LINKAGE SYSTEM
TECHNICAL CERTIFICATION TRAINING

LifeFitness
WHAT WE LIVE FOR

Field Engineering | 2010

Course Objectives

- Cross-trainer linkage systems
- Summit trainer linkage system
- Common Issues
- Summary

Crosstrainers Linkage System

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Crosstrainers

91X, CLSX

CLSXH

95X

X1, X3

X5,X7,X8

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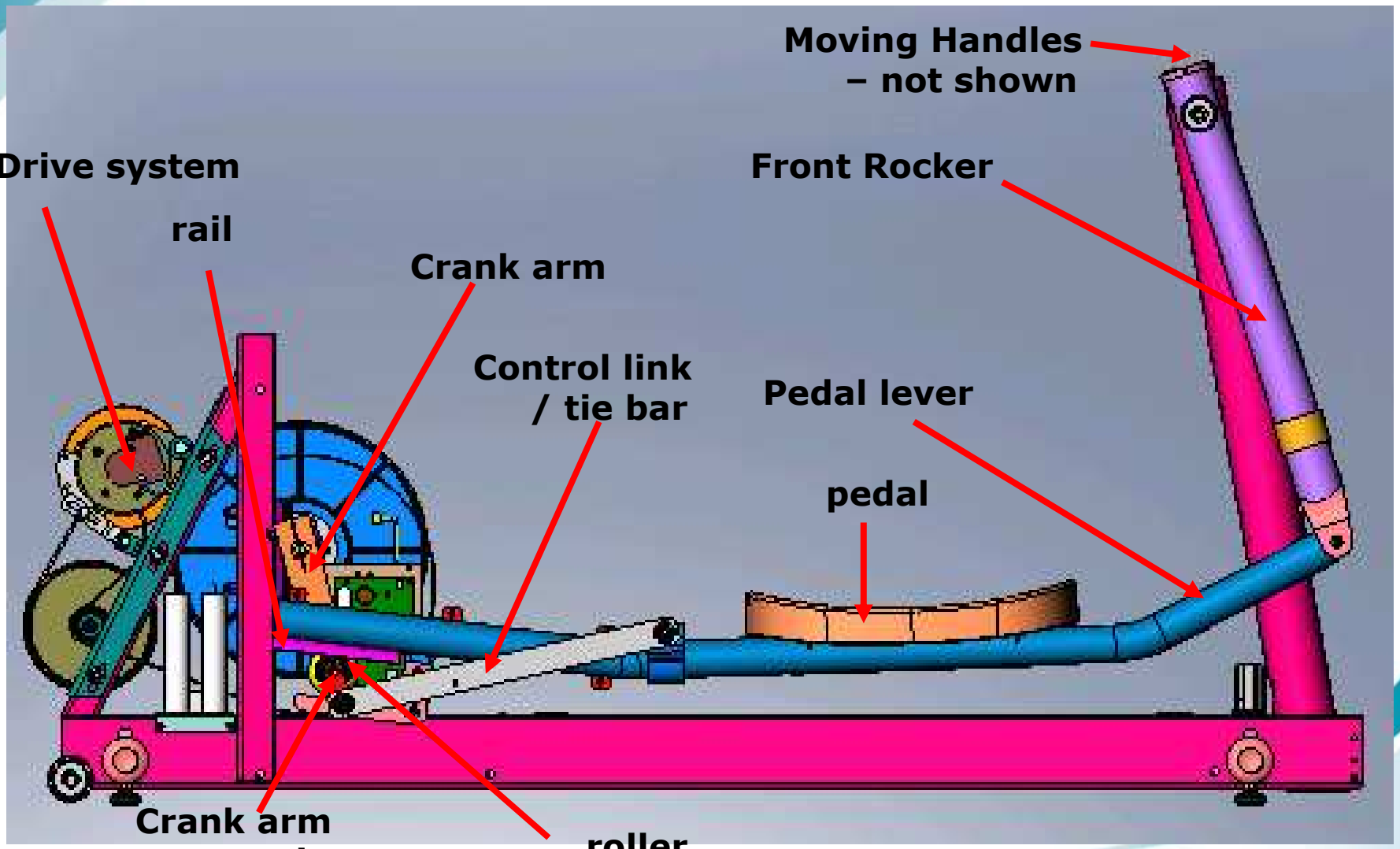
Theory of Operation

- The pedal levers are connected to the crank arms. As the crank arm rotates, it moves the pedal levers forwards / backwards in an elliptical path. The pedal lever then is connected to the front rocker arms/user arms causing them to oscillate.
- Classic 91X/CLSX and CLSXH utilize a 5-bar mechanism with a crank extension and roller to generate an elliptical motion
- Elevation 95X utilizes a 6-bar, rocking-rocking linkage with timing belts and pulleys to generate an elliptical motion
- Consumer X1, X3, X5, X7, and X8 utilize a 6-bar rocking-rocking mechanism to generate an elliptical path.

Stride Lengths and Step-Up Heights

- Classic 91X/CLSX stride = 18”, min. step-up = 9.0”
- Classic CLSXH stride = 20”, min. step-up = 10.5”
- Elevation 95X stride = 20”, min. step-up = 11.5”
- Consumer X1, X3 stride = 20”, min. step-up = 6.5”
- Consumer X5, X7, X8 strides = 18” to 24”, min. step-up height = 10.0”

91X / CLSX Components –Visual Representation



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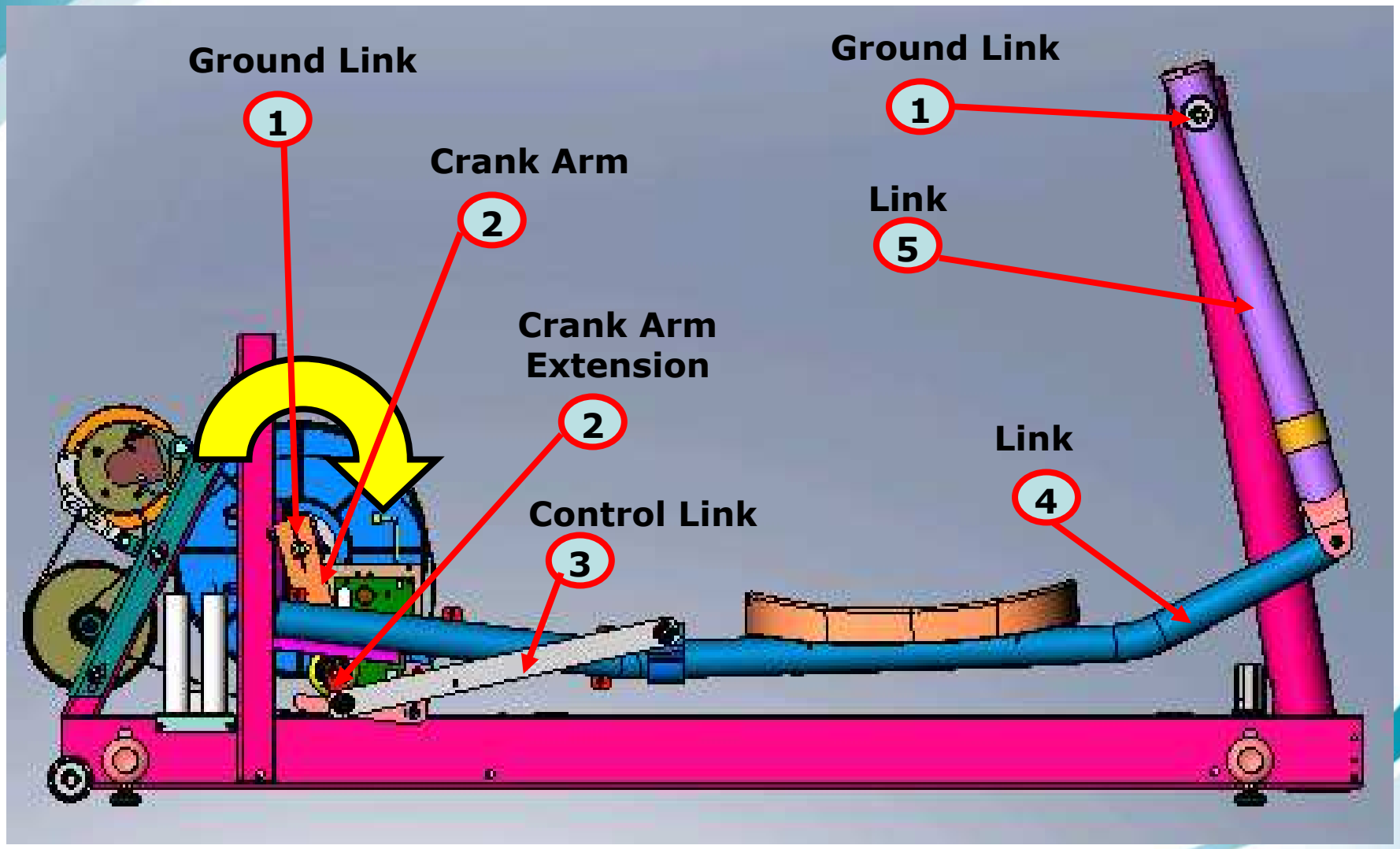
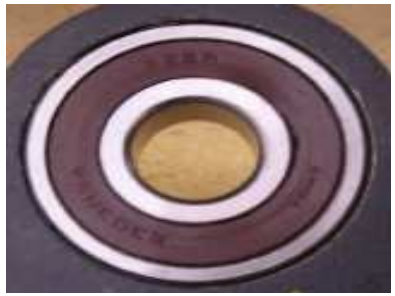
91X / CLSX 5-bar Linkage System



Bearings

- Ball bearing, oil lite, and pillow block spherical ball bearings are used as needed to produce a smooth motion without the need for very high precision weldments.

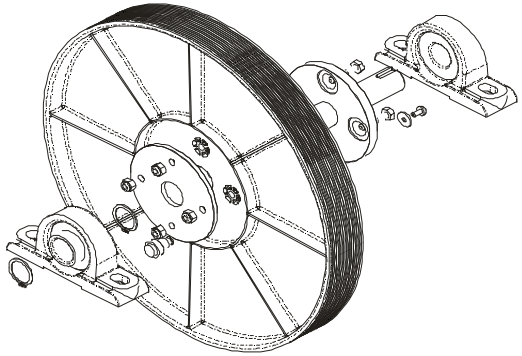


Ball Bearing – external race does not move while the internal race moves with shaft

Add "bearing grease" if bearings do not have seals or shields on them

Oil Lite – Lubricates as it heats up and retains oil when it cools, use a 30 wt non-detergent oil to keep lubricated

DO NOT USE GREASE!

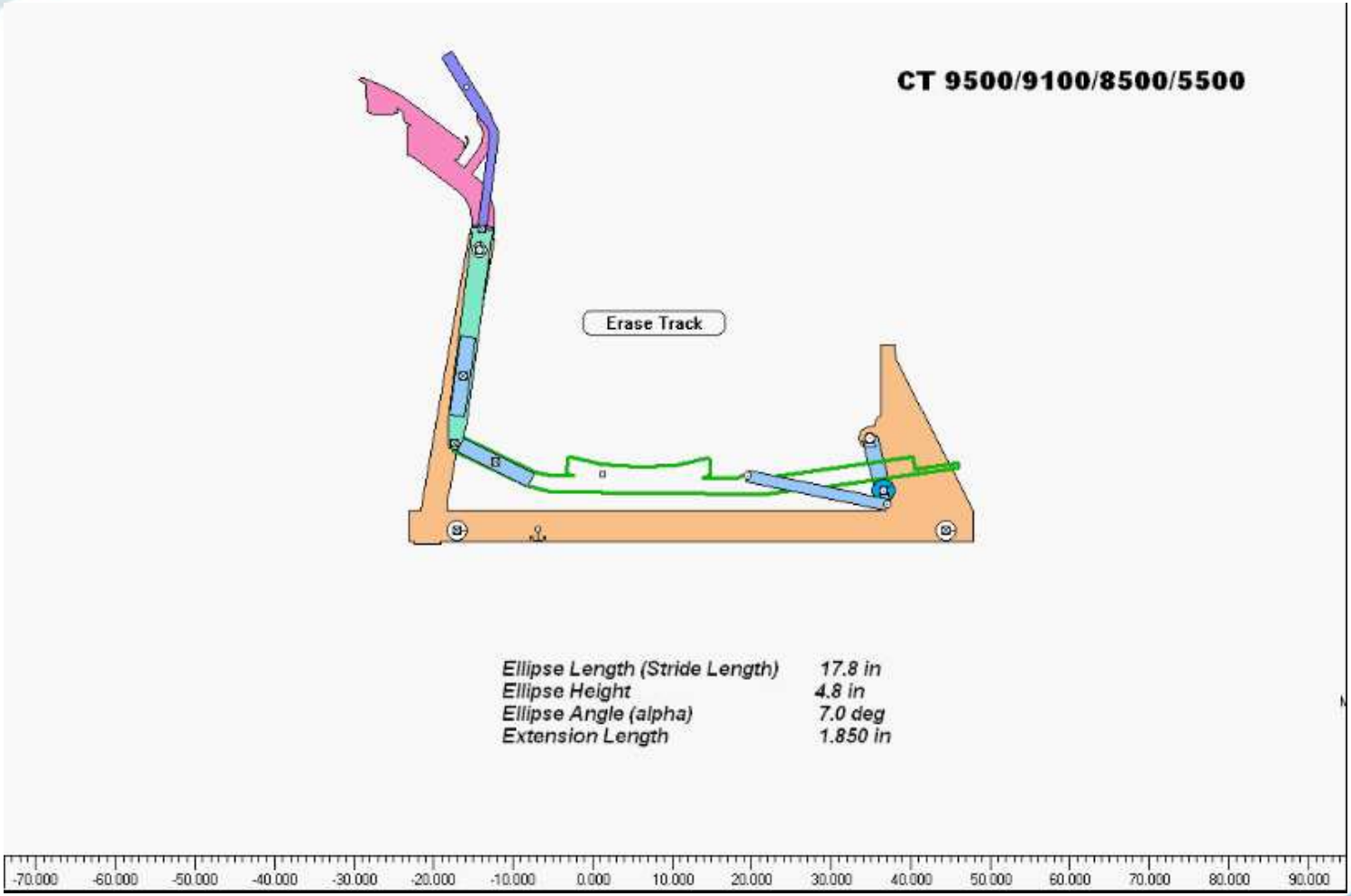


Pillow Block - Housing does not move but the ball bearings spin inside with the sleeve

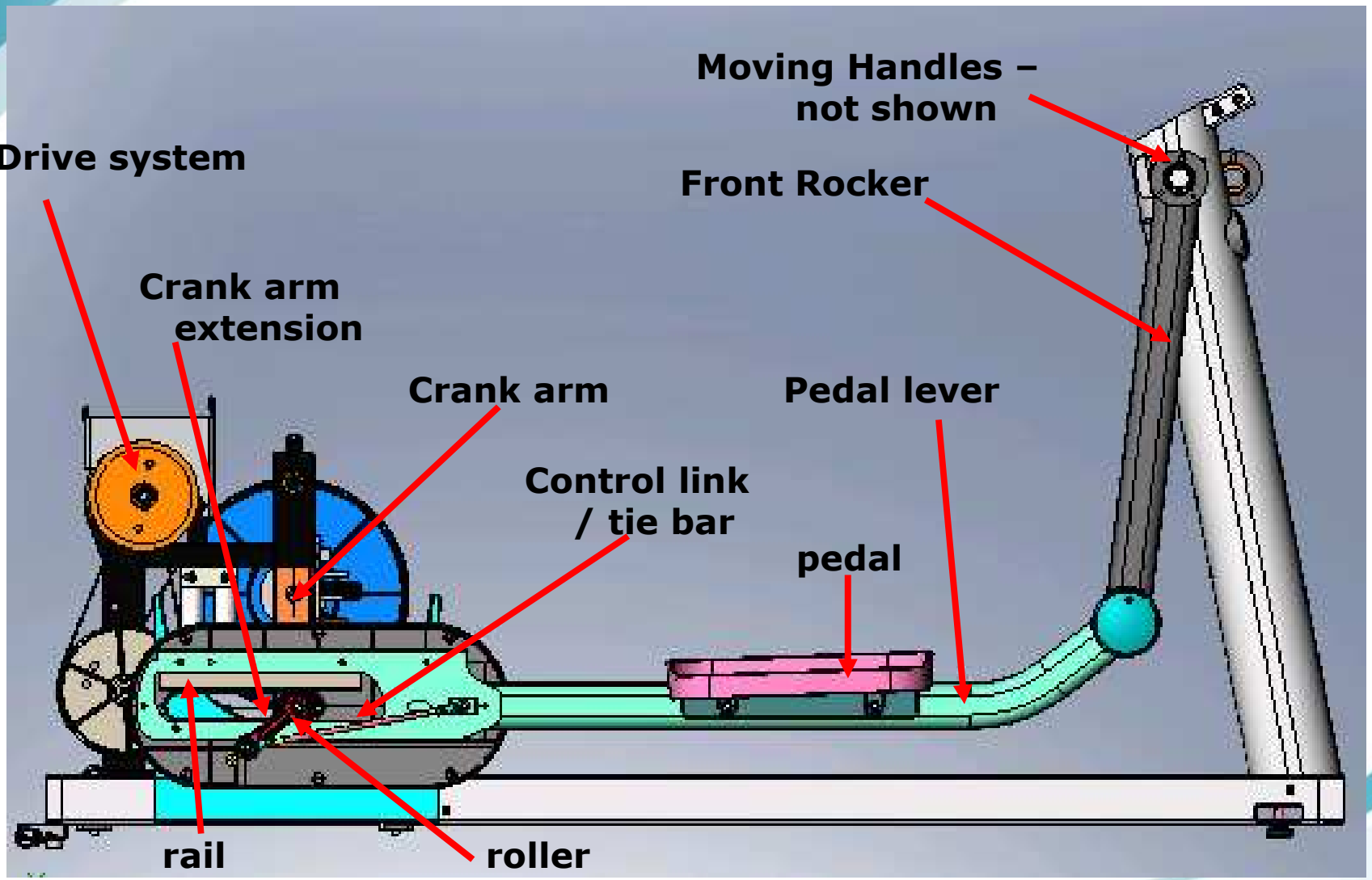
No need to add grease:

"Greased for Life"

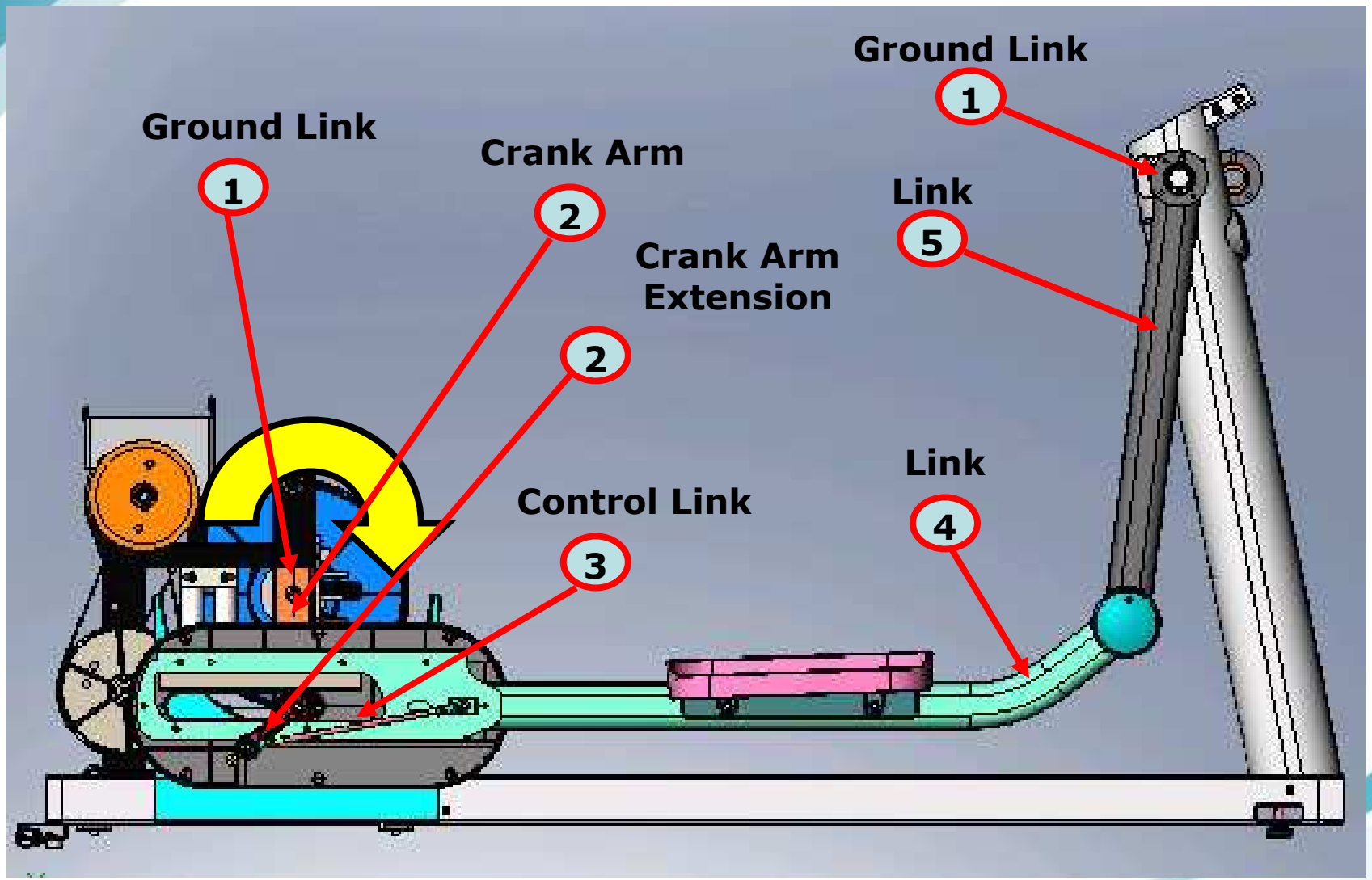
Elliptical Motion of 91X / CLSX Cross Trainers



CLSXH Components – Visual Representation

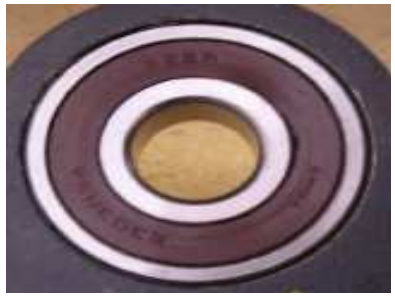


CLSXH 5-bar Linkage System



Bearings

- Ball bearing, oil lite, pillow block spherical ball, and needle bearings are used as needed to produce a smooth motion without the need for very high precision weldments.



Ball Bearing – external race does not move while the internal race moves with shaft

Add "bearing grease" if bearings do not have seals or shields on them

Oil Lite – Lubricates as it heats up and retains oil when it cools, use a 30 wt non-detergent oil to keep lubricated

DO NOT USE GREASE!

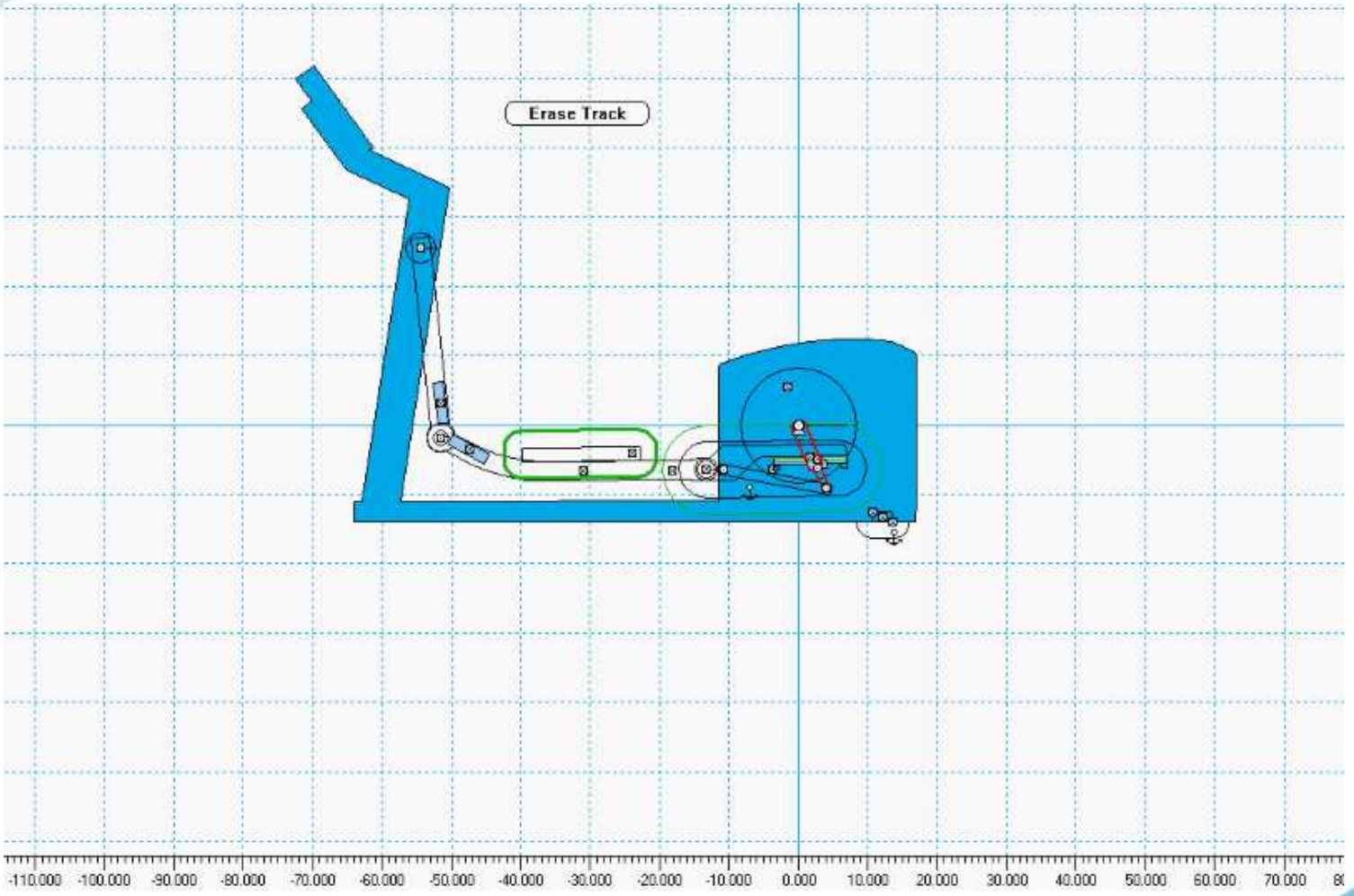
Needle Bearings - the housing does not move but the needles/rollers spin inside. Always apply press to wording/pn side.

Add "bearing grease" since the bearing is "open".

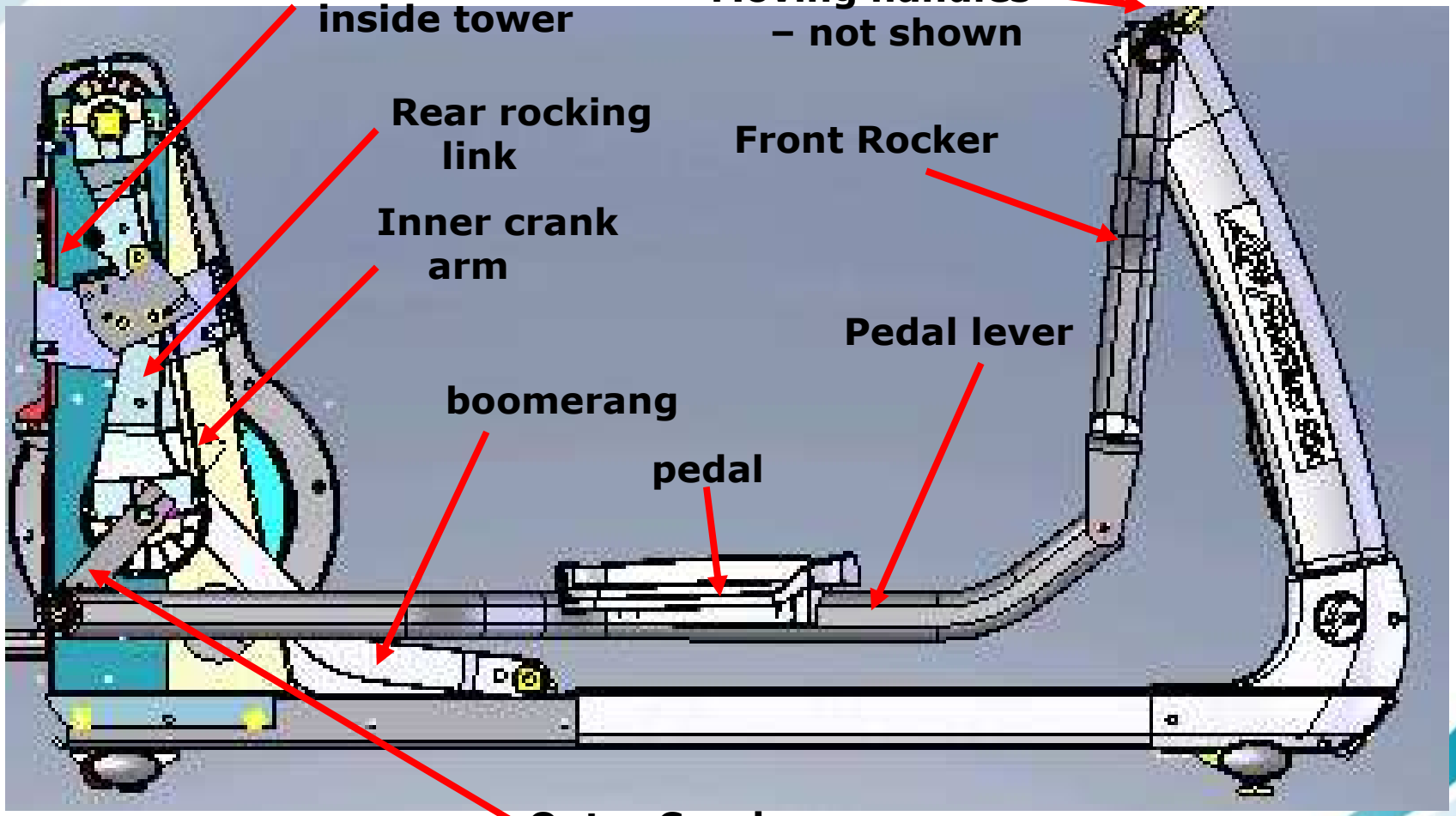
Flanged Sealed Bearing - stays secure to the shaft causing the bearing to only rotate

No need to add grease: "Greased for Life"

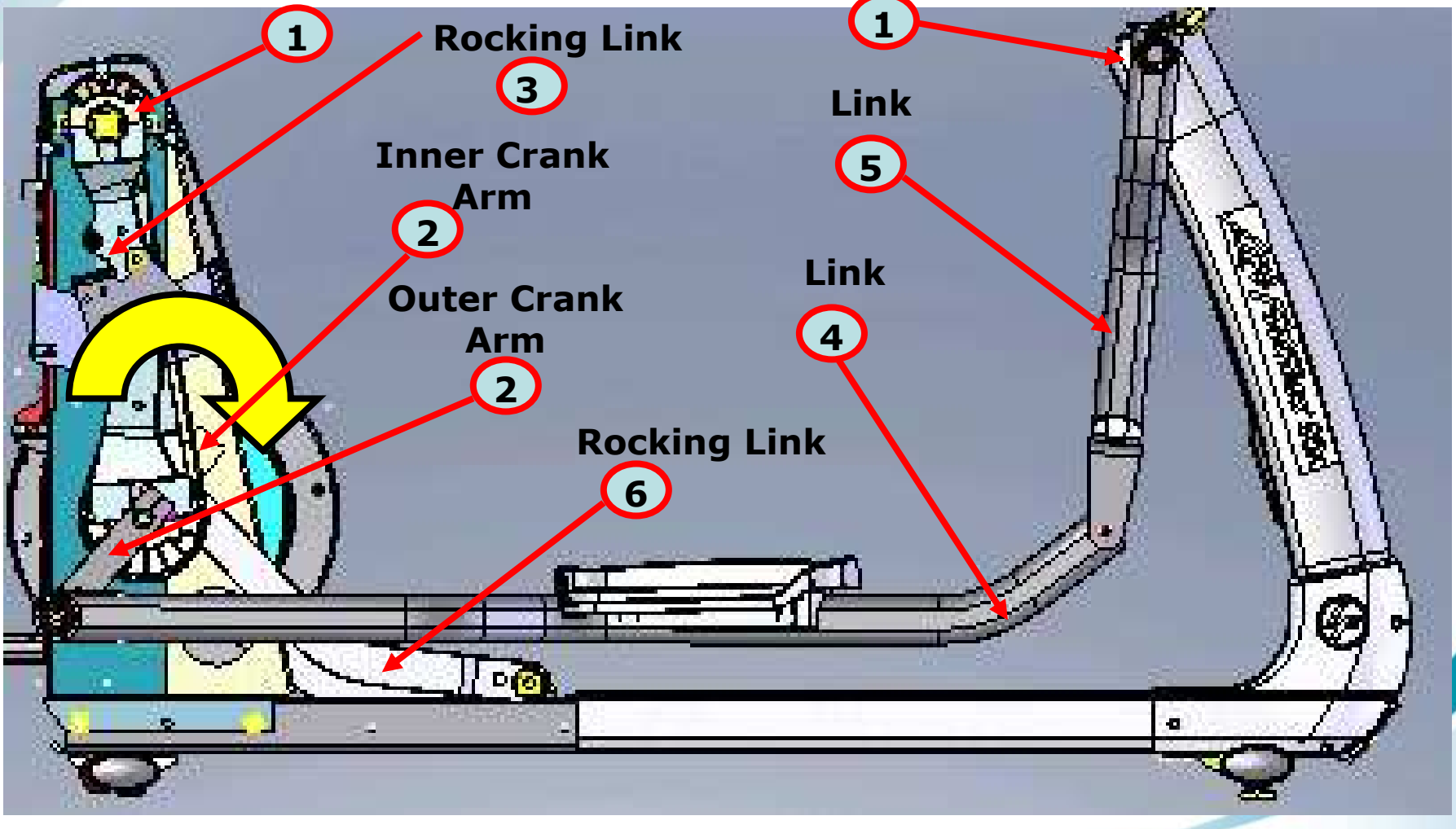
CLSXH Elliptical Motion



Elev. 95X Components – Visual Representation

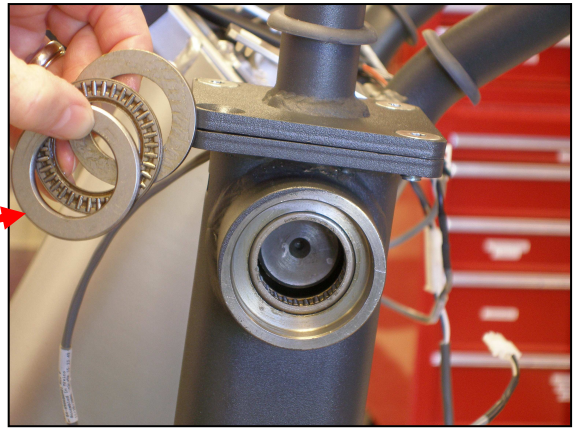


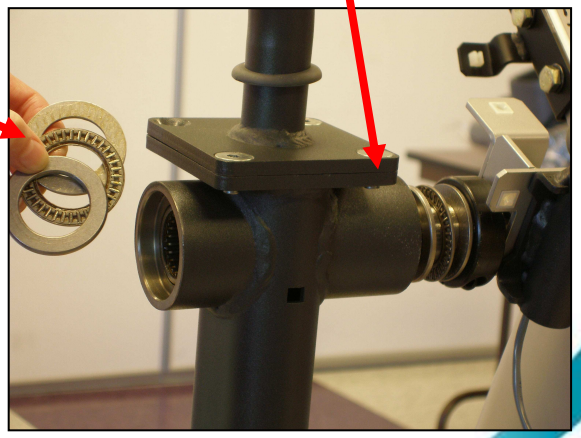
Elevation 95X 6-bar Linkage System

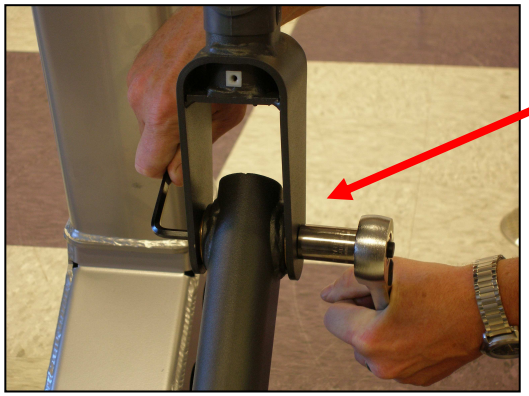


Front Rocker Arms Removal

- Remove and save the e-ring securing the Rocker Arm to the dead shaft.
- Remove the rocker arm and save needle bearing and washers on the outside edge of the rocker arm bushing to use with the new rocker arm.
- Note: There is a thrust washer and hardened washer on both sides of the pedal lever shaft.
- Note their orientation for correct installation of the new rocker arm. See next slide.





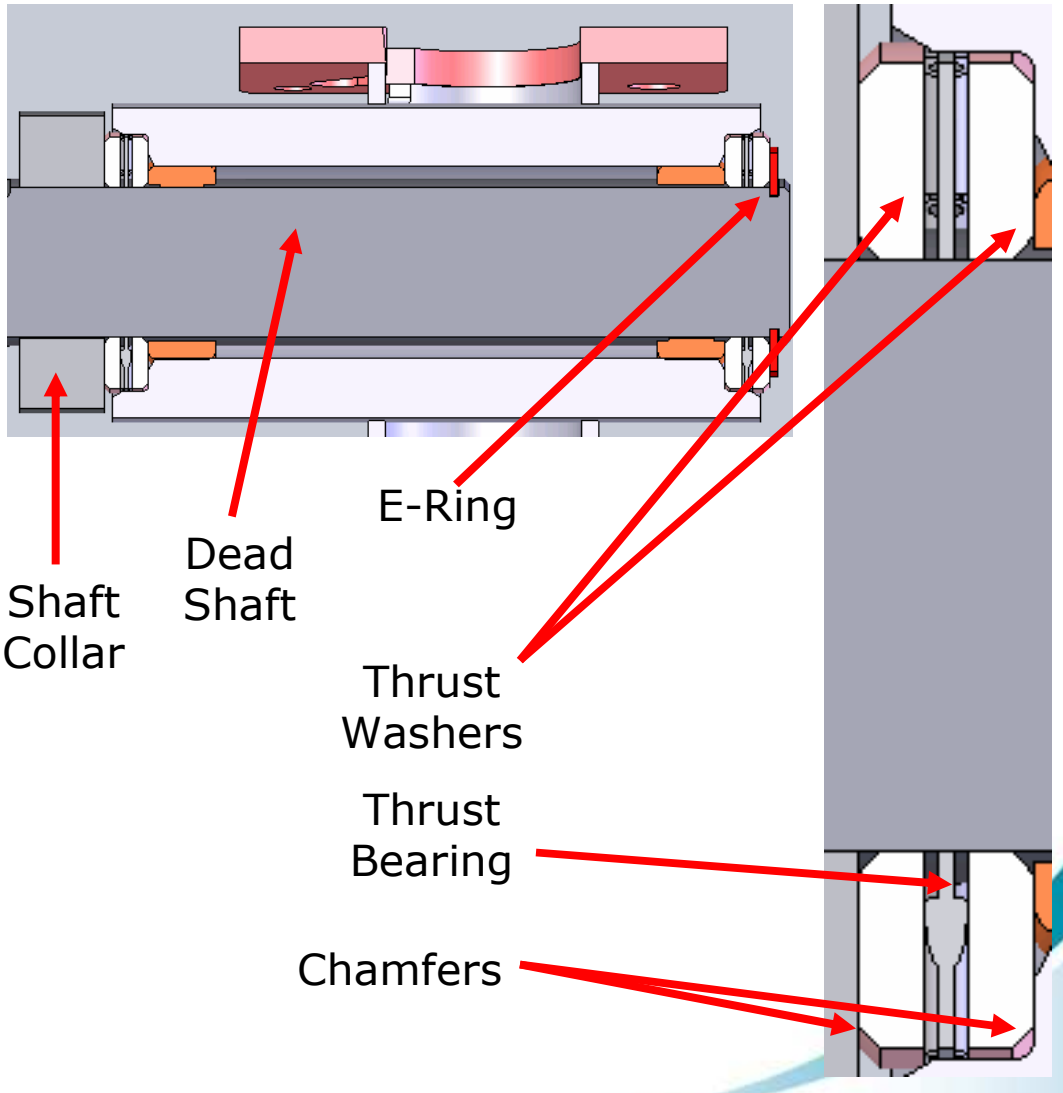


Remove and save the 6mm Allen bolt and 17mm nut securing the pedal lever to the rocker arm.

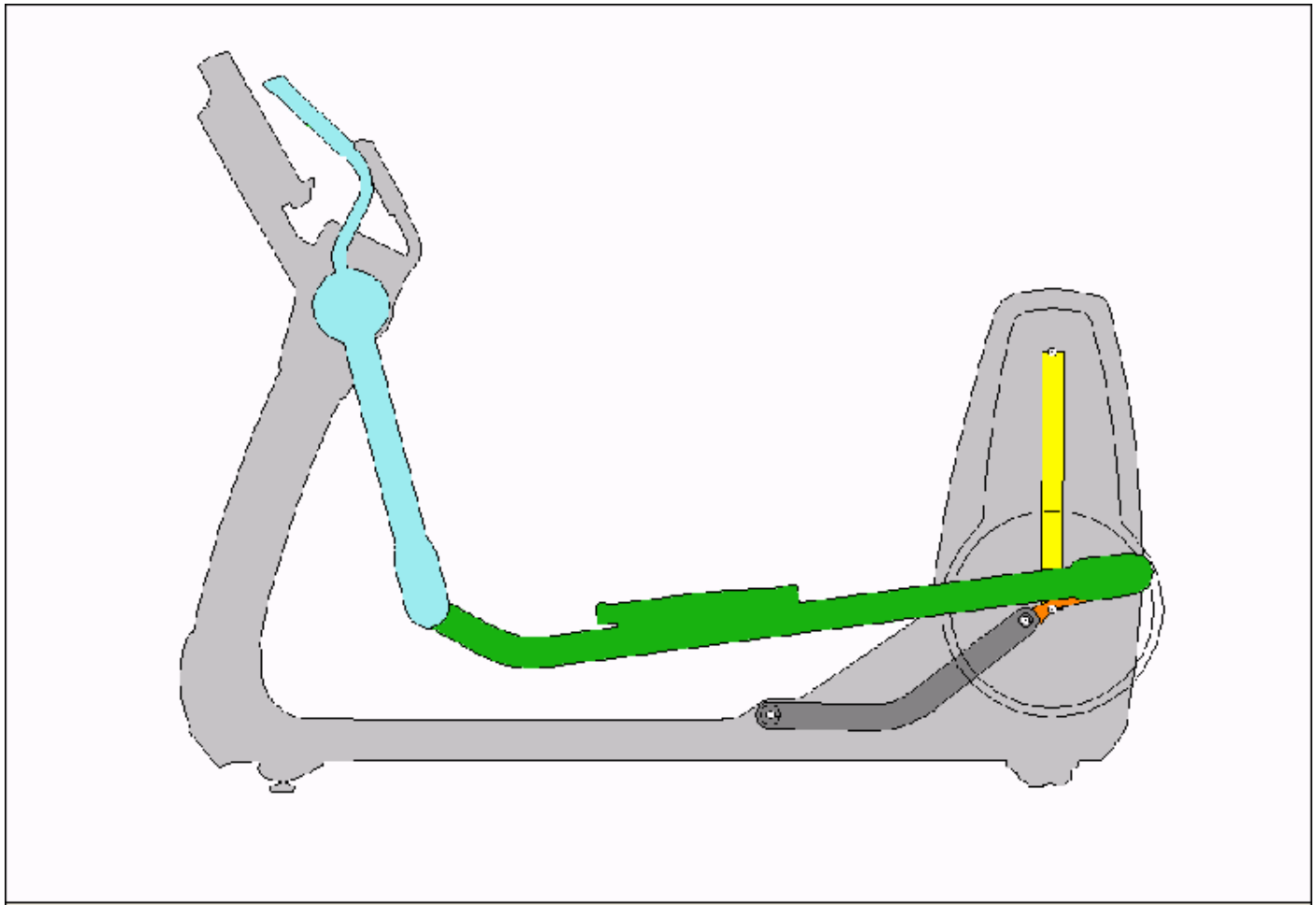
Tools required: 6mm Allen wrench, E-ring tool, 17mm Socket

Orientation of Thrust Washers

- Proper orientation of thrust washers is essential or else the E-ring at the end of the shaft will not fit on the shaft correctly.
- Each set of thrust washers surrounds each needle thrust bearing
- Orientation of needle bearings does not matter.
- Outside chamfers of the thrust washers face away from the thrust bearing



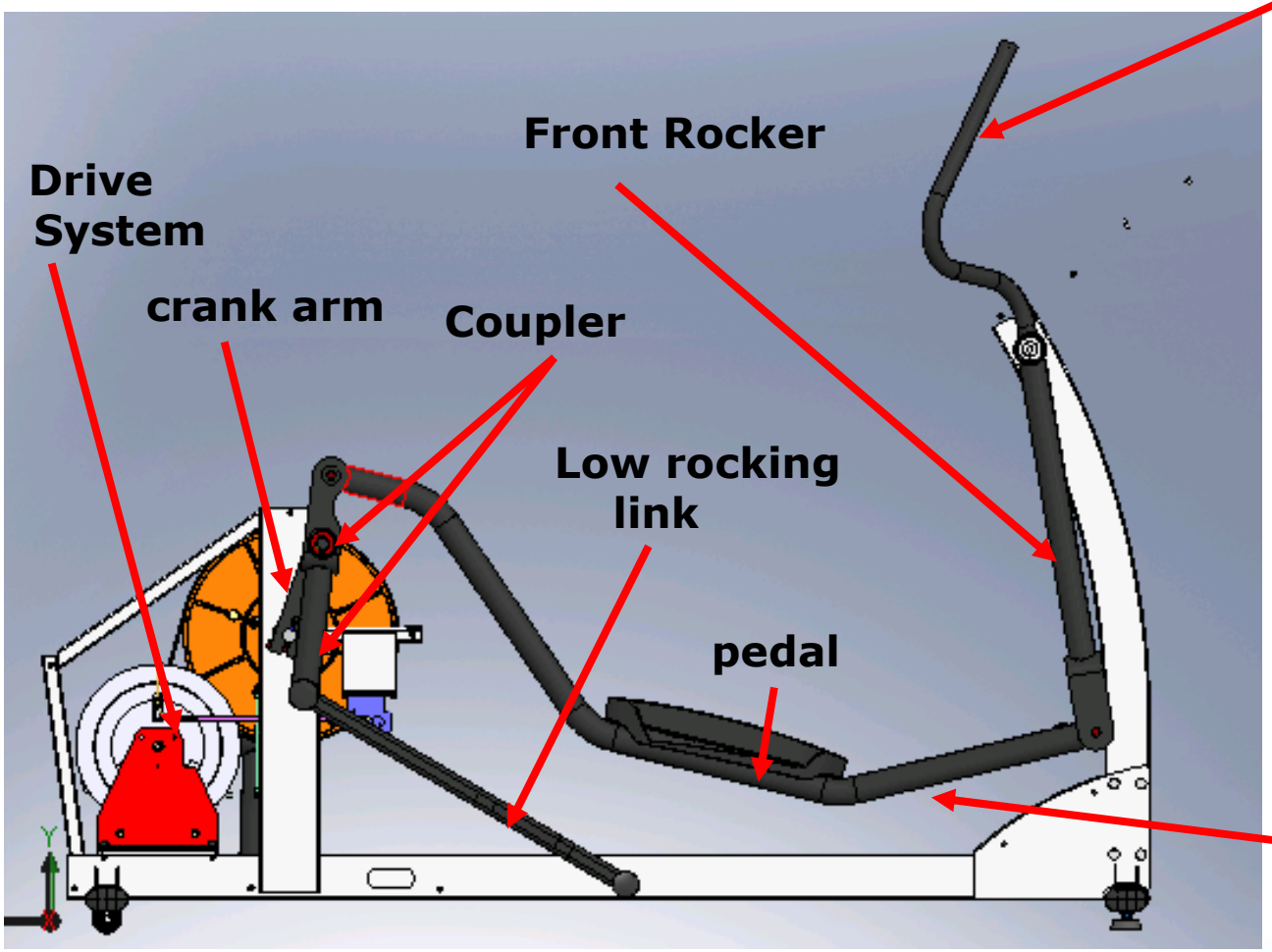
Elevation 95X Elliptical Motion



95x Elevation Series (Mercury)_simple with Silhouettes ASSEMBLED_for AVI(visibleCrank)

X1, X3, X5, X7 & X8 Components – Visual Representation

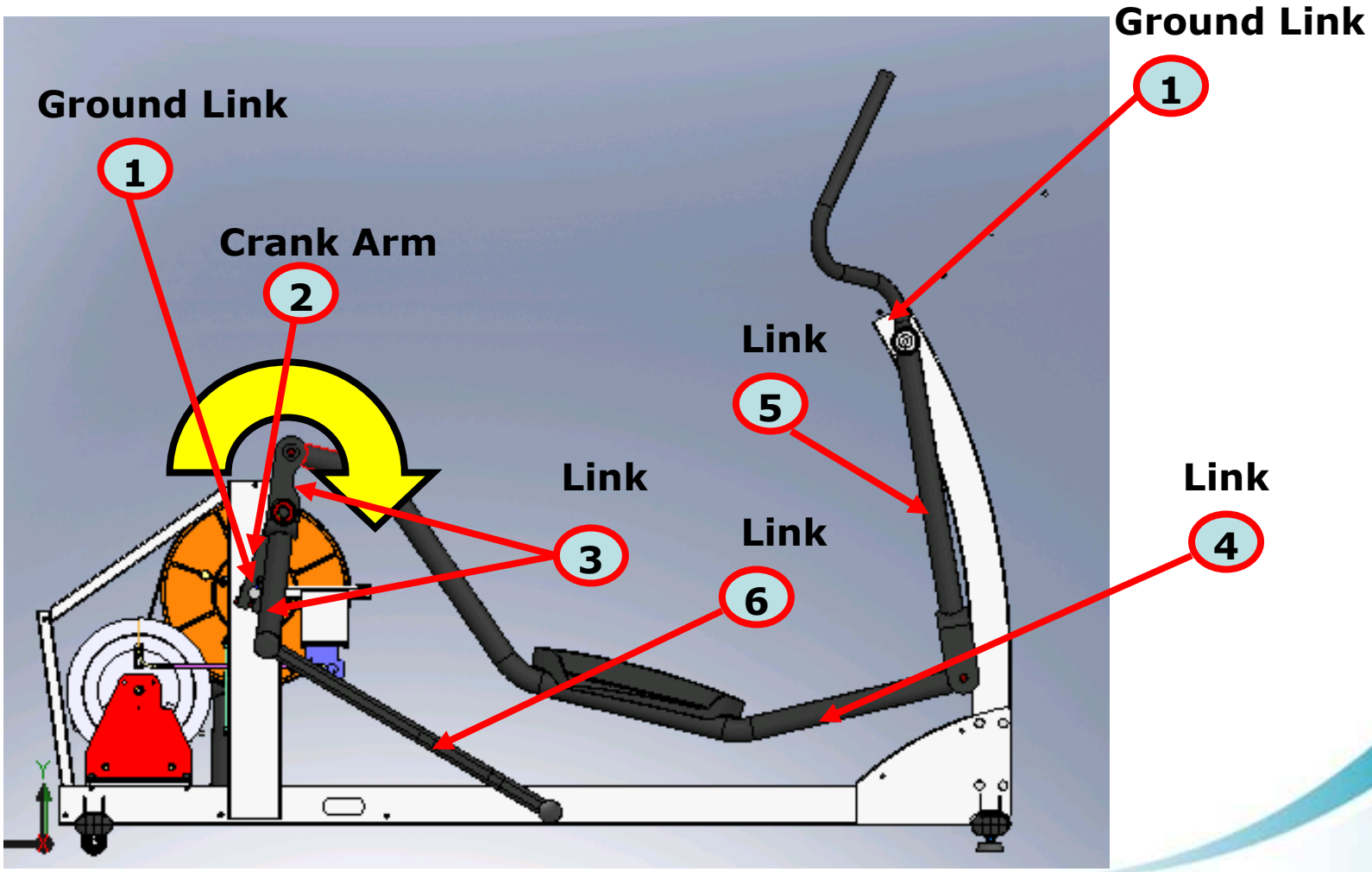
» X1 shown below for clarity.



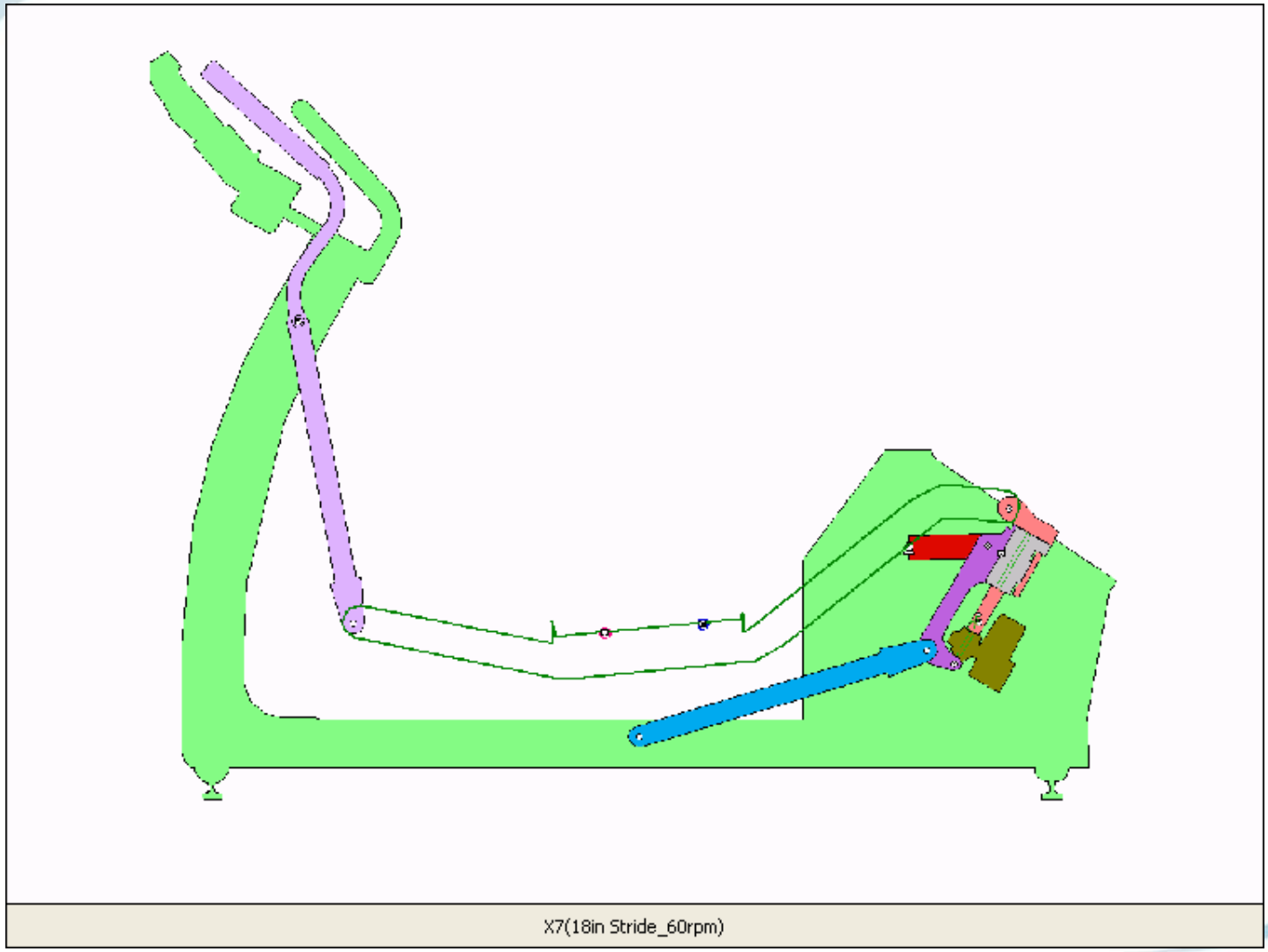
» X5, X7 and X8 are the same linkage as X1 and X3, except contain the stride adjustment mechanism within the coupler

Consumer Cross Trainers 6-Bar Linkage System

» X1 shown below for clarity.



X7/X8 (shown with 18” stride) Elliptical Motion



Summit Trainer Linkage System

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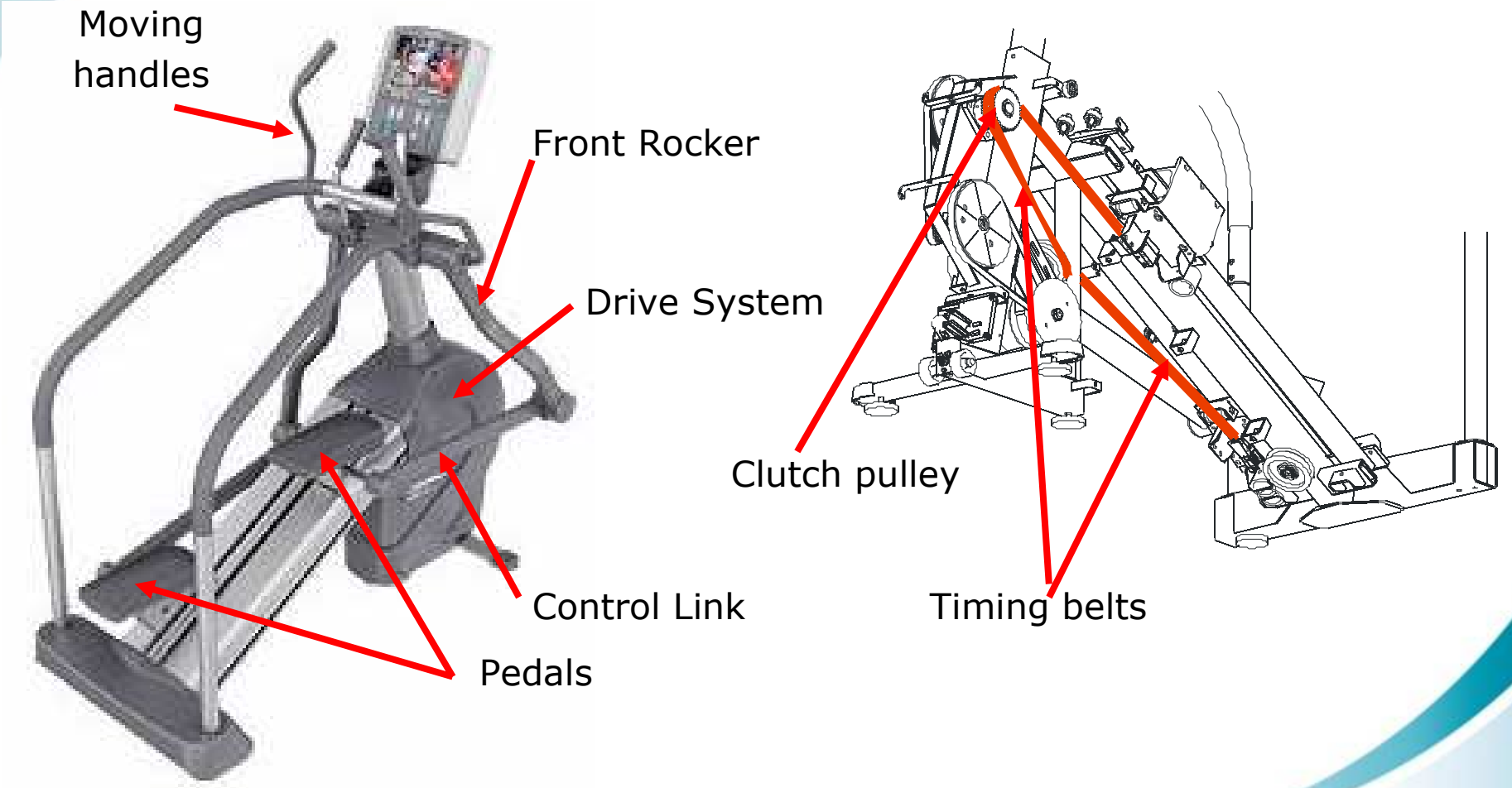
Theory of Operation

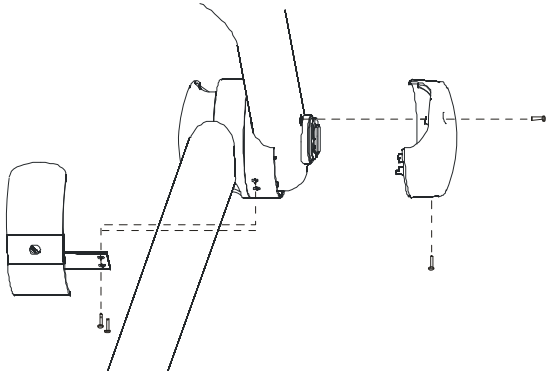
- The left and right pedals are connected to one another through the use of a timing belt (HTD profile).
- When the user pedals, the timing belt engages the one-way clutch pulleys thus spinning the crank pulley.
- The pedals are connected to control links that then oscillate the front rockers.
- Stride length is user defined up to 26”.
- Minimum step-up = 5.5” to rear step.

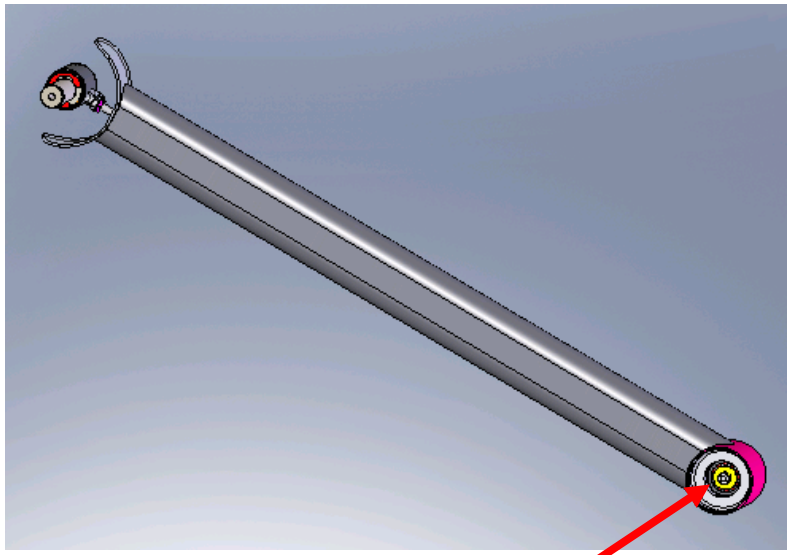
Components – Visual Representation



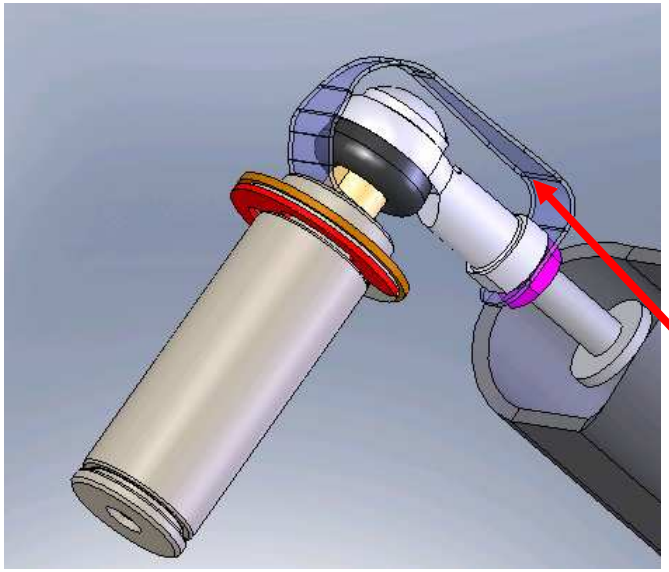
Control Link Assembly

Control Link to Front Rocker Connection





Self Aligning Bearing



Threaded Tie Bar and retaining spring

Common Issues

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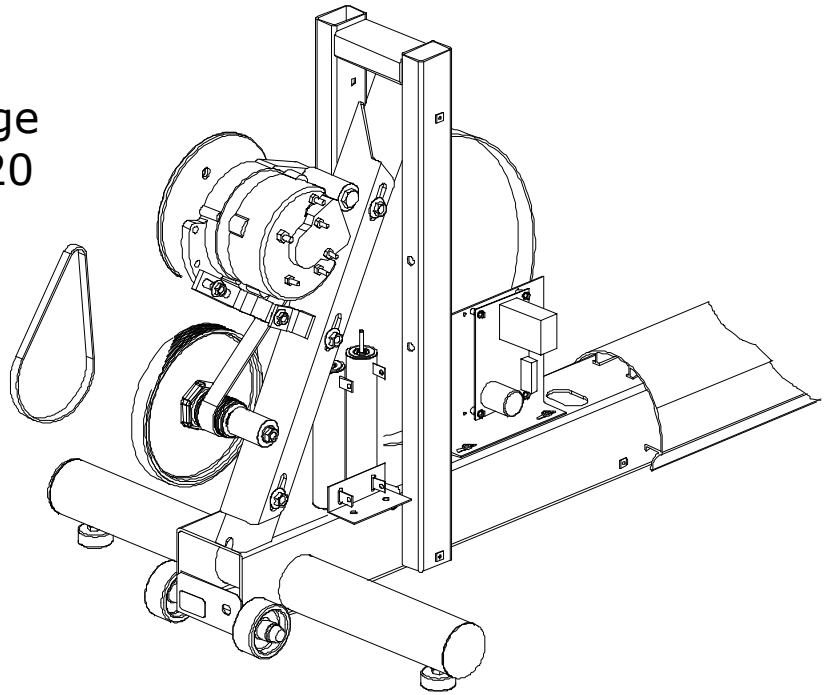
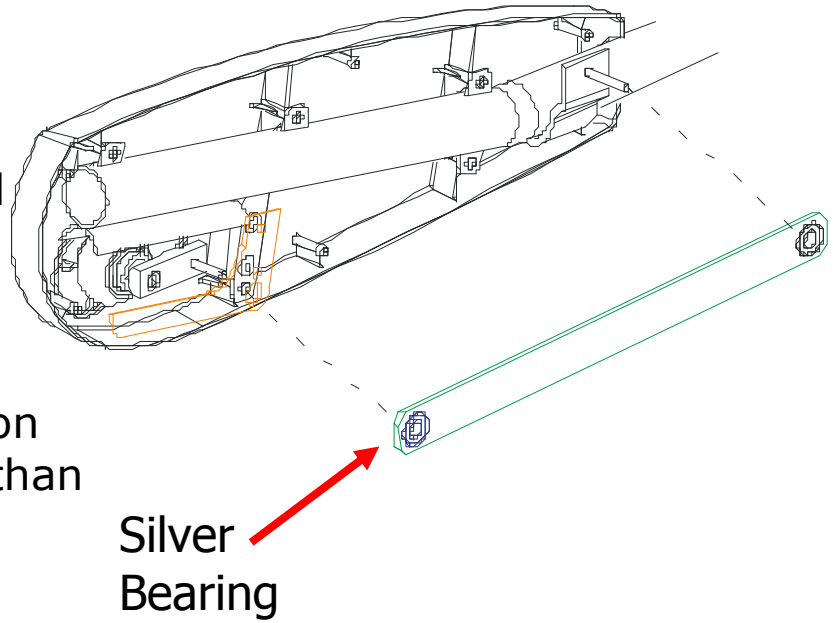
No Resistance on 91X / CLSX and X9i Cross Trainers

- Issue:
  - In Quick Start or Manual program, the resistance level does not change if the level is increased from 1 to 20
- Probable cause:
  - Main drive belt or alternator belt loose
- Solution:
  - Adjust main drive belt and/or alternator belt to ¼” deflection.
  - If belt slips or tension is still loose, replace faulty belts.



91X, CLSX, X9i and CSX Knocking Noise at Rear Pedal

- Issue:
  - Thumping knocking from rear pedal area of tie rod linkage after reinstallation due to service error
- Probable cause:
  - If the white mark or black bearing on the "tie rod bar" is facing forward, than the tie rod bar has been installed backwards.
- Solution:
  - Put the mark or black bearing on the tie rod bar towards the front. If problem still exists, replace faulty part.
  - Silver bearing should be to the back.

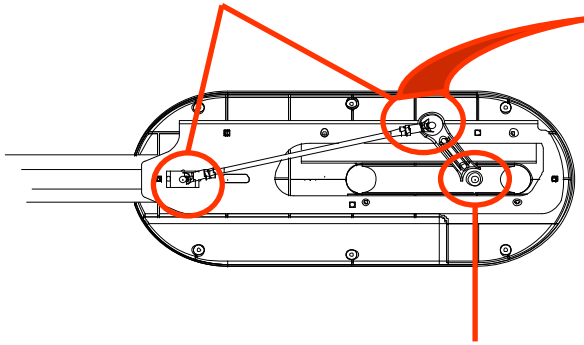


S.B.# CT02111502

CLSXH - Noise From the Old Control Link

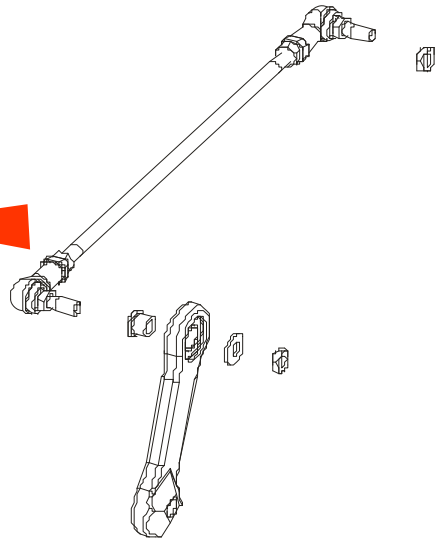
- Issue:
  - Ticking noise
- Probable cause:
  - Socket in the tie rod end has "opened-up"
- Solution:
  - Replace the control link

Hex Nuts
Torque 10-12 ft lbs

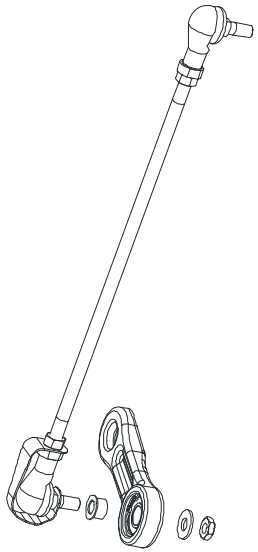


Mounting Bolt
Torque 50-55 ft lbs

1st Control Link Version



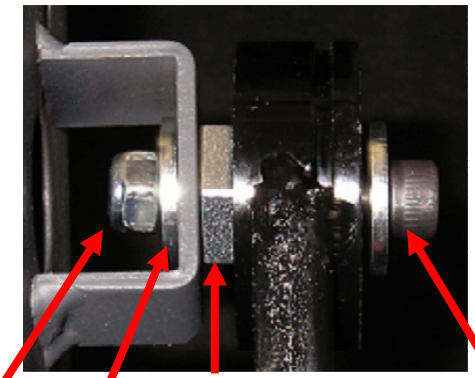
2nd Control Link Version



Old revisions

CLSXH - New Control Link Assembly

New control link assembly – PN: GK62-00002-0071



6mm Allen bolt + washers

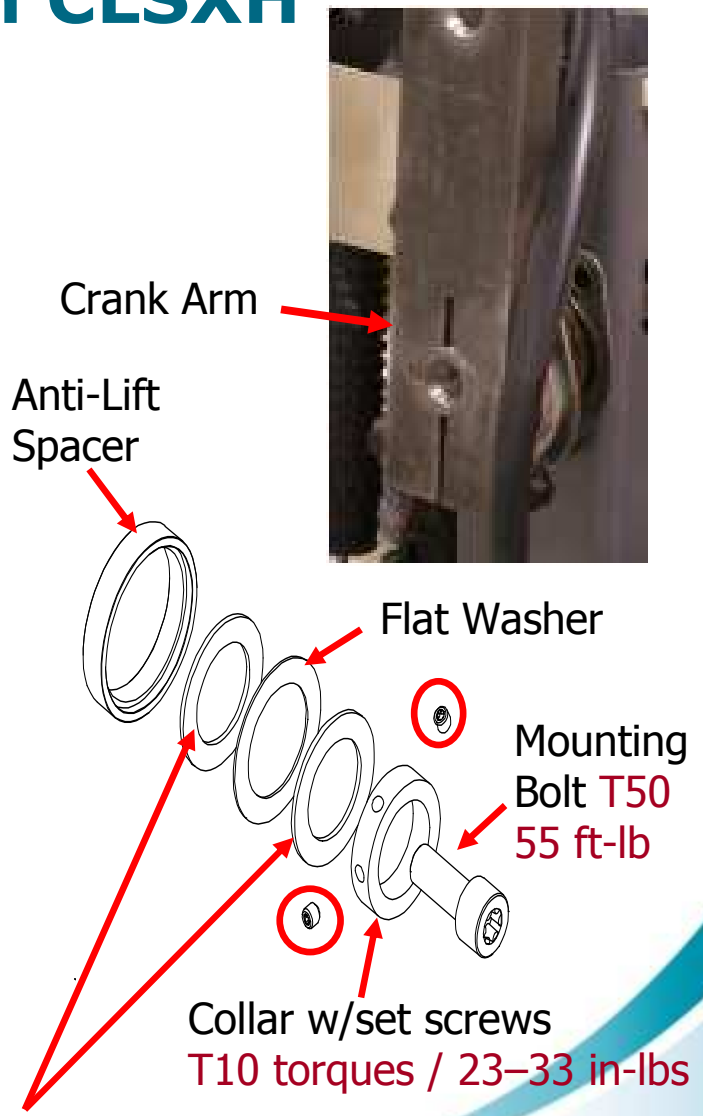
spacer

washers

Nylon Lock nut

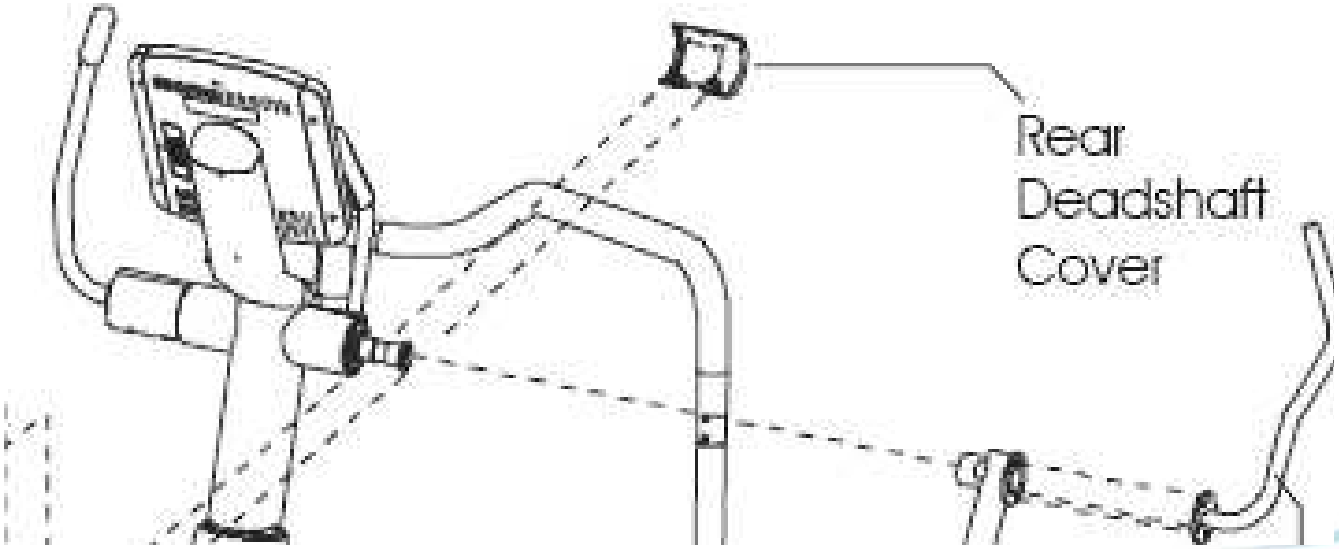
Shrouds Rubbing on CLSXH

- Issue:
  - Rubbing noise between pedal lever shrouds, drive system shrouds, or pizza pans
- Probable cause:
  - Crank arms are not in a proper position
- Solutions:
  - Solution #1
    - If the crank arms are mounted flush to the ends of the crank arms, loosen and readjust their mounting position by moving them about 1/8" outwards.
  - Solution #2 – more time consuming.
    - Loosen roller collar and install new hardened washer in front of the e-ring on the crank arms Reference parts list for the hardened washer part number



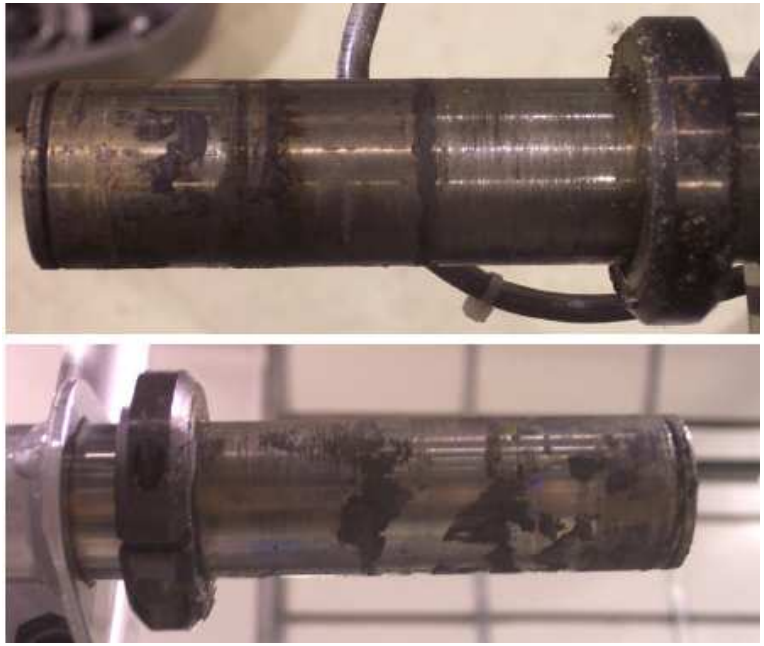
Crosstrainers and Summit Trainer Noise at the Upper Rocker Arm Area

- Issue:
  - Noise at the Upper Rocker arm area
- Probable cause:
  - Rocker arm moves side-to-side. Collar spacing incorrect
- Solution:
  - Loosen and adjust collar to .005 clearance



Crosstrainers and Summit Trainer Noise at the Upper Rocker Arm Area

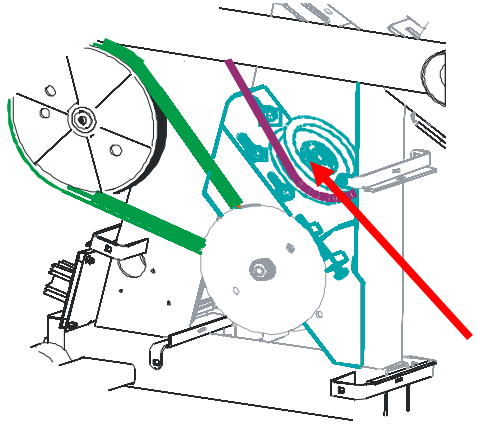
- Issue:
  - Noise at the Upper Rocker arm area
- Probable Cause -
  - Heavy deposits on dead shaft
  - Worn flange bearings
- Solution:
  - Clean dead shaft
  - Replace both rocker arm assemblies



Summit Trainer Squeaking Noise

- Issue:
  - Squeaking noise
- Probable cause:
  - Belt running up on pulley edge causing a squeaking noise
- Solution:
  - Install a washer in between pulley and frame to change pulley angle
  - Confirm proper belt placement.

Note belt location

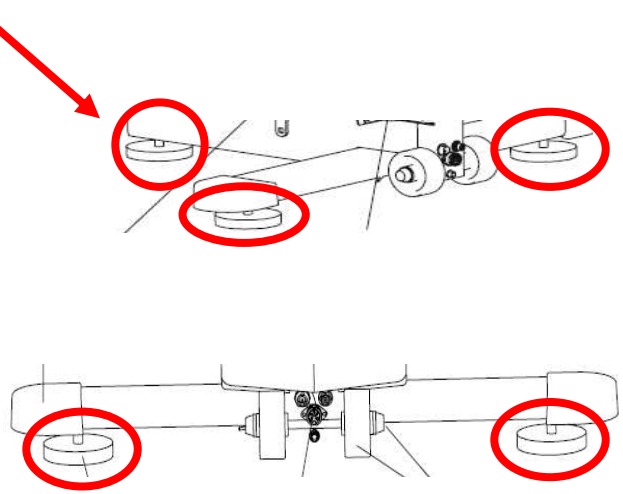


Tension pulley

Summit Trainer Thumping and/or Rocking Motion

- Issue:
  - Thumping and rocking motion
- Probable cause:
  - Damaged or uneven leveler
- Solution:
  - Replace and/or adjust the levelers
- Tip:
  - Always adjust fifth leg lever last

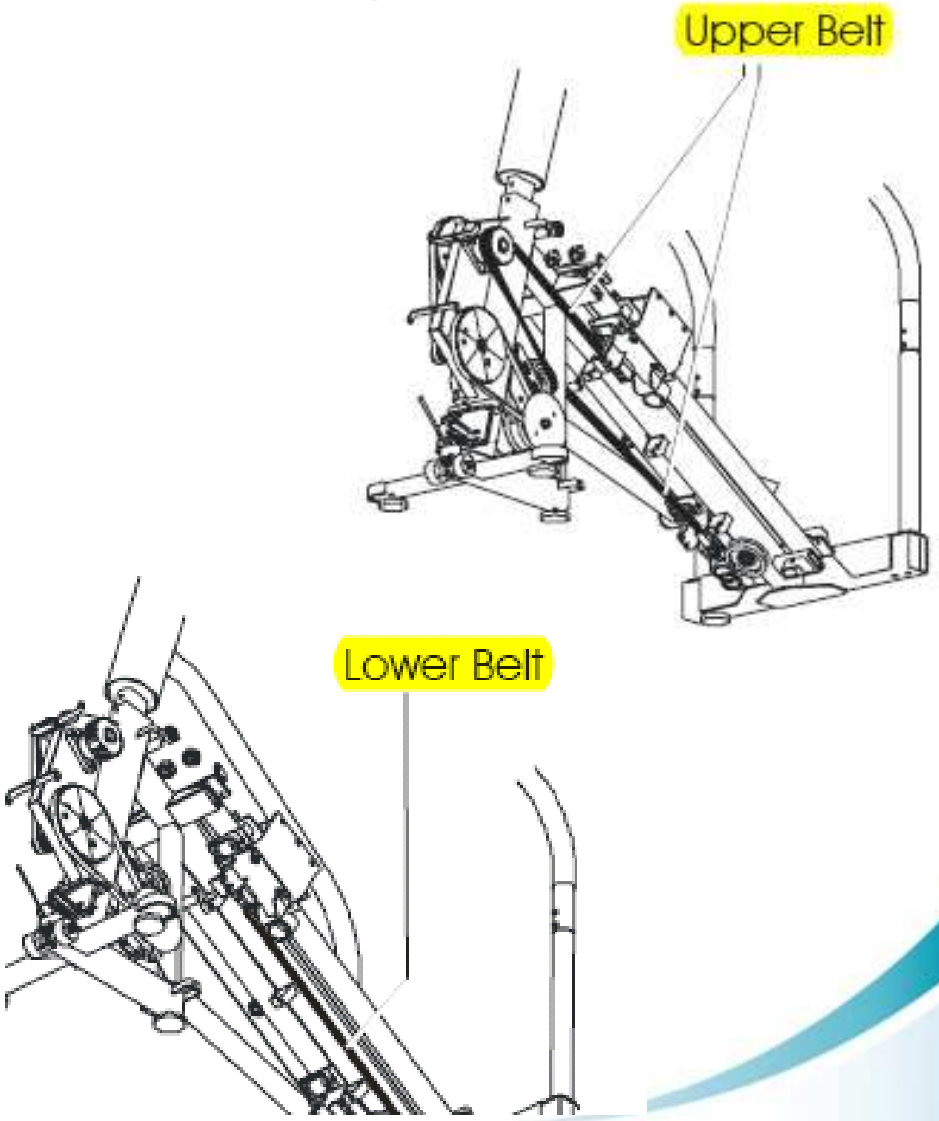
Fifth Leg Leveler



Summit Trainer Noise

- Issue:
  - Noise
- Probable cause:
  - Worn timing belts
  - Loose belt terminator connections
- Solution:
  - Replace/Inspect timing belts and connections

Timing Belt



Summary

- Do we need to grease open ball bearings?
- Do we need to grease Oil Lites?
- What is the solution for rubbing noise between pedal lever shrouds, drive system shrouds, or pizza pans?
- What is the reason for noise from the upper rocker arm area?
- What is the fix for a squeaking noise on the Summit trainer?

Questions

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