STAGE 2

- **31 HP Gain**
  Stage 1 Wingman's 11 hp, plus
  Stage 2 Ninja Backup's nitrous 20 hp
  equals a 31 hp performance increase
- **Simple Arming Switch**
- **Activated by Throttle**
- **Raze Performance ECU with Barometric Sensor**
- **Billet Inline Thermostat**
- **Patented Nitrous Engagement Strategy**
- **5 lb. Nitrous Bottle and Bracket for Yeti, Timbersled, and MotoTrax**
- **.5 Amp Battery Draw** *(no aux. battery)*
- **Fully Autonomous**
- **Includes all fittings, hoses, cables, jet kit, valve, gauge, etc.**

The Raze Ninja Backup Kit starts out with the Wingman Kit for its base. The Wingman's base is worth 11 HP and provides flawless engine operation in any conditions. We stack a 20 HP nitrous system with it to create our Ninja Backup Kit which provides a 31 HP gain. It is armed with a switch, and activated by throttle using our patented nitrous engagement strategy.

Nitrous Oxide — Nitrous is extremely violent, sensitive to temperature, and if engaged at the wrong time can cause severe immediate engine damage. Our nitrous strategy is the first ever autonomous nitrous system that eliminates human error. Our Ninja Backup system prevents engine damage.

Arming Switch — The supplied switch that mounts on the clutch side of the handlebar switches the ECU into armed or disarmed nitrous mode. When armed, the ECU starts calculating the following:

Engine Operating Temperature — If the engine operating temperature is too low the ECU will not allow the nitrous to activate. Spraying nitrous into a cold engine could cause stiction (seized pistons, 4-point scarring, etc.).

Gear Position — We do not let the nitrous activate in 1st gear. Nitrous activation in 1st gear goes instantly to the rev limiter and is useless. Even with a soft-rev limiter strategy in the ECU it risks valve train damage. Therefore, we only activate in 2nd gear and above.

Barometric Sensor — This is the black circle you see on top of the ECU in the photo. We use the baro sensor in almost every calibration table. It is extremely important for calculating the amount of oxygen the engine is breathing. This baro sensor lets us know what altitude the rider is at. We do not activate the nitrous solenoid anything under 2,000' in altitude. The engine makes too much power at that low elevation to use a 20 HP shot of nitrous without mechanical upgrades. (This setting can be changed in the software, but is not recommended without mechanical upgrades to the engine.)

Bottle Pressure — This is by far the most important aspect of our strategy. Most nitrous systems are tuned and jetted for maximum bottle pressure. When you see us or other professionals using nitrous for drag cars etc., we use bottle heaters to maximize the bottle pressure, then bleed the pressure off right before the race to hit a target bottle pressure number. 15-30 minutes before the race, guys have electric blankets wrapped around the bottles to heat them up to 1,000 psi. Generally speaking, nitrous jets are targeted for 700 psi. When you see people spraying off their nitrous right before a race it's not for show. When they pull up to the line for a burnout they blow it off to bring it down to the 700 psi they jetted their fuel for. If they have too high of a bottle pressure the engine will be lean. If too low of a pressure engine will be fuel rich. The only way to overcome it is to have an ECU monitoring this so it can adjust the fuel table as the bottle pressure changes. With snowsports we do not have that luxury of warming bottles up to their maximum pressure. We already don't have a big enough charging system to run lights and electric hand warmer grips — let alone heat a giant aluminum bottle in the middle of the snowy mountains. An advertised 20 HP nitrous jet with a 700 psi bottle will spray 12 HP at 350 psi and 28 HP at 1,000 psi. The bottle pressure is constantly changing due to volume in the bottle and outside air temp. Even on long pulls you can drop 100psi or more during the run. If the bottle pressure is constantly changing then the only way to fuel accurately is to constantly change the fueling table according with the bottle pressure. Or jet it absolutely pig rich so you have a huge safety window, but now your 20 HP jet of nitrous makes half. Another way people fuel nitrous systems, that we do not agree with, is off the O2 reading. When tuning nitrous off of the O2 reading you are reading what already happened. You're reading aftermath. With nitrous, if the bottle pressure is high and you spray a huge hit that was set for a low pressure bottle, by the time you read on the O2 gauge that you are lean, it could cost you a piston. Therefore, we write our nitrous fuel/timing maps based on the bottle pressure so our ECU knows how much fuel/timing to add before it even reaches the intake manifold. It then changes the engine calibrations in sync as the bottle pressure changes.

Engine RPM — The ECU will not activate the nitrous solenoid unless the engine is above 6,000 rpm. The second nitrous is activated, the engine cylinder pressure skyrockets. Nitrous is extremely violent. It's no different than hitting the oxygen valve to start cutting with your oxy acetylene torch. It determines if you are warming the steel or blitzing a hole right through it and cutting it in half. That's what nitrous does to your combustion event in your cylinder. When it's activated it's game time. If the engine is being lugged down at low rpm and the nitrous is activated, the cylinder pressure instantly rises. If the increased pressure can't drive the piston down because the engine has too much load on it, the next weak link is a bent or broken connecting rod. Anybody in the nitrous racing world with manual nitrous kits has experienced this personally or knows somebody that has bent or broke rods by activating nitrous too soon. The only way to safely activate nitrous on a snowbike is 6,000 rpm or greater. We also cut the nitrous off at 10,500 rpm even if the rider has the nitrous armed with torque request at 100%. We do this to protect the machine from over-revving and harming the valve train. If you are using nitrous and the engine accelerates up to 10,500 rpm we shut the nitrous off at that point. The engine will maintain that rpm without the nitrous on or you can shift to the next gear and it will activate again.

TPS — Throttle Position. If the ECU green-lights everything above, it will activate the nitrous solenoid once the rider requests 65% throttle or more. As soon as the rider drops below 65% torque request the ECU will shut the nitrous off.

Tip In Fuel — Tip in fuel is simply making sure that the fuel hits the combustion chamber at the same exact combustion event or before the nitrous gets to it. People talk about this a lot but do not realize that watching an O2 sensor with the human eye is an average, and by the time you see the number on the display you are 30–40 combustion events late. The only way to log that is with a laptop and watch the graphs in microseconds. It is extremely important to make sure the fuel is at the combustion event before the nitrous, especially in a recreational nitrous application that gets multiple activation requests per day. Think about what that does to the piston if every single time you hit the nitrous button at 8,000–10,000 rpm. A split second to you is 30–40 combustion events to your engine, and that can wreak havoc on the piston and rings. You would never hear it, feel it, nor see it by looking at an O2 sensor, but it's there if you don't tip in the fuel. The ECU knows how long it takes for the nitrous to reach the intake manifold. From the time the solenoid opens a few feet away till it reaches the jet installed on the intake. Depending on the bottle pressure, it effects how long it takes the nitrous to reach the intake manifold. So the ECU is dynamically adjusting the tip in fuel according to what the bottle pressure sensor is telling it.

Tip Out Fuel — Tip out fuel is making sure there is fuel still spraying after the nitrous shuts off. This is just as important as tip in fuel. Imagine you are washing your car and while you are spraying the nozzle somebody shuts off your water supply. Water doesn't shut off instantly, it continues to flow for a little bit. When the nitrous solenoid closes there is still nitrous in the line between the intake and the solenoid that is going to flow into the engine. If the extra fuel shuts off the instant the nitrous solenoid closes that extra little bit of nitrous gets ingested into the motor without extra fuel, and you have a lean event. Depending on the length and diameter of the nitrous line this could be way more than 30-40 combustion events. Once again, this can wreak havoc on your piston giving nitrous a bad wrap when truthfully it points back at the engine strategy. Our ECU leaves the fuel map rich for a period of time after the solenoid is shut off to account for the nitrous left in the line. The ECU is also referencing bottle pressure to calculate the tip out fuel table. A 300 psi bottle compared to a 1,000 psi bottle has a massive tip out fuel change.

Fuel Injector in Stock Location — We supply a non-modified Bosch injector to supply the extra fuel demand for the greater horsepower. The stock injector will barely supply enough fuel for 10 HP over stock. Removing the stock injector and replacing it with ours is very easy to do.

In the end when the nitrous mode is armed the Ninja Backup ECU is calculating all the above at 1,000 times per second in closed loop. There is no safer product on the market when it comes to nitrous power kits.

Ninja Backup Features

Wingman Kit — Includes **Raze Performance ECU**, **Billet Thermostat**, and **Handlebar Switch**.

Bosch Fuel Injector — A replacement that fits the stock location.

Bottle Pressure Sensor

2" Raze Motorsports Liquid Filled Pressure Gauge

.5 amp Nitrous Solenoid

5 lb. Nitrous Bottle

All Brackets, Fittings, Wiring, Lines, and Hardware to Install the Kit.