

Small **Engine** **Repair**

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Quick and Simple Tips to Get Your
Small Engine Running Again



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Introduction

Strategies for Getting Your Engine Running

This guide will give the most common repairs and maintenance procedures for a hard to start, or a non-running small engine. Its gives you the quickest results and will save money by avoiding trips to a repair shop. In the following pages, you will discover the tips to fix a non-starting small engine. It also has simple ideas that will add years to your small engine investment.

Stay Safe and Be Smart

Please refer to your operator's manual that came with your equipment. It will contain the safe operating procedures of your small engine and outdoor power equipment, as well as correct usage and storage of gasoline. Use an approved container to store your fuel. Buy clean fuel and keep it clean. Do not add fuel to hot engine or while it's running.

Don't Bypass the Safety Brake

Make sure all safety devices on your small engine and power equipment are working properly. If you are working with a lawn mower, do not bypass the engine brake. It is there to keep operator and bystanders safe. The engine brake should stop the engine completely in three seconds or less. It is there for everyone's safety. I don't recommend you bypass the safety device by using a wire, bungee cord or similar tool to keep the mower running when you leave the machine.

Gasoline Needs to Vaporize

Your small engine uses gasoline mixed with air to cause a controlled explosion that happens numerous times a second. The main thing to know is that gasoline has to be in vapor form to burn or to combust. Gasoline does start out in liquid form, but eventually it has to turn into a vapor form. When it's mixed with air, it is directed into the engine for the combustion process.

A Must Have Tool

I will stress here to find your owner's manual for the power equipment you have. If you have lost it, most manufactures do have owner's manuals available online in PDF format. Find your model and serial number of your engine or power equipment and go to the website of the manufacture. It has great information contained within and it is paramount that you obtain one. One example of this resource is to look at the Briggs & Stratton® website.

<http://www.BriggsandStratton.com> Most manufactures have excellent websites that contain useful information about your engine and equipment.

Chapter 1

Why Air Filters Are Important

Air Filter Issues

You may have an engine that is unable to get enough fresh filtered air. Service the air cleaner. You need to do this for easy starting, fuel conservation, and for the long term health of your engine. Doing this step is necessary in regular maintenance, so it's a good use of your time to perform this anyway.

Locate the air filter. Usually held in place by a plastic or metal cover near the top of the engine and secured by wingnut or bolt. There are different shapes and sizes of air filters. Some have a pre-cleaner with them. Older models have a foam type air cleaner. To clean the **foam type air cleaner**, use a good dishwashing soap and warm water to deep clean the filter. Get a container with warm water and soap. Soak and then squeeze out the filter several times. Redo your soap and water supply if the filter is very dirty. Continue till you don't see dirt or oil in the soap solution. Rinse it out with just water to finish. Do your best to get all of the water out. You may let it air dry also. Now add a few tablepoons of engine oil to the filter, (it can be the same oil as you have your engine) and distribute the oil evenly in the foam by squeezing out a few times. If the oil is not looking like distributed

completely, just add a little more oil to it. Squeeze gently again to evenly distribute the oil. Oil in the foam will prevent fine particles from getting into your engine. If the foam material looks old and crumbly on a foam filter, replace it.

To clean a **dry pleated air filter**, carefully tap the filter several times to loosen dirt and foreign material. It's not recommended to use compressed air to clean an air filter. Doing so may blow a small hole in the filter and that will let damaging dirt get into the engine. I recommend replacing your air filter at least once a year. If the paper pleats of the filter have become gas or oil soaked, or show damage from water, replace it. This is not the place to go cheap and get eight years from your air filter. Check any pre-cleaner (this is an extra air filter for the main air filter that takes out bigger items before they can get into the air filter) and clean it as well. Your engine needs to have clean air available to it and not have to work hard to get it. Spending a little money on your air filter is a great investment.

Chapter 2

Fuel Is the Key

Fuel Issues

A no-start or poor running engine can be caused by a lack of or incorrect amount of fuel. Be vigilant when you're buying and storing gasoline. You will have the best results for starting and running reliability, with just a little extra effort in managing your fuel supply. Purchase no more gas than you would normally use in a months' time. I know this sounds inconvenient but unfortunately gasoline breaks down quickly and makes engines harder to start. I also recommend that you don't tip your gas container all the way over when you are filling the gas tank of your small engine or power equipment. Always leave a small amount of fuel in the bottom of your gas can. When you do that, you leave any dirt, foreign material, or water in the container and not in your gas tank.

You May Need to Remove Last Year's Fuel

If you think your fuel may be getting old or it's the spring and you have last year's gas, here is a tip. Use a turkey baster to remove the old fuel from the tank. Of course, use that baster now for just fuel removal. The

Environmental Protection Agency does say if you have at least half a tank of fuel in your car, you can safely put that old gas in your car and not affect the car's fuel system since it is such a small amount. Obtain a fresh supply of gasoline to add to the fuel tank. Check with area oil recyclers, they may have a place to dispose of old fuel.

Fuel Additives Can Help Prevent Fuel Problems

There are some fuel additives that do improve the starting ability and offer long-term storage of fuel solutions. There're many manufacturers that now sell additives to help gasoline from breaking down and thereby reducing hard starts. Some brands of additive are Sta-Bil®, and also Lucas Oil® makes a fuel stabilier. Many stores such as hardware, big-box type stores as well as small engine repair dealerships and automotive parts stores sell additives. Get recommendations from those stores to see which works well for your application.

Hard to Start Repair Procedure for Fuel Issues

Before you start, remember you must wear proper safety equipment for any maintenance, especially for this procedure. Consult an owner's manual. For the safe operation here, it would be eye protection, gloves to resist

chemicals found in gasoline, and other items to keep chemicals away from your skin.

Remove the spark plug and carefully **add 1 teaspoon of gasoline** to the engine through the spark plug hole. Be careful not to spill gasoline when doing so. Use a flexible funnel or similar item to direct the gas into the engine. Then reinstall the spark plug and spark plug wire and attempt to start. Repeat for two or three times if needed. If the engine will not stay running after two attempts, you may need to get service from a qualified professional to repair.

An alternative to this is to purchase a quality choke and carburetor cleaner in a spray can. It comes in 12 to 15 ounce size can typically. Buy one with a spray straw if possible. You can find choke/carb cleaner at small engine repair shops, automotive supply and hardware stores. Again with proper personal protection as used above, remove air filter cover and the air filter. If you are able, you may take off air cleaner housing for even better access. Spray a **one second shot** of the choke and carb spray into the throat of the carburetor. Check the area around the mower to be safe and attempt to start. If it does start, you may let it run for a short time without the air filter cover in place. Don't over do this method, you may end up with a fuel soaked spark plug. If you do, you may need to remove and dry the spark plug out. Refer to the next chapter for replacement. Do remember to reinstall all covers and housings that you have removed, before you use the engine/power equipment. You may use a limited amount of cleaner for the outside of the carburetor to clean linkages and other parts on the carburetor.

Do this with a cool engine, never hot. Use a disposable shop towel or similar item to collect the liquid from the carb spray and dirt/oil that will be dissolved. This cleaner is aggressive and it will start to attack paint if left to sit on surfaces. Remember also that the carb cleaner is as flammable as gasoline so be very careful in using this.

Chapter 3

No Starts Can Come From No Spark

Ignition Issues

You may want to replace your spark plug if your engine is hard to start or in a no-start situation. A good practice is to replace it seasonally. If you do change the spark plug, take time to get the correct one. There are several different spark plugs for different applications. Wait till the engine is completely cool to remove the spark plug. Putting a cold spark plug in a hot engine is not a good idea. When the engine cools around the plug, it can become extremely difficult to remove the next time you service the spark plug.

Remove spark plug wire carefully and using a proper spark plug tool, remove from engine. Install new one in reverse order. Do not over tighten. Spark plugs are just a little fragile, so take your time. Your manual may have the correct tool listed to buy for a spark plug installation procedure for your small engine. A dealership or hardware store can sell you a proper wrench for spark plug removal. It is important to check the gap before installing. Spark plug gap for small engines run in the .025" to 035" range. If you handled a spark plug carefully, you should not need to adjust it.

No start can be caused by an engine shut off switch. Many engines have a kill switch within the throttle assembly. They shut off the ignition when you put the throttle lever past the idle setting in a stop position. But some engines may have a **remote shut off switch** that may be keeping your engine from getting spark to the engine. Also check for any safety switches that are activated because a part of the machine is engaged mode and is preventing a unsafe condition, and not allowing the engine to start due to a safety hazard.

Chapter 4

Engine Oil Must Have's

Always Check Your Engine Oil Before Using

Check the oil level it before you use your engine **every time**. What clean fresh gas is to starting, keeping oil level at the correct level is to long life for the engine. Just this one practice will save you a lot of grief and avoid costly breakdowns. The way to check the oil level is by way of a dipstick or fill opening. Most engines will say “oil” on the dipstick or oil cap. The owner’s manual can also help you to bring the oil level to the correct spot. In most cases, the dipstick will tell you where to keep the level at. It will also give you instructions on what way the dipstick needs to be put in the engine to check the oil. Usually it's done of one of two ways. You either have to screw the dipstick back in tight and remove it and read the level, or you will need to just “set” the dipstick back in and remove to check the oil. There is a little difference, but it's important. Use correct engine oil for the engine. In most cases you'll be using 10W-30 or 30W engine oil. These numbers designate the oil viscosity. Which basically means how well it performs in the engine when the oil is cold, and also when it is hot.

Engine Cooling

Your small engine is most likely an air cooled engine. It's a little different than the engine in your car which uses a mix of water and antifreeze coolant formula to keep your engine from getting too hot during operation. Small engines typically use air running over the outside the engine to cool it. Overheating is a major reason along with insufficient oil level for engines that stop running or have little power and consume excessive oil. You don't have a lot to worry about when it comes to care. Just some simple steps. Keep all debris off the engine. Especially at the top where usually there is a screen on the flywheel. Air enters at the top and is forced down around the engine. The engine will have a series of fins to dissipate heat when that air from the flywheel blows across it. Keep the top screen clear, as well as the sides. Keep all engine shrouds and covers on that came with the engine. They are needed to direct the air around the engine for it to cool correctly. If you suspect more debris, you could remove the shroud of the engine to access more of the engine and remove grass and any foreign material.

Oil Changing Procedures

Here are two ways that you can service your engine add more years to the life of your engine and save you money. Check your owners manual for proper oil change intervals. Many small engines suggest that you change oil approximately every 20 hours. If your engine is new, many manufacturers

suggest changing oil for the first time after 5 hours of use. Always use proper safety equipment like oil resistant gloves and eye protection during oil changing. Change oil when the engine is at a “warm” to the touch, but not when hot, to be safe. Oil will still drain properly when it's warm. If you decide to go ahead and change your oil you can go the usual method of finding the drain plug and dropping the oil that way. Or use the alternative method.

In the alternative method, obtain or purchase an evacuation pump made for oil changes. There are several different ones but you only need a simple one that has a hand pump to operate. Look for one made for small engine oil changes. I use one made by LiquiVac®. How it works is that it's creates a vacuum within the pump and pulls engine oil out of the engine. Buy one to your liking, however you only need one with a capacity of 2 to 4 quarts which is plenty capacity. To use, find your oil fill port or dipstick and remove the the cap or dipstick to get access to the oil. Place the suction hose onto the port so it makes it all the way down to the lowest part of the engine crankcase. Tilt your engine just slightly if you can so that all the oil runs into the corner of the engine. Depending on the model of your evacuation pump, you may be able to use the unit to take the used oil out to be recycled. Refill your engine oil, check the level and use the proper oil as stated by the manufacturer. Check that level again after a few minutes. Stay safe by wearing all required safety equipment and dispose of used oil in an approved method.

Chapter 5

Most Important Fall Project

Do This and Next Year You Will Have Trouble Free Starting

If you live in an area that you normally have to put your equipment away for the season, here are some tips to give you success for next season. I recommend when using your engine or equipment for the last time for the season, keep your fuel tank low as possible. Start out with enough fuel that you would normally use up in a typical operation. Example would be when you mow with a lawn mower, try to put as much gas as you would normally use for that cutting. Now, when you are about 10 minutes from being completely done with your engine for the season, add a fuel additive designed for long-term or winter storage to the fuel tank according to label directions. Your engine manufacturer usually sells their brand of fuel additive for long-term storage or you can select from other aftermarket brands as stated in chapter 2. Read the instructions carefully as to how to

add in the correct amount. It will be a little difficult to guess the amount you fuel you have your tank. Higher concentrations of additive usually don't cause problems. But do mix as close as you can according to directions. Start your engine back up. It should only run a few minutes. After it stops running, continue to restart your engine until it dies. Use your cold starting method for your engine to try to use up as much fuel as you can. Using your choke or primer bulb will allow the engine to run a little longer and use up more fuel. When the engine does not attempt to fire or start, you have completed the task. In the next season, when you add fresh gas to the tank, it will make it directly into the carburetor and thereby making it easier to start.

Engines With a Fuel Shut Off Valve

If your engine has a valve to shut off the gas from the tank to the carburetor, simply shut the valve off and you don't have to worry about how much fuel is in the tank during this procedure. It will stop the gas flow, and the engine will use up what is now left in the carburetor. If you can't run your tank empty, simply pour the additive to the fuel and just make sure the engine runs for 5 to 10 minutes more with additive in the tank. This way the stabilizer will make it to the carburetor where it is needed the most.

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