

4-MIX® Troubleshooting and Repair

Before any repair work is performed on a machine, a thorough evaluation should be made to determine what parts are actually in need of replacement or maintenance. The service manuals for **STIHL 4-MIX®** engines outline testing procedures as well as special tools that are needed to repair the equipment.

The STIHL troubleshooting video and corresponding iCademy module are ideal checklists to use when performing repairs and will assist the technician in performing a step by step analysis of the machine.

Repair Procedures: Quick Check

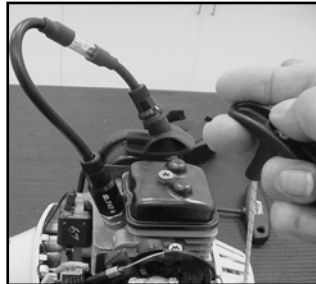
The fastest way to find any major fault is to quickly check for compression, ignition, spark, and fuel delivery.

- ☑ Use a spark tester to verify that spark is present.
- ☑ If the engine has no spark, the spark plug, the ignition module or stop switch system is at fault.
- ☑ If the fuel system is completely restricted, the engine may not fire at all when trying to start it. Squirt some choke spray in the carburetor and try to start the engine.

Does the engine have any compression?



Is fuel getting to the combustion chamber?



Does the engine have spark?



On **4-MIX® engines**, if compression feels low, or if the spark is okay and fuel is getting to the engine, then do a leak down test.

- ☑ This only takes a few minutes. If the leak down is below 10%, then the combustion chamber is okay and the running problems are due to something else.
- ☑ If the leak down is greater than 10%, the problem needs to be repaired, as well as making sure that there are no other faults present.



If leak down is less than 10% on a 4-MIX® engine, check for faults elsewhere.



If leak down is greater than 10%, the engine will need service, but check for any other faults before doing any repair.

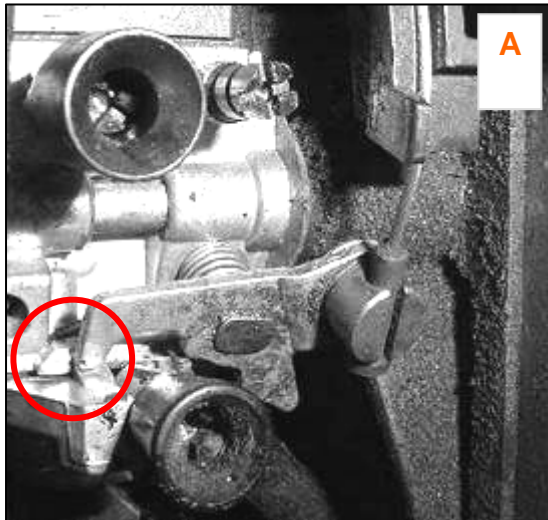
Click to download the [STIHL 4-MIX® Engine Check Worksheet](#).

- ☑ The STIHL 4-MIX® Engine Check Worksheet is a simple guide to verify any faults found in a logical and efficient manner.
- ☑ Worksheets are available for both 2-cycle and 4-MIX® engines.
- ☑ An accurate repair cost estimate can then be prepared.

Throttle Operation

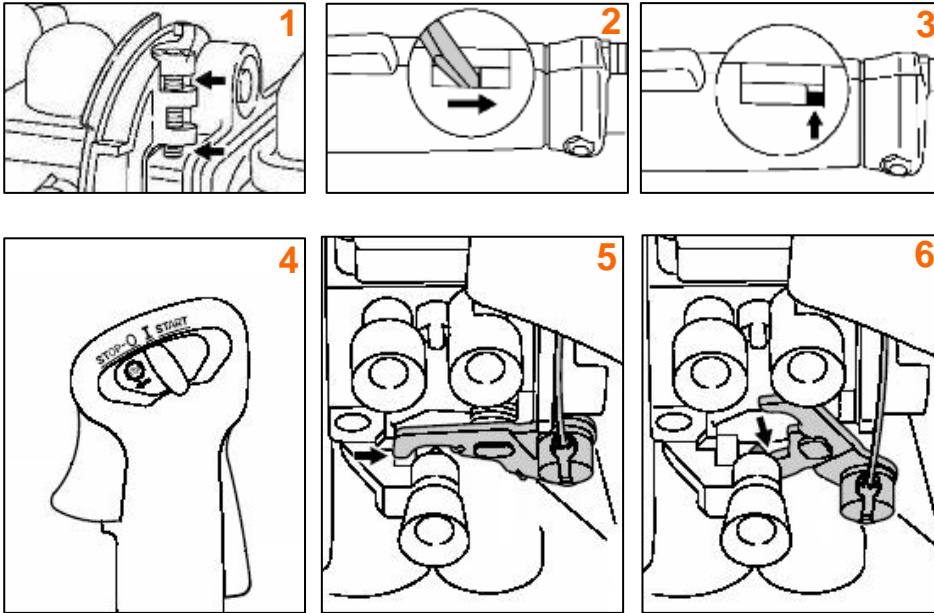
Verify that the throttle works smoothly, and that the [throttle interlock](#) is working correctly.

- ☑ The throttle cable should be adjusted so that the throttle is opening all the way to the stop on the carburetor without causing excessive tension on the cable.
Example A.
- ☑ Be sure that the throttle returns to idle easily and smoothly.
- ☑ On a shaft mounted 4-MIX® product, inspect the cable for fraying where it slides over the plastic cam on the carburetor flange. Example B.



4180 Series – Throttle Adjustment Procedure

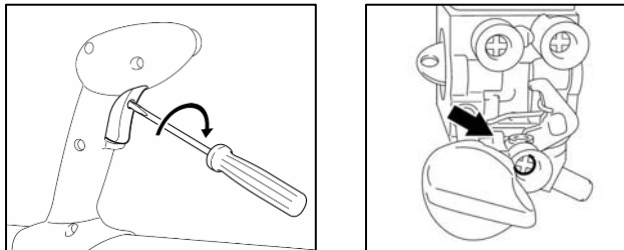
- ☑ To adjust the throttle correctly on a shaft mounted product, set the screw on the adjuster cam that is located on the carburetor flange so the same amount of threads show on either side of the cam.
- ☑ Next, using a small screwdriver, push down on the tab located in the top of the throttle assembly and slide the tab towards the engine.
- ☑ Now squeeze the throttle to the wide open position. The tab will slide forward and automatically adjust the throttle cable. Release the throttle trigger and verify that the throttle lever comes back fully to idle.



The throttle cable should always be checked for proper adjustment when a new machine is set up for delivery and anytime a machine is in for service.

4282 Series – Throttle Cable Adjustment

- ☑ If the throttle is not opening all the way on a backpack blower, performance and engine cooling will suffer.
- ☑ To adjust the throttle cable on a 4-MIX® blower, turn the small screw that is located in the throttle trigger until the proper throttle opening is achieved.



Ignition Module

Check for spark with a spark tester that loads the ignition module.

- ☑ Modules can have intermittent faults: Heat related failures where the spark returns after the module cools down, or even show spark but not start the engine.
- ☑ Check for spark. The spark plug must be installed in the cylinder when performing an ignition module test with the STIHL ZAT 4.
- ☑ Holding the plug against the cylinder and pulling the starter rope is not a valid test of an ignition module.

Inspect the spark plug and verify heat range.

- ☑ Verify that the correct spark plug is installed. The spark plug for an FS 100 is hotter than the spark plug for a BR 600.

- ☑ If an incorrect spark plug is installed in a BR 600, the engine may quit after it warms up, or it may run poorly. It may also try to run-on when the ignition is switched off.
- ☑ Set the gap on all STIHL spark plugs at twenty thousands of an inch.
- ☑ The final verification of a faulty ignition module may have to be done by replacing it with a known good ignition module for comparison.

FS 90, FS 100, FS 110, KM 110, FC 100, FC 110, HT 100, HT 101 , HL 100	FS 130, KM 130, HT 130, HT 131 BR 500, BR 550, BR 600
STIHL 0000 400 7009 Bosch USR7AC NGK CMR5H	STIHL 0000 400 7011 NGK CMR6H

Refer to the STIHL repair specification charts for other models.

Air Filters

Air filters should be inspected and cleaned regularly. Filters should be replaced at least once a year, or more often if needed.

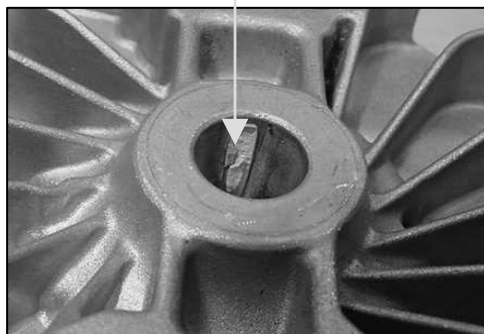
- ☑ The air filter element used on the 4-MIX® shaft mounted engines should never be cleaned in solvent. Brush off any loose debris and clean it with compressed air.
- ☑ STIHL backpack blower engines use a pleated paper air filter. The only way to service it is to brush off any debris or gently blow it off. Do not use high pressure air or the pleats may tear.
- ☑ Always inspect the clean side of the filter housing for any evidence of dirt or grit. If dirt is present, the filter needs to be serviced more often.

Flywheel

Fault – A sheared flywheel key.

- ☑ Occurs when: The nut is not properly tightened, or if an impact wrench is used to loosen or tighten the fan wheel, flywheel, clutch, or starter cup nut.
- ☑ A sheared key may not cause the ignition module to lose spark, so the spark tester will not show a fault.

Kev is sheared.



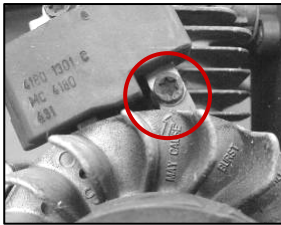
Never use an impact wrench on any STIHL product!



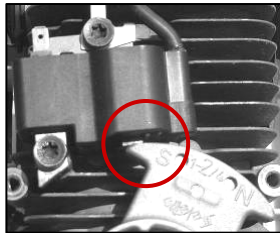
Verify flywheel timing.

- ☑ The shaft mounted **4-MIX® engines** have a timing arrow on the flywheel that should point at the ignition module mounting screw as a reference point when the piston is at top dead center.
- ☑ For the **4-MIX®** blower engine the “S” marked corner on the flywheel should be just at the edge of the ignition armature leg when the piston is at top dead center.

Shaft Mounted Engine



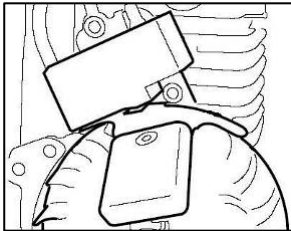
Backpack Blower Engine



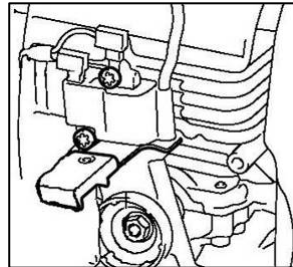
Ignition Module Air Gap.

- ☑ The specification for the ignition module to flywheel air gap is eight thousandths of an inch for all **4-MIX® engines**.
- ☑ The STIHL setting gauge can be used to check and properly adjust the air gap. STIHL Part # 4118 890 6401.

Shafted Products
4180 Series



Backpack Blowers
4282 Series



Valve Clearance

Break-in and normal wear tend to open up the valve clearance, and may lead to a loss of power and performance.

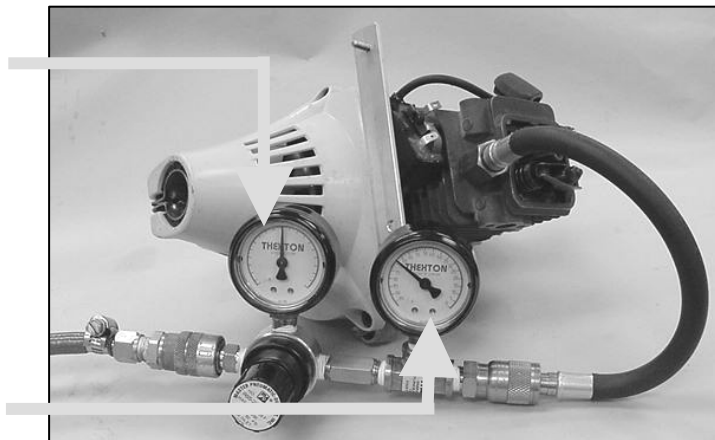
- ☑ The valve clearance for all **4-MIX® engines** is 0.1 mm. or four thousandths of an inch when the engine is cold.
- ☑ The instruction manual suggests checking the valve clearance around 135 hours of operation.
- ☑ A cylinder pressure leak down test will allow you to quickly determine the condition of the valves and piston rings without disassembling the engine.
- ☑ A special feeler gauge is required to check the minimum valve clearance. STIHL Part # 4180 893 6400.

Check valve adjustments



Adjust regulator gauge to the set-point.

Leakage % is indicated on gauge that is connected to cylinder.



Engine - Leak Down Test

Test the 4-MIX® engine for leaks.

Connect the gauge to the engine and read the amount of leakage.

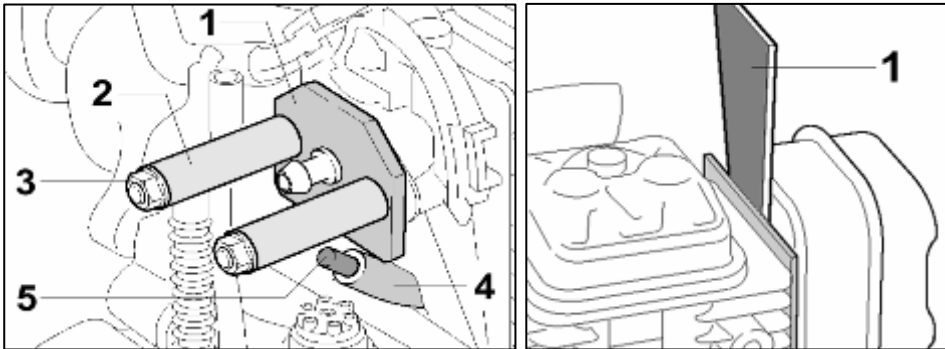
- ☑ There may be a little leakage past the end-gaps of the rings. If leakage is less than 10% the sealing of the combustion chamber is acceptable. If leakage is over 10% you will need to identify the area of leakage and repair the leak.
- ☑ Listen at the muffler, carburetor, flange inlet, or where the push rods come up from the cam. A rushing air sound should be evident at one of these locations, verifying the location of the leakage from the engine.

The leak down tester recommended by STIHL has a smaller air inlet orifice and is designed for testing any small engine.

Crankcase - Vacuum & Pressure Test

- ☑ Install the rubber block off plate between the muffler gasket and the engine and install a flange adapter in place of the carburetor. Be sure to block the impulse hose.
- ☑ When checking the crankcase for leaks, pressurize the crankcase to a reading of positive 0.5 bar, or about 7 pounds per square inch. The pressure should not leak down to positive 0.3 bar, or about 4 pounds per square inch, in 20 seconds. If it will not hold pressure or leaks down too fast, locate the leak with a soapy water solution.

To perform a crankcase pressure and vacuum test the intake port and exhaust port must be sealed with the proper blocking tools. **STIHL 4-MIX®** engines need to also have the valve cover installed.



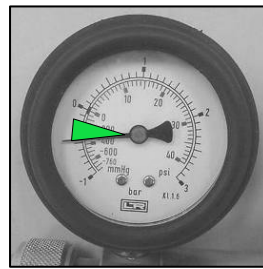
Gauge readings.

- ☑ If the crankcase holds pressure, then apply a vacuum of negative 0.5 bar, or about negative 7 pounds per square inch. The vacuum reading should not leak to above negative 0.3 bar, or about negative 4 pounds per square inch, in 20 seconds.
- ☑ If the engine has a vacuum leak, but no pressure leak, the fault is most likely a crankshaft seal. Expose each seal and position the engine with the seal facing up, spray some light penetrating lubricant on the seal around the crankshaft and apply a vacuum with the tester to see if any of the liquid is sucked into the seal.

Pressure Range



Vacuum Range



Impulse Line

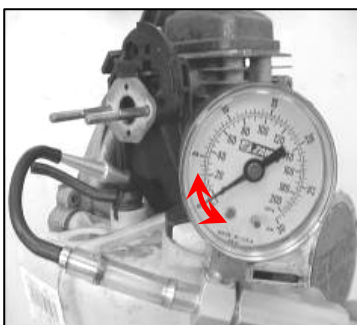
Check impulse line for blockage.

- ☑ One method to check the impulse is to use a small carburetor pressure tester, and hook it to the impulse hose.
- ☑ When you pull the starter rope, the needle on the gauge should bounce back and forth indicating positive and negative pressure. If nothing happens, the impulse line or impulse passageway is restricted.



- ☑ If the starter is not assembled to the engine you can connect a carburetor testing gauge to the impulse hose when you perform a crankcase pressure and vacuum test.
- ☑ The needle on the carburetor gauge should move as pressure and vacuum are applied to the crankcase.

If the impulse line becomes blocked, the running behavior of the engine will indicate carburetor problems, when in fact there may be none.



Carburetors

Inspect carburetor visually.

- ☑ Before testing or disassembly, visually inspect the carburetor for damage. If something on the carburetor is physically broken or worn, most likely the carburetor will need replacing and no further time will be spent on evaluation.
- ☑ If the carburetor has no physical damage and the throttle shaft is tight, then perform a three step evaluation with a carburetor pressure tester, such as a ZAMA ZPG-1. This will allow any internal faults in the carburetor to be identified quickly.

Worn Mounting Surface



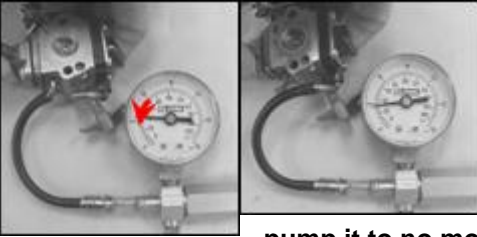
Worn Throttle Shaft



Fuel Leak Indicated by
Dirt Build-up



Three step evaluation for a 4-MIX® engine used on shafted products.



Step 1: Hook the gauge to the inlet fitting on the carburetor, and pump it to no more than 10 PSI. The gauge reading should hold steady. If not, immerse the carburetor in water and identify where it is leaking. If bubbles come out of the venturi, the inlet needle is leaking. If the bubbles come out around the fuel pump side or primer flange then the cause of the leak is most likely loose screws or damaged gaskets. The pressure gauge must hold steady at 10 PSI before performing step 2.

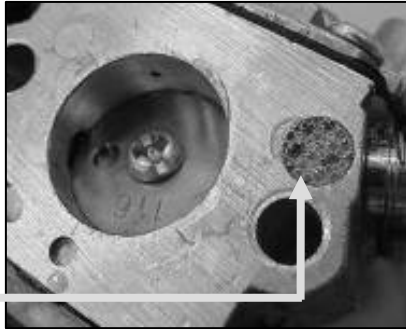
Step 2: While the carburetor is still under pressure from step 1, pump the primer bulb and the needle on the gauge should drop. Continue until the gauge reading indicates a slight vacuum. This will pull a vacuum on the metering chamber. The gauge reading should indicate a vacuum and hold steady for at least one full second.

Step 3: If the carburetor passes step 2, switch the tester to the return fitting on the flange and pump the bulb. The needle on the gauge should climb and hold each time. This verifies that the outlet check valve in the **purge primer** flange is working properly.

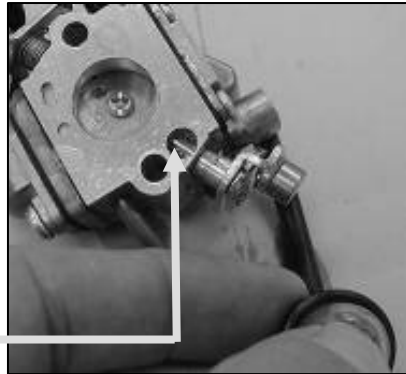
Quick test for accelerator pump o-ring.

- If the carburetor fails step 2, it could be a leaking check valve or the o-ring, or both.
- Before taking the carburetor apart, a quick check can be made by filling the accelerator pump bore with some soapy water and pump the **purge primer** bulb. If the liquid is drawn in, the o-ring is leaking.

Accelerator
Pump Bore

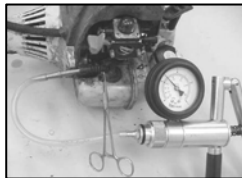


Liquid
Drawn In



Fuel Tank

Test fuel tank and tank vent.

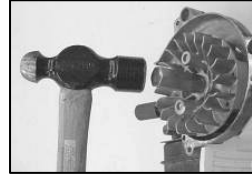
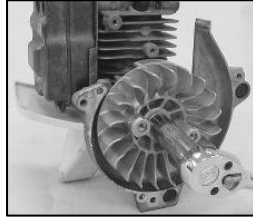


- ☑ It is a good practice to always pressure test an empty tank to be sure it has no leaks. Then perform a vacuum test to verify that the tank vent is allowing air into the tank.
- ☑ A poorly venting tank can cause running behavior such as engine stalling when hot, poor acceleration, or loss of power when hot.

Special Service Procedures

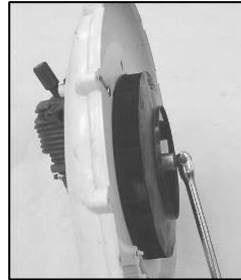
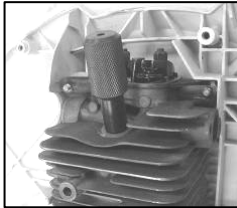
Special Tool Application: 10mm Piston Stop, Flywheel Removal.

- ☑ To remove the flywheel or starter cup nut on a 4-MIX® engine, block the piston with the piston stop. STIHL Part # 4282 890 2700.
- ☑ Install the flywheel puller, part number 1116 893 0800, until it seats against the flywheel, then back it off one full turn. Hit it squarely with a ball peen hammer to release the flywheel from the crankshaft.
- ☑ Do not use an impact wrench on any STIHL product.



Remove Fan Wheel: BR 500, BR 550, BR 600.

- ☑ To remove the fan wheel on a **4-MIX®** backpack blower, block the piston with the piston stop and use a ½ inch breaker bar with a 17 mm. socket to unscrew the fan wheel. Piston stop STIHL Part # 4282 890 2700.
- ☑ The mounting nut is molded into the fan wheel as one piece and has right hand threads.
- ☑ It will be extremely tight, and may take one person to hold the engine and fan housing while another applies pressure to the breaker bar.
- ☑ Do not use an impact wrench on any STIHL product.



Engine De-Carbonizing Procedure.

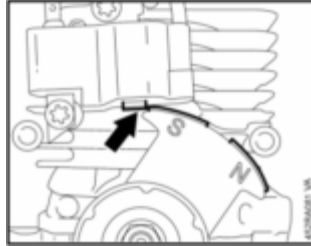


- ☑ If a 4-MIX® engine is showing more than 10% leakage past the exhaust valve, the most likely cause is carbon build-up on the valve face.
- ☑ **STIHL Engine Decarbonizing liquid** can be used to soften and flush out carbon deposits. Engine treatment involves putting the piston at top dead center on valve overlap, where both valves are slightly open at the same time. This is 360° of crankshaft rotation from top dead center on the compression stroke. With the valve cover removed this is easy to verify.
- ☑ Then fill the cylinder with the decarbonizing liquid.

STIHL 4-MIX® Cam Timing: Backpack Blowers – 4282 Series

- ☑ If the engine is being assembled and the flywheel is not in place yet, just be sure the piston is at top dead center to time the cam correctly.
- ☑ To install the cam on the backpack blower engines, notice that when the piston is at top dead center, the cam lobe is pointing up when the alignment marks are matched up. Now install the dowel pin.

Rotate the crankshaft until the tip (arrow) of the flywheel lines up with the ignition module as shown.



Fit the cam gear so that the arrows (2) and (3) are in alignment with the notches (1 and 4) in the cylinder.

