M8 / M1000 Arctic Cat 3D Turbo (Auxiliary Injector)
EFI Control Box Instructions

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 connectors
___1 battery/jumper connector
___1 Reusable Zip Tie

Arctic Cat Wiring Harness Connector Assembly Instructions

The **two black connectors** must be installed on the Control Box EFI harness as shown below before continuing with the installation.

All Models: Connect a test light to the chassis ground. Unplug a stock injector. Connect the other connector of 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 injector.

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

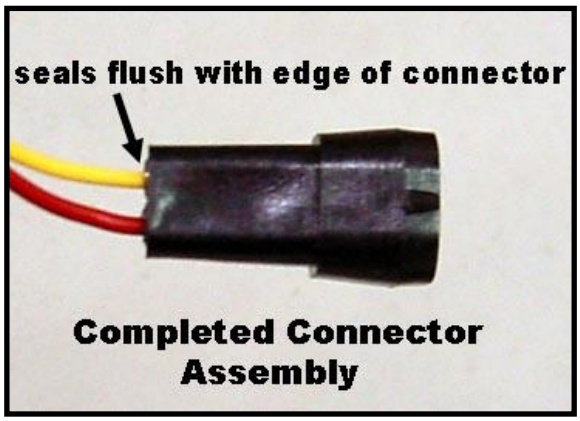
1. **<u>Non-1000 connector:</u>** Hold the black connector with its locking tab up. Insert the terminal with its alignment tabs up (see picture).

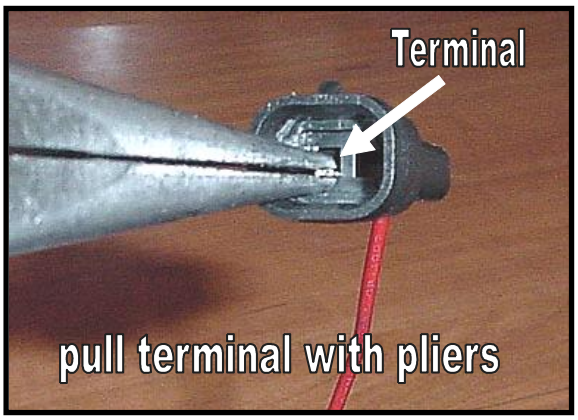
   <u>2010 and newer M-800 and M-1000 connector:</u> Orient the black connector and pin terminal as shown in picture.

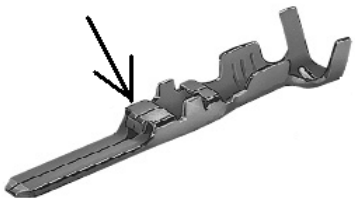
   Note: Look inside black connector to verify that the lock tab inside will mate with the slot in the terminal (below guide tabs).

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 absolutely 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.

I. Theory of Operation:

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

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

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

IMPORTANT NOTES – READ THIS!

Note 1: We recommend using **Dielectric Grease** on all connections to help prevent corrosion on the terminals.

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 box is mounted on 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** (hood is removed or aftermarket hood is used), the electrical system can cause interference with the Control Box. In some cases, the sled's computer may become damaged! We recommend and sell a 100W power resistor that can be used to place a sufficient load on the electrical system to avoid this condition.

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

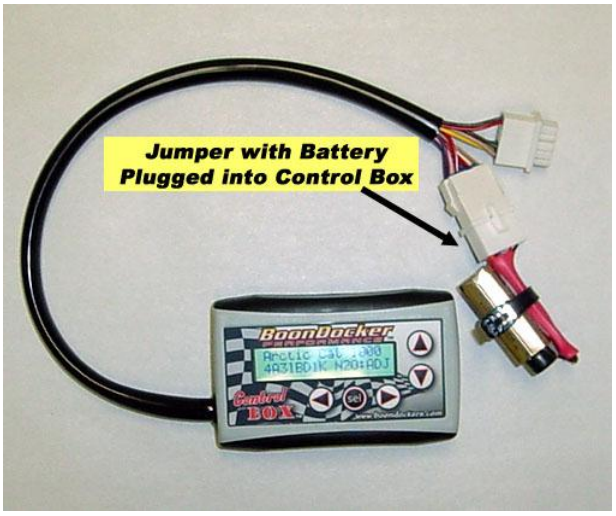
II. Control Box Harness Connectors

The Control Box will plug directly into the factory injector connectors. There is also an unused connector for the optional Nitrous wiring harness or for the battery jumper (see below).

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

III. 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. The battery will eventually drain if left connected to the box, so it is best to disconnect the battery when not in use.

2. Jumper Connector

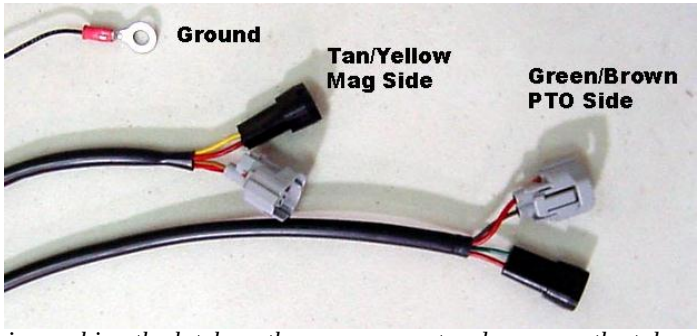
The Battery/Jumper connector can also be used to bypass the Control Box in case the sled needs to be run without the Control Box. Disconnect the Control Box from the EFI harness and plug in the Jumper connector - the injectors are now connected directly to the sled's ECU.

IV. EFI Wiring Harness

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: If the control box is to be mounted on the handlebars, it is best to have 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.



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.*

5. Connect the Control Box harness ground wire 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: **heat-tape** may be used to protect the harness and connectors near the fuel rail from the hot exhaust pipe.*

Oil Pump Test:

1. Disconnect the top oil line from the turbo.
2. Hold the oil line over a container and start the sled.
3. Hold the sled rpms above 3000 for 10 seconds. A thin stream of oil should be observed flowing from the line.
4. If no oil is seen, verify that the voltage into the oil pump driver box is between 11 to 13V DC when the engine is revved up.

V. Startup Menu

A Cat Turbo 800
5A3dBD2i

1. **TOP LINE** Shows Make, model, and sometimes Year.
2. **BOTTOM LINE** Shows software version number.

VI. Main Menu

The Main Menu is shown below:

```
Main →Fuel  Stats
Menu  Xtra  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 menu option and press the "**SEL**" key.

Fuel	Go to the **Fuel** adjust menus.
Stats	Display runtime data, captured data, and recorded maximum data.
Xtra	Go to setup menus for off boost adjustments, and button options
Map	Go to the **Map** menu to store, lock, or change maps.

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

VII. Boost Fuel Adjust Menus

This selection is used to make fuel adjustments. There are 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 screen:

```
psi →LO MD HI
4300 08 10 00
```

1. Fuel Screens (RPM Adjustments)

In the RPM screens, the Fuel Control Box allows fuel adjustments to be made according to the following two factors: RPM and Engine Load **while on Boost**.

RPM Regions:
In the example above, the 4300 screen sets the fuel level for near 4300RPM and up to 5100. 5100 sets the fuel level for RPMs near 5100. Between 4300 and 5100, the fuel adjustment will be proportioned between the two settings. For example, suppose the 4300RPM fuel setting is at "4" and the 5100RPM fuel setting is at "8". If engine is at 4700RPM, the actual fuel adjustment made will be ½ of "4" and ½ of "8" which is "6".

Throttle Position:
Each RPM Region is split into 3 throttle position ranges: closed throttle (idle) to 1/3 open, MD is 1/3 to 2/3 open, and HI is 2/3 to full open.

```
M1U →LO MD HI□□□
4300 00 00 00□□□
```

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

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

00 **Fuel adjustment value.** Each setting can go from 0 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 stock-supplied 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!

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1.A Acel Pump Adjustments

```
M1L →AM DR Sens
ACEL 00 00 00
```

AM Amount of fuel to be added/subtracted during acceleration
DR Duration in engine cycles to make acceleration adjustment
Sens Accelerator pump Sensitivity. Larger values are Less sensitive (throttle must be moved more). Value of Zero will cause accelerator pump to always be on! Typical values are between 5 and 20.

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2. Map / Setup Menus

From the **Main Menu**, select **Map1U** to go to the **Map Menu** (shown below). This screen is used to **Load**/**Copy**/**Lock**/**Unlock** saved "maps" that contain fuel and N2O settings. Five maps can be used (**Map1**-**Map5**).

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

2.1 Map: Load

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

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

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

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

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

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

2.2 Map: Copy

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

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

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

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

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

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

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

"**A**" represents the map copied TO and "**B**" represents the current map to be copied FROM. If this is exactly what you intend, use the Left Arrow to underscore "**Y**" and press "**SEL**". Then the current map will be loaded into the selected map number, the selected map number will become the current map, and the Control Box will return to the Main Menu.
To quickly Lock or Unlock maps, move the cursor down to the **Lock** row, place the cursor under the **L** or **U** by the desired map number, and press "**SEL**" to change a **U** (Unlocked) to an **L** (Locked) or vice versa.

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

2.3 Map – Lock and ULock

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

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3. Stats Menus

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

3.1 Stats: RUN/CAPTURE

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

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

1st line

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

2nd line

5500 RPM (note, if the engine is shut off, the last recorded RPM may be displayed)

MD Engine Load. **LO**, **MD**, or **HI** will be displayed.

███ These bars are a graphic display of **LO**, **MD**, or **HI** as shown below:

LO
MD ███
HI ██████

10 Current Fuel Adjustment

Run/Capture mode:

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

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

3.2 Stats: MAX

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

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

MAX:	5500	Max rpm
DCIn	35	Max Duty Cycle Input from sled's ECU.
DCOut	45	Max Duty Cycle Output to the injectors.

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

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

3.3 Stats: PSI

This menu displays nitrous and TPS information.

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

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

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

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

6. Xtra Menus

Boondocker's Synergy feature allows you to trigger nitrous several different ways, using combinations of RPM, throttle position, and the handlebar button. For example, the handlebar button can be used to arm nitrous, then throttle position determines when to turn it on. Activation can be further constrained to an RPM range, for best engine protection.

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

```
Fuel PSI RPM Btn
→004 OFF On  CAP
```

Fuel **Fuel** setting during Off Boost Conditions
PSI Shows **PSI** mode is **OFF** or displays **PSI** value if **PSI** is **ON**
RPM Shows whether **RPM** mode is **ON** or **OFF**
Btn Displays button mode (described in detail below)

Fuel: This is the amount of fuel that will be added when certain qualifications are met. (Off Boost, Between RPM, and Below Set Boost)

LO	MD	HI
04	00	-05

PSI: Off boost Fuel will only be added if boost is below this value

```
 PSI  Xtra on if
→OFF  PSI  < 21
```

PSI OFF = Box does not care about **PSI** value to add **Xtra** Fuel
PSI ON = PSI < 021 = **PSI** value has to be less than 4.5lbs to add **Xtra** fuel

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

.

```
RPM  Min  Max
ON ← 3900 5950
```

RPM OFF Will not add Xtra fuel
RPM ON Will add Xtra fuel when RPM's are within the threshold
3900 Min RPM threshold
5950 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** and the **Maximum RPM**. If **RPM** mode is **ON**, fuel adjustment will activate only when RPM is between these values.

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

4.D BTN (Button) Settings

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 allows the Fuel adjustment to be made whenever the button is pressed. Fuel is adjusted on the Auxiliary injectors. Be sure **ExV** and **RPM** triggering are OFF when using this feature.

TUN:
```
Description: Btn
Fuel only  :→TUN
```
This mode allows the Fuel adjustment to be made whenever the button is pressed. Fuel is adjusted only on the Stock injectors. 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. Be sure **ExV** 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
```
This mode is probably not useful for turbo use. If desired the Exhaust Valve fuel adjustment can be "armed" by using the button. In this mode, if the Exhaust Valve fuel adjustments are set up, the button must be on for the fuel adjustments to be made.

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

VI. Turbo EFI Tuning

Fuel Requirements:

Race gas is recommended to be used, even for low boost! Detonation will quickly destroy your engine! (see topic in Tuning Tips)

SUNOCO 112 is recommended and has been determined to be adequate for boost levels up to 14psi. **VP fuel is not recommended - it has been found to have lower octane than other comparable fuels**. Other suggested brands include Unical, Rockett Brand, F&L Racing Fuel, and Trick racing gas. Always use fresh fuel from a sealed barrel.

Spark Plug Gap:

Use new spark plugs and reduce the gap to .018" - .020". Carry extra plugs – leaded fuel and boost are hard on spark plugs!

Recommended Control Box Settings:

Call Boondocker for suggested starting numbers.

Boost Controller:

It is recommended to start with your Electronic Boost Controller set below 4psi. If you are using a boost tee, set it to the **lowest boost setting.** To find this starting point, remove the boost tee, loosen the knob all the way, blow through it while tightening the knob until you start to feel resistance (the valve starts to close off). Make sure the engine is tuned properly before increasing the boost and watch closely for proper fuel mixture and detonation (see topic in Tuning Tips).

Tuning Instruments:

Air/Fuel gauge:

A good wideband O2 gauge is highly recommended as an effective tuning tool. The sensor will have a limited lifespan due to exposure to pre-mix oil and leaded racegas, but in many cases it can last for a season and it is a very valuable tuning tool. If desired, after initial tuning is completed the probe may be removed to prolong its life.

Be aware that too rich a mixture can cause the gauge to read lean due to unburned fuel not being read by the gauge (the oxygen will produce a lean reading). Whenever the engine is decelerating, your A/F numbers will be lean - these readings can be ignored. However, whenever the throttle is being applied, pay attention to the readings!

Higher numbers are leaner (less fuel), lower numbers are richer (more fuel). A 14.7:1 ratio means all the available oxygen has combined with all the available fuel. Numbers from 11:1 to 13:1 generally produce the best power (extra fuel helps cooling and can help prevent detonation). A lower A/F ratio (10.8 to 11.2:1) is considered safer on a turbo since the extra fuel prevents heat build-up and helps prevent detonation. We recommend you find the lowest ratio where the sled still runs without being too rich.

EGTs:

Exhaust Gas Temperature gauges can also be an effective tuning tool and are recommended, but they are not a substitute for reading spark plugs and piston wash and for a general feeling of 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. Typical EGT temps can be between 1250 – 1325degF after a long pull.

Plug and Pipe Color:

Color will develop inside the pipe and on the plug after running a while which can be used to determine fuel mixture. A tan/cardboard brown color is desired. Light-gray is too lean, and dark brown is rich.

Tuning tips:

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

1. Tune with the engine and pipe at operating temperature. The sled's ECU will make adjustments as the engine warms up – you might think the engine needs leaner settings then later realize you are too lean once the engine warms up.

2. Use the **Load/Save Map** feature to quickly change and compare fuel settings when testing. This can also be useful for riding under different conditions. For example, changing elevations or temperatures may require different adjustments if the stock ECU does not compensate properly for your modifications. For drag racing, you might want to run richer settings for longer distances than you would for short distances.

3. One method for finding out where a fuel adjustment setting is effective, greatly increase only that setting. Run the engine to find out when it suddenly becomes too rich – this is where that setting is effective. Be careful – you can easily flood the motor, especially with low (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 whether the load setting is LO, MD, or HI. The handlebar button can be configured to capture these stats (see nitrous configuration section). 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
 002 OFF ON →CAP
```

5. The 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. Use small numbers for this test, either positive or negative.

   N2O Menu in "TUNE" mode:

```
Fuel TPS RPM Btn
 002 OFF ON →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! As oxygen is added, the flame gets hotter to a certain point, then too much air can can gradually cool things off.
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. Stock timing seems to work best for this turbo.
Fuel	Different fuels have different specific gravities (densities) and other characteristics which can affect your mixture requirements from one fuel to another – be aware of this if you change fuels**.** Oxygenated fuel will run leaner than non-oxygenated fuel and is not recommended.
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 erraticly. 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.

IX. Control Box Troubleshooting

Stuck Button

When the Control Box is first turned on, all buttons are checked to verify that a button is not stuck on. If a button is detected to be on during power up, the button will be disabled and the following message will be displayed until another button is pressed. To verify if a button really is stuck on, re-power the box without pressing any buttons.

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

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

Injector Fault

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

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

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

Note 1: Injector errors that occur infrequently can be ignored since they are likely caused by sporadic electrical noise.

Note 2: It is possible for the sled to run but the wiring harness to be wrong – the box cannot make proper fuel adjustments. **If you see an injector error, first recheck the wire positions in the black connectors according to the tables in these instructions.**

Other Issues

Engine runs erratic:

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!

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.

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.
4. Unplug the EFI harness and plug original harness back into the injectors and verify that the sled runs OK (test can only be done at low rpms before boost comes on).

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. On the AC voltage setting, the reading should be less than 1V (this will be much 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 7-9V).

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.

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). Unplug the temp sensor (yellow connector located below where the rope goes into the recoil). Pull the engine over once or twice – it usually pops. Then plug the sensor back in and the engine should operate normal.

Another trick is to use the battery jumper to turn on the control box and set 3000 LO to +10 (to add just enough fuel get the engine started), start the engine, then set it back to the original setting.

X. Warranty, Terms & Conditions

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

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

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