



SINGLE STAGE PULLEY DRIVE SYSTEM TECHNICAL CERTIFICATION TRAINING

Field Engineering | 2010

LifeFitness
WHAT WE LIVE FOR

Course Objectives

- » Single Stage Drive System with Generator
- » Single Stage Drive systems with Weighted Flywheel
- » Single Stage Drive systems with Eddy Current Brake
- » Common Issues on Elevation Bikes with Generator
- » Common Issues on LeMond Bikes with Flywheel
- » Common Issues on Consumer Crosstrainers and Bikes with Eddy Current Brake

Single Stage Pulley Drive System with Generator

Single Stage Drive Pulley Units with Generator



Elevation: 95C, 97C



Elevation: 95R

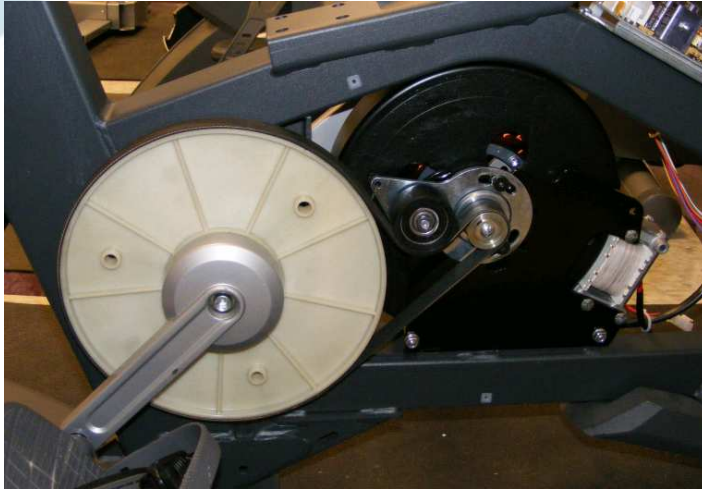


Consumer: C3



Consumer: R3

Theory of Operation



Elevation Bike



Consumer Bike

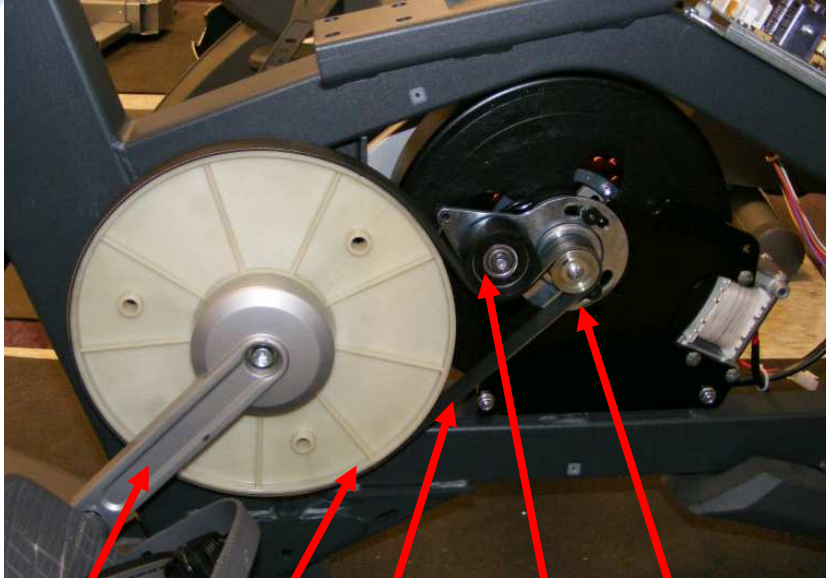
- » Single stage drive system contains crank pulley and generator brake pulley.
- » Pedals are connected to the crank arms.
- » When the user pedals, the crank pulley spins.
- » The crank pulley transfers the rotation to the generator pulley thru the poly-v drive belt.

Components and Drive Ratio

- » Idler assembly is necessary to maintain the drive belt's tension
 - ◆ Elevation Bikes use static tension device
 - ◆ Consumer Bikes use a dynamic spring loaded tensioning idler assembly
- » Elevation 95R, 95C, 97C final drive ratio is: 0.13:1
- » C3 and R3 final drive ratios are: 0.12:1
- » Crank pulley and generator pulley diameters and number of ribs can vary depending on final drive ratio at the generator and design parameters

Components – Visual Representation

Elevation Bike



Crank Arm

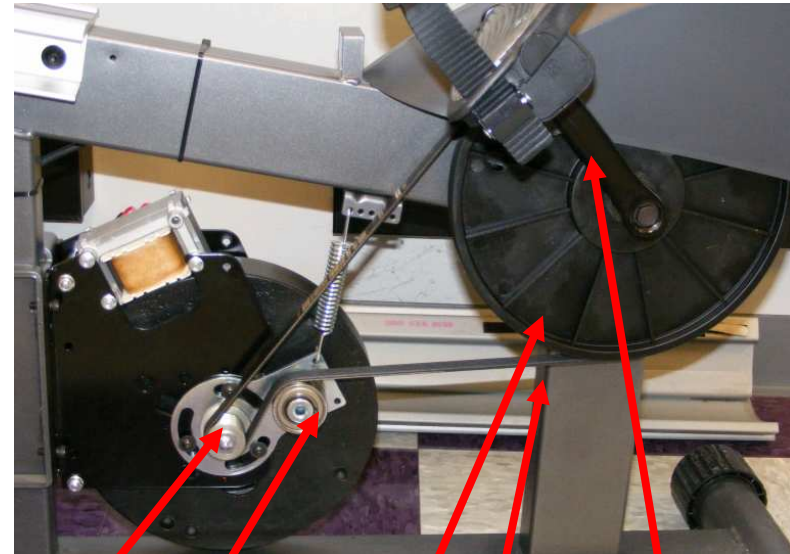
Crank Pulley

Drive Belt

Generator pulley

Idler Assembly with spring

Consumer Bike



Crank Arm

Drive Belt

Crank Pulley

Single Stage Pulley Drive System with Weighted Flywheel

Single Stage Drive Pulley Units with Weighted Flywheel



Rev Master I



RevMaster II

Theory of Operation

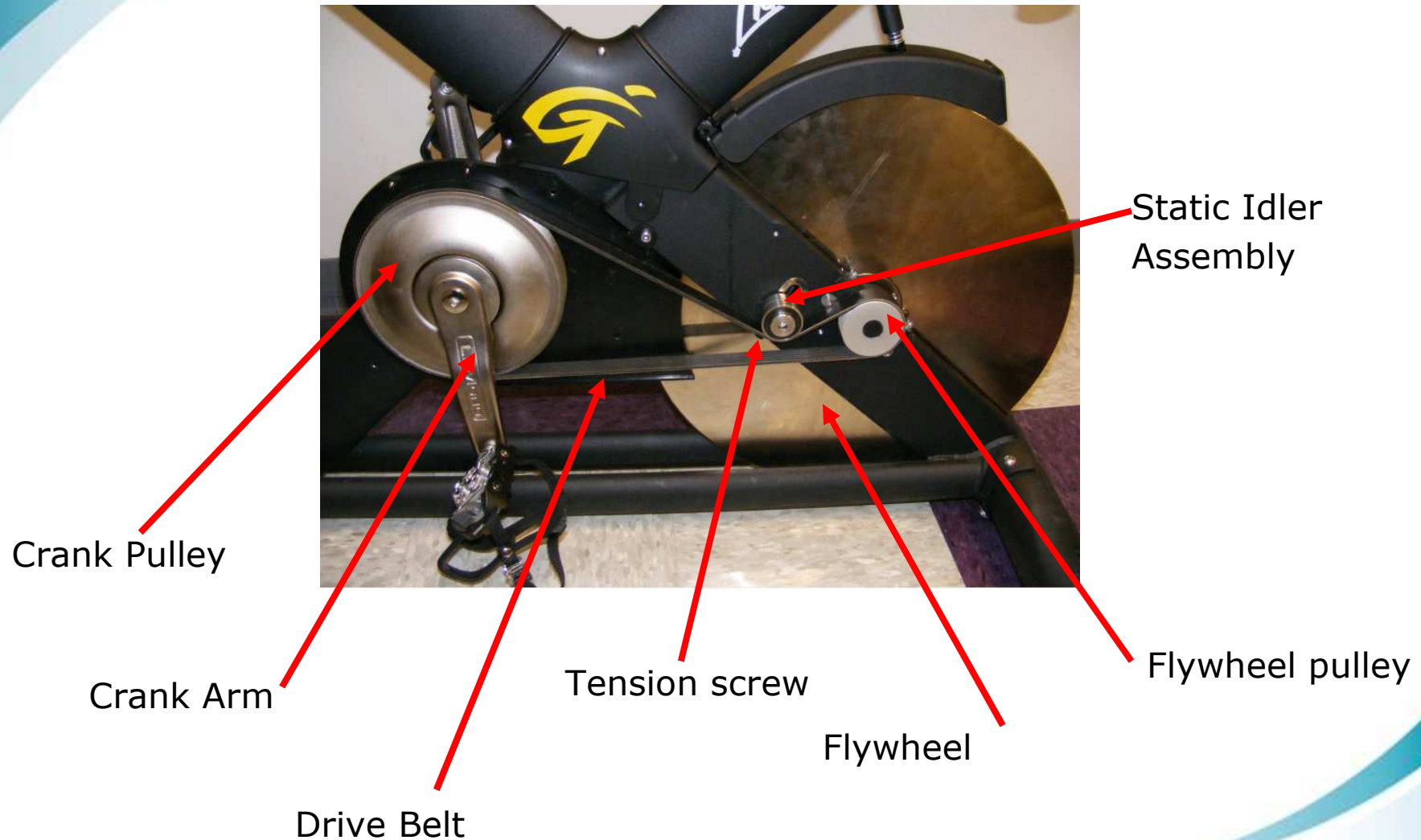


- » Single stage drive system – Crank pulley and flywheel pulley
- » Pedals are connected to the crank arms.
- » When the user pedals, the crank pulley spins .
- » The crank pulley then turns the flywheel pulley thru the poly –v drive belt.
- » Flywheel weight determines the amount of inertia.

Components & Drive Ratio

- » This system uses non-stretchy K type poly-v drive belt.
- » Idler assembly is necessary to maintain tension of drive belt.
- » Crank pulley and flywheel pulley diameters and number of ribs can vary depending on final drive ratio and design parameters.

Components – Visual Representation



Single Stage Pulley Drive System with Eddy Current Brake

Single Stage Drive Pulley Units with Eddy Current Brake



X1 Cross-trainer

X1



X3 Cross-trainer

X3



X5



X7, X8

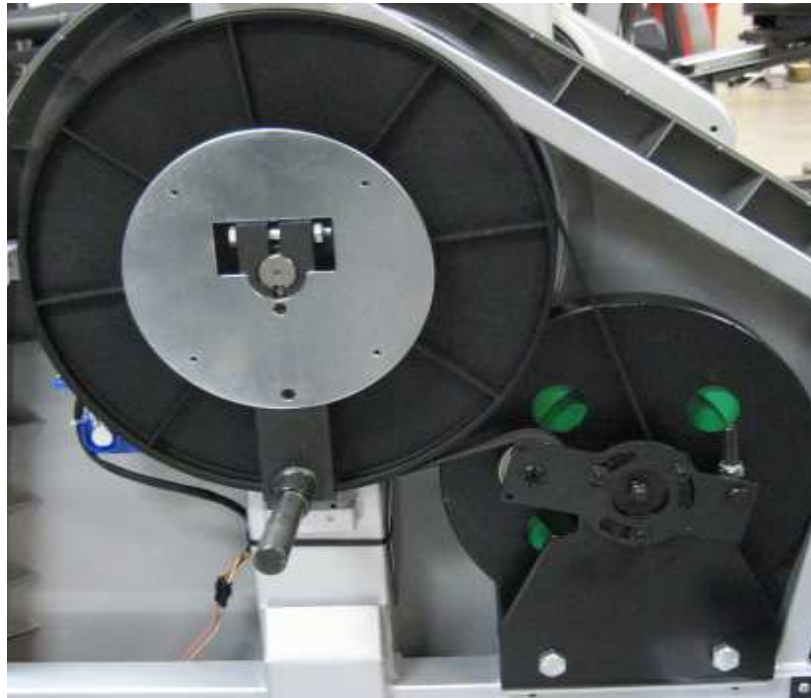


R1



C1

Theory of Operation

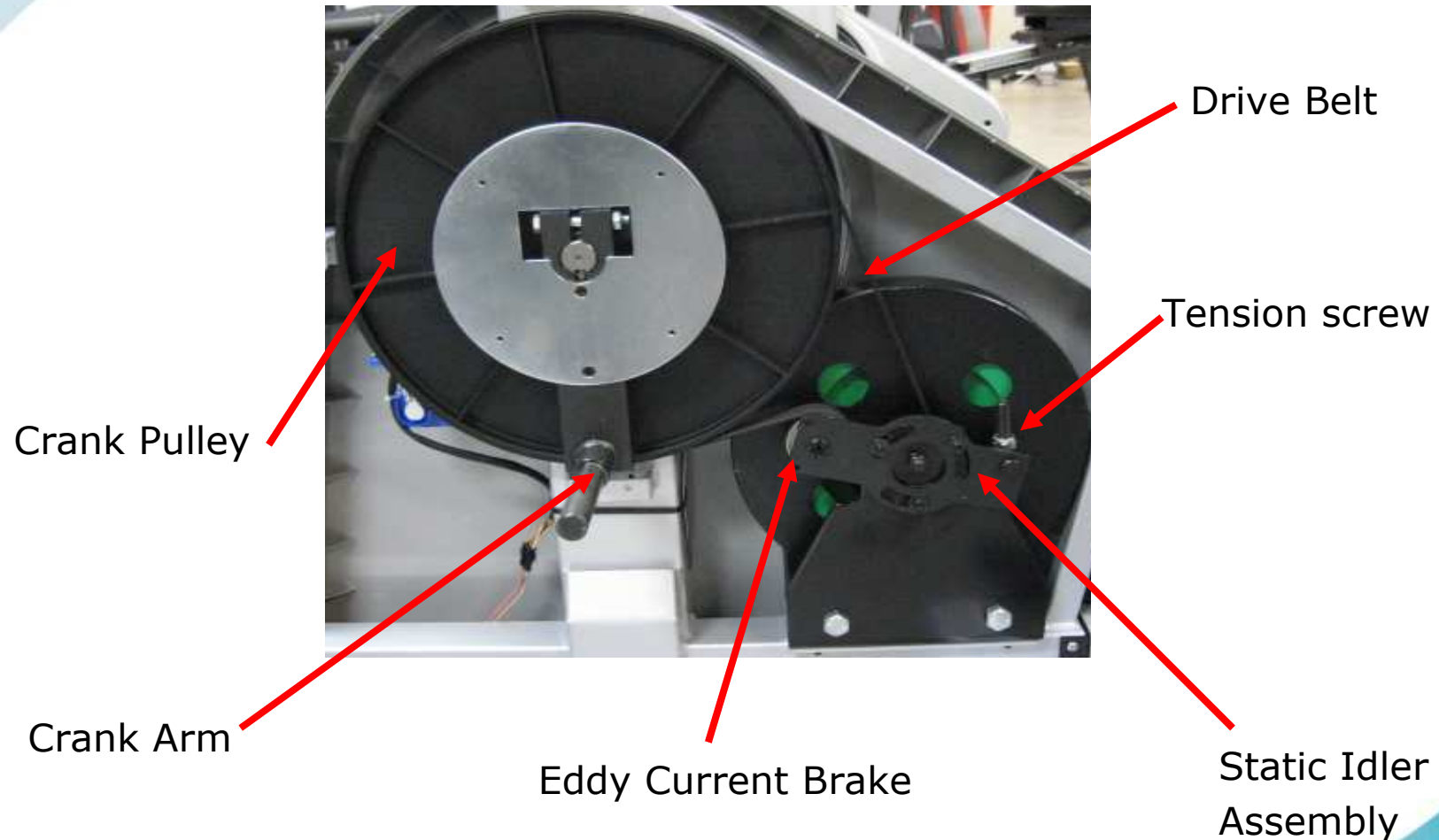


- » Single stage drive system - Crank pulley to Eddy Current Brake pulley
- » Pedals are connected to the crank arms.
- » When the user pedals, the crank pulley spins.
- » The crank pulley turns the Eddy Current Brake pulley thru the poly-v drive belt.

Components & Drive Ratio

- » Idler assembly is necessary to maintain tension.
- » Idler assembly may be fixed (static tension) or spring loaded (dynamic tension) depending on the type of product.
- » R1 and C1 final drive ratios = 0.14:1
- » X1, X3, X5, X7, and X8 final drive ratios = 0.12:1
- » Crank pulley and Eddy Current Brake pulley diameters and number of ribs can vary depending on final drive ratio and the design parameters.

Components – Visual Representation



Permanent Magnet Eddy Current Brake



- » Works similar to a drum brake system on a car.
- » Permanent magnets mounted to a brake shoe that pivots at the bottom.
- » Distance of magnets to flywheel changes resistance.
- » Pulling the slide block down pulls brake shoes away from flywheel.
- » Common service issue: internal mechanical cable break.

Common Issues on Elevation Bikes with Generator

Loss of Resistance or Belt Slippage (1)

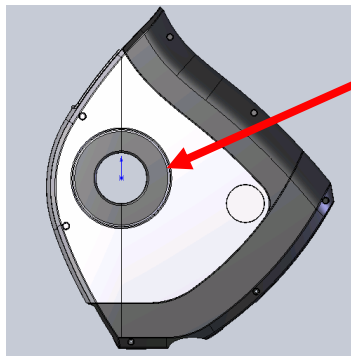
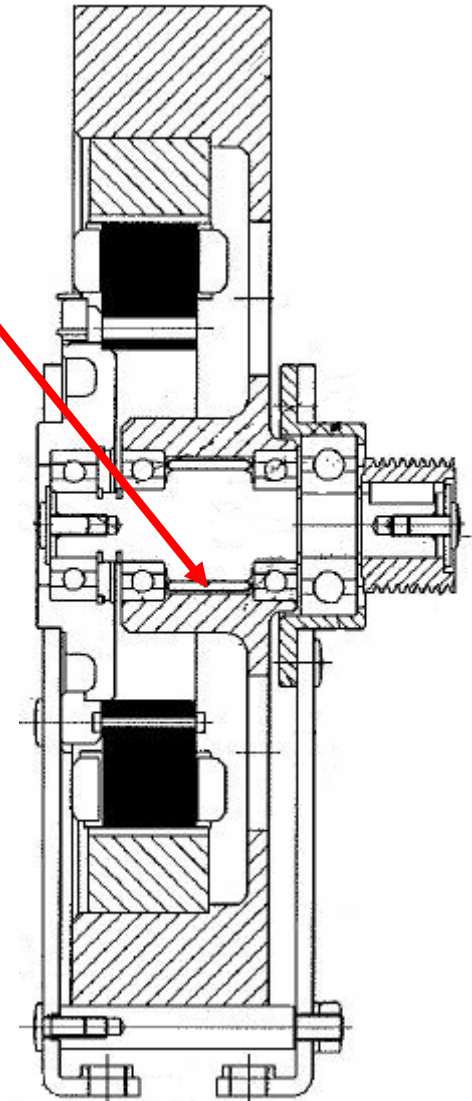
» Issue:

- ♦ The drive belt slips or user feels free-wheel rotation while pedaling.

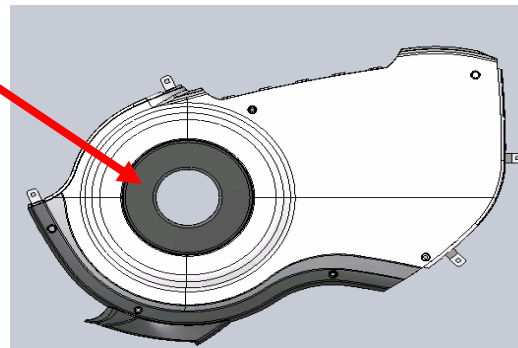
» Root cause:

- ♦ Generator has an internal clutch that is located in a compartment with poor ventilation.
- ♦ In a high usage facility, the generator brake assembly may overheat, which over time can cause the grease in the clutch bearing to burn up.

Original generator
brake design with
internal clutch



Original shroud
design without
ventilation holes



Loss of Resistance or Belt Slippage (2)

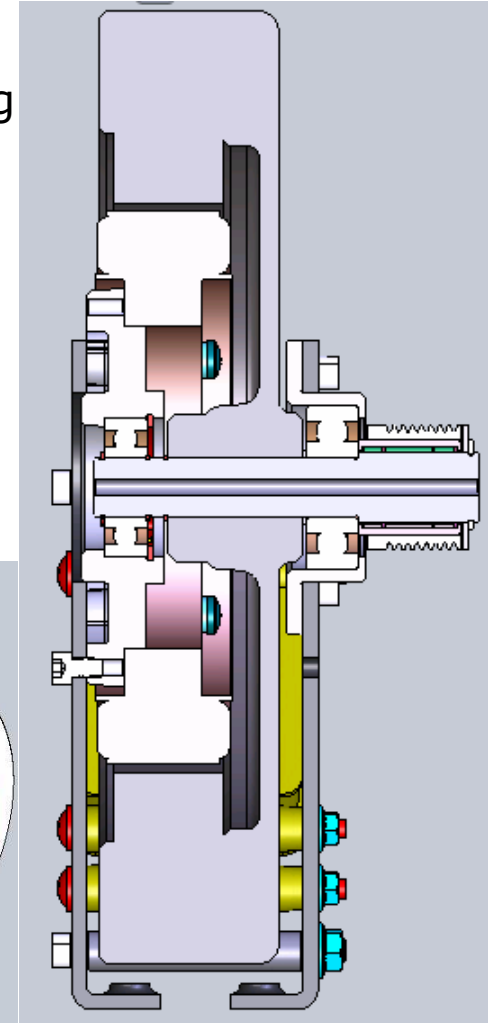
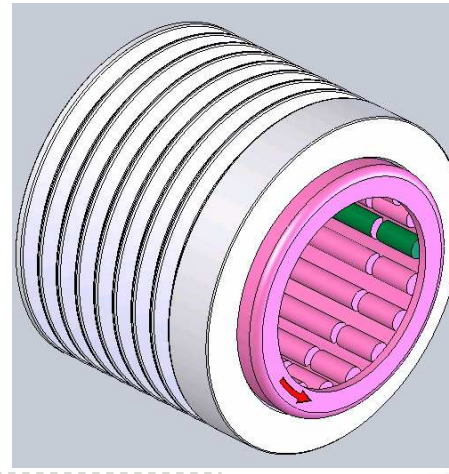
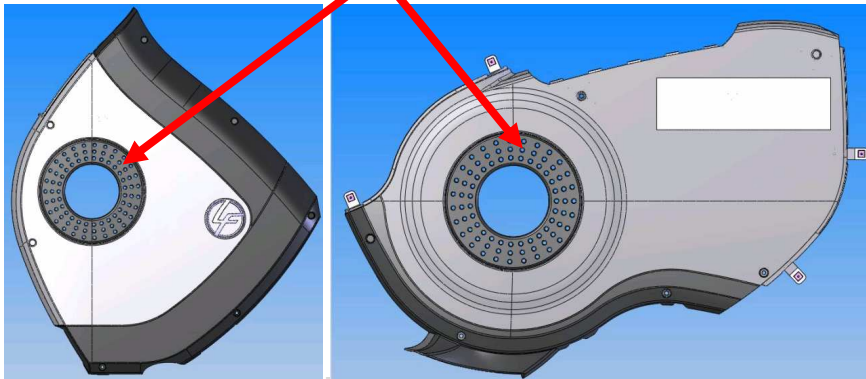
» Solution

- ♦ Install new generator brake assembly with external clutch bearing. under the pulley allows better cooling and elimination of the clutch grease burn up.
- ♦ Installation of vented shrouds helps with the cooling down the internal compartment of the bikes.

» Reference:

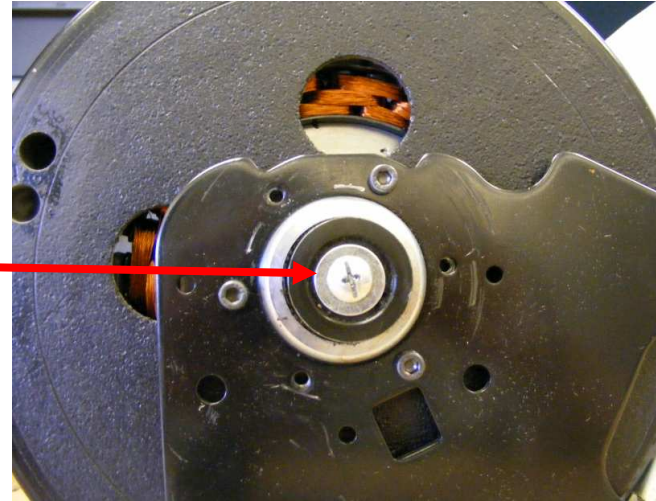
- ♦ Service Bulletin: LC10031201R1

Vented shroud design. Available in Shadow gray only. Images do not represent proper coloring schema.

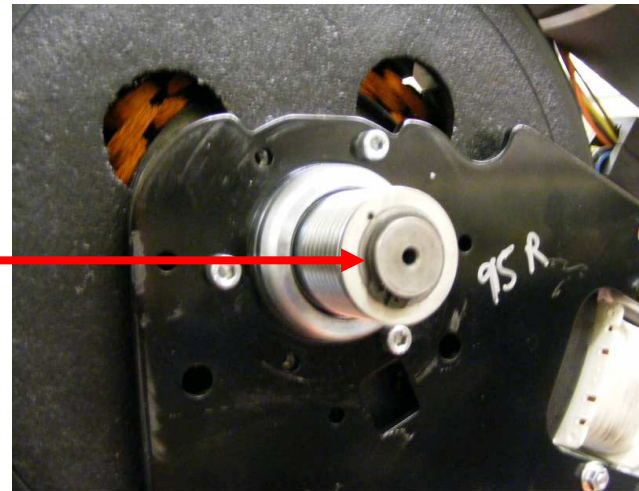


Generator Identification

- » Generators with internal clutch have a screw holding the pulley to the end of the shaft.



- » Generators with external clutch have a snap ring holding the pulley to the end of the shaft.



Loss of Belt Tension/Variable Resistance

» Issue:

- ♦ Drive belt slips during use
– usually at higher resistance levels

» Probable cause:

- ♦ Tensioning spring is long - original design
- ♦ Damaged spring
- ♦ Tensioning bracket is loose.

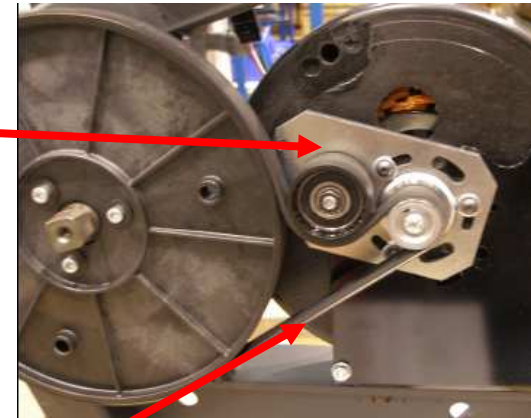
» Solution:

- ♦ Install new shorter spring
- ♦ Place spring into lowest hole in bracket

» Reference:

- ♦ Service Bulletin:
LC09072201N

Tension
bracket
assembly



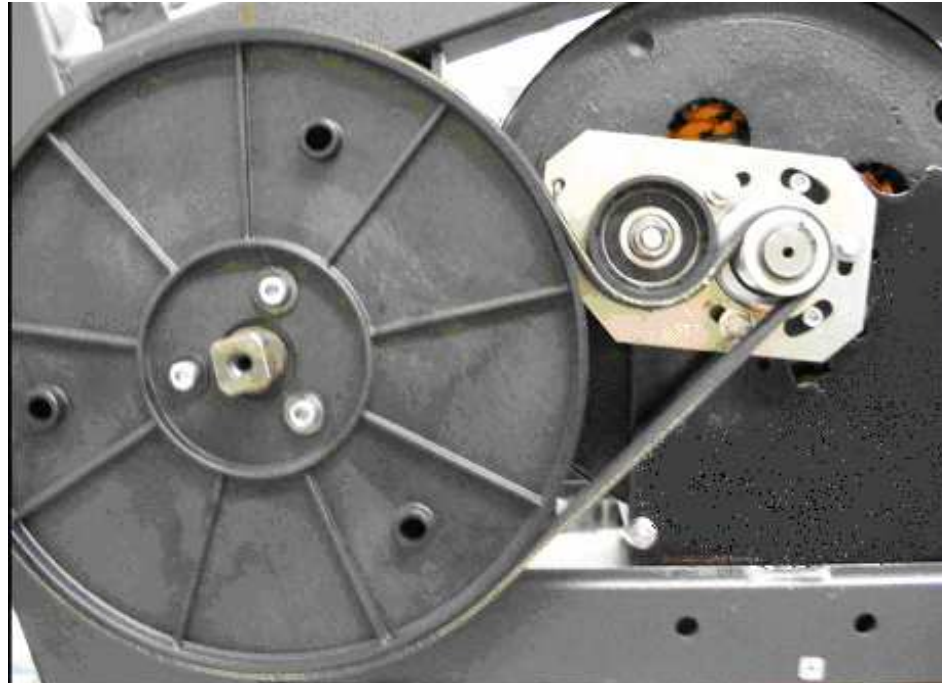
Drive Belt



Tension
Spring and
bracket

Drive Belt Walks Off Pulleys (1)

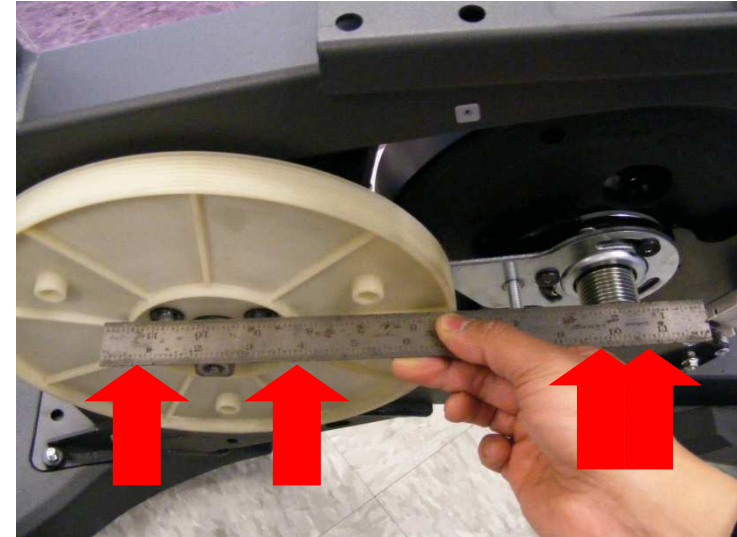
- » Issue:
 - ♦ Drive belt “walks-off” crank or generator pulley
- » Probable cause:
 - ♦ Crank pulley and generator pulley misalignment
- » Solution:
 - ♦ Align the pulleys



Drive Belt Walks Off Pulleys (2)

» Tips:

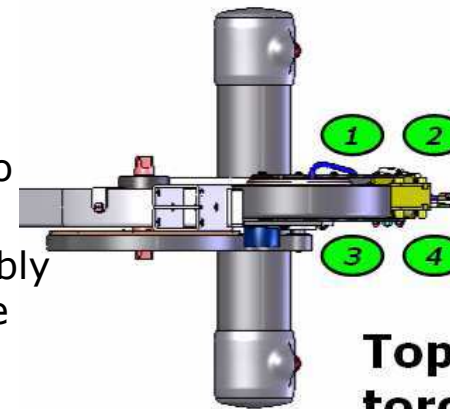
- ◆ Alignment of a system employing **internal clutch** Generator brake assembly with a 12" (30cm) straight edge:
 - > Snug-up the Generator's four mounting bolts and then align the straightedge with the raised edges of the Crank pulley and the Generator pulley.
 - > For proper alignment, the straightedge must be in contact with four points - two on the crank pulley and two on the generator pulley.
 - > Reposition the generator until all four points align.
 - > Next, rotate the crank pulley $\frac{1}{4}$ turn at a time and align the straightedge.
 - > Repeat the steps until the crank pulley has completed a full revolution.



Keep the mounting bolts snug while aligning!

Drive Belt Walks Off Pulleys (3)

- ◆ Alignment of a system employing **external clutch** Generator brake assembly with the alignment tool:
 - > Loosely attach alignment fixture tool to the generator face and the crankshaft mounting plate.
 - > Slightly tightening the crank pulley screws first, then tighten the tension bracket mounting screws on the generator side, and finally tighten the crank pulley screws.
 - > Install the existing generator brake assembly mounting screws and washers, but do not tighten them to final torque yet.
 - > Tighten the generator brake assembly hardware in the order shown on the diagram to the right.



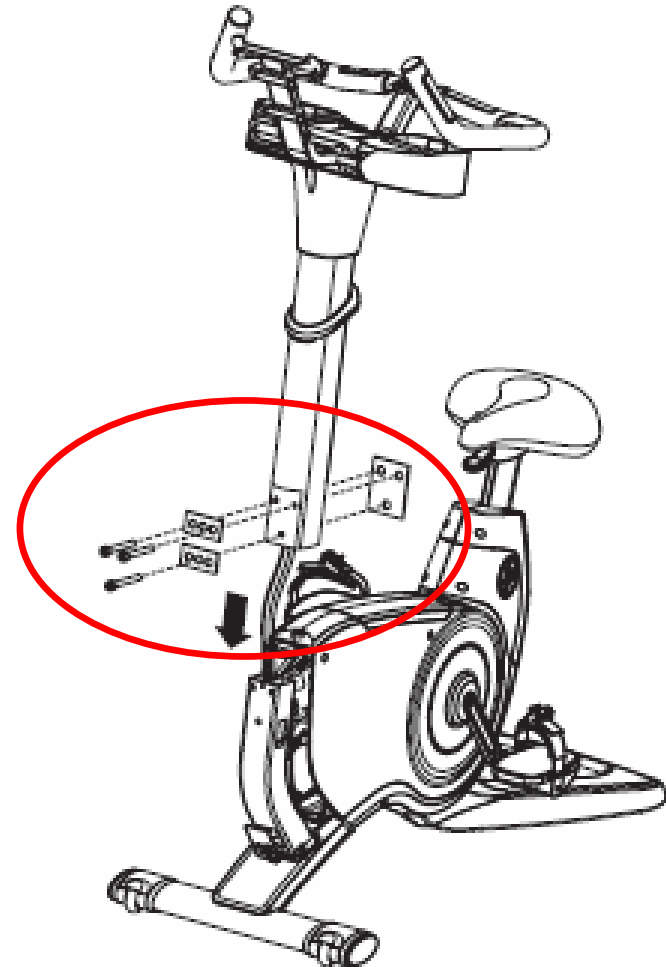
Top view of bike torque sequence

» Reference:

- ◆ Service Bulletin: LC10031201R1

Loose Mono-Column – 95C & 95R

- » Issue:
 - ◆ Elevation 95C or 95R loose mono-column
- » Probable cause:
 - ◆ Loose hardware
- » Solution:
 - ◆ Torque the mono-column bolts to 50 to 55 ft-lbs.
 - ◆ Use of **calibrated torque wrench** is a must.
 - ◆ Need to crush aluminum mono-column around welded steel frame
- » Reference:
 - ◆ Service Bulletin: LC08120901R



Common Issues on Lemond Bikes with Flywheel

RevMaster II - Tapping or Ticking Noise

- » Issue:
 - ◆ Tapping or Ticking noise when pedaling
- » Probable cause:
 - ◆ The three screws that hold the flywheel bearing in place are loose
- » Solution:
 - ◆ Loose flywheel bearing screws
 - ◆ Remove screws, apply Loctite ® 242/243 and refasten



Rev Master I and II Knocking Noise (1)

- » Issue:
 - ◆ Knocking noise when pedaling
- » Probable cause:
 - ◆ Loose bottom bracket bearing cups
- » Solution:
 - ◆ Tighten the bottom bracket bearing cups
 - ◆ Reapply Loctite ® 242/243 and tighten bottom bracket bearing cups with bottom bracket tool – **left side is reverse threaded.**



RevMaster I



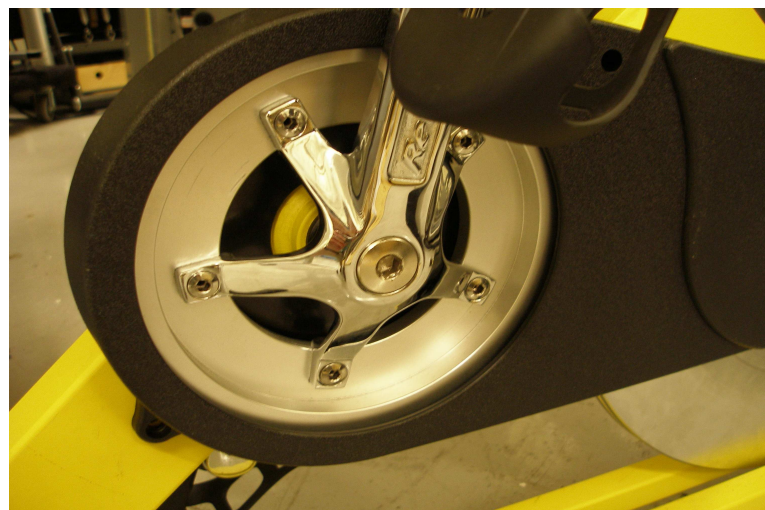
RevMaster II

Rev Master I and II Knocking Noise (2)

- » Issue:
 - ♦ Knocking noise when pedaling
- » Probable cause:
 - ♦ Loose crank bolts
- » Solution:
 - ♦ Replace bottom bracket spindle.



RevMaster II – torque to 48 ft-lbs



RevMaster I – torque to 26.5 ft-lbs

Rev Master I and II Grinding Noise

- » Issue:
 - ♦ Grinding / Excessive Side-to-side play
- » Probable cause:
 - ♦ Bad bottom bracket bearing spindle
- » Solution:
 - ♦ Replace bottom bracket spindle



RevMaster I



RevMaster II

Rev Master I and II Belt Slipping

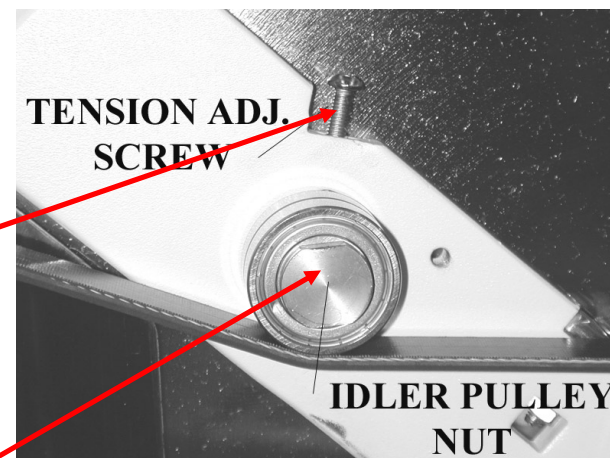
- » Issue:
 - ♦ Slipping felt when pedaling
- » Probable cause:
 - ♦ Loose drive belt
- » Solution:
 - ♦ Loosen the idler
 - ♦ Tighten the tension bolt
 - ♦ Tighten the idler.

4mm hex key

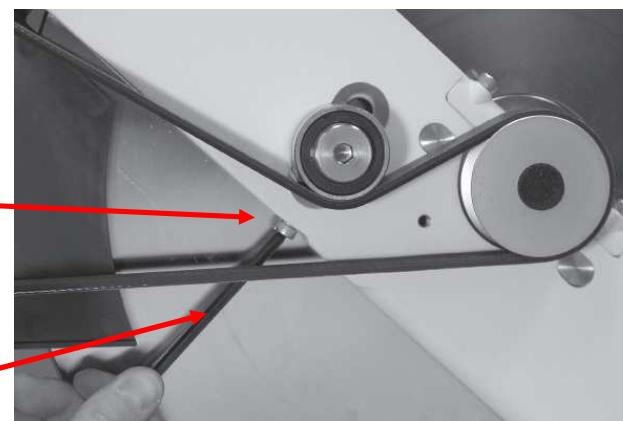
Idler Bolt
Open End wrench

Tensioner Bolt
5mm hex key

Idler Bolt
8mm hex key



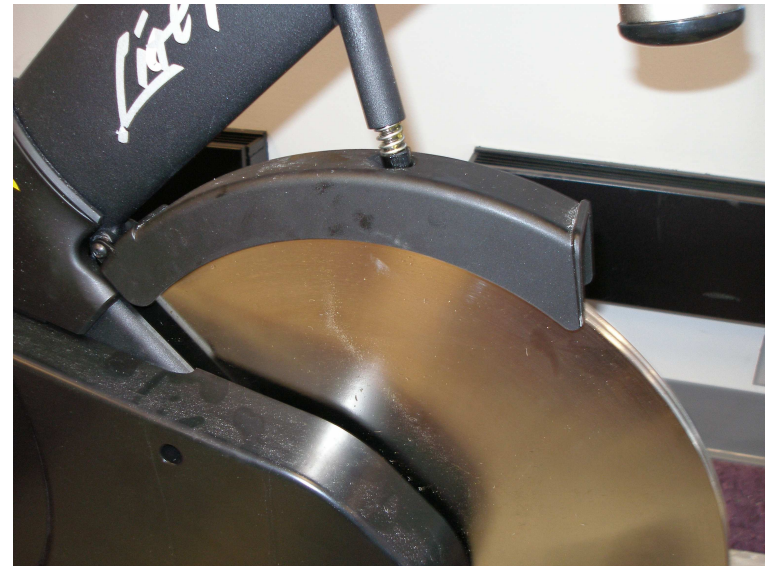
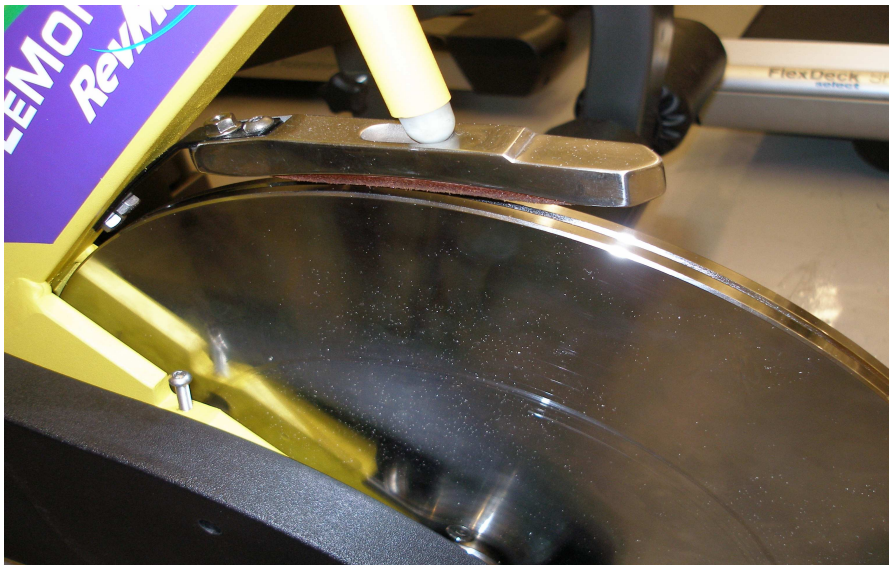
RevMaster I



RevMaster II

Rev Master I and II Clicking Noise

- » Issue:
 - ♦ Clicking noise when flywheel rotates
- » Probable cause:
 - ♦ Small imperfections in the flywheel
- » Solution:
 - ♦ Buff out imperfections with Scotch Brite or Emory Cloth



Rev Master I and II Vibrating Pad

- » Issue:
 - ♦ Noisy / Vibrating brake pad
- » Probable cause:
 - ♦ The brake pad needs lubrication
- » Solution:
 - ♦ Lubricate brake pad and flywheel groove with a 3-IN-1 oil



Brake Pad

Rev Master I and II Cracked Frame

- » Issue:
 - ◆ Cracked frames where the support tube meets the stabilizer bar
- » Probable cause/:
 - ◆ “Cold-Weld” – not full penetration weld
 - ◆ Metal frame fatigue
- » Solution:
 - ◆ Under warranty for RevMaster II– order a new unit.
 - ◆ Post warranty: RevMaster I or II - use 2-part epoxy then apply touch-up paint. The epoxy must be ordered from Lemond. Touch-up paint can be ordered from Life Fitness.
 - ◆ The frame can also be re-weld after the powder coat paint removal.

Epoxy/Putty



RevMaster II

Common Issues on Consumer Crosstrainers and Bikes with Eddy Current Brake

Consumer Crosstrainers Common Issues (1)

» Issue:

- ◆ Noise

» Probable cause:

- ◆ 1. Machine not leveled
- ◆ 2. Main axle bearings are loose and create clicking noise.
- ◆ 3. Too much axial movement
- ◆ 4. On the X7, X8 the idler bushing where the cable exits to the coupler is popped out of position and rubbing
- ◆ 5. Pedals' plastics are loose.

» Solutions:

- ◆ 1. Insure that levelers are down and wheels are off the ground. Leveler jam nut must be tightened
- ◆ 2. Remove and replace bearings. Use Loctite ® 680/609 (green bearing mount) to secure bearings in the bore
- ◆ 3. Add a wave washer at pivot joints to reduce the axial movement
- ◆ 4. Replace the idler bushing
- ◆ 5. Insure that the pedals' plastics are tight and in position.

Consumer Crosstrainers Common Issues (2)

- » Issue:
 - ◆ Crooked console
- » Probable cause:
 - ◆ Install issue
- » Solutions:
 - ◆ Loosen Bolts in console support and realign

Consumer Bike Common Issues

- » Issue:
 - ◆ Clicking noise
- » Probable cause:
 - ◆ Loose main bearings
- » Solutions:
 - ◆ Remove and replace bearings. Use Loctite (680/609) green bearing mount to secure bearings in the bore.

Summary

- » What is the Idler assembly used for in a Single Stage Drive System?
- » What are the two options for aligning the crank pulley and the generator brake assembly pulley on Elevation 95C and 95R?
- » What is critical in fixing the loose mono-column on Elevation 95C or 95R?
- » What is the fix for vibrating pad on LeMond?
- » How can the noise from too much axial movement on the consumer Cross-trainers be fixed?
- » How can the noise from loose main bearings on the consumer Bikes be fixed?

Questions





THANK YOU!

LifeFitness
WHAT WE LIVE FOR