

Yamaha Nytro 240 turbo

Thank you for choosing the MC Xpress turbo kit to your Yamaha Nytro snowmobile.

The turbo kit is designed for racing use only.

The turbo kit is designed to give you the best performance possible together with reliability.

During the development work we have tried to keep the snowmobile as stock as possible to make the installation easy and to keep the sled as untouched as possible.

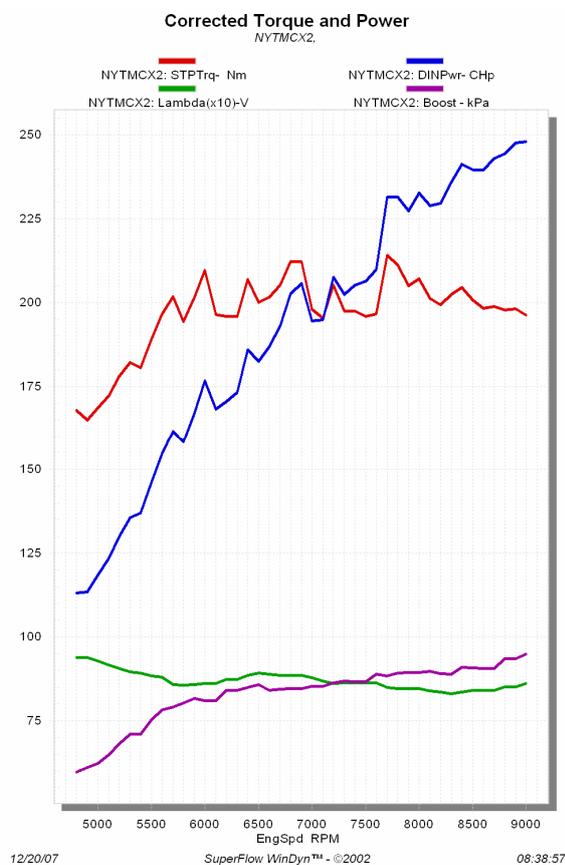
Read this manual carefully before you start with the installation.

We hope you will get much joy with your new investment.

The turbo snowmobile is only recommended to be used by experienced riders and for racing use only.

- This turbo kit greatly enhances the performance of the vehicle it is installed upon!
- Professional training should be received by anyone that operates this modified vehicle.
- Installation of this turbo kit may void any warranty that is provided by the vehicle manufacturer.
- A one (1) year warranty is provided on the kit parts only. This warranty does not cover any other parts even if the damage is caused by the installation of the turbo kit.
- MCXpress AB, its distributors, dealers, nor installers will not be held liable for any personal or physical damaged obtained in association with the installation or use of this product.

By installation or purchase of this product, the end user and or installer agree that the end user has been informed of this information.



Dyno graph Yamaha Nytro. At 90 kPa (13 Psi) turbo pressure you can expect 180 kW (240 hp)

Before the installation

To make the installation as efficient as possible, we recommend you to follow these instructions.

The engine has to be removed from the chassis.

We recommend removing the rear suspension from the chassis.

No slip drive wheels are also recommended (This is stock on the MTX models)



Lower the compression ratio

To compression ratio has to be lowered by two reasons.

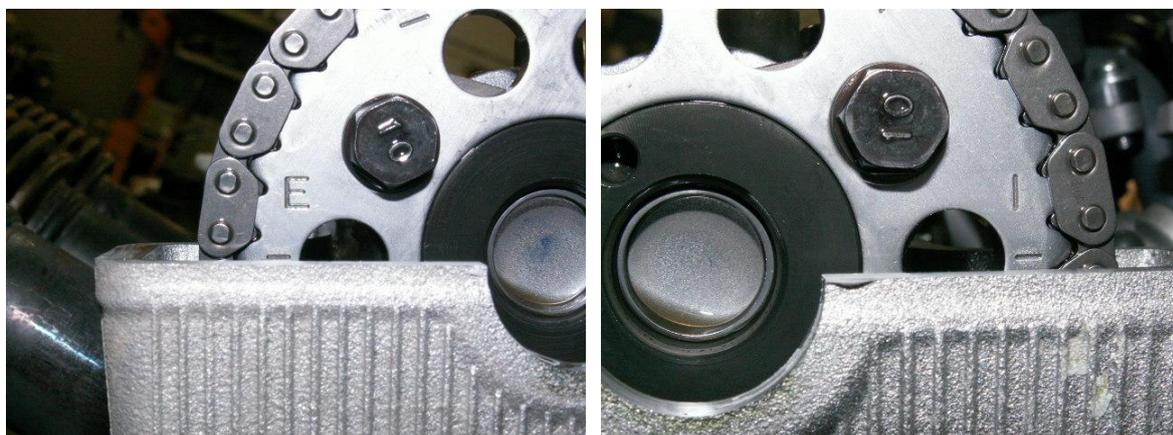
1. When the turbo is producing pressure, the compression pressure in the cylinder and combustion chamber will be much higher than on a natural aspirated engine. This can cause detonation and serious engine damage.
2. It is possible to let the turbo produce more turbo pressure when the compression ratio of the engine is lower.

The compression ratio is lowered to make the engine both reliable and more powerful.

Take off the valve train cover. Now, you have a nice opportunity to check the valve clearance before removing the camshafts. The clearance shall be 0, 11-0,20mm on intake and 0, 20-0, 26 mm on exhaust.



Two marks on the flywheel = TDC



Exhaust cam

Intake cam

Rotate the crankshaft until piston number one reaches TDC (See upper photo)
(Two marks on the flywheels =TDC)

Remove the valve train cover. Note how the marks on the camshafts are located on both intake and exhaust before you remove them.

First, start by removing the cam chain tensioner. Then remove the camshafts.

CAUTION: Remove the screws ðall togetherö so you don't hurt the camshafts. Note how the upper camshaft bearings are located before you lift them away

If the valve clearance has to be adjusted, do it now.

Remove the cylinder head. Do not turn it upside down to remain the valve lifters and shims in their positions.

Install the cylinder head

Clean the surfaces carefully before installing the new thick head gasket.

The cylinder head nuts (M10) shall be tightened in three steps, first 20Nm, then 40 Nm and finally torque the bolts with a 60 degrees angle. Start from the centre of the cylinder head and move towards the ends.

The M6 bolts shall be tightened 10-12 Nm.

When installing a thick head gasket, the cam timing will be a little different than stock.

We recommend adjusting them back to its normal position compared to the crankshaft.

It is made like this: Note how the sprockets are installed on the cams.

Make a scratch between the centre of the cam and the sprocket.

Remove the sprocket from the cam and grind the holes a little oval.



The surface of the cam sprockets is very hard. Use a sharp cutting tool when grinding the holes.

Turn the cam just below 1 mm (0,85 mm to be exact) where the scratch is located.

Note the direction you shall turn the sprocket compared to the camshaft (See photo below)

Use thread lock like loctite on the cam sprocket screws.

Make the adjustment on both camshafts.

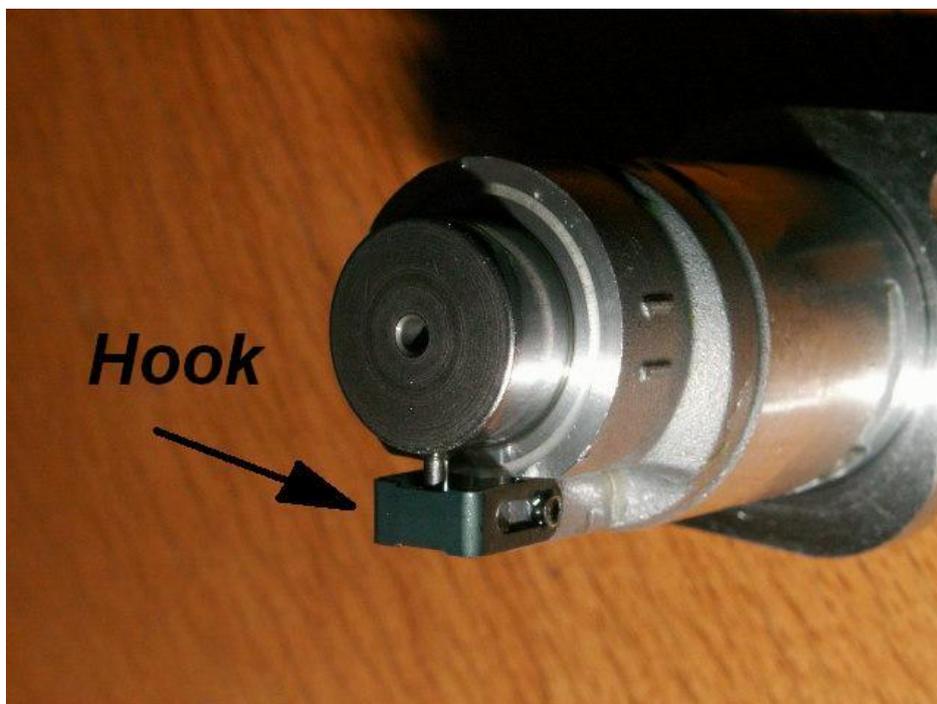
If you don't do this adjustment, the performance of engine will be less and the air/fuel ratio will be wrong during some conditions.





(This picture is from the RS-engine)

Make sure piston number one is at TDC before installing the camshafts again.
 Install the cambearing screws ðall togetherö to avoid the camshafts to be damaged.
 Apply engine oil on the bearing surfaces. Make sure the cams are installed after the right marks. The torque shall be 10-12 Nm on the M6 bolts. Make sure the cam chain doesn't jump during the installation. Use cable ties like the upper right photo to avoid this.



To be able to press it in you have to hold out a small spring located on the side of the tensioner. You shall then not have to use much force to press it in.
 Note: Make sure you install the cam chain tensioner with the right side up.
 When the tensioner has been installed rotate the engine a couple of turns.
 Check the cam timing again and make sure everything is right.

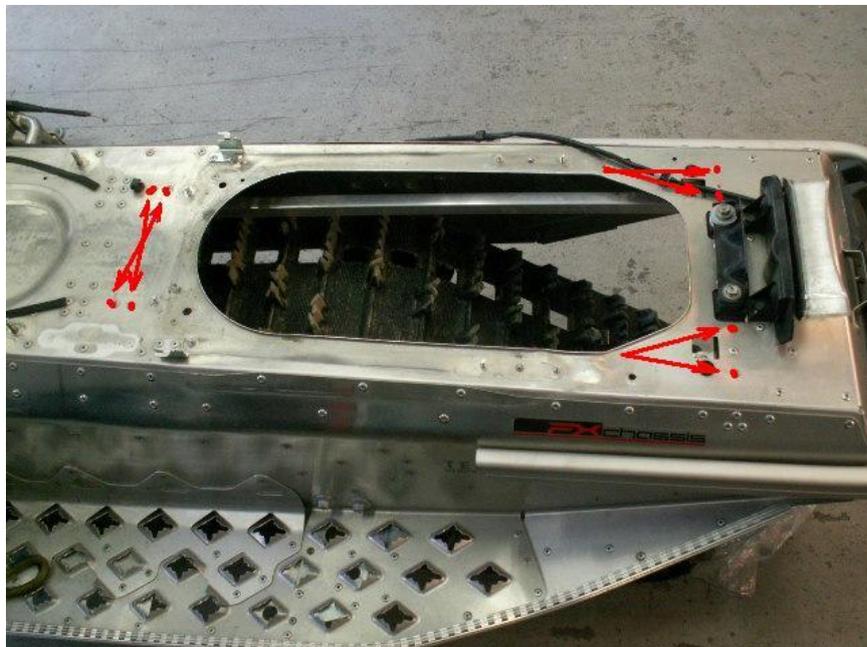
CAUTION: Check valve clearance again to make sure all the valve adjusting shims are in their right positions.

(If one shim has moved from its position in the upper valve spring retainer when the cylinder head has been off, engine failure will follow if you start it.)

Install the valve train cover.

Stud protectors

Only on short track and XTX models:
Remove the aluminium stud-protectors.
Drill out the rivets (marked with red dots in the picture.)



To make the drilling easier, use a punch and remove the centre steel-pin of the rivets.



Some rivets in front of the stud-protectors can be removed, but some are difficult to reach. Leave them. Use a wrench to make the alu-stud protectors to come loose. (right upper picture).

Oil pump installation

The oil that has lubricated the turbo has to be pumped back to the engine.
An oil pump shall be installed on the right cover of the engine.
Drain the oil tank and remove it from the chassis.



First of all, grind down the three dents close to the centre of the generator engine cover. (See upper picture)

Remove the centre plastic cap.

Remove the centre bolt that keeps the flywheel and the steel pin that is located inside the bolt. Be careful with the washer behind the bolt so it stays in place.

Install the new bolt supplied with the kit.

Install the pump shaft and the 3mm pin.

Use the stock O-ring from the plastic-cap between the pump and the cover.

Install the oil pump and tighten it like the picture below. (You can use two M5 screws to make the installation easier)



Install the pump gears and the small 3 mm pin.

Important: Lubricate with motor oil the pump gears before you put the pump together. Install the O-rings and the centre section with the M12 thread facing like the right upper picture. Install the endplate with the four M5 screws.

Oil hose to turbo

Remove the oil pressure sensor located beside the oil filter from the engine block.

Install the adapter supplied with the kit where the oil pressure sensor was located.

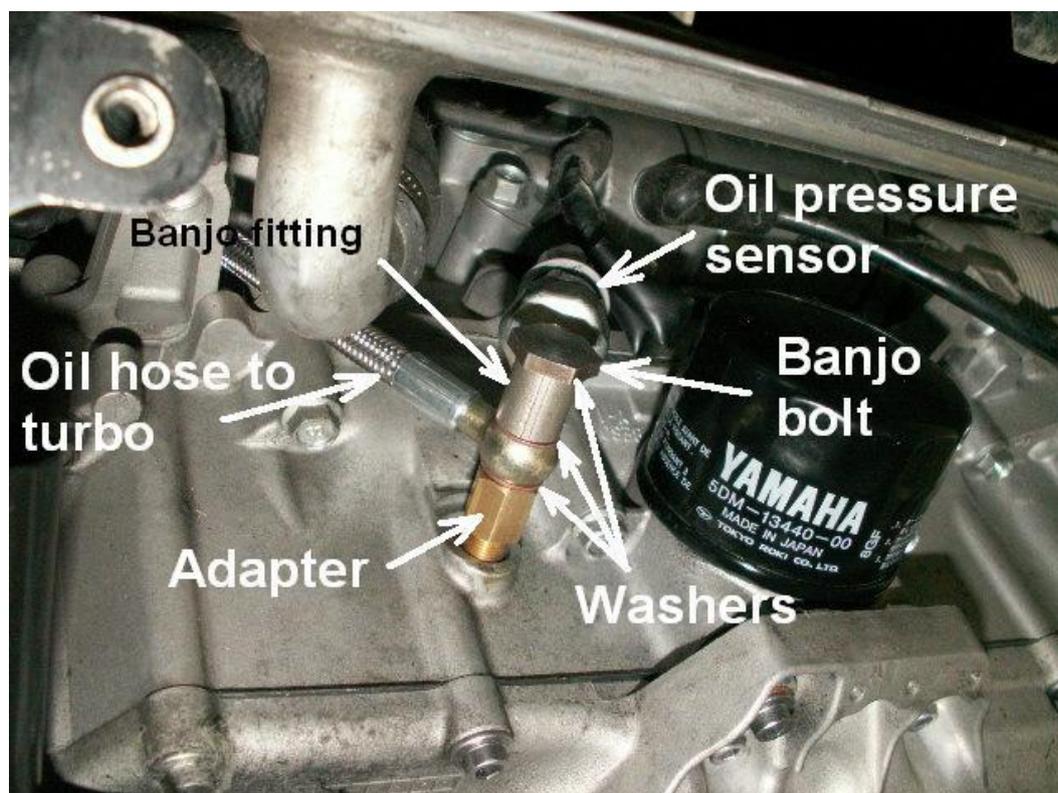
Use Loc-tite thread sealant (or similar) on the threads.

Install the sensor to the banjo-fitting that is supplied with the kit.

Use thread sealant on the threads.

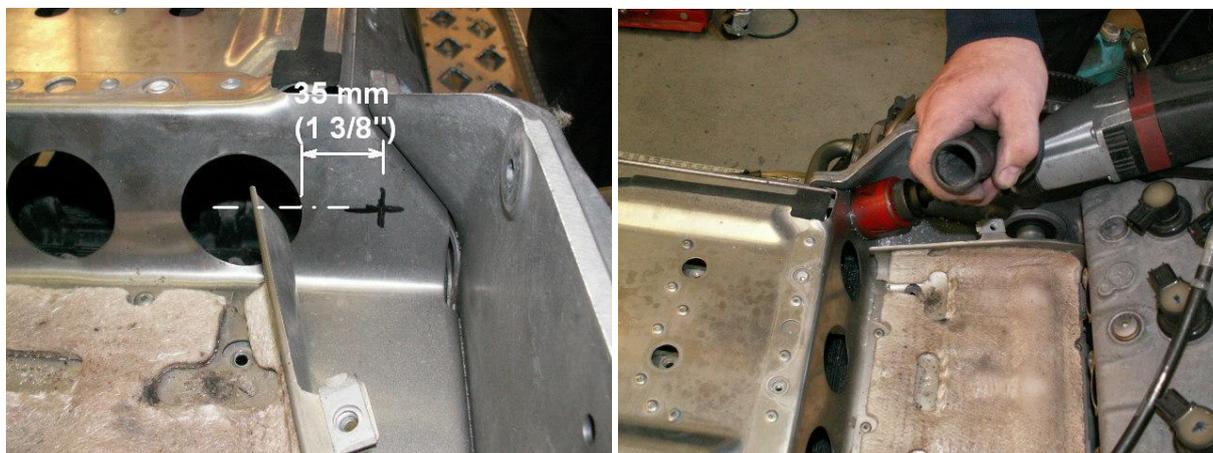
Install the turbo-oil hose (=the hose with 10 mm banjo on one side and 12 mm banjo on the other) the oil pressure sensor and the banjo-bolt like the picture.

Use copper washers between each item.

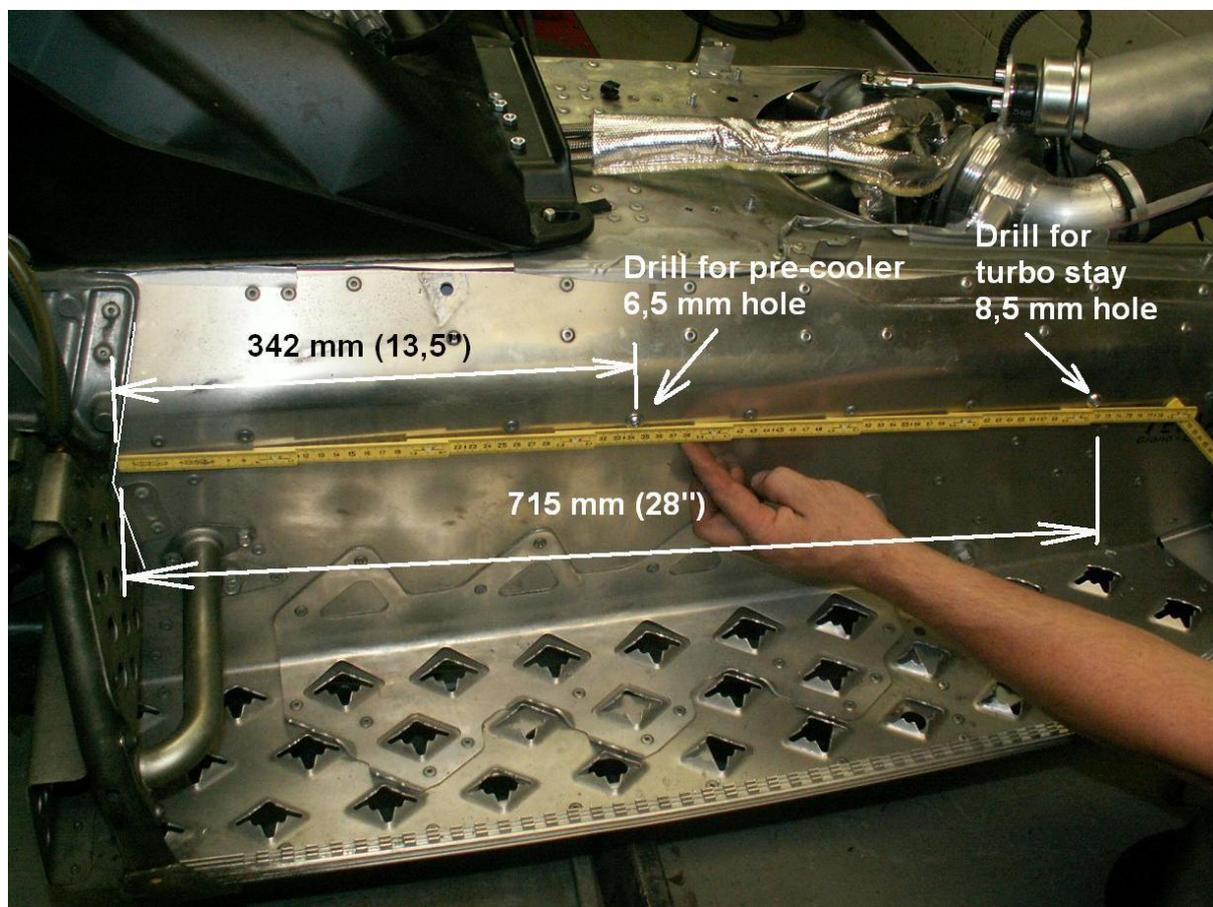


Pre-cooler installation

An charge air cooler ócalled pre-cooler- shall be installed above the track inside the tunnel.
A 51 mm (=2ö) hole shall be drilled like the picture.
Press the heat-shield a little to the side to make space for the drill.



Try on the pre-cooler to make sure that the hole is big enough.
Install the pre-cooler under the chassis. Remove one rivet and drill a 6,5 mm hole.
One 6 mm screw shall be located in this hole to secure the pre-cooler. Use a nut on the inside.



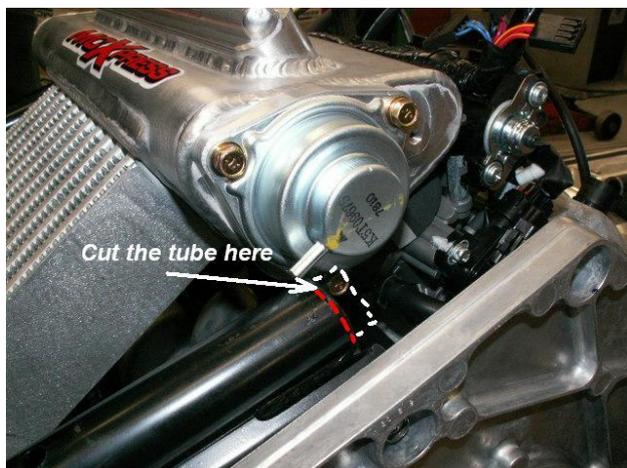


Pre-cooler view from under the chassis.
(Here are also the turbo installed)

Front frame modification

Cut the left tube (seen from the drivers view) about 15 mm before you install the front frame to the chassis.

Remove the plastic plug and install it again after you have made the cut.
The tube shall be cut to make enough space to the blow off valve.



Turn out the air adjusting screws $\frac{1}{2}$ turn each to get slightly higher idling rpm.

Turbo installation

Install the engine and the front frame to the chassis.

The front section of the exhaust system shall be used.

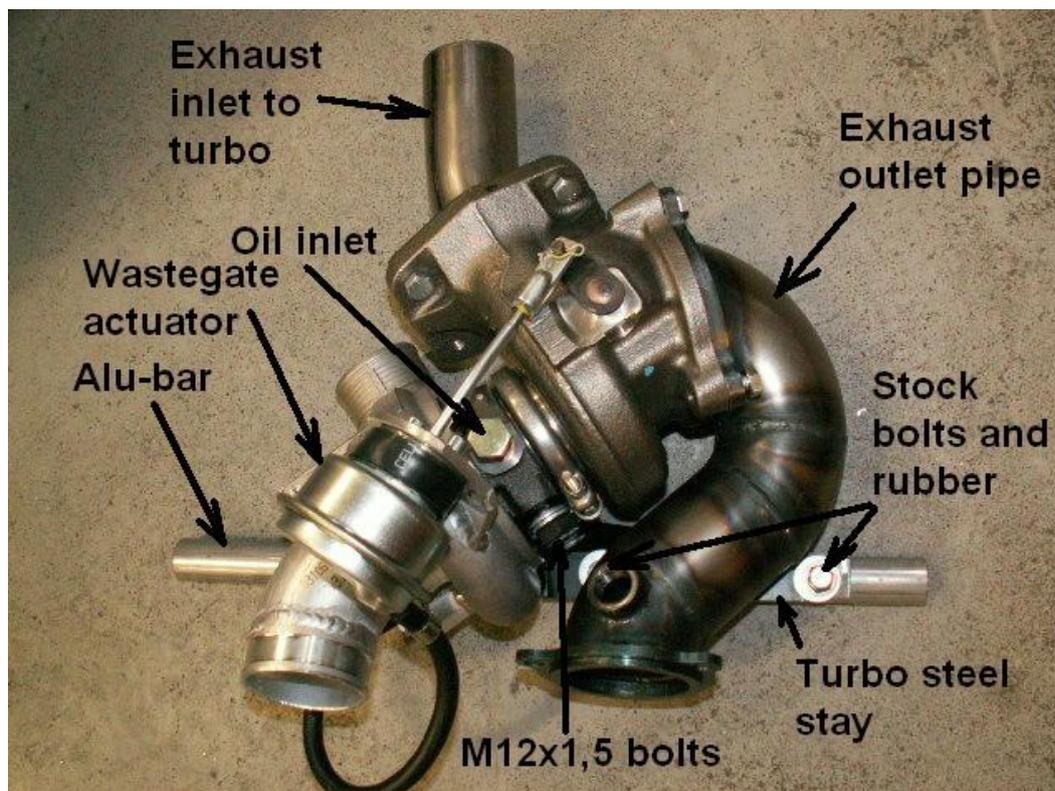
A short turbo inlet exhaust pipe supplied with the kit shall be welded to the stock exhaust pipe. To get the pipes in their right positions during welding, the turbo unit shall first be installed temporary, the pipe shall be spot welded and removed to be able to weld it properly. (A jig-tool is available to buy as an option to make the welding job faster.)



Cut the stock exhaust pipe where it has been welded (see upper photo)
Install the front end of the exhaust pipe in its normal position on the snowmobile.



Remove one rivet on each side of the chassis and drill a 8,5 mm hole where they have been located. (Regarding the location of the rivet that shall be drilled out, see page 10)



Install the steel-rear stay that shall keeps the turbo in place. (use two washers on each M12x1,5 bolt)

Install the 25 mm aluminium bar under the turbo to the rear bracket.

Use bolts and rubber mounts from the stock muffler.

Note: The length of this bar is made for the MTX model Nytro. This bar has to be cut about 3 mm on each side when installing the turbo kit on the short track model Nytro.



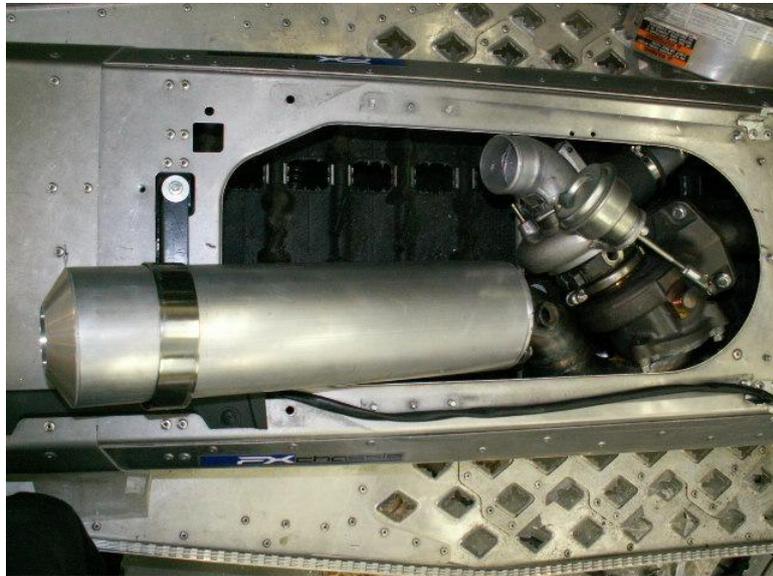
XTX model

To make space for the alu-bar on the XTX model, a steel-plate on each side must be grinded from inside of the chassis.

Install the exhaust outlet pipe to the turbo, but let the bolts stay loose.

Install the complete turbo unit into the chassis. Secure the aluminium bar to the chassis with 2 bolts with flat head where the rivets you just removed have been located.

Install the rear aluminium bracket for the muffler supplied with the kit to the chassis (use bolts and rubber mounts from stock muffler) Install the muffler clamp and the muffler. Tighten the exhaust outlet to the turbo.



Now when all the parts are in their right positions it is time to spot-weld the short exhaust pipe on the turbo to the stock exhaust pipe. Remove the turbo and the exhaust system again and weld the joint between the stock exhaust pipe and the pipe connected to the turbo.

Before you install the turbo to the chassis, install the air vent hose and the oil return hose to the oil pan under the turbo.

We recommend filling up the oil pan under the turbo with motor oil through the little hole at the top of the pan before you install the air ventilation hose. The reason for this is to ensure that the oil return pump gets lubricated fast when the engine is started.

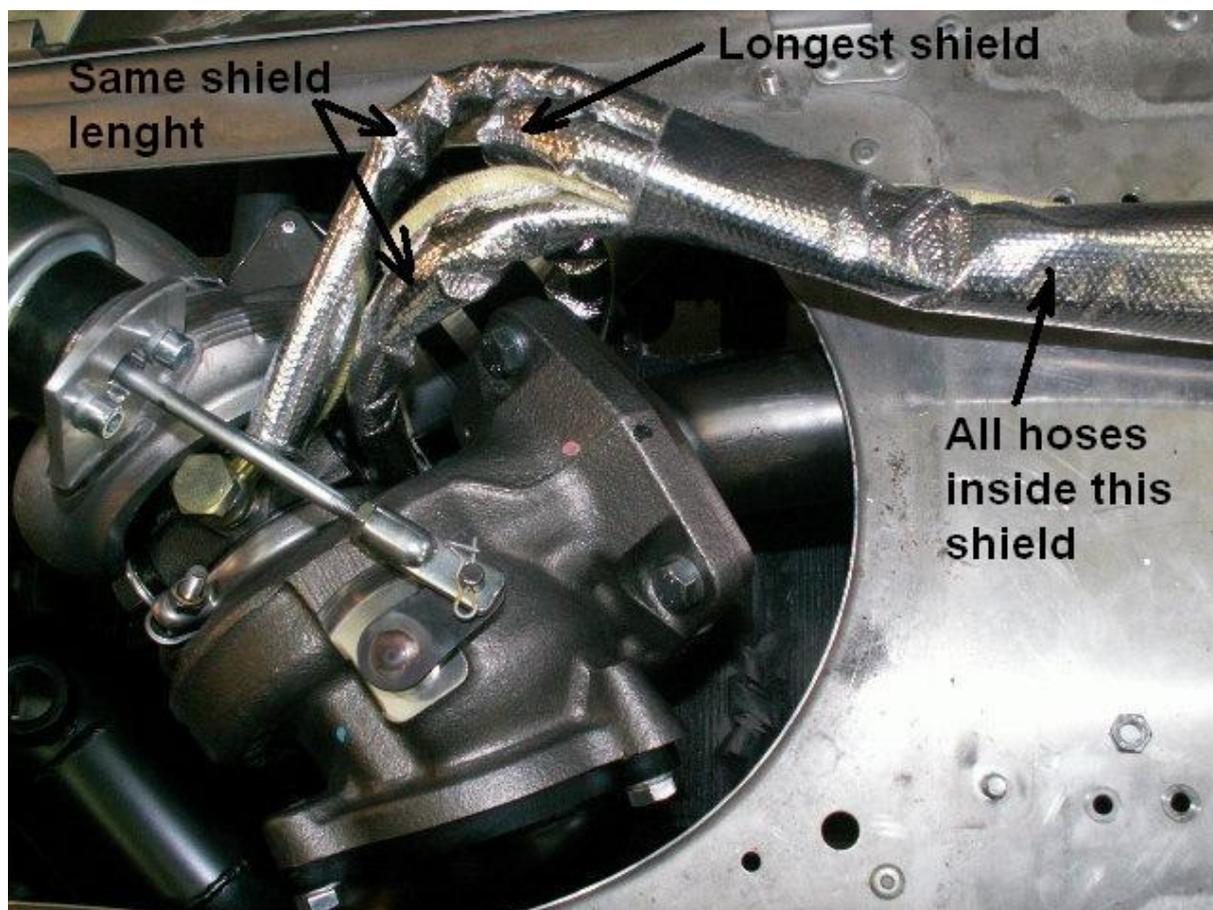
Use thread sealant on the small G1/8ö thread.



Install the heat shield above the exhaust system. Bend it a little (se arrows) to make space for the pre-cooler tube.

Hoses to and from the turbo

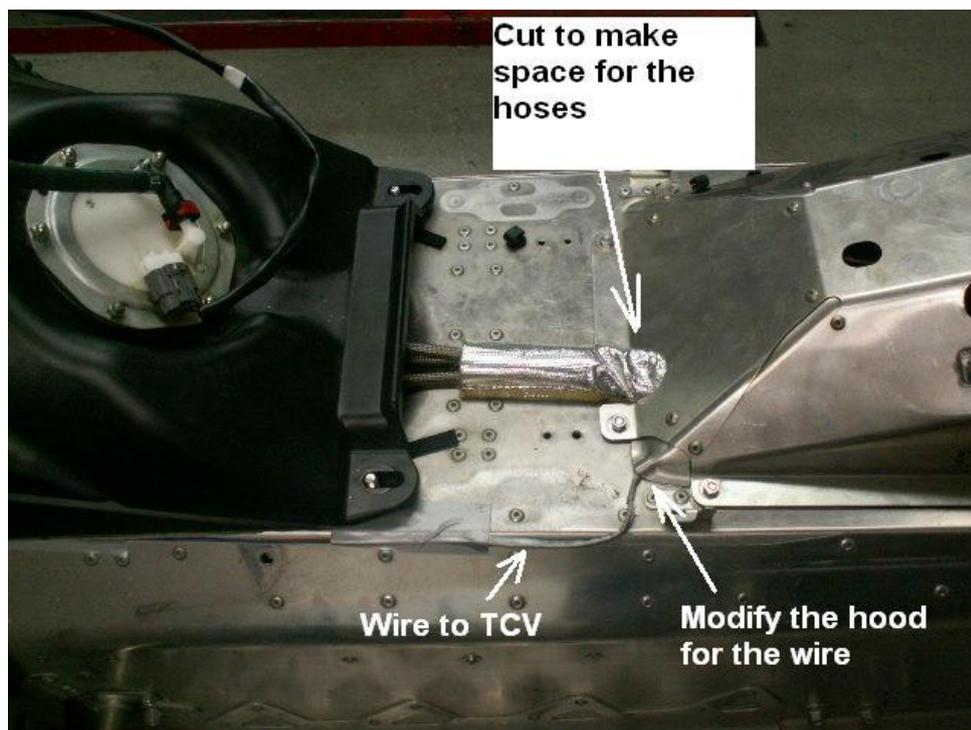
The air ventilation and oil hoses to the turbo shall be protected from the heat.



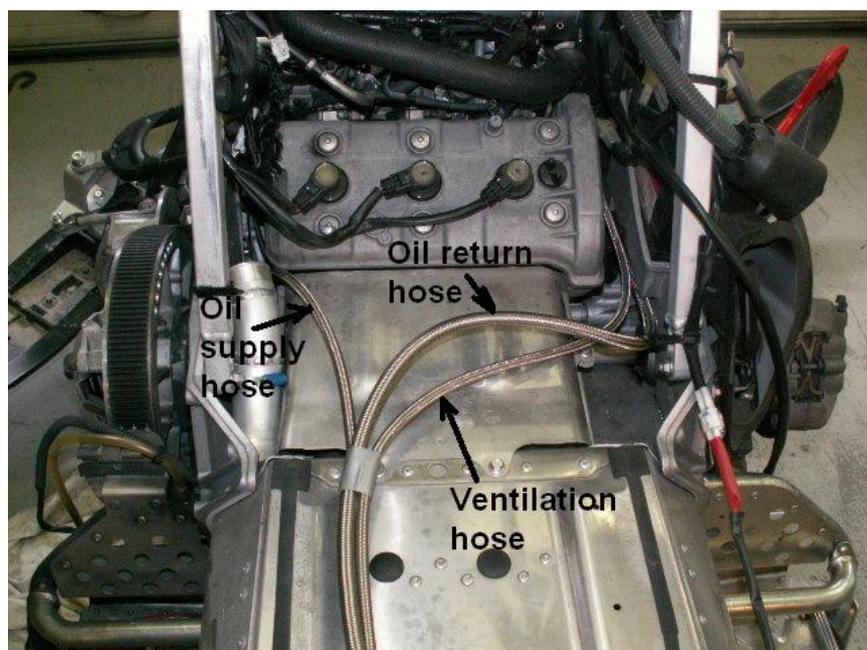
Fill some oil in the oil inlet of the turbo before you install the hose on top of the turbo.



Remove the bracket inside the hood above the turbo.



Modify the alu-hood on top of the turbo to make space for the hoses and the TCV wire. Do not final-install the alu-cover above the turbo until you have started the engine.

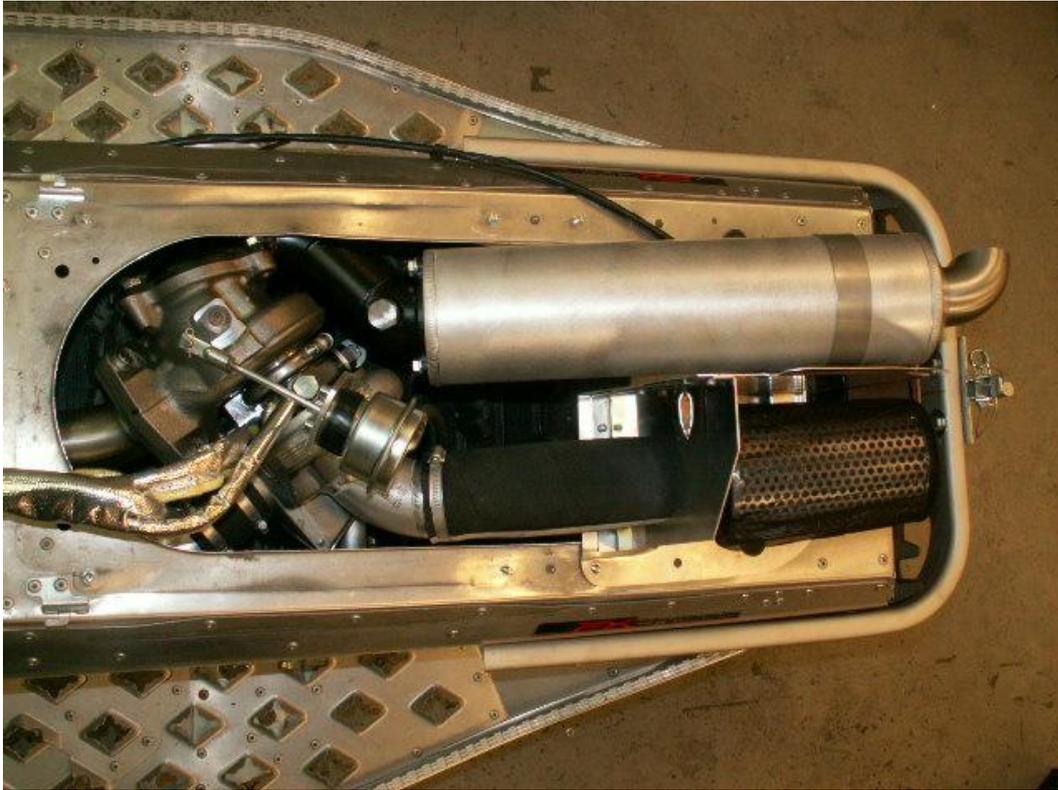


The thickest hose is the oil return hose.

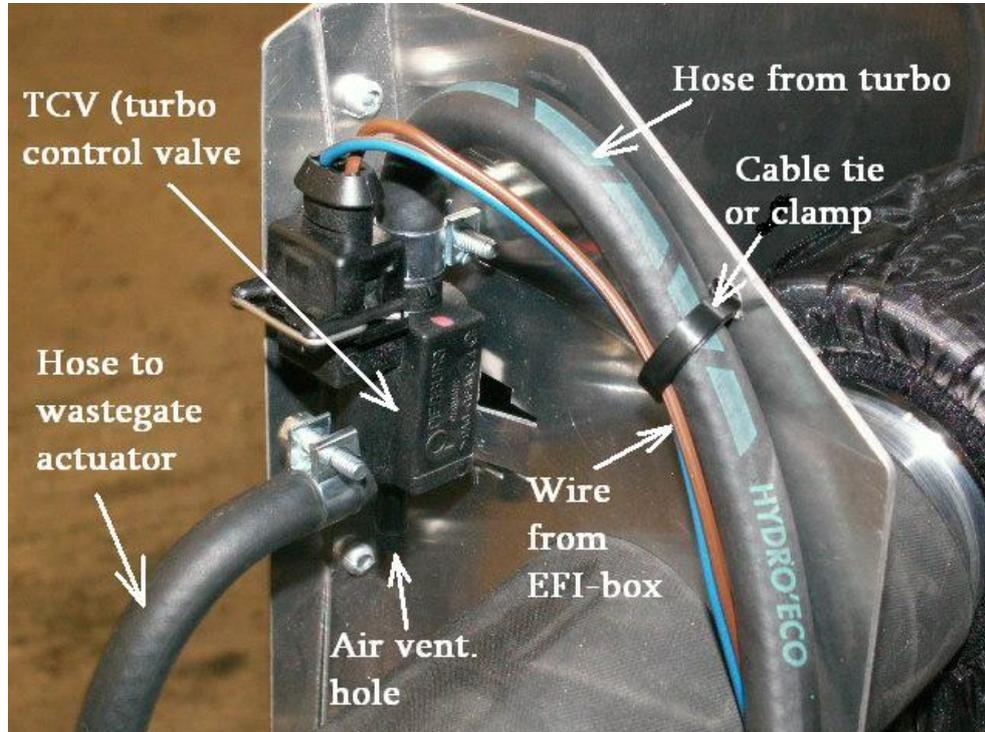
Caution: Hold up and fill the oil return hose with motor oil before you connect it to the oil pump. If not, the oil pump can jam when you start the motor for the first time. (See picture of the hose to the pump on previous chapter oil pump installation.)

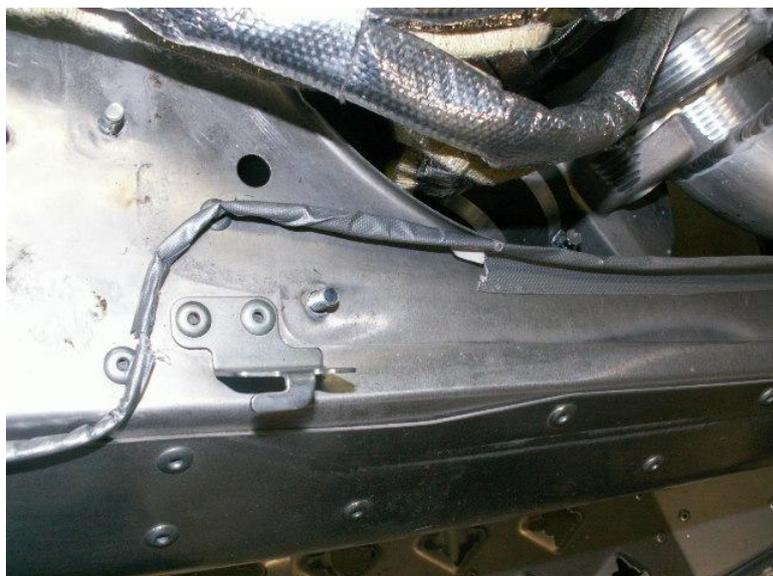
The oil supply hose is leading oil from the engine to the top of the turbo.

The ventilation hose goes from the top of the oil pan under the turbo to the side of the plenum.



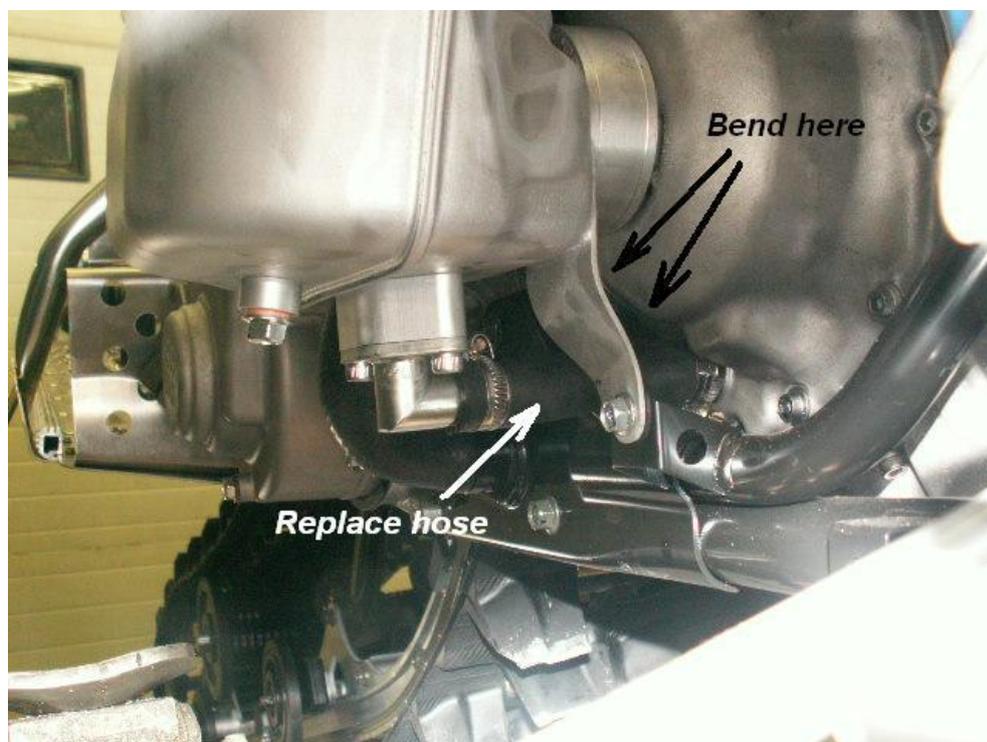
Install the heat shield plates beside the muffler and the air intake hose and basket. The thin snow-pre-charger shall be placed over the intake basket to prevent powder snow from being sucked into the turbo and engine.





The TCV (Turbo Control Valve) shall be fit on the snow shield plate.
 Drill two holes in the alu-shield and strap the hose against the shield with a cable tie or a rubber clamp.
 Strap the hoses to and from the TCV carefully to avoid them to come loose.
 Use duct tape to secure the TCV-wire to the chassis.

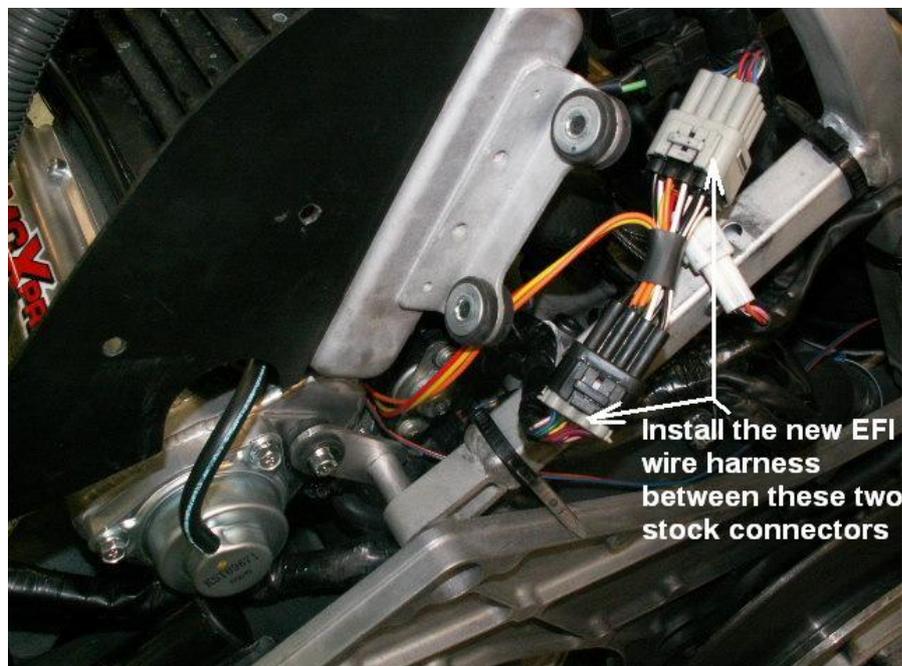
Oil tank



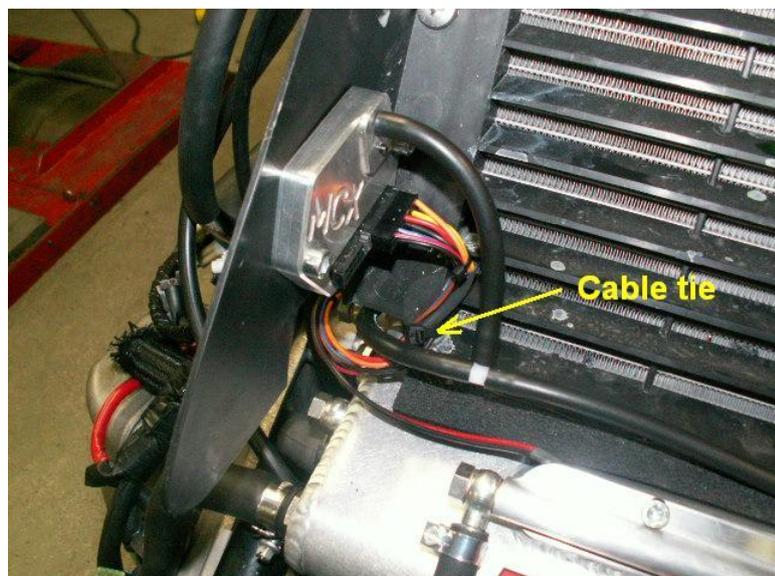
The oil tank has to be moved sideways a little due to the oil pump. Bend the stay a little to make this possible. Replace the hose between the engine and the tank to the longer one supplied with the kit. Stock hose clamps can be used.

EFI-box installation

The opening time of the fuel injectors must be extended when the turbo creates pressure. An EFI-box shall be connected to the stock wire harness.



Disconnect the big connector se picture above, and install the EFI-box with wire harness supplied with the kit. Install the black wire to battery ground (-)

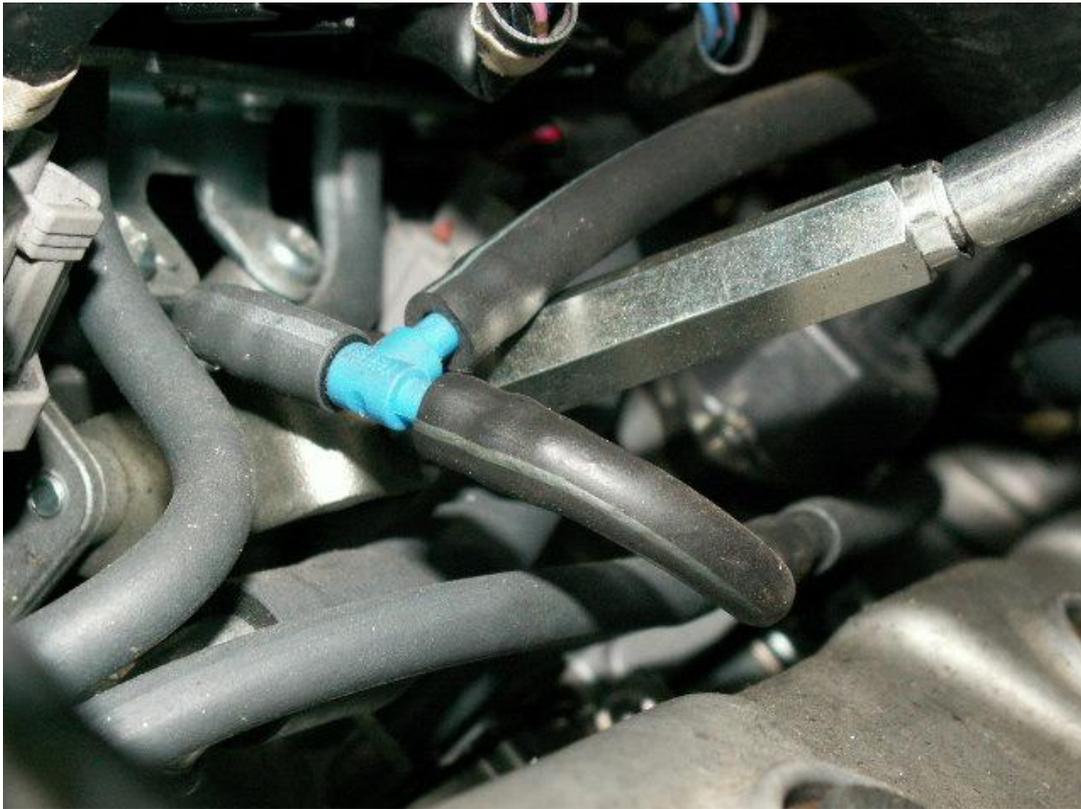


Install the EFI-box against the plastic like the picture above. Drill two holes in the plastic to make it possible.

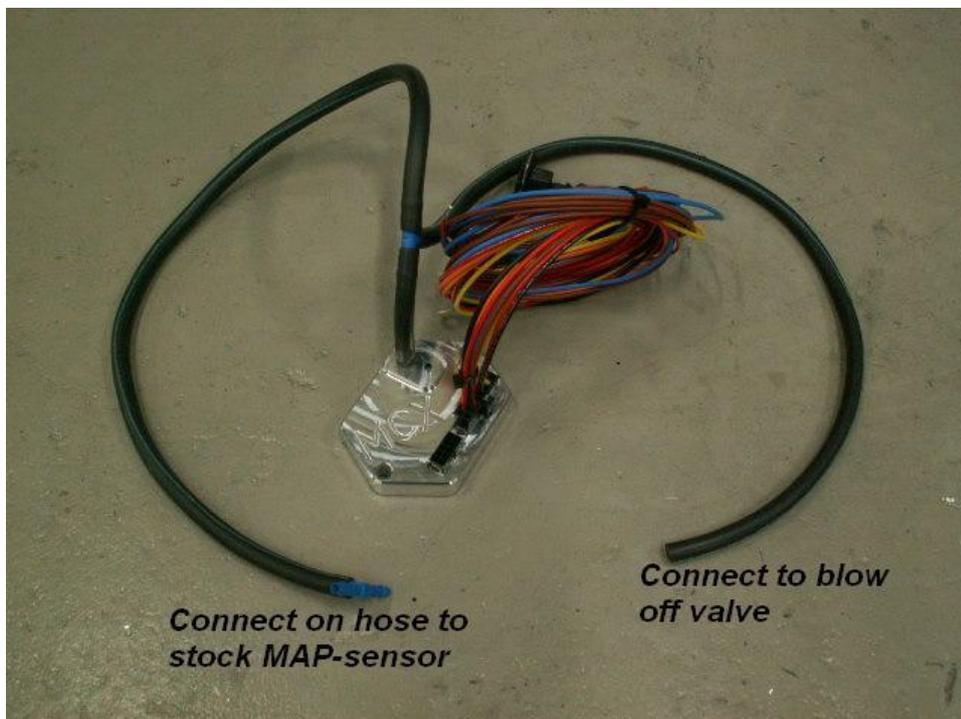
Strap the wire harness against the plastic with a cable tie.

Strap the wires between the big connectors and the EFI-box against the stock fuel rail.

The EFI-box and the blow off valve have to be connected to the pressure on the intake manifold.



Cut the small hose leading to the stock / right MAP-sensor.
Install the plastic T on this hose leading the pressure to the EFI-box
and blow off valve located in front of the plenum.



The EFI-box and the blow off valve have to be connected to the pressure on the intake manifold.

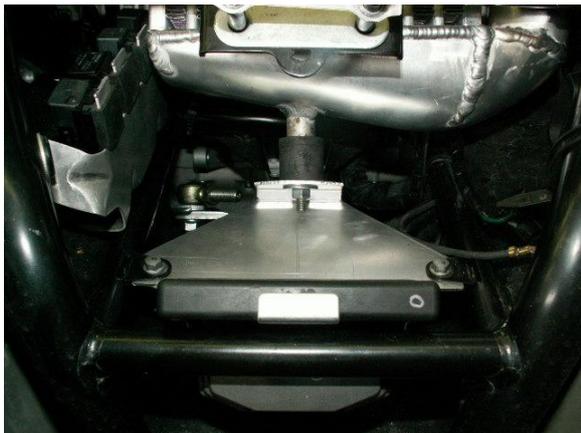
The water reservoir has to be moved to a new location under the intercooler /plenum. Install the 60 mm long alu-spacer like the photo below. A 25 mm long rubber mount shall be placed on top of the spacer.



Plenum installation



To make space for the intercooler, the small stay where the water reservoir was originally installed has to be cut away.



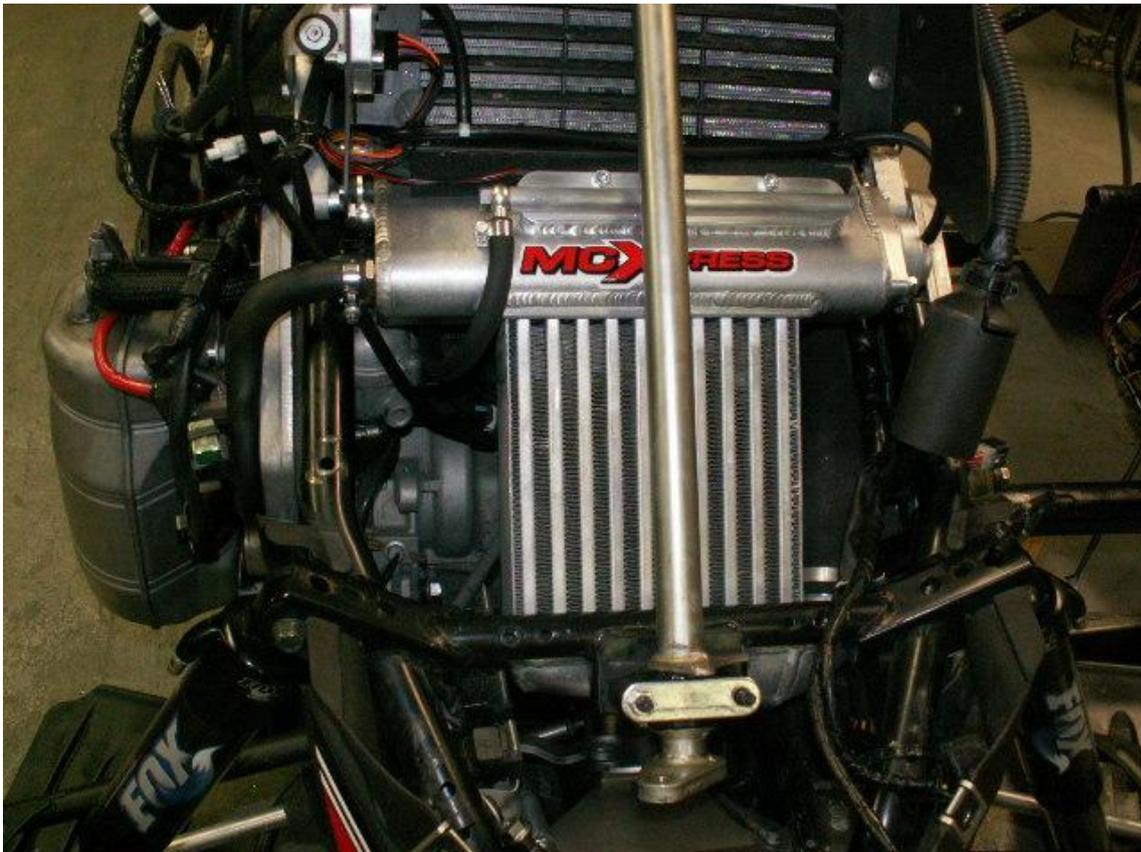
Front intercooler/plenum bracket shall be installed as the picture. Use the 25 mm long rubber mount between the air tank of the intercooler and the bracket. Don't forget the ground cable.

Connect the wires from the injector inside the plenum to the EFI-box wire harness.



Remove both stock fuel quick connector from the fuel hose and use it on the new rubber hose supplied with the kit.

Install the new rubber hose between the fuel outlet of the tank to both the stock fuel rail and via the blue T -to the extra injectors in the plenum.



The plenum shall be installed on top of the throttle bodies.

Three 25 mm long hoses diameter 50 mm and 6 hose clamps shall be placed between the plenum and the throttle bodies.

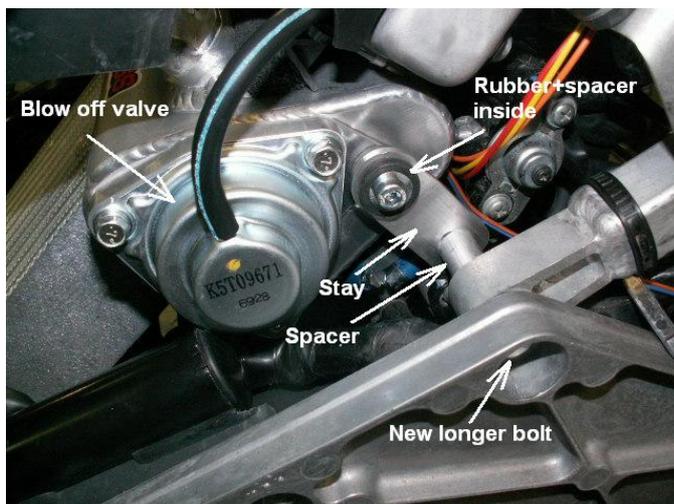
To prevent the plenum from blowing off, one bracket on each side shall be installed.

A rubber mount with a spacer inside shall be installed on each bracket to get rid of the vibrations. Use rubber mounts and spacers from stock air box.

Use new longer M8 bolts to secure the stay and alu-spacer to the frame.

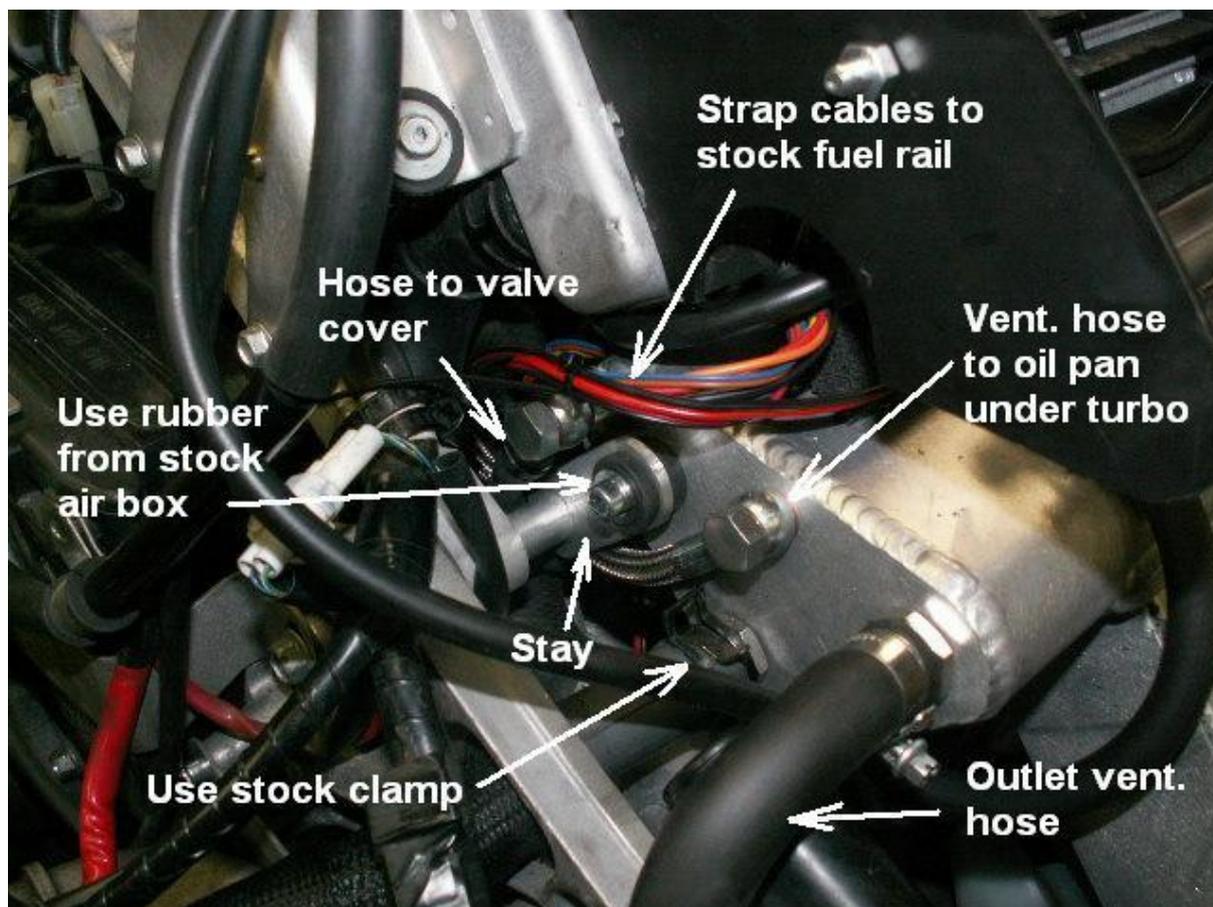
Connect the hose from the idle speed control valve.

Connect the vacuum hose to the blow off valve.



Install a stay on each side of the plenum.

Use the rubber mounts from the stock air box.

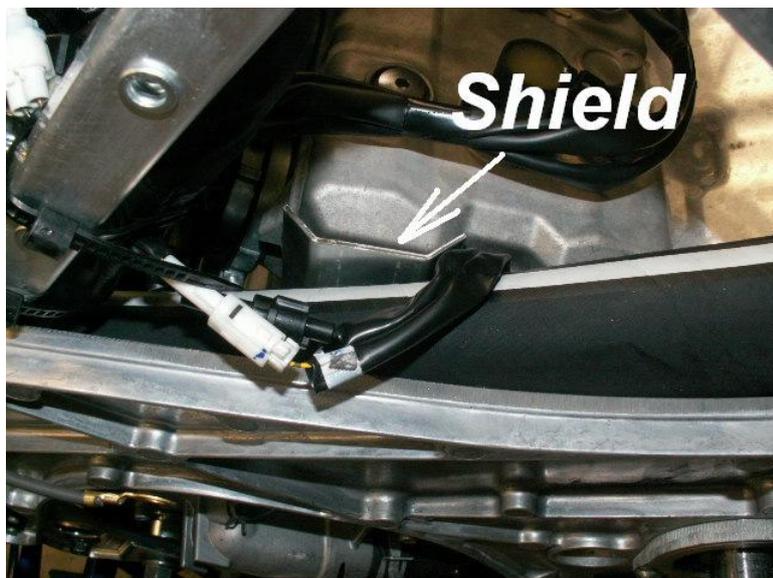


Connect these hoses to the side of the plenum.



The hose from the oil tank shall be cut a little. (See picture)

The outlet ventilation hose you find inside the stock air box. Cut this hose about 25 mm(1ö) to make it fit better. This hose shall ventilate out in the atmosphere.



Install the pressure hose between the pre-cooler and the plenum.
To protect the head cover gasket, an alu-shield shall be installed like the picture.
To make it stay in place permanent, you can use suitable sealant between the head cover and the shield.

Install the water radiator to the frame again.



The air temp sensor shall be removed from the stock air box.
Connect the sensor to the stock wire harness and strap it against the plastic headlight frame like the picture above.

Clutch modification.

Thanks to the higher power of the engine, the clutch has to be adjusted.
Install new clutch weights. (bought as an option)



Remove the bushing from the stock clutch weights and install them on the new ones.
Use the alu-pin-tool supplied with the clutch kit.

Start the engine

Start the engine before you put on the shield, seat and fairings above the turbo.
Check for leaks.

Caution: We recommend loosening the oil inlet M12 banjo-screw on the turbo for a second just after you started the engine, just to make sure the engine and turbo get lubricated.
If everything seems to be working fine, install the heat shield. Let the engine be heated up and make sure the water is circulating through the coolers.
Install the remaining parts.

Test-driving

CAUTION: Always use high octane pump gas or race gas. Low octane may cause engine damages. Test-drive the snowmobile.

CAUTION: Be very careful when you drive in the beginning. Check water level and oil level several times. Check for leaks and control so everything seems normal. It is very important that it is no air left in the water cooling system.

The recommended turbo pressure is 90 kPa. (12 psi) The power will then be 240 hp. Using higher turbo pressure may cause engine damages.

The maximum turbo pressure shall be tested after the installation.

When testing turbo pressure, we recommend connecting a gauge via a T-connector on the same hose as the blow off valve is located.

The test shall be made at full throttle for at least 4 seconds.

The clutching must be right to avoid the engine to hit the RPM-limiter when testing the turbo pressure.

We recommend being careful when testing the turbo pressure.



The turbo pressure can be adjusted by changing the spring pressure of the waste gate actuator. This is done by adjusting the length of the rod on top of the turbo. Shorter rod=higher turbo pressure.

When the turbo pressure is tested and everything seems to work fine, install the shield on top of the turbo permanent and the seat etc.

Good to know:

When you start: Turn the key and start it without touching the throttle.

Let the engine idle for a while until the temp light has turned off.

Drive gently before the engine has reached proper temperature.

Before you intend to stop, drive slowly and gently the last minute.

Let the engine idle, but maybe just for about 10 seconds.

Don't use full power if the fuel level in the fuel tank is low, especially in steep hills.

This can cause fuel starvation and engine damages.

Stickers

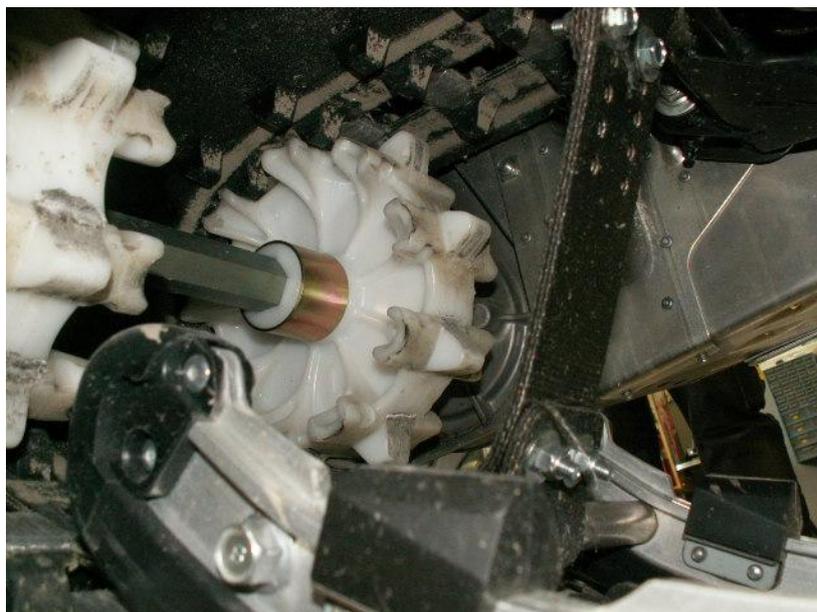
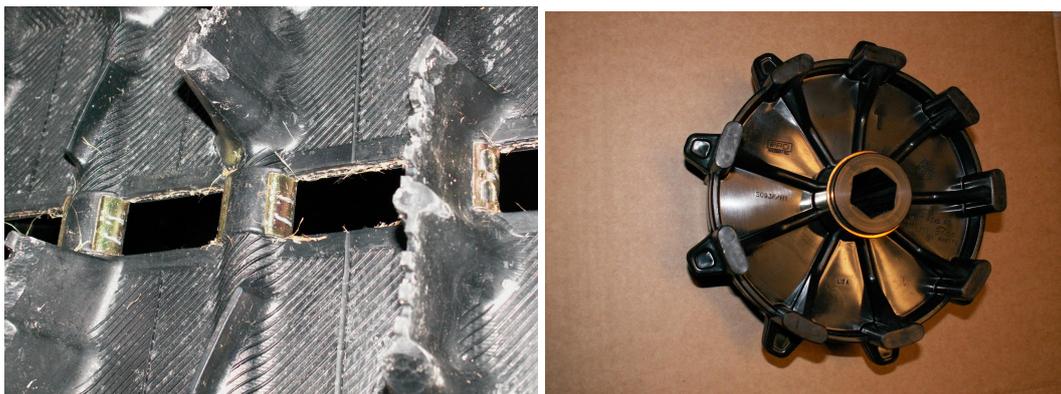


Put the sticker 98 octane (Europe) or Premium only (USA/Canada) close to the fuel cap to remind the driver of the recommended fuel quality.

Options:

Track modification.

The increased power by the turbo will make the stock drive wheels to spin in the track. This can be prevented by installing new drive wheels like the pictures. We also recommend opening up the windows and fully clip the track. This is not necessary on the mountain (MTX) model.



Powder snow air intake (Option)



When driving in deep powder snow, we recommend installing our snorkel kit. The parts included with the kit are a 90 degree hose bend, a short 60 mm alu tube and some hose clamps.



Power upgrade kit (Option)



MCX offers a power upgrade kit.

With a new fuel pump and fuel pressure regulator like the pictures above, 270 hp can be reached at 212 kpa absolute pressure, still running on high octane pump gas. This is 112 kpa (=16 psi) turbo pressure at sea level.

