

# Engine Removal / Installation

Polaris 650 / 750 / 780

## Step 1

### Battery Removal

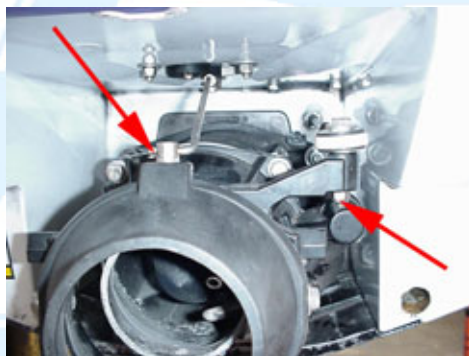


1.1 (Above) Remove the two retaining straps, disconnect the battery and remove it from the hull. Disconnect the negative (black) cable first, then the positive (red).

## Step 2

### Pump Removal

2.1 (Below) Remove the cotter pin from the trim control arm and slide the arm out. Remove the 10mm nut and disengage the steering control. Remove the four 14mm bolts from the pump housing.



2.2 (Below) Loosen the hose clamps and pull off the cooling inlet and bilge lines from the pump fittings. Pull the pump assembly straight back and out of the hull.



## Step 3

### Intake Removal

3.1 (Below) If your ski has the following intake design, loosen the hose clamp and remove the duct. Remove the six screws securing the top of the flame arrestor cover and remove it. Remove the screen, and the bolts securing the base to the carbs. Remove the assembly.



3.2 (Below) If you have this type of intake system, all you need do is remove the six nuts found on the underside of the intake manifold, to remove the carbs. Also remove the carb control cables.



# Engine Removal / Installation

Polaris 650 / 750 / 780

3.3 (Below) Loosen the gas tank cap to relieve pressure. Be sure the fuel switch is turned to the "OFF" position, and be aware of any fuel that may spill from the hoses. Make sure the hull is clear of any gasoline fumes before continuing work, especially with power tools. Remove the fuel in, fuel return, pulse and oil injection lines from the carbs. Remove the pulse fitting from the block. Lift the carbs out of the hull.



## Step 4

### Exhaust Removal

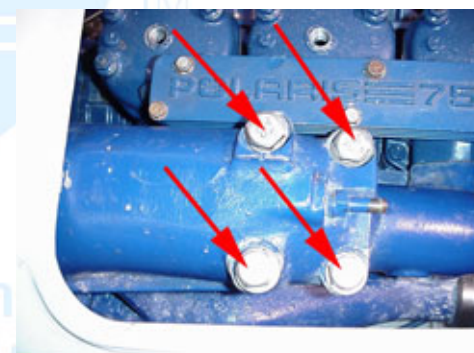
4.1 (Below) Loosen the hose clamps and remove the waterbox from the hull.



4.3 (Below) Remove the two 12mm bolts from the front exhaust mount bracket, and the 16mm securing it to the pipe.



4.4 (Below) Remove the four 19mm bolts securing the pipe to the exhaust manifold.



4.2 (Below) Remove the two 12mm nuts from the rear exhaust mount bracket.



# Engine Removal / Installation

Polaris 650 / 750 / 780

4.5 (Below) Slide the pipe forward enough to clear the exhaust manifold mount to gain access to the manifold mount bolts. Remove the nine 14mm bolts securing the exhaust manifold to the block and remove it from the hull.



4.7 (Below) Slide the pipe back and out. Remove the bottom drain line by loosening the hose clamp.



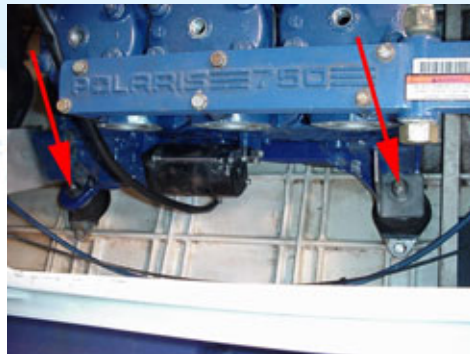
## Step 5

### Engine Removal

5.1 (Below) Loosen the hose clamps on the intake lines and PTO shroud. Remove the lines, shroud and the thermo sensor screwed into the cooling rail.



5.2 (Below) Disconnect the starter positive and ground lines with a 10mm socket. Remove the four 19mm motor mount bolts.



5.3 (Below) Remove the two Allen bolts securing the wiring plug to the top of the electrical box and pull the plug out. Remove the six Allen bolts holding the electrical box together, and disconnect the wires going between the two halves. Disconnect all of the wires from the board coming in the wiring bundle from the flywheel.



5.4 Remove the engine from the hull.

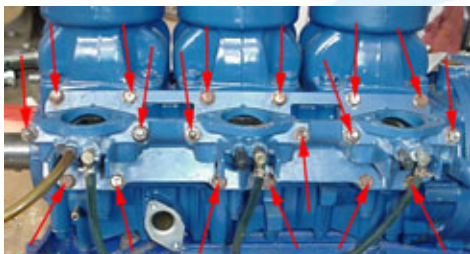
# Engine Removal / Installation

Polaris 650 / 750 / 780

## Step 6

### Accessory Removal

6.1 (Below) With the engine on the ground, workbench or some other solid surface, begin removing the external accessories that will NOT be shipped with the core. Remove the 18 10mm bolts securing the intake manifold to the block.



6.2 (Below) Remove the manifold and remove the six studs from the block with a stud socket.



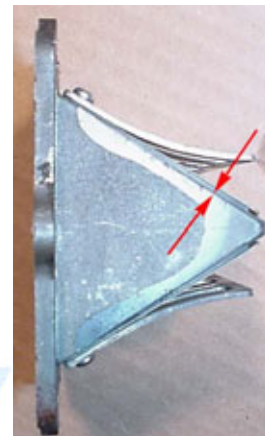
6.3 (Below) Remove the reed cage assemblies.



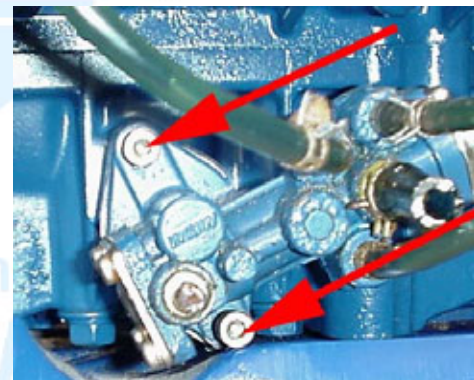
6.4 (Below) Inspect each reed assembly for damage and wear. Look at each reed petal and inspect the edges for signs of cracking, chipping or any missing parts. If any damage is present, replace the petals.



6.5 (Right) Look at each petal-to-cage surface and check for gap. If a gap of more than 0.015" is present, replace the petals.



6.6 (Below) Remove the oil pump (if equipped) by removing the two Allen bolts. Pull out the drive shaft inside.



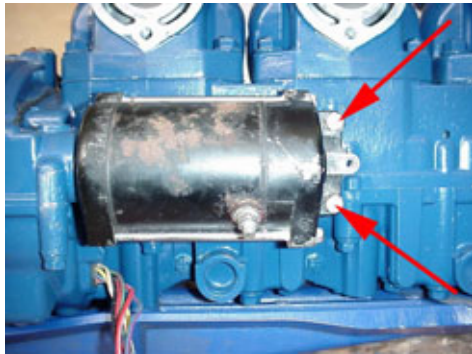
6.7 (Below) Remove the six 10mm bolts securing the cooling rail to the heads and remove it.



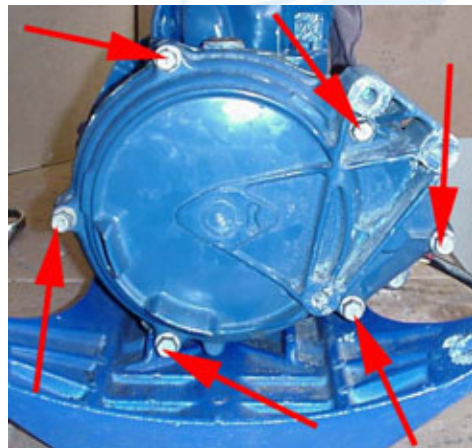
# Engine Removal / Installation

Polaris 650 / 750 / 780

6.8 (Below) Remove the starter bolts with a 12mm socket, and slide it back, out of the housing.



6.9 (Below) Remove the six 12mm bolts securing the flywheel cover to the housing and remove it.



6.10 (Below) Stuff a rag into one of the exhaust ports. Make sure the rag penetrates through the port, into the combustion chamber on top of the piston. This will prevent the engine from turning over while you remove the PTO coupler and flywheel.



6.11 (Below) Remove the flywheel nut with a 22mm socket or wrench.



6.12 (Below) Use a universal flywheel puller to remove the flywheel from the crankshaft. **CAUTION:** Do not screw the puller screws into the flywheel more than 5 complete turns or damage to the stator may occur. Take care not to lose your woodruff key – this is not to be shipped back to SBT.



6.13 (Below) Use a 14" pipe wrench or chain wrench to remove the PTO coupler.



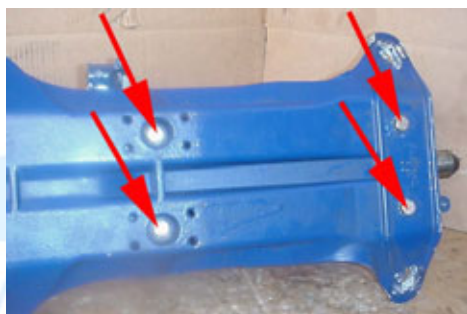
# Engine Removal / Installation

Polaris 650 / 750 / 780

6.14 (Below) Remove the five 12mm and two 10mm bolts securing the flywheel housing to the block. Remove it.



6.16 (Below) Remove the four 14mm bolts securing the bed plate to the case and remove it.

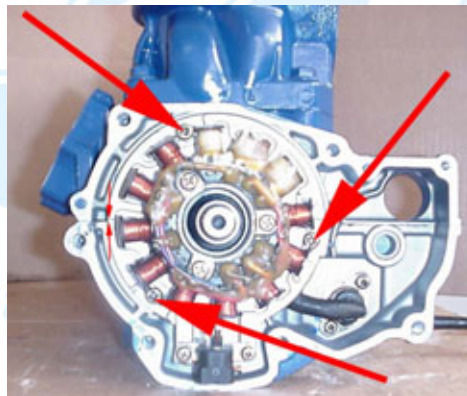


With all of the external accessories removed, the engine is now ready to be packaged and shipped to SBT!

6.15 (Below) Remove the bendix gear assembly.



6.17 (Below) Remove the three 10mm bolts from the stator and the two screws securing the wiring plug. Remove the stator.



# *Engine Removal / Installation*

*Polaris 650 / 750 / 780*

## **Engine Installation**

### **Oil Injection**

It is SBT's recommendation that the oil injection pump be disabled, and block-off plate(s) be installed prior to use of the new engine in your ski. This is only recommended to insure reliable lubrication and extended engine life for all our customer's PWCs. Re-use of your functioning oil injection pump, if so equipped, does not void your warranty.

### **Paper Gaskets**

It is SBT's recommendation that all paper gaskets be treated with Loctite® High-Tack Gasket Sealer prior to installation. Read and follow all instructions on the product canister to insure good gasket sealing on your new engine.

### **Special Gaskets**

It is SBT's recommendation that all exhaust gaskets be sealed with Loctite® Copper Gasket Adhesive prior to installation. Read and follow all instructions on the product canister to insure good gasket sealing on your new engine.

### **Bolts**

It is SBT's recommendation that all bolts be treated with Loctite® Medium Strength Threadlocker Blue (242) during assembly.

### **Break-In Oil**

It is SBT's requirement that the new engine be broken-in with additional oil in the fuel supply for the first tank. Follow the mixing chart on the back of the bottle to determine quantity needed.

### **Electrical Connections**

It is SBT's recommendation that all electrical connections be sanded, cleaned and secured during the assembly process. It is a common problem to not have solid connections due to corrosion, paint, poor wire condition, etc.

### **Disclaimer**

While every precaution has been taken in the preparation of these guides, SBT assumes no responsibility for errors or omissions. Neither is any Liability assumed for damages resulting from use of the information contained herein. Publication of the procedures in these guides does not imply approval of the manufacturers of the products covered. Persons engaging in the procedures herein do so at their own risk.

# Engine Removal / Installation

Polaris 650 / 750 / 780

Follow the removal steps in reverse order to install your new SBT short block assembly:

**6.17** Install the stator.

- Torque to 108 in. lbs.

**6.16** Install the bed plate.

- Torque to 50 ft. lbs.

**6.15** Install the bendix gear.

**6.14** Using a new gasket (if supplied, if not use Permatex 2), install the flywheel housing.

- Torque to 22 ft. lbs.

**6.13** Install the PTO coupler.

- Torque to 40 ft. lbs.

**6.11-6.12** Install the flywheel and nut.

- Torque to 65 ft. lbs.

**6.9** Using a new gasket (if supplied, if not use Permatex 2), install the flywheel cover.

- Torque to 108 in. lbs.

**6.8** Install the starter.

- Torque to 108 in. lbs.

**6.7** Install the cooling rail.

- Torque to 78 in. lbs.

**6.6** Install the oil pump or block off plate.

- Torque to 60 in. lbs.

**6.3-6.5** Install the reed cage assemblies.

**6.2** Install the intake studs.

**6.1** Using new gaskets, install the intake manifold.

- Torque to 108 in. lbs.

**5.4** Place the engine in the hull.

**5.3** Reconnect the electrical wires inside the box. Secure the halves back together and the wire plug(s).

**5.2** To properly align the engine, it should be taken to the dealer at this point to have them align it for you. This service normally runs \$30-\$40. Install the mount nuts and starter wires.

- Torque to 24 ft. lbs. (mounts)
- Torque to 108 in. lbs. (starter ground)

**5.1** Install the cooling lines and thermo sensor.

**4.7** Attach the front pipe cooling line.

**4.6** Slide the pipe forward in the hull and place the exhaust manifold in the hull. Install the manifold bolts.

- Torque to 22 ft. lbs.

**4.5** Install the top pipe mount bolts.

- Torque to 45 ft. lbs.

**4.3** Attach the front pipe bracket.

- Torque to 22 ft. lbs.

**4.2** Install the rear pipe bracket nuts.

- Torque to 14 ft. lbs.

**4.1** Install the waterbox.

**3.3** Install the carbs, pulse line(s) and fuel lines.

- Torque to 16 ft. lbs.

**3.2** Attach the control cables.

**3.1** Reattach the flame arrestor if equipped.

**2.2** Slide the pump and driveshaft into the hull. Attach the cooling and bilge lines in the hull. Silicone around the fittings.



# *Engine Removal / Installation*

*Polaris 650 / 750 / 780*

**2.1** Install the pump mount bolts to the hull and control cables.

- Torque to 22 ft. lbs. (mount bolts)

**1.1** Mount the battery and electrical box, and attach the straps.



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*Polaris 650 / 750 / 780*

## **Tools Needed:**

### **Sockets**

- 19mm socket
- 14mm socket
- 12mm socket
- 10mm socket

### **Misc.**

- Ratchet
- Long socket extension
- Short socket extension
- Screwdrivers
- Universal flywheel puller  
(Available at most major auto parts stores for rent/lend/purchase)

### **Sealers / Lubricants**

- Loctite® Copper Gasket Adhesive
- Loctite® 2 Gasket Sealer
- Loctite® Medium Threadlocker (Blue) 242
- Loctite® High-Tach
- SBT Break-In Oil

### **Parts**

- External Gasket Kit
- Zip-Ties

### **Wrenches**

- 22mm wrench
- 12mm wrench
- 10mm wrench
- Torque wrench
- Chain/pipe wrench

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