


Safety Bulletin			 <p>Tesco Corporation 5616 – 80th Avenue SE Calgary, Alberta, Canada T2C 4N5 Tel: 1-877-TESCO-77 (North America) Tel: 1 (713) 359-7195 (AMSS 24-hour support) Tel: 1 (713) 359-7295 (International) Email: bulletins@tescocorp.com www.tescocorp.com www.tescoparts.com</p>
No: SB073	Rev: 2	Date: Nov. 29, 2012	
Grabber Lift Cylinder Failure – TESCO EMI Top Drive			

BACKGROUND INFORMATION:

An incident occurred where the grabber lift cylinder on a TESCO EMI Top Drive separated while breaking out of a connection. It was found that a loss of the nitrogen gas cushion for breaking connections was a contributing factor in the lift cylinder (TESCO part number 7972) separating from the grabber.

The lift cylinder (Figure 2) is a three-port/double acting hydraulic cylinder with two active rods. The upper rod has a 22.5" stroke for hydraulic lift and the lower rod has a 6.5" stroke for the nitrogen charged cushion (Figure 1). When the nitrogen charge is lost, there is no cushion left in the lift cylinder and the travel required for breaking out of a connection with the grabber closed on the saver sub is no longer available. This compresses the oil trapped in the 22.5" stroke section, causing it to tear the upper rod from its piston, separating the lift cylinder.

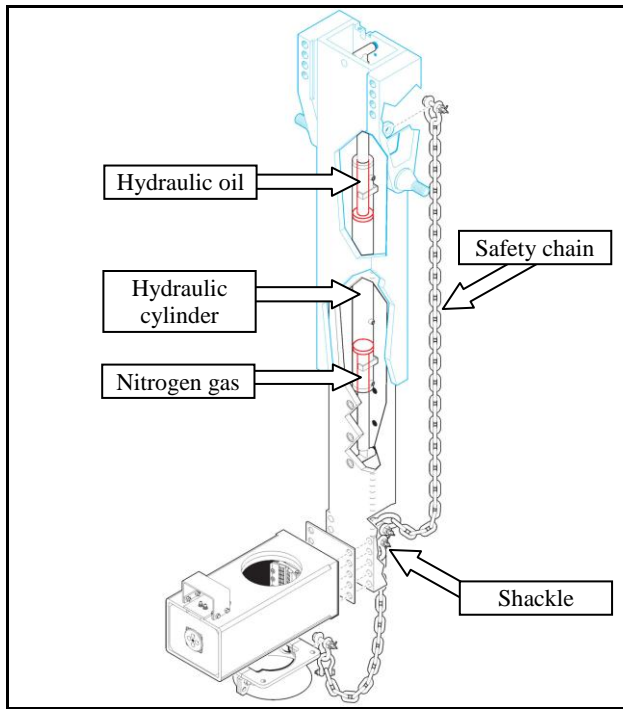


Figure 1: EMI grabber leg



Figure 2: Hydraulic cylinder

The lift cylinder supports the lower leg. If the lift cylinder is separated it has the potential to become a dropped object. A shackle and safety chain are provided as a secondary retention mechanism to prevent the grabber from falling.

Version	Date (D/M/Y)	ECN	Description of changes
Rev 0	25/09/2012	TBC	Initial release of document
Rev 1	10/10/2012	TBC	Added breather to lift cylinder middle port
Rev 2	29/11/2012	TBC	Replaced Grabber Leg Accumulator Kit (was 5027329)

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AFFECTED PRODUCTS:

TESCO 150TON and 250TON EMI 400HP Top Drives manufactured since 2005.

ACTION REQUIRED:

IMMEDIATE ACTION: All EMI grabber legs must have the nitrogen charge checked immediately and daily thereafter, until a permanent fix is implemented. Ensure the safety chain and shackle (Figure 3) are correctly installed and inspected regularly for corrosion or loose components. As well, confirm that the lower rod is completely retracted into the lift cylinder body as per Figure 4.



Figure 3: Safety chain and shackle



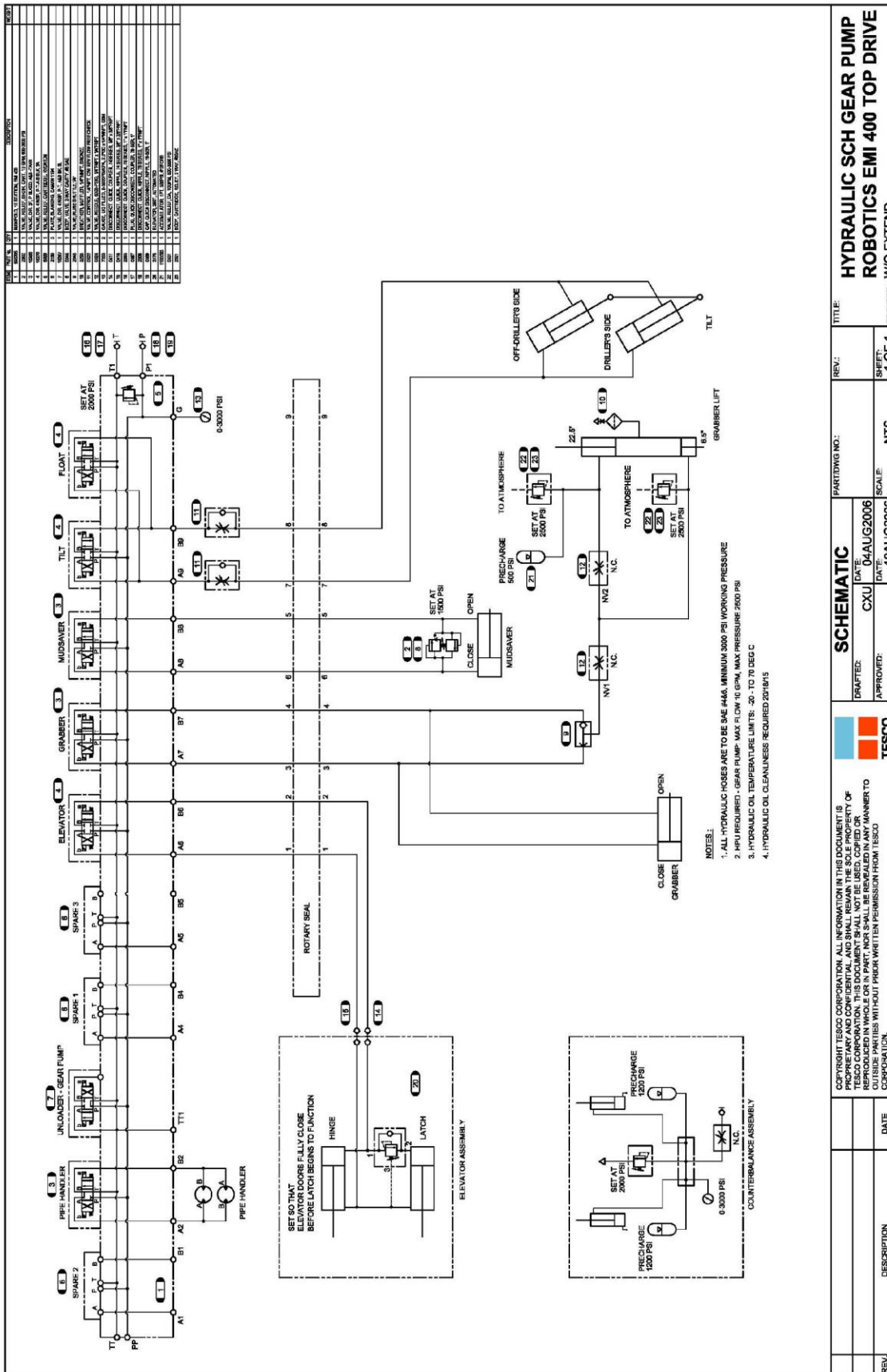
Figure 4: Lower rod retracted into the lift cylinder body

PERMANENT FIX: For existing EMI Top Drive units operating in the field, TESCO has designed a Grabber Leg Accumulator Kit (TESCO part number 5030334), which should be installed immediately. See Appendix B for work instruction and Appendix C for accompanying bill of materials. The Grabber Leg Accumulator Kit moves the nitrogen cushion from the lift cylinder to a remotely mounted accumulator, which is readily accessible for monitoring and servicing. The bottom section of the lift cylinder will be filled with hydraulic fluid and connected to an accumulator and pressure relief.

Refer to schematic drawing in Appendix A for more information.

New EMI Top Drives units sold will incorporate the fix prior to shipping to customers.

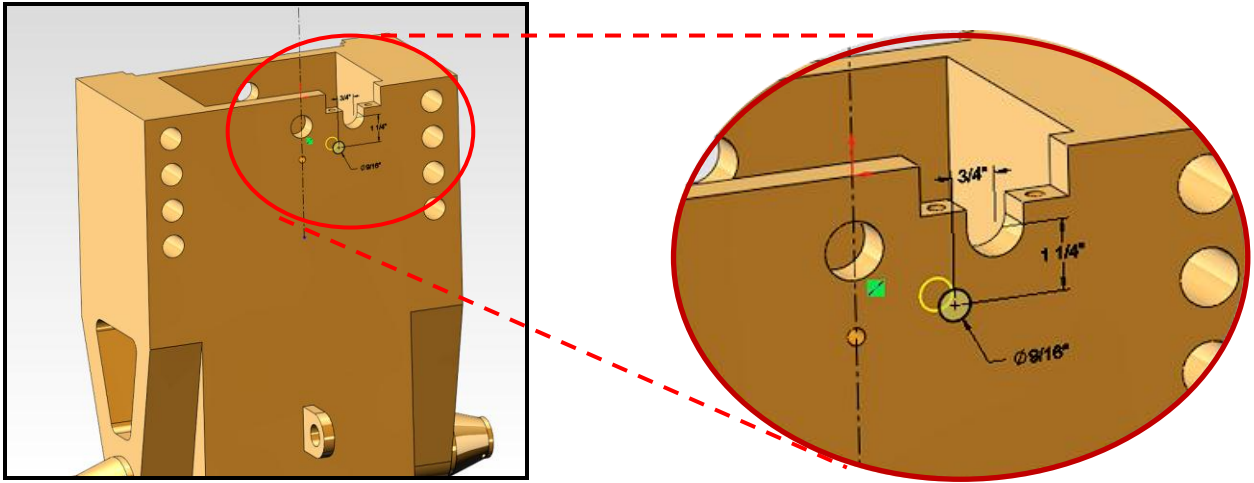
APPENDIX A:



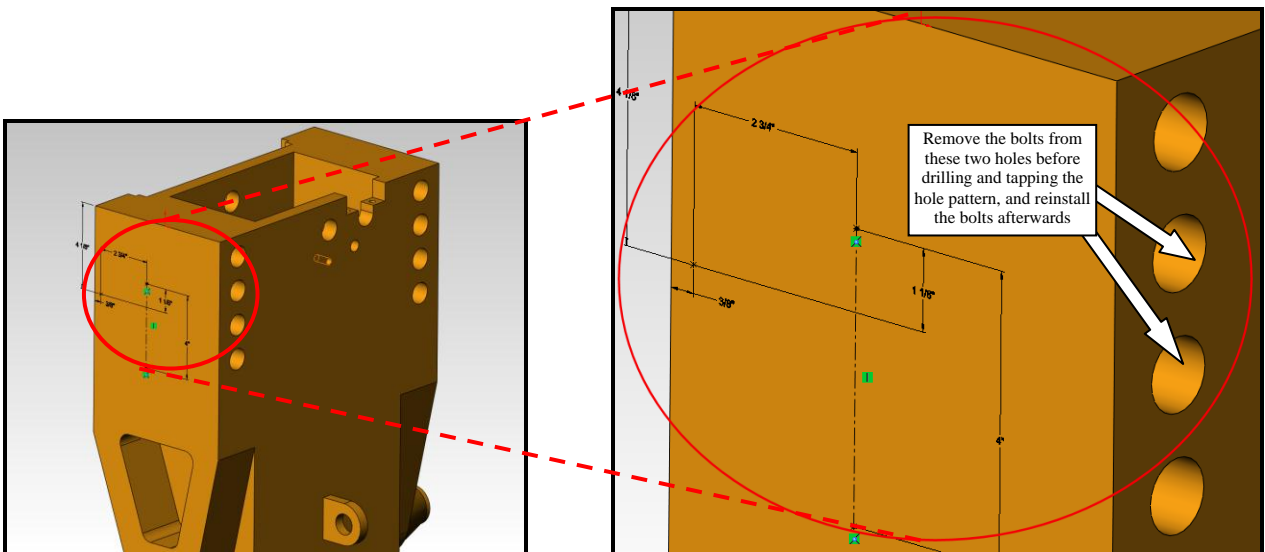
APPENDIX B:

Work Instructions for installation of Grabber Leg Accumulator Kit (part number 5030334):

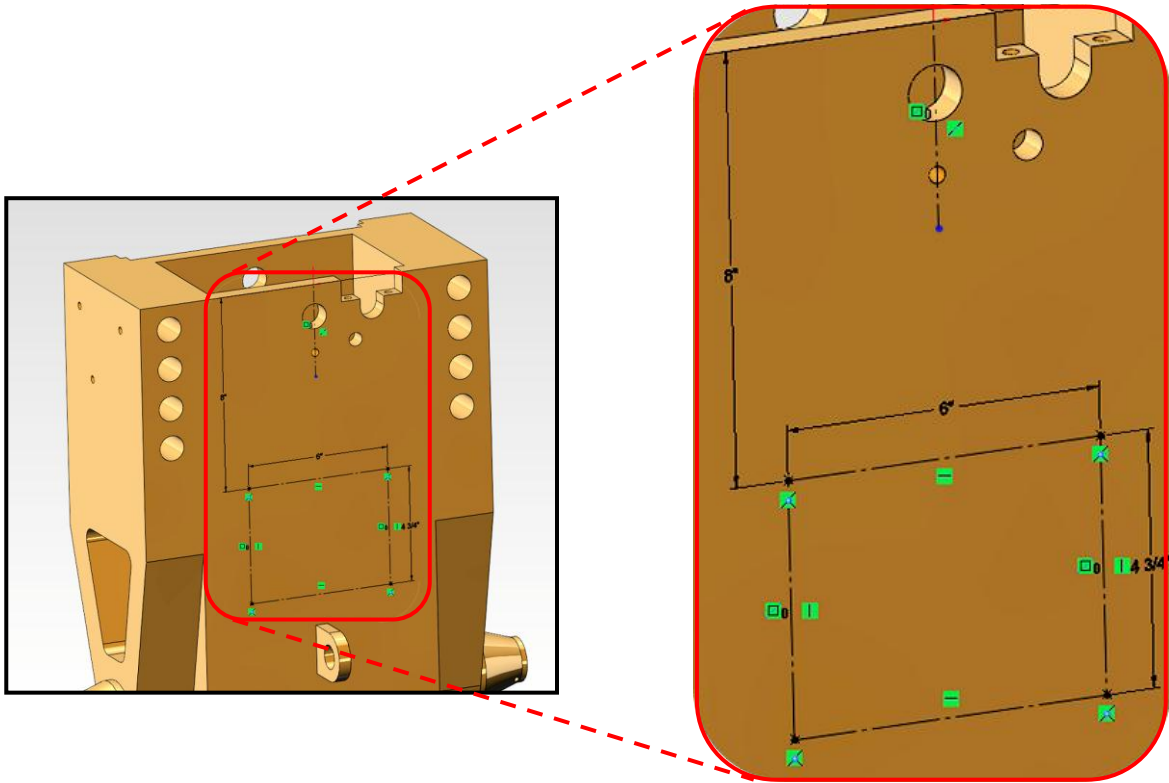
1. Remove the nameplate (part number 8151) and screws (part number 5968).
2. Remove the grabber lift cylinder (part number 7972) from the top drive.
3. Drill a $\text{Ø}9/16$ " hole for the lift cylinder lower port. From the existing port, mark a hole location $3/4$ " to the left and $1-1/4$ " beneath. Drill $\text{Ø}9/16$ " through.



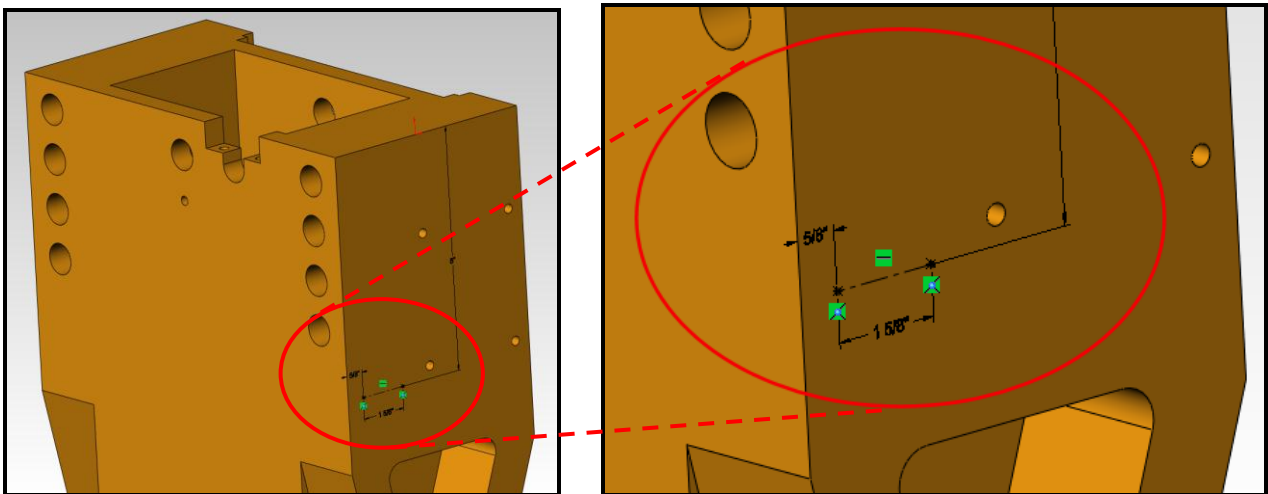
4. Drill and tap the hole pattern for the accumulator mount to the off driller's side of the upper leg. Lay out a $2-3/4$ " wide by 4" tall hole pattern $4-1/8$ " below the top of the leg and $3/8$ " behind the front of the leg, as shown. Drill $\text{Ø}5/16$ " by $1-5/16$ " deep, and tap $3/8-16$ UNC by 1" deep for three holes.



5. Drill and tap the hole pattern for the nameplate on the back of the upper leg. Lay out a 6" wide by $4-3/4$ " tall hole pattern 8" below the top of the leg and centered, as shown. Drill #7 through and tap $1/4-20$ UNC through for four holes.



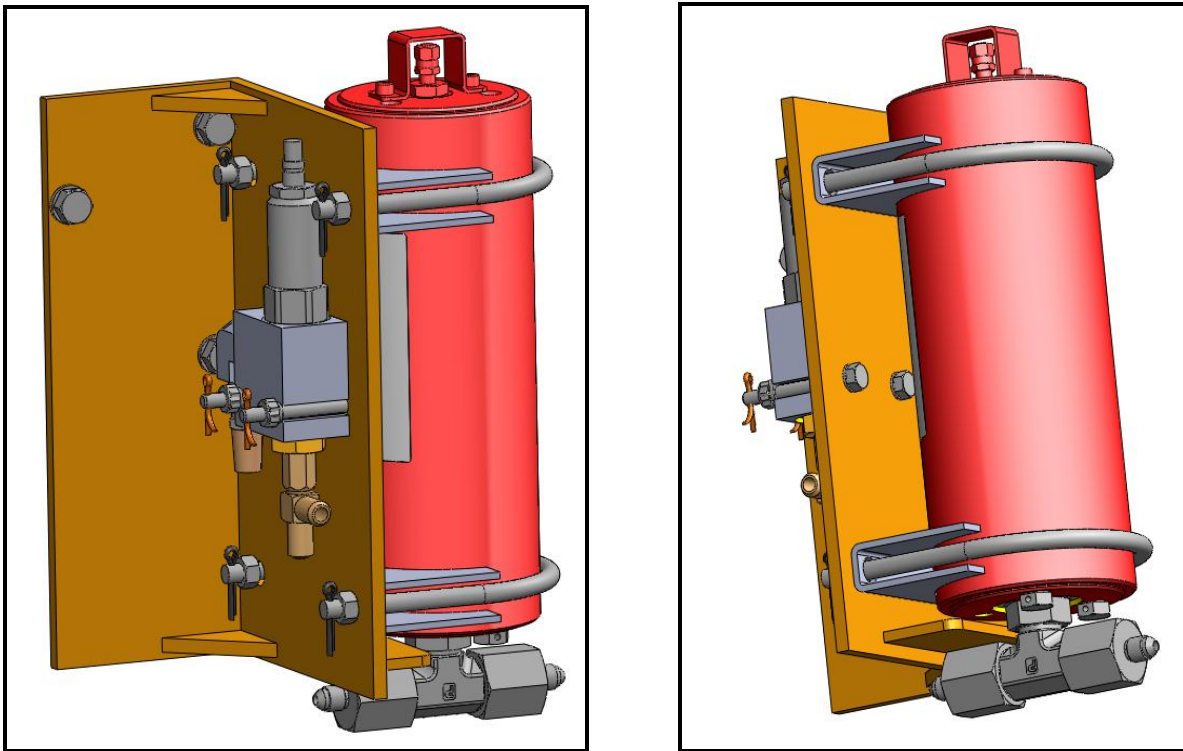
6. Drill and tap the hole pattern for the lower rod relief to the driller's side of the upper leg. Lay out a 1-5/8" wide hole pattern 8" below the top of the leg and 5/8" forward of the back of the leg, as shown. Drill #7 by 3/4" deep, and tap 1/4-20 UNC by 1/2" deep for two holes.



Relief mounting hole pattern

7. Replace the grabber lift cylinder (part number 7972) with a new cylinder supplied by TESCO. Transfer only the upper port hose connection from the old cylinder to the new cylinder.
8. Install two elbows (part number 0323), one each in the middle port and the lower port, both oriented downwards.
9. Install the 6" long #4 hose (part number 4374) to the middle port elbow.

10. Connect the #4 adapter (part number 10508) and #4 breather (part number 3293) to the free end of the 6" long hose.
11. Install the 99" long #4 hose (part number 1110131) to the bottom port elbow.
12. Connect another elbow (part number 10535) to the free end of the 99" hose.
13. Connect a 3-1/2" long 1/4" nipple (part number 730068) to the elbow at the free end of the 99" hose.
14. Fit the end of the 1/4" nipple through the $\text{Ø}9/16$ " drilled hole (from step 3) at the top of the upper grabber leg, installed from the inside out. The nipple assembly should fit from inside the upper grabber leg with about 1/2" of clearance. The 99" long #4 hose will be inside the upper grabber leg, oriented downward from the nipple.
15. Install another elbow (part number 10535) to the free end of the nipple projecting through the upper grabber leg. The elbow should be oriented downward.
16. Reinstall the grabber lift cylinder (part number 7972) into the upper grabber leg.

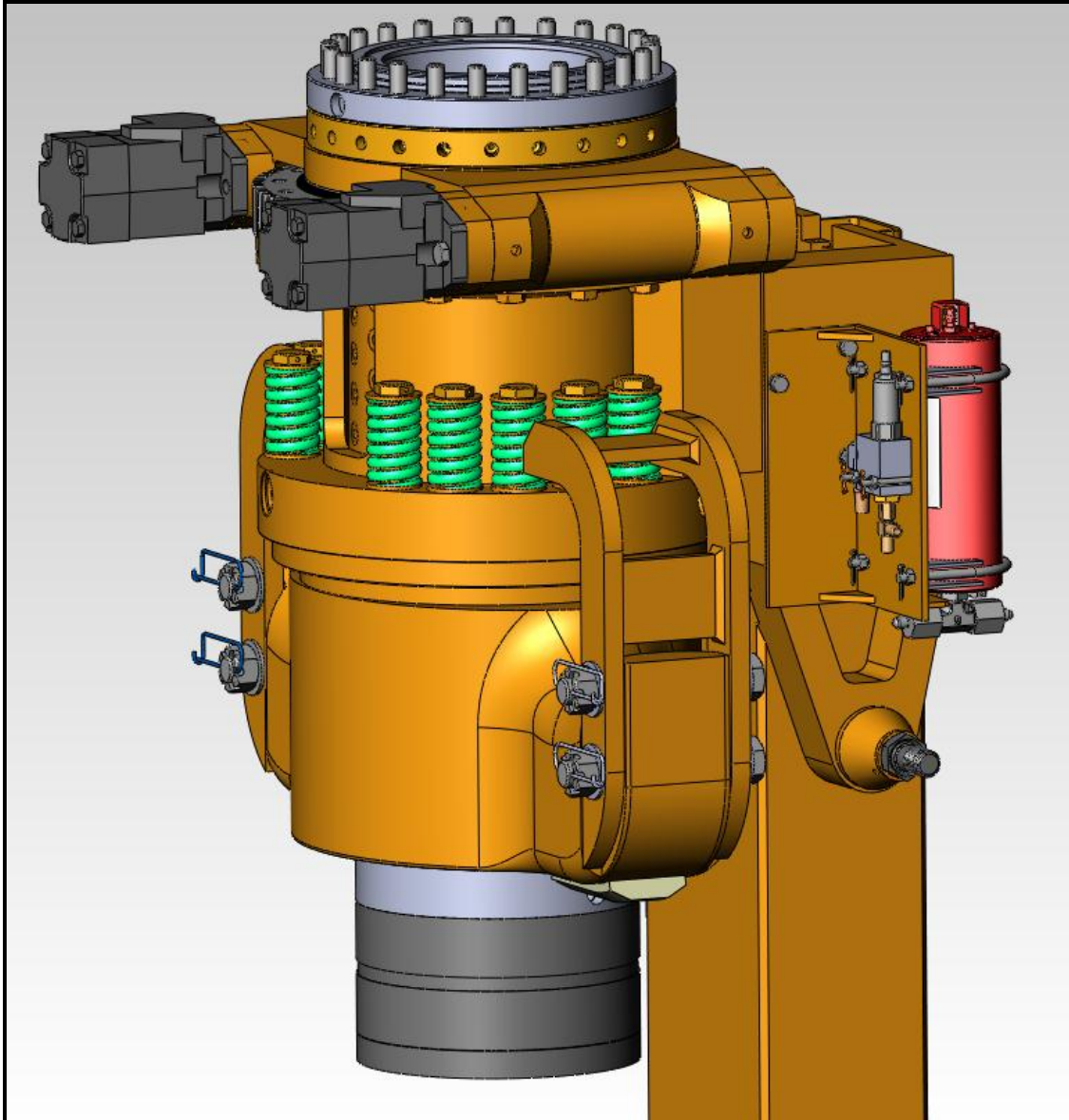


Upper rod accumulator assembly

17. Assemble the upper rod accumulator mount (part number 5030328), the 1 pint accumulator (part number 1100093), and two accumulator clamps (part number 1030253) as shown. Secure each clamp with two nylon lock nuts (part number 4333) and two cotter pins (part number 1091). Connect a safety cable (part number 1390064) to the accumulator with a cap screw (part number 1390065). Install another cap screw (part number 1390065) to the top of the accumulator and safety wire the two cap screws together. Install the tee (part number 17854) and the two hose adapters (part number 0338) as shown.
18. Charge the accumulator (part number 1100093) to 500 psi nitrogen.
19. Assemble the relief body (part number 2021) and relief valve (part number 0031). Adjust the cracking pressure to 2,500 psi. On the inlet port, install the adapter (part number 1499) and the

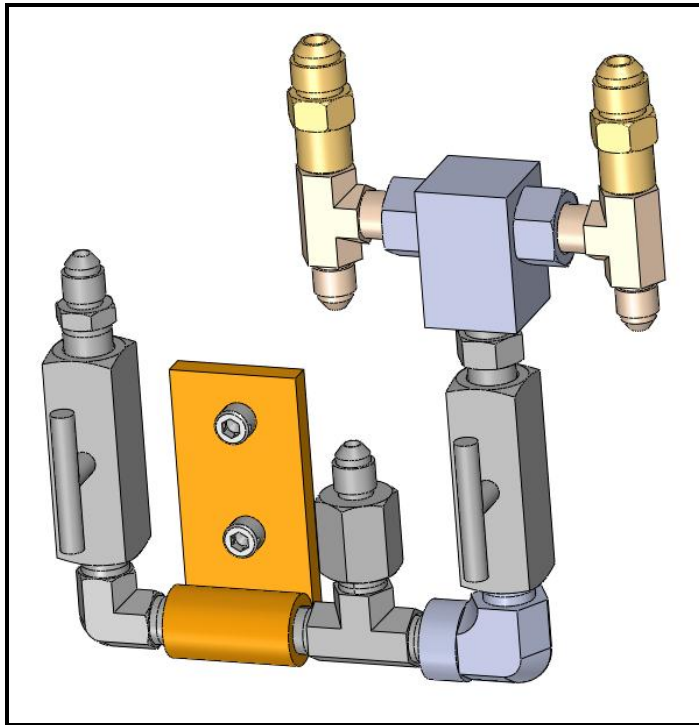
tee (part number 0374) as shown. On the outlet port, install the elbow (part number 12354), the adapter (part number 0251), and the bronze breather (part number 3293) as shown.

20. Install the relief assembly onto the accumulator mount with two bolts (part number 5030330), two lock washers (part number 1068), two flat washers (part number 11467), two nylon lock nuts (part number 9785), and two cotter pins (part number 15608) as shown.



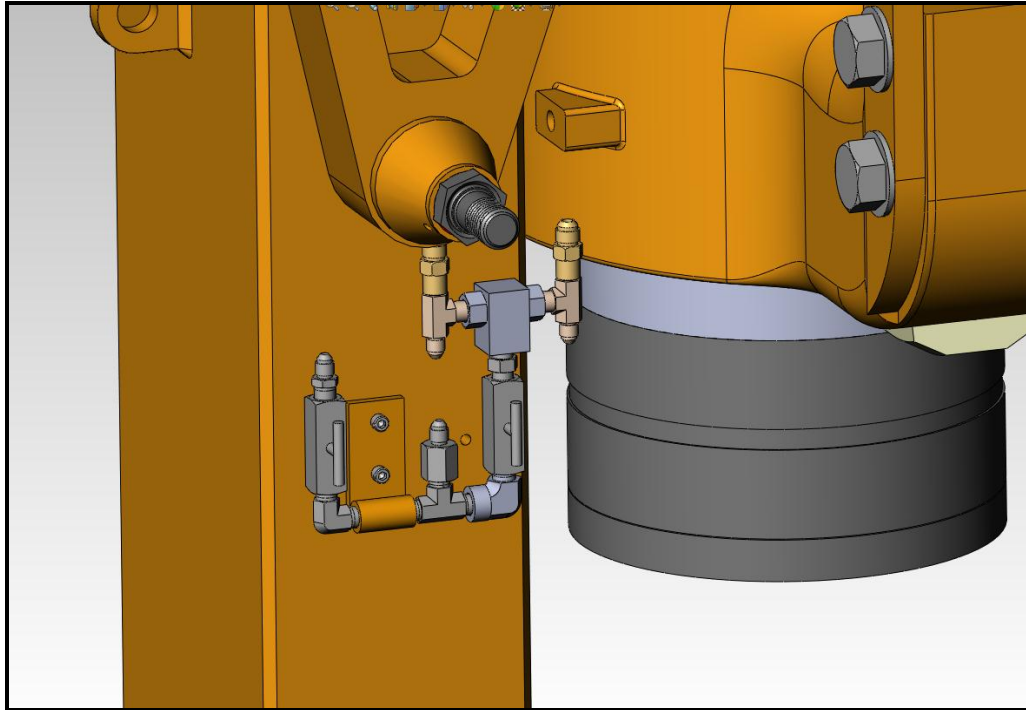
Accumulator mount on upper grabber leg

21. Assemble three lock washers (part number 1066) onto the three cap screws (part number 3533), apply Loctite 243 (part number 17756) to the cap screw threads, and attach the upper rod accumulator mount onto the upper leg. Make sure to anchor the safety cable (part number 1390064) with one mounting cap screw. Tighten the cap screws to 30 lb-ft and install safety wire on the cap screws.



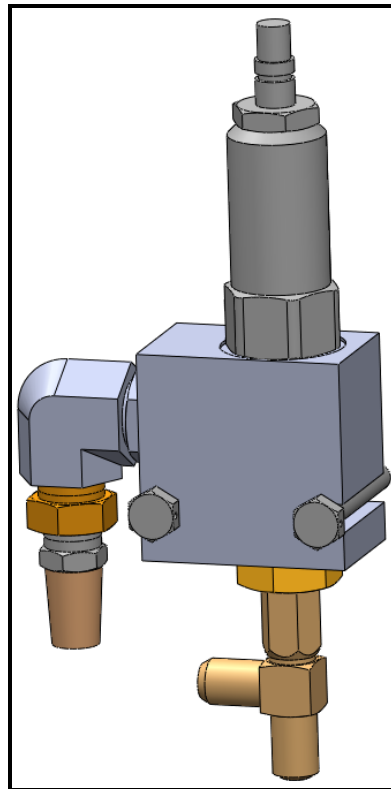
Control valve assembly

22. Install an elbow (part number 11871) into the left side of the needle valve mount (part number 13923). Orient the elbow upwards as shown.
23. Assemble a needle valve (part number 0024) and a hose adapter (part number 0285). Install to the elbow (part number 11871).
24. Install a tee (part number 720476) and a hose adapter (part number 10508) into the right side of the needle valve mount. The hose adapter should be oriented upwards as shown.
25. Attach an elbow (part number 0254), another needle valve (part number 0024), and an adapter (part number 0240) to the tee of step 24. Orient the elbow upwards as shown.
26. Attach the outlet of an inline shuttle valve (part number 2048) to the adapter (part number 0240). Orient the inlet ports sideways as shown.
27. To each of the two inlet ports of the shuttle valve, attach a tee (part number 5707) and a #6 hose adapter (part number 0346). Orient each #6 hose adapter upwards as shown.



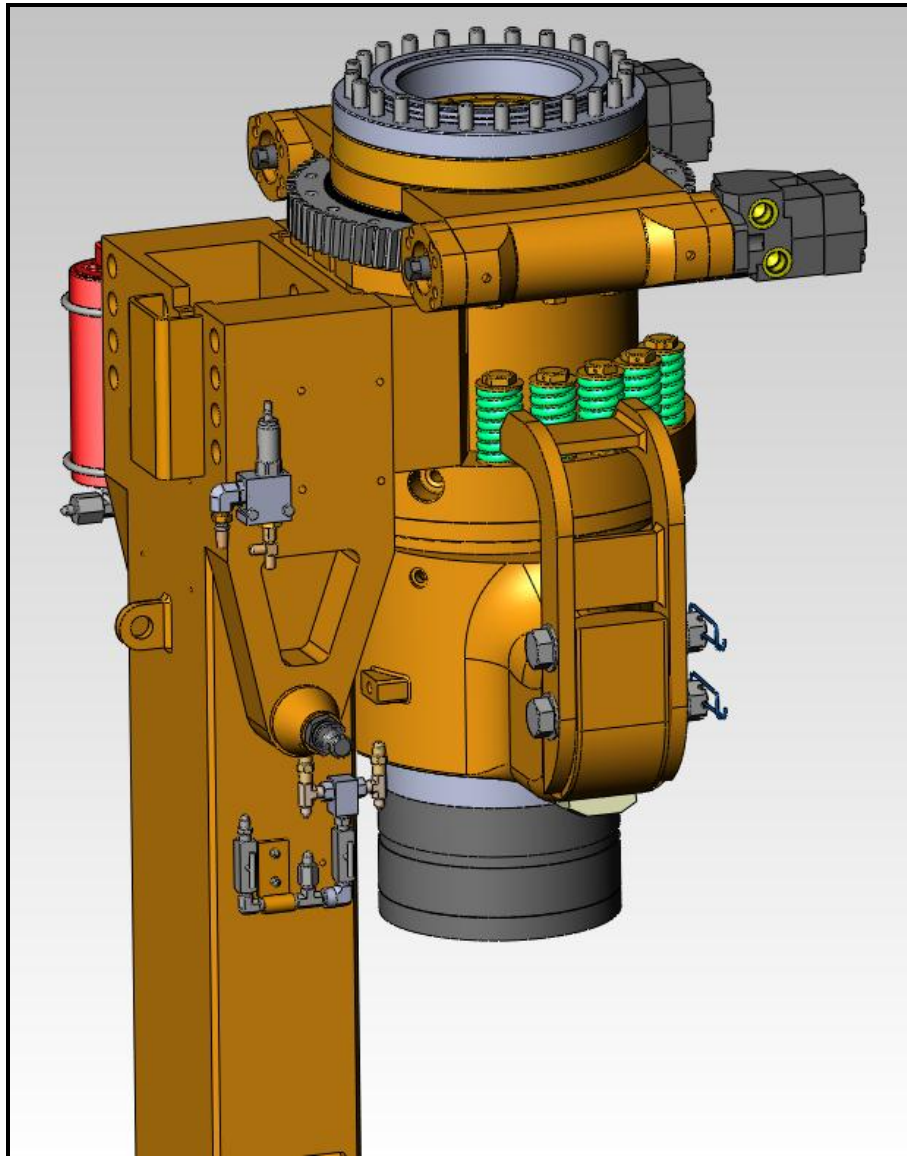
Control valve assembly on upper leg

28. Apply Loctite 243 (part number 17756) to the threads of the two mounting screws (part number 731067), and attach the control valve assembly onto the upper leg as shown. Tighten the cap screws to 8 lb-ft and install safety wire on the cap screws.



Lower rod relief assembly

29. Assemble the relief body (part number 2021) and relief valve (part number 0031). Adjust the cracking pressure to 2,500 psi. On the inlet port, install the adapter (part number 1499) and the tee (part number 0374) as shown. On the outlet port, install the elbow (part number 12354), the adapter (part number 0251), and the bronze breather (part number 3293) as shown.



Relief assembly on upper leg

30. Assemble two lock washers (part number 1068) onto the two cap screws (part number 5030332), apply Loctite 243 (part number 17756) to the cap screw threads, and attach the relief body onto the upper leg as shown. Tighten the cap screws to 8 lb-ft and install safety wire on the cap screws.
31. Remove the grabber hoses from rotary seal ports #3 and #4. Attach two new size #6 hoses from rotary seal ports #3 and #4 to the size #6 hose adapters on either side of the shuttle valve of step 27 (part number 2048).
32. Connect two size #4 hoses from the bottom of the tees on either side of the shuttle valve of step 27 (part number 2048) to the control ports of the grabber box.

33. Install a size #4 hose from the middle hose adapter of step 24 (part number 10508) to the lower rod relief valve of step 30 (part number 0374). The hose will be approximately 11-3/4" long, straight-to-straight.
34. Install another size #4 hose from the lower rod relief valve of step 30 (part number 0374) to the lower rod control port of step 15 (part number 10535). The hose will be approximately 21-1/2" long, straight-to-straight.
35. Install a size #4 hose from the left hose adapter of step 23 (part number 0285) to the upper rod relief valve of step 19 (part number 0031).
36. Install another size #4 hose from the upper rod relief valve of step 19 (part number 0031) to the upper rod accumulator of step 17 (part number 5030328).
37. Install another size #4 hose from upper rod accumulator of step 17 (part number 5030328) to the upper rod control port.
38. Install the name plate (part number 8151) to the new 1/4"-20 UNC holes (from step 5). Use four cap screws (part number 5968) with Loctite 243 (part number 17756) applied to the threads. Tighten the cap screws to 8 lb-ft and install safety wire on the cap screws.

APPENDIX C:

Bill of materials for the EMI 400 Grabber Leg Accumulator Kit (part number 5030334):

Part Number	Description	Quantity
Lift Cylinder and Fittings		
7972	Cylinder,Hydraulic,Double Acting,2.5"Bore,1.25"Rod,29"Stroke	1
0323	Fitting,Hyd,90°Elb,#4MJICx#4MNPT	2
4374	Hose,Hyd,100R2-AT,#4x6",FJICxFJIC	1
10508	Fitting,Hyd,Str,#4MJICx#4FNPT	1
3293	Breather,Muffler,1/4"MNPT,Bronze	1
1110131	Hose,Hyd,100R2-AT,#4x99",FJICxFJIC	1
10535	Fitting,Hyd,90°Elb,#4MJICx#4FNPT	2
730068	Fitting,Pipe,Nipple,Sch80,1/4"MNPTx3-1/2"Lg	1
Upper Rod Accumulator and Relief Valve		
5030328	Mount,Clamp,Accumulator,1pt,Grabber Lift,250-EMI-400	1
1066	Washer,Lock,Helical Spring,3/8",Stl,Pld	3
3533	Screw,Cap,Hex Hd,3/8"-16UNCx3/4",Gr8,Pld,Dr Hd	3
1030253	Clamp,Exhaust,3-1/2"IDx3/8"-16UNC,Dr Thd,Yellow	2
1091	Pin,Cotter,1/8"ODx1"Lg,Pld	4
1100093	Accumulator,1PT,3000-psi,#12FORB	1
1390064	Cable,Safety,7x7Wire Rope,1/8"Dia,3/8"ID Tab x 6"Long x 3/8"	1
1390065	Screw,Cap,Hex Hd,3/8"-24UNFx1/2",Gr8,Pld,Dr Hd	2
17854	Fitting,Hyd,Tee,#8MJICx#8MJICx#12MORB-Br	1
0338	Fitting,Hyd,Str,#8FJICx#4MJIC	2
2021	Body,Cartridge,Relief,2 Way,#8 SAE	1
0031	Valve,Relief,Dir Act,Cart,10 gpm,600-3600 psi	1
1499	Fitting,Hyd,Str,#4MJICx#8MORB	1
0374	Fitting,Hyd,Tee,#4MJICx#4FJIC-Swvl-Runx#4MJIC	1
12354	Fitting,Hyd,90°Elb,#8MORBx#6FNPT	1
0251	Fitting,Hyd,Str,#6MNPTx#4FNPT	1
3293	Breather,Muffler,1/4"MNPT,Bronze	1
1068	Washer,Lock,Helical Spring,1/4",Stl,Pld	2
11467	Washer,Flat,Type A,Narrow,1/4",Hardened,Pld	2
5030330	Screw,Cap,Hex Hd,1/4"-20UNCx2 1/4",Gr8,Pld,Dr Thd	2
9785	Nut,Hex,Lock,Nylon,1/4"-20UNC,Gr8,Pld	2
15608	Pin,Cotter,3/32"ODx3/4"Lg,Pld	2
Control Valve Assembly		
13923	Mount,Needle Valve,Grabber Hyd Loop,EMI	1
731067	Screw,Cap,Skt Hd,1/4"-20UNCx3/4",Dr Hd	2
11871	Fitting,Hyd,90°Elb,#4MNPTx#4MNPT	1
0024	Valve,Needle,6000-psig,1/4"FNPTx1/4"FNPT	1
0285	Fitting,Hyd,Str,#4MJICx#4MNPT	1
720476	Fitting,Hyd,Tee,#4MNPTx#4MNPTx#4MNPT	1
10508	Fitting,Hyd,Str,#4MJICx#4FNPT	1
0254	Fitting,Hyd,90°Elb,#4MNPTx#4FNPT	1
0024	Valve,Needle,6000-psig,1/4"FNPTx1/4"FNPT	1

0240	Fitting,Hyd,Str,#4MNPTx#4MNPT	1
2048	Valve,Inline Shuttle,1/4"	1
5707	Fitting,Hyd,Tee,#4MJICx#4MJICx#4MNPT-Br	2
0346	Fitting,Hyd,Str,#4FJICx#6MJIC	2
Lower Rod Relief Valve		
2021	Body,Cartridge,Relief,2 Way,#8 SAE	1
0031	Valve,Relief,Dir Act,Cart,10 gpm,600-3600 psi	1
1499	Fitting,Hyd,Str,#4MJICx#8MORB	1
0374	Fitting,Hyd,Tee,#4MJICx#4FJIC-Swvl-Runx#4MJIC	1
12354	Fitting,Hyd,90°Elb,#8MORBx#6FNPT	1
0251	Fitting,Hyd,Str,#6MNPTx#4FNPT	1
3293	Breather,Muffler,1/4"MNPT,Bronze	1
1068	Washer,Lock,Helical Spring,1/4",Stl,Pld	2
5030332	Screw,Cap,Hex Hd,1/4"-20UNCx1-3/4",Gr8,Pld,Dr Hd	2

Bill of materials for tools required to install the Grabber Leg Accumulator Kit:

Part Number	Description	Quantity
730041	Bit,Drill,Straight Shank,Twisted Drill,9/16",HSS	1
N/A	Bit,Drill,Straight Shank,Twisted Drill,#7,HSS	1
1472	Tap,Taper,G/T,NC,HSS,E700,1/4"	1
2861	Bit,Jobber,Drill,HSS,A150,5/16"	1
1473	Tap,Taper,G/T,NC,HSS,E700,3/8"	1
4398	Wire,Lock,18Ga(0.0403"Dia),100-ft Spool	1
5017066	Plier,Wire Twisting,0-1.04mm Dia	1
N/A	Press,Drill,Magnetic Base	1
17756	Threadlock,Removable,50ml,Loctite 243	1