

## **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**

### **Outboard-Bearing & Fan-Housing Removal And Installation**

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

Under normal circumstances, it is only necessary to disassemble the chipper-shredder, 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 outboard-bearing and fan-housing, 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 to properly complete the maintenance of your unit:

[ ] 7/16” combination-wrench

[ ] 1/8” Allen-wrench

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

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Tools – Recommended

The following tools are recommended to properly complete the maintenance of your unit:

- [ ] 7/16" socket for torque-wrench
- [ ] Sand-paper, 240-grit, to clean-up the exposed-end of rotor-shaft
- [ ] Oil or grease, a small amount, to lubricate exposed-end of rotor-shaft, during bearing removal and installation
- [ ] Wood-blocks, 2 pieces, 2" x 6" x 12" long, to support the unit
- [ ] Patriot Bearing-Removal Tool

#### Removal Procedure

1. Identify a ground-level work-area, where the chipper-shredder can be handled comfortably. The area should have a hard level-surface.
2. For your safety, please follow the **Chipper-Knife Removal Procedure**, before continuing with the **Outboard-Bearing & Fan-Housing Removal Procedure**.
3. Using a 1/2" wrench, remove the leftmost nut, from the end, of each of the bolts, located above and below the discharge-opening, as shown.

*Note: The discharge-deflector is shown raised, to better clarify the removal process; the deflector can hang down during removal, if that is easier.*

Remove the bag-bolt and nut, located below the discharge-opening, as shown.

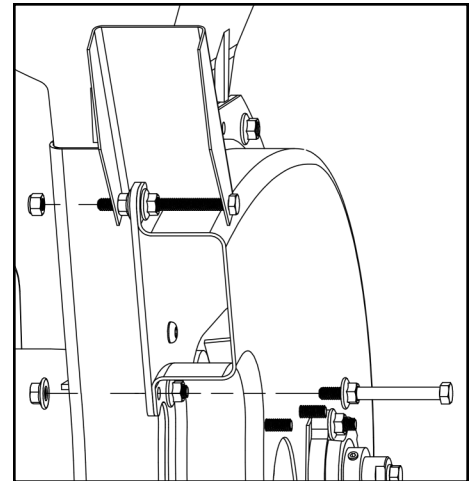
*Note: This bolt may be loose, in which case, it can just be pulled out; otherwise, you may need to use the 1/2" wrench to turn the bolt out. It is strictly a matter of how well the holes in the center-plate and fan-housing happened to be aligned, when they were last assembled.*

### WARNING

#### MOVING PARTS HAZARD

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

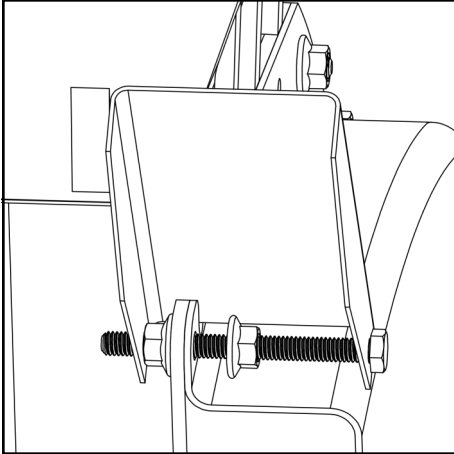
Turn off the motor, disconnect the electrical-cord, and wait for the rotor to come to a complete stop, before attempting to service the chipper-shredder.



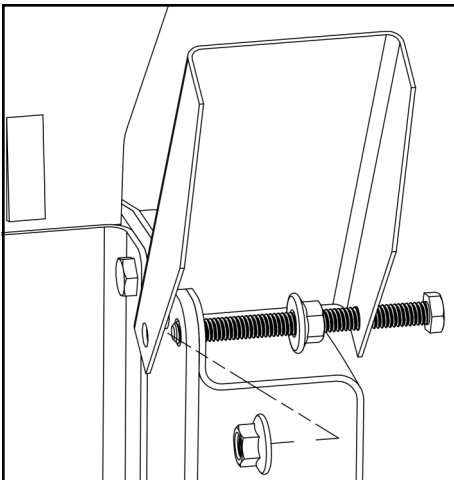
## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

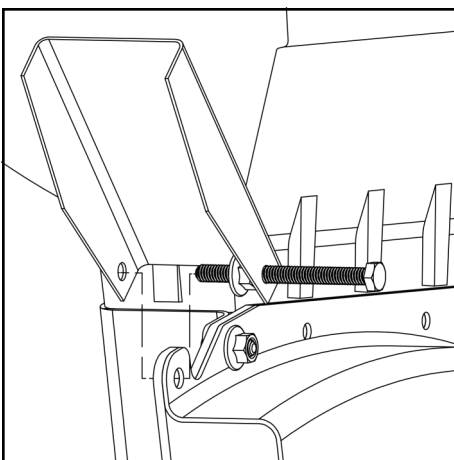
#### Removal Procedure (continued)



4. Using a 1/2" wrench, loosen the rightmost serrated flange-nut, as shown.



5. Remove the leftmost serrated flange-nut, by holding it against the centerplate and turning the bolt, until the bolt separates from the nut, as shown. Set the serrated flange-nut aside, with the nylon-insert lock-nut, for reassembly later.



6. Pull the bolt out of the hole, in both the centerplate and fan-housing, as shown. Set the discharge-deflector assembly aside, with the corresponding nuts, for reassembly later.

## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Removal Procedure (continued)

7. Use a pick (or similar tool) to thoroughly clean-out the center, see the grayed surface in the illustration for location, of both of the hopper-screws, located on the inside of the hopper, protruding through the fan-housing.

*We cannot emphasize enough that, this is the most important step in ensuring successful removal and reinstallation of the hopper-screws.*

Failure to thoroughly clean-out the center of the hopper-screws could result in damage to either screw's head; which may require

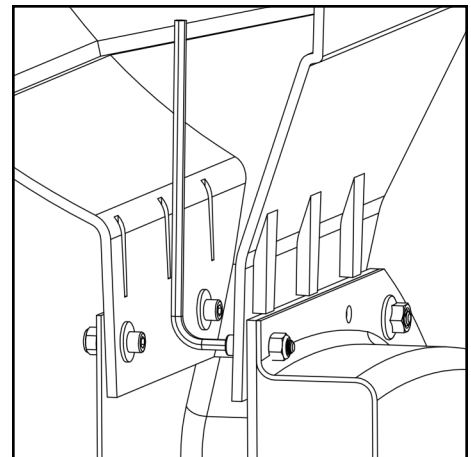
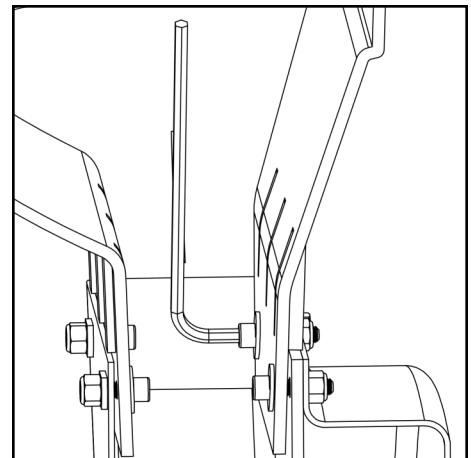
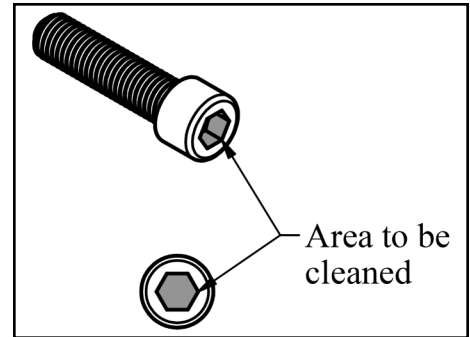
8. Reach down, through the top of the hopper, and insert the short leg of the 3/16" Allen-wrench into the head of the rightmost hopper-screw, protruding through the fan-housing, as shown.

Using a 7/16" wrench, loosen and remove the nylon-insert lock-nut, from the screw.

Remove the Allen-wrench, screw, and washer, from inside the hopper, being careful not to drop any of these items into the unit.

Set the screw, nut, and washer aside, for reassembly later.

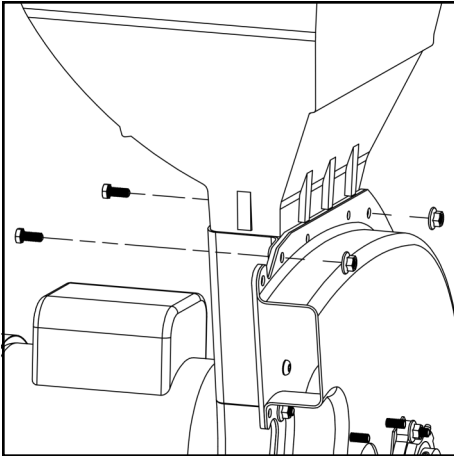
9. Repeat step 8 for the leftmost hopper-screw, protruding through the fan-housing, as shown.



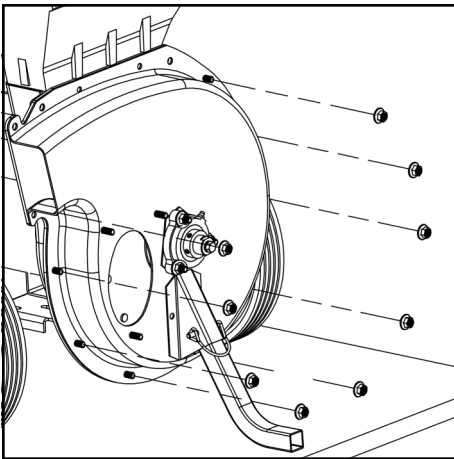
## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

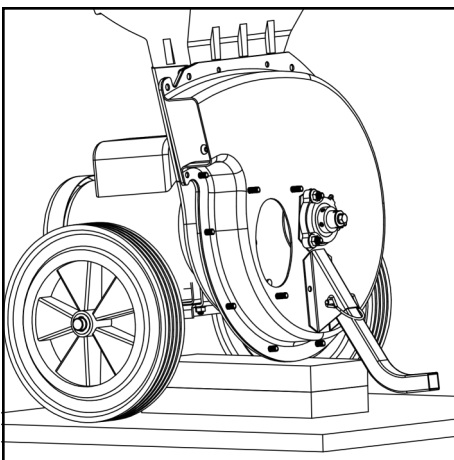
#### Removal Procedure (continued)



10. Using a 1/2" wrench, loosen and remove the two (2) nut-and-bolt sets, located on each side of the hopper, as shown. Set the nuts and bolts aside, for reassembly later.



11. Using a 1/2" wrench, loosen and remove the nine (9) serrated flange-nuts, located around the perimeter of the fan-housing, as shown. Set the serrated flange-nuts aside, for reassembly later.



12. Place two (2), 2" x 6" x 12", wood-blocks under the center of the center-plate and fan-housing, as shown.

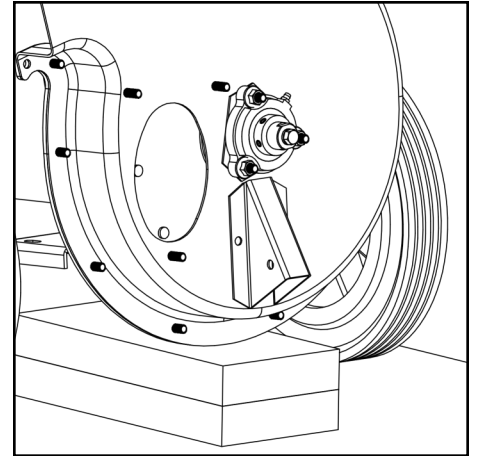
*Note: The wood-blocks will be supporting the unit, during the removal of the bearing and fan-housing; therefore, make sure the wood-blocks are centered, directly under the center-plate and fan-housing, so the unit doesn't slip off the blocks, in the steps that follow.*

## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

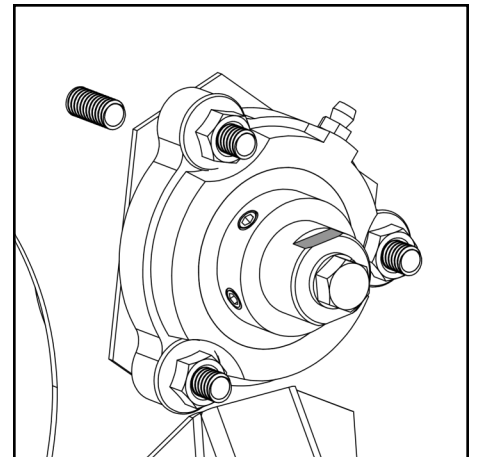
#### Removal Procedure (continued)

13. Remove the lynch-pin and leg from the fan-housing, as shown. Set the lynch-pin and leg aside, for reassembly later.



14. Two flat-surfaces have been machined into the end of the rotor-shaft, which comes through the bearing; see the grayed surface in the illustration for location. We recommend using a 7/8" wrench to slowly rotate this shaft, in a clockwise direction, until both of the bearing's set-screws are visible and easily accessible, as shown.

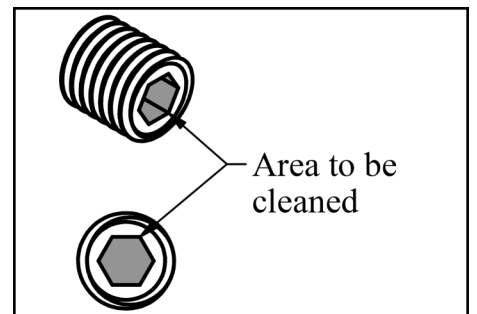
*Note: The rotor-shaft, of the electric chipper-shredder, can typically be turned with your fingers, the use of a wrench simply provides additional leverage and safety. While the rotor can be turned in either direction, we recommend rotating in the clockwise direction, so that the dull-edge of the knife enters the opening first, to reduce the risk of injury.*



15. Use a pick (or similar tool) to thoroughly clean-out the center, see the grayed surface in the illustration for location, of both of the bearing's set-screws.

***We cannot emphasize enough that, this is the most important step in ensuring successful removal and reinstallation of the bearing. When tightened, these screws ensure that the inner-race, of the bearing doesn't move, relative to the rotor-shaft.***

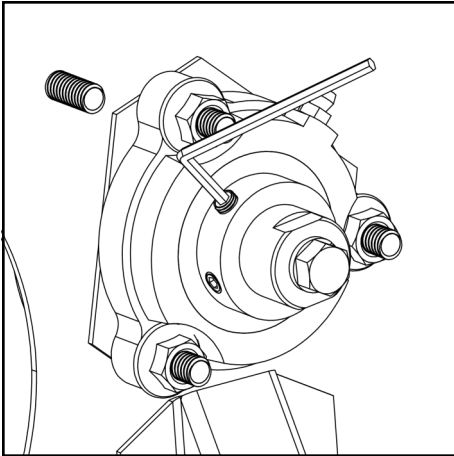
Failure to thoroughly clean-out the center of the bearing's set-screws could result in damage to either screw's head; which may require extreme-measures to remove the damaged screw.



## Maintenance Instructions

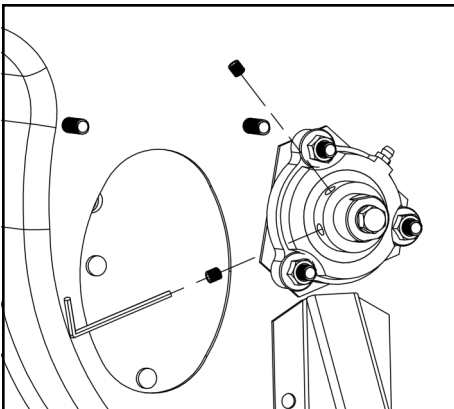
### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Removal Procedure (continued)

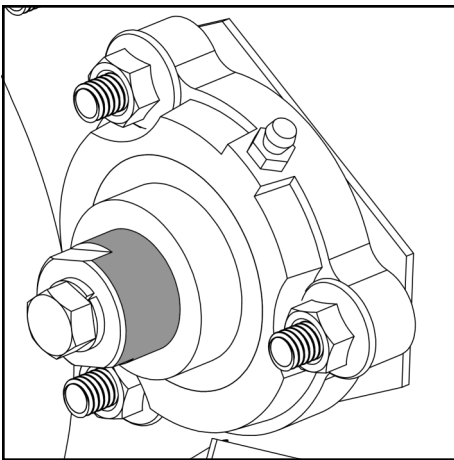


16. Loosen, but do not remove, both of the bearing's set-screws, by fully inserting the short leg of the 1/8" Allen-wrench into the head of each of the set-screws, as shown.

*Note: The torque applied to the Allen-wrench, to loosen the screws, will rotate the inner-race of the bearing and the rotor. The wrench will likely contact the one of the studs, that secure the bearing to the fan-housing; there is no need to try to prevent this. However, you can use a 7/8" wrench, as described in step 13, to hold the rotor and inner-race of the bearing steady.*



17. Slowly remove both of the bearing's set-screws, by fully inserting the long leg of the 1/8" Allen-wrench into the head of each of the set-screws, as shown. Be careful not to drop or lose the set-screws. Set the two (2) set-screws aside, for reassembly later.



18. Before you attempt to remove the bearing and fan-housing, it is very important to make sure that the exposed-end of the rotor-shaft, that protrudes through the inner-race, of the bearing, see the grayed surface in the illustration for location, is clean and smooth.

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

Use a fine sand-paper, 240-grit or finer, to clean up the exposed-end of the rotor-shaft. Wipe off the exposed-end of the rotor-shaft, then apply a small amount of oil or grease to the shaft, so that it is easier for the bearing to slide off the shaft.

## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Removal Procedure (continued)

19. At this point, the bearing and fan-housing are ready to be removed. We recommend removing the bearing and housing together, so you can get a better grip.

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

With a little patience and effort, you can work the bearing and fan-housing off of the rotor-shaft. In the steps that follow, we have provided an alternative method for pulling the bearing and fan-housing off of the exposed-end of the rotor-shaft.

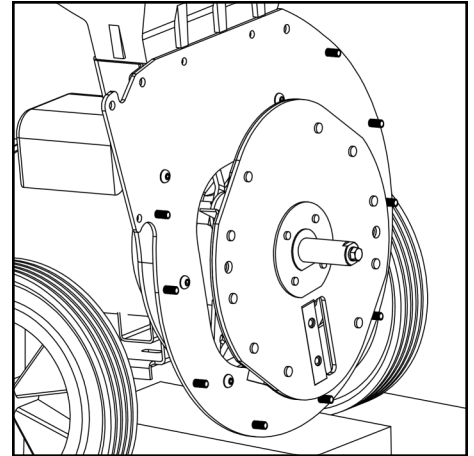
#### Removal Using Patriot Bearing-Removal Tool

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 bearing and fan-housing off of the rotor 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.

Patriot originally developed the Patriot Bearing-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, for a wide variety of users and Patriot chipper models. The just-of-it is that, the Patriot Bearing-Removal Tool gives you a quick, simple, way to apply the smooth, even, pull required to remove the bearing and fan-housing from the rotor shaft.

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

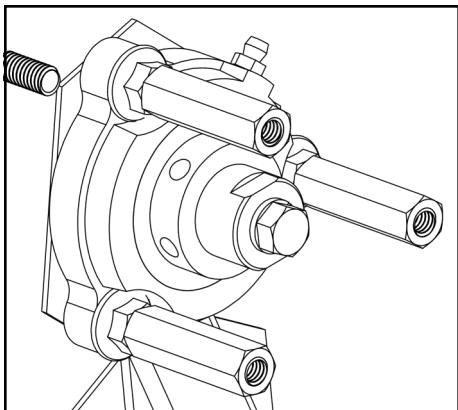




## Maintenance Instructions

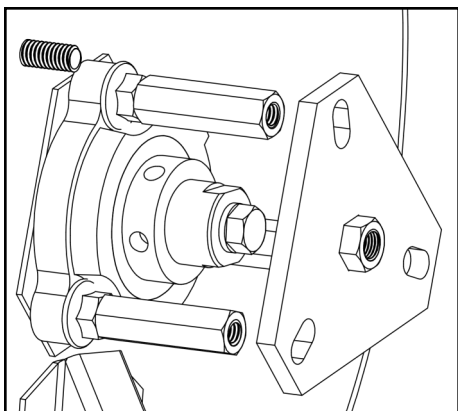
### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Optional Removal Procedure



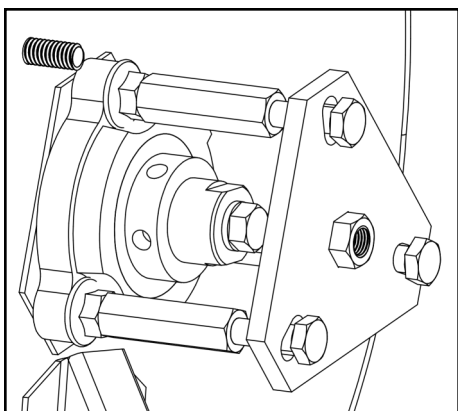
20. Thread one (1) of the coupling-nuts onto each of the three (3) bearing-mounting studs, as shown.

*Note: The coupling-nuts should be threaded completely onto the studs, until they contact the serrated flange-nuts, which secure the bearing in place. Also note, the coupling-nuts should only be hand tightened.*



21. Position the plate from the bearing-removal tool, as shown.

*Note: The portion of the nut, that protrudes out of the center of the plate, should face away from the bearing, as shown.*



22. Insert one (1) of the bolts, through each of the three (3) slots in the plate, and thread the bolt into the corresponding coupling-nut, as shown.

*Note: The bolts should be threaded completely into the coupling-nuts, until they stop. Similarly, as with the coupling-nuts, the bolts should only be hand tightened. Also note, the plate is intended to be able to slide along the unthreaded portion of the bolts.*

## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Optional Removal Procedure (continued)

23. Thread the long forcing-bolt into the nut, that protrudes out of the center of the plate. Hand tighten the long forcing-bolt, until the tip of the bolt contacts the head of the bolt in the rotor-shaft; the plate will slide out to contact the heads of all three (3) bolts, installed in step 22, as shown.

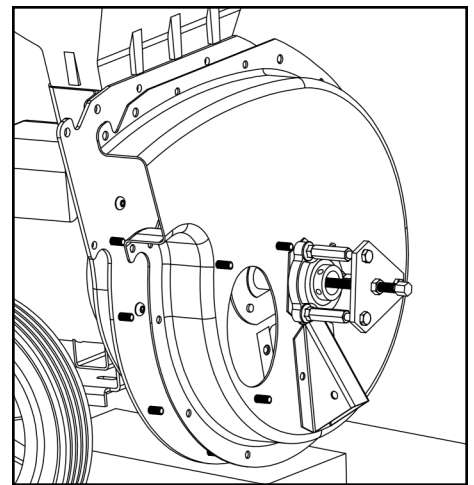
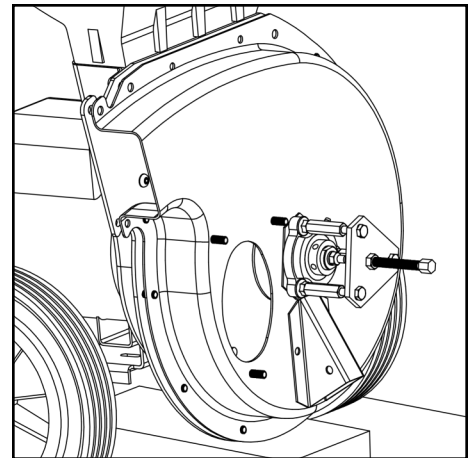
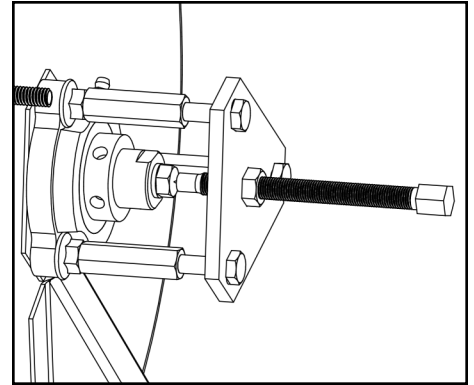
*Note: For this step, the long forcing-bolt should only be hand tightened. It should turn very easily, until the plate is pushing against the heads of all three (3) of the bolts, installed in step 22.*

24. Using a 1/2" wrench, slowly begin to turn the long forcing-bolt, installed in step 23. It should be quite easy to turn the bolt and you should notice the bearing and fan-housing moving towards the end of the rotor-shaft, away from the center-plate. Stop turning the bolt just before the fan-housing clears the studs, located around the perimeter of the center-plate.

*Note: If it is not easy to turn the long bolt, check to see that all of the fasteners, addressed in steps 1 through 17, have indeed been removed. Also, verify that the exposed-end of the rotor-shaft has been prepared, as described in step 18.*

*Note: Once the fan-housing clears the studs, located in the perimeter of the center-plate, as shown, it is likely that fan-housing, bearing, and bearing-removal tool will tend to suddenly rotate counterclockwise. While this is not a problem, we don't want you to be startled or potentially injure yourself. The easiest solution is to simply grip the discharge-opening of the fan-housing, before proceeding.*

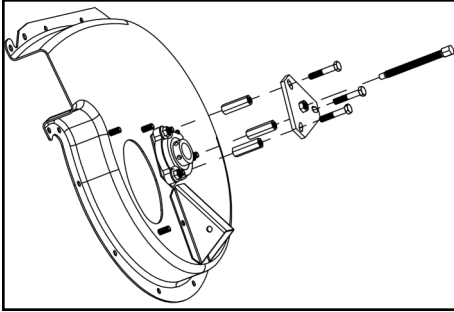
25. Continue turning the long forcing-bolt, until the bearing and fan-housing separate completely, from the exposed-end of the rotor-shaft.



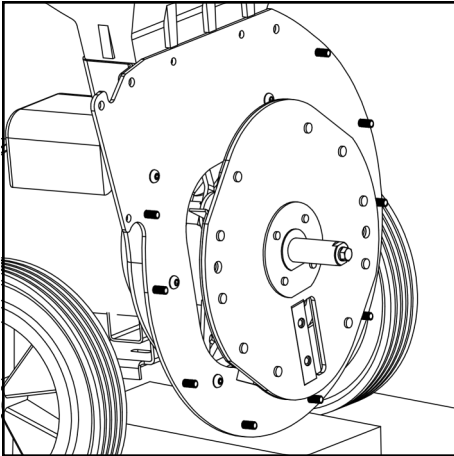
## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Optional Removal Procedure (continued)



26. Disassemble the bearing-removal tool components from the bearing and fan-housing. Take a moment to store these components somewhere, for future use. Set the bearing and fan-housing aside.

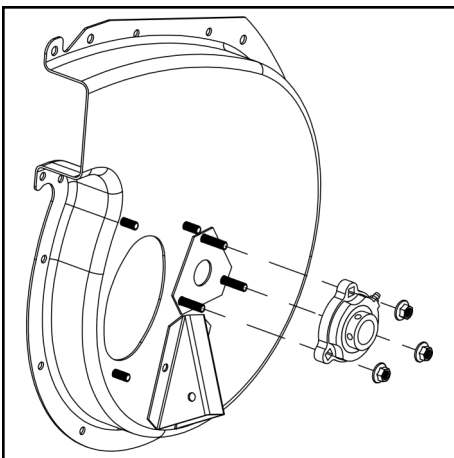


27. **CONGRATULATIONS!** You have successfully removed the bearing and fan-housing from your chipper-shredder.

#### Installation Procedure

1. Using a 1/2" wrench, remove the three (3) serrated flange-nuts and the bearing, from the fan-housing, as shown.

*Note: At first glance, this may seem foolish based, on the subsequent steps; However, this one step makes reassembly a much easier task.*



## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Installation Procedure (continued)

2. Grasp the fan-housing, by the discharge-opening and the leg-bracket, and place it onto the unit, as shown.

**CAUTION:** ***DO NOT** grasp or reach into the oval-shaped opening in the fan-housing. The chipper-knife is sharp and may be in a position that it could unexpectedly cut you.*

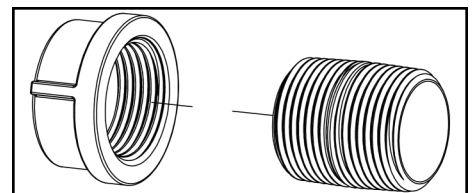
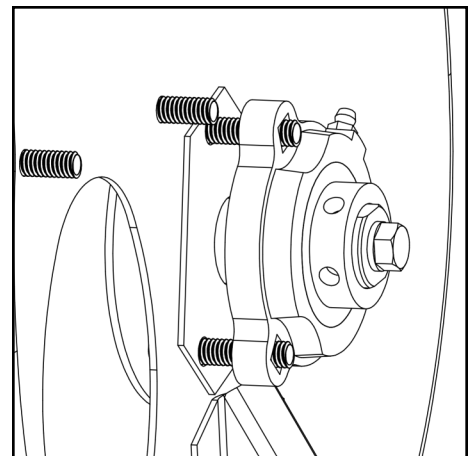
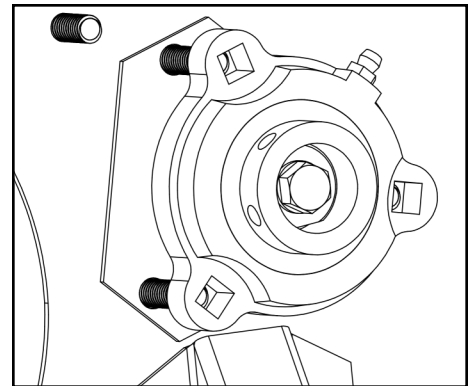
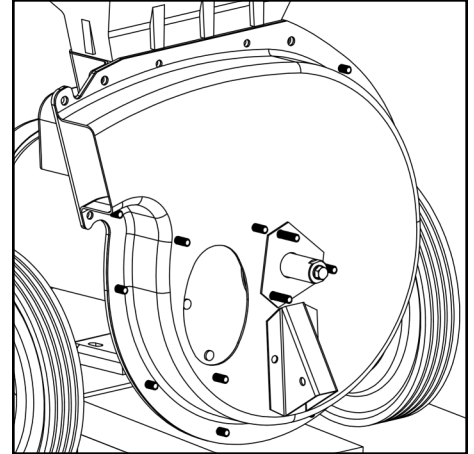
**NOTE:** ***DO NOT** install any of the fasteners around the perimeter of the fan-housing at this time. The fan-housing needs to move freely, while the bearing is installed.*

3. Position the bearing at the exposed-end of the rotor-shaft, with the bolt holes aligned with the three (3) studs in the fan-housing and the grease zerk facing towards the upper right, as shown.

**Note:** ***DO NOT** install the set-screws at this time. You will be advised exactly when to installation them, in a future step.*

4. Depending on how well the exposed-end of the rotor-shaft was cleaned, during the removal procedure, you should be able to begin to push the bearing down the rotor-shaft. As best you can, adjust the bearing-flange, so that it is parallel to the bearing-shield and fan-housing. If possible, continue to push the bearing, until the flange is flush against the bearing-shield.

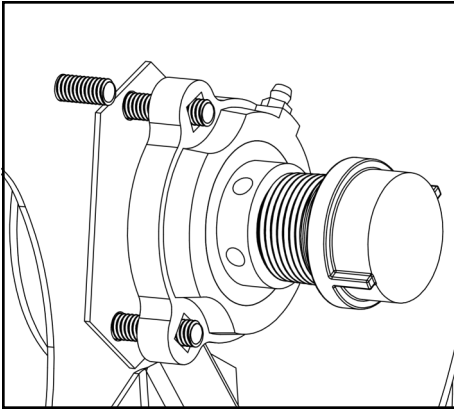
5. If you cannot easily push the bearing down the rotor-shaft, you can create a simple tool that will allow you to GENTLY tap the bearing into position; This tool is made by assembling a 1" threaded, steel pipe-cap to a short 1" schedule 40, threaded, steel pipe-nipple. You only need to hand-tighten this assembly.



## Maintenance Instructions

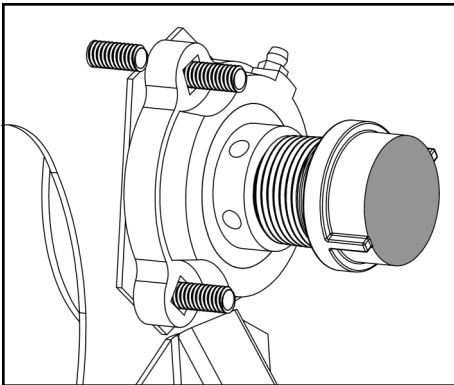
### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Installation Procedure (continued)



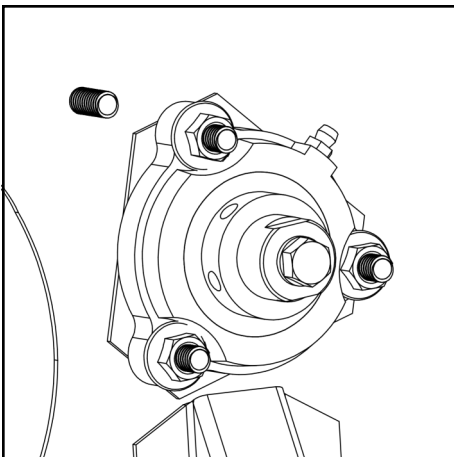
6. To use the tool, created in step 5, position the open-end of the pipe-nipple over the exposed-end of the rotor-shaft. The end of the pipe-nipple should be flush, with the inner-race of the bearing.

*Note: The end of the pipe-nipple needs to push only against the inner-race of the bearing. If the END of the pipe-nipple is pushing on the end of the rotor-shaft, you can damage the end of the rotor-shaft.*



7. Using a hammer, GENTLY TAP on the end of the pipe-cap, see the grayed surface in the illustration for location. Continue GENTLY TAPPING, on the end of the pipe-cap, until the bearing-flange is flush against the bearing-shield.

*Note: If it takes more than a GENTLE TAP to move the bearing, something is wrong; repeat steps 3 through 6. **DO NOT POUND HARDER** on the end of the pipe-cap, as it is only likely to damage the rotor-shaft, bearing, or motor.*



8. Install a serrated flange-nut on each of the three (3) bearing mounting-studs and tighten them using a 1/2" wrench.

Recommended torque: 14 - 16 ft-lb

*Note: The sequence of steps, to get the fan-housing and bearing reassembled and placed on the chipper-shredder, are designed for overall ease-of-installation and to ensure that there is no load on the bearing, when the chipper-shredder is not running. Having a load on the bearing, when the chipper-shredder is not running, is likely to cause the bearing to fail prematurely, requiring replacement.*

## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Installation Procedure (continued)

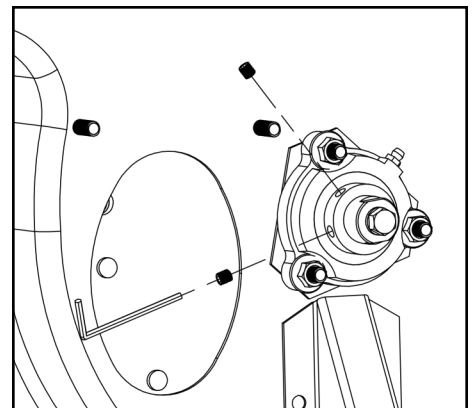
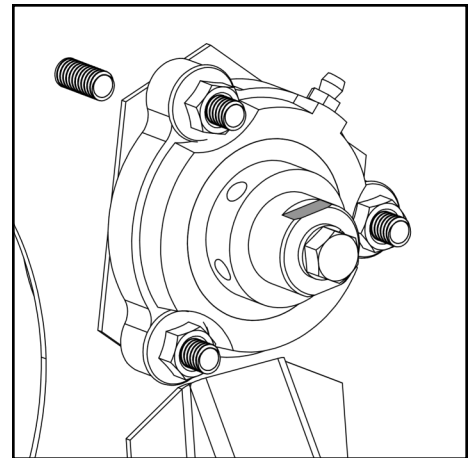
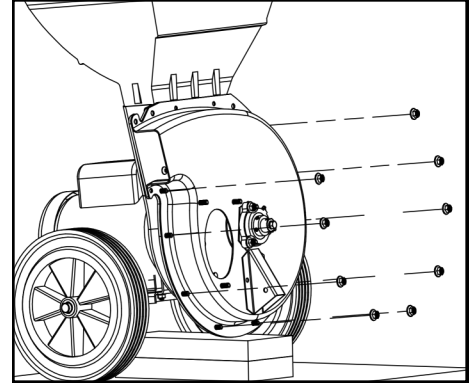
9. Install the nine (9) serrated flange-nuts, on the studs located around the perimeter of the fan-housing, as shown. Securely tighten each nut using a 1/2" wrench.

Recommended torque: 14 - 16 ft-lb

10. Two flat-surfaces have been machined into the end of the rotor-shaft, which comes through the bearing; see the grayed surface in the illustration for location. We recommend using a 7/8" wrench to slowly rotate this shaft, in a clockwise direction, until the holes for both of the bearing's set-screws are visible and easily accessible, as shown.

*Note: The rotor-shaft, of the electric chipper-shredder, can typically be turned with your fingers, the use of a wrench simply provides additional leverage and safety. While the rotor can be turned in either direction, we recommend rotating in the clockwise direction, so that the dull-edge of the knife enters the opening first, to reduce the risk of injury.*

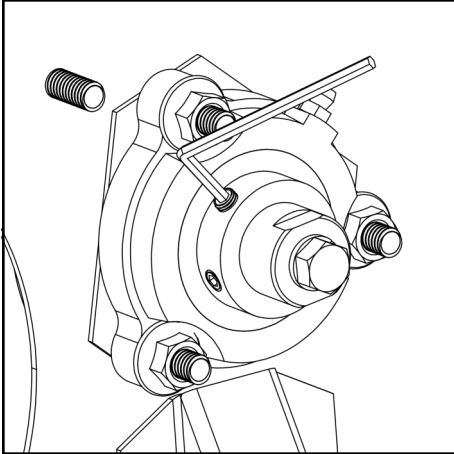
11. Carefully install both of the bearing's set-screws, by fully inserting the long leg of the 1/8" Allen-wrench into the head of each of the set-screws, as shown. Be careful not to drop or lose the set-screws.



## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

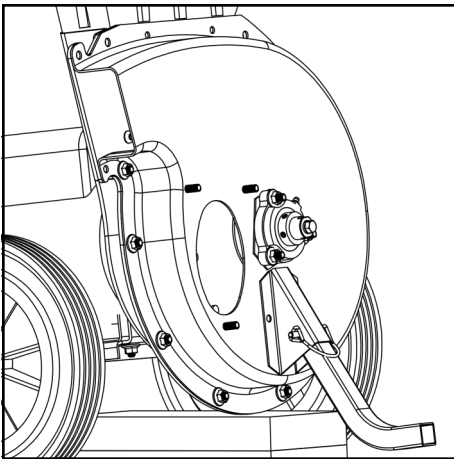
#### Installation Procedure (continued)



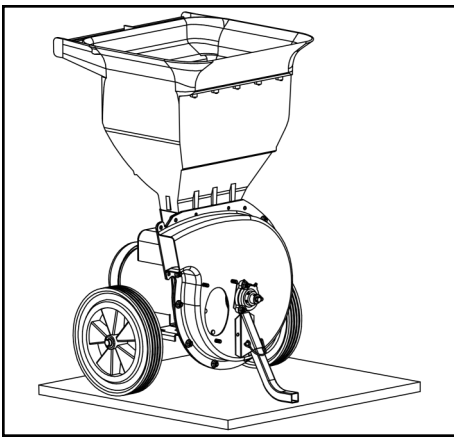
12. Securely tighten, both of the bearing's set-screws, by fully inserting the short leg of the 1/8" Allen-wrench into the head of each of the set-screws, as shown.

*Note: The torque applied to the Allen-wrench, to tighten the screws, will rotate the inner-race of the bearing and the rotor. The wrench will likely contact the one of the studs, that secure the bearing to the fan-housing; there is no need to try to prevent this. However, you can use a 7/8" wrench, as described in step 10, to hold the rotor and inner-race of the bearing steady.*

Recommended torque: 6 - 8 ft-lb



13. Insert the leg into its bracket and secure it with the lynch-pin, as shown.



14. Carefully remove the two (2) wood-blocks, from under the center-plate and fan-housing, so that the unit is once again supported by both wheels and the leg, as shown.

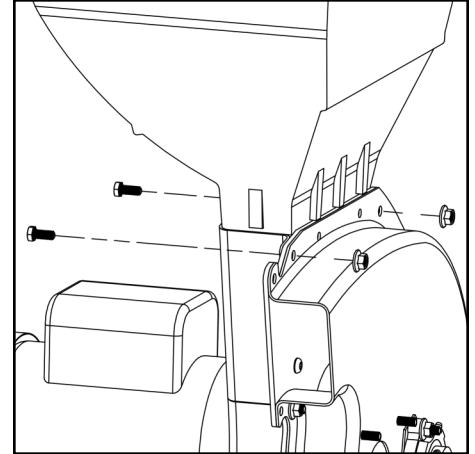
## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Installation Procedure (continued)

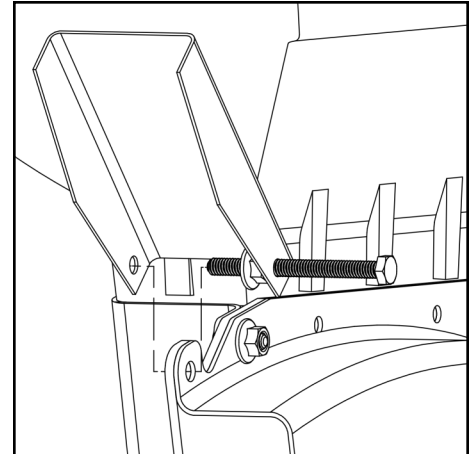
15. Install the two (2) nut-and-bolt sets, located on each side of the hopper, as shown. Securely tighten with a 1/2" wrench.

Recommended torque: 14 - 16 ft-lb

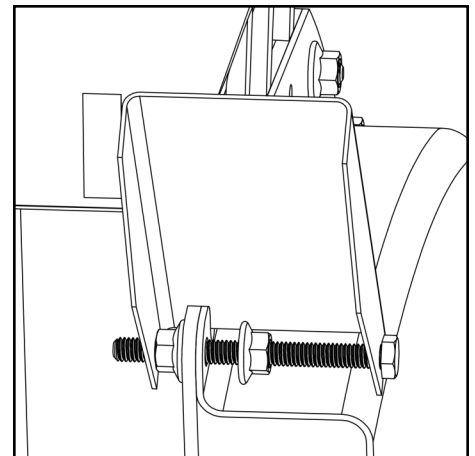


16. Position the discharge-deflector assembly, at the discharge-opening of the wood-chipper, as shown.

*Note: The bolt is supposed to pass through the hole, in both the center-plate and fan-housing, located above the discharge-opening. Also, please note that the discharge-deflector is shown raised, to better clarify the assembly process; the deflector can hang down during assembly, if that is easier.*



17. Position a serrated flange-nut on the left side of the hole in the center-plate and begin to thread the bolt through the nut. Once the nut is on the bolt, you can use the deflector to hold the nut in position, while you turn the bolt. Ultimately, the bolt will pass completely through the nut and the corresponding hole, in the left side of the deflector. Stop turning the bolt just before the head of the bolt makes contact with the right side of the deflector.

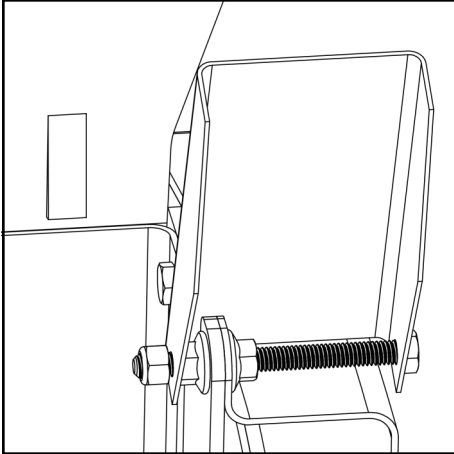




## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Installation Procedure (continued)

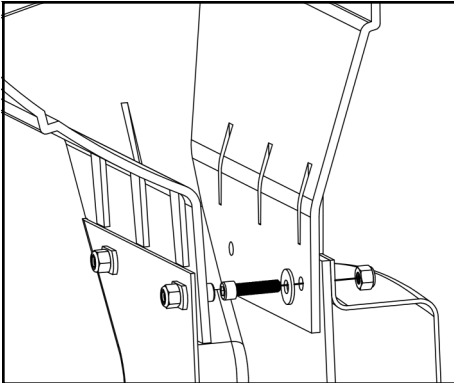


18. While holding the discharge-deflector in place, securely tighten the rightmost serrated flange-nut against the fan-housing using a 1/2" wrench.

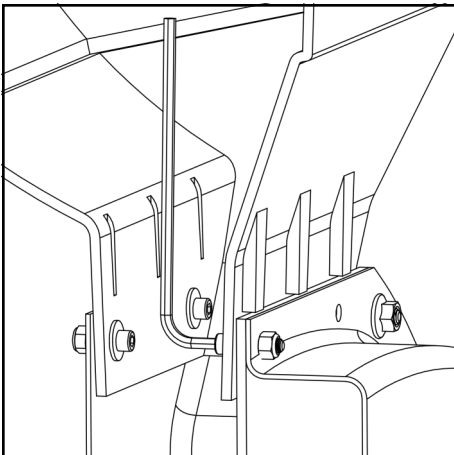
Finally, attach the nylon-insert lock-nut on the end of the bolt, using a 1/2" wrench. The bolt needs to just pass through the plastic in the end of the nut. **DO NOT** tighten the nylon-insert lock-nut **too** tight or it can prevent the discharge-deflector from swinging freely.

If the discharge-deflector does not swing freely, simply loosen the rightmost serrated flange-nut, enough that you can turn the bolt; Turn the bolt slightly, while holding the leftmost serrated flange-nut against the center-plate, in or out as required, to adjust the assembly. Then retighten the rightmost serrated flange-nut.

Recommended torque: 14 - 16 ft-lb (doesn't apply to nylon-insert lock-nut )



19. Place one (1) of the 1/4" flat washers onto one (1) of the 1/4" x 1" socket-head cap-screws. Carefully reach down through the top of the shredder-hopper and insert the screw, with washer, into one of the holes, in the front of the shredder-hopper, as shown. While holding the head of the screw, place one of the 1/4" nylon-insert lock-nuts onto the exposed-end, of the screw, and hand tighten.



20. Reach down through the top of the hopper and insert the short leg of the 3/16" Allen-wrench into the head of the screw. Finish securely tightening the nut with a 7/16" wrench.

Recommended torque: 6 - 8 ft-lb

## Maintenance Instructions

### Outboard-Bearing & Fan-Housing Removal And Installation (continued)

#### Installation Procedure (continued)

21. Repeat steps 16 and 17 for the second connection-point, in the front of the shredder-hopper.

Recommended torque: 6 - 8 ft-lb

*Note: The hopper should not move, relative to the lower-unit assembly. If necessary, re-check tightness of all four (4) of the hopper attachment screws.*

22. Install the bag-bolt and nut, below the discharge-opening, as shown. Please note that this bolt may insert into the hole easily or you may need to use the 1/2" wrench to turn the bolt in. It is strictly a matter of how well the holes in the center-plate and fan-housing happened to be aligned, when they were last assembled. Securely tighten with a 1/2" wrench.

Recommended torque: 14 - 16 ft-lb

23. Please follow the **Chipper-Knife Installation Procedure**.

24. **CONGRATULATIONS! You have completed the reassembly of your Patriot chipper-shredder.**

