rear of the front seat beneath the flap.

1. Disconnect the main harness/element connector.
2. Connect one ohmmeter lead to the red/black main harness wire; then connect the other ohmmeter lead to the green/red main harness wire. The meter must read the following ± 5%:

LO	4.32K ohms
HI	3.75K ohms

■NOTE: If resistance is not within specification, troubleshoot the switch connector located below the steering support. If the switch connector tests good, replace the switch.

PASSENGER HEATER SWITCH - Resistance

1. Disconnect the main harness/element connector.
2. Connect one ohmmeter lead to the red/black main harness wire; then connect the other ohmmeter lead to the green/red main harness wire. The meter must read the following ± 5%:

LO	4.32K ohms
HI	3.75K ohms

■NOTE: If resistance is not within specification, troubleshoot the switch connector located beneath the seat. If the switch connector tests good, replace the switch.

OPERATOR/PASSENGER SWITCH - Voltage

1. Disconnect the main harness/element connector.

■NOTE: For this procedure, test the main harness side of the connector, not the element side of the connector.

2. Connect one meter lead to the red/black main harness wire; then connect the other meter lead to the black main harness wire.
3. Start the engine. The meter must read 12-15 volts.

■NOTE: If this voltage test does not read within specification, troubleshoot the main harness, F-2 fuse, K-2 relay, or the F-7 main fuse.

Testing Speedometer Sensor

■NOTE: The following test should be made using MaxiClips and the Fluke Model 77 Multimeter set to the DC Volt scale.

■NOTE: Prior to testing the sensor, inspect the three-wire connector on the sensor harness for contamination, broken pins, and/or corrosion. With the engine running, note that a power supply of 10.8-14.4 DC volts exists at the main harness/speedometer connector.



PC067B

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1. Elevate the rear of the snowmobile onto a suitable safety stand.
2. Set the meter selector to the DC Voltage position.
3. At the sensor side of the plug-in, connect the red maxiclip and meter lead to the white/orange lead; then connect the black maxiclip and meter lead to the black lead.
4. Connect a positive 12-volt DC power supply to the red/blue wire; then connect a negative cable to the black wire from the main harness side of the plug-in.
5. Rotate the driven clutch. The meter must read 0 volts and 12 volts alternately.

Testing Gear Position Switch

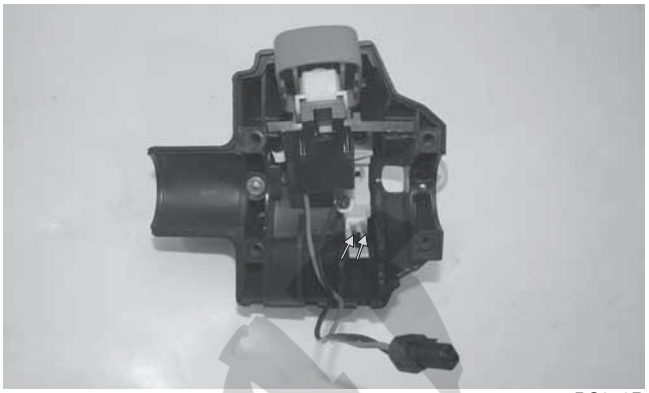
1. Disconnect the switch two-wire connector.
2. Connect one ohmmeter lead to one black wire; then connect the other ohmmeter lead to the other black wire.
3. With the reverse button pressed in, the meter must read less than 1 ohm of resistance. With the reverse button released, the meter must read OL (infinite resistance).

■NOTE: If the meter does not read as specified in either test, the switch is defective and must be replaced.

Testing Shift Switch

■NOTE: The switch is located on the right-side handlebar control. To access the switch, the control assembly must be disassembled.

1. Disconnect the two-wire connector from the handlebar control.
2. Connect one ohmmeter lead to one pin; then connect the other ohmmeter lead to the other pin.



PC253B

3. With the reverse button pressed in, the meter must read less than 1 ohm of resistance. With the reverse button released, the meter must read OL (infinite resistance).

■NOTE: If the meter does not read as specified in either test, the switch is defective and must be replaced.

Testing Shift Actuator

■NOTE: The actuator is located on the chain case.

1. Disconnect the actuator two-wire connector; then connect Actuator Test Harness onto the harness side of the connector.
2. Connect one meter lead to the red/blue lead of the test harness; then connect the other meter lead to the yellow/orange wire lead of the test harness.
3. Press the reverse button; there should be a flash of DC battery voltage indicated on the meter. Release the reverse button; then again press the reverse button; there should be a flash of DC battery voltage indicated on the meter.

■NOTE: If the meter indicates a flash of voltage but the actuator does not function, the actuator is defective and must be replaced.

■NOTE: If the meter does not indicate a flash of voltage, troubleshoot the main harness.

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Voltage/Resistance Chart - Air Temperature

Temperature		Volts	Ohms	Temperature		Volts	Ohms
100° C	212° F	0.113	555	28° C	82° F	1.230	8540
98° C	208° F	0.121	595	26° C	79° F	1.322	9530
96° C	205° F	0.128	635	24° C	75° F	1.413	10520
94° C	201° F	0.136	675	22° C	72° F	1.505	11510
92° C	198° F	0.143	715	20° C	68° F	1.596	12500
90° C	194° F	0.151	755	18° C	64° F	1.716	14020
88° C	190° F	0.162	819	16° C	61° F	1.836	15540
86° C	187° F	0.173	883	14° C	57° F	1.955	17060
84° C	183° F	0.184	947	12° C	54° F	2.075	18580
82° C	180° F	0.195	1011	10° C	50° F	2.195	20100
80° C	176° F	0.206	1075	8° C	46° F	2.323	23060
78° C	172° F	0.222	1160	6° C	43° F	2.452	26020
76° C	169° F	0.238	1245	4° C	39° F	2.580	28980
74° C	165° F	0.253	1330	2° C	36° F	2.709	31940
72° C	162° F	0.269	1415	0° C	32° F	2.837	34900
70° C	158° F	0.285	1500	-2° C	28° F	2.969	39940
68° C	154° F	0.308	1640	-4° C	25° F	3.101	44980
66° C	151° F	0.331	1780	-6° C	21° F	3.233	50020
64° C	147° F	0.353	1920	-8° C	18° F	3.365	55060
62° C	144° F	0.376	2060	-10° C	14° F	3.497	60100
60° C	140° F	0.399	2200	-12° C	10° F	3.610	76080
58° C	136° F	0.432	2410	-14° C	7° F	3.722	92060
56° C	133° F	0.465	2620	-16° C	3° F	3.835	108040
54° C	129° F	0.498	2830	-18° C	-0.4° F	3.947	124020
52° C	126° F	0.531	3040	-20° C	-4° F	4.060	140000
50° C	122° F	0.564	3250	-22° C	-8° F	4.142	156000
48° C	118° F	0.612	3595	-24° C	-11° F	4.224	172000
46° C	115° F	0.659	3940	-26° C	-15° F	4.306	188000
44° C	111° F	0.707	4285	-28° C	-18° F	4.388	204000
42° C	108° F	0.754	4630	-30° C	-22° F	4.470	220000
40° C	104° F	0.802	4975	-32° C	-26° F	4.522	261000
38° C	100° F	0.869	5490	-34° C	-29° F	4.574	302000
36° C	97° F	0.937	6005	-36° C	-32° F	4.625	343000
34° C	93° F	1.004	6520	-38° C	-36° F	4.677	384000
32° C	90° F	1.072	7035	-40° C	-40° F	4.729	425000
30° C	86° F	1.139	7550				

Voltage/Resistance Chart - Coolant Temperature

Temperature		Volts	Ohms	Temperature		Volts	Ohms
110° C	230° F	0.115	129	28° C	82° F	1.377	1800
108° C	226° F	0.129	137	26° C	79° F	1.459	1950
106° C	223° F	0.143	145	24° C	75° F	1.541	2100
104° C	219° F	0.157	153	22° C	72° F	1.623	2250
102° C	216° F	0.171	161	20° C	68° F	1.705	2400
100° C	212° F	0.185	169	18° C	64° F	1.806	2670
98° C	208° F	0.192	180	16° C	61° F	1.907	2940
96° C	205° F	0.199	191	14° C	57° F	2.008	3210
94° C	201° F	0.206	202	12° C	54° F	2.109	3480
92° C	198° F	0.213	213	10° C	50° F	2.210	3750
90° C	194° F	0.220	224	8° C	46° F	2.327	4170
88° C	190° F	0.235	240	6° C	43° F	2.444	4590
86° C	187° F	0.250	256	4° C	39° F	2.561	5010
84° C	183° F	0.265	273	2° C	36° F	2.678	5430
82° C	180° F	0.280	289	0° C	32° F	2.795	5850
80° C	176° F	0.295	305	-2° C	28° F	2.901	6510
78° C	172° F	0.317	327	-4° C	25° F	3.007	7170
76° C	169° F	0.339	349	-6° C	21° F	3.113	7830
74° C	165° F	0.361	371	-8° C	18° F	3.219	8490
72° C	162° F	0.383	393	-10° C	14° F	3.325	9150
70° C	158° F	0.405	415	-12° C	10° F	3.421	9422
68° C	154° F	0.438	445	-14° C	7° F	3.517	9694
66° C	151° F	0.471	475	-16° C	3° F	3.613	9966
64° C	147° F	0.504	505	-18° C	-0.4° F	3.709	10238
62° C	144° F	0.537	535	-20° C	-4° F	3.805	10510
60° C	140° F	0.570	565	-22° C	-8° F	3.885	13688
58° C	136° F	0.598	609	-24° C	-11° F	3.965	16866
56° C	133° F	0.626	653	-26° C	-15° F	4.045	20044
54° C	129° F	0.654	697	-28° C	-18° F	4.125	23222
52° C	126° F	0.682	741	-30° C	-22° F	4.205	26400
50° C	122° F	0.710	785	-32° C	-26° F	4.267	30520
48° C	118° F	0.759	849	-34° C	-29° F	4.329	34640
46° C	115° F	0.808	913	-36° C	-32° F	4.391	38760
44° C	111° F	0.857	977	-38° C	-36° F	4.453	42880
42° C	108° F	0.906	1041	-40° C	-40° F	4.515	47000
40° C	104° F	0.955	1105	-42° C	-44° F	4.553	55100
38° C	100° F	1.023	1214	-44° C	-47° F	4.591	63200
36° C	97° F	1.091	1323	-46° C	-51° F	4.629	71300
34° C	93° F	1.159	1432	-48° C	-54° F	4.667	79400
32° C	90° F	1.227	1541	-50° C	-58° F	4.705	87500
30° C	86° F	1.295	1650				

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Drive Train/Track/Brake Systems

This section has been organized into sub-sections for servicing drive train, track, and brake systems; however, some components may vary from model to model. The technician should use discretion and sound judgment when removing and installing components.

■NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

SPECIAL TOOLS

A number of special tools must be available to the technician when servicing the drive train, track, and brake systems.

Description	p/n
Drive Clutch Bolt Tool	0644-281
Bearing Removal and Installation Tool	0644-167
Movable Sheave Bearing Tool	0644-594
Clutch Alignment Bar	0644-428
Drive Clutch Puller	0744-062
Drive Clutch Spanner Wrench	0644-136
Driven Clutch Compressor Tool	0644-444
Rear Suspension Spring Tool	0144-311
Brake Caliper Bearing Puller	0744-067

■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

CAUTION

Never attempt to substitute any other drive clutch puller for the recommended puller or severe clutch damage will occur.

Drive Belt

If the drive belt is longer than specified, the drive clutch and driven clutch will not achieve full shift ratio. This will result in poor acceleration and a decrease in top speed.

If the drive belt is shorter than specified, the starting ratio will be higher causing the belt to slip. A too-short drive belt will cause a bog on engagement and will not allow the engine to reach peak RPM.

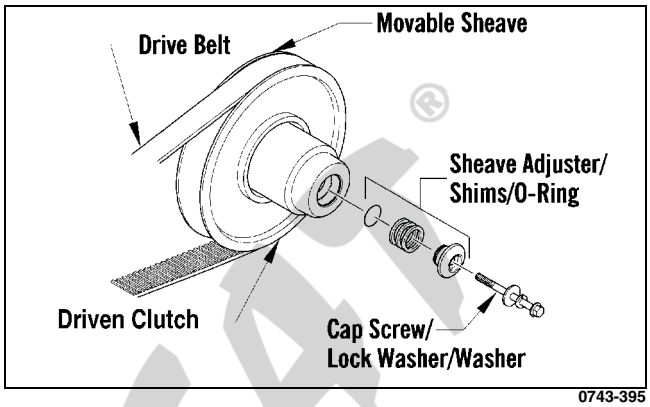
■NOTE: A thinly-worn drive belt may produce the same effect as one that is too long.

■NOTE: A stiff belt causes a HP loss to the track. As a belt warms up, it gets more flexible and transmits power with less HP loss.

REMOVING

1. With the engine off, open the left-side access panel. Loosen the quarter turn screw on the lower console and secure out of the way.
2. Remove the cap screw, lock washer and sheave adjuster from the end of the driven clutch; then remove the cap screw, lock washer, and washer from the adjuster.

■NOTE: Ensure the shims and O-ring are not removed from the adjuster.



0743-395

3. Reverse the adjuster and install the cap screw without washers into the adjuster. Install the sheave adjuster and cap screw onto the driven clutch; then tighten the cap screw until the movable sheave opens far enough to allow the belt to be removed.
4. Remove the drive belt from the driven clutch first; then from the drive clutch.

■NOTE: Each time the driven clutch cap screw is removed, the hole in the driven shaft should be cleaned free of any Loctite residue.

INSTALLING

CAUTION

Before securing the driven clutch, be sure the rollers are up against the torque bracket or damage to the backside cams may occur.

1. Place the drive belt (so the arrow is pointing toward the front of the snowmobile) on the drive clutch; then between the sheaves of the driven clutch.
2. Install the sheave adjuster in its original position (beveled side out); then install the cap screw, lock washer, and washer into the driven clutch. Tighten the cap screw (threads coated with blue Loctite #243) to 20 ft-lb.
3. Secure the lower console; then install the left-side access panel.

⚠ WARNING

Never operate the snowmobile without the belt guard/access panel secured in place.

Drive Clutch

CHANGING CAM ARMS/SPRINGS

Removing

1. Using Drive Clutch Bolt Tool, remove the torx-head screw and lock washer securing the drive clutch to the crankshaft.

■NOTE: Before installing the clutch puller, apply oil to the threads of the puller and a small amount of grease to the tip of the puller.

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2. Using the Drive Clutch Puller and the Drive Clutch Spanner Wrench, tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases.

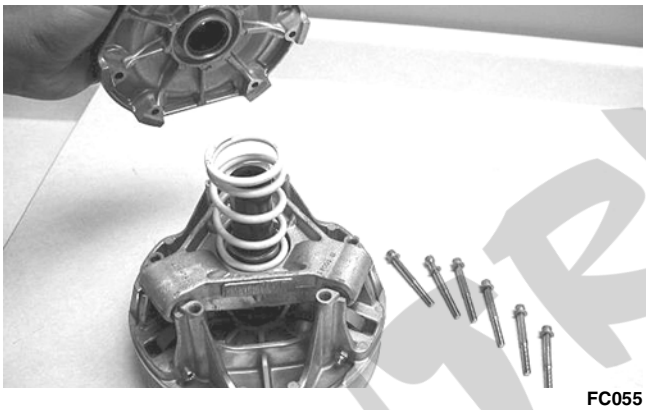
3. Remove the drive clutch and drive belt from the engine compartment.

Disassembling

■NOTE: Note the timing marks on the cover, spider, and movable sheave. These must be aligned when assembling the drive clutch for balance purposes.

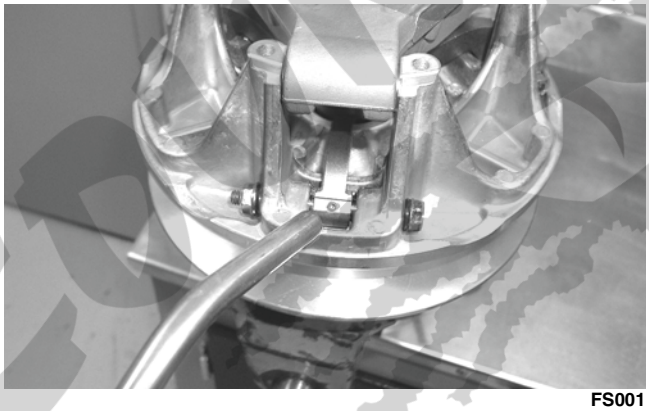
1. Loosen the screws securing the cover. Remove every other cap screw and lock washer from the cover; then while firmly holding the cover, remove the three remaining screws and lock washers equally.

2. Remove the cover and spring.



FC055

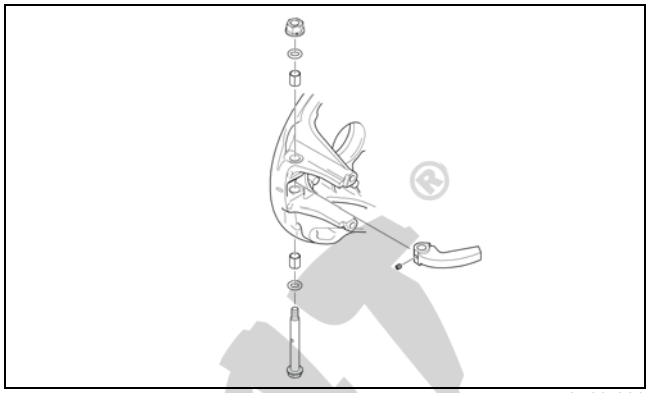
3. Remove the cam arm pin lock nuts; then using a small torch, apply heat to the cam arm set screws to loosen the Loctite used in assembly.



FS001

■NOTE: Heat must be applied to the cam arm in order to remove the set screws.

4. After the set screws have been removed, remove the cam arm pins one at a time noting the position of the alignment notches in the cap screws for assembly purposes. Account for both O-rings.



0739-038

Cleaning and Inspecting

1. Using parts-cleaning solvent, wash grease, dirt, and foreign matter off all components; dry with compressed air.

⚠ WARNING

Always wear safety glasses when using compressed air to dry components.

2. Remove any drive belt dust accumulation from the stationary sheave, movable sheave, and bushings using parts-cleaning solvent only.

3. Inspect stationary sheave, movable sheave, spider, and cover for cracks or imperfections in the casting.

4. Inspect the cam arm pins for wear or bends.

5. Inspect the spring for distortion, cracks, or wear.

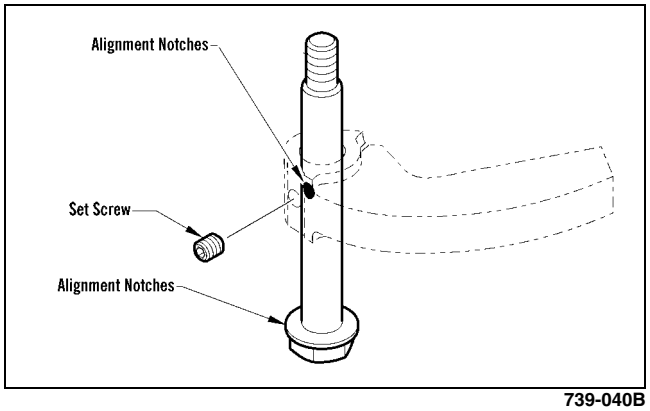
6. Inspect rollers for damage or wear.

Assembling

1. With the head of each cam arm pin positioned towards the direction of the drive clutch rotation, install the cam arms.

■NOTE: The drive clutch rotates counterclockwise.

2. With the cam arm pin properly positioned, apply green Loctite #620 to the set screw holes in the cam arm, install the new set screws (pre-coated with Loctite), and tighten to 19 in.-lb.



739-040B

CAUTION

Green Loctite #620 must be applied to the set screw holes in the cam arms or component damage may occur.

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3. Secure the cam arm pins with new lock nuts and tighten to 11 ft-lb.

CAUTION

When installing cam arms, always use new lock nuts and cam arm set screws.

4. Place the spring and cover into position making sure the timing mark on the cover is properly aligned; then compress the spring and install the screws coated with blue Loctite #243 and lock washers. In a crisscross pattern, tighten evenly to 120 in.-lb.



XM009A

CAUTION

Care must be taken when installing the cover not to damage the bushing.

Installing

■NOTE: Before installing the drive clutch, be sure to wipe both the crankshaft taper and clutch mounting taper clean using a clean towel.

1. Place the drive clutch into position on the crankshaft; then apply a few drops of oil to the threads of the cap screw.
2. Using Drive Clutch Spanner Wrench to hold the drive clutch, secure using the cap screw and high collar washer. Tighten to 51 ft-lb.

CAUTION

When installing the drive clutch, do not tighten the cap screw with any kind of impact tool. Tighten cap screw using a hand torque wrench only. Failure to do so could result in stationary sheave damage.

3. Check alignment between the drive clutch and driven clutch.
4. Install the drive belt. Check drive belt deflection. Close the left-side access panel.

■NOTE: For installing drive belt, see Drive Belt in this section.

⚠ WARNING

Never operate the engine without the belt guard/access panel secured.

5. Either test drive the snowmobile or run the engine for five minutes; then verify the drive clutch cap screw torque specification.

Driven Clutch

REMOVING

1. Remove the drive belt.
2. Slide the driven clutch off the shaft.

■NOTE: Account for any alignment washers. These washers must be in place during installation.

DISASSEMBLING

1. Place the driven clutch on the Driven Clutch Compressor Tool; then install the compressor flange and compress the driven clutch spring.
2. Mark the moveable sheave, stationary sheave, and the torque bracket for assembly purposes.



XM139

3. Apply heat to the screws securing the torque bracket to the movable sheave; then remove the screws.



XM140

■NOTE: Heat must be used to soften the Loctite using a torch or damage to the screw will occur.

4. Release the compression of the spring by removing the wing nut; then remove the movable sheave.
5. Remove the stationary sheave; then remove the plastic spring seat. Account for the driven spacer.

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XM141

5. Remove the spring and remaining spring seat.



PC112

CLEANING AND INSPECTING

1. Using parts-cleaning solvent, wash grease, drive belt dust, and foreign matter off all components.

CAUTION

Do not use steel wool or a wire brush to clean driven clutch components. A wire brush or steel wool will cause the sheaves to be gouged (thus, the drive belt may not slide properly between sheaves). Decreased performance and possible accelerated drive belt wear will result.

2. Inspect the rollers for damage, cracks, or wear.
3. Inspect the sheaves for any gouges, cracks, or other damage. Also, inspect threaded areas of sheaves for damaged or stripped threads.
4. Inspect the back-side cams and torque bracket for cracks or damage. The ramp portions of the bracket must be free of gouges and damage. Minor scratches may be repaired using #320 grit wet-or-dry sandpaper.
5. Inspect spring for distortion, crystallization, or breaks.
6. Inspect the cover and movable sheave bearing for wear. If wear is present, replace the bearing using Movable Sheave Bearing Tool.

REPLACING TORQUE BRACKET BEARING/COVER BEARING

1. Remove the snap ring.
2. Using a suitable driving tool, drive the bearing out.

⚠ WARNING

Always wear safety glasses when using the bearing driver.

3. Install the new bearing; then secure with a new snap ring.

REPLACING ROLLERS

1. Bend the locking tabs down away from the shoulder bolt; then remove the bolt.



XM143

2. Place a new roller into position and secure with the shoulder bolt (with a drop of red Loctite #271). Tighten securely and bend the lock tabs to contact the bolt head.

■NOTE: If the flat does not align with the tab, tighten the shoulder bolt until it aligns.



XM144A

ASSEMBLING

1. Place the torque bracket onto the Driven Clutch Compressor Tool; then install the spring seat (flat side toward the spring) onto the torque bracket and place the spring into position.

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PC112

■**NOTE: Premature wear will result if the spring seat is not installed.**

2. Place the stationary sheave spring seat onto the spring (flat side toward the spring); then noting the alignment marks made during disassembling, place the stationary sheave onto the torque bracket.
3. Place the movable sheave onto the stationary sheave.
4. With the clutch in place on the compressor, install the compressor flange spacer and wing nut; then compress the driven clutch spring.



XM139

5. With the driven clutch compressed, apply a small amount of **green Loctite #620** to the machined area of the movable sheave so the loctite can drip onto the threads of the torque bracket.



XM142

6. Install new screws securing the movable sheave. Tighten in a crisscross pattern to 27 ft-lb.



XM140

7. Remove the clutch from the compressor.
8. Install the back-side cams; then secure with the screws and tighten to 24 in.-lb.

INSTALLING

1. Set the brake lever lock.
2. Install the alignment washers; then install the driven clutch. Tighten to 20 ft-lb (threads coated with blue Loctite #243).
3. Check drive clutch/driven clutch alignment; then install the drive belt.

Drive Clutch/Driven Clutch

If premature drive belt wear is experienced or if drive belt turns over, check parallelism/offset. Also, parallelism/offset must be checked whenever either drive clutch or driven clutch is serviced. To check offset, use appropriate Clutch Alignment Bar. To check parallelism, use Parallelism Bar.

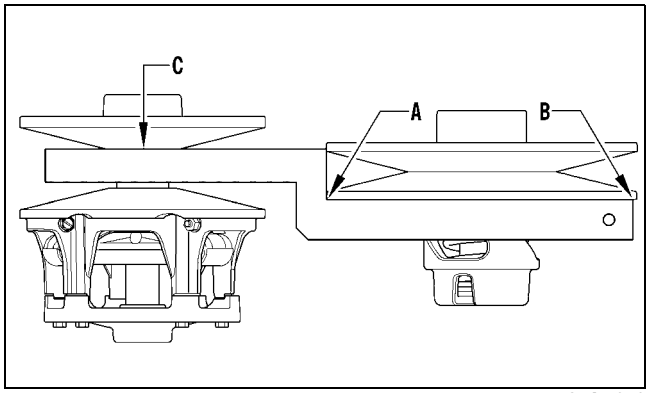
CHECKING OFFSET

1. With the engine off, open the left-side access panel; then remove the belt guard. Remove the drive belt.
2. Install appropriate Clutch Alignment Bar between the drive clutch sheaves.
3. Allow the bar to rest on the drive clutch shaft and against the outside edge of the driven clutch stationary sheave.

■**NOTE: The alignment bar must extend beyond the front edge of the drive clutch.**

4. With the bar against the outside edge of the driven clutch stationary sheave at points A and B, the bar should just clear the inside edge of the stationary sheave of the drive clutch and rest on the stationary shaft at point C. If the bar either will not clear the inside edge or is more than the specified amount, the offset must be corrected.

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0747-959

CORRECTING OFFSET

1. To correct offset, the driven clutch must be moved laterally on the input shaft. Remove the cap screw and washers securing the driven clutch.

■NOTE: If the driven clutch is tight on the shaft, pull the driven clutch off using the Driven Clutch Puller.

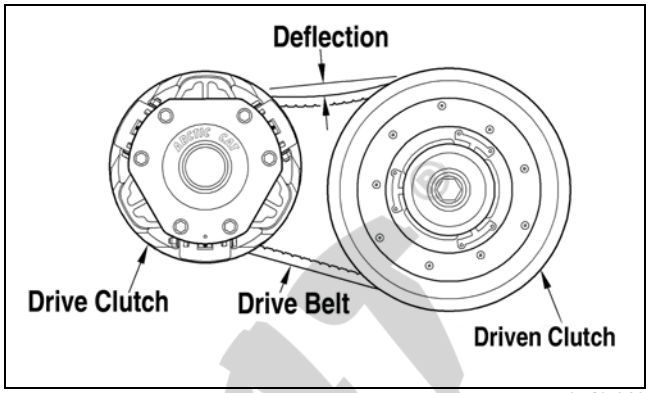
2. To move the driven clutch inward on the shaft, remove alignment washers located on driven shaft from the chain case of the clutch.
3. To move the driven clutch outward on the shaft, add alignment washers to the driven shaft on the chain case of the clutch.
4. Arrange washers to obtain correct offset; then install driven clutch, cap screw, and washers.
5. Install the drive belt.

DRIVE BELT DEFLECTION

Drive belt length, condition, and deflection are all important for peak performance. To check and adjust drive belt deflection, use the following procedure.

■NOTE: Make sure the drive belt is sitting at the top of the driven clutch sheaves.

1. Place a straightedge on top of the drive belt. The straightedge should reach from the drive clutch to the top of the driven clutch.
2. Using a stiff ruler centered between the drive clutch and driven clutch, push down on the drive belt just enough to remove all slack. Note the amount of deflection on the ruler at the bottom of the straightedge. The deflection should be at 1 1/4 in.



0743-319

■NOTE: Push down on the belt with the ruler only until the bottom of the belt flexes upward; then read the amount of deflection.

3. To correct drive belt deflection, remove the sheave adjuster from the clutch, remove or add shim washers to the adjuster, and install the adjuster.

■NOTE: Adding shim washers will decrease belt deflection; removing shim washers will increase belt deflection.

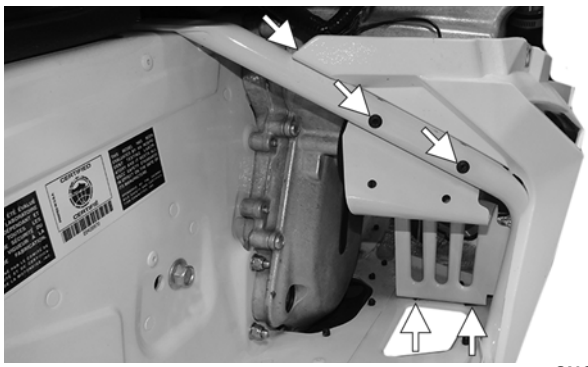
Drive Train

REMOVING CHAIN CASE/DRIVEN SHAFT/DRIVESHAFT/TRACK

CAUTION

If the chain or sprockets on 7000 models need to be replaced for any reason, only use the correct chain or sprocket as shown in the POGA Reference Guide. Using different chains or sprockets than those listed will cause damage due to the different tooth profiles.

1. Remove both access panels and the hood; then disconnect the oxygen sensor and remove the resonator. Discard exhaust gaskets, cap screws, and nuts but retain the exhaust spring.
2. Remove the torx-head screw securing the belly pan to the right-side foot rest support; then remove the torx-head screws securing the right-side foot rest.



SNO-960A

3. Disconnect the speed sensor connector, gear position sensor connector, and reverse actuator connector.

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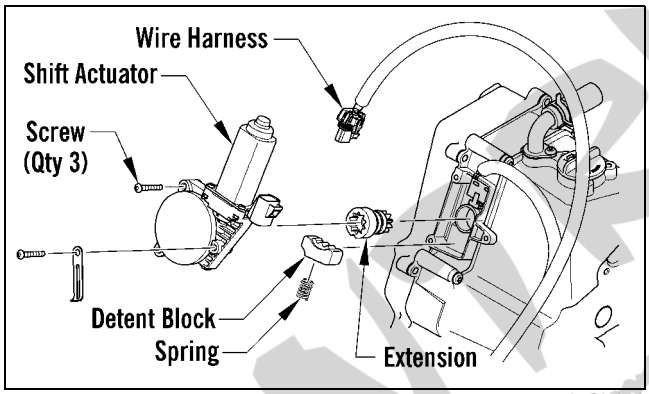
4. On 5000 and 9000 models, remove the clamp securing the oil separator line; then remove the line from the oil tank elbow fitting.



SNO-963A

■NOTE: On 7000 models, the oil separator line is vertical but still needs to be removed from the oil tank fitting.

5. Remove the extension, detent block, and spring.

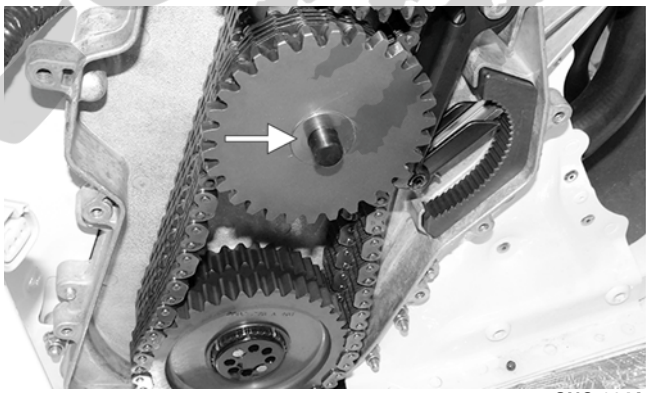


0748-259

6. To drain the chain lube, place a drain pan under the chain case; then loosen the eleven screws securing the chain case cover/oil tank assembly to the chain case housing starting at the bottom.

■NOTE: Do not remove all eleven screws completely until the chain lube has been completely removed. This will help keep debris/oil out of the screw holes.

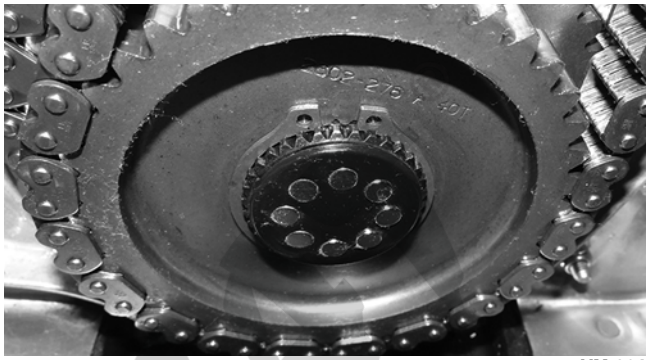
7. Swing the chain case out of the way. Account for a thrust washer on the reverse shaft.



SNO-964A

8. Remove the reverse gear, reverse fork, reverse shift rack, and the reverse shift shafts as an assembly.

9. Remove the snap ring from the driveshaft; then remove the reverse chain and sprockets. Account for a thrust washer behind the upper sprocket.



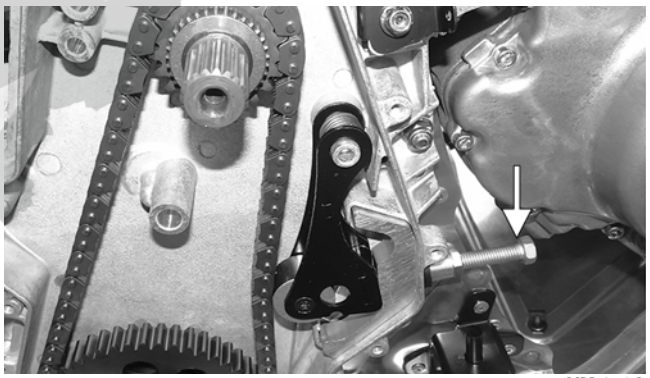
YM-094

10. On 5000 and 9000 models, release tension on the chain tensioner; then remove the ratchet block. The tensioner does not need to be removed.



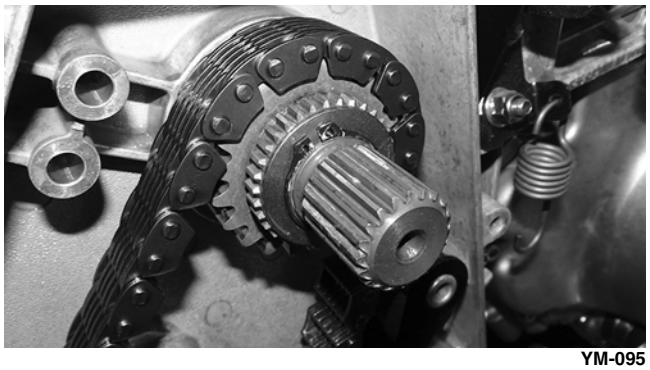
SNO-966A

■NOTE: On 7000 models, loosen the tensioning cap screw enough so the tension is removed from the chain.



YM-053A

11. Remove the black snap ring and thrust washer from the driveshaft; then remove the sprockets and chain.

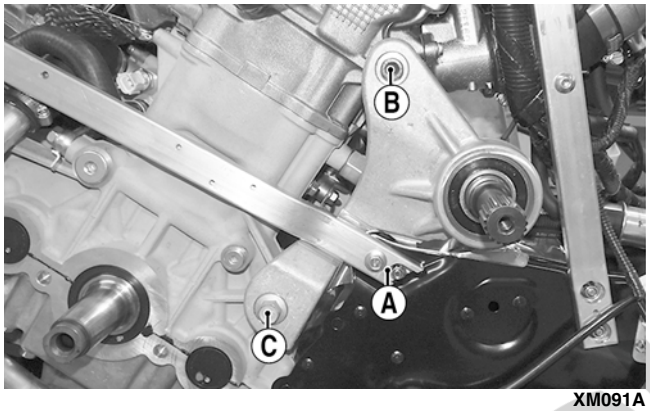


YM-095

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■NOTE: If the driven shaft and driveshaft are going to serviced, proceed to Cleaning and Inspecting Chain Case. If bearings and chain or case assembly are to be replaced, remove the driven clutch; then proceed to step 12.

12. Remove the left-side chassis support.
13. On 5000 and 9000 models, remove the left and right rear engine mount bolts (A); then remove the Allen-head screw (B) and cap screw (C) securing the left rear engine mount to the engine.



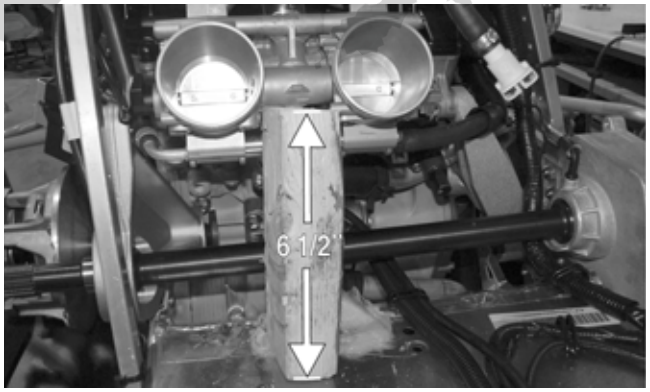
XM091A

14. On 7000 models, once the cap screws and nuts securing the left-side chassis support are removed, carefully remove the support and driveshaft.

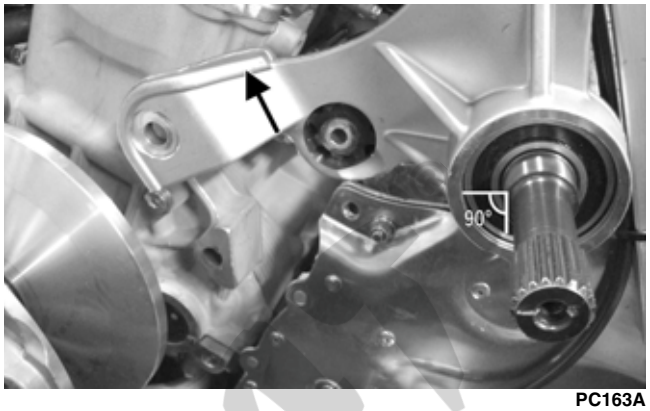

YM-054

15. On 5000 and 9000 models, lift and support the engine at the rear to allow the engine mount to clear chassis.

■NOTE: A support can be cut from a wood block 6 1/2" long and placed under the throttle bodies for support.



PC169A

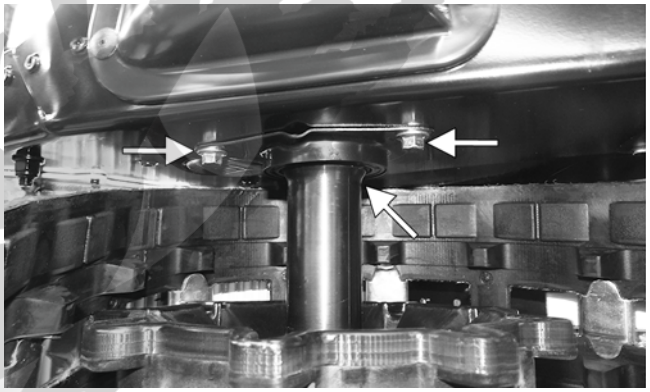


PC163A

16. Remove the inner snap ring; then from the left side, carefully remove the driven shaft assembly keeping the bearing 90° to the shaft.
17. Remove the skid frame assembly.
18. Remove the brake cover and the left-side footrest.

■NOTE: DO NOT split the brake caliper unless necessary service work is required.

19. Remove the cap screws securing the inner caliper to the tunnel; then remove the inner caliper.


YM-077A

20. Pull the driveshaft out to the left; then drop out of tunnel right side first.

■NOTE: If the calliper does not remove from the driveshaft easily, proceed to step 22.

21. Remove the brake pads; then remove the outer brake caliper. Account for a rubber seal.

■NOTE: Place an absorbent towel under the caliper to absorb slight amount of brake fluid. Do not compress the brake lever.

22. Remove the snap ring securing the brake disc to the driveshaft and remove the brake disc.

■NOTE: It may be necessary to use Brake Caliper Bearing Puller (p/n 0744-067) to remove the caliper/bearing assembly.

23. If the chain case needs to be removed, remove all self-tapping screws and machine screws with lock nuts.

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CLEANING AND INSPECTING CHAIN CASE

1. Inspect sprockets and chain(s) for excessive wear or stretching.
2. Inspect bearings and gears for roughness or chipping.

■NOTE: If bearing replacement is necessary, the chain case must be removed from the tunnel and an appropriate press utilized to remove and install bearings.

3. Inspect reverse shift rack and fork for excessive wear, discoloration, or other damage.
4. Clean all interior chain case surfaces and components in cleaning solvent and dry using compressed air.

⚠ WARNING

Always wear safety glasses when using compressed air.

5. Inspect chain snubbers for excessive wear.

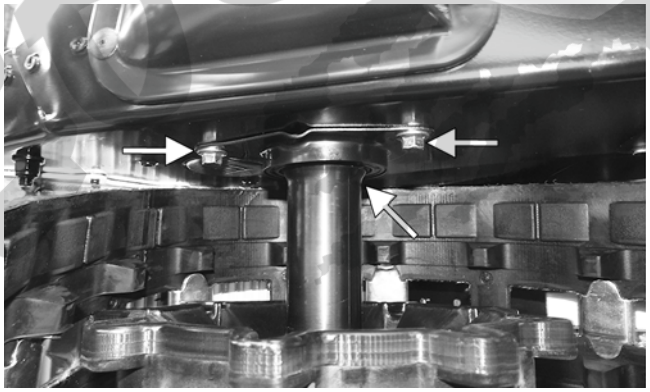
ASSEMBLING/INSTALLING CHAIN CASE/DRIVEN SHAFT/DRIVESHAFT/TRACK

If the driveshaft and driven shaft were not removed, proceed to step 16.

1. Install chain case assembly onto chassis and secure with six self-tapping screws and four machine screws with lock nuts. Tighten the self-tapping screws to 12 ft-lb.

■NOTE: If an existing chain case is being reinstalled, tighten the self-tapping screws to 105 in.-lb.

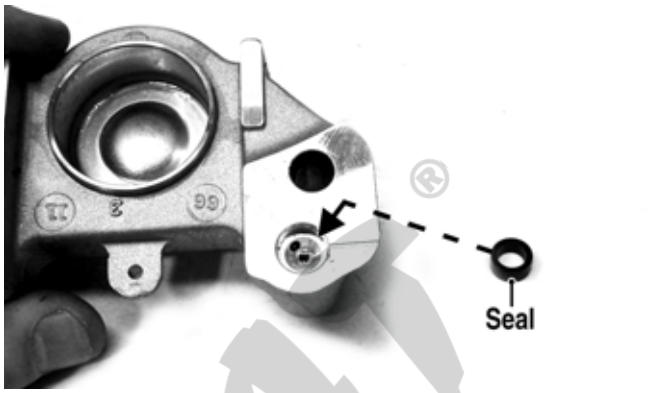
2. Place the driveshaft/drive sprocket assembly into the tunnel brake-end first; then into the chain case driveshaft bearing.
3. Install the inner brake caliper assembly and secure with three cap screws and the snap ring. Tighten the cap screws securely.



YM-077A

■NOTE: If the brake caliper was split, proceed to step 4. If not, proceed to step 6.

4. Install the brake disc and secure with the snap ring.
5. Making sure the seal is correctly installed in the outer brake caliper, install on the inner caliper and secure with two cap screws. Tighten to 25 ft-lb.

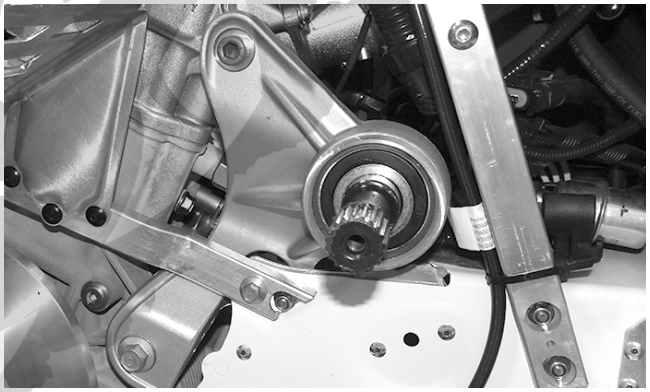


PC173A

6. Install the skid frame.
7. Install the brake cover and left-side footrest. Tighten the cover cap screws to 8 ft-lb.

■NOTE: Bleed the brake system if the brake caliper was split in this section.

8. Install the driven shaft from the left side making sure the bearing remains at 90° to the shaft.
9. On 5000 and 9000 models, install the screws (threads coated with blue Loctite #243) securing the PTO-side engine mount to the engine. Tighten the upper and lower screws to 100 ft-lb.



XM037

10. Install the right rear engine mount bolt and secure with a new lock nut. Tighten securely.
11. Install the side chassis support and the left rear engine mount bolt with a new lock nut. Tighten securely.

■NOTE: On 7000 models, install the driven shaft from the left side; then secure the support to the chassis using the existing cap screws and nuts. Tighten to 20 ft-lb.

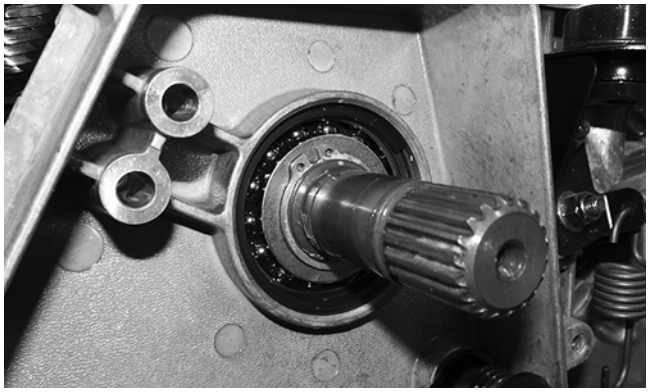


YM-054

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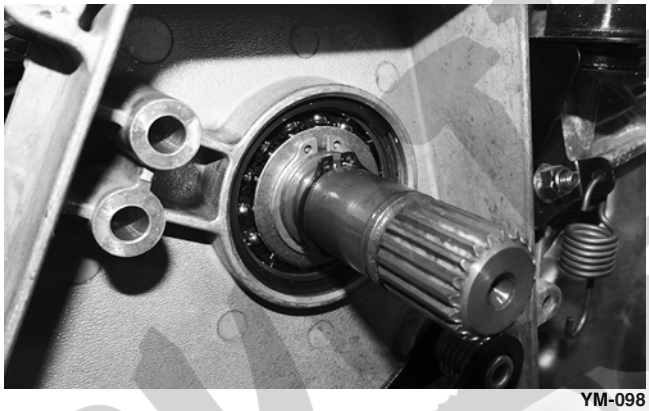
12. Install the drive clutch and tighten the clutch cap screw to 51 ft-lb; then install the driven clutch and drive belt. Tighten to 20 ft-lb (threads coated with blue Loctite #243).

13. With the driveshaft installed into the chain case, install the existing thrust washer and secure with the silver snap ring making sure it is fully seated into the groove closest to the bearing.



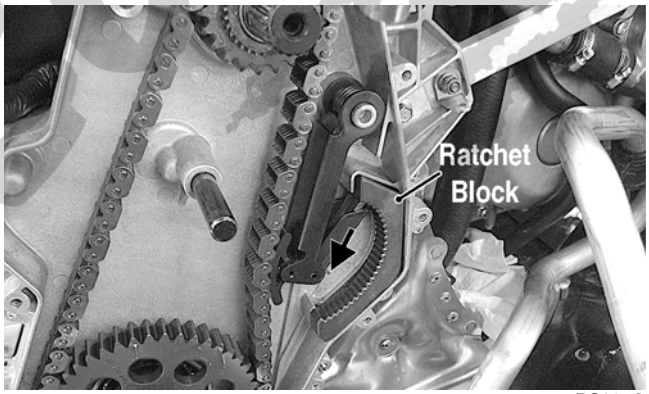
YM-096

14. Install the black snap ring into the groove on the driveshaft making sure it is fully seated into the groove; then install the thrust washer up against the snap ring.



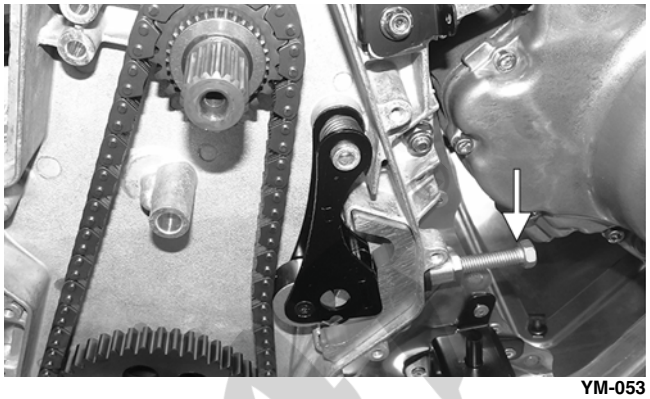
YM-098

15. On 5000 and 9000 models, install the chain and sprockets; then install the ratchet block making sure to have the tensioner on the fifth notch.



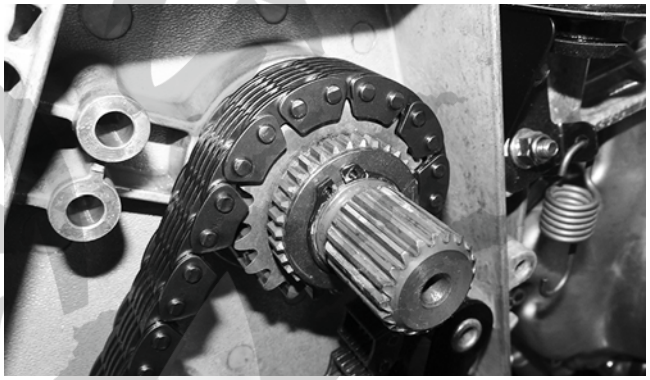
PC085A

■NOTE: On 7000 models, turn the chain tension adjustment bolt clockwise until it is finger tight; then loosen it 1 1/2 turns. While holding the bolt with a wrench, tighten the jam nut to 18 ft-lb.



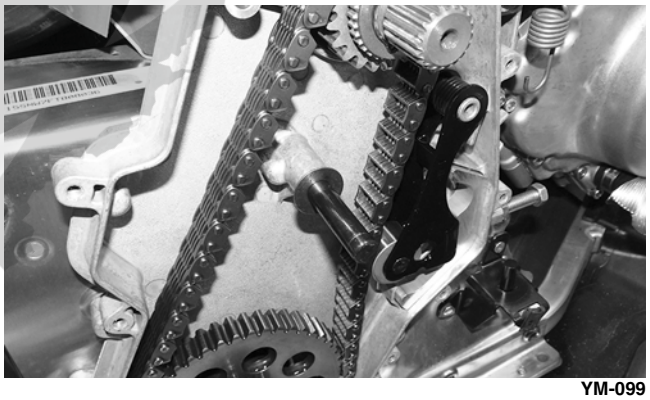
YM-053

16. Secure the top sprocket using the existing thrust washer and black snap ring making sure it is fully seated into the groove.



YM-097

17. Before installing the reverse sprockets and chain, be sure the reverse shaft and thrust washer are installed into the chain case.

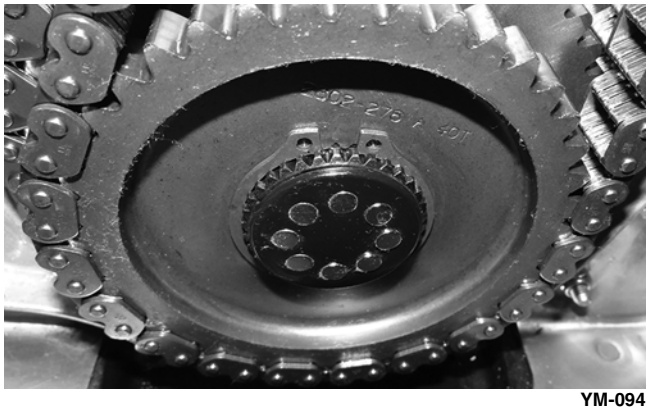


YM-099

18. Install the reverse sprockets and chain; then place the existing thrust washer on the outside of the upper reverse sprocket.

19. Secure the driveshaft reverse sprocket to the driveshaft with a snap ring; then install a existing thrust washer on the outside of the upper reverse sprocket and reverse idler shaft.

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YM-094

20. Install the reverse gear, fork, shift shaft, and shift rack assembly into the chain case.



YM-100

21. Install the chain case cover/oil tank assembly and secure with the screws. Tighten in a crisscross pattern to 14 ft-lb.

22. Fill the chain case with 12 oz of Arctic Cat Chain Lube.

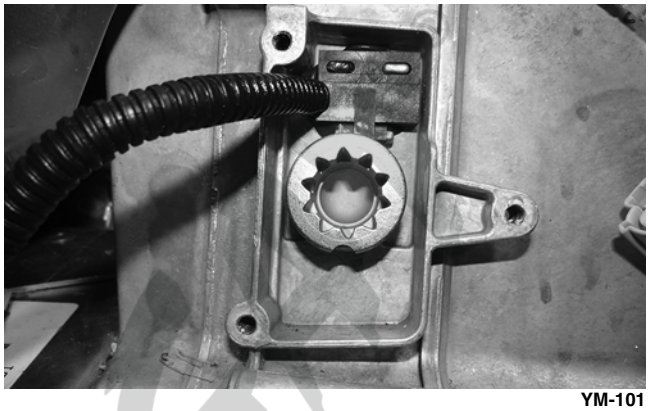
■NOTE: Make sure the gear position sensor wires are routed up and over the top side of the actuator so they are not pinched when installing the reverse shift actuator.



SNO-982

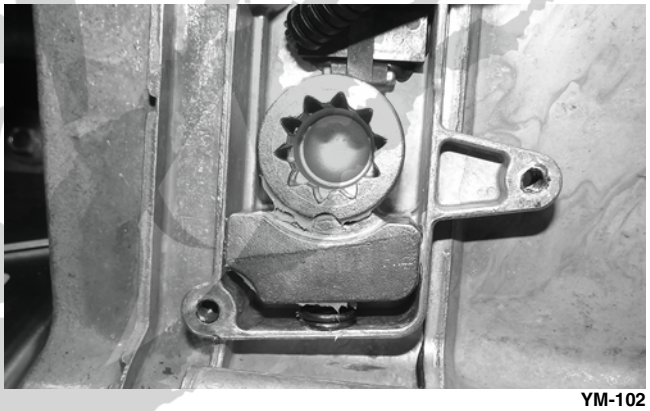
■NOTE: Be sure to add a small amount of white lithium grease to the O-rings of the new actuator extension and the shift actuator detent block before installing.

23. Install the actuator extension and gently rotate counter clockwise to make sure the shift fork is in the forward position. When the shift fork is in the forward position, make sure the notch in the extension is directed downward.



YM-101

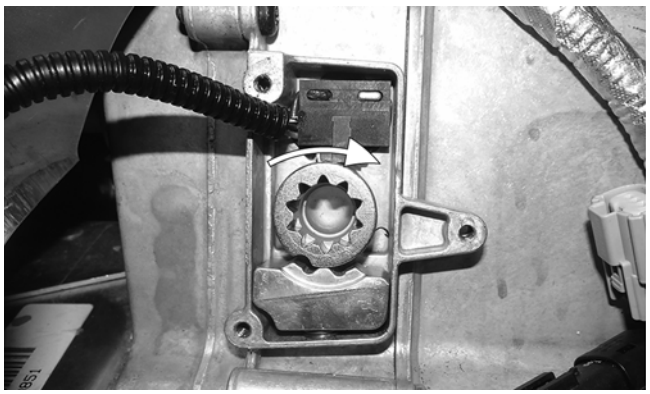
24. Install spring into the bottom of shift actuator detent block and install into the chain case cover. The notch in the extension should be lined up with the notch in the block.



YM-102

■NOTE: To verify everything is installed correctly, turn the extension counter clockwise. The notch in the extension should not rotate out of the detent block.

25. Rotate the extension clockwise approximately 20° making sure not to pull out the extension when rotating. This is only to aid in the installation of the actuator.

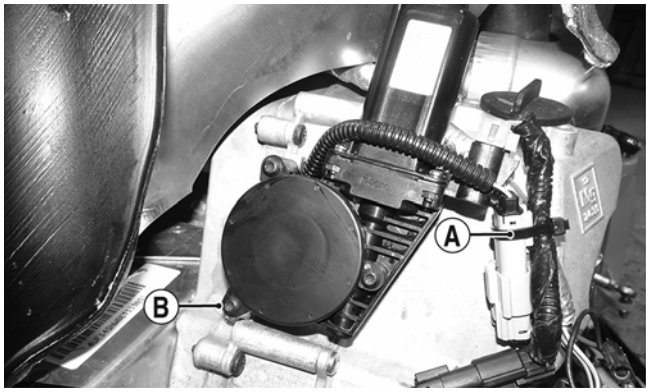


SNO-1247A

26. Install the actuator and secure using the existing three torx screws (B) (threads coated lightly with blue Loctite #243). Tighten to 36 in-lb.

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27. Connect the harness to the gear position sensor; then secure the connector to the main harness using a Cable Tie (A).



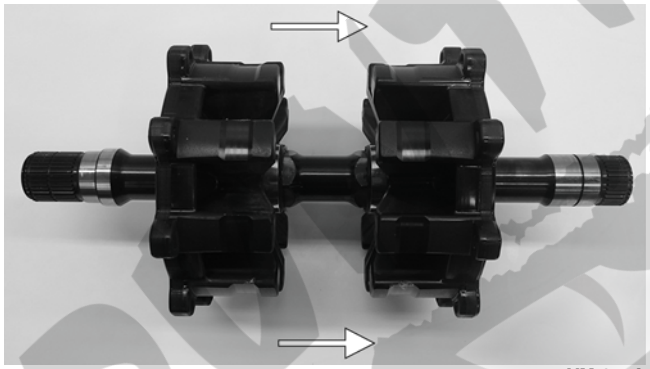
YM-103

28. Install the lower console; then install the seat and both access panels.
29. Start the engine; then shift the snowmobile into and out of reverse three times.

Drive Sprockets

REMOVING

■NOTE: The drive sprockets must be removed from the brake side.



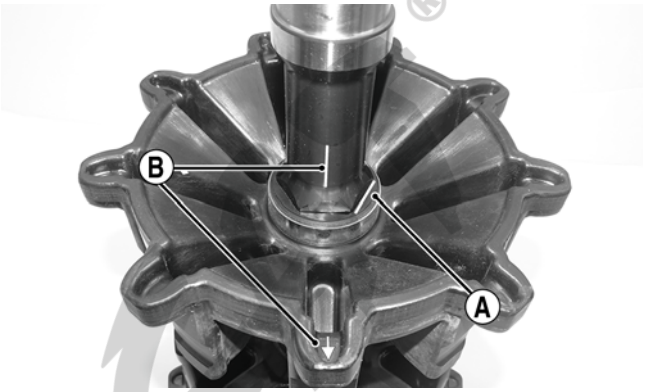
YM-075A

1. Remove the snap ring on the brake side of the driveshaft; then remove the retaining plate seal.



YM-074A

2. For installing purposes, scribe a line on the driveshaft (A) next to the drive sprocket for proper alignment; then scribe a line on the driveshaft directly in line with the timing arrows (B located on the inside of the sprockets) on the drive sprockets for proper sprocket timing.

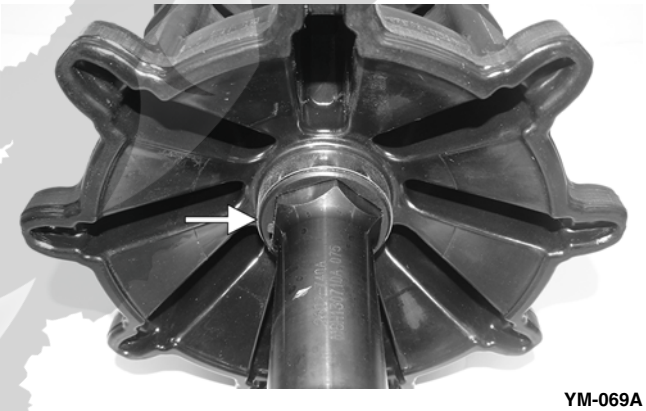


YM-071A

3. Using a suitable press positioned against the tension-collar of the drive sprocket (located on the gear case) and of the driveshaft, press the drive sprockets off the driveshaft.

CAUTION

Always press against the tension-collar of the drive sprockets or damage to the components will occur.



YM-069A

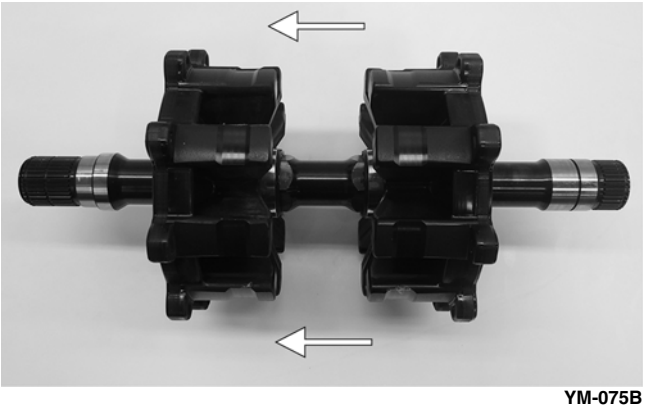
CLEANING AND INSPECTING

1. Thoroughly wash all metallic components in parts-cleaning solvent. Dry using compressed air.
2. Wash all non-metallic components with soap and water.
3. Inspect the driveshaft for damaged splines or stripped threads.
4. Inspect the seals for any breaks or damage.
5. Inspect the track for cuts, gouges, or wear.
6. Inspect the brake disc for wear or cracks.
7. Inspect the track drive sprockets for wear or damage.

INSTALLING

■NOTE: The drive sprockets must be installed from the brake side.

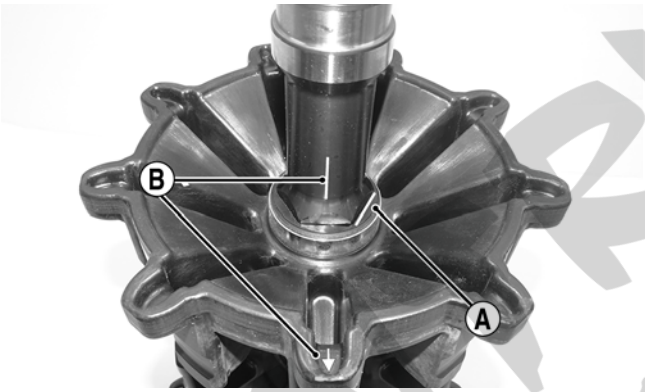
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YM-075B

■**NOTE: Prior to installing the sprockets onto the driveshaft, lightly chamfer the inside edge of the sprocket to avoid binding.**

1. Properly align the scribed line (B) on the driveshaft (from removing) with the timing arrow on the drive sprocket; then slide the sprocket onto the driveshaft as far as it will go.



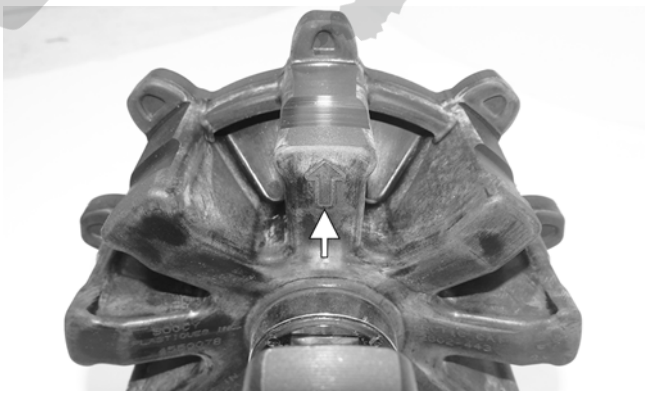
YM-071A

2. Using a suitable press and fixture, press the driveshaft into the sprocket until it aligns with the line scribed in removing.
3. Slide the remaining sprocket onto the driveshaft making sure the timing arrow/lines (from removing) are aligned; then using the press/fixture, press the sprocket to the remaining alignment line.

CAUTION

Always press against the tension-collar of the drive sprockets or damage to the components will occur.

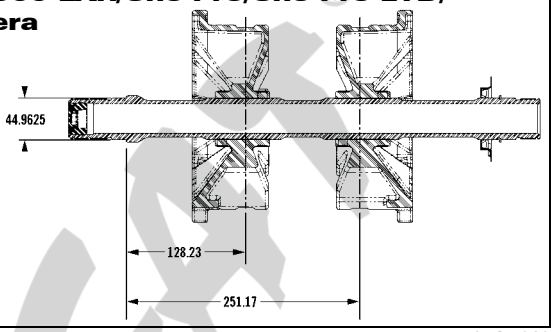
■**NOTE: When pressing new sprockets on the driveshaft, align the sprocket alignment marks or the sprockets won't be timed correctly.**



YM-072A

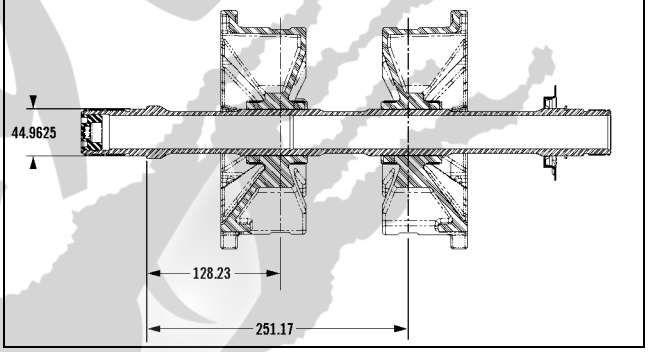
4. Using a calipers, measure distances between the sprockets and from the sprockets to each end of the driveshaft for proper location (see appropriate illustration).

XF 7000 LXR/Sno Pro/LTD
ZR 7000 LXR/Sno Pro/Sno Pro LTD/
Pantera



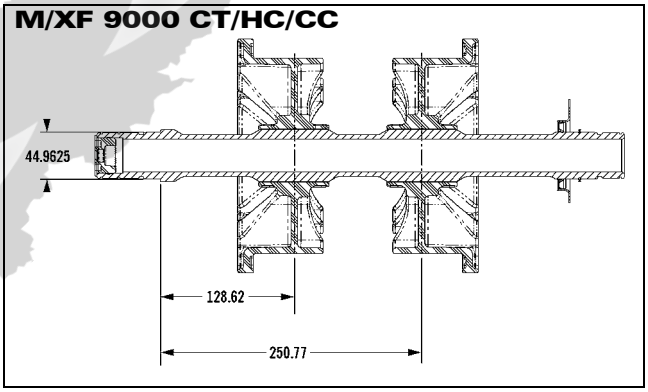
0747-963

XF 9000 LXR/Sno Pro/Sno Pro LTD
ZR 9000, ZR 5000



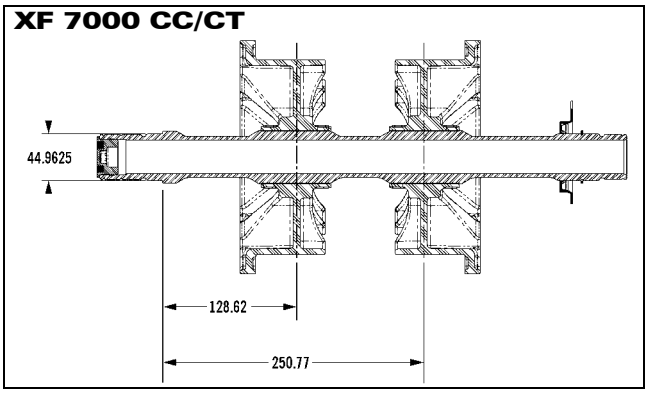
0747-961

M/XF 9000 CT/HC/CC



0747-960

XF 7000 CC/CT



0747-964

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5. Install the retaining plate seal onto the drive shaft; then install the existing snap ring making sure it is installed into the groove of the shaft.



YM-074A

Track Tension

CHECKING

⚠ WARNING

DO NOT attempt to check or adjust track tension with engine running. Turn ignition key to the OFF position. Personal injury could result from contact with a rotating track.

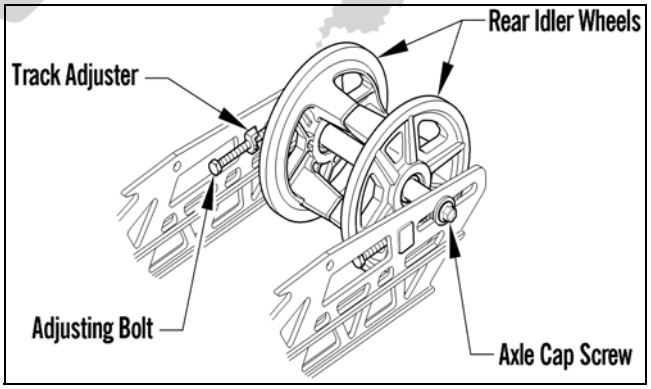
1. Remove excess ice and snow buildup from the track, track drive sprockets, and the inside of the skid frame.
2. Elevate the snowmobile on a shielded safety stand high enough to use a spring scale.
3. At mid-point of the track (on the bottom side), hook a spring scale around a track clip; then pull down on the scale to the proper pressure. Measure the deflection (distance) between the bottom of the wear strip and the inside surface of the track clip. Measurement should be 2 in.

■NOTE: Measurement is from the bottom of the wear strip at the point of the shock pad on the slide rail.

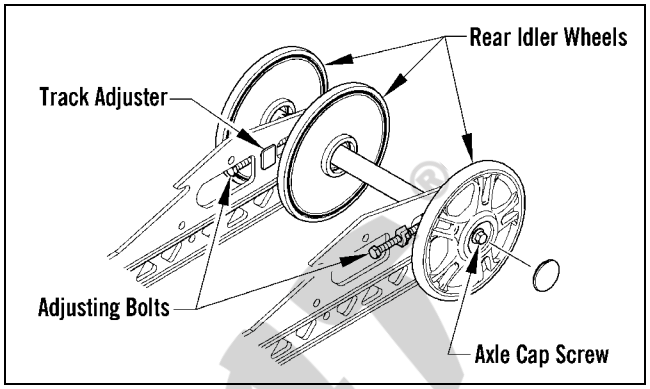
ADJUSTING

■NOTE: To ensure proper track tension adjustment, perform all adjustments on both sides of the snowmobile.

1. Loosen the idler wheel axle cap screws.



0745-811



0748-447

2. If the deflection (distance between the bottom of the wear strip and the inside surface of the track clip) exceeds specifications, tighten the adjusting bolts to take up excessive slack in the track.
3. If the distance between the bottom of the wear strip and the inside surface of the track clip is less than specified, loosen the adjusting bolts to increase the slack in the track.

CAUTION

Always maintain track tension within recommended specification.

4. Check track alignment (see Track Alignment subsection in this section).
5. After proper track tension is obtained, tighten the idler wheel axle cap screws to 34 ft-lb.

■NOTE: Since track tension and track alignment are interrelated, always check both even if only one adjustment seems necessary.

⚠ WARNING

Always make sure the adjusting bolts are snug against the axle and the idler wheel cap screws and the axle nut on the RR models are tightened to specifications. Failure to do so could cause the track to become extremely loose and, under some operating conditions, allow the idler wheels to climb over the track lugs forcing the track against the tunnel causing the track to "lock." If a track "locks" during operation, severe personal injury could result.

Track Alignment

■NOTE: Proper track alignment is when the rear idler wheels are equidistant from the inner drive lugs on the inside surface of the track.

CHECKING/ADJUSTING

⚠ WARNING

Make sure the ignition key is in the OFF position and the track is not rotating before checking or adjusting track alignment. Personal injury could result if contact is made with a rotating track.

1. Remove excess ice and snow buildup from the track, track drive sprockets, and the inside of the skid frame.

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2. Position the tips of the skis against a wall; then using a shielded safety stand, raise the rear of the snowmobile off the floor making sure the track is free to rotate.

⚠ WARNING

The tips of the skis must be positioned against a wall or similar object for safety. Keep hands, feet, and clothing away from moving components.

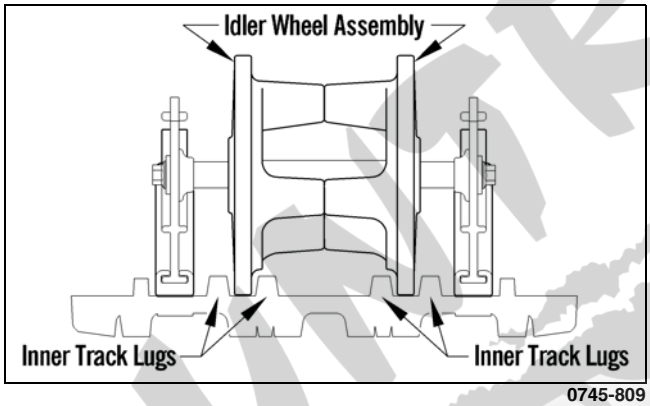
⚠ WARNING

DO NOT stand behind the snowmobile or near the rotating track. NEVER run the track at high speed when the track is suspended.

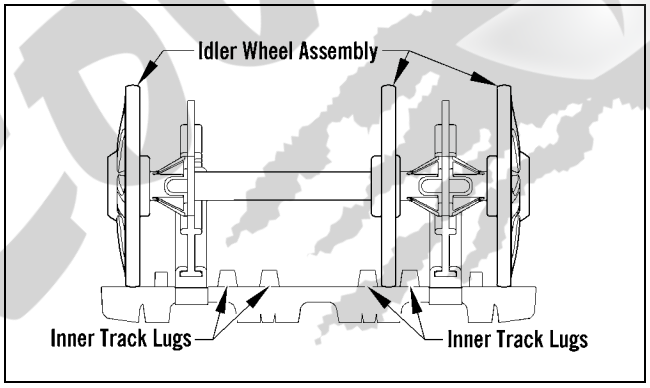
3. Start the engine and accelerate slightly. Use only enough throttle to turn the track several revolutions. SHUT ENGINE OFF.

■NOTE: Allow the track to coast to a stop. DO NOT apply the brake because it could produce an inaccurate alignment condition.

4. When the track stops rotating, check the relationship of the rear idler wheels and the inner track drive lugs. If the rear idler wheels are centered between the inner track drive lugs, no adjustment is necessary. If not, proceed to step 5.

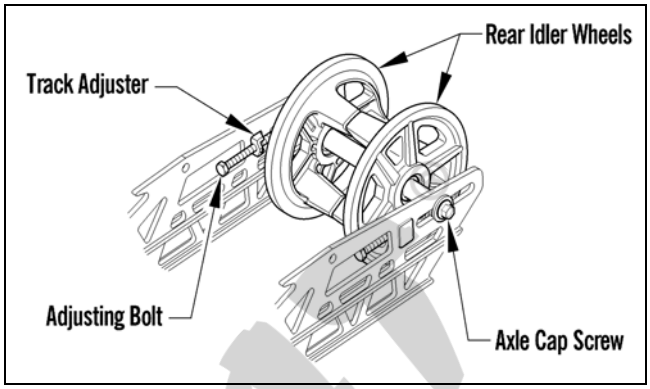


0745-809

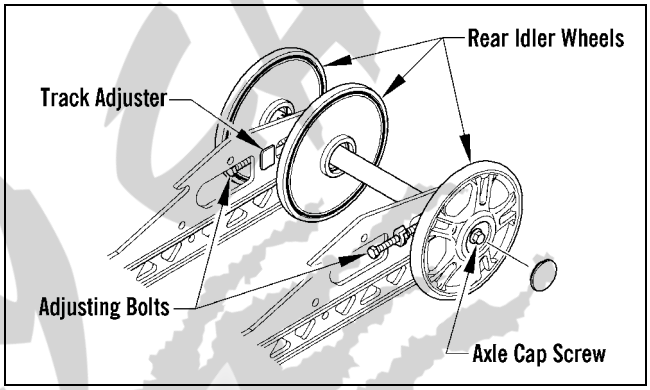


0748-448

5. On the side of the track which has the inner track drive lugs closer to the rear idler wheel, loosen the idler wheel axle cap screw; then rotate the adjusting bolt clockwise 1 to 1 1/2 turns.



0745-811



0748-447

6. Check the track alignment and make the necessary adjustments until proper alignment is obtained.

■NOTE: Make sure correct track tension is maintained after adjusting track alignment (see Track Tension sub-section in this section).

7. After proper track tension and alignment are obtained, tighten the idler wheel axle cap screw to 34 ft-lb; then tighten the adjusting bolt to 84 in.-lb.

⚠ WARNING

Always make sure the adjusting bolts are snug against the axle and the idler wheel cap screws. Failure to do so could cause the track to become extremely loose and, under some operating conditions, allow the idler wheels to climb over the track lugs forcing the track against the tunnel causing the track to "lock." If a track "locks" during operation, severe personal injury could result.

■NOTE: Field test the track under actual conditions and after the field test, check track alignment and track tension; adjust as necessary.

Brake System (Hydraulic)

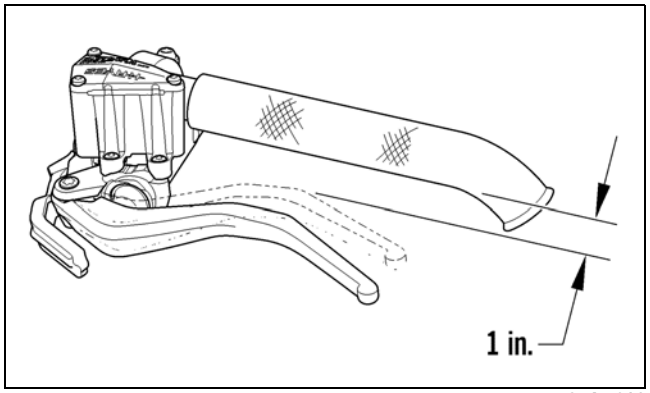
CHECKING BRAKE LEVER TRAVEL

1. Compress the brake lever fully.

■NOTE: Do not pump the brake lever as it will produce an inaccurate reading.

2. Measure the distance between the brake lever and the handlebar. The distance must be greater than 1 in.

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0745-816

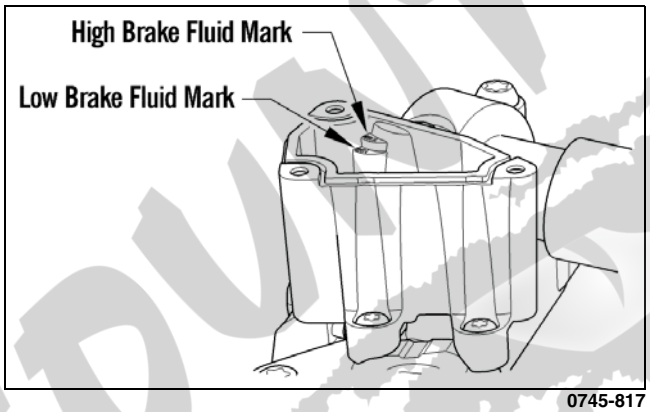
3. If the distance is less than specified, check the brake fluid level (see Checking and Adding Brake Fluid in this sub-section), inspect for leakage, and check the brake pads (see Checking and Replacing Brake Pads in this sub-section).

⚠ WARNING

Do not operate the snowmobile if the distance between the compressed brake lever and handlebar is less than 1 in. Brake loss may occur. Brake loss can result in severe personal injury.

CHECKING AND ADDING BRAKE FLUID

1. With brake fluid reservoir in a level position and the cover removed, check the fluid level. The brake fluid level must be at the high mark in the reservoir.



0745-817

2. If the brake fluid level is low, add Arctic Cat approved brake fluid until the fluid is at the recommended level. Install and secure the reservoir cover. DO NOT allow moisture to contaminate the brake system.

CAUTION

Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the snowmobile.

⚠ WARNING

Do not overfill the brake fluid reservoir. Overfilling the reservoir may cause the brake system to hydraulically lock. Use only approved brake fluid. Never substitute or mix different types or grades of brake fluid. Brake loss may occur. Brake loss can result in severe injury or even death.

CHANGING BRAKE FLUID

The brake fluid must be changed on a regular basis and/or whenever the brake fluid has been overheated or contaminated. The brake fluid should be changed every 1000 miles or at the end of the snowmobiling season, whichever occurs first.

Arctic Cat recommends the removal and disassembly of the brake caliper assembly when changing the brake fluid (see Brake Caliper/Brake Disc/Driveshaft Bearing in this sub-section).

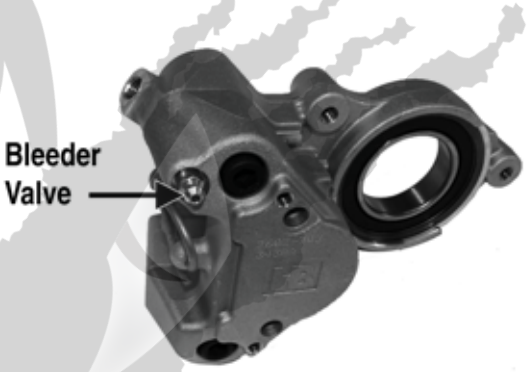
CAUTION

Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the snowmobile.

⚠ WARNING

Use only Arctic Cat approved brake fluid. Any substitute may result in a loss of brakes.

1. Slide a piece of flexible tubing over the ball of the bleeder valve and direct the other end into a container.



PC223A

2. Slowly compress the brake lever and hold. Open the bleeder valve to release the fluid; then compress the brake lever repeatedly until all brake fluid is expelled. Close the bleeder valve.

3. Add new approved brake fluid to the reservoir; then compress the brake lever and hold. Open the bleeder valve. Repeat the compression until brake fluid flows free of air bubbles and appears clean.

■NOTE: It may be necessary to refill the reservoir a number of times to eliminate all air bubbles in the system.

4. When the brake fluid is free of all air and the brake lever feels firm when compressed, fill the reservoir; then install and secure the cover. Remove the tube from the bleeder valve.

5. Bleed the brake system (see Bleeding Brake System in this sub-section).

BLEEDING BRAKE SYSTEM

If the brake lever feels spongy when applied, the brake system may need to be bled.

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1. With the handlebar in the highest position, remove the reservoir cover and fill the reservoir with approved brake fluid.

CAUTION

Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the snowmobile.

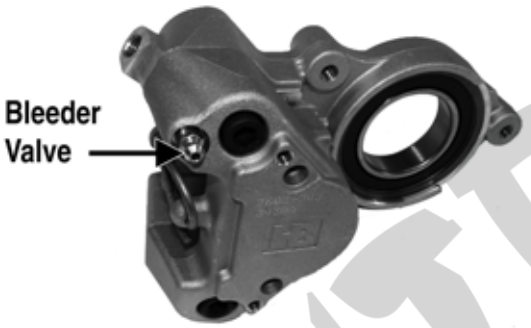
⚠ WARNING

Use only approved brake fluid. Any substitute may result in a loss of brakes.

⚠ WARNING

Do not use brake fluid from a container opened for a long period of time. Unsealed brake fluid containers will absorb moisture and can contaminate the fluid inside.

2. Slide a piece of flexible tubing over the ball of the bleeder valve and direct the other end into a container.



PC223A

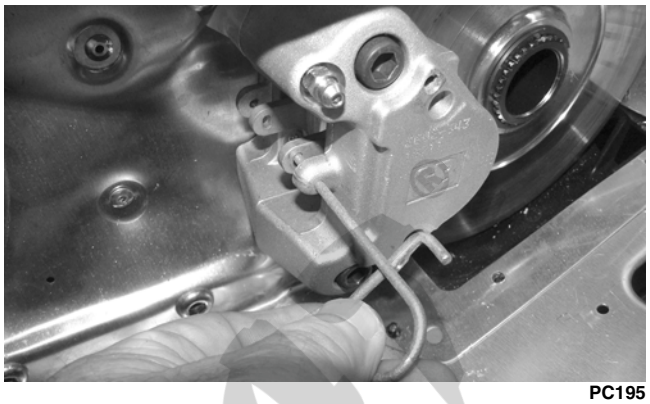
3. Slowly compress the brake lever and hold. Open the bleeder valve to release the fluid and air. When the fluid stops flowing, close the bleeder valve; then release the brake lever.
4. Repeat step 3 until the brake fluid flows free of air bubbles.

■NOTE: It may be necessary to refill the reservoir during the bleeding process.

5. When the brake fluid is free of all air and the brake lever feels firm when compressed, fill the reservoir; then install and secure the cover. Remove the tube from the bleeder valve.

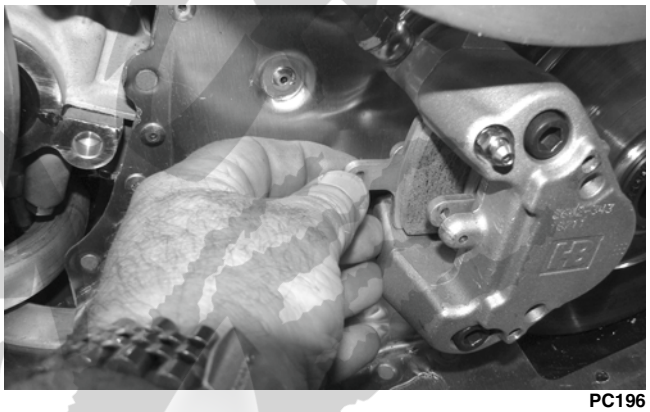
CHECKING AND REPLACING BRAKE PADS

1. Remove the brake shield; then remove the retaining pin securing the brake pads.



PC195

2. Remove one brake pad and measure the thickness.



PC196

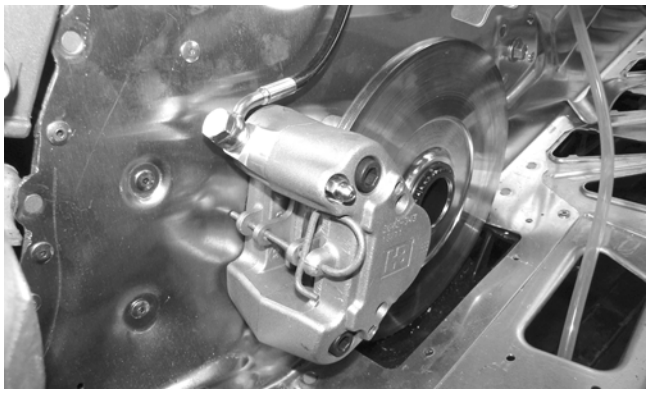


PC199

■NOTE: Brake pad thickness must be greater than 0.20 in. If brake pad thickness is less than specified, replacement of both pads is necessary. Always replace with new pads and always replace as a set.

3. Position the new brake pad into the caliper.
4. Repeat for the other pad; then secure the pads with the retaining pin.

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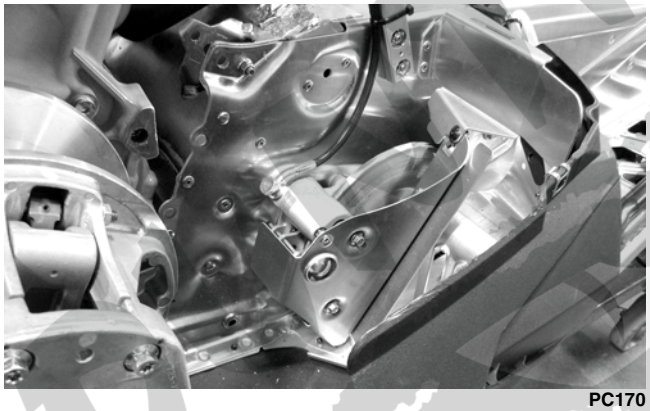
PC194

■**NOTE: When new brake pads are installed, a "burnishing" process is required. Drive the snowmobile slowly and compress the brake lever several times until the pads just start to warm up; then allow them to cool down. This procedure stabilizes the pad material and extends the life of the pads.**

BRAKE CALIPER/BRAKE DISC/ DRIVESHAFT BEARING

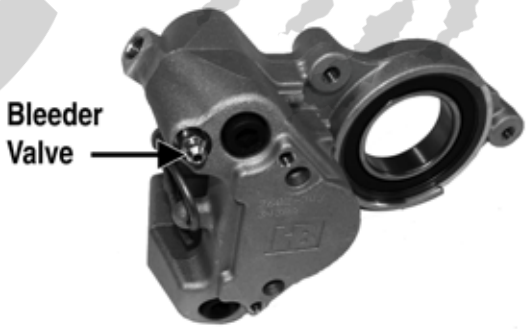
Removing/Disassembling

1. Remove both access panels; then remove the drive belt (see Drive Belt in this section) and driven clutch.
2. Remove the screws securing the brake shield and footrest to the chassis; then remove the shield and rest.



PC170

3. Slide a piece of flexible tubing over the ball of the bleeder valve and direct the other end into a container.

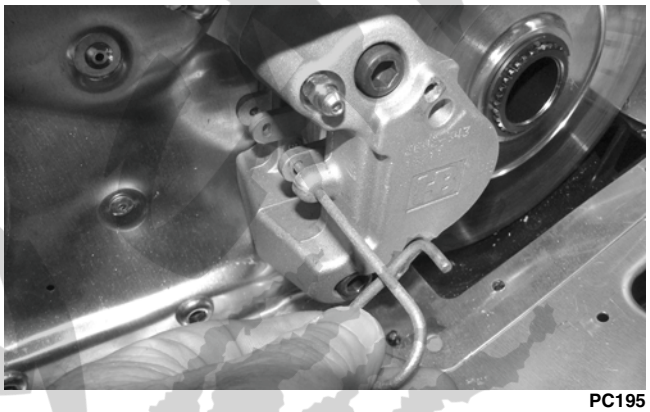


PC223A

CAUTION

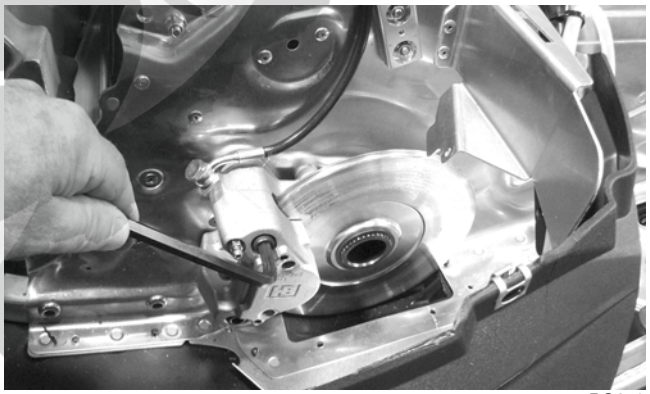
Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the snowmobile.

4. Open the bleeder valve and compress the brake lever several times to drain the reservoir of fluid.
5. Remove the brake hose from the caliper. Use an absorbent towel to collect any remaining brake fluid.
6. Remove the retaining pin securing the brake pads; then remove both pads.



PC195

■**NOTE: If servicing the brake disc only, remove the cap screws securing the caliper housings together; then remove the outside housing. Account for the seal.**



PC172

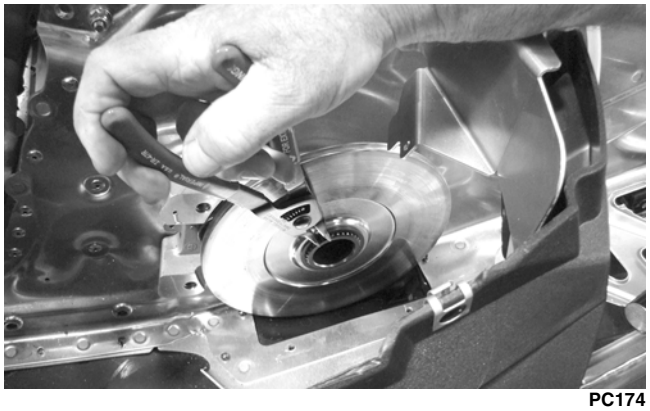
CAUTION

If the caliper housings are to be separated, take care not to allow any contaminants into the fluid passages of the calipers.

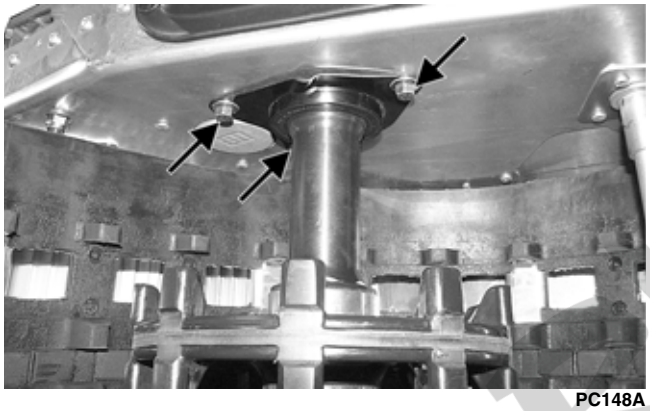
■**NOTE: To aid in removing the inner caliper housing, completely loosen track tension.**

7. Remove the snap ring from the driveshaft and remove the brake disc; then remove the cap screws securing the inner caliper/driveshaft bearing housing to the chassis.

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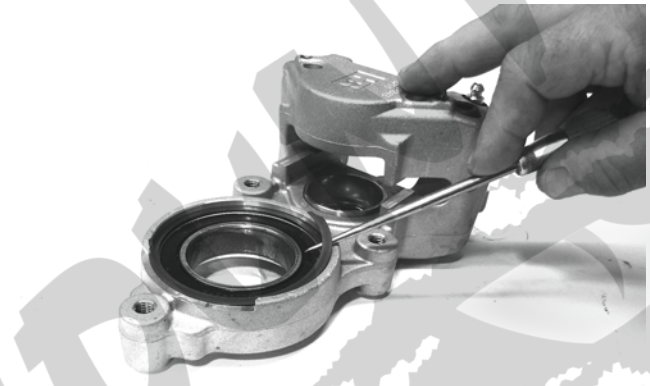


PC174



PC148A

8. If the bearing will be replaced, remove the snap ring; then using a suitable press, remove the bearing from the housing.



PC200

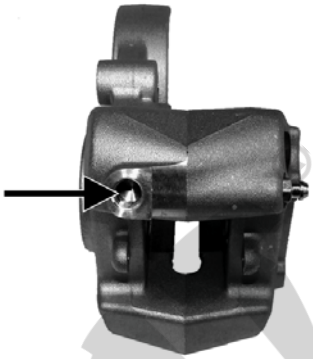
■NOTE: Never reuse bearings that have been removed. Always use new bearings.

■NOTE: If the caliper housings were separated, they must be secured together with the seal installed between the inner and outer housings.

9. Position a piece of wood between the pistons. Using low-pressure compressed air, blow into the caliper brake hose fitting to loosen the brake pistons.

⚠ WARNING

Always wear safety glasses when using compressed air.

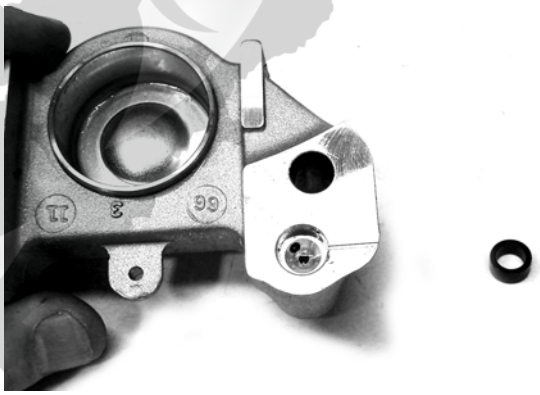


PC221A

10. Remove the two screws securing the caliper halves. Discard the seal.

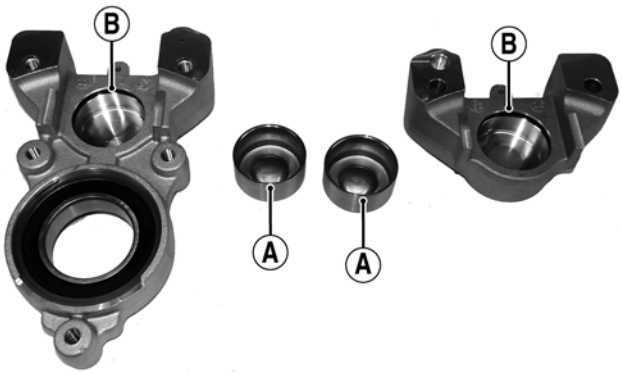


PC219A



PC173

11. Remove the pistons (A) and O-rings (B); then discard the O-rings.



PC220A

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Cleaning and Inspecting

1. Inspect the brake pistons for gouges, cracks, pitting, scuffing, or corrosion. If any of these conditions exist, replace the piston.

■NOTE: The inner and outer caliper housings are not serviceable components. If either or both are defective or damaged, the complete caliper assembly must be replaced.

2. Clean the piston outer surface by using a soft Scotch-Brite pad and clean brake fluid as a cleaner.

CAUTION

Do not use any sharp cleaning tool on the piston surface or in the O-ring groove as it may cause damage.

3. Inspect the piston bore of the inner and outer brake calipers for gouges, cracks, pitting, scuffing, or corrosion. If any of these conditions exist, replace the caliper.
4. Clean the caliper inner wall surface using a soft lint-free cloth and clean brake fluid.

CAUTION

Care must be taken not to allow any contaminants into the fluid passages of the calipers or brake system malfunction may occur.

5. Inspect the condition of the brake pads. Replace if damaged or worn. The brake pad thickness must be greater than 0.20 in. If the brake pad thickness is less than specified, replacement of both pads is necessary.
6. Inspect the brake hose for cracks and deterioration and check the condition of the threaded connectors.

Assembling/Installing

1. Apply approved brake fluid to new O-rings; then install the O-rings into the groove of each caliper half.

CAUTION

Never reuse piston O-rings. Always install new O-rings when installing pistons in the brake caliper.

2. In each caliper half, apply approved brake fluid to the brake piston; then while twisting, install the piston with the dished side facing out.



PC201

■NOTE: To aid in installing the piston, make sure the piston O-ring is properly seated in the groove of the caliper housing.

3. Using a suitable press, install a new inner bearing into the caliper housing until it is properly seated.

CAUTION

When installing a bearing, always press on the outer race of the bearing.



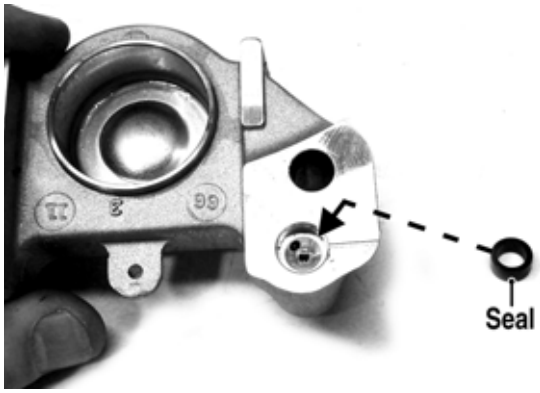
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4. Install the snap ring securing the bearing in the caliper housing.



PC204

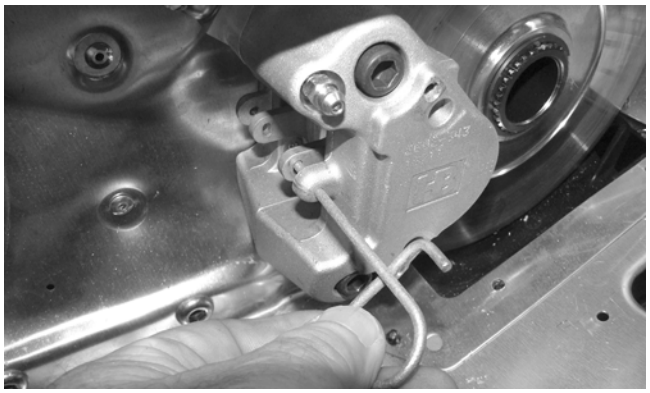
5. Place the inner caliper housing/driveshaft bearing housing onto the driveshaft and secure with the cap screws coated with blue Loctite #243. Tighten to 25 ft-lb.
6. Apply Anti-Seize Thread Compound to the splines of the brake disc; then install on the driveshaft and secure with the snap ring.
7. Install a new seal in the outer caliper fluid passage; them install the outer caliper and secure with the cap screws. Tighten to 25 ft-lb.



PC173A

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8. Install new brake pads in the caliper and secure with the retainer pin.



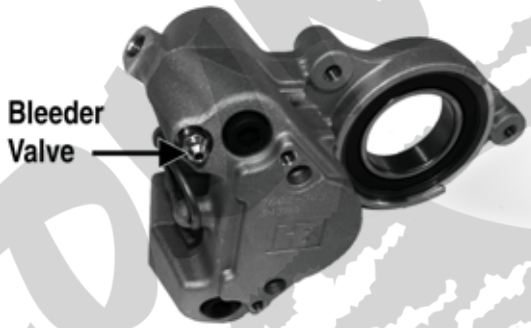
PC195

9. Bleed the brake system.
10. Install the brake shield and footrest; then install the drive belt and driven clutch. Tighten the driven clutch cap screw to 20 ft-lb.
11. Adjust the track tension and track alignment.
12. Close and secure both side panels.

Brake Lever/Master Cylinder Assembly

REMOVING

1. Slide a piece of flexible tubing over the ball of the bleeder valve and direct the other end into a container.

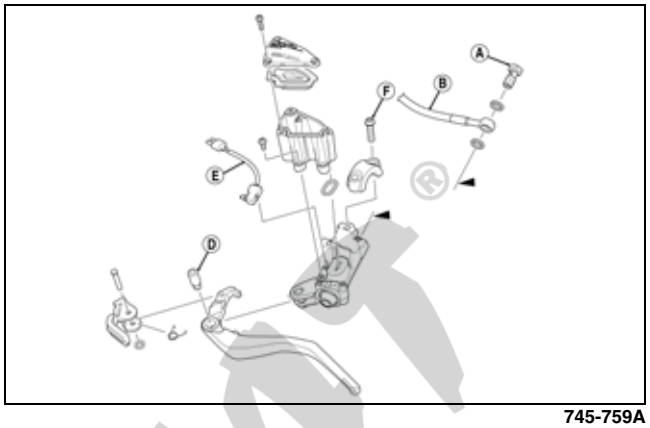


PC223A

2. Remove the two screws securing the reservoir cover and remove the reservoir cover; then open the bleeder valve. Allow the brake fluid to drain completely.
3. Place an absorbent towel around the connection to absorb brake fluid. Remove the banjo-fitting bolt (A) securing the brake fluid hose (B) to the master cylinder. Discard the two crush washers.

CAUTION

Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the snowmobile.



745-759A

4. Remove the pin (D) securing the brake lever to the master cylinder.
5. Using a small screwdriver, compress the tabs of the brakelight switch (E) to release it from the master cylinder.
6. Remove the two torx-head screws (F) and clamp securing the brake reservoir to the handlebar; then place a towel over the reservoir and remove the assembly from the handlebar.

INSPECTING

1. Inspect the snap ring and pin securing the brake lever for wear or damage; then inspect the brake lever for cracks or damage.
2. Inspect the master cylinder reservoir and cover for cracks and leakage.

■NOTE: The master cylinder is a non-serviceable component. If any wear or damage is detected, the master cylinder must be replaced.

3. Inspect the brake fluid hose for cracks, deterioration, and the condition of the fittings (threaded and compression).

INSTALLING

1. Position the brake assembly on the handlebar. Secure with two torx-head screws (F) and clamp; tighten securely.
2. Install the brake fluid hose (B) to the master cylinder with the banjo-fitting bolt (A) and two new crush washers. Tighten securely.

CAUTION

Always use new crush washers when installing the brake fluid hose.

3. Install the brakelight switch (E) to the master cylinder.
4. Install the brake lever; then secure with pin (D).
5. Place the reservoir cover onto the reservoir; then secure with the two screws.
6. Bleed the brake system.

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Troubleshooting Track

Problem: Track Edge Frayed — Drive Lugs Worn	
Condition	**Remedy**
1. **Track alignment** adjusted incorrectly	1. Align — replace track
Problem: Track Worn Adjacent to Outer Drive Lugs	
Condition	**Remedy**
1. **Track tension** adjusted incorrectly 2. **Rear idler wheels** dirty — damaged	1. Adjust track tension 2. Clean — replace idler wheels
Problem: Track Ratchets — Slaps Tunnel	
Condition	**Remedy**
1. **Track tension** adjusted incorrectly (too loose) 2. **Drive sprockets** misaligned — damaged	1. Adjust track tension (tighten) 2. Align — replace sprockets
Problem: Wear-Strip Wear Excessive	
Condition	**Remedy**
1. **Slide rail** bent — broken — damaged 2. **Track alignment** adjusted incorrectly	1. Repair — replace slide rail 2. Adjust track alignment

Troubleshooting Hydraulic Brake System

Problem: Caliper Leaks	
Condition	**Remedy**
1. **Caliper O-ring** deteriorated — severed 2. **Piston — O-ring** damaged	1. Replace O-ring 2. Repair piston — replace piston — O-ring
Problem: Lever Spongy — Bottoms Out	
Condition	**Remedy**
1. **Brake system air bubbles** present 2. **Master cylinder** damaged — faulty	1. Bleed brake system 2. Replace master cylinder
Problem: Oscillation Feedback in Lever	
Condition	**Remedy**
1. **Brake pad residue** present on brake disc 2. **Caliper** loose	1. Replace pads — clean disc 2. Tighten mounting bolts
Problem: Loss of Brake	
Condition	**Remedy**
1. **Brake fluid** overheated — contaminated 2. **Master cylinder** damaged — faulty 3. **Caliper — brake hose** leaking 4. **Brake lever linkage** damaged	1. Replace fluid 2. Replace master cylinder 3. Replace caliper O-ring — repair piston —replace piston — O-ring — brake hose 4. Repair — replace lever — mounting bolt
Problem: Brakes Drag	
Condition	**Remedy**
1. **Master cylinder** damaged — faulty 2. **Brake pads** worn — tapered	1. Replace master cylinder 2. Replace pads
Problem: Snowmobile Won't Stop — Have to Pull Too Hard on Lever	
Condition	**Remedy**
1. **Pads/brake disc** glazed 2. **Brake lever** binding 3. **Caliper pistons** binding	1. Replace pads — clean disc 2. Loosen pivot bolt — replace master cylinder 3. Service caliper assembly

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Troubleshooting Drive Clutch/Driven Clutch

Problem: Midrange Shift-Up (Too Quickly - Lowers RPM)	
Condition	**Remedy**
1. **Drive clutch spring** weak	1. Replace drive clutch spring
2. **Driven clutch spring** weak	2. Replace driven clutch spring
3. **Driven clutch spring preload tension** inadequate	3. Replace driven clutch spring
4. **Center-to-center distance** too close	4. Adjust center-to-center distance
5. **Driven clutch bearing** worn — damaged	5. Replace bearing — movable sheave
Problem: Midrange Shift-Up (Too Slowly - Raises RPM)	
Condition	**Remedy**
1. **Drive clutch components** dirty	1. Clean drive clutch components
2. **Driven clutch components** dirty	2. Clean driven clutch components
3. **Driven clutch spring preload tension** excessive	3. Replace driven clutch spring
4. **Driven clutch bearing** worn — dirty	4. Clean — replace bearing — movable sheave
Problem: Excessive Belt Deposits	
Condition	**Remedy**
1. **Offset/parallelism** incorrect	1. Adjust offset/parallelism
2. **Drive clutch/driven clutch sheaves** rough — damaged — dirty	2. Repair — replace — clean drive clutch/driven clutch
3. **Driven clutch movable sheave travel** impaired	3. Service driven clutch
4. **Driven clutch bearing** worn — dirty	4. Clean — replace bearing — movable sheave
Problem: Excessive Belt Drag—Impaired Drive Clutch Disengagement	
Condition	**Remedy**
1. **Drive clutch components** dirty — damaged	1. Clean — replace drive clutch components
2. **Drive belt** does not meet measurement specifications	2. Replace drive belt
Problem: Engine RPM Suddenly Increases—Drive Clutch Vibrates	
Condition	**Remedy**
1. **Cam arm pin** bent — damaged	1. Replace pin
2. **Cam arm** damaged — broken	2. Replace cam arm
3. **Drive clutch** out of balance	3. Align — replace components — drive clutch — drive belt
Problem: Driven Clutch Vibrates	
Condition	**Remedy**
1. **Driven clutch** out of balance	1. Service — replace driven clutch
Problem: Drive Clutch Engagement (Before Specified RPM)	
Condition	**Remedy**
1. **Drive clutch spring** weak — bent	1. Replace spring
2. **Cam arms** incorrect — worn	2. Replace cam arms
Problem: Drive Clutch Engagement (After Specified RPM)	
Condition	**Remedy**
1. **Drive clutch spring** incorrect	1. Replace spring
2. **Spider buttons** worn	2. Replace clutch
Problem: Drive Clutch Sticks	
Condition	**Remedy**
1. **Drive clutch components** dirty	1. Clean drive clutch components
2. **Movable sheave** bent — binding	2. Clean — replace movable sheave
3. **Spider buttons** worn	3. Replace clutch
Problem: Drive Clutch Jerks—Shifts Erratically	
Condition	**Remedy**
1. **Drive clutch** dirty	1. Clean — drive clutch components
2. **Rollers** worn	2. Replace clutch
3. **Cam arms** rough	3. Polish — replace cam arms
4. **Spider buttons** worn	4. Replace clutch
5. **Sheaves** dirty	5. Clean sheaves

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Suspension

SPECIAL TOOLS

A number of special tools must be available to the technician when servicing the rear suspension.

Description	p/n
Shock Absorber Air Pump	2603-614
Idler Wheel Puller Kit	0644-570
Rear Suspension Spring Tool	0144-311
Handlebar Stand	5639-152
Steering Post Stand	5639-946

■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

UNDERSTANDING THE SUSPENSION

Quick acceleration and the ability to go through the turns with power are the most important handling qualities. This section explains how the skid frame functions to provide these two important handling qualities. Before proceeding, however, note these terms.

Weight Transfer — A shift in the center of gravity in any direction depends on the force applied.

Track Tension — The amount of tightness or looseness of the track when correctly mounted in the chassis.

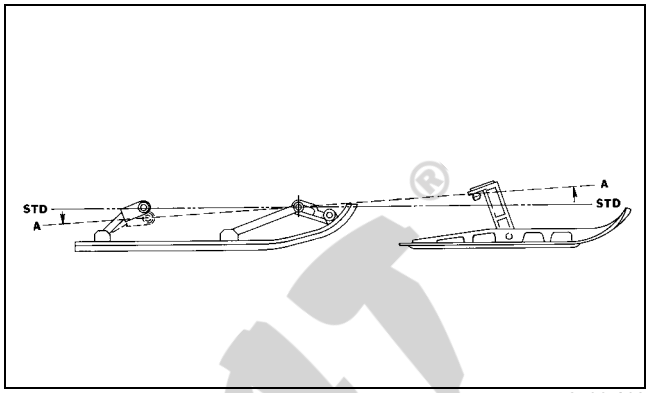
Spring Tension — The amount of force exerted on the spring by either fork tension adjustment or eyebolt adjustment.

Ski Pressure — The amount of force exerted downward on the skis.

Good weight transfer characteristics are needed for fast acceleration (shift of weight from skis to track) and for cornering (shift of weight back to skis to hold the front end in turns). Effective weight transfer depends on suspension tension, position of rider, and the position of the front arm limiter.

To understand how the suspension system works, think of the entire system in terms of three points; the skid frame rear axle center, the skid frame front arm, and the ski saddle center.

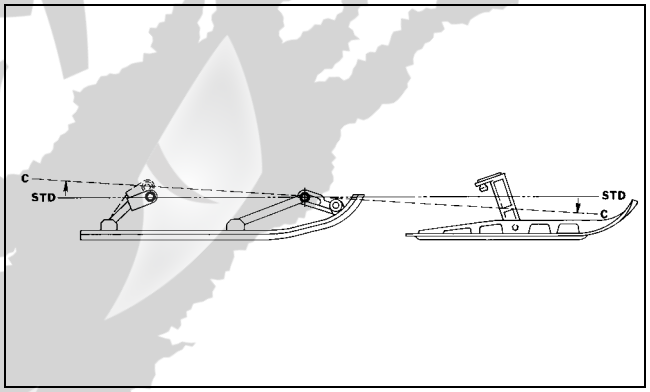
Assume that the front arm functions as a stationary pivot point between the rear axle center and the ski saddle center. Also assume that the ski saddle center is the same height off the ground as the rear axle center. This produces the standard position arrangement.



0728-180

Under acceleration when the center of gravity is transferred to the rear of the machine, the rear suspension collapses slightly. This brings the rear arm point downward and with the front arm stationary, the teeter-totter effect reduces the pressure on the skis, position A.

However, for controlled cornering, more pressure is needed on the skis. So when the driver decelerates coming into a corner, the center of gravity is transferred forward, putting the required pressure onto the skis and reducing the pressure on the rear suspension, position C.



0728-181

This is essentially what weight transfer is all about — the shift of weight to the rear of the machine for positive traction and good acceleration or to the front of the machine for positive handling and cornering control.

Suspension Setup Basics

SKI SHOCK ABSORBER SPRINGS

The shock absorber springs have been matched to the shock valving and rear suspension. These springs are the result of hours of testing and comparison riding trying many different combinations of springs and shocks. If changes are necessary, several spring and shock sizes are available. While making these changes, keep the following points in mind.

Heavier Or Stiffer Springs

1. These will require shocks with more rebound control, or the front end will become like a pogo stick.

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2. With stiffer springs, the front end will become more aggressive in the corners as more weight will be transferred to the skis when decelerating. Also, more weight is transferred to the rear on acceleration and can cause the rear shocks and spring to bottom out.
3. If the springs are too stiff for general riding conditions and style, the ride comfort is gone.

Spring Tension Too Soft

1. Front end bottoms out; hard on front end parts.
2. Less aggressive steering in corners on deceleration, and less weight is transferred to the skis because of softer springs.
3. Less weight gets transferred to rear of the machine upon acceleration.

■NOTE: When softening the ski springs, also soften the rear to match entire suspension.

CAUTION

If the ski shock spring is adjusted too loose, the spring retainer may fall out. If the spring is adjusted beyond specification, the spring will coil bind and spring adjuster damage will occur.

ADJUSTING SKI SHOCKS (Fox Air Shocks)

The air shocks are individually adjustable for the terrain conditions and driving style of the operator. The ski shocks are initially preset at the factory. However, the shocks can be "fine tuned" to match the operator's weight, riding style, and terrain conditions.

■NOTE: Care should be taken to have equal pressure in the shocks before operating the snowmobile.

To increase or decrease air pressure, use the following procedure.

■NOTE: The shocks should not be under load when adjusting.

■NOTE: Adding air pressure will increase the air spring force; reducing air pressure will decrease air spring force.

⚠ WARNING

Do not exceed 105 kg/cm^2 (150 psi) in the shock.

1. Remove the air valve cap from the shock; then thread the valve of Shock Absorber Air Pump onto the shock air valve approximately six rotations.

■NOTE: As the pump is being attached to the shock, the hose will fill with air resulting in a lower gauge pressure 0.14-3.52 kg/cm^2 (2-5 psi).

2. To decrease air pressure in the shock, press the black bleed valve button half way down and hold until desired pressure is attained.

■NOTE: Pressing the button fully down and releasing it will allow only a small amount of air to escape (micro-adjust).

3. To increase air pressure in the shock, pump until desired pressure is attained.
4. Remove the pump valve from the shock air valve.

■NOTE: As the pump valve is being removed from the shock, the sound of air loss is from the pump hose, not from the shock.

5. Install the air valve cap onto the shock.

FRONT ARM SPRING TENSION

Having very light front arm spring tension is desirable. When riding in 4 in. or more of snow, the machine will be quicker if the front spring tension is adjusted lightly.

If the spring tension is adjusted too stiff, the track angle at the front of the skid frame is steep. This steep angle prevents the snowmobile from getting up on plane and slows down by 5 to 8 mph. Also, the following could occur.

1. Slows machine down in loose snow.
2. Causes the snowmobile to dart and dive as a result of less track on the ground on deceleration.

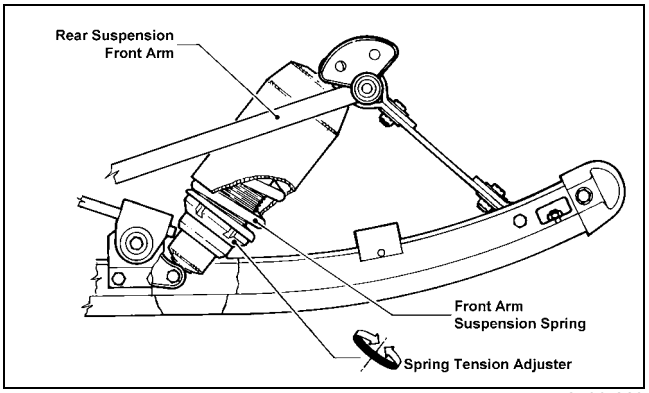
■NOTE: A tight front arm works well under only two conditions: sticky snow conditions in the spring of the year and in hill climbing on hard packed snow.

With the front arm adjusted too soft, the spring may come off the roller.

When riding in sticky snow (springtime or warm days) or hill climbing on hard snow, it may be desirable to stiffen the front arm spring tension. When this is done, weight is transferred back quicker. The problem with too much front arm spring tension is that the feel of the snowmobile becomes very short. The reason for this is the front arm becomes the pivot point between the spindles and rear of the snowmobile. With dominant spring tension on the front arm, the suspension is basically contacting the snow from a point below the front arm to the skis or the spindle pressure point. This makes for a very short and darting snowmobile on the trail. This is especially true when decelerating and the center of gravity is transferred forward.

A method for adjusting the front spring tension follows.

■NOTE: The spring tension should be set as soft as possible when operating on trails and in deep snow.



0729-662

FRONT ARM LIMITER STRAPS

Under no circumstances should the front arm limiter strap be lengthened. If lengthened, it may cause shock absorber travel problems.

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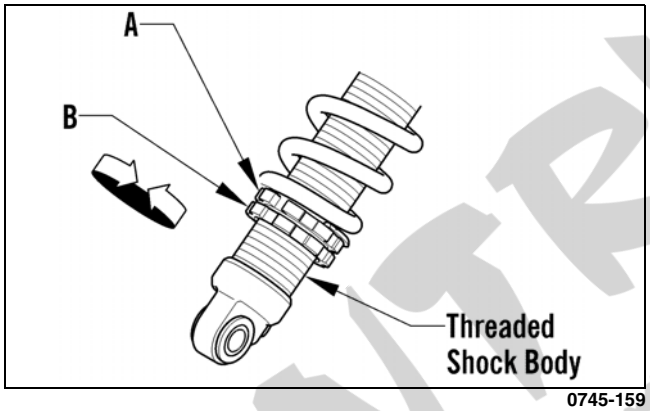
The two limiter straps can be shortened to suit driving style and some test driving time. With the rear arm in its present mounting location, no advantage has been noted from changing the strap length. If the front arm straps are shortened, the result will be more ski pressure and aggressive steering.

REAR ARM SHOCK SPRING (M/XF)

Proper adjustment of rear arm shock absorber spring pre-load is necessary to get the most desirable ride.

The rear arm shock spring is adjustable for the terrain conditions and driving style and weight of the operator. The spring adjuster nut has been set at the factory so the correct amount of threads are exposed between the adjuster nut and the threaded shock body as an initial setting.

Rear spring pre-load adjustment is accomplished by loosening the adjuster nut locking collar (B) from the adjuster nut (A) and using the Spring Adjuster Tool from the tool kit, rotating the adjuster nut in whichever direction is desired. Tighten the locking collar against the adjuster nut.



0745-159

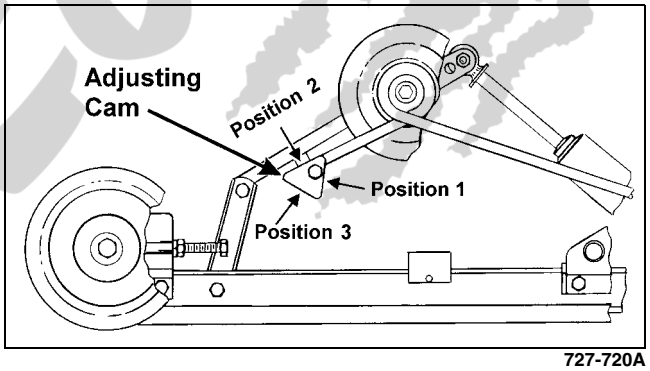
REAR ARM SPRING TENSION

The rear spring tension is adjusted for the weight of the driver. Three possible adjustments exist.

1st block position - set for up to 150 lb

2nd block position - set for 150 to 200 lb

3rd block position - set for over 200 lb



727-720A

■NOTE: When making any changes to the front or rear suspension, the change should be made at both ends to keep the suspension balanced. For example, installing stiffer springs in front may require installing the next step stiffer spring in back to keep everything in balance.

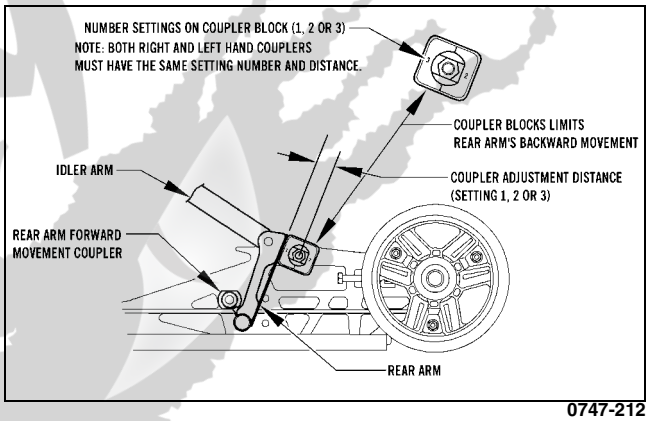
ADJUSTING REAR ARM COUPLER

The rear arm coupler provides advantages over the standard suspension.

First, with the coupler system, ski lift under acceleration is greatly reduced which provides improved handling. Second, when riding through rough terrain, the rear suspension arm receives some needed assistance from the front arm shock and spring as the rear arm is fully collapsed and locked up by the coupler blocks. The front arm then starts to collapse the shocks and spring which assist the rear springs. The result is a smoother ride for the operator.

If additional coupler action is desired, the coupler blocks can be set to the number 2 or 3 position. Each of the coupler blocks has three positions numbered on the inside surface of the block. When changing the block position, change both to the same number. To make the coupler adjustment, follow the procedure below.

1. Loosen the two cap screws that secure the coupler blocks to the inside of the suspension rails.
2. Rotate the coupler blocks to the desired position making sure both are set the same.



0747-212

3. Place a 4-in. block of wood under the rear of the suspension just in front of the rear idler wheels to assist in collapsing the suspension.
4. Collapse the rear suspension until the rear arm is firmly against the coupler blocks aligning the two blocks squarely with the arm. While in this position, tighten the two cap screws securely.

Overload Springs (Pantera)

When either carrying a heavy load or riding 2-up, the overload springs should be engaged by rotating the spring tension blocks to the UP position. The spring tension blocks lock in an over-center position when engaged.

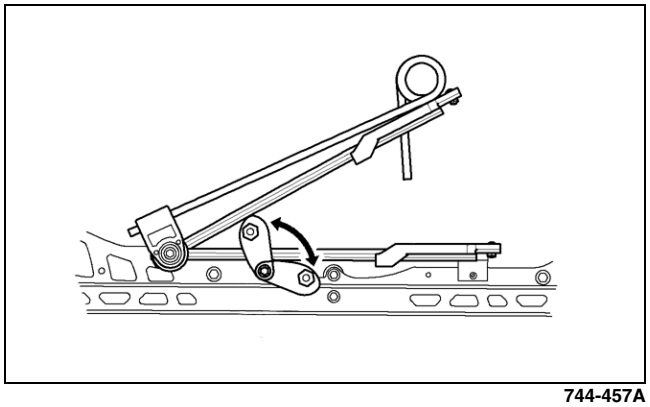
■NOTE: Arctic Cat recommends that the overload springs be engaged whenever a load on the snowmobile (operator/passenger/cargo) exceeds 136 kg (300 lb).

CAUTION

There are weight limitations for these snowmobiles. Maximum weight on the snowmobile (operator/passenger/cargo) should not exceed the maximum limitation of 170 kg (375 lb). Also, the overload springs should be engaged.

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To either engage or disengage the spring tension blocks, use a spark plug socket and a screwdriver to adjust the spring block to the desired position. Make sure both spring blocks are in the same position (either engaged or disengaged).



744-457A

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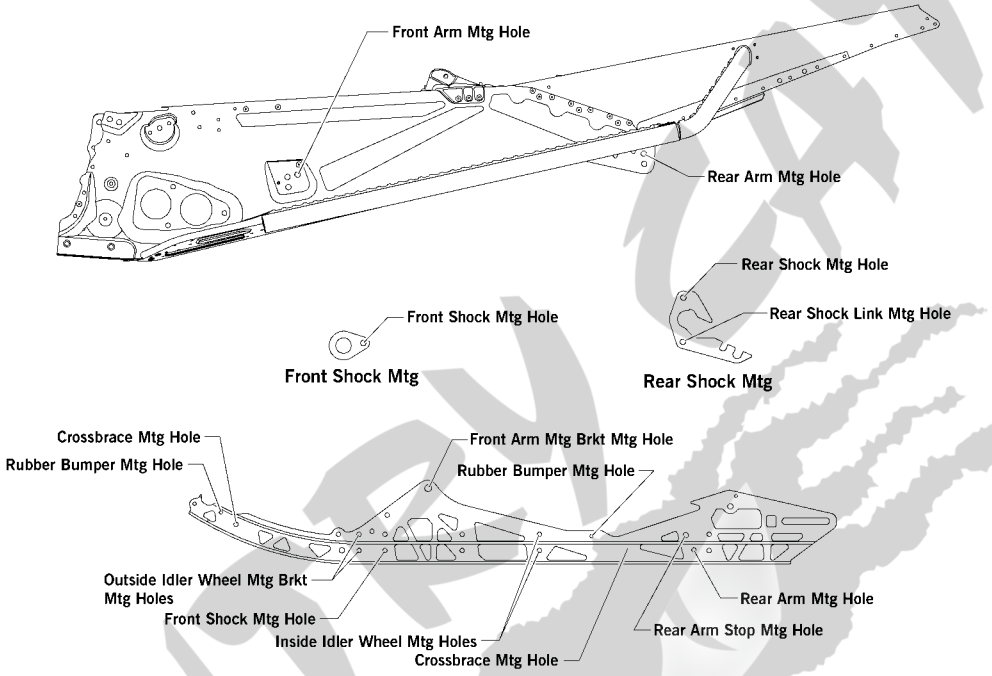
Chassis and Skid Frame Mounting Locations

The suspensions have several possible mounting locations in the slide rails and tunnel. However, Arctic Cat recommends that when disassembling and assembling the suspension, all stock mounting locations be used as shown in the following illustrations.

CAUTION

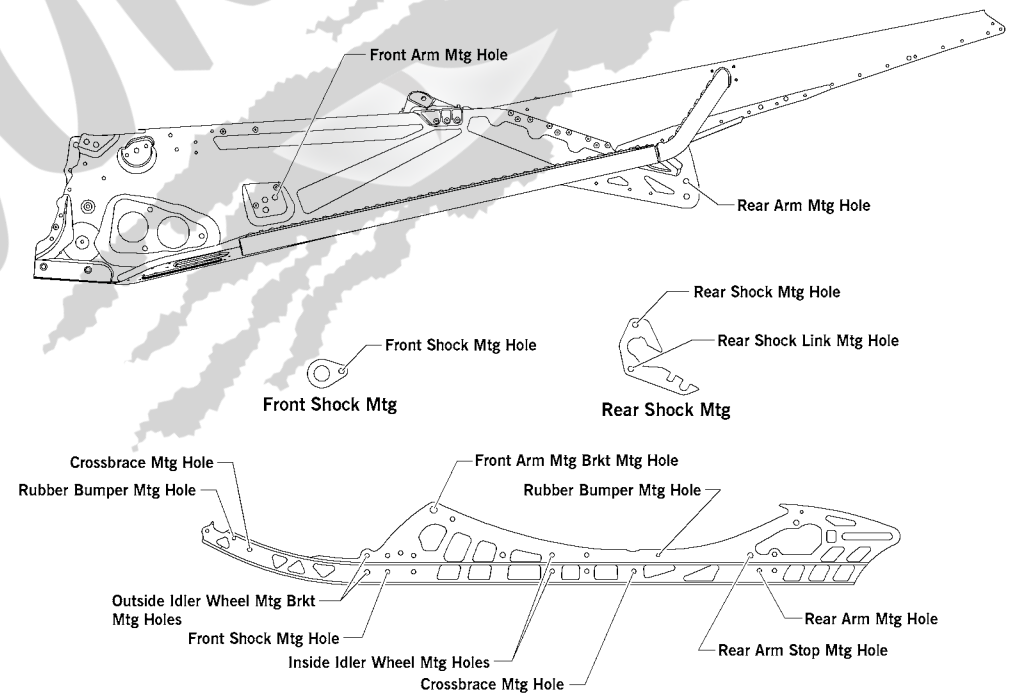
All stock mounting locations must be used. If any alterations to the skid frame are made, shock absorber and suspension damage may occur.

ZR and XF 137" Models



0747-411

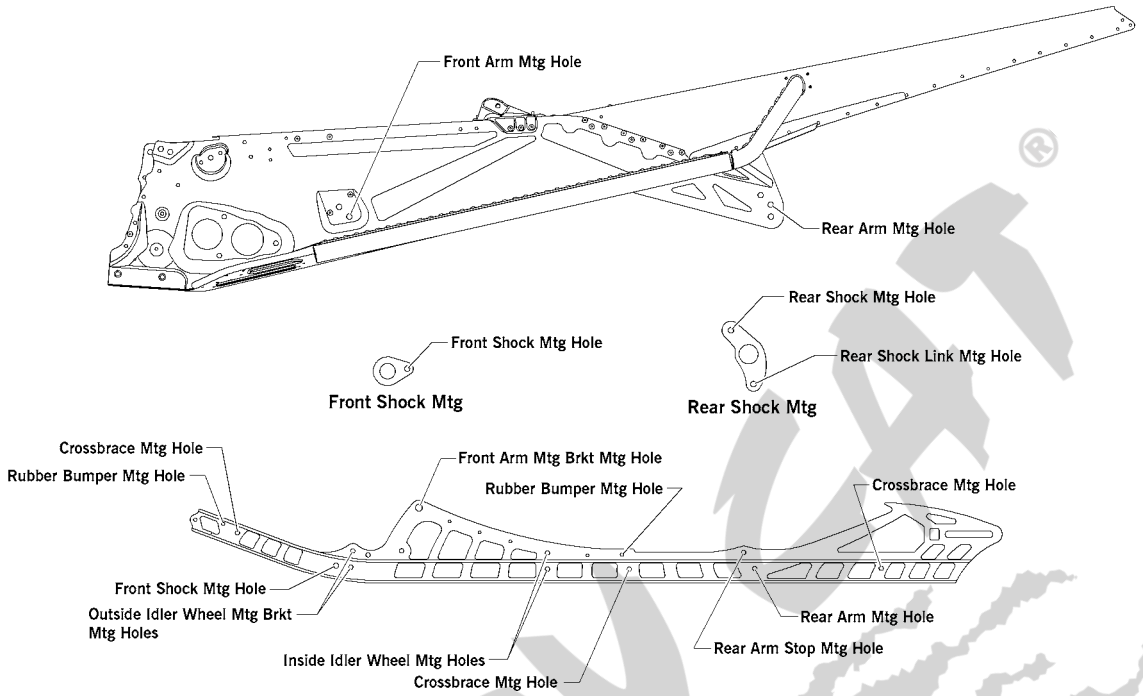
XF 141" Models



0747-413

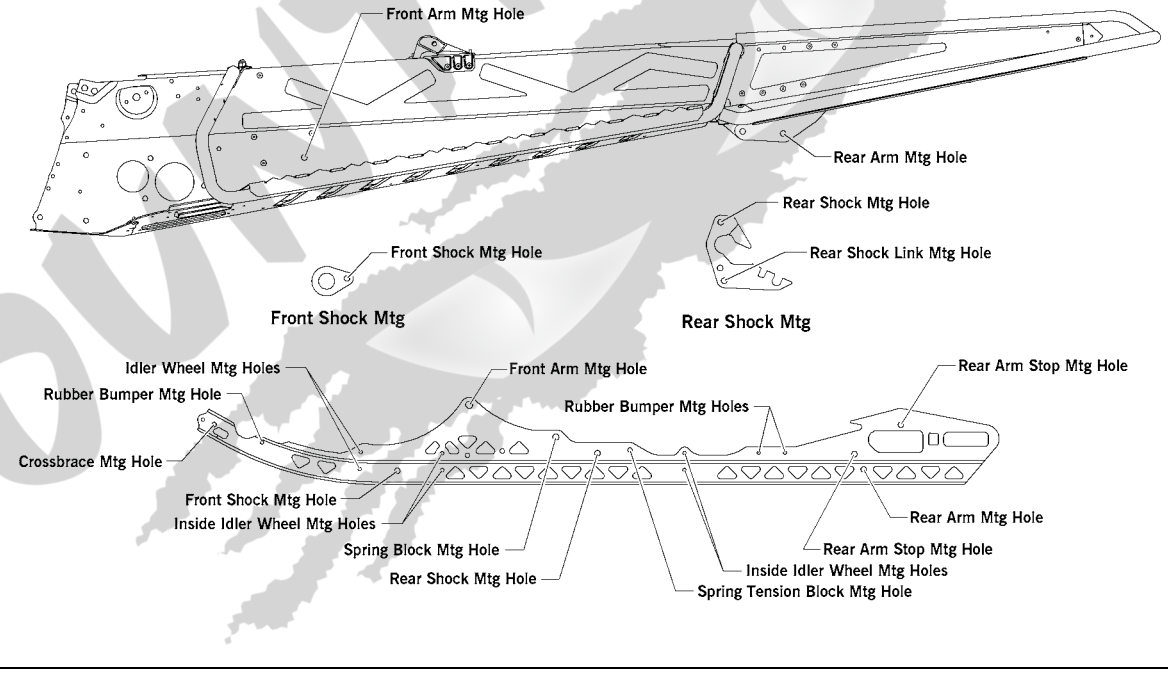
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M Models



0747-413

Pantera Models



0748-835

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Servicing Suspension

This sub-section has been organized so each procedure can be completed individually and efficiently.

■NOTE: If service work is needed on any FOX shock, the shock will have to be removed and sent to FOX or any FOX distributor for any service work. For FOX shock information log on to www.ridefox.com.

■NOTE: Some components may vary from model to model. The technician should use discretion and sound judgment when removing and installing components.

■NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

Removing Skid Frame

■NOTE: Many service procedures can be performed without removing the skid frame. The technician should use discretion and sound judgment when removing and installing components.

1. Loosen the jam nuts and two track-tension adjusting bolts.
2. Place a support stand under the rear bumper; then while holding the flared bushing, remove the rear arm assembly cap screws securing the skid frame to the tunnel.

■NOTE: The support stand should hold the snowmobile level but not raised off the floor.

3. Remove the support stand; then using an appropriate handlebar/steering post stand, tip the snowmobile onto one side.
4. On the ZR and Pantera, slide the skid frame rearward far enough to drop the front arm out of the slider axle; then remove the skid frame.
5. On the M and XF, remove the two cap screws and nuts securing the front of the skid frame to the chassis. Account for two washers.

End Caps

REMOVING

1. Remove the lock nut and cap screw securing the end cap.



FZ096B

2. Using a hammer, tap the end cap off the rail.

CLEANING AND INSPECTING

1. Inspect the end cap area of the slide rail for cracks and wear.
2. Inspect the end cap for any signs of cracking or wear.
3. Clean both the slide rail area and the end cap. Using compressed air, clean the areas of dirt and gravel.

⚠ WARNING

Always wear an approved pair of safety glasses when using compressed air.

4. Inspect the cap screw for cracked, stretched, or damaged threads. Use a new lock nut when assembling.

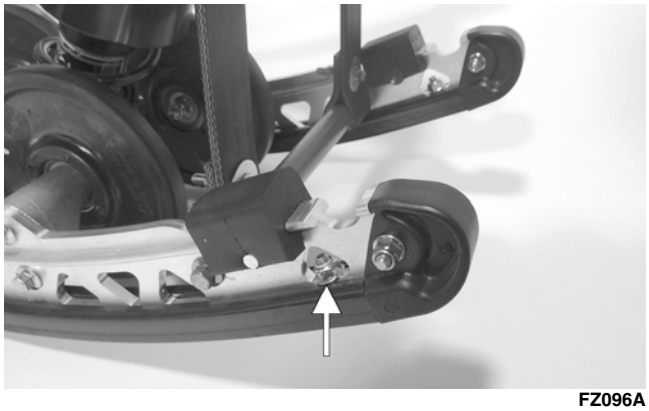
INSTALLING

1. Position the end cap on the slide rail; then align the hole in the end cap with the hole in the slide rail.
2. Secure with a cap screw and lock nut. Tighten to 80 in.-lb.

Wear Strips

REMOVING

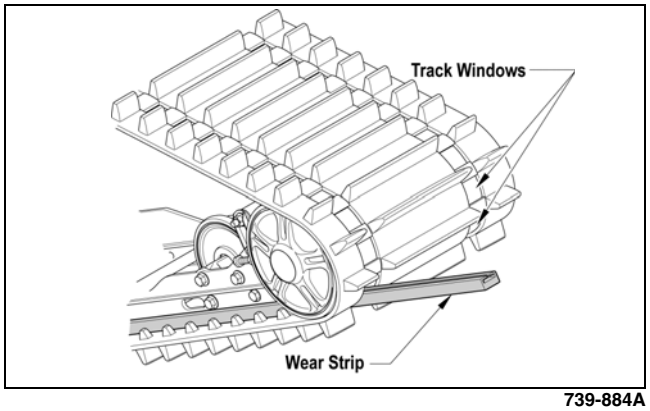
1. Remove the machine screw and lock nut securing the wear strip to the front of the slide rail.



FZ096A

2. Align the wear strip with the openings (windows) in the track; then using a suitable driving tool, drive the wear strip rearward off the slide rail.

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739-884A

CLEANING AND INSPECTING

1. Clean the slide rail using parts-cleaning solvent and compressed air.

⚠ WARNING

Always wear an approved pair of safety glasses when using compressed air.

2. Inspect the slide rail for cracks. If any cracks are found, replace the slide rail.
3. Using a straightedge, inspect the slide rail for any unusual bends. With the slide rail removed, place the straightedge along the bottom surface of the slide rail. If the rail is found to be bent, it must be replaced.

INSTALLING

■NOTE: Use a file to remove any sharp edges on the lower portion of the rail.

1. Align the wear strip with the openings (windows) in the track and from the back, start the wear strip onto the rail; then using a block of wood and a hammer, drive the wear strip forward into position.
2. Secure with a machine screw and lock nut. Tighten to 50 in.-lb.

Shock Pads

REMOVING

1. Remove torx-head screws and nuts securing the shock pads.
2. Remove the rear shock pads.

INSPECTING

1. Inspect the pads for damage or wear.
2. Inspect the rivet holes in the slide rail for damage or elongation.

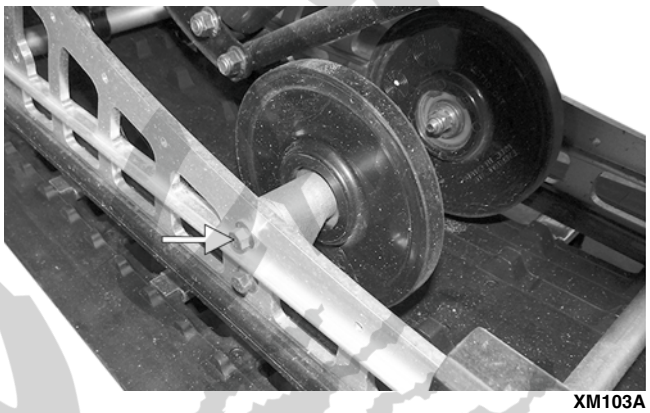
INSTALLING

1. Place the pads brackets into position on the slide rail.
2. Secure the pads with existing torx-head screws and nuts.

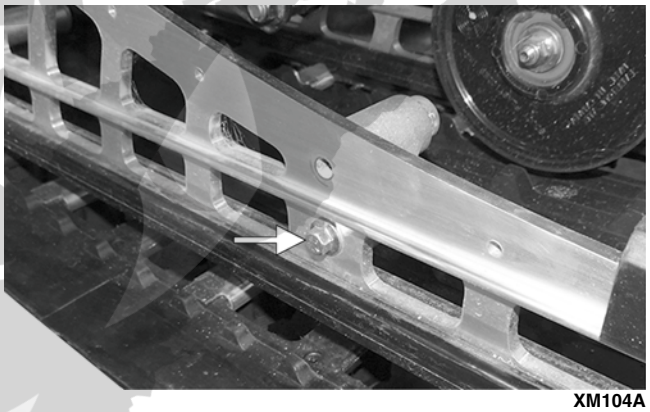
Idler Wheels/Mounting Blocks

REMOVING

1. Remove the cap screw and lock nut securing the idler wheel to the idler wheel mounting block; then remove the cap screw and lock nut securing the mounting block to the slide rail.



XM103A



XM104A

2. Account for a flat washer from the idler wheel cap screw.

CLEANING AND INSPECTING

1. Clean the bearing with a clean cloth.
2. Inspect each idler wheel for cracks or damage.
3. Rotate the idler wheel bearing (by hand) and inspect for binding or roughness.
4. If a bearing must be replaced, use this procedure.

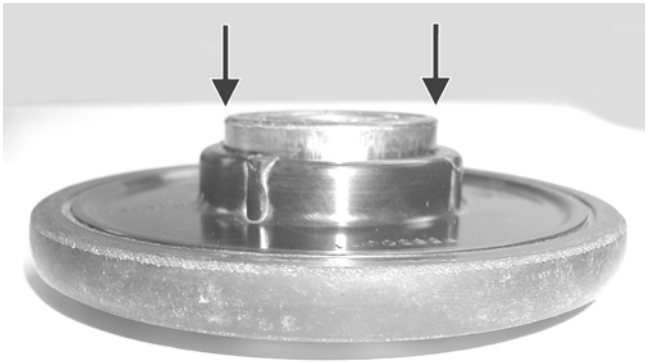
■NOTE: If the idler wheel has no snap ring securing the bearing, the idler wheel is not serviceable.

A. Remove the bearing snap ring.

B. Using a hydraulic press or suitable driving tool, remove the bearing from the inside of the wheel.

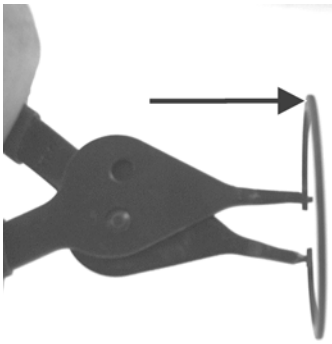
C. Press the new bearing (on its outer race) into the idler wheel.

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MS006A

D. Install the snap ring making sure the “sharp side” is directed away from the bearing.



MS007A

INSTALLING

1. Secure the mounting block on the slide rail with a cap screw and lock nut. Tighten to 12 ft-lb.

■NOTE: For proper alignment, install an idler wheel cap screw into the top mounting block hole prior to tightening.

2. Place the idler wheel to the mounting block; then secure the idler wheel assembly with a cap screw, flat washer, and a lock nut. Tighten to 12 ft-lb.

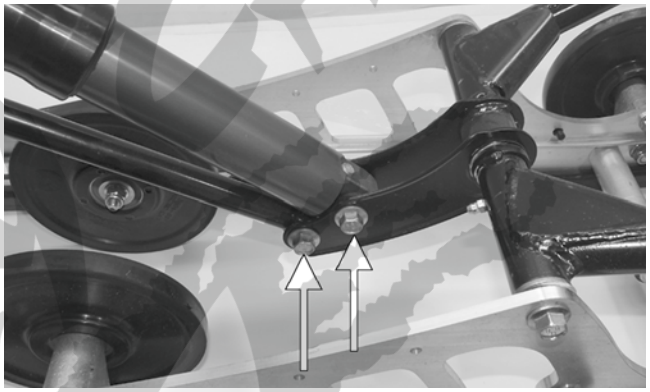
Front Arm Assembly (ZR/XF/M)

1. With the skid frame removed, remove the cap screws and lock nuts securing the limiter straps to the front arm. Account for flat washers.
2. Remove the cap screw and lock nut securing the upper front shock absorber eyelet to the front arm. Pull the shock eyelet free of the bracket. Account for a sleeve.



ZJ271A

3. Remove the lock nut and cap screw securing the rear shock pivot to the front arm.



XM004A

4. Remove the cap screws securing the front arm to the rails.
5. Remove the front arm and account for the front arm axle.
6. Remove the cap screw securing the front outer idler wheel to the idler wheel mounting block. Account for lock nut, cap screw, and flat washer.
7. Remove the cap screw and lock nut securing the idler wheel mounting block to the slide rail.
8. Remove the cap screws, washer, and lock nut from the front shock axle; then from one side, tap the assembly forward far enough for the axle assembly to clear the slide rails. Account for an axle, two spacers, and two shim washers.

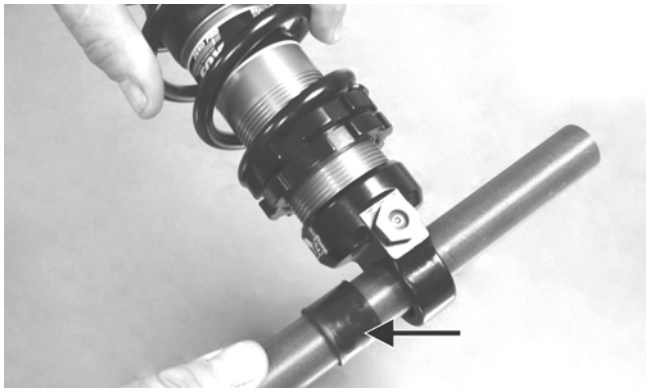
INSPECTING

1. Inspect all front arm weldments for cracks or unusual bends; then inspect the front arm mounting brackets for cracks and for elongated holes.
2. Closely inspect all tubing for cracks or unusual bends.
3. Inspect the bearings, bushings, and front arm spacers for wear or damage.
4. Inspect the shock absorber for damage and for any signs of oil leakage especially at the point where the shock shaft enters the shock body.
5. Inspect the shock absorber eyelet welds (at each end) for any cracks, signs of separation, or for unthreading.

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INSTALLING

1. With the rubber bushing in place, install the axle into the lower shock eyelet bushing assembly; then install the two shim washers and two spacers.



CM246A

2. Place the front arm shock axle assembly into position on the skid frame making sure the spacers and washers are properly positioned. Secure with the cap screw, washer, and a new lock nut. Tighten to 40 ft-lb.

3. On the side that the idler wheel and mounting block were removed from, secure the mounting block on the slide rail with a cap screw and lock nut. Tighten to 12 ft-lb.

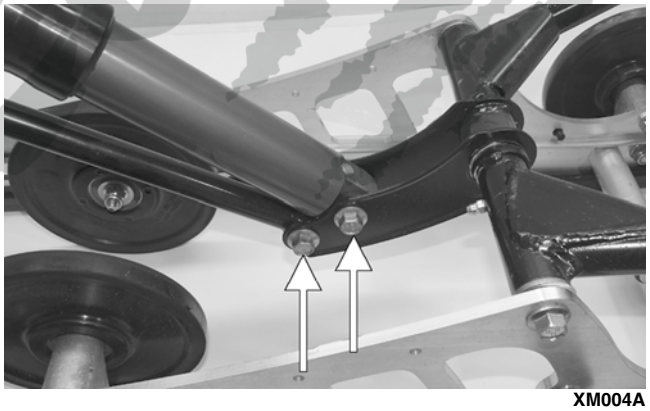
■NOTE: For proper alignment, install an idler wheel cap screw and lock nut into the top mounting block hole prior to tightening.

4. Secure the idler wheel to the mounting block with both existing cap screw. Tighten cap screws to 12 ft-lb.

5. Install the axle into the front arm; then position the front arm to the mounting location of the slide rail. Secure with cap screws and lock nuts. Tighten to 40 ft-lb.

■NOTE: Move the rear arm assembly forward enough to allow the rear arm springs to be installed into the slide blocks.

6. Secure the rear shock pivot to the front arm with cap screw and lock nut. Tighten to 20 ft-lb.



XM004A

7. Secure the upper shock eyelet and axle in the mounting hole of the front arm. Secure with a cap screw and lock nut. Tighten securely.



ZJ271A

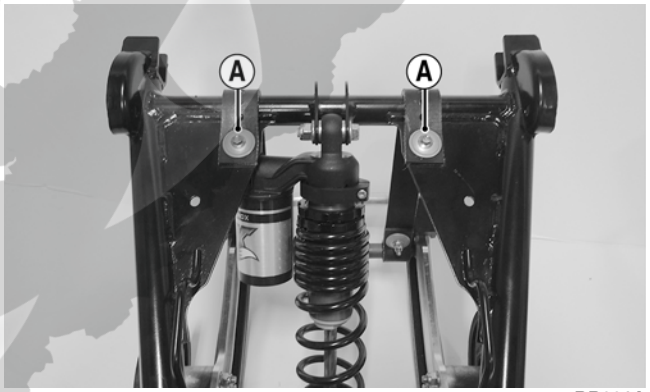
■NOTE: Do not over-tighten the shock absorber cap screw as the shock eyelet must be free to pivot.

8. Secure the limiter straps to the front arm with cap screws, washers, and lock nuts. Tighten to 72 in.-lb.

Front Arm Assembly (RR)

REMOVING

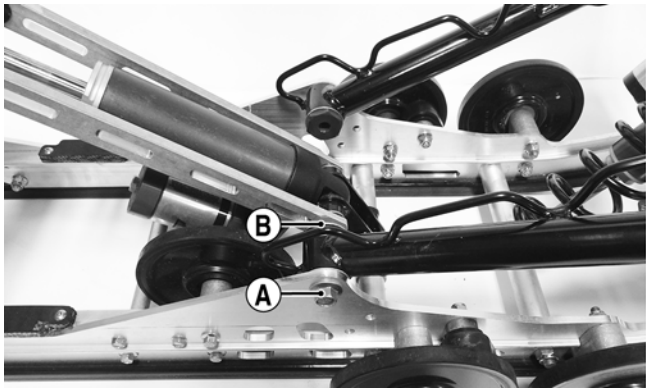
1. With the skid frame removed, remove the cap screws (A) and lock nuts securing the limiter straps to the front arm. Account for flat washers.



RR001A

2. Remove the cap screw and lock nut securing the upper front shock absorber eyelet to the front arm. Pull the shock eyelet free of the bracket. Account for two spacers and two O-rings.

3. Remove the cap screw (A) and axle (B) securing the front arm to the rails Account for two washers.



RR002A

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INSPECTING

1. Inspect all front arm weldments for cracks or unusual bends; then inspect the front arm mounting brackets for cracks and for elongated holes.
2. Closely inspect all tubing for cracks or unusual bends.
3. Inspect the bearings, bushings, and front arm spacers for wear or damage.

INSTALLING

1. Install the existing washers onto both axles; then install the axles into the front arm and secure using existing cap screws (threads coated with blue Loctite #243). Tighten to 50 ft-lb.



RR002

2. Secure the front shock absorber to the front arm using existing cap screw and nut. Tighten to 20 ft-lb.
3. Secure the limiter straps to the front arm using exiting cap screws, washers and nuts. Tighten to 72 in.-lb.

Front Arm Assembly (Pantera)

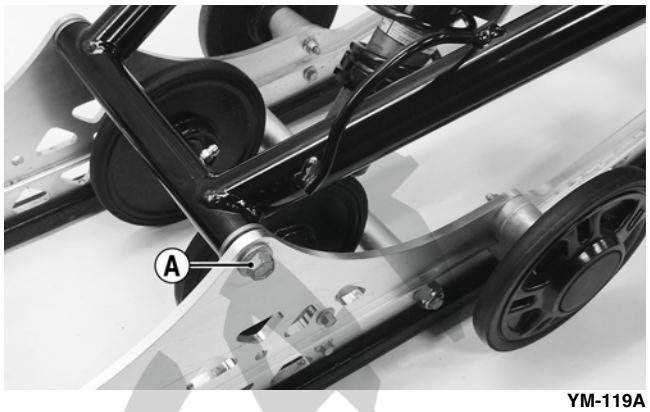
REMOVING

1. With the skid frame removed, remove the cap screws (A) and lock nuts securing the limiter straps to the front arm. Account for flat washers.



YM-118A

2. Remove the cap screw and lock nut securing the upper front shock absorber eyelet to the front arm. Pull the shock eyelet free of the bracket. Account for a spacers.
3. Remove the two cap screws securing the front arm to the rails Account for two washers.



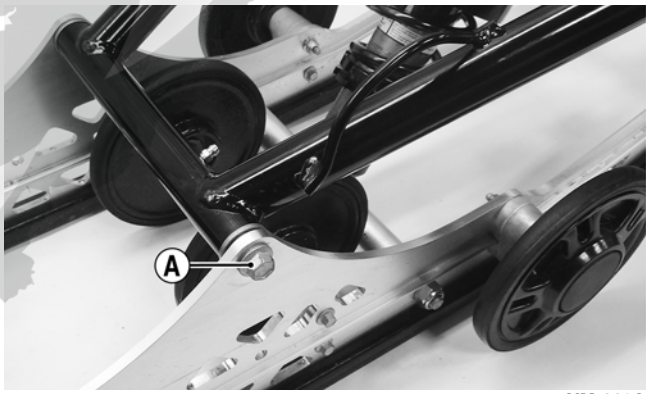
YM-119A

INSPECTING

1. Inspect all front arm weldments for cracks or unusual bends; then inspect the front arm mounting brackets for cracks and for elongated holes.
2. Closely inspect all tubing for cracks or unusual bends.
3. Inspect the bearings, bushings, and front arm spacers for wear or damage.

INSTALLING

1. Install the existing axle into the front arm; then position the front arm between the two slide rails and secure using existing cap screws (A) and washers (threads coated with blue Loctite #243). Tighten to 50 ft-lb.



YM-119A

2. Install the spacer into the shock eyelet; then secure the front shock absorber to the front arm using existing cap screw and nut. Tighten to 20 ft-lb.
3. Secure the limiter straps to the front arm using exiting cap screws, washers and nuts. Tighten to 72 in.-lb.

Rear Arm Assembly (ZR)

■NOTE: To service the rear arm assembly on the RR models, proceed to Rear Arm Assembly (RR) in this sub-section.

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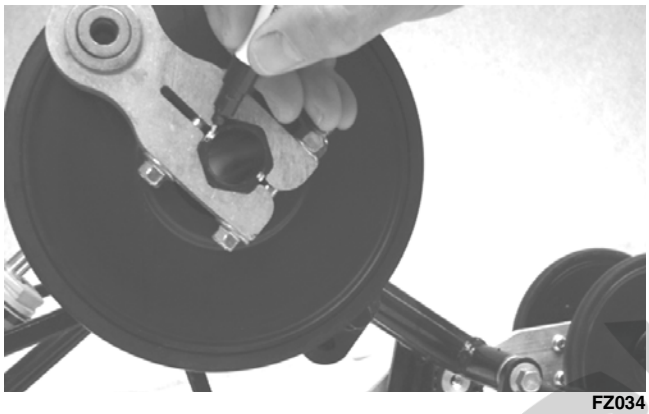
REMOVING

1. With the skid frame removed using the Rear Suspension Spring Tool, remove the spring from the adjusting cam.

⚠ WARNING

Care must be taken when removing the spring or damage or injury could result.

2. Mark the offset arm and the idler arm for assembly purposes.

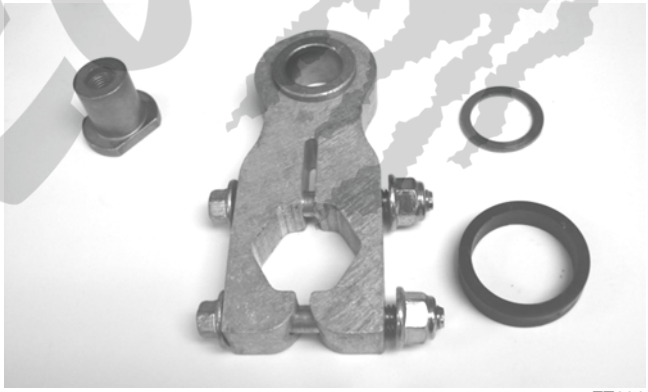


FZ034

3. Loosen the cap screws and lock nuts securing the offset arm assembly to the idler arm; then remove the offset arm assembly. Account for a flanged axle, idler spacer, and washer.



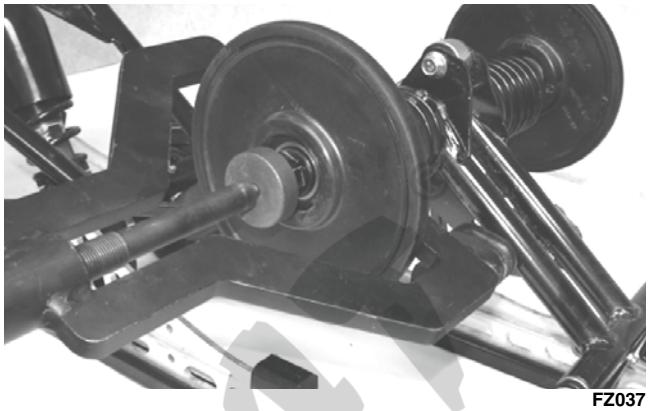
FZ035A



FZ036

4. Remove the idler wheel.

■NOTE: Use the Idler Wheel Puller Kit to remove the wheel.



FZ037

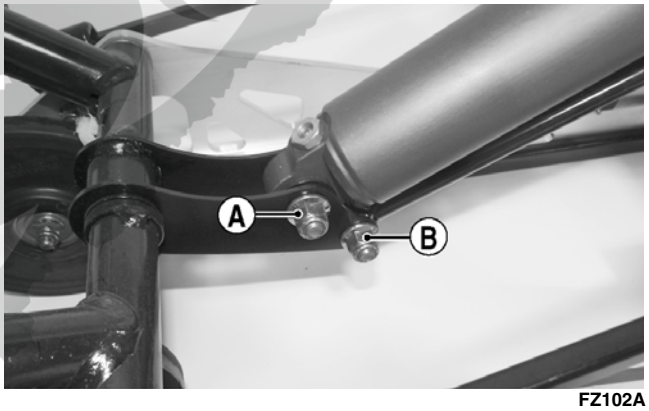
5. Remove the cap screw, flat washer, and lock nut securing the spring slide to the slide rail. Account for the spring slide and all mounting hardware.

6. Remove the spring and sleeve from the idler arm.

■NOTE: Use the same procedure for the other side.

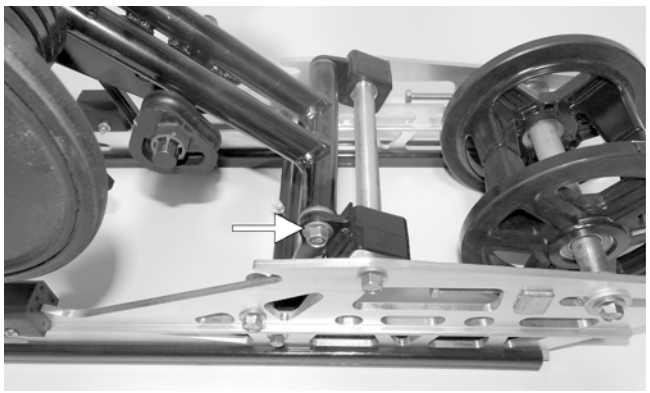
7. Remove the cap screw and lock nut securing the upper shock eyelet to the idler arm; then remove the cap screw and lock nut securing the upper shock link to the idler arm. Account for the cap screws, lock nuts, and sleeves.

8. Remove the cap screw (A) and lock nut securing the rear arm shock absorber to the rear shock pivot; then remove the cap screw (B) and lock nut securing the shock absorber link to the pivot and account for the cap screws, lock nuts, and sleeves.



FZ102A

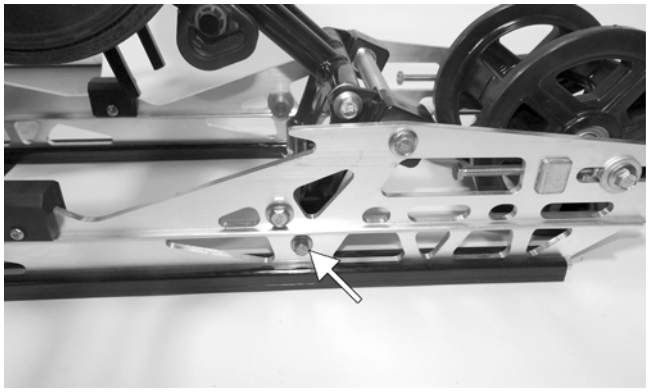
9. Remove the cap screw securing the rear arm to the idler arm. Account for the aluminum axle.



FZ101A

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10. Remove the cap screw and lock nut securing the rear arm to the slide rail. Account for the serrated axles and axle tube.



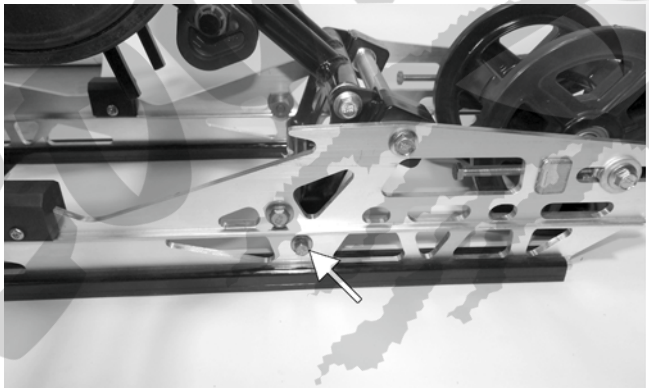
FZ103A

CLEANING AND INSPECTING

1. Clean the bearings with a clean cloth.
2. Inspect each idler wheel for cracks or damage.
3. Inspect the bushings (located in the arm pivot area) for wear or damage.
4. Inspect all welds and the tubing of the rear arm/idler arm for cracks or unusual bends.
5. Inspect the two adjusting cams for damage.
6. Rotate the idler wheel bearings (by hand) and check for binding or roughness.
7. If a bearing must be replaced, see Idler Wheels/ Mounting Blocks - Cleaning and Inspecting in this sub-section.

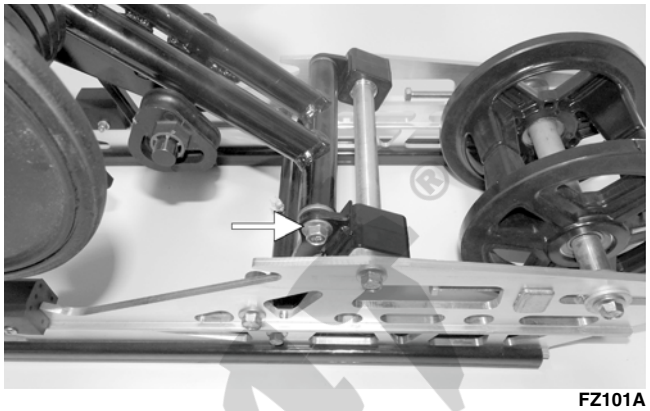
INSTALLING

1. Place the rear arm assembly into position between the slide rails. Secure with a cap screw and lock nut. Tighten to 40 ft-lb.



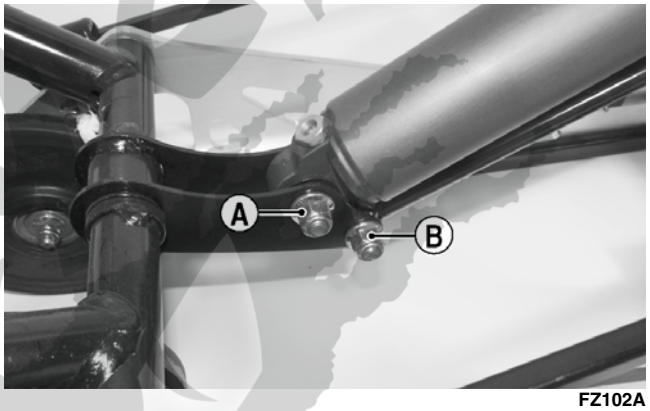
FZ103A

2. Install the rear arm onto the idler arm with an aluminum axle and two cap screws. Tighten to 40 ft-lb.



FZ101A

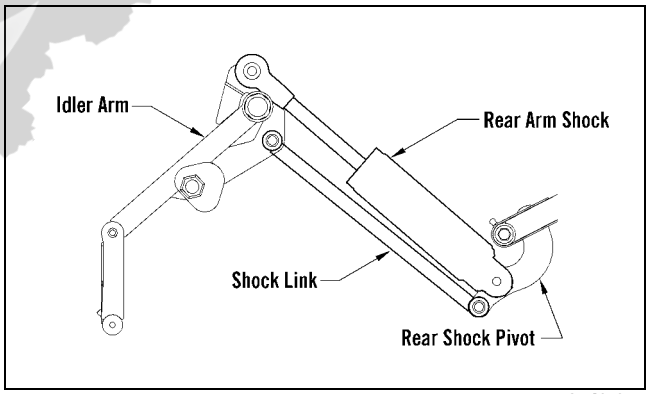
3. With the sleeves installed, install the shock absorber link to the lower mounting hole of the rear shock pivot; then install the shock absorber with cap screws (A) and (B) and lock nuts. Tighten securely.



FZ102A

CAUTION

When installing the shock absorber link, note that the offset of the link eyelets are directed away from the rear arm shock absorber for proper clearance.



0742-877

4. With the sleeves installed, install the shock absorber link to the lower mounting hole of the idler arm along with the cap screw and lock nut; then secure the shock absorber to the idler arm with cap screws and lock nuts. Tighten securely.

■NOTE: Do not over-tighten the shock absorber cap screw as the shock eyelet must be free to pivot.

■NOTE: Install the rear arm springs onto the adjuster blocks after the skid frame has been installed.

5. Slide the sleeve and spring onto the idler arm.

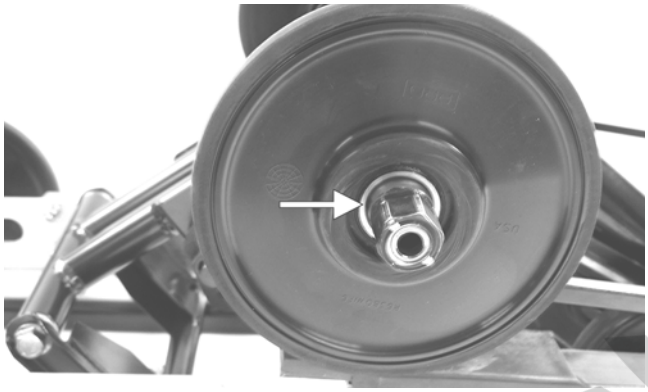
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6. Place the spring slide and slide block (with spring in slide block) into position on the slide rail. Secure with a cap screw and washer. Tighten to 20 ft-lb.

7. With wheel insertion tool, install the rear upper idler wheel on the idler arm.

CAUTION

When driving the idler wheel onto the idler arm, use a tool to contact the inside race of the bearing or damage to the wheel or bearing may occur.



MS072A

8. Install the idler spacer collar onto the idler arm.

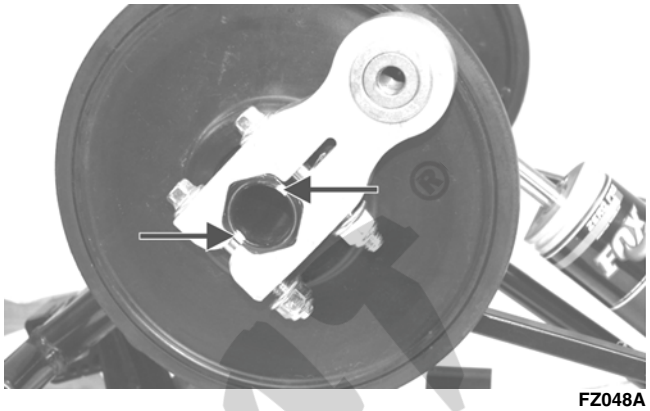


FZ047

9. Place the flared bushing with a thin flat washer through the notched side of the offset arm assembly.

■NOTE: If the flared bushing in the offset arm is loose, it must be cleaned and green Loctite #609 must be applied to it prior to installation.

10. Align the marks on the idler arm to the centerline of the offset arm assembly. Secure the offset arm to the idler arm with cap screws and lock nuts. Tighten to 20 ft-lb.

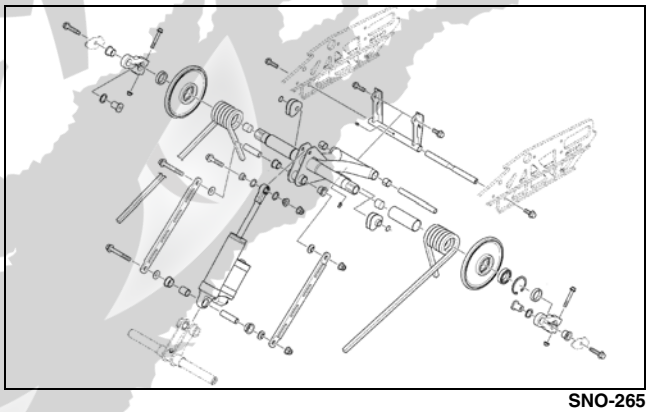


FZ048A

■NOTE: When tightening the offset arm lock nuts, tighten the upper lock nut first to ensure an even clamp load. Make sure the flared side of the bushing is directed outward.

11. Grease the idler arm and rear arm grease fittings with an all-temperature grease.

Rear Arm Assembly (RR)



SNO-265

REMOVING

1. With the skid frame removed using the Rear Suspension Spring Tool, remove the springs from the adjusting cams.

⚠ WARNING

Care must be taken when removing the spring or damage or injury could result.

2. Mark the offset arm and the idler arm for assembly purposes.

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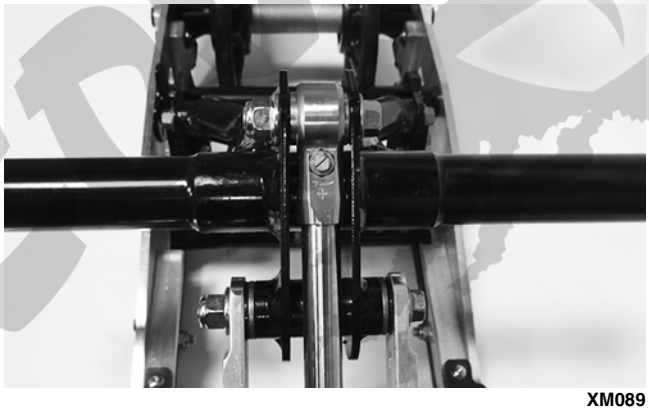
FZ034

3. Loosen the cap screws and lock nuts securing the offset arm assembly to the idler arm; then remove the offset arm assembly. Account for a flanged axle, idler spacer, and washer.



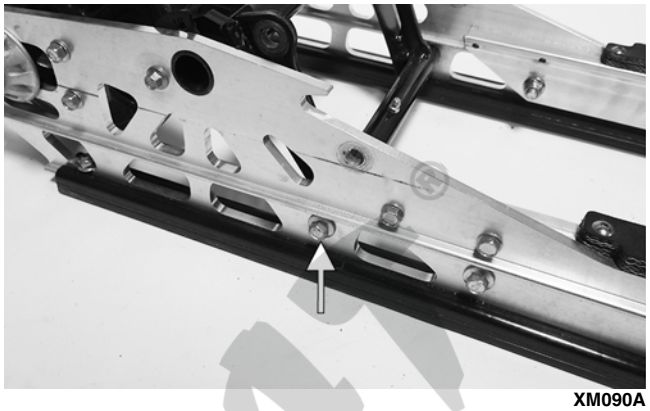
FZ036

4. Remove the upper idler wheel.
5. Remove the spring and sleeve from the idler arm. Repeat for opposite side.
6. Remove the cap screw and lock nut securing the upper rear shock absorber eyelet to the rear arm. Account for two spacers and two O-rings.



XM089

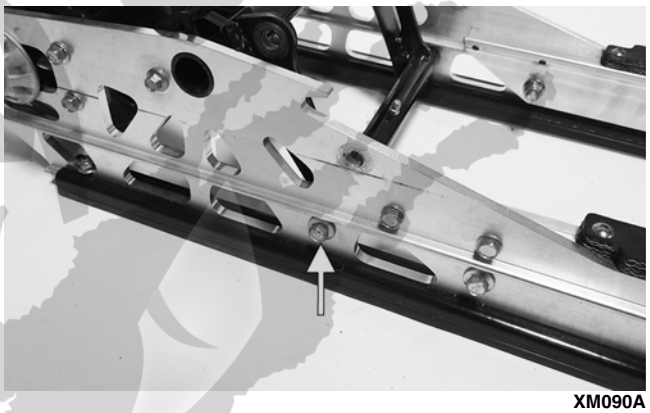
7. Remove the cap screw and nut securing the rear shock links to the rear arm. Account for one axle.
8. Remove the cap screw securing the rear arm to the idler arm. Account for the aluminum axle.
9. Remove the cap screw and lock nut securing the rear arm to the slide rail. Account for the axle tube.



XM090A

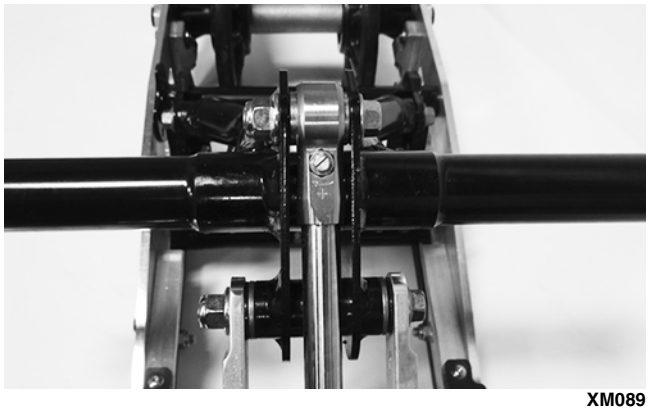
INSTALLING

1. Slide the axle tube into the rear arm; then position the rear arm with the holes in the slide rails. Secure using existing cap screws (threads coated with blue Loctite #243. Tighten to 20 ft-lb.



XM090A

2. Install the aluminum axle into the idler arm; then position the idler arm between the rear arm and secure using existing cap screws (thread coated with blue Loctite #243. Tighten to 40 ft-lb.
3. Loosely secure the rear shock links to the idler arm using existing cap screw and nut.
4. With both O-rings and spacers, secure the rear shock absorber to the idler arm using existing cap screws and lock nut. Tighten to 40 ft-lb.

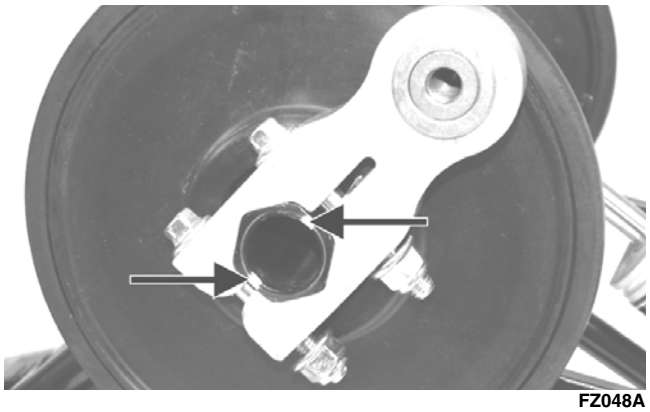


XM089

5. Install both spring sleeves onto the rear arm; then install the suspension springs into the spring slides then onto the idler arm.
6. Install spacers onto the idler arm.

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7. Align the marks on the idler arm to the centerline of the offset arm assembly. Secure the offset arm to the idler arm with cap screws and lock nuts. Tighten to 20 ft-lb.



FZ048A

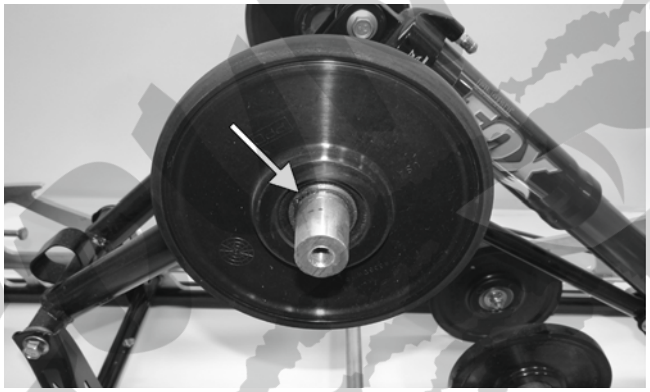
■NOTE: When tightening the offset arm lock nuts, tighten the upper lock nut first to ensure an even clamp load. Make sure the flared side of the bushing is directed outward.

8. Grease the idler arm and rear arm grease fittings with an all-temperature grease.

Rear Arm Assembly (M/XF)

DISASSEMBLING

1. With the skid frame removed, remove the snap ring securing the rear arm idler wheels to the inner carriage axle and account for the wave washers; then remove the axle from the idler arm.

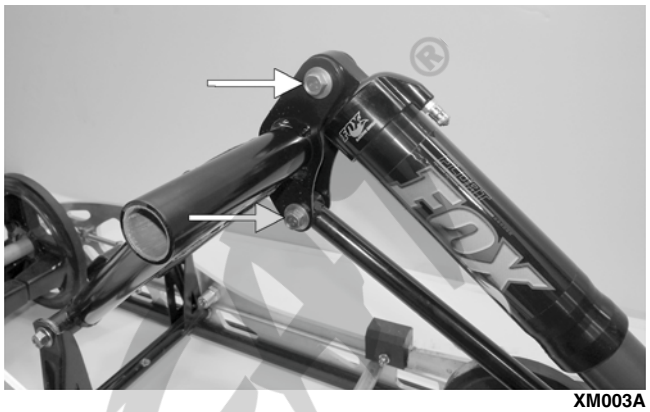


XM001A



CM232

2. Remove the cap screw and lock nut securing the upper shock eyelet to the idler arm; then remove the cap screw and lock nut securing the rear shock link to the idler arms.



XM003A

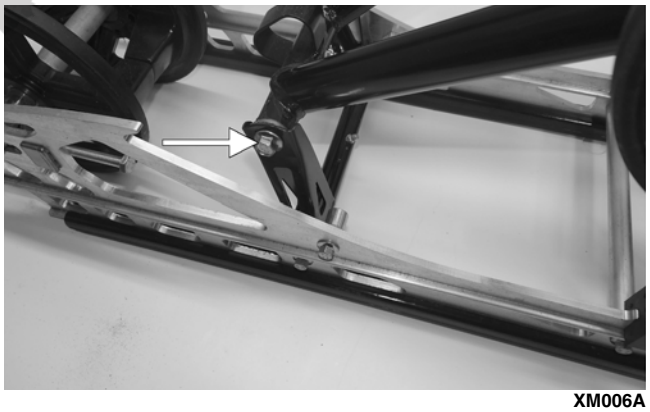
3. Remove the cap screws and lock nuts securing the rear arm shock absorber and shock link to the offset arm.



XM004A

■NOTE: With the rear arm shock and shock link removed, account for the four sleeves.

4. Remove the cap screw and lock nut securing the rear arm to the idler arm. Account for the aluminum axle and flared bushings.

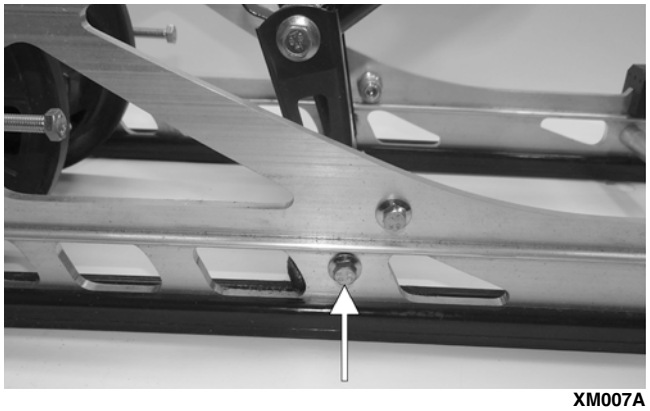


XM006A

■NOTE: To loosen and remove the remaining cap screw from the rear arm/idler arm, it may be necessary to reinstall the cap screw.

5. Remove the cap screw and lock nut securing the rear arm to the slide rail. Account for the bushings and axle tube.

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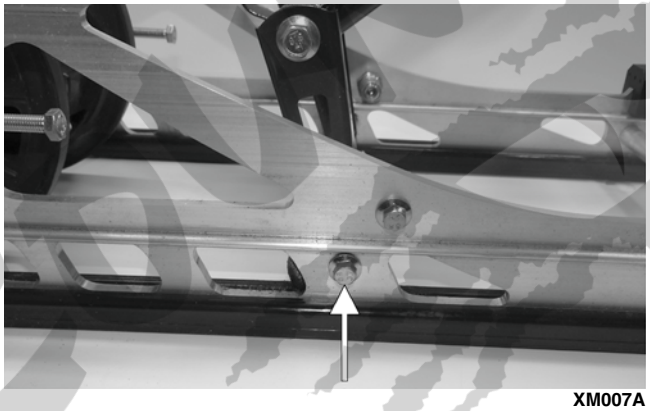
XM007A

CLEANING AND INSPECTING

1. Clean the bearings with a clean cloth.
2. Inspect each idler wheel for cracks or damage.
3. Inspect the bushings (located in the arm pivot area) for wear or damage.
4. Inspect all welds and the tubing of the upper arm for cracks or unusual bends.
5. Inspect the two adjusting cams for damage.
6. Rotate the idler wheel bearings (by hand) and check for binding or roughness.
7. If a bearing must be replaced, see Idler Wheels/ Mounting Blocks - Cleaning and Inspecting in this sub-section.

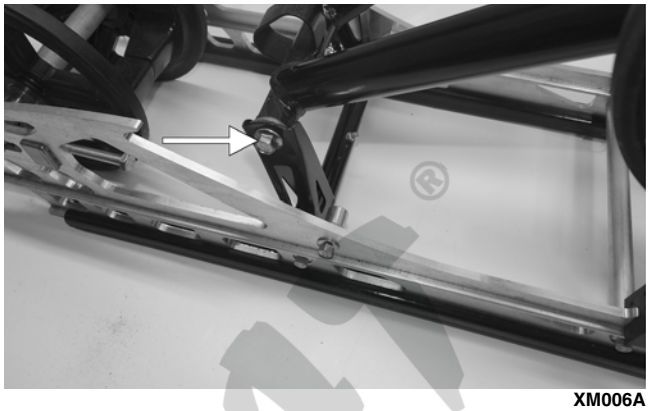
ASSEMBLING

1. Place the rear arm assembly into position between the slide rails. Secure with existing cap screws. Tighten to 20 ft-lb.



XM007A

2. Install the idler arm onto the rear arm with an aluminum axle, bushing assemblies, and two cap screws. Tighten to 40 ft-lb.



XM006A

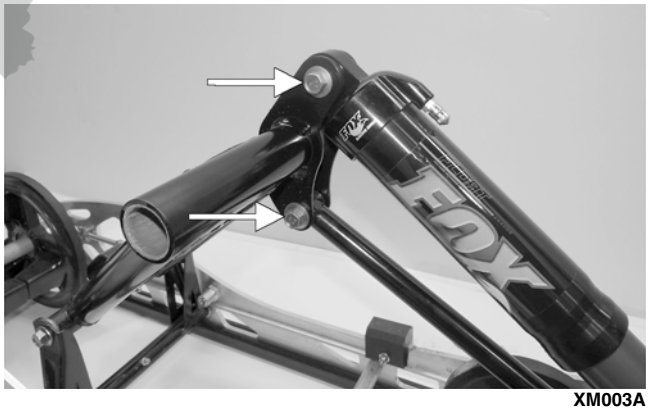
3. With the sleeves installed, place the shock absorber and shock link between the offset arm bracket. Secure with the cap screws and lock nuts. Tighten securely.



XM004A

■NOTE: Do not over-tighten the shock absorber cap screw as the shock eyelet must be free to pivot.

4. With the sleeves installed, position the shock link in the appropriate holes of the idler arm brackets and shock absorber; then insert the cap screw through the eyelets. Secure with the cap screws and lock nuts. Tighten securely.



XM003A

5. Install the inner carriage axle to the idler arm; then install a wave washer and idler wheel. Secure with the snap ring.

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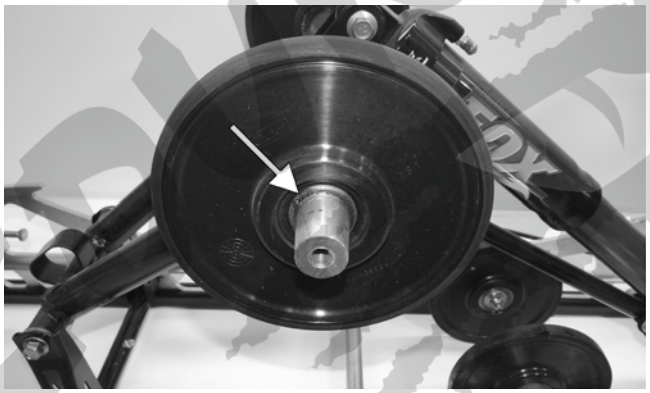
XM002

6. Turn the slide rail onto the side the idler wheel was installed in (from step 5); then with a block of wood placed under the inner carriage axle/idler arm, install a wave washer.



XM005

7. Install the remaining idler wheel along with the snap ring onto the axle; then using a suitable driving tool, carefully drive the snap ring into the idler wheel until properly seated in the groove of the axle.



XM001A

8. Grease the idler arm and rear arm grease fittings with an all-temperature grease.

Rear Arm Assembly (Pantera)

REMOVING

1. Remove the skid frame; then remove the slide spring from the adjusting cam.

⚠ WARNING

Care must be taken when removing the spring or damage or injury could result.

2. Mark the offset arm and the idler arm for assembly purposes.
3. Loosen the cap screws and lock nuts securing the offset arm assembly to the idler arm; then remove the offset arm assembly. Account for a flanged axle, idler spacer, and washer.



YM-120

4. Remove the idler wheel.

■NOTE: Use the Idler Wheel Puller Kit to remove the wheel.

5. Remove the cap screw, flat washer, and lock nut securing the spring slide to the slide rail. Account for the spring slide and all mounting hardware.
6. Remove the spring and sleeve from the idler arm.

■NOTE: Use the same procedure for the other side.

7. Remove the cap screw and lock nut securing the upper shock eyelet to the idler arm; then remove the cap screw and lock nut securing the upper shock link to the idler arm. Account for the cap screws, lock nuts, and sleeves.



YM-121

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9. Remove the cap screw securing the rear arm to the idler arm. Account for the aluminum axle.



FZ101A

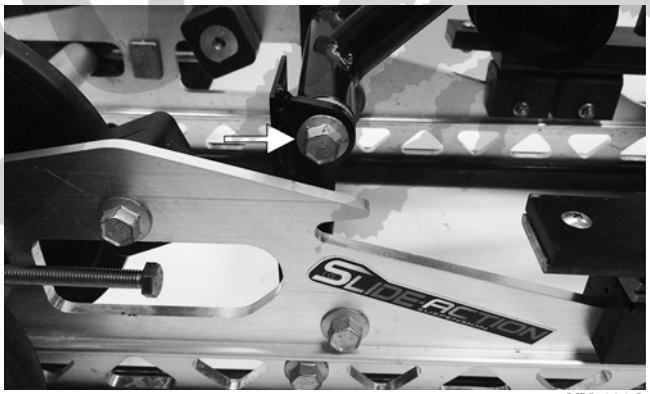
10. Remove the cap screw and lock nut securing the rear arm to the slide rail. Account for the serrated axles and axle tube.

CLEANING AND INSPECTING

1. Clean the bearings with a clean cloth.
2. Inspect each idler wheel for cracks or damage.
3. Inspect the bushings (located in the arm pivot area) for wear or damage.
4. Inspect all welds and the tubing of the rear arm/idler arm for cracks or unusual bends.
5. Inspect the two adjusting cams for damage.
6. Rotate the idler wheel bearings (by hand) and check for binding or roughness.
7. If a bearing must be replaced, see Idler Wheels/ Mounting Blocks - Cleaning and Inspecting in this sub-section.

INSTALLING

1. Place the rear arm assembly into position between the slide rails. Secure with a cap screw and lock nut. Tighten to 40 ft-lb.
2. Install the rear arm onto the idler arm with an aluminum axle and two cap screws. Tighten to 40 ft-lb.



YM-122A

3. With the sleeves installed, install the shock absorber link to the lower mounting hole of the idler arm along with the cap screw and lock nut; then secure the shock absorber to the idler arm with cap screws and lock nuts. Tighten securely.


YM-121

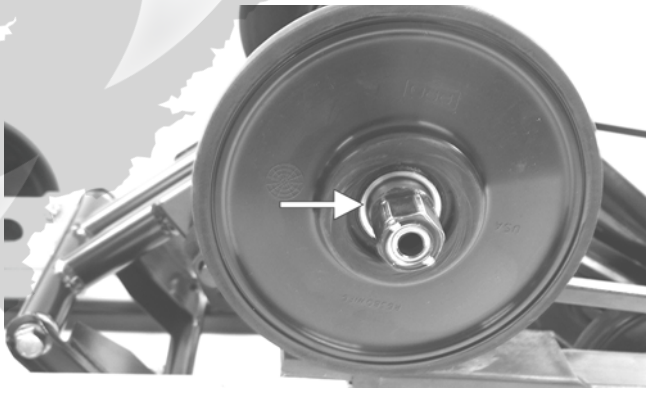
■NOTE: Do not over-tighten the shock absorber cap screw as the shock eyelet must be free to pivot.

■NOTE: Install the rear arm springs onto the adjuster cams after the skid frame has been installed.

4. Slide the sleeves and springs onto the idler arm.
5. Place the spring slide and slide block (with spring in slide block) into position on the slide rail. Secure with a cap screw and washer. Tighten to 20 ft-lb.
6. With wheel insertion tool, install the rear upper idler wheel on the idler arm.

CAUTION

When driving the idler wheel onto the idler arm, use a tool to contact the inside race of the bearing or damage to the wheel or bearing may occur.


MS072A

7. Install the idler spacer collar onto the idler arm.
8. Place the flared bushing with a thin flat washer through the notched side of the offset arm assembly.

■NOTE: If the flared bushing in the offset arm is loose, it must be cleaned and green Loctite #609 must be applied to it prior to installation.

9. Align the marks on the idler arm to the centerline of the offset arm assembly. Secure the offset arm to the idler arm with cap screws and lock nuts. Tighten to 20 ft-lb.

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YM-120

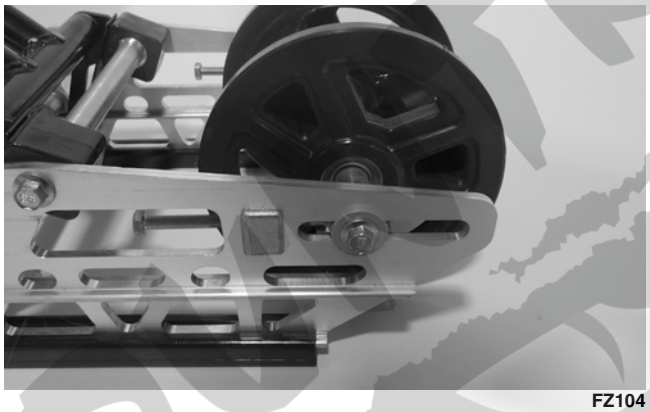
■**NOTE: When tightening the offset arm lock nuts, tighten the upper lock nut first to ensure an even clamp load. Make sure the flared side of the bushing is directed outward.**

11. Grease the idler arm and rear arm grease fittings with an all-temperature grease.

Rear Axle/Idler Wheels

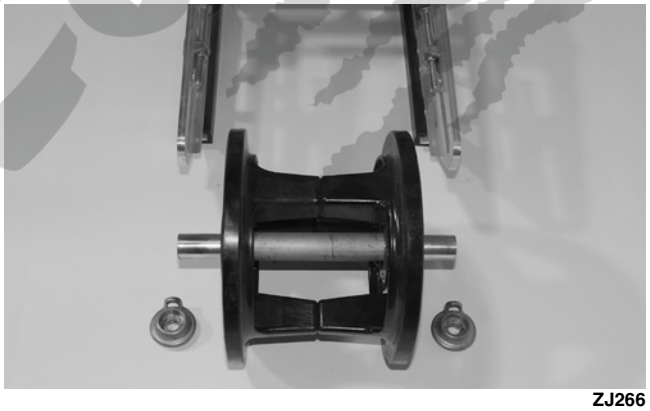
DISASSEMBLING REAR AXLE

1. Remove both cap screws and washers and securing rear wheel assembly to the rails.



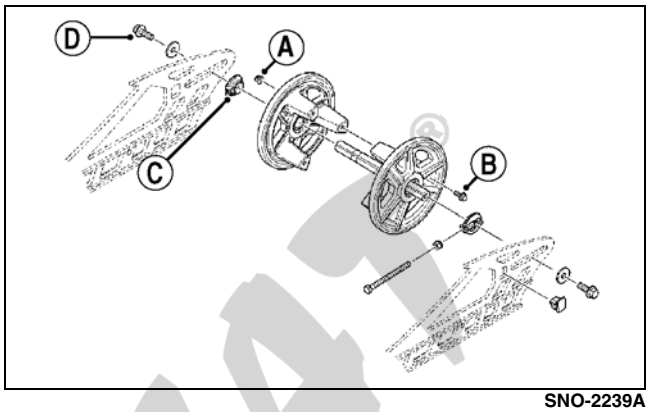
FZ104

2. Loosen the track adjusting bolts then carefully remove the rear axle assembly from the skid frame.



ZJ266

ASSEMBLING REAR AXLE



SNO-2239A

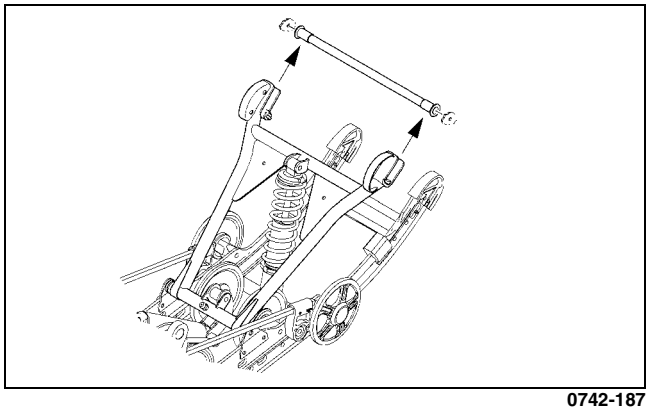
1. If the rear idler wheels were separated, install both wheels onto the axle and secure using the existing cap screws (B) and nuts (A). Tighten to 80 in.-lb.
2. Place the adjuster bushings (C) on the axle; then install the idler wheels and secure with two cap screws (D) (coated with blue Loctite #243) and flat washers. Tighten cap screws only until snug.

■**NOTE: Tighten the rear idler wheel axle only until snug until the skid frame has been installed and track tension has been adjusted; then the axle assembly must be tightened to 34 ft-lb.**

3. Install the skid frame (see Installing Skid Frame in this sub-section).

Installing Skid Frame

1. Using a piece of cardboard on the floor to protect against scratching and an appropriate handlebar/steering post stand, tip the snowmobile onto one side.
2. Pull the track away from the tunnel and spread open; then place the skid frame into the track.
3. On the ZR and Pantera, position the front of the skid frame into the tunnel and engage the front arm with the slider axle in the tunnel.



0742-187

4. On the M and XF, secure the front of the skid frame to the tunnel using the existing cap screws, flat washers, and lock nuts.

■**NOTE: To aid in centering the front arm with the hole in the tunnel, position the skid frame and track at a 45° angle to the bottom of the tunnel.**

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5. Push the rear of the skid frame and the track into the tunnel.
6. Align the rear arm assembly with the appropriate hole in the tunnel. Secure the rear arm assembly with a cap screw, lock washer, and flat washer. AT THIS TIME, TIGHTEN ONLY UNTIL SNUG.
7. Tip the snowmobile onto the other side; then align the offset arm assembly with the appropriate hole in the tunnel. Secure the rear arm assembly with a cap screw, lock washer, and flat washer. AT THIS TIME, TIGHTEN ONLY UNTIL SNUG.

■**NOTE: Do not install the short legs of the rear springs onto the adjusting cams at this time.**

8. At this time, place the snowmobile to the upright position; then tighten all cap screws to 40 ft-lb.
9. On the ZR, using the Rear Suspension Spring Tool, install the short legs of the rear springs onto the adjusting cams making sure the cams are in the same adjustment positions.
10. Adjust track tension (see the Drive Train/Track/Brake Systems section) and track alignment (see the Drive Train/Track/Brake Systems section).

CAUTION

After proper track tension and alignment have been attained, make certain that the rear axle cap screws tightened to specifications or component damage will occur.

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Servicing IFP Shock

SPECIAL TOOLS

A number of special tools must be available to the technician when servicing the rear suspension.

Description	p/n
Floating Piston Location Gauge Tool	0644-350
Floating Piston Depth Tool	0644-575
Inflation Needle Tool	0744-020
Rear Suspension Spring Tool	0144-311
Shock Body Clamping Tool	0644-486
Shock Rod Clamp Tool	0644-425
Bearing Cap Seal Protector Tool	0644-268/403/404
Shock Spring Removal Tool	0644-057

■NOTE: Special tools are available from the Arctic Cat Service Parts Department.

■NOTE: If service work is needed on any FOX shocks, the shock will have to be removed and sent to FOX or any FOX distributor for any service work. For FOX shock information log on to www.ridefox.com.

⚠ WARNING

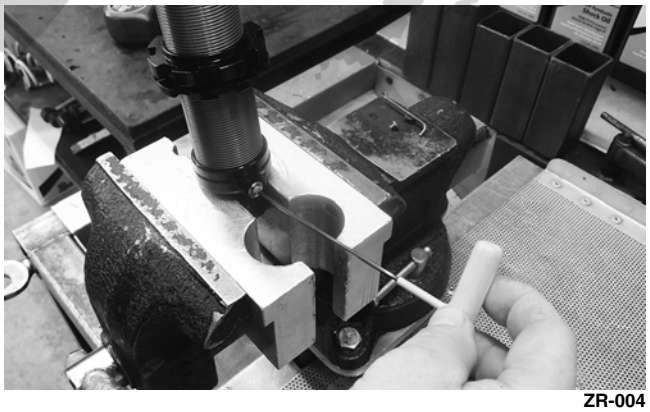
Before any service is performed on the gas shock absorber, first discharge all pressure from the shock remote reservoir. Remove the valve screw from the pressure valve and insert the Inflation Needle. Open valve until all pressure is released. Failure to do this may cause personal injury.

REMOVING/CLEANING

1. Remove the shock from the snowmobile; then remove the spring from the shock body using the shock spring removal tool.
2. Wash the shock body in parts-cleaning solvent.

DISASSEMBLING

1. Remove the screw from the bottom of the shock. Discharge all the pressure from the shock using the Inflation Needle. Open the valve in filler handle until all pressure is released.



ZR-004



ZR-017

2. Using a 1-in. wrench, loosen the bearing assembly and remove the shock rod and valve assembly from the shock body.



ZR-003



ZR-016

3. Pour the oil from the shock body into a suitable container; then hang the shock body upside down and let it drip into the container.
4. Clamp the shock rod and valve assembly in bench vise; then remove the nut securing the valve stack.

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ZR-011

■**NOTE: Placing the valve stack on a screwdriver when removing from the shock rod will allow the shims and valve to stay in order.**

5. Remove the bearing end cap.
6. Items to inspect:
   A. Shock rod for straightness, nicks, or burrs.
   B. Bearing end cap — clean, inspect, or replace.
   C. Inside of shock body for scratches, burrs, or excessive wear.
   D. Piston strap for cuts, chipped or nicked edges, or excessive wear.
   E. O-rings for nicks, cuts, or cracks.
   F. Valves for kinks or waves.
   G. Rubber damper (ski shocks only) for chipping, cracking, or being missing.
7. Items to replace:
   A. Floating piston O-ring.
   B. Shock shaft bearing cap if any signs of oil leaks or damage.
   C. Any part worn or damaged.

ASSEMBLING

1. Lubricate the O-rings in the bearing end cap; then install the bearing cap seal protector onto the end of the shock rod. Install the bearing end cap.



ZR-013

2. Install the valve stack onto the shock rod; then secure using the existing nut. Tighten to 15 ft-lb.



ZR-014



ZR-010

3. Using tape measure, make sure the floating piston is at the correct depth in the shock body (according to the chart in the specifications section of the manual).



ZR-009

4. If the floating piston is not at the correct depth, use the floating piston location gauge to set the piston to the correct depth in the shock body.

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ZR-008

5. Fill shock body with new synthetic shock oil to bottom of threads.



ZR-007

6. With the bearing cap positioned at the top of the shock rod, install the piston/valve stack into the shock body; then gently tap the top of the rod eyelet with a soft hammer until the piston/valve stack is just below the oil.

■NOTE: Using a torch, carefully wave the flame over the top of the shock oil to remove any air bubbles.



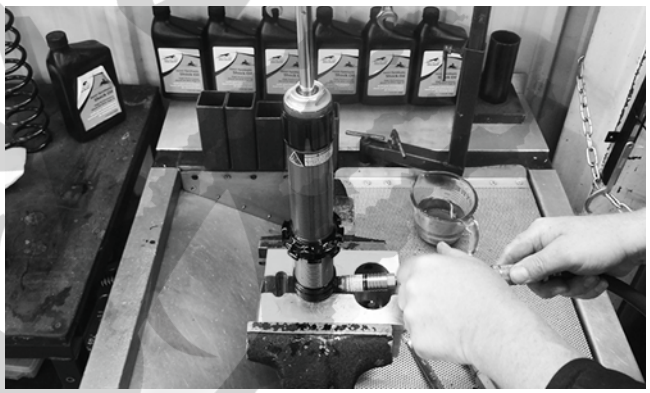
ZR-006

7. Slide the bearing cap down to the shock body and into the oil; then while holding the shock rod in place, begin to thread the cap into the body. As the cap threads into the body, oil will escape. Lift slightly on the shaft while threading until the O-ring contacts the shock body. Tighten the bearing cap to 50 ft-lb.



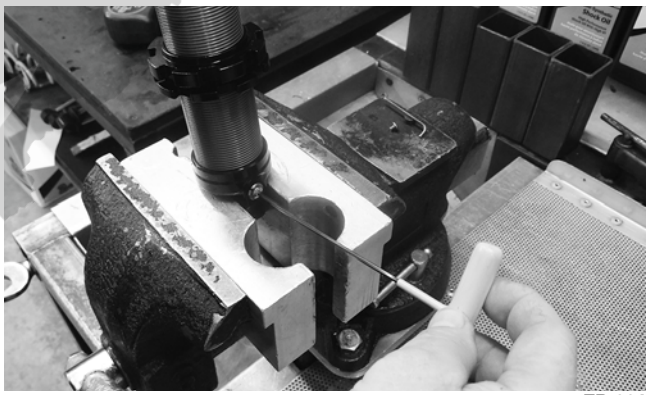
ZR-003

8. With shock oil around the seals in the bearing cap and on the shock rod, slowly compress the shock rod until the shock eyelet bottoms out. Pressurize the shock with nitrogen to 200 psi and until the shock eyelet fully extends.



ZR-018

9. Install the screw into the shock body.



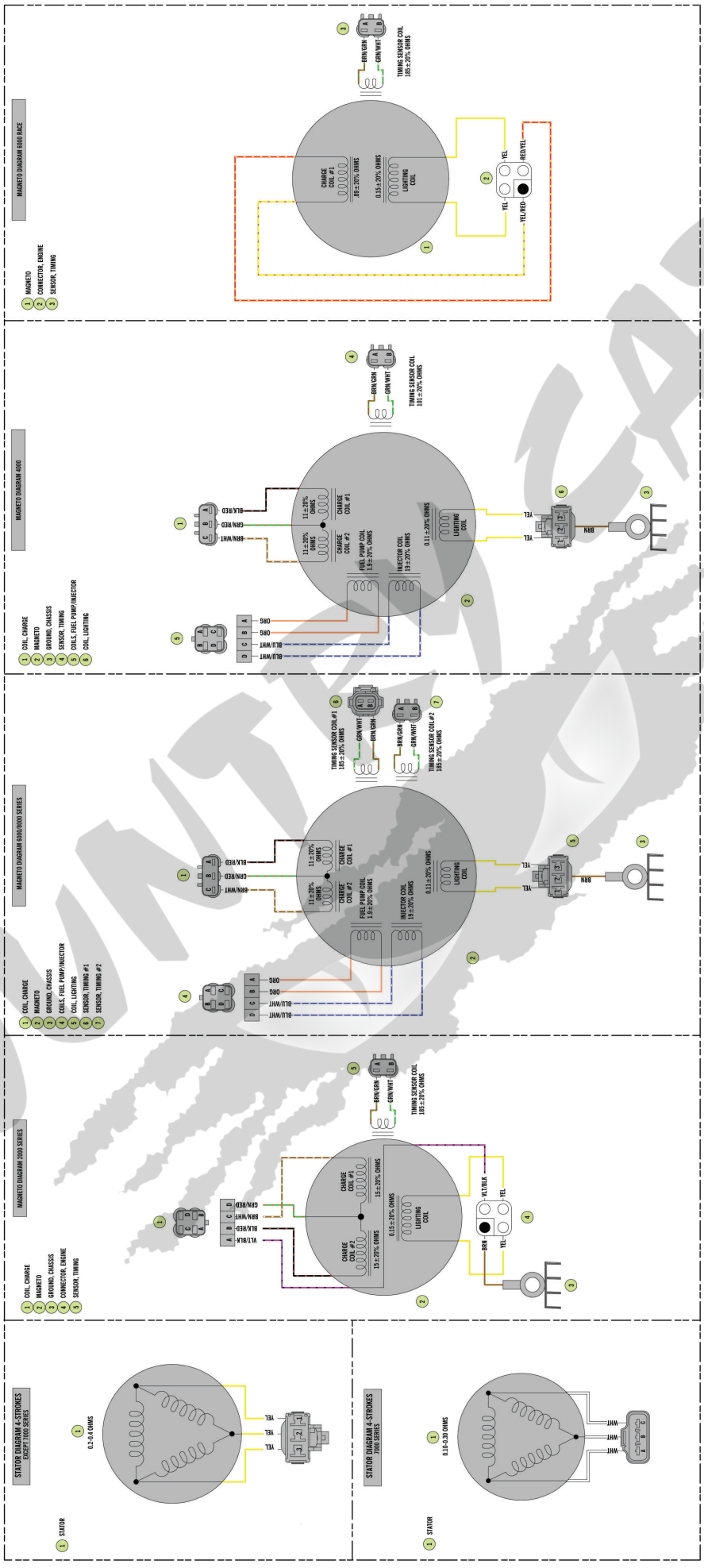
ZR-004

10. Compress the shock eyelet until it bottoms out; then the shock eyelet should fully extended. Wash the shock and install the spring.

INSTALLING

1. Place the shock into position on the snowmobile.
2. Secure with existing hardware and bushings.

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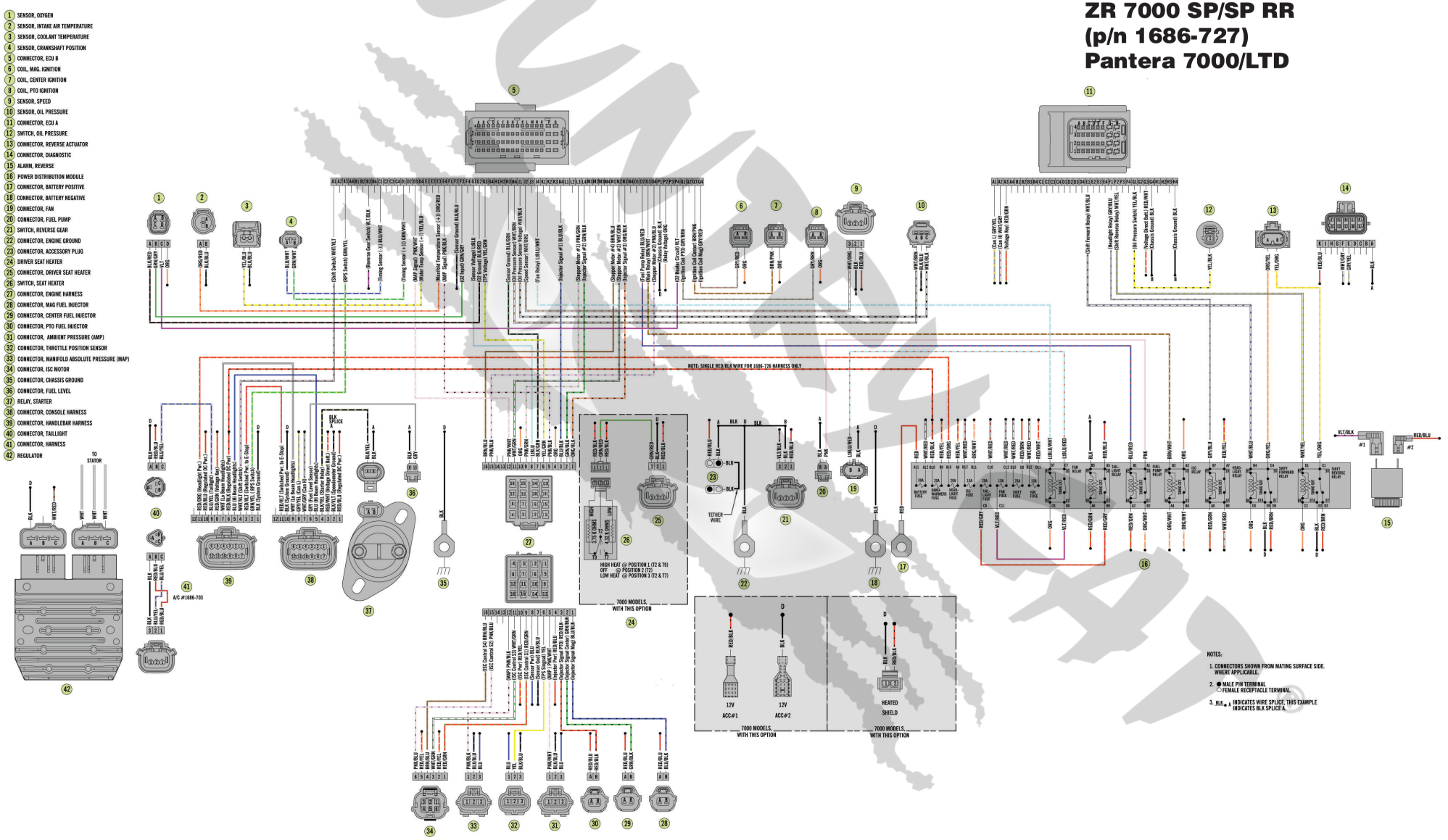


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Main Harness
(p/n 1686-725)
ZR 7000 LXR/SP LTD/SP LTD ET
XF 7000 CT/LXR/SP LTD
(p/n 1686-726)
M 7000 SP
XF 7000 SP/CC SP/HC SP
ZR 7000 SP/SP RR
(p/n 1686-727)
Pantera 7000/LTD

1. SENSOR, OXYGEN
2. SENSOR, INTAKE AIR TEMPERATURE
3. SENSOR, COOLANT TEMPERATURE
4. SENSOR, CRANKSHAFT POSITION
5. CONNECTOR, ECU B
6. COIL, MAG. IGNITION
7. COIL, CENTER IGNITION
8. COIL, PTO IGNITION
9. SENSOR, SPEED
10. SENSOR, OIL PRESSURE
11. CONNECTOR, ECU A
12. SWITCH, OIL PRESSURE
13. CONNECTOR, REVERSE ACTUATOR
14. CONNECTOR, DIAGNOSTIC
15. ALARM, REVERSE
16. POWER DISTRIBUTION MODULE
17. CONNECTOR, BATTERY POSITIVE
18. CONNECTOR, BATTERY NEGATIVE
19. CONNECTOR, FAN
20. CONNECTOR, FUEL PUMP
21. SWITCH, REVERSE GEAR
22. CONNECTOR, ENGINE GROUND
23. CONNECTOR, ACCESSORY PLUG
24. DRIVER SEAT HEATER
25. CONNECTOR, DRIVER SEAT HEATER
26. SWITCH, SEAT HEATER
27. CONNECTOR, ENGINE HARNESS
28. CONNECTOR, MAG FUEL INJECTOR
29. CONNECTOR, CENTER FUEL INJECTOR
30. CONNECTOR, PTO FUEL INJECTOR
31. CONNECTOR, AMBIENT PRESSURE (AMP)
32. CONNECTOR, THROTTLE POSITION SENSOR
33. CONNECTOR, MANIFOLD ABSOLUTE PRESSURE (MAP)
34. CONNECTOR, ISC MOTOR
35. CONNECTOR, CHASSIS GROUND
36. CONNECTOR, FUEL LEVEL
37. RELAY, STARTER
38. CONNECTOR, CONSOLE HARNESS
39. CONNECTOR, HANDLEBAR HARNESS
40. CONNECTOR, TAILLIGHT
41. CONNECTOR, HARNESS
42. REGULATOR



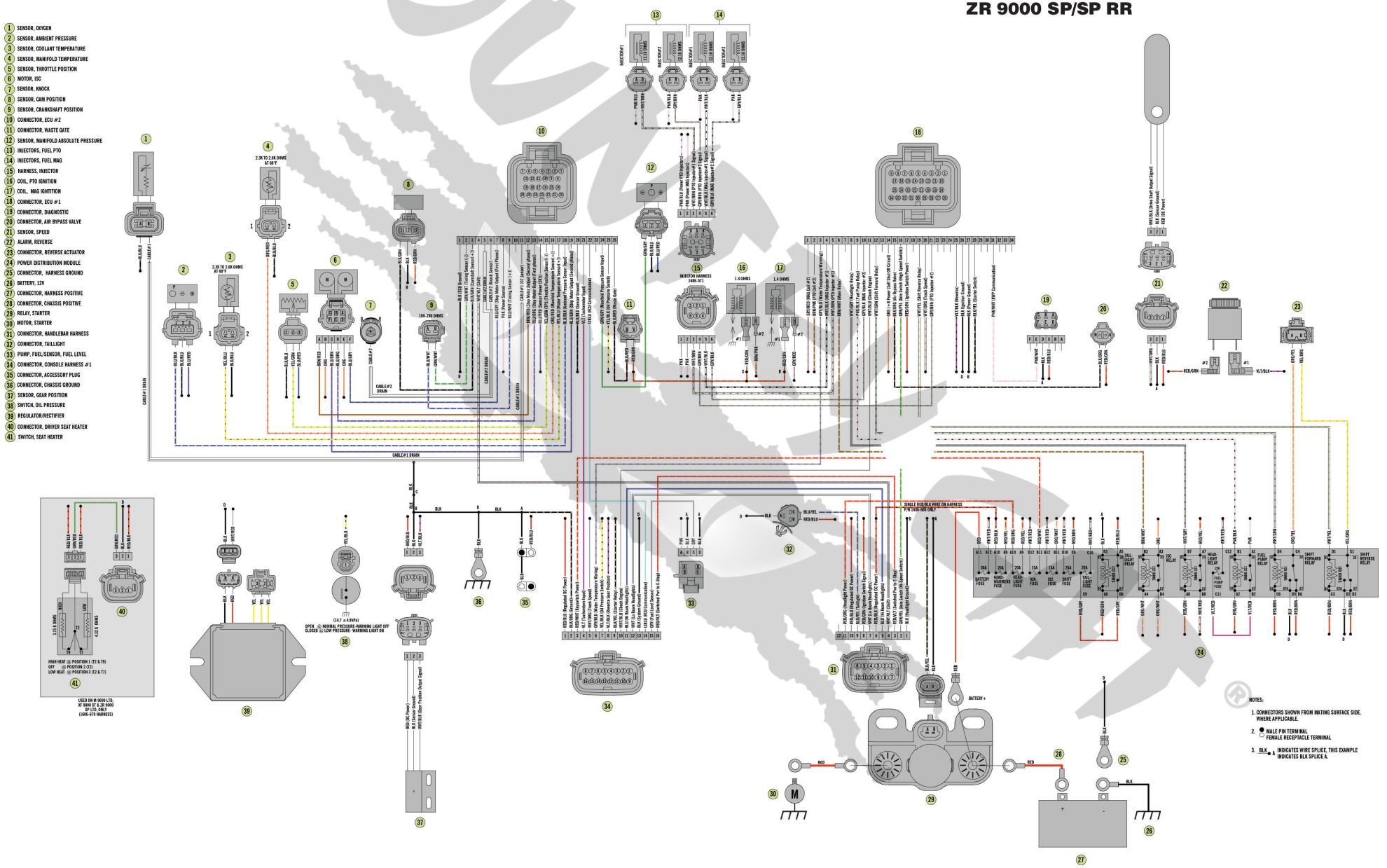
NOTES:

1. CONNECTORS SHOWN FROM MATING SURFACE SIDE. WHERE APPLICABLE.
2. ● MALE PIN TERMINAL ○ FEMALE RECEPTACLE TERMINAL
3. BLK ▲ INDICATES WIRE SPLICE. THIS EXAMPLE INDICATES BLK SPLICE A.

0748-727

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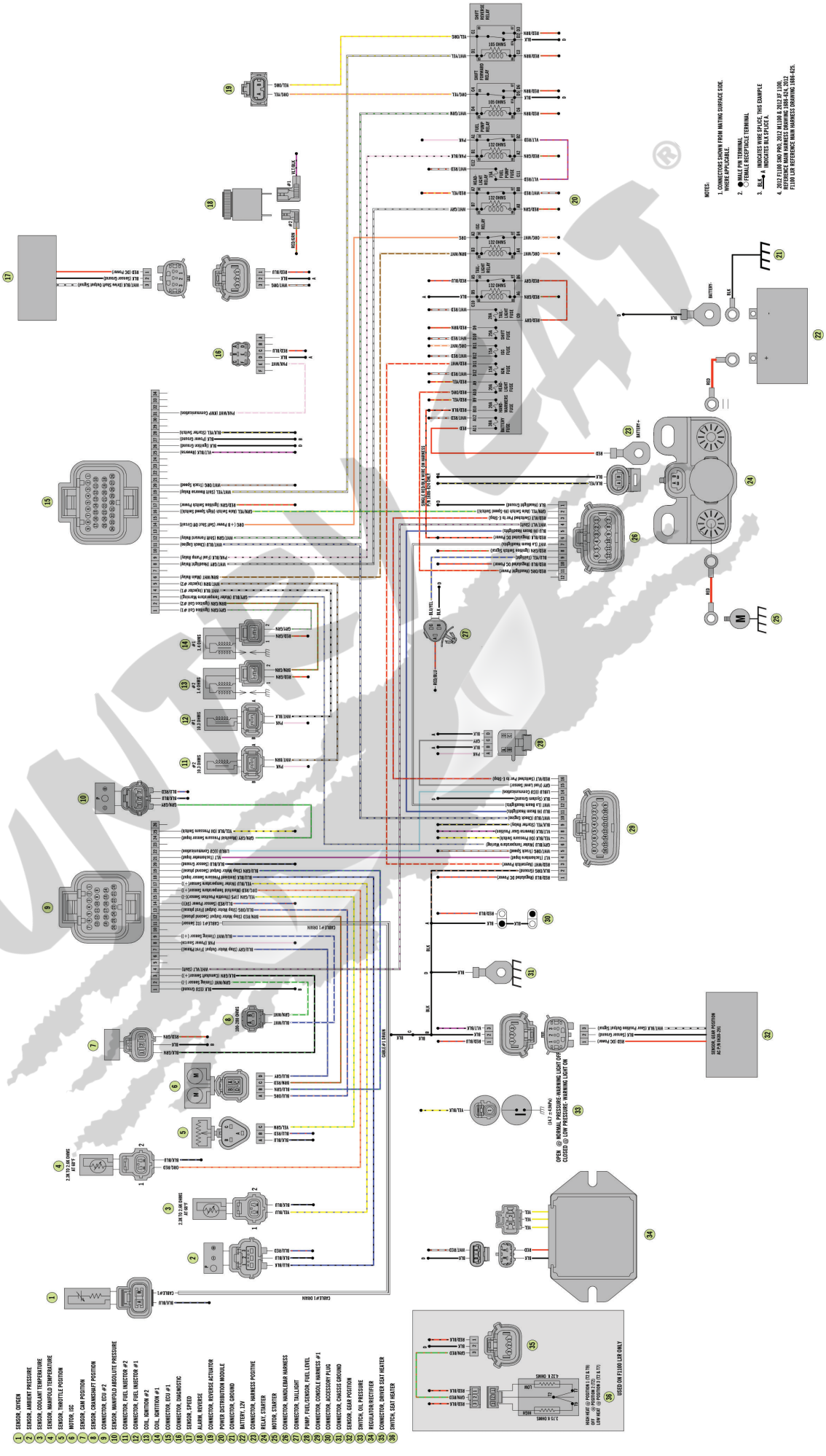
Main Harness
(p/n 1686-679)
M 9000 SP LTD
XF 9000 CC SP LTD/CT/SP LTD/LXR/HC SP LTD
ZR 9000 SP LTD/LXR/SP ET
(p/n 1686-680)
M 9000 HCR
XF 9000 SP
ZR 9000 SP/SP RR



0748-268

Main Harness (p/n 1686-682) ZR 5000 LXR

0748-005

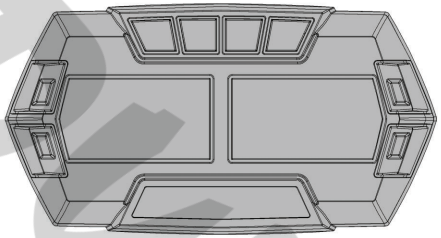


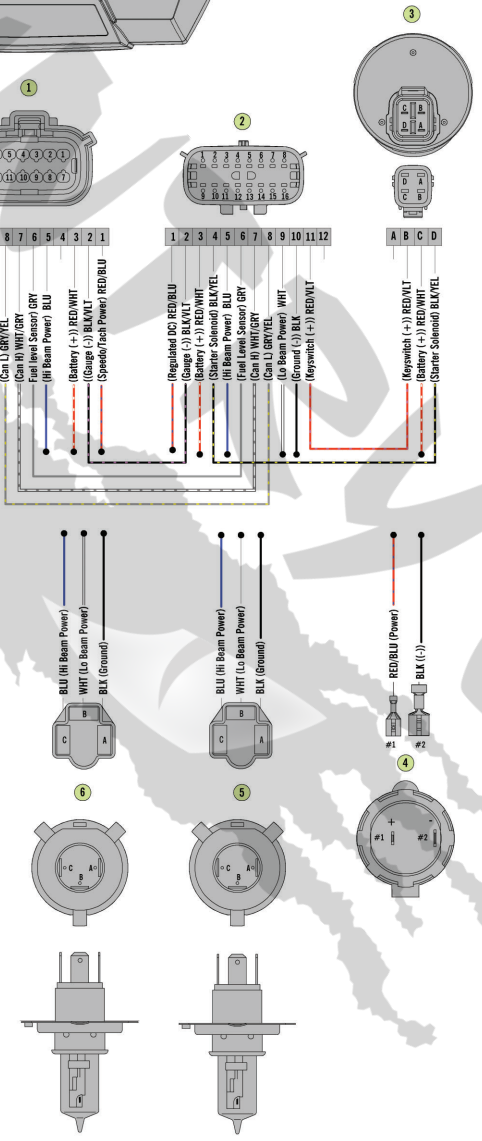
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Hood Harness
(p/n 1686-704)
Pantera 7000/LTD
XF 7000
ZR 7000
M 7000

1. SPEEDOMETER
2. CONNECTOR, MAIN HARNESS
3. CONNECTOR, KEYSWITCH
4. OUTLET, ACCESSORY
5. HEADLIGHTS, B
6. HEADLIGHTS, A





CIRCUIT DIAGRAM				
SWITCH FUNCTION	TERMINAL "A"	TERMINAL "B"	TERMINAL "C"	TERMINAL "D"
OFF	●	●	●	●
ON	●	●	●	
START		●	●	●

NOTES:

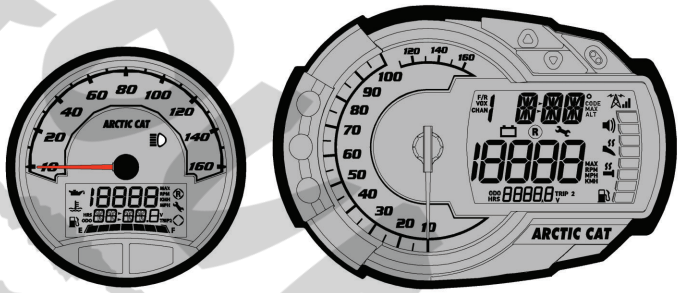
1. CONNECTORS SHOWN FROM MATING SURFACE SIDE.
2. BLK ● INDICATES WIRE SPLICE, THIS EXAMPLE INDICATES BLK SPLICE.

0748-011

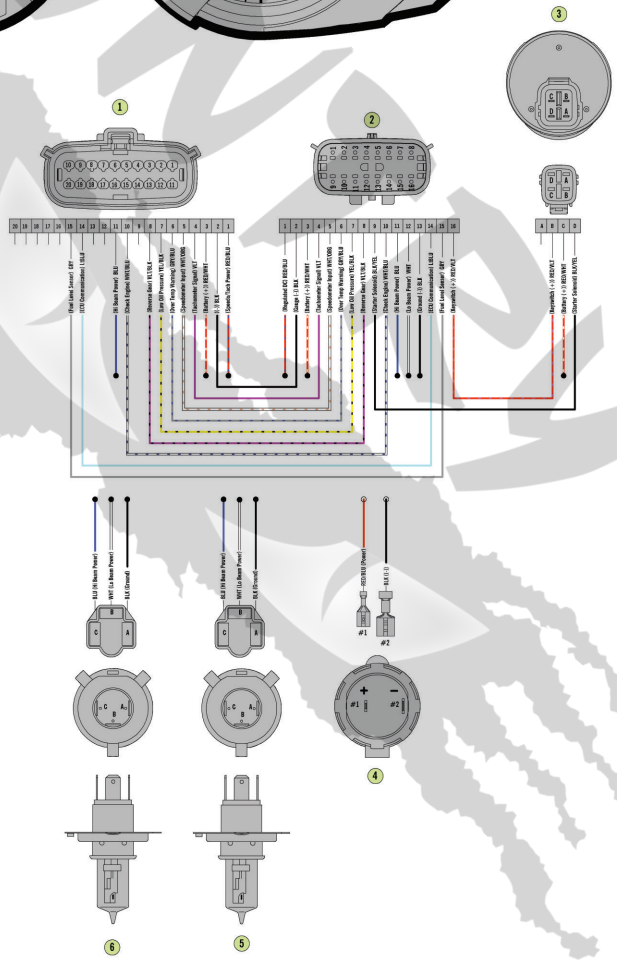
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Hood Harness
(p/n 1686-639)
ZR 5000 LXR
ZR 9000 Models
XF 9000 Models
M 9000 Models

1. CONNECTOR, SPEEDOMETER
2. CONNECTOR, MAIN HARNESS #1
3. CONNECTOR, KEYSWITCH
4. OUTLET, ACCESSORY
5. HEADLIGHT, B
6. HEADLIGHT, A



CIRCUIT DIAGRAM				
SWITCH FUNCTION	TERMINAL "A"	TERMINAL "B"	TERMINAL "C"	TERMINAL "D"
OFF	●	●	●	●
ON	●	●	●	
START		●	●	●



NOTES:

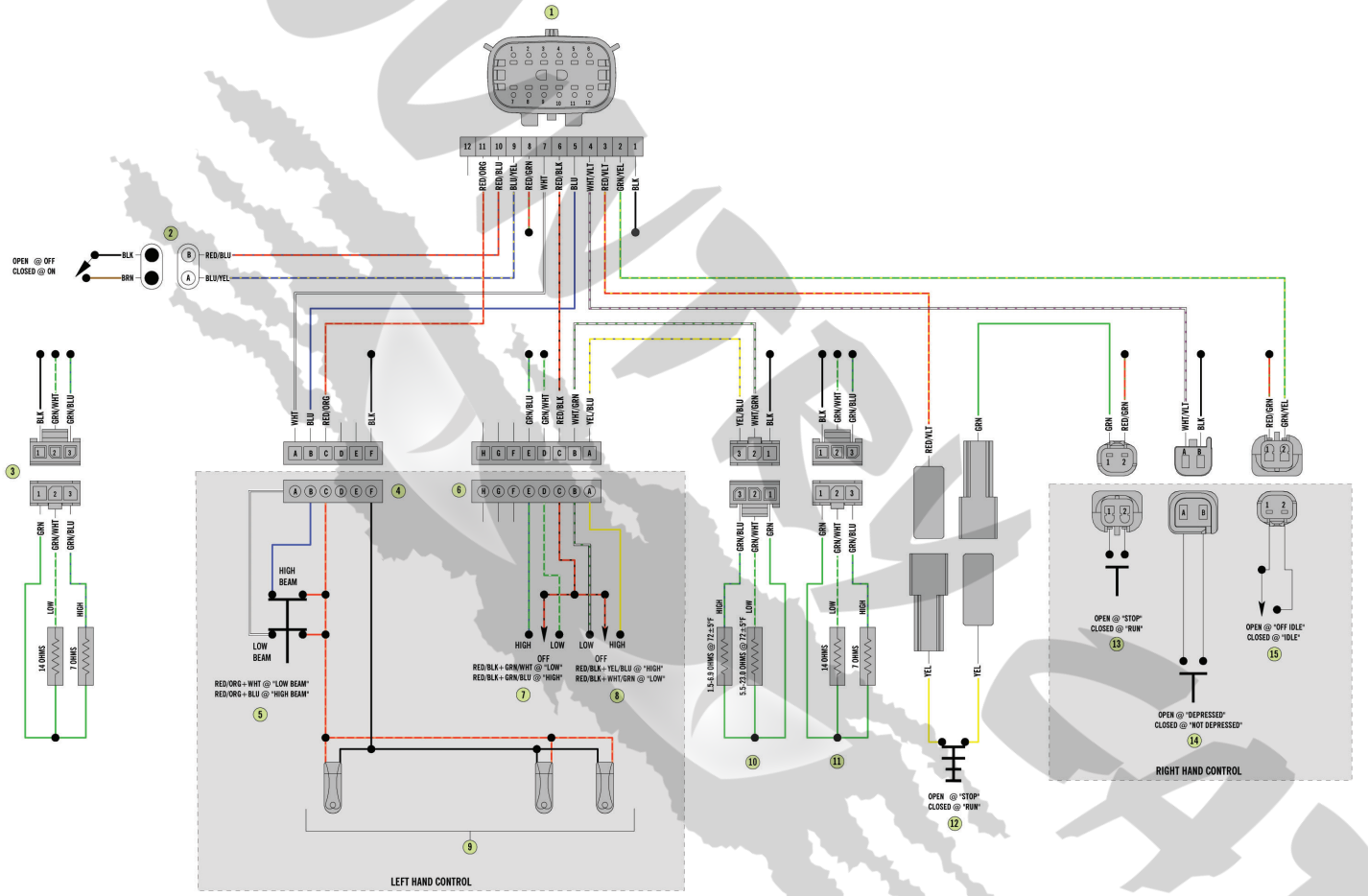
1. CONNECTORS SHOWN FROM MATING SURFACE SIDE. WHERE APPLICABLE.
2. BLK ●A INDICATES WIRE SPLICE, THIS EXAMPLE INDICATES BLK SPLICE A.

0746-246

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Handlebar Harness
(p/n 1686-656)
ZR 9000 SP RR
M 9000 HCR

1. CONNECTOR, HANDLEBAR
2. SWITCH, BRAKE
3. ELEMENT, LH HANDWARMER
4. CONNECTOR, HEADLIGHT CONTROL
5. SWITCH, HEADLIGHT
6. CONNECTOR, HANDWARMER/THUMBWARMER
7. SWITCH, HANDWARMER
8. SWITCH, THUMBWARMER
9. BULBS, SWITCH
10. ELEMENT, THUMBWARMER
11. ELEMENT,RH HANDWARMER
12. SWITCH, TETHER
13. SWITCH, EMERGENCY STOP
14. SWITCH, SHIFT
15. MICROSWITCH, RPS



NOTES:

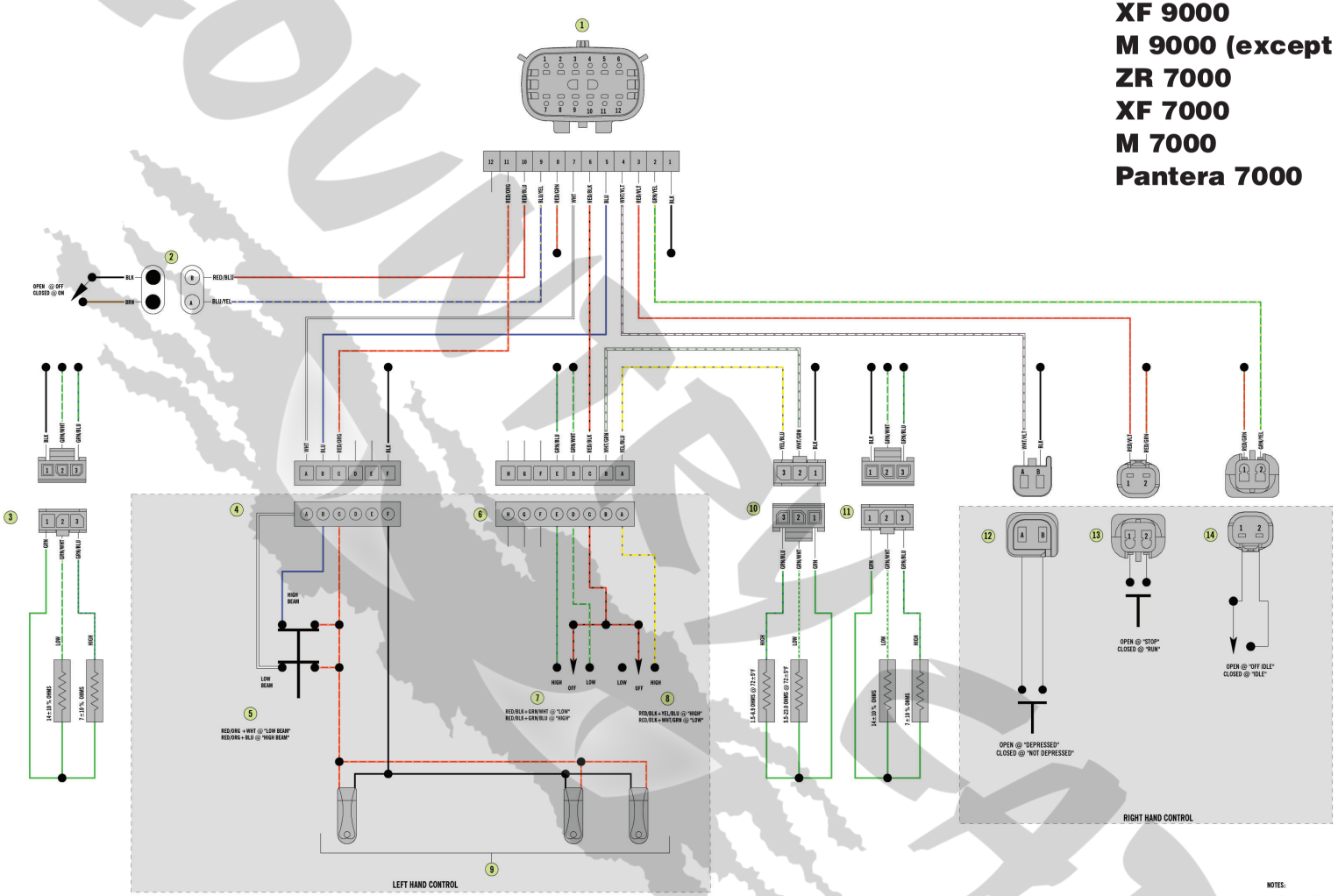
1. CONNECTORS SHOWN FROM MATING SURFACE SIDE. WHERE APPLICABLE.
2. ● MALE PIN TERMINAL
   ○ FEMALE RECEPTACLE TERMINAL
3. BLK ● A INDICATES WIRE SPLICE, THIS EXAMPLE INDICATES BLK SPLICE A.

0746-510

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Handlebar Harness
(p/n 1686-637)
ZR 5000 LXR
ZR 9000 (except SP RR)
XF 9000
M 9000 (except HCR)
ZR 7000
XF 7000
M 7000
Pantera 7000

1. CONNECTOR, HANDLEBAR
2. SWITCH, BRAKE
3. ELEMENT, LH HANDWARMER
4. CONNECTOR, HEADLIGHT CONTROL
5. SWITCH, HEADLIGHT
6. CONNECTOR, HANDWARMER/THUMBWARMER
7. SWITCH, HANDWARMER
8. SWITCH, THUMBWARMER
9. BULBS, SWITCH
10. ELEMENT, THUMBWARMER
11. ELEMENT,RH HANDWARMER
12. SWITCH, SHIFT
13. SWITCH, EMERGENCY STOP
14. MICROSWITCH, RPS



NOTES:

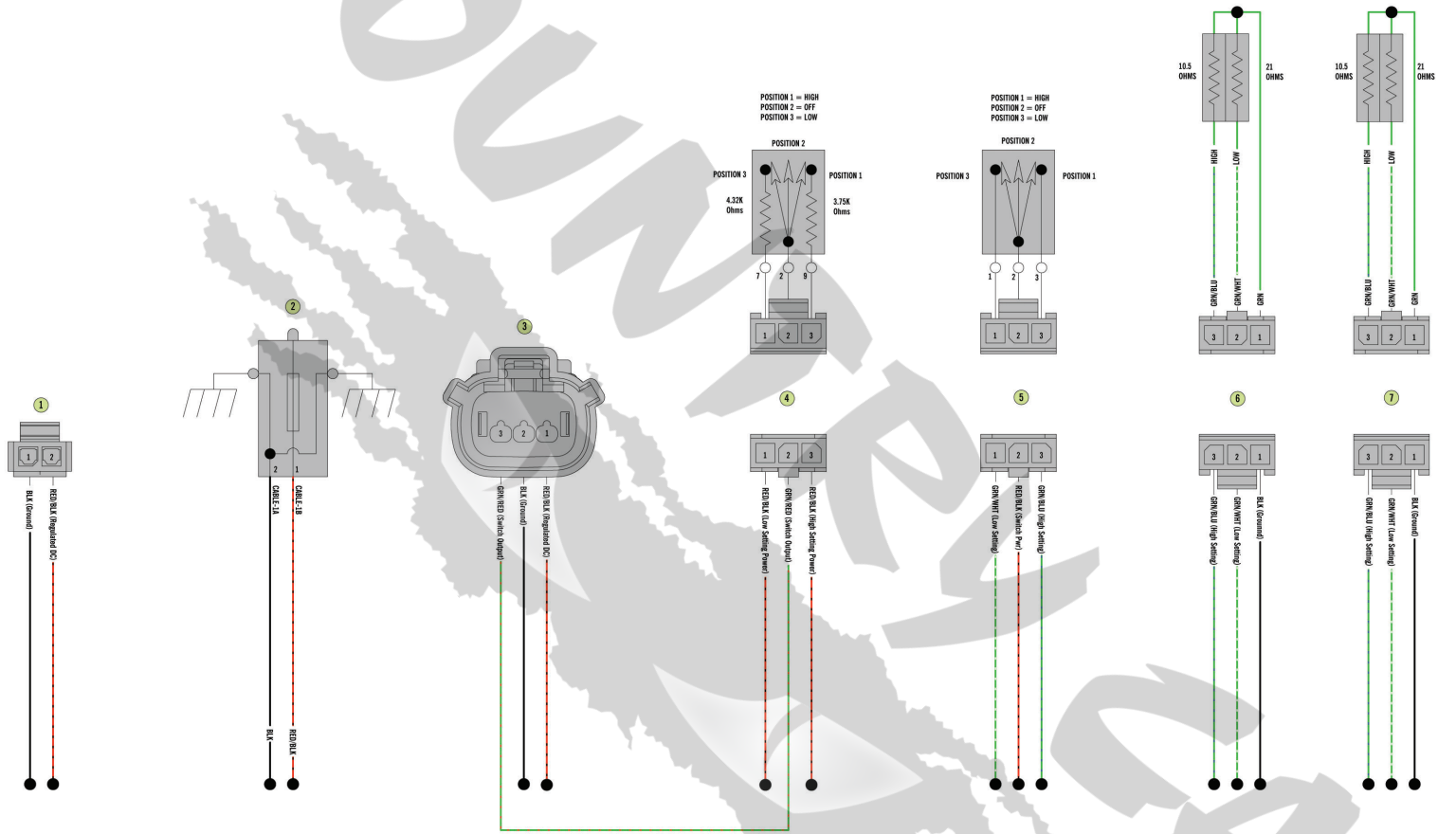
1. CONNECTORS SHOWN FROM MATING SURFACE SIDE. WHERE APPLICABLE.
2. ● MALE PIN TERMINAL
   ○ FEMALE RECEPTACLE TERMINAL
3. BLK ●—● A INDICATES WIRE SPLICE, THIS EXAMPLE INDICATES BLK SPLICE A.

0746-247

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Passenger Seat Harness (p/n 1686-729)

1. CONNECTOR, ACCESSORY POWER
2. APAPTER, 12V ACCESSORY
3. CONNECTOR, PASSENGER SEAT HEATER
4. SWITCH, SEAT HEATER
5. SWITCH, HAND WARMER
6. ELEMENT, HANDWARMER 1
7. ELEMENT, HANDWARMER 2



NOTES:

1. CONNECTORS SHOWN FROM MATING SURFACE SIDE. WHERE APPLICABLE.
2. ● MALE PIN TERMINAL
   ○ FEMALE RECEPTACLE TERMINAL
3. BLK ●—A INDICATES WIRE SPLICE, THIS EXAMPLE INDICATES BLK SPLICE A.

COUNTERCAT



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