

# Single-Nozzle Nitrous Kit for '2001 & newer Ford Escape, '99 & newer Ford Ranger, Explorer & Sport Trac Part #13099



## INSTALLATION AND TUNING INSTRUCTIONS

### INTRODUCTION

Congratulations on your purchase. Now, that you're fully equipped with the latest technology from NitrousWorks, the high-performance world of nitrous oxide awaits you.

However, despite the natural impulse to have the kit installed in record time and an unbridled desire to go out and test it, please read the following information first. It's important you understand all aspects of these instructions, prior to the installation of your new system. Let's begin by taking a brief look at the basics of nitrous.

Adding nitrous oxide to an internal-combustion engine is the most cost-effective way of increasing its performance. Nitrous is rich in oxygen which is a vital component for making more power. By introducing nitrous oxide to the combustion chamber, more fuel can be burned as a result of the higher oxygen content, and the engine will produce more power.

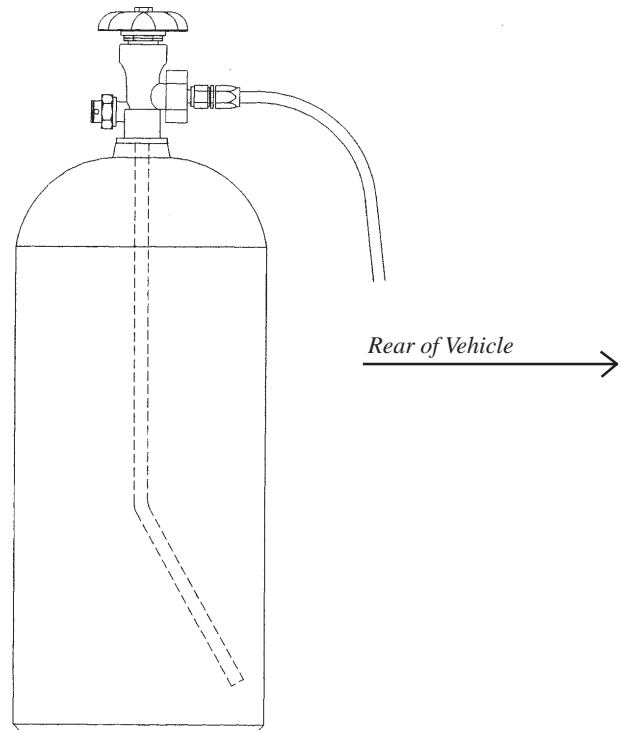
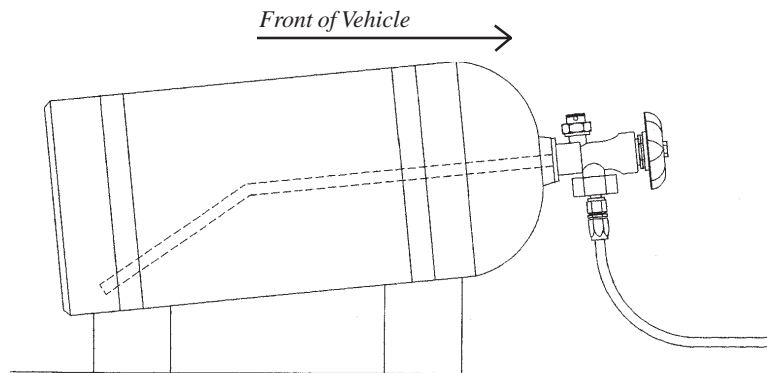
This formula works without exception, providing the correct amount of fuel is added to the combustion chamber to match the nitrous charge. If fuel is not added to the nitrous, or if the amount of fuel is insufficient, the resulting incorrect mixture will bring about leanness. This is an undesirable condition that causes combustion temperatures to increase rapidly, and one that has the potential to inflict severe engine failure.

The nitrous system comprises four main components: nitrous delivery system, fuel delivery system, delivery nozzle, and electrical system. Let's look at each of these with regard to installing and tuning. Testing the system will be discussed along with some general tips.

**NOTE: BEFORE ANY WORK BEGINS, DISCONNECT THE POSITIVE BATTERY TERMINAL.**

### NITROUS DELIVERY SYSTEM

The nitrous-oxide cylinder should be mounted in the cargo area, bed, or similar area, but not in the driver's compartment. The positioning of the cylinder must be executed as shown in the diagrams below to ensure the siphon tube remains covered with liquid nitrous. Either installation is acceptable, use the layout that suits your vehicle best.



When mounting the cylinder/bottle in the horizontal position, assemble the brackets on the cylinder and use them as a template for marking the positions of the eight, 5/16" mounting holes. In this position, the valve end will be higher than the bottom of the cylinder; the valve will be pointing forward and the valve outlet facing downwards.

**NOTE: BE SURE NOT TO PUNCTURE THE FUEL TANK OR ANY OF THE FUEL LINES ETC. WHEN DRILLING.**

The smaller fitting, opposite the valve outlet, is for pressure relief. Should the cylinder exceed 3000psi, the relief fitting will expel the contents of the cylinder. Cars competing under IHRA regulations are required to have this relief fitting vented to the outside of the car. To comply, NitrousWorks offer an IHRA-legal relief valve, part number 16024. It's threaded to accept either an external vent tube or braided-steel hose with a -8AN hose end. The other end of the hose can be fixed to a -8 AN bulkhead fitting (part number 150887) to exit the car.

There are several ways in which the nitrous supply line can be routed to the engine compartment. Some suggestions include running it under the carpet, under the kick-panel moldings, or under the floor panel. Anyone of these methods is acceptable. Ensure the line is secure, that it cannot be tugged out of position, and it's protected from blows that could cause the line to rupture. Route the line into the engine compartment towards the area where the throttle body is located and where the nozzle will be installed. Make sure the line has a small amount of slack to absorb any engine-to-chassis movement.

## FUEL DELIVERY SYSTEM

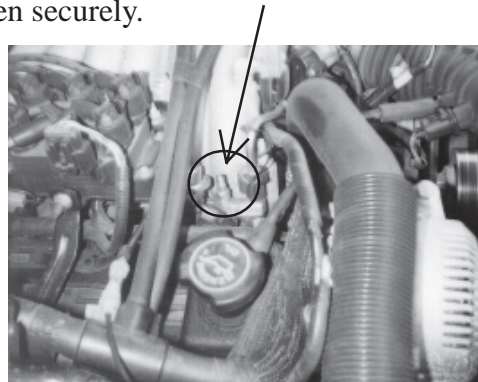
**PLEASE NOTE: FOR FUEL DELIVERY SYSTEM, MAKE SURE YOUR FUEL DELIVERY CAN HANDLE THE ADDITIONAL REQUIREMENTS OF THE NITROUS SYSTEM TO AVOID LEANNESS AND SUBSEQUENT ENGINE DAMAGE.**

The first step in the installation of the fuel is to determine which type of fuel system that your vehicle has. If you have a **2001 or newer Escape**, or a **1999 or newer Ranger**, you will follow the *screw-in fuel rail fitting* instructions. If you have a 1999 or newer **Explorer/Sport Trac**, you will follow the *flange mount fuel rail fitting* instructions.

### Screw-in Fuel Rail Fitting

The first step in the installation of the fuel delivery system is to locate the Schrader valve. It will be found on the fuel rail. On the **Escape**, the valve is located on the fuel rail on the front/center of the engine under the black cover. On the **Ranger**, the valve is located on the rail on the passenger side of the engine, near the front.

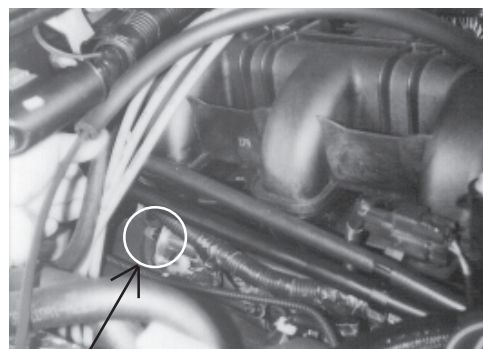
Once the valve has been located, remove it from the fuel rail. It's a good idea to have some rags handy at this point to soak up the leaking fuel. Now, install the special fuel rail fitting (1/16" pipe to #4) which is included in your kit. This fitting should be installed with thread sealant (but never teflon tape) around the threaded end of the pipe. Tighten securely.



*Ford Ranger*

### Flange Mount Fuel Fitting

In the engine bay, locate the fuel rail. On the passenger side of the vehicle, at the rear of the fuel rail near the firewall, you will find an oval end plate cover held in place with two bolts. This oval end plate is the same shape as the adapter fitting found in your kit. With a rag ready, remove the "O"-ring from the original plug, and carefully install it on the adapter fitting. Install the adapter fitting to the fuel rail and carefully tighten, using the original hardware.



*Explorer/Sport Trac*

## DELIVERY NOZZLE

The best location for the nozzle is on the air intake side of the butterfly on the throttle body. Ensure that the location of the nozzle, and the lines that run to it, do not adversely affect other nitrous or existing engine components and that there is sufficient hood clearance.

Depending on what vehicle you have, here are some suggested air nozzle installation instructions:

### Explorer/Sport Trac

Mount the nozzle into the air intake duct about three inches before the throttle body, coming in horizontally from the passenger side of the vehicle.

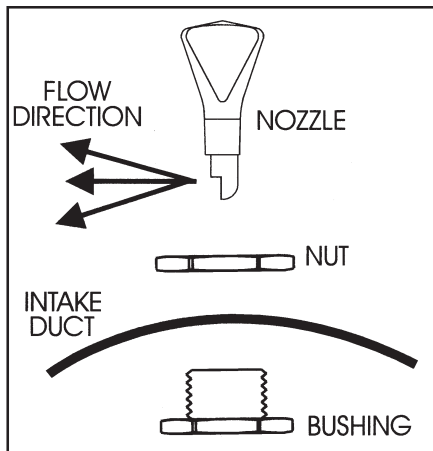
### Escape

Mount the nozzle into the air intake duct about three inches before the throttle body, coming in horizontally from the front of the vehicle.

### Ranger

Mount the nozzle into the air intake duct about three inches before the throttle body, coming in horizontally from the passenger side of the vehicle.

With the location selected, install the nozzle using the nozzle duct bushing to secure the nozzle into the inlet duct.



### Nozzle Duct Bushing Installation

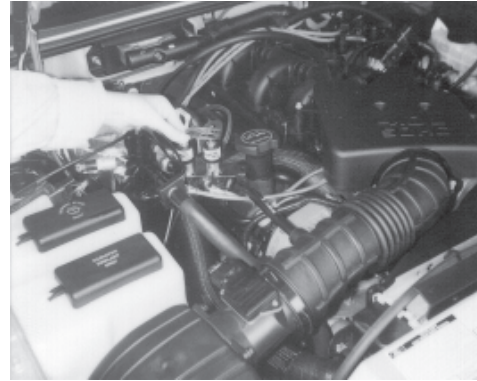
To install bushing, cut or drill 9/16" hole in the air intake duct on the vehicle in the suggested location. It is mandatory to install the nozzle on the engine side of any mass air flow sensors on the vehicle.

## MOUNT SOLENOIDS

As before, the installation of components will vary depending on which vehicle is being used. Here are some solenoid mounting suggestions for each type of vehicle:

### Explorer/Sport Trac

The solenoids will mount to the stand next to the oil fill neck, however, the corner of the bracket may need to be trimmed for clearance.



### Escape

Mount the solenoids to the front stud of the intake manifold near the driver's side headlight.

### Ranger

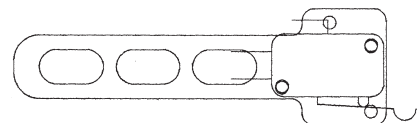
Mount the solenoids to a stud on the firewall on the driver's side of the vehicle.

With the nozzle and solenoids installed, attach the nitrous feed line to the inlet side of the nitrous solenoid (marked "IN")

Route the fuel line from the fuel rail fitting to the inlet side of the fuel solenoid (marked "IN"). The fuel line is the 18" 4 A/N line with the 90° fitting on the end. Attach the 90° fitting to the fuel rail fitting.

Mount the Full Throttle Switch and Bracket such that the switch is engaged with the lever depressed when the car is at full throttle. Mount the switch securely as required for your installation. It's wise to verify that the switch is engaged when the pedal is depressed. (See Diagram One)

Diagram One



Selecting the proper jets for the desired horsepower with your system can be done using the following chart. A discussion covering the use of jets can be found under the 'Tuning Tips' section.

With the nozzle installed properly, the fuel jet will be the one closest to the engine; the other will be the nitrous jet. (See insert - **Diagram Two**)

After inserting the proper jets, install the delivery lines from the solenoids to the nozzle. Use the #3 / #4 line with the red nuts between the fuel solenoid and the fuel jet (closest to the engine) and the line with the blue nuts between the nitrous solenoid and the nitrous jet.

HP LEVEL	NITROUS JET	FUEL JET	TUNING JET(S)
25	24	18	16,21
50	33	25	24,26
75	42	28	26,29

## ELECTRICAL SYSTEM

The proper and safe wiring of the nitrous system is also critical for consistent performance. Safety should always be the primary consideration when wiring. NitrousWorks strongly recommends the use of electrical relays, which prevent the amperage draw of the solenoids from damaging the activation switches. Relays also contribute to the proper functioning of the solenoids.

**Diagrams three and four** (see insert) illustrate two alternative wiring arrangements. It should be noted that any wire used to deliver power to the solenoids should be a minimum of 16-14 gauge wire. The trigger wiring for the relay can be 22 - 18 gauge wire. (See insert - **Diagrams 3 and 4**)

**Diagram three** exemplifies the minimum requirement. Though this diagram may appear simpler in design than diagram four, it can be more cumbersome to install. To ensure proper solenoid operation, the 12volt switched power supply must be capable of handling 25 - 30 amps. From the power supply, run the cable to the toggle-arming switch. From the toggle switch, run to the solenoids, either directly or via an optional momentary switch (Pt. Number 16010).

It should be noted at this point that each solenoid has two wires coming from it. Either wire can be positive or ground - the choice is yours.

From the remaining two wires, either run to the optional Hobbs switch or directly to the full-throttle switch. The Hobbs switch is a pressure-sensing device that will close the circuit, as long as it's exposed to its minimum-rated pressure. They are available in two different settings, 5-psi and 30-psi. It is recommended to include one of these switches (5-psi Part Number. 16006) to monitor the pre-regulated fuel pressure and immobilize the setup, should the fuel system fail. This is a wise precaution that could save your engine. From the throttle switch run to a good ground

**Diagram four** shows the preferred wiring layout. This design has four main legs. The switched power supply in this system does not need to provide high amperage to the toggle switch. A switched auxiliary port on the fuse panel is an excellent choice. Run from the toggle switch, through the optional momentary switch to the #86 connection on the relay. From the relay (connection #85), wire through an optional Hobbs switch, or directly to the full-throttle switch and then to ground. The switch is to be wired using the 'NO' (normally open) terminal and the 'COM' (common) terminal as shown in the diagram.

To supply power to the solenoids, it is recommended to run from the positive terminal of the battery to the #30 connection. From relay connection #87, run to the solenoids and from the solenoids to a good ground.

## TESTING THE SYSTEM

**NOTE: AT THIS POINT, RECONNECT THE POSITIVE BATTERY TERMINAL.**

The first thing to check is the wiring. If a Hobbs switch is included in the wiring layout, it will be necessary to build a small jumper, or remove it from the system temporarily. Unless exposed to pressure, a Hobbs switch will not close the circuit. These tests need to be performed with the engine switched off.

With the ignition key in the 'on' position, the engine not running and the toggle switch in the 'off' position, depress the full-throttle switch and any optional momentary switches. Nothing should happen. Now, perform the same test with the toggle switch in the 'on' position. This time



the solenoids should click. If they do, the wiring is correct. This test applies to either wiring scheme.

To check for fuel leaks, start the car and inspect the fuel fittings and the solenoid inlet fitting. If the fuel system is leak-free, switch off the engine.

**CAUTION: NITROUS IS EXTREMELY COLD AND CAN CAUSE BURNS SIMILAR TO FROSTBITE. USE CAUTION WHEN HANDLING NITROUS.**

To check for nitrous leaks, open the cylinder/bottle valve to examine both the connection at the valve and the connection at the solenoid inlet fitting. Remove the nitrous supply line at the nozzle and check for nitrous in the line (caution: very cold). Any sign of weeping in this area would indicate a leaking solenoid. If no leaks are found, close the cylinder valve and bleed the lines. This can be accomplished by loosening the line nut at the cylinder valve. If any leaks are found at the fittings, tighten the line nut. If leaking persists, close the cylinder valve and remove the line for inspection. Contact the NitrousWorks technical staff at (706) 864-7009.

### **TUNING TIPS**

**NOTE: TO OVERCOME THE INCREASED COMBUSTION PRESSURES CUSTOMARY WITH NITROUS USE, IT MAY BE NECESSARY TO DECREASE THE PLUG GAPS, OR INSTALL AN IGNITION PERFORMANCE ENHANCER SUCH AS AN MSD-6AL, OR SIMILAR, TO REDUCE THE PROSPECT OF BACKFIRE OR OTHER DETRIMENTAL EFFECTS.**

All NitrousWorks systems are calibrated to operate with a cylinder/bottle pressure of 1000-psi. Running with a pressure lower than this will cause the system to operate in a rich condition, and make the vehicle seem sluggish - producing power 'in waves'. If the

cylinder pressure exceeds the 1000-psi mark, the system may become lean, which as discussed earlier, can cause severe engine damage. The best way to monitor cylinder pressure is to install a gauge and in-line adapter (Part. Number 16005 [-4] or Part Number 16013 [-6]).

Along with cylinder pressure, specified jetting changes can be made to affect the richness or the leanness of the kit. The larger the fuel jet, the richer the system and, conversely, smaller jets create leanness. The kits are designed to function with a fuel system operating at 40-psi. You may need to adjust the jetting based on the fuel pressure (go up or down a size or two). A telltale sign of richness is a black exhaust. One can also look at the spark plugs. If the plug is black and wet, the system is rich. If the plug is white or has a semi-burned tip, the system is lean. Remember, in order to get a good sparkplug reading, one must check the plugs immediately after a run, not after a drive back to the pits.

**NOTE: WHEN TUNING A NITROUS KIT FOR PEAK PERFORMANCE, IT IS ALWAYS BETTER TO ERR ON THE RICH SIDE THAN THE LEAN. A RICH CONDITION MAY LACK PERFORMANCE BUT, UNLIKE A LEAN CONDITION, IT'S LESS LIKELY TO DAMAGE ENGINE PARTS.**

Finally, ignition timing can also play a key role in nitrous tuning, and retarding it by 2 - 4 degrees is a good rule of thumb. Further retardation may be necessary on larger kits to prevent detonation.

**For further questions, please contact our technical department at (706) 864-8544.**

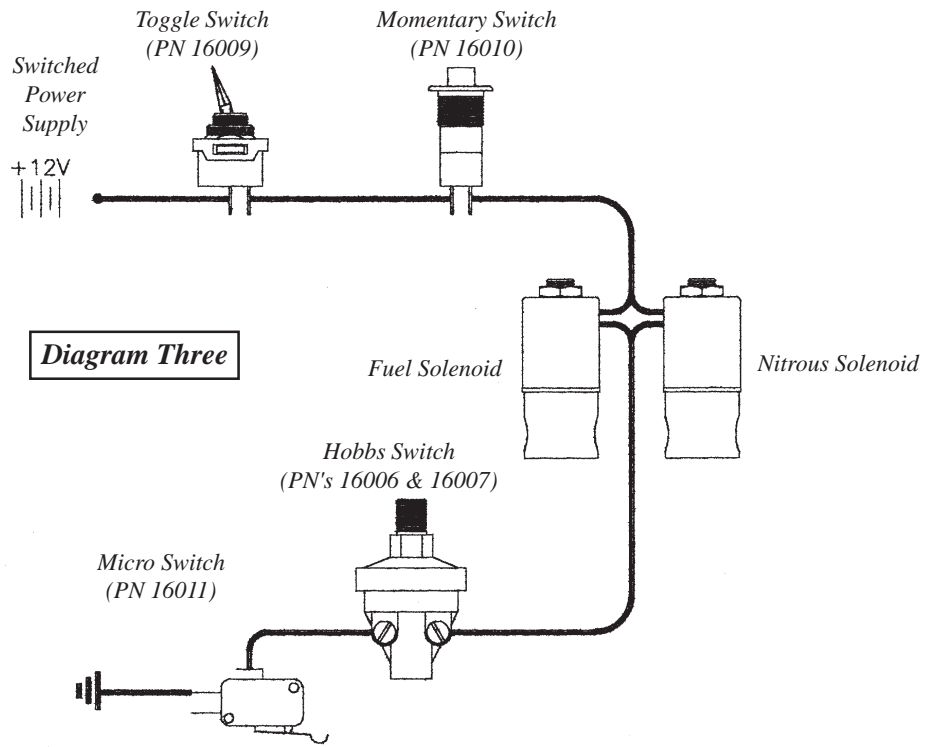
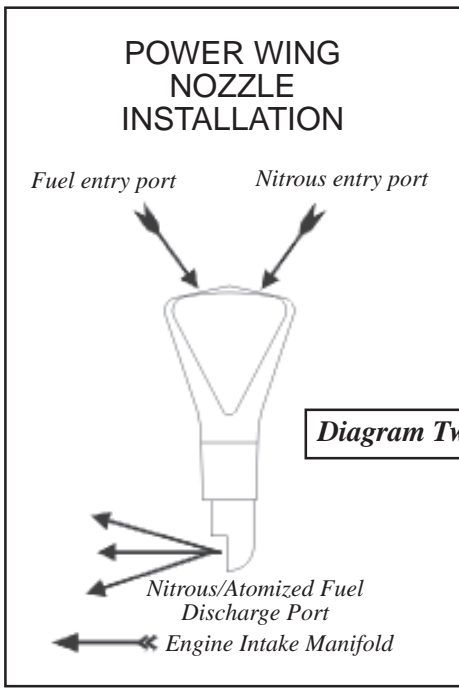


Diagram Three – Suggested Wiring

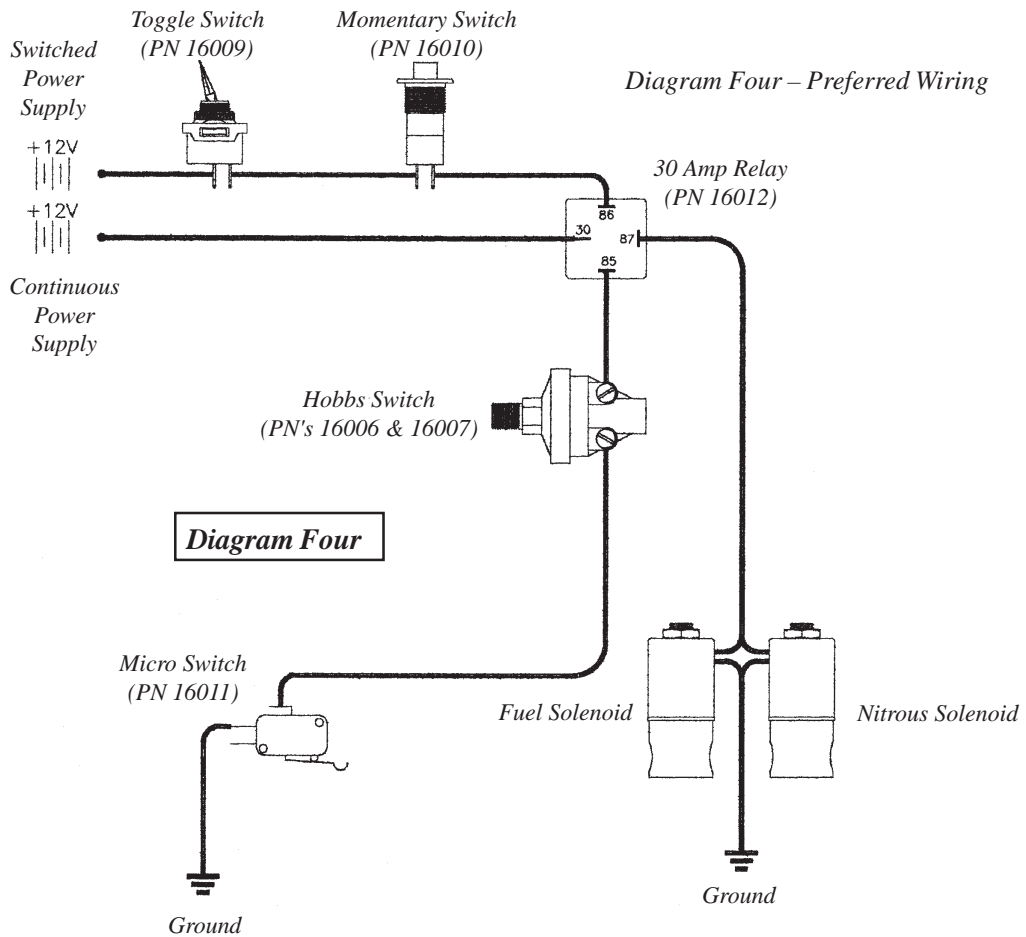


Diagram Four – Preferred Wiring