

## Rebuild Your Engine Like a Pro!

We will take you through step-by-step instructions showing you how to rebuild your engine. We show the Nitro Star 15FE in these pictures, however these steps are basic in rebuilding any R/C 2-stroke car, buggy or truck engine. Part numbers required or recommended for HPI brand engines will be noted in the tables below, your engine may require different part numbers if it is not an HPI engine.

First, we start with taking the engine out of your car or truck. By the time your engine requires a rebuild (one to three gallons, depending on how you care for your engine) you should be somewhat familiar with this step, especially if you built your kit. If you did *not* build your kit, find the part of your instruction manual that describes the installation of the engine and see what needs to be removed to take off the engine.

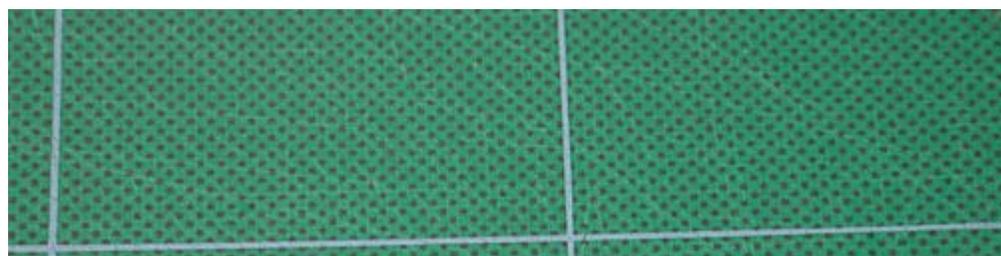
It is beyond the scope of these instructions to show you how to remove the engine and anything attached to it - see the [Instructions Page](#) for your kit for details.

The next step is gathering the required tools - in the picture below you can see the engine (15FE) in the top right, with the tools below: needlenose pliers, #1 and #2 Philips screwdrivers (with hardened tips), 2.5mm Allen wrench.

While you have the engine out of the car you may decide to upgrade the flywheel/collet set, replace the wrist pin, wrist pin clip and connecting rod. See the tables below for the part numbers you should order from your local hobby shop. If you decide to upgrade the flywheel, you will also need the tube of light grease that came with your Nitro kit, or an equivalent grease.



Hardened-tip screwdrivers are highly recommended, they lessen the chance of damaging the screw heads and the screwdriver tips and last much longer than "bargain bin" screwdrivers.





The parts needed for the rebuild are the piston/sleeve set and head shim/gasket set for the engine. The parts marked "required" are of course required to rebuild the engine; the other parts listed should be replaced periodically or are listed in case engine owners want to upgrade to these parts. Make sure that you have the correct piston/sleeve set and shim set for the engine you own:

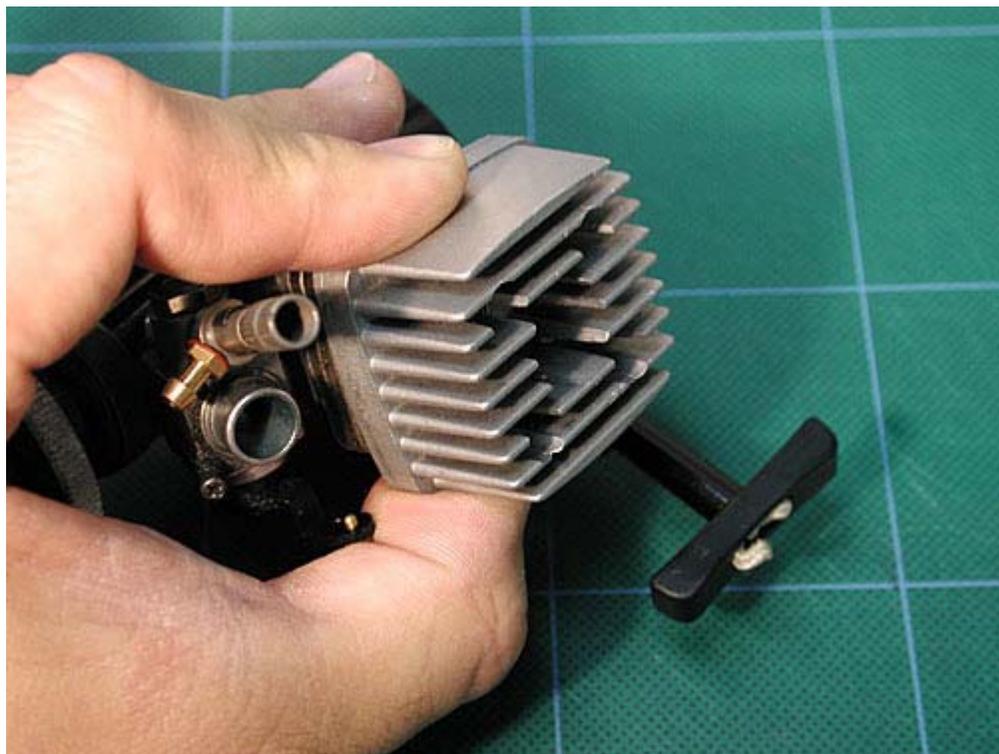
	<b>Nitro Star 15FE</b>	<b>Nitro Star 12E</b>	<b>Nitro Star 15SS/15SC</b>	<b>Nitro Star Pro 12R SC/RC Evolution II</b>
<b>Piston/Sleeve Set (required)</b>	#1716	#1708	#1653	#1953
<b>Head Shim/Gasket Set (required)</b>	#1663	#1713	#1663	#1913 (0.10 shim) #1914 (0.30 shim) #1929 Backplate gasket
<b>Head Screw Set</b>	#1662 (8 pcs)	#1662 (8 pcs)	#1662 (8 pcs)	#1910
<b>Connecting Rod</b>	#1710	#1710	#1655	#1918
<b>Wrist Pin</b>	#1717	#1709	#1656	#1915
<b>Wrist Pin Clip</b>	N/A	N/A	#1685	#1916
<b>Machined Flywheel</b>	A801	A801	A801	N/A
<b>Collet and Washer set (required w/ A801)</b>	A804	A804	A804	N/A
			<b>Nitro Star Pro 12R SC/RC</b>	<b>Nitro Star Pro 21R SC/RC</b>
<b>Piston/Sleeve Set (required)</b>			#1922	#1820
<b>Head Shim/Gasket Set (required)</b>			#1913 (0.10 shim) #1914 (0.30 shim) #1929 Backplate gasket	#1824 (0.10 shim) #1825 (0.15 shim) #1826 (0.20 shim) #1827 (0.25 shim) #1828 (0.30 shim)
<b>Head Screw Set</b>			#1910	#1822
<b>Connecting Rod</b>			#1918	#1833

<b>Wrist Pin</b>	#1915	#1830
<b>Wrist Pin Clip</b>	#1916	#1831
<b>Machined Flywheel</b>	N/A	N/A
<b>Collet and Washer set (required w/ A801)</b>	N/A	N/A

Once you have all the parts you need for the rebuild, you're ready to begin.

Check the type of screw holding the heatsink head on the engine case. The 15FE uses #2 Philips head screws; the Nitro Star Pro engines use flat head screws, other engines may use hex screws, make sure you have the correct size. It's very important to use the correct size screwdriver - #2 screws require the #2 screwdriver, NOT the #1 screwdriver. You will have a hard time removing the screws and possibly damage the screws if you use the wrong size screwdriver.

Please note that the engine used in this example is an HPI 15FE engine - *you may have a different type or brand of engine, but the process is still the same.* You will have to check the screws that need to be removed because the 15FE may use a different type of screw in a particular location than what your engine uses.

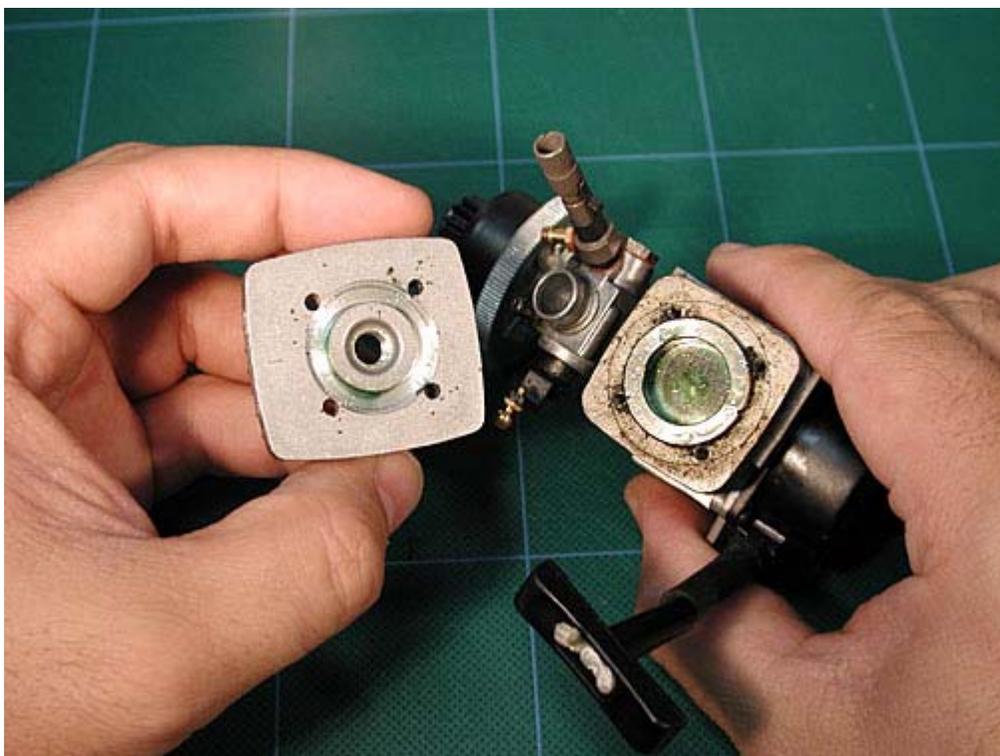


Remove the screws with the correct screwdriver or Allen wrench. Put the screws aside, either in a plastic or cardboard parts tub or another convenient location. If they roll off the table you'll have to waste time looking for them!





Now that you have the heat sink head off, set it aside also. Remember the way the fins faced so later on you won't have to reposition the head after you install it in your car or truck.



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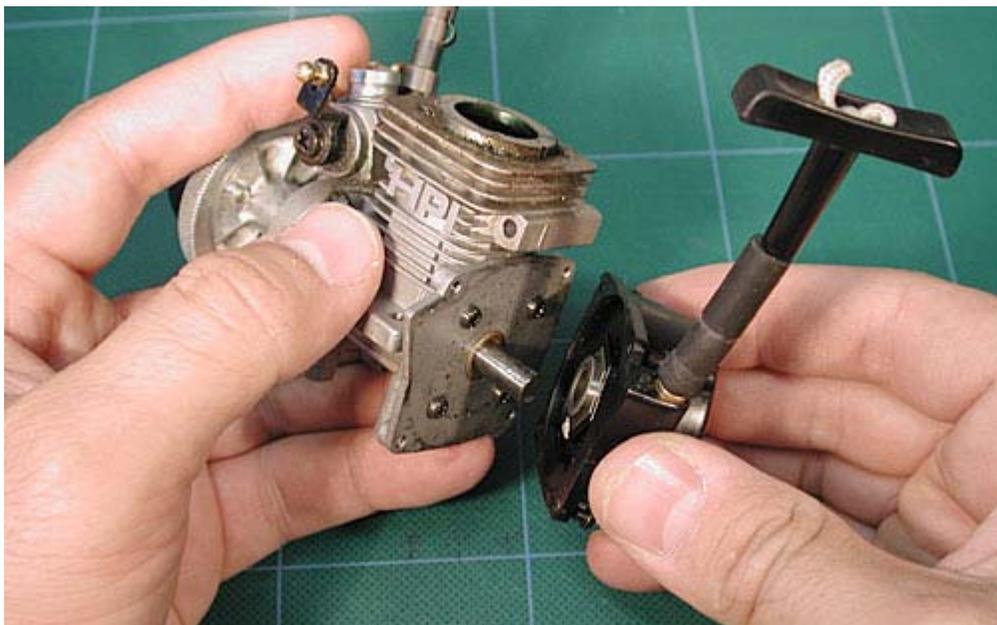
## Rebuild Your Engine

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Use the right screwdriver to take off the pullstarter. For the 15FE, a #2 screwdriver is needed for this. If your engine does not have a pullstarter, take off the backplate and skip the next couple of steps.

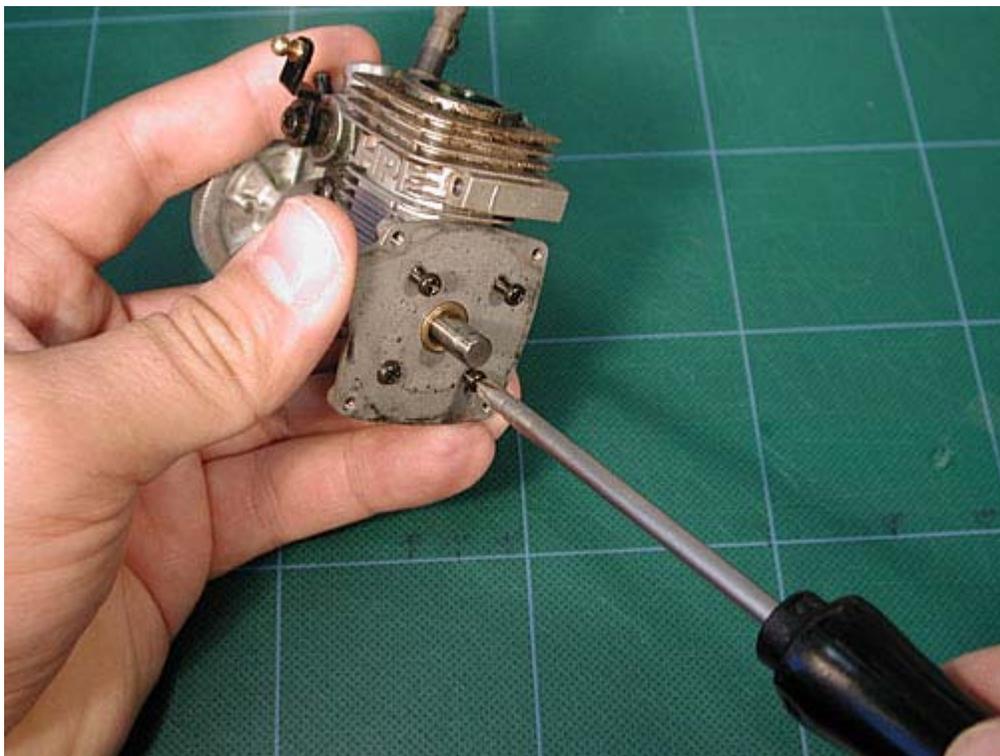


Pull off the pullstarter assembly carefully. A tightly wound spring-loaded mechanism is inside and if it is allowed to slide out the spring will need to be rewound. Use a finger as shown to hold the spring and its plastic housing in place. Be aware that a metal one-way bearing is also part of the pullstarter, it should stay in its place inside the pullstarter. Set the pullstarter assembly aside. If your work area is in a location where people can pick up or touch things on the table, wrap a rubber band or length of tape around the pullstarter.

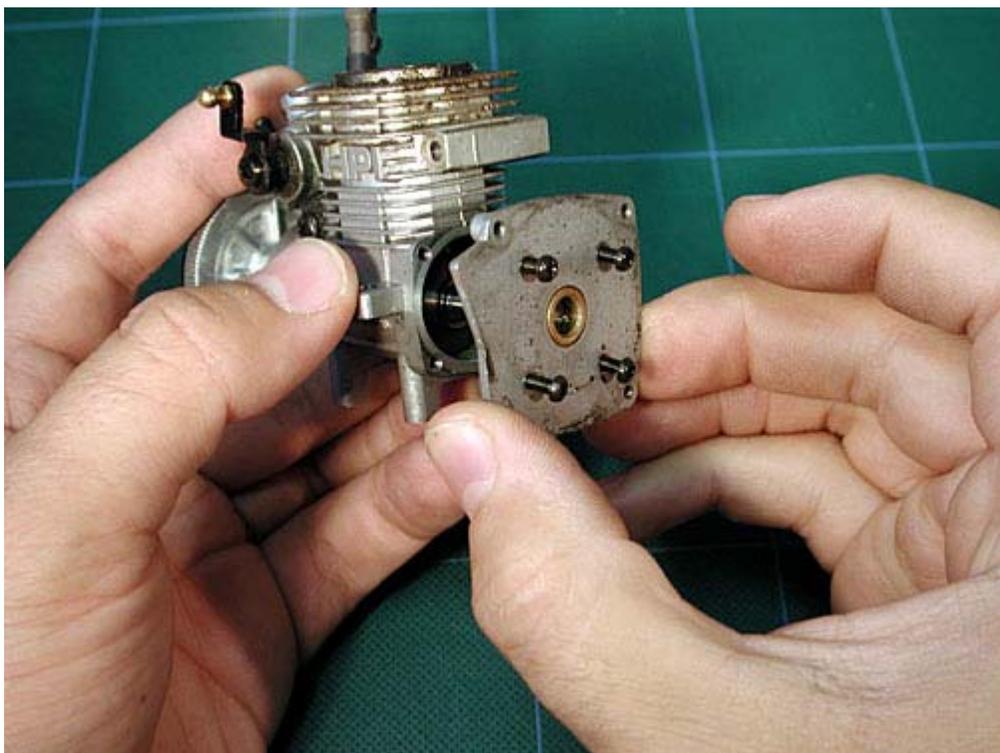




Take off the pullstarter plate off. For the 15FE, a #2 screwdriver is needed for this also.

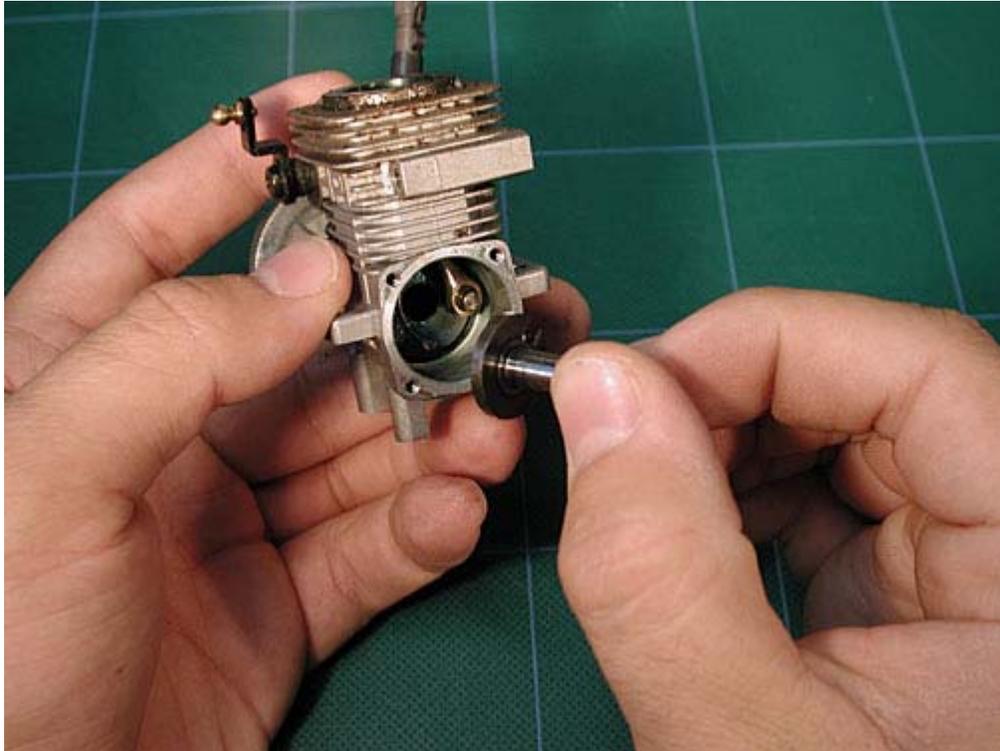


Remove the pullstarter plate and put it next to the engine head and pullstarter.



You will now have the interior of the engine exposed. Pullstarter-equipped engines will

have the pullstarter shaft lying loose in the engine interior. Take the shaft out and set it aside.



Use a pair of pliers to loosen the engine sleeve from the engine case.



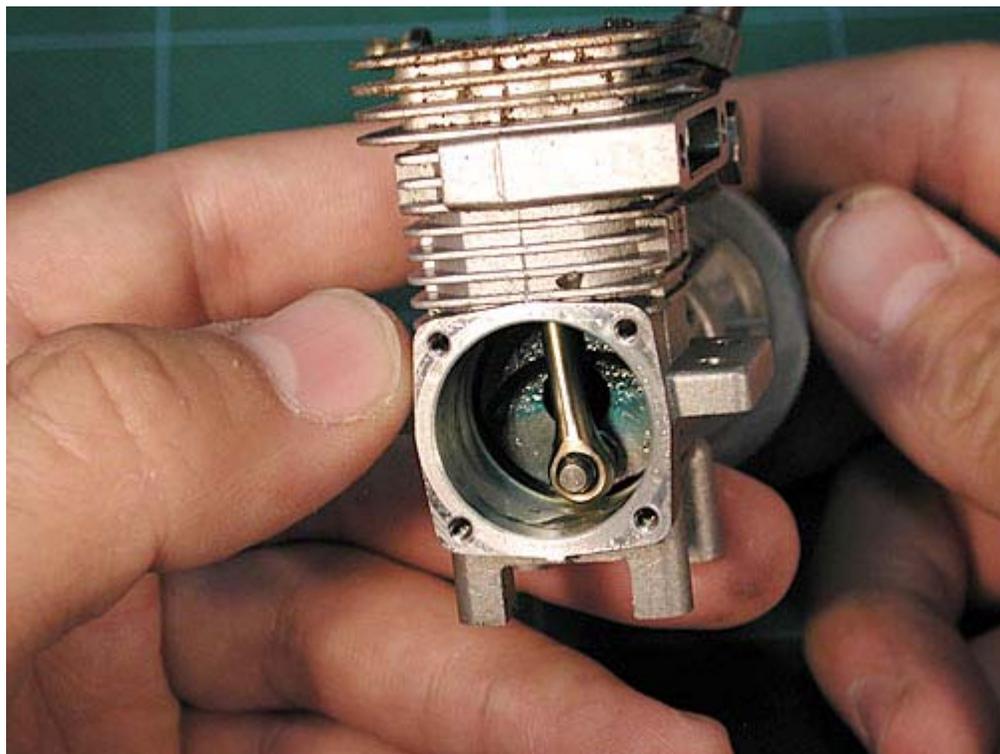
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Pull the sleeve out. You can safely toss it in the garbage.



Move the flywheel back and forth until the cam is at the bottom of the engine case, as shown.

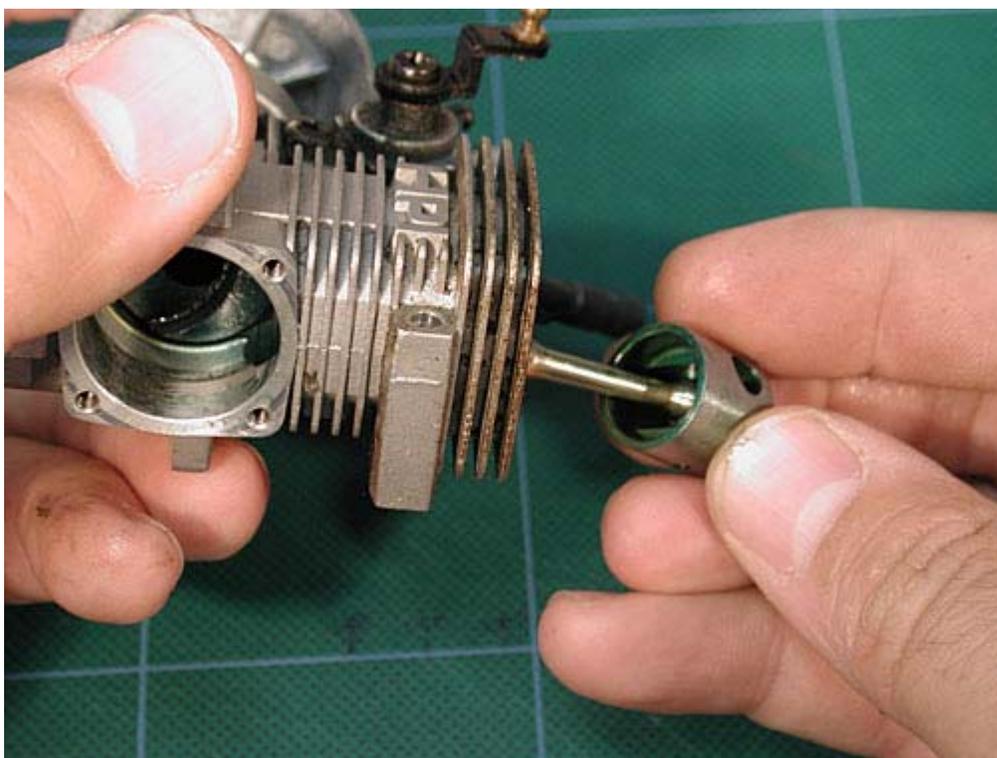


Use a pair of needlenose pliers to pull the bottom of the connecting rod off the cam. If you

are planning to replace the connecting rod (which you may want to do every 3rd time you rebuild the engine, or if it is discolored or damaged), don't worry about scratching the connecting rod. However, wrap the pliers in a rag if you will not be replacing the connecting rod.



Pull the piston and connecting rod out from the top of the engine case.



This is a good time to look at the piston and diagnose your engine, especially if you think the engine should have lasted longer.

If it has scratches on the side, dirt or other foreign debris got inside the engine and ruined it. Solution: Never run the engine without an air filter; use a better air filter that is made for the carburetor you have installed; use a nylon tie wrap to hold on the air filter. You should take off the crankshaft and inspect it for scratches also, it may need to be replaced.

If the sides of the piston are black, the engine was run too lean and overheated, destroying the piston and sleeve. Make sure you break in the new piston and sleeve at a rich setting (see the instructions for your engine) and always run the engine so that a plume of blue smoke is always present when it's in the car.

With the 15FE piston, you can shake out the wrist pin that holds the connecting rod to the piston. Some engines use a wrist pin clip that keeps the wrist pin in place. Use needlenose pliers to remove the clip. Be careful not to bend the clip too much.



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Get the new piston, the wrist pin and connecting rod and reverse the procedure you just did to remove the wrist pin. Put the thin end of the con rod into the piston.

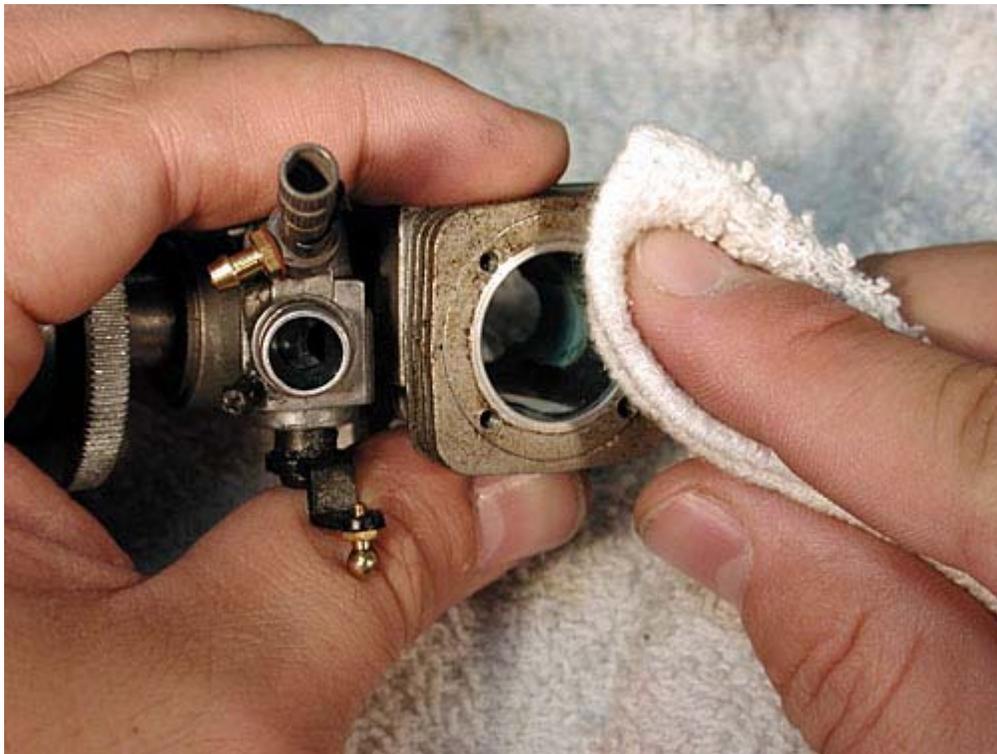


Notice that the 15FE wrist pin has white plastic on one end and is plain on the other end. The white plastic is Teflon; this end of the wrist pin should face to the outside of the piston. Now slide the wrist pin through the piston hole and through the con rod. Make sure the white end faces to the outside, as shown. If the engine you have uses wrist pin clips, make sure to attach those now.

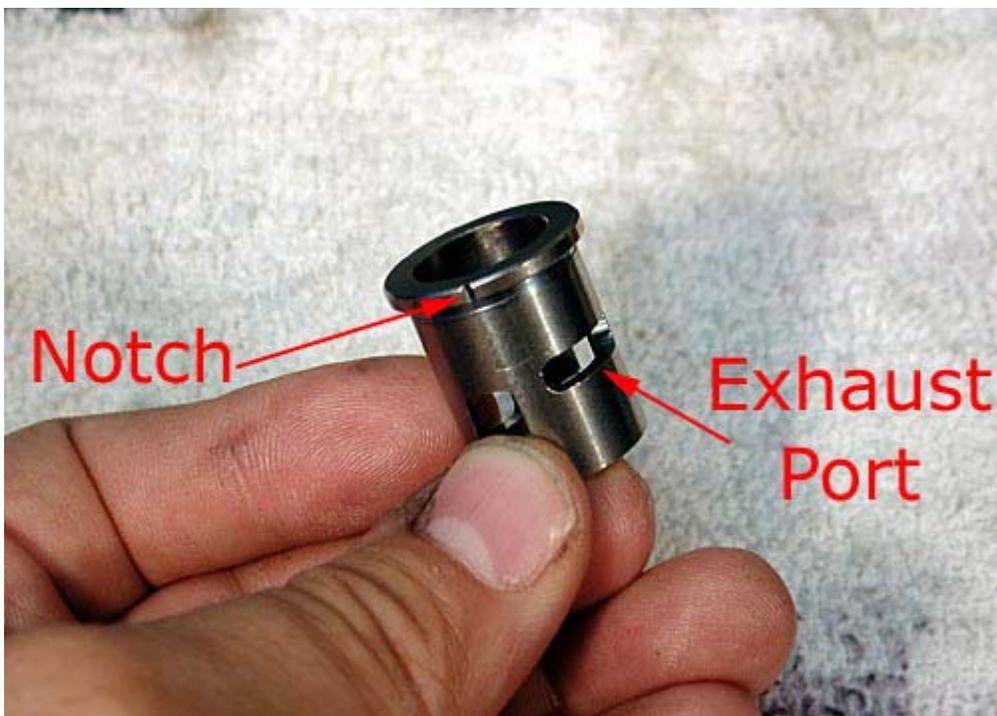




Set the piston/con rod assembly aside and clean the top of the engine case carefully. Using a rag or towel sprayed with Nitro Car Cleaner or another degreaser, wipe from the inside edge to the outside. This will help prevent dirt from falling into the engine case.



Now we will start the process of installing the new piston and sleeve into the engine case. HPI engines have a notch in the top of the sleeve. This notch must face to the rear of the engine (towards the pullstarter or back plate). Find this notch and insert the piston through the bottom of the sleeve.





In the picture below the notch in the sleeve faces directly away from the camera. Note that the large hole in the piston must NOT face the exhaust port. Some engines do not use pistons with a hole, however remember this example engine is the 15FE - this is the type of piston it must use.



Carefully insert the sleeve (with piston installed) partially into the engine case. Make sure the notch in the sleeve faces the rear of the engine case. Remember, the "front" of the engine is always the side with the flywheel, clutch, etc., and the "rear" of the engine is where the pullstarter or backplate sit.





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The con rod should be positioned similar to the picture below. If the piston was inserted as instructed above, you should not have to straighten the con rod.



Push the sleeve only partially into the engine case as shown below.



Use a pair of needlenose pliers to carefully position the con rod over the cam in the

crankshaft.



If the piston comes out of the bottom of the sleeve while you're positioning the con rod, don't worry. Use a hobby knife to gently push the piston into the sleeve again.



Push the sleeve all the way down into the case. Make sure the notch lines up with the seam of the case, again, facing to the rear of the engine.





Set the engine case aside. Get the engine head and pull out the head shim with a hobby knife.



Use Nitro Car Cleaner to spray away any dirt from the screw holes and bottom of the head.





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The bottom of the heat sink head should be pretty clean before installation.



Get the new head shim and gently lay it in place. If it was slightly bent in transit, it's okay, the pressure from the head will hold it flat in place.



Carefully install the head as shown below, so the head shim doesn't fall off the head.



Remember how the head was positioned on the engine.

If you will be installing the engine in a car that is belt-driven or most 2WD trucks, the picture below shows how the fins should probably face. If you are unsure which way the fins should face, see the instruction manual for your kit or the box or manual pictures that show your kit without the body installed and look for the direction of the fins.



If you will be installing the engine in a car or truck that is shaft-driven, the picture

below shows how the fins should probably face. If you are unsure which way the fins should face, see the instruction manual for your kit or the box or manual pictures that show your kit without the body installed and look for the direction of the fins.

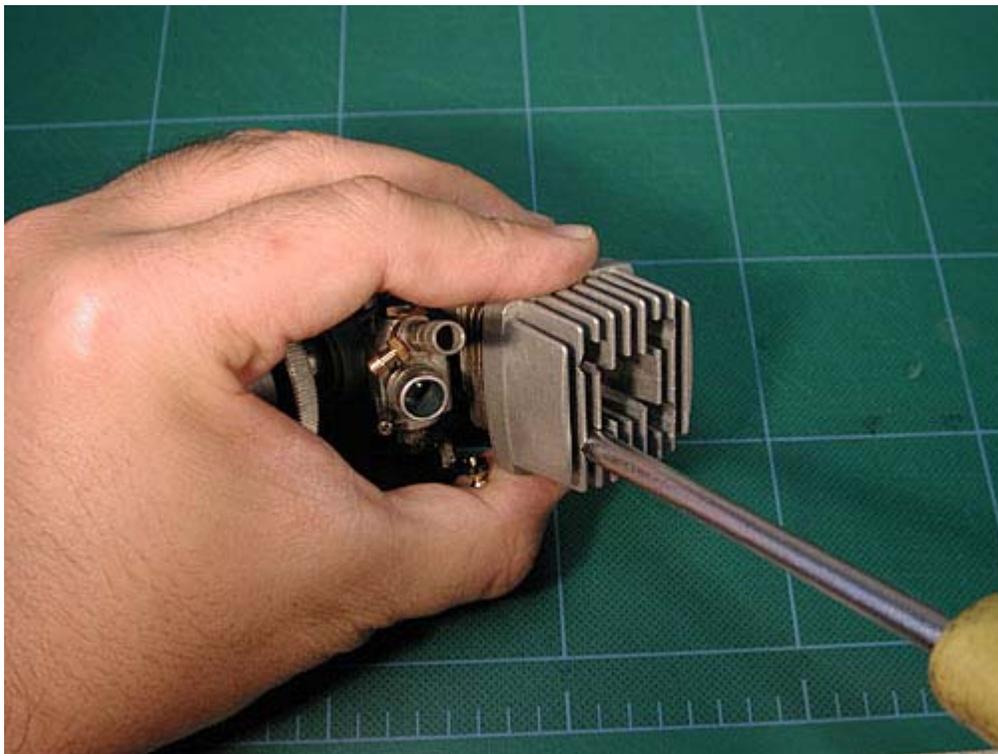


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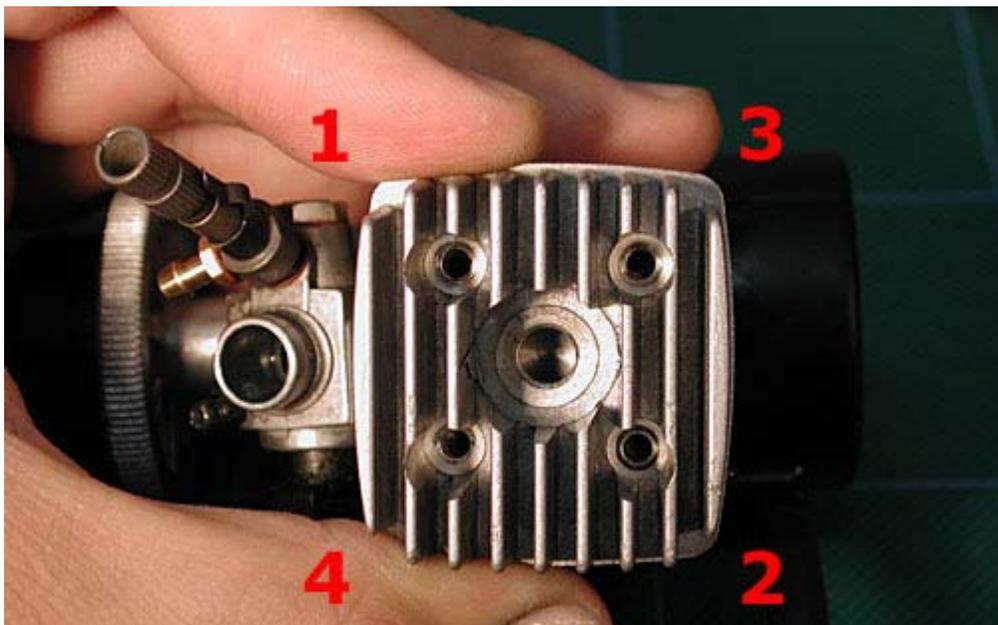
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Install the head screws to hold the head in place. When you start to feel resistance, STOP turning the screwdriver.

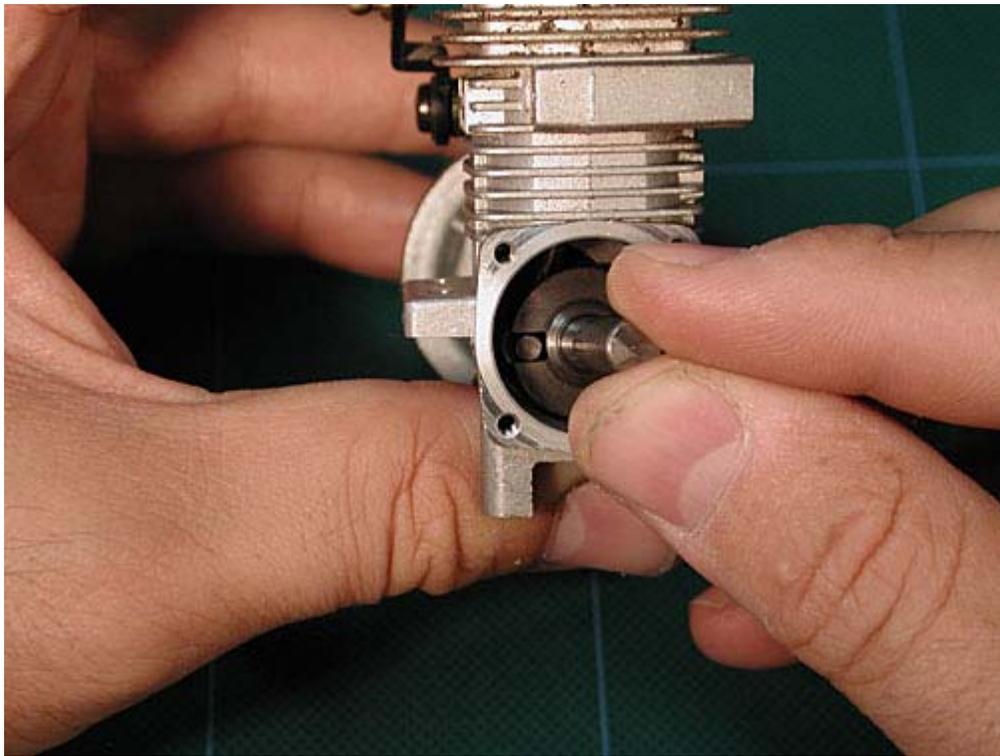


This is where you must use the "star" technique to finish tightening the screws. Use the picture below to guide you. You must NOT tighten the screws going clockwise or counterclockwise around the engine head. You MUST use the same technique that is used to tighten wheel nuts on a full-size car. In the example below, we start at the top left, then the bottom right screw, then top right, and finally bottom left. This makes sure that the pressure holding the head on is near equal for all the screws, and the head is on flat against the sleeve.

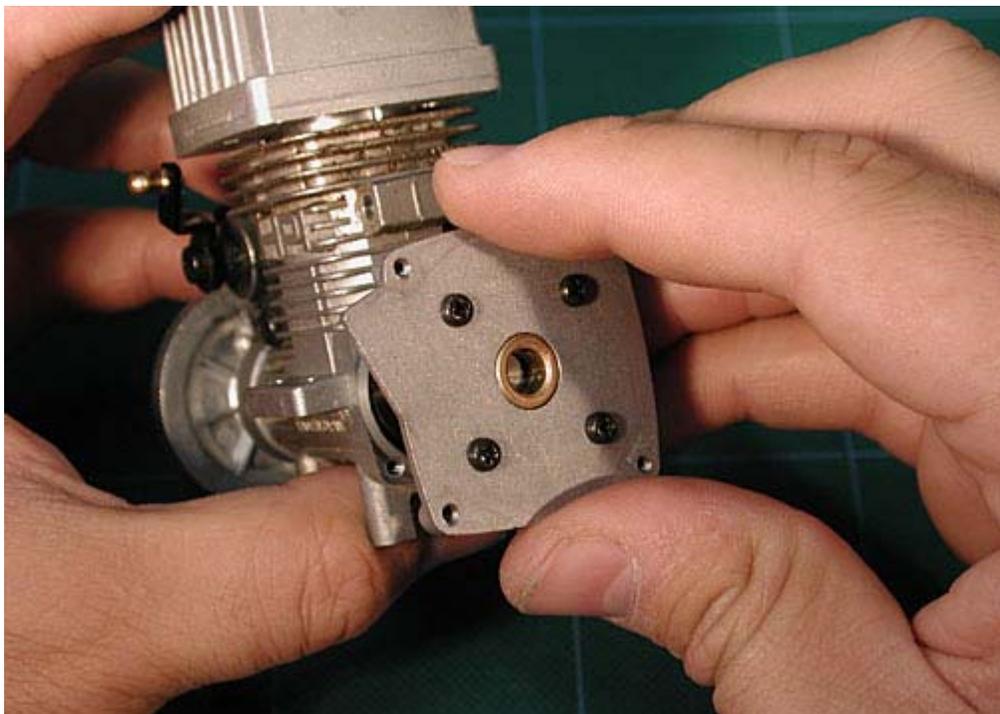




Install the pullstarter shaft.

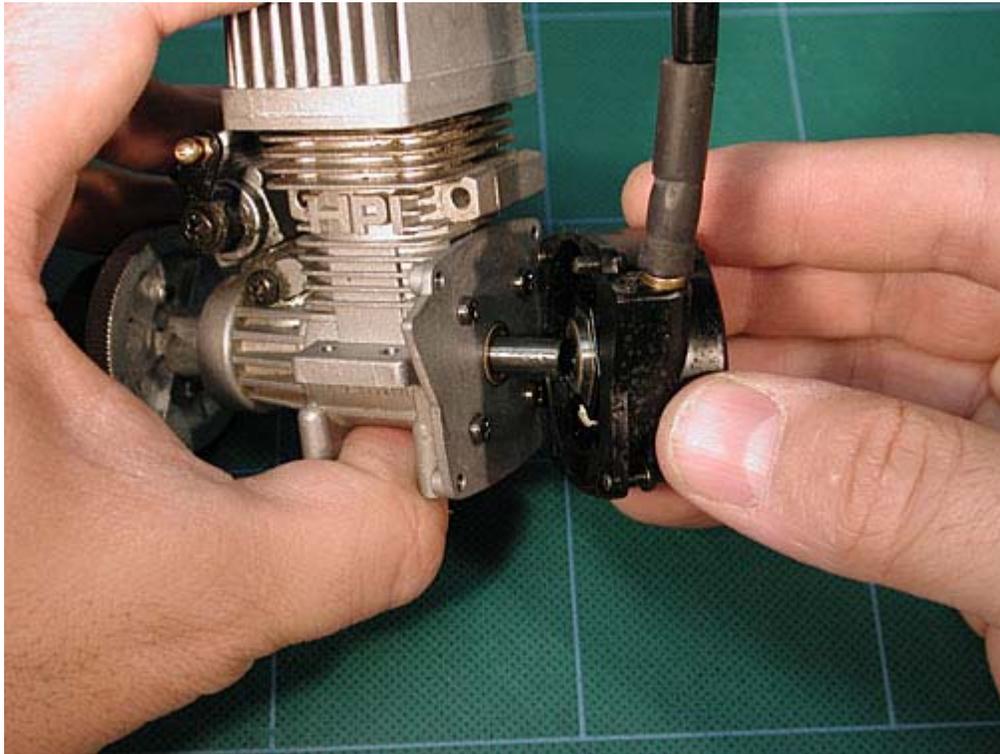


Install the pullstarter plate and tighten the screws. Use the "star" technique - it isn't absolutely necessary for the pullstarter, but get in the habit of using this technique on all parts on your engines. Because the head shim package for the 15FE includes a pullstart gasket, you can replace the gasket on the pullstarter plate if you wish.





Install the pullstarter and tighten the screws. Use the "star" technique - it isn't absolutely necessary for the pullstarter, but get in the habit of using this technique on all parts on your engines.



You're finished! Now you're able to competently rebuild any engine you may own in the future.



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