13 RPM
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 connector

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"!!!

Note: In most cases the Yellow wire with a Red stripe (MAG) will be positive and the Yellow wire with the Black stripe will be Negative.
The Green Wire with the Red stripe (PTO) will be Positive and the Green wire with the Black stripe will be Negative.

Final Wiring Verification (all Models):

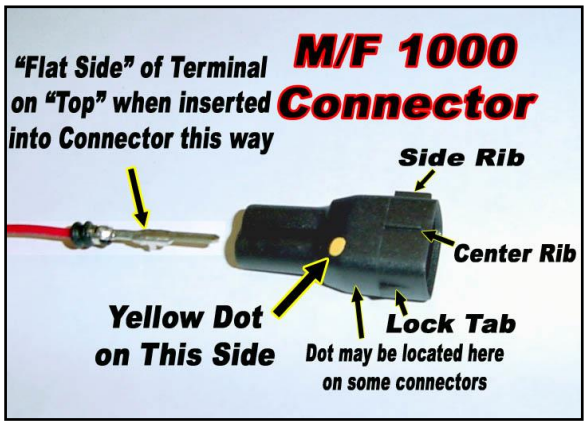
Once the harness and control box are installed according to the instructions below, if one of the following messages appear, the Control Box has detected that the two wires are crossed and these wires need to be reversed:

`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).

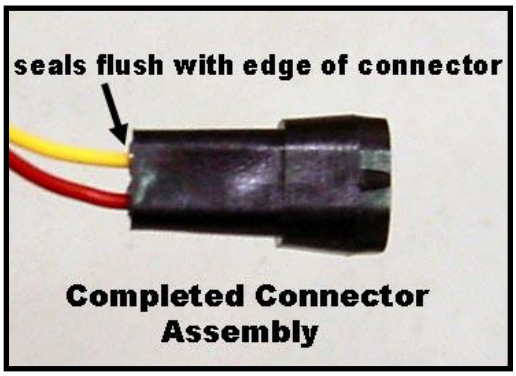
1000 Connector: Orient the black connector and pin terminal as shown in picture.

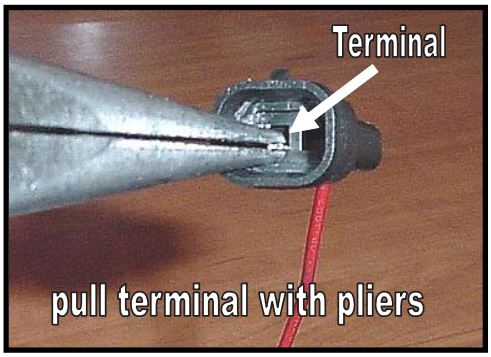


Note: Look inside the Black Connector to verify that the lock tab slot on the terminal will mate with the corresponding locking protrusion inside the connector.

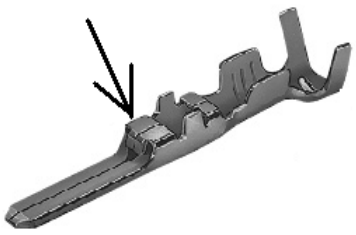
2. Push the terminal into the black connector. The terminal will go part way into the connector and stop.

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.

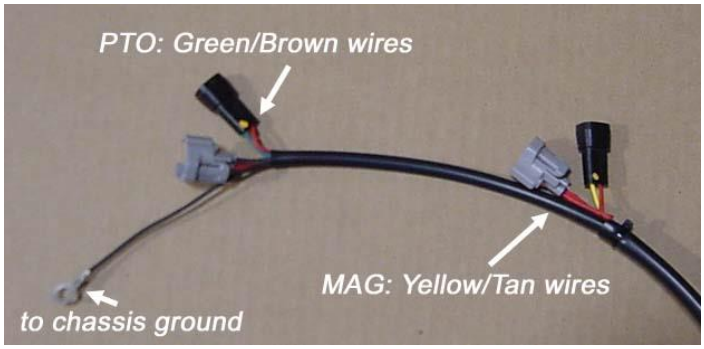


II. Installation of EFI Wiring Harness

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.***

II. a TPS INSTALLATION

This TPS connection need to be connected to the Throttle Position Sensor located on the throttle bodies, or the control box will not function properly.

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 Accessory Push button connector (refer to picture below

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

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.

3. RPM Modes (13 RPM / 5 RPM)

The Control Box can be used in either 13 RPM Mode, or 5 RPM Mode. See **4. Setup Menu** below about how to change between these two modes.

3a. 13 RPM Mode

13 RPM screens with 6 TPS settings are available in the Fuel Menu as shown below. TPS settings are shown as 1-6 after "00", Left/Right arrows will move cursor over each number and Up/Down buttons adjust each fuel setting.

```
M1U↓
2500 001 002 003
004 005 006
```

Note: When the Arrow is over the RPM, use the Up / Down buttons to change RPM settings. Use Left/Right buttons to go to TPS setting 1-6, then use Up/Down to change the setting.

Useful Tip1: Press the Left + Right Arrow Buttons together at any time to return to the Main Menu
Useful Tip2: Press the Sel + Right Arrow Buttons together at any time to go to 5rpm Fuel Menu
Useful Tip3: Press the Sel + Left Arrow Buttons together at any time to go to 13rpm Fuel Menu

TPS position 1 corresponds to the lowest throttle position setting and 6 corresponds to the highest throttle position. See **4. Setup Menu** about how to change the default TPS transition values.
Each TPS position will be displayed in the Stats screen as: L1, L2, M3, M4, H5, H6 (L=Low, M=Mid, H=High).

3b. 5 RPM Mode

5 RPM screens with 3 TPS settings are available in the Fuel Menu as shown below.

```
M1U↓  LO  MD  HI
2500  00  00  00
```

LO = low load range= tps 1
MD = mid load range = tps 3
HI = high load range = tps 5

The Control Box always uses 13 RPM and 6 TPS settings to make fuel adjustments. The 5 RPM Mode is used for making broad adjustments to multiple RPM and TPS settings at once. The 5 RPM Mode only shows every third RPM setting (rpm1,4,7,10,13) and every other TPS setting (tps1,3,5). Whenever a Fuel setting is changed, up to 5 additional fuel settings are also changed at the same time. Below is an example (the result of each example is shown color-coded in the table below):

Example 1: **2500 LO** is incremented by 1. The following settings will be incremented by 1:
2500 *tps1, tps2
4000 tps1, tps2

Example 2: **6750 MD** is decremented by 1. The following settings will be decremented by 1:
6500 tps3, tps4
6750 *tps3, tps4
7000 tps3, tps4

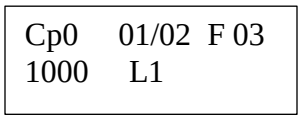
Example 3: 8**500 HI** is incremented by 1. The the following settings will be incremented by 1:
8000 tps5, tps6
8500 ***tps5**, tps6
***** = setting seen in 5 RPM Mode

5 RPM values	**TPS** values	**13 RPM** values	**TPS** values
2500	**LO**$_1$, MD, HI	**2500**	**1**$_1$, **2**$_1$, 3, 4, 5, 6 (example 1)
		4000	**1**$_1$, **2**$_1$, 3, 4, 5, 6
		5000	1, 2, 3, 4, 5, 6
5500	LO, MD, HI	**5500**	1, 2, 3, 4, 5, 6
		6000	1, 2, 3, 4, 5, 6
		6500	1, 2, **3**$_2$, **4**$_2$, 5, 6 (example 2)
6750	LO, **MD**$_2$, HI	**6750**	1, 2, **3**$_2$, **4**$_2$, 5, 6
		7000	1, 2, **3**$_2$, **4**$_2$, 5, 6
		7250	1, 2, 3, 4, 5, 6
7500	LO, MD, HI	**7500**	1, 2, 3, 4, 5, 6
		7750	1, 2, 3, 4, 5, 6
		8000	1, 2, 3, 4, 53, 63 (example 3)
8500	LO, MD, **HI**$_3$	**8500**	1, 2, 3, 4, **5**$_3$, **6**$_3$

1,2,3 = refer to each example above

4. Multiple Capture Feature

Whenever the Capture feature is used, 10 Stats captures (8 for Polaris) are made. The display will change to the
first captured screen as shown below:



***Cp0** = Capture 0 (first capture)*

Use the Up/Down Arrow Buttons to scroll between Captures 0-9. Press the Right Arrow Button to return to the Run Screen, and Up/Down Arrows to display Capture data again. **Capture data is lost whenever the box is powered off, so be sure to view data before shutting off the engine!**

*Note: To configure the Control Box to do a capture, go to N2O menu, set BTN to CAP, then whenever the N2O button is **released**, the captures will start.*
Note: When observing the O2 values, all sensors have a slight delay which will cause the O2 reading to lag the actual engine conditions.

5. Setup Menus

To get to the Setup Menu, go to: Main Menu → Map → StUP (move cursor, press Sel to go to next menu)
The Setup Menu allows the settings shown below to be changed.

*Note: Control Box must have **Advanced Mode ON** to display all the Setup selections. Press Sel and Left Arrow Buttons to set Advanced Mode ON, Press Sel and Right Arrow Buttons to set Advanced Mode OFF.*

1st Setup Menu:

N2O Setup Mode: ***N2O Setup** = Adjustable/Fix/Non-adjustable N2O regulator*
ADJ TPS **Mode:** = TPS or DutyCycle activated Nitrous

2nd Setup Menu (press Sel in 1st Menu):

LMH L1L2 L2M3 ***LMH** = TPS or DCy (Injector Duty Cycle) is used to determine 1,2,3,4,5,6 load ranges*
TPS 063 089 ***L1L2** = 1 to 2 transition value, **L2M3** = 2 to 3 transition value.*

Note: It is recommended that you have a TPS wire connected from the sled's 0-5V TPS wire to the control box's white wire (contact Boondocker if questions). However, it is possible to use the sled's Injector Duty Cycle (LMH=DCy) to determine the 1-6 transitions, but this will not be as accurate as using the sled's TPS input.

3rd Setup Menu (press Sel from 2st Menu):

M3M4 M4H5 H5H6 ***M3M4, etc**. = 3 to 4 transition value, etc.*

113 138 163

To set the transition points in 6 equal partitions according to TPS input for your sled, go to the 3rd Stats Screen and Clr the MxTPS (Maximum TPS) value. The displayed value will be TPSmin used below.

With the sled on a trackstand, or while riding the sled in a safe area, press the throttle to full open for 1 second and observe MxTPS. This value will be TPSmax. Use the following equation to determine each transition value.

Equation:	**Example:** (TPSmin = 38, TPSMax = 190)
Step = (TPSmax – TPSmin)/6	Step = (190–38)/6 = 25.33 = **25**
L1L2 = TPSmin + Step	L1L2 = 38 + 25 = **63**
L2M3 = L1L2 + Step	L2M3 = 63 + 25 = **89**
M3M4 = L2M3 + Step	M3M4 = 88 + 25 = **113**
M4H6 = M3M4 + Step	M4H5 = 113 + 25 = **138**
H5H6 = M4H5 + Step	H5H6 = 138 + 25 = **163**

4th Setup Menu (press Sel in 3st Menu):

#RPM Cy/Cap Mode ***#RPM** = 13 or 05 RPM Mode*

5 008 PCT ***Cy/Cap** = Cycles per Capture (# of engine revolutions between each capture)*

Cy/Cap can be used to increase or decrease the time delay between each capture, typical values are between 5 and 10.

***Mode** = Method used to adjust fuel, PCT (percent) or FIX (fixed)*

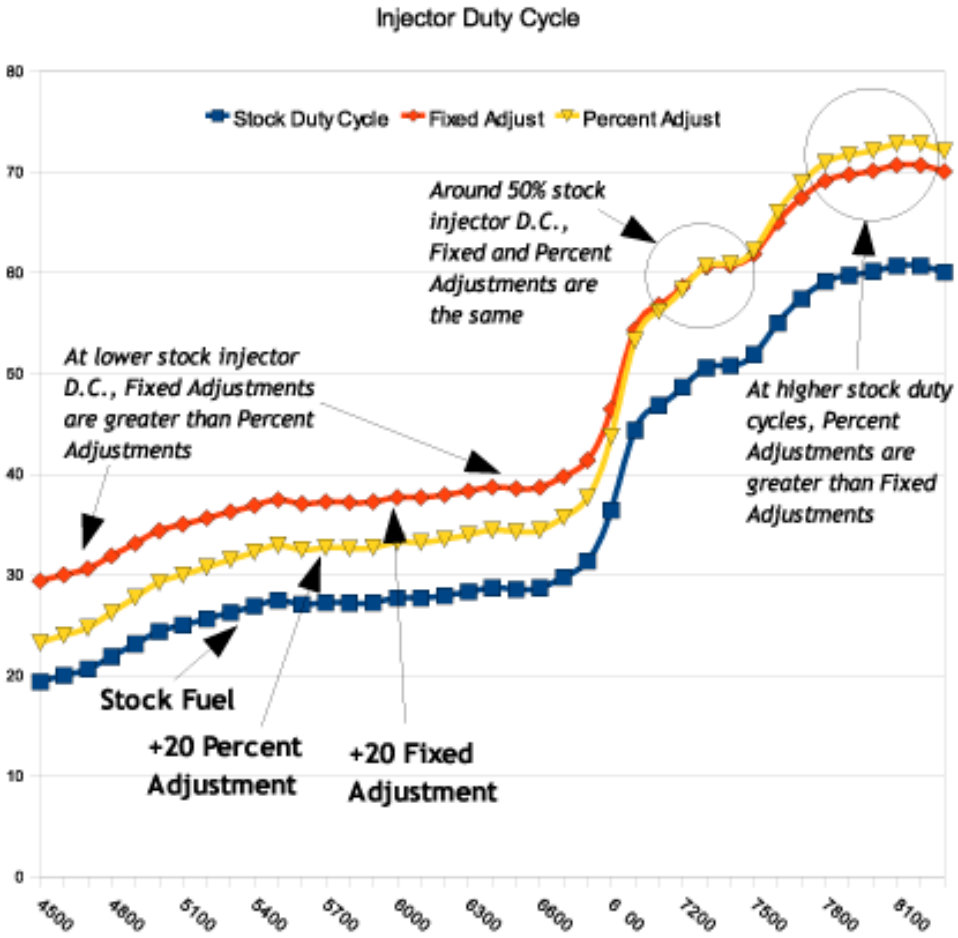
The Mode setting is important to understand when comparing tuning numbers with older versions of the Control Box. All previous versions of Control Boxes (with a few exceptions) used a fixed fuel adjustment mode. Fixed mode means the amount of fuel that is added or subtracted will always be a "fixed" amount, and will not vary according to what the stock engine control unit (ECU) is doing. Each number of adjustments in fixed mode corresponds to .5% of the total available fuel. In Percent mode each number of adjustment corresponds to 1% of the fuel the ECU is supplying, and as the ECU varies the injector signal, this amount will vary.

Example:

The ECU is sending a 60% duty cycle pulse to the injector, and the control box is adjusting the fuel by 10.

In Fixed mode, this would be 10 x .5% = 5% more of the total available fuel will be added. This gives a total injector duty cycle of 60% + 5% = 65%.

In Percent mode, this would be 10 x 1% = 10% more fuel of what's being supplied, or 10% x 60% = 6%, which gives a total injector duty cycle of 60% + 6% = 66%.



This graph compares the Stock injector duty cycle with adjustments (Blue line) made using Fixed (Red line) and Percent (Yellow line) mode adjustments, both adjustments using a fuel adjustment value of 20.

Comparing the same adjustment numbers the following can be observed:

• Fixed Mode and Percent Mode adjustments are the same at 50% stock injector duty cycle.
• Fixed Mode results in more fuel at injector duty cycles below 50% than the same adjustment using Percent Mode (observe low and mid-rpm ranges).
• Percent Mode results in more fuel at injector duty cycles above 50% (observe high rpms). Note, on some engines and at higher elevations, stock injector duty cycle may not go above 50%.

Percent Mode Advantages:

• As the stock ECU adjusts fuel according to elevation and temperature requirements, the fuel adjustments the control box makes will also be adjusted. This should allow fueling adjustments to be consistent for various elevation and temperature changes.
• Percent mode is recommended for stock engines or engines with minor modifications.

Fixed Mode Advantages:

• The sled's stock ECU program may overcompensate fuel adjustments for certain elevations and temperatures. For example, some early Arctic Cat tuning was found to be too lean at high elevations. This could cause engine tuning to go from being safe at lower elevations to suddenly becoming too lean at higher elevations.
• The sled's ECU is programmed according the engine's stock volumetric efficiency parameters and how they behave at different elevations and temperatures. Adding engine mods such as porting, pipes, etc. will change the engine's volumetric efficiency and it's fueling requirements at various elevations and temperatures. For example, at high elevations there is less atmospheric back pressure than at low elevations. A pipe designed for high elevations may become more efficient at higher elevations than a pipe designed for low elevations, thus changing the engine's fueling requirements.
• Fixed Mode is recommended for heavily modified engines that cannot be easily tuned using Percent Mode.
◦ Big-bore engines that need lots of added fuel in the mid-range may be tuned more easily using Fixed Mode.
◦ Race engines that operate way beyond the stock engine's rpm operating range may be tuned more easily using Fixed Mode.

6. 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
```

7. 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
```

7.1 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      →Q
Lock L U       Q
```

Load 1-2 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.

7.2 Map: Copy

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

```
Copy 1 2      →Q
Lock L 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.

7.3 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.

8. 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.

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9. 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.

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!

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:

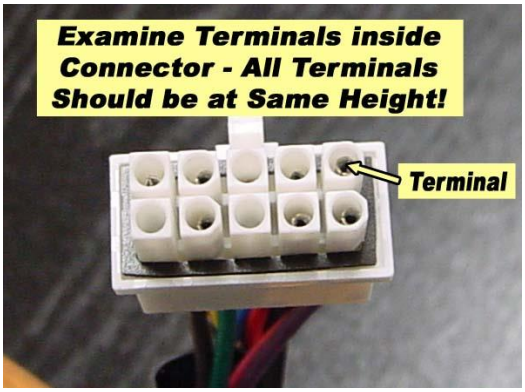
If the Control Box detects that either MAG or PTO wires are **crossed** in one of the Black connectors, the following will be displayed:

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.

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.