Yamaha Phazer Boost Capable
EFI Control Box Instructions

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

Control Box Kit Contents:

Quality check by:

___1 Control Box
___1 EFI harness
___1 Pressure Transducer
___1 pressure transducer harness
___1 mounting bracket for transducer
___1 battery/jumper connector
___2 velcro strips

IMPORTANT - PRODUCT REGISTRATION: Please register this product online as soon as possible (if you do not have internet access, please call us at 208-542-4411). It is required that you register this product so you can receive technical support, warranty claims, and so you can keep informed of product updates.

To register, go to **www.boondockers.com**, select "**SUPPORT"** then select "**PRODUCT REGISTRATION**". Please complete the on-line form.

I. Theory of Operation:

The Boondocker Control Box connects between the sled's ECU (Electronic 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 changes while keeping the stock fuel map. This means the ECU can still compensate for engine speed, throttle position, barometric pressure, engine temperature, air temperature, etc.

The Control Box can reduce fuel or increase fuel amounts for certain rpm ranges and load conditions. This is done by changing its fuel adjustment settings by using the buttons and LCD display. As with tuning a carburetor, it is possible to go too rich or too lean!

Note: Be sure you know how to properly tune an engine before you adjust the fuel settings! Use of an Air/Fuel Guage 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).

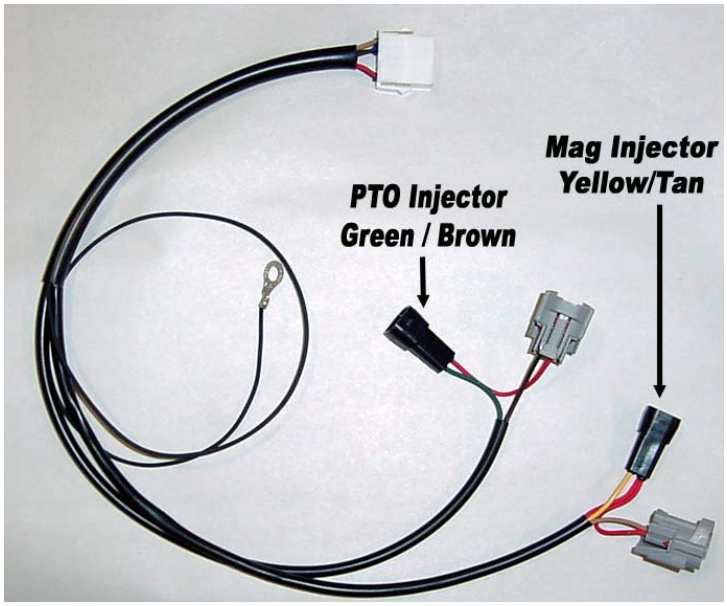
Note 4: The Control Box is sealed – do not take it apart or it will no longer be sealed. The Control Box is designed to be splash-proof. Do not submerge or subject the box to high-pressure spray. During long periods of non-use it is recommended that you do not leave the control box exposed to the elements.

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

II. Wiring:

A. EFI 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 optional Nitrous Harness. These two connectors are keyed (male/female) so only the correct harness will fit into the correct plug-in.



Note: Use **Dielectric Grease** on all plug connections to help prevent corrosion on the terminals.

The EFI harness plugs into the stock sled's injector connectors as follows:

1. Disconnect the stock harness connector from each fuel injector. Note which connector goes to which injector.

2. Determine where the control box will be mounted and how the harness will be routed. Route the harness so the injector connectors end up near the sled's fuel injectors.

3. There is a left (PTO) and right (MAG) pair of connectors for each injector (see picture). The connector pair with the Yellow and Tan wires go to the MAG side, and the connector pair with the Green and Brown wires go the PTO side.

4. Plug the gray Control Box connector (female) to the sled's fuel injector, and the black connector to the sled's gray injector connector. Do this for both the MAG and PTO sides. The space above each injector is tight – it may help to rotate the injector 90deg to install the connector, then rotate it back.

   Note: *Be sure the black harness connectors latch securely to the gray injector connectors. This may require pushing the latch on the gray connector down over the tab on the black connector. Do not force the connectors – check for bent pins.*

5. Connect the Control Box harness ground eyelet to a bolt on the chassis. A good ground connection is extremely important!

6. Use zip ties to keep the harness away from moving parts. Use reflective heat tape if the harness must be routed near hot items such as the exhaust.

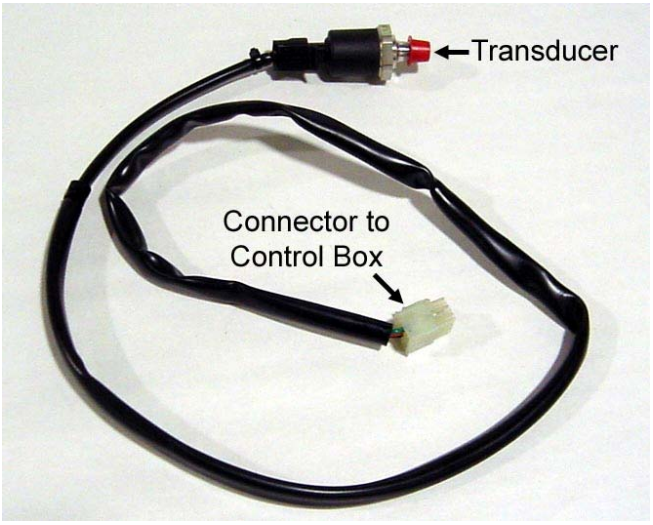
B. Pressure Transducer wiring:

The pressure transducer is used to determine manifold pressure (vacuum or boost).

1. Connect the pressure transducer so it is Tee'd into the manifold vacuum line (same hose that goes to MAP sensor). The pressure transducer can be mounted to the frame with the supplied mounting bracket.

2. Plug the transducer connector into the transducer.

3. The white connector from the transducer harness plugs into the Control Box.



C. Jumper/Battery Connector
The jumper can be used in one of the following two ways:

1. A 9-volt battery can be plugged into the jumper and the jumper can be plugged into the female connector (pressure transducer connector must be unplugged) to power the Control Box. This allows the Control Box to be turned on when the engine is off.

2. If the Control Box is unplugged from the injector harness, the jumper can be plugged in its place into the injector harness (9-volt battery is not required). This bypasses the Control Box to allow the sled's ECU to directly drive the injectors. <u>This is for emergency or diagnostic use only!</u>

III. Control Box Mounting Locations

The Control Box can be mounted under the hood, on the dash, or on the handlebars using the supplied Velcro strips. Before applying the adhesive strips, thoroughly clean each surface (rubbing alcohol works well). It is also best if each surface is room temperature.

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

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

IV. Control Box Operation

The control box is powered only when the injectors are on which occurs for a few seconds when the key is first turned on or when the engine is running. Up to 5 different fuel adjustment maps are stored in the box (currently all with zero values). 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 when making adjustment (see Fuel Adjustments below).

A. Intro / Startup Screen

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

```
Phazer Turbo
4B5gBD  N2O:FIX
```

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

Phazer Turbo	Sled model. This box is designed for the Yamaha Phazer. Boxes for other sleds will have other lettering.
4B5gBD	This is the software version of the box. The box can be reprogrammed only by sending the box back to Boondocker
N2O:	Shows that this Control Box is nitrous capable.
FIX	Nitrous pressure regulator type (refer to Nitrous Section for more description)

B. Main Menu

The Main Menu is shown below:

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

The current selection is shown by the **Right-Arrow** and the **cursor** (underscore below the "**F**"). Use the **arrow keys** to move the cursor. Move the cursor to the desired selection and press the "**SEL**" key to select the desired menu option from one of the following:

Fuel Go to the **Fuel** adjust menus (see Section 1).
Stats Display runtime data, captured data, and recorded maximum data (see Section 3).
N2O Menus for optional Boondocker Nitrous kit (see Chapters VII and IX..).
Map Go to the **Map** menu (see Section 2)

The current **Map** number is displayed as "**Map1U**". This indicates that map number **1** is being used and it is **U**nlocked.

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1. Fuel Adjust Menus

This selection is used to make fuel adjustments. There are four **Fuel** adjust screens (examples shown below). The first screen comes up after selecting **Fuel**.

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 settings. Sample **Fuel** adjust screens are shown below (actual rpm settings and number of screens may be different for your model).

Fuel screen1:
```
M1L  LO MD HI tr
3000 00 00 00 00
```

Fuel screen2:
```
M1L  LO MD HI tr
6000 00 00 00 00
```

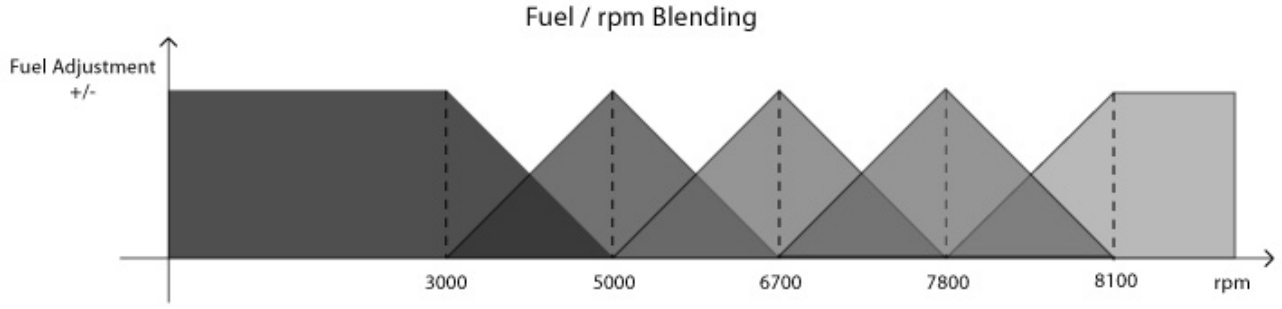
Fuel screen3:
```
M1L  LO MD HI tr
8500 00 00 00 00
```

Fuel screen4:
```
M1L  LO MD HI tr
10K5 00 00 00 00
```

Fuel screen5:
```
M1L  -4 -2 +4 +8
TboL 00 00 00 00
```

Fuel screen6:
```
M1L  12 16 20 24
TboH 00 00 00 00
```

Fuel screen7:
```
M1L  AM DR Sens
ACEL 00 00 00
```



The fuel adjustment rpm ranges are blended as shown in the picture above. This allows for a broader range of adjustments with fewer steps. Each fuel setting is centered at a particular rpm value, in this example: 3000, 5000, 6700, 7800, 8100rpm. Each region is blended with the region below and the region above it as shown. For example, if the rpm is at 4000, the adjustment value will be half the value of the 3000 setting plus half the value of the 5000 setting.

1.A Fuel: RPM Adjustments

```
M1L →LO MD HI tr
3000 00 00 00 00
```

M1L This displays current map that is being used – in this case, **M1** stands for **Map1.** Five possible fuel maps can be used. Each map consists of all your configuration and fuel settings for a particular setup. The "**L**" indicates that this map is **Locked** – this means the settings cannot be changed (the up/down buttons have no effect). If the map is **Unlocked,** adjustments can be made to any setting and these changes will be automatically saved to the selected map. Refer to the Load/Copy sections for more details about how to lock and unlock individual maps.

3000 This is the **RPM Region** for the fuel adjustments on this screen. For this example, this screen's adjustments will be centered at 3000rpm. There are usually 5rpm regions (some boxes with special programming will have additional regions). The effect of the 3000rpm setting tapers off until 5000rpm as shown in the picture above, while the effect of the 5000rpm setting is ramping up. The other regions work similar to this.

LO This adjustment is for **Low load** conditions. This will affect throttle settings from approximately 0 up to 1/3. For rpm region 3000, this adjustment will affect idle. For other rpm regions, this will affect deceleration and light-load cruising conditions.

MD This adjustment is for **Medium (mid-range) load** conditions. This will affect throttle settings from approximately 1/3 up to 2/3.

HI This adjustment is for **High load** conditions. This will affect throttle settings from approximately 2/3 to full open.

Note 1: Each number is equal to about 1/2% of the total available fuel. The maximum available fuel will vary with each engine as well as with elevation and air temperature.

Note 2: It is possible to max the injector (duty cycle > 100%) **before** the adjustment setting is maxed! Pay careful attention to EGT's, O2 readings, and fuel pressure when running with engine mods that require a lot of additional fuel!

tr This adjustment is to **Trim** the **PTO cylinder** (**left-side cylinder** when sitting on the sled). This is used to add or subtract fuel on the left side if fine-tuning is desired. *The LO adjustment is not affected by the Trim value – trim is only used for the MD and HI settings.* It is best to tune the right (mag) cylinder first then make adjustments to the left (PTO) cylinder if necessary. If more than a small amount of adjustment is required (greater than plus or minus 7), check for other problems first (such as incorrect harness connections to the PTO cylinder).

1.B Fuel: Boost Adjustments

Screen 6 (Turbo Low Boost)

```
M1U  -4 -2 +4 +8
TboL 00 00 00 00
```

This menu adjusts the fuel according to the pressure transducer. Fuel can be added or subtracted as follows:

-4: fuel adjustment when pressure is below -2 in Hg (normal idle)

-2: fuel adjustment when pressure is between -2 and 0 in Hg

+4: fuel adjustment is centered at 4 psi. If pressure is below 4, fuel is blended with -2 setting. If pressure is above 4, fuel is blended with +8 setting.

+8: fuel adjustment is centered at 8 psi. If pressure is below 8, fuel is blended with 4 setting. If pressure is above 8, fuel is blended with 12 setting.

Screen 7 (Turbo High Boost)

```
M1U  12 16 20 24
TboH 00 00 00 00
```

12: fuel adjustment is centered at 12 psi. If pressure is below 12, fuel is blended with 8 setting. If pressure is above 12, fuel is blended with 16 setting.

16: fuel adjustment is centered at 16 psi. If pressure is below 16, fuel is blended with 12 setting. If pressure is above 16, fuel is blended with 20 setting.
20: fuel adjustment is centered at 20 psi. If pressure is below 20, fuel is blended with 16 setting.
24: fuel adjustment is centered at 24 psi. If pressure is below 24, fuel is blended with 20 setting. If pressure goes above 24psi, fuel is kept at this setting.

1.C Fuel: Accel Pump Adjustments

```
M1L →AM DR Sens
ACEL 00 00 00
```

AM Amount of fuel to be added/subtracted during acceleration

DR Duration in engine cycles to make acceleration adjustment

Sens Accelerator pump Sensitivity. Larger values are Less sensitive (throttle must be moved more). Value of Zero will cause accelerator pump to always be on! Typical values are between 5 and 20.

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2. Map / Setup 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 can be used (**Map1**-**Map5**).

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

2.1 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 select Load and press "**SEL**". The following **Load/Lock Menu** will be displayed:

```
Load 1 2 3 4 5→Q
Lock L 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, the **M*x*** (***x*** is the map number) that is displayed in the Main and Fuel menus will show the loaded map number as a reminder.

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.

2.2 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 L 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 to be 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 to be copied FROM. If this is exactly what you intend, use the Left Arrow to underscore "**Y**" and press "**SEL**". Then the current map will be loaded into the selected map number, the selected map number will become the current map, and the Control Box will return to the Main Menu.
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.

2.3 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.

2.4 Map – StUp (if Shown)

Refer to the Advanced Mode Instructions

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3. Stats Menus

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

3.1 Stats: RUN/CAPTURE

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

```
Run 35/40  10.2NA
 5500 MD███   10
```

1st line

Run "Run" indicates display is in Run mode. If in capture mode, "Cap" will be displayed.
35 Input duty cycle in percent
40 Output duty cycle in percent
10.2 Current Boost Pressure
N If "N" displayed, Nitrous is on
A If "A" displayed, Accelerator Pump Fuel adjustment is on

2nd line

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 ██████

10 Current Fuel Adjustment

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 re-entered before the engine is shut off and the box is in Capture mode, the last captured data will 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 Button Mode can also be configured to Capture the Status screen Press **SEL** to go to the next screen: **Stats: MAX**.

3.2 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.

These max 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/TPS**.

3.3 Stats: PSI

This menu displays nitrous and TPS information.

```
PSI MAX Peak Clr
   12.2 13.4 Y→N
```

MAX **12.2** This is the **average** maximum boost amount measured in psi. The boost is averaged during a 1 second window in order to filter out boost spikes. This value should be very close to the actual sustained boost. If the display shows "XX.X", the boost value has exceeded the valid range.

Peak **13.4** This is the peak boost value. This is usually higher than the Max boost value by 1 to 2 psi due to spikes on the boost pressure. If the display shows "XX.X", the boost value has exceeded the valid range.

Clr **Y N** Selecting **Y** will clear the save PSI Max/Peak values. Use any arrow key to select **Y** or **N**. Pressing "**SEL**" takes you to the **Main Menu**.

VI. 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 burndown! 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 gauges can be an effective tuning tool, but they are not a substitute for reading spark plugs and piston wash and feeling how the engine runs. Use EGTs only as a backup to verify what you see. They can be misleading under certain conditions and safe 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, 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 RPM, and if the load setting is LO, MD, or HI. The nitrous button can be configured to capture these stats (see nitrous configuration section below). 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. The nitrous handlebar button can be used to add or subtract a preset amount of fuel for interactive tuning purposes (see nitrous configuration section below). 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.

   N2O Menu in "TUNE" mode:

   ```
   Fuel TPS RPM Btn
    040 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 erratic. 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.

VII. Nitrous Tuning (for optional Boondocker Nitrous kit)

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.

ADJ – Configured for a nitrous system using an Adjustable or Fixed N2O pressure regulator.
Note: Do not use ADJ mode for Control Boxes programmed with Boost capabilities.
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!** Please call Boondocker if your setting is incorrect. 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. The next chapter will describe 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**. 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. Select **N2O** from the Main Menu.

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

   Select Fuel. The following screen will appear:

   ```
   N2O Fuel   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.

3. 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.

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

4. 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.

5. After this adjustment is made, <u>if the engine does not run perfectly smooth when using nitrous, do not use it!</u> 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.

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.

VIII. N2O System Configuration

A. N2O Configuration Options

There are seven ways to configure nitrous activation using one of more of the following inputs: button, throttle position (requires installation of Boondocker TPS kit), and rpm range. A brief description for each configuration is given below. More details can be found in sections B and C.

1. **Button only:** Pressing the momentary button activates the nitrous and releasing the button turns it off. The button can be configured to activate the nitrous regardless of TPS or RPM conditions.

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 (when not pressed).

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
      →040 OFF OFF OFF
```

Fuel	**040**	**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 above in **section VIII**.

```
N2O Fuel   Delay
→050         000
```

Descritpion of N2O Fuel menu for NON / FIX mode:

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.

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.

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**.
200		TPS threshold value.

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.

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**.
5050		Min RPM threshold
7550		Max RPM threshold

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.

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. 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.

IX. Control Box 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 detected to be on during power up, the button will be disabled and the following message will be displayed until another button is pressed. To verify if a button really is stuck on, re-power the box without pressing any buttons.

```
Button is Stuck!
```

Note: A common problem is a **bad ground connection** on the sled causing the box to keep resetting itself. If a button is being pressed when this occurs, the "button stuck" message will be displayed. Start the sled without pressing a button and see if the message goes away. If it is not present, start looking for a disconnected ground on the sled (see Other Issues below).

If a button really is stuck on, the Control Box can still function and adjust fuel properly. The Control Box can be sent back to Boondocker to be serviced.

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 two error messages.

MAG Inj. Fault!	Missing or bad signal detected on the MAG side injector (yellow or tan wire).
PTO Inj. Fault!	Missing or bad signal detected on the PTO side injector (green or brown wire).
xxx Inj. Fault!	This means a previous injector fault has occurred which has not yet been cleared.

If any of these conditions occur, the Control Box will still function and it will still try to make fuel adjustments, but the intermittent injector connection will need to be fixed. Contact Boondocker to determine if the Control Box and harness need to be sent back to be inspected or serviced.

Note: Injector errors that occur infrequently can be ignored since they are likely caused by sporadic electrical noise.

Other Issues

Engine runs erratically:

1. Verify that the ground on the sled's harness has a good connection to the chassis.
2. Verify that the EFI Harness Ground Wire has a good connection.
3. Verify that all wiring is in good condition 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, or the seal on the back-side will be protruding out farther than the rest.
4. Unplug the EFI harness and plug original harness back into the injectors and verify that the sled runs OK.
5. If problem only occurs with Control Box plugged in, change all fuel adjustment settings to 0 and see if problem persists.
6. 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.
7. If necessary, the voltage supply to the box can be verified using a voltmeter. Probe from the Mag-side gray connector on the EFI harness where two red wires go to one connector terminal. Insert a small thin wire such as a paperclip or a small probe tip between the connector and the rubber seal in order to make contact with the terminal inside. Place the positive voltmeter probe here. Place the negative voltmeter probe on chassis ground. At idle the **DC voltage** should read around 12-14V.

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 is 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. 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. Look at the seals on the back of each connector – if a pin has backed out, its wire seal will be protruding out of the connector more than the rest.

X. Fuel Octane Recommendations

The octane your engine needs depends on many variables such as air density (elevation/temp), engine compression ratio, camshaft timing, and ignition timing. The table below is provided as a general guideline only – your engine requirements may be different.

Note: When using pump gas, be aware that the fuel quality can vary and has been known to be less than that shown on the pump! We recommend you obtain fuel from a known source and/or mix with race gas if in doubt.

Boost →	**8lbs**		**10lbs**		**12lbs**		**14lbs**		**16lbs**	
Comp. Ratio →	**11.8:1**	**9.0:1**	**11.8:1**	**9.0:1**	**11.8:1**	**9.0:1**	**11.8:1**	**9.0:1**	**11.8:1**	**9.0:1**
0 ft	95	93	100	95	105	100	x	x	x	x
2500 ft	93	92	98	94	103	98	108	103	x	x
5000 ft	92	91	97	92	102	97	107	102	112	107
8000 ft	91	91	95	91	100	95	105	100	110	105

octane shown is determined by (R+M)/2

x = not recommended when using stock injectors and fuel pump

XI. 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.