



READ PRIOR TO STARTING MACHINE

Engine Notes

Spark Plugs:

- The Spark plugs that work the best are NGK B9EG-S, BR9ECS-S or a more expensive plug that can be used is a BR9EIX-S. In order to prevent blowing out the flame gap at .022 to .024.
- Tighten plugs to 15 to 20 ft. lbs and recheck after starting. If you notice the plugs are coming loose, you are probably detonating. **Find the problem and fix it immediately.**

Note: The -S in the NGK part number is for solid caps. Use dielectric grease upon assembly on the solid top of the plugs. You may also use project tip plugs, but only after you, as the tuner have over 1000 miles on the sled and fully comprehend the system. BPR9EIX work well, but are expensive. **Do not use the stock projected tip Champion plugs!**

Note: Because of the use of leaded race fuel, lead deposits and over rich or lean conditions can shorten their life. If the engine starts to miss or just not run correctly the first thing to do is change the spark plugs, they break down very quickly. HM Turbos recommends replacing them every 250 miles or so. If you detonate the engine, then replace your plugs sooner so the electrode does not damage the engine.

Chain case:

Another maintenance item is changing oil on a chaincase. HM Turbos recommends that the oil be changed every 500 miles. The best mountain ratio is 19-41=2.15 @ 4500 to 8500 ft w/ 8 to 10 psi of boost.

- Keep your chain adjusted properly and we recommend a steel billet top gear (stock are powder metal) at boost levels over **8 psi**.

Drive Belt:

Another maintenance area is that of drive belts. You need to expect your drive belts to wear out sooner since you have more horsepower and torque. Keep an eye on them, measure them with a caliper and compare the width to that of a new belt. New belts measure 1.405" at the top of the belt, if your belt measures 1.375" or less it is time for a new belt. Peak performance or fall off of power at high RPM's will be experienced if the belt is not replaced.

- If you blow a belt under full boost, you risk bending your crankshaft! Pull the clutch if this happens and check the PTO crankshaft run out with a dial indicator right away!

Pistons:

Periodically it is a good idea to replace pistons. How often you replace them depends on how many miles you drive and more importantly how you have tuned your engine. **If you have run Nitrous, you must replace the pistons before running a turbo on the motor.**

- Engines that are run too lean will wear out pistons faster.
- Riders who climb long hills (long pulls over 10 seconds) will wear pistons out sooner due to heat saturation.
- Riders who know only one speed (wide-open) will wear pistons out faster.
- #2204154 is the dual ring piston and #2204168 is the complete top end rebuild kit w/head for the 800 motor. Call for custom turbo pistons.

Note: Individuals who change out pistons sooner will have less long-term problems. Most turbo owners change out pistons from 2000-2500 miles of use, depending on the above variables. Check compression on your motor when new and then follow-up every 500 miles to verify piston condition.

Cylinder Head:

The recommended compression ratios are as follows:

- Sea Level-2000 ft 11.0 to 1
- 2000-4000 ft 11.5 to 1
- 4000-6000 ft 12.0 to 1
- 6000-8000 ft 12.5 to 1
- 8000-10000 ft 13.0 to 1

Select the lowest elevation you plan to run, if you have questions call us at 406-273-6111.

The stock compressions for Polaris are:

- 800 12.5 to 1
- 700 13.5 to 1

Reed Pedals:

If you notice lazy throttle response from and idle to 6500 RPM's you may have a broken or burned pedal.

- This can be caused by running the machine to rich for extended periods of time in the stutter mode or an exhaust backfire or pop out the muffler can also cause problems.
- If running to rich be sure and lean down the box in the green mode, replace plugs and test lower RPM's prior to tearing the machine down to check the reed pedals.

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.

- Keep an eye on the water temp.
- Remember it is normal for water to heat up after the engine is shut off (due to no water circulation).
- The thermostat opens at 126-128 degrees; try to keep max water temp below 150 degrees.

Clutching:

Primary spring:

- Orange spring provided= 165-310(111 rate)
- Pink 180-320(106 rate) can also work/call for information.

Change primary spring every 500 to 750 miles or if you see engagement drop from 3800 to 3500 RPM's. This change in engagement is an indicator that the primary spring may be broken.

NOTE: The following weights are MTX recommendations for the Polaris 800 at 4500 to 8500 + elevation:

- 6 psi boost = 65 grams
- 7 psi boost = 65 + 1 gram tip
- 8 psi boost = 65 + 1 grams tip
- 9 psi boost = 65 + 2 grams tip
- 10 psi boost= 65 + 3 grams tip**
- 11 psi boost = 68 + 1 to 2 grams tip
- 12 psi boost= 68 + 2 to 3 gram tip
- 13 psi boost = 71 + 1 to 2 grams tip

On the 800 Dragon at 9 to 11 lbs of boost, 65 gram MTX weights with 2 grams in the belly and 3 grams in the tip work the best when riding at 4500 ft. to 7500 ft. in elevation. The 700 Dragon runs best with 1 gram in the belly and nothing in the tip at 9 to 11 psi boost.

Add 1-2 gram(s) minimum in addition to the settings above in the first hole for best pull in the bottom & mid-range at 4500 ft or higher, below this you can add 2 grams and test.

****NOTE:** Add 6 to 8 grams to MTX weights in chart for sea level to 4000 ft elevation.
Low elevation drag racing @ 14 psi of boost works best at 78 to 80 gram Polaris or EPI clutch weights. Normal running @ 10 psi at sea level usually requires 72 to 74 gram Polaris weights.

Snow drags: 74 MTX weights with 3 grams in the belly and 2 grams in the tip with a 1.75 to 1 gear ratio and 10-12 psi boost at 0 to 2000 ft elevation should allow for 125+ MPH.

NOTE: Various tracks, gearing, elevation, snow conditions and engine combinations (heads and porting) can affect top running RPM's. Best RPM's are 8350 to 8400 for peak power.

SECONDARY:

TSS-04 secondary can be set up with the stock black/purple (160-240) spring and the helix set on HM1 position. (Custom 50-degree angle). HM2 position-48 degree custom angle is not used with the 700 or 800. A single Delrin washer can be added under the gold colored spring cup if desired.

The secondary can be set up with the red/blue (140-200) or blk. /grn. (140-220) spring and the custom HM1- 67degree helix or HM2 -65 degree helix. Call for testing results.

GEARING:

Gearing for the mountains works best at 19-41 or 19-42 for climbing(up to 10 psi of boost), which is stock in 2009. A taller 20 -41 can be opted for running roads, high speed, shorter tracks, or boost levels over 10 psi. (Based on 2.86 drivers). Tracks, snow conditions, clutching and riding styles may vary. Test accordingly.

FUEL FILTER:

The fuel filter needs to be replaced every year or every 1000 miles to prevent plugging which can lean your engine down and cause damage.

Fuel Requirements are as follows:

- 6 psi boost =91 octane super unleaded
- 7 psi of boost =91 octane + 1 gallon 112
- 8 psi of boost =91 + 2 gallon race gas 112
- 9 psi of boost =91 octane + 3 gallons race gas 112
- 10 psi of boost =50 % 91 octane/ 50 % race gas 112
- 11 psi of boost =40 % 91 octane/ 60 % race gas 112
- 12 psi of boost =30% 91 octane/70% race gas 112
- 13 psi of boost =100% race gas 112
- 14 psi of boost =100% race gas 114
- 14 psi + of boost recommend 100% race gas at 116 octane

NOTE: These stats are based on 4500+ feet elevation and 32 degrees with an 800 2009 model. Lower elevation or colder temperatures may require higher octane. The 800 2008 model has slightly higher compression and may also require slightly more octane. We recommend lowering the compression ratio when installing this kit. These are only recommendations. Use caution when proceeding and always lean on the higher-octane side to prevent detonation. Watch your plugs, oxygen readings and piston wash readings. Remember the more octane you run the more forgiving the motor will be in the event of detonation. Don't go overboard with the race gas. If you run too much race gas, especially with an off brand fuel, it will burn too slow and create **lazy throttle response**. Fuel requirements based on NON-oxygenated, NON-ethanol rated fuel.

The 700 model has more compression and more timing than the 800 model, so more octane may be needed than prescribed above.

FUEL:

Change the fuel filter every 1,000 miles or once a year. Replace with Polaris P/N: 2520771.

We recommend **Sunoco 110 or 112 Supreme** (motor octane of 110) or **VP 110, VP 111 or VP C-12**. If you choose VP110 use 10 % more in the chart above due to the lower 107 motor octane or opt for VP C-12). Find a quality brand of fuel and stick with it for consistency. The super unleaded you choose needs to be from a frequently used station, non-ethanol base and a common name brand.

Ethanol: If running this fuel be sure on the 2009 and up that the male/female plug above your left foot, on top of the clutch cover, are **unplugged**. They are black/blue and pink in color.

Additives: If race gas is not available, Lucas octane boost may be used, but use caution to not run too low of motor octane

Oil- Red Line Synthetic Regular (or Racing) or Polaris Racing Synthetic are the best choices for your turbo. The most important concept to focus on is to **use a 100% Synthetic oil**. If you are going to run a petroleum based oil be sure and use Phillips Injex 66 or Yamahlube only. We also require you to run a **½ to ¾ ounce of oil per gallon** of gas or 100 to 1 in the tank for better engine protection and durability. **Do not run Klotz or Amsoil**, as it can gum up the veins in your turbo.

Sled Storage-Store your sled with less than a 1/4 of a tank of fuel. Treat the fuel with Sea Foam and two stroke oil. Start sled and run until peak operating temperature has been reached. You may now pull the oil pump lever until motor is fully fogged with the fuel/oil mixture. Tape the top of the turbo and the exhaust pipe closed. Store in a covered, well ventilated area out of the sunshine. Grease all bearings and suspension points. When you

fire the sled in the fall be sure and top off the tank with fresh fuel before running and remove the tape.

ENGINE TROUBLESHOOTING:

If you ever experience a high idle you probably have a loose connection between the intercooler and the reed cages. Check for loose clamps or blown throttle body boots. If the engine backfires through the exhaust that may indicate that you also have an intake leak. If the engine starts to miss and drops a cylinder, (check spark with an inline spark tester for a bad coil) (Lissle #20610) or you may have torn throttle body boots. They will need to be checked and replaced if de-laminated. (Replacement throttle body boots part #1203865) (Boot/ throttle body retainers are available from HM TURBOS) Do not run the engine as a lean condition will occur and cause engine damage.

Another probable cause for you to drop a cylinder is a ripped fuel regulator diaphragm. Pull the boost line off the intercooler from the regulator and start the machine to be sure there is no fuel coming out of the line.

If you notice the throttle response lazy, blubbery or won't run at low rpm you may have cracked or broken reed pedals.

If you notice the boost climb slightly (1 to 1.5 psi) on a long climb and the sled feels sluggish you may have a bad pipe temp sensor retarding the timing. (It may not show a check engine light on the dash.) Replace immediately as this can eventually gum up the variable veins inside the turbo.

If the sled acts lean and you move the red and the grn. /blu. lights to the maximum setting and nothing changes, the fuel control box may be bad. Call for details.

If the dash lights or headlight go dim or completely off, the voltage regulator may be the cause. Change the voltage regulator out immediately, otherwise the ECU may be damaged and erratic O2 readings may be erratic.

**INSTALLED PROPERLY YOU SHOULD HAVE MANY FUN TROUBLE-FREE
MILES WITH THE HM TURBO Kit
BE SURE TO PAY ATTENTION TO AVALANCHE SAFETY.
TAKE AVALANCHE TRAINING COURSES AND BE AWARE OF
AVALANCHE CONDITIONS.**

CFI Diagnostic Trouble Codes (DTC's)

Trouble Code	P Code	MFD Blink Code	Description
Throttle Position Sensor Unrealistic Transition	P0120	1	TPS signal changes too rapidly to be correct. Can be caused by faulty connections or a faulty TPS.
Throttle Position Sensor Voltage High	P0123	1	TPS signal is above 4.39 Vdc. Can be caused by a faulty wire connection or faulty TPS.
Throttle Position Sensor Voltage Low	P0122	1	TPS signal is below .7 Vdc. Can be caused by a faulty wire connection or faulty TPS.
Engine Coolant Temp Sensor Voltage High	P0118	2	Sensor signal is above 4.8 Vdc. Can be caused by a faulty wire connection or faulty temp sensor.
Engine Coolant Temp Sensor Voltage Low	P0117	2	Sensor signal is below 0.1 Vdc. Can be caused by a faulty wire connection or faulty temp sensor.
Intake Air Temp Circuit Voltage High	P0113	3	Sensor signal is above 4.9 Vdc. Can be caused by a faulty wire connection or faulty TBAP.
Intake Air Temp Circuit Voltage Low	P0112	3	Sensor signal is below 0.19 Vdc. Can be caused by a faulty wire connection or faulty TBAP.
Barometric Pressure Sensor Voltage High	P0108	4	Sensor signal is above 3.23 Vdc. Can be caused by a faulty wire connection or faulty TBAP.
Barometric Pressure Sensor Voltage Low	P0107	4	Sensor signal is below 1.25 Vdc. Can be caused by a faulty wire connection or faulty TBAP.
Exhaust Temperature Sensor Circuit Voltage High	P0546	5	Sensor signal is above 4.9 Vdc for at least 2 minutes and the engine has been running at or above 3000 RPM.
Exhaust Temperature Sensor and Circuit Voltage Low	P0545	5	Sensor signal is below 0.06 Vdc for at least 2 minutes the engine has been running at or above 3000 RPM.
Detonation Sensor Circuit Voltage High	P0328	6	Engine speed is above 6000 RPM and the sensor signal is above 4.3 Vdc for at least 2 seconds.
Detonation Sensor Circuit Voltage Low	P0327	6	Engine speed is above 6000 RPM and the sensor signal is below 1.23 Vdc for at least 2 seconds.
Exhaust Valve Solenoid Circuit Malfunction	P1477	8	Solenoid control circuit is OPEN. Can be caused by faulty wiring, solenoid, or ECU.
MAG Part Load Injector Circuit Open	P0261	7	OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
MAG Full Load Injector Circuit Open	P0261	7	OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
PTO Part Load Injector Circuit Open	P0264	7	OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
PTO Full Load Injector Circuit Open	P0264	7	OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.

CFI Diagnostic Trouble Codes (DTC's) page 2.

Trouble Code	P Code	MFD Blink Code	Description
Fuel Injector Voltage Too High	P2148	7	Engine is running, but the injector voltage is above the acceptable limit. <u>Can be caused by faulty wiring, ECU or stator.</u>
Fuel Injector Voltage Too Low	P21487	7	Engine is running, but the injector voltage is below the acceptable limit. <u>Can be caused by faulty wiring, ECU or stator.</u>
MAG Ignition Coil Circuit Malfunction	P0351	9	Failure within the primary circuit. <u>Can be caused by wiring, ignition coil, or ECU.</u>
PTO Ignition Coil Circuit Malfunction	P0352	9	Failure within the primary circuit. <u>Can be caused by wiring, ignition coil, or ECU.</u>
5 Tooth CPS Signal Missing	P0335	10	Engine is running, but there is no signal from the 5 tooth CPS. <u>Can be caused by a faulty stator, wiring, or ECU.</u>
5 Tooth CPS Signal Intermittent	P0336	10	Engine is running, but the pulses from the 5 tooth CPS are incorrect. <u>Can be caused by a faulty stator, wiring harness, or there is no 2 tooth CPS signal. If there is no 2 tooth CPS signal, the engine will not run, but the P0336 code will be set because the ECU receives extra 5 tooth signals without any 2 tooth signals.</u>
5 VDC Sensor Supply Voltage Low	P0643	Steady LED	Sensor supply voltage is below an acceptable limit. <u>Can be caused by faulty wiring or ECU.</u>
Chassis Voltage High	P0503	Steady LED	System voltage is too high. <u>Can be caused by faulty wiring or regulator / rectifier.</u>
Chassis Voltage Low	P0562	Steady LED	System voltage is too low. <u>Can be caused by faulty wiring or regulator / rectifier.</u>
Ignition Voltage Circuit Malfunction	P0350	Steady LED	Engine is running but a problem is found with the ignition coil power circuit. <u>Can be caused by faulty wiring or ECU</u>
Chassis Relay Coil Open Circuit	P1611	Steady LED	The Chassis relay control circuit is open. <u>Can be caused by faulty wiring or a faulty relay.</u>