MTS FSE MODULAR TRAINING

319 Load Frames

September 14, 2015 Rev A

be certain.

319 Load Frame

- The 319 Load frame is a floor standing axial torsional load frame.
- This load frame has 2 actuators. There is both a model 244 linear actuator and a model 215 rotary actuator combined to provide simultaneous axial and torsional forces to a test specimen.
- The rotary actuator is attached to the lower piston rod of the linear actuator and rotates the piston rod to provide torsional forces to the specimen.

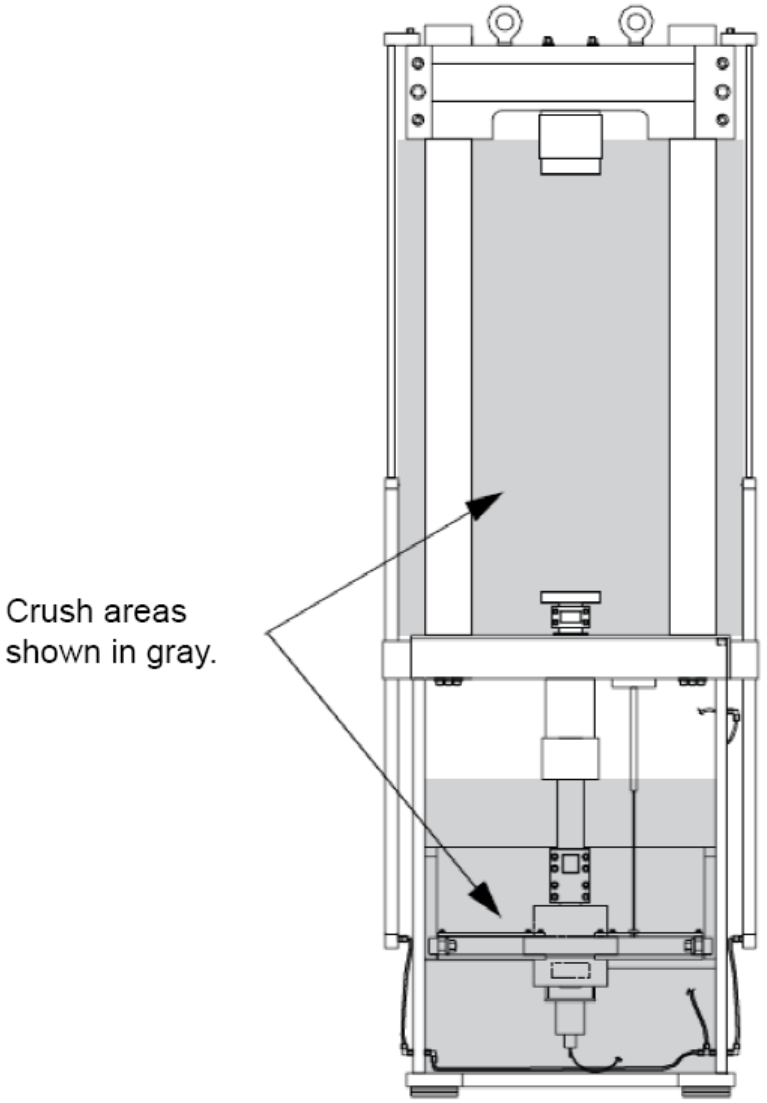
Load Frame Specifications

» There are several configurations available as shown in the chart below.

Model	Actuator Ratings		Transducer Ratings	
	Axial Force	Torsional Force	Axial Capacity	Torsional Capacity
319.02	25 kN (5.5 kip)	220 N-m (2000 in-lb)	25 kN (5.5 kip)	220 N-m (2000 in-lb)
319.05	50 kN (11 kip)	550 N-m (5000 in-lb)	50 kN (11 kip)	550 N-m (5000 in-lb)
319.10	100 kN (22 kip)	1100 N-m (10,000 in-lb)	100 kN (22 kip)	1100 N-m (10,000 in-lb)
319.25	250 kN (55 kip)	2200 N-m (20,000 in-lb)	250 kN (55 kip)	2200 N-m (20,000 in-lb)
319.50	500 kN (110 kip)	5500 N-m (50,000 in-lb)	500 kN (110 kip)	5500 N-m (50,000 in-lb)
319.60	1000 kN (220 kip)	11,000 N-m (100,000 in-lb)	1000 kN (220 kip)	11,000 N-m (100,000 in-lb)

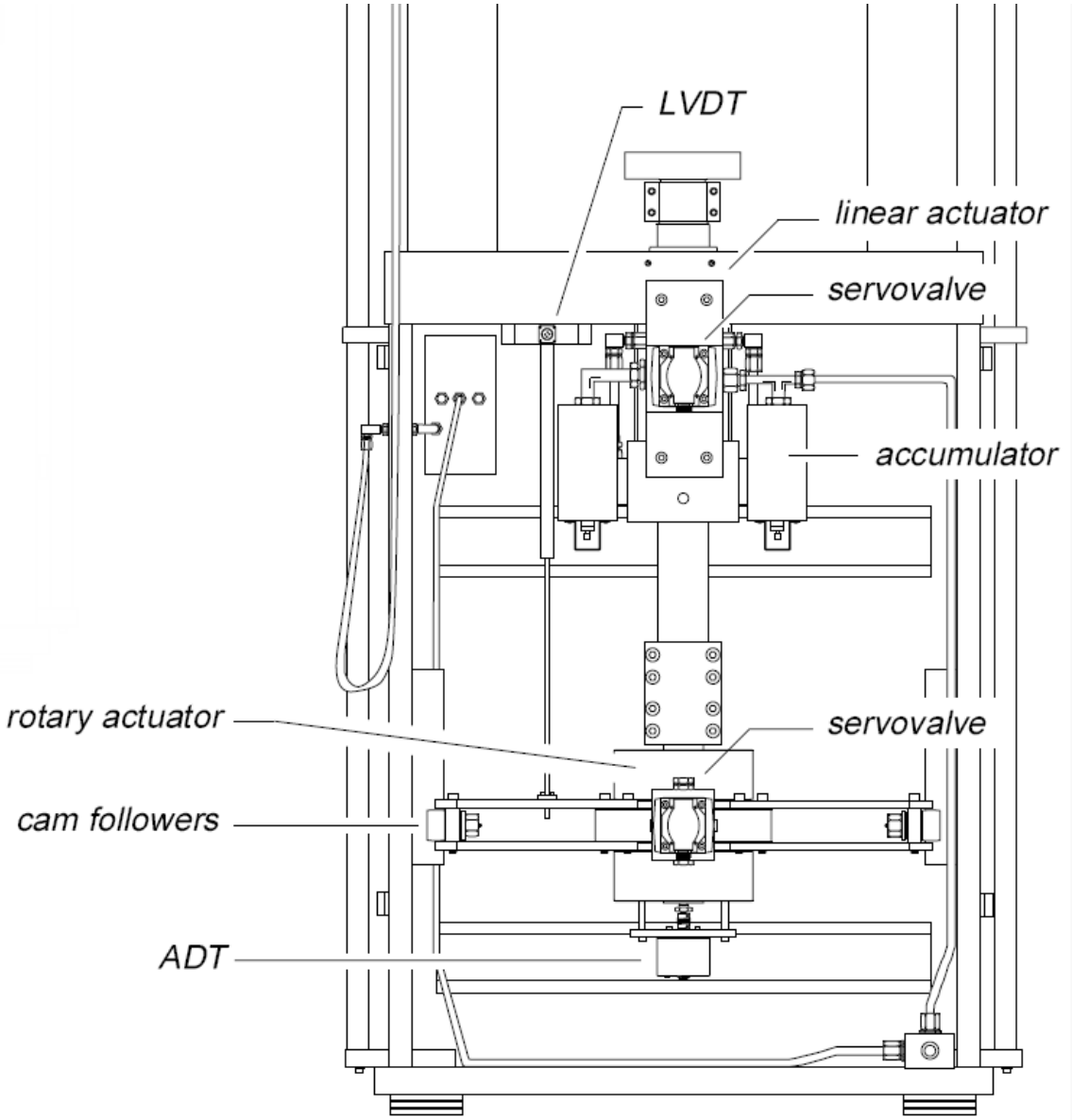
Safety

- Be aware of the crush zones on this load frame. Keep clear of the crush zones.
- There is a crush zone in the test space area between the platen and the crosshead.
- There is also a large crush zone below the linear actuator. This is caused by the entire rotary actuator moving vertically with the linear actuator.



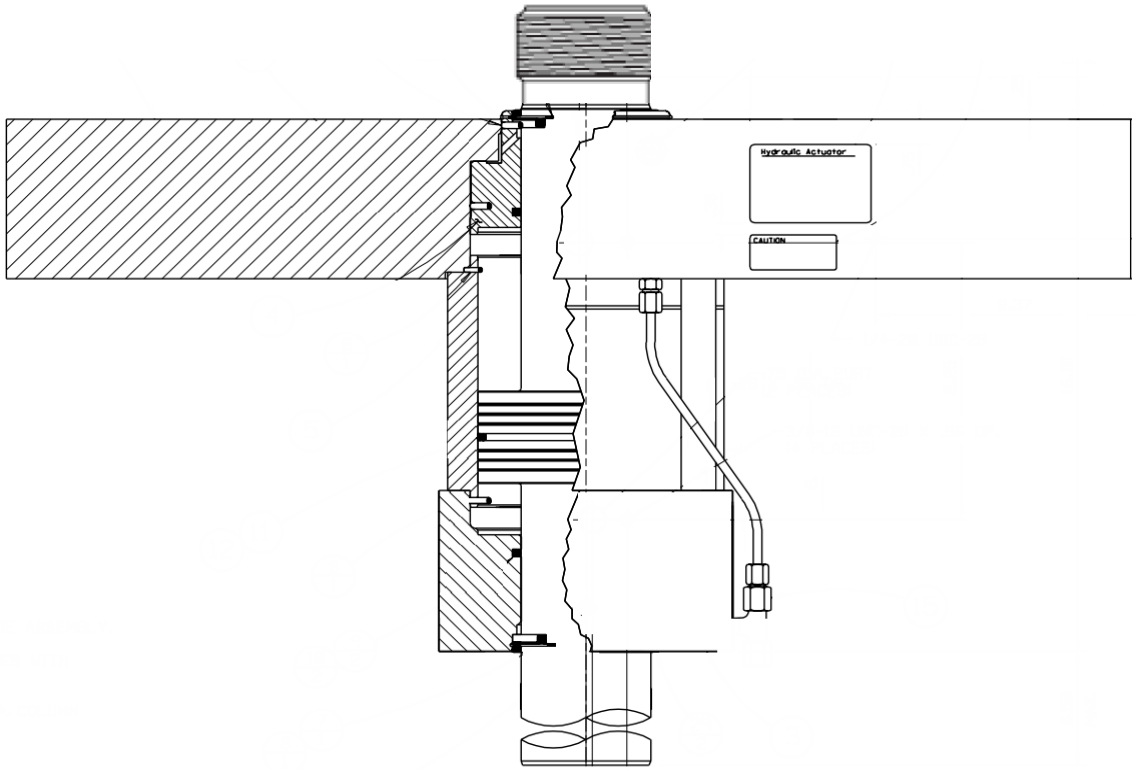
Component Locations

- This is the rear view of the bottom half of the load frame with a base mounted actuator.
- Note the LVDT for the linear actuator is mounted externally.



Linear Actuator

- The linear actuator used in this load frame is similar to the model 244 which is used in a 318 load frame with an integral upper end cap.
  - Additional details can be found in both the linear actuator module and the 312 / 318 load frame module.

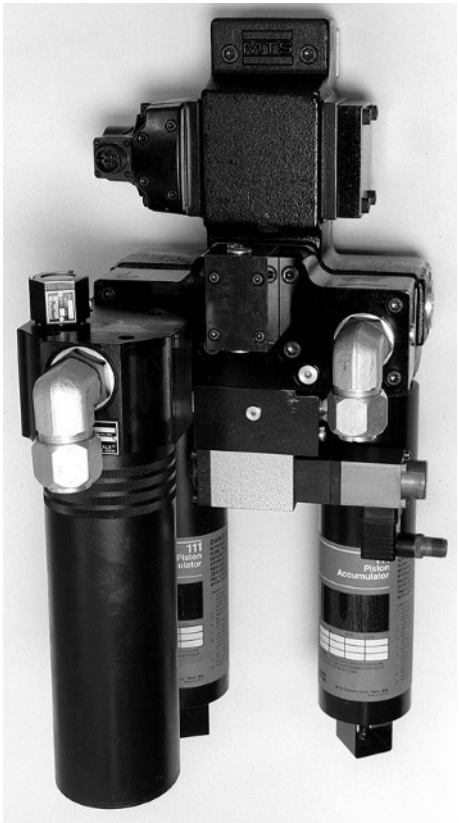


Rotary Actuator

» The rotary actuator used in this load frame is a standard model 215 rotary actuator.
  - Additional details can be found in the rotary actuator module.

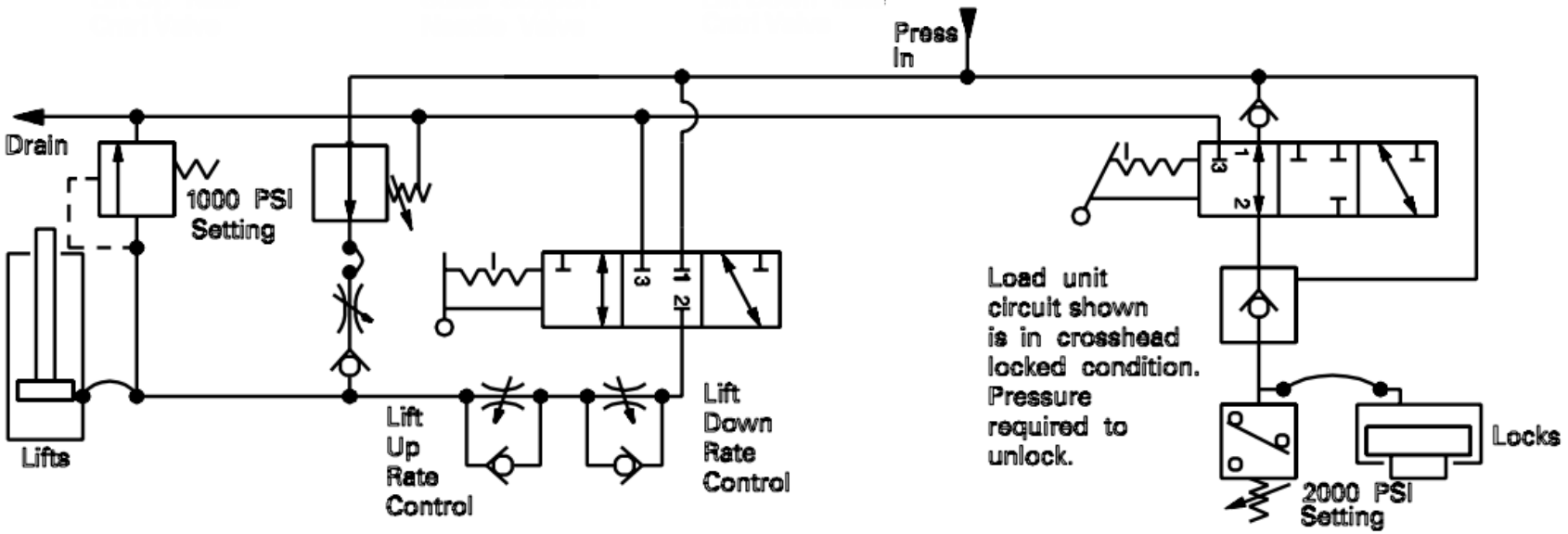
Hydraulic service manifold

- The HSM used in this load frame is a 298 manifold with controlled pressure for the rotary actuator.
  - For additional details see the hydraulic service manifold module.



Crosshead Hydraulic Lifts

» The hydraulic lifts and locks use both the same control panel and same hydraulic circuit as the model 318 load frame.
  - See the 318 module for additional details on the lift and lock circuit.



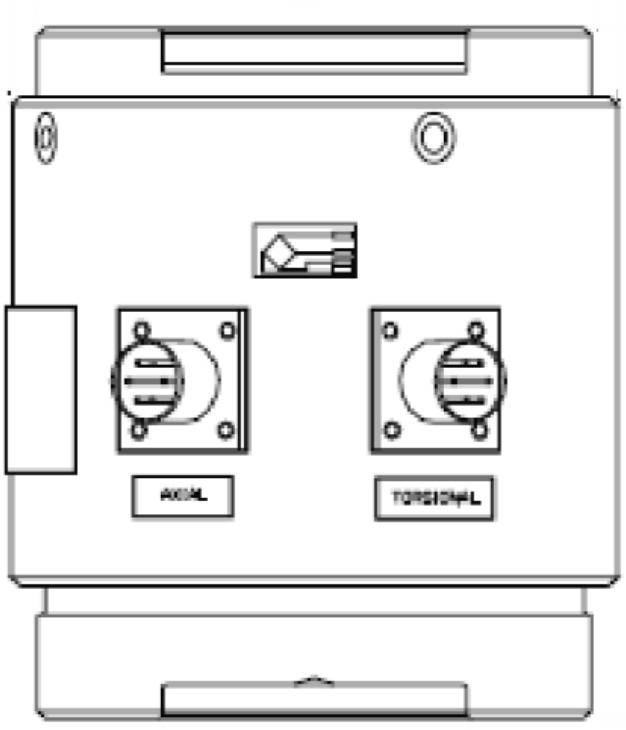
Load Frame Connections

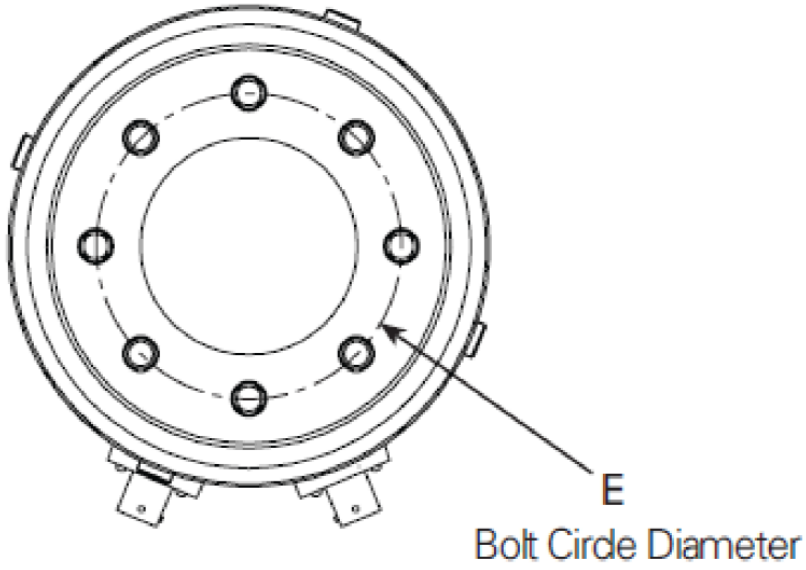
- The connections for the axial torsional load frame are similar to other load frames.
  - Linear actuator LVDT
    - This connection is in a different location than a standard linear actuator due to the LVDT being mounted externally.
  - Rotary actuator ADT – Located at rear of rotary actuator
  - Axial / Torsional force cell
    - This has 2 connections present on the load cell, one for the axial force and one for the torsional force.
  - HSM – Standard proportional valve connection for a 298 manifold
  - Load Frame Lift / Lock / Emergency stop
  - Ground

Load Cell

- This load frame uses a single force transducer which measures both the axial and torsional forces in one transducer.

- This is attached using multiple bolts rather than a single threaded connection.

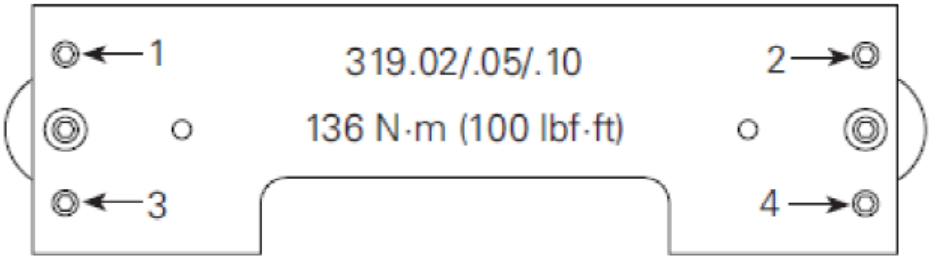


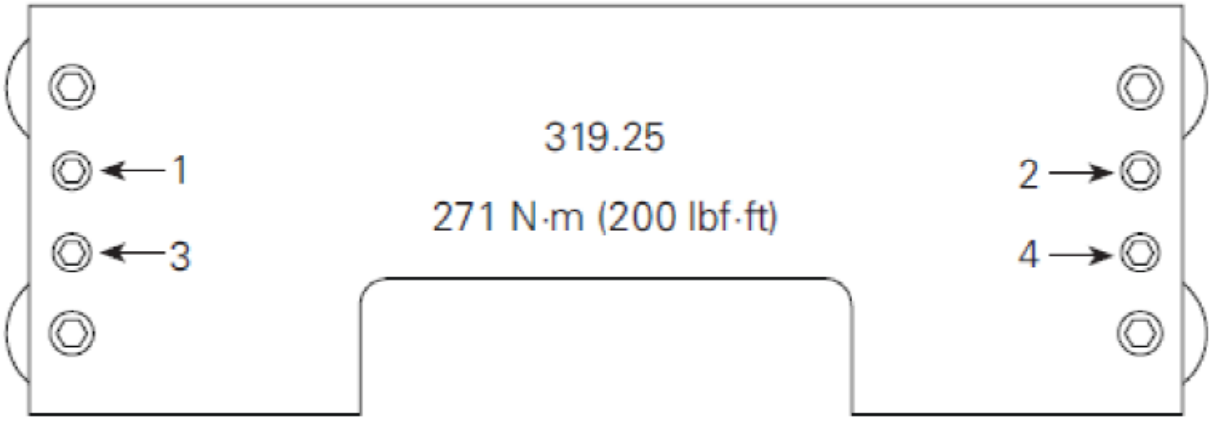


Crosshead Locks

» The crosshead contains manual locking bolts. These should be torqued in the sequence indicated to the torque specified in the manual.

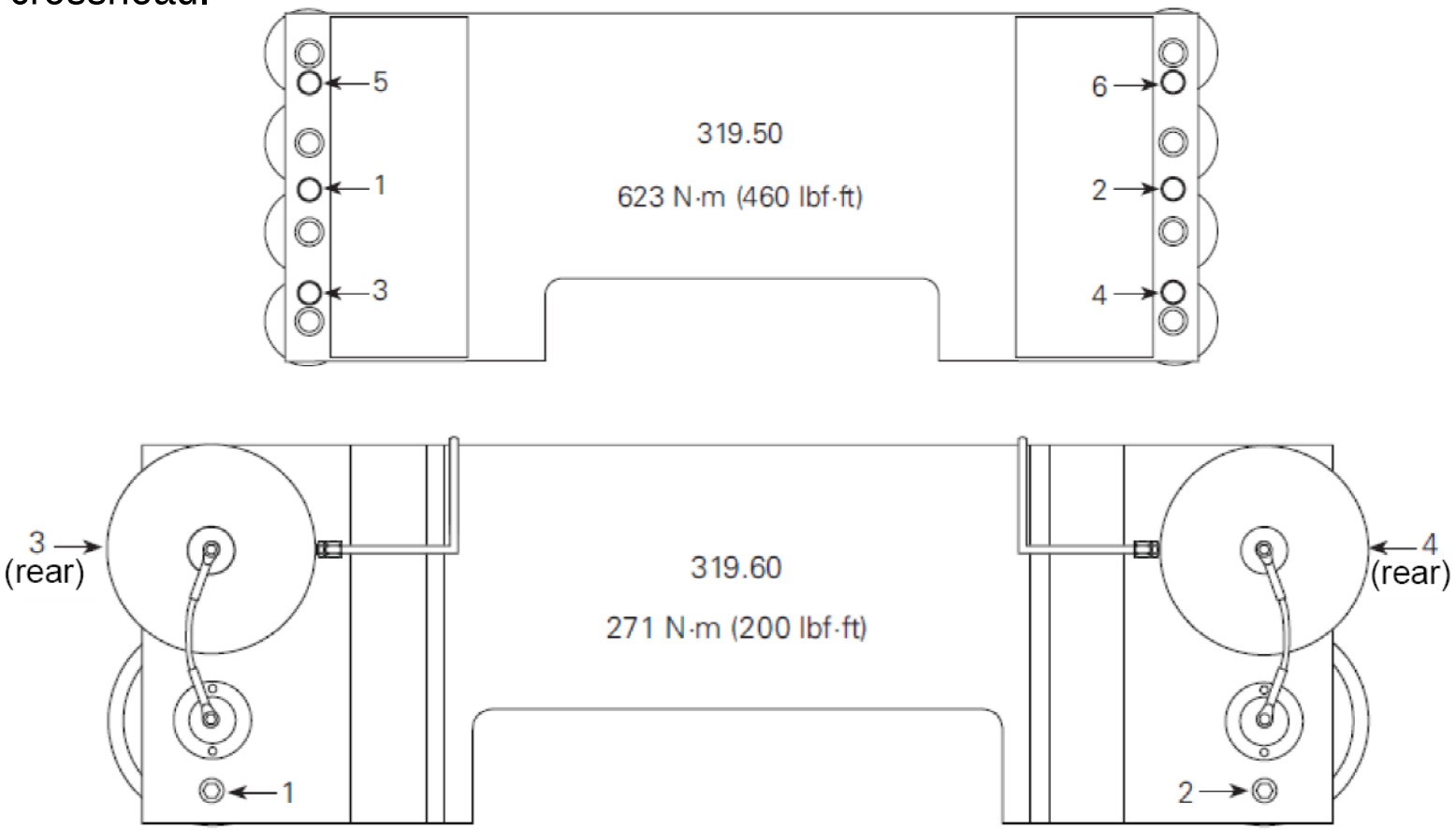
- These bolts are tightened prior to shipping and need to be loosened after hydraulic power is connected to the load frame.





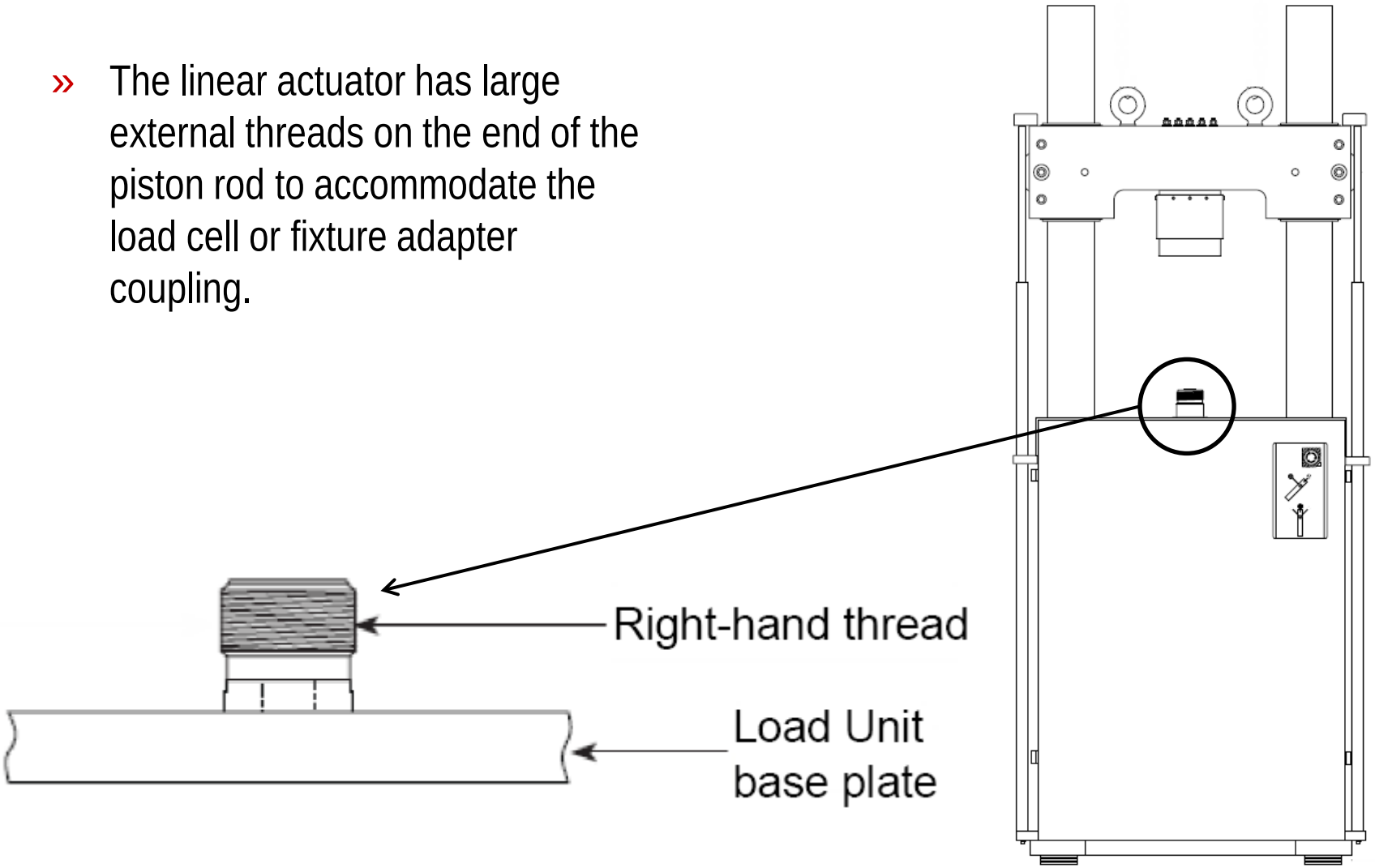
Crosshead Locks

» On the 319.60 two of the manual crosshead lock bolts are on the rear of the crosshead.



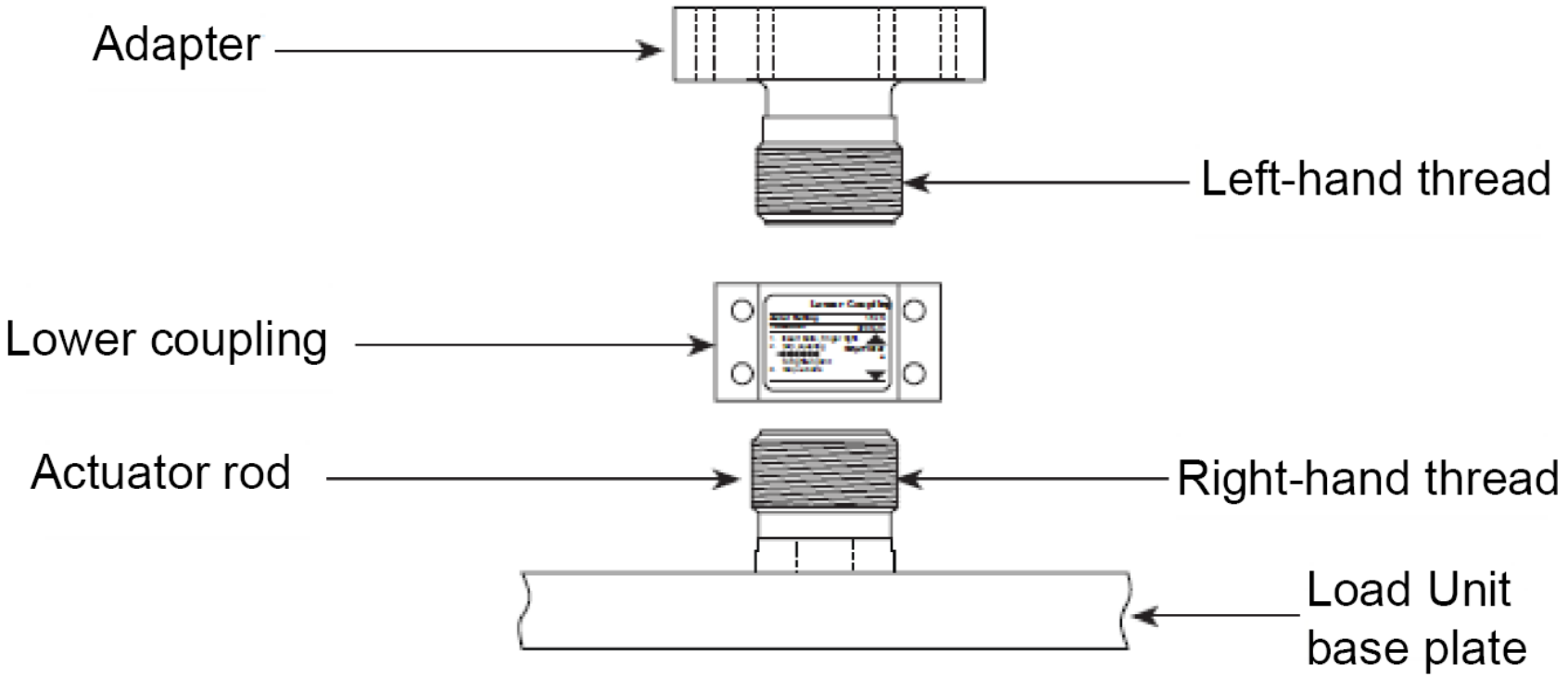
Linear Actuator

- The linear actuator has large external threads on the end of the piston rod to accommodate the load cell or fixture adapter coupling.



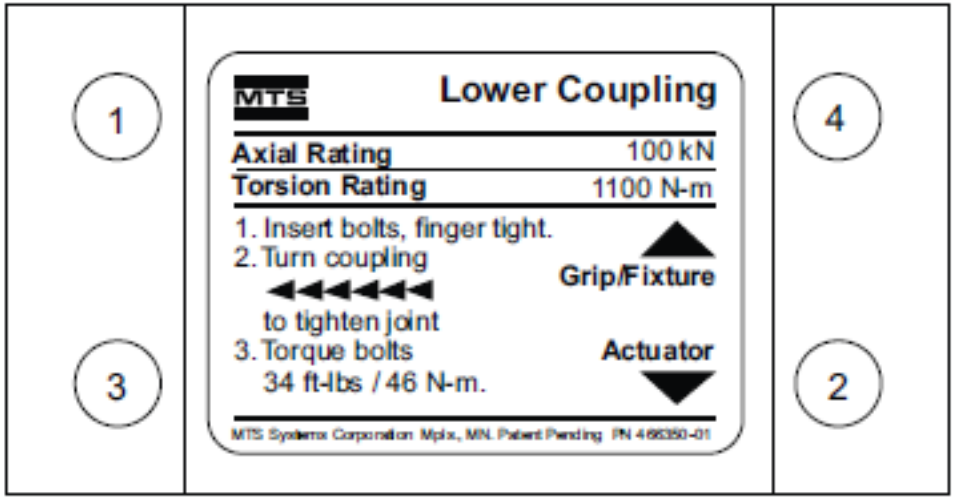
Installing an Axial-Torsional Adapter

» The actuator has a right hand thread and the fixture adapter has a left hand thread. These are also different thread pitches. These are assembled using a special coupling clamp.



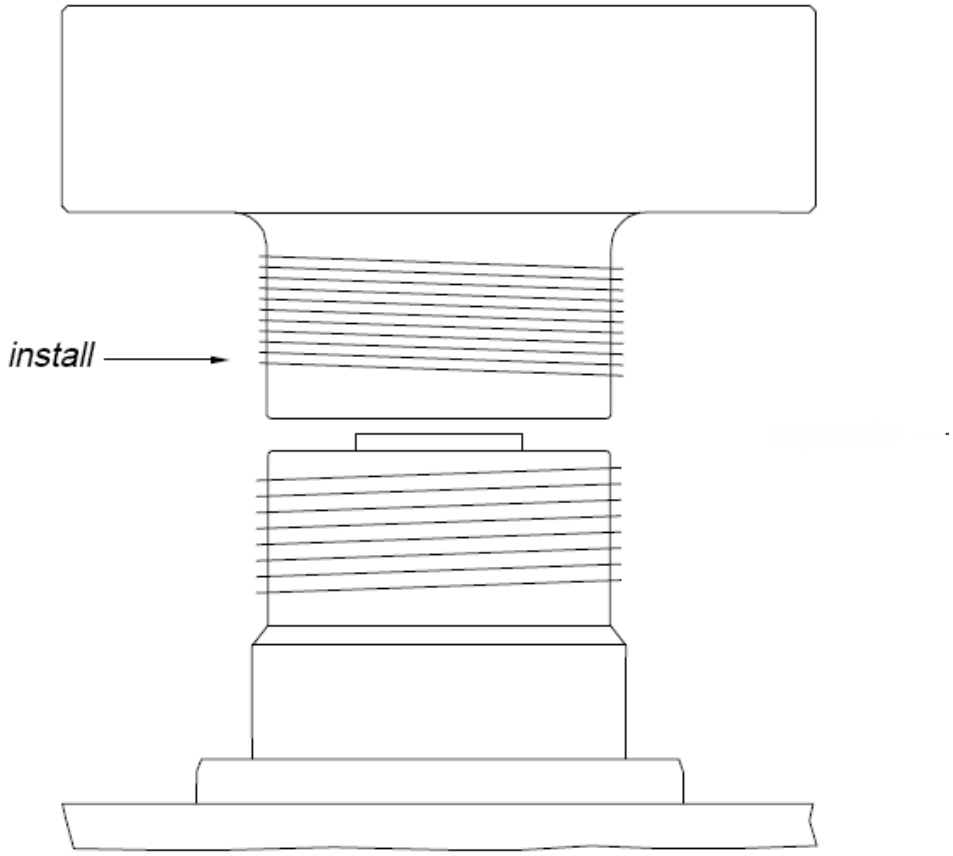
Installing an Axial-Torsional Adapter

» The following pages describe how to properly install and torque the Axial-Torsional coupling.



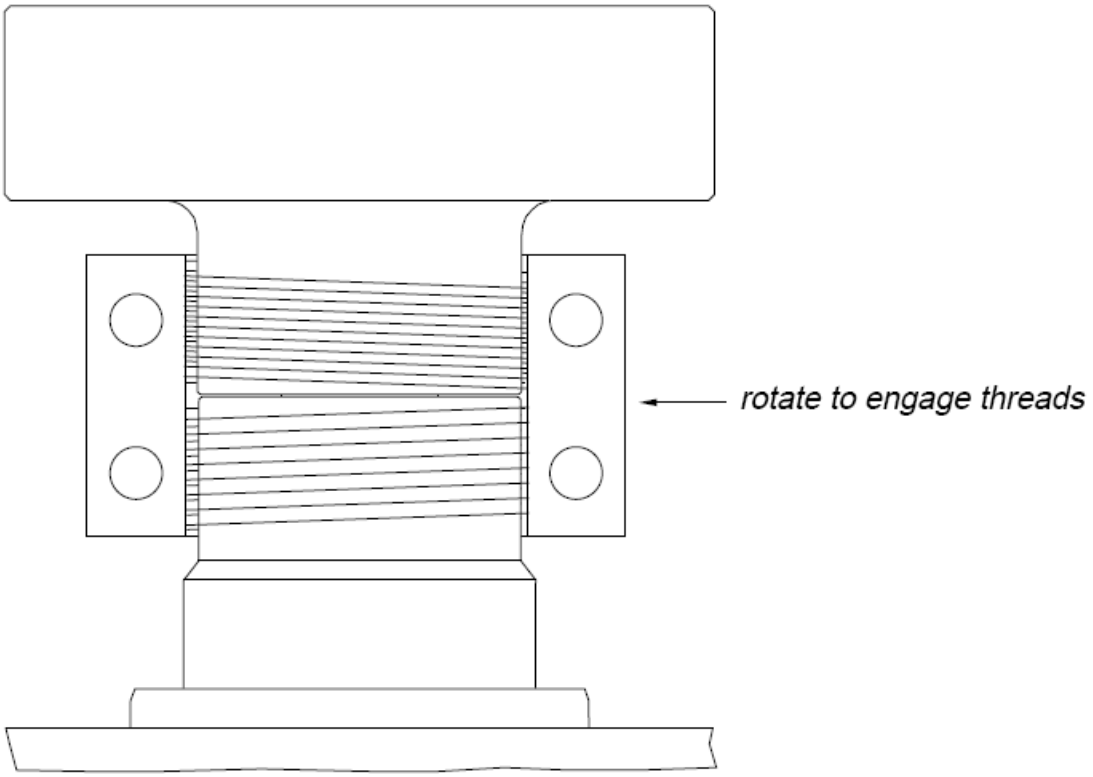
Installing an Axial-Torsional Adapter

» Before installing inspect and clean the threads. Apply a thin cote of Molykote G-n paste to the threads. Install the adapter onto piston rod.



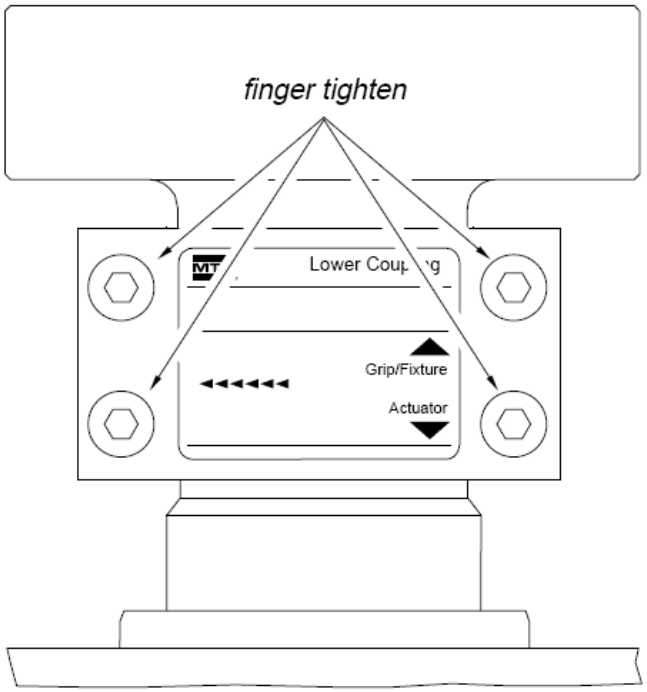
Installing an Axial-Torsional Adapter

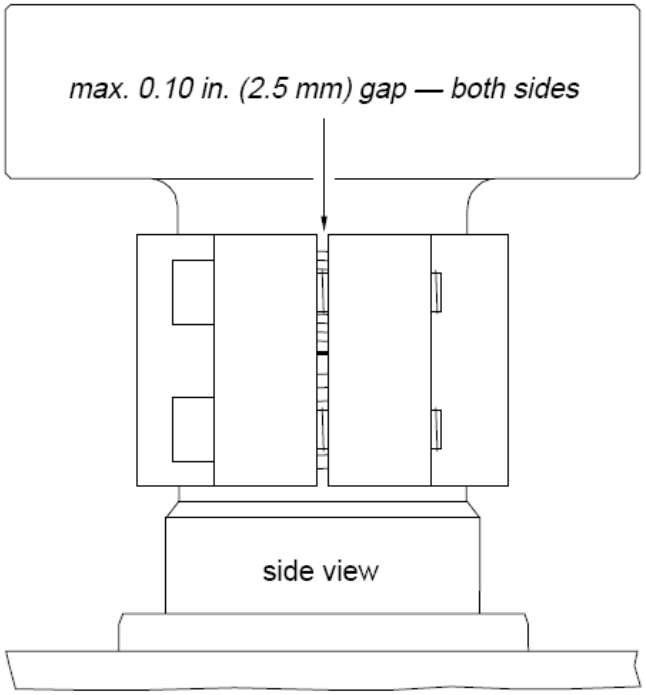
» Place the lower coupling rear half with the treaded holes against the actuator and adapter threads. Rotate the coupling back and forth until the threads mesh with both the actuator and adapter.



Installing an Axial-Torsional Adapter

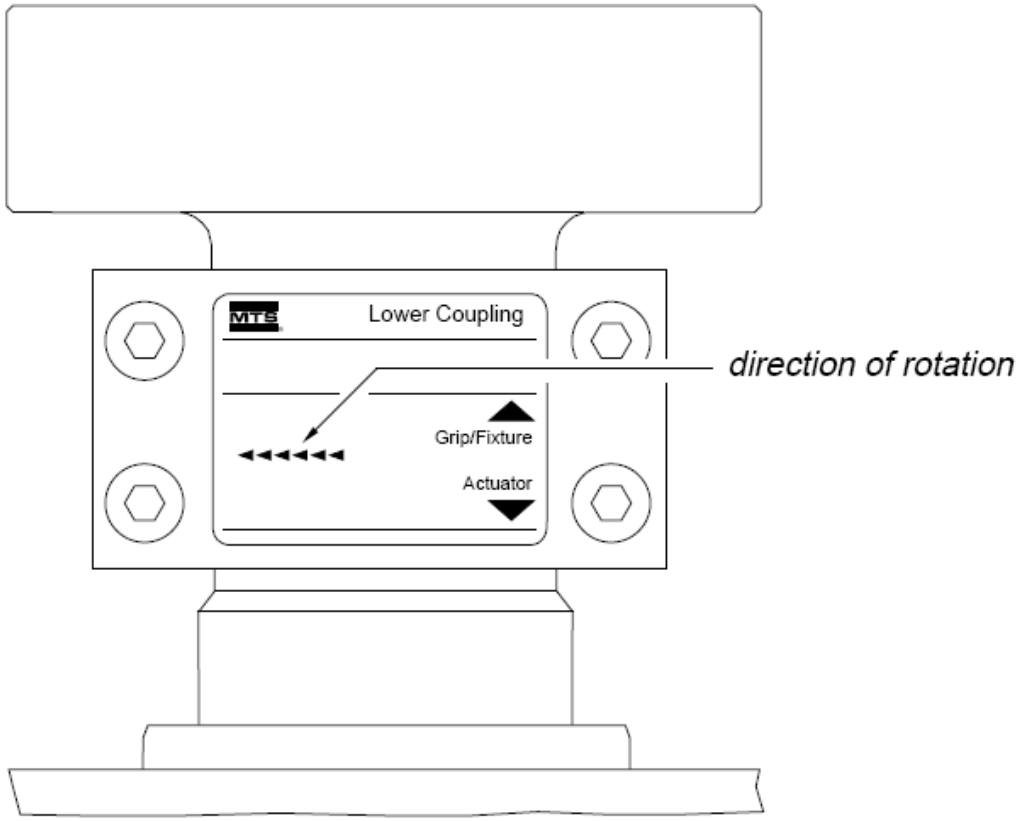
» Attach the lower coupling front half and install the bolts finger tight. Check the gap between the coupling halves is equal and does not exceed 2.5 mm (0.10 Inch).
  - If the gap is more than 2.5 mm check for proper thread alignment





Installing an Axial-Torsional Adapter

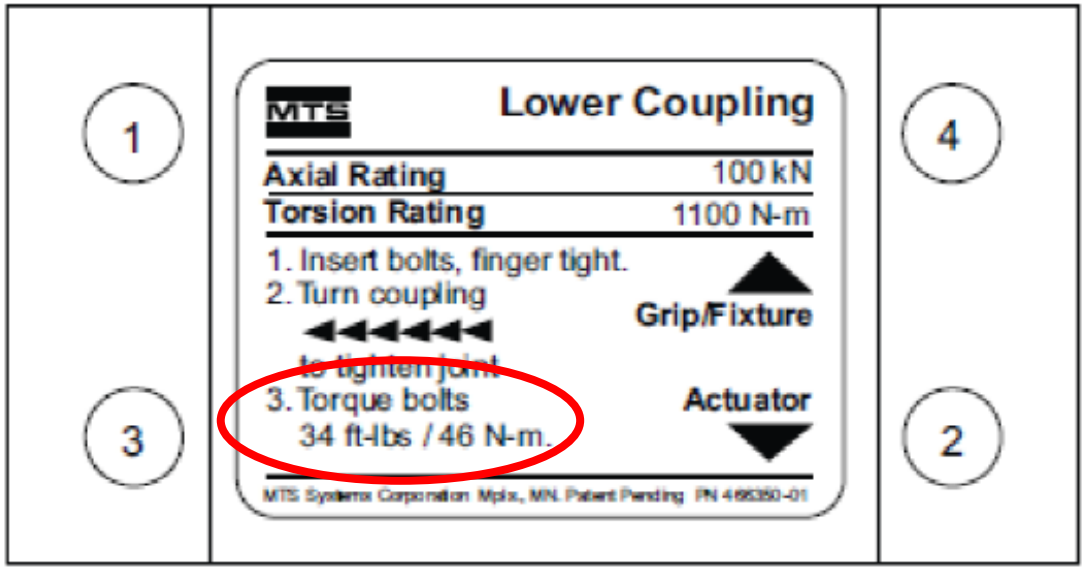
» Tighten the connection by rotating the coupling in the direction shown. This removes any separation between the actuator rod and adapter fixture.



Installing an Axial-Torsional Adapter

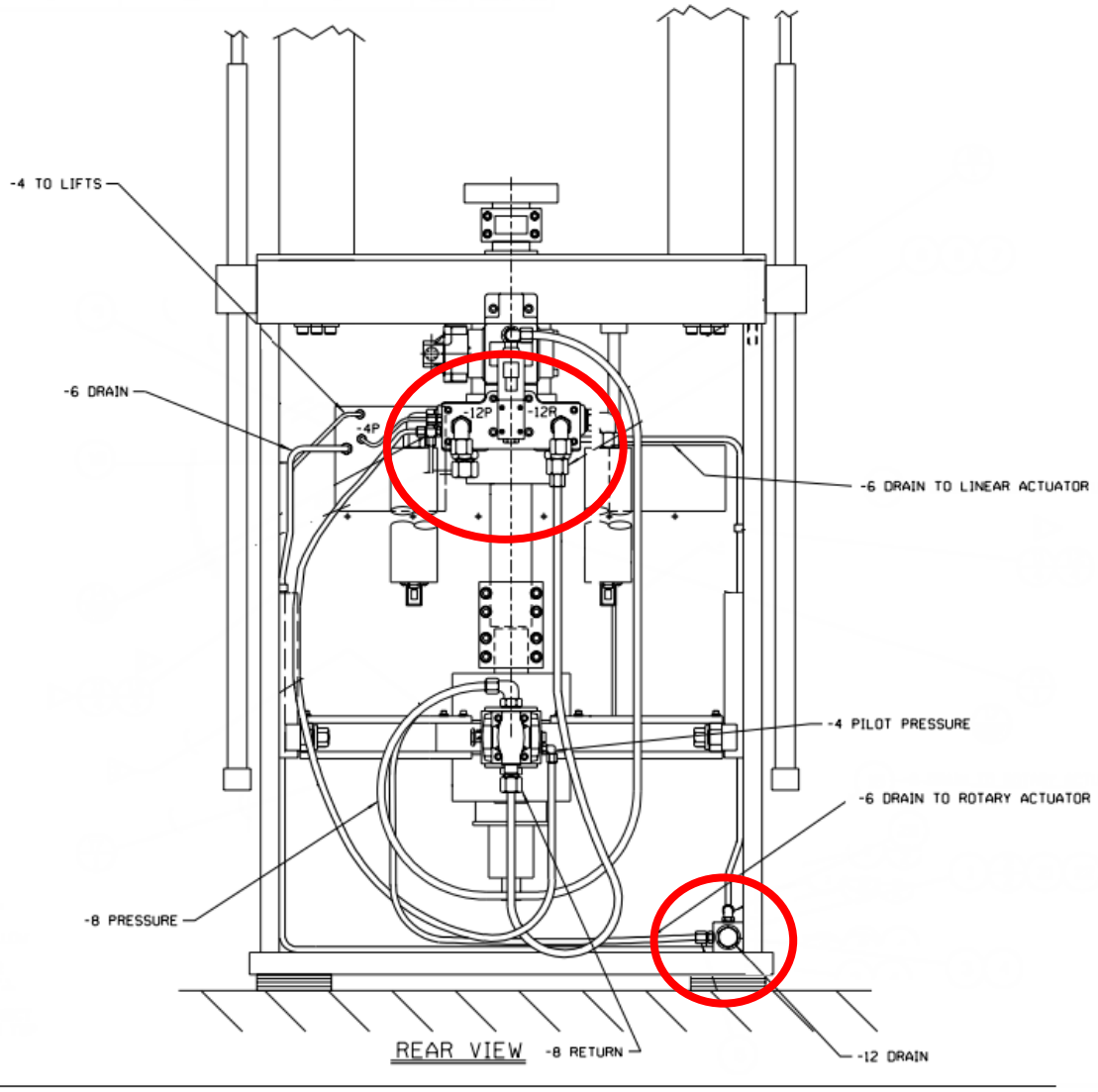
» Torque the bolts incrementally to the value shown on the coupling using the pattern shown on the image below.

- First torque to 10%
- Then torque to 50%
- Finally torque to 100%



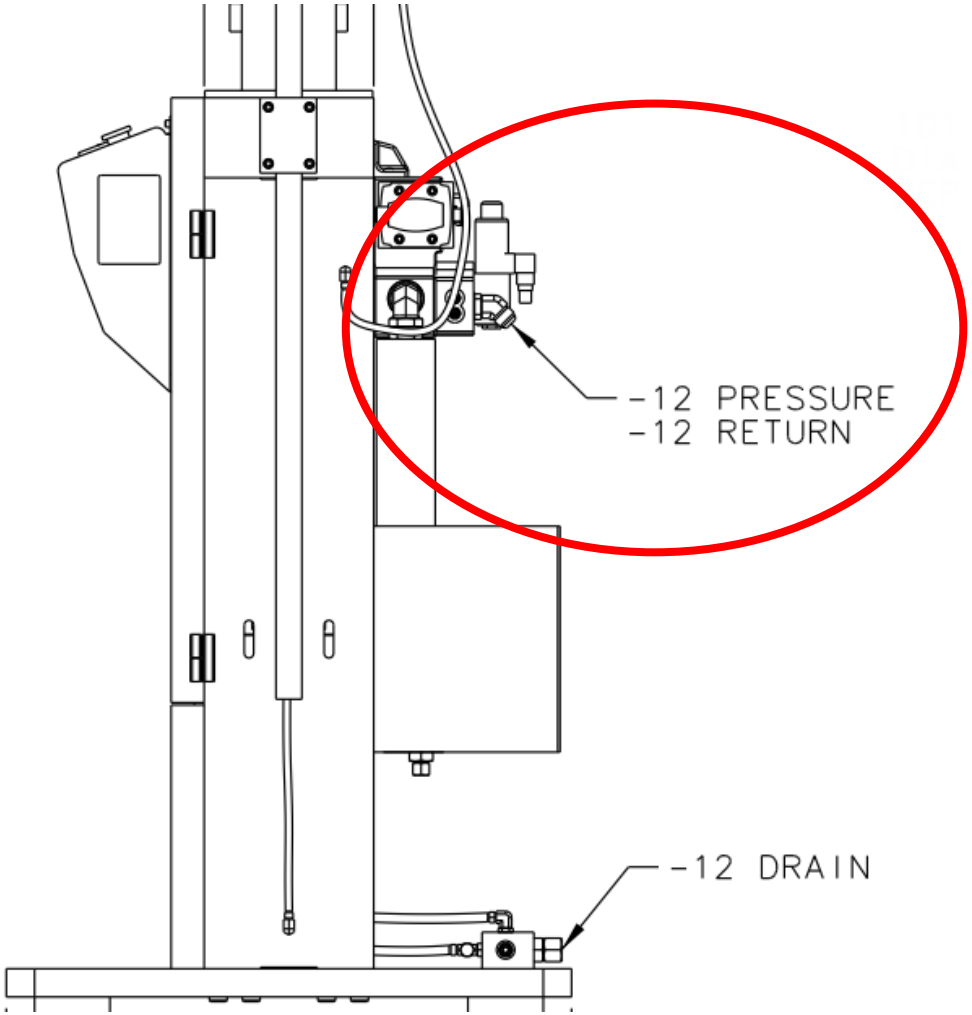
Hydraulic Connections

- The linear and rotary actuators are hydraulically connected in the load frame assembly.
- Only one set of hoses is required to connect the load frame to the HPU.



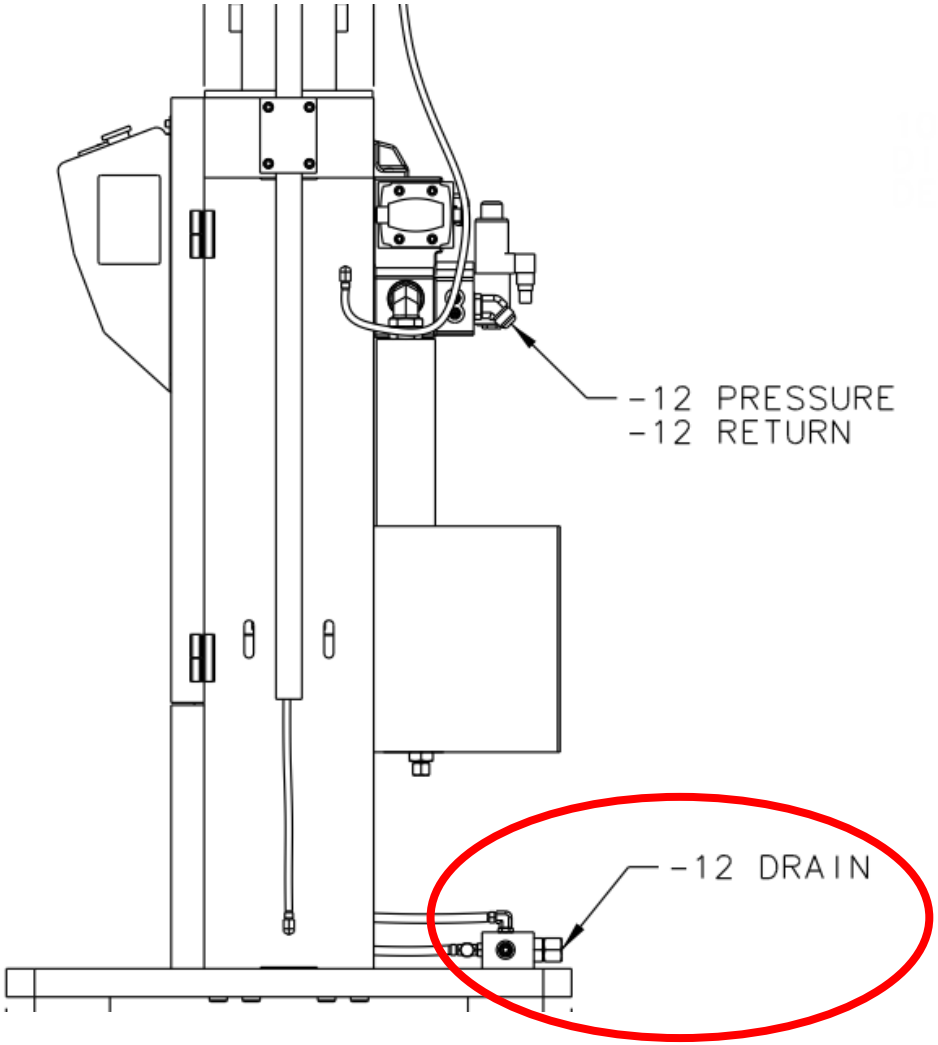
Hydraulic Connections

- The 298 manifold used has a port for controlled pressure to the rotary actuator. Both actuators are turned on simultaneously when the HSM is energized.
- Connect the pressure and return hoses from the HPU to the 298 manifold.



Hydraulic Connections

- The drain connections from the linear actuator and the rotary actuator are connected together and brought out to a manifold.
- One drain hose is required from the HPU to the load frame. This is larger than a typical drain hose to accommodate the flow from both actuators.



Maintenance Items

- The cam rollers should be lubricated every 50 hours of operation.
  - Use a lithium based grease containing 1% molybdenum disulfide
  - Mobilgrease Special meets these requirements

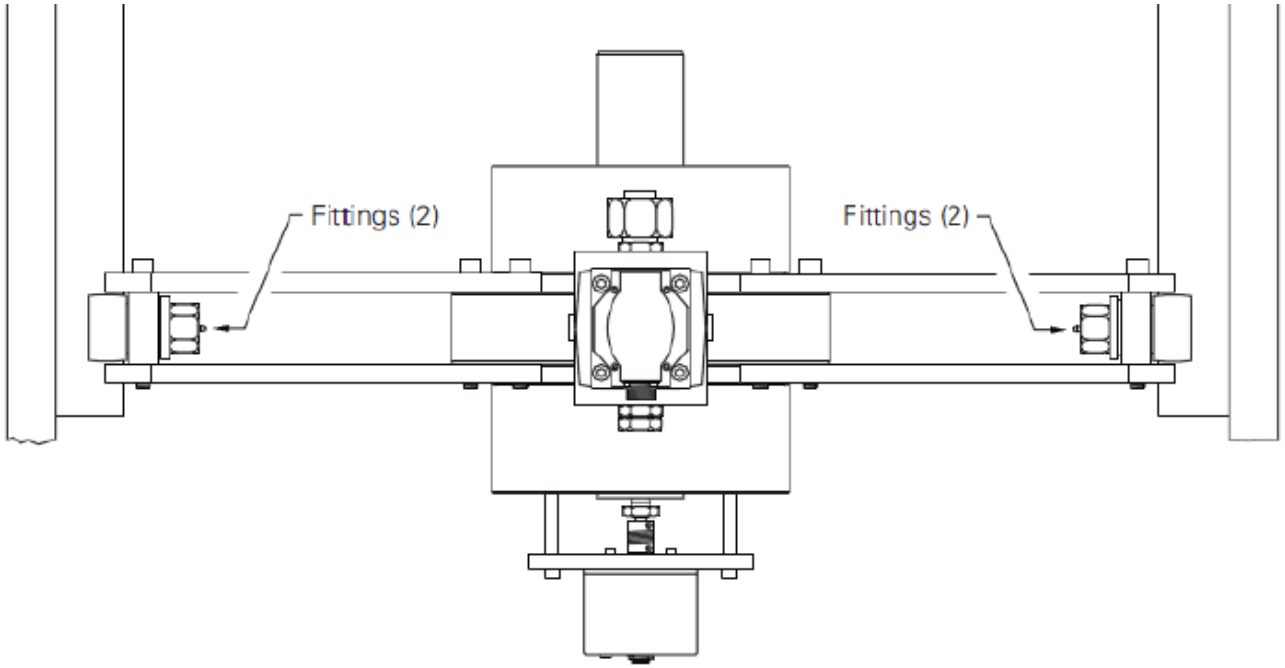
- The cam roller backlash should be checked and adjusted if necessary every time the cam rollers are lubricated.

Cam Roller Lubrication and Adjustment

- Be sure to follow appropriate safety measures.
- Move linear actuator to bottom of travel to prevent any further downward movement.
- Turn off hydraulic power.
- Ensure that actuator cannot drift downward any further before proceeding.

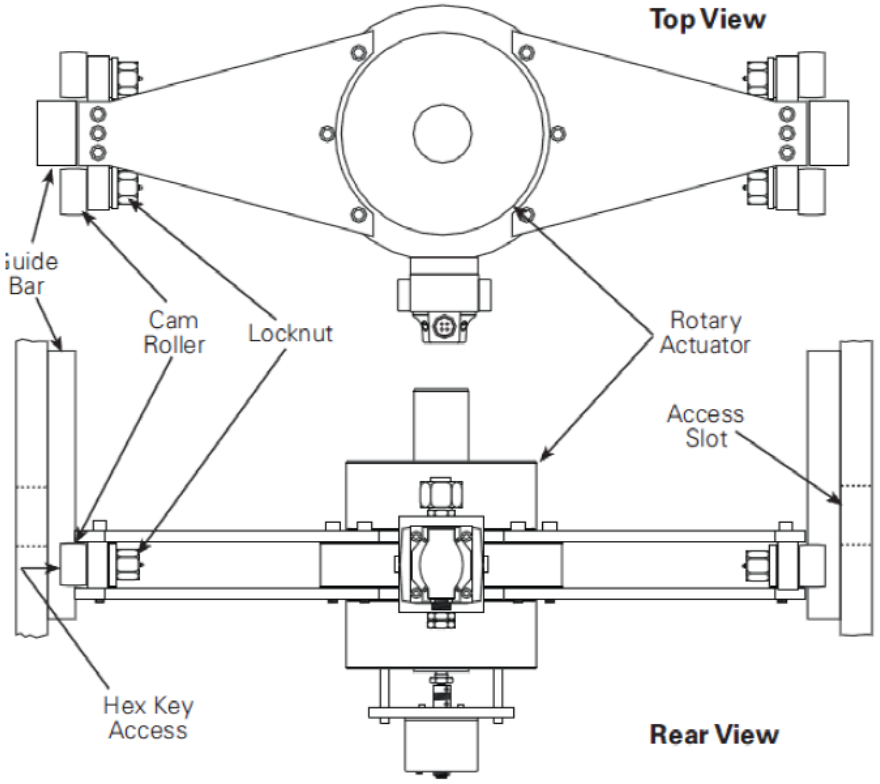
Cam Roller Lubrication

- Turn off hydraulic power with the linear actuator at the bottom of travel
- Locate the grease fittings on each side of the actuator
- Wipe off any grease present on the grease fittings
- Pump grease into each fitting until it comes out the rear of the roller
- Clean off any excess grease



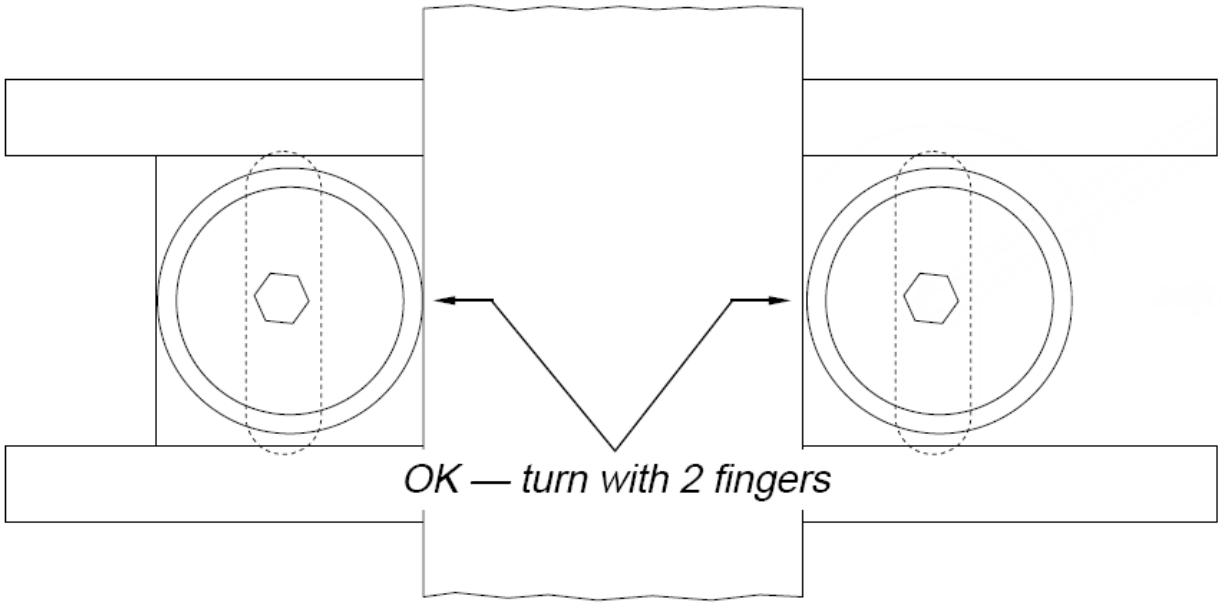
Cam Roller Backlash Check

- Check each of the cam rollers for the proper backlash.
- Turn off hydraulic power with the linear actuator at the bottom of travel. Ensure actuator cannot drift down beyond its current position.



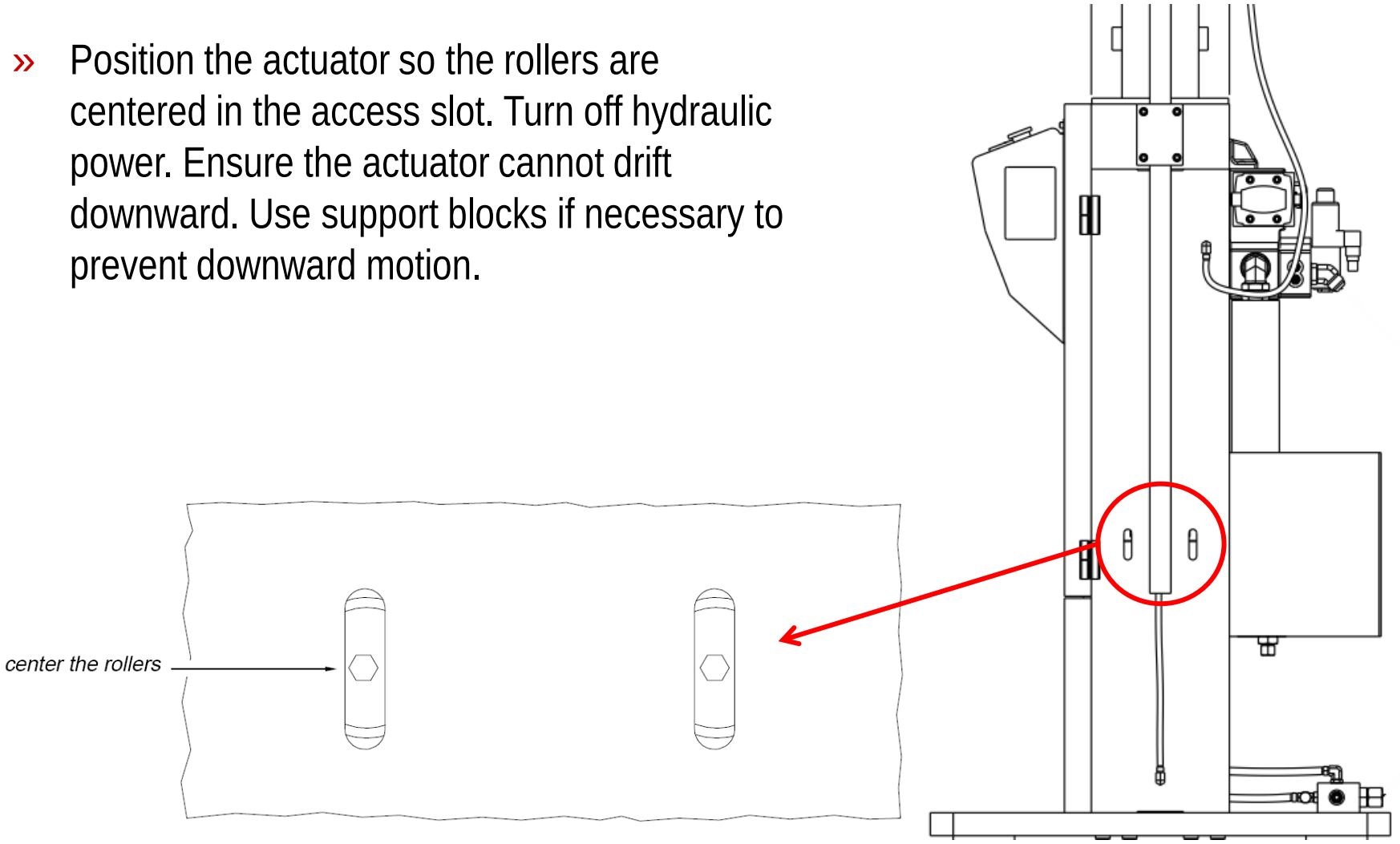
Cam Roller Backlash Check

» Grasp each roller one at a time with your thumb and forefinger.
  - If you can turn the roller using your thumb and forefinger the backlash is correct.
  - If you can turn any roller using just 1 finger there is to much backlash.
  - If you cannot turn any roller using your thumb and forefinger there is not enough backlash.



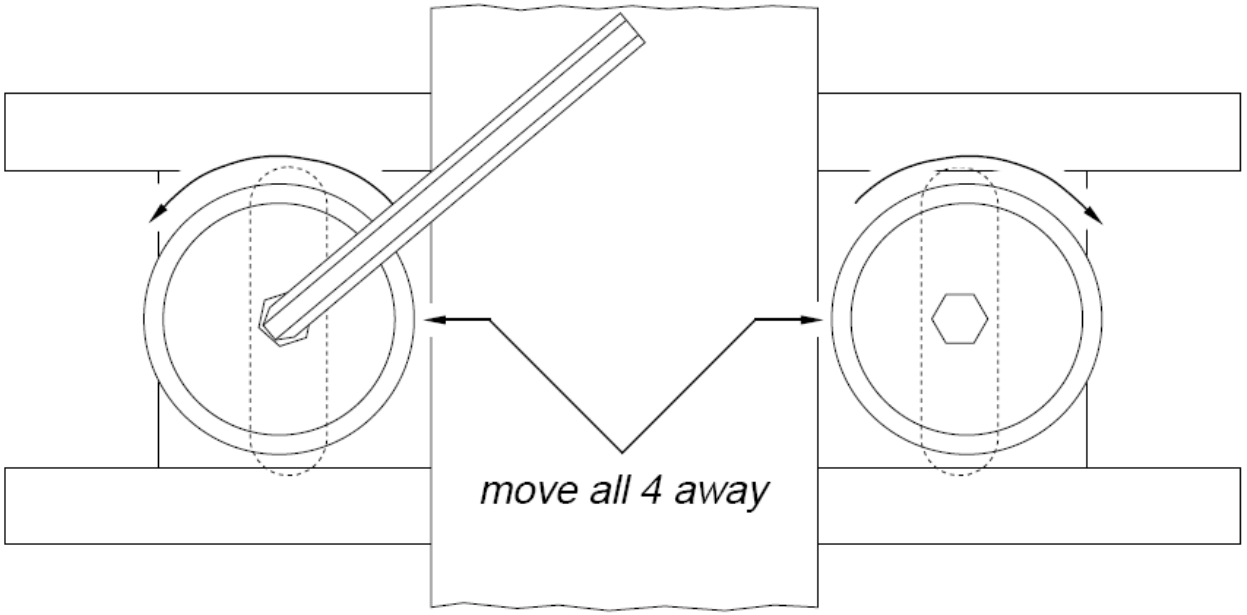
Cam Roller Backlash Adjustment

- Position the actuator so the rollers are centered in the access slot. Turn off hydraulic power. Ensure the actuator cannot drift downward. Use support blocks if necessary to prevent downward motion.



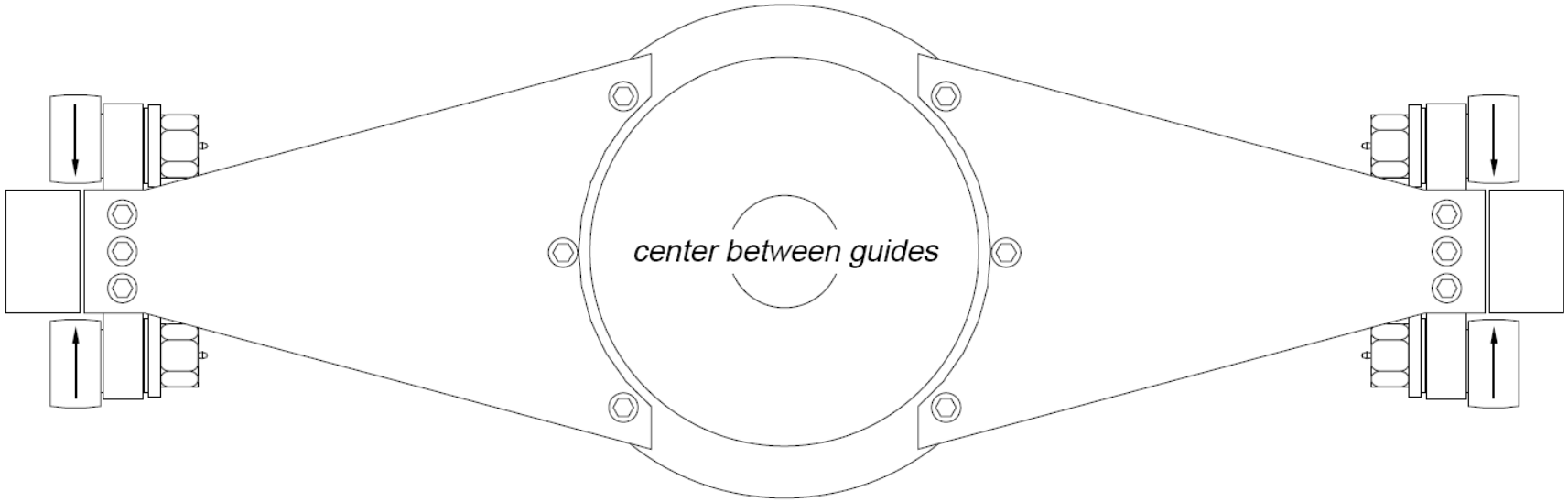
Cam Roller Backlash Adjustment

- Loosen the lock nut on all cam rollers.
- Use a hex key and turn each roller as far away as possible form guide bar.



Cam Roller Backlash Adjustment

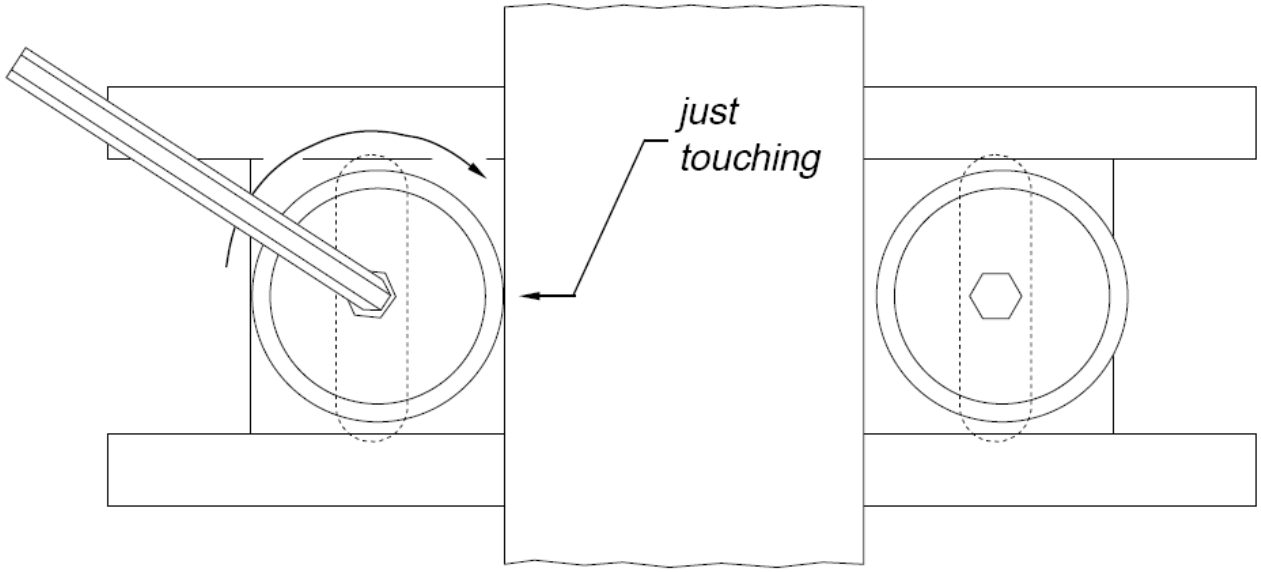
» Center the rotary actuator so there is equal distance between all cam rollers and the guide rail.



Cam Roller Backlash Adjustment

» Adjust one of the rollers until it is just touching the guide rail. Torque the lock nut on the roller which was adjusted to the proper torque.

Model	Locknut Torque
319.02	145 N·m (105 lbf·ft)
319.05	145 N·m (105 lbf·ft)
319.10	145 N·m (105 lbf·ft)
319.25	260 N·m (190 lbf·ft)
319.50	405 N·m (300 lbf·ft)
319.60	405 N·m (300 lbf·ft)



Cam Roller Backlash Adjustment

- Adjust the roller on the other side of the guide bar until it just touches the guide bar. Continue adjusting the roller to increase friction on the roller until it takes both your thumb and forefinger to turn both this roller and the roller previously adjusted.
  - If you can turn the roller with your forefinger only the roller is too loose
  - If you cannot turn the roller with your thumb and forefinger the roller is to tight.

- Torque the lock nut to the proper value of the roller just adjusted.

- Repeat these steps for the remaining 2 rollers.