

Thank you for selecting Strut Pro. Our mission is to provide you with a superior method of strut bearing replacement. Please read the entire manual before starting.

Please review drawings and photos to familiarize yourself and staff with the parts. It is important to read the instructions carefully and understand the procedure before starting. As our products are continually evolving check our website periodically for new information or updates.

Included with your kit is a tube of copper based anti-seize. Apply anti-seize inside the forward machined nut and on the threaded rods to insure super smooth operation. If you keep all parts clean and free of dirt and other debris you will get years of service from this tool. Using anti-seize will keep the threaded rods in optimum condition and help prevent galling.

Global Marine Industries, Inc. manufactures its products with the highest standards of manufacturing. Even with our strict quality control measures, occasionally a defective part may not be discovered during our inspection process. Also, from time to time, a part necessary for operation fails to be shipped with the product. Even with the highest inspection and quality controls in place these things can happen. Please do not return the product. Contact us should this occur and we will immediately remedy the problem.

WARNING

Strut Pro® is a safe and convenient tool when used properly. As with any tool it is important to have a thorough knowledge of proper use. To reduce the risk of serious injury, read the following safety instructions. Review all drawings and photos before using and please call us before using should you have any questions.

IMPORTANT:

Strut Pro is designed to replace most popular size water lubricated strut bearings. Should you encounter a size, including metric that does not match properly to a collet you can shim the nearest collet that most closely matches the outer diameter of the cutless bearing. Shim material is included in the complete repair yard kits where a variety of sizes are encountered including metric. Individual kits are pre-sized prior to shipping. The shim material is a non-metallic, pressure sensitive adhesive material that is applied to the inside of collets. This allows you to properly space the collet to match the outer shell of the bearing if necessary. Knowing the exact size of the bearing outside diameter is a critical measurement.

NOTE: Do not exceed the bearing outside diameter as you will then be pushing against leading edge of the strut.

NOTE: Do not push on the rubber bearing material as the collets could get stuck by being wedged between the bearing shell and rubber. Always use calipers when measuring. Calipers will allow you to perfectly measure the propeller shaft and bearing outside dimension.

Contact us if you have any questions whatsoever before you begin.

This photo shows the rubber has lost its bond to the inside of bearing shell. When this happens the rubber can “walk” itself out of the strut. Shaft rotation against the strut bore would become a very costly repair.



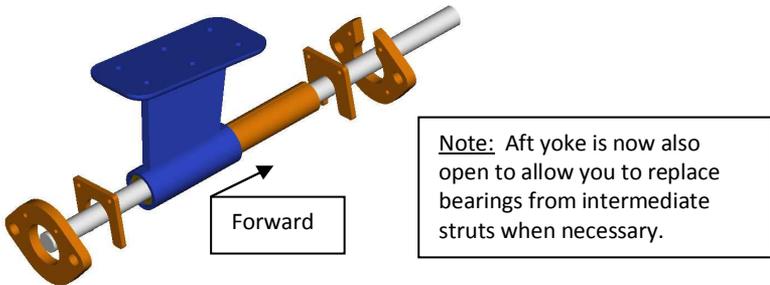
The Standard In Affordable Damage-Free Strut Bearing Replacement.

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Parts List

See exploded drawing below to view individual parts description.



Components are tumbled and Zinc plated to resist corrosion.

Forward Yoke

Aft Yoke

T-1 High Tensile Steel Horseshoes

Laser Cut High Tensile Steel Collets (Stackable) (Always Install With Seams Top and Bottom)

Hook & Loop Collet Retaining Straps

7/8" B7 Grade Threaded Rods (Includes Anti-Seize)

Special Machined Collared Nuts

Horseshoe Retaining Cotter Pins

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Horseshoe and Collet Legend

Horseshoes and collets are marked showing the outside diameter (O.D.). This information will assist in matching which horseshoe and collet is closest to the actual shaft and bearing dimension.

Collets are precision laser cut slightly undersize of the strut bore to prevent the collets from being jammed inside the strut. It is important to always use the collet that is slightly smaller than the O.D. of the bearing to be removed.

Equally important is to insure the collets are not too loose. The bearing outer shell is usually 1/8" thick or less. It is important the collets make full contact with the bearing outer shell only. This prevents the collets from pushing on the rubber which can cause them to get jammed. Not good.

Read the information about shimming to precisely match each size.

Standard Sizes Fit 8 1/4" Wide Yokes

Note:

All Collets Are Interchangeable Between Standard and Mega Kits

Collets I.D. x O.D.	Standard Size Horseshoes
3/4" x 1"	
1" x 1 1/4"	
1 1/4" x 1 1/2"	3/4"
1 1/2" x 1 3/4"	1"
1 3/4" x 2"	1-1/8"
2" x 2-3/8"	1-1/4"
2 3/8" x 2-5/8"	1-3/8"
2 5/8" x 3"	1-1/2"
3" x 3 1/4"	1-3/4"
3 1/4" x 3 1/2"	2"
3 1/2" x 3 3/4"	2 3/8"
3 3/4" x 4"	2 5/8"
4" x 4 1/4"	3"

Mega Fits 10¹/₄" Wide Yokes

Mega Size Horseshoes

3/4"	2-3/4"
1"	3"
1-1/4"	3-1/4"
1-1/2"	3-1/2"
1-3/4"	3-3/4"
2"	4"
2-1/2"	4-1/4"

Before You Begin

Identifying the bearing condition is the first step. A casual glance is not enough. Look at the example photos shown here. From a distance the bearing looks great; lots of rubber and no apparent looseness. A closer inspection shows clearly this bearing needs replacement. The rubber is aged severely age cracked.



Tools You Need

Calipers

3/4" Drive Ratchet with 1-7/16" Six Point Socket (For Manual Tool)

2 - 4 Lb. Brass mallet.

Setup

Remove the propeller. Locate and remove strut bearing set screws. Set screws are often hidden with debris or have been painted over with antifouling paint. It's important to search closely and remove any set screws before proceeding.

If you haven't already ordered your new bearing you will need two measurements; prop shaft diameter and strut bore which is the outside diameter of the bearing shell.



The above photo shows how cleaning the strut face thoroughly will clearly reveal the bearing outer shell for most accurate measuring.

With these measurements you can select the collets and horseshoes you need to replace the bearing. The collets are precision formed to be slightly smaller diameter than the strut bore. The horseshoes will measure slightly larger (.050") than the nominal size. This allows the bearing to slide through the horseshoe without jamming.

For a first time user setting up the tool can be somewhat confusing. Once you grasp the best order of set-up you will find this very straightforward. Occasionally a repair yard customer will call or send a note stating it took 1 or 2 hours to do the first job and only 30 minutes for the 2nd! Follow these instructions and tips and you will be very pleased with the results.

Galvanic Corrosion Issues:

Rarely do we get that call where the bearing simply will not move. It is not impossible for this can happen, however and is typically caused from lack of vessel maintenance and attention. If the vessel remained in water for an extended period without anodes (commonly known as zincs) then galvanic corrosion begins to occur.

Anodes are a critically important part of any vessel. How can this affect a cutless bearing? The answer is technical and you will need to review a Galvanic Corrosion Chart to understand clearly, but here are the basics: Whenever metal is exposed to water electrical current is established. This electrical activity removes metal ions which basically dissolves the metal components. So the vessel needs sacrificial metal that the galvanic corrosion attacks, thus preventing unwanted deterioration of the vessel components.

The underwater metal components are Cathodes (the parts we need and want to keep). Anodes, normally made from zinc or aluminum are the protective (sacrificial) metal. They are called sacrificial metals as they are least Nobile (Anodic) on the Nobility chart which means they are sacrificed to the electrolyte (water) instead of underwater fixtures such a propellers or shafts. Most below water fixtures are usually made of bronze or stainless steel which is more Nobile (Cathodic).

Should a vessel be left in the water without these sacrificial Anodes then any remaining metals become attacked. The thinnest metals are affected first and can take on a “rosy” color and pitting occurs. You may have seen this on the tips of propellers blades. Another thin metal affected by the lack of Anodes is the Cutless bearing shell which is the next thinnest metal. On rare occasions the Cutless bearing shell has actually welded itself to the bore of the strut though galvanic corrosion. We have seen bearing shells be totally disintegrated and crumbled into small pieces.

If you want to learn more about this subject a good reference site is: [http://www.corrosionist.com/Seawater Corrosion Rates.html](http://www.corrosionist.com/Seawater_Corrosion_Rates.html)

Collets are the sleeves that push on the bearing. They rest on the propeller shaft and match up with the bearing outside diameter. The collets can be stacked and shimmed as may be necessary to fit a wider range of prop shaft and bearing combinations such as metric or 1/8" sizes.

The collets are precision made to be slightly smaller than the outside diameter of the bearing. This is to insure maximum coverage against the bearing outer shell. The bearing outer shell can vary from as thin as 1/16" so it is very important to be precise.

First step is to install the collets onto the propeller shaft. Secure the collets using the hook & loop straps provided, or any other means to hold the collets parallel with the shaft. Electrical tape works great, just remember to remove it as the collets are pushed into the strut. Secure the collets by positioning one strap near each end of the collet and pull snug.

Rotate the collets so the seams are on top and bottom. This will maximize the surface area of the collet to the horseshoe. Slide the collets back to butt against the old bearing. Fitting the collets in place first will allow you to quickly attach the tool assembly and start the removal process without any issues. Once the collets are strapped onto the prop shaft do a final measurement to insure the outside diameter of the collets do not exceed the strut bore. Use your calipers for exact measurement.

Next measure the distance between the forward end of the collets to the aft end of the strut. Adjust the threaded rods to get close to this measurement before setting the tool onto the strut. Then only minor adjustments are needed.

Pre-fitting is particularly helpful when working alone.

Special Items

Note: The smallest bearing outside diameter is 1-1/4". These bearings are common on 3/4", 7/8" and 1" prop shafts. Use the spacers shown below when replacing bearings on 3/4" and 7/8" prop shafts.



These special non-metallic spacers are provided for 3/4" and 7/8" shafts. They space the 1-1/4" o.d. x 1" i.d. collets away from the shaft to match up the two smallest shafts.

Assembly Instructions

(You can skip this section if the tool is already assembled)

Set the forward and aft yokes on a clean surface. The threaded rods are shipped assembled, however if the parts were separated follow these instructions:

First remove the threaded rod protective mesh. Insert a flat steel washer and then the bronze oil impregnated bronze thrust bearing and then another flat steel washer over each threaded rod (below right photo). Insert the threaded rods through the aft yoke and then through the forward yoke. Position the forward yoke with the machined nut cage facing forward.

Next thread the machined tapered nuts (below left photo) onto the threaded rod. Apply some anti-seize (included) to the inside of each nut and the threaded rods where the nuts will turn. The nuts are machined to protrude through the forward yoke to prevent the threaded rods from ever making contact with the yoke. These nuts nest into the forward yokes machined nut cage and are locked into position so no wrenches are needed at the forward end. Only the aft acorn nuts are turned.

Threaded Rod Assembly Photos



Next attach the horseshoe that matches the bearing diameter to the aft yoke. Use the cotter-pins provided to secure the horseshoe in place.



Tip! Place your new bearing over the back of the prop shaft and butt it up the old bearing. This now becomes a perfect pilot alignment. Next rest the aft horseshoe on the new bearing. This provides you perfect alignment for the old bearing to slide through the aft horseshoe.

This photo shows the old bearing partially removed. Here the collets will be inside the strut completing the removal process

Next select the forward horseshoe that matches the prop shaft diameter. With the aft horseshoe attached to the aft yoke lift the tool assembly over the back of the propeller shaft. Position the forward yoke up and between the propeller shaft forward of the collets already installed onto the shaft.

Attach the forward horseshoe to the forward yoke and secure using the cotter-pins.

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Note: Some struts (typically wakeboard and tournament ski boats but also some small inboard sailboats) have a steep rake angle due to their mid engine configuration. If you encounter this situation you may need to rotate the forward horseshoe 180 degrees so the opening is facing upwards. This will provide the needed clearance so the forward horseshoe does not contact the strut. You may need a helper to hold it in place until pressure is applied. Hand tightening the nuts will usually provide ample pressure to hold the horseshoe in place while in this inverted position.



This close up photo shows a wakeboard boat strut with the horseshoe inverted and facing upward. This method provides clearance so the horseshoe does not contact the leading edge of the strut.

With the yokes in position begin turning the threaded rods clockwise by hand. This will compress the puller assembly and snug it up to the horseshoes against the strut (aft) and collets (forward). Once the slack has been taken up do a final inspection and make any necessary adjustment, making sure the tool is evenly positioned and square against the strut.

Bearing Removal

The tool is now attached and you are about to remove the bearing. Use a $\frac{3}{4}$ " drive ratchet for best leverage as it is not uncommon for some bearings to be tight.

Continue evenly tightening the threaded rods. About three pulls on one side then switch. The tool is designed to allow

some imbalance but try to keep everything as square as possible.

Inspect and make sure the aft horseshoe is aligned so to allow the old bearing to clear the aft horseshoe as the bearing is pressed out. This is very important as there must be clearance for the old cutless bearing to slide through the aft horseshoe.

Watch carefully. If the puller assembly gets tight without the bearing moving stop and examine the cause. (Also re-examine to make positive there are no hidden set screws securing the bearing into the strut). Often the bearing will notify you when it starts moving by a “pop” sound. This is your signal the bearing has given up its hold inside the strut.

Proceed with caution. Turn each nut no more than few cranks then switch to the other. Watch closely to insure alignment remains square between the forward and aft yokes. As you continue turning the nuts the tool will force the collet through the out of the strut, removing the worn bearing.

Once the bearing is free loosen the threaded rods and remove the collets which are now inside the strut. This might require tapping the collets to free them from the strut. Note: If the collets appear tight inside the strut don't be alarmed or waste time trying to get them out. They will easily slide forward and out of the strut when the new bearing is being installed.

New Bearing Installation

Installing the new bearing is basically a reverse action of the removal process. Switch horseshoes as you will now be pressing the new bearing into the strut. This will allow the aft horseshoe to make maximum contact with the new bearing to be installed. Next attach the larger horseshoe to the forward yoke.

Tip! Place the new bearing into a bucket of icy water or in the freezer a couple hours before installing. This will shrink the bearing shell slightly and allow easier installation. Applying a small amount of biodegradable dish soap to the bearing shell before installation is also helpful.

Slide the new bearing over the shaft and gently start it inside the strut. In some cases the new bearing can be easily pressed part way into the strut by hand. Begin compressing the threaded rods until the new bearing is in place.

Remove the tool, reinsert new set screws, reinstall the propeller and get back out on the water...

Thank You and Happy Boating!



This product is protected under U.S. Patent Number 6,539,601

Strut-Pro® is a registered trademark of

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