

UPGRADING OLD PILLOW BLOCK BEARINGS WITH NEW PILLOW BLOCK BEARING

TOOLS RECOMMENDED

5/16" Socket Allen Wrench
1/4" Socket Allen Wrench
3/16" Socket Allen Wrench
3/32" Allen Wrench
9/16" Short or Deep 3/8" drive socket
5/8" Short or Deep 3/8" drive socket
3" extension for 3/8" drive
9/16" Box End Wrench
5/8" Box End Wrench
#2 Phillips Screwdriver
Flat Blade Screwdriver
Retaining Ring Pliers (Large Pins)
2 Jaw Gear Puller w/ 3-1/2 Depth Jaw
5/8" Cold Chisel
Ball-peen Hammer
Scotch Brite Pad

Parts List

- Pillow Block Bearing upgrade kit (ST P/N **130-1721-KT**) – *qty. 4 per Cross Trainer*
- 0.5cc tube of 609 Lok-tite – *qty. 1 per Cross Trainer*
- Cross Trainer Preventative Maintenance Completion Form – *qty. 1 per Cross Trainer*

DIAGNOSTIC PROCESS TO FIND BEARING NOISE:

1. ___ Ride unit and engage "Quick Start" program type. It is recommended to use anywhere between levels 8-12 for this diagnostic check of the Cross Trainer
2. ___ Check for any noise coming from the upper or lower crank area. If there is any sort of grinding noise, it will most likely occur in a repeating fashion which will be in phase with the strides you are taking on the Cross Trainer. The noise can be described as sounding like a duck quack. It may take 30 seconds to one minute to get this noise to occur.
3. ___ If this noise is occurring from one of the bearings, it is important to first isolate the problem by finding out which area the noise is coming from. To do this, use lubricant such as WD40 to spray into the area where the main drive bearing comes in contact with the shaft. You must guide a straw through the slot in the rear of the crank to spray the lubricant into the correct location.

Do this process **one bearing at a time and run on the Cross Trainer in between applications.** If the bearing sprayed is the one making noise, the sound should go away after 30 seconds or so of running the Cross Trainer. If the noise does not go away, move onto the next bearing.

Mark on the preventative maintenance form whether or not there was any bearing noise and where that bearing noise was coming from.

DIAGNOSTIC INFORMATION				***Use diagram at right as reference							
noise coming from bearings upon inspection?				all pillow blocks replaced? (circle if yes)							
YES		NO		UPPER-1	UPPER-2	LOWER-1	LOWER-2				
noise coming from which bearing? (circle all that apply)				upper shaft in need of replacement?							
UPPER-1	UPPER-2	LOWER-1	LOWER-2	YES	NO						
NOTES:				lower shaft in need of replacement?							
total maintenance time on individual unit:				YES		NO					
<p><i>For note that task is complete</i></p> <p>both the bearing ID and the shaft surface at all 4 bearings.</p> <p>spacers are installed correctly against the spacers (this includes the spacer kit).</p> <p>torque to 100lb-ft</p> <p>install guard disks.</p> <p>inspections and make sure that there is no shroud or shroud</p> <p>no backlash or misalignment.</p> <p>Verify Trac @ fax number listed above</p> <p>all maintenance notes are correct.</p>											
Date:											
Date:											
Date:											

Figure 1 Preventative Maintenance Completion Form

Whether or not there was a noise diagnosed, all 4 of these bearings must be replaced. The next step after diagnosing the location of the noise is to tear the unit down to the level where these bearings are accessible.

Disassembly of Shrouds and Linkages:

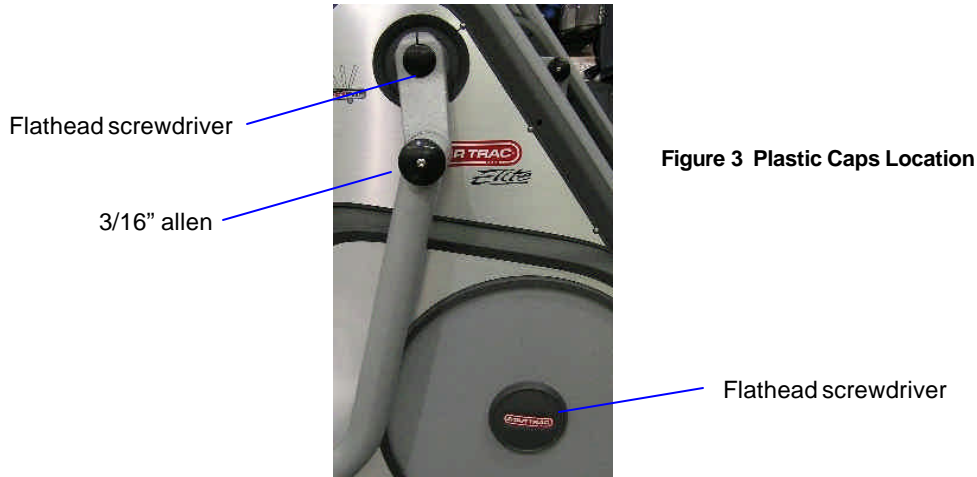
- Remove the side shroud plates on both sides of the unit using a 3/32" Allen key. There are 6 screws on each side. One of these screws is longer than the rest. This screw is to be placed at the split in the shroud plate as shown in the picture below.



Figure 2 Shroud Access Panel

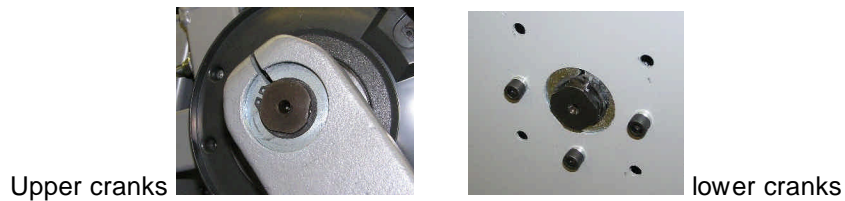
- Remove the plastic caps that are on the leg beam, upper crank and guard disk on each side of the unit. There are a total of six of these caps (three per side).

The caps on the upper crank and lower disk can be removed by using a flat-head screwdriver as shown in the pictures below.



Use a 3/16" Allen key to remove the cap on the end of the leg beam.

6. ___ Next, remove the 4 retaining rings from the ends the upper and lower cranks.



This can be done by using a set of retaining ring pliers equipped with large pin-hooks (pin-hooks about 1/16" in diameter should be adequate).

7. ___ Next, the "dog-bone" linkage must be detached from the lower crank on both sides of the cross-trainer. To do this, use you will need a 5/16" allen socket and a ratchet. The bolt holding the "dog-bone" linkage to the lower crank is installed at the factory to a torque of 100lb-ft. Due to this high torque specification, it may be necessary to use a breaker bar 12-18" in length in conjunction with the ratchet to get more leverage.



As you are removing this bolt, keep in mind that the leg beam assembly along with the attached foot pedal weighs in excess of 50lbs. This assembly will swing down to the ground once this bolt is removed. It is a good idea to orient the leg beam in the position shown in the image below while this bolt is being removed.



Orient dog bone so this joint is close to the ground.

Figure 6 Leg Beam Orientation

This will minimize the distance the leg beam assembly will swing down when the bolt is removed.

With the bolt removed and the dog-bone detached from the lower crank, take care not to lose the 1/2" Nord-lock washers or the hat-spacers.



Figure 7 Dog Bone Hardware

These small components are shown in the picture below. It is important to remember to install these components back in their original position upon re-assembly.

8.____ Now, remove the 3/4" E-clips which are holding the leg beams onto the upper cranks.

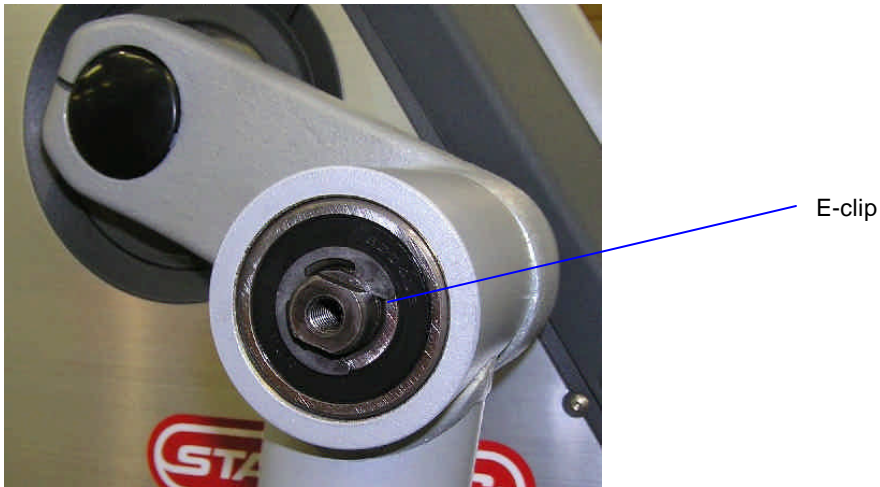


Figure 8 Leg Beam e-clip

9.____ One side at a time, slide the leg beam off of the upper crankshaft. Sometimes, the bearings of the leg beam will stick to the crankshaft and the leg beam will be difficult to slide off. In this event, the use of a flathead screwdriver might be necessary to pry the leg beam loose from the crankshaft (shown in the image below).

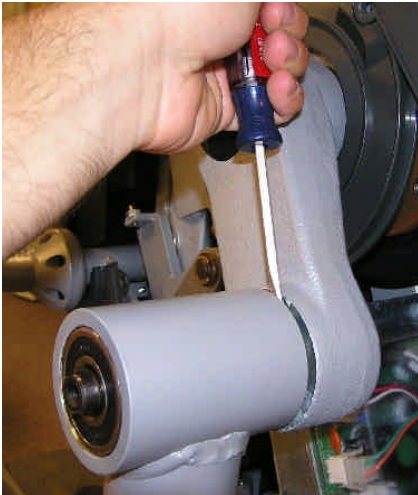


Figure 9 Leg Beam Removal

Once the leg beam is taken off of the crankshaft, pull the leg beam and pedal sub-assembly toward the rear of the machine and hook the top end of the leg beam onto the upper body arm as shown in the image below.

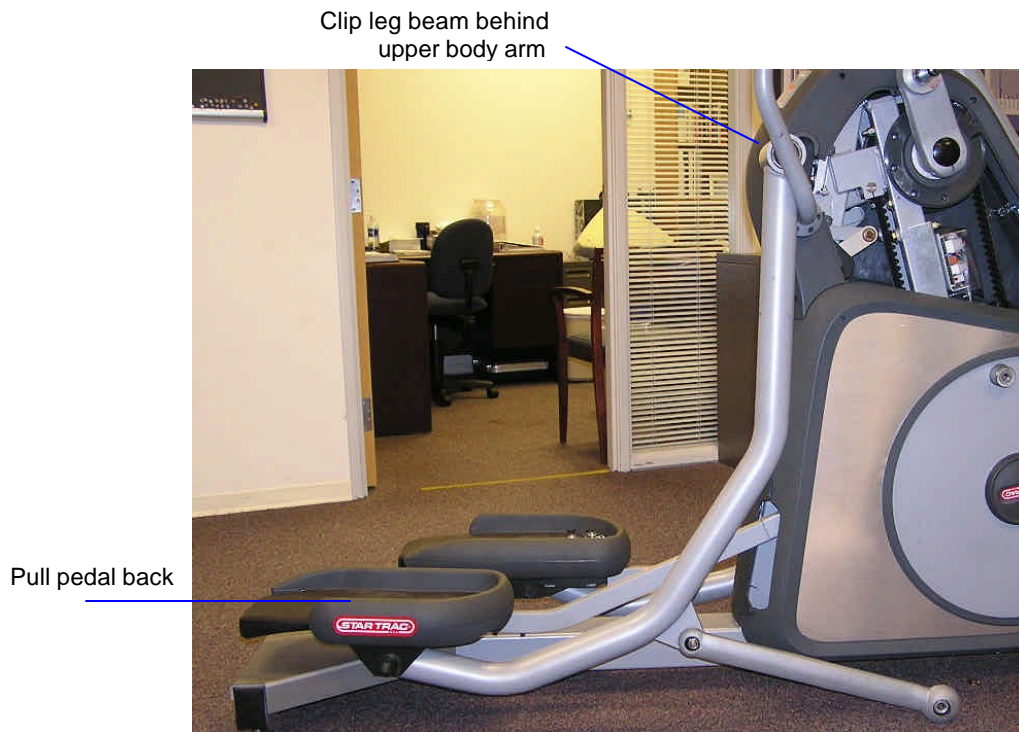


Figure 10 Leg Beam Storage Location

Doing this will keep the leg beam and attached linkages out of the way during the rest of the process.

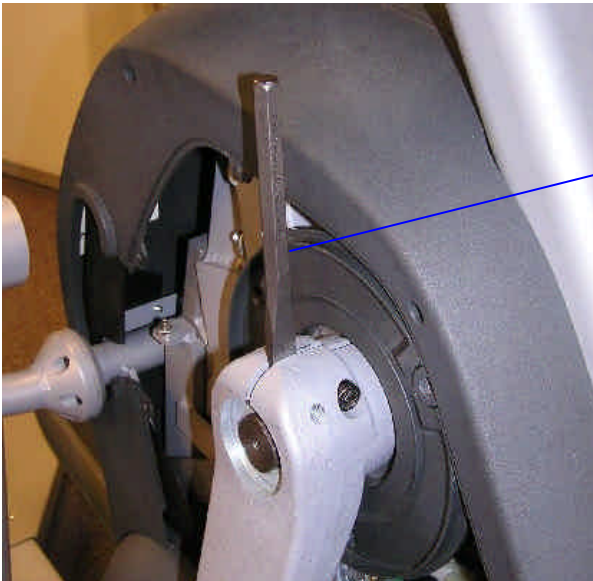
Repeat this process on the other side of the cross-trainer.

10.____ Now, it is time to remove the upper cranks. The first step of this is to loosen the socket head screws that clamp the crank to the main shaft. The inner screw only needs to be loosened about 5 full revolutions. The outer bolt must be completely removed (see image below).



Figure 11 Removal of Outer Crank Bolt

The next step is to pry the crank open at the clamp slot. This can be done with a 5/8" cold chisel and hammer. Hammer the cold chisel into the slot as shown in the image below.



Hold chisel while hammering

Figure 12 Crank Removal

About 3-4 good strikes with the hammer should be sufficient. Once this clamp area is pried open with the chisel, you can slide the crank (using both hands) off of the main shaft. If the crank is still stuck on the shaft, you may need to hammer the chisel in more. We have listed a few other tips below to aid in this step:

- Remember that the inner clamp screw is still in the crank. The chisel should be positioned between the middle and outer edge of the crank. Make sure that the chisel is not coming in contact with the inner screw while trying to remove the crank.
- Angle the chisel outward slightly to avoid interfering with the plastic shrouds.
- When pulling the crank off of the shaft, be sure to use two hands and hold the crank at the end where it comes in contact with the shaft. This will help you pull the cranks straight off and prevent cocking the crank to the side and binding it on the shaft.
- If the crank is not coming off easily but you can feel that it is loose on the shaft, try wiggling the crank as you pull it off the shaft.

- 11.____ After removing the upper cranks, remove the plastic spacer on both sides of the shaft. You can throw these spacers away as new spacers have been provided to you in the pillow block parts kit.

Crank spacer

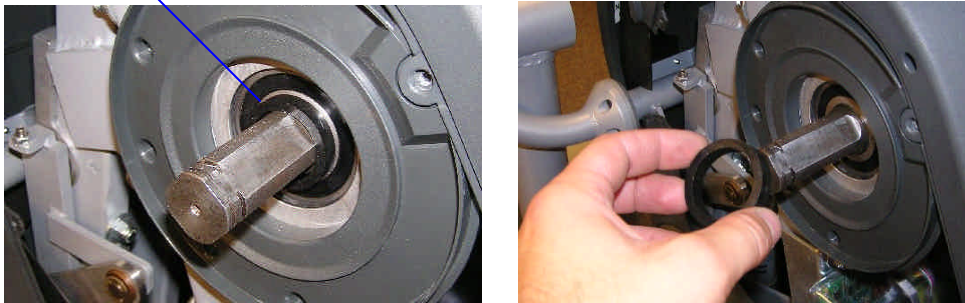


Figure 13 Removal of Crank Spacer

- 12.____ Once the upper cranks and plastic spacers are removed, the upper plastic shroud disk must be removed from each side to expose the bearings.

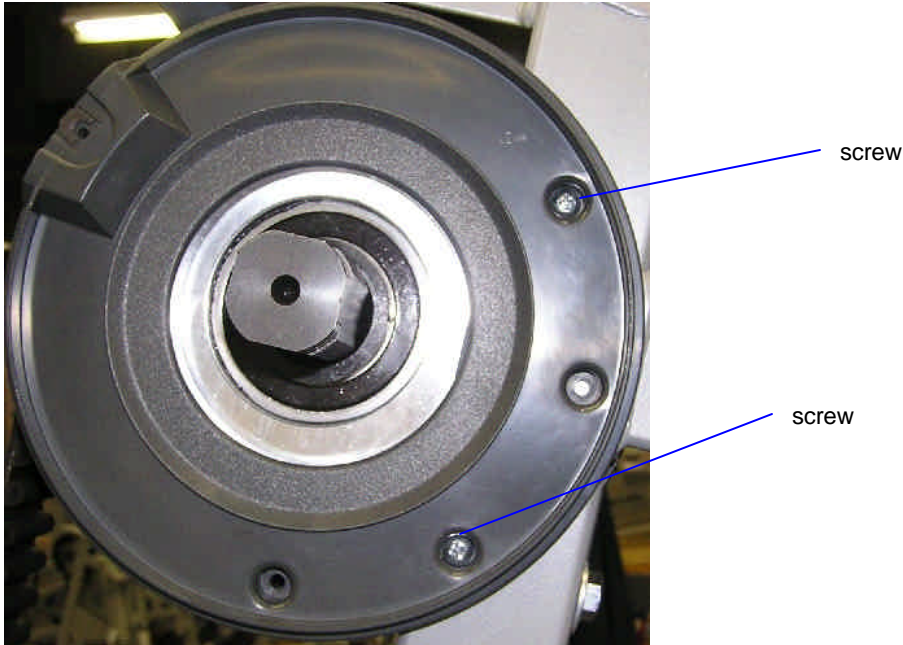


Figure 14 Plastic Shroud Disk Removal

This can be done by removing the 2 screws on each side with a Phillips screwdriver. After these disks are removed, it is a good idea to place them on or next to the upper cranks that have just been removed. These plastic shroud disks must be reinstalled before the upper cranks are put back on. Failing to put this plastic shroud disk back on can result in quite a bit of time-consuming backtracking.

- 13.____ With a #2 Phillips screwdriver, remove the front 3 screws on each side of the lower shrouds (shown in picture below).

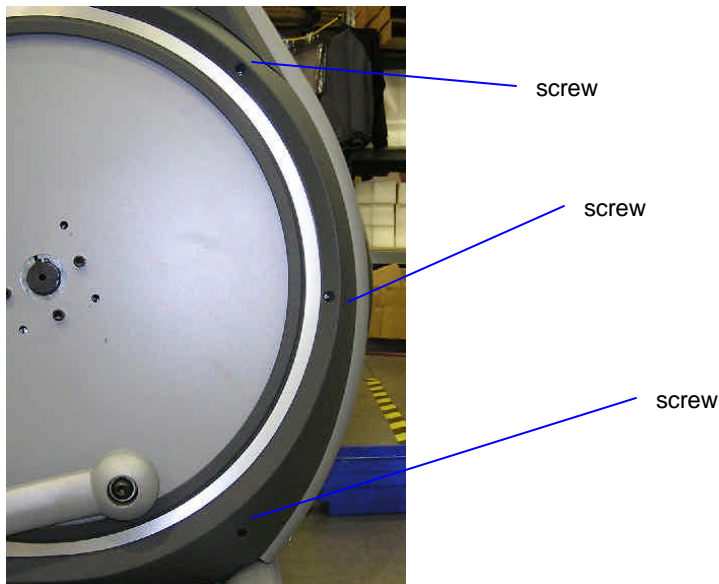


Figure 15 Lower Shroud Access

- 14.____ Now, the large steel guard disk must be removed from each side of the cross-trainer.
Use a 1/4" allen key to remove the 3 socket head screws which fasten the guard disk to the lower crank. Once these screws are removed, slide the disk out over the boss of the crank, then pull the disk forward between the lower plastic shroud and the front neck of the cross-trainer (the area where the 3 shroud screws were removed. See image below).

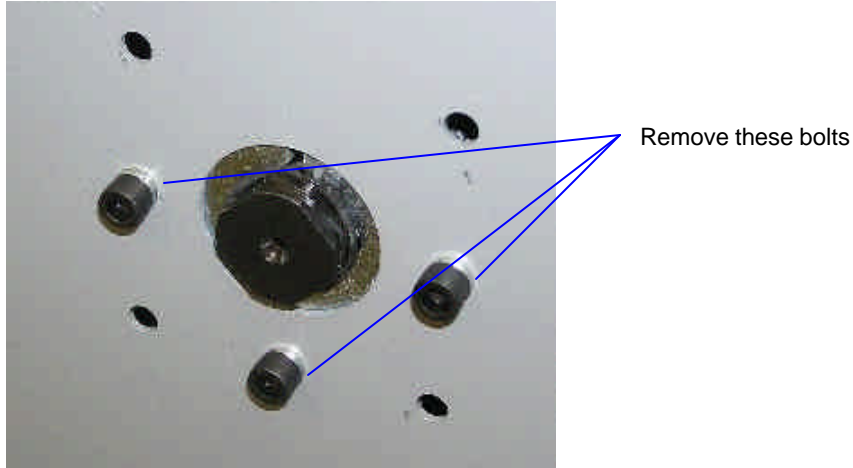


Figure 16 Guard Disk Removal

- 15.____ Remove the lower cranks using the same procedure for removing the upper cranks.

Between each lower crank and bearing is a small plastic spacer. Remove this spacer from both sides. This lower spacer is thinner than the upper spacer and will not be used to reassemble the unit. We have provided you with a new set of spacers to use. They are in the kit with the new bearings. These new spacers are the same size as the spacers currently used on the upper cranks.

Pillow Block Replacement:

- 16.____ Next, loosen the pillow block bolts on the upper left pillow block (for the purposes of this written document, left and right is oriented from standing at the rear of the cross-trainer and looking at it. See the image below for clarification).



Figure 17 Orientation of Cross Trainer

The bolts can be loosened by using a 9/16" socket and ratchet on the bolt head and a 9/16" box-end wrench on the nut side. Loosen these bolts until about 1/8-1/4" of gap can be seen in the bolt.

- 17.____ Next, loosen and remove the bolts on the upper right pillow block. To remove these bolts, it may be necessary to use a hammer to tap them out.

- 18.____ Now, this upper right pillow block & bearing must be removed. Sometimes, these bearings will slide right off of the shaft. However, in the majority of cases, the use of a small 2-jaw gear puller is necessary. This gear puller needs to have at least a 3-1/2" reach and must have a gripping tip thickness of no greater than 1/4" (ref. Craftsman P/N 46905). Place the puller up against the end of the shaft and orient the gripping tips onto the pillow block as shown below.

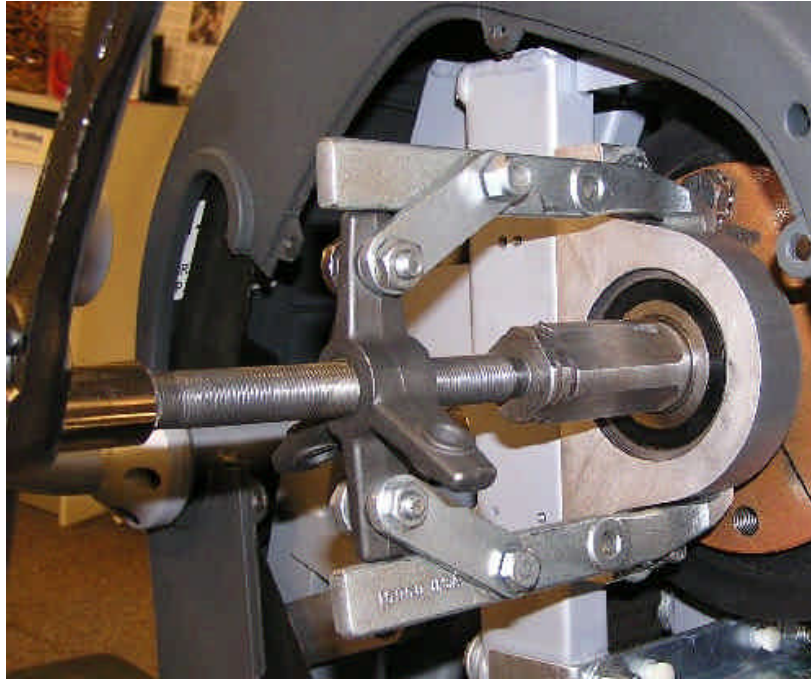
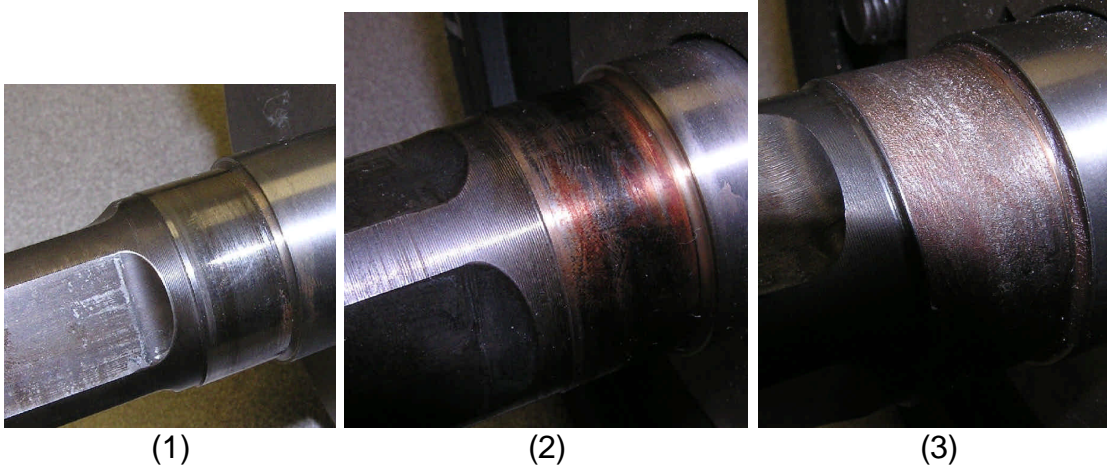


Figure 18 Pillow Block Removal w/ Gear Puller

19.____ Once the bearing is removed, clean any dirt, grease, etc. off of the shaft. The use of a scotch-brite pad and a solvent cleaner is highly recommended in this cleaning process. Examine the shaft for damage. If the shaft is damaged to a large extent, the entire shaft & pulley assembly must be replaced. Examples of what the shaft might look like can be seen below. The image on the left shows a brown stained surface from grease. As long as the surface of the shaft is smooth in this area, the shaft is reusable. The image on the right shows a shaft that has been damaged to the point where it must be replaced. This shaft at the bearing surface will have a rough texture around its entire circumference.



- (1) Shaft is fairly clean and has no visible damage. Clean shaft surface and reuse.
- (2) Shaft surface is not clean. A brown film is deposited on shaft. This is a combination of dirt and grease. Clean the deposit off with cleaning solution and an scotch-brite pad. Shaft surface should be fairly smooth. As long as shaft surface is fairly smooth, you may reuse shaft.
- (3) Shaft surface is not smooth. The surface feels like fine grit sandpaper or a fine-toothed file. This shaft is not reusable. Please contact StarTrac Product Support and inform than this Cross Trainer needs a new shaft/pulley assembly (specify upper or lower pulley assembly..

Figure 19 Shaft Conditions

If the shaft is not reusable based on comparing it to the above pictures, the entire pulley/shaft assembly must be replaced. In the event of this, please contact StarTrac product support and inform them that the upper pulley assembly (S.T. P/N 721-1064) is in need of being replaced.

20. ___ As long as the shaft is re-useable, you can move forward to this step. Make sure that the shaft surface which will contact the bearing is clean and apply a very thin layer of 609 Loc-tite to the leading edge of this surface (see image below).

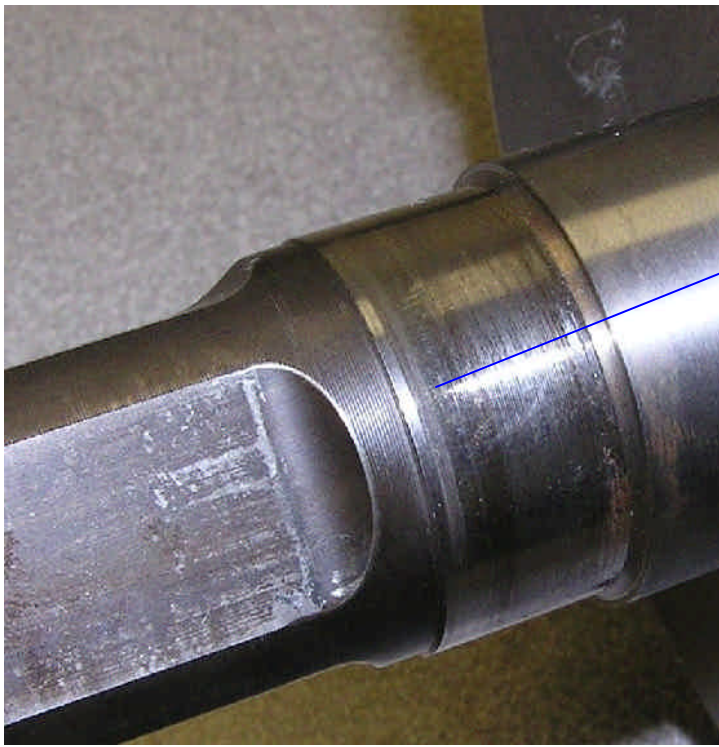


Figure 20 Loc-tite on Shaft Bearing Journal

This Loc-tite must be applied 360-degrees around the entire area of this shaft.

21. ___ Apply a very thin layer of 609 Loc-tite to the inner race of the new bearing supplied in the service kit (S.T. P/N **130-1721**). As with the shaft, the Loc-tite must be applied 360-degrees around the entire I.D. of the inner race. Take care not to get any Loc-tite on any other part of the bearing. Doing so can cause damage to the bearing which would result in complete bearing failure. If Loc-tite does get on any other part of the bearing, wipe it off before proceeding.

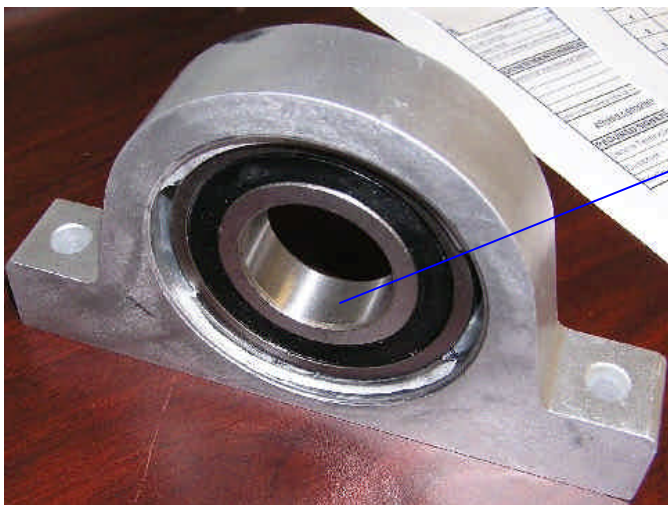


Figure 21 Loc-tite on Inner Race of Bearing

- 22.____ Once the Loc-tite is applied to both surfaces, slide the new bearing onto the shaft. The fit between the bearing and shaft is a close fit. We have supplied you with a custom slide hammer to aid in this process. (If you do not have the custom slide hammer tool, use two of the 3-1/2" x 3/8" bolts held on opposite sides of the square shaft to tap the bearing on with a hammer.) Use this slide hammer in conjunction with a ball-peen or dead-blow hammer to tap the inner race of the bearing into place on the shaft. Continue to tap the bearing into place until it is flush against the stop shoulder of the shaft.



Hold slide hammer against inner race w/ one hand and hammer end of slide hammer with other hand.

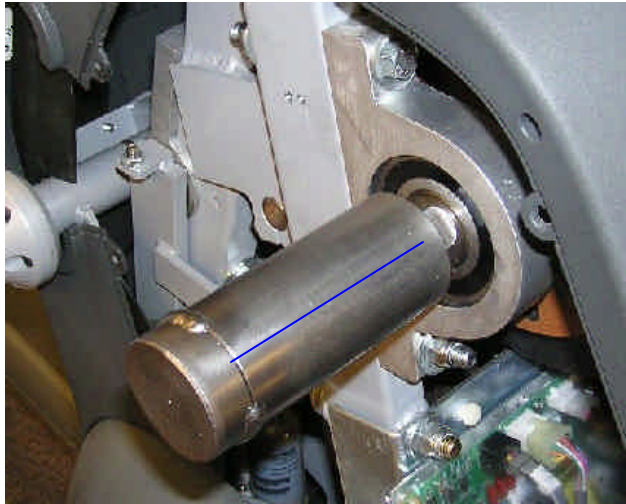


Figure 22 Bearing Installation w/ Slide Hammer

After the bearing is in place, wipe all excess Loc-tite off of the bearing, shaft or any other moving part. Also, check to make sure that the bearing is aligned straight within the pillow block.

23.____ Now, the 2 bolts fastening the pillow block to the frame must be re-installed. While re-installing these bolts, do not forget to place a 3/8" flat washer onto the bolt. It is easiest to begin with the upper bolt. Install this bolt from the front end of the machine. It is recommended to align the holes for this upper bolt by using a screwdriver to pry the pillow block up from the lower hole.

In many cases, the holes on the pillow block may not align with the holes on the frame. The bearings are mounted spherically inside the pillow blocks. This means that you can tap the outer extents of the pillow block to properly align the bolt holes.



Pillow Block bearing has misalignment capabilities. Tap pillow block in place to better line up bolts if necessary

Figure 23 Pillow Block Alignment

With the bolt holes properly aligned, there is still a chance that the upper bolt will not be able to protrude out the rear bolt hole on the frame. If this happens, leave the top bolt in half-way, remove the screwdriver from the lower hole and move on to installing the lower bolt.

The orientation of the lower bolt is very important the function of the cross-trainer. Be sure to install this bolt from the back end so the bolt head is on the frame side, not the pillow block side. See the image below or look at the opposite side of the Cross Trainer for reference.

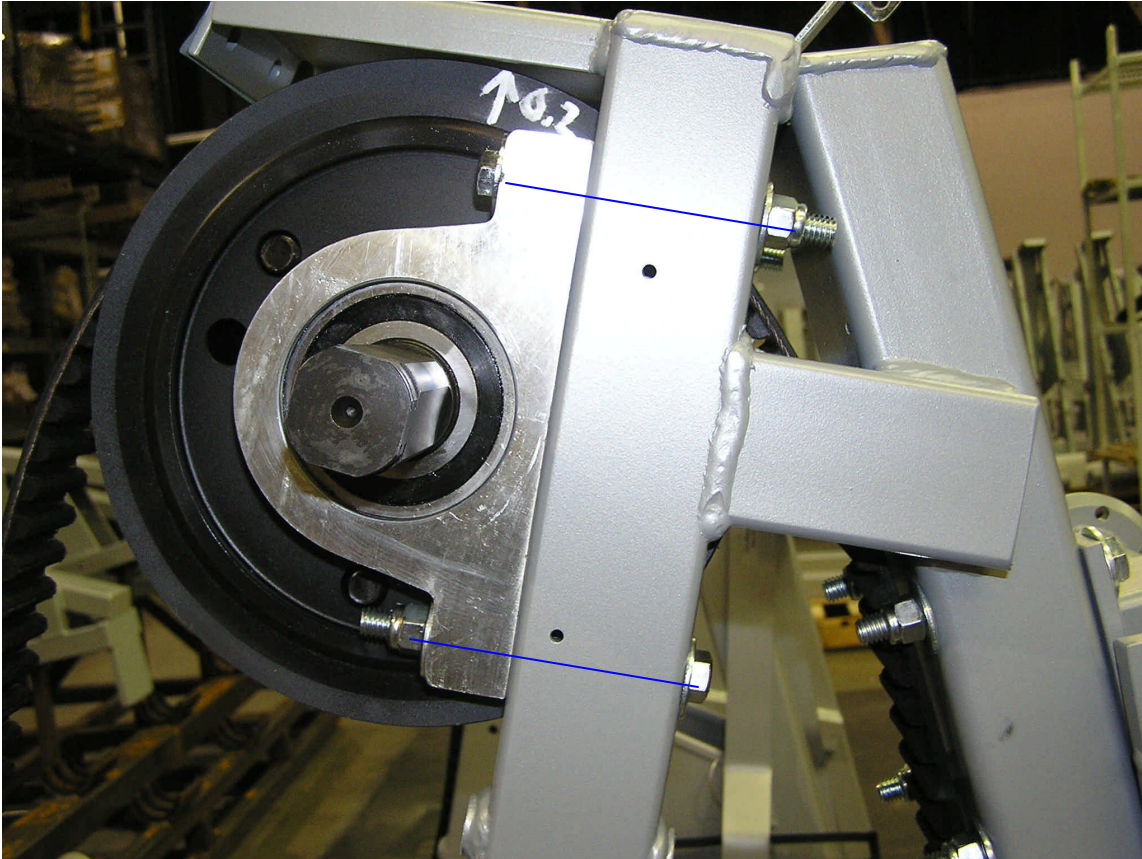


Figure 24 Pillow Block Alignment Assistance

Failure to install this bolt in the above orientation will result in linkage interferences that will not allow the cross-trainer to be used.

If there were problems installing the upper bolt, installing this lower bolt will make it easier to align the upper bolt and slide it through the rear bolt hole on the frame.

24. ___ Once both bolts are in place, reinstall the nuts and flat washers. Do not tighten these bolts all the way at this point. Leave them loose with 1/8-1/4" of gap until all 4 bearings have been replaced.
25. ___ With this new pillow block in place, you can move on to installing the upper left pillow block. Remove the old bearing and install the new one in the same fashion that the first pillow block was replaced.
26. ___ With both upper pillow blocks replaced, it is time to move on to the lower pillow blocks. Make sure that the bolts on the upper pillow blocks are still loose with 1/8-1/4" gap on the bolts. This will allow for slack in the transmission system and make replacing the lower pillow blocks much easier. Begin by loosening the bolts on the lower left pillow block. **When replacing the lower pillow blocks, it is VERY IMOPRTANT that you do not loosen or move the jack screws that set these pillow blocks into place. These jack screws are set in place at the factory to achieve the correct belt tension and alignment.**

Loosening or adjusting the jack screws will disrupt the factory specified tension and alignment.

- 27.____ Next, remove the bolts on the lower right pillow block.
- 28.____ Now, remove the lower right pillow block in the same fashion as the upper pillow blocks were removed.
- 29.____ Clean and inspect the shaft just as you did on the uppers and install the new pillow block using the same process.
- 30.____ On the lower pillow blocks, the tension of the brake belt along with the jack screw above the pillow block make for a little bit of a challenge during replacement. This process will be much easier if you tap the pillow block into misalignment so it better guides its way up onto the frame and under the jack screw.

Angling the pillow block will help position the pillow block into its proper final location without interfering too much with the frame or the pillow blocks. Also, as you use the slide hammer to install the pillow block, it will help to pull it towards the front of the machine (away from the frame beam).

As the pillow block is tapped into place, the frame beam and jack screw will help align the pillow block into its final straight orientation. Sometimes, this process needs to be aided by tapping the pillow block into alignment with a ball peen hammer.

- 31.____ Once this first pillow block is in place, re-install (but do not tighten) the 2 bolts and move onto the lower right pillow block. Use the same procedures for this final pillow block.
- 32.____ Now that this last pillow block is in place, make sure both lower bearings are aligned straight within the pillow blocks, re-install the last 2 pillow block bolts, and check to make sure that all 3/8" flat washers are in place (there should be 16 total between the 4 pillow blocks).
- 33.____ The bolts can now be re-tightened. **This process must begin by first tightening the bolts on the upper pillow blocks. Failure to tighten the upper pillow blocks first will result in misalignment of the main belt.** It does not matter if you start with the upper left or upper right bolts. Just make sure to tighten the bolts on **BOTH** upper pillow blocks before moving on to the lower pillow block bolts.

Once the upper pillow block bolts are tightened, move on to tightening the lower bolts.

- 34.____ Next, check to make sure that the four bolts holding the frame brace to the frame are tight (see image below). This area is a possible source for noise if the bolts are not tight. Making sure these bolts are tight will eliminate the possibility for future noise coming from this area. These nuts and bolts take a 5/8" wrench.

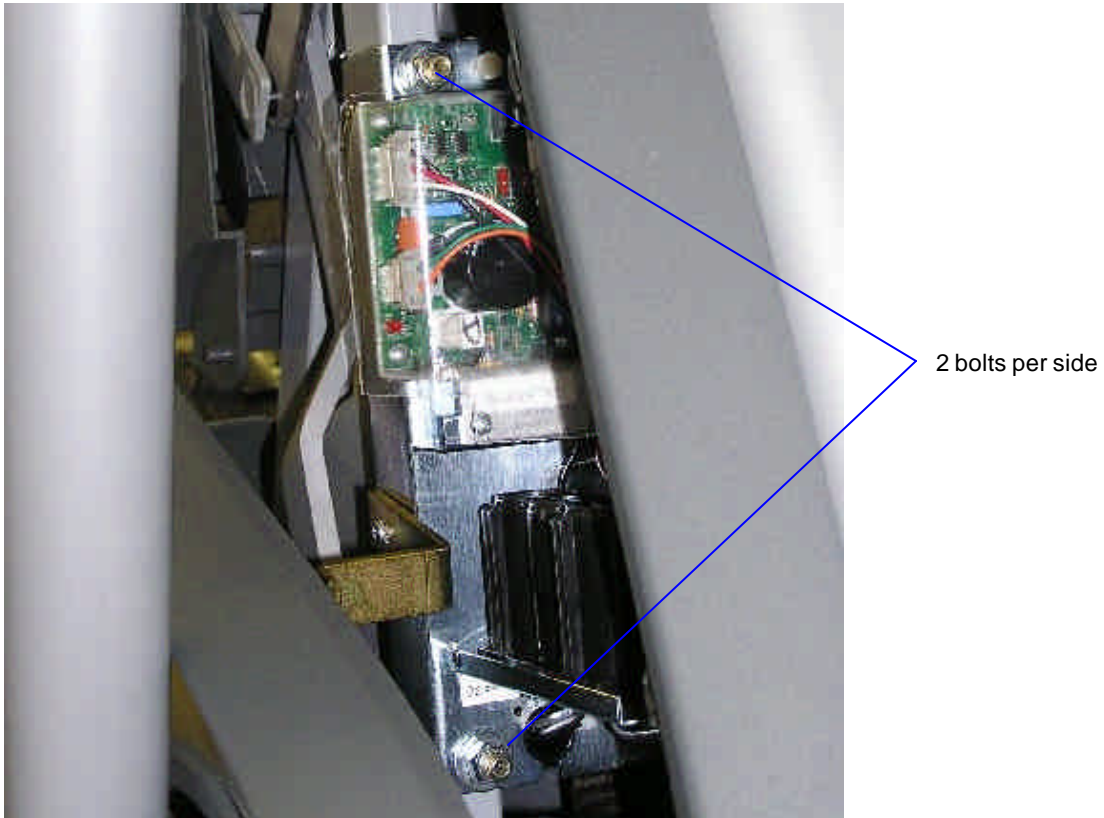


Figure 25 Frame Brace Bolts

35.____ Before moving on to re-assembly of the unit, it is beneficial to bend a few shroud brackets outward. This will help prevent any interference/rubbing between the lower shrouds and the steel guard disk. See the image below for which shroud brackets to bend out. There are four total brackets (2 per side). Each bracket should be bent outward 1/8-1/4”.

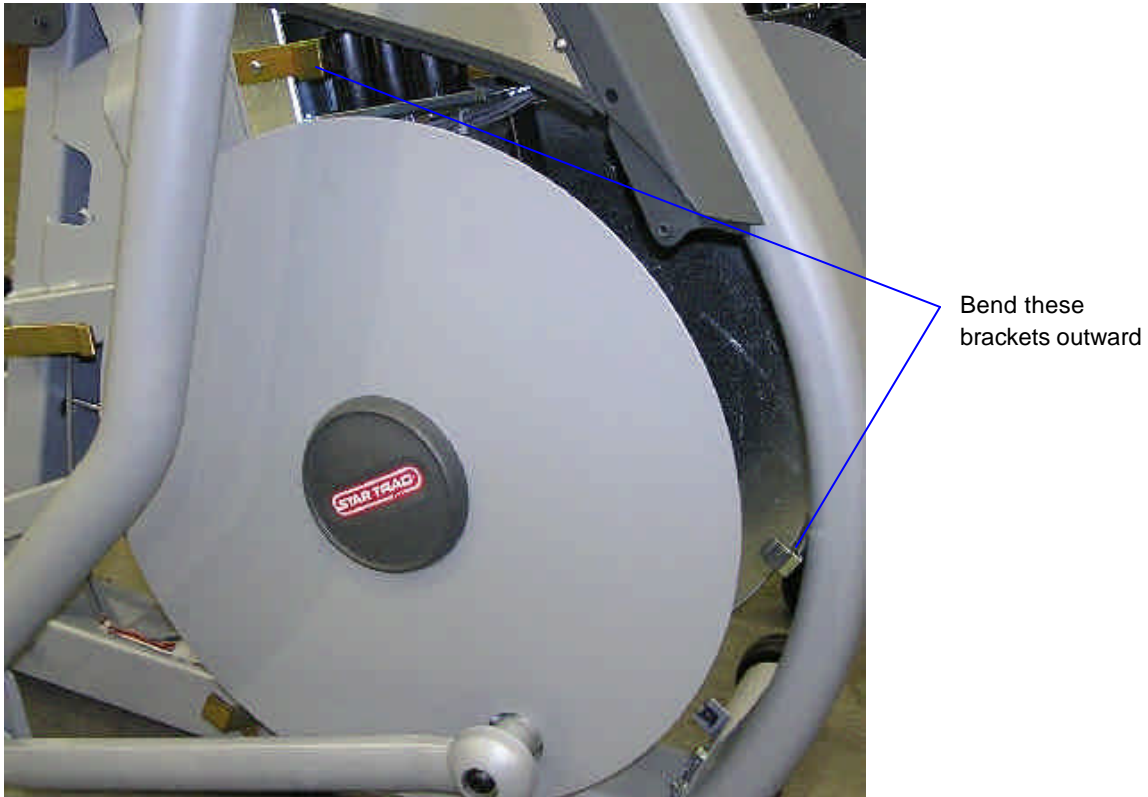


Figure 26 Shroud Brackets to Bend Out

36.____ With the main transmission now fully reassembled, it is time to re-install the cranks. Start with the lower cranks. There is one important thing to check for on the lower cranks before re-installing them. Look next to the square bore on the cast surface that faces inward. You will notice a part number cast into this surface. Next to that part number, there is a small space where the supplier stamps the revision level of that crank. This space is supposed to be recessed into the surface of the crank. On some of these cranks, this space is protruding out from the surface of the crank.

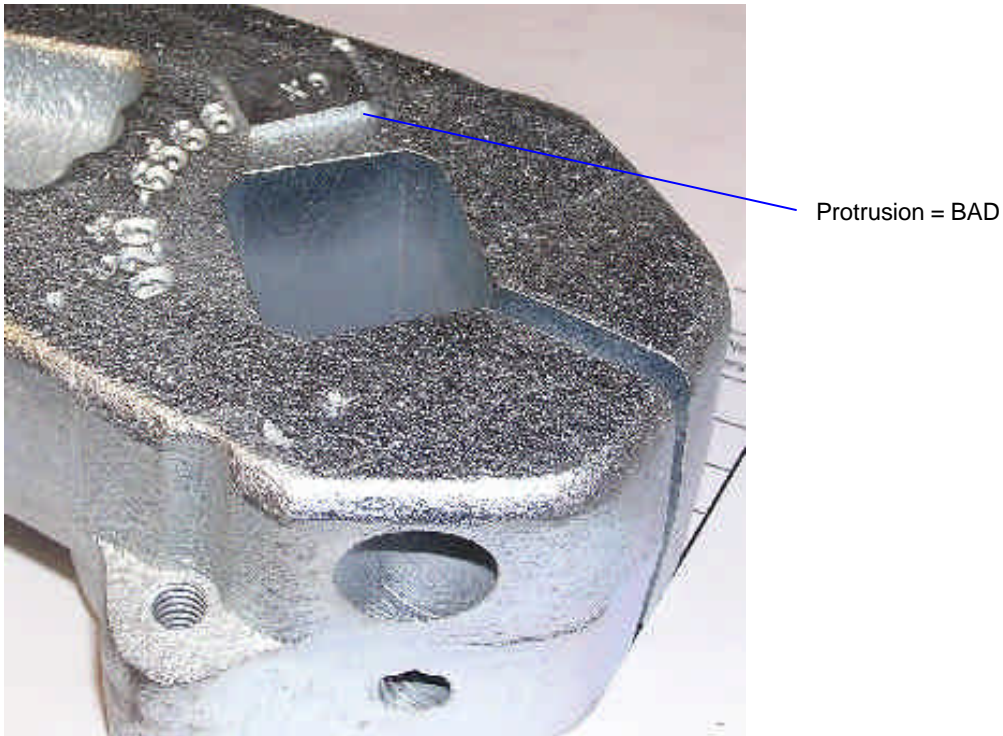


Figure 27 Lower Crank Revision Protrusion Removal

This protrusion will interfere with the new spacer provided. If this space is a protrusion and not a recess, you will need to grind this protrusion down so it is flush with the surface of the crank. Another option aside from grinding would be to trim the spacer down in the area where the spacer would come in contact with the protrusion.

37.____ With that out of the way, you can install the new lower crank spacers provided in the parts kit.

- 38.____ Next, install the cranks using the 5/8" cold chisel to first spread the clamp end of the crank open. **When re-installing these cranks, it is very important to make sure that the crank is pressed completely up against the spacer and the spacer is pressed completely up against the inner race of the bearing. The cross-trainer will not perform properly if this step is ignored.** Just to ensure that the crank is in its correct position, take the 5/8" cold chisel and place it in the side of the clamp split as shown in the picture below.

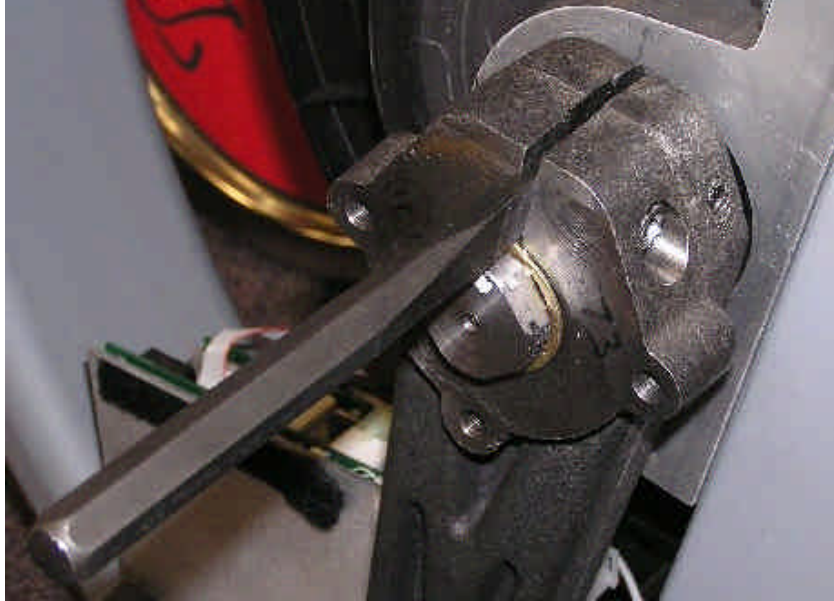


Figure 28 Lower Crank Re-installation

Tap the chisel with a ball-peen hammer a few times as if you were trying to move the crank inward towards the center of the machine. Remove the chisel and use a small allen wrench or any other object at least 3" long and no more than 1/8" thick to poke at the plastic crank spacer. If you can move this spacer by poking it, the crank is not flush against the spacer & you need to repeat the process. If you cannot move the spacer by poking it, the crank is properly installed and you can move onto the next step.

- 39.____ Once the crank is in its correct location, tighten the 2 clamp screws. These screws are to be tightened to 50lb-ft each.
- 40.____ Move onto the other lower crank and install this one facing the opposite direction as the first (180-degrees apart). **Be sure to install the NEW spacer correctly on this side as well.**
- 41.____ Before moving on to the upper cranks **do not forget to re-install the 2 plastic shroud disks by using a #2 Phillips screwdriver to fasten the disks to the frame**

42.____ The next step is to install the upper cranks. **The orientation of the upper cranks with respect to the lower cranks is very important to achieving the proper motion of the cross-trainer. Follow this step closely to ensure proper crank orientation.**

Start with either the left or right upper crank. Whatever side you start on, rotate the lower crank on that side so it is facing straight down towards the ground. With the lower crank in this position, install the upper crank so that it is facing downward and is in line with the main beam of the frame. See the image below for a visual of this proper orientation

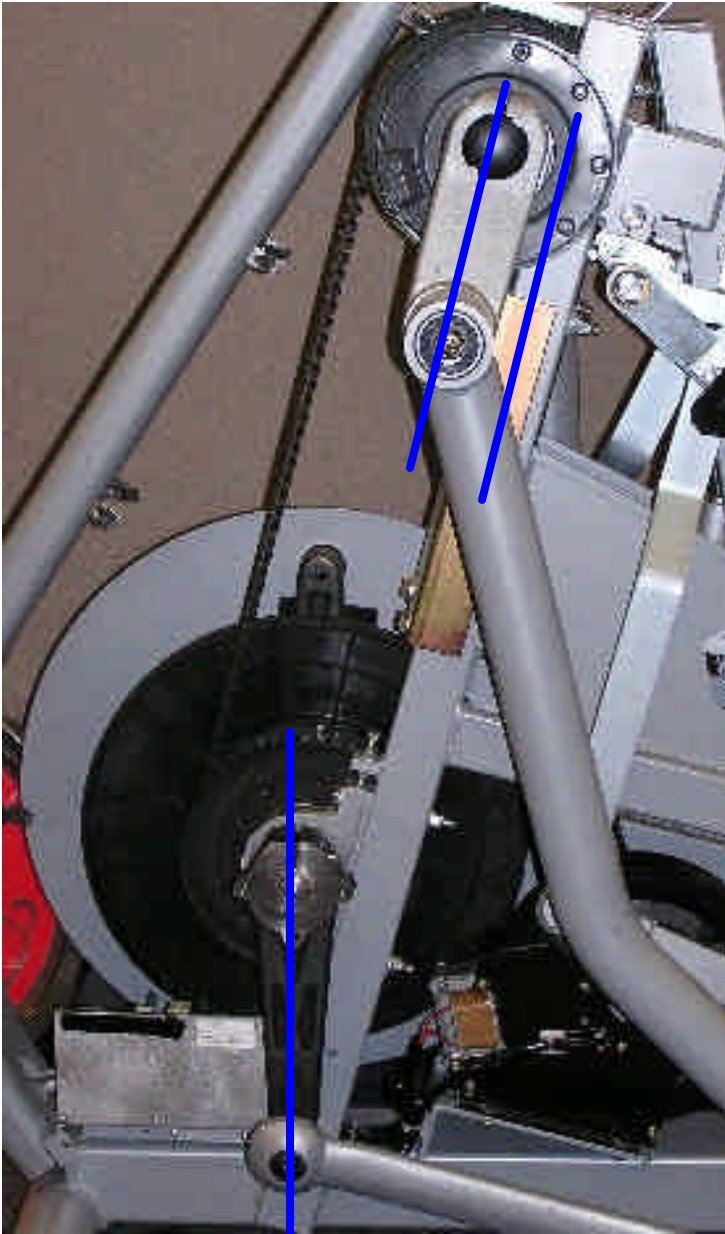


Figure 29 Crank Installation Orientation

While installing the upper cranks, make sure to follow the same procedures outlined in steps #39-41.

Re-assembly of Cross Trainer:

- 43.____ With the cranks installed, the rest of the cross-trainer can now be re-assembled. The best sequence to put the cross-trainer back together is as follows:
- steel guard disks
 - re-install screws on lower shrouds and make sure shrouds are not rubbing against the steel guard disk. If the guard disk is rubbing up against the shroud, you may need to bend the shroud brackets outward more as mentioned in step # 36.
 - slide leg-beams onto upper crank shafts (do not forget the shim and wave washer).
 - Put the 3/4" E-clip back on both upper crankshafts.
 - Re-attach the dog bone link to the lower crank (do not forget the hat spacers and Nord-lock washers. The washers need to be oriented where the large serrations are facing each other and the small serrations are facing outward. See the image below for a visual). **This bolt (on each side) must be torqued to 100 lb-ft.**

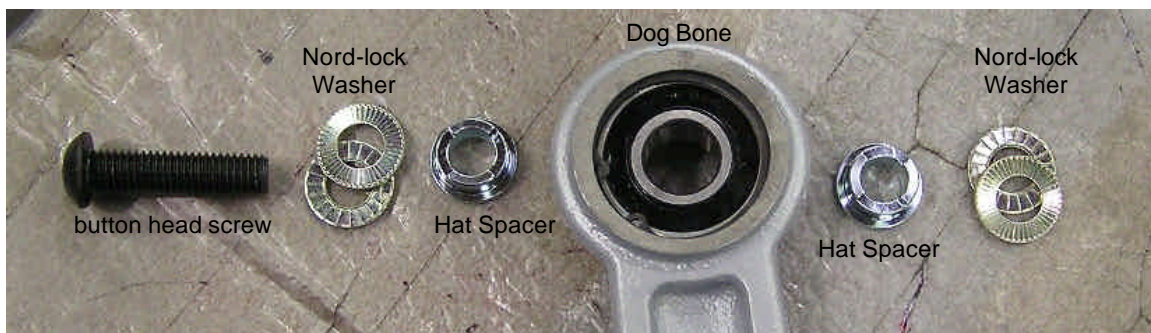


Figure 30 Re-Assembly of Hardware in "Dog-Bone"

- Ride cross-trainer to test for functionality.
- Install the 4 retaining rings on the ends of the main shafts.
- Install the 6 plastic caps on the upper cranks, leg beams and steel guard disks.
- Install the shroud side panels. Prior to putting these should panels back into place, it is a good idea to check the J-nuts on the upper shroud to make sure that they are all accounted for and affixed into place. Remember from step #4 that the longer screw is to be placed at the split in the shroud plate (ref. Fig. 3) Do not over-tighten these screws. You will damage the plastic shrouds and you may create interference between the screws and the internal moving parts of the system.
- Lastly, be sure to completely fill out the "Cross Trainer Preventative Maintenance Completion Form". One of these forms must be filled out for **each** Cross Trainer. Once the form is filled out, please fax it to StarTrac @ the fax number listed on the form.