Nitrous Outlet Solenoid Maintenance "How To"

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The nitrous system's solenoids are the heart of the operating system. It is just as important to keep them in good working condition as it is for your body to maintain a good healthy heart. Over a period of time the use of the system can start to cause wear and tear on the solenoids. Knowing how to disassemble the solenoids and what parts to check for wear and tear can keep your system working reliably and safely.

Most mechanical nitrous and fuel solenoids share many similarities in build construction and design. There are many differences that can vary in a solenoids construction, such as port orifice size, port configuration, coil amperage, coil construction, piston material, piston design, tower size, and main body construction. While I am not one to agree that a solenoid is a solenoid, I do feel that this technical "how to" will cover 99 percent of the solenoids on the market.

Understanding how to maintain maintenance on the system solenoids requires knowing more than how to take them apart. Proper installation is important to a reliable operating solenoid.

1. If your nitrous solenoid does not have a screen filter in the inlet port of the solenoid, use an inlet fitting with built in screen. This will keep contaminants from entering the piston chamber and wedging between the piston and the solenoid seat, preventing the piston from sealing off flow when closed.
2. Inline nitrous filters are another method of keeping trash out of the solenoid. Most filters mount in the main feed line close to the bottle. Most inline filters offer a better filtration than the screen fittings however they do have some drawbacks. Since inline filters mount in the main feed line, they provide an expansion chamber for the nitrous. This can create a phase change and at some level restrict flow. (Knowing the limitation of flow VS your power level is key)
3. Thread sealant is important as well. We suggest using Teflon paste or a medium grade Loc-tite. On fittings that you will be taking apart we suggest Teflon paste for easy removal. In the event the pressure pushes the paste out and nitrous is leaking past the treads, clean the fittings and use Loc-tite. Keep in mind that when using the Loc-tite if you need to remove the fittings it may require heat to release.
4. Improper wire size, improper grounding contact surface and improper wire connections are the main cause of solenoid coil burn out. It is important that you know the amperage draw of your solenoids so that you can select the proper wire length and gauge for your system. Proper connection splices and ground contacts are also very critical. Without the proper connection and clean ground contact, the solenoid can operate inconsistently and cause coil burn out.
5. Using the correct fuel solenoid for the type of fuel you are using is also important. Today's pump gases contain methanol and most all "old style" fuel solenoids contain a piston material not designed for today's fuels. Most "new style" solenoids contain a piston material designed to work with today's pump gas fuel. These solenoids will work with pump gas as well as unleaded and leaded race fuels. Alcohol solenoids will need a different piston and, depending on power level, possibly a larger flowing orifice. If your fuel solenoid does not have the correct piston material for the fuel you are using, the piston material can swell and prevent the solenoid from opening or closing all the way.

Solenoid tear down is very simple and you should not be intimidated by taking the solenoid apart for routine maintenance or cleaning. A clean work area is critical so that you can lay out the solenoid components without losing anything. In this section we will cover solenoid components, disassembling the solenoid and how to determine what may or may not need to be replaced.

You will need the following tools.
1. Nitrous Outlet Solenoid Maintenance Wrench.
2. Bench Vice
3. Brake Cleaner
4. Pressurized air and blow nozzle.

Section 1

Solenoid Components

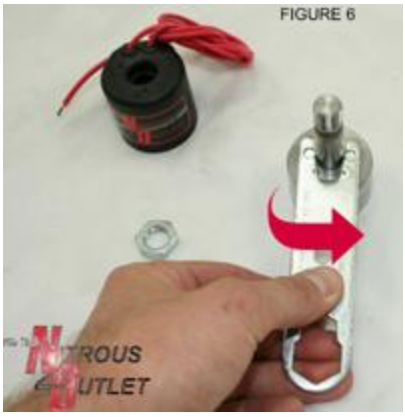
Most solenoids are made up of 8 main components. **(FIGURE 1)**

1. Coil canister
2. Electromagnetic coil
3. Tower nut
4. Tower
5. Tower "O-ring" seal
6. Piston
7. Piston Spring
8. Solenoid base
9. Inlet screen

Section 2

Solenoid Dis-assembly

1. With the solenoid maintenance wrench, use the boxed end to remove the solenoid nut located on top of the coil canister. **(FIGURE 2)**
2. Remove the coil canister and electromagnetic coil assembly from the solenoid tower. **(FIGURE 3)**
3. Slide the electromagnetic coil from the coil canister. **(FIGURE 4)**
4. Using the solenoid maintenance wrench, match the two extruding dowels to the inverted dowel holes on the tower base. Loosen the tower from the solenoid base by turning counter clock wise. (This may require clamping the solenoid base into a bench vice) **(FIGURE 5 & 6)**
5. Once the tower is loose, un-screw the tower from the solenoid base while carefully removing the piston and spring from inside the tower. Pay attention to the spring and piston orientation. **(FIGURE 7)**
6. Remove the tower O-ring from the solenoid base. **(FIGURE 8)**



Section 3

With all the solenoid components carefully laid out on the work bench it is time to check for wear, tear and contaminants.

1. If the solenoid base has fittings screwed into the base, remove the fittings.
2. Using brake cleaner, spray the base and the tower to wash any contaminants away.
3. Using pressurized air, blow out the solenoid base and tower.
4. If the solenoid has a screen filter in the inlet port make sure it is clean from any contaminants. Also verify that the screen has not been pushed in, pushed up or wadded up from tightening the inlet fitting in too far. **(FIGURE 9)**
5. Check the tower "O-ring" for any tears, hardness or brittleness. If the "O-ring" has a tear or is becoming hard and brittle, contact the system manufacture for a replacement.
6. Check the piston Seal for wear and tear. The nitrous solenoid is prone to get a nipple cut into it over a period of time. The nipple is due to the solenoid base seat cutting into it as the piston hammers against the seal when it closes. **(FIGURE 10)**

It is normal to see a little dimple in the seal, however if the seal has a definite nipple cut into it, it should be replaced.

(FIGURE 11)

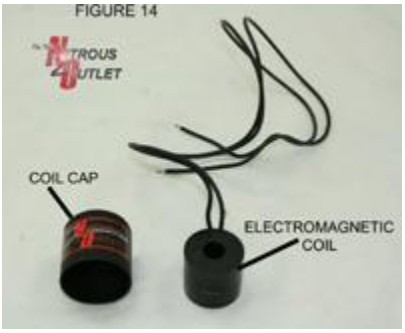
7. Make sure there is no trash embedded into the piston seal. The fuel piston seal should be inspected to make sure it has not swelled due to certain fuels exposure. Some seals are completely embedded into the piston. The seal should be flat and level with the top of the piston. If it is protruding past the piston it has swelled and needs replaced. **(FIGURE 12)**

Another style of fuel piston seal is pressed into the housing but the sealing surface does not embed into the piston. This sealing surface covers the entire tip of the piston. The edges should have a defined edge. If they are rounded and the flat surface looks like it has a high spot, it has swelled and needs to be replaced. **(FIGURE 13)**

Also verify there are no contaminants embedded into the seal. For all nitrous and fuel solenoids make sure the seal is firmly attached to the piston.

8. Check the piston spring to verify it has not been crushed or deformed in any way.
9. Check piston travel in the tower by placing the piston and spring back in the manner in which it came apart. Using your finger, make sure the piston slides up and down in the tower with out any drag or

resistance. If the piston does not slide up and down freely, the tower has more than likely been crushed or twisted and it should be replaced. Also make sure the spring is making contact and causing resistance against pressure when the piston is fully pushed into the tower.
10. Visually inspect the electromagnetic coil for any cracks due to overheating. Check and make sure the coil wires are connected into the coil firmly and have no breaks in the insulated covering. Smell the coil to determine if it has been over heated. If the coil has been over heated it will normally have a burnt smell or it will be cracked. If the coil has been severely over heated, it may weld itself to the tower making removal hard. **(FIGURE 14)**
11. Next, take a Volt/Ohm meter and check the resistance value of the coil and compare it to factory specs. (Since some nitrous manufactures may not have the information needed for you to verify the coil is working properly you may not be able to do this step.) To determine resistance you will take voltage and divide it by amperage.



Section 4
Reassembly

1. Place the "O-ring" into the solenoid base.
2. Place the piston and spring correctly into the tower.
3. Screw the tower into the solenoid base.
4. Using the solenoid wrench, firmly tighten the tower back into the base. (May require holding the solenoid in the bench vice.)
5. Push the electromagnetic coil wires up through the holes in the coil canister and slide the coil up into position.
6. Slide the electromagnetic coil and coil canister onto the solenoid tower.
7. Clock the coil canister into position.
8. Using the solenoid wrench, tighten the tower nut back on to the tower. (Be careful not to over tighten. It just needs to be snug. Over tightening can result in cracking the electromagnetic coil.

Section 5

Bench testing
Bench testing will require the following components.
1. Car battery.
2. Bench Vice.
3. Nitrous bottle with nitrous.
4. Pressurized air.
5. Misc. fittings and hoses.

Section 6
Testing the Nitrous Solenoid
1. Screw a fitting sealed with Teflon paste into the nitrous solenoid.
2. Firmly fasten the nitrous solenoid into the bench vice.
3. Connect the nitrous bottle to the nitrous solenoid inlet fitting.
4. Open the nitrous bottle and listen for a leak past the piston.
5. If you can hear a slight leak, take the solenoid wires and place one to the battery terminals positive and one to the ground for a brief second. This should fire the solenoid. If after firing it, if it still leaks, turn the solenoid over and take a dead blow hammer and pop the bottom of the solenoid. This should slam the piston up into the tower and back down onto the seat. It may take a couple of times. If after following these steps and the solenoid still has leak, re-tear down the solenoid for inspection. (You may need to replace the piston)
6. If the solenoid test well for no leaks it's time to check operating pressure. Starting at 900-1000 fire the solenoid to make sure it opens. Then move up in pressure until it no longer opens. Once you reach the point it no longer opens you have reached your max cold operating pressure. What this means is that your solenoid will open up to X amount of pressure cold. If you cannot get the solenoid to open up to the 1050-1100 psi pressure range check with the manufacture for max operating pressure ratings. If the ratings are 1050-1100 and the solenoid will not fire your coil may need to be replaced. (NOTE: If the piston has a large nipple cut into the seal it can alter the seat resistance VS orifices pressure and coil magnetic preventing the solenoid from opening.)

Section 7
Testing the Fuel solenoid

1. Using regulated compressed air, turn your regulator down to the regulated pressure the manufacture suggest for checking your fuel solenoid. Different solenoids will have different max pressure ratings.
2. Firmly fasten the fuel solenoid into the bench vice.
3. Connect the air hose into the fuel solenoid inlet port and follow the same steps for testing the nitrous solenoid in section 6.
Most manufactures offer replacement parts to rebuild and maintain your solenoids. It is good practice to do routine checks on your solenoids to make sure they are operating properly.

See you at the finish line...

Nitro Dave