

WARNING

Serious personal-injury to the operator or bystanders, as well as damage to equipment or property, can occur, if all safety and assembly instructions, provided with this product, are not followed.

You **MUST** read, understand, and comply with all of the safety, assembly, and operating instructions in this manual, **BEFORE** you attempt to operate your chipper-shredder-vac.

Maintenance Instructions

Rotor Removal And Installation

Most situations, such as clearing jams or removing the chipper-knife, **do not** require removal of the rotor. Please refer to the instructions, for these situations, located elsewhere in this manual.

Under normal circumstances, it is only necessary to remove the rotor, if you are replacing the y-hammers or the rotor assembly. If you have a different situation, that you feel requires you to remove the rotor, contact Patriot Products, before proceeding; it can save you a lot of time and frustration.

Your Patriot Electric Chipper-Shredder-Vac (CSV) is designed to allow for it to be easily maintained by the average person. However, disassembling and, more importantly, reassembling the unit is a formidable undertaking that, if done hastily or carelessly, can render your machine inoperable or unsafe. Therefore, only disassemble your chipper-shredder if it is truly necessary; doing so, only if you are capable and willing, to reassemble it properly, per the instructions provided.

Tools – Required

The following tools are required specifically to properly complete the rotor removal and installation procedures for your unit:

[] Work-gloves

[] 5/8" combination-wrench

*Note: Completion of this procedure requires you to follow the **Outboard-Bearing and Fan-Housing Removal and Installation Procedures**. Please also refer to the required and recommended tools sections in the **Outboard-Bearing and Fan-Housing Removal and Installation Procedures**, prior to continuing.*

Always use the proper hand-tools, for assembly. Personal-injury can result through the use of the improper type-or-size of tool, as well as while using a worn-or-damaged tool, that may slip off of hardware being tightened.

In addition, improper tools may damage hardware, making it difficult or impossible to properly tighten the hardware. Finally, damaged hardware will discourage timely-and-proper maintenance, which could lead to serious personal-injury or property-damage.

Common examples of improper assembly tools are: adjustable open-end wrenches and toothed gripping-pliers.

Maintenance Instructions

Rotor Removal And Installation (continued)

Tools – Recommended

The following tools are recommended specifically to properly complete the rotor removal and installation procedures for your unit:

- [] Anti-seize compound, to coat the motor-shaft, before reassembly
- [] Patriot Electric Rotor-Removal Tool
- [] Oil or grease, a small amount, to apply to forcing bolt of rotor-removal tool, during rotor removal
- [] Wood board (or similar item), 2" x 2" x 36", to keep rotor from rotating, during rotor removal

Removal Procedure

1. Complete the **Outboard-Bearing & Fan-Housing Removal Procedure**, located elsewhere in this manual, to expose the rotor for removal.

WARNING: DO NOT proceed to the next step, without verifying that the chipper-knife has been removed from the rotor. Attempting to remove the rotor with the chipper-knife attached and fully exposed, unnecessarily exposes you to a severe laceration hazard.

2. *Note: The high torque, applied during the rotor-removal procedure, will rotate the rotor. To minimize the risk of personal injury, we highly recommend that you use an object, such as the recommended 2" x 2" x 36" wood board, to keep the rotor from turning.*

Place an object, such as a 2" x 2" x 36" wood board, see shaded object in illustration, down through the shredder-hopper. Wedge the object between the rotor's hub and one (1) of the y-hammer shafts. This will help prevent the rotor from turning, during the rest of the procedure.

WARNING

MOVING PARTS HAZARD

Serious personal-injury can occur, if you come into contact with the chipper-shredder's moving parts.

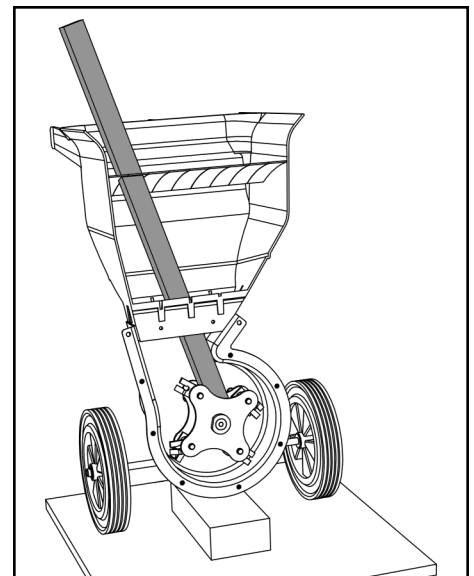
Turn off the motor, disconnect the electrical-cord, and wait for the rotor to come to a complete stop, before attempting to service the chipper-shredder.

WARNING

SEVERE LACERATION HAZARD

The chipper-knife is sharp, even if you think it's dull.

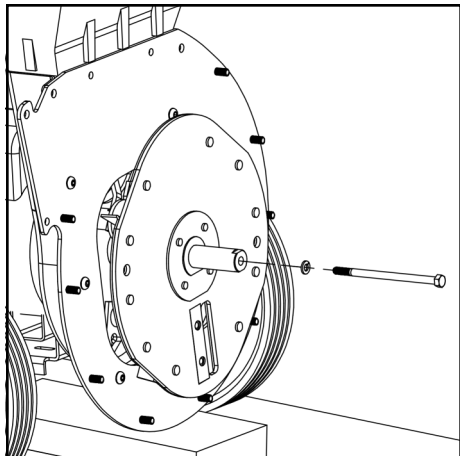
DO NOT proceed to step 2, if the chipper-knife was not removed, as specified during step 1. Accidentally contacting the sharpened-edge of the exposed chipper-knife, during the process of removing the rotor, can cause serious personal-injury.



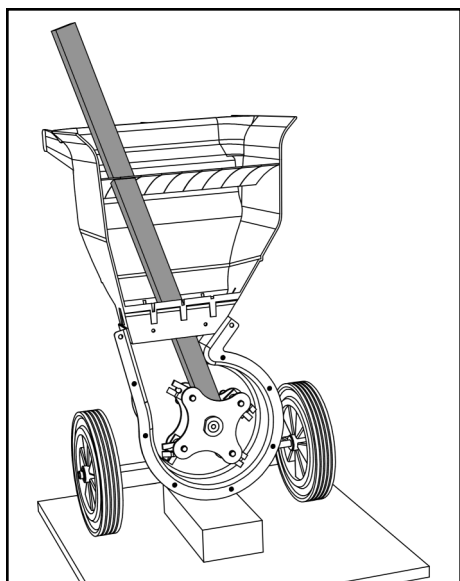
Maintenance Instructions

Rotor Removal And Installation (continued)

Removal Procedure (continued)



3. Using a 1/2" wrench, carefully remove the rotor-bolt from the exposed-end of the rotor-shaft, as shown. Set the bolt and corresponding lock washer aside, for reassembly later.



4. Now that the rotor-bolt has been removed, remove the object that was placed in step 2, see shaded object in illustration, to allow the rotor to now move. Set the object aside, for use later.

Maintenance Instructions

Rotor Removal And Installation (continued)

Removal Procedure (continued)

5. At this point, you are ready to start to remove the rotor.

Note: Since there are only a few thousandths-of-an-inch clearance, between the motor-shaft and the inside of the rotor, you need to provide a smooth, even, pull on the rotor. Pulling significantly more on one side of the rotor will cause the rotor to bind against the motor-shaft.

Note: Due to the tight tolerances and large amount of surface contact between the motor-shaft and the inside of the rotor, it can take a fair amount of effort to move the rotor. Factors such as how long it's been since the rotor was last removed, the humidity where you live, and the moisture content of the material you process can all contribute to surface corrosion, between the motor-shaft and rotor.

CAUTION: DO NOT attempt to PRY the rotor off of the motor-shaft. This will most likely only damage parts and make the situation worse.

With a little patience and effort, you can theoretically begin to pull the rotor off of the motor-shaft. The motor has a straight shaft with a keyway, so it truly takes just a straight pull.

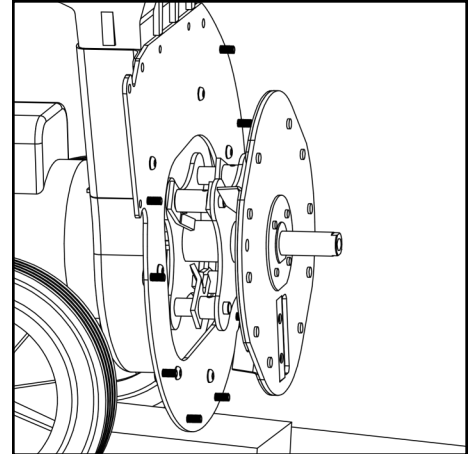
In the steps that follow, we have provided an alternative method for pulling the rotor off of the motor-shaft.

Optional Removal Procedure

Removal Using Patriot Rotor-Removal Tool

Patriot has made every effort to design its products to be easily maintained, by the average homeowner, using common tools. That being said, there are occasions when a specialty tool is beneficial; while a small investment, such tools can reduce the effort, frustration, and time required to complete a task.

One such occasion is specifically pulling the rotor off of the motor-shaft. It is simple in theory, but in practice, people struggle with applying a smooth, even pull. It's especially difficult when you're already frustrated or in a hurry.



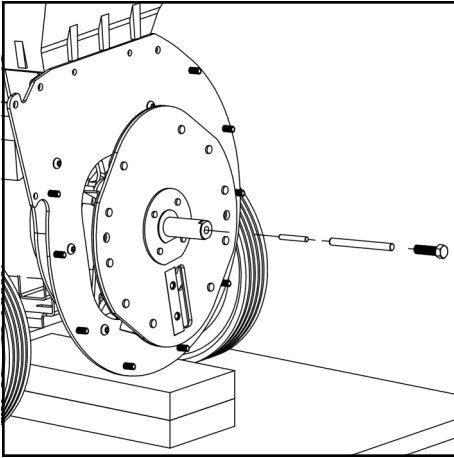
Maintenance Instructions

Rotor Removal And Installation (continued)

Optional Removal Procedure (continued)

Patriot originally developed the Patriot Rotor-Removal Tool for our own convenience, in case we needed to disassemble a unit. We have since made several minor improvements, to make it more user-friendly. The just-of-it is that, the Patriot Rotor-Removal Tool gives you a quick, simple, way to apply the smooth, even, pull, required to remove the rotor from the motor-shaft.

The steps that follow depict how to use the Patriot Rotor-Removal Tool. The parts described are provided, if you purchase the Patriot Rotor-Removal Tool.

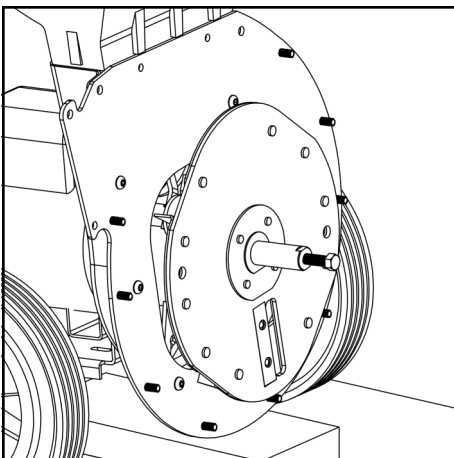


6. Gently insert the main Rotor-Removal Tool components in the following order:

- a. 1/4" diameter x 1 3/4" dowel, rounded end first
- b. 3/8" diameter x 4" dowel, rounded end first
- c. 7/16" x 1 1/2" forcing bolt

Note: The 3/8" diameter x 1" dowel, provided, is not used in this step.

Note: For this step, just barely start to thread the forcing-bolt, into the end of the rotor-shaft; it should turn very easily.



7. Apply a small amount of lubricant to the threads of the forcing bolt and hand tighten. It should turn very easily, until only approximately 1" of threads remain exposed, as shown.

Note: For this step, the forcing-bolt should only be hand tightened. This allows the two (2) dowels, inserted in step 6, to properly position themselves, without damaging the threads in the motor-shaft or rotor-shaft. Also, you want to make sure there is plenty of thread engagement, before you apply any significant torque to the forcing bolt, this will prevent stripping the threads out of the end of the rotor-shaft.

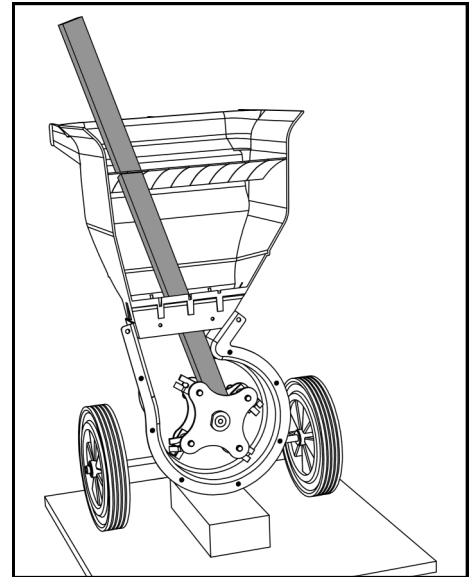
Maintenance Instructions

Rotor Removal And Installation (continued)

Optional Removal Procedure (continued)

8. *Note: The high torque, applied during the optional rotor-removal procedure, will rotate the rotor. To minimize the risk of personal injury, we highly recommend that you use an object, such as the recommended 2" x 2" x 36" wood board, to keep the rotor from turning.*

Place an object, such as a 2" x 2" x 36" wood board, see shaded object in illustration, down through the shredder-hopper. Wedge the object between the rotor's hub and one (1) of the y-hammer shafts. This will help prevent the rotor from turning, during the rest of the procedure.



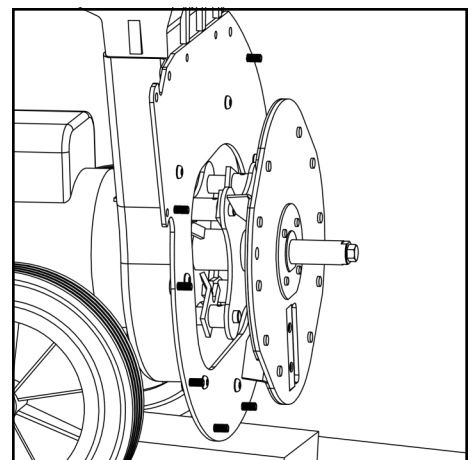
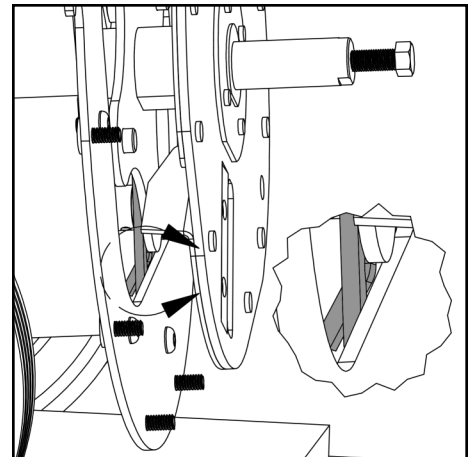
9. Using a 5/8" wrench, slowly begin to tighten the forcing bolt.

Note: When the rotor begins to move, remove the object that was placed in step 8. You will need to watch to see that the y-hammers do not get caught against the center plate. Refer to the shaded areas in the illustration. The next couple of steps describe how to address this situation, to prevent damage to the chipper-shredder.

*Note: **DO NOT** apply a torque in excess of 27 ft-lbs to the forcing bolt. If you're applying this much torque and the rotor is not moving, there is most likely some sort of interference. If you cannot find the interference, contact Patriot at 1-800-798-2447, before proceeding.*

10. If a y-hammer is going to catch on the center-plate, stop turning the forcing bolt and rotate the y-hammer out of the way, as depicted in the illustration. Once you are certain that the y-hammers are clear of the center-plate, continue to remove the rotor, by turning the forcing bolt with the 5/8" wrench. After about an inch of travel, the head of the forcing bolt will be touching the top of the rotor-shaft, as shown. The rotor should be freed up; enough so, that you can pull it off by hand. If this is not the case, make sure that you do not have a y-hammer caught on the center-plate or some other interference. If no interference is found, proceed to the next step.

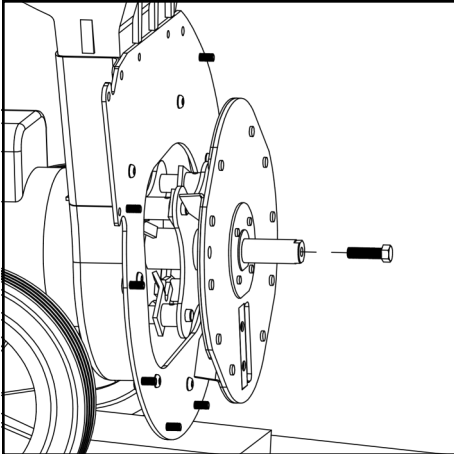
Note: You can cause irreparable damage to the chipper-shredder, including bending the motor-shaft, if you tighten the forcing bolt while there is interference, between a y-hammer and the center-plate. For best results, be patient and attentive, when tightening the forcing bolt.



Maintenance Instructions

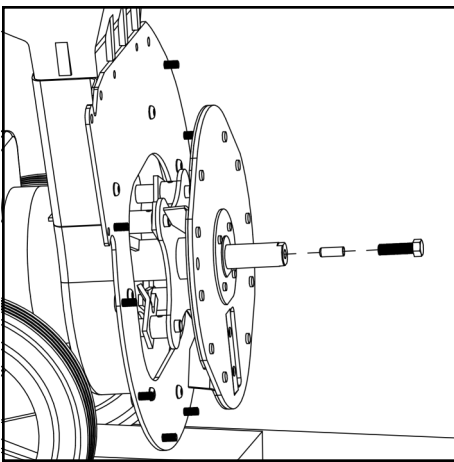
Rotor Removal And Installation (continued)

Optional Removal Procedure (continued)



11. If you were able to pull the rotor off by hand, in the previous step, jump ahead to step 15. Otherwise, use a 5/8" wrench to remove the forcing bolt from the rotor-shaft, as shown.

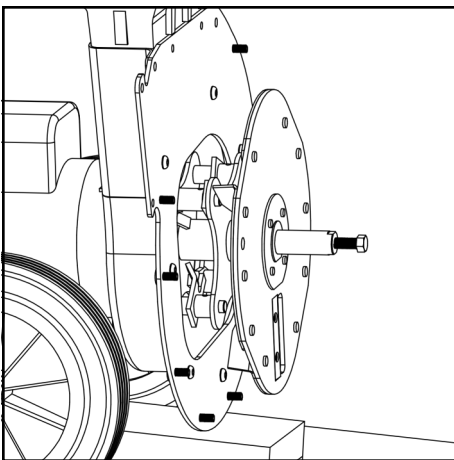
Note: For the same reasons you are using this optional removal procedure, there still may be enough resistance between the motor-shaft and the inside of the rotor, that you'll need to continue to use the forcing bolt to remove the rotor.



12. Gently insert the final Rotor-Removal Tool components in the following order:

- 3/8" diameter x 1" dowel, rounded end first
- 7/16" x 1 1/2" forcing bolt

Note: For this step, just barely start to thread the forcing-bolt, into the end of the rotor-shaft. It should turn very easily.



13. Apply a small amount of lubricant to the threads of the forcing bolt and hand tighten. It should turn very easily, until only approximately 1" of threads remain exposed, as shown.

Note: For this step, the forcing-bolt should only be hand tightened. This allows the three (3) dowels, inserted previously, to properly position themselves, without damaging the threads in the motor-shaft or rotor-shaft. Also, you want to make sure there is plenty of thread engagement, before you apply any significant torque to the forcing bolt, this will prevent stripping the threads out of the end of the rotor-shaft.

Maintenance Instructions

Rotor Removal And Installation (continued)

Optional Removal Procedure (continued)

14. Using a 5/8" wrench, slowly begin to tighten the forcing bolt.

Note: As before, when the rotor begins to move, you will need to watch to see that the y-hammers do not get caught against the center plate.

*Note: **DO NOT** apply a torque in excess of 27 ft-lbs to the forcing bolt. If you're applying this much torque and the rotor is not moving, there is most likely some sort of interference. If you cannot find the interference, contact Patriot at 1-800-798-2447, before proceeding.*

As before, if a y-hammer is going to catch on the center-plate, stop turning the forcing bolt and rotate the y-hammer out of the way, as depicted in the illustration. Once you are certain that the y-hammers are clear of the center-plate, support the rotor before continuing.

Note: The rotor weighs roughly 15 pounds and will ruin your day if it falls on your hand or foot!

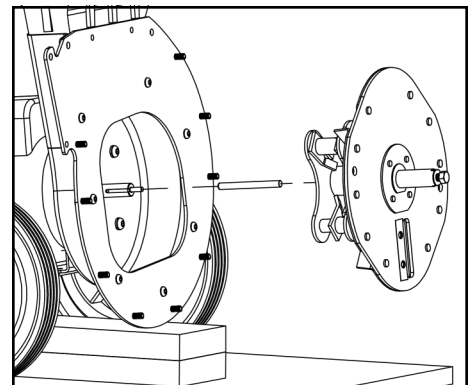
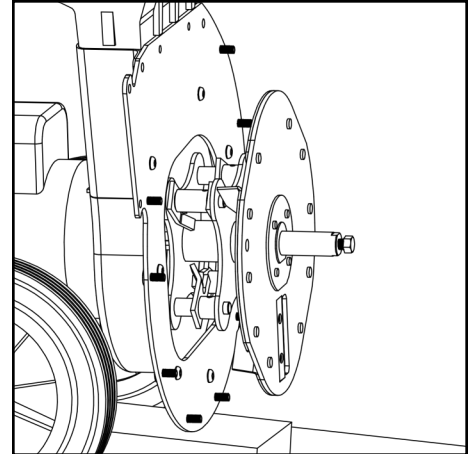
Continue to remove the rotor by turning the forcing bolt with the 5/8" wrench. After about 1/2" of travel, be prepared for the rotor to come off of the motor-shaft just before the head of the forcing bolt touches the end of the rotor-shaft, as shown.

Note: You can cause irreparable damage to the chipper-shredder, including bending the motor-shaft, if you tighten the forcing bolt while there is interference between a y-hammer and the center-plate. For best results, be patient and attentive, when tightening the forcing bolt.

15. Once the rotor has been removed, use the 5/8" wrench to remove the forcing bolt from the end of the rotor-shaft and immediately locate the following four (4) items:

- a. 1/4" diameter x 1 3/4" dowel (may still be in motor-shaft)
- b. 3/8" diameter x 4" dowel
- c. 3/8" diameter x 1" dowel
- d. 7/16" x 1 1/2" forcing bolt

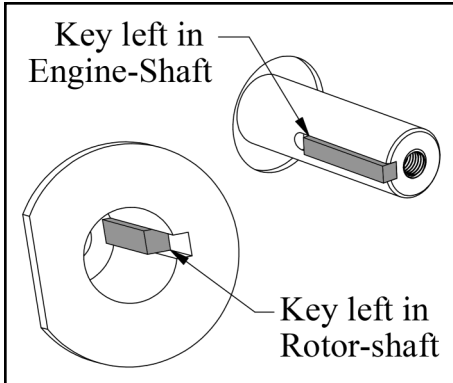
Take a moment to store these four (4) components somewhere, for future use. Also, set the rotor aside.



Maintenance Instructions

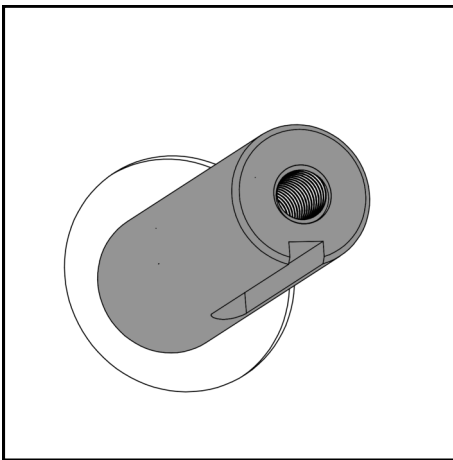
Rotor Removal And Installation (continued)

Optional Removal Procedure (continued)



16. Before you move on to other tasks, it will be beneficial to locate the rectangular key, that prevents the rotor from spinning, relative to the motor-shaft, see grayed objects in illustration. The key measures $\frac{3}{16}$ " x $\frac{3}{16}$ " x $1 \frac{1}{4}$ ". As indicated in the illustration, after the rotor was removed, the key typically is stuck in the keyway of either the motor-shaft or rotor-hub. So you don't accidentally lose it, locate and remove the key. Place the key with the rotor-bolt and lock washer, removed in step 3, for reassembly later.

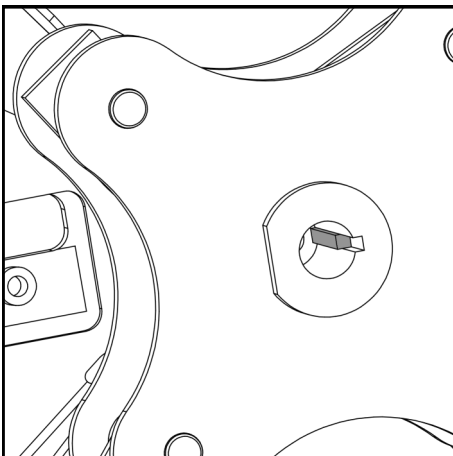
Installation Procedure



1. Before you attempt to install the rotor, it is very important to make sure that the motor-shaft, see the grayed surfaces in the illustration for location, is clean and smooth.

Note: There are only a few thousandths-of-an-inch clearance, between the motor-shaft and the inside of the rotor. Therefore, scratches or nicks in the shaft's surface, as well as debris or rust on the shaft's surface, will make the rotor difficult to install.

Use a fine sand-paper, 240-grit or finer, to clean up the exposed-end of the rotor-shaft. Wipe off the motor-shaft, then manually rotate the shaft, so that the keyway faces down, as shown. Apply a thin coating of anti-seize compound to the shaft. The anti-seize compound will make it easier for the rotor to slide onto the shaft and help facilitate future rotor removal.



2. Insert the rectangular key, from Rotor Removal Procedure step 16, into the keyway of the rotor. Push the key as far into the rotor as possible, as depicted by the grayed surface in the illustration.

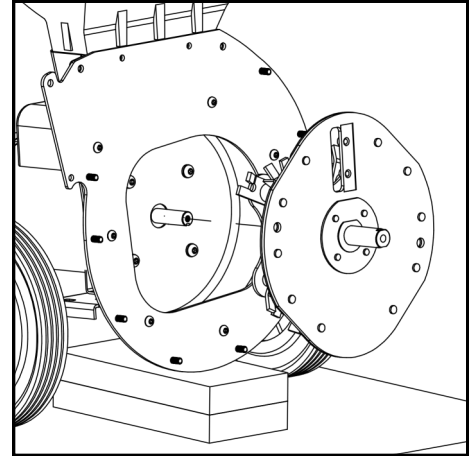
Note: Making sure you push the key in as far as possible, makes reassembly a much easier task.

Maintenance Instructions

Rotor Removal And Installation (continued)

Installation Procedure (continued)

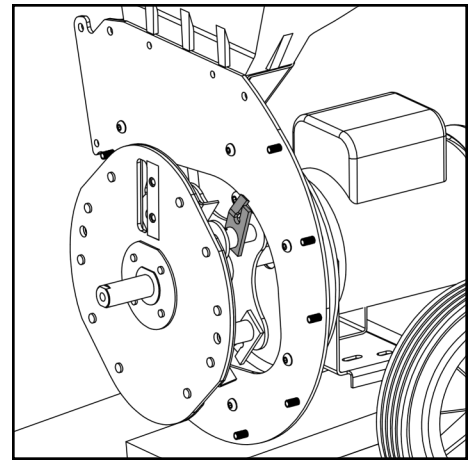
3. Orient the rotor and align it with the motor-shaft, as shown. This orientation has the keyway in the rotor facing down, just like the keyway in the motor-shaft.



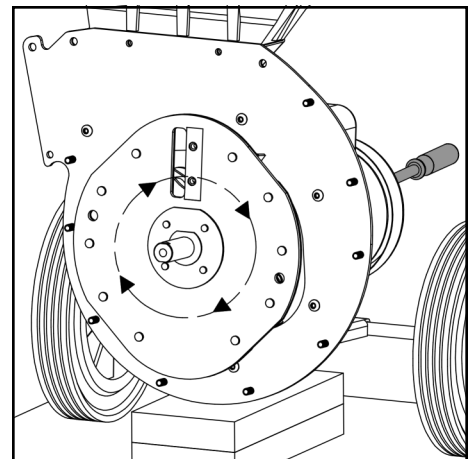
4. Attempt to get the rotor started onto the end of the motor-shaft.

Note: As with the rotor removal procedure, you will need to watch to see that the y-hammers do not get caught against the center plate; refer to the grayed areas in the illustration.

If a y-hammer is going to catch on the center-plate, as depicted in the illustration, rotate the y-hammer out of the way. Once you are certain that the y-hammers are clear of the center-plate, continue to push the rotor onto the motor-shaft. After about 3/4" of travel, the rotor is likely to stop moving, because the end of the motor-shaft will hit the key you placed inside of the rotor. This is perfectly normal because the keyways in the rotor and motor-shaft are not currently aligned. The next step addresses this situation.



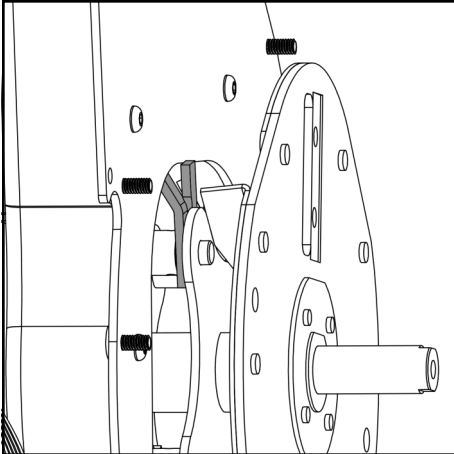
5. To align the keyways in the rotor and motor-shaft, insert a small screwdriver, refer to the grayed object in the illustration, through the louvered cover on the back of the motor until it contacts the motor's cooling fan. Hold the screwdriver steady and slowly rotate the rotor, until you feel the key in the rotor catch the keyway in the motor-shaft. Once this happens, you can continue to slowly push the rotor onto the motor-shaft.



Maintenance Instructions

Rotor Removal And Installation (continued)

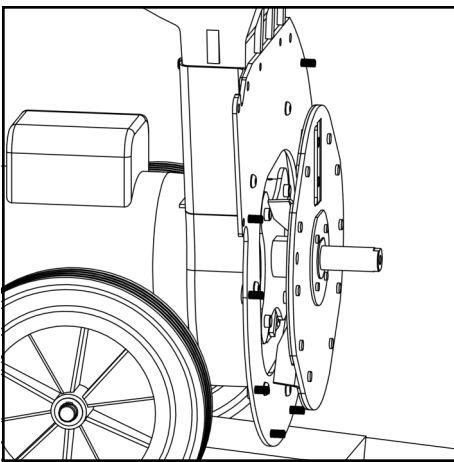
Installation Procedure (continued)



6. Attempt to finish pushing the rotor onto the motor-shaft.

Note: As with mentioned earlier, you will need to watch to see that the y-hammers do not get caught, against the center plate. Refer to the shaded areas in the illustration.

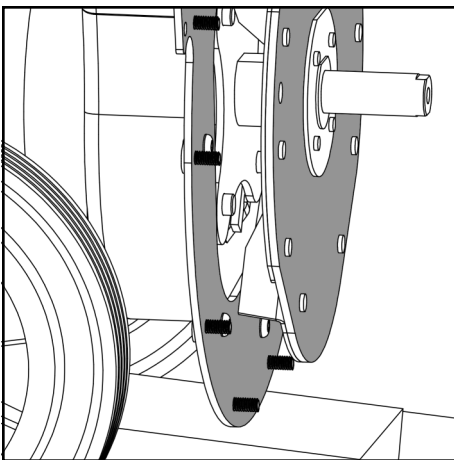
If a y-hammer is going to catch on the center-plate, as depicted in the illustration, rotate the y-hammer out of the way. Once you are certain that the y-hammers are clear of the center-plate, continue to push the rotor onto the motor-shaft. When you have pressed the rotor onto the motor-shaft as far as possible and there are no interferences, proceed to the next step.



7. The illustration depicts the rotor fully seated on the motor-shaft.

Note: You should be able to manually rotate the rotor in a complete circle, without any interferences. If any interferences are encountered, repeat step 6.

Once you can manually rotate the rotor one complete revolution and there are no interferences, proceed to the next step.



8. Another quick check to see that the rotor is fully seated on the motor-shaft is to measure the distance from the face of the center-plate to the face of the rotor-plate. Refer to grayed surfaces in the illustration.

Note: Don't overthink this step and think you've found a problem where one doesn't exist. This is just a quick reference measurement to reassure you you're ready for the next step.

If you're measurement is $1 \frac{5}{8}$ " or just under, proceed to the next step. If you're measurement is $1 \frac{11}{16}$ " or greater, recheck Rotor Installation Procedure steps 1 through 7 to see if you can find the problem. If you've retraced your steps and you're measurement is still $1 \frac{11}{16}$ " or greater, contact Patriot at 1-800-798-2447, before proceeding.

Maintenance Instructions

Rotor Removal And Installation (continued)

Installation Procedure (continued)

9. Install the rotor-bolt and lock washer into the rotor-shaft, until they contact the motor shaft. Begin to tighten the rotor-bolt by hand to make sure it is properly threaded into the end of the motor shaft. Continue to hand tighten the rotor-bolt until the lock washer is in contact with both the head of the bolt and the end of the rotor-shaft.

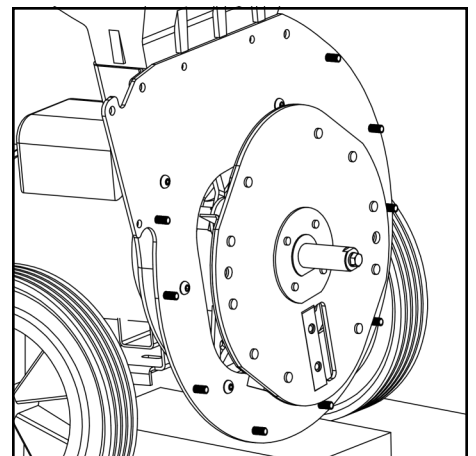
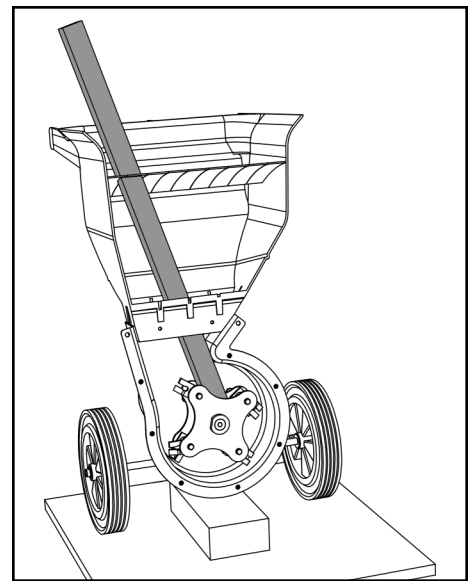
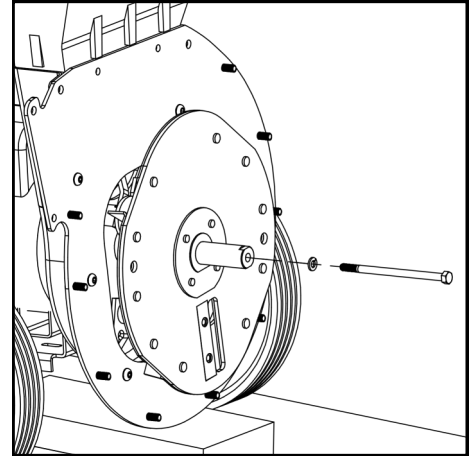
Note: Failure to properly thread the rotor-bolt into the end of the motor shaft can cause irreparable damage to the threads in the motor shaft.

10. *Note: The high torque, applied during the rotor-installation procedure, will rotate the rotor. To minimize the risk of personal injury, we highly recommend that you use an object, such as the recommended 2" x 2" x 36" wood board, to keep the rotor from turning.*

Place an object, such as a 2" x 2" x 36" wood board, see shaded object in illustration, down through the shredder-hopper. Wedge the object between the rotor's hub and one (1) of the y-hammer shafts. This will help prevent the rotor from turning, during the rest of the procedure.

11. Securely tighten the rotor-bolt using a 1/2" wrench.

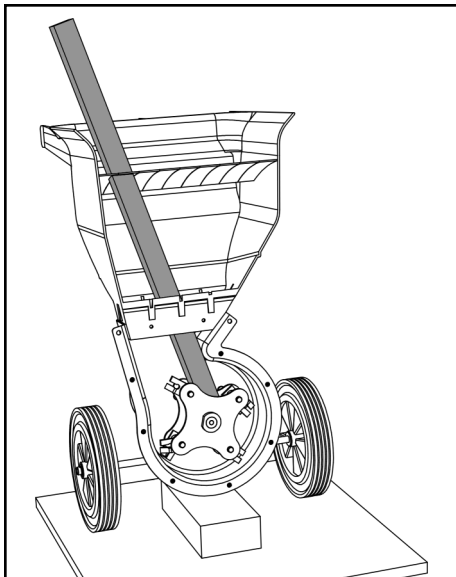
Recommended torque: 25 - 27 ft-lb



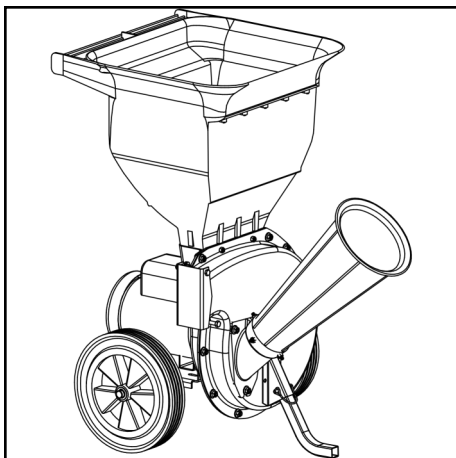
Maintenance Instructions

Rotor Removal And Installation (continued)

Installation Procedure (continued)



12. Now that the rotor-bolt has been securely tightened, remove the object that was placed in step 10, see shaded object in illustration. Set the object aside, for future use.



13. Please follow the **Outboard-Bearing & Fan-Housing Installation Procedure**, located elsewhere in this manual, .
14. **CONGRATULATIONS! You have completed the reassembly of your Patriot chipper-shredder.**