How-To Article

Modifying A Zenoah G230RC Motor

by Rudy Hilado (8/2002)

The Zenoah G230RC motor is an incredibly powerful motor in it's stock form. With the voluminous 4−port cylinder head design, this motor is capable of tremendous power and high RPMs. The motor was designed for use in 1/5 scale cars so it is manufactured as an air−cooled motor. Even in it's stock air−cooled form, it makes a great power plant in for model boats as well, although modifying the motor to be water cooled can result in a modest increase in RPMs and a cooler and possibly longer running motor.

This article describes the "poor man's" way of water−cooling a G230RC motor. I made these modifications using a Dremel tool, drill press and a bench grinder. Using a mill or lathe would produce more professional looking results. I am presenting only one way to water cool this motor, I'm sure there are dozens of different ways to do it. Use your imagination and have fun!

Please note that this project should not be attempted unless you feel completely comfortable with the mechanical and metal working aspects. These modifications, of course, will void any warranties. Implement the modifications at your own risk, and please, ALWAYS wear safety goggles.


1. Stock Zenoah G230RC Motor


2. Top and Exhaust View


3. Remove Exhaust and Carb


4. Remove Clutch Shoes


5. Special Tool


6. Removing Clutch Plate


7. Clutch Housing


8. Pull Start And Flywheel Housing Removed


9. Shroud Removed


10. Special Tool To Remove Flywheel


11. Removing Flywheel


12. Flywheel Removed, Flywheel Key


13. Cylinder Removed


14. Close Look Cooling Fins


15. Top Of Cylinder


16. Cut Off Top Coil Mount


17. Mark Cylinder Top


18. Fins Removed, Marking Tape


19. Fins Removed


20. Baseball Bat Water Jacket, Side View


21.Baseball Bat Water Jacket


22. Water Jacket Gaskets


23. Finished Watercooled Cylinder

24. Coil Brace, Full View


25. Coil Brace, Mounted


26. Marking the Coil Bracket


27. Coil Brace, Kill Switch


28. Flywheel Modifications, Pull Start Side


29. Flywheel Modifications, Case Side


30. Mounted Flywheel


31. Completed Motor, Carb Side


32. Completed Motor, Exhaust Side


33. Bad Coil Brace

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Modifying A Zenoah G230RC

1. Stock Zenoah G230RC Motor

This is the stock Zenoah G230RC from the factory. It comes with a canister exhaust, a carburetor air filter, and one−half of a clutch housing (yes, it's strange that it's missing the clutch bell, but I guess it allows for various installations).

Modifying A Zenoah G230RC

2. Top and Exhaust View

The stock G230RC has a large plastic shroud that directs the air flow through the fins on the cylinder head.

Modifying A Zenoah G230RC

3. Remove Exhaust and Carb

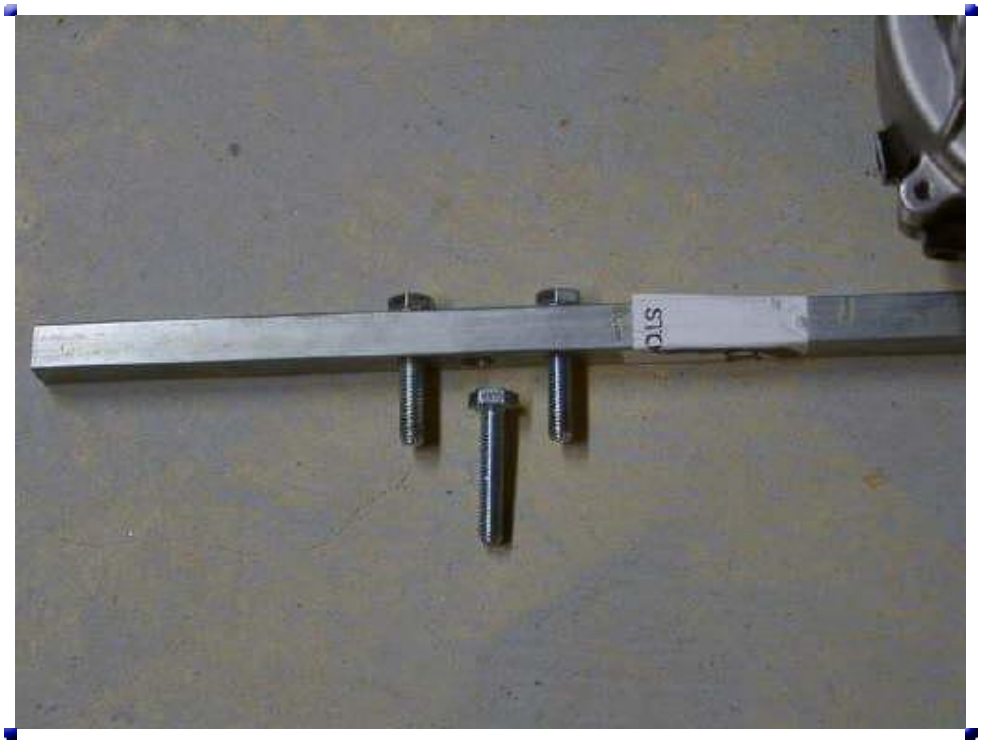
The canister muffler and the carburetor must be removed before modifications can be made. The two large black bolts on the clutch shoe will need to be taken out to remove the shoes and backplate. To prevent the crank from turning, you can use a piston stop tool (goes in through the spark plug), or you can use a large screw driver wedged between the flywheel fins and housing (I use this technique).

Modifying A Zenoah G230RC

4. Remove Clutch Shoes

Once the clutch shoes are removed, the clutch back plate must be taken off. This will require a special tool that can be purchased, or you can make your own (as I did). The 6 mm screw in the middle of the back plate should be taken out.

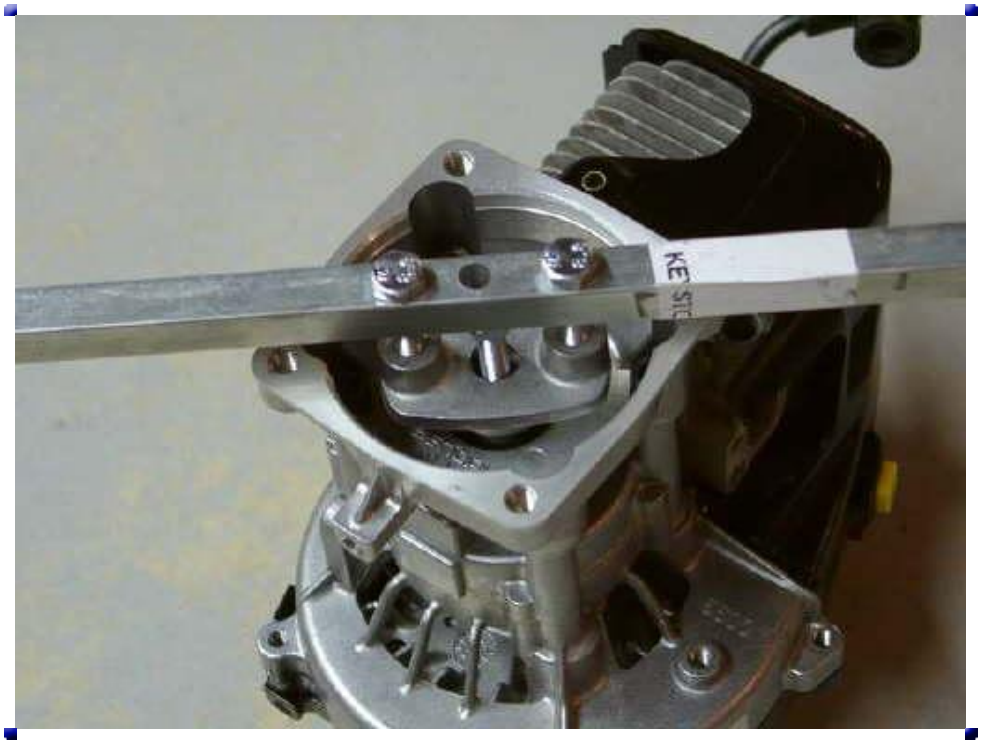
Modifying A Zenoah G230RC



5. Special Tool

Here's the special tool I made to remove the clutch back plate. It can also be used to remove the flywheel. It's basically bar stock found at the local hardware store. I drilled three holes in it. The spacing of the holes should match the tapped holes in the clutch back plate, and one hole in the middle. You'll need three 6 mm bolts and some 6 mm nuts.

Modifying A Zenoah G230RC



6. Removing Clutch Plate

To remove the clutch plate, you'll need to "pop" it off the crank shaft. Insert one of the 6 mm bolts into the center of the crank then set the tool on top and thread the other two bolts through. Tighten the outside 6 mm bolts evenly so the bar presses against the head of center bolt. The clutch plate will "pop" off the crank shaft.

Modifying A Zenoah G230RC

7. Clutch Housing

Once the clutch plate is removed, take out the 4 bolts and remove the clutch housing.

Modifying A Zenoah G230RC

8. Pull Start And Flywheel Housing Removed

On the back of the motor remove the pull start shroud. You can then take the coil off the motor.

Modifying A Zenoah G230RC

9. Shroud Removed

Now you can take the flywheel off the crankshaft. Notice the double−sided flywheel. These fins push a tremendous amount of air. Removing them will add a few hundred extra RPM.

Modifying A Zenoah G230RC

10. Special Tool To Remove Flywheel

You can use the same special tool to remove the flywheel. Note how the center bolt is mounted. Use the head of the center bolt to push against the crankshaft. Tightening down on the outer bolts will pull the flywheel off the crank. You'll hear the same "pop" when it comes off.

Modifying A Zenoah G230RC

11. Removing Flywheel

A closer look at how the special tool is positioned to remove the flywheel.

Modifying A Zenoah G230RC

12. Flywheel Removed, Flywheel Key

When the flywheel is removed, be sure and watch for the flywheel key. It is a small metal piece that fits in a slot in the crank and matches a slot in the flywheel.

Modifying A Zenoah G230RC

13. Cylinder Removed

Once the flywheel is removed, the cylinder can be gently taken off the motor case. Pull lightly on the cylinder and try not to rotate it back and forth. The piston should come out fairly easily. Be careful not to damage the cylinder gasket or let foreign material get into the lower part of the case.

Modifying A Zenoah G230RC

14. Close Look Cooling Fins

If you look closely at the exhaust port and intake port on the cylinder you'll notice that the exhaust port is one fin higher than the intake port. Later this extra fin will be marked with tape to make sure it is not cut off by accident.

Modifying A Zenoah G230RC

15. Top Of Cylinder

Here's a view of the top of the cylinder. Notice that there are "ears" off to the left and right. These ears are important since they will be drilled and tapped for the cooling jacket mounting bolts.

Modifying A Zenoah G230RC

16. Cut Off Top Coil Mount

Using the Dremel tool with a cutoff wheel I cut off the top coil mount at the base. I use this small piece as a nut to remount the coil to the support bracket (these bolts are metric and this saves keeping metric nuts around).

Modifying A Zenoah G230RC

17. Mark Cylinder Top

Mark the cylinder top to make sure enough area is left around the spark plug hole for the gasket that is used to seal the cylinder to the top of the water jacket (I actually mark a much bigger circle now, closer to the edges of the "ears")

Modifying A Zenoah G230RC

18. Fins Removed, Marking Tape

Now start removing the fins. Using the Dremel tool and a cutoff wheel (or other appropriate cutting bit), I score the top fin around the markings. Using a needle−nosed pliers, you can easily "snap" the fins off. They will break at the score marks. Go down fin by fin, trying to score the fins as close to the cylinder as possible. It doesn't have to be pretty. It is cleaned up a little later with a bench grinder. Notice the piece of masking tape marking the bottom fin. This prevents accidental removal of the lowest fin (it's easy to get carried away).

Modifying A Zenoah G230RC

19. Fins Removed

Here's another view of the fins removed. The only difficult part of removing the fins is the upper coil brace. The metal is pretty thick around the brace so a full cut is needed with a cutoff wheel.

Modifying A Zenoah G230RC

20. Baseball Bat Water Jacket, Side View

I prefer to use the top of a baseball bat as my water jacket. The baseball bat is 2.25" in diameter, which allows for significantly more cooling water than the cooling jackets typically found on the G23PUM motor. I cut the top 1−1/8" off the bat, measuring from edge of the rounded top (not the center of the top). I cut the bat with a table saw, but a hack saw can probably do the job. I then wet sand off any labling that is on the jacket from the bat logos. Notice the cylinder fins have been ground down on a bench grinder. It's not necessary to go all the way to the cylinder, there is plenty of room within the cooling jacket.

Modifying A Zenoah G230RC

21.Baseball Bat Water Jacket

For the spark plug hole I cut a 7/8" hole in the center of the jacket (the one pictured is much larger than 7/8", I don't make the hole as big any longer). I use a hole cutting bit in a drill press. You could make the hole with a Dremel. I then drill two holes for the mounting bolts. I like to use 8−32 stainless steel socket head bolts. Once you drill the mounting bolt holes, mark the appropriate spots on the cylinder "ears". Notice that the "ears" have been ground down to make a flat area for the gasket. Drill and tap the mounting holes for 8−32 bolts.

Modifying A Zenoah G230RC

22. Water Jacket Gaskets

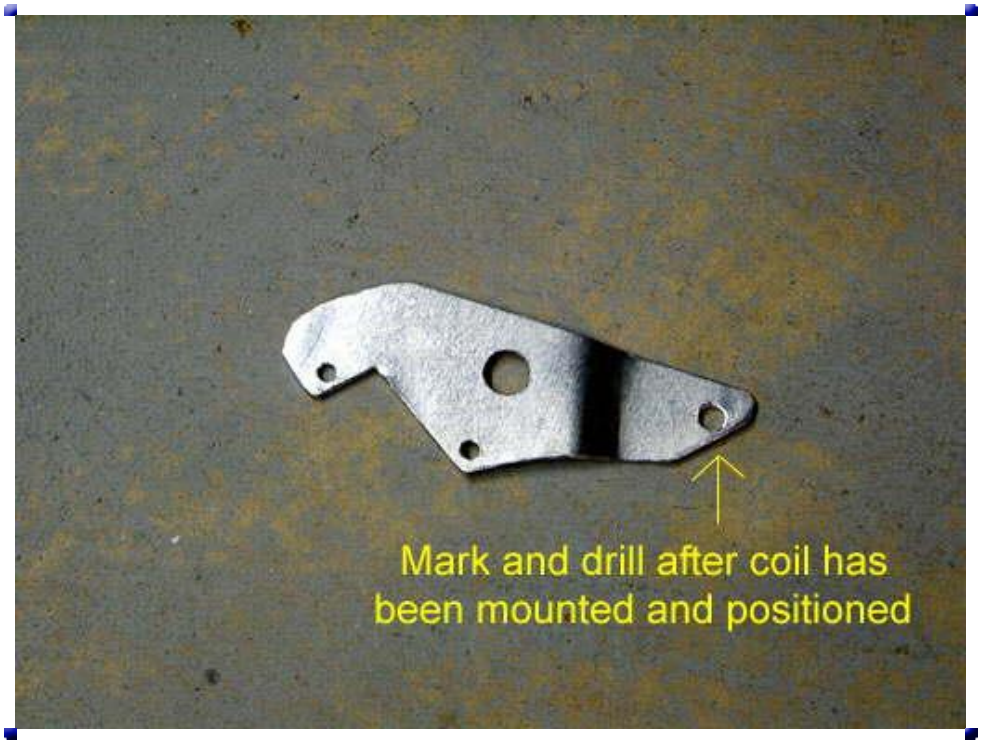
Once the mounting holes on the jacket are fitted, drill and tap the water fittings. I use 10−32 brass barbed fittings. Mount the input fitting low on the jacket and the output fitting high, on the opposite side. For the base gasket I use a shower gasket found at the local hardware store. The I.D. of the black bottom gasket is 1−11/16" and it is 1/8" thick. It's important to have a thick gasket so it seals over the cylinder bolt holes properly. The top gasket is cut from inexpensive rubber sheets, also found at the local hardware store. I use one or two stacked gaskets on the top (approx. 3/16" thick) to make sure it seals. Notice the silicone tubing on the mounting bolts. The silicone tubing on the mounting bolts is used to waterproof the bolts. When the jacket is mounted, the silicone is compressed on the bolts and it prevents water from escaping out from under the bolt heads. Alternatively, small o−rings could be placed under the bolt heads.

Modifying A Zenoah G230RC

23. Finished Watercooled Cylinder

When the jacket is mounted it should make a firm seal with the bottom gasket and the top gaskets. Blow air through the inlet on the jacket plugging the outlet. Check for air leaks. If there are leaks, you may have to shim the gaskets with additional material to get a good seal. Also, before putting the cylinder back on the motor case throughly wash it out with soap and water to get any metal filings out. Then lightly spray the insides with WD40. When you put the cylinder back on the case, make sure the piston ring is aligned with the ring tab, and gently slide the piston into the cylinder while pinching the ring. Do not rotate the cylinder back and forth to make the piston go in.

Modifying A Zenoah G230RC



24. Coil Brace, Full View

To mount the coil on the motor, a special brace needs to be made. This brace keeps the coil from rotating around, hitting the flywheel (a bad thing). Initially I made the brace out of aluminum, but I switched to stainless steel. (See last picture). You can download a template of this brace here. Initially only drill the coil bolt holes, do not drill the shroud hole (the hole on the far right). Drill a large hole in the middle for the kill switch wire lead.

Modifying A Zenoah G230RC

25. Coil Brace, Mounted

The coil is mounted back on the motor with the brace between the coil and the cylinder (temporarily remount the flywheel). Use thread locker when putting in the lower coil bolt. This is the primary bolt that holds the coil. Rotate, raise or lower the coil until the proper gap is set over the flywheel. Use that piece that was cut off the top coil brace earlier to act as the nut for the top coil bolt.

Modifying A Zenoah G230RC

26. Marking the Coil Bracket

When the coil is set in the proper position, put the pull−start case back on and mark the proper drill location with a drill bit. Take everything apart again then drill out the shroud hole.

Modifying A Zenoah G230RC

27. Coil Brace, Kill Switch

Pass the red lead of the kill switch through the middle hole in the brace and put it back on the coil tab.

Modifying A Zenoah G230RC

28. Flywheel Modifications, Pull Start Side

Shaving the fins off the flywheel will add RPMs to your motor. The fins come off the same way as the cylinder head. Score or slightly cut each fin with a Dremel cutoff wheel. Then use a pair of pliers to snap the fins off. Use a bench grinder or the Dremel tool to cut the fins down to the base.

Modifying A Zenoah G230RC

29. Flywheel Modifications, Case Side

I cut the fins off both sides. Once that is done you must re−balance the flywheel. I use my prop balancer with a jig that holds the flywheel. My prop balancer is all plastic and aluminum, which is important since the magnet on the flywheel will prevent proper balancing if you use a steel balancer.

Modifying A Zenoah G230RC

30. Mounted Flywheel

Here's the flywheel remounted after being cut down.

Modifying A Zenoah G230RC

31. Completed Motor, Carb Side

The completed motor from the carb side.

32. Completed Motor, Exhaust Side

The completed motor from the exhaust side.

Modifying A Zenoah G230RC

33. Bad Coil Brace

I discovered that the vibrations of the motor quickly causes an aluminum coil brace to fatigue. I now use a stainless steel brace (fairly thin sheet metal too) to hold the coil. So far it hasn't fatigued and cracked and it seems to hold up very well. Once again, the bottom bolt fixes the coil, the top bolt attached to the brace prevents the coil from rotating or moving. Many other techniques can be used to mount the coil (possibly in a more secure fashion), but I have driven these G230RC motors very hard and the brace hasn't failed yet. I have noticed that the two cylinder screws tend to come loose, so I've added lock washers to the bolts. I don't like to use thread locker on the cylinder bolts since it can muck up the gasket and interfere with the seal.