STAGE 1

MOTORSPORTS

RAZE

- 11 HP Gain
- 21% Fuel Savings
- Consistent Engine Temperature
- Perfect AFR in all Temperatures & Altitudes
- Snow Bike Power Curve
- Raze Performance ECU with Barometric Sensor
- Billet Inline Thermostat
- Adjustable On-The-Fly Dual Switch for Cruise or Race Mode
- #MindBlown

Wingman

Maintaining Snow Bike Engine Temperature

One of the root problems is that most dirt bikes being converted to snow bikes don't have a thermostat. Dirt bikes were originally designed to be run in hot environments where you need maximum cooling without restriction. When being used as a snow bike the coolant system overpowers the BTU output of the engine, resulting in a cold engine. The OEM ECU monitors the engine coolant temperature and bases many aspects of the engine calibrations on it.

When the fuel and intake track are very cold, the atomization of the fuel is not as efficient. Fuel droplets pool in the intake track or on top of the piston. This negatively effects the efficiency of the combustion chamber. Not only does the engine coolant temperature need to maintain its target temperature, but so does the engine oil. In all gasoline engines a small amount of fuel gets past the piston rings and ends up in the engine oil — especially in stock snow bikes run for long periods with cold coolant and oil. When the engine oil temperature is at proper operating temperature, the oil flashes off any fuel found in the oil. If the oil isn't at operating temperature the crankcase will slowly fill with fuel, and over long runs — like those in the cold mountains — the engine can hydro lock. Some snow bikers have already experienced this situation. This problem gets exaggerated because the ECU commands a richer fuel mixture when it sees a cold coolant reading. The OEM does this for many reasons such as combating 4 point seizures on the piston from not letting the engine warm up.

So when riding a stock snow bike without a thermostat, in typical cold conditions, you will have an extremely rich air/fuel ratio — causing horrible fuel consumption, calibrations tables limiting maximum horsepower, and risk severe engine failure from fuel thinning out the engine oil. Or a seizure.

Our fix: Install a thermostat and maintain a consistent target engine temp.

How a Thermostat Works — The type of thermostat we are talking about is a mechanical auto adjusting valve that restricts the flow of the coolant system. A properly selected thermostat is what controls and maintains a liquid cooled combustion engine's operating temperature. When the engine coolant is cold, the valve is closed. Once the engine gets up to operating temperature, the valve opens a little, and starts to allow coolant to flow to the radiator. When the engine is hot the valve opens more, allowing the coolant to flow through the radiator to dissipate excess heat. As the engine heats up or cools off, due to environment or work load, the valve self-adjusts to maintain a targeted 180°F, the proper engine temperature.

The Engine Strategy — The engine strategy is the behind-the-scenes flow chart of algorithms that the ECU uses to run the engine. There are millions of engine strategies out there. Every single OEM engine out there uses a different strategy specifically designed and tailored to its application. Keep in mind that OEM goals are not 100% geared toward maximum power.

A naturally aspirated engine strategy for a car is different than a dirt bike. A naturally aspirated strategy for a dirt bike is insanely different than a strategy for a snow bike, especially a boosted snow bike, for example.

Strategies designed by OEM engineers are extremely complex and designed for specific projects. The fueling and timing calibrations is one of the last things engineers do. The engine strategy is where the hard work is and why it sometimes takes years of engineering before an OEM will release a new engine. They aren't spending most of their time on the fuel/timing calibrations, they are perfecting the strategy loops.

Most of the after-market performance companies don't understand these strategies let alone even know how to get into the background to see them. This is the reason in the power sports performance game we typically see three scenarios over and over.

The first scenario is a company piggy backs the stock ECU with a "fuel control box" and clamps down sensors such as the TPS, map, and knock to keep the stock ECU from throwing engine codes.

The second scenario is to re-flash the ECU. Most of the time aftermarket turbo companies find a guy that knows how to brute force enter a stock ECU's encryption. With the ECU unlocked, the binary code can be read. They search the binary code for patterns that represent fuel, timing tables, and TPS controls. Once these A2L file locations are found, they can manipulate the numbers which change the calibrations tables.

It is extremely tricky if the vehicle was originally naturally aspirated and now is being manipulated to work for a boosted application. Remember the sensor package and strategy loaded in that ECU they are trying to manipulate was never designed to be used for a boosted motor. Often, the re-flash engineer has to shut off the safety strategies, lock down different sensors to keep the ECU happy, and resort to a simplified engine strategy referred to as speed density.

Re-flashed ECUs are a cheap band-aid that works for more mild applications especially if the engine is in its stock design. The instant you introduce blowers, nitrous, or using any of the other performance tricks out there in the racing world to a stock ECU, you are playing with fire.

The third scenario is overpriced standalone units that are broadly designed to work on just about anything you can harness them up to. They also usually don't have the CAN bus communications loaded in them, which is supposed to operate your factory dash and functions.

A common thing that racers, dealers, and end users try is an engine calibration or tuning tool. Calibration and/or tuning tools do not change the engine strategy, they simply modify the calibration (tune) of the locked strategy. Because these tools are mass-marketed to everyone, from everyday Joes to highly skilled tuners, most use a very simple generic strategy called "speed density tuning" or "3D." It seems like a simple solution, but it's also too simple for specific applications. It also may be too advanced for the everyday consumer, and not anywhere near enough for an advanced level guy. At the end of the day, they really just wanted to change the strategy, but the software won't let them — leaving both frustrated.

The Wingman Kit Features

Billet Thermostat — Fixes the unstable engine temperatures to create stable, efficient combustion and power.

Replacement ECU — The Raze Performance ECU Replaces the stock ECU with a designed-from-the ground-up snow bike ECU that's direct plug and play, and waterproof. We built in a ***Barometric Pressure Sensor*** (that any and all mountain vehicles should have) to properly altitude compensate. This tests the air pressure for perfect engine calibration regardless of altitude. Rob Crain, our CTO, spent hundreds of hours designing the strategy algorithms completely based on the environment and tasks a snow bike is exposed to.

The Engine Calibrations (Tune) — These are spot-on, while maintaining perfect air/fuel ratios, applying maximum timing at all times. The end result is more horsepower, less fuel consumption, and a throttle curve feel that matches the track load.

Map Switch — A handlebar mounted tune switch that adjusts the bike between race and cruise mode.

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