Polaris 600 2009 2 injector EFI Control Box Instructions
(Fuel + N_2O, TPS)

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

Kit Contents:
Quality check by:

___1 Control Box
___1 EFI Harness
___1 battery/ jumper connector
___5 red butt-splices (1 is spare)
___3 blue butt-splices (1 is spare)
___1 TPS Harness (if w/o nitrous)
___1 reusable zip-tie
___1 Advanced mode instructions

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!

Note 1: 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.

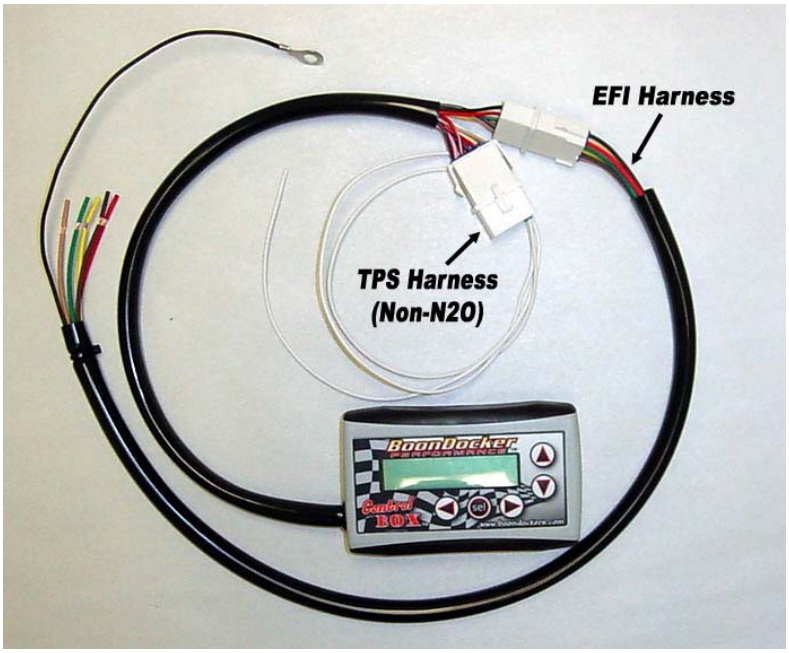
Note 3: Avoid exposing the Control Box to environments where **static charges** may exist. For example, quickly removing a sled cover from the sled in a dry environment can create a static spark that will damage the box (especially if the box is mounted up on the handlebars).

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 Harness Installation
There are two 10-pin connectors at the end of the black cable on the control box. One is for the EFI wiring harness and the other is for the optional Nitrous wiring 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 connections to help prevent corrosion on the terminals.



The EFI harness has wires that will be hard-wired into your sled's injector harness.

IMPORTANT: You must install a TPS wire. If you are installing a nitrous kit at the same time, this wire will be included with the nitrous kit. If you are not installing a nitrous kit, you will need to install the white TPS wire which is by itself on a separate connector that plugs into the Control Box N2O connector (see photo).

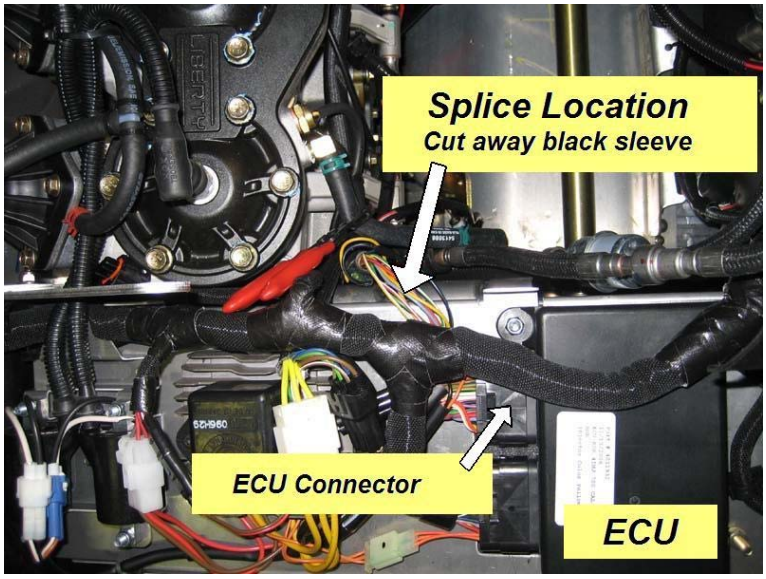
The EFI harness will need to be connected to your sled's harness as follows:

1. Remove the plastic clutch cover.

2. Locate the fuel injector harness (see photo). This harness comes from the smaller (26-pin) ECU connector. Cut away several inches of the black sleeve around the harness as shown.

3. Determine where the control box will be mounted and how the harness will be routed. Route the harness so the wires end up near the sled's fuel injector harness. Be sure to route the harness away from heat and moving parts.

4. If the sleeve over the Boondocker EFI harness wires is too long, mark a cutting location, pull the sleeve off the wires, cut it to length, and reinstall it over the wires.



Note on using the supplied Crimp/Heat-shrink connectors:

The supplied Crimp/Heat-Shrink Connectors, if installed correctly, will provide a reliable connection. After the wires are cut and the insulation is stripped, the connector is crimped onto the wires. The connector is then sealed by the heat-shrinking process (adhesive inside the connector will melt and seal out moisture). Proper crimping and sealing is critical to the reliability of these connectors. When crimping, be sure to use the correct crimping tool. DO NOT USE A CRIMPER THAT PUNCHES INTO THE INSULATION. DO NOT USE PLIERS. After crimping, pull on the wires to be sure they are securely crimped. Then apply heat to shrink the connector's insulation tightly around the wires. See example in photo.

5. Power wire:

Boondocker EFI Harness	Sled Injector Harness
Red	**Red/Blue**

Use a **blue** Crimp/Heat-Shrink Connector to attach the **Red** power wire to the **Red/Blue** wire **(position 3)** on the sled's harness. Cut the **Red/Blue** wires on the sled's harness, leave enough working room on both ends. Cut the **Red wire** on the Boondocker EFI harness to length, but leave a little extra length. Strip the insulation from these three wires about 1/4" from the end. Twist together the **Red** and one **Red/Blue** wire, insert into one end of the Crimp/Heat-Shrink Connector and crimp. Insert the other **Red/Blue** wire into the other end of the connector and crimp. (Note that the stock connection has not been interrupted in this hookup.)

6.Injector wires:

Boondocker EFI Harness	Sled Injector Harness
Yellow	**Yellow/white** on **ECU** side
Tan	**Yellow/white** on **Injector** side
Green	**Darker blue/white** on **ECU** side
Brown	**Darker blue/white** on **Injector** side

Caution: There are 2 yellow/white wires on the 26-pin connector. Be sure to use the yellow/white wire in **position 15** on the 26-pin ECU connector. The position numbers are molded into the rear of the ECU connector.

Note: The Yellow/white wire is in position 15 and the dark blue/white wire is in position 2 in the 26 pin connector.

a. Cut the injector wires (yellow/white and dark blue/white) leaving enough working room on both ends. Strip these wires about 3/16". Be sure these wires don't have any tracer colors (stripes) on them.

b. Cut the Yellow, Tan, Green, and Brown EFI harness wires to length, leaving a little extra length. Strip these to about 3/16".

c. Note that two of the injector harness wires go to the ECU and two go to the injectors. Use **red** Crimp/Heat-Shrink Connectors to connect to the four wires as listed above. (Note that the stock connections have been broken so that the signals from the ECU go only to the Control Box and the Control Box directly drives the injectors.)

6. TPS wire: If installing a nitrous kit, use the white wire on the N2O harness, otherwise, use the white wire on the supplied TPS connector.

Boondocker N2o/Aux Harness	Sled Injector Harness
White or Pink	**Light Blue (position 7)**

Use a **blue** Crimp/Heat-Shrink Connector to attach the **White** TPS wire to the **Light Blue** wire on the sled's harness. Cut the **Light Blue** wire on the sled's harness leaving enough working room on both ends. Cut the **White** wire on the Boondocker TPS/N2O harness to length, but leave a little extra length. Strip the insulation from these three wires about 1/4" from the end. Twist together the **White** and one **Light Blue** wire, insert into one end of the Crimp/Heat-Shrink Connector and crimp. Insert the other **Light Blue** wire into the other end of the connector and crimp. (Note that the stock connection has not been interrupted in this hookup.)

7. Connect the EFI harness ground eyelet (black wire) to the grounding stud next to ECU as shown in the picture. If necessary, cut a slit in the sleeve of the EFI harness to allow this to reach. This connection must be made to **chassis ground**, not the engine ground! A good ground connection is extremely important!

8. Heat shrink all the splice connectors.

9. Double check the harness routing to be sure it is away from heat and moving parts. Use zip ties to secure it. Use reflective heat tape if the harness must be routed near hot items such as the exhaust.

10. Install the plastic clutch cover.

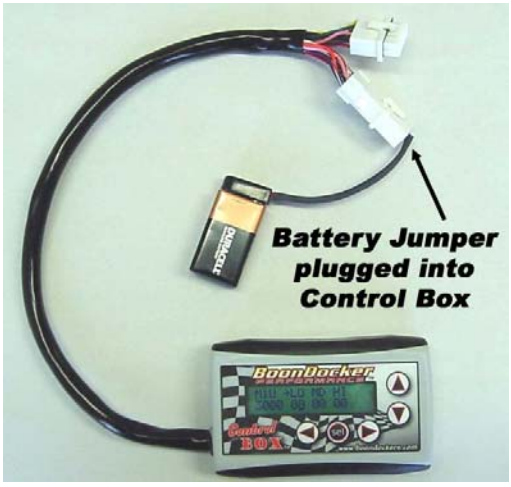
III. Control Box Mounting Locations

The Control Box can be mounted under the hood, on the dash, or on the handlebar riser 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 coils.

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

IV. Battery / Jumper Connectors



Two jumpers are supplied with the Control Box:

1. Battery Connector

The Control Box is designed to operate without a battery – the box will turn itself on whenever power is applied for the fuel injectors. However, a 9-volt battery (not included) can be plugged into the box through the Control Box's connectors with the supplied **Battery Connector** in order to operate the box without the sled running.

2. Jumper Bypass Connector

The Jumper/Bypass connector can be used to bypass the Control Box in case the sled needs to be run without the Control Box. Disconnect the Control Box from the EFI Plug-in box plug in the Jumper connector. This will connect the injectors directly to the sled's ECU.

V. 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 and when the engine is running. Up to 5 different 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.

1. Startup Screen

Every time 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** is shown below:

```
Polaris  600-700
xxxxxxxx N2O:ADJ
```

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

Polaris	Sled make	
600-700	Sled model	**Note:** Be sure the Control Box is for your make and model of sled!
xxxxxxxx	Code Version	This is the version of code in the box. The version of code can only be changed by sending the box back to Boondocker.
N2O:	Shows that this Control Box is nitrous capable.	

ADJ Nitrous pressure regulator type (if used). This mode is described below in the Nitrous Section.

2. 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.
Stats Display runtime data, captured data, and recorded maximum data.
N2O Menus for optional Boondocker Nitrous kit.
Map Go to the **Map** menu

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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3. Fuel Adjust Menus

This selection is used to make fuel adjustments. There are up to seven **Fuel** adjust screens (examples shown below). 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:
```
M1L  LO MD N2 DL
3000 00 00 00 00
```

Fuel screen2:
```
M1L  LO MD HI tr
5000 00 00 00 00
```

Fuel screen3:
```
M1L  LO MD HI tr
6700 00 00 00 00
```

Fuel screen4:
```
M1L  LO MD HI tr
7800 00 00 00 00
```

Fuel screen5:
```
M1L  LO MD HI tr
8100 00 00 00 00
```

Fuel screen6:
```
M1L  AM DR Sens
ACEL 00 00 00
```

The control box allows fuel adjustments to be made according to the following two factors: RPM and Engine Load.

RPM Regions:

Up to seven RPM regions are pre-programmed in the control box which allows fuel adjustments to be made at specific RPM settings. Whenever the engine RPMs are between these specific regions, the fuel adjustment will be the result of the adjacent RPM fuel settings blended together. For example, the fuel setting at 5000 RPM is centered at 5000 RPM, but this value also has an effect on fuel whenever RPMs are above 3000 RPM and below 6700 RPM (the two adjacent settings for this example). Suppose the 3000 fuel setting is at "4" and the 5000 fuel setting is at "8", so if engine rpms are at 4000 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 (idel) 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 LO RPM settings will be used. 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.

3.1 Fuel Screens (RPM Adjustments)

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

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

M1L This displays current map that is being used – in this case, **M1** stands for **Map1**, and **L** indicates the map is **Locked** (changes are not allowed). Five possible fuel maps can be used. Each map consists of all the fuel settings for a particular setup. If the map is **Locked,** the settings cannot be changed and the up/down buttons have no effect. If **U** is displayed, 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, Unlock, Load**, and **Copy** different **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 can be from 3 to as many as 7 rpm regions depending on the program version. The effect of the 3000rpm setting tapers off until 5000rpm, while the effect of the 5000rpm setting ramps up as rpms go towards 5000. The other regions work similar to this.

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

tr This adjustment is to **Trim** the **PTO cylinder** (injector connector with green/brown wires). This is used to add or subtract fuel on the PTO 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).

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.

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!

3.2 Fuel Screen (ACEL Adjustment)

```
M1U →AM DR Sens
ACEL 00 00 00
```

This is the last screen displayed when in the Fuel menus. This screen is used to control fuel when the control box senses acceleration (like an accelerator pump). Below is a description for each field show in the above screen:

M1U This displays current map that is being used – in this case, **M1** stands for **Map1**

AM This displays the **Amount** of fuel to be added (if number is positive) or subtracted (if number is negative) during Acceleration. This fuel amount will be summed with any other current fuel modifications being made by the Control Box. This means during acceleration the final fuel adjustment amount will be the amount due to the Control Box RPM and/or Nitrous settings in *addition* to the AM fuel setting.

DR This displays the **Duration** in engine cycles that the fuel shown in AM will modify the existing fuel during Acceleration. The accelerator pump feature will be turned off if this value is zero and no fuel adjustments will be made. The Acceleration fuel adjustment will be turned off whenever deceleration is detected (throttle is backed off) regardless of the DR value.

Sens This displays the **Sensitivity** that is used to detect engine acceleration. Higher numbers make this **Less** sensitive. Do not use zero, or acceleration will be on all the time! Suggested values are between 6 and 20, start with a value between 8 and 10.

Note: The **Stats** Screen will display an "A" and a solid block on the right-side of the screen to indicate when the Accelerator pump feature is active as shown:

Stats Screen indicating Acceleration:

```
Run 35/40  F 10   
 5500 MD███      A
```

---

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 (**Map1**-**Map5**) 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 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.

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 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.

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.

4.4 Map – StUp (SetUp)

Select "StUp" to change the N2O regulator Mode. Use the **Up/Down** arrows to change between: "ADJ" if an adjustable nitrous regulator is used, "FIX" if a fixed nitrous regulator is used, or "NON" if nitrous is non-regulated. Press "Sel" to go back to the MAP Menu.

```
N2O Regltr Mode:
ADJ←
```


5. 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.

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 35/40  F 10 
 5500 MD■■■     N
```

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
F 10	Fuel adjustment
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 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.
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.

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/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. This can be cleared manually and is always cleared 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. 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.

VI. 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.

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. 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**.

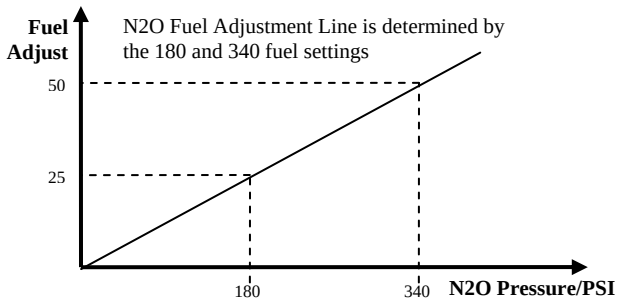
   N2O Menu for Button Activation for initial Nitrous Tuning:

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

2. 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 (displayed as "**200**" on the screen above).

Increase the **low pressure (180) nitrous Fuel adjustment** on the Control Box (displayed as "**020**" on the screen above) 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 it 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.

VII. 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
→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)

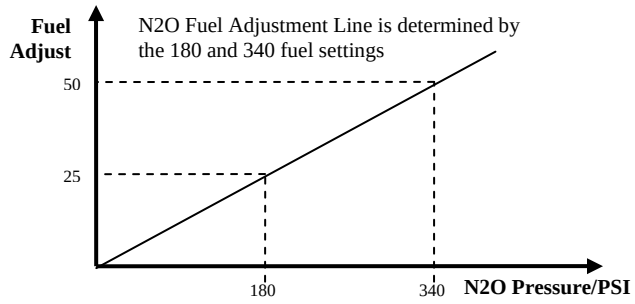
Fuel: The nitrous fuel adjustment tuning procedure is described above in **section VIII**.

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...



Descritpion 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 in in N2O:NON (non-adjustable regulator) mode or N2O:FIX (fixed-regulator) mode:

```
N2OFuel   F-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. 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**.

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. 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). 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 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**.
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.

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.

VIII. 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 Errors

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 Error`	Missing or bad signal detected on the MAG side injector.
`PTO Inj Error`	Missing or bad signal detected on the PTO side injector.

If either of these errors 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. Check for loose terminals in the connectors and frayed wires. If the problem cannot 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 (more than several minutes apart) may be ignored since they are likely caused by sporadic electrical noise. Try rerouting the Control Box harness so it is kept away from ignition, fuel pump, and stator wires. Verify that the sled's factory ground wire is securely attached.

`Prev Inj Error`	This means a previous injector fault has occurred which has not yet been cleared. Press any button to clear this.

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.

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.

IX. 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.

