

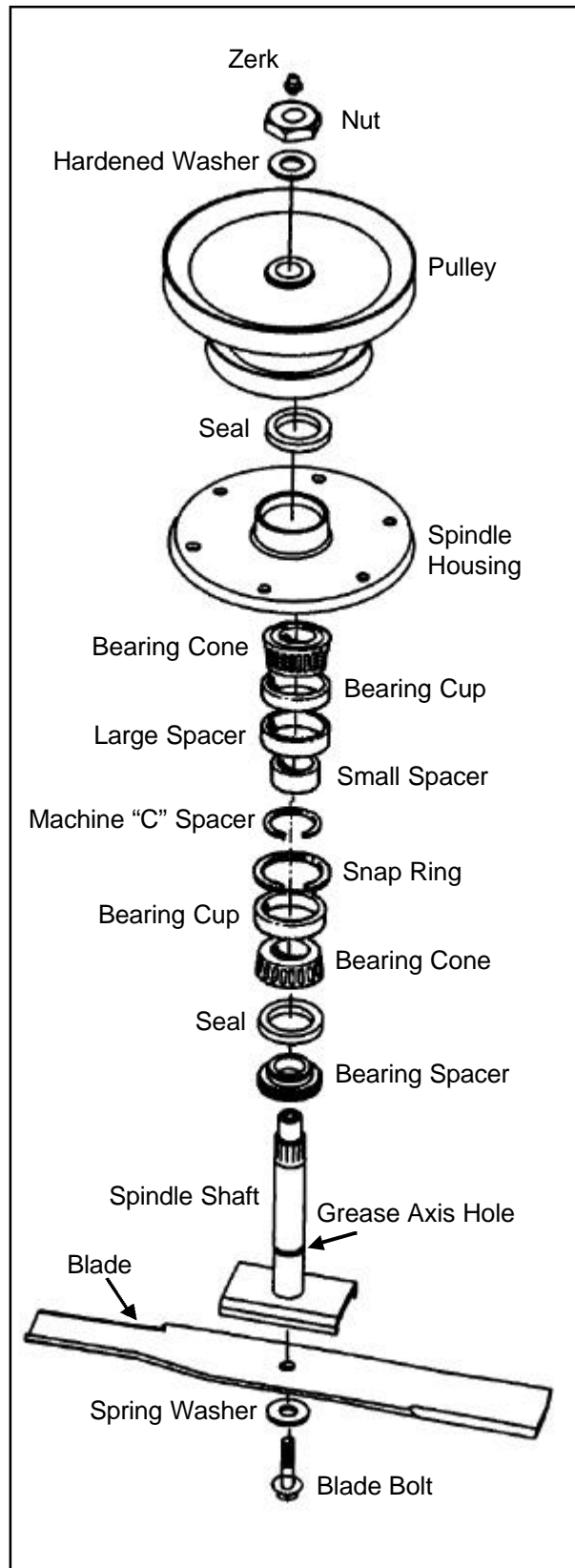


# SPINDLE REPAIR MODULE



## Z Master 200 Series

1. Stop the engine, remove the key, and engage the parking brake.
  2. Remove covers from the cutting unit.
  3. Using a floor jack raise the machine until you can access the underside of the cutting unit.
  4. Support the machine using a properly rated jack stand.
  5. Inspect the assembly before removing. Look for the following:
    - A. Bent or damaged blade.
    - B. Missing or unused grease zerk.
    - C. String, wire, rope, etc. wrapped around the spindle under the deck.
  6. Remove the drive belt(s) from the pulley. Consult the machine owner's manual for this procedure.
  7. Remove the nut and washer retaining the spindle pulley. Then remove the pulley from the shaft.
  8. Unbolt the spindle housing from the deck. Place spindle assembly on a bench or in a vise and remove the blade.
  9. Remove the spindle shaft from the spindle housing; it may need to be pressed out of the housing.
- Note:** The lower bearing spacer will remain on the spindle shaft.
10. Inspect the spindle shaft for the following:
    - A. Elongated grease axis hole. Normally this hole is perfectly round, if it is deformed it is directly a result of impact.
    - B. Damaged splines - If the splines are twisted, it is a sign of impact. If they are worn, it's an indication that the assembly was running with the pulley loose.



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- C. Damaged shaft - When the shaft is worn at the point where the upper bearing is located in the assembly, it is a result of the assembly running loose.

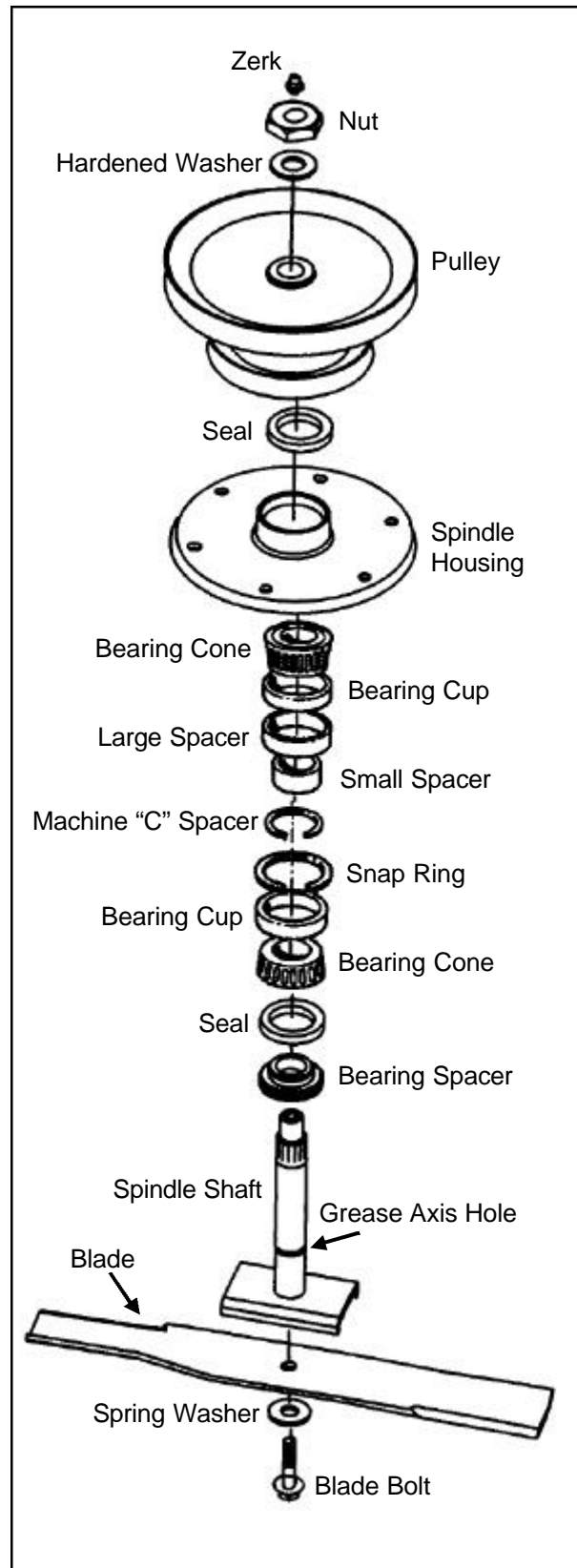
There are two causes for this:

1. Improper torque on the pulley retention nut. This allows individual components of the assembly to move and wear against other components.
  2. Impacts cause the shaft to stretch, which will lessen the clamp load and cause the assembly to wear as if the nut did not have proper torque.
11. Remove the seals, note the direction of the seals, this will be important during re-assembly. The upper seal faces inward, and the lower seal faces outward. If the lower seal is installed incorrectly, the lower bearing spacer will crush the seal and allow dirt into the assembly, causing bearing failure to occur.
12. Remove the bearings and the two small diameter spacers from the housing. One of the two spacers removed will look like a "C" slip and the other will be a thicker spacer with a hole in it. The open side on the "C" shaped spacer, in addition to the lubrication hole in the thicker spacer, allows grease to pass from the spindle shaft to the bearings.

**Note:** When removing the bearings, mark or isolate the top bearing from the lower bearing. This will allow the bearings to be installed in their original operating position. Failure to do this may cause premature bearing failure when reassembled.

Inspect the bearings as follows:

- A. Look for the presence of grease, particularly in the upper bearing. Dry or cooked grease indicates a lack of maintenance
- B. Look for dirt in the grease. This indicates a bad seal or worn lower bearing spacer. If the unit was recently



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rebuilt, look for proper installation of the lower seal.

- C. Clean the bearings and look for any pitting or flaking on the rollers.
- D. Roll the clean bearings in your hand and feel for rough spots. If the bearing catches or the rollers get stuck in the cage, replace the bearing.

**Note:** With this spindle design, both bearings and bearing cups must be replaced as a set. Even if only one of the two bearings is damaged.

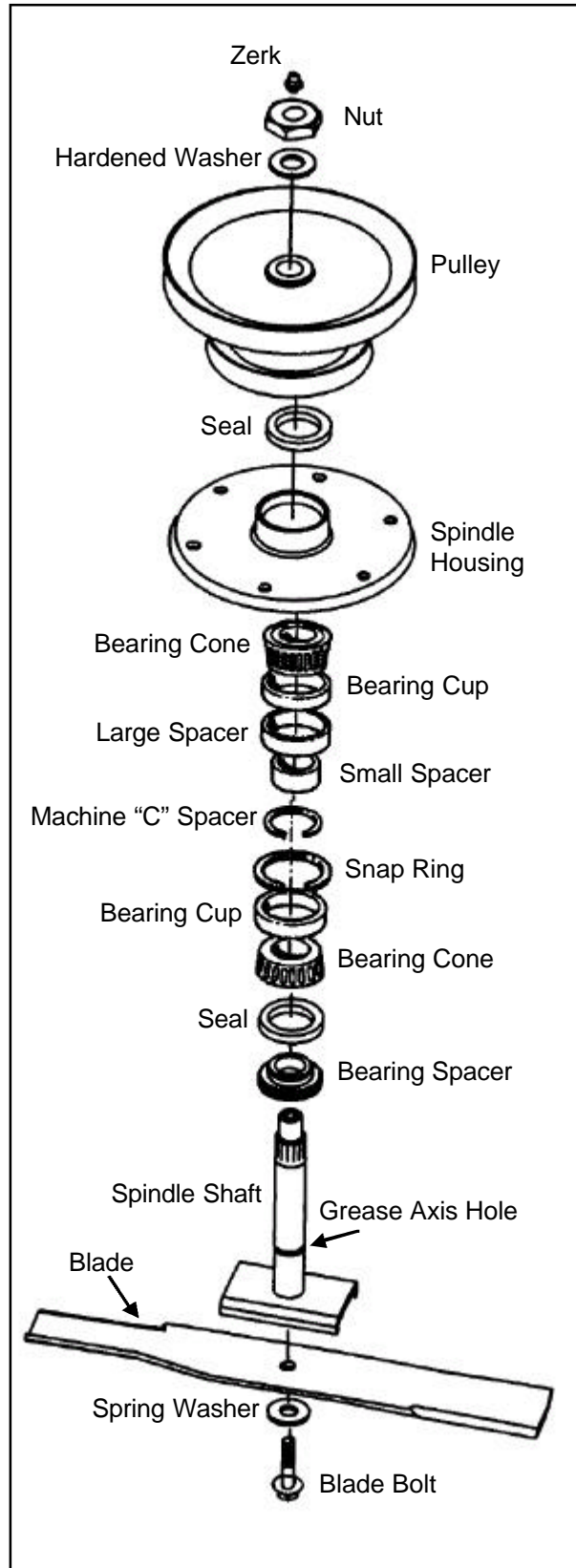
- 13. If replacing the bearings, use a punch and hammer to drive both of the bearing cups out of the spindle housing. Also, remove the large diameter spacer at this time.

**Caution:** Do not use old bearing cups with new bearings. This may cause premature bearing wear and result in failure.

- 14. A large snap ring is still inside the spindle housing. It locates the matched bearing set in the bore of the spindle housing. There is no need to remove and replace this snap ring.

### Assembly

- 15. Thoroughly clean and inspect the parts prior to assembly:
  - A. Spindle shaft for bearing surface damage or signs of impact. Also check for damage to the threaded areas for both the blade bolt and the pulley retention nut.
  - B. Bottom bearing spacer for wear. If the spacer is damaged the seal may not be able to keep dirt out properly.
  - C. Bearings for wear. If reusing bearings, you must examine them carefully for wear. Also, make sure to put the same bearing and bearing saddle together as they were. As noted above, look for pitting on the rollers of the bearings and replace the bearing set if any pitting is present.



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**Note:** If using compressed air to dry the bearing after cleaning, **DO NOT** allow it to spin. The bearing could come apart and cause serious injury. Always wear safety glasses.

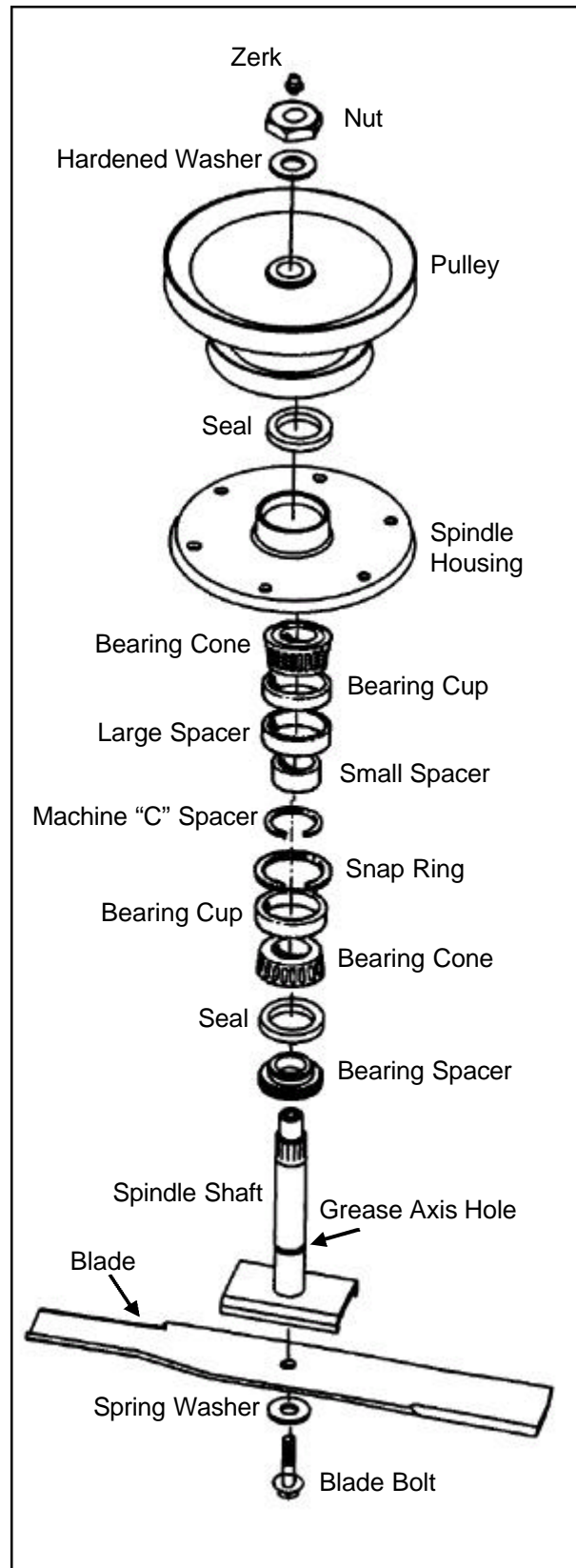
- D. Spindle housing for damage or wear.
- E. Pulley assembly, if the shaft shows signs of wear inspect the pulley for excessive wear in the splines. If excessive wear is found, replace the pulley. Excessive wear of the splines will show up as sharp edges on the splines.

**Note:** New bearings are only available in matched sets. The matched set is necessary because the bearing endplay is not adjustable. The small "C" shaped spacer is machined to specifically match the bearings in the set. The advantage of a matched set is the ability to torque the assembly to a specified value and have a pre-set endplay. Alternatively, most tapered bearing applications use either a crush washer or a castle nut with key as a means to set endplay.

16. Install the snap ring into spindle housing. Discard the new snap ring if the spindle housing is being reused.
17. Press in lower bearing cup until it firmly contacts the snap ring.

**Note:** The machined stop for the seal may cause your driver to stop before the bearing cup is seated completely. **NEVER** use a punch to drive in a bearing cup, this will damage the cup.

18. Slide the large spacer in from the top until it also contacts the snap ring. Now press the upper bearing cup in against the spacer. Apply a layer of grease to both bearing surfaces.
19. Pack both bearings with grease. Smearing grease on the outside of the bearing is not



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enough lubrication. Pack the bearing by hand or use a bearing packing tool.

20. With the spindle upside down, set the lower bearing in the bearing cup. Now install the lower seal. Use a seal driver to prevent damage.

**Note:** Remember to install the seal with the lip facing out.

21. With the spindle right side up, install the small "C" shaped spacer first, then the small thick spacer. The order of these two is not critical to the performance of the spindle, but putting the thinner spacer in first it prevents the possibility of the open part of the spacer from dropping down on the thicker spacer.

22. Now install the upper bearing and seal. The upper seal must face inward. Again, be sure to use a seal driver.

23. Lubricate both seal lips with grease and insert the bearing spacer into the lower seal. By inserting the spacer individually, and not with the shaft, you will prevent possible damage to the lower seal.

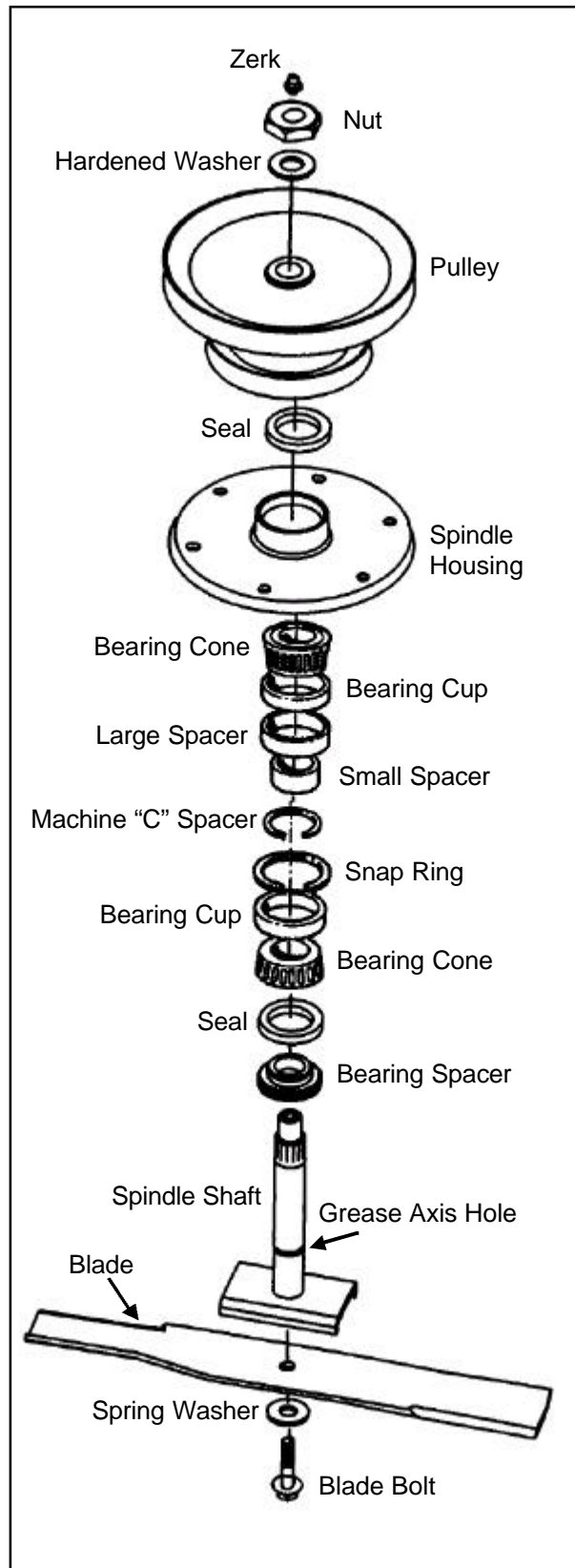
24. Bolt the assembly back into the deck shell.

25. Install the spindle shaft.

**Note:** The shaft will slide out if not supported.

26. Slide the pulley down onto the shaft and secure with the washer and nut. Be certain to only use the washer specified because it is hardened, a softer washer will deform and spindle damage will occur. Torque the nut to 100-120 ft/lbs and rotate the assembly to make sure that it turns smoothly and freely.

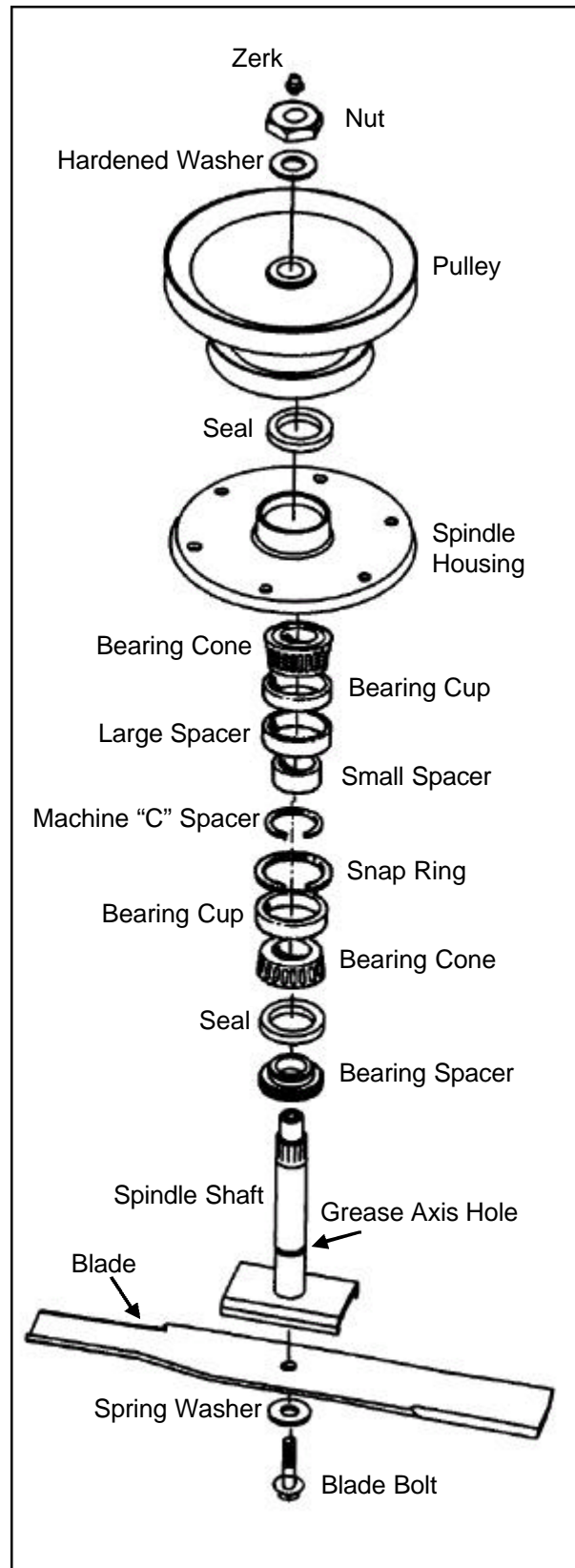
27. Pump grease into the assembly until grease is relieved pass the lower seal. The ability to relieve grease without pushing out the seal is why the lower seal is installed with the lip facing out. Make sure the blade bolt is threaded into the spindle



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shaft or grease will push out that opening.

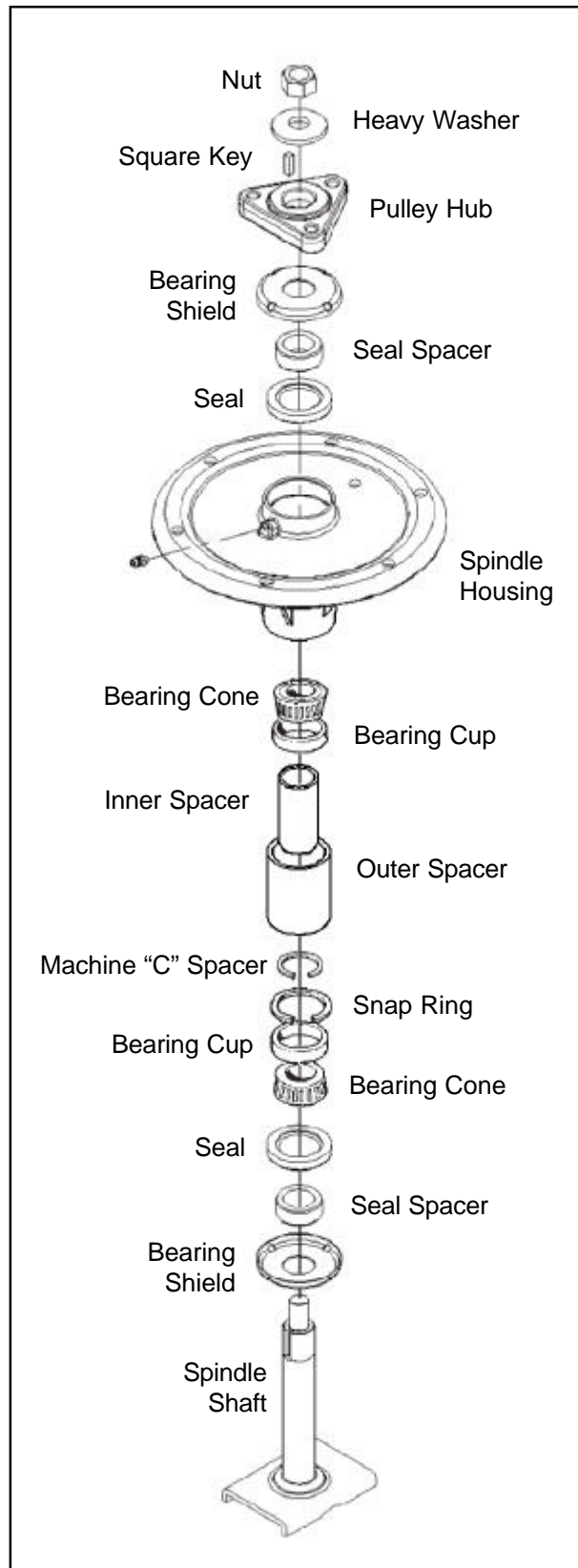
28. Install the blade and torque the blade bolt to 85-110 ft/lbs.
29. Install the drive belts. Consult the machine owner's manual for this procedure.
30. Replace the deck covers.
31. Remove the machine from the jack stands.





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1. Stop the engine, remove the key, and engage the parking brake.
  2. Remove covers from the cutting unit.
  3. Using a floor jack and properly rated jack stands or the Z Stand®, raise the machine until you can access the underside of the cutting unit.
  4. Inspect the assembly before removing it from the mower. Look for the following:
    - A. Bent or damaged blade.
    - B. Missing or unused grease zerk.
    - C. String, wire, rope, etc. wrapped around the spindle under the deck.
  5. Remove the drive belt from the pulley. Consult the machine operator's manual for this procedure.
  6. Remove the bolts retaining the spindle pulley. Then remove the pulley from the hub.
  7. Unbolt the spindle housing from the deck. Place spindle assembly on a bench or in a vise and remove the blade.
  8. Remove the spindle nut, heavy washer, pulley hub, square key, and bearing shield.
  9. Inspect the pulley hub and square key for damage. Carefully check the pulley hub for cracks.
  10. Remove the spindle shaft from the spindle housing. If corrosion has bonded spacers or bearings to the shaft, it may need to be pressed out.
- Note:** The lower bearing spacer may remain on the spindle shaft.
11. Inspect the spindle shaft. Check for the following:
    - A. Worn or damaged keyway. Impacts cause key and keyway damage.



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B. Damaged Shaft - when the shaft is worn at the point where the upper bearing is located in the assembly, it is a result of the assembly running loose. The cause for this is improper torque on the pulley hub retention nut. This allows individual components of the assembly to move and wear.

12. Remove the seals, note the direction the seals face. This will be important during re-assembly. The upper seal faces inward, and the lower seal faces outward. If the lower seal is installed incorrectly, the lower bearing spacer will crush the seal and allow dirt into the assembly causing bearing failure to occur. This orientation of the lower seal also allows grease to bypass the seal, purging old grease from the spindle when fresh grease is supplied.

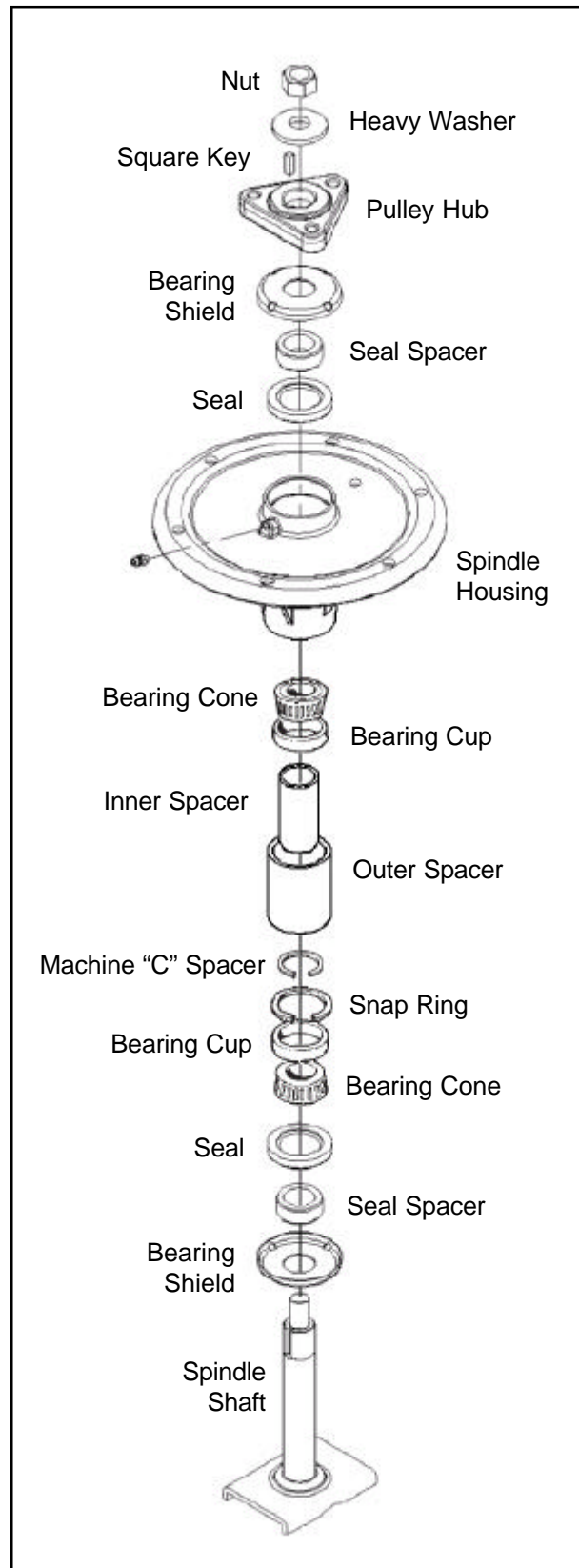
13. Remove the bearing cones and inner spacers.

**Note:** There is a long spacer and then a machined "C" spacer.

**Note:** When removing the bearings, tag or isolate the top bearing from the lower bearing. This will allow the bearings to be installed in their original operating position. Failure to do this may cause premature bearing failure when reassembled.

Inspect the bearings as follows:

- A. Look for the presence of grease, particularly in the upper bearing. Dry or cooked grease indicates a lack of maintenance.
- B. Look for dirt in the grease. This indicates a bad seal or worn lower bearing spacer. If the unit was recently rebuilt, look for proper installation of the lower seal.
- C. Clean the bearings and look for any pitting or flaking on the rollers.
- D. Roll the clean bearings in your hand and feel for rough spots. If the bearing catches or the rollers get stuck in



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the cage, replace the bearing set.

**Note:** With this spindle design, both bearings and bearing cups must be replaced as a set.

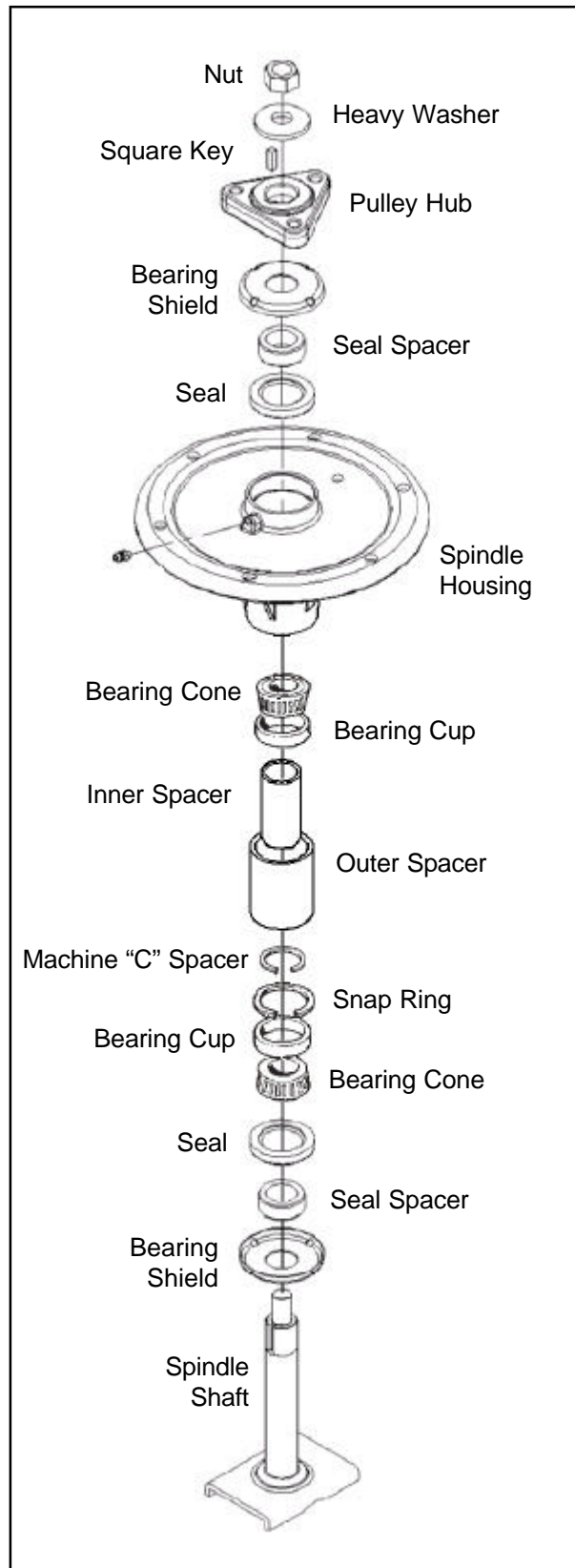
14. If replacing the bearings, use a punch and hammer to drive both of the bearing cups out of the spindle housing. Also remove the large diameter spacer at this time if spacers are to be replaced.

**Caution:** Do not use old bearing cups with new bearings. This may cause premature bearing wear and result in failure.

15. A large snap ring is still inside the spindle housing. It locates the matched bearing set in the spindle housing. Unless this is damaged or worn, there is no need to remove and replace this snap ring. A replacement snap ring comes with the replacement bearing set. If the snap ring is damaged, look for damage to the housing. Replace as needed.

### Assembly

16. Thoroughly clean and inspect the spindle assembly parts prior to assembly. Always wear safety glasses.
  - A. Check spindle shaft for bearing surface damage or signs of impact. Also check for damage to the threaded areas for both the blade bolt and the spindle retention nut.
  - B. Check lower bearing spacer for wear. If the spacer is damaged, the seal may not be able to keep dirt out properly.
  - C. Check bearings for wear. If reusing bearings, you must examine them carefully for wear. Also, make sure to put the same bearing cone and bearing cup together as they were when disassembled. Look for pitting on the rollers of the bearings and replace the bearing set if any pitting is present.



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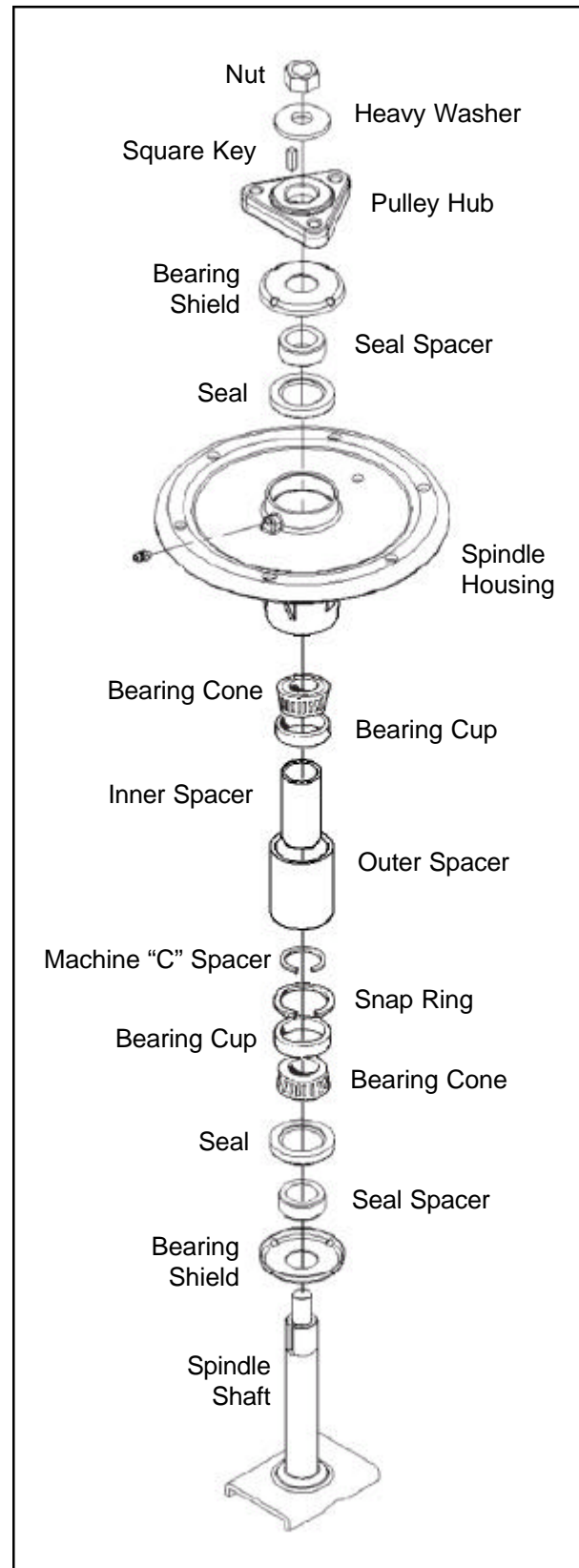
**Note:** If using compressed air to dry the bearing after cleaning, **DO NOT** allow it to spin. The bearing could come apart and cause serious injury.

**Note:** New bearings are only available in matched sets. The matched set is necessary because the bearing end-play is not adjustable. The small "C" shaped spacer is machined to specifically match the bearings in the set. The advantage of a matched set is the ability to torque the assembly to a specified value and have a preset end-play.

- D. Check spindle housing for any damage or wear.
  - E. Check pulley hubs for wear marks or worn keyway. A worn or cracked hub should be replaced.
17. If the snap ring is being replaced, install it into the spindle housing. If the old snap ring is being reused, discard the new snap ring.
  18. Press in lower bearing cup until it firmly contacts the snap ring.

**Note:** The machined stop for the seal may cause your driver to stop before the bearing cup is seated completely. **NEVER** use a punch to drive in a bearing cup. This will damage the cup.

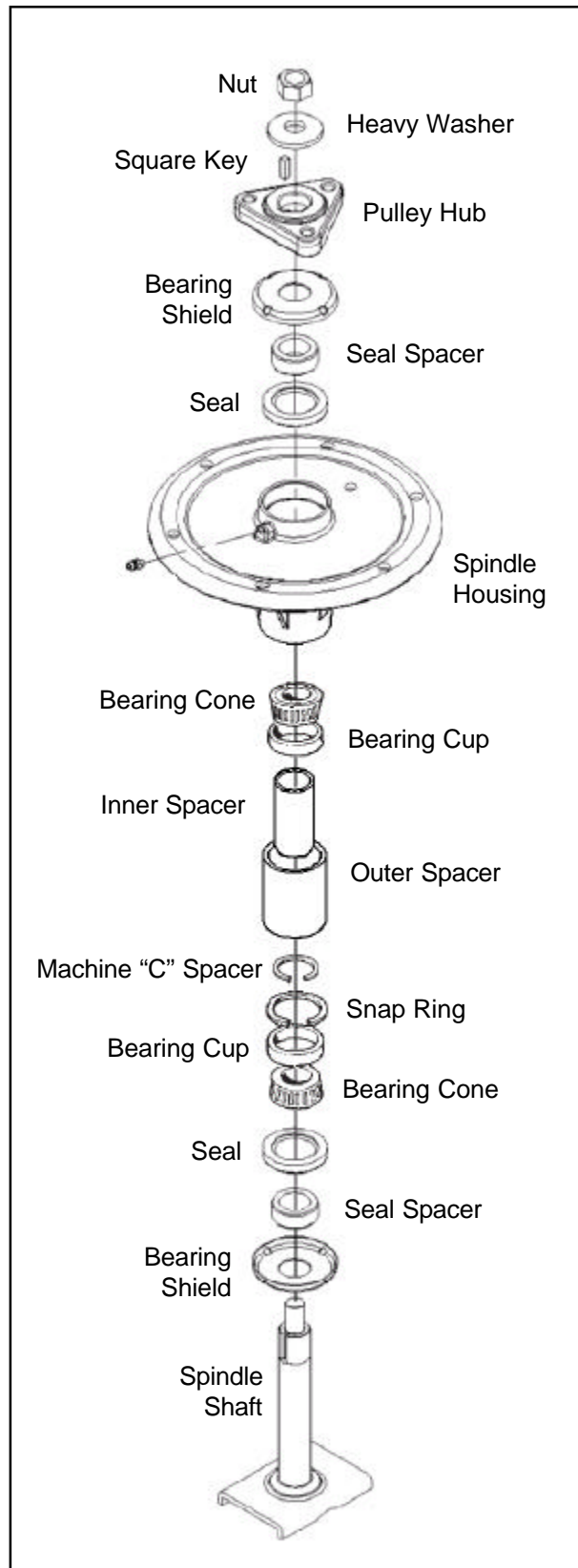
19. Slide the large diameter spacer in from the top until it also contacts the snap ring. Now press the upper bearing cup in against the spacer. Apply a layer of grease to both bearing surfaces.
20. Pack both bearings with grease. Smearing grease on the outside of the bearing is not enough lubrication. Pack the bearing by hand or use a bearing packing tool.
21. With the spindle upside down, set the lower bearing in the bearing cup. Now install the lower seal. Use a seal driver to prevent damage.



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**Note:** Remember to install the seal with the lip facing out.

22. With the spindle right side up, install the small "C" shaped spacer first, then the long inner spacer. The order of these two is not critical to the performance of the spindle, but putting the thin spacer in first prevents the possibility of the open part of the spacer dropping down on the long spacer.
23. Now install the upper bearing and seal. The upper seal must face inward. Again, use a seal driver.
24. Lubricate both seal lips with grease and insert the bearing spacer into the lower seal.
25. Place the bearing shield on the spindle shaft with the cup up.
26. Slide the spindle shaft up through the bearing spacer, lower bearing, spacers, and upper bearing.
27. Install the upper bearing spacer on the shaft and into the upper seal. By inserting the upper spacer individually rather than with the shaft, you will prevent possible damage to the lower seal.
28. Place the bearing shield, cup down, on the shaft.
29. Install the pulley hub, square key, heavy cupped washer, and nut on the top of the spindle. Torque the nut to 85-110 ft.-lbs.
30. Grease the spindle until grease flows from the lower seal.
31. Bolt the assembly back into the deck shell. The screws are self-tapping with a nut backup on top of the deck. This design makes it easier for one person alone to install the spindle assembly and also provides a method of retention if a hole is stripped out by overtorquing or repeated replacement.



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32. Install the pulley on the pulley hub and torque the bolts to 27-33 ft.-lbs.
33. Install the blade and torque the blade bolt to 85-110 ft.-lbs.
34. Install the drive belt. Consult the operator's manual for the proper procedure.
35. Replace the deck covers. Remove the machine from the jack stands or Z Stand®.

