

# FSM Operating instructions – first time use

By Had Robinson

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**GASOLINE** – Ethanol free unleaded gasoline is best, should be fresh, and have fuel stabilizer added. Use premium (2) stroke 100% synthetic oil e.g., Amsoil Dominator (U.S.), Motul 800 2T or 710 2T Synthetic 2-Stroke (worldwide). These racing oils will better withstand the higher temperatures in engines fitted with the FSM. Please see our fuel & oil specification page for a complete discussion of recommended fuels & oils for paramotors.

<https://www.southwestairsports.com/ppgtechinfo/top80/hrservicenotes/fueloilspecs/fuelOil.htm>

Note: use of AVGAS with the FSM may cause fouling of the piston lands and rings(s) in some engines because of higher operating temperatures.

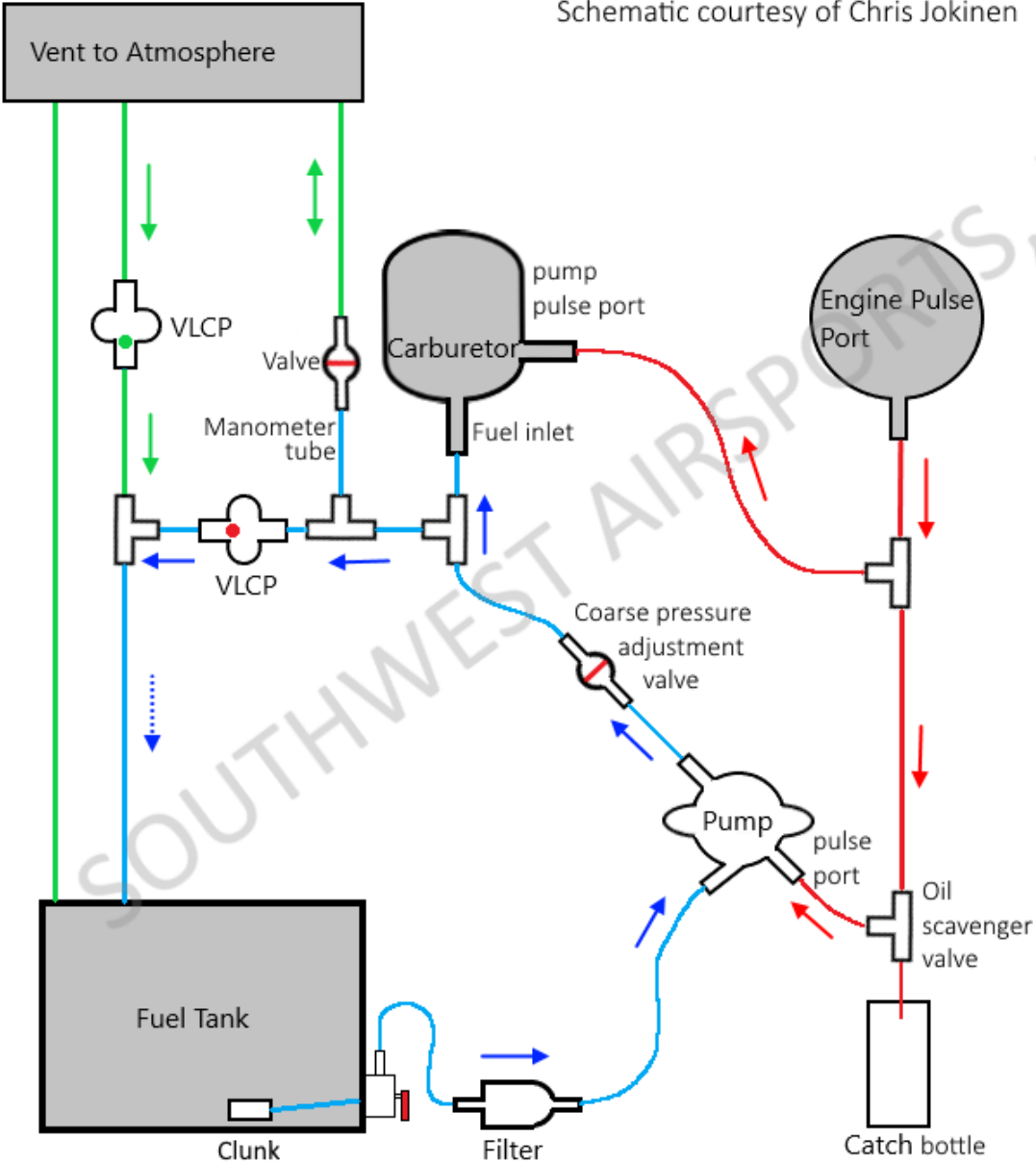
Note: Use of ethanol fuels will greatly increase maintenance of the fuel system!

**MAINTENANCE** – If ethanol free fuels are used, carburetor rebuilds and replacement of the VLCP's should be done at (50) hour intervals or as needed.

The VLCP Green is particularly sensitive to aging due to the presence of gasoline and any additives.

If the bubbles in the overflow line are difficult to control, it is time to replace it regardless of how many hours. Generally, a carburetor rebuild and spark plug replacement are indicated by erratic idle, difficulty starting the engine, or roughness in the midrange.

Schematic courtesy of Chris Jokinen



- blue lines – contains gasoline
- red lines – pulses that power the carburetor and Walbro fuel pumps (some engines will not have a pulse line going to the carburetor)
- green lines – air
- green, red, or blue dots/arrows indicate flow direction. The dotted arrow is fuel + air

## STEPS

Please read these instructions through before starting your engine.

1. Pick a perfect launch site and optimal flying conditions when first using the FSM. You do not want any unnecessary distractions while becoming familiar with how the FSM operates. You also must be able to land at any time if there are problems. (This is not the time for cross country or going to high altitude.)
2. Check that your installation has been done correctly.
3. Purging the system – Fill the fuel tank half full or more. Purge the fuel system by using the priming tube. Pump at least 1 cup/250ml of fuel out the carburetor inlet line #12 (figure 1 p. 4) that was left disconnected per the FSM Installation Instructions, step #11.

Once the purge is complete, attach the carburetor inlet line #12 using a 9mm or 10mm clamp, depending on the size of the fuel line. If the carburetor inlet fitting is 1/8" (3mm), it is recommended that a nylon zip-tie **double wrapped** be used to secure the line rather than a clamp. The purged fuel may be returned to the main tank.

Note: If the fuel system is not perfectly clean, the oil drain valve #5 (figure 2) will clog and the auxiliary fuel pump #6 (figure 2) will fill with oil and fail.

4. Prepare the engine for flight according to the owner's manual that came with your paramotor.
5. Open the coarse pressure adjustment valve #9 (figure 1) to 45° CW or CCW off vertical, depending on how the valve was installed. Close the manometer tube valve #17 (figure 1).

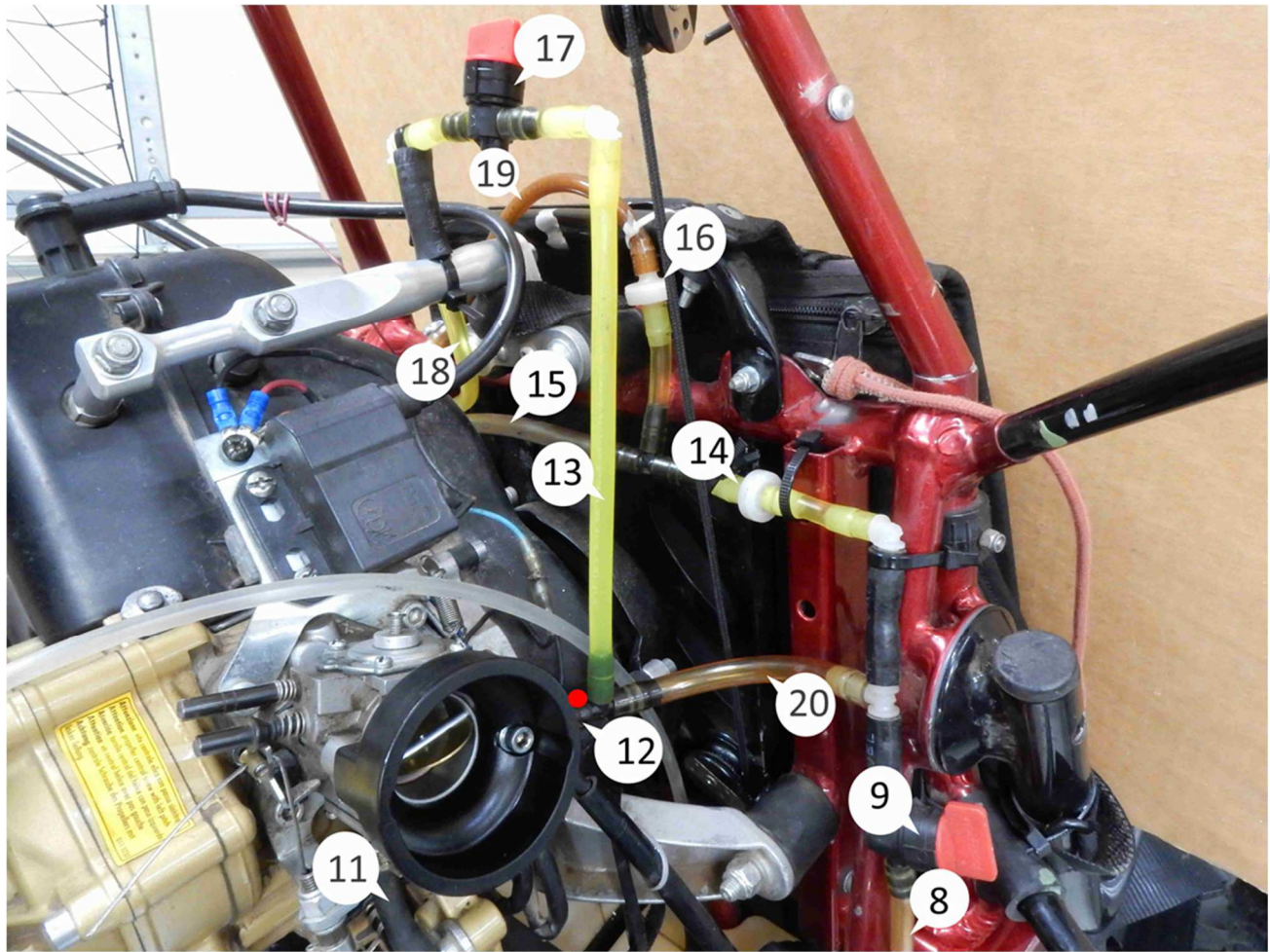


Figure 1

6. Open the fuel tank valve #4 (figure 2) if there is one (some kits have a fitting with a valve, some without).



<https://www.southwestairsports.com/ppgtechinfo/top80/hrservicenotes/Starting/starting.htm>

When priming the system through a primer tube VLCP Green #16 (figure 1) can make a "honking" sound and prevent the fuel tank from being pressurized. The remedy is quick and simple. De-pressurize the tank briefly or take a finger and cover the VLCP Green air vent for a moment. As the VLCP's age due to the presence of gasoline and other additives, the honking sound can happen more often. To keep complexity and cost to a minimum, this harmless and brief annoyance will continue.

**ALWAYS KEEP YOUR HAND ON THE THROTTLE AND THUMB ON THE KILL SWITCH BEFORE PICKING UP AN IDLING ENGINE.**

8. Start the engine. Check the fuel line from the fuel tank fitting valve #4 (figure 2) to the fuel pump #6 (figure 2) for bubbles in the fuel. Any bubbles means that the tank clunk, the fuel tank fitting, or some other part of the tank fuel line assembly is clogged, restricted, and/or leaking air.
9. Adjust the coarse pressure adjustment valve #9 (figure 1) so that the fuel level in manometer tube is at the mark made during the installation. There should be a strong stream of bubbles moving through the fuel overflow line #15 (figure 1). The presence of the bubble stream indicates that the auxiliary fuel pump and the VLCP's are operating correctly.

If there are no bubbles in the fuel, it is likely that VLCP Green was installed incorrectly (backwards) or the auxiliary fuel pump is not working correctly. See this video in the link below if you are unsure what to do look for. The bubbles in the video are not bubbles of vaporized fuel but air bubbles:

[https://www.southwestairsports.com/ppgtechinfo/top80/hrservicenotes/fuelsystemmod/bubble\\_adjustment.mp4](https://www.southwestairsports.com/ppgtechinfo/top80/hrservicenotes/fuelsystemmod/bubble_adjustment.mp4)

The stream of bubbles guarantees that there is enough static pressure in the system for the carburetor to function correctly. As the VLCP's age, the minimum static pressure will increase. It is more important that the fuel pressure not change during operation rather than it be at a particular value.

10. Allow the engine to reach 60°C or more, the approximate temperature at which vaporization of the fuel/air mixture entering the combustion chamber is complete. Some engines may require a greater warm up temperature e.g., the Moster 185.
11. Adjust the carburetor so that the engine idles smoothly. Note: It is a good idea to set the low speed jet close to 1 turn in both the WG and WB carburetors. This is because the engine will not be at operating temperature e.g., 140C-180C. Engines that are adjusted at 70C, for example, will experience a severe lean condition at idle when at operating temperature. This is can lead to a stall when going to idle for some reason while flying. Because of the low positive pressure of fuel at the carburetor inlet, this idle adjustment

becomes much more sensitive. A rich idle is to be preferred.

12. Test your kill switch! In case of an accidental WOT, always have two ways to shut-down a runaway engine. There continues to be serious and deadly accidents because of cascading events when on the ground. All pilots should be terrified of an uncontrolled WOT!!! Don't be foolish or complacent! Always run up paramotors on your back, not on the ground. Always have some way of holding the propeller when starting your engine. Prop covers with straps are the simplest.

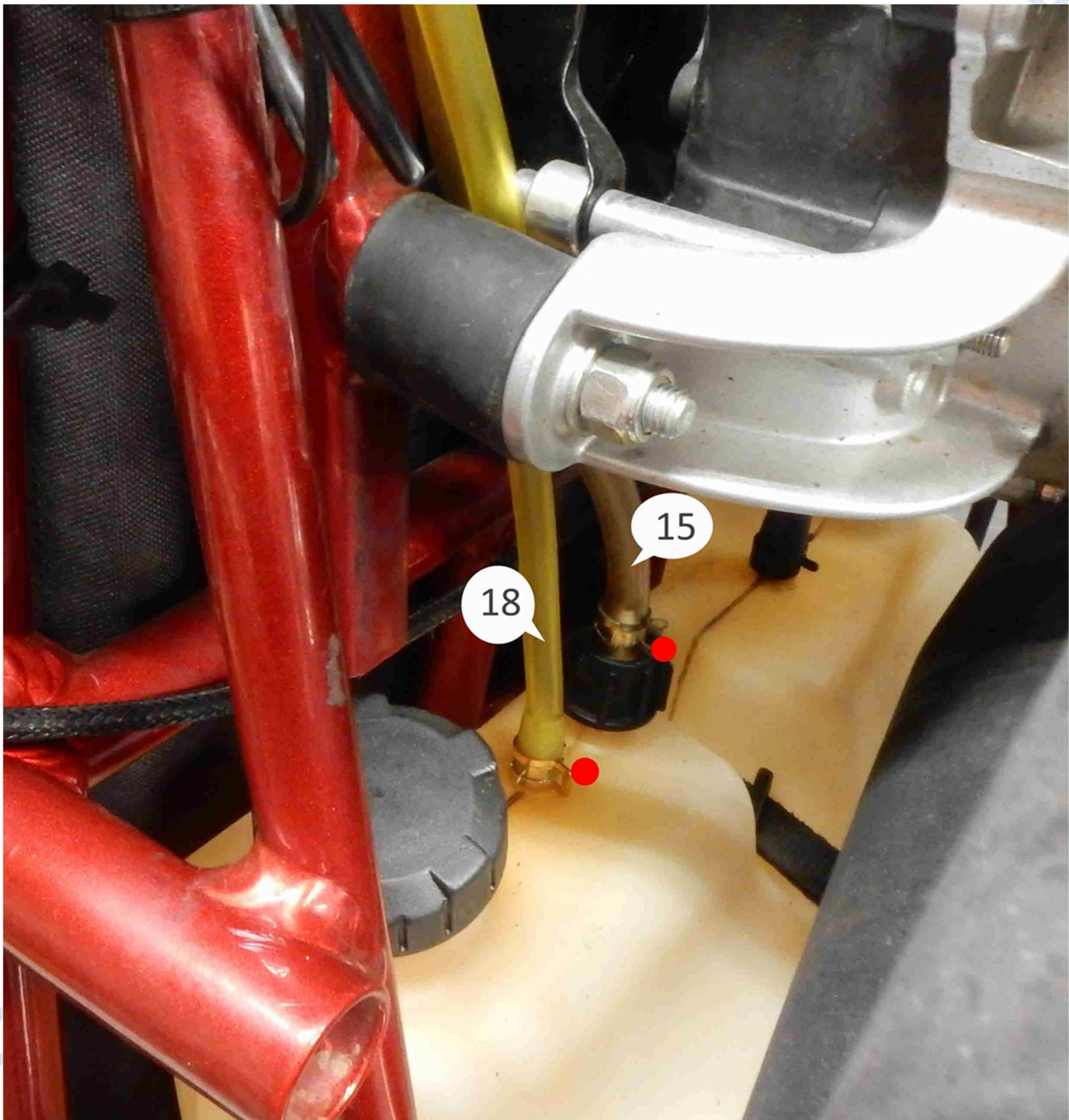


Figure 3

13. Fully open valve #17 (figure 1). The fuel level should be at the mark on the manometer tube or between 4 & 5 inches higher than the carburetor inlet. This is the pressure (height of the fuel) that is needed to open VLCP Red #14 (figure 1) and create the air bubble stream in the overflow line.

When done close the manometer vent shutoff valve.

The VLCP system is self-regulating when the coarse pressure adjustment valve #9 (figure 1) is set correctly. Before every flight it is a good idea to check the fuel height in the manometer tube and be sure that the fuel overflow line has a strong stream of air bubbles.

The tube going from the manometer to the fuel tank protects against fuel system over-pressurization but ONLY if the valve is open during operation. The down side of the open valve is that if there is some malfunction of the auxiliary pump, the carburetor pump will suck air through the manometer vent instead of fuel from the tank causing the engine to quickly shut down.

If the coarse pressure adjustment valve is accidentally opened fully, a siphon will be created in the manometer tube. It is easy to stop: a.) close the coarse pressure adjustment valve. b.) close the manometer valve, c.) wait for the fuel in the siphon to drain into the tank, d.) reopen the manometer valve, e.) properly adjust the coarse pressure adjustment valve.

14. Adjust the idle mixture and speed a second time. Note: The FSM installation will change the air/fuel ratio of the engine as well as make idle adjustments much more sensitive to the ambient air temperature.
15. Idle the engine on the ground for 5-10 minutes while examining the FSM for leaks. With the engine on your back for safety, run it up to at least 3/4 throttle for a few minutes to be sure everything is working correctly. Go to idle and put the engine back on the ground while running at idle and check to be sure there are no bubbles in the fuel line coming from the base of the tank. We are checking for leaks in the lines **before** the auxiliary pump.
16. It is important to check VLCP Green #16 (figure 1) for functionality while the engine is running. It must not be in the open mode (defective) or installed backwards. If it is, it will be impossible to prime the system by pressurizing the fuel tank. An open or reversed VLCP Green could result in a fuel exiting the vent line/hose that exits the top of the regulator or yield poor performance of the FSM due to negative pressure on the fuel entering the carburetor. To test the regulator: close the fuel overflow line #15 (figure 1) using a fuel line clamp that will not damage the fuel line (available from <https://www.lislecorp.com>). Note: the test may cause the engine to flood and stop.



ABSOLUTELY NO FUEL SHOULD COME OUT THE VENT LINE CONNECTED TO VLCP GREEN #16 (figure 1)

If it does, the green VLCP has been installed backwards or has failed and must be replaced. This test is **CRITICAL** for the safe operation of the FSM and should be done often to ensure that gasoline never leaks from the fuel system. NEVER FLY WITH THE VENT LINE DISCONNECTED FROM VLCP GREEN! Reminder: Extending the VLCP Green vent to the bottom of the paramotor frame will allow any fuel leakage to be harmlessly dumped into the atmosphere should both a failure of VLCP Green AND should the fuel overflow line become blocked.

17. Be cautious when first flying with the FSM. This is not the time for contests or anything distracting. Make sure you can kill the engine at any time and safely land in case of a problem.
18. Monitor engine temperature constantly when using the FSM, especially during first time use.
19. Launch and fly for (15) minutes. Do not go to full throttle on the first flight. Remember that the carburetor has pressurized fuel right at the inlet so throttle response will be faster and power output of the engine will be greater. Your engine will respond differently and you must be cautious using the throttle.

If you notice that the midrange is rough (4 cycling), the main jet size may be reduced. The FSM delivers fuel into the carburetor at all throttle settings which allows us to lean things out.

For example, the stock jet for a Thor 130 is #130 but it can be reduced to #125 or less in order to eliminate 4 cycling in the midrange. In engines with an adjustable main jet, screw in the jet 1/8 of a turn and then do a test flight to see the effect on temperature. Do not be in a hurry to do this! Note: it is always best to run the engine as rich as possible because unburnt fuel helps cool the engine

In general, engines can be leaned out until all 4 cycling has been eliminated without exceeding the maximum head temperature allowed.

The Southwest Airsports website has the maximum head temperature listed in the specification section for the respective paramotors. If your engine is not listed, you may have to do some research to find the maximum engine temperature allowed.

Rather than purchase a custom-made fixed jet from us, a temporary modification of the main jet may be done:

<https://www.southwestairsports.com/ppgtechinfo/top80/hrservicenotes/walbrowg8/carbmodification/jetmod.htm>

Once you have a good idea of what your engine needs, we can supply you with a permanent fixed jet. It is amazing how much leaner the midrange can be set without overheating the engine at WOT with the FSM installed. Here is the link to order jets for the WG carburetor, if needed:

[https://www.southwestairsports.com/shop/paramotors/fuel\\_system/fuel\\_system.htm](https://www.southwestairsports.com/shop/paramotors/fuel_system/fuel_system.htm)

20. After landing, inspect the FSM and engine for fuel leaks. Remember: substituting fuel line with anything but premium, ethanol resistant line will create a safety hazard.
21. Check the oil drain catch bottle. It should be filling with oil at a rate of 0.5 teaspoon/hr (2ml/hr). If there are no signs of oil drainage after an hour of flying, the scavenging valve is likely clogged. Remove the valve. Some oil will drain out of the lines from the pump and/or from the pulse port. Examine the valve to be sure that the tiny port inside the white leg of the tee is open. **DO NOT USE ANY METAL OBJECT TO CLEAN THE PORT!** Use only air less than 7 psi (0.5 Bar). The tee can be easily checked by attaching a hose to the white leg of the tee, submerging it in water, and blowing into the hose. A small stream of bubble coming out one of the legs of the tee should be seen. The size of this port is precise within 0.1mm and calibrated to maintain the pulse port function and bleed oil, both at the same time. If the tee valve fails in some way, you may order a replacement.

If the catch bottle is filling at a much greater rate it is an indicator that the pressure in the crankcase is above normal. The cause of this is usually a clogged exhaust system, most likely the muffler.

22. Please reference the "Operation Manual – general" for important notes at the end which will help ensure the maximum benefits of the FSM that you have installed on your engine.

**END OF FIRST TIME OPERATING INSTRUCTIONS**

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