GEN3 PRO SEFI System

Four (4) Stage Dry Nitrous System

User Instruction Manual

Introduction

Thank you for purchasing BigStuff3's GEN3 PRO SEFI four (4) stage dry nitrous system. The system described in this User's Manual is targeted **for race applications only** using the Alpha/N control algorithm within the GEN3 ECU. A street version will be available in the summer of 2011.

The GEN3 PRO SEFI four (4) stage dry nitrous system is available in two configurations as described below. The preferred system configuration must be specified when ordering.

- Four stage nitrous and spark control via the GEN3 ECU, and BigComm software.
- Four stage nitrous (only) control via Digi-set timing controllers. The Digi-set controllers allow for last second adjustability in the staging lanes (Digi-set timers sold separately). The spark retard for each stage remains under the control of the GEN3 ECU.

Note: When using Digi-set timers, extreme care must be taken to ensure that the spark retard timing tables and the Digi-set timers are configured to work together.

Before Installing

This manual is a supplement to the GEN3 System User's Manual. The GEN3 system needs to be installed in the vehicle as described in the GEN3 System User's Manual.

System Contents

The ECU, supplied with the four (4) stage NOS system, will include two (2) header connectors at each end of the ECU housing. **It is essential that the NOS harness connector be installed in the correct header location. Not installing the NOS header connector into the correct header location will damage the ECU and void the warranty!!** The header connector (header 2) on the GEN3 ECU will be marked **"NOS"**. The harness side NOS header will also be marked **"NOS".** Mate the matched "NOS" connectors together. The remaining NOS functionality is contained within the GEN3 ECU.

NOS System Installation Overview

BigStuff3's Four (4) Stage Dry Nitrous system was designed to turn on nitrous solenoid valves (via relays), in a user defined timed sequence. The additional fuel required, when the nitrous solenoids are turned on, is added through the injectors already present in the system.

Note: Once the NOS system is activated, fuel and spark are controlled using the simple graphs described below.

Wiring the Relays to Control the Nitrous Solenoids

Note: The relays, used to activate the nitrous solenoids for each stage of nitrous, must be wired to the NOS header connector in the exact order (stages 2 – 4) shown below to avoid a mismatch between the spark retard tables and each stage of nitrous.

Note: If the GEN3 system is being upgraded to the four (4) stage nitrous system, the data log trigger will now be activated from pin Y2 in header 2. The new data log trigger wire is included in the wire harness provided with the NOS system upgrade. The "Timer Enable" wire will remain in pin A of the boost connector and **must be** wired per the Timer Enable/Clutch wiring diagram shown below.

The diagrams below show how to wire the relays into the system. Relays are required to activate the nitrous solenoid valves. BigStuff3 recommends using solid state relays for increased speed and reliability. Solid state relays are available from BigStuff3. Call BigStuff3 for more details.

One (1) of two (2) wiring configurations will be used based depending on whether the GEN3 ECU internal timers, or Digi-set timers will be used to activate the nitrous solenoids.

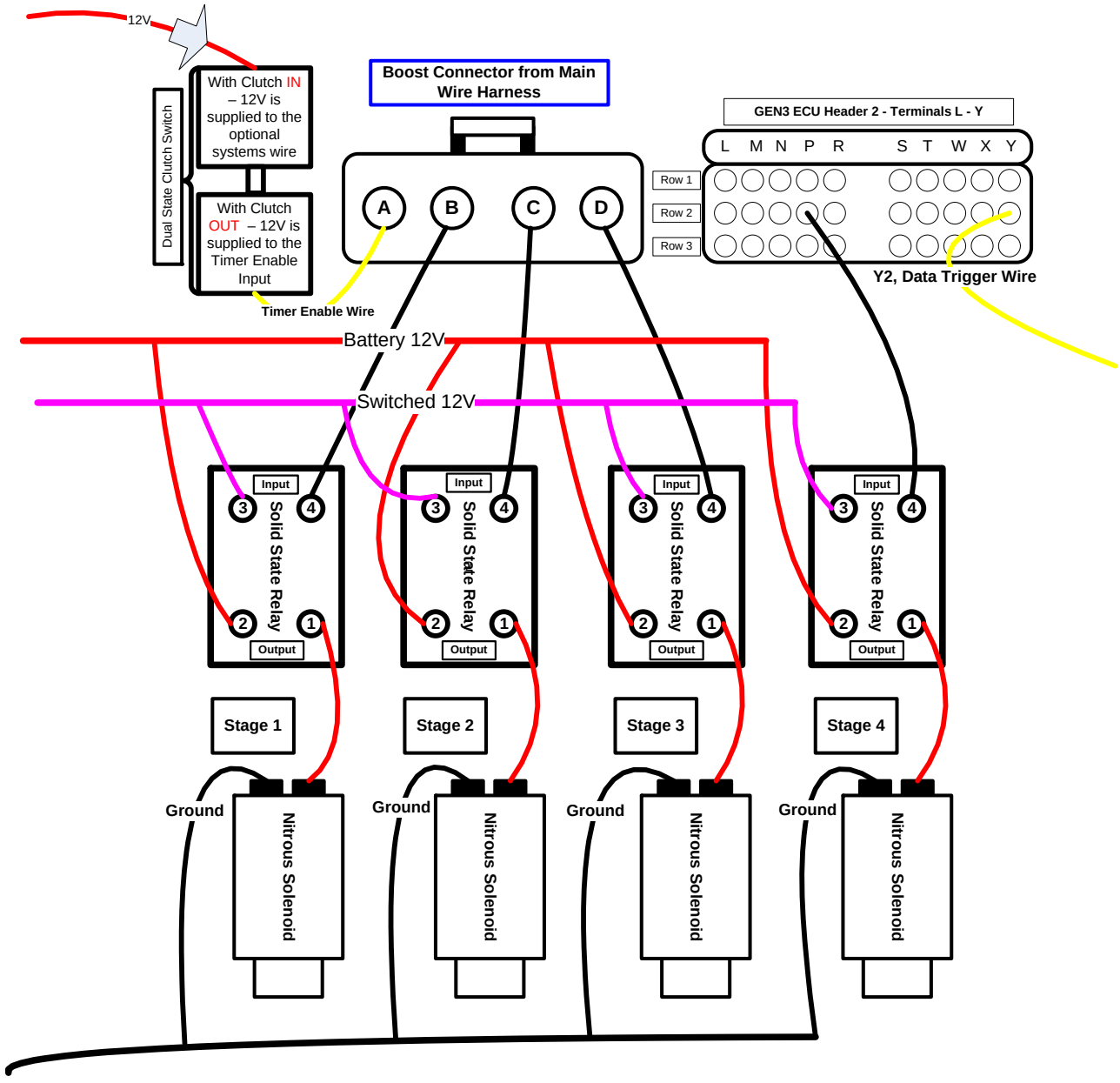
Solenoid Wiring using the GEN3 ECU for Spark Control & Nitrous Control

The following diagram illustrates how to wire the nitrous solenoids when the GEN3 ECU will be used to control the nitrous solenoid timing/activation and the spark retard for each stage of nitrous used.

The four (4) way "Boost" connector shown in the diagram is part of the GEN3 main wire harness and is labeled "Boost" The GEN3 NOS system includes a wire harness/header connector labeled "NOS". This connector will mate to the ECU header connector also labeled NOS.

The NOS wire harness will have 5 wires in the header connector. If the GEN3 ECU is going to be used to control the nitrous solenoid timing/activation and the spark retard for each stage of nitrous, only the wires labeled "data log trigger" (Y2) and "BS3 Stage 4" (P2) will need to be connected as shown below. The wires labeled X1, X2 and X3 are used in the Digi-set timer configuration and therefore will not be used.

BigStuff3 4 Stage Nitrous Solenoid Wiring - Using the GEN3 Internal Spark & Nitrous Control and Solid State Relays

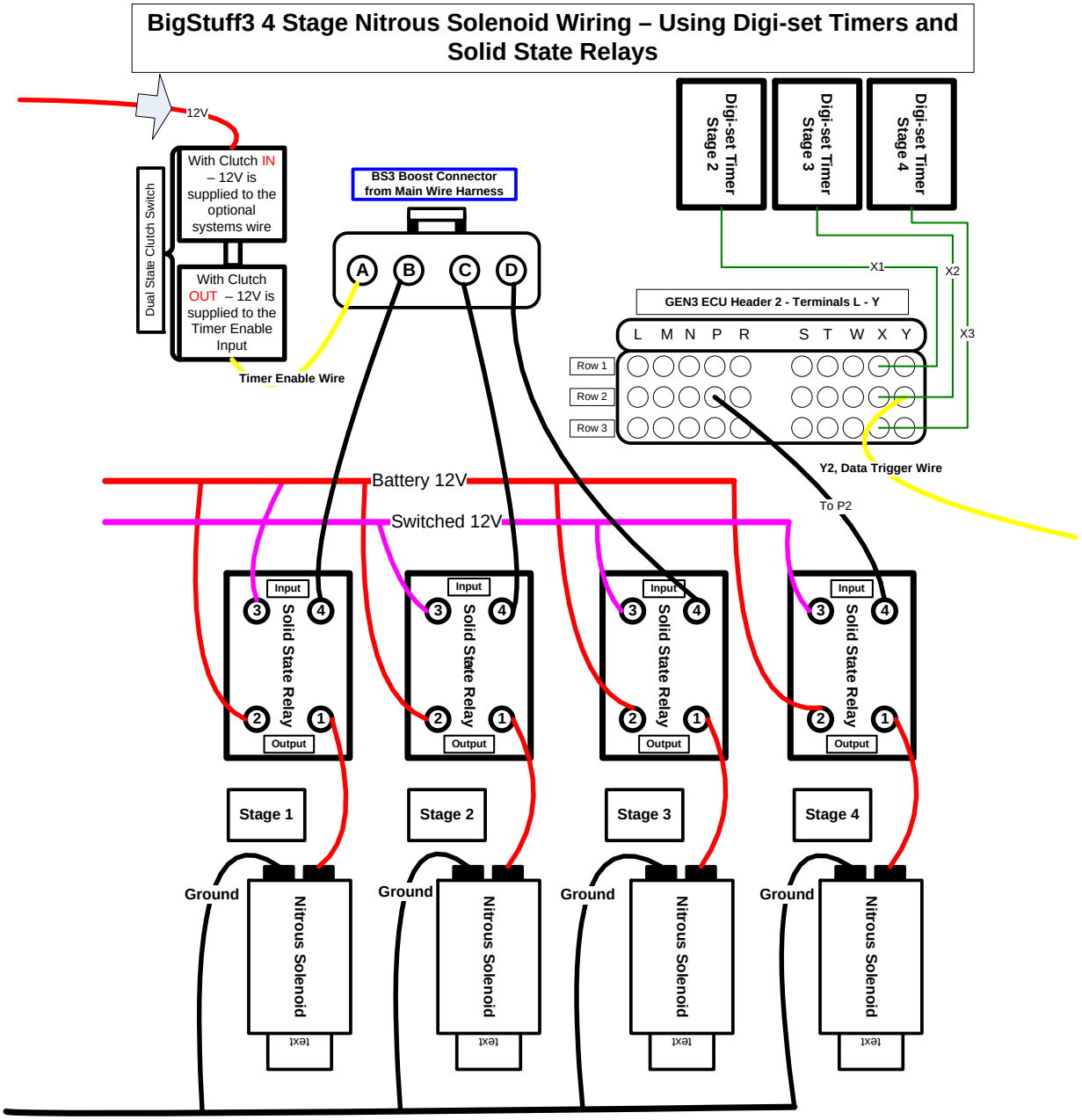


Solenoid Wiring using the GEN3 Spark Control & Digi-set Nitrous Control

The following diagram illustrates how to wire the nitrous solenoids when the GEN3 ECU is going to be used to control the spark retard for each stage of nitrous and Digi-set timers will be used to control the nitrous solenoid timing/activation.

The four (4) way "Boost" connector shown in the diagram is part of the GEN3 main wire harness and is labeled "Boost" The GEN3 NOS system includes a wire harness/header connector labeled "NOS". This connector will mate to the ECU header connector also labeled NOS.

The NOS wire harness will have 5 wires in the header connector. In this configuration only the wires labeled "data log trigger" (Y2), Digi-set Stage 2 (X1), Digi-set Stage 2 (X2) and Digi-set Stage 3 (X3) will need to be connected as shown below. The wire labeled "BS3 Stage 4" (P2) will not be used.

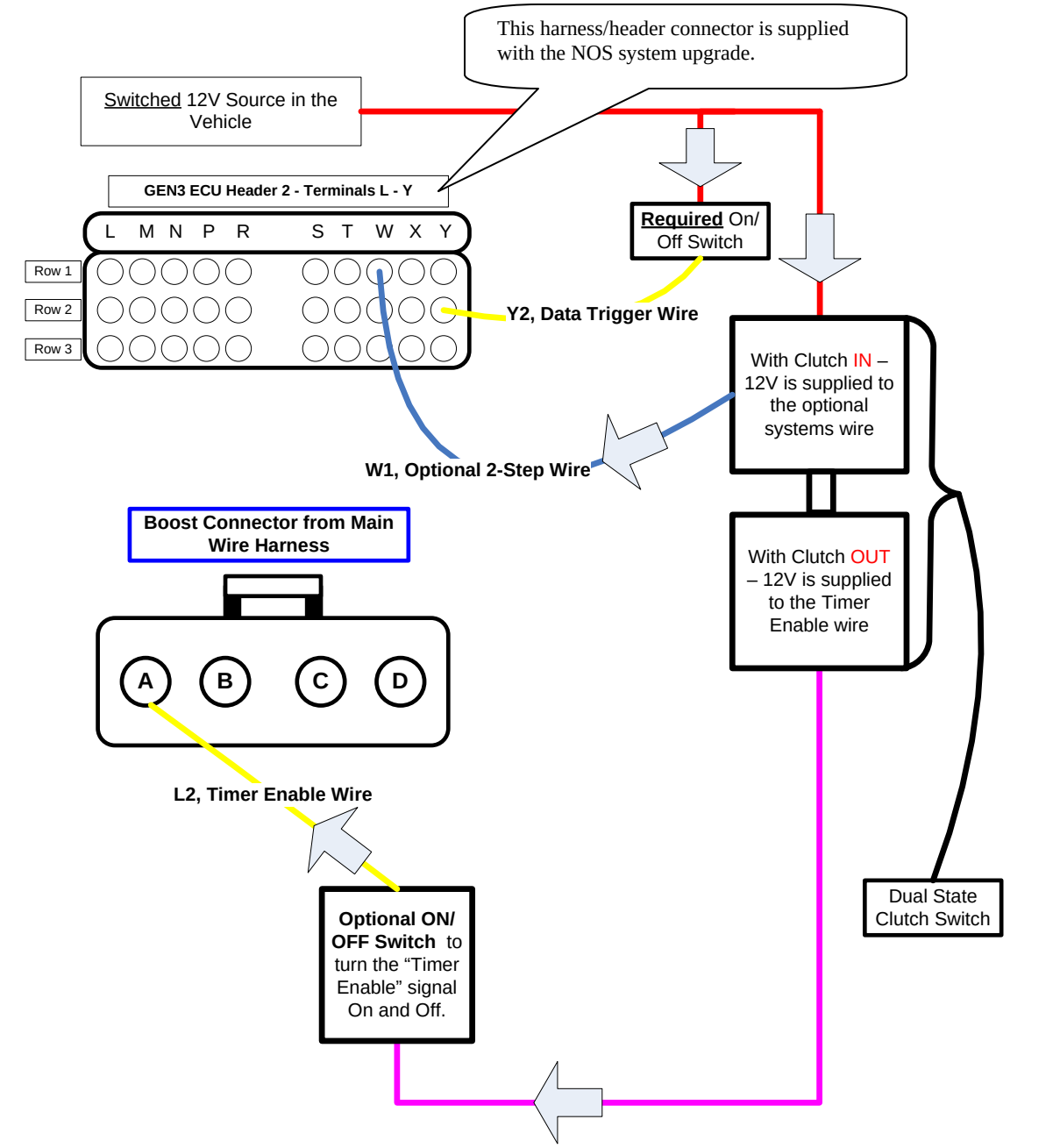


Clutch Input Wiring

The clutch input wiring, required to activate the four (4) stage dry nitrous system, is shown in the diagram below. Ignore the 2-Step input below if the system does not include BigStuff3's optional 2-Step RPM launch control.

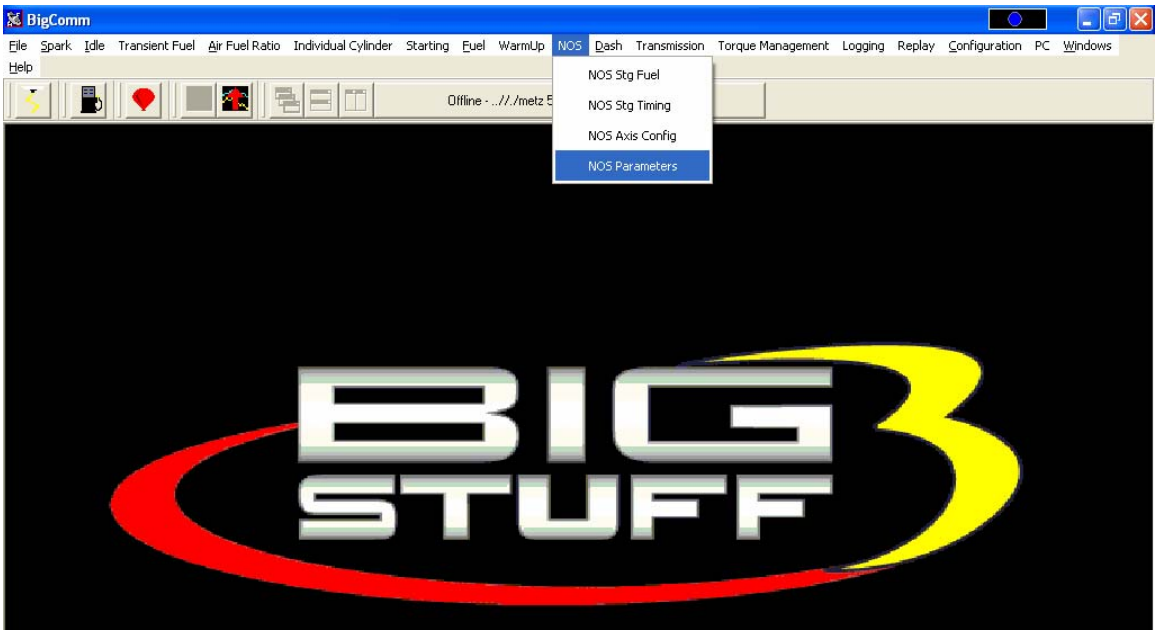
In order to activate the staged NOS control, 12 Volts must be applied to the "Timer Enable" wire, when the clutch is released. The "Timer Enable" input is Pin A of the 4-way Boost connector in the main wire harness. An ON/OFF switch can be added between clutch switch and the Pin A of the Boost connector to allow the timer enable input pin to be turned on and off.

BigStuff3 - Data Log Trigger/Timer Enable - Wiring Diagram
Using a Dual State Clutch Switch



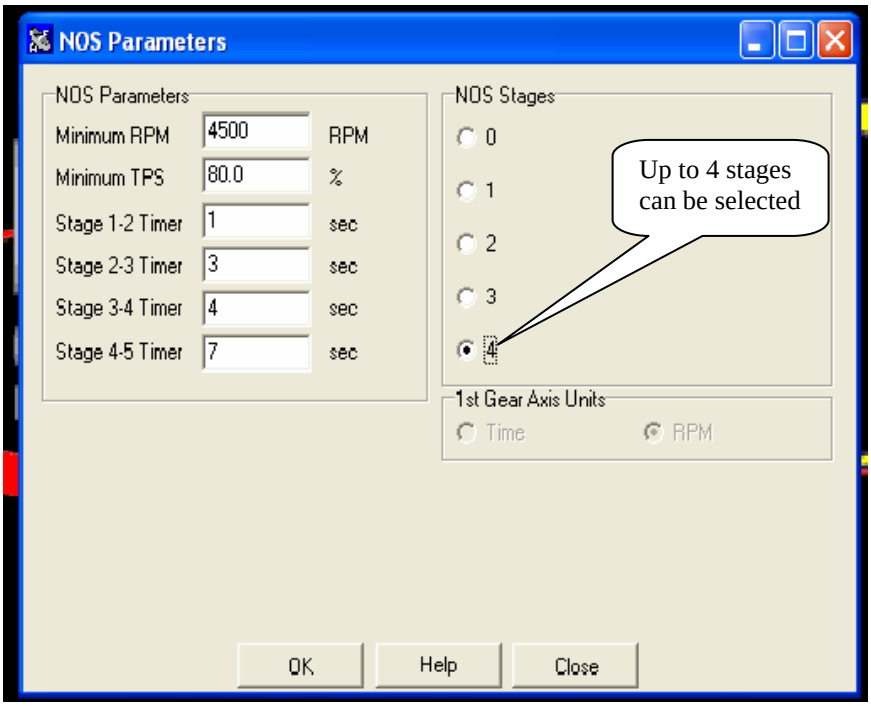
Configuring the NOS System

From the main BigComm screen, go to NOS.



When the drop-down screen opens, select “NOS parameters”, as shown below.

NOS Parameters Configuration



The "**NOS Parameters"** table defines:

- When the system will become active, via the minimum RPM and TPS setting.
- When each stage (nitrous solenoid) will turn on.

The four "Stage Timer" cells in the table allow the user to define the time intervals between the stages. From one (1) to four (4) stages can be used.

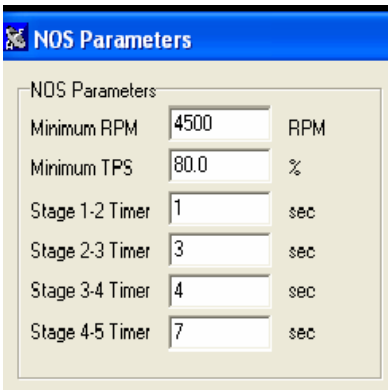
Using the parameters shown in the "NOS Parameters" table below, the system will activate when:

- The engine RPM exceeds 4,500 RPM
- The Throttle Position Sensor (TPS) exceeds 80%
- 12V is applied to the Timer Enable wire via the clutch switch (see diagram above).
- There must be a timer value in all four (4) "Stage Timer" cells, even if all four stages are not being used. For example, if only two stages are being used, stage timer one (1) is set for one (1) second, stage timer two (2) is set for four (4) second and stage timers 3 & 4 are set at zero seconds the system will not activate.
- The timer values in all four (4) "Stage Timer" cells must grow in duration. For example, if stage one has a timer value of one (2) second, and the stage two (2) timer has a value of one (1) second, the system will not activate.

NOTE: If 12V is **not** applied to the "Timer Enable" wire, the minimum TPS and RPM parameters are **not** met, and the Stage Timers are **not** configured as defined above, the NOS system **will not** become active!

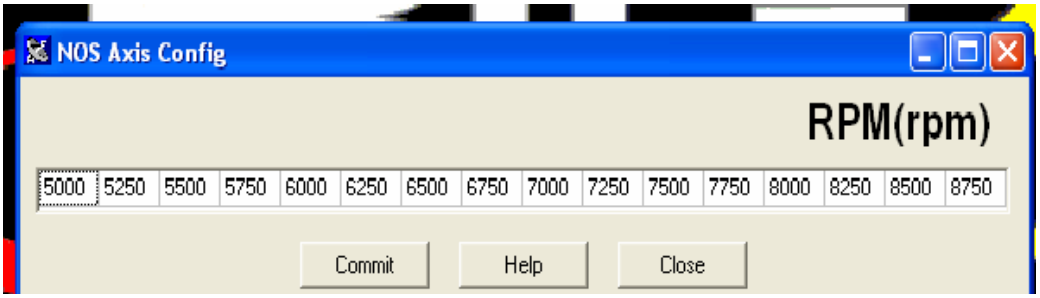
Once all these criteria are met, the stages will respond as follow:

- Stage 1 will be activated one (1) second after 12V is applied to the Timer Enable wire (the clutch is released).
- Stage 2 will be activated three (3) seconds after 12V is applied to the Timer Enable wire.
- Stage 3 will be activated four (4) seconds after 12V is applied to the Timer Enable wire.
- Stage 4 will be activated seven (7) seconds after 12V is applied to the Timer Enable wire.



The RPM axis, for both the Spark and Fuel Control Graphs, is configured using the NOS axis configuration table below.

NOS Axis Configuration Table



NOS Staged Fuel & Spark Control Graphs

Once the criteria defined in the "NOS Parameters" are met, and the nitrous system is activated, the GEN3 ECU will ignore the base fuel and spark maps and complete control (of the fuel and spark) is handled per the settings (curves) in the Fuel and Spark graphs.

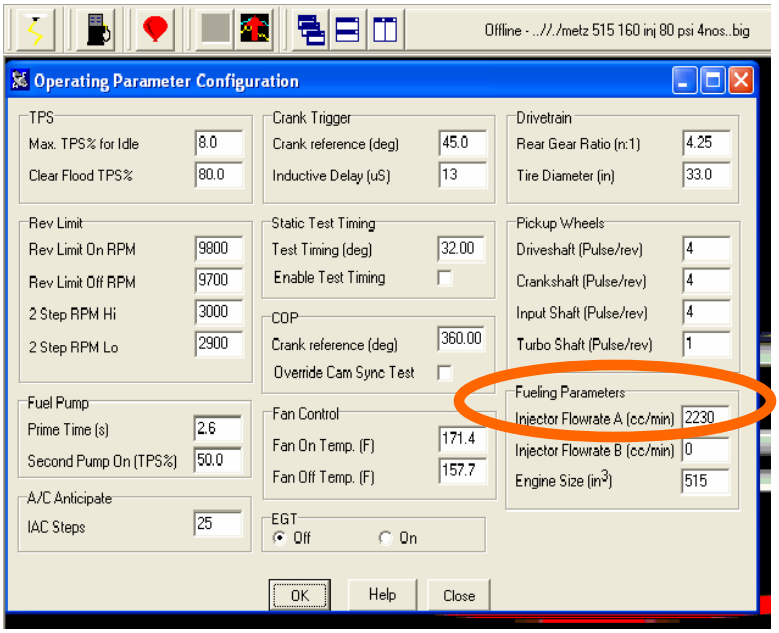
NOS Staged Fuel Control Graph

Use the left mouse button to drag the lines (representing each stage) in the graph to the desired value. The Y axis of the Fuel Control Graph represents fuel flow in pounds (lbs) per hour. When the mouse button is released, the software will provide the following information for that point in the graph:

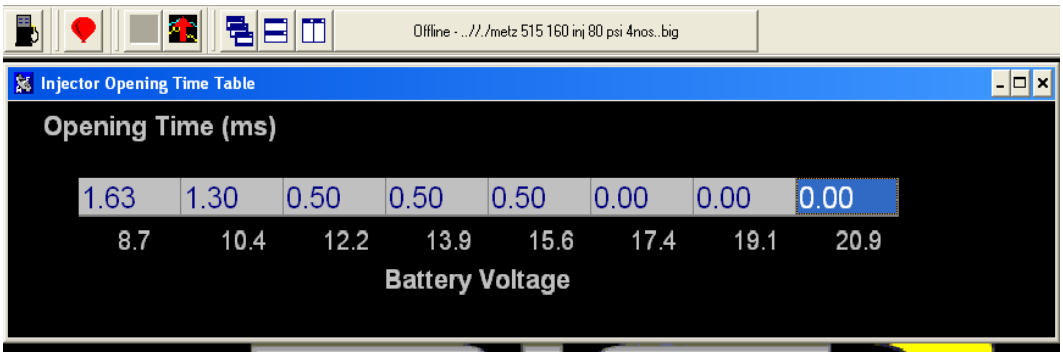
- The injector duty cycle
- Fuel flow in lbs/hr
- Engine RPM

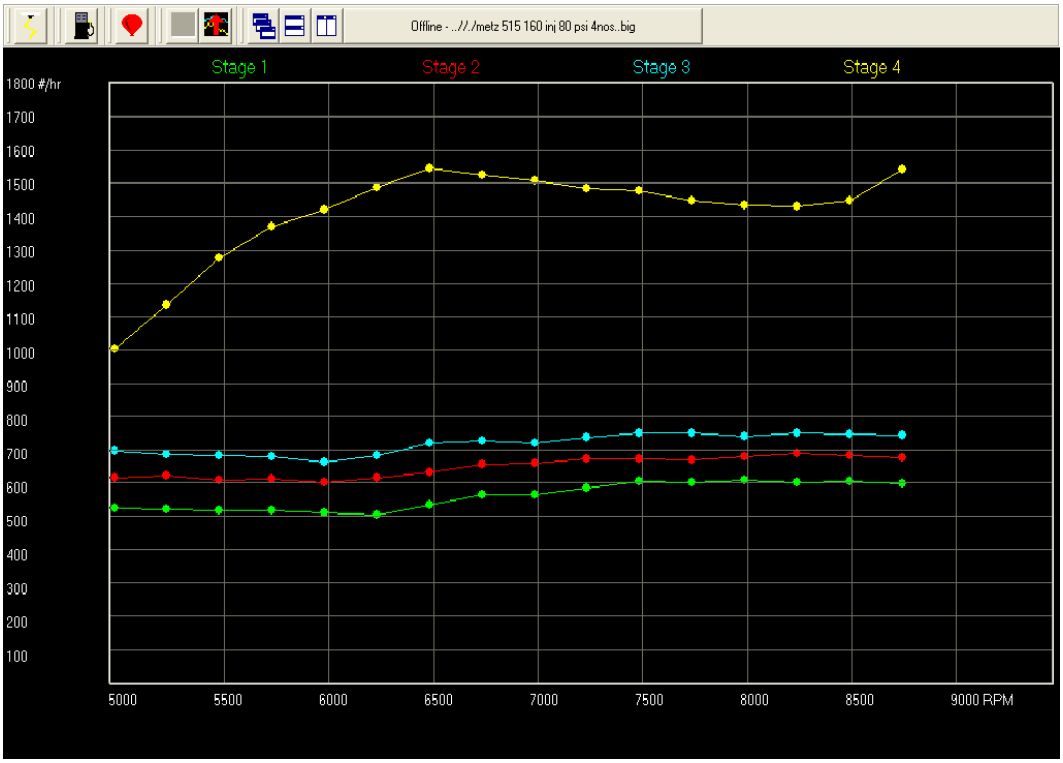
The new fuel flow value will be updated in the graph once the mouse button is released. BigStuff3 recommends saving your changes as you go along. Go to the GEN3 system User's Manual for information on how to save changes.

The firmware supplied with the four (4) stage nitrous system was configured based on eight (8) 160 lb/hr Bosch injectors at 80 PSI of rail pressure, which equates to 2230 cc/min w/0.5 mS injector opening time. The injector flow rate input is configured in the Operating Parameter Configuration table in the BigComm software as shown below.



Injector Opening Time table





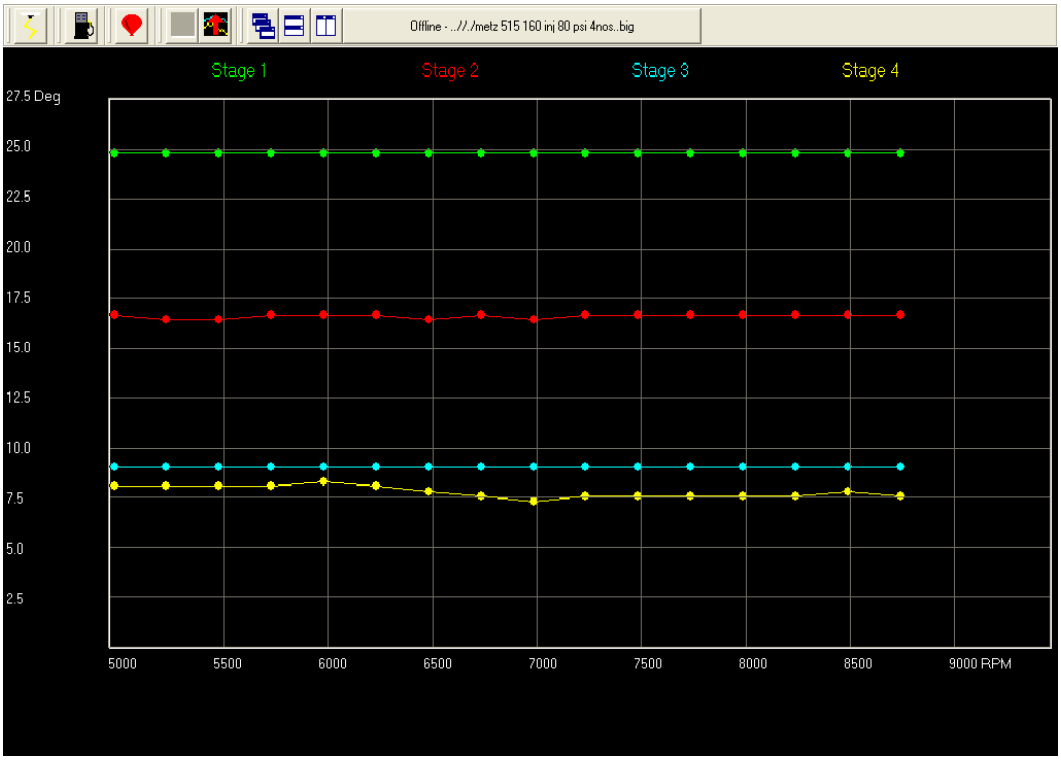
NOS Staged Spark Control Graph

The Y axis of the Spark Control Graph represents ignition timing as a function of RPM. When the mouse button is released, the software will provide the following information for that point in the graph:

- Ignition timing
- Engine RPM

The new spark value will be updated in the graph once the mouse button is released. BigStuff3 recommends saving your changes as you go along. Go to the GEN3 system User's Manual for information on how to save changes.

Note: The spark values for each stage are absolute spark values and not spark retard values. In other words, the spark value at any point in the spark graph is the total spark the engine will see at that RPM!



If the "Engine Saver" RPM limit is reached, the GEN3 ECU will shut off the Nitrous control! The rev limiter can be set from the Operating Configuration table in the BigComm software, as shown below.