Carburetor Testing and rebuilding.

This paper is specific to chainsaws using the Walbro SDC series Carburetor.

It applies to many small engines and most types of carburetors used in them.

It is assumed that you have basic skills and tools. You may know most of this already. You can use it as a check list or a reminder. I acknowledge and give thanks to the contributors on the forum groups and the wonderful YouTube videos posted by generous people. If there is something that you don't understand youtube.com videos are a great help. Specific problems I usually go to a chainsaw forum group and ask. Posting good pictures help others help you. Links are listed at the end of this article.

Lets get STARTED!

Is it the carburetor or some other problem? The carburetor is often suspected because the saw does not respond to adjustments. Here is a list of things that can cause a carburetor to not respond to adjustments that is NOT a carburetor problem.

Air leak: Loose or cracked boot or manifold. Loose carburetor attachment bolts. Slipped gasket or damaged gasket.

Air filter: Dirty air filter. Missing air filter. Bad seal around air filter.

Weak impulse signal: Cracked, damaged or restricted impulse line.

Fuel: Wrong mix, old fuel, dirty fuel. Restricted fuel line. Missing or dirty fuel filter. Cracked, hard or mushy fuel line. Plugged fuel tank vent. Primer bulb, cracked, stiff or check valve bad.

Low Compression: Scored piston, cylinder or stuck ring. Leaking decompression valve. Carbon build-up in cylinder. Loose cylinder bolts.

Spark: Fouled spark plug. Wrong spark plug. Weak spark. Failing coil. Excess coil gap. Rev limiter problems.

Clutch problems: Broken springs. Seized bearing. Dirt or debris in clutch.

Chain and bar problems: Bent or damaged bar. Wrong chain causing binding.

Some of these things may seem unrelated to the carburetor but they effect the performance of the saw. When trying to adjust the carburetor and the saw just will not run right it is natural to suspect the carburetor. Isolating the problem to the carburetor is difficult. Putting a rebuild kit in the carburetor may fix the problem. If it does not then you are left with not knowing if it is the carburetor or something else. Putting a rebuild kit in the carburetor does not automatically mean that the carburetor does not have a problem. Often the welch plugs and screens are not pulled when putting in a kit. Once in a while the needle is not adjusted properly or seating properly. Rebuilding the

carburetor is not a guarantee that it is working properly. Pressure testing the carburetor is simple, fast and a really good practice. See the section on pressure testing.

Let's Get the names straight.

There is some confusion with the names and terms used.

There are two diaphragms. The fuel pump diaphragm and the metering diaphragm.

The metering diaphragm is connected to the lever and needle valve. The fuel pump diaphragm is also the check valves. The two little flaps are check valves. See {#24 Diaphragm – fuel pump} and {#25 Diaphragm – check valve}. The large hole in #25 is the missing fuel pump diaphragm. They both have the little floppy valves. (more on that in the fuel pump diaphragm type section.)

Metering diaphragm with the metal plate. {#27 Diaphragm Ass'y Metering} also called the main diaphragm. The metering diaphragm connects to the metering arm and needle valve.

Primer bulb. The SDC carburetor does not have a primer bulb built into the carburetor. You may find an external one on the saw. The primer bulb is often referred to as a fuel pump. I do not like this term because it is only used to prime the carburetor. All fuel does flow through it when the saw is running but it is not the fuel pump. It has a check valve and can also cause a saw not to start or run right.

You have decided to rebuild the carburetor now what.

Get the right rebuild kit. Locate the carburetor number usually stamped into the carburetor body. Carburetors kits are for a series of carburetors and may have extra gaskets. Check very carefully that ALL the holes line up. Some gaskets have a hole for the impulse directly from the manifold instead of an impulse hose.

The kit usually has two different types of fuel pump diaphragm gaskets. Check the new gaskets with old one. See the section on diaphragm types.

Factory OEM (Original Equipment Manufacture) kits are good but cost a little more. I have had good success with aftermarket kits. If the OEM kit is not available or cost is a factor I use an aftermarket kit.

Dissemble. I like to dump the fuel into a clean glass jar and check it. If it is dirty or a missing fuel filter I will pull the welch plugs and small screens. If the fuel is clean and I find a bad diaphragm or other obvious problem I do not pull the welch plugs. Just remember that you may have to go back and pull the welch plugs later if the saw does not run right. I also like to take lots of pictures and lay the parts out it order. I often find that someone else has put something in wrong on old saws.

Clean. Carburetor cleaner if it has lots of varnish. Brake cleaner works good. Sonic cleaners work GREAT. Use low air pressure (10 PSI). Some other carburetors (not the SDC) have check balls under the welch plug and air pressure can damage them and ruin the carburetor.

Inspect. I use a magnifying class and LED flash light. I try to see light through all the tiny holes in the venturi. I look for any scratches that may cause sealing problems. I look at the needle tips for wear groves bending from over tightening. Check the old gaskets for sealing problems. I feel much better if I find the cause or reason the carburetor was not working properly. Look at the metering diaphragm for stiffness. Hold it up to the light and look for pin holes.

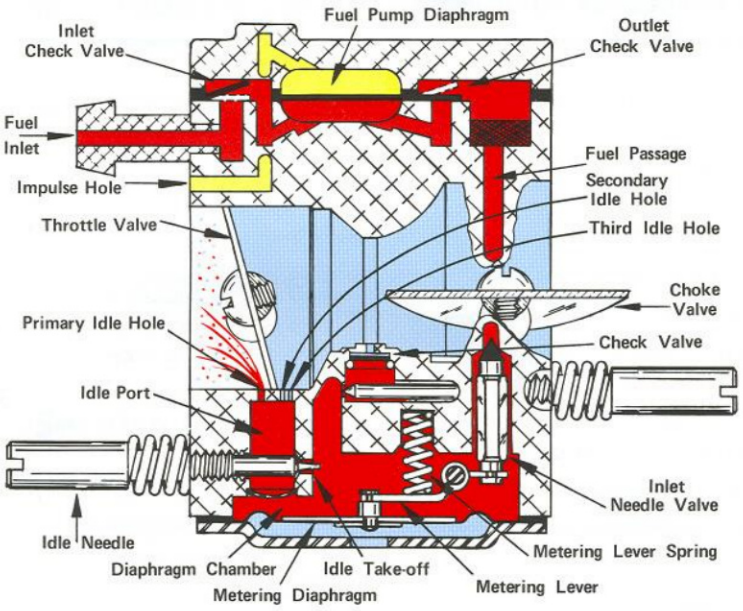
Assemble: Tighten screws evenly and not too much. They are small. A good fitting screwdriver helps. Metering diaphragm height is important so check it.

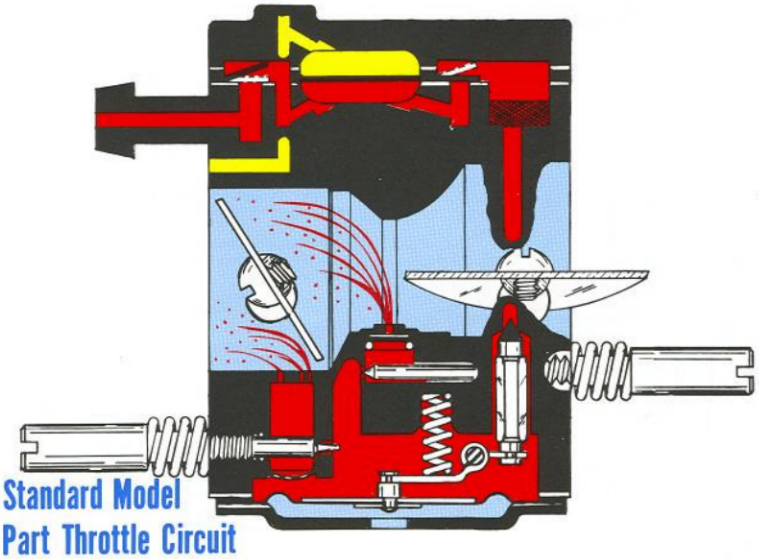
Set the mixture screws: (L Low and H High) to factory specs. Usually 1 ½ turns out on each will get it started. The throttle stop screw (idle RPM) set to one turn in (open) from just starting to move the throttle.

I like to check the settings before I disassemble the carburetor and sometimes set it back to that for a starting point. It also helps to see if they were very far off from the 1 ½ turns originally.

Pressure check the carburetor. You are checking for pop off pressure (15 psi min)and holding or reseat pressure (5psi min)on the metering needle valve. See Testing Procedure section.

Standard Model Idle Speed Circuit

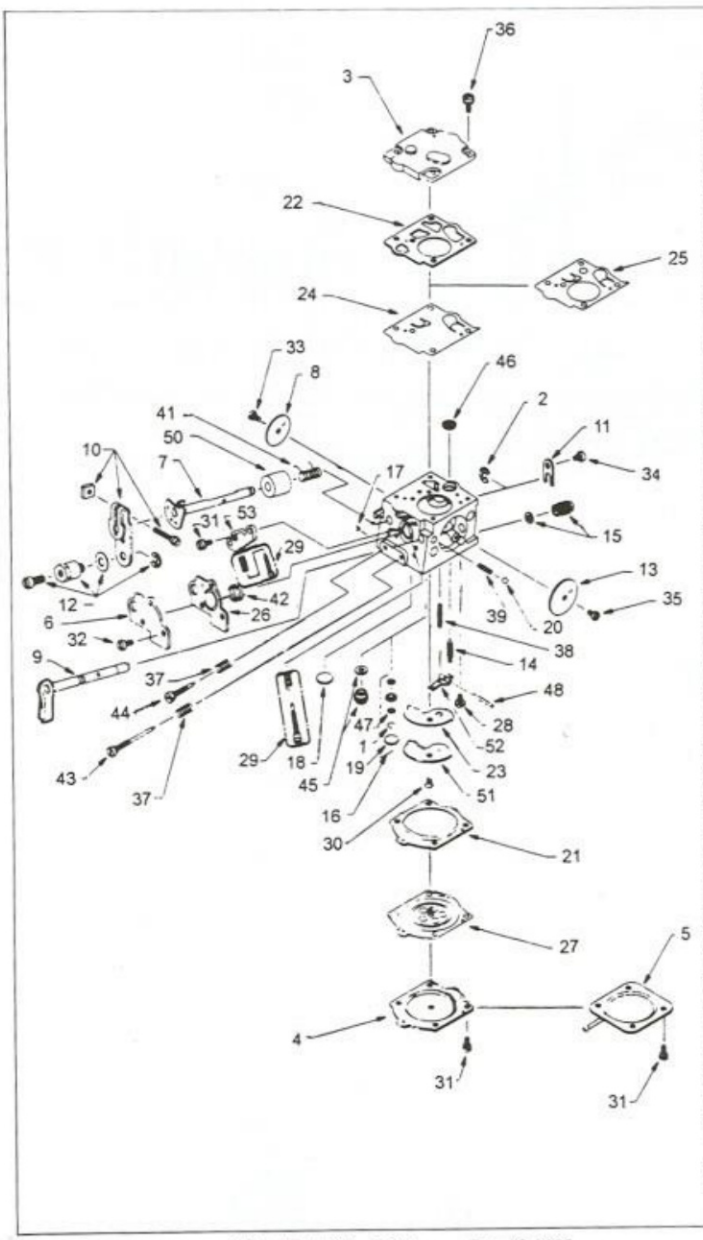




Standard Model
Part Throttle Circuit

CHAIN SAW CARBURETOR STANDARD MODEL SERVICE MANUAL





Ref. No.		Part Name
1	*	Ring - Screen Retainer
2		Ring - Shaft Retainer
3		Cover - Fuel Pump
4		Cover - Metering Diaphragm
5		Cover - Metering Diaphragm
6		Cover - Accelerator Pump
7		Shaft Assembly - Throttle
8		Valve - Throttle
9		Shaft Assembly - Choke
10		Lever - Choke
11		Clip - Throttle Shaft
12		Swivel Kit
13		Valve - Choke
14	*	Valve - Inlet needle
15		Kit - Governor
16		Nozzle Assy - Check Valve
17		Plug - Limiting
18	*	Plug - Welch (idle 3/8)
19	*	Plug - Welch (main 5/16)
20		Ball - Choke Friction
21	**	Gasket - Metering Diaphragm
22	**	Gasket - Fuel Pump
23	**	Gasket - Circuit Plate
24	**	Diaphragm - Fuel Pump
25	**	Diaphragm - Check Valve
26	**	Diaphragm - Accelerator Pump
27	**	Diaphragm Ass'y - Metering
28		Screw - Merering Lever Pin
29		Screw - Idle Adjustment Kit
30		Screw - Circuit Plate
31		Screw - Diaphragm Cover (4)
32		Screw - Accelerator Pump (3)
33		Screw - Throttle Valve
34		Screw - Retainer Clip
35		Screw - Choke Valve
36		Screw - Fuel Pump Cover (4)
37		Spring - Needle (idle & power) (2)
38		Spring - Metering Lever
39		Spring - Choke Friction
41		Spring - Throttle Return
42		Spring- Accelerator Pump
43		Needle - Power
44		Needle - Idle
45		Jet - Nozzle Assembly
46	*	Screen - Fuel Inlet
47	*	Screen - Check Valve
48		Pin-Metering Lever
50		Seal - Throttle Shaft
51		Plate - Circuit
52	*	Lever - Metering
53		Bracket - Idle Adjust

*Contents in Repair Kit
**Contents in Gasket/Diaphragm Kit

Printed in U.S.A. - 5-94 Form C-1032

Fuel Pump Diaphragm types

There are at least three different kinds of pump diaphragms.

RUBBERIZED: The regular black rubber diaphragm

ACETATE: Blue Plastic transparent diaphragm

TEFLON: Brown or white diaphragm that looks like it is made from a very thin fiberglass cloth..



There are pros and cons to each type. The kit may have more than one type ONLY USE ONE!

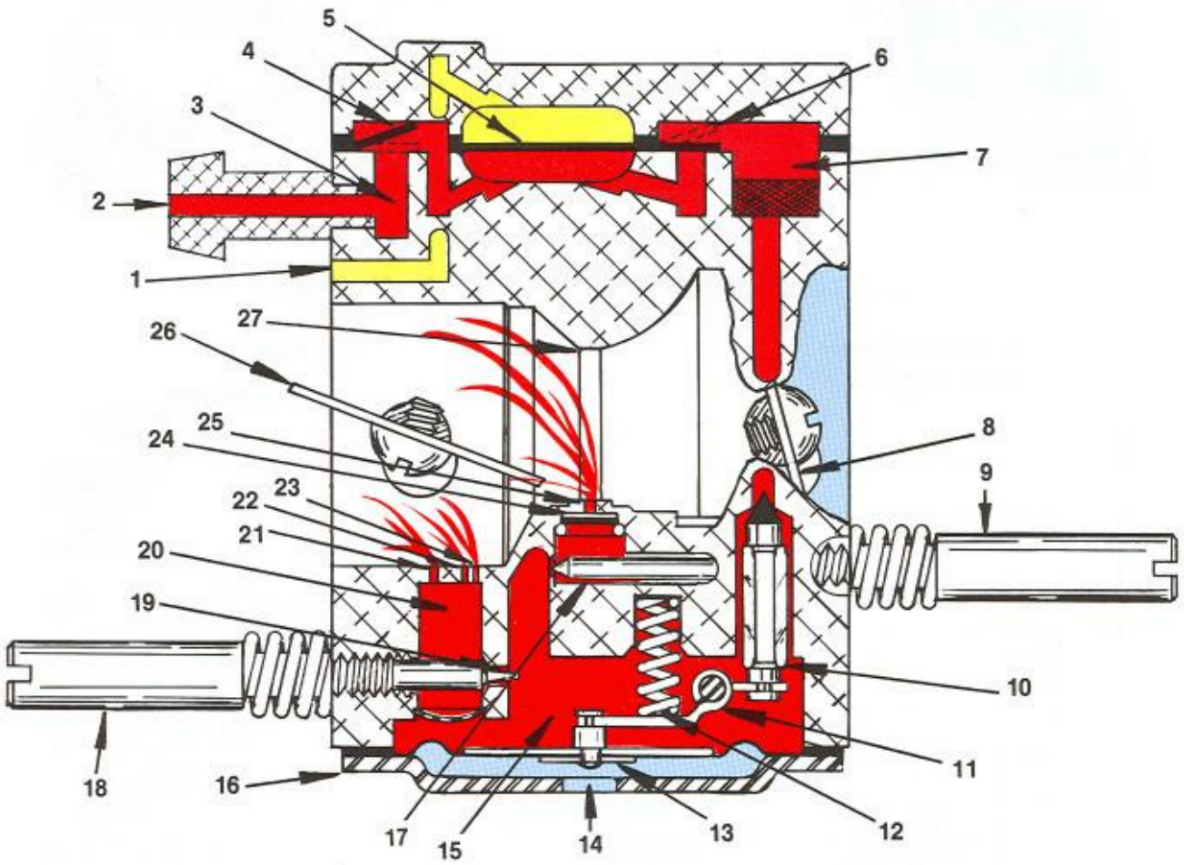
A good practice is to use the type that was in the carburetor when it was torn down. Especially if the saw was running good and is just being freshened up.

The rubberized one is used on older saws and is more flexible. It works well with low impulse signal. It does not like ethanol fuel. I have used the Teflon on older saws with success. Many techs surveyed said they use the Teflon one because of the Ethanol (alcohol) in the fuel. Sometimes it is a little stiff for a saw back in the 70s and 80s or one with a lot of wear.

The Acetate (blue) diaphragm you will often find in small engines (weed trimmers). It has low pump capacity. I have found it not to work well in chainsaws especially over 40cc.

Teflon is resistant to ethanol in the fuel. It has high pump capability for larger saws and modified saws. Most techs surveyed said they use the Teflon diaphragm as a first choice.

Standard Model Starting Circuit



SDC Operating Functions

1 Engine Impulse: Actuates Fuel Pump Diaphragm No. 5.

2 Fuel Inlet: Fuel drawn from Tank.

3 Surge Chamber: Dampens Fuel Flow.

4 Inlet Valve: Opens on demand from Fuel Pump.

5 Fuel Pump: Responds to engine impulse force.

6 Outlet Check Valve: Forced open by pump pressure.

7 Filter Screen: Filters fuel.

8 Choke Valve: Closes air passage at starting position.

9 Hi Speed Needle: Adjust for fuel richness at high speeds.

10 Inlet Needle Valve: Lifts off seat to allow fuel entry.

11 Metering Lever: Lifts Inlet Needle off seat.

12 Metering Lever Spring: Transmits force to Metering Lever.

13 Metering Diaphragm: Drawn up by vacuum to activate Metering Lever.

14 Atmospheric Vent: Allows air pressure against Metering Diaphragm.

15 Metering Chamber: Fuel reservoir, feeds to idle and nozzle holes.

16 Cover: Protects Metering Diaphragm.

17 Nozzle Well: Fuel is drawn in from Metering Chamber at high speed.

18 Idle Needle: Adjust for fuel richness to 3 Idle holes.

19 Idle Take-off: Fuel entry for Idle and Part Throttle holes.

20 Idle Port: Fuel reservoir for Idle and Part Throttle holes.

21 Primary Idle Hole: Only fuel source to engine at Idle position.

22 Second Idle Hole: Allows additional fuel flow on acceleration.

23 Third Idle Hole: Increases fuel flow at Part Throttle.

24 Nozzle Check Valve: Engine vacuum draws valve open.

25 Nozzle: Increases fuel discharge for high speeds.

26 Throttle Valve: Regulates engine speed as it exposes Primary, Second and Third Idle holes, then Nozzle for fuel delivery.

27 Venturi: Increases air velocity at Nozzle, creating a suction to draw fuel into Throttle Bore passage to engine intake.

Notes:

Walbro SDC fuel pump gasket. Thick or Thin.
Choosing the thick one or the thin one in the kit.
The thicker gasket on the pump side is used for the carburetors not calling for the check valve diaphragm. Most carburetors will use the thin gasket.
Check the parts list on the Walbro website.
Thin gasket 0.031" +/- .003 PN 92-93 Thick gasket 0.062" +/- .005 PN 92-108

Gasket location: The pump diaphragm goes next to the metering body, then the gasket. The metering diaphragm gasket goes next to the carb body, then the metering diaphragm.

Questions and Answers

HDA-199 poor idel fix.
Scot has a great video on this https://youtu.be/fBMIMoWw4B0
https://www.youtube.com/watch?v=fBMIMoWw4B0&feature=youtu.be
The HAD 24 kit has two gaskets and need an extra hole for the intele system.

Youtube video and website links

Walbro website. https://www.walbro.com/

Walbro.com has lots of good information and on line help with parts.

WALBRO PART LOOK UP LINK https://walbro.force.com/parts/Comm_PartsServiceSearch

Look up by saw manufacture or part number. Use the dashes in the part number.

Walbro carburetor service (rebuild) video by Walbro 21 minutes.

https://www.youtube.com/watch?v=cDaOcNrS6BM

By: Leonard Meehan
TheOldChainsawGuy
January 2020

Posted on Facebook – McCulloch Vintage Chainsaws. 1/14/2020

Please give your 2cents worth. Check out my draft of an article on rebuilding a carburetor. If you have any suggestions of things I should include please post them. If anything is not clear let me know. Should I include any other links. (found at the end) Thanks for everyone ideas and input. I want input from you old pros. I very much want input from new guys. Is there a term or procedure that I missed?

I do this because I helps me learn and I give it away to other chainsaw enthusiasts.