CARDIO MECHANICS TECHNICAL CERTIFICATION TRAINING

LifeFitness
WHAT WE LIVE FOR

Field Engineering | 2010

Course Objectives

- Torque wrenches and requirements
- Fastener Adhesives - Loctite
- Bearings – Installation
- Poly-V belts
- Machine Alignment
- Reference Section – Bearing Tool Kit

Torque Wrenches & Requirements

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Torque Wrench Recommendation

- Recommended: “Dial and Click” type torque wrenches:
  - Torque Wrench, 10-75 ft. lbs., 3/8 or 1/2 inch Drive. Manual adjustment type with micrometer-type scales stamped into housing show torque settings in both English and metric units.
  - Accuracy: +/– 4%.

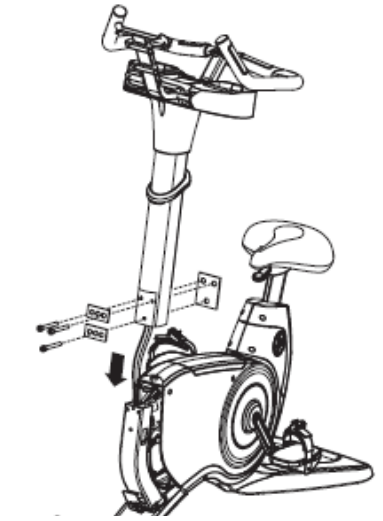
“Dial and Click”

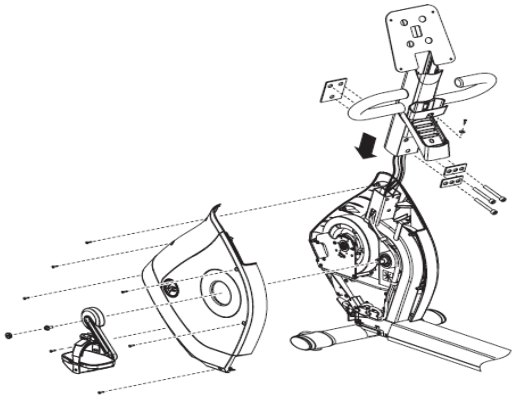
“Beam Torque Wrench”

- Not recommended: “Beam Torque Wrench” type:
  - Accuracy +/– 8%

Structural Fasteners Requirements

- Keep and use your torque wrenches calibrated.
- All structural joints of any Life Fitness machine must be tightened to the recommended torque specification shown in the service documentation.
- Examples:
  - The mono-column joint hardware on 95C and 95R Elevation Series bikes required torque is 50-55 ft-lbs (36.9-40.6 N-m)
- Examples of other structural joints:
  - Bikes' stabilizers;
  - Cross-trainers' mono-column to the main frame attachment;
  - Treadmills' uprights.





Fastener Adhesives - Loctite®

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Fastener Adhesives Used by Life Fitness

- Split or star lock washers are a very ineffective means to retain screws/bolts from loosening up very quickly under repeated vibration.

- Most, of the present production Life Fitness products use fasteners with an adhesive patch.
  - The adhesive patch on the fasteners' threads reduces the likelihood of loose components under vibration.

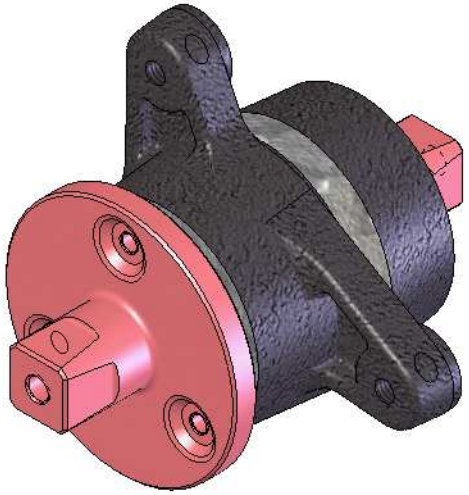
- Main types of adhesive used by Life Fitness:
  - 1. Loctite® 242/243 for threaded fasteners or equivalent (blue in color)
  - 2. Loctite® 680/609 for bearing retention or equivalent (green in color)

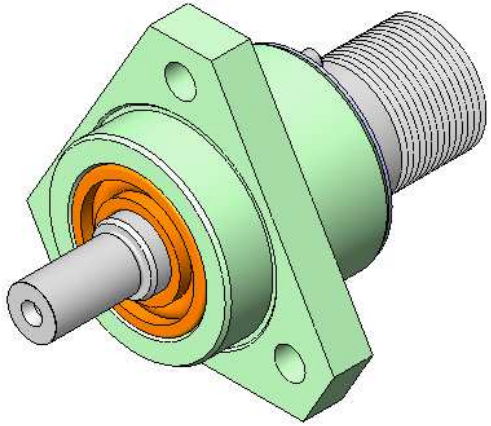
Fastener Adhesives – Best Practices

- Loctite® 242 or 243 is blue in color:
  - Low strength breakable bond
  - Always clean off the threads and reapply the Loctite® 242 to the threads before reassembly
  - Wipe off any excess amount of adhesive after the screw installation
  - Equivalent in bond strength adhesive:
    - ND Industries brand - pink or light red in color.
- Loctite® 7649 primer:
  - Acts like a thread cleaner
  - Speeds up cure time.
- Loctite® 680/609 is green in color:
  - It is a permanent bond
  - Starts to set up in 5-10 minutes, full cure in 24 hrs.
  - Use ONLY where specified.
  - The bond can be broken by high temperature – heating up with an acetylene torch.

Example of Loctite® 680/609 Use

- For retaining of the bearings on the crank-shaft and the bearing housing/cartridge on the Elevation bikes.
- For retaining of the bearings on the intermediate shaft and the bearing housing/cartridge on Summit Trainer.
- The crank-shaft and/or intermediate shaft and bearings should be replaced as an assembly – crank hub assembly.





Loctite ® Application Chart

Loctite® Type	Color	Application	Bond Strength	Comments
222	Purple	Fasteners smaller than 1/4" diameter	Low strength , wrench can be used to break bond	Not used by L.F.
242/243	Blue	General purpose removable grade for fasteners up to 1" diameter	Medium strength, wrench can be used to break bond	Used by L.F.
262/263	Red	Chemical resistant for fasteners. Considered permanent	High strength. Heat needed to break bond. Temp. range: 250 deg F - 350 deg F	Not used by L.F.
680/609	Green	Bearing / cylindrical retention	Very high strength. Heat needed to break bond. Temp. range: 300 deg F - 400 deg F	Used by L.F.

Bearings - Installation

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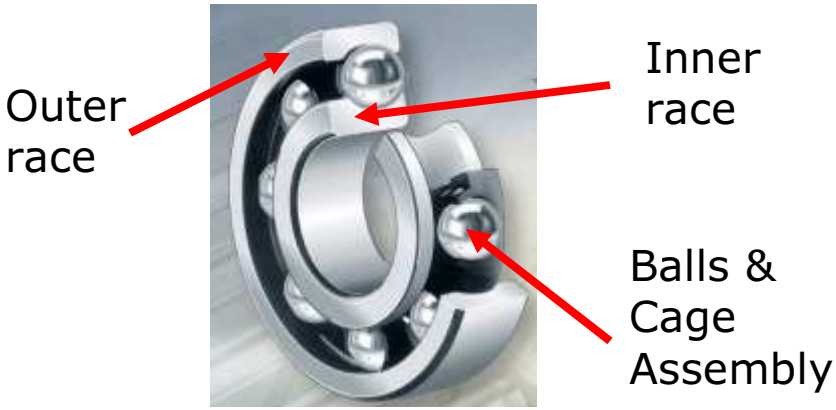
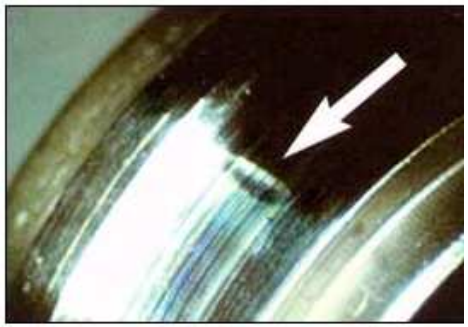
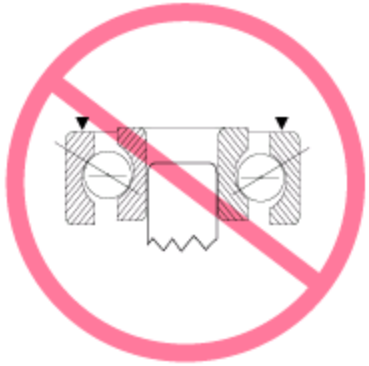
Ball Bearings

- Deep groove ball bearings are self-retaining with solid outer races, inner races, balls and cage assemblies.
- Very quiet and can take some axial loading.
- Low frictional torque - suitable for high speeds.
- Life Fitness is mostly using single row bearings.
- **Proper installation:**
  - Installing bearings into housings – press on outer race of the bearing
  - Installing bearings onto shafts – press on inner race of the bearing
- Incorrect installation can result in failure known as **Brinelling**
  - Damaged raceway, increased noise, higher torque, and reduced lifetime



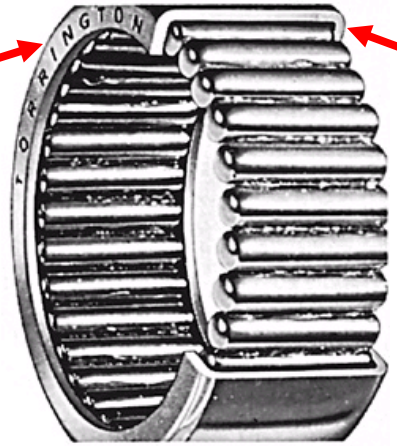




Needle Bearings

- Drawn cup needle roller bearings with open ends comprise thin-walled drawn outer rings, needle roller and cage assemblies.
- Suitable for high load capacity, high speeds and easy fitting.
- Noisy and can not take any axial load
- Use of thrust bearing or washer in conjunction with the needle bearings is a must.
- **Proper installation:**
  - Install the bearings into the housings by pressing on the bearing surface that contains the bearing manufacturer and part number of the bearing.
  - An example would be INA – HK2512

Side with bearing manufacturer and pn



Side with no information

Poly – V Belts

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Non-stretchy Poly-v versus *Flexonic*® Belt

- Poly-v J, PJ, or K type Non-stretchy belts:
  - … stretch/relax up to 5%
  - Require tensioning device – with or without idler
  - Life Fitness machines utilize J and PJ type belts
  - K type belts are used on Lemond Spin Bikes

- Flexonic® (stretchy) belts:
  - Stretch from 10% to 15%.
  - No tensioning device is necessary
  - Require fixed center-to-center pulley distances
  - Elimination of the tensioning device need compensates for the extra cost of this belt
  - Some installation difficulties can be expected

Fatigue - Random Cracking

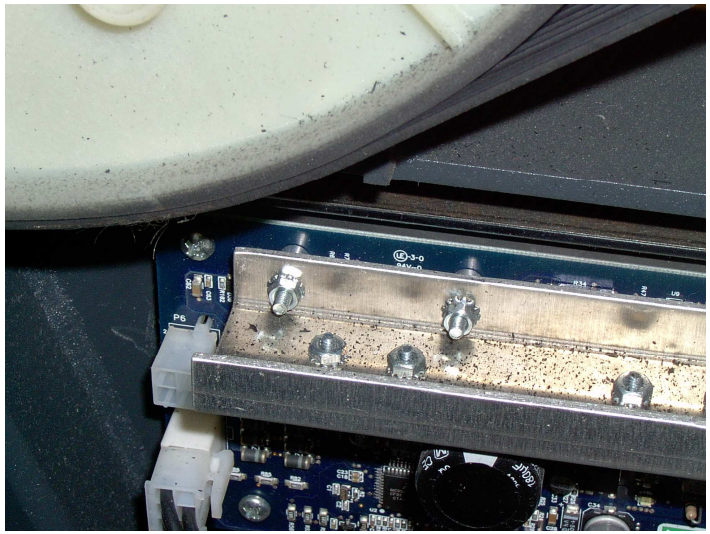
- Issue:
  - Small cracks form across width of belt
  - Pieces of rubber material come off the belt along a rib
- Probable cause:
  - Stress cycling of bending over pulleys
  - Excessive heat (slippage)
- Solution:
  - Imminent belt failure – replace immediately
  - If cracks less than 2cm (3/4”) apart - replace belt

Pilling / Flocking

- Issue:
  - Belt material is sheared off from ribs and builds up in pulley and belt grooves
  - Noise and vibration
- Probable cause:
  - Misalignment
  - Low Tension
  - Worn pulleys
  - Rough surface condition
  - Debris from belt grinding operation
- Solution:
  - Check alignment
  - Check tension and increase if needed
  - Check the pulleys, replace if required
  - Check belt, clean or replace if required

Belt Debris/Wear

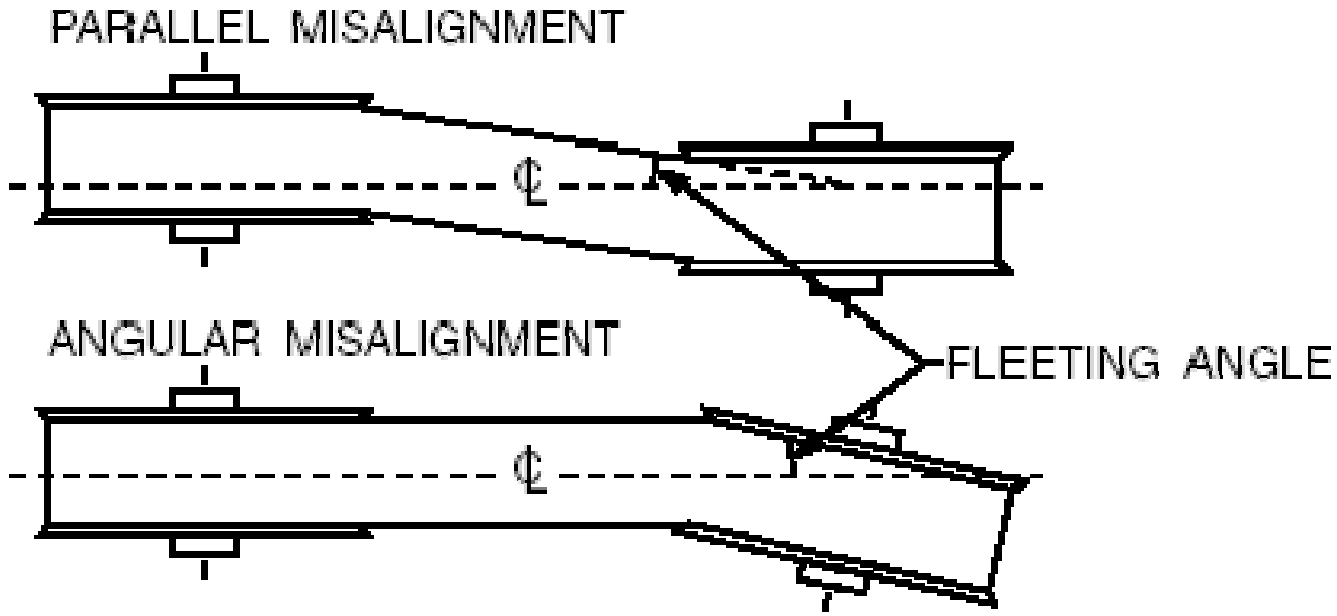
- Issue:
  - Black “powder” residue in the area below the belt
- Probable cause:
  - Misalignment
  - Excessive Tension
  - Rough surface condition
- Solution:
  - Check alignment
  - Check tension and lower if needed
  - Check the pulleys, replace if required
  - Check the belt and replace if required



Tensile Cord Break

- Issue:
  - Destroyed belt
- Probable cause:
  - Foreign object cut into the belt and broke tensile cords
  - Installation practice
  - Severe shock loads can also cause
- Solution:
  - Check surrounding area for loose objects
  - Replace the belt:
    - Use proper belt
    - Follow the installation procedures

Belt Misalignment



- Both, parallel and angular misalignment cause wear, life reduction and “off tracking”
- Alignment requirements for the Elevation and Platinum Club Series bikes:
  - Angular <= 1/4° total
  - Linear <= .060” [1,5 mm].

Machine Alignment

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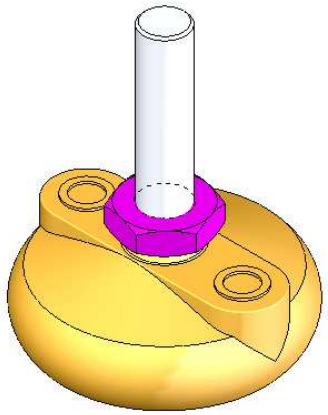
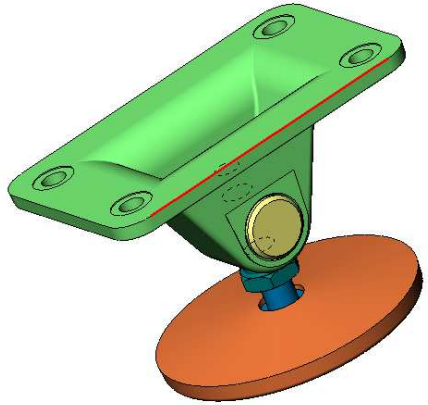
Life Fitness Cardio Equipment Alignment

- As most stationary equipment, the Cardio exercise machines need to be leveled before use.
- Alignment is a requirements for a proper functionality of the unit.



Non-treadmill leveler

- For Bikes, Treadmills, Cross Trainers, Summit Trainer and Stair Climber loosen the nut with open-ended wrench.
- Adjust levelers until unit is level and does not wobble on the floor and tighten the nuts.



Treadmill leveler

Reference Section – BEARING TOOL KIT

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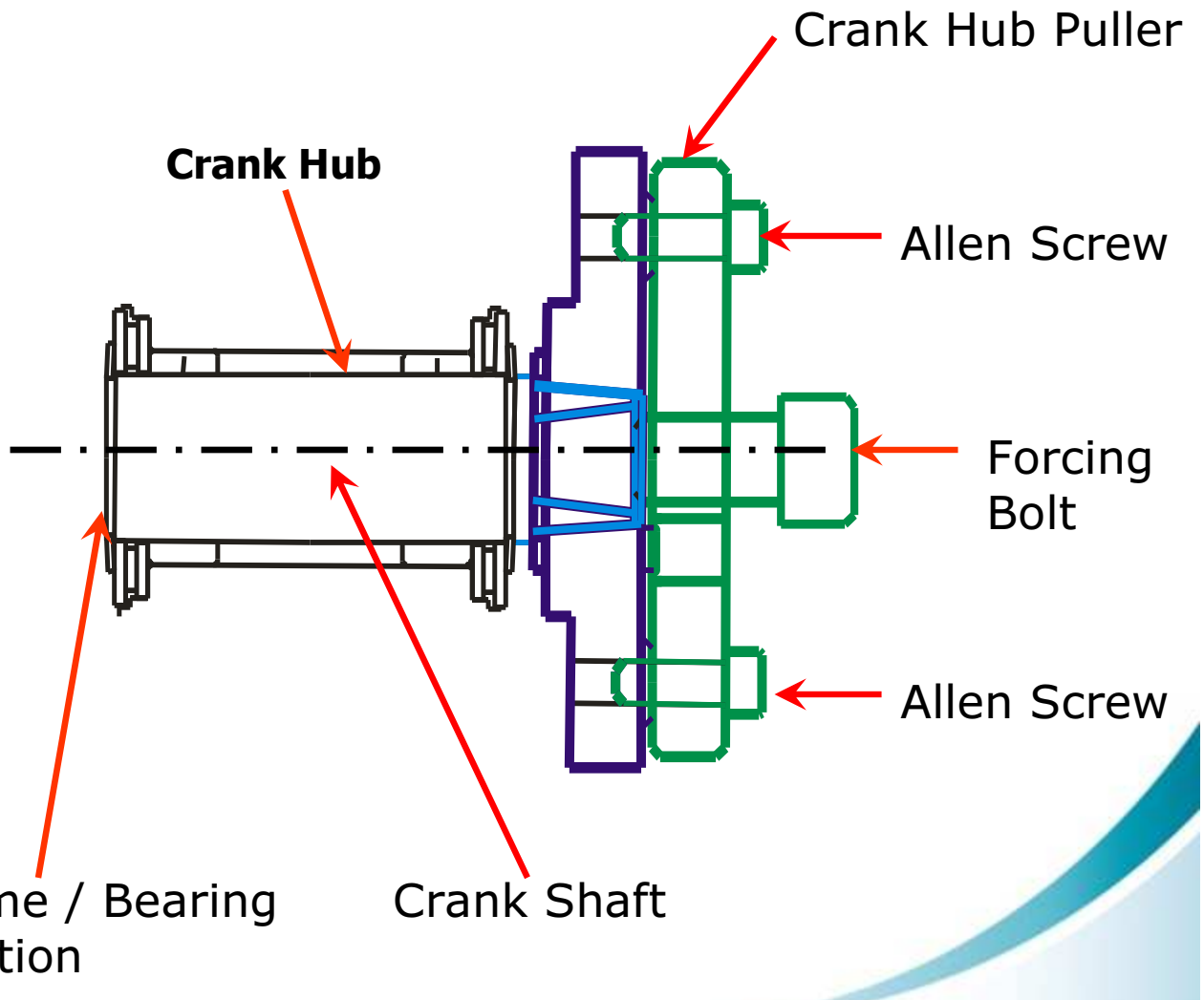
Crank Hub Puller

Secure the Crank Hub Puller to the Crank Hub with 2

Allen screws. With the Crank Hub Puller securely in place, use an Allen wrench in the forcing bolt to remove the Crank Hub from the Crank Shaft.

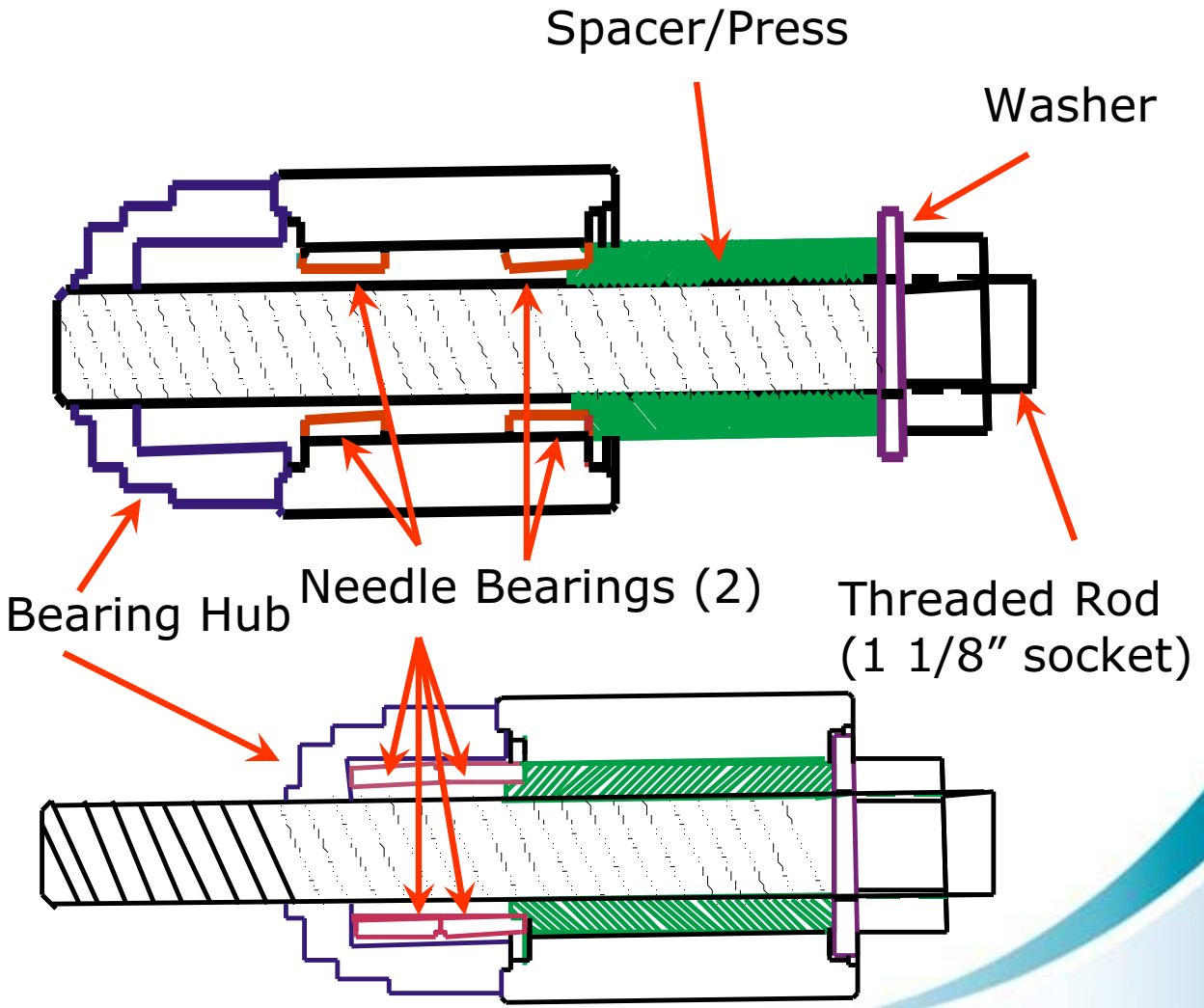


Bearing Replacement Tools

Tool kit part number:
GK63-00002-0010

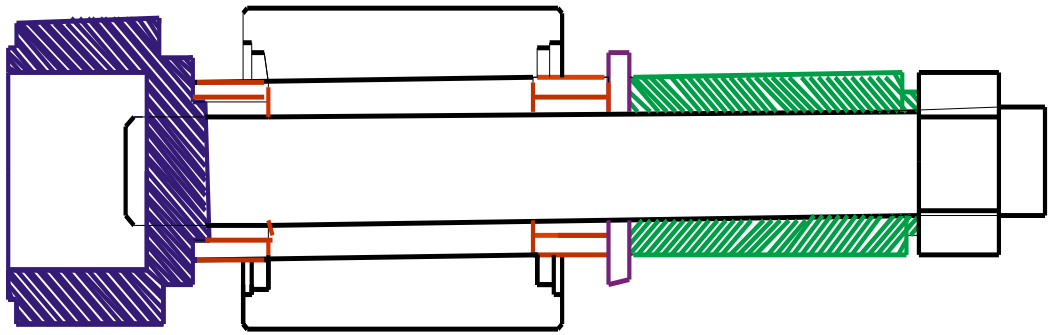
Use the Threaded Rod, Spacer/Press, Bearing Hub and Washer from the Bearing Removal Tool Kit.

Press both Bearings out of the Frame, from Right to Left, and into hub.



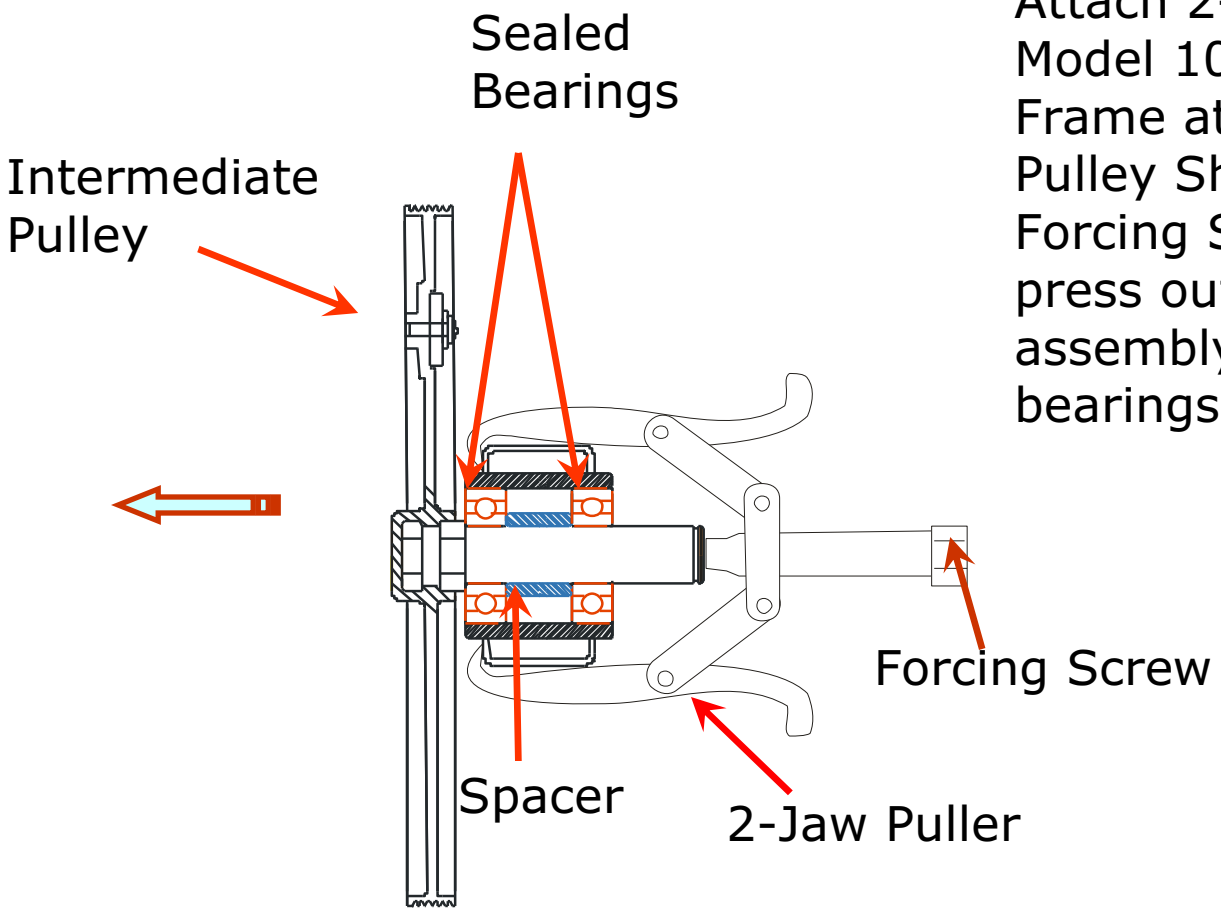
Bearing Replacement

- When installing the new Bearings, the wording on the Bearing should go to the outside. This is the installation "press" side.
- Place the Bearings (wording side out) onto the tapered ends of the Bearing Hub and Press. This will allow better control of the bearing.



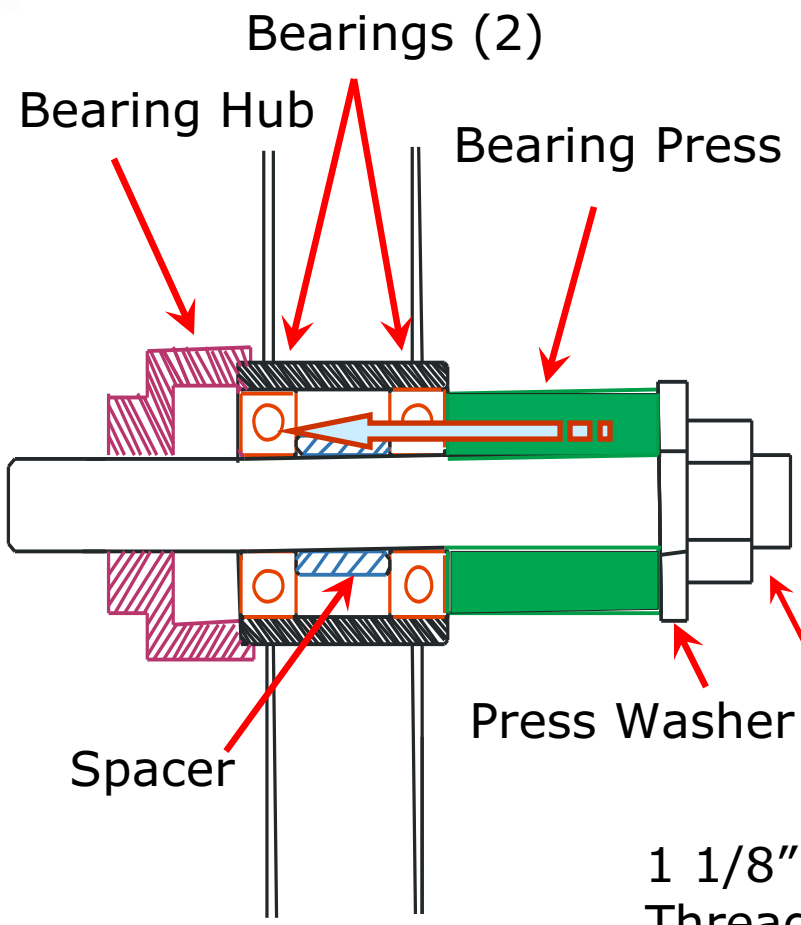
- After pressing the bearing ¾ of the way into the frame, remove the tool and reverse positions of the Press and Washer, as shown in the above illustration. Continue pressing in the Bearings until the Hub and Washer are flush with the Frame Housing Shoulder.
- Note: The Frame, Hub and Washer are the same diameter.

Intermediate Pulley Removal



Attach 2-Jaw Puller, OTC Model 1025, to the Bike Frame at the Intermediate Pulley Shaft. Turn the Forcing Screw clockwise to press out the pulley shaft assembly from the bearings and spacer.

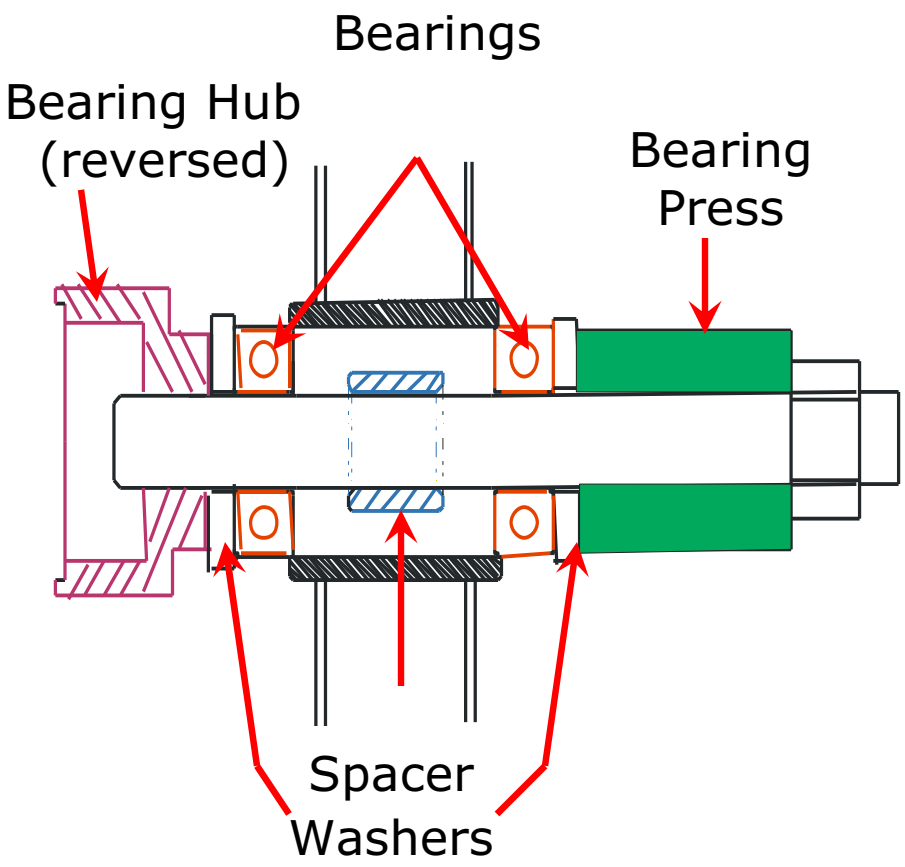
Intermediate Shaft Bearings Removal



Turn the Hex Nut clockwise to push the 1st Bearing and Spacer out into the Hub. Remove Hub from Press Assembly and remove the 1st Bearing and Spacer.

Re-attach Hub to Press Assembly and continue tightening Hex Nut until the 2nd bearing is pressed out of its housing into the hub.

First Method for New Intermediate Bearings Install



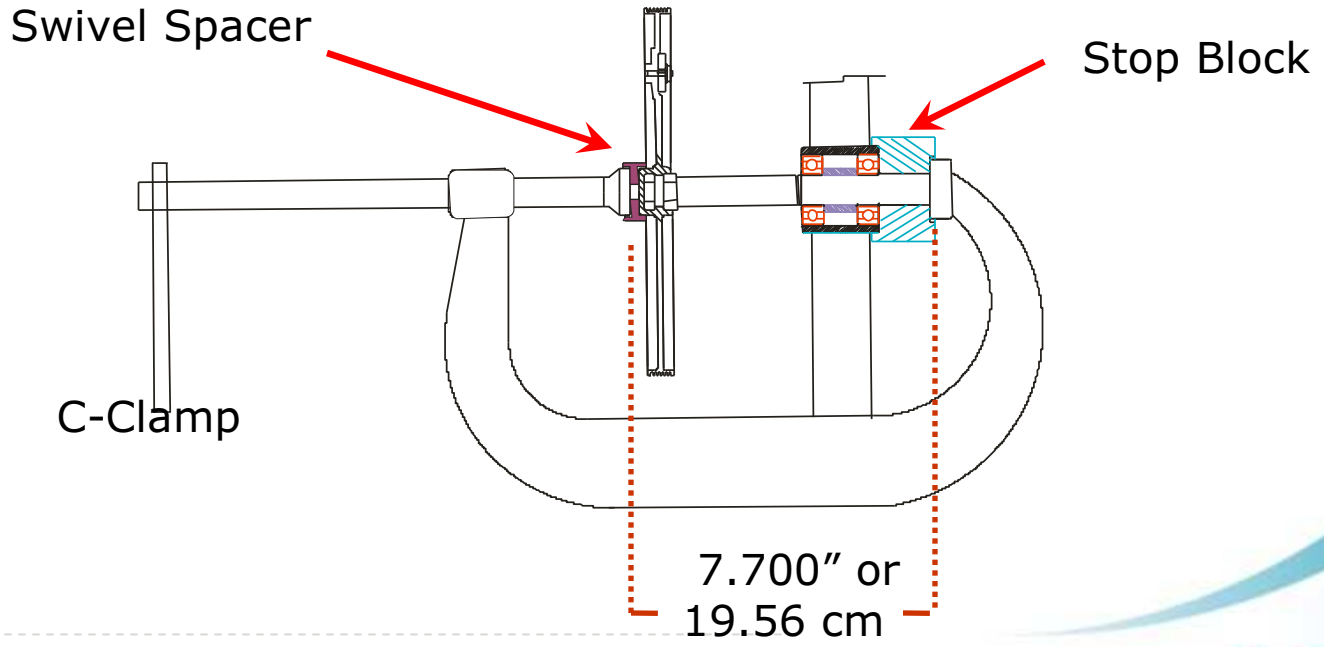
Start tightening the Hex Nut to press in the Bearings. Continue pressing in the Bearings until the Press Washers (2) stop against the Housing Shoulder.

Remove the Press Assembly and inspect for proper placement of the Spacer. The Spacer is held in position by the Bearings. If the Bearing Spacer is secured between the Bearings, proceed to pressing in the Intermediate Shaft.

If the Bearing Spacer is loose, repeat Bearing pressing procedure until it is secure.

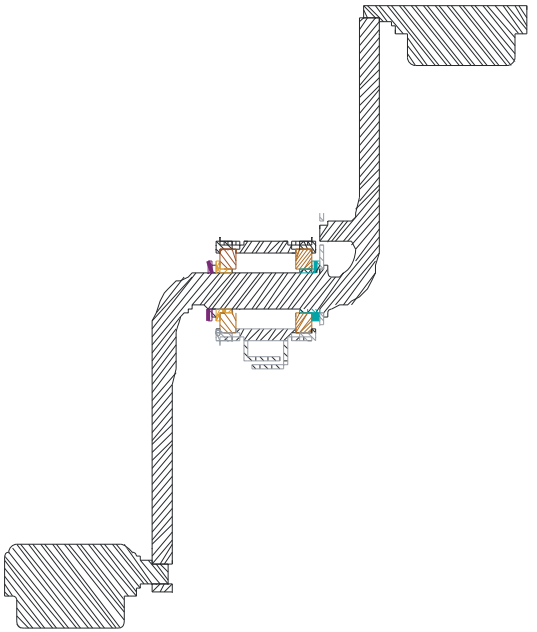
Second Method for New Intermediate Bearings Install

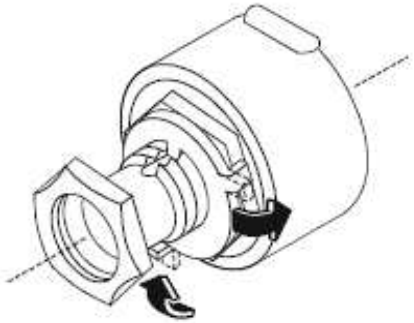
- Position the Intermediate Pulley/Shaft in the Housing. Position the Swivel Spacer on the Pulley and the Stop Block against the right side Bearing, then secure the C-Clamp as illustrated. Make sure the shaft is aligned straight and square and verify that the Plastic Bearing Spacer between the Bearings is centered. Once these criteria are met, tighten C-Clamp until assembly is installed.



Pre- Classic One-Piece Crank Shaft Bearing Replacement

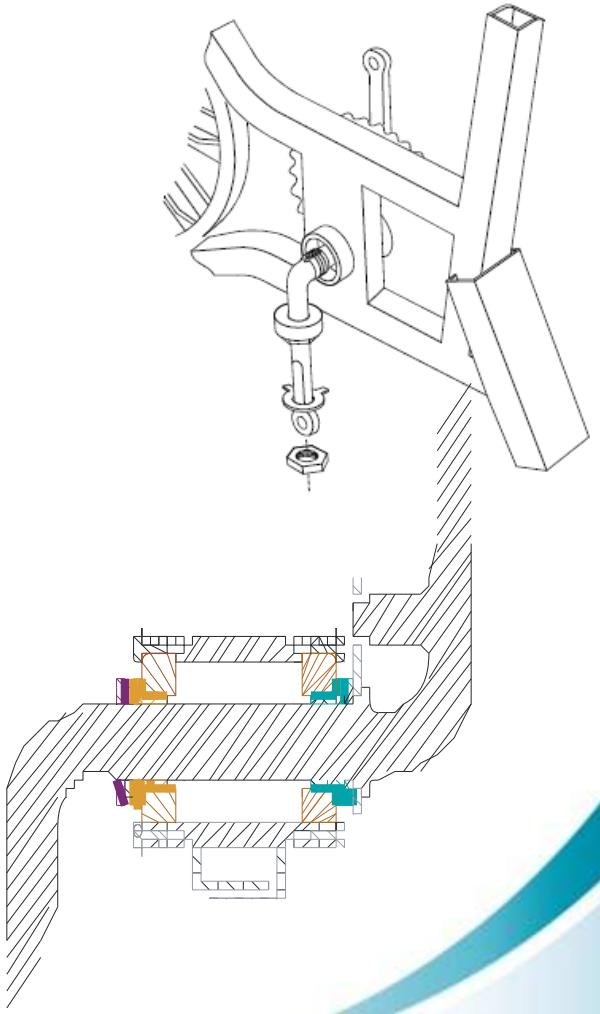
- Remove & Replace the Crank Arms & Bearings
  - With a 32mm open end wrench, loosen and remove the reverse threaded lock nut, tab lock washer, and the left bearing crank nut assembly.
  - Remove the bearing crank nut assembly from the worn crank arm.





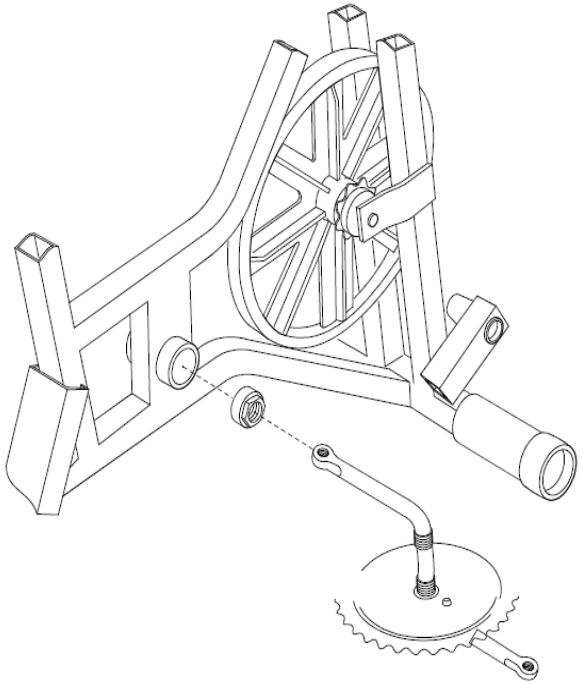
Pre-Classic One-Piece Crank Shaft Bearing Replacement

- Remove & Replace the Crank Arms & Bearings
  - Remove the worn crank arm from its retaining hub by tilting it from its vertical position to a horizontal position. Guide the crank arm through the retaining hub until it has been completely removed from the left side of the bike to the right side.
  - With a 32mm open-end wrench, loosen and remove the right bearing crank nut assembly from the worn crank arm



Pre-Classic One-Piece Crank Shaft Bearing Replacement

- Remove & Replace the Crank Arms & Bearings
  - Remove the worn crank arm from the sprocket and position the new crank arm in its place, replacing the bearings at this time.



ELEVATION SERIES

IGAGE CONSOL

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INTEGRITY SERIES

NEW PRODUCTS









ADDITIONAL CARDIO




Single Stage Drive Pulley Units with Eddy Current Brake

X1

X3

X5

X7, X8

R1

C1

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Dual Stage Pulley Drive System: Bikes and Crosstrainers

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WHAT WE LIVE FOR

Classic Bikes and Crosstrainers

Classic 95C, 97C

Classic 95R

CLSXH

91X, CLSX

Dual Stage Pulley Drive System: Stairclimber and Summit Trainer

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Stairclimbers and Summit Trainer

95Si

95Le

Summary

- What grade screws Life Fitness uses?
- Which retaining ring requires special tool for installation?
- What joints absolutely require use of torque wrenches?
- What is the reason for replacing the crank hub assembly, instead of the shaft and bearings separately?
- What do you use to fix damaged threads?
- What are extractor tools used for?
- What can cause a poly-v belt to walk out?
- What is the reason for using the timing belt instead of poly-v belt?
- What can be the reason for unstable (rocking) machine?
- What is the use of the Bearing Tool Kit?

Questions

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