

Engine Removal / Installation

Yamaha 650 / 701X

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).

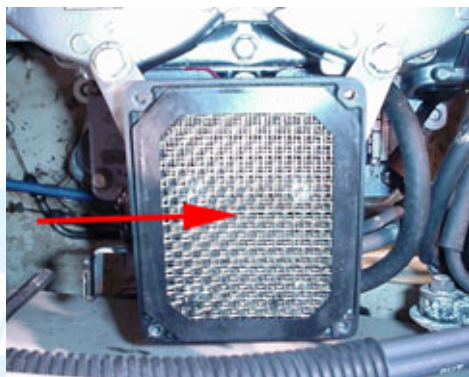
Step 2

Intake Removal

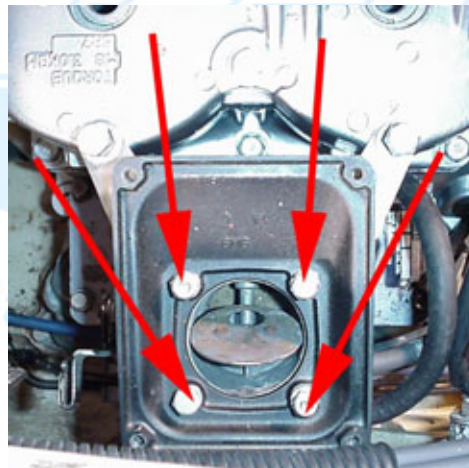
2.1 (Below) Remove the 4 screws securing the flame arrestor cover to the base and remove it.



2.1 (Below) Remove the flame arrestor screen.



2.2 (Below) Remove the four 10mm bolts securing the flame arrestor base to the carb.

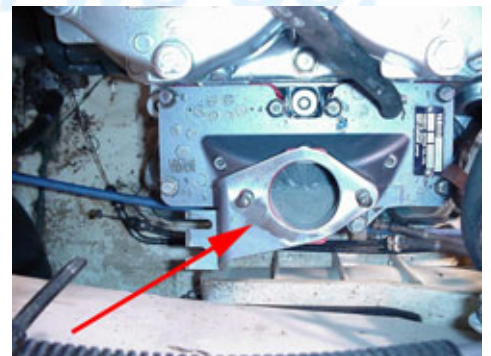


2.3 (Below) Loosen the gas tank cap to relieve pressure. Be sure the fuel switch is turned to the "OFF" position, and be aware of any fuel that may spill from the hoses. Make sure the hull is clear of any gasoline fumes before continuing work, especially with power tools. Remove the pulse, fuel in and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



Disconnect the choke and throttle cables from the carb. Remove the two 10mm nuts securing the carb to the manifold and remove it.

2.4 (Below) Remove the cable bracket from the intake manifold.



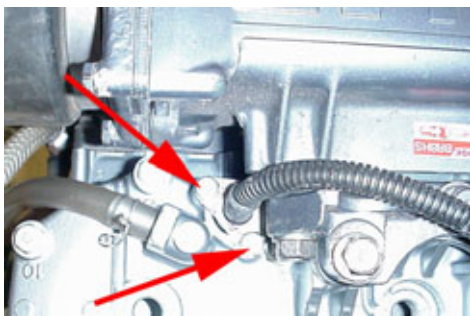
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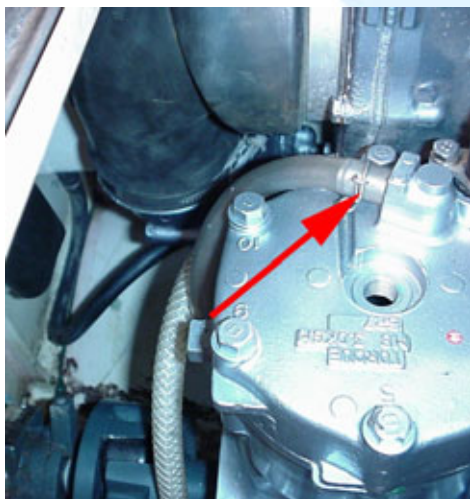
Step 3

Exhaust Removal

3.1 (Below) Remove the two 10mm bolts securing the thermo sensor to the head and remove it.



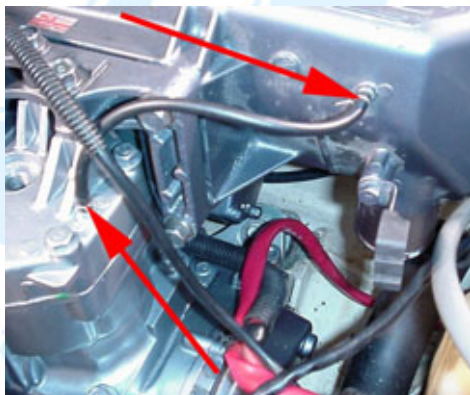
3.2 (Below) Remove the head cooling inlet line.



3.3 (Below) Remove the exhaust hose from the pipe using a screwdriver.



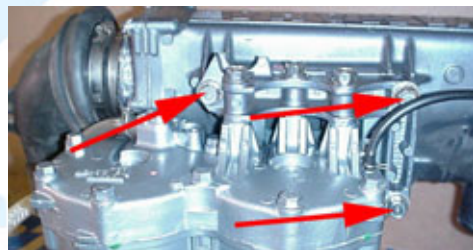
3.4 (Below) Remove the water line from the pipe and the head.



3.5 (Below) Loosen the clamp on the pipe to manifold coupler and remove it from the pipe. Fold back the outer flap for easy access.



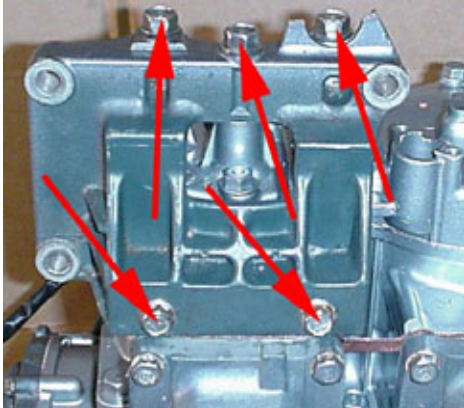
3.6 (Below) Remove the three 12mm exhaust muffler mounting bolts from the bracket and remove the pipe.



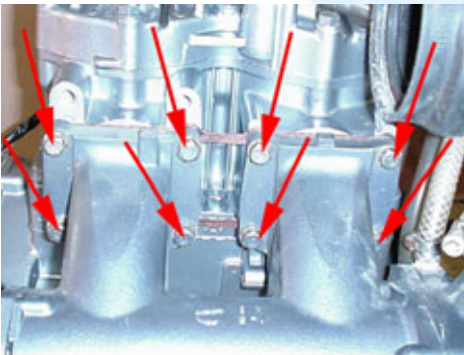
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3.7 (Below) Remove the five 14mm bolts securing the exhaust bracket to the cylinders and remove it.



3.8 (Below) Remove the eight 12mm bolts from the exhaust manifold and remove it.



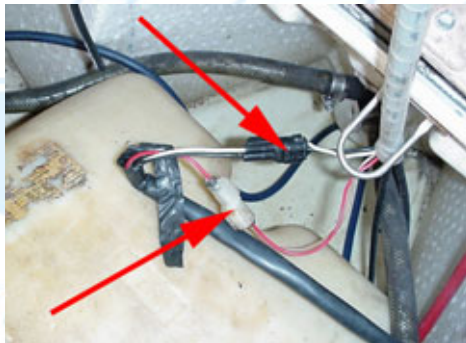
Step 4

Engine removal

4.1 (Below) Remove the two 12mm bolts securing the electrical box and remove it.



4.2 (Below) Disconnect the starter switch wires at the harnesses.



Disconnect the positive wire at the starter with a 10mm socket.

Remove the PTO coupler cover with a 10mm socket.

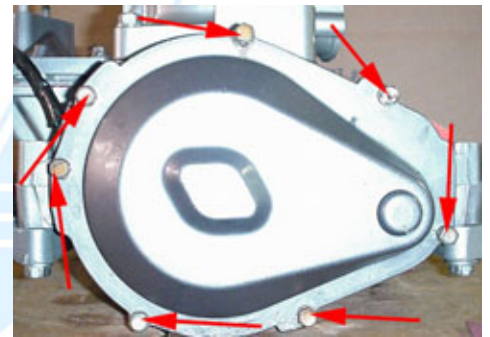
Remove the four 12mm bolts from the motor mounts, releasing the engine. Slide it slightly forward in the hull to disconnect the PTO coupler from the driveshaft, and lift the engine out of the hull.

Step 5

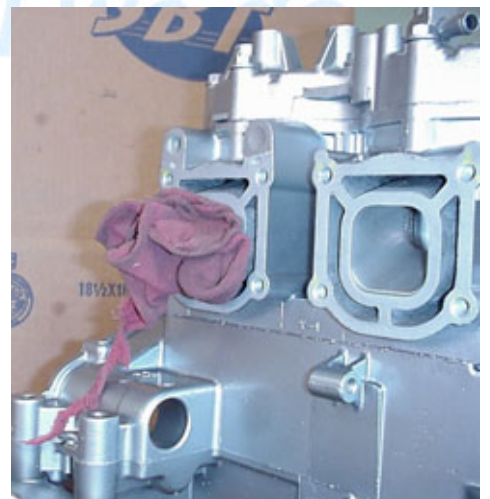
Accessory Removal

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.

5.1 (Below) Remove the seven 10mm bolts securing the flywheel cover to the housing, and remove it.



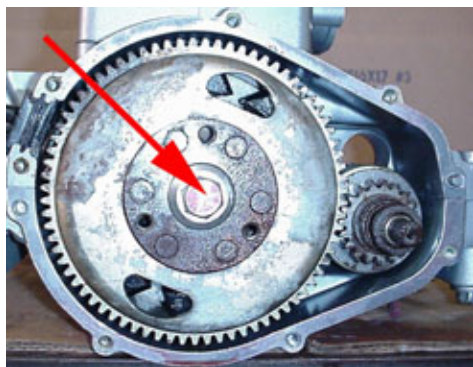
5.2 (Below) Stuff a rag into an open exhaust port. This will prevent the engine from turning over while removing the flywheel and PTO coupler.



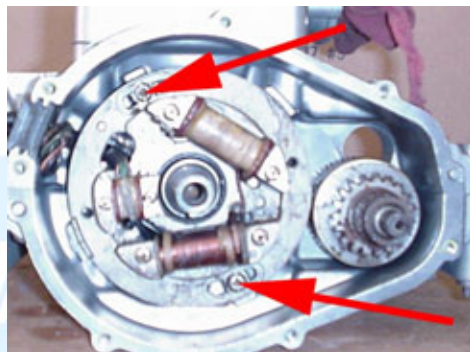
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5.3 (Below) Use a 17mm socket to remove the flywheel nut.



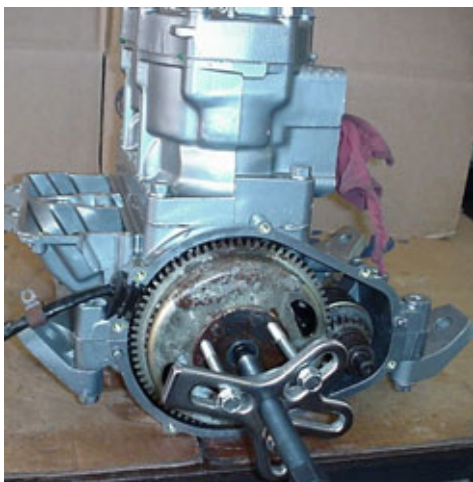
5.5 (Below) Use a screw driver to remove the two screws securing the stator assembly to the case.



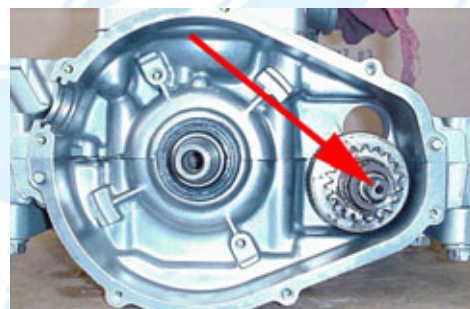
5.8 (Below) Use a chain wrench to remove the PTO coupler.



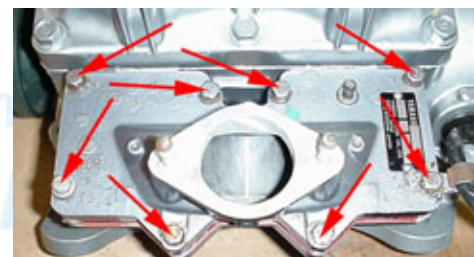
5.4 (Below) Use a universal flywheel puller to remove the flywheel from the crank. **CAUTION:** Do not screw the puller screws into the flywheel more than 5 complete turns or damage to the stator may occur. Take care not to lose your woodruff key – this is not to be shipped back to SBT.



5.6 (Below) Pull the starter bendix gear assembly out of the case.



5.9 (Below) Remove the eight 10mm bolts from the intake manifold and remove the top plate. The reed cages and center bracket are one piece – pull it out.

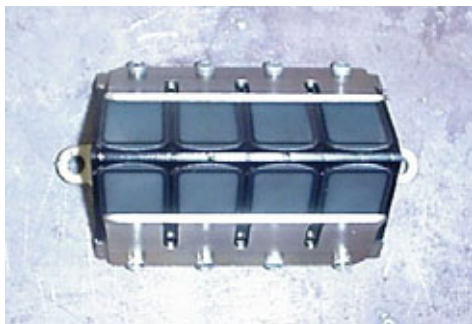


5.7 (Above) Use a 10mm socket to remove the two bolts securing the starter to the case, and pull it straight back.

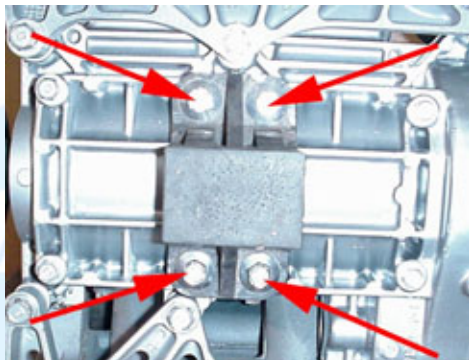
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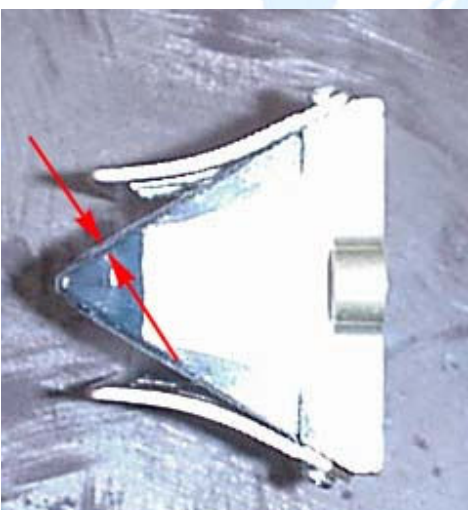
5.10 (Below) Inspect each reed assembly for damage and wear. Look at each reed petal and inspect the edges for signs of cracking, chipping or any missing parts. If any damage is present, replace the petals.



5.12 (Below) Remove the four 12mm bolts securing the rubber support and remove it. Keep the rubber support, but put the bolts back into the case to be returned.



With all of the external accessories removed, the engine is now ready to be packaged and shipped to SBT! NOTE: the engine saddles stay on the block to be shipped back. Removal is not necessary.



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

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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.

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

5.12 Install the rubber support and bolts.

- Torque to 12 ft. lbs.

5.9-5.11 Using a new gasket, place the reed cages and plate into the intake. Bolt on the intake manifold.

- Torque to 12 ft. lbs.

5.8 Stuff a rag into an open exhaust port. Install the PTO coupler.

- Torque to 27 ft. lbs.

5.7 Install the starter.

- Torque to 12 ft. lbs.

5.6 Install the starter bendix gear assembly.

5.5 Install the stator, taking care to line up the timing line on the stator assembly with the arrow cast into the case. Tighten the screws by hand.

5.4 Install the flywheel onto the crankshaft.

5.3 Install the flywheel bolt.

- Torque to 50 ft. lbs.

5.2 Remove the rag from the exhaust port.

5.1 Using a new gasket, install the flywheel cover and bolts.

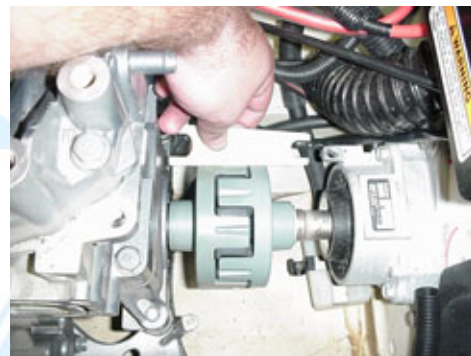
- Torque to 4 ft. lbs.

4.2 Spin the engine mount bolts into the mounts, and rock them back & forth with your hands; try to break them. If any mount(s) fails, replace it before installing the new engine. Place the engine in the hull. Place it on the mounts in a forward position, sliding it back into the coupler.

- Torque to 12 ft. lbs.

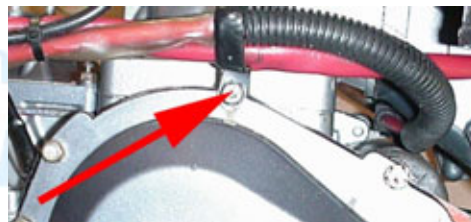
Your new engine may require re-shimming. Shims are necessary between the engine mounts and brackets to properly align the engine and pump shafts. If you do not have enough factory shims with your hull, very thin, wide washers may be substituted.

Take a small straight edge and place it on the coupler. You are looking for an even match all the way around the coupler. Place shims where necessary to align the couplers. Replace the coupling cover.



Reconnect the positive starter wire, and the start/stop wiring harnesses.

Make sure your wiring clip is back in the original position on the flywheel housing bolt, as shown.



4.1 Re-install the electrical box.

- Torque to 12 ft. lbs.

3.8 Using a new gasket, install the exhaust manifold.

- Torque to 14 ft. lbs.

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3.7 Install the exhaust bracket to the cylinders.

- Torque to 12 ft. lbs.

3.6 Place the pipe in the hull, and install the mounting bolts.

- Torque to 14 ft. lbs.

3.5 Install the manifold to pipe coupler. It is easiest to roll the rubber flap over the inner seal.

3.4 Install the head to pipe water line.

3.3 Attach the muffler exhaust hose.

3.2 Install the head cooling water inlet line.

3.1 Install the thermo sensor and bolts.

- Torque to 5.8 ft. lbs.

2.5 Place the carb cable bracket on the manifold.

2.4 Using a new gasket, install the carb and two nuts.

- Torque to 12 ft. lbs.

Re-connect the fuel and pulse lines to the carb, along with the control cables.

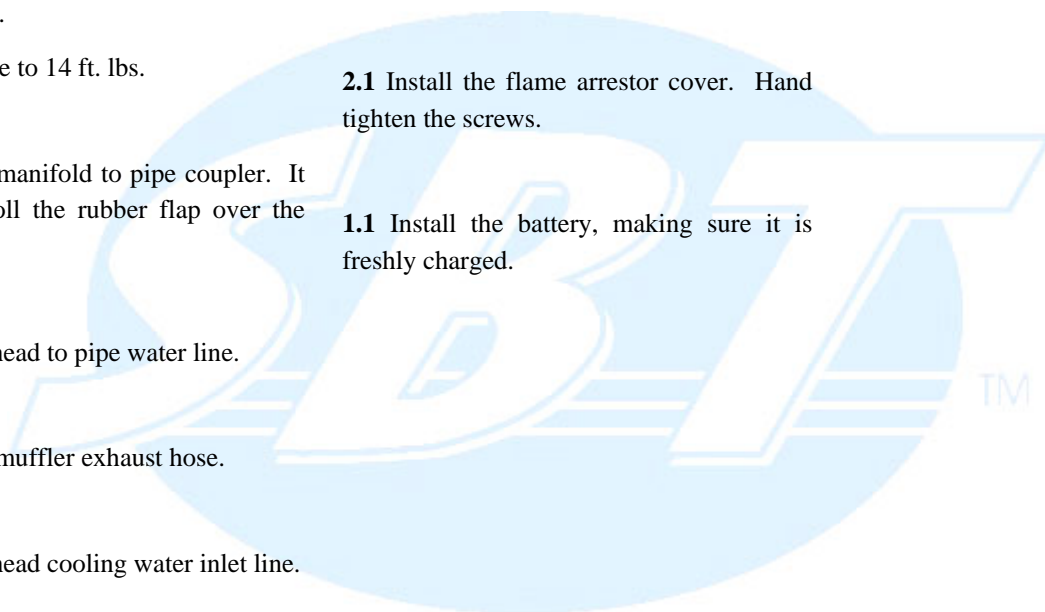
2.3 Install the flame arrestor base.

- Torque to 8 ft. lbs.

2.2 Place the flame arrestor screen in the base.

2.1 Install the flame arrestor cover. Hand tighten the screws.

1.1 Install the battery, making sure it is freshly charged.



Remanufactured PWC Engines...
It's all we do.

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Tools Needed:

Sockets

- 17mm 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

- 10mm wrench
- Torque wrench
- Chain wrench

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