HP Engines

The premier American made engine with Austrian heritage

HP VT ENGINE - OWNER'S MANUAL

BEFORE YOU HAVE PROBLEMS PLEASE READ THIS!

Common mistakes made with VT engines. **We won't cover problems associated with improper operation under warranty**.

The **HP VT engines use 2 cycle glow fuel**. Don't use 4 cycle fuel. It does not contain the proper amount of oil. The perfect fuel is 22% oil (all castor or at least 50/50 castor/synthetic) and 5-10% nitro. Most poor idling and performance problems are usually traced to fuel or glow plugs.

The **HP VT engines use a standard long glow plug**. Don't use an R/C, 4 cycle, miracle or other plugs that have anything extending from the end. These plugs can hit and destroy the rotary valve. We won't cover this under warranty.

If you have trouble maintaining a consistent idle after break-in, check your glow plug. If speed increases with battery attached to plug. Try a different brand plug. The HP VT plug is best. Most poor idling is traced to a poor plug element or insufficient oil in fuel.

Break in your engine properly. The VT's design requires break-in. Sometimes as much as two hours of running is required before full performance and idling characteristics are realized.

Don't let your engine hydraulic lock. This happens when the cylinder fills with liquid fuel which can not be compressed by the piston. Major damage can result, especially when bumped with an electric starter. This is very common when your engine is mounted on its side or inverted.

Fuel Draw Problems? We have found in some instances, modelers using the VT 49 were unable to obtain sufficient fuel draw.

This is usually caused by insufficient oil content or the type of oil used in the fuel. The rotary valve requires an oil film to develop the necessary seal. Add about 4 ounces of castor oil to 1 gallon of fuel to correct the problem. Also try a different brand of fuel.

If still, after break-in and use of the above remedy, you experience inadequate fuel draw when the aircraft is held in a upward position, hook up the muffler pressure line direct to the fuel tank and vent both breather nipples to open air via a piece of fuel line to the bottom of the fuselage. You must use the correct fuel oil content as indicated with this hook up.

Return Your Warranty Card. You receive many benefits by returning your warranty card. Your standard 90 day warranty will be extended to two years just by sending in the warranty card. If we don't have your warranty card on file we cannot help you under our warranty. Sorry, NO EXCEPTIONS to this policy.

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READ EVERYTHING FIRST! THEN START YOUR ENGINE.

STARTING AND BREAK-IN

All HP engines are produced to the highest standards and inspected before leaving the factory, but they are not "BROKEN-IN" and will require approximately 90 minutes of running before the full potential of the engine is realized. Break-in can be accomplished by airborne or bench running.

A model engine makes sounds that will tell you how it's performing. Four cycle engines make sounds that are a lot more subtle than a two cycle engine, you'll have to listen very carefully for them, recognize their message, and make adjustments to the fuel control needle valves accordingly. The mixture of fuel and air is controlled by the amount of fuel metered by the needle valve.

RICH MIXTURE running is characterized by a slower, sometimes irregular, sputtering exhaust sound. The exhaust gas will be smoky and probably contain small droplets of oil. This condition is good for Break-in since the engine receives excess lubrication and runs cooler.

SLIGHTLY RICH type setting is fast enough to pull the airplane but is still too rich to achieve full RPM's. This is the setting you normally look for before launching the airplane because the engine will run leaner when airborne.

PEAKED RUNNING is obtained as the main needle is closed (clockwise), this reduces the amount of fuel mixed with the air drawn into the engine. At a specific point, which varies with each engine, air temperature, altitude and relative humidity, the exhaust note will change into a smooth, steady note. If the needle is closed further, the note will stay smooth, but will weaken. The peak occurs just at the break point from a rich setting and further leaning will ruin the engine. A lean setting raises the engine heat above the safe point, reduces lubrication, and destroys glow plugs and valves due to high combustion temperature. This is very harmful to the engine and your investment. Learn to tune the engine before flying. Remember, a little rich is always preferred for long motor life.

STARTING PREPARATIONS

Use a standard long glow plug. **DO NOT USE** a R/C or Idle Bar Type plug or Four-cycle plug. Any plug with anything protruding beyond the threads (like the Fox Miracle Plug) will cause damage to the rotary valve.

You will also need a 1.5 volt battery, quality propeller (refer to prop chart) and good commercial grade two cycle glow fuel (yes, two cycle fuel) with 5% nitro-methane (more helps in cold weather). Two cycle fuel contains the right percentage of oil (22%) and be sure the fuels oil contains at least a 50-50 mix of castor oil. Not all synthetic oil. Keep fuel clean and filter it during fueling. Keep exposure to air to a minimum as methanol will absorb moisture rapidly.

	VT 21	VT 49
Break-in	8x4; 9x4	10x6; 11x5
Normal models	8x4; 8x6; 9x4; 9x5	11x5; 11x6; 12x5
Speed models	8x7; 9x6	10x7; 11x7

CRANKCASE PRESSURE LINE HOOK-UP

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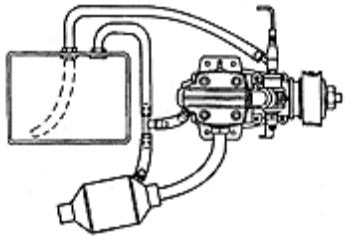
Muffler pressure must be connected to head. Vent line on bottom of crankcase must be vented to open air. Do not plug this line off.

For tank pressure, use "T" between muffler and head or if more pressure is required due to poor fuel draw, connect muffler pressure direct to tank and vent both engine lines. Be sure to use fuel with correct oil content.



TYPICAL SIDE MOUNTING SHOWN

- **ACTUAL STARTING**

  Open the high speed needle valve about 4 turns. Your HP four stroke has a built in choke which is actuated by closing the carburetor barrel completely. This position should be set with your trim in full down position. Choke the engine and slowly turn the prop over six to ten times counterclockwise. You should see fuel being drawn up the fuel line. If fuel is not drawn into the carburetor, open the main needle two more turns and unscrew the idle needle two turns and repeat the above. Don't allow engine to hydraulic lock (this means cylinder filling with fuel and piston being unable to compress it). If this occurs, remove glow plug and rotate propeller. Don't force it, serious internal damage can result. Open the carburetor barrel about quarter-way. Connect the 1.5 volt battery to the glow plug and pull the prop through until you feel a bump before compression. Now the engine will start with your electric starter.

  Once the engine starts, open the carburetor to full throttle. At this time the engine should be running very rich. Slowly turn the main needle valve in and the engine should start speeding up. If it slows, dies or only starts with a brief bust of power and stops, the needle valve setting is too lean. Unscrew the needle 1 more turn and try again. If engine starts, runs slowly and briefly the mixture is too rich. Turn needle in 1/2 turn and restart. IF THE ENGINE DOES NOT FIRE AT ALL, refer to the TROUBLESHOOTING section in this manual.

  AFTER FIRST RUN it is a good idea to flush out the lower crankcase thru the lower vent nipple and cap. Clean fuel should be used for this and engine must be run again to remove excess alcohol. Then after run oil should be added thru lower vent tube.

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- **AIRBORNE BREAK-IN** (also see "aircraft installation")

  1> BREAK-IN running should be done with the recommended propeller (see chart) at a slightly rich setting. The needle valve should be set at a point just into this range from a rich setting. Fly the plane at maximum throttle for 2 minutes, then throttle back for approximately 30 seconds. Repeat this sequence until approximately 45 minutes of accumulated running time has been obtained. Additionally, certain maneuvers, such as "CUBAN EIGHT'S", that allow the engine to load and unload are recommended. AVOID PROLONGED CLIMBING MANEUVERS AT MAXIMUM THROTTLE.

  2> After the first 45 minutes change to normal size prop and fly an additional 45 minutes. Continue to run the engine at a slightly rich setting and fly your normal pattern.

  3> After the above break-in period, run the engine at a normal peak needle valve setting. This should be a little on the rich side because engines run leaner in the air. 5% nitro may be used.

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- **BENCH BREAK-IN**

  NOTE THAT THE ENGINE MUST BE FIRMLY MOUNTED ON A SOLID TEST STAND. DO NOT CLAMP ENGINE IN A VISE. Muffler must be used during bench break-in so rotary valve receives adequate lubrication.

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The initial bench break-in period is also approximately 90 minutes (45 minutes bench and 45 minutes airborne). During this time, run the engine at a rich setting. It is best to run the engine for about 10 minutes, then allow it to cool. The heating and cooling aid break-in.

1> Start the engine and run it at a rich full throttle for about 1-1/2 minutes, then let it fast idle (about 4000 rpm's) for 30 seconds. Repeat this sequence for about 20 minutes of running time.

2> Increase the full open throttle time to about 3 minutes followed by a 30 second idling period (about 3,500 rpm's). Do this for an additional for 20 minutes.

3> Install the engine in your aircraft. Using an normal size prop, proceed as described in step 2 of "AIRBORNE BREAK-IN".

- **ADJUSTING THE R/C CARBURETOR**

HP engines are fitted with a variable mixture carburetor which automatically alters both fuel and air mixtures as it's closed. Best and most reliable carburetor settings are obtained after engine break-in.

1> Start the engine and open the carburetor to the full open position, then adjust for peak R.P.M. with the main needle as previously described.

2> Close the carburetor barrel slowly until the lowest possible speed is reached without the engine stopping.

3> Go to full throttle after about 10 seconds of idling. If the engine gains speed slowly, the idle mixture is too rich. If the engine stops, the idle mixture is too lean. Turn the idle needle clockwise if mixture is too rich and counterclockwise if too lean.

The engine will accelerate from idle to full throttle smoothly and instantaneously when properly adjusted. The engine may not idle well at a low setting or accelerate as quickly until it is well broken in.

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- **AIRCRAFT INSTALLATION**

These engines are designed for beam type mounting. Securely mount the engine on hardwood mounts or firewall mount with a good quality motor mount. Be sure mounting surface is flat and parallel and all mounting holes line up, the crankcase could become distorted if screws or mounts are forced. We strongly advise against using a soft or rubber mount installation as our engines are correctly balanced and these mounts can cause excess vibrations from resonance frequencies.

Fuel tank should be located as close to the engine as possible. The center line of the tank should be within 1/2 inch above or below the center of the carburetor.

Muffler pressure is recommended as it provides an even run throughout the whole tank of fuel. DO NOT PLUG OFF VENT LINE ON BOTTOM OF CRANKCASE.

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- **TROUBLE SHOOTING**

Generally most engine starting problems can be traced to bad glow plugs, weak starting batteries, or inadequate fuel systems.

- **GLOW PLUGS**

The glow plug when connected to a 1.5 volt battery should glow a bright orange. If the plug slightly glows the battery or plug should be replaced.

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If the seal leaks around the center plug post, replace it.

The glow plug element should be examined after several flights. If the element is deformed or touching the side of the plug body, replace it. If the glow plug element is pitted or has a frosty look, the engine is running too lean and continued running will seriously harm the engine.

- **FUEL SYSTEMS**

The most frequent problems encountered with fuel systems are:

1> Improper fuel tank location. The center line of the fuel tank should be located on the center line of the carburetor.

2> Fuel pick up in tank is not free.

3> Dirt or contaminates in the fuel, tank, lines, filter or carburetor.

4> Holes in the fuel line. The tear resistance of silicon tubing is very low and it's not uncommon to develop a hole where the fuel line is assembled over the edges of brass tubing. If the engine runs well on the first half of tank and then quits, it's almost always caused by a hole in the pick up line inside the tank. Look for bubbles in the fuel line, this is also a sign of holes.

- **MAINTENANCE**

When you are finished flying for the day, run your engine dry by removing the fuel line at a moderate speed or allow the fuel tank to run dry. Running the engine dry removes any methanol residue from the internal engine components. This methanol attracts moisture and will result in rust and corrosion if this procedure is not followed. It is best to squirt some RJL AFTER RUN OIL in the carburetor, thru lower vent tube and upper oiling tube, then flip the propeller about 10 to 20 times. This oil will keep castor based fuels from gumming and protect internal engine parts from rust and corrosion. When storing your model between flying sessions, it is best to wrap your engine in a rag or plastic to prevent dust, dirt and moisture from entering the engine. The engine should also be wrapped in a rag at the flying field between flights.

If dirt does enter the engine do not turn it over until it has been flushed out completely. Alcohol is recommended for this. DO NOT USE carburetor cleaner or chlorinated industrial solvents as they may attack the plastic parts of the engine. The following steps may be used as a disassembly/assemble guide:

1> Remove carburetor, intake manifold, exhaust pipe and glow plug.

2>Remove the valve cover.

3>Remove sliding shims or roller bearing above rotary valve and carefully remove valve.

4>Flush engine out completely using alcohol or mild solvent.

5>Install and time the valve with piston at top dead center. Insert valve so a equal portion of the rotary valves port window can be seen thru both intake and exhaust passages in the crankcase casting. If you can't make it exactly equal, the larger opening should be seen thru intake passage. Make sure the piston is at top dead center.

6> Install valve sliding shims or roller bearing and valve cover with gasket. There should be about .008" to .014" clearance between the cover and valve.

7> Install carb, manifold, glow plug and exhaust system.

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To disassembly/assemble lower crankcase:

8> Remove lower crankcase cover, crankshaft, connecting rod, piston/ring, and bevel valve gear.

9> Ball bearings are press fitted to the crankshaft and require special tool to remove.

10> Clean halves of case with Loctite cleaning solvent to remove factory installed sealant. Do not use a knife or sharp edged tool or sand paper.

11> Install piston/ring on connecting rod and be sure Teflon pads are in place at the ends of wrist pin and retainer shim is on crankpin behind connecting rod. See illustration on previous page.

12> Install crankshaft/piston assembly into upper portion of crankcase being sure bearings seat in proper location.

13> Rotate crankshaft so piston is at top dead center.

14> Place bevel valve gear in lower case and be sure bevel shaft in secure. Rotate gear so crankpin slot is up and carefully place assembly onto upper crankcase. This is easily done while engine is in the inverted position. Sealant does not need to be used between case halves.

15> Re-time valve as described in step 5 above.

ENGINE SPECIFICATIONS

SPECIFICATIONS		
	VT .21	**VT 49**
Displacement	.21 cu.in. (3.5ccm)	.49 cu.in (3.5ccm)
Bore	0.354	0.898
Stroke	0.63	0.772
Power	.35 hp	.75 hp
RPM Range	2500 ~ 15,000	2500 ~ 13,000
Piston/Cyl Type	Dykes Ringed ABC	Conventional Ringed ABC
Weight	9.5 oz	17.3 oz

ENGINE DIMENSIONS

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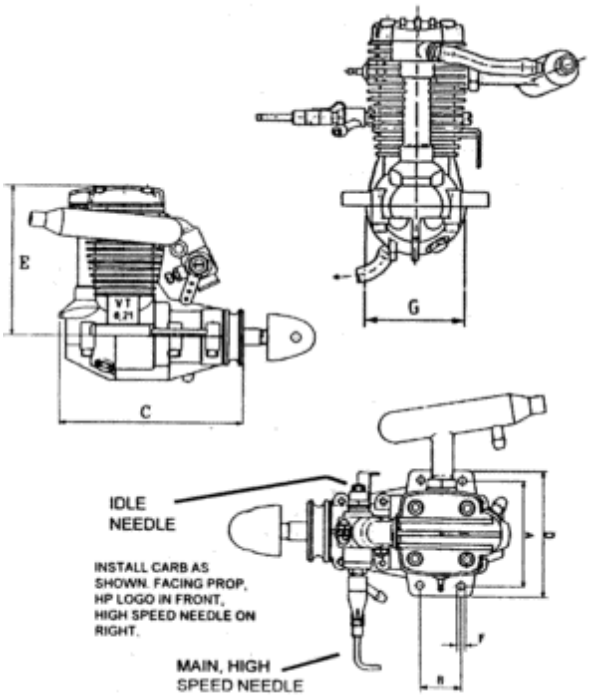

	VT 21	VT 49
	(DIMENSIONS IN MM)	
A	41.0	54.50
B	16.0	22.00
C	79.0	100.00
D	49.0	63.00
E	65.0	81.80
F	3.20	4.30
G	33.0	42.50

LIMITED WARRANTY

Your HP Model Engine has passed rigid factory inspections and is warranted to be free from defects in materials and workmanship for a period of 90 days, however if you return your warranty card within 10 days from date of original purchase the warranty period will be extended to two years from date of original purchase. Retain your sales receipt as the as proof of purchase and date of purchase is required.

This warranty does no apply to damage caused by:

1. Shipping and handling.
2. Improper break-in.
3. Use of fuel other than specified.
4. Crash, misuse or abnormal service.
5. Use of muffler or tuned pipe not approved by RJL.
6. Any modification, alteration, or abuse of the engine.
7. Use for purposes other than engine was designed.
8. Use of improper type glow plug.
9. Plugging of vent line on bottom of engine.
10. Running engine without adequate cooling.
11. Use of incorrect size propeller.
12. Rusted internal parts.
13. Damage caused by hydraulic lock.

Other exclusions from warranty are marring or scratching of the finish, any incidental or consequential damages caused by, or resulting from, a defect in material or workmanship, and normal wear.

DO NOT DISASSEMBLE YOUR ENGINE! Doing so will void your warranty. No exceptions! Call us first and explain your problem.

Our liability under this warranty is limited to the repair or replacement of the defect or defective part at our factory and does not include inbound shipping expenses. Specifically, no responsibility is

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assumed for any damage to any model, accessory, radio control equipment, person or property resulting from a crash in which a RJL or HP model engine is used.

WARRANTY CARD MUST BE MAILED WITHIN 10 DAYS OF PURCHASE TO VALIDATE YOUR TWO YEAR WARRANTY.

Any questions? Call or write: *(include your phone number with all correspondence)*

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