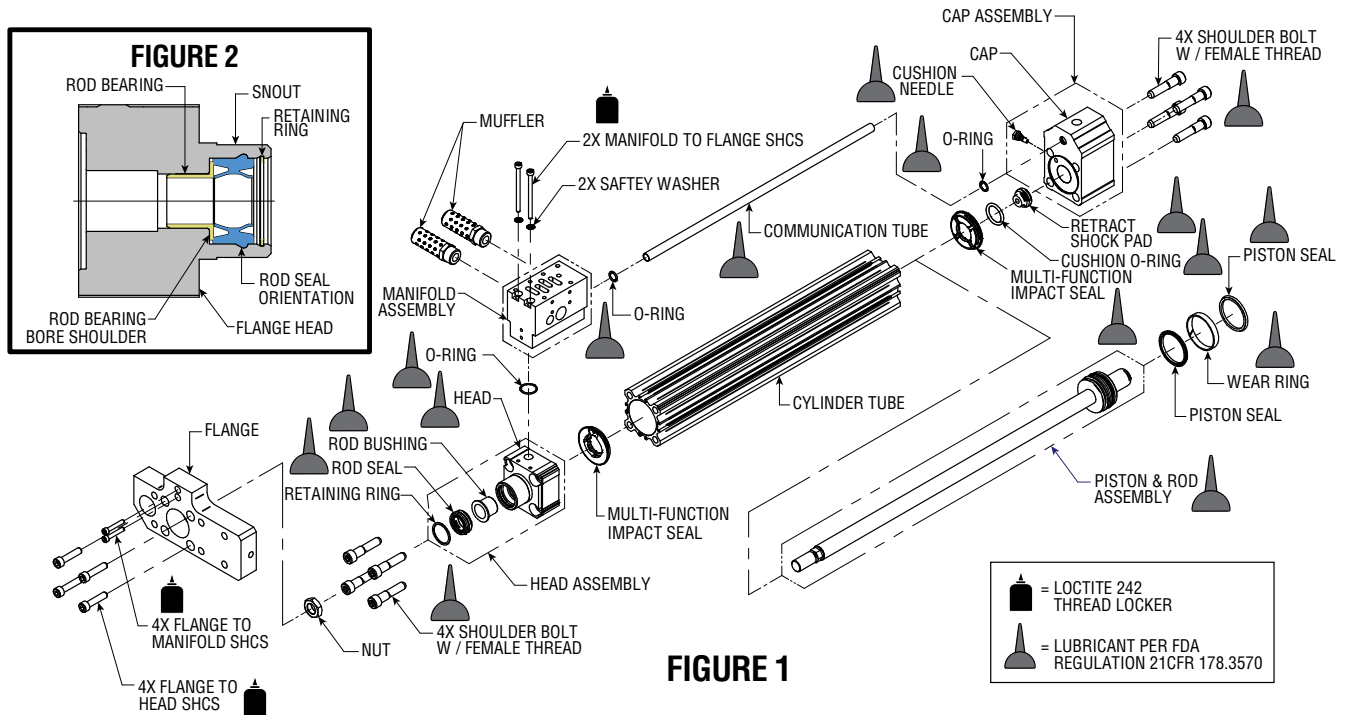


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DISASSEMBLY OF THE CYLINDER

- WARNING:** All air pressure in the unit must be exhausted prior to disassembly of nozzle cylinder.
- Remove valve from manifold (valve not shown).
- Remove mufflers, fittings and orifice disk from manifold if necessary.
- Remove manifold from manifold mounting plate.
- Remove flange, rod eye, and jam nut.
- Remove polyurethane tubes.
- Remove fittings from head and cap.
- Remove fasteners retaining head and cap.
- Remove head and cap.
- Slide piston rod assembly from cylinder tube.
- Remove all seals, noting orientation (especially note orientation of rod seal). Exercise caution to prevent scratching of the sealing surfaces. See FIGURE 2.
- Clean and inspect all components. Excessively worn or damaged components should be replaced.

REBUILD / REASSEMBLY

- PHD recommends using Loctite[®] 242 thread locker on all threaded fasteners.
- PHD recommends using lubrication per FDA Regulation 21CFR 178.3570 on metal-to-metal contact points.
- Be careful to prevent cutting or damaging seals during reassembly.
- Use lubricant per FDA Regulation 21CFR 178.3570 for lubrication of air cylinders during reassembly.
- Use FIGURE 1 for reference.

TOOLS NEEDED

- Hex wrenches: M4, M5, M6, and M8
- Pliers
- Small flat blade screwdriver
- Open end or adjustable wrench
- 22 mm diameter pin or socket (to press in rod bearing and rod seal)
- Arbor press
- 80-250 in-lb torque wrench with M4, M5, M6 and M8 hex attachments

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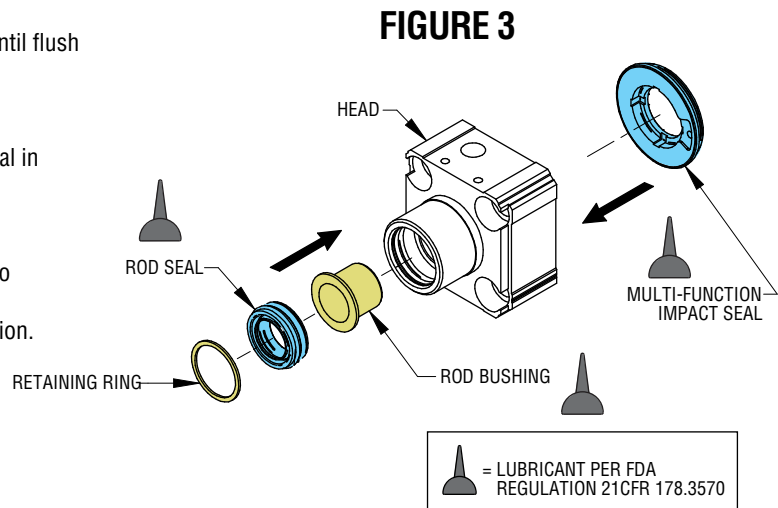
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HEAD ASSEMBLY

- A1) Press rod bearing into head, from end with snout, until flush as shown. **SEE FIGURE 2.**
- A2) Lubricate rod seal cavity and press in rod seal.
- A3) Install retaining ring.
- A3) Lightly lubricate and install multi-function impact seal in head. **SEE FIGURE 3.**

NOTE: No Alignment of the orifice hole in multi-function impact seal to the hole in the head is necessary. No cushion o-ring is present for cushioning.

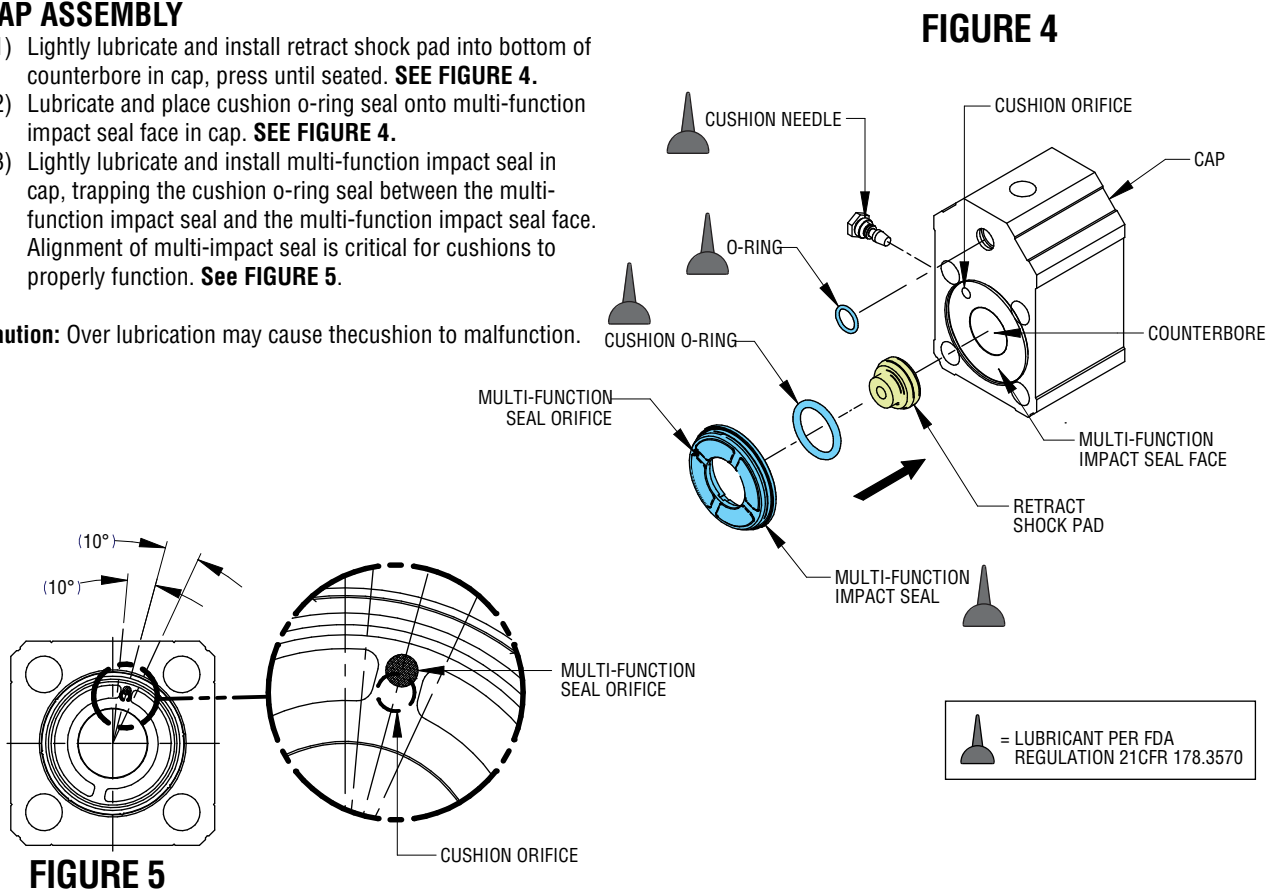
Caution: Over lubrication may cause cushion to malfunction.



CAP ASSEMBLY

- B1) Lightly lubricate and install retract shock pad into bottom of counterbore in cap, press until seated. **SEE FIGURE 4.**
- B2) Lubricate and place cushion o-ring seal onto multi-function impact seal face in cap. **SEE FIGURE 4.**
- B3) Lightly lubricate and install multi-function impact seal in cap, trapping the cushion o-ring seal between the multi-function impact seal and the multi-function impact seal face. Alignment of multi-impact seal is critical for cushions to properly function. **See FIGURE 5.**

Caution: Over lubrication may cause the cushion to malfunction.



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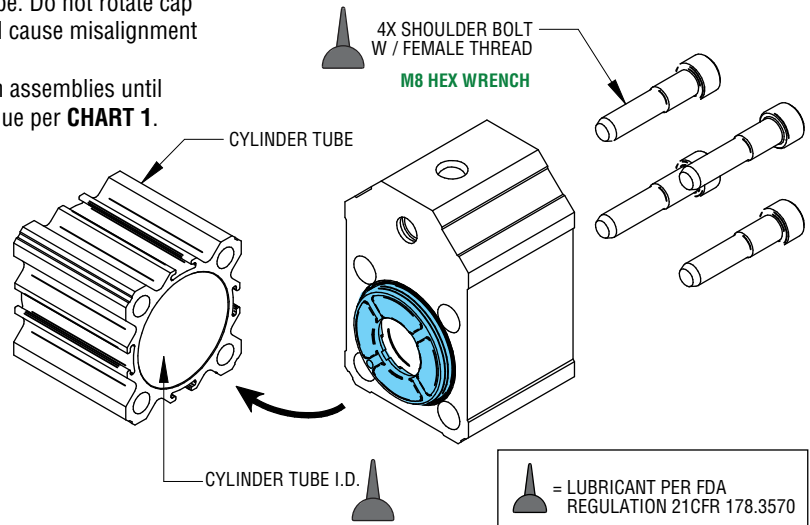
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CAP TO TUBE ASSEMBLY

- C1) Lubricate multi-function impact seal O.D. and I.D. of tube at cap end.
- C2) Align cap squarely with tube and press cap onto tube. Do not rotate cap with respect to tube during this process. This could cause misalignment of orifices in impact seal and cap.
- C3) Insert custom shoulder bolts through head. Tighten assemblies until they bottom out on counterbores in head, then torque per **CHART 1**.

TORQUE CHART 1

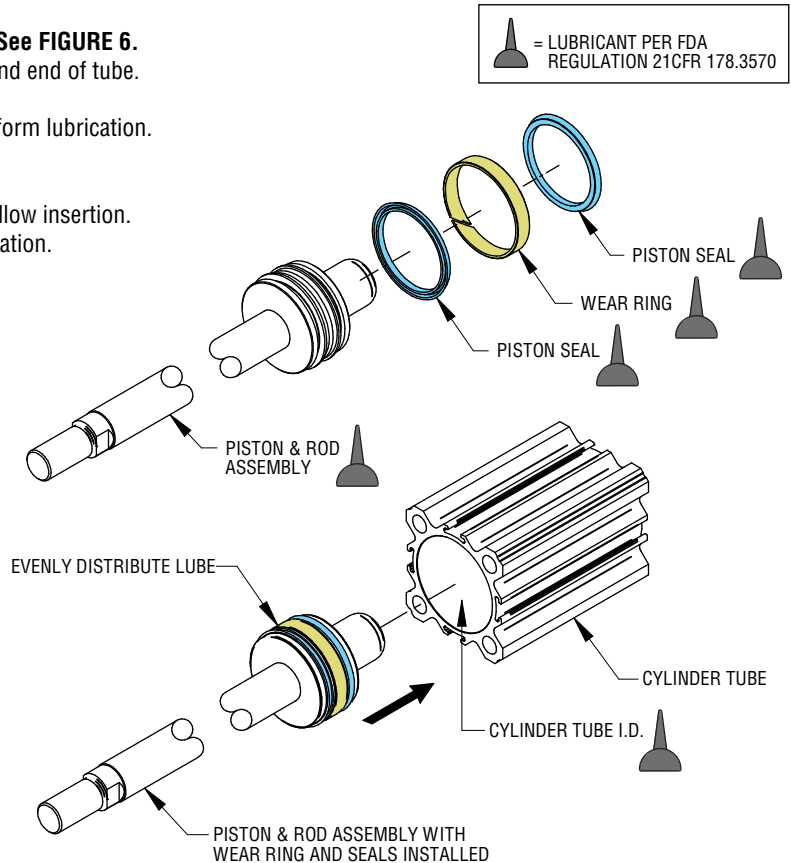
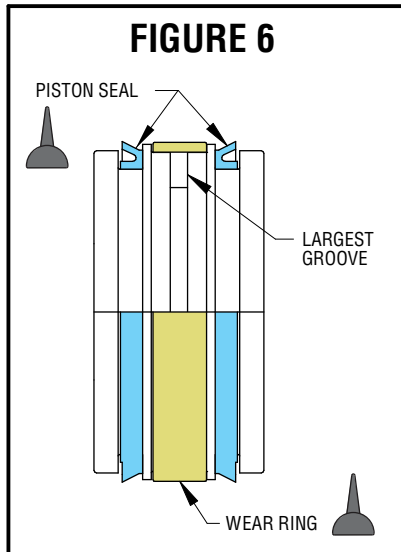
PART DESCRIPTION	TORQUE	
	in-lb	Nm
Shoulder Bolt w/Female Thread	250	[28.2]



PISTON ROD ASSEMBLY AND INSTALLATION INTO TUBE

- D1) Lightly lubricate seals and tube, install onto piston.
See FIGURE 6 for proper seal orientation.
- D2) Lubricate piston grooves (filling the largest groove). **See FIGURE 6.**
- D3) Apply light coat of lubrication to cylinder bore at extend end of tube.
- D4) Lubricate wear ring and wrap around piston.
- D5) Re-lubricate piston seals and wear ring to assure uniform lubrication.
- D6) Insert piston and rod assembly into cylinder bore.

NOTE: Tool may be required to compress lips of seals to allow insertion. Be careful to prevent damage to seals during installation.



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HEAD ASSEMBLY TO TUBE

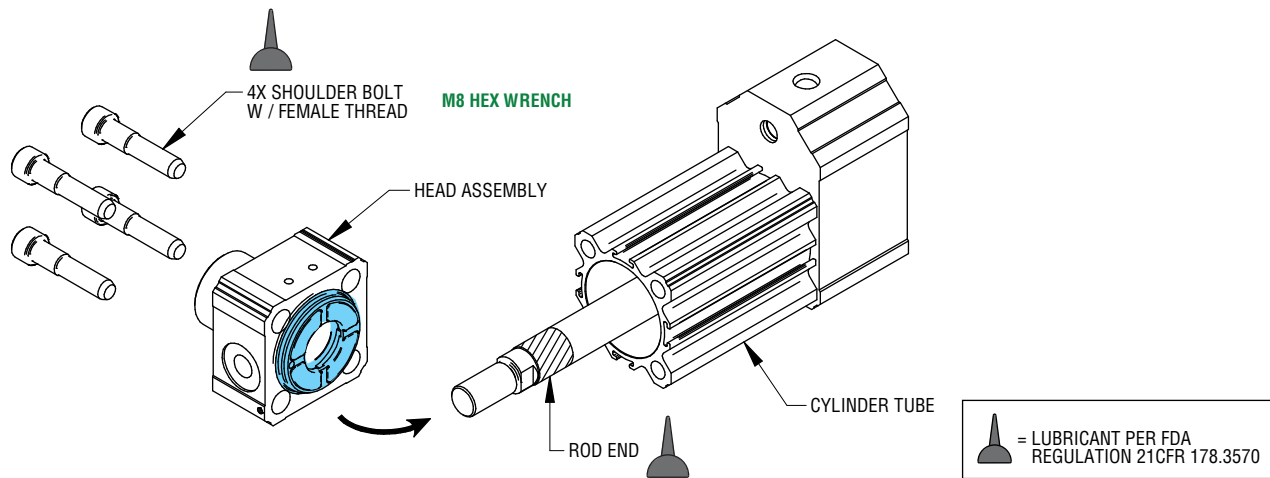
- E1) Lubricate rod end.
 E2) Insert head onto rod, rotating head slightly to help rod through rod bearing and rod seal.

NOTE: Multi-function impact seal orientation with respect to head is not critical during this process.

- E3) Align head squarely with tube and press head onto tube.
 E4) Loosely thread custom shoulder bolts into head. Tighten assemblies until they bottom out on counterbores in head, then torque per **CHART 1**

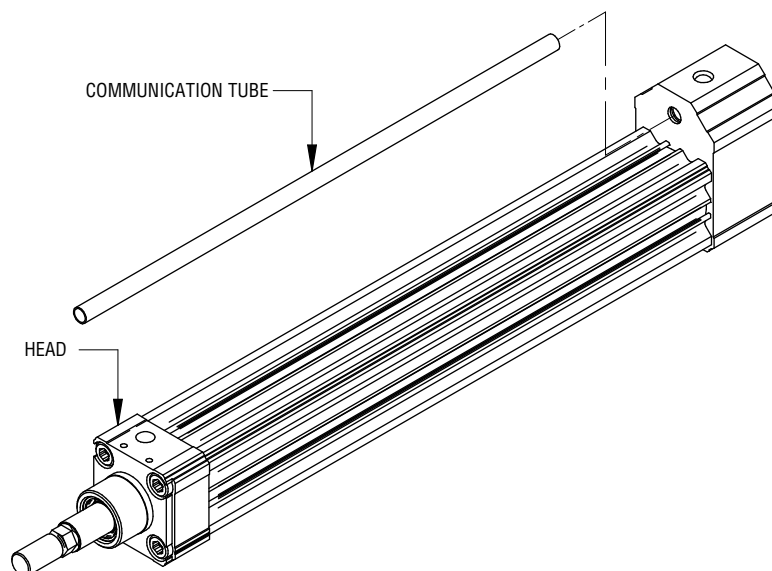
TORQUE CHART 1

PART DESCRIPTION	TORQUE	
	in-lb	Nm
Shoulder Bolt w/Female Thread	250	[28.2]
Piston to Rod	325	[36.7]



COMMUNICATION TUBE TO CAP

- H1) Install communication tube into cap with a slight twisting motion.



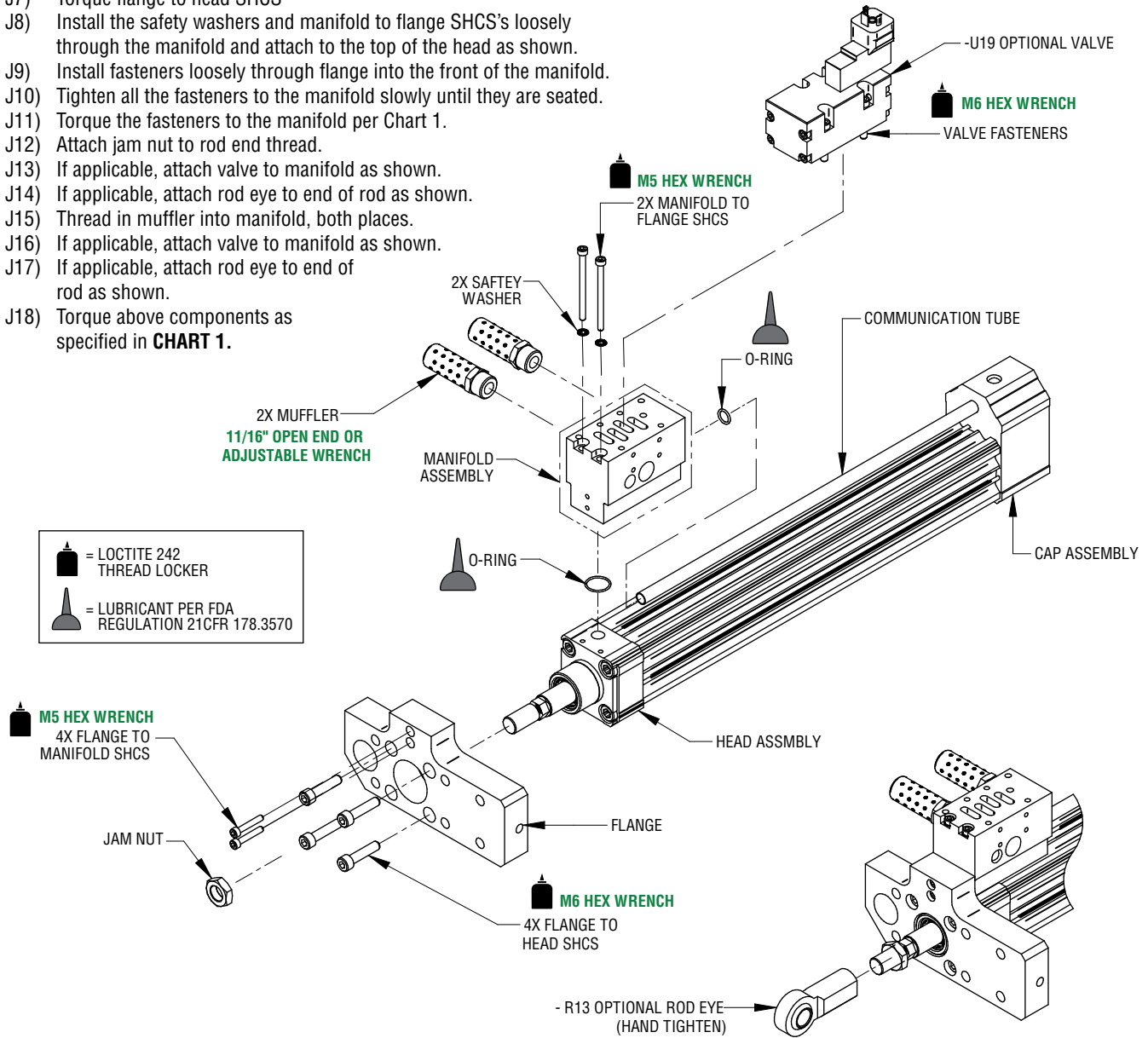
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FINAL ASSEMBLY AND OPTIONAL ASSEMBLY

- J1) Install o-ring into the groove in the back of manifold assembly.
- J2) Install o-ring into bottom counterbore of manifold as shown.
- J3) Carefully slide manifold assembly onto communication tube.
- J4) Place flange onto head as shown.
- J5) Loosely install SHCS through flange into head.
- J6) Align flange edge to be perpendicular to cylinder.
- J7) Torque flange to head SHCS
- J8) Install the safety washers and manifold to flange SHCS's loosely through the manifold and attach to the top of the head as shown.
- J9) Install fasteners loosely through flange into the front of the manifold.
- J10) Tighten all the fasteners to the manifold slowly until they are seated.
- J11) Torque the fasteners to the manifold per Chart 1.
- J12) Attach jam nut to rod end thread.
- J13) If applicable, attach valve to manifold as shown.
- J14) If applicable, attach rod eye to end of rod as shown.
- J15) Thread in muffler into manifold, both places.
- J16) If applicable, attach valve to manifold as shown.
- J17) If applicable, attach rod eye to end of rod as shown.
- J18) Torque above components as specified in **CHART 1**.



 = LOCTITE 242
 THREAD LOCKER
 = LUBRICANT PER FDA
 REGULATION 21CFR 178.3570

 **M5 HEX WRENCH**
 4X FLANGE TO
 MANIFOLD SHCS




JAM NUT

 **M6 HEX WRENCH**
 4X FLANGE TO
 HEAD SHCS

- R13 OPTIONAL ROD EYE
(HAND TIGHTEN)

TORQUE CHART 1

PART DESCRIPTION	TORQUE	
	in-lb	Nm
Flange to Head SHCS	227	[25.6]
Flange to Manifold SHCS	227	[25.6]
Manifold to Head SHCS	90	[10.2]
Muffler	227	[25.6]
Valve Fastener (M6)	140	[15.8]

KIT DESCRIPTION	KIT NUMBER	COLOR CODE
Seal Kit	83435	
Repair Kit	84509	
Cushion Needle Kit	52493-03-1	

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-X27 OPTION ASSEMBLY

- K1) Lube and install o-ring into counterbore in inlet assembly.
 K2) Install bleed off and indicator into inlet assembly (SEE NOTE 1).
 K3) Using the 4 inlet to manifold SHCS, attach the inlet assembly to the manifold assembly.
 K4) Lube and attach the o-ring to the inlet cap.
 K5) Lube and install the check seal into the inlet assembly bore
NOTE: Make sure that the lips of the seal are pointing down.
 K6) Using the 4 cap to inlet SHCS, attach the cap to inlet assembly.
 K7) Attach the threaded adaptor fitting to the end of the inlet cap.
 K8) Install intermediate tee, reducer and compact elbow as shown.
 K9) Torque above components as specified in **CHART 1**.
NOTE: Hand tighten + 1/4 turn

TORQUE CHART 1

PART DESCRIPTION	TORQUE	
	in-lb	Nm
Cap to Inlet SHCS	125	[14.1]
Inlet to Manifold SHCS	80	[9.0]

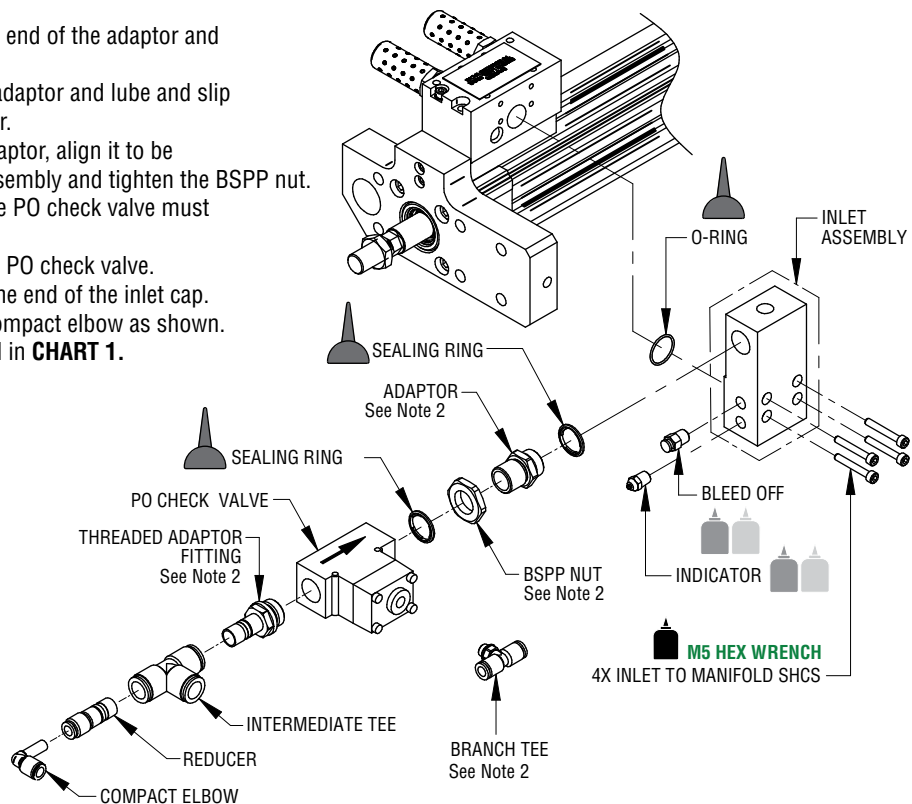
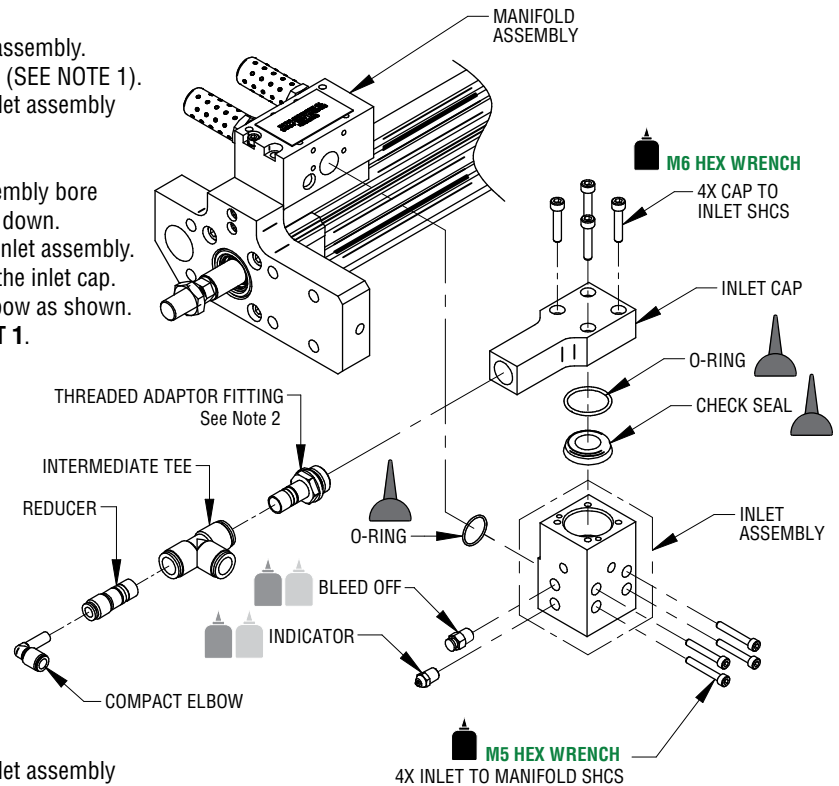
-X24 OPTION ASSEMBLY





- L1) Lube and install o-ring into counterbore in inlet assembly.
 L2) Install bleed off and indicator into inlet assembly (SEE NOTE 1).
 L3) Using the 4 inlet to manifold SHCS, attach the inlet assembly to the manifold assembly.
 L4) Lube sealing ring, slip it onto the short end of the adaptor and thread adaptor into inlet assembly.
 L5) Thread bspp nut onto the long end of adaptor and lube and slip sealing ring onto the end of the adaptor.
 L6) Thread the PO check valve onto the adaptor, align it to be perpendicular to the top of the inlet assembly and tighten the BSPP nut.
NOTE: The arrow direction on the side of the PO check valve must point in toward the inlet assembly.
 L7) Attach the branch tee to the side of the PO check valve.
 L8) Attach the threaded adaptor fitting to the end of the inlet cap.
 L9) Install intermediate tee, reducer and compact elbow as shown.
 L10) Torque above components as specified in **CHART 1**.

TORQUE CHART 1

PART DESCRIPTION	TORQUE	
	in-lb	Nm
Inlet to Manifold SHCS	80	[9.0]

NOTE: Hand tighten + 1/4 turn

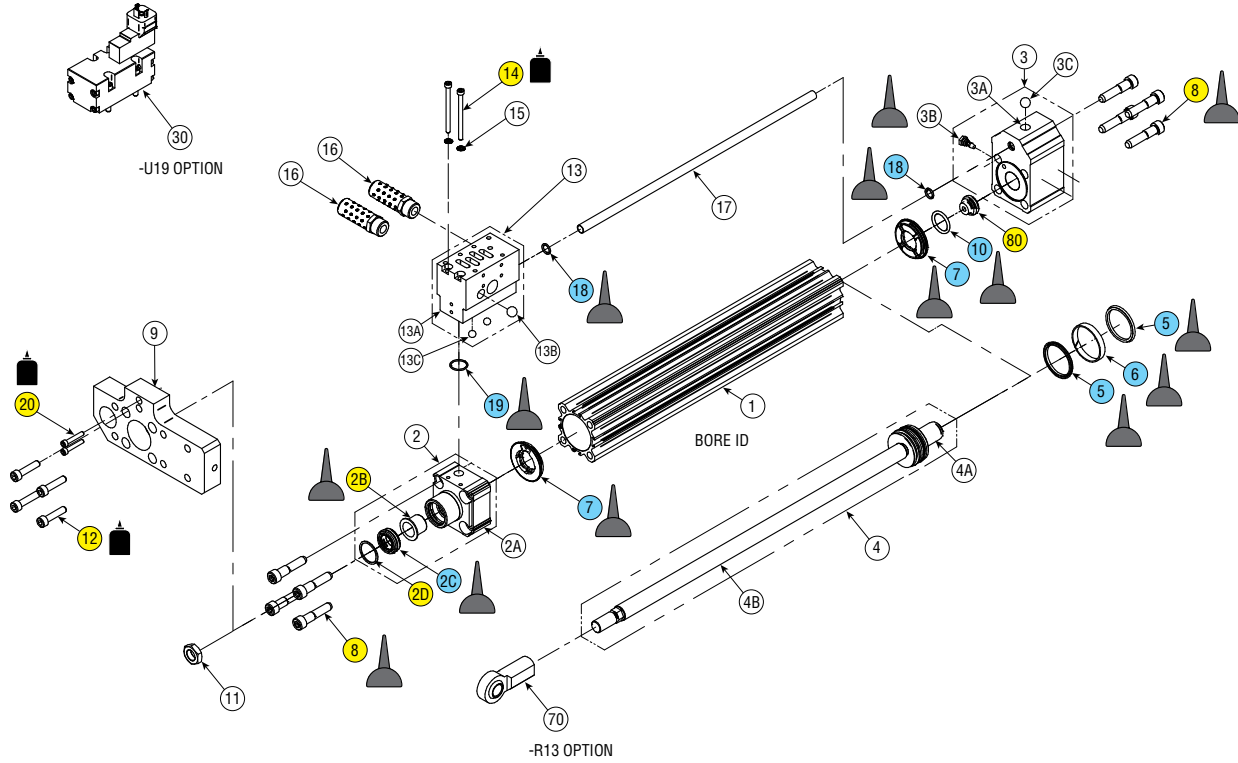


	= LOCTITE 242 THREAD LOCKER		= LOCTITE HYDRAULIC SEALANT
	= LUBRICANT PER FDA REGULATION 21CFR 178.3570		= LOCTITE PRIMER 7090

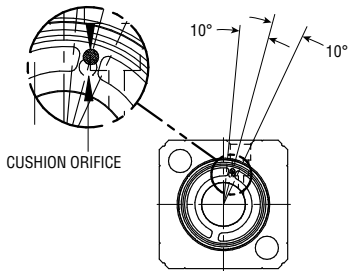
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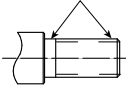


MULTI-FUNCTION SEAL ORIFICE



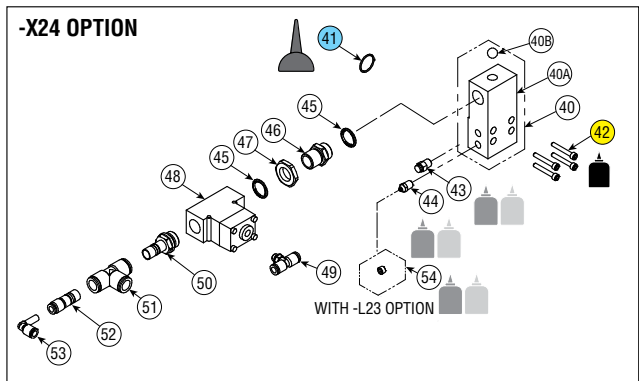
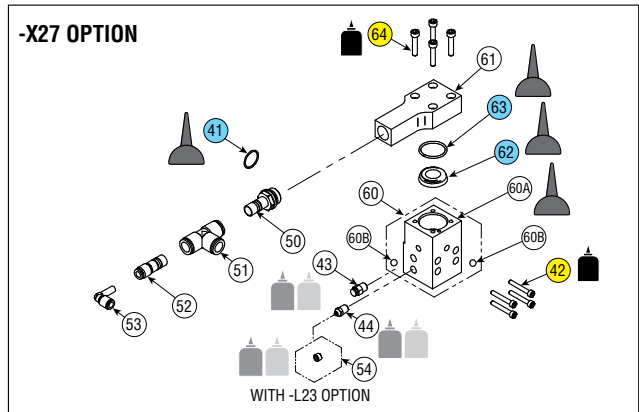
ALIGN CUSHION ORIFICE IN CAP WITH CUSHION ORIFICE HOLE IN MULTI-FUNCTION SEAL SO THAT CUSHION ORIFICE HOLE IS NOT BLOCKED MUST BE FREE FLOW THRU ORIFICE

APPLY ADHESIVE TO BOTH SHOULDER & THREADS



- = LOCTITE 242 THREAD LOCKER
- = LOCTITE HYDRAULIC SEALANT
- = LUBRICANT PER FDA REGULATION 21CFR 178.3570
- = LOCTITE PRIMER 7090

KIT DESCRIPTION	KIT NUMBER	COLOR CODE
Seal Kit	Full unit description required followed by -H9000	
Repair Kit	Full unit description required followed by -H9010	
Cushion Needle Kit	Full unit description required followed by -H6530	



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CYLINDER ONLY PARTS LIST

KEY	PART DESCRIPTION	PART NO.
1	Finished Tube	Full unit description required followed by -H1300
2	Head Assembly	Full unit description required followed by -H1100
2A	Finished Head	Sold as part of Head Assembly
2B	Rod Bushing	Sold as part of Repair Kit (-H9010*)
2C	Rod Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
2D	Retaining Ring	Sold as part of Repair Kit (-H9010*)
3	Cap Assembly	Full unit description required followed by -H1200
3A	Finished Cap	Sold as part of Cap Assembly
3B	Needle Assembly	Sold as part of Cap Assembly, Sold as part of Cushion Kit -6530
3C	Steel Ball	Sold as part of Cap Assembly
4	Piston & Rod Assembly	Full unit description required followed by -H1000
4A	Piston	Sold as part of Piston & Rod Assembly
4B	Rod	Sold as part of Piston & Rod Assembly
5	Piston Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
6	Wear Ring	Sold as part of Repair Kit (-H9010*)
7	Multi-function Impact Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
8	Custom Shoulder Bolt	Sold as part of Repair Kit (-H9010*)
9	Mounting Plate	87474
10	O-ring Cushion Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
11	Jam Nut	Full unit description required followed by -H2001
12	SHCS	Sold as part of Repair Kit (-H9010*)
13	Manifold Assembly	Full unit description required followed by -H9090
13A	Manifold	Sold as part of Manifold Assembly
13B	Steel Ball	Sold as part of Manifold Assembly
13C	Steel Ball	Sold as part of Manifold Assembly
14	SHCS	Sold as part of Repair Kit (-H9010)
15	Serrated Safety Washer	84141-007-02
16	Muffler	73616
17	Finished Steel Tube	Full unit description required followed by -H1310
18	O-ring Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
19	O-ring Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
20	SHCS	Sold as part of Repair Kit (-H9010*)
80	Shock Pad	Sold as part of Repair Kit (-H9010*)

NOTE: * Full unit description required (followed by -Hxxxx)

-U19 OPTION PARTS LIST

KEY	PART DESCRIPTION	PART NO.
30	Mac ISO 2 Valve	78212

-X24 OPTION PARTS LIST

KEY	PART DESCRIPTION	PART NO.
40	Inlet Adaptor Assembly	Sold as part of Repair Kit (-H9010*)
40A	Inlet Adaptor	Sold as part of Inlet Adaptor Assembly
40B	Steel Ball	Sold as part of Inlet Adaptor Assembly
41	O-ring Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
42	SHCS	Sold as part of Repair Kit (-H9010)
43	Push Button Bleed Valve	85084-02
44	Mini Pneumatic Indicator	85083
45	Sealing Washer	77629-004
46	Male to Male Nipple	81525
47	BSP Nut	87476
48	Pilot Operated Check Valve	77187
49	Branch Tee Fitting	Full unit description required followed by -H4250
50	Threaded Adaptor Fitting	74345-020
51	Intermediate Tee Fitting	74345-040
52	Fitting Reducer	74345-141
53	Compact Elbow Fitting	61734-150

-X27 OPTION PARTS LIST

KEY	PART DESCRIPTION	PART NO.
60	Inlet Adaptor Assembly	Sold as part of Repair Kit (-H9010*)
60A	Inlet Adaptor	Sold as part of Inlet Adaptor Assembly
60B	Steel Ball	Sold as part of Inlet Adaptor Assembly
61	Inlet Adaptor Cap	Sold as part of Repair Kit (H9010)
62	Check Seal	85662
63	O-ring Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
41	O-ring Seal	Sold as part of Seal kit (-H9000*) & Repair Kit (-H9010*)
42	SHCS	Sold as part of Repair Kit (-H9010)
43	Push Button Bleed Valve	85084-02
44	Mini Pneumatic Indicator	85083
50	Threaded Adaptor Fitting	74345-020
51	Intermediate Tee Fitting	74345-040
52	Fitting Reducer	74345-141
53	Compact Elbow Fitting	61734-150
64	SHCS	Sold as part of Repair Kit (-H9010*)

-R13 OPTION PARTS LIST

KEY	PART DESCRIPTION	PART NO.
70	Rod Eye	63429-003-01

-L23 OPTION PARTS LIST

KEY	PART DESCRIPTION	PART NO.
54	Port Plug	1992-001-01

NOTE: * Full unit description required (followed by -Hxxxx)

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