"PERFORMANCE INNOVATORS NOT IMITATORS"

CPC TURBO M8 Stage I "Pump Gas" HANDBOOK W/ GARRETT AUTOMOTIVE TURBO

CPC Turbo Pump Gas M8 Handbook with Garrett Automotive Turbo

Thank you for purchasing a CPC Arctic Cat M-8 Turbo Kit. Our kits are built to the highest quality standards. This handbook contains both generic and specific information regarding turbo operation and installation. It contains valuable information that will help you understand how turbos work. It also provides information on how to tune your turbo powered Arctic Cat and how to get the most performance out of this product as well as ways to avoid potential problems and save money.

CPC has been turbo charging snowmobiles since the mid 1990's. Back in the day, the snowmobile public thought that turbo charging a Two Stroke engine could not be accomplished successfully. Our first Turbo project was a 1994 EXT 580 which proved to be a learning experience The following year we completed a more reliable turbo charged ZR 580 with great success. As the years followed, the Turbo kits continue to be refined. During this time period the small displacement engines posed a challenge to clutch the "turbo lag" out. We were inspired to develop special clutching for turbos. CPC invented the "Turbo Helix". This allowed us to clutch the power characteristics of turbo charged engine. We then developed special springs and cam arms as well. Recently we invented the duel injector throttle body and the intake high performance fuel pump. All of these designs are still being used today by CPC and many other tuners.

What kind of Turbo does CPC use and why?

CPC uses a GT Garrett RS series duel ball bearing turbos. Garrett turbos have passed intensive testing for durability, safety and efficiency. Garrett GT series turbos have higher efficiency ratings which reduce heat and produces more pounds of air per minute than other turbo manufactures.

What kind of maintenance and care is required for the Garrett RS series turbo?

We recommend that you use Mobile 1 synthetic 5 w 30 oil or 0 w 30 if temps drop below -20 F. This oil should be changed every 750 miles along with the replacement of the in-line oil filter.

How can the Garrett turbo become damaged?

The most common way a turbo can be damaged is when catastrophic engine failure exists. A hard piston seizure can damage a turbo if metal particles are sent down the exhaust pipe into the turbo. Second, is improper lubrication or the lack of lubrication from an oil pump failure. This can happen if the snowmobile is run upside down or on its side. If you have an accident where you roll the snowmobile and the snowmobile spends a considerable time up side down or on its side, then you should immediately shut the engine off, up-right the snowmobile, then check oil level. The correct amount of oil is 18 to 20 ounces when filling the oil tank. The tank is full when the oil is about 1.75 inches from the top of the tank (which is to the top of the baffle inside the tank). The oil level should be checked often to avoid running the turbo low on oil.

Why doesn't CPC use an Inter-cooler on your kit?

Inter-coolers can be beneficial after 12 lbs of boost and if the user is on boost for long periods of time, (usually after 30 to 45 seconds of max boost). We have found that 85% of our customers do not use their turbo snowmobile to this extent. Therefore inter-coolers are only effective if and only if they are large enough and only if there is adequate air moving through the inter-cooler.

This is hard to achieve on a snowmobile application because of space limitations. Also all inter-coolers add restriction. 1 to 1.5 lbs of boost is normally lost when using an inter-cooler. You need to work the turbo harder by turning up the boost (meaning more heat as you compress the air at a higher boost) to overcome the loss of efficiency. CPC also uses a cold air intake, one of the few companies to offer cold air intake on turbos kits. Remember that colder air is more dense, that is, it caries more oxygen than hot air. For every 10 degrees F. you lower your intake temperature, your engine produces 1% more horsepower. An example of this is if one turbo kit breathes hot air under the engine compartment and another turbo kit manufacture use a cold air intake, and the difference is 40 degrees F, then the company with a cold air kit has a 4% advantage over the other. More oxygen means more horsepower!

What kind of fuel is required on a CPC turbo kit?
CPC requires that you use a minimum of 91 to 93 octane fuel depending on how much boost and what altitude you run. The pump gas kit does NOT come with a high performance fuel pump or electronics to drive the pump so you are limited at 4 ½ lbs of boost at sea level. If you run between 5000 to 8000 feet altitude you are limited to 6 lbs of boost. If you run over 8000 feet altitude, then you can run safely on 6.5 lbs to 7lbs of boost with 91 octane fuel. If you try to run over these boost limits, then you will experience engine failure because the stock fuel system and electronics can not supply enough fuel to prevent seizure nor can the above octane recommendations safely support these boost limits without detonation. If at a later time, you decide to run higher boost levels, then CPC has upgrades to allow safe higher boost levels along with running higher octane fuel.

What kind of oil do I use in my engine on a CPC turbo kit?
There are many brands of quality oil. The most important concept to focus on is to use 100% synthetic oil. We use genuine Arctic Cat synthetic APV (blue) and have had great success. Again, pick a brand of oil and stay with it. Mixing brands of oil each ride does not make good sense.

Will running a turbo wear my engine out prematurely?
Yes, it is impossible to make more horsepower and not experience added wear to your engine. The most important thing that you can do is make sure you are jetted correctly. Running your engine with a lean air/fuel ratio can promote detonation even if you use 110 octane fuel. If you experience detonation (loose spark plug is the first sign of detonation), the first thing you should do is add more fuel with your Attitude EFI controller.

If I install a CPC turbo kit on a new snowmobile, will I need a break-in period of time?
Yes, all new engines require a break-in. Naturally aspirated (stock) require a one tank fuel break-in. CPC recommends two tanks of fuel break-in period of time. This allows for the piston to wear a little. Most piston seizures result from too much heat being induced into the piston. Piston's expands when heated. If the piston is heated too much, they will grow larger than the cylinder and piston seizure will result. Long pulls up a steep mountain will result in stressing the pistons. If you are jetted a little on the lean side, you will be a major candidate for a new piston and cylinder. The two tanks of fuel break-in also allows you plenty of time to dial your jetting in and get use to the awesome power of this kit.

What type of maintenance will be required with my CPC turbo kit?

Spark Plugs. Spark plugs are always a wear and tear item on turbos. Because of the use of leaded race fuel, lead deposits can shorten their life. If your engine starts to miss or just doesn't seem to run right, then replace the spark plugs. CPC recommends replacing them every 300 to 500 miles. If you detonate your engine, then replace your spark plugs as we have seen the electrode break off due to detonation shock waves. Spark plug gap should be set at .025 on all turbo applications due to boost "blowing out the flame" concept which occurs on wide gaped spark plugs.

Reed Valves. Turbos are hard on reed valves and wear them out quickly! Reed valves will need to be replaced on a regular basis on all turbos regardless of how much boost you run. Generally we recommend replacement at 600 miles. Running boost over 8 lbs will require reed valve replacement sooner.

Diamond Drive. Another maintenance item is changing oil on a diamond drive. CPC recommends that the oil be changed every 250 to 500 miles. Another maintenance area is that of drive belts. You need to expect that your drive belts to wear out sooner since you have more horsepower and torque. Keep an eye on them every ride. If you blow a belt under full boost, you can expect for your crankshaft to be bent! On a turbo powered sled, belt alignment is critical and you will need to correct any misalignment. This alignment is different than clutch offset. This procedure should be performed before using your turbo powered snowmobile.

Pistons. Periodically it is a good idea to replace pistons. We are often asked how often, that depends on how many miles you drive and more importantly is how you have tuned your engine. Engines that are run too lean will wear out pistons faster. Riders who climb long hills (long pulls over 30 seconds) will wear out pistons sooner due to heat saturation. Riders who know only one speed (wide open) will wear out pistons faster. If you experience detonation (loose spark plugs is a sign of detonation), you can break the ring lands out of your pistons. Simple put there are too many variables. But one thing that I can tell you is that those individuals who change out pistons sooner will have less long term problems. Most turbo owners on an average change out pistons at about 1000 to1500 miles of use depending on the above criteria.

Water Temp Water temp is always a concern especially on hard packed roads and spring riding. Remember that the byproduct of horsepower is heat. With a turbo it is easy to stress your coolant system. Using a water temp gauge is a great idea to keep an eye on the water temp. We recommend that you never exceed 145 degrees F. water temp. On the M-8 engine, the ECU has been programmed so that if the engine sees too high of water temp, the engine will go into fail safe mode. The same is true with respects of shutting off a hot engine. It is normal for water to heat up after the engine is shut off (due to no water circulation). The ECU see's this high water temp and will not allow the engine to restart. This can cause concern and may be a hassle if this happens to you. Because CPC can not reprogram the ECU, we can not change this symptom. We have addressed this issue by installing a water temp by pass wiring plug assembly. If you shut off the engine and can not restart it then you will need to reset or trick the ECU. This can be accomplished by flipping a switch, then restarting the engine and again flipping the toggle switch to the normal run mode. Now that you know that this is a characteristic of a turbo charged engine, it should not create any more concern.

The following chart will show recommended fuels and recommended **SAFE** boost levels to be run at specific elevations. If you exceed boost levels or run lower octane, you're on your own as internal engine damage may result! CPC manufactures a special waste gate actuator for customers wanting to run pump gas (91 to 93 octane). NOTE: **Pump gas turbo kits must be upgraded with larger fuel pump & electronics before running more that 7 lbs of boost regardless of elevation or octane of fuel!!! All 2010 models must have their heads modified for running elevations lower than 6000 feet!!!!!**

Elevation	Max Boost on Pump Gas 91 Octane	Max Boost on TrackTec 110 Octane	Max Boost on Sunoco 112 Octane
0 - 5000 FT	4 1/2	7	9
5000 - 8000 FT	5 1/2 - 6	9	11
8000 + 11000 FT	6 1/2	10	13

M-8 Installation Instructions:

#1. Wash your snowmobile to remove all dirt and grease and belt dust in the engine compartment. Leave the fuel tank empty as the fuel pump will need to be removed later in these instructions. Remove both left and right hand side panels.

#2. Remove the hood by using a 5/16 socket or flat head screwdriver and remove screws which hold the hood retaining cables to the hood. Then remove the hinge pins and disconnect the headlight harness.

#3. Using a spring removal tool; remove all springs which hold the exhaust pipe onto the muffler and "Y" pipe from the engine. Then remove both the muffler and by using a 12mm end wrench, remove the stock "Y" pipe. Save the hair pin and rubber grommet out of the stock muffler and exhaust springs as they will be used later.

#4. On 2007-08 models remove the CCU (Chassis Control Unit) on the right hand shock well. Then remove the ECU (Electronic Control Unit) using a torex #27 and 7/16 socket from the air box. Using a #20 torex driver, remove the front bolt holding the air box to the nose cone. Next use a flat blade screwdriver and pry the push darts out that holds the air temp sender onto the air box. Then unplug the air temp sender. Save the push darts to be installed later. Then remove the black plastic air duct between the throttle bodies and air box.

#5. Next using a torex #25 driver, remove the aluminum shield which is located in front of the fuel tank which is mounted to the steering post supports square tubes, and then remove the two nuts holding the steering post on to the steering support using a ½ inch socket.

#6. Next unplug the black plastic two way connector that comes out of the fitting in right hand front of the fuel tank. Then using a long flat head screwdriver, remove the hose clamp off the hose (at the fuel tank location) that leads to the throttle bodies.

#7. Using a 15/16 wrench and a flat blade screwdriver; remove the nut and brass fuel nipple on front of the fuel tank. Account for the rubberized flat washer and standard flat washer. Next remove the fuel cap and by reaching one of your hands down the filler neck, gently wiggle the fuel pump assembly which is located in the top right hand corner and remove this assembly and smart valves out the filler neck. Using a 3/16 inch drill bit, carefully drill the head off the two pop rivets that hold on the factory pressure regulator onto the fuel pump assembly. Using compressed air, blow off the metal chips. Then gently remove the factory pressure regulator by pulling straight out. Account for the two black rubber "O" rings. Using a 1/8 punch; remove the remains of the shank of the pop rivets in the fuel pump assembly. Then search through the provided turbo assembly parts and locate an aluminum plug and two large head pop rivets. Next install the two black "O" rings onto the aluminum plug. Then lubricate the outside diameter of each "O" ring with a small amount of grease. Then insert the aluminum plug/O rings into the fuel pump assembly making sure that you do not pinch the O rings. **Do not install the green plastic rings onto the aluminum plug.** Then secure the plug by using the two new pop rivets provided in the turbo kit. Then reinstall the fuel pump assembly into the fuel tank. Using your hands, make sure the lines leading to the smart valves are straight and not kinked and are returned to their original location in the tank. You can now reverse the order for the fuel pump reassembly. Then re-plug the fuel pump wiring into the original wiring harness location.

#8. Now hook up the Attitude Industries EFI control box as per instructions provide by Attitude Industries. If you are going to mount the Attitude box on the steering post you must now route the wire down the steering post area and wire tie the wires together. You will hook up the Attitude connectors to the injectors after step # 10. If you mount the Attitude box under the hood then you can attach the Attitude box up later and route the wires as needed. You can view these instructions at their web site at www.tunewithattitude.com. After you complete the turbo install, you can then program the Attitude box as it will require the engine to be running to power up the EFI Attitude control box. If you ride at 9000 ft altitude the beginning settings are as follows: Green 3 ½ lights, Yellow 4 1/2 lights, Red 5 lights, Green/Blue 5 lights and Red/Blue 5 lights. **This is just a starting point**. Adjust fuel as needed.

#9. The next step is to install the charge box. This step is best performed by removing the bottom belly pan with a T20 Torex driver. Next, using a Phillips screwdriver, loosen the clamps holding the throttle bodies onto the rubber intake manifolds. Disconnect the injector plugs and then disconnect the throttle cable and disconnect both coolant lines that go to the throttle bodies at the throttle body location. Then remove the fuel line to the fuel rail and then remove the oil injection link between the throttle bodies and oil injection pump. Then remove the throttle bodies from the rubber intake boots. Next apply a small amount of grease to both "O"rings in the air charge box. Apply a good amount of pressure to slide the charge box onto the intake side of the throttle bodies. If it appears that the charge box will not slide on the throttle bodies, perform the next steep. Using a screw driver, loosen **all** the Phillips head screws that attach the throttle bodies onto the brackets. This will allow the throttle bodies to line up with the holes in the charge box. Then slide the charge box on to the throttle bodies and then tighten all the Phillips screws. At this point the charge box has perfect "O" ring alignment to prevent boost leakage or "O" ring pinching. Then using the aluminum boss on the charge box as a guild, mark the spot where the aluminum boss lines up with the metal support of the throttle bodies and drill a 1/4 inch hole in the steel bracket. Then insert the supplied 6m X 14 Allen head socket cap screw through the bracket into the charge box to hold it on securely. Tighten the screw with a 5mm Allen wrench. If your snowmobile has several hundred miles or more on it, we recommend that you replace the reed valve pedals. All turbo are hard on reeds and we suggest that they be replaced approximately at 600 mile intervals. Before reinstalling the throttle bodies, the coolant lines that originally fed the throttle bodies must be removed from the clamps on the bottom of the engine and re-routed to the back of the engine. Then rout the coolant lines under the recoil starter towards the turbo.

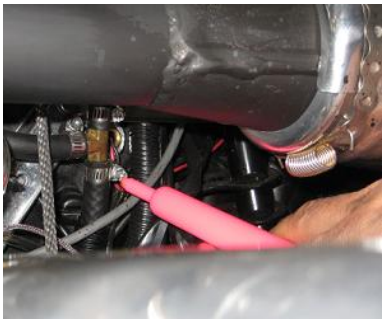
#10. The next step is to find the provided CPC fuel pressure regulator. Using some Teflon tape to seal the threads of the two 5/16 X 90 degree brass fittings, then screw the brass fitting into the back side of the pressure regulator. The center port on the back side is the fuel return back to the top R.H. corner of fuel tank. Then use Teflon tape on the fuel pressure gauge and install it into the top side port of the pressure regulator. Clock the pressure regulator so it positions the hose barb at about the 4 o'clock position, then install the pressure regulator onto the aluminum pressure

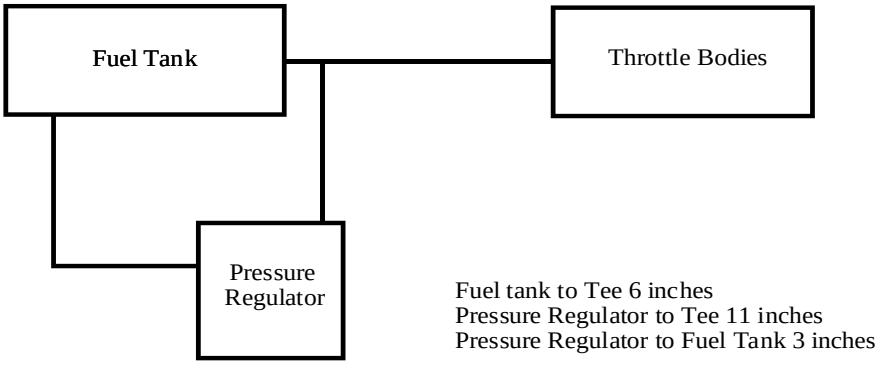
regulator bracket by removing the two screws from the pressure regulator body. Then using a 5/32 Allen wrench, tighten the pressure regulator screws onto the aluminum bracket. When installed correctly, the pressure regulator hose barb on the regulator should point inward toward the engine. At this point, make sure the brass 90 degree elbow is pointing up towards the top right hand corner of the fuel tank. The pressure regular/bracket assembly can now be attached to the fuel tank tab that holds the coolant bottle to the fuel tank. Using the aluminum pressure regulator bracket as a template, drill (3) three 3/16 (.187) holes into the plastic coolant bottle tab and attach with the provided pop rivets and backing washers (see photo).

#11. Next, attach a 5 inch piece of 5/16 hose to the brass 90 degree elbow coming out of the fuel pressure regulator. At the top RH corner of the fuel tank, where the end of this hose lies, is the approximate spot where a 9/16 (.562) inch hole is to be drilled into the fuel tank for the return line coming out of the fuel pressure regulator. From the supplied parts, locate the rubber bulkhead grommet and metal 90 degree bulkhead fitting. Then install the metal nipple of the bulkhead fitting onto the other end of the 5 inch piece of hose. The center of this fitting will now locate the position of the hole to be drilled into the fuel tank. Using a 9/16 (.562) drill bit, drill a hole in the top right hand corner of the fuel tank. (See photo) Note: Using a clean rag in your hand, with your hand down the filler neck of the fuel tank, you can catch the plastic shavings when drilling into the fuel tank. **Caution: be careful not to push drill bit into your hand and make sure fuel tank is empty!** Then push the rubber bulkhead fitting into the fuel tank. Then apply a small dab of grease onto the metal bulkhead fitting and push the metal end into the hole of the rubber fitting. Secure all fittings with the provided 5/16 hose clamps. In the provided parts, you will find a 35 inch piece of clear 1/8 inch hose. Connect it to the 1/8 hose barb coming off the fuel pressure regulator and attach the other end to one of the three brass hose barbs that are screwed into the charge box. Next, find a 12 inch piece of clear 1/8 hose and push the center brass barb of the 1/8 X 1/8 X 1/8 brass "T" onto this same hose. The other two ends of the brass "T" are spliced at a convenient spot into the 1/8 inch vacuum line that goes from the pressure regulator to the charge box. Then attach a 1/4 to 1/8 inch brass reducer to the end of the clear hose and then attach a 3 inch X 1/4 inch id black hose. This hose is connected to the turbo waste-gate actuator hose barb in step #16.

#12. From the supplied parts, you will find an on/off switch connected to a short wiring harness. This switch allow manual over ride for the temp sensor which is located on the bottom of the engine by the recoil starter. Located just below the coolant bottle you will find a yellow electrical connector. Unplug it from the main wiring harness and connect the said switch in series with this electrical connector. Drill console and mount this switch next to the key switch. Read the above section called "Water Temp" for more details.

#13. Next, re-install the factory aluminum heat shield back on to the steering post support bracket. Measure 6 inches down from the fuel tank fitting and cut the original 5/16 black fuel hose that leads to the throttle bodies, then install a 5/16 X 5/16 X 5/16 brass "T" fitting and reconnect it to the original fuel line that leads to the throttle bodies. Finally connect an 11 inch piece of black fuel line from the bottom of the Fuel pressure regulator to the "T". Using the provided 5/16 hose clamps, tighten and secure all lines. (See photo and diagram).





Fuel tank to Tee 6 inches
Pressure Regulator to Tee 11 inches
Pressure Regulator to Fuel Tank 3 inches

#14. Remove the Garret 28 series turbo out of the box. In the center of the turbo you will find a drain hole with two (2) 8m treaded holes on each side. In the turbo box you will find a fiber gasket as well as a metal exhaust flange gasket which will be used in the following step. Find two (2) 8m X 25m Allen head socket cap screws (SHCS) and an aluminum drain fitting with a hose barb nipple and center the aluminum fitting with the gasket between the turbo and turbo drain fitting and tighten to 20 ft lbs of torque. Using a ½ inch wrench, loosen all the bolts that secure the compressor housing and exhaust housing to the center section of the turbo. You will need to clock both the aluminum compressor housing and exhaust housing by spinning them on the center turbo bearing cartridge. Point the oil drain straight down and then rotate each housing so that the compressor housing outlet and exhaust housing inlet both point upwards. Do not tighten the bolts until step #15. (See photo). Next, find three rubber grommets from the supplied parts and install them into the CPC turbo oil tank. Then find three (3) 5/16 X 1 inch bolt and three (3) 5/16 SAE flat washers and three (3) 5/16 nylock nuts and mount the oil tank through the rubber grommet,

then into the CPC turbo hanger bracket. (See photo). Tighten the 5/16 bolts so that only one (1) thread are showing on the bolt. Over tightening of the three (3) bolts will cause the rubber to smash out and will negate the anti-vibration feature of the rubber grommets. Next from the supplied parts, find two washers that have a 14m rubber seal in the inside diameter and twist the metal/rubber washers on to two (2) of the fitting that have male threads on them; the end that has 14m threads is where the metal/rubber washer is placed. Then this fitting is screwed into the center section of the turbo. Tighten both fittings with a 19m wrench or socket. Both of these fitting will serve as coolant line fittings. Last of all find a brass fitting that is attached to a 5/16 id X 19 inches long hose. This hose and fitting screw into the top of the turbo and feeds oil to the turbo. Tighten this fitting with a 7/16 end wrench. The other end of the hose goes to the oil pump outlet brass fitting at the top of the oil pump. The turbo is now ready to mount onto the CPC hanger bracket.

#15. The next step is to mount the turbo to the CPC turbo hanger bracket. Now find a two (2) inch long X 5/8 id blue silicon hose and attach the blue hose to the aluminum oil drain fitting on the turbo and attach it to the aluminum welded fitting in the oil tank. From the supplied parts, find two (2) hose clamps and slide them over both ends of the blue hose. Using the four provided 8mm X 25m hex bolts and one (1) 8m X 12m hex bolt and (5) five lock washers, screw each bolt through the muffler flange, then through the CPC turbo bracket, then into the turbo. Make sure you use a small amount of never seize lube on the bolts. Never seize will prevent the bolts from seizing and aid disassembly if ever needed. Torque all bolts to 25 ft lbs. Now you can tighten the hose clamps on the blue hose. Then using the original rubber grommet out of the muffler canister, reinstall it into the new CPC turbo hanger bracket. Then install the turbo/muffler assembly by inserting the two 3/8 inch tangs into the original rubber mounts located at the base of the aluminum bulkhead and the plastic belly pan location. You will need to push **very, very** hard to get the muffler outlet, the two rubber stud mounts and the hanger mount to align at the same time. Don't get discouraged, this is a difficult step. The turbo hanger bracket can now be installed and retained by using the original washer and hair pin. Using a 13mm end wrench and a 13m socket, bolt the exhaust flange to the turbo with the following hardware: (4) 8m X 25m bolts, (4) lock washers and (4) 8m nuts making sure to install a gasket between the turbo bracket and the exhaust flange. Torque bolts 25 to 30 ft lbs. **Then next step is to clock the turbo so that the outlet of the compressor housing is tipped so that it does not touch the coolant bottle. Now tighten all the bolts on both the compressor and the turbine housing.** At this point, it is a good idea to temporarily put a shop rag down the exhaust flange to prevent any foreign material from entering the turbo.

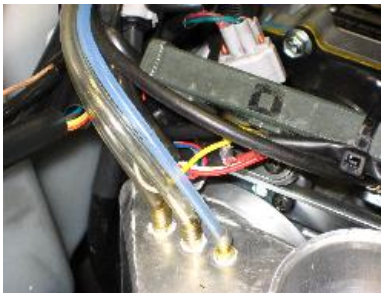
#16. The next step is to attach the coolant lines to cool the turbo. The procedure is to take the original factory coolant line that has a 90 degree bend in the rubber end and then from the supplied parts, slide an Otiker pinch clamp over the hose and then find a 90 degree water fitting and slide the barbed end of the fitting into the rubber hose that also has a 90 degree bend in it and tighten the Otiker pinch clamp on it. Then attach this water fitting to the inside water male adapter that is closest to the recoil starter that was installed on the turbo in step #13. Tighten the female connector to the turbo with a 9/16 end wrench. The other coolant line, which has a straight end on it must be extended with a 5/16 to 5/16 brass coupler, a 5/16 id X 13 inch hose and Otiker pinch clamps, along with a 90 degree water fitting. Then tighten the female water fitting end with a 9/16 end wrench to the outside water fitting closest to the right hand side pod (See photo). The charge tube can now be installed sliding the 2 inch id X 2 1/4 inches long black rubber couplers over the charge box nipple and over the turbo compressor end nipple and install provided hose clamps to secure each end. Last of all connect the small 3 inch X 1/4 id black hose from step #11 to the turbo waste-gate actuator hose barb. This hose provides boost reference from the clear 1/8 lines that go between the pressure regulator and the charge box.

#17. Next step is to mount the oil pump to the right hand side of the foot rest. (See photo). Using a T20 torex wrench, remove the four (4) screws that hold on the plastic cover above the right hand foot rest. Next disconnect the purple wire and the red/black wire that goes to the reverse alarm. Then remove the reverse alarm as it will not be used. Mount the oil pump through the perforated holes in the foot rest (See photo). Before permanently mounting the oil pump to the foot rest, you will need to connect the oil line hoses to the oil pump. The oil line that is 5/16 X 19 inches long the feeds to the top of the turbo and must be connected to the top of the oil pump outlet (this is the same hose as in instruction #13 above). The other brass barb is connected to the 5/16 id hose that has an inline red oil filter connected to it, which leads to the bottom of the oil tank. Next, use a pinch clamp tool and the supplied small Otiker pinch clamps to the inlet and outlet hose at the oil pump location. Then permanently attach the oil pump to the foot rest with the two (2) supplied 1/4 X 3/4 inch long bolts, flat washers and nylock nuts. Attach the black ground wire to one of these bolts. You will need to purchase a quart of Mobile 1 synthetic 5w-30 motor oil and pour 18 to 20 ounces of oil into the oil tank. Next temporarily hook a 12 volt battery to the positive red lead of the oil pump and the negative to the chassis to ground it out, then purge any air bubbles out of the line and also test to see if the pump works and if the oil is pumping oil into the top of the turbo and out the bottom of the oil tank. If everything works ok, then attach the red lead off the oil

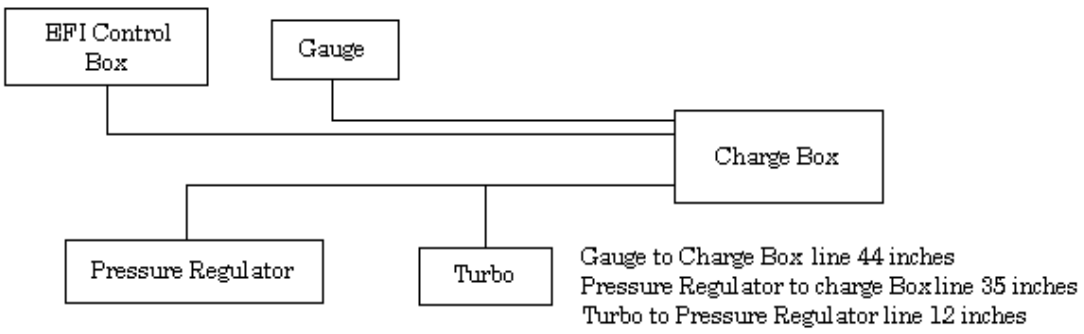
pump to the Red/black wire that goes to the reverse alarm. The purple wire that comes off the other lead of the reverse alarm is not used and can be wire tied out of the way. Now you can reinstall the plastic cover and the four (4) torex screws with a T20 wrench.

#18. Using a 1/8 inch drill bit, drill a hole in the aluminum bulkhead next to the belly pan to retain the CPC turbo hanger bracket to bulkhead with a spring to the aluminum bulkhead. This step is optional and is only needed if you jump a lot or if you race and want to secure the turbo hanger bracket to the fullest extent.

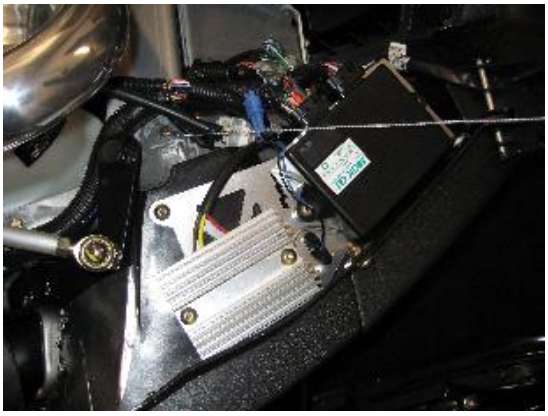
#19. For 2007 & 2008 models you will need to remove the protective vinyl covering off the base of the handlebars and using a ½ inch wrench, remove the 2 of the nuts holding the handlebar on. Install the CPC boost gauge bracket. Then install the gauge into the bracket. Note: If a long handlebar riser is used, the throttle cable must be re-routed to the right hand side of the engine/bulkhead. On 2009 or newer models that have the telescoping handlebars, you will need to take a round file or a die grinder with a carbide burr and widen the mounting holes in the boost bracket and you will need to install longer Stainless steel 8m X 40m bolts and washers to space the boost bracket to the handlebar clamp to hold the boost bracket on. We also have in stock a optional two hole gauge stainless steel bracket if you want to install more gauges as well as custom brackets for EGT gauges.



#20. Next you will find 3 brass hose barbs screwed into the right hand top of the charge box. Using the supplied 1/8 inch clear line, plumb the vacuum line from the boost gauge to the charge box. Next plumb a line from the hose barb coming from the fuel pressure regulator which is located on the outside of the top right hand side of the fuel tank to the charge box. The 3rd hose barb on the charge box is used for boost pickup from the Attitude Industries EFI control box green hose. (See photo and see plumbing diagram)



#21. The "Y" pipe and the exhaust pipe must be modified before installation. Using a small cut off wheel notch the factory spring tabs to allow more width in order to install two springs in each factory spring location. Do not go deeper; only widen the "U" groove. The best way to modify the "Y" pipe is to use a small carbide burr on a die grinder. If these tools are not readily available, you can use a hand file to widen the notches. Using a 12mm end wrench or socket, reinstall the "Y" pipe and the exhaust pipe using both factory graph oil seals. Install 2 provided springs in each location to prevent exhaust pipe losing boost pressure. Note if the graph seals are worn; replace them with new seals to prevent boost loss. **On 2010 models, the exhaust stinger must be cut off at the factory weld and you will need to fabricate a new stinger to fit exhaust flange at turbo location. A larger exhaust donut and spring tab and washer are included in this kit.**



#22. On 2007 & 2008 models, remove the CCU from the right hand belly pan/shock tower. Next slide the ECU/CCU bracket under the CCU and using the provided denotation 1/4 X 1 1/4 bolts and SAE yellow zinc flat washers and by reusing the original nuts, re-mount in the same location on the belly pan/shock tower and tighten bolts using a 7/16 socket or end wrench. On 2007 or earlier models, this bracket will need to be slide forward about 1/4 inch. Using 7/16 socket or end wrench and using supplied bolts and nuts remount the ECU to the forward portion of this bracket. Then reinstall Phillips head screw into the side tab. On 2009 models, you will need to drill a 1/4 inch hole through this bracket to mount the stock voltage regulator in the stock position on top of this bracket. Next re-mount the air temp sender onto the top side of this new bracket. Re-attach the blue/black wires to the main wiring harness.

#23. On pump gas turbo kits, only basic cam arms are included. It is mandatory that the cam arms in the drive clutch kit are installed before operating the snowmobile. The clutch kit will allow your engine to run at the right RPM's. On 2007-2009 models the engine should be clutched to run between 7900 and 8000 RPM's. On 2010 models the engine should be clutched to run between 8100 and 8250 RPM's. You can order optional clutch parts by contacting CPC at 801-224-5005 M-F 9:30 to 6:00 Mountain standard time. Install the cam arms for the drive clutch as per CPC instruction sheet.

#24. **An optional exhaust gas temperature (EGT) is highly recommended to help you tune your engine. Without gauges, it is almost impossible to achieve the correct air/fuel adjustment on your Attitude control box. Achieving the correct air/fuel adjustments are your responsibility. If you don't have a way to monitor your temperatures, you can expect to damage your engine! Gauges can be purchased direct from CPC.** Correct location for

exhaust probes are 100mm from the face of your piston. Adjust your fuel settings to achieve an 1100 to 1150 F for safe half throttle to wide open throttle settings.

#25. **Let's talk about fuel quality. It is your responsibility to insure proper octane quality. It is CPC recommendation to add one gallon of 110 octane race fuel each and every time you refuel to insure that your fuel that you are running will not detonate. This recommendation is for those of you who are not absolutely certain that you have 91 to 93 octane pump fuel.**

#26. Take a few minutes at this point to review the instructions and to check to see if all kit installations have been performed correctly. The Attitude Industries EFI box has been delivered with a special program that has been tuned for the CPC turbo kit. Since there is no fuel in the system, it may take 15 or 20 pulls to get the engine started. After pulling the rope several times, check the fuel pressure. If there is no fuel pressure, you will need to screw Allen screw with a 3/32 inch Allen wrench a full turn, then pull the rope several more times. There has to be at least 20+ lbs of fuel pressure for the engine to start. As soon as the engine starts, you must hurry and re-set the fuel pressure to 38 psi at a high idle (2500 to 3000 rpms). If higher fuel pressure is used, you will enrichen the engine from an idle to 1/8 throttle. If less fuel pressure is used, it will lean the idle1/8 throttle position. Fuel pressure is adjusted by using a 9/16 end wrench and loosening the jam nut on the fuel pressure regulator and by using a small 3/16 Allen wrench, adjust the screw in or out to achieve the correct pressure at an idle.

#27. Initial boost adjustment is made by attaching the waste-gate actuator rod to the waste-gate flapper link located on the left side of the turbo. Approximately 4 ½ lbs of boost will be achieved if the actuator rod slips over the pin without applying any spring pressure. We call this position the neutral position. Additional boost can be achieved by shortening the rod. This is done simply by screwing the actuator rod further onto the threaded portion, ie making the rod shorter which pre-loads the spring in the waste-gate actuator. Lengthening the rod lowers the boost level. The extra aluminum spacers are for increasing pre-load spring pressure to increase boost for race gas turbo kits.

Clutch Adjustment Run engine at 7800 to 8000 RPM's on 2007 through 2009 models. On the 2010-11 H. O. model; run the engine at 8050 to 8250 RPM's. A clutch tuning handbook can be ordered through CPC for $19.95 at (801)224-5005 or visit our web site at www.cpcracing.com.

Compression On all 2010 models running below 6000 feel altitude, we recommend that you change compression ratios by machining your head!

Gearing On all 2010 models, the factory has lowered the gear ratio to 55-65. For riders who want to run higher mph, we recommend changing your gears to a higher gear ratio and you may want to limit your miles per hour to 80 mph to avoid the belt coming in contact with the helix.

#28**.** "Annihilation" this is what your competition will fear until they get one.

Notes