



Cylinder Repair & Maintenance Instructions

Model HP

NFPA High Pressure Hydraulic Cylinder



- 5,000 PSI Rated - 3,000 PSI Working Pressure
- 1 1/2" to 20" Bore Sizes
- Teflon Backup Seals at all Pressure Points
- Designed for Destructive Applications

800-526-7968

27650 Groesbeck Highway • Roseville, MI 48066

Local: 586-775-7211 • Fax: 586-775-4545 • www.peninsularcylinders.com • sales@peninsularcylinders.com



Cylinder Maintenance and Repair Instructions

Model HP High Pressure Hydraulic Cylinders

Please refer to the Cylinder Parts List drawing and related charts when performing maintenance on a cylinder.

NOTE: FOR YOUR SAFETY, BE CERTAIN THAT CYLINDER IS FULLY DE-PRESSURIZED AND DRAINED OF FLUID PRIOR TO PERFORMING ANY MAINTENANCE OPERATION DESCRIBED BELOW...

ROD CARTRIDGE SEALS

To replace the Rod Cartridge Seals:

1. Remove the Rod Bearing Cartridge Retainer Plate Screws (items 36). Normally, the Tie Rod Nuts (items 17) DO NOT have to be loosened to replace the Rod Bearing Cartridge Seals which consist of the Rod Wiper Seal (item 3), the Rod Seal (item 35), the Rod Bearing Cartridge O-Ring Seal (item 6) and the Rod Bearing Cartridge O-Ring Backup Seal (item 5) unless the cylinder is supplied with a "Tie Rod Retained Cartridge".
2. Remove the Rod Bearing Cartridge Retainer Plate (item 4).
3. Remove the Rod Bearing Cartridge (item 2) from the Front End Cap (item 7) by pulling it straight out while twisting slightly.
4. Remove the Rod Wiper Seal (item 3), Rod Seal Retainer (item 34), the Rod Seal (item 35), the Rod Bearing Cartridge O-Ring Seal (item 6) and the Rod Bearing Cartridge O-Ring Backup Seal (item 5). It is very important to note the location and orientation of all of these seals in the seal grooves. The new seals must be placed in the exact same grooves and be oriented the exact same way during replacement.
5. Clean the Rod Bearing Cartridge (item 2) and inspect it for excessive wear or scoring. Replace the Rod Bearing Cartridge if necessary.
6. Install a new Rod Wiper Seal (item 3), new Rod Seal (item 35), new Rod Bearing Cartridge O-Ring Seal (item 6) and new Rod Bearing Cartridge O-Ring Backup Seal (item 5). Coat the I.D. of the Rod Bearing Cartridge (item 2) with Acrolube™ grease or system hydraulic fluid.
7. Check the Piston Rod end (item 1) for burrs in the rod thread areas and on the wrench flats. Remove and polish sharp edges as required.
8. Install the reassembled Rod Bearing Cartridge Assembly over the Piston Rod end (item 1) with a slight twisting motion. Push the Rod Bearing Cartridge Assembly into the bored cavity machined into the Front End Cap (item 7).
9. Install the Rod Bearing Cartridge Retainer Plate (item 4) and torque the Rod Bearing Cartridge Retainer Plate Screws (items 36) to the values in our torque table on Page 7.

TUBE END SEALS

To replace the Tube End O-Ring Seals:

1. Remove the Tie Rod Nuts (items 17). It may be helpful to grip the Tie Rods (items 18) with Vise Grip Pliers to prevent the Tie Rods from twisting.
2. Remove the Front End Cap (item 7) and the Rear End Cap (item 20) from the cylinder.

(“TUBE END SEALS” section continued on the following page)

(“TUBE END SEALS” section continued from the previous page)

3. Remove the old End Cap to Sleeve O-Ring Seals (items 9) and old End Cap to Sleeve O-Ring Backup Seals (items 8). It is especially important to note the position and orientation of these end cap to tube seals. Clean the Front and Rear End Cap seal grooves thoroughly.
4. Install new End Cap to Sleeve O-Ring Backup Seals (items 8) and new old End Cap to Sleeve O-Ring Seals (items 9) into the Front and Rear End Caps (items 7 & 20). A small amount of grease on the seals may be helpful to hold them in place during assembly. It is very important that the seals are fully seated in the seal grooves before proceeding.
5. Re-assemble the Front and Rear End Caps (items 7 & 20) to the Cylinder Sleeve (item 10) being careful not to pinch the O-Rings.
6. Hand tighten the Tie Rod Nuts (items 17) while making sure the Front and Rear End Caps (items 7 & 20) are square to the Cylinder Sleeve (item 10). Assembling the cylinder on a flat surface is helpful to assure proper alignment of the Front and Rear End Caps (items 7 & 20) to the Cylinder Sleeve (item 10).
7. Torque the Tie Rod Nuts (items 17) in the order and values shown in the torque chart on Page 7. Gripping the Tie Rods (items 18) with Vise Grip Pliers may be helpful to avoid twisting the Tie Rods during tightening.

PISTON SEALS

To replace the Piston Seals:

1. Remove the Tie Rod Nuts (items 17), the Tie Rods (items 18) and the Front and Rear End Caps (items 7 & 20) See instructions 1 & 2 under the "Tube End Seals" section above.
2. Pull the Piston and Piston Rod Assembly from the Cylinder Sleeve (item 10).
3. Remove the old Piston U-cup Seals (items 27) and old Piston U-Cup Backup Seals (items 26) from their grooves in the Piston (item 28) (which is the bottom area of the Piston on the illustration). Again, it is very important to note the location and orientation of these four seals in the two piston seal grooves. The new seals must be placed in the exact same grooves and be oriented the exact same way during replacement. Use a brass or plastic tool (avoid any tools which might damage the seal groove surfaces). In the event optional Cast Iron Piston Rings (items 15) are used, remove them from their four grooves in the Piston (item 14) (which is the top area of the Piston on the illustration).
4. Clean the Piston and Cylinder Sleeve (item 10) with suitable solvent. Blow dry with compressed air. Inspect parts for wear or scoring and replace if necessary.
5. Install new (2) Piston U-cup Seals (items 27) and new (2) Piston U-Cup Backup Seals (items 26) into the two seal grooves on the piston. (Note: Lips on U-cup type seals must face system pressure in cylinder. See the parts list illustration for proper seal orientation). Lightly coat seals and tube I.D. with hydraulic system fluid. In the event optional Cast Iron Piston Rings (items 15) are used, install new (4) Cast Iron Piston Rings (items 15) into the four seal grooves on the Piston. Lightly coat seals and tube I.D. with hydraulic system fluid to ease installation.
6. Reinstall the Piston Rod Assembly into the Cylinder Sleeve (item 10) being careful to avoid damage to piston seals.
7. Reinstall the Front & Rear End Caps (items 7 and 20), Tie Rods (items 18) and Tie Rod Nuts (items 17). Tighten the Tie Rod Nuts following the instructions 5 thru 7 under "Tube End Seals".

CUSHION INSERT, CUSHION ADJUSTMENT SCREW & BALL CHECKS

To replace the Cushion Insert (item 19), the Cushion Adjustment Screw (item 23) and/or the Ball Check or Seals:

(The procedure described below applies to both the Cushion Adjustment Screw and the Ball Check hardware). The Cushion Adjustment Screw (or Ball Check) and its sealing O-ring Seals & Backup Seal may be replaced without dismantling the cylinder. (Make sure that the cylinder is not pressurized before attempting this procedure).

1. Remove the Lock Screw (item 24). Unscrew Cushion Adjustment Screw(s) and/or Ball Check Plug(s) (items 23 & 32) by turning counter clockwise.
2. For the Cushion Adjustment Screw - Inspect the Cushion Adjustment Screw tip (item 23), Cushion Adjustment Screw O-ring Seal (item 21) and Cushion Adjustment Screw O-ring Backup Seal (item 22). Replace any worn or damaged parts.
For the Ball Check System - Inspect the Ball Check Plug (item 32), Ball Check Steel Ball (item 30), Ball Check O-ring Seal (item 33) and Ball Check O-ring Backup Seal (item 31). Replace any worn or damaged parts.
3. Install a new O-ring seal and O-ring Backup Seal on the Cushion Adjustment Screw and/or Ball Check Plug. Lubricate O-ring Seals(s) and Backup O-ring Seals(s) with system hydraulic fluid and reinstall components into the Front and/or Rear End Caps (items 7 and 20).
4. To replace the hydraulic Cushion Insert (item 19), the Rear End Cap (item 20) must be removed (See the instructions under the "Tube End Seals" section). Once the Rear End Cap is removed, the Cushion Insert (item 19) may be replaced by removing the Cushion Insert Retaining Ring (item 16) and pulling the Cushion Insert out of its insert bore. Clean out the Cushion Insert bore and install a new Cushion Insert (item 19) by simply pushing it into the bore. Re-install the Retaining Ring (item 16) and make sure it is properly seated into its groove.

PISTON

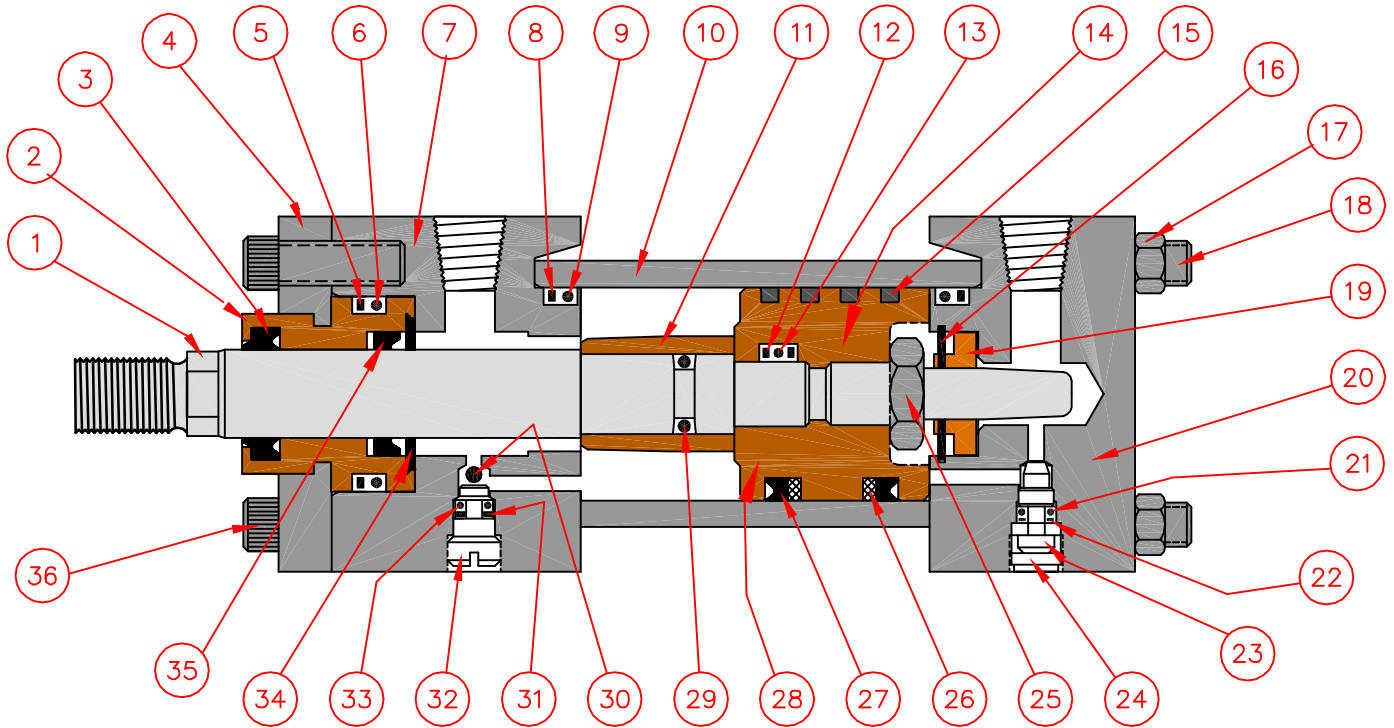
To remove Piston from Piston Rod:

1. The Piston Rod (item 1) and Piston (item 14 or 28) are assembled at the factory with a high strength locking sealant.
2. Remove the Piston Rod Assembly (referred to as the Piston Rod Assembly when the Piston is installed on the Piston Rod) from the cylinder (see instructions 1 through 3 under the "Piston Seals" section). Remove the Piston U-Cup Seals (items 27) and Piston U-Cup Backup Seals (items 26) from their grooves on the piston.
3. Heat the Piston Rod Assembly to 400 degrees - 450 degrees Fahrenheit.
4. Disassemble the Piston (item 14 or 28) from the Piston Rod (item 1) while hot. Remove the Piston Retaining Nut (item 25). Do not damage the surface of the rear cushion hub. Use a spanner wrench to remove the Piston from the Piston Rod (the Piston is machined with Slots and/or Spanner Wrench Holes).
5. Clean the Piston Rod threads (on the Piston area of the Piston Rod) with solvent and bristle brush. Blow dry with compressed air. Replace the Piston U-Cup Seals (items 27) and Piston U-Cup Backup Seals (items 26) into their grooves on the piston. Again, it is very important to note the location and orientation of these four seals in the two piston seal grooves. The new seals must be placed in the exact same grooves and must be oriented the exact same way during replacement.
6. Apply "Loctite" sealant #277 or equivalent to the threads of the Piston Rod. Assemble Piston to Piston Rod and torque to specifications (see torque chart on Page 6). Allow the sealant to cure for 30 minutes before operating the cylinder.

Model HP - NFPA - High Pressure Hydraulic Cylinder

Complete Cylinder Parts List

(Drawing is not to scale - Please use for informational purposes only)



- | | | | |
|-----------|--|-----------|--|
| 1 | Piston Rod | 19 | Cushion Insert (for Rear Cushion) |
| 2 | Rod Bearing Cartridge | 20 | Rear End Cap |
| 3 | Rod Wiper Seal | 21 | Cushion Adjustment Screw O-Ring Seals |
| 4 | Rod Bearing Cartridge Retainer Plate | 22 | Cushion Adjustment Screw O-Ring Backup Seals |
| 5 | Rod Bearing Cartridge O-Ring Backup Seal | 23 | Cushion Adjustment Screws |
| 6 | Rod Bearing Cartridge O-Ring Seal | 24 | Lock Screw (for Cushion Adjustment Screw) |
| 7 | Front End Cap | 25 | Piston Retaining Nut |
| 8 | End Cap to Sleeve O-Ring Backup Seals | 26 | Piston U-Cup Backup Seals (Standard) |
| 9 | End Cap to Sleeve O-Ring Seals | 27 | Piston U-Cup Seals (Standard) |
| 10 | Cylinder Sleeve | 28 | STANDARD SOFT PISTON SEALING
(shown on the bottom side of the Piston Schematic) |
| 11 | Cushion Bushing (for Front Cushion) | 29 | Cushion Bushing O-ring Seal |
| 12 | Piston O-ring Backup Seals | 30 | Ball Check Steel Balls |
| 13 | Piston O-ring Seal | 31 | Ball Check O-ring Backup Seals |
| 14 | OPTIONAL METAL PISTON SEALING
(shown on the top side of the Piston Schematic) | 32 | Ball Check Plugs |
| 15 | Cast Iron Piston Ring Seals | 33 | Ball Check O-ring Seals |
| 16 | Cushion Insert Retaining Ring | 34 | Rod Seal Retainer |
| 17 | Tie Rod Nuts | 35 | Rod Seal |
| 18 | Tie Rods | 36 | Rod Bearing Cartridge Retainer Plate Screws |

HP Series Hydraulic Cylinders

Seal & Repair Kit Part Numbers Standard Seals & Viton Seals

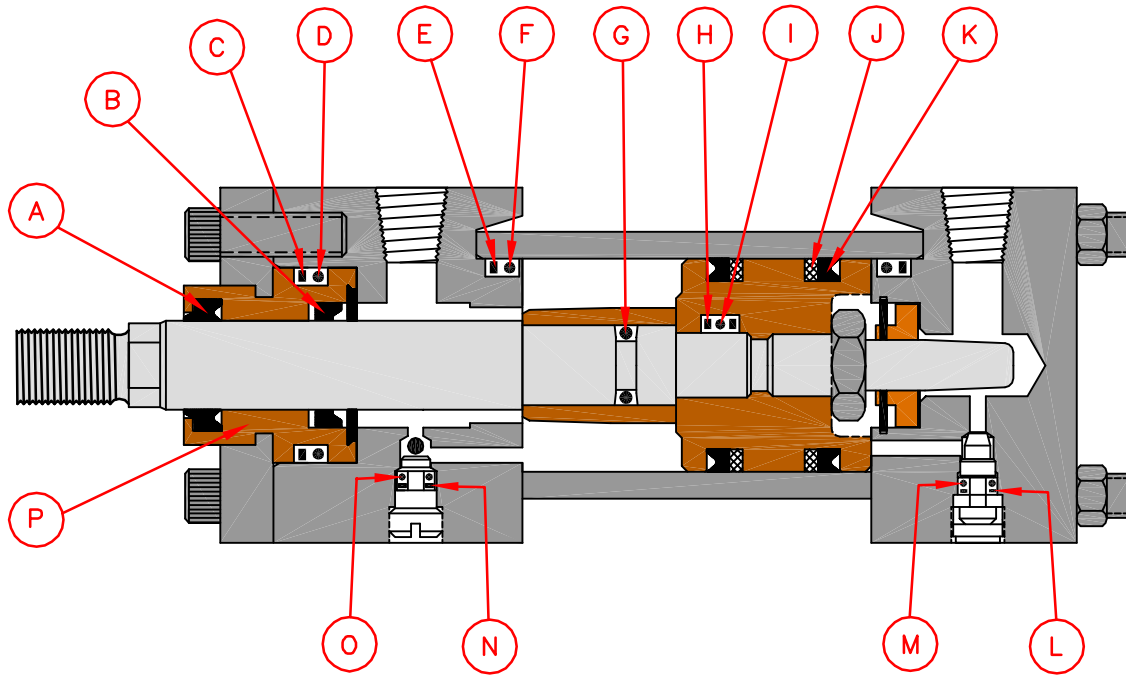
(See Page 6 for an Illustration and Listing
of each Seal and Repair Kit)

Bore Size	Rod Diameter	Complete Cylinder Seal Kits		Complete Cylinder Repair Kits		Rod Bearing Cartridge Repair Kits	
		Standard Part #	Viton Part #	Standard Part #	Viton Part #	Standard Part #	Viton Part #
1.50	A = .62	SKHP1506	SKHP1506V	RKHP1506	RKHP1506V	CKHP1506	CKHP1506V
	B = 1.00	SKHP1510	SKHP1510V	RKHP1510	RKHP1510V	CKHP1510	CKHP1510V
2.00	A = 1.00	SKHP2010	SKHP2010V	RKHP2010	RKHP2010V	CKHP2010	CKHP2010V
	B = 1.38	SKHP2013	SKHP2013V	RKHP2013	RKHP2013V	CKHP2013	CKHP2013V
2.50	A = 1.00	SKHP2510	SKHP2510V	RKHP2510	RKHP2510V	CKHP2510	CKHP2510V
	B = 1.38	SKHP2513	SKHP2513V	RKHP2513	RKHP2513V	CKHP2513	CKHP2513V
	C = 1.75	SKHP2517	SKHP2517V	RKHP2517	RKHP2517V	CKHP2517	CKHP2517V
3.25	A = 1.38	SKHP3213	SKHP3213V	RKHP3213	RKHP3213V	CKHP3213	CKHP3213V
	B = 1.75	SKHP3217	SKHP3217V	RKHP3217	RKHP3217V	CKHP3217	CKHP3217V
	C = 2.00	SKHP3220	SKHP3220V	RKHP3220	RKHP3220V	CKHP3220	CKHP3220V
4.00	A = 1.75	SKHP4017	SKHP4017V	RKHP4017	RKHP4017V	CKHP4017	CKHP4017V
	B = 2.00	SKHP4020	SKHP4020V	RKHP4020	RKHP4020V	CKHP4020	CKHP4020V
	C = 2.50	SKHP4025	SKHP4025V	RKHP4025	RKHP4025V	CKHP4025	CKHP4025V
5.00	A = 2.00	SKHP5020	SKHP5020V	RKHP5020	RKHP5020V	CKHP5020	CKHP5020V
	B = 2.50	SKHP5025	SKHP5025V	RKHP5025	RKHP5025V	CKHP5025	CKHP5025V
	C = 3.00	SKHP5030	SKHP5030V	RKHP5030	RKHP5030V	CKHP5030	CKHP5030V
	D = 3.50	SKHP5035	SKHP5035V	RKHP5035	RKHP5035V	CKHP5035	CKHP5035V
6.00	A = 2.50	SKHP6025	SKHP6025V	RKHP6025	RKHP6025V	CKHP5606	CKHP5606V
	B = 3.00	SKHP6030	SKHP6030V	RKHP6030	RKHP6030V	CKHP5610	CKHP5610V
	C = 3.50	SKHP6035	SKHP6035V	RKHP6035	RKHP6035V	CKHP5607	CKHP5607V
	D = 4.00	SKHP6040	SKHP6040V	RKHP6040	RKHP6040V	CKHP5608	CKHP5608V
8.00	A = 3.50	SKHP8035	SKHP8035V	RKHP8035	RKHP8035V	CKHP5607	CKHP5607V
	B = 4.00	SKHP8040	SKHP8040V	RKHP8040	RKHP8040V	CKHP5608	CKHP5608V
	D = 4.50	SKHP8045	SKHP8045V	RKHP8045	RKHP8045V	CKHP5611	CKHP5611V
	E = 5.00	SKHP8050	SKHP8050V	RKHP8050	RKHP8050V	CKHP5612	CKHP5612V
	C = 5.50	SKHP8055	SKHP8055V	RKHP8055	RKHP8055V	CKHP5609	CKHP5609V
10.00	D = 4.50	SKHP10045	SKHP10045V	RKHP10045	RKHP10045V	CKHP5613	CKHP5613V
	E = 5.00	SKHP10050	SKHP10050V	RKHP10050	RKHP10050V	CKHP5617	CKHP5617V
	B = 5.50	SKHP10055	SKHP10055V	RKHP10055	RKHP10055V	CKHP5618	CKHP5618V
	C = 7.00	SKHP10070	SKHP10070V	RKHP10070	RKHP10070V	CKHP5615	CKHP5615V
12.00	A = 5.50	SKHP12055	SKHP12055V	RKHP12055	RKHP12055V	CKHP5618	CKHP5618V
	C = 7.00	SKHP12070	SKHP12070V	RKHP12070	RKHP12070V	CKHP5615	CKHP5615V
	D = 8.00	SKHP12080	SKHP12080V	RKHP12080	RKHP12080V	CKHP5616	CKHP5616V

Model HP - NFPA - High Pressure Hydraulic Cylinder

Complete Seal and Repair Kits

(Drawing is not to scale - Please use for informational purposes only)



Complete Cylinder Seal Kit includes:

- A** (1) Rod Wiper Seal
- B** (1) Rod Seal
- C** (1) Rod Bearing Cartridge Backup Seal
- D** (1) Rod Bearing Cartridge O-Ring Seal
- E** (2) End Cap to Sleeve Backup Seals
- F** (2) End Cap to Sleeve O-Ring Seals
- G** (1) Cushion Bushing O-ring Seal
- H** (2) Piston O-ring Backup Seals
- I** (1) Piston O-ring Seal
- J** (2) Piston U-Cup Backup Seals
- K** (2) Piston U-Cup Seals
- L** (2) Cushion Adjustment Screw Backup Seals
- M** (2) Cushion Adjustment Screw O-Ring Seals
- N** (2) Ball Check Backup Seals
- O** (2) Ball Check O-ring Seals

Complete Cylinder Repair Kit includes:

Includes all of the seals in the Complete Cylinder Seal Kit plus:

- P** (1) Rod Bearing Cartridge

Complete Rod Bearing Cartridge Kit includes:

- A** (1) Rod Wiper Seal
- B** (1) Rod Seal
- C** (1) Rod Bearing Cartridge Backup Seal
- D** (1) Rod Bearing Cartridge O-Ring Seal
- P** (1) Rod Bearing Cartridge

PENINSULAR CYLINDER CO.

HP SERIES HYDRAULIC CYLINDER FASTENER TORQUE CHART

TABLE 1

Torque Values Shown For Up To And Including 3,000 P.S.I. Above Consult Factory

TIE ROD & SOCKET HEAD CAP SCREW TORQUE VALUES	
THREAD SIZE	TORQUE (FT. LBS.)
10-32	2.5
1/4-28	6.5
5/16-24	12
3/8-24	22
7/16-20	35
1/2-20	55
5/8-18	110
3/4-16	185
7/8-14	300
1-14 UNS	450
1 1/8-12	600
1 1/4-12	780

FASTENER TORQUE INSTRUCTIONS:

Tighten tie rod nuts & retainer nuts in pattern shown at the right and to torque values in Table 1.

Use MoS2 grease or equivalent on both the threads and bearing surface.

Should lubricant not be available, torque values should be increased by 50%.

TIE ROD TORQUE PATTERN

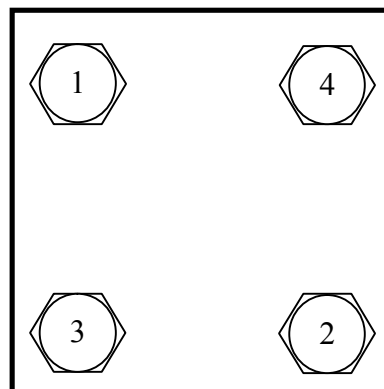


FIGURE 1

27650 GROESBECK HWY. ROSEVILLE, MI. 48066-2759

Phone 586-775-7211 FAX 586-775-4545

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