Polaris RMK Pro Nitrous Fuel Control Box Instructions

Before you begin, please check kit contents and read all the instructions.

Control Box Kit Contents:

Quality check by: _____

___1 Fuel Control Box
___1 EFI Harness
___1 TPS Adapter (or optional Nitrous Harness)
___1 TPS Wire
___1 Reusable Zip-Tie
___1 jumper/battery adapter (4A style)

I. Theory of Operation:

The Boondocker Fuel Control Box connects between the sled's ECU (Engine Control Unit) and the fuel injectors. It does not reprogram or communicate with the ECU. It only modifies the existing signals sent from the ECU to the fuel injectors. By modifying only these signals, it is possible to make fuel adjustments while keeping the basic stock fuel map. This means the ECU can still compensate for engine speed, throttle position, barometric pressure, engine temperature, ambient air temperature, etc.

The Fuel Control Box modifies the stock fuel map to compensate for sled or engine modifications. It can reduce or increase fuel amounts for certain RPM ranges and engine load conditions. This is done by changing its fuel adjustment settings using the buttons and LCD display. As with tuning a carburetor, it is possible to go too rich or too lean!

The Control Box also activates nitrous delivery (nitrous kit sold separately) and adds fuel to achieve proper air/fuel mixture. Again, as with tuning a carburetor, it is possible to go too rich or too lean! There are seven different ways to activate nitrous using such factors as RPM, throttle, and a handlebar button or arming switch.

Other features include the ability to capture and display operational data, store maximum values, and save multiple setups.

Note: Be sure you know how to properly tune an engine before you adjust the fuel settings! Use of an Air/Fuel Gauge and plug readings are highly recommended when tuning.

IMPORTANT NOTES – READ THIS!

Note1: Never unplug the Control Box when the engine is still running! Electrical damage may result which is not covered under warranty!

Note 2: We recommend using **Dielectric Grease** on all connections to help prevent corrosion on the terminals.

Note 3: Avoid exposing the Control Box to environments where **static charges** may exist. For example, quickly removing a sled cover from the sled in a dry environment can create a static spark that will damage the box (especially if the box is mounted up on the handlebars).

Note 4: The Control Box is sealed – do not take it apart or it will no longer be sealed. The Control Box is designed to be splash-proof. Do not submerge or subject the box to high-pressure spray. During long periods of non-use it is recommended that you do not leave the control box exposed to the elements.

Note 5: Always use Resistor Spark Plugs! Non-resistor plugs WILL cause electrical interference with the Control Box.

II. Control Box Mounting Locations

The Control Box can be mounted under the hood, on the console, or on the handlebar riser using the supplied Velcro strips. Before applying the adhesive strips, thoroughly clean each surface (rubbing alcohol works well). Be sure each surface is room temperature or higher. Using a blow drier to warm up the surface and Velcro will improve adhesion.

If the box is mounted under the hood, keep the box away from excess heat (like the exhaust), and away from the ignition coils.

Note: The Control Box is designed to be splash proof. Do not submerge or subject the box to high-pressure spray.

III. Installation of Fuel Injection Harness

There are two 10-pin connectors at the end of the black cable on the Control Box. One is for the EFI Harness and the other is for the TPS wire or optional Nitrous Harness. These two connectors are keyed (male/female) so only the correct connectors will mate. However, you must be careful to not cross the 6-pin connectors for fuel injectors (EFI Harness) with the connectors for the crank position sensors. The EFI Harness is shown below.

Install the EFI Harness and TPS Wire as follows. **Note:** Use Dielectric Grease in all connectors to help prevent corrosion on the terminals.

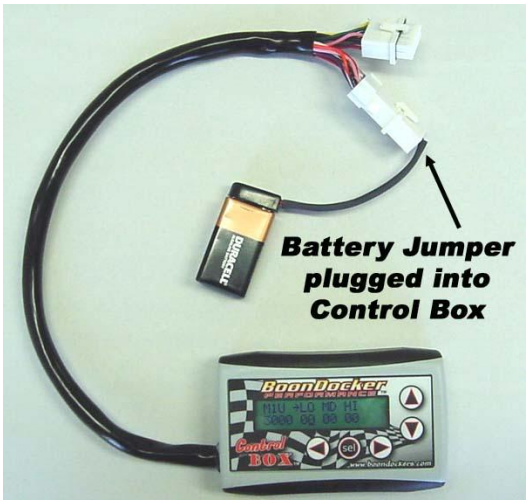
1. Locate the six-pin connector behind the center of the engine cylinders and just above the throttle bodies. This is the sled's EFI harness. Lift the latch to disconnect it.
2. Connect the Boondocker EFI harness between these two connectors.
3. Route the Boondocker EFI harness from this location upward to the white 10-pin connectors on the Fuel Control Box pigtail and plug it in.
4. Connect the ring terminal on the black wire to a solid chassis ground. It is very important to have good electrical contact. It must be attached in such a way that it cannot come loose.
5. If you did not purchase a Boondocker nitrous kit, plug the TPS Adapter into the other white 10-pin connector on the Fuel Control Box pigtail.
6. If you purchased a Boondocker nitrous kit, follow the kit instructions to install the Nitrous Harness.
7. Refer to the instructions in the TPS wire kit to install the TPS wire. Plug it into the TPS Adapter or Nitrous Harness.
8. Double check the routing of all wires to be sure they are away from hot areas and moving parts. Use zip ties to secure it.

IV. Battery / Jumper Connector

A battery connector and jumper is supplied with the Control Box:

1. Battery Connector

The Fuel Control Box is designed to operate without a battery. It will be on whenever power is applied to the fuel injectors. However, by disconnecting the Control Box's TPS wire or Nitrous Harness and plugging in the supplied **Battery/Jumper Connector** with a 9-volt battery (not included) **INTO THE CONTROL BOX**, you can operate the Fuel Control Box without the sled running.



2. Jumper Connector

The jumper is used for troubleshooting only. If your sled will not run or will not idle correctly, disconnect the EFI harness from the Fuel Control Box and plug the Battery/Jumper Connector **INTO THE BOONDOCKER EFI HARNESS** to bypass the Fuel Control Box. The injectors are now connected directly to the sled's ECU through the Boondocker EFI harness. Caution: This is only to be used to test at an idle. Without the Fuel Control Box, no fuel can be added to the stock fuel quantity. If your sled will not run with the Jumper, then unplug the Boondocker EFI harness above the throttle bodies and plug the stock connectors together.

V. Control Box Operation

The control box is powered only when the injector power is on which occurs during start-up and when the engine is running.

1. Startup Screen

When the box is first turned on (by the engine or battery), the Startup screen is displayed. Press any key to go to the main menu. An example Startup screen display is shown below:

```
Polaris Pro RMK
5B5jBD   N2O:ADJ
```

In the example shown above, this screen displays the following information:

Polaris Pro RMK	Sled model. This box is designed for the Polaris RMK without a turbo. Boxes for other sleds will have other lettering.
5B5jBD	This is the software version of the box. The box can be reprogrammed only by sending the box back to Boondocker. Have this number handy when you call Boondocker for technical support.

---

2. Main Menu

The Main Menu is shown below:

```
Main →Fuel Stats
Menu  N2O  Map1U
```

The current selection is shown by the arrow pointing to the right and by the **cursor** (underscore below the "**F**"). Use the **arrow keys** to move the cursor. Move the cursor to the desired menu option and press the "**SEL**" key.

Fuel	Go to the **Fuel** adjust menus.
Stats	Display runtime data, captured data, and recorded maximum data.
N2O	Go to setup menus for optional Boondocker Nitrous kit or to set up the tuning feature.
Map	Go to the **Map** menu to store, lock, or change maps.

The current **Map** number is displayed as "**Map1U**". This indicates that map number **1** is being used and it is **U**nlocked. Up to 5 different maps can be stored in the box. The box will remember what map was last selected and what its settings are – you do not need to do anything to save a map. The maps store fuel settings and configuration data such as for nitrous.

---

3. Fuel Adjust Menus

This selection is used to make fuel adjustments. There are six **Fuel** adjust screens (examples shown below). Five of them are for engine fuel according to RPM and engine load conditions and the sixth is to configure an accelerator pump. Fuel screen1 will be displayed after moving the cursor to the **Fuel** selection on the **Main Menu** and pressing the **"SEL"** button.

Go to the next screen by pressing the "**SEL**" button. After pressing the "**SEL**" on the last **Fuel** adjust screen, you will return to the **Main Menu**. Use the **Left/Right Arrow** keys to switch between settings. Use the **Up/Down Arrow** keys to change the setting values. Sample **Fuel** adjust screens are shown below (actual RPM settings and number of screens may be different for your model).

Fuel screen1:
```
M1U →LO MD HI tr
3000  00 00 00 00
```

Fuel screen2:
```
M1U →LO MD HI tr
5000  00 00 00 00
```

Fuel screen3:
```
M1U →LO MD HI tr
6700  00 00 00 00
```

Fuel screen4:
```
M1U →LO MD HI tr
7800  00 00 00 00
```

Fuel screen5:
```
M1U →LO MD HI tr
8400  00 00 00 00
```

Fuel screen6:
```
M1U →AM DR Sens
ACEL  00 00 08
```

3.1 Fuel Screens (RPM Adjustments)

In the RPM screens (1 through 5), the Fuel Control Box allows fuel adjustments to be made according to the following two factors: RPM and Engine Load.

RPM Regions:
In the example above, the 3000 screen sets the fuel level for near 3000RPM down to idle. The 5000 screen sets the fuel level for RPMs near 5000. Between 3000 and 5000, the fuel adjustment will be proportioned between the two settings. For example, suppose the 3000RPM fuel setting is at "4" and the 5000RPM fuel setting is at "8". If engine is at 4000RPM (half way between RPM ranges), the actual fuel adjustment made will be ½ of "4" and ½ of "8" which is "6".

Load Ranges:
Each RPM Region is split into 3 load ranges: LO (low), MD (medium), HI (high). Each load range is roughly equivalent to the throttle position divided into thirds: LO is closed throttle (idle) to 1/3 open, MD is 1/3 to 2/3 open, and HI is 2/3 to full open. During light-throttle conditions (slow cruising or deceleration), the Fuel Control Box will use the LO RPM settings to adjust fuel. During part-throttle conditions (normal or faster cruising), the MD RPM settings will be mostly used. During heavy-throttle conditions (accelerating or heavy load operation), the HI RPM settings will be used.

```
M1U →LO MD HI□□□
3000 00 00 00□□□
```

Below is a description for each field show in the above sample screen:

M1U This displays current map that is being used – in this case, **M1** stands for **Map1**, and **U** indicates the map is **Unlocked** (changes are allowed). (Map storage, retrieval, locking, and unlocking are covered below.)

3000 This is the **RPM Region** for the fuel adjustments on this screen. In this example, this screen's values will be used near 3000RPM down to an idle. The effect of the 3000RPM setting tapers off until 5000RPM, while the effect of the 5000RPM setting ramps up as RPMs go from 3000 toward 5000.

LO / MD / HI These are the engine Load settings for each RPM region. Since engine load is directly related to throttle position, each load range is equivalent to the following approximate throttle positions:
- **LO** = 0 up to 1/3 throttle
- **MD** = 1/2 up to 2/3 throttle
- **HI** = 2/3 up to full throttle

00 **Fuel adjustment value.** Each setting can go from –99 to 127. Refer to the EFI tuning section for general tuning guidelines. A value of 00 means no fuel adjustment will be made and the original injector signal will be passed through unmodified. Negative values will reduce the fuel. Positive values will increase the fuel. Each number is equal to about ½% duty cycle which is ½% of the total available injector-on time.

3.2 Accelerator Pump

Fuel can be added or subtracted from the stock accelerator-pump fuel quantity. The accelerator pump is activated when the throttle is moved from a low level to a significantly higher level. The setting parameters are as follows:

```
M1U →AM DR Sens□
ACEL 00 00 08  □
```

- **M1U** Map 1 is selected and it is unlocked.
- **AM** Amount of fuel to inject per stroke upon throttle activation.
- **DR** Duration of fuel injection counted in strokes.
- **Sens** Sensitivity of accelerator pump activation.

4. Map Menus

From the **Main Menu**, select **Map1U** to go to the **Map Menu** (shown below). This screen is used to **Load**/**Copy**/**Lock**/**Unlock** saved "maps" that contain fuel and N2O settings. Five maps are available.

```
 Lock ULock StUp
→Load Copy  Quit
```

4.1 Map: Load

When a new map is loaded, the current adjustment settings will be changed to the values from that map. To load a new **Map**, first move the cursor to **Load** and press "**SEL**". The following **Load/Lock Menu** appears:

```
Load 1 2 3 4 5→Q
Lock U U U U U Q
```

Load 1-5	Selects which map to load
Lock	**L** = Locked, **U** = Unlocked, applied to the map number the **L** or **U** is under
Q	Quits this menu

Use the **Up/Down** and **Left/Right Arrow** keys to move the cursor around. To load a new map, move the cursor to the desired map number and press "**SEL**." The map will be loaded and the **Main Menu** will be displayed. When a map is loaded, **M*x*** (***x*** is the map number) is displayed in the Main and Fuel menus showing which map is loaded.

To quickly Lock or Unlock maps while in this screen, move the cursor down to the **Lock** row, place the cursor under the letter under the desired map number, and press "**SEL**" to change from **L**ocked to **U**nlocked or vice versa.

Select **Q** to Quit and return to the Main Menu.

4.2 Map: Copy

To copy a map, first select **Copy** from the **Map Menu**. The following **Copy/Lock Menu** will be displayed:

```
Copy 1 2 3 4 5→Q
Lock U U U U U Q
```

Copy 1-5	Selects which map to copy the current map ***TO***
Lock	**L** = Locked, **U** = Unlocked
Q	Quits this menu

This screen is used to save the CURRENT fuel adjustment map ***TO*** one of five available map locations. The map that is being copied TO must be Unlocked – otherwise a message will be displayed telling you that the map you selected cannot be overwritten.

Note: When a map is copied, the Control Box will load the map copied ***TO*** as the new current map.

Use the **Up/Down** and **Left/Right Arrow** keys to move the cursor to the map number you want to copy ***TO*** and press "**SEL**". The following confirmation message will be displayed:

```
Overwrite Map A
With Map B? Y→N
```

"**A**" represents the map copied ***TO*** and "**B**" represents the current map (copied ***FROM***). If this is exactly what you intend, use the Left Arrow to underscore "**Y**" and press "**SEL**". Now the current map is loaded into the selected map number, the selected map number will become the current map, and the **Main Menu** will be displayed.

To quickly Lock or Unlock maps, move the cursor down to the **Lock** row, place the cursor under the **L** or **U** by the desired map number, and press "**SEL**" to change a **U** (Unlocked) to an **L** (Locked) or vice versa.

Select **Q** to Quit and return to the Main Menu.

4.3 Map – Lock and ULock

Either **Lock** or **ULock (UnLock)** can be selected from the **Map Menu** to quickly lock or unlock the ***CURRENT*** map. Move the cursor to the desired selection and press "**SEL**". The box will return to the Main Menu and the current map will be locked or unlocked when **SEL** is pressed.

5. Stats Menus

This Control Box has a feature that allows real-time data to be displayed and captured. This feature can be useful for tuning or for diagnostic purposes.

5.1 Stats: RUN/CAPTURE

Selecting **Stats** from the Main Menu will first display the following screen with real "Run-time" data (current conditions):

```
Run 35/38  F  6 
 5500 MD███    N
```

Run	"Run" indicates display is in Run mode. If in capture mode, "Cap" will be displayed.
35	Input injector duty cycle in percent of cycle time on (this is the ECU injector signal)
38	Output injector duty cycle in percent of cycle time on (Fuel Control Box added 3% duty cycle)
F 6	Fuel adjustment by Control Box in ½% duty cycle. This is the fuel number for the current range.
5500	RPM (note, if the engine is shut off, the last recorded RPM may be displayed)
MD	Engine Load. **LO**, **MD**, or **HI** will be displayed.
███	These bars are a graphic display of **LO**, **MD**, or **HI** as shown below:

LO
MD ███
HI ██████

N	Nitrous is on (also indicated by the black square above it)

Run/Capture mode:

Left-Arrow button : Sets **Capture Mode**, "**Cap**" will be displayed and the current data will be frozen on the display. The capture occurs on the display when the button is **released** (data will continue to be captured if the button is held down). It will stay in capture mode (data will remain frozen) until the **Right-Arrow** is pressed to return to **Run** mode or until the Control Box is re-powered. If the Stats menu is exited and re-entered before the engine is shut off and the box is in Capture mode, the last captured data will still be displayed.

Right-Arrow button : Clears capture mode (captured data will be lost!) and sets **Run mode**. "**Run**" will be displayed and real-time data will be displayed. Note: The Handlebar Button Mode can also be configured to Capture the Status screen.

Press **SEL** to go to the next screen: **Stats: MAX**.

5.2 Stats: MAX

Any button press from the Run screen will go to the next **Stats** screen which is the **Max** screen, displaying max RPM, Duty Cycle In from the sled's ECU, and Duty Cycle Out to the injectors.

```
MAX DCIn/Out Clr
 5500 35/45  Y→N
```

MAX:	**5500**	Max rpm
DCIn	**35**	Max Duty Cycle Input from sled's ECU
DCOut	**45**	Max Duty Cycle Output to the injectors
Clr	**Y→N**	Select "Y" to clear maximum values

These maximum values will be saved when the box is shut off so they will remain the next time this screen is displayed even if the box is re-powered. Peak values or "spikes" are filtered by finding the average during a certain time-window. Therefore, a maximum must be held for at least 1 second to be recorded and displayed properly.

Use the arrow keys to move the cursor between Y and N. Pressing **SEL** when the cursor is on **Y** will clear the max values. Pressing **SEL** when the cursor is on N takes you to the next screen: **Stats: N2O/DC**.

5.3 Stats: N2O/TPS

This menu displays nitrous information.

```
N2O PSI MxTP Clr
 32 240 208  Y→N
```

N2O	**32**	Maximum fuel adjustment during last nitrous activation (blacked out ▮▮▮ during nitrous activation). This can be cleared manually and is always clear upon next nitrous activation.
PSI	**240**	For systems without a N2O pressure regulator (**NON** in lower right-hand corner of **Startup Screen**), this displays current nitrous tank pressure. For systems using a N2O pressure regulator (**ADJ** or **FIX** in lower right-hand corner of **Startup Screen**), this shows the maximum nitrous pressure during the shot, where the pressure is measured after the solenoid valve. The maximum is averaged over a 1 second period.
MxTP	**208**	Maximum throttle position reading since this menu was last cleared or since engine was last started.

Selecting **Y** will clear these values. Use any arrow key to select **Y** or **N**. Pressing "**SEL**" takes you to the **Main Menu**.

VI. N2O System Configuration

A. N2O Configuration Options

There are seven ways to configure nitrous activation using one or more of the following inputs: button, throttle position, and rpm range. A brief description for each configuration is given below. Detailed setup instructions are provided in sections B and C.

1. **Button only:** Pressing the momentary button on the handlebar activates the nitrous and releasing the button turns it off. TPS and RPM are ignored.
2. **TPS (Throttle Position Sensor) only:** When the throttle is pressed beyond a point set by the user, nitrous is activated. Nitrous is deactivated when the throttle returns to a point below the chosen threshold.
3. **TPS and RPM:** When the RPM and TPS are within a range set by the user, nitrous will activate. Nitrous will turn off when the throttle is decreased (TPS is below the adjustable threshold) or when the RPM is out of the selected range (lower than Min or higher than Max).
4. **Button (N2O) or TPS:** The handlebar button can be used in combination with the TPS. In this way, either the throttle or the button can activate the nitrous. The button will always activate nitrous regardless of the TPS condition.
5. **Button (N2O) or TPS and RPM:** The handlebar button can be used in combination with the TPS and RPM range. In this way, either the throttle/RPM or the button can activate the nitrous. The button will always activate nitrous regardless of the TPS and RPM conditions.
6. **Button (ARM) and TPS:** The nitrous button input on the Control Box can be used to quickly arm and disarm nitrous capability. When armed (button input is on), the system can be configured to activate with TPS. Optionally, the handlebar button, which is momentary (only activated while pressed), can be replaced with a toggle, rocker, or slide switch so it remains in the on or off position as desired.
7. **Button (ARM) and TPS and RPM:** Same as option 6 above except with RPM capability. When armed (button input is on), the system can be configured to activate with TPS and RPM.

B. N2O Configuration Procedure

Note: All nitrous configuration settings are stored in the same map as the EFI settings. All changes you make become part of the current map. The current map number is shown in the Main Menu.

From the **Main Menu**, select the **N2O** option. Below is a description of this menu:

```
Fuel TPS RPM Btn
→050 OFF OFF OFF
```

Fuel	**050**	**Fuel** setting during nitrous activation
TPS	**OFF**	Shows **TPS** mode is **OFF** or displays **TPS** trigger value
RPM	**OFF**	Shows whether **RPM** mode is **ON** or **OFF**
Btn	**OFF**	Displays button mode (described in detail below)

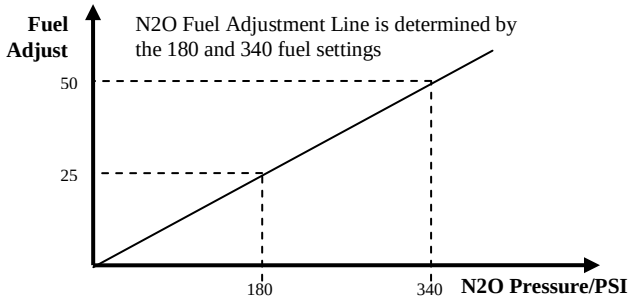
Fuel: The nitrous fuel adjustment tuning procedure is described below in **section VIII**.

If box in in N2O:ADJ (adjustable regulator) mode:

Use the 180 and 340 settings to customize the N2O Fuel Adjustment Line for your engine and nitrous nozzle sizes.

```
 340 180psi FDly
→050 025    000
```

The 340 and 180 fuel settings are used to create a Fuel Adjustment Line (see graph) which allows nitrous fuel to be automatically adjusted according to N2O pressure...



Description of N2O Fuel menu for ADJ mode:

340 050	High N2O pressure fuel setting (fuel adjustment is centered at 340psi)
180 025	Low N2O pressure fuel setting (fuel adjustment is centered at 180psi)
FDly	Number of engine cycles to delay fuel. Use this feature to reduce any bog that occurs due to fuel being delivered before nitrous. Start with 000, and only exceed numbers above 10 with extreme caution!
000	Zero = no delay, non-zero = engine cycles before fuel is delivered.

If box is in N2O:NON (non-adjustable regulator) mode or N2O:FIX (fixed-regulator) mode:

```
 N2OFuel F-Delay
→050         000
```

Description of N2O Fuel menu for NON / FIX mode:

N2OFuel 050	N2O fuel setting. Amount is centered at 1000psi, if bottle pressure is lower, actual fuel delivered will be reduced, if bottle pressure is higher, actual fuel delivered will be higher.
F-Delay 000	Delay in number of engine cycles from when nitrous is activated to when fuel is delivered. Use this feature to reduce any bog that occurs due to fuel being delivered before nitrous arrives in the engine. Start with 000, and only exceed numbers above 10 with extreme caution!

TPS: To select throttle-position triggering, move the cursor until it is under **TPS** and press "**SEL**", **Up** or **Down Arrow**. The following screen will appear:

```
 TPS  N2O on if
→OFF  TPS > 200
```

TPS OFF	Shows **TPS** mode is **OFF**.
TPS>200	If TPS mode is turned **ON,** this is the TPS threshold value used to trigger nitrous.

Under **TPS**, press the **Up or Down Arrow** to toggle the TPS mode **ON** or **OFF**.

Move the cursor right to the **200** setting, then use the **Up and Down Arrows** to select the trigger level. This number is set to near 200 at the factory. You can adjust it from 50 to 248. To choose your level, look at the third **Stats** screen. (Press "**SEL**" to get to the Main Menu, then select **Stats**, and press "**SEL**" until the third **Stats** screen appears – "**N2O"** is displayed in upper left-hand corner). Clear the current data by selecting "**YES**". With the engine on a test stand, quickly press the throttle fully and release it. Note the number under "**MxTP**" This is the maximum value your TPS will output. Let the engine idle, clear the **Stats** screen, and note the **MxTP** number, which is the minimum TPS output. Choose a number close to but a little under the maximum for full-throttle activation. If you choose a number too close to the maximum, it may sometimes fail to trigger. If you choose a number too low, it may trigger when only moderate acceleration is desired.

Press the "**SEL**" button to return to the **Main Menu**.

RPM: To select rpm triggering, move the cursor right until it is under **RPM** and press "**SEL**", **Up** or **Down Arrow**. The following screen will appear:

```
RPM  Min  Max
OFF← 5050 7550
```

RPM	**OFF**	Shows **RPM** mode is **OFF**.
Min	**5050**	If RPM mode is turned **ON**, nitrous will turn on above this RPM**.**
Max	**7550**	If RPM mode is turned **ON**, nitrous will turn off above this RPM**.**

Under **RPM**, press the up or down button to turn this mode **ON** or **OFF**.

Move the cursor right to adjust the **Minimum RPM** (nitrous will be on above this level) and the **Maximum RPM** (nitrous will turn off above this level).
Note: To use this mode, **TPS** must also be ON and the TPS trigger threshold set. Also, these limits will be over-ridden if the button mode is set to N2O and the button is pressed.

Press the "**SEL**" button to return to the **Main Menu**.

BTN: To select the button mode, move the cursor right until it is under **Btn**. Press the up or down key to select between the following five possible modes. The screen will change to the following:

OFF:
```
Description: Btn
Button Off :→OFF
```
This mode disables the handlebar button.

N2O:
```
Description: Btn
N2O + Fuel :→N2O
```
This mode adds nitrous and fuel when the button is pressed. When the button is pressed, nitrous will be activated regardless of the TPS or RPM settings.

TUN:
```
Description: Btn
Fuel only  :→TUN
```
When the handlebar button is pressed in **TUN** mode, only fuel is added. This is used to experiment with fuel addition and subtraction while riding. Press the button at a certain rpm or under a certain load to see whether your addition or subtraction is beneficial. Use very low fuel numbers to experiment. This cannot be used in combination with N2O operation. Be sure **TPS** and **RPM** triggering are OFF when using this feature.

CAP:
```
Description: Btn
StatCapture:→CAP
```
In **CAP** mode, the handlebar button is used to capture current data. When pressed, the **Stats Capture** screen will be displayed and the data will be frozen when the button is released. After a capture, pressing the **Right-Arrow** button will erase the captured data and return to **Run** Mode.

ARM:

```
Description: Btn
On for N2O :→ARM
```

By using a pushbutton (momentary), toggle, rocker, or slide switch connected to the button input, the nitrous system can be armed or disarmed. When the switch is closed the system is armed and ready. Then, depending upon other configuration settings, either the **TPS** or **RPM** with **TPS** can activate the nitrous system. When the switch is open, the system is disarmed so neither **TPS** nor **RPM** will result in nitrous activation.

Nitrous activation idea: One way to use the button for nitrous activation and to have the RPM limiting feature (to prevent hitting the rev-limiter), set Btn to ARM, TPS to ON (with a low threshold), and RPM to ON (with desired Min/Max settings).

Press the **Left or Right Arrow** to return to the N2O menu or push the "**SEL**" button to return to the **Main Menu**.

C. N2O Configuration Examples

The following are examples of settings to achieve the various nitrous triggering configurations described in Section A above:

1. **Button only:** Activate nitrous only when the button is pressed.

```
Fuel TPS RPM Btn
 040 OFF OFF→N2O
```

Set: TPS to OFF, RPM to OFF, and Btn to N2O.

2. **TPS only:** Activate nitrous only when the throttle is pressed beyond a set level.

```
Fuel TPS RPM Btn
 040→200 OFF OFF
```

Set: TPS to ON (set the TPS threshold to the desired level), RPM to OFF, Btn to OFF.

3. **TPS and RPM only:** Activate nitrous only when the throttle is pressed beyond a set level AND when RPMs are with a certain range.

```
Fuel TPS RPM Btn
 040 200→ON  OFF
```

Set: TPS to ON (set TPS threshold to desired level), RPM to ON (set Min/Max to desired levels), Btn to OFF.

4. **Button (N2O) or TPS:** Activate nitrous when button is pressed OR when throttle is pressed beyond a set level.

```
Fuel TPS RPM Btn
 040 200 OFF→N2O
```

Set: TPS to ON (set TPS threshold to desired level), RPM to OFF, and Btn to N2O.

5. **Button (N2O) or TPS and RPM:** Activate nitrous when button is pressed OR when throttle is pressed beyond a set level AND the RPMs are within a certain range.

```
Fuel TPS RPM Btn
 040 200 ON →N2O
```

Set: TPS to ON (set TPS threshold to desired level), RPM to ON (set Min/Max values), and Btn to N2O.

6. **Button (ARM) and TPS:** Activate nitrous when button input is on (armed) AND throttle is pressed beyond a set level.

```
Fuel TPS RPM Btn
 040 200 OFF→ARM
```

Set: TPS to ON (set TPS threshold to desired level), RPM to OFF, and Btn to ARM.

7. **Button (ARM) and TPS and RPM:** Activate nitrous when button input is on (armed) AND throttle is pressed beyond a set level AND the RPMs are within a certain range.

```
Fuel TPS RPM Btn
 040 200 ON →ARM
```

Set: TPS to ON (set TPS threshold to desired level), RPM to ON (set Min/Max values), and Btn to ARM.

D. N2O Pressure Transducer Faults

If the Nitrous Mode is set to **FIX**, the pressure transducer is ignored and no Nitrous faults should appear. If the Nitrous Mode is set to **ADJ** or **NON**, when the nitrous button is pressed, the Control Box first checks to make sure the readings from the pressure transducer are correct. One of the following two fault messages may be displayed. If a fault message is displayed, the nitrous solenoid will not operate and the message will remain displayed until any key is pressed to clear it or the engine is restarted.

```
ERROR: N2O press
too LOW!
```

This screen may appear if the pressure in the N2O tank is zero, the transducer is unplugged, or there is a wiring problem.

Important Note: If the bottle becomes empty, this message will be displayed and nitrous will be shut off to prevent extra fuel from being added without nitrous!

```
ERROR: N2O press
over 2000psi
```

This screen will appear if the pressure transducer senses a pressure above **1000**psi for regulated systems or **2000**psi for non-regulated systems.

VII. EFI Tuning Suggestions

Each Fuel adjustment setting goes from –99 to 127. Positive numbers add fuel and negative numbers subtract fuel. The Control Box will not prevent a lean burn-down! You must take the proper tuning steps the same as if you were tuning a carburetor.

The maximum is set to 127. This does not mean you have an effective range all the way to 127 – you will likely max out the injector before this setting is reached. Your usable adjustment range (max value) is dependent on how long the ECU already has the injector on. This will vary depending on rpm, throttle setting, temps, and can be different from sled to sled even of the same model. There is no direct relation.

Exhaust Gas Temperature (EGT) and Air/Fuel (A/F) gauges can be effective tuning tools, but they are not a substitute for reading spark plugs and piston wash and feeling how the engine runs. Use EGTs and A/F ratios only as a backup to verify what you see. They can be misleading under certain conditions. Safe EGT readings can vary greatly from engine to engine depending on such things as probe placement, fuel, timing, pipe design, porting, etc.

Tuning tips:

Important: Find the settings where your motor runs rich **before** you decide to go lean!

1. Tune with the engine and pipe at operating temperature. The sled's ECU will make adjustments as the engine warms up – you might think the engine needs leaner settings then later realize you are too lean once the engine warms up.
2. Use the **Load/Save Map** feature to quickly change and compare fuel settings when testing. This can also be useful for riding under different conditions. For example, changing elevations or temperatures may require different adjustments if the stock ECU does not compensate properly for your modifications. For drag racing, you might want to run richer settings for longer distances than you would for short distances.
3. One method for finding out where a fuel adjustment setting is effective is to greatly increase only that setting. Run the engine to find out when it suddenly becomes too rich – this is where that setting is effective. Be careful – you can easily flood the motor, especially with LO load or low rpm settings. If this happens, to restart the engine you may have to pull several times with the throttle held wide open.

4. The **Stats Capture** feature can be used to determine RPMs where there's a problem, and if the load setting is LO, MD, or HI. The nitrous button can be configured to capture these stats. From the Main Menu, select **N2O**, set **Btn** to **CAP.** Whenever the button is pressed, the **Stats: Capture** screen will be displayed. The current stats will be captured when the button is released.

   N2O Menu in "Capture" mode:

```
Fuel TPS RPM Btn
 040 OFF OFF→CAP
```

5. Alternatively, the nitrous handlebar button can be used to add or subtract a preset amount of fuel for interactive tuning purposes. From the Main Menu, select **N2O**, set **RPM** and **TPS** to **OFF**, set **Btn** to **TUN** and adjust the fuel number as desired for the test (see example menu screen below). When the nitrous button is pressed, this amount of fuel will be added or subtracted immediately from the current settings for all RPMs and all loads. Use small fuel numbers for this test. If you are trying to improve tuning at a particular RPM and engine load, try to press and release the button near that condition to see what difference it makes.

   N2O Menu in "TUNE" mode:

```
Fuel TPS RPM Btn
 002 OFF OFF→TUN
```

Also consider the following:

A/F Mixture	Generally EGT's get hotter as the motor gets lean, but too lean and the temps can actually drop! It's like turning the oxygen up too high on a torch – as oxygen is added, the flame gets hotter to a certain point, then gradually cools off until it becomes extinguished from too much oxygen.
Detonation	Detonation often requires an experienced tuner to detect – in most instances it cannot be heard or noticed. Careful examination of the piston and sparkplug are required. Watch for melted sparkplug electrodes, speckling on the sparkplug insulator, or shiny or gray flakes on the electrode which could be melted aluminum from the piston. If possible, watch the crown of the piston (near exhaust port) for a pitted or sand-blasted look. EGT's can sometimes read low during detonation – heat is going into the cylinder and piston instead of out the pipe.
Timing	Timing can affect the pipe temperature. Generally if the ignition is retarded, more heat will build up in the pipe. Too much advance may drop EGT temps, but increase cylinder temps.
Fuel	Different fuels have different densities and other characteristics which can affect your mixture and fuel requirements. Oxygenated fuel will run leaner. Octane rating is important for highly modified motors.
Lean spots	Sometimes a motor runs hot at certain RPMs and throttle positions (usually in its mid-range) no matter what. The fuel adjustment settings can be used to richen this up, but the engine may quickly become too rich and run erratically. Under light load conditions you can sometimes get away with running hot for short periods of time. Under such conditions it is best to vary the throttle position often and not stay at one throttle setting for long durations.

VIII. Nitrous Tuning (for optional Boondocker Nitrous kit)

Important Tuning Note: **Be sure to make non-nitrous (RPM-based) tuning adjustments first**. Once the nitrous tuning procedure has been done, any changes to the RPM fuel settings may affect nitrous fuel delivery. If this occurs, the nitrous tuning steps will need to be done again.

On the startup screen (displayed when first powered on), note the message in the lower right-hand corner after "**N2O:**"

- **ADJ** – Configured for a nitrous system using an Adjustable or Fixed N2O pressure regulator.
- **FIX** – Configured for a nitrous system using a Fixed N2O pressure regulator.
- **NON** – Configured for a nitrous system that is Non-regulated.

Be sure that this description matches your actual nitrous system. Some internal settings and some user menus and settings are affected by this configuration. **Do not attempt to run a Non-regulated nitrous setup with the Control Box in ADJ mode or a Regulated nitrous setup in NON mode!** Go to the **SetUp** menu (under the **MAP Menu**) to change this setting. If you do not have nitrous capability, then this configuration does not matter.

The fuel adjustment setting in the **N2O** menu is used to control how much fuel is added during nitrous use. The nitrous pressure transducer input is used to automatically scale the fuel adjustment up or down from this base setting according to nitrous pressure. However, you still must go through the nitrous tuning procedure before you can safely use nitrous.

> **Warning:** Only adjust the control Box settings according to the steps below. The best way to tune an engine is with the use of an oxygen sensor and gauge (available from Boondocker). This adjustment process should only be performed by an experienced tuner. If you are not an experienced tuner, find someone who is. Remember, safety first!

The steps below should be performed with a full nitrous bottle. On systems without a nitrous pressure regulator, make sure the bottle is at proper operating temperature (70-90deg F) and pressure (700-1000psi). Make sure the engine is at normal operating temperature.

***** Do not exceed 2 seconds of nitrous use until the fuel adjustment is complete and correct! *****

1. First configure the nitrous system for Button use. Section VI describes different ways to configure your system for nitrous activation, but we're going to shortcut that for now.

   Select **N2O** from the **Main Menu**, move the cursor so it is under **Btn** and press the **Up Arrow** until **N2O** appears. Press "**SEL**" to return you to the **Main Menu**. Select **N2O** from the **Main Menu** again. Look at the **N2O Menu** to be sure that **TPS** and **RPM** are turned **OFF**.

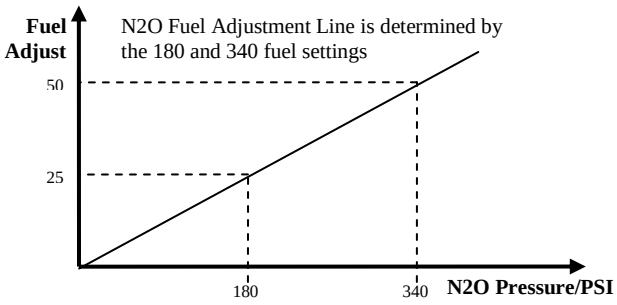
   N2O Menu for Button Activation for initial Nitrous Tuning:

   ```
   Fuel TPS RPM Btn
   →040 OFF OFF N2O
   ```

2. Follow this step only if you have an adjustable N2O pressure regulator: Select **N2O** from the **Main Menu**. With the cursor under **Fuel**, when you press the **up**, **down**, or "**SEL**" key, the following menu appears:

   ```
    340 180psi FDly
   →050 025    000
   ```

   The 340 and 180 fuel settings are used to create a Fuel Adjustment Line (see graph) which allows nitrous fuel to be automatically adjusted according to N2O pressure. Raising or lowering either of these values will change the slope of the line.



Description of N2O Fuel Screen for ADJ regulator:

340 050 High N2O pressure fuel setting (fuel adjustment is centered at 340psi)

180 025 Low N2O pressure fuel setting (fuel adjustment is centered at 180psi)

Adjust the low pressure (180psi) **Fuel** setting first. Set your regulator pressure to 180psi +/-20psi (approximately 1 3/4 turns out on the adjustable regulator knob). The actual N2O pressure will be displayed after nitrous has been activated in the upper right of this screen.

Increase the **low pressure (180) nitrous Fuel adjustment** on the Control Box until you notice a drop in the power increase when using nitrous. Oxygen, EGT, and rpm readings can be used to help determine when you are too rich. Be sure you have reached this point before proceeding to the next step. Note this adjustment setting.

3. Follow this step only if you have a **Fixed** N2O pressure regulator or a **Non**-regulated system: Select **N2O** from the Main Menu.

```
Fuel TPS RPM Btn
→050 OFF OFF N2O
```

Select Fuel. The following screen will appear:

```
N2OFuel   F-Delay
→050         000
```

Increase the nitrous **Fuel** adjustment setting until you notice a drop in the power increase when using nitrous. Oxygen, EGT, and rpm readings can be used to help determine when you are too rich. Be sure you have reached this point before proceeding. Note this adjustment setting.

4. Only after step 2 or 3 is complete, start reducing the **Fuel** setting. Continue reducing the **Fuel** setting until a maximum power increase is obtained. Again, note oxygen, EGT, and rpm readings, and do not exceed 2 seconds of nitrous use which is just sufficient to get a good reading. A useful technique is to accelerate, allow rpm to stabilize, apply nitrous, and notice maximum rpm, and if available, O2, and EGT readings.

5. If the **Fuel** is reduced but no power increase is noticed from the previous setting, this means you are lean. Note this adjustment setting.

6. Increase the **Fuel** setting back to where it was before no additional power increase was noted in step 4. This setting should be somewhere between the rich and lean settings. It is best to stay on the rich side.

7. After this adjustment is made, if the engine does not run perfectly smooth when using nitrous, do not use it! If the exhaust note does not sound clean, the cause is likely detonation, which can quickly destroy the engine. Use higher octane fuel, add more ignition retard, reduce the engine's compression, or reduce the amount of nitrous (see instructions for changing nozzles) before using nitrous again.

8. Follow this step only if you have an adjustable N2O pressure regulator and you desire to use pressure over 210psi. Set the nitrous pressure to the highest pressure you intend to run (should be at least 210psi) and repeat steps 2 and 4-7 while making adjustments on the 340psi N2O **Fuel** setting.

   Note: You do not have to calibrate at the high pressure shown on the screen (340psi). If you will not be running higher than 210psi, then the second fuel setting is not required. Leave the 340psi number at the factory setting.

   Note: The high-pressure fuel setting (340psi) must be higher than the low-pressure fuel setting (180psi). If you attempt to violate this, the low pressure setting will be reset to the high pressure setting.

Note 1: The RPM and Nitrous fuel adjustments are summed. Therefore, any changes made to RPM fuel settings will affect the quantity of fuel delivered for nitrous. Therefore, for example, if the 7800 **HI** fuel setting is **decreased** by X amount, you need to **increase** the nitrous fuel setting by X amount in order to get the same total fuel delivery for nitrous.

Note 2: After initial tuning, any new performance enhancements to your engine will require re-tuning the EFI and nitrous fuel delivery.

Note 3: All nitrous fuel settings are stored in the same map as the RPM settings. All changes you make become part of the current map. The current map number is shown in the Main Menu.

IX. Troubleshooting

Stuck Button

When the Control Box is first turned on, all buttons are checked to verify that a button is not stuck on. If a button is on during power up, the button will be disabled and the following message will be displayed until a button is pressed:

```
Button is Stuck!
```

If this condition occurs, the Control Box will still function and adjust fuel properly. The Control Box can be sent back to Boondocker to be serviced. Contact Boondocker to get an RMA number (Return Merchandise Authorization) before sending your unit.

Injector Fault

The Control Box monitors the signals from the sled's ECU. If it detects signals on one set of wires but not the other, it will detect a fault on that injector and display one of the following error messages.

`Injector 1 Fault`	No signal detected on the MAG side (yellow wire).
`Injector 2 Fault`	No signal detected on the PTO side (green wire).
`Injector x Fault`	An error occurred that did not get cleared (by pressing any button) before the engine was started again.

If any of these conditions occur, the Control Box will still try to function and adjust fuel properly. Contact Boondocker to determine if the Control Box and harness need to be sent back to be serviced.

Other Issues

Engine runs erratically:

1. Verify that the EFI Harness Ground Wire has a good connection.
2. Verify that all wiring is in good condition (not cut or melted) and that the wires have not pulled out of the terminals. To verify this, look inside each connector and verify that the terminal pins are all at the same height. If a terminal is starting to back out, it will appear to be lower in the connector.
3. Unplug the EFI harness and plug the stock connectors onto the injectors and verify that the sled runs OK. For this test, do not run engine under any conditions where it will not get enough fuel.
4. If problem only occurs with Control Box plugged in, change all fuel adjustment settings to 0 and see if the problem persists. This will isolate the problem to either the Control Box or to the fuel settings used.
5. Verify that the Control Box does not reset itself when the sled is running by doing the following:
    a. When the sled is first powered up, change the menu screen on the Control Box to one of the fuel adjust screens.
    b. Run the sled.
    c. Before shutting off the sled, verify that the screen is still on the same menu selection.
    d. If the startup screen is displayed (showing version number etc.), the box has reset itself. This is likely caused by bad voltage to the box due to an intermittent connection.

Rough Idle: Idle adjustments are much more sensitive than other adjustments since the injectors are on for a very short duration. You may not be able to adjust your 3000 LO settings by very much.

LCD characters are dim: If you are using a 9 volt battery to power the box when the sled is not running, your battery voltage is getting low – replace your battery, even if the back light is on. Extreme hot or cold temperatures may cause the LCD to not display properly.

LCD display is slow: Cold weather conditions can make the LCD respond very slowly. The Control Box will still function OK. You can locate the box under the hood in order to provide heat so the LCD will display quicker.

Moisture on LCD: Condensation is normal if the Control Box is quickly moved from a cold to a warm environment. In some cases, the Control Box enclosure may no longer be sealing properly. If such problems persist, contact Boondocker to determine if resealing the box is necessary.

Check Engine light: Make sure the wires in the EFI harness are correct and check for a bad connection in the wiring harness. Recheck all connectors and be sure each is completely latched. Also inspect each wire to make sure there are no frayed, broken, or melted wires.

X. Warranty, Terms & Conditions

Returned Goods – No merchandise will be accepted without prior approval. A RMA number (Return Merchandise Authorization) provided by Boondocker is required before a return will be accepted. A 20% handling and restocking charge will be applied to returned merchandise. No unauthorized returns will be accepted.

Limited Warranty – Boondocker warrants its product to the original purchaser against workmanship defects for a period of 90 days, commencing from the date of product delivery to the Consumer.

Maximum Liability – The maximum liability of Boondocker in connection with this warranty shall not under any circumstances exceed the price of the product claimed to be defective.