Arctic Cat EFI Control Box Instructions
(Fuel + N_2O Version, TPS capable)

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

Kit Contents:

Quality check by:

___1 Control Box
___1 EFI harness
___2 Black molded connectors
___1 battery/jumper connector
___1 reusable zip-tie
___1 TPS wire kit (if not in nitrous kit)
___1 Advanced mode instructions

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: 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 3: 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 4: If the headlights have been removed (often when the hood is removed or an aftermarket hood is used), the sled's electrical system can cause interference with the Control Box. In many cases, the sled's ECU (computer) has been known to become damaged! We recommend and sell a 100W power resistor that can be used to place a sufficient load (in place of the headlights) on the electrical system to avoid this condition. This condition may or may not occur on newer model sleds.

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

I. Arctic Cat Wiring Harness Verification and Connector Assembly Instructions

All Models: Connect a test light to the chassis ground. Unplug both stock injector connectors. Connect the test light to one of the contacts on the stock injector connector. Pull the starter rope and watch for the test light to come on. If there is no light, try the other contact terminal. The terminal that produces light is positive.
After you have determined which of the terminals is positive, insert the red wire of the BoonDocker harness into the black connector to correspond with the positive wire on the factory connector. Repeat for other connector "The positions are not always the same"!!!

Final Wiring Verification (all Models):

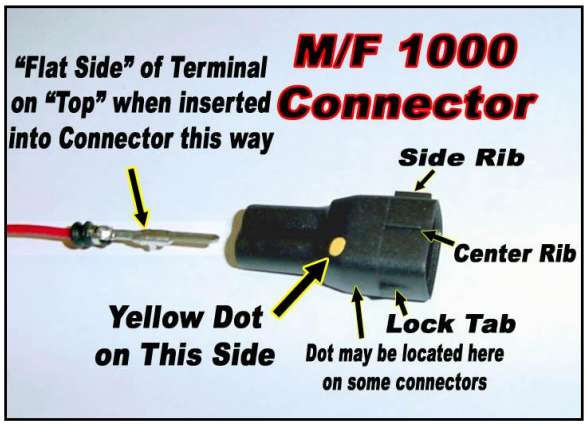
Once the harness and control box are installed according to the instructions below, if one of the following messages appear, the Control Box has detected that the two wires are crossed and these wires need to be reversed:

`MAG Wire Crossed` **or** `PTO Wire Crossed`

Insert the terminals into the connectors by following the steps below:

1. **Non-1000 Connector:** Hold the black connector with its locking tab up. Insert the terminal with its alignment tabs up (see picture).

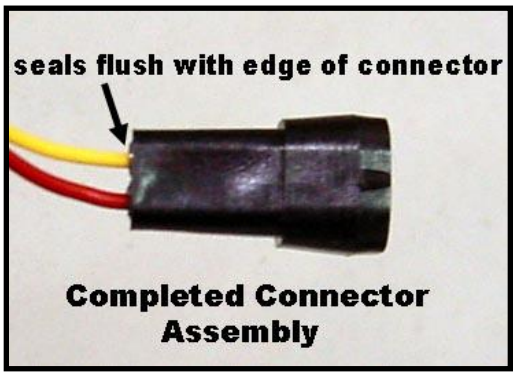
1000 Connector: Orient the black connector and pin terminal as shown in picture.

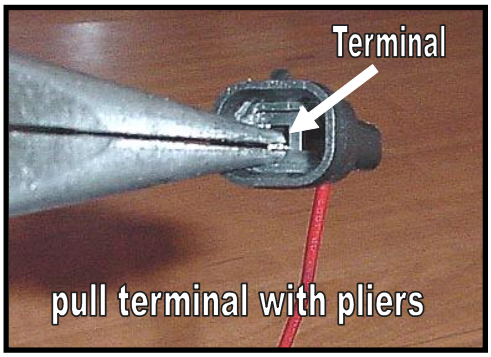


Note: Look inside the Black Connector to verify that the lock tab slot on the terminal will mate with the corresponding locking protrusion inside the connector.

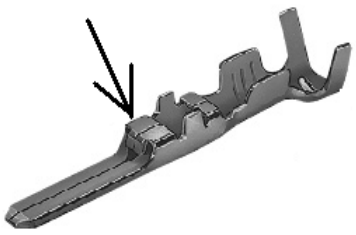
2. Push the terminal into the black connector. The terminal will go part way into the connector and stop.

3. Using needle-nose pliers, pull the terminal the rest of the way into the connector. You should feel the terminal lock into place (you will feel a slight "pop"). The rubber seal should be flush with the end of the connector. Use care to not gouge the terminals.





4. If a terminal must be removed, use pliers to carefully push the terminal out of the connector. The terminal can usually be re-inserted one more time. Don't do this unless necessary! The terminal tabs need to be pried up slightly before re-inserting. See photo of terminal at right for tab location. Use a 1.2mm or 0.050" jeweler's screwdriver to pry with. Check to be sure that the wire can resist a slight tug without coming out.

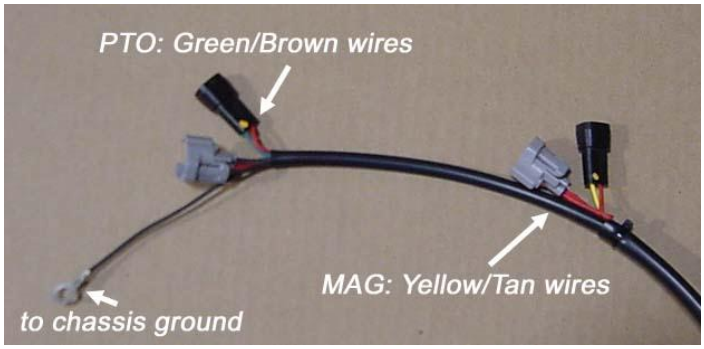


II. Installation of EFI Wiring Harness

Note: Use **Dielectric Grease** on all 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.
   Note: Extra harness length can be obtained by having the harness follow the routing of the fuel line to the fuel rail (inside of the oil bottle) instead of following the sled's harness around the outside of the oil bottle. Both methods will work.
3. There is a left (PTO) and right (MAG) pair of connectors for each injector (see picture). The shorter length connectors go to the MAG side, and the longer length connectors 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.

   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 (near the PTO-side injector for M and Crossfire sleds). This must be made to **chassis ground**, not the engine ground! 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. **Note: *Twin pipes will require heat-tape to cover the harness and connectors near the fuel rail.***

III. Control Box Mounting Locations

The Control Box can be mounted under the hood, on the dash, or on the handlebars (if pad is removed) 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.

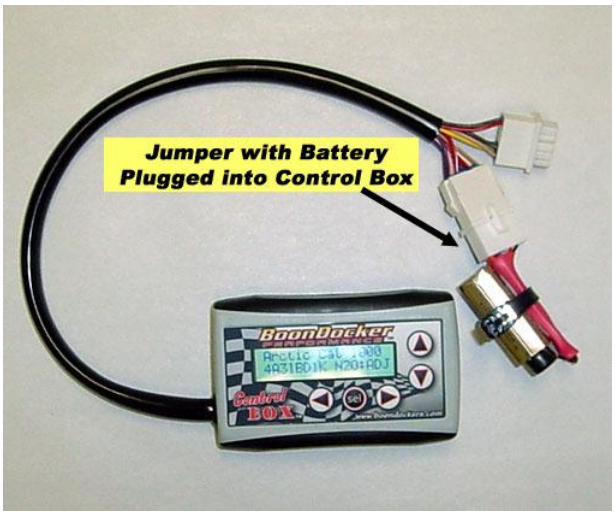
Note: The location on the plate in front of the steering shaft, above the exhaust pipe gets **very hot**! We DO NOT recommend this location.

IV. Battery / Jumper Connector

The supplied Battery/Jumper Connector has a dual purpose. It can function as a battery connector in order to supply voltage to the Control Box when the engine is not running, and it can function as a jumper in order to bypass 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 / jumper connector** in order to operate the box without the sled running. This battery connector plugs into the Control Box's nitrous connector (refer to picture below). Secure the battery to the connector with a zip tie in order to provide a strain relief for the 9-volt connector. The battery can also be secured to part of the harness if it is to be used on the sled while it is running.



The battery connector can be left plugged in during engine operation, but the nitrous harness (if used) cannot be plugged into the Control Box. <u>The battery will eventually drain if left connected to the box, so it is best to disconnect the battery when not in use.</u>

2. Jumper Connector

The Battery/Jumper connector can also 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 harness and plug in the Jumper connector - the injectors are now connected directly to the sled's ECU.

V. Control Box Menus

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:

```
Arctic Cat 6-900
xxxxxxxx N2O:ADJ
```

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

`Arctic Cat`	Sled make	
`6-900`	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 mode. This mode can be changed in the "Setup Menu".	

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 (see Chapters VII and IX..).
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. 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!

The Control Box also adds fuel when nitrous oxide is injected (only with optional Boondocker nitrous kit). The amount of fuel added depends upon the pressure in the nitrous bottle plus user settings.

Note: Be sure you know how to properly tune an engine before you adjust the fuel settings! Use of oxygen sensor, EGTs and plug and piston readings are highly recommended when tuning.

VII. EFI Tuning Suggestions

Each Fuel adjustment setting goes from –99 to 127. Positive numbers add fuel and negative numbers subtract fuel. The Control Box will not prevent a lean 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.

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 engine'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)

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**.

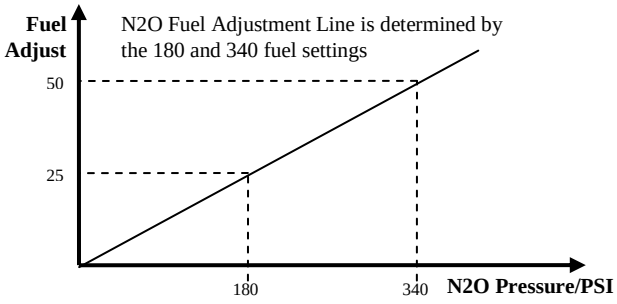
   N2O Menu for Button Activation for initial Nitrous Tuning:

   ```
   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 "**025**" 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, <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.

8. <u>Follow this step only if you have an adjustable N2O pressure regulator and you desire to use pressure over 210psi</u>. 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.

IX. 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)

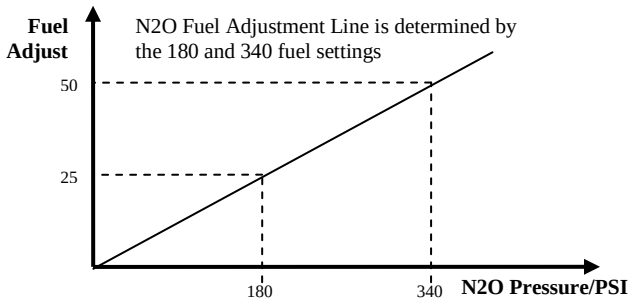
Fuel: The nitrous fuel adjustment tuning procedure is described above in **section VIII**.

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.

X. 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

A. Intermittent 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 (recoil) side injector (yellow or tan wires).
`PTO Inj Error`	Missing or bad signal detected on the PTO (clutch) side injector (green or brown wires).

If either of these errors occur, the Control Box will still function and it will still "try" to make fuel adjustments (as long as the injector connections are good), but the injector connection will need to be fixed. Check for loose terminals in the connectors and frayed wires. If the problem cannot be fixed and the error reoccurs frequently, contact Boondocker to determine if the Control Box and harness need to be sent back to be inspected or serviced.

Note 1: Injector errors that occur **infrequently** (more than several minutes or hours 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 ground wire is attached to the frame.

Note 2: If an error occurs more than 10 times (before being cleared), and exclamation point "!" will be displayed after "MAG" or "PTO" is displayed as shown:

`MAG!Inj Error`	"!" = More than 10 errors have been detected on MAG injector.
`PTO!Inj Error`	"!" = More than 10 errors have been detected on PTO injector.

Note 3: Even though "MAG" or "PTO" is displayed, it is possible the actual fault is on the opposite injector or on both injectors.

B. Injector Wires Crossed:

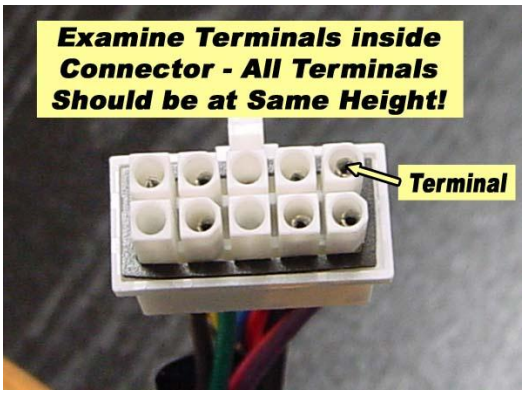
If the Control Box detects that either MAG or PTO wires are **crossed** in one of the Black connectors, the following will be displayed:

`MAG Wire Crossed`	The yellow and red wires need to be reversed in the Black connector.
`PTO Wire Crossed`	The green and red wires need to be reversed in the Black connector.
`Prev Inj Error`	This means a previous injector fault has occurred which has not yet been cleared. Press any button to clear this.

Note 4: It is possible for the sled to run **but the wiring harness to be wrong** (wires are crossed in the Black connectors). If this occurs **the box cannot make proper fuel adjustments**! If you see the injector error **"MAG/PTO Wire Crossed",** recheck the wire positions in the black connectors according to the tables in these instructions.

Verify Harness Connections

If the Sled runs bad and an error message is displayed on the control box, there is likely a bad connection in the wiring. If the "Check Engine" light flashes on the Sled, this is a sure indication that a broken or intermittent condition exists in the EFI wiring harness. Check to make sure a terminal has not backed out of any of the Control Box or EFI harness connectors (pull lightly on each wire to see if it comes out). A quick way to check the white connectors is to unplug each connector and verify all the pins are at the same height (see picture):



Also, check each socket (female) pin to see if it has become spread too far apart to make good contact with the male pin. A small thin instrument may be used to carefully push the socket terminal closed again.

If the problem cannot easily be fixed, the Control Box / harness assembly may be returned to Boondocker to be serviced.

Note: A common problem on the Arctic Cat 1000 Black connectors is to insert the terminal with the "wrong side up" so it is unable to latch inside the connector. Re-verify the correct terminal orientation as shown.

Other Issues

Engine runs erratically:

1. Verify that the ground on the sled's harness (heavy brown wire) has a good connection to the chassis. On the M7 model, this ground is connected by an eyelet attached to the bolt at the base of the steering support hoop on the Mag side of the sled (close to the gas tank)

   Note: The nut that holds the ECU ground wire on M7 sleds is known to come loose, some are not even connected as delivered from the dealer!

2. Verify that the EFI Harness Ground Wire has a good connection.

   Note1: Arctic Cats require that this ground wire on the Control Box must be connected to CHASSIS GROUND (not Engine ground!).

   Note2: If the headlights have been removed (hood is removed or aftermarket hood is used), the electrical system can cause interference with the Control Box. We recommend using a 100W power resistor to place a sufficient replacement load on the electrical system. This may or may not be necessary for newer 2007 sleds since the system is now DC regulated.

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 **19-21V**. Turn the meter to the AC voltage setting, the reading should be less than 1V (this could read higher if an older analog-needle meter is used). A bad ground to the sled's ECU will cause these readings to be incorrect (DC readings around 7 to 9V).

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.
Engine won't start when Hot:	A problem has been known to occur on some sleds involving the engine temperature sensor when the engine is hot and especially after it has been sitting for a while (gets heat soaked) that will cause the engine not to start. Unplug the temp sensor (yellow connector located down by where the rope goes into the recoil) – this will cause the engine to add extra fuel during startup. Pull the engine over once or twice – it usually pops. Then plug the sensor back in and the engine should operate normally.

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.