

***14" 80K TONG, BACKUP &
FRAME ASSEMBLY***

TECHNICAL MANUAL

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While continually striving to maintain accuracy, Farr Canada hereby states that the information contained in this technical documentation is subject to change without notice. If you feel this document does not meet your needs, please contact our sales office for the most current available documentation for your product.

Summary Of Revisions			
Date	Section	Page	Description Of Revision
May 2007	N/A	N/A	Initial Release

14"- 80K Tong & Wedge Backup

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IDENTIFICATION OF OF WARNINGS AND OTHER NOMENCLATURE OF IMPORTANCE USED IN THIS MANUAL

Farr Canada uses three subsets to describe items in three degrees of importance.

The highest level of urgency is called a **CRITICAL WARNING**, and is identified with an exclamation point, is red in color, and is surrounded by a double black box. A **CRITICAL WARNING** denotes an item of extreme importance, and failure to heed a warning may result in bodily injury, death, severe equipment damage, or any combination of these.

A **STANDARD WARNING** is identified with an asterisk, and contains information critical to the correct assembly or operation of the unit. A **STANDARD WARNING** may also serve to alert the user to a potential low-level injury hazard. A **STANDARD WARNING** is also surrounded by a double black box, but is amber in colour.

An **ALERT** is identified by black text within a double black box. An alert contains specific information of note that pertains to the correct assembly or operation of the unit.



This is how to identify a critical warning



This is how to identify a standard warning

This is how to identify an alert

Congratulations on the purchase of your new Farr Canada tong, backup, and frame assembly. This unit will provide you with years of outstanding performance. Simple maintenance and care will extend its life and insure a continuing level of excellent performance and reliability.

This manual will assist you in giving your equipment the care it requires. Please read the manual and follow the enclosed maintenance instructions. Replacement parts are readily available from FARR Canada Ltd. in Edmonton Alberta. However, most of the parts that are subject to wear or damage are standard items likely to be found in supply stores or parts depots. Many parts are transferable between FARR tongs and backups.

Should you need replacement parts, or should you experience any difficulty not covered in this manual, please contact:

FARR CANADA (SALES)

11086 156 Street, Suite 216
Edmonton, Alberta
Canada T5P 4M8
Phone: 780.481.3174
Fax: 780.481.9246

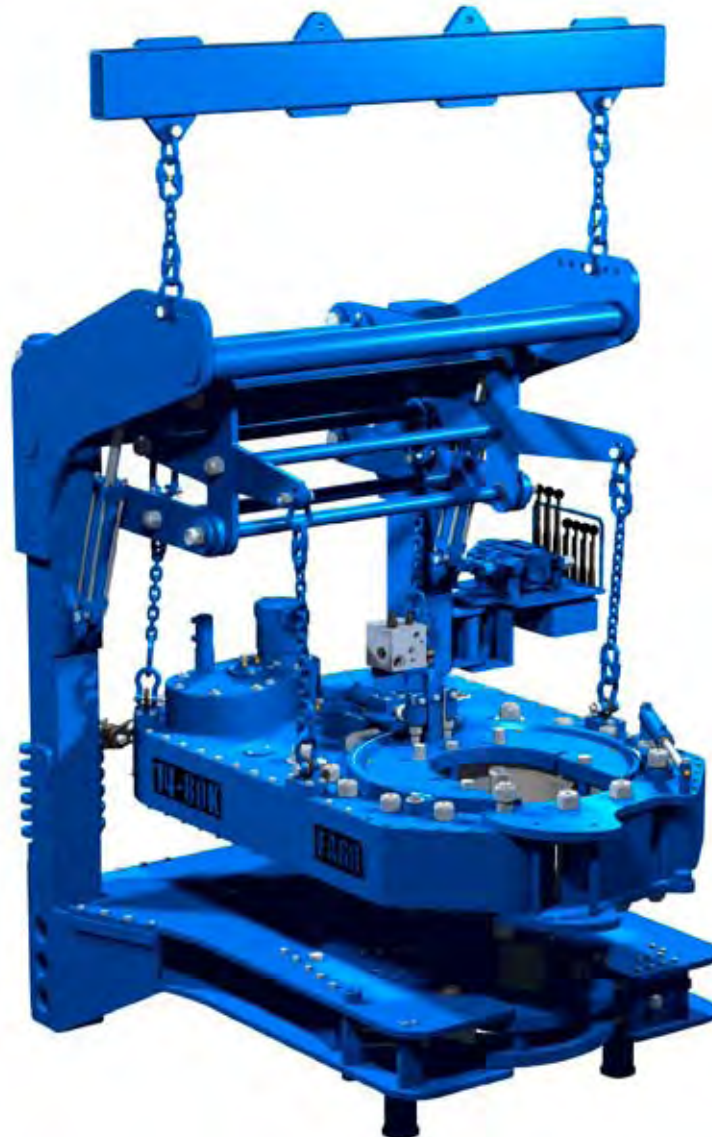
FARR CANADA (ENGINEERING)

14755 121A Avenue
Edmonton, Alberta
Canada T5L 2T2
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Fax: 780.455.2432

Email Sales: info@farrcanada.com

Email Engineering: eng@farrcanada.com

Website: <http://www.farrcanada.com>



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Torque Range: High Gear: 10700 ft.-lb. / 14507 Nm
 Low Gear: 80000 ft.-lb. / 108465 Nm
Note: Torque is specified at 2200 PSI / 15.168 MPa

Maximum Rotation Speeds:	<u>Gear</u>	<u>Motor Speed</u>	<u>Rotation Speed</u>
	Low	Low	2.5 RPM
	Low	High	5 RPM
	High	Low	19.2 RPM
	High	High	38.5 RPM

Note: Speed is specified at 50 GPM / 189 LPM

Maximum Power Unit Requirements: 50 GPM / 227 LPM
 2200 psi / 15.17 MPa

Max Length: 88-1/8" / 224 cm

Max Width: 81" / 206 cm

Max Height (without Spreader Bar): 89" / 226 cm

Maximum Elevator Diameter: Unlimited (tong comes off pipe)

Space Required On Pipe: 10" / 25.4 cm

Torque arm length: 45.3" / 115 cm
 Center Line of Pipe Center Line of Anchor Handle

Weight (Approximate): 8700 lbs / 3955 kg

Casing Jaws Available (inches): See Page 3.15

!

The spreader bar assembly has been designed for lifting the frame, tong, and backup assembly supplied by Farr Canada. Farr Canada will not guarantee the ability of the spreader bar to lift any other part, assembly or combination of parts and assemblies. Farr Canada will not guarantee the ability of the spreader bar to lift the assembly supplied from Farr Canada if there are any modifications to the lifting assembly, or any additions to the supplied assembly that adds weight to the supplied assembly

Use an EP synthetic grease that meets or exceeds the following specifications:

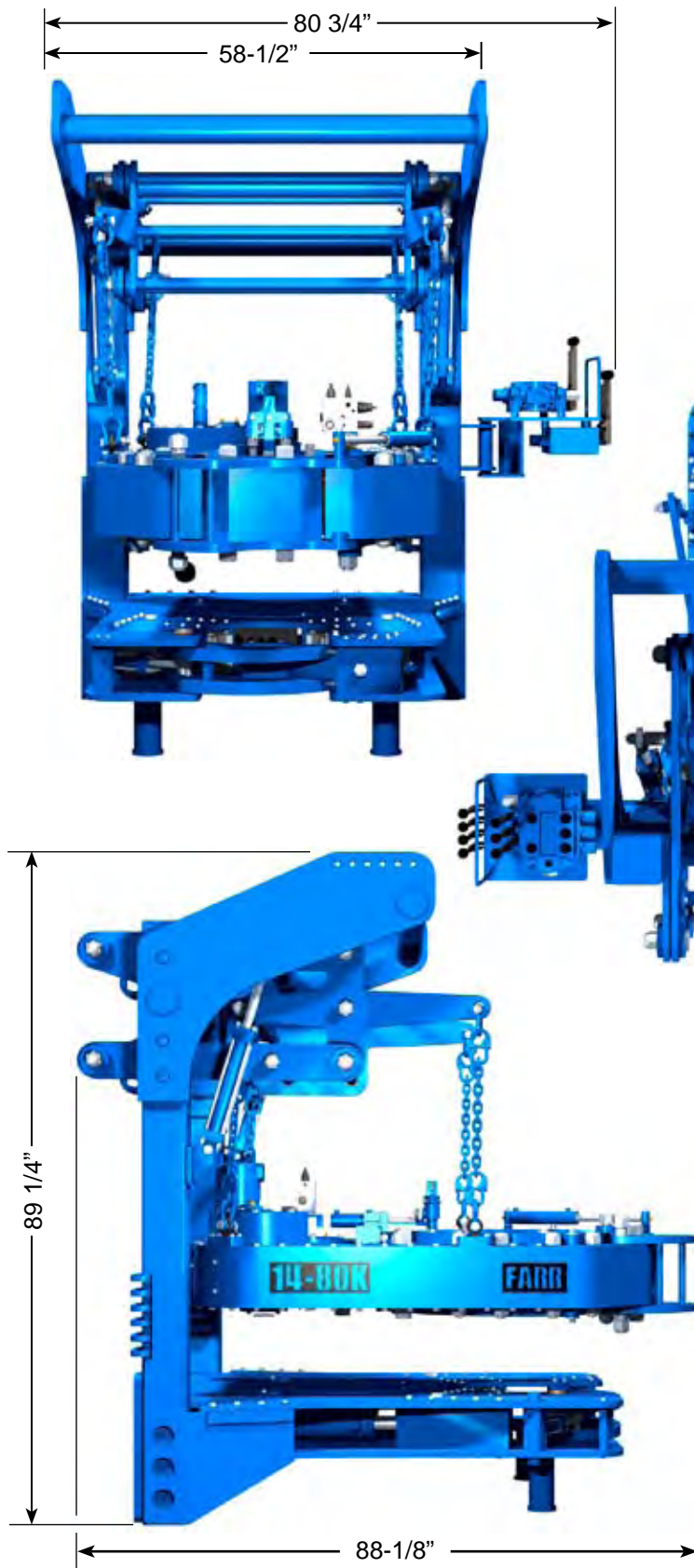
Thickener	Lithium Complex
NLGI consistency grade	2
NLGI performance grade	GC-LB
Penetration - ASTM D 217 (25°C [77°F] 0.1 mm) worked 60 strokes	265-295 minimum
Dropping point, °F[°C] - ASTM D2265	550 [288] minimum
High temperature life, hours - ASTM D 3527	160 minimum
Oxidation stability, psi - ASTM D 942	(100 hr/300 hr) 0/3
Water washout, percent - ASTM D 1264	1.8 max
Rust and corrosion - ASTM D 1743	pass
Oil separation, percent loss - ASTM D 1742 (24 hours, 25°C [77°F])	1.1 max
Leakage, g lost - ASTM D 4290	1.0 max
Four ball wear test, mm scar - ASTM D 2266	0.40 max
Fretting wear, mg - ASTM D 4170	3.4 max
Four ball EP, kgf - ASTM D 2596	
Weld point	400 minimum
Load wear index	50 minimum
Timken OK load test, lbs - ASTM D 2509	50
Low temperature torque, N*m - ASTM D 4693 (-40°C [-40°F])	1.3 max
LT-37 pumpability, g/min (60°F/0°F [16°C/-18°C])	360/7
Copper corrosion - ASTM D 4048	1B
Disc brake wheel bearing specifications	
Ford ESA-M1C 198A	Yes
Chrysler MS-3701	Yes
Oil viscosity: 40°C [104°F], cSt	151
100°C [212°F], cSt	19.2
Flash point, °F[°C] - ASTM 92	450[232]



Use a premium quality hydraulic fluid that meets or exceeds the following specifications:

Typical Density (kg/m ³)	878
Viscosity - cSt @ 40 °C	68.8
- cSt @ 100 °C	8.7
Viscosity Index	97
Pour Point °F [°C]	-22 [-30]
Flash Point °F [°C]	432 [222]
Colour, ASTM	1.5
Neutralization Number	0.40
Rust Protection - Distilled Water	No Rust
- Sea Water	No Rust
Hydrolytic Stability - Cu Mass Loss, mg/cm ²	0.04
Copper Corrosion Test	1A
Filterability: Denison - Wet & Dry	Pass
Afnor - Wet & Dry	Pass
Cincinatti Milacron Spec Approved	P69
Denison HF-0:	Approved
Denison P-46 Piston Pump:	Pass
Denison T6C Vane Pump:	Pass
Vickers 35VQ25 Vane Pump Test:	Pass
104/105C Vane Pump Test:	No Data Available
Vane pump test total ring and vane wear, mg.	<10
Oxidation Stability	
Turbine Oil Stability Test Life, hours	2500+
Rotary Bomb Oxidation Test, minutes	325
FZG Spur Gear Test, Failure Load Stage (FLS)	12





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Assembly of Farr Hydraulic Power Tongs is simple, and can be accomplished without the use of special tools. The instructions on this page are presented as a guide only, and are similar to the assembly sequence our technician would use while assembling the tong in our plant. There is also a section on disassembly in preparation for overhaul, which can be found in the Maintenance section of the manual. However, this assembly section should be used as a specific guide to assembly.

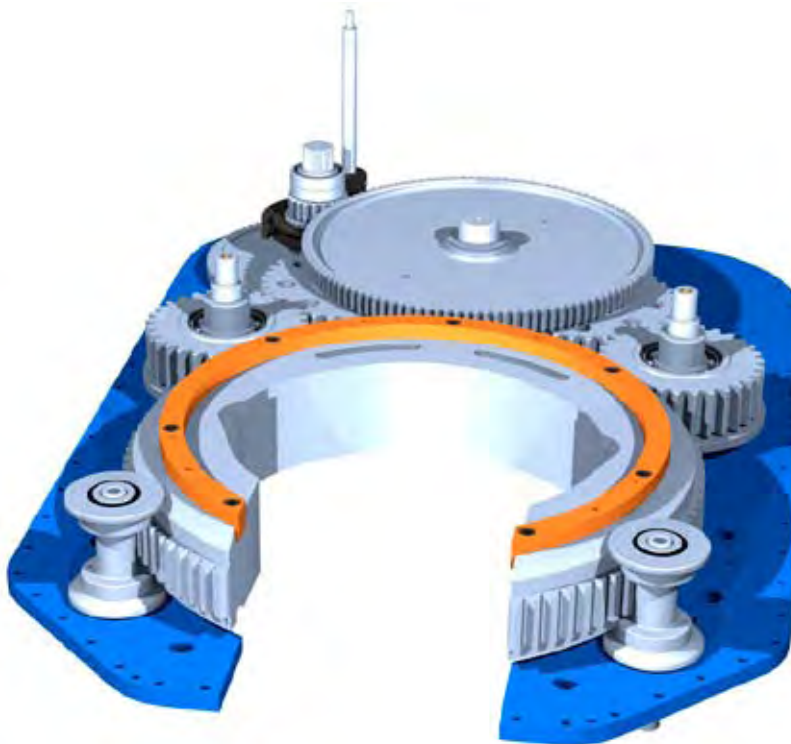
ASSEMBLY SEQUENCE

1. Position the tong body gear case on a suitable stationary support such that the bottom body plate is accessible. Also ensure the tong will be high enough to allow installation of the front and rear legs.
2. Press bearing into bottom pinion bearing cap, and install bearing cap into bottom plate of tong.
3. Press bearing into clutch bearing cap, and install bearing cap into bottom plate of tong.
4. Press one each of the cylindrical roller bearings, PN 1393-106, into each of the rotary idler gear plates. Assemble the rotary idler gear stacks (See Pp. 7.12 - 7.13), and place bottom end of idler shafts through the bottom plate. The bottom idler pads and large nylock nuts may be loosely installed at this time - do not tighten completely. Do not install the top idler gear plate/bearings and idler gear spacers at this time.
5. Place low pinion gear shoulder side down over the lower bearing and bearing cap, centering as best as able. Ensure there is a pinion gear spacer, PN 1374-94, installed between the gear and bearing.
6. Slide two clutch shaft spacers, PN 1374-47, onto clutch shaft (one on either side of centre gear), and press them firmly against the centre gear. Slide two needle roller bearings, PN 1374-53, onto clutch shaft (one on either side of centre gear), and press them firmly against the clutch shaft spacers.
7. Slide the high clutch gear over the lower needle bearing. Place lower end of clutch shaft into the lower clutch bearing that has been pre-mounted in the lower body plate.
8. Assemble pinion idler gear stacks and install in to bottom plate of tong. The bottom large nylock nuts and 3/4" bolts may be loosely installed at this time - do not tighten completely
9. Slide pinion gear shaft through the spline of the bottom pinion gear and into the lower pinion bearing.
10. Install shifting collar which will slip over clutch shaft and mesh with low or high clutch gear.
11. Slide the low clutch gear over the end of the clutch shaft and over the previously installed needle bearing.
12. Place the shifting fork up against the shifting shifting collar, roughly in its final position.
13. Install top pinion gear (shoulder side up) and the top pinion gear spacer.
14. Slide one of the two top clutch bearings, PN 1374-56, over the end of the clutch shaft and press firmly against the low clutch gear.
15. Place two support roller assemblies, less the shafts and the top washers, near the front of the tong. These, along with the bottom gear plates on the rotary idler, will be used to support the initial installation of the rotary gear. Liberally grease the shafts for the support roller assemblies, and slide each shaft into a support roller assembly from the bottom. Insert shaft until the top of the shaft protrudes just above the support roller sleeve (see illustration next page).

ASSEMBLY SEQUENCE (continued):



16. Install rotary gear. Note that the backing pin grooves are in the top side of the rotary gear. Support the rotary gear using the two previously placed support roller assemblies. Ensure that the brass guide ring is installed into the top of the rotary gear.



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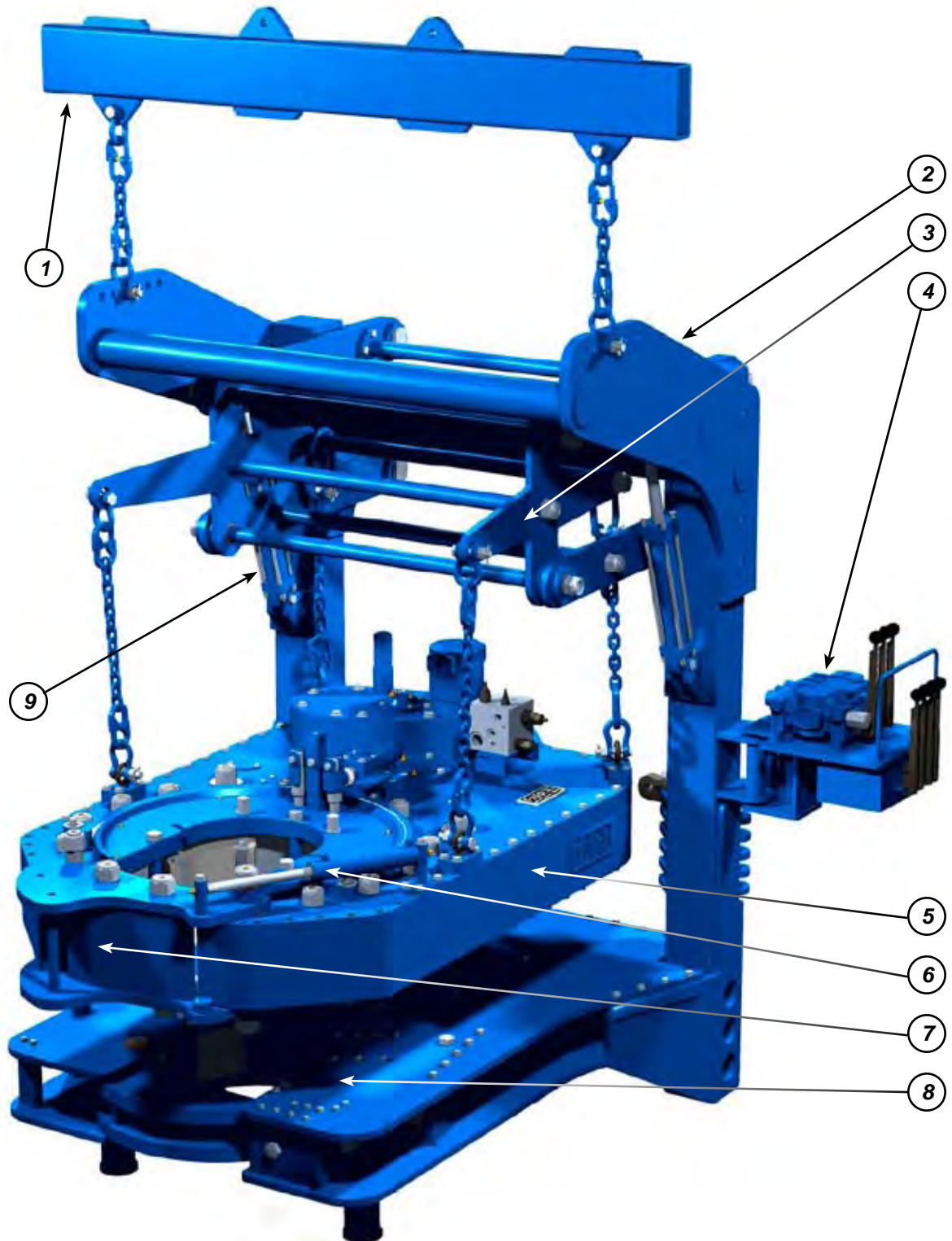
17. Install the remainder of the support roller assemblies around the rotary gear, not including the door pivot and latch roller assemblies. Insert the remainder of the support roller shafts so that they protrude just above the top of the inner support roller sleeve.
18. Position the side body assembly and fasten in place from the bottom.
17. Position the top plate in its proper location and insert dowel pins. Use caution not to damage threads when aligning the top plate with the idler and support roller shafts.
18. Loosely install top plate fasteners - do not tighten completely at this point.
19. Gently tap the support roller shafts from the bottom up through the top plate. Position shafts so that there is roughly the same amount protruding from the top plate as there is from the bottom plate.
20. Loosely install the remaining nylock nuts for the support roller shafts - do not completely tighten at this time.
21. Loosely install the remaining 1-1/2" nylock nuts and washers onto the rotary idler assemblies - do not completely tighten at this time.
22. Press the remaining bearing in the pinion assembly into the top pinion bearing cap, and install the bearing cap in the top plate of the tong.
23. Install the remaining clutch bearing, PN 1374-56, into the top clutch bearing retainer, and install clutch bearing retainer into top plate. Secure with four 3/8" NC x 1-1/4" hex socket head cap screws.
24. Press cylindrical roller bearing, PN 02-0374, into the Reduction Pinion Gear bottom gear retainer, and install retainer in top plate. Secure the retainer with two 3/8" NC x 1-1/4" hex socket head cap screws.
25. Install reduction pinion gear into bottom gear retainer.
26. Press lower shifting shaft bushing into the top plate of the tong.
27. Install clutch drive gear and retaining snap ring. Ensure the drive gear is installed shoulder-side down, as this is how the gear maintains correct spacing in the stack (it rotates in contact with the bearing race).
28. Press bottom motor bearing retainer into top plate of tong. Press cylindrical roller bearing, PN 02-0123, into the bearing retainer.
29. Install drive gear onto the reduction pinion gear and secure with snap ring.
30. Press four motor mount locating dowel pins into top plate.
31. Install motor mount side body.
32. Press cylindrical roller bearing, PN 02-0374, into the Reduction Pinion Gear top bearing cap. Install bearing cap into the top motor mount plate.
33. Press four top plate locator dowel pins into the top of the motor mount side wall.
34. Install motor mount top plate. Secure with two 5/8" NC x 5-1/2" hex cap screws and six 1/2" NC x 5-1/2" hex cap screws. Do not neglect to install washers.
35. Slide motor gear spacer, PN AX01-307, over motor shaft and secure with modified cap screw, PN 101-1638.
36. Install motor/gear assembly and secure with four 1/2" NC x 1-1/2" hex cap screws and plain narrow washers.

14"- 80K Tong & Wedge Backup

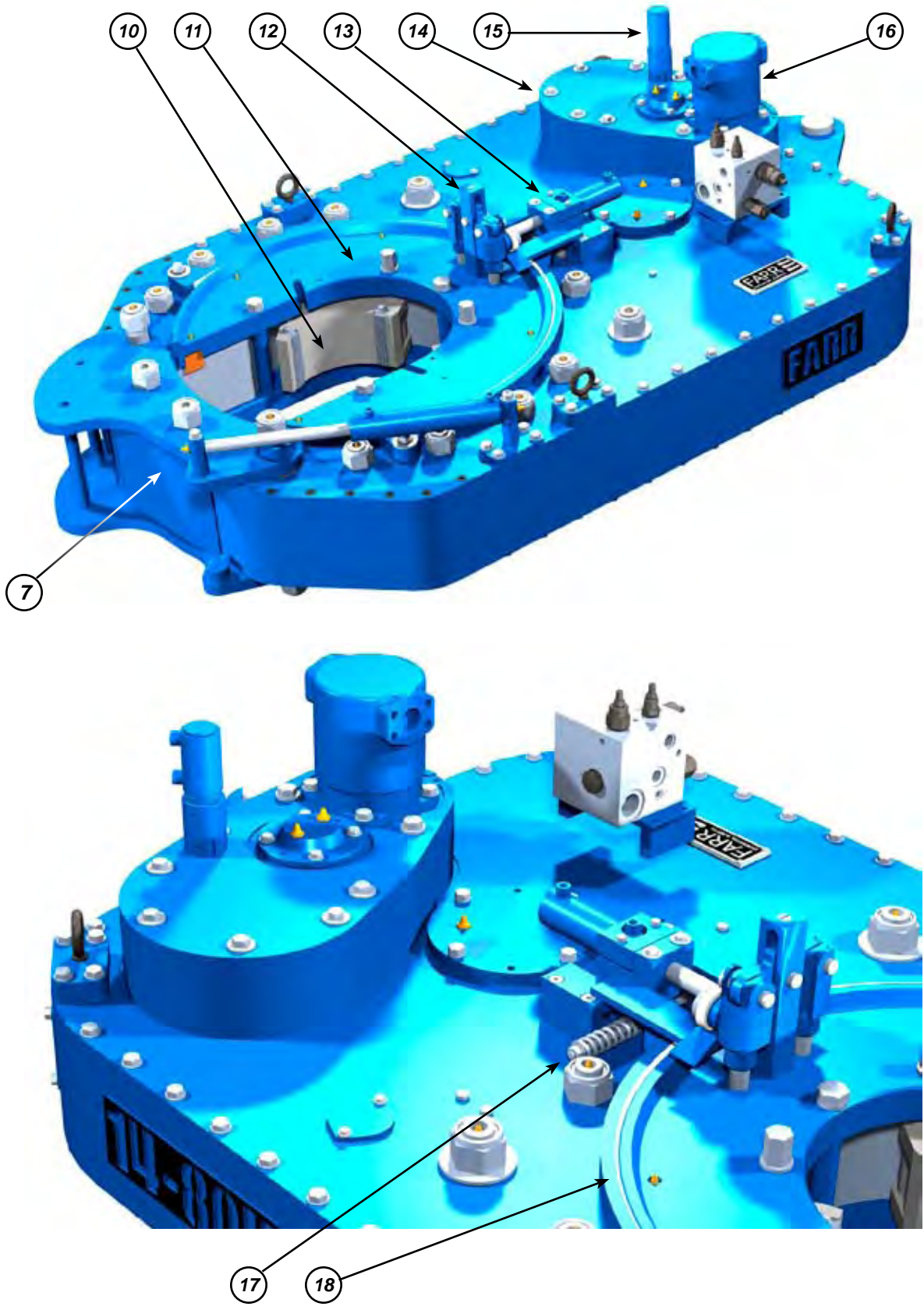
36. Thread shifter cylinder shaft guide, PN 1393-71R-02, into the top motor mount plate.
37. Thread the shifter shaft coupling onto the shifter shaft guide installed in previous step.
38. Install hydraulic shift cylinder assembly. Guide the shaft through the upper shaft guide and lower shifting shaft bushing, and mate with shifter fork. Thread the cylinder barrel into the shifter shaft coupling, and secure shaft to shifting fork with a 3/4" nylock nut.
39. Install the bottom brass guide ring into the bottom cageplate using seven 5/8" NC x 2" hex socket head cap screws.
40. Position the cageplates, and attach the bottom cage plate to the top cage plate, securing it in place with three 7/8" NC x 11-1/2" hex cap screws and three 7/8" NC nylock nuts. Do not neglect to install the three cageplate spacers.
41. Install the door pivot and latch support roller components that fit within the body plates, i.e. everything except the roller shafts, nuts, washers, and door stop spacers.
42. Install the two door support rollers in the door weldment.
43. Install the door pivot bushings in the door weldment assembly.
44. Align the door pivot holes with the pivot holes in the top and bottom plates. NOTE: Do not neglect to install the two door pivot washers between the top and bottom plate, and the door weldment.
45. Insert the door pivot roller shaft from the bottom - it may have to be tapped lightly with a soft metal or rubber hammer. Use caution when sliding the shaft through the support roller components. Once the shaft has been tapped all the way through, secure with washers and nylock nuts. Use the same procedure to complete assembly of the door latch roller, and do not neglect to install the top and bottom door stop spacers.
46. Bolt rear door cylinder support post to top plate of tong.
47. Install door cylinder - secure onto posts with 1/2" thin nylock nuts and 1/2" washers.
48. Install top and bottom brakeband assemblies.
48. Attach remote cylinder mounting block onto the "cutout" side of the backing pin support plate using two 3/8" NC x 1-1/4" hex cap screws and two 3/8" lockwashers.
49. Install remote backing pin support plate to top plate of tong using four 3/8" NF x 3" hex flat head cap screws.
50. Install remote backing pin cylinder into the mounting block using the cylinder mount cover, and secure with two 1/4" NC x 1-3/4" hex cap screws and two 1/4" lockwashers.
51. Install remote backing pin ramp weldment
52. Attach the backing pin arm assembly to the top cageplate using two
53. All top plate fasteners, all support roller fasteners, all gear bearing cap fasteners, and all other fasteners on the tong assembly may now be tightened.

Adequate setup and proper hydraulic connections are essential in ensuring reliable operation of your tong. For best results and long term reliability, read and obey the start-up instructions in this section.

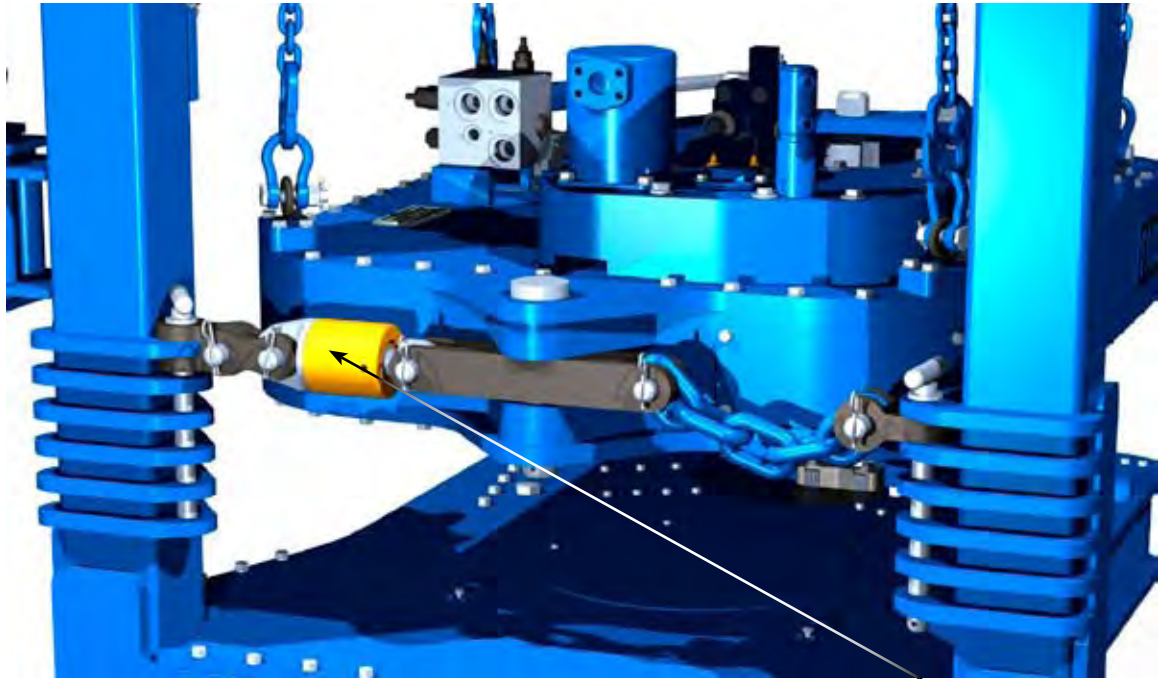
A. MAJOR COMPONENT IDENTIFICATION



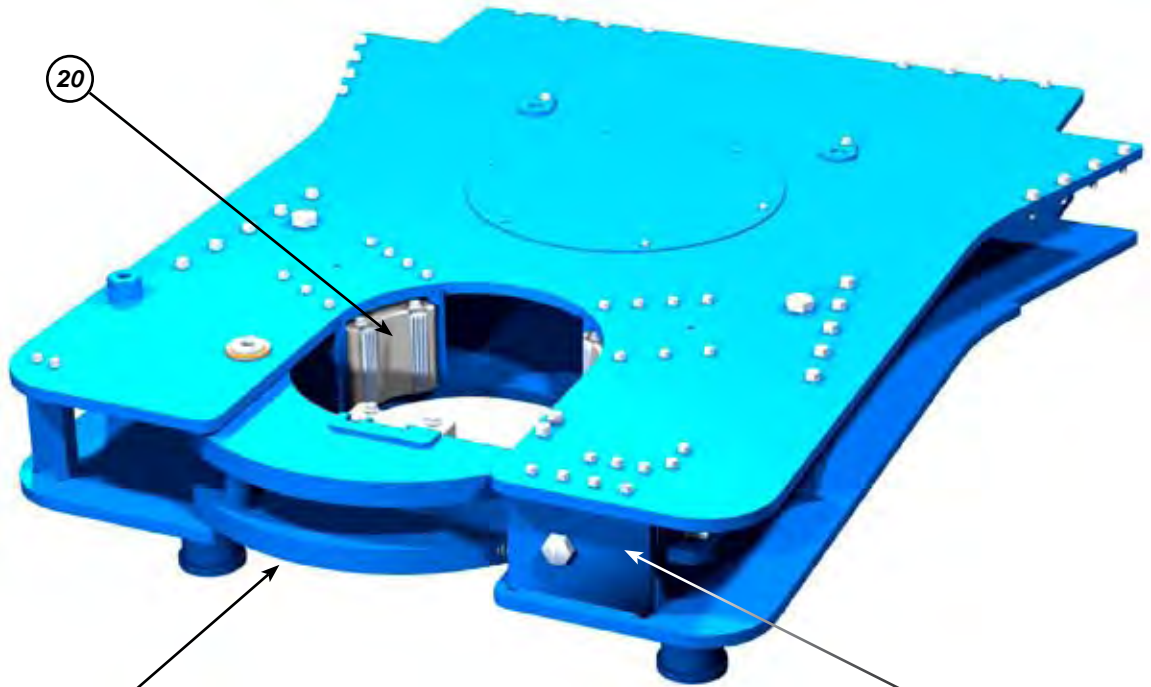
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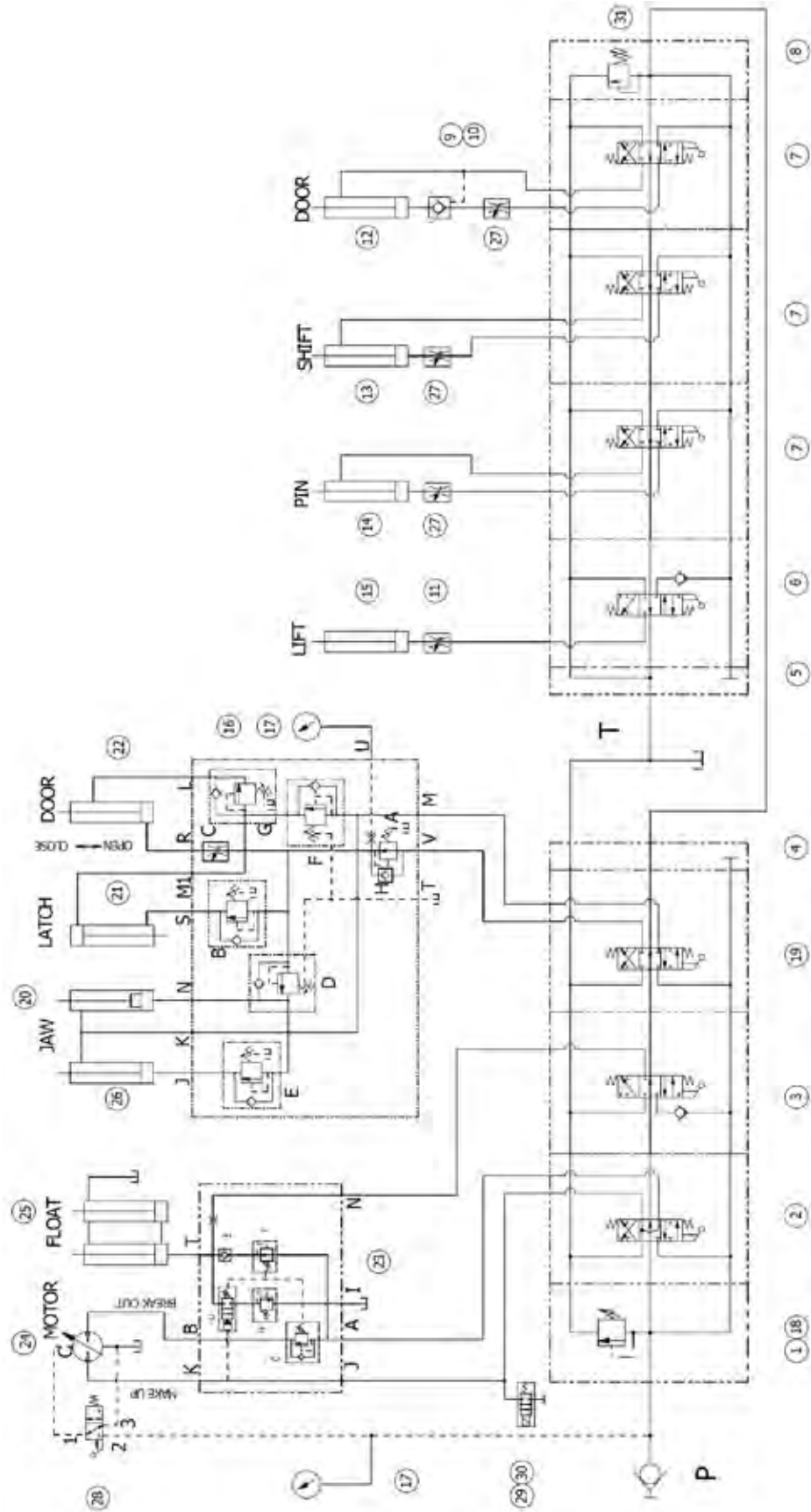
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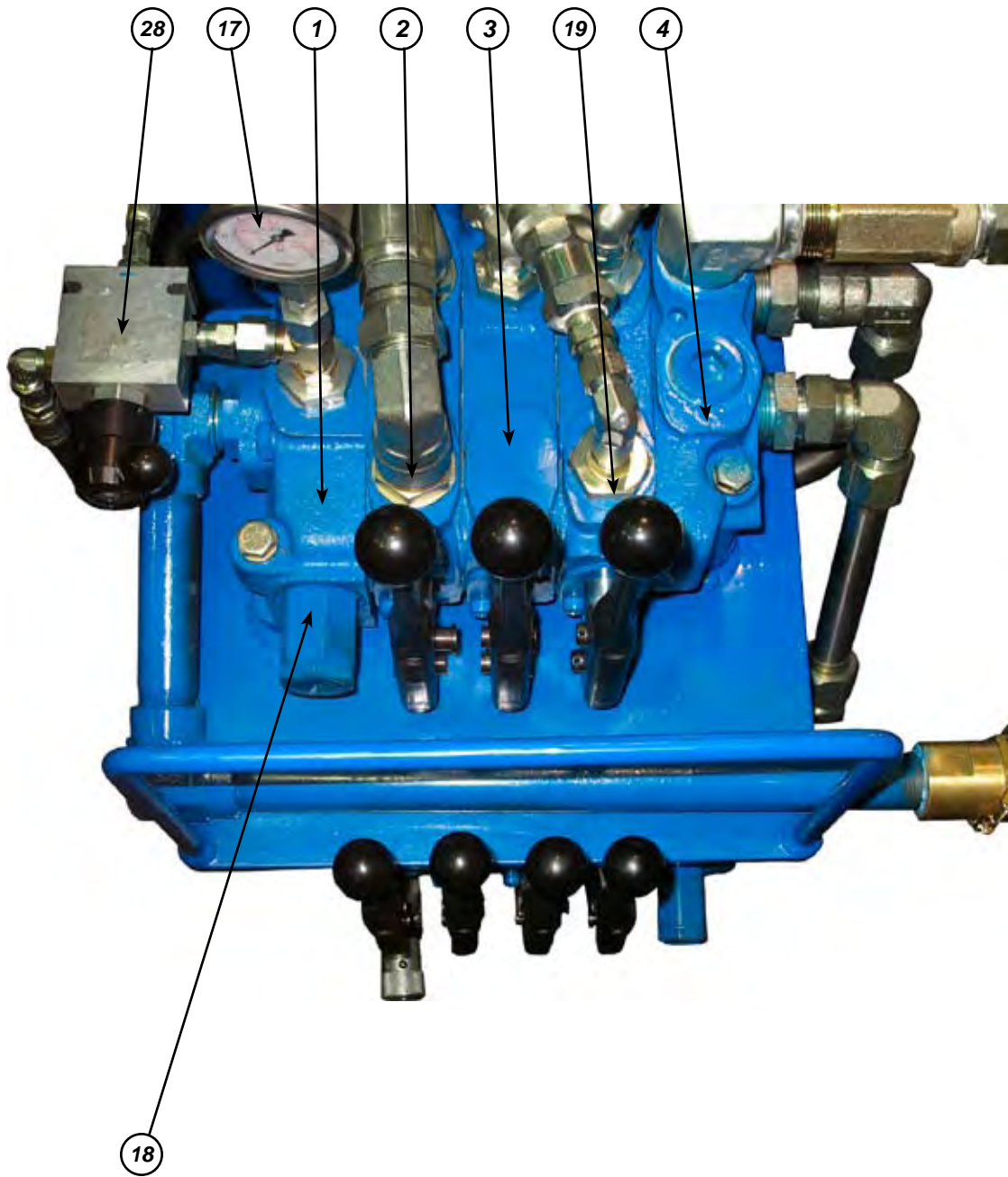


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B. HYDRAULIC SCHEMATIC / COMPONENT IDENTIFICATION

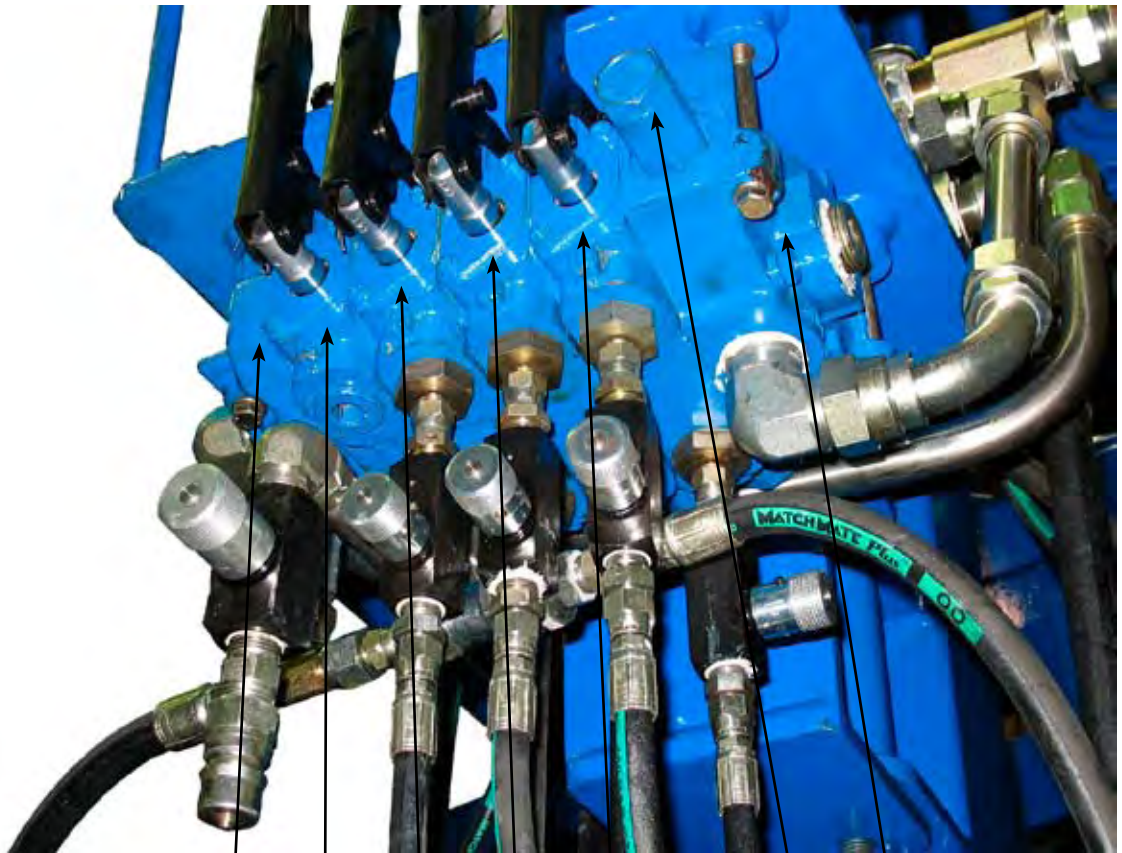




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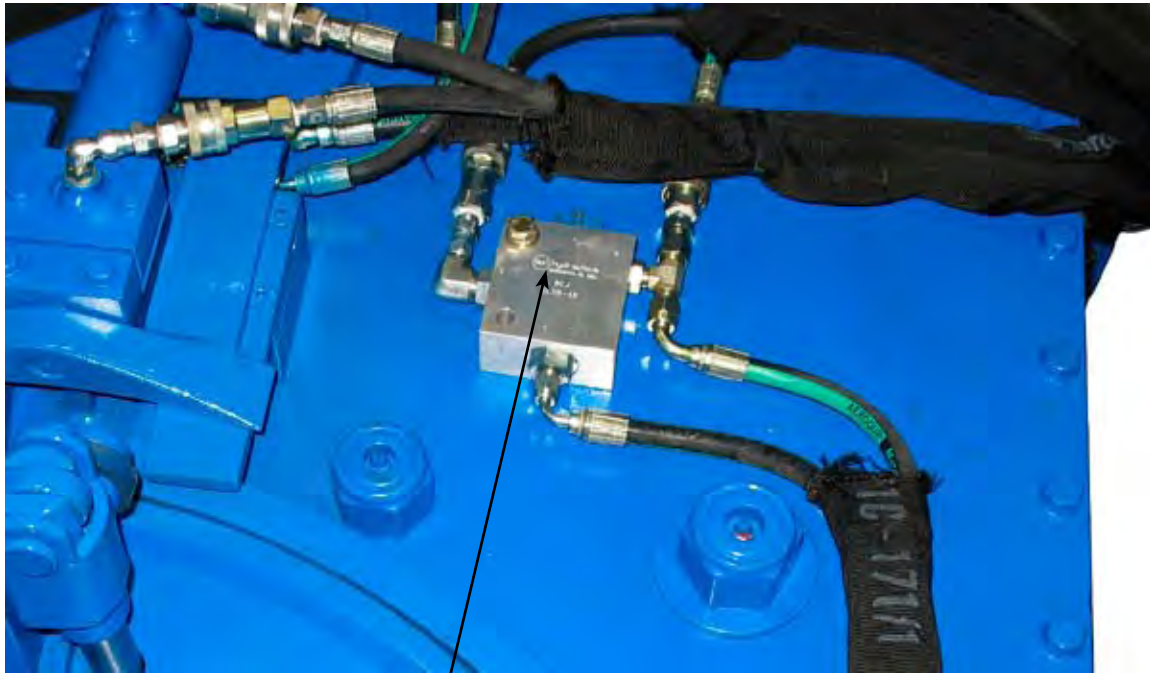
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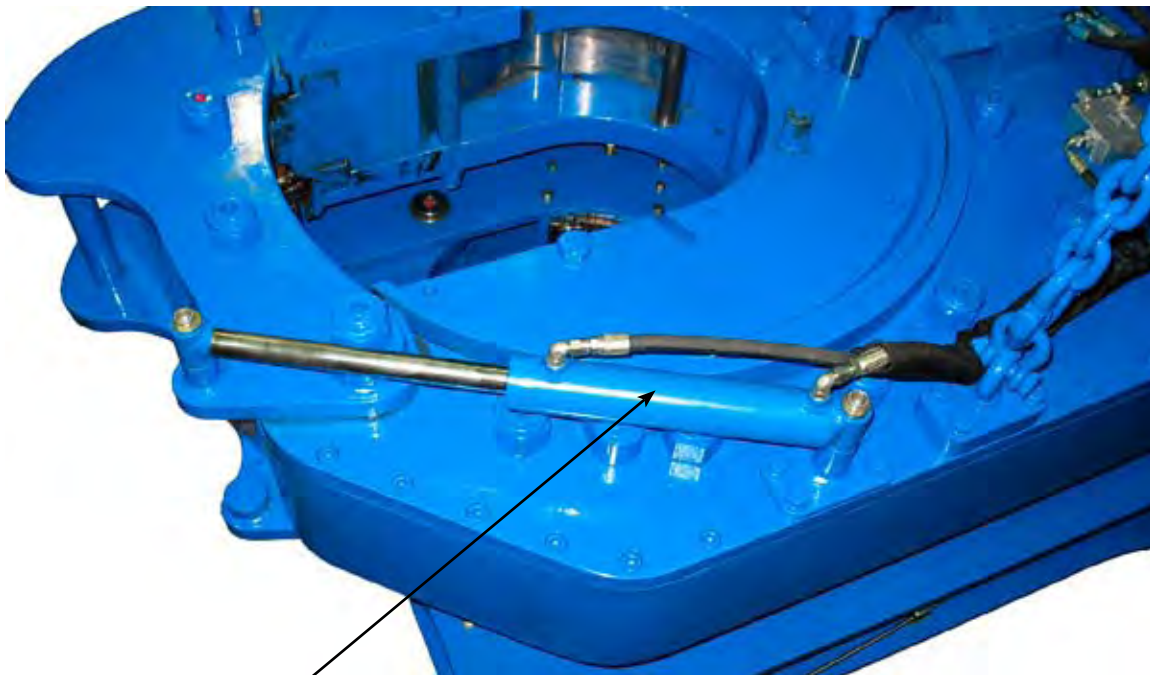
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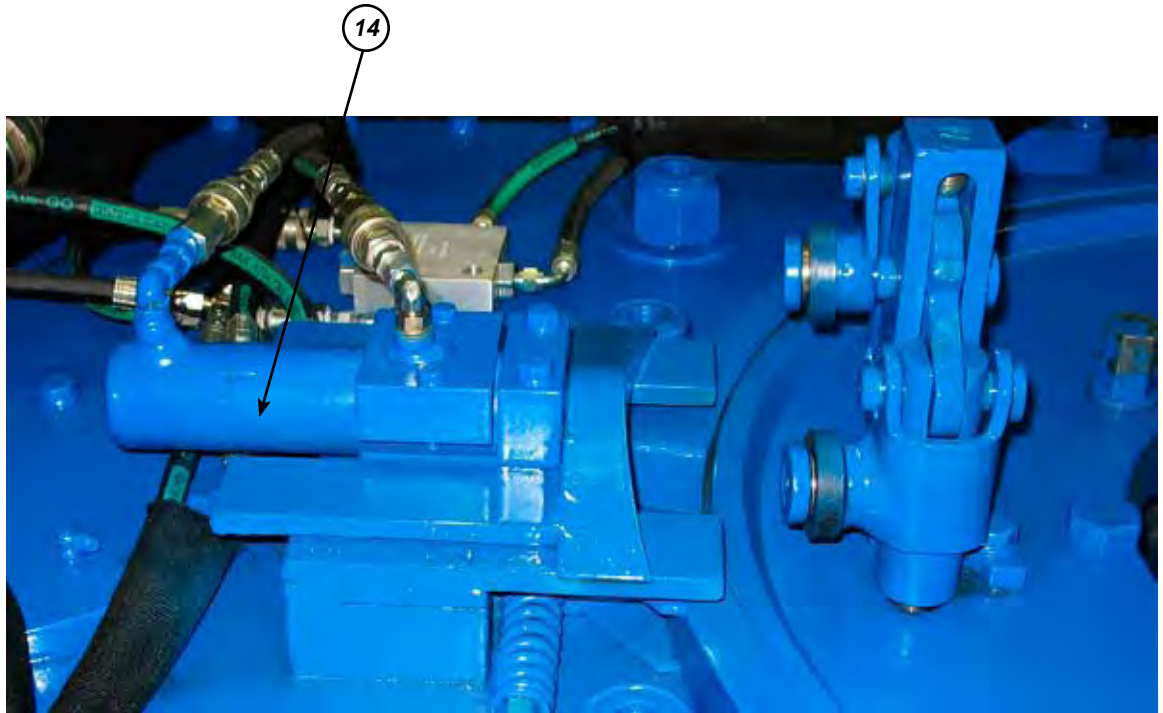
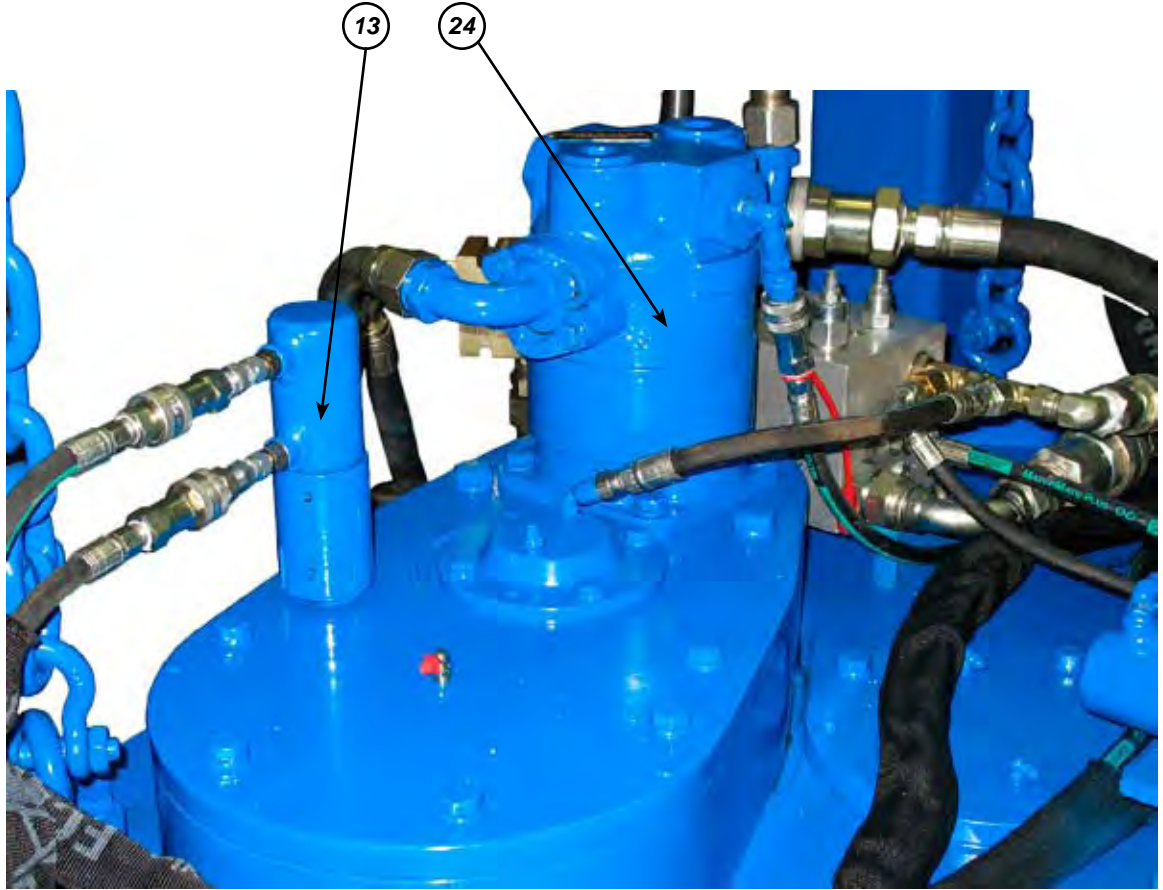
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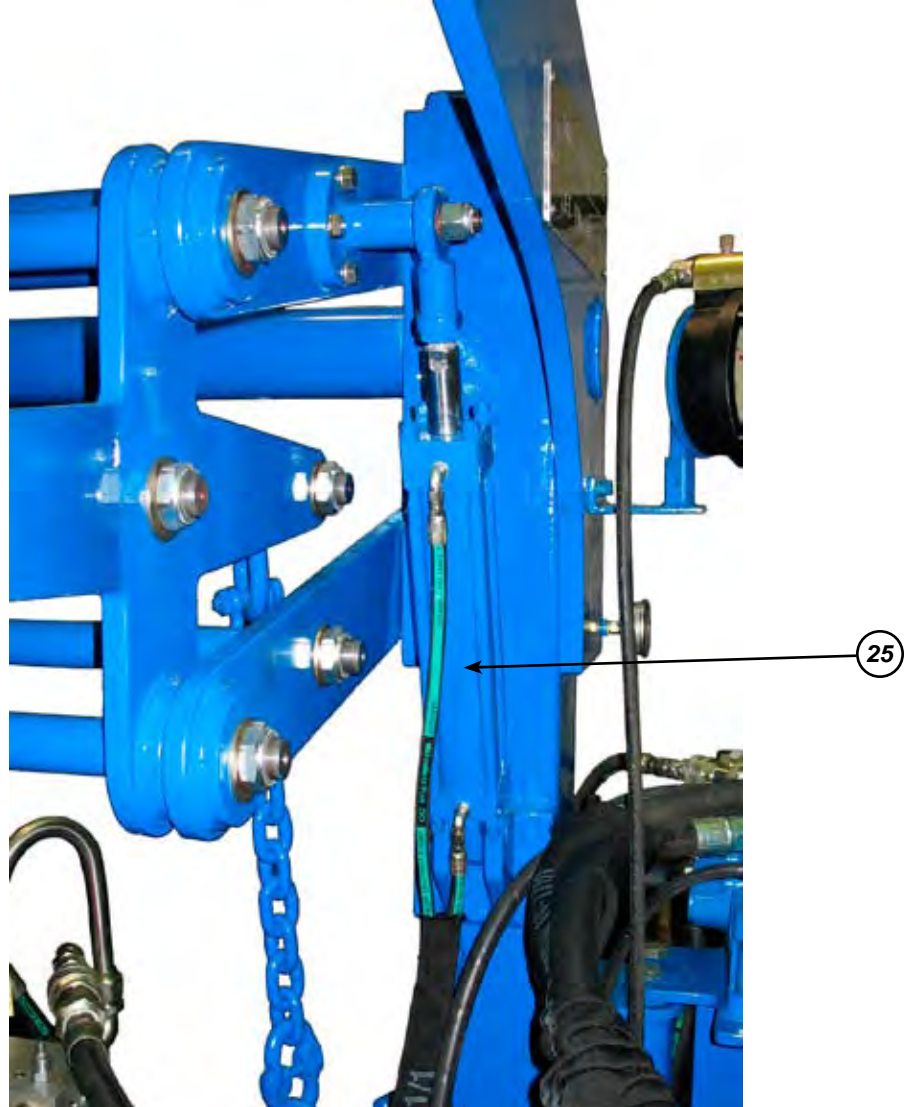
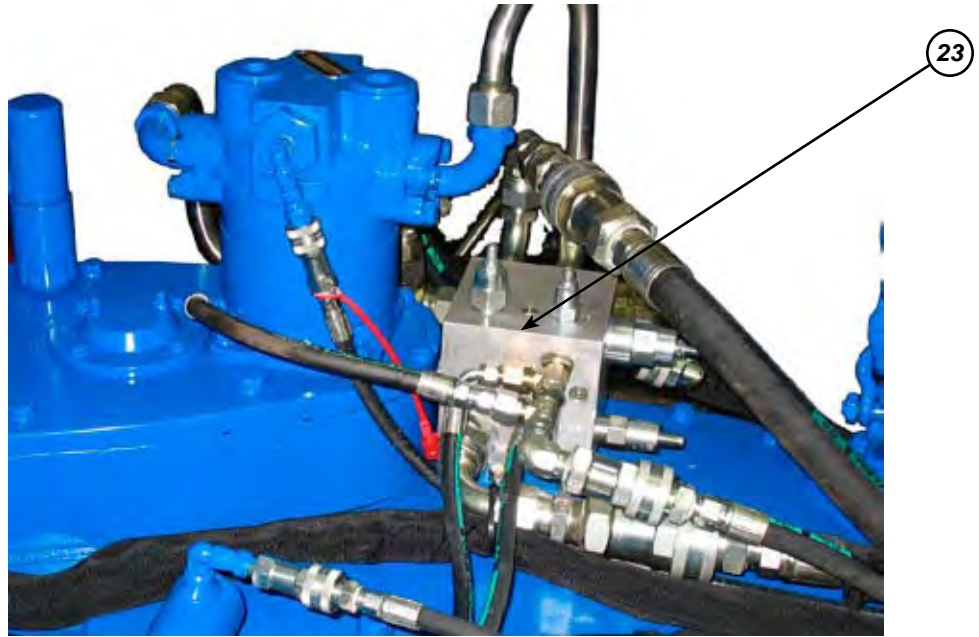
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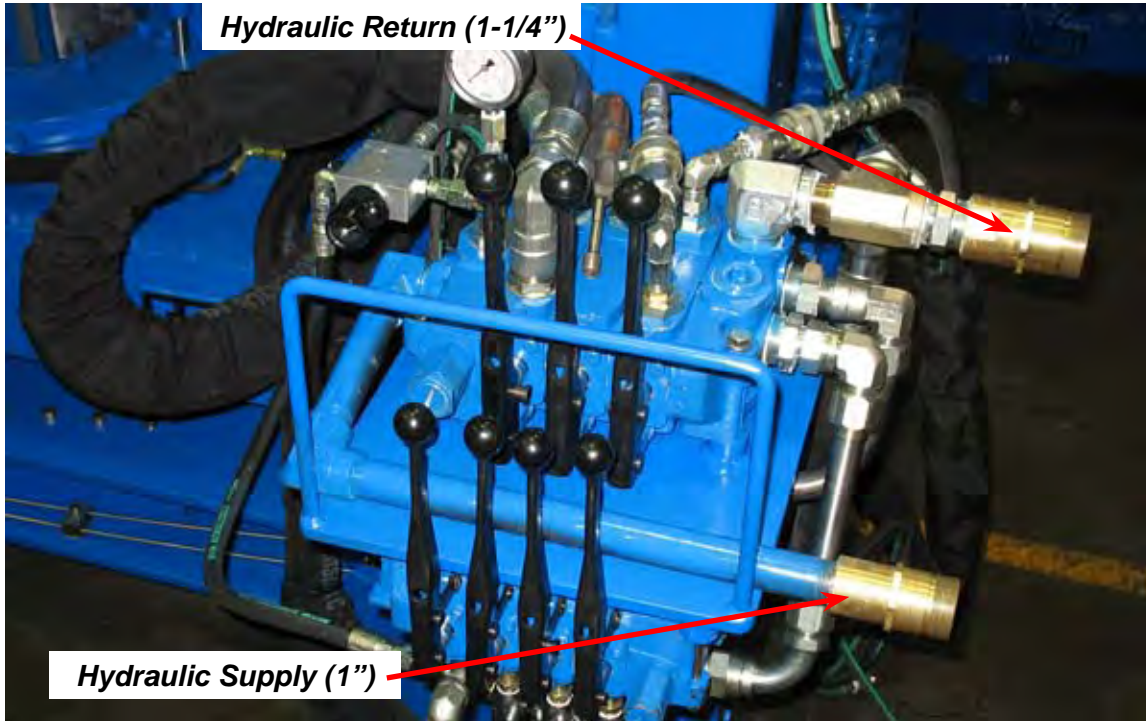
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4	Outlet Section, DVA35-PB09	08-1825	3.6
5	Outlet Section, DVA20-TR88	10-0027	3.7
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15	Lift Cylinder (Not Shown)	1411-200-000	
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23	Float Hydraulic Block	101-1198	3.11
24	Rineer 2-Speed Motor, MO15-62-1S-015-31-B1-TB	87-0006	3.9
25	Float Cylinder	AC05-000B	3.11
26	Backup Clamp Cylinder (Without Spacer)	HYC-105	3.10
27	Needle Valve, Parker N600S	08-9064	3.7
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31	Relief Valve Cartridge, DVA20-MRV **	10-0025R	3.6

**** Relief valve DVA20 is not used in this application - it is typically completely shut down.**

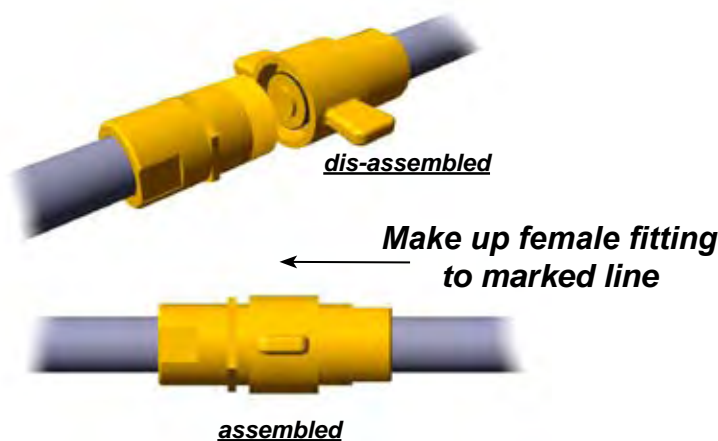
C. HYDRAULIC CONNECTIONS

A pair of hydraulic lines - a 1-1/4" supply line and a 1" return line - connect the tong to the power unit (see illustration below). Ancillary devices (hydraulic motors, hydraulic cylinders, etc.) are connected through the valve block.

Perform any hydraulic connection when the power unit is not running, or when the hydraulic pump is disengaged. The possibility of error in inter-changing the high pressure supply hose and the low pressure return hose has been eliminated, because the supply side coupling is smaller than the return side.



These hose couplings are self-sealing, and care should be taken to ensure complete engagement to prevent partial closure of the check valve in the coupling. Ensure that the nut (female) side is completely made up onto the male connector - there is a line on the male fitting that indicates complete make-up. Snug the female fitting right up to the line.



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D. TONG JAW AVAILABILITY & INSTALLATION**1. AVAILABLE JAWS**

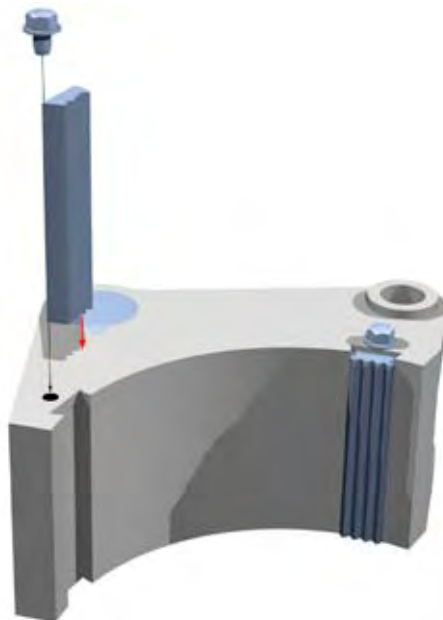
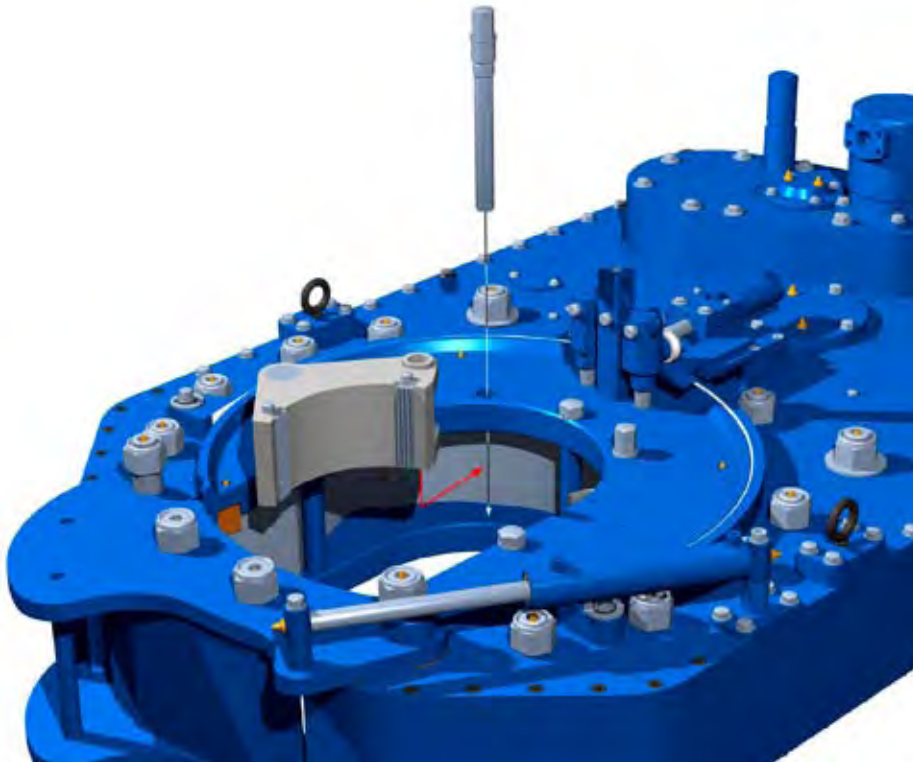
The following table lists all jaw die kits that are available as standard sizes for this model of tong. If your desired size is not listed, Farr can engineer custom jaw sizes - contact the sales department for further information.

Description	Part Number
4" Jaw Die Kit	1393-JDK-340
4 - 1/2" Drill Pipe Jaw Die Kit	1393-JDK-45DP
4 - 1/2" Jaw Die Kit	1393-JDK-345
5" Drill Pipe Jaw Die Kit	1393-JDK-50DP
5" Jaw Die Kit	1393-JDK-350
5 - 1/2" Jaw Die Kit	1393-JDK-355
6-1/2" Jaw Die Kit	1393-JDK-358
6-5/8" Drill Pipe Jaw Die Kit	1393-JDK-6625DP
6-5/8" Jaw Die Kit	1393-JDK-360
6-7/8" Drill Pipe Jaw Die Kit	1393-JDK-6875DP
7" Jaw Die Kit	1393-JDK-365
7-1/2" Jaw Die Kit	1393-JDK-368
7-5/8" Jaw Die Kit	1393-JDK-370
7-3/4" Jaw Die Kit	1393-JDK-371
8" Jaw Die Kit	1393-JDK-374
8-1/4" Jaw Die Kit	1393-JDK-372
8-1/2" Jaw Die Kit	1393-JDK-373
8-5/8" Jaw Die Kit	1393-JDK-375
9-5/8" Jaw Die Kit	1393-JDK-380
9-7/8" Jaw Die Kit	1393-JDK-385
10" Jaw Die Kit	1393-JDK-188
10-3/8" Jaw Die Kit	1393-JDK-387
10-5/8" Jaw Die Kit	1393-JDK-388
10-3/4" Jaw Die Kit	1393-JDK-390
11" Jaw Die Kit	1393-JDK-393
11-3/4" Jaw Die Kit	1393-JDK-395
11-7/8" Jaw Die Kit	1393-JDK-397
12-3/4" Jaw Die Kit	1393-JDK-398
13-3/8" Jaw Die Kit	1393-JDK-400
13-1/2" Jaw Die Kit	1393-JDK-401
13-5/8" Jaw Die Kit	1393-JDK-402
14" Jaw Die Kit	1393-JDK-405
14-3/8" Jaw Die Kit	1393-JDK-410
Standard 5" Die Insert	12-1005

2. JAW REMOVAL/INSTALLATION

- Remove jaw pivot bolt.
- Remove the jaw assembly - slide it up and out away from the cageplage assembly
- Remove the two die - if they do not slide out easily they may have to be lightly tapped.

Reverse this procedure to install new jaw dies.



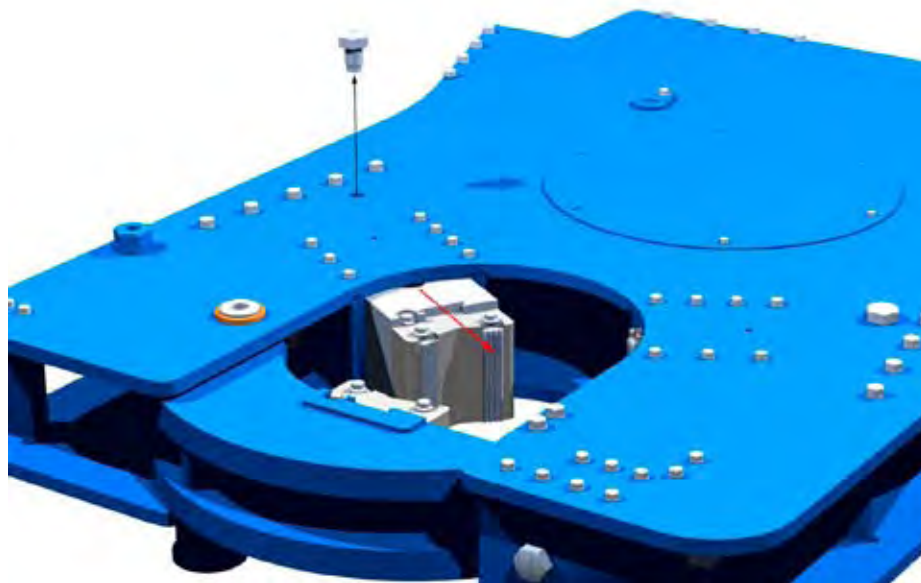
3. BACKUP JAWS

The following table lists all inserts that are available as standard sizes for your wedge backup. If your desired size is not listed, Farr can engineer custom jaw sizes - contact sales for further information.

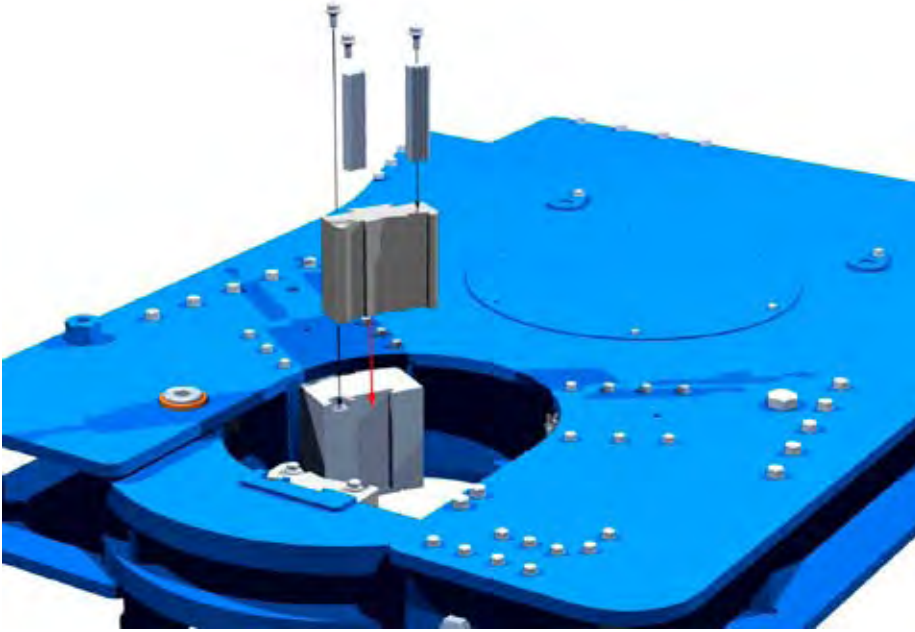
Description	Part Number
4 - 1/2" Jaw Die Kit	AD21-JDK-04500
5" Jaw Die Kit	AD21-JDK-05000
5 - 1/2" Jaw Die Kit	AD21-JDK-05500
6 - 5/8" Jaw Die Kit	AD21-JDK-06625
7" Jaw Die Kit	AD21-JDK-07000
7 - 5/8" Jaw Die Kit	AD21-JDK-07625
8 - 1/2" Jaw Die Kit	AD21-JDK-08500
8 - 5/8" Jaw Die Kit	AD21-JDK-08625
9 - 5/8" Jaw Die Kit	AD21-JDK-09625
10" Jaw Die Kit	AD21-JDK-10000
10 - 3/4" Jaw Die Kit	AD21-JDK-10750
11 - 3/4" Jaw Die Kit	AD21-JDK-11750
12.125" Jaw Die Kit	AD21-JDK-12125
12.142" Jaw Die Kit	AD21-JDK-12142
13 - 3/8" Jaw Die Kit	AD21-JDK-13375
13 - 5/8" Jaw Die Kit	AD21-JDK-13625
14" Jaw Die Kit	AD21-JDK-14000
14 - 3/8" Jaw Die Kit	AD21-JDK-14375
14 - 5/8" Jaw Die Kit	AD21-JDK-14625
14.955" Jaw Die Kit	AD21-JDK-14955
Standard 5" Replacement Die	12-1005

BACKUP STANDARD AD21 JAW REMOVAL/INSTALLATION

- i. Remove 1" x 1-1/2" ram retaining bolt to allow ram and jaw assembly to slide forward. Slide ram towards the centre of the backup opening.



- ii. Remove the 3/8" x 1" flange head screw to release the die holder. Slide the die holder up to remove. Remove the two standard die by removing the two 3/8" x 1" flange head screws, and then sliding the die up and out of the die holder. If the fit is too tight, the die may have to be lightly tapped to free them. Reverse these two steps to install new die. Ensure that the ram retaining bolt has been properly and securely reinstalled.



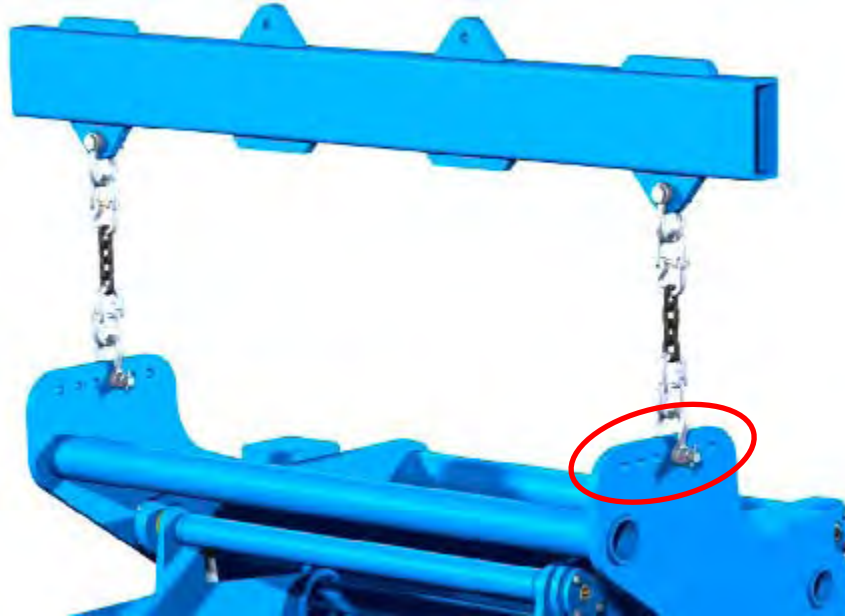
E. LEVELING TONGS

In order to ensure that the dies on the tong and backup are able to evenly grip the pipe, and to ensure generally smooth operation of the rotary gear, it is essential that the tong is hung level within the frame. If the tong is not level once it is hung, adjust the level by adding or removing chain links to the chain hangers.



LEVELING THE SPREADER BAR

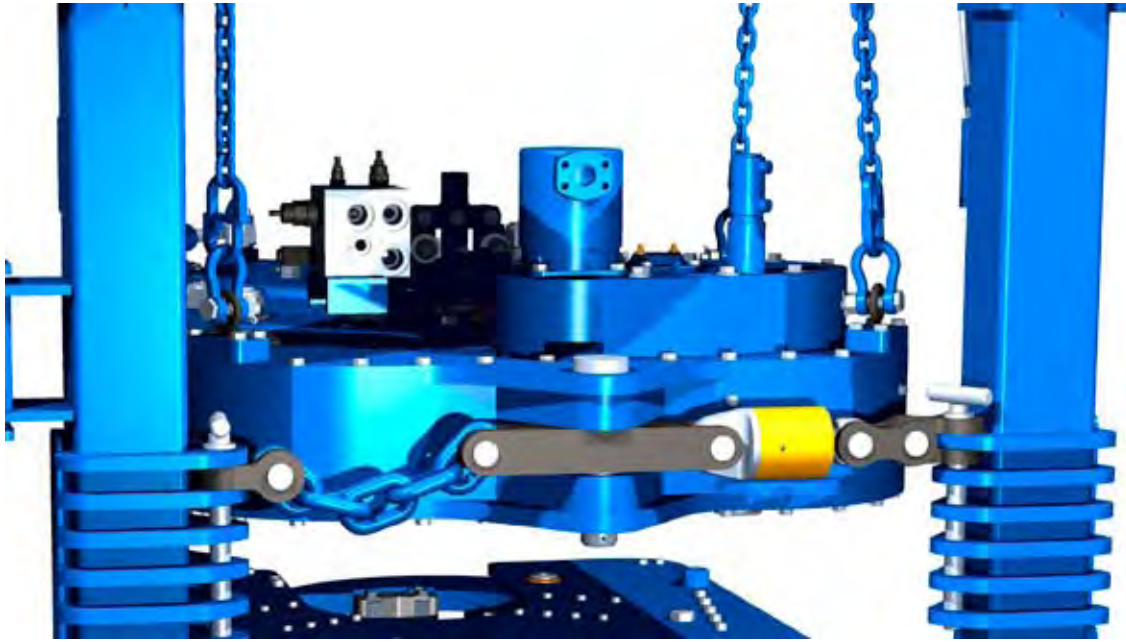
The spreader bar may be leveled "front-to-back" by moving the connecting chains to different locating holes on the frame assembly. Ensure the the connector chains are connected to the same locator holes on each side of the frame to prevent the possibility of misaligning the frame.

**F. BACK-UP LINE & TENSION LOAD CELL**

The use of the 3/4" chain set in combination with the tension load cell ensures a constant and positive reading of torque. To assure accurate operation of the load cell and torque gauge, the chain set should be connected at a 90 degree angle with the tong, and in the same horizontal plane as the load cell (square and level) - (see following illustration). Note that the load cell assembly in the illustration below is set up for making up a joint.



When the tong and backup assembly is being used to break out a joint, please note that the configuration of the load cell assembly must be the reverse of the make-up configuration. The illustration below demonstrates the load cell assembly in the "break-out" configuration.



F. TONG OPERATION

1. INITIAL START UP & BREAK-IN PROCEDURE

ALTHOUGH YOUR NEW EQUIPMENT HAS BEEN TESTED AND INSPECTED AT THE FARR FACTORY PRIOR TO SHIPPING, WE ADVISE THOROUGH TESTING OF YOUR NEW TONG AFTER YOU TAKEN POSSESSION IN ORDER TO ELIMINATE THE POSSIBILITY OF SHIPPING DAMAGE.

Farr recommends that the following pre-operating tests be performed prior to releasing the tong assembly to a operational environment:

- Operate the tong at full speed and in high gear for a duration of one-half hour.
- Switch to low gear and operate for an additional one-half hour at full speed.
- Inspect all components and hydraulic fittings for possible defects following completion of the tests. All FARR Tongs have been thoroughly tested at the factory prior to shipping and any defects may be the result of shipping damage.



DOOR MUST BE CLOSED AND SECURELY LATCHED BEFORE THE POWER UNIT IS STARTED IN ORDER TO ASSURE THE SAFETY OF OPERATING PERSONNEL.

Ensure adequate lube oil and hydraulic oil levels before starting engine. Use start up procedures as recommended by the power unit engine operator's manual. Open the Bypass Valve on the hydraulic system, and inspect all pressure and return line hose connections to ensure correct and secure installation.

IMPROPERLY SECURED HYDRAULIC CONNECTIONS WILL INTERRUPT HYDRAULIC FLUID FLOW, AND COULD RESULT IN THE FOLLOWING FAILURES:

- A restriction in the pressure supply hose will result in high pressure within the power unit hydraulic system, which will activate the hydraulic governor and increase the engine speed to as high as maximum RPM.
- A restriction in the return line will result in high pressure within the power unit and the tong hydraulic system, causing engine speeds as high as maximum RPM, and possible failure of the motor seal.

Following inspection of the hoses, start the engine and allow it to idle until warm. Allow hydraulic fluid to circulate for approximately 10 minutes, then slowly close the Bypass Valve to allow hydraulic fluid to circulate through the hoses and to the tong (circulating pressure should not exceed 200 psi). Place the tong gear shifter in low gear and rotate the tong slowly forward and then reverse with the throttle valve control lever. Once this has been done and the proper size jaws have been installed, the tong is then ready to run pipe.

2. VALVE OPERATION

Single- and dual-acting hydraulic valves control operation of hydraulic devices on the tong assembly. Devices typically include hydraulic motors and cylinders. When any one valve is "centered" or in the detent position, there is no hydraulic output from the valve. When the valve is pushed forward there is an effect, and in the case of a dual-acting valve, when the valve is pulled back there is an opposite effect. Several of the valves feature proportional control, which means that further extension of the valve handle (thereby further opening the valve orifice) results in proportionally higher hydraulic output to the controlled device. In the case of a tong motor the speed of the motor can be controlled by the position of the valve handle, in the case of a lift cylinder the rate of extension can be controlled, etc. Some control valves are connected in turn to sequenced valves, meaning that actuating a single control valve will control actuation of several hydraulic devices in sequence - for instance, closing the backup doors, followed by compressing the wedge rams.

The following illustrations demonstrate the type and effect of each valve on the valve bank, as well as the corresponding symbol on the valve control plate.





TONG MOTOR SPEED

This is a simple three-way valve. When the valve handle is turned fully clockwise, as in the illustration below, the tong motor will run at its highest speed. Rotating the valve handle fully counter-clockwise (roughly a 90 degree rotation) will run the motor at its low speed, approximately one-half the RPM of high speed.



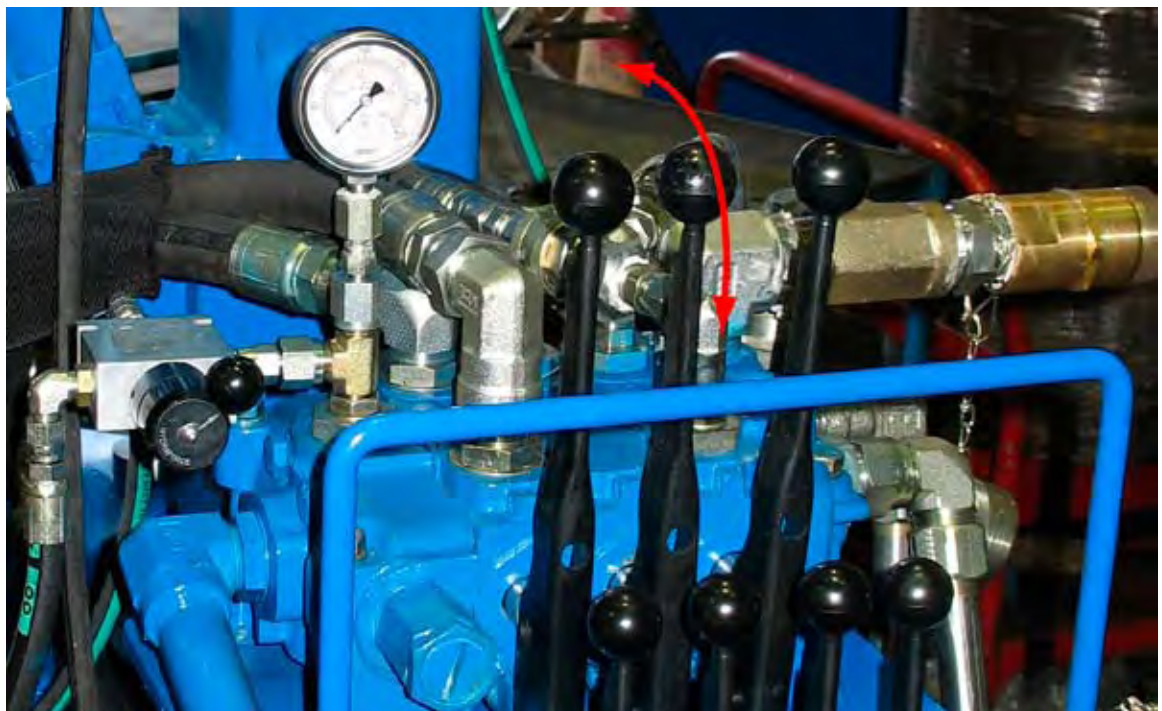
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TONG MOTOR

This is a proportional cross-action valve. Pushing and holding the valve handle forward will cause the tong motor to rotate in a clockwise direction (as seen from the motor side of the tong). This is the desired direction of rotation for making up a joint. Pulling and holding the valve handle in the opposite direction results in counter-clockwise rotation, which is the desired direction of rotation for breaking out a joint.

**LIFT CROSS FLOAT CYLINDERS**

This is a proportional valve that controls the two float cylinders that are connected to the lift cross assembly. This adjusts the height of the tong relative to the fixed position of the backup.



BACKUP

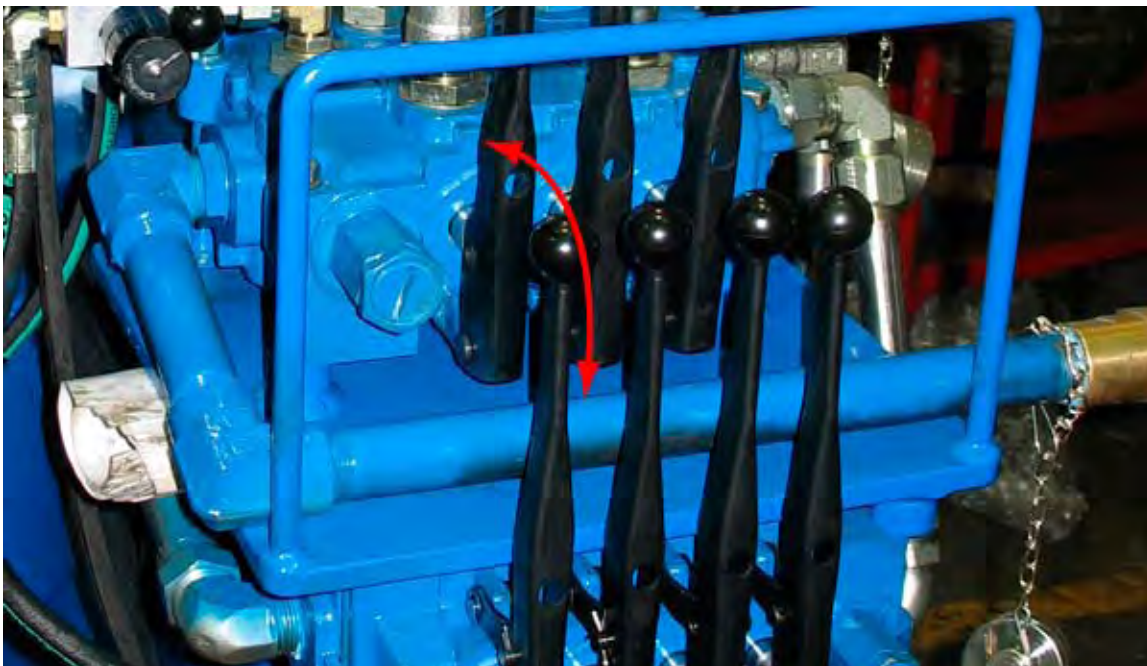
This is a sequenced valve. Pushing and holding the valve handle forward will cause a sequence of events to occur:

- the backup doors close
- the backup door latch engages
- the wedge cylinders extend, causing the rams to engage the pipe.

Pulling and holding the valve handle backward, towards the operator, reverses the above sequence.

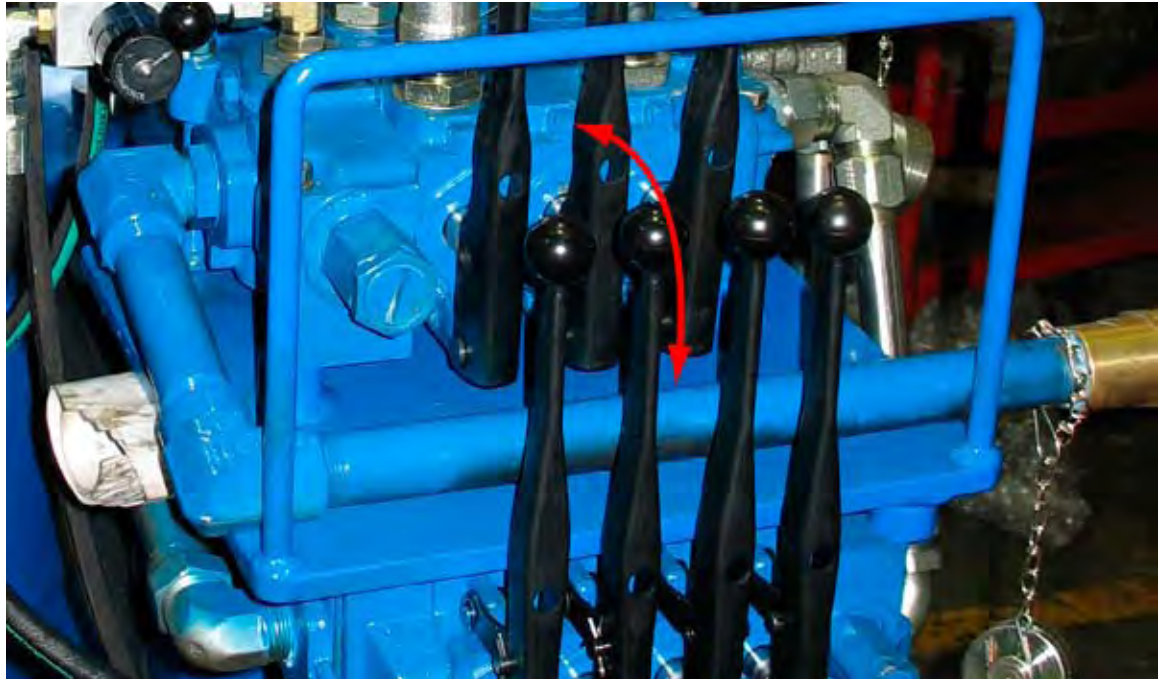
**LIFT CYLINDER**

This is a one-way single-action valve, without proportional control, that is connected to the hydraulic cylinder that controls the height of the entire assembly.

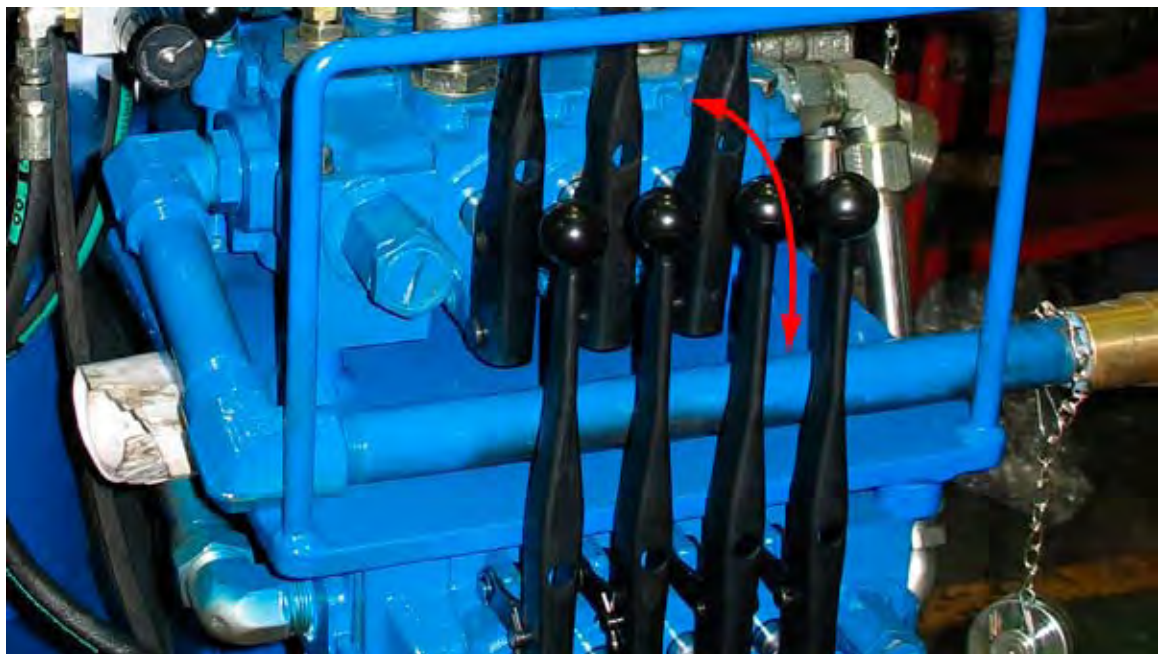


BACKING PIN

This is a two-way double-action valve, without proportional control. Moving the control handle in one direction extends the backing pin ramp, while the other direction retracts it.

**TONG SHIFT**

This is a two-way double-action valve, without proportional control. When the valve is in the middle (detent) position, the tong is in "neutral", or not rotating. Pulling the valve handle backward, or toward the operator, will cause the tong to begin rotating in low gear. Pushing the valve handle forward through the neutral position will cause the tong to shift to a higher gear, and increase the rotational speed. Note that maximum torque can only be applied with the tong in the low gear.

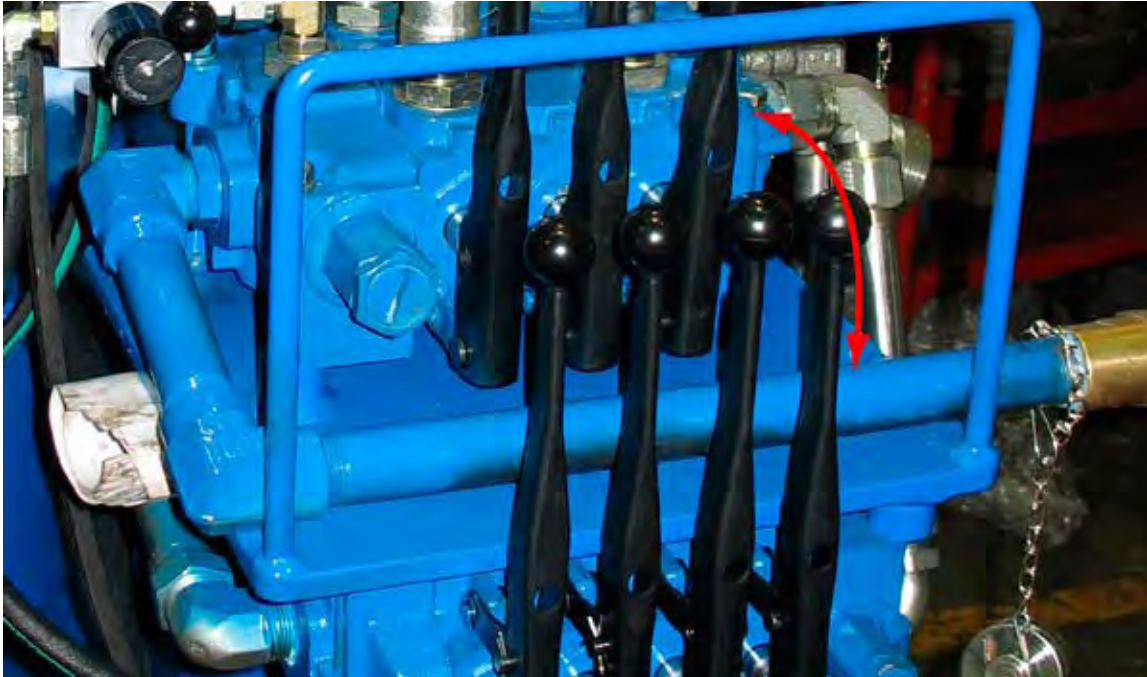


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TONG DOORS

This is a two-way, double-action valve, without proportional control. Pushing the valve handle forward will cause the tong doors to close, and pulling the valve backward toward the operator will cause the tong doors to open.



3. GENERAL COMMENTS

- a) Position rotary gear in contact with both idler gears when breaking out joints or collars where high torques are required.



FOR SAFETY OF RIG PERSONNEL, MAKE SURE THE DOOR IS SECURELY CLOSED AND LATCHED AT ALL TIMES

- b) When making-up integral (shouldered) joints, it is essential to make up the last turn of the threads in low gear. This reduces the tendency of an instant stop or a sudden increase in torque, which induces extremely high stresses on the gear train.
- c) DO NOT employ the "snap break" method of breaking-out joints when pulling a string. By definition, the "snap break" method is a procedure used by some operators to break out connections, accomplished by leaving slack in the "jaw-pipe" engagement, and then quickly pulling the throttle valve control lever allowing the tong to snap into its loaded or high torque condition. Although this method is very effective in breaking out joints, the extremely high stress placed on the gear train frequently causes gear breakage.



THE "SNAP-BREAK" METHOD IS HAZARDOUS TO RIG PERSONNEL

G. EXTREME COLD WEATHER OPERATION PROCEDURES

- 1) Consult the power unit engine operator's manual for all cold weather operating procedures and precautions.
- 2) Select gear and bearing lubricants that are compatible with expected climatic conditions.
- 3) Select hydraulic fluid that is compatible with expected climatic conditions.
- 4) Allow hydraulic fluid to circulate for approximately 20 minutes after starting the power unit, prior to activating the bypass valve to allow fluid to circulate to tong. If the power unit is equipped with an oil temperature gauge, ensure that the fluid has reached operating temperature as specified by hydraulic fluid data sheet.
- 5) Allow for adequate drying of moisture (prior to lubricating) when cleaning tong parts in cold weather.

H. REMOTE BACKING PIN OPERATION

The Cage Plate and Rotary Gear opening must be aligned when installing or shifting the Backing Pin. Misalignment may result in the backing pin failing to shift, and damage may occur to the soft rollers.

Proper alignment of the cageplate and rotary gear openings will allow the proper shifting of the pin using the Ramp. When using the Ramp to shift the Remote Backing Pin, the Rotary Gear and Cage Plate are aligned and moving together as the pin is moving up the ramp. As the engaged pin is freed from the slot the second pin is now in its slot. At this point you will see the Rotary Gear moving, the Cage Plate will have stopped moving until the second pin has traveled to the end of its slot.

The operator must leave the ramp in position until the cage plate moves a 1/8 of a turn. This ensures the second pin has completely engaged into the slot.

The Backing Pin must never be shifted while in high gear. Use low gear only.

When necessary, the adjustment of the spring plunger should be checked to ensure proper engagement of backing pins. With pivot arm in neutral position, turn spring plunger clockwise until it makes contact with the pivot arm. Then turn the spring plunger 3/4 turn clockwise and tighten locknut. Finally, check to ensure free movement of backing pins by hand.

Always ensure the cage plate and rotary gear are aligned when installing or manually changing the direction of the backing pin to ensure the pin goes into its correct slot.

The brake band must have proper tension before operating backing pin

I. "MAKING UP" JOINTS

USE THE FOLLOWING PROCEDURE TO PROPERLY MAKE UP A CASING JOINT:

1. POSITION TONG ASSEMBLY OVER CASING.

Open tong and backup doors, and move assembly into place over the protruding casing (the "stump"). Engage the clamping jaw of the back-up using the back-up clamp control on the operator control panel.

Note: Ensure clamping pressure is set within the range proscribed by the pipe size and wall thickness by adjusting the relief valve on the side of the back-up.

2. ENGAGE CASING WITH TONG.

Load fresh casing piece, and close tong door. Ensure backing pin is correctly set for making up a joint. Raise tong to the top of the float by pulling down on Tong Vertical position. Set tong rotation speed to the high range, and engage tong via the tong rotation control.

3. MAKE UP JOINT

- Run tong at high speed until joint begins to tighten (torque will begin to rapidly increase)
- Stop tong rotation by centering the Tong Rotation Joystick, switch to low gear, and push the tong rotation joystick up to "make-up". Continue to make-up casing to desired torque.

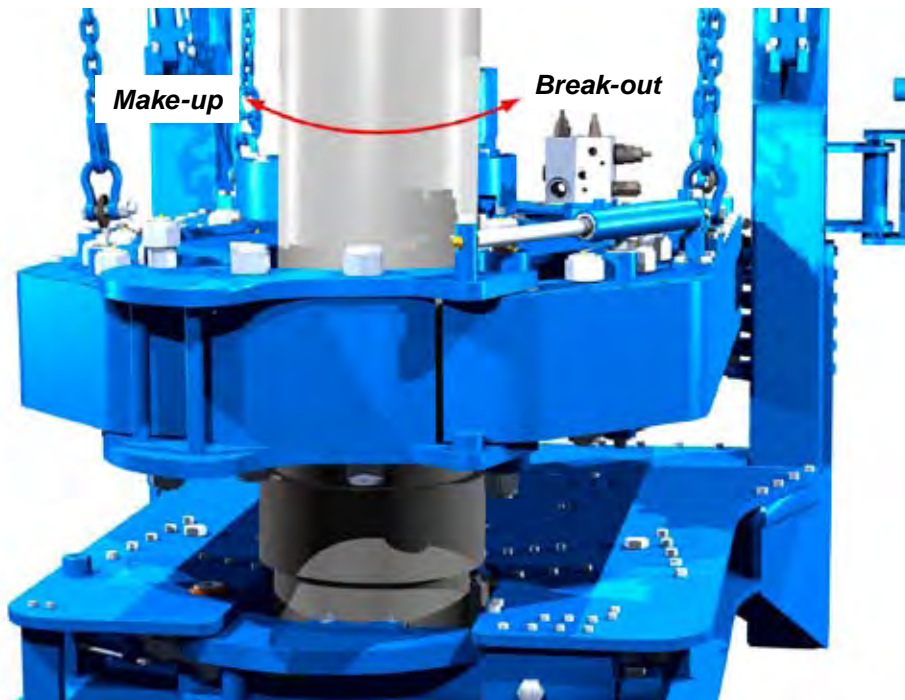
NOTE: Your tong will be equipped with either a torque gauge or a Wincatt torque measurement system. Stop applying torque when the torque measurement reaches the pre-determined value, or when the Wincatt system actuates the pressure dump valve.

4. DISENGAGE JAWS.

Rotate the rotary gear in the opposite direction until the jaws have disengaged from the pipe/casing, and the opening of the rotary gear aligns with the door opening. Disengage the backup clamping jaw from pipe.

5. OPEN DOORS.

The tong can now be cleared from the pipe by opening both doors using the back-up control to open the front jaws, and the tong door control to open the tong door.



J. "BREAKING OUT" JOINTS

USE THE FOLLOWING PROCEDURE TO PROPERLY BREAK OUT A CASING JOINT:

1. POSITION TONG ASSEMBLY OVER CASING.

Open tong and backup doors, and move assembly into place over the protruding casing (the "stump"). Engage the clamping jaw of the back-up using the back-up clamp control on the operator control panel.

Note: Ensure clamping pressure is set within the range proscribed by the pipe size and wall thickness by adjusting the relief valve on the side of the back-up.

2. ENGAGE CASING WITH TONG.

Ensure tong is in low gear. Lower tong to close proximity to back-up before engaging pipe in order to ensure the tong has enough travel to completely unthread connection. Close tong door and push the tong backing pin joystick up until the cams engage the jaws. Pull the tong rotation joystick down to the "break out" position, which will rotate the casing, causing the threads to begin to unthread.

3. RELEASE THE THROTTLE.

Now that the connection has been broken, stop applying torque by centering the tong rotation joystick.

4. TONG SPEED.

Set the tong rotational speed to high, and push the tong rotation joystick down to "break out". Continue to rotate the casing until free.

5. DISENGAGE JAWS.

NOTE: Ensure that free section of pipe/casing is supported or otherwise restrained before disengaging jaws. Rotate the rotary gear in the opposite direction until the jaws have disengaged and the rotary gear aligns with the door opening.

6. OPEN DOORS.

The tong can now be cleared from the pipe by opening the door using the back-up control to open the front jaws, and the tong door control to open the tong door.

SEE ILLUSTRATION PREVIOUS PAGE

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Regular maintenance programs are necessary, and must be established to assure dependable and lengthy operation of your FARR Hydraulic Tong. Use the following cleaning, lubrication, and adjustment recommendations to enhance the life expectancy of the tong and assure safety of operating personnel.

A. CLEANING

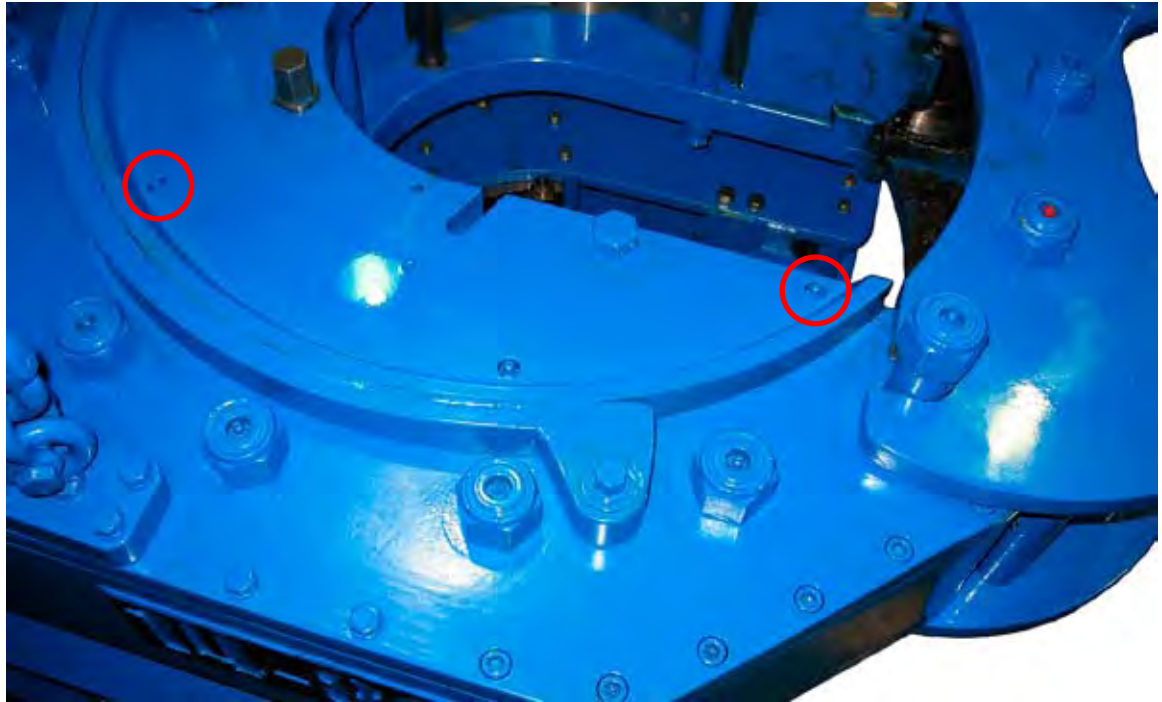
Clean tong thoroughly with a good petroleum-based cleaning agent after each job, and prior to storage. Farr recommends that the motor and valve assembly be periodically removed, along with the top tong plate, so that guides, rollers and gears can be properly cleaned and re-lubricated.

B. LUBRICATION

Farr recommends using lubricants that meet the specifications provided in Section 1 of this manual. In the event of extreme temperatures, use a quality multipurpose bearing lubricant that will remain within its viscosity range at expected operating temperatures. See the guide at the end of this section for detailed information on the amount of lubricant to apply at each location. In addition, Farr recommends the following lubrication procedure at the completion of each job prior to storage.

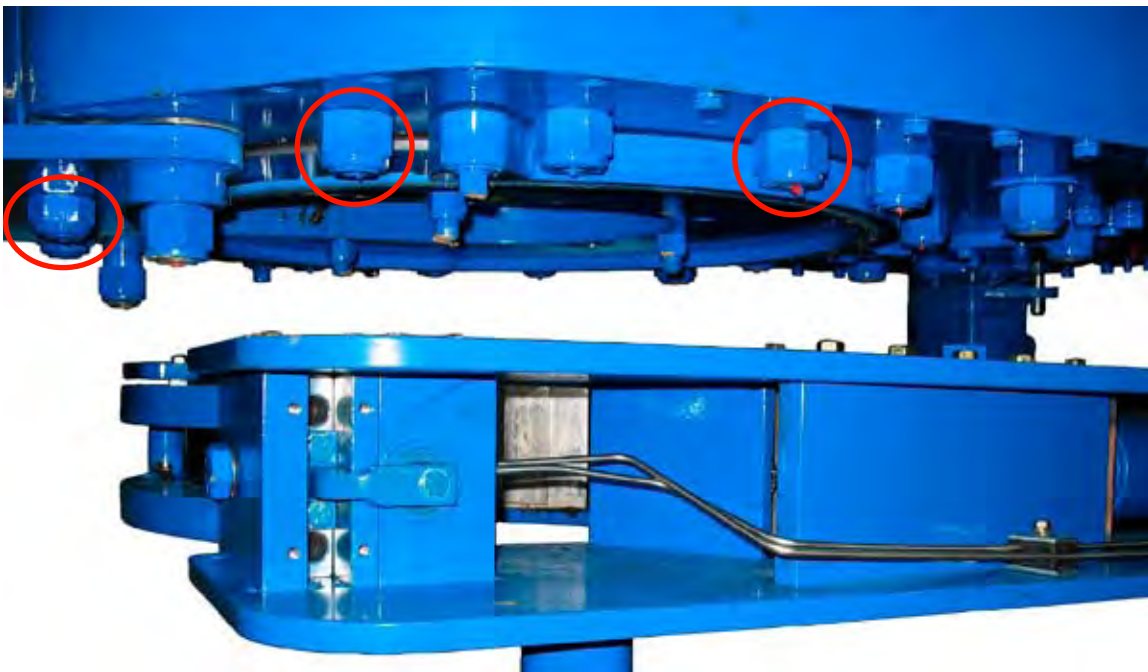
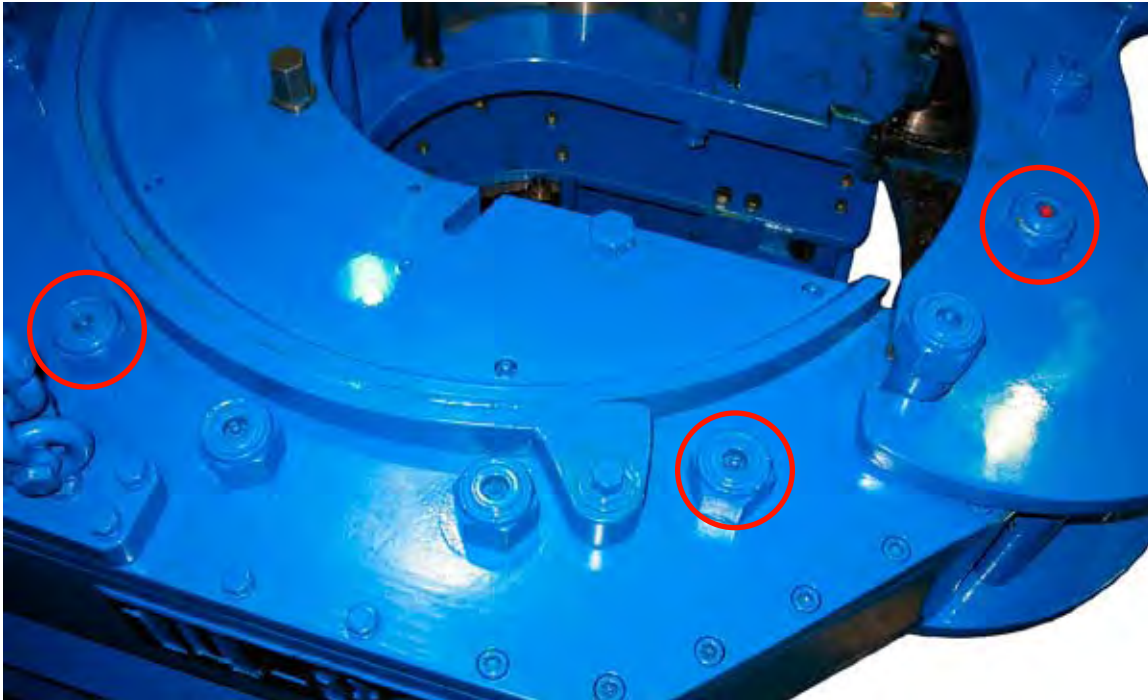
1. CAGE PLATE GUIDE RINGS

Apply grease to the upper and lower guide rings through the grease fittings in the top and bottom cageplates (7 locations top cageplate, four locations bottom cageplate).



2. SUPPORT ROLLER/DOOR ROLLER/LATCH ROLLER BEARINGS

Supply grease to these bearings through the grease fittings in the ends of the rotary roller shafts, located at the top and bottom face of the tong (16 locations top, 16 locations bottom including door rollers, and latch & pivot rollers.)



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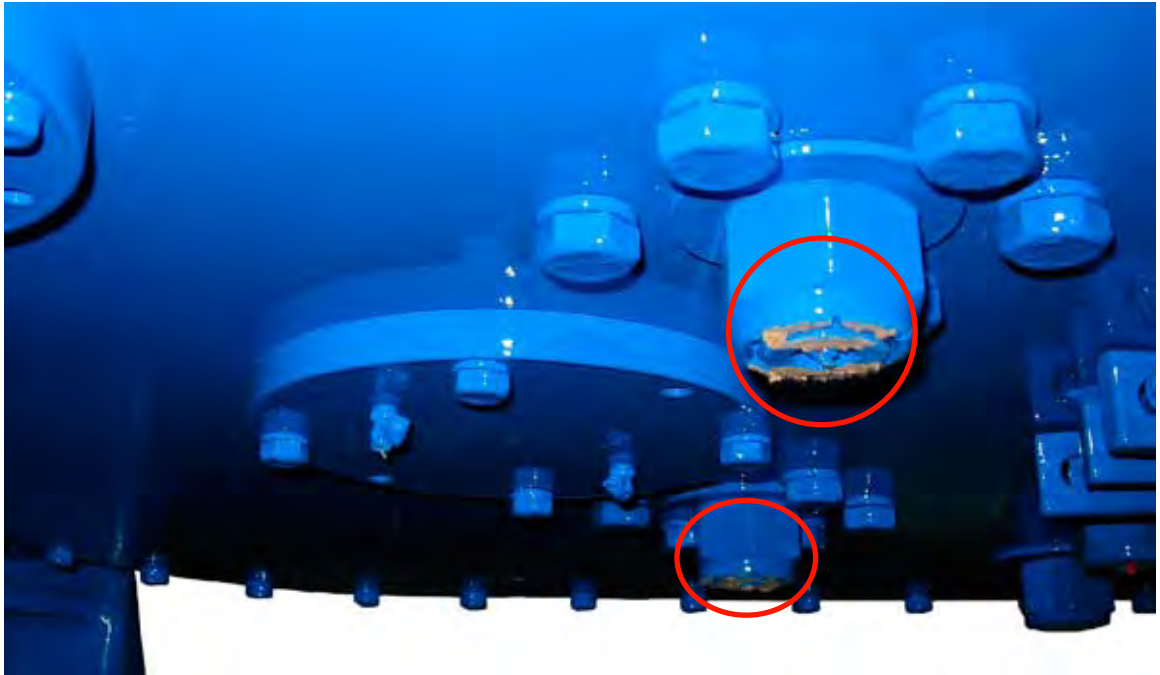
3. ROTARY IDLER BEARINGS

Apply grease to these bearings through the grease fittings in the ends of the rotary idler shafts, located on the top of the tong (2 locations total)



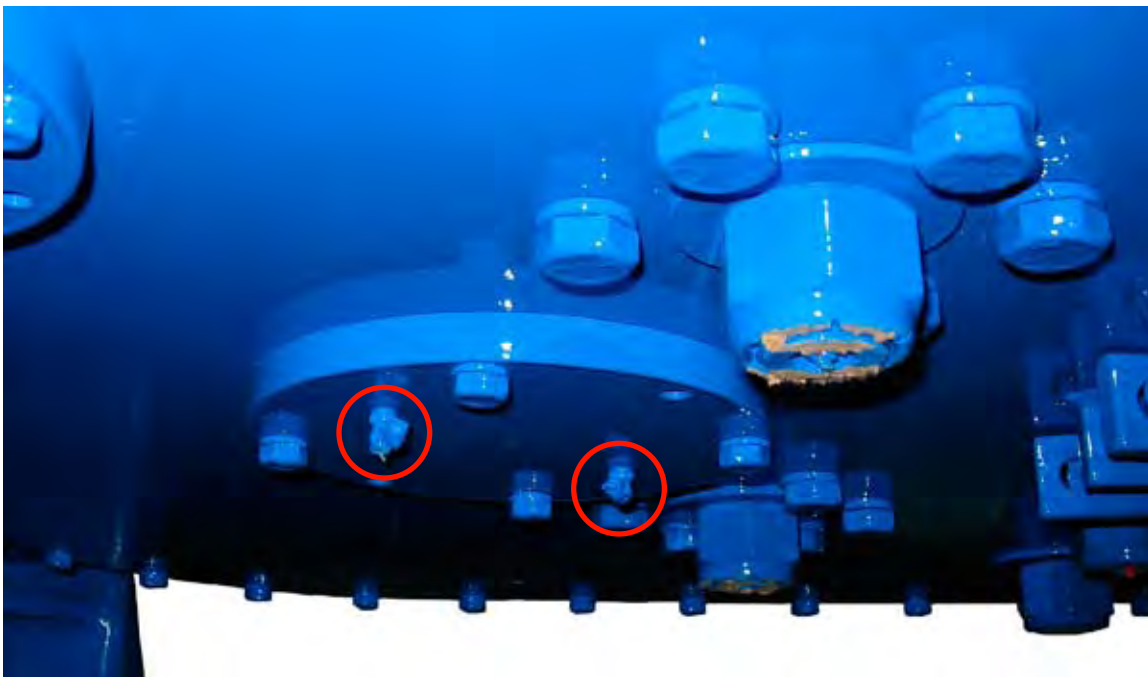
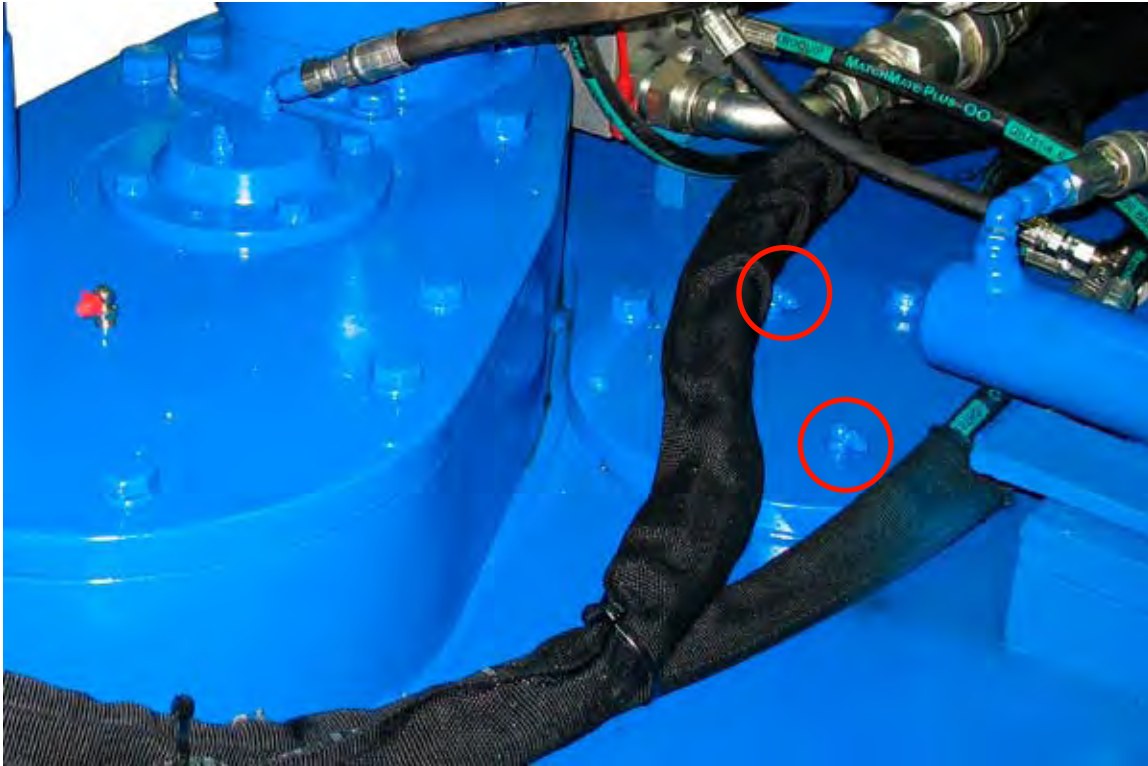
4. PINION IDLER BEARINGS

Apply grease to these bearings through the grease fittings in the ends of the pinion idler half-shafts, located on the bottom of the tong (2 locations total)



5. PINION BEARINGS

Apply grease to these bearings through the grease fittings in the pinion bearing caps located on the top and bottom of the tong (total of four locations).



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6. CLUTCH SHAFT BEARINGS

Apply grease to these bearings through the grease fittings shown below. Note that a grease fitting is recessed into the centre of the bearing cap



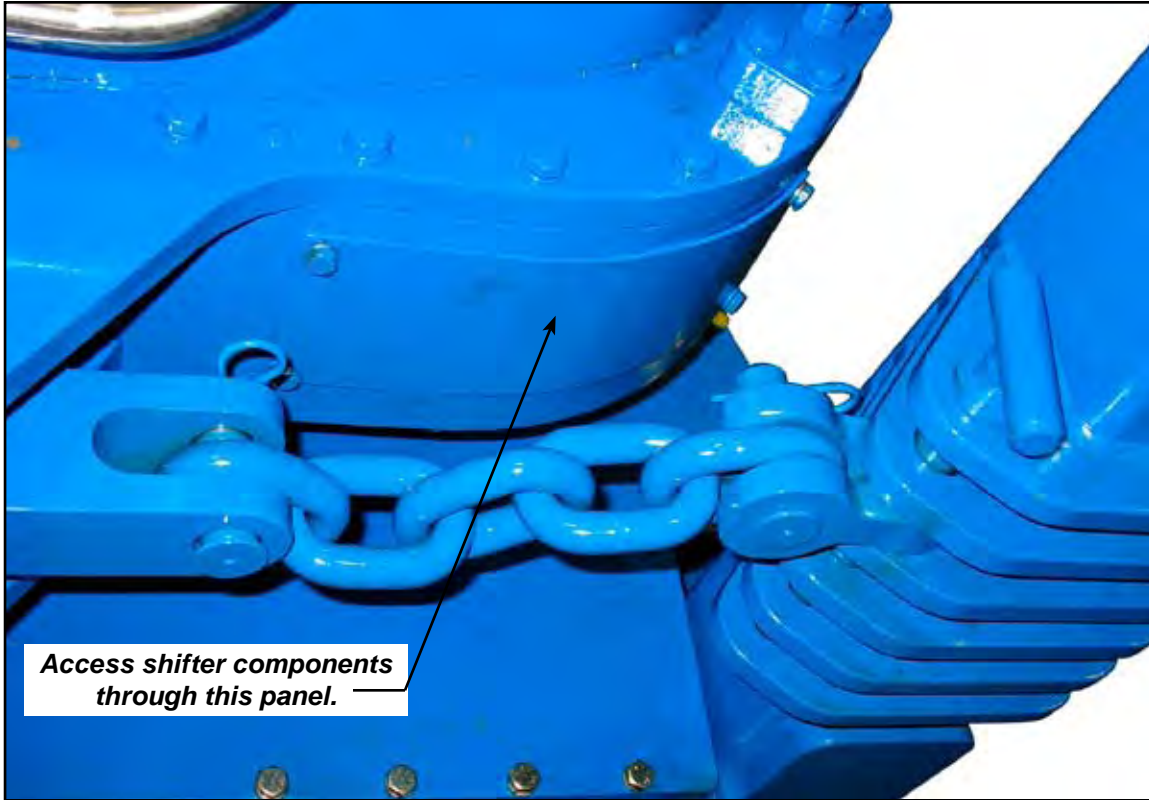
7. DOOR CYLINDER PIVOT POSTS

Apply grease to the door cylinder pivot posts as indicated below (two locations total).



8. **SHIFTING SHAFT**

Apply grease to the shifting shaft and shifting shaft bushings. These can be accessed through the access plate on the side of the tong, next to the shift cylinder.



9. **PINION REDUCTION GEAR**

Apply grease to the pinion reduction gear assembly through the two grease fittings located in the bearing cap on top of the motor mount.



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10. MOTOR MOUNT HOUSING

Apply grease to the motor mount housing through the grease fitting on top of the motor mount.



11. BACKUP DOOR CYLINDER PIVOT

Apply grease to the backup door pivot at the location indicated in the following illustration



10. DOOR LATCH & DOOR STOPS

Apply a small amount of grease to the door latch claws, post, and stops as necessary in order to maintain smooth operation.

Recommended lubrication amount at the completion of each job:

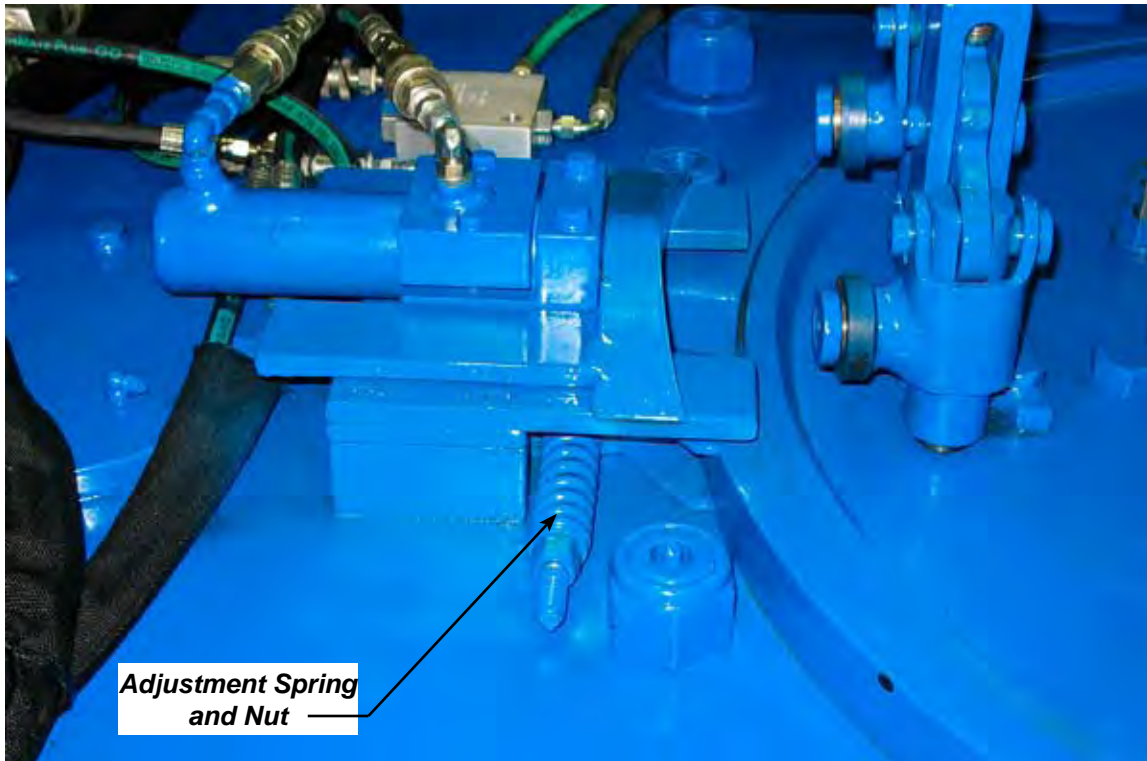
- | | |
|--|----------------|
| 1. Cage Plate Guide Ring Grooves (Upper and lower) | as required |
| 2. Roller Bearings (Upper and lower) | 3 shots grease |
| 3. Rotary Idler Bearings | 4 shots grease |
| 4. Pinion Idler Bearings | 4 shots grease |
| 5. Pinion Bearings (Upper and lower) | 2 shots grease |
| 6. Clutch Shaft Bearings | 1 shot grease |
| 7. Door Cylinder Pivots | 1 shot each |
| 8. Shifting Shaft | as required |
| 9. Pinion Reduction Gear | 2 shots grease |
| 10. Motor Mount Housing | as required |
| 11. Backup Door Cylinder Pivot | 1 shot |
| 12. Door Latch & Door Stops | as required |

Farr recommends that a liberal coating of grease be applied to the cam surface of the rotary drive gear prior to jaw installation. Also, the clutch inspection plate should periodically be removed, and a liberal coating of grease applied to the clutch, drive gears and shifting shaft.

C. ADJUSTMENTS

BRAKE BAND ADJUSTMENT (See illustration below):

The brake bands must be periodically adjusted to continue to provide smooth and efficient jaw cam action. If the cage plate turns with the rotary gear, the jaws will not cam properly and, therefore, will not bite on the tubing or casing. Tightening the brake band against the cage plates will increase frictional resistance, allowing jaws to cam properly and grip the casing. To adjust the brake band, simply turn the adjustment bolt clockwise to tighten and counterclockwise to loosen. Do not over tighten, as this causes excessive wear to the brake bands.



Adjustment Spring and Nut

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D. RECOMMENDED PERIODIC CHECKS**1. BACKING PIN**

Perform a visual inspection of the backing pin after each job. Replace the pin if stress cracks or excessive wear is found.

2. SHIFTING SHAFT

The shifting yoke is secured to the shifting shaft by one hex jam nut and one locknut on the bottom of the yoke. Check these nuts after each job. Do this by removing the clutch inspection plate and ensuring a snug fit prior to lubrication.

3. TORQUE GAUGE ASSEMBLY

Periodic calibration of the torque gauge is recommended to assure accurate torque readings. When having the torque gauge serviced and calibrated, it is important to note the arm length of the tong, as indicated on page 2.1.

E. OVERHAUL PROCEDURES

Once the tong has been removed from frame assembly, it may be overhauled using the disassembly instructions specified in the following procedure. Access to the gear train is possible by removal of the top plate of the tong.

ALL MAINTENANCE AND OVERHAUL SHOULD BE PERFORMED FROM THE TOP. THEREFORE, THE BOTTOM PLATE OF THE TONG SHOULD NEVER BE REMOVED FROM THE GEAR CASE HOUSING.

1. Disconnect all hydraulic connections between the tong and valve assembly.
2. Remove load cell pin, disconnecting the tong from the load cell.
3. Remove the tong from the frame assembly and place on a flat, level work surface that still allows access to the bottom of the cageplate. Ensure the work surface is capable of supporting the entire weight of the tong with a good safety margin.
4. Remove the hydraulic blocks from the top plate of the tong.
5. Remove the four hanger bracket assemblies.
6. Remove the tong doors using the following procedure:
 - a. Remove the door cylinder.
 - b. Remove the door cylinder mounting post from the top plate of the tong.
 - c. Ensure the door is well supported from the bottom. Remove the 1-3/8" nylock nut from the top of the door pivot support roller shaft, and while supporting the door, use a soft alloy material (e.g. brass rod, etc.) to lightly tap the shaft down through the support roller assembly until it can be removed. Do not lose the door pivot bushings and washers.
7. Remove the backing pin cylinder mount assembly - the backing pin arm assembly may remain attached to the top cageplate.
8. Remove the fasteners securing the motor, and lift the motor off the motor mount. Inspect the motor gear, located at the bottom of the motor shaft, for gear clashing or tooth damage. Also, ensure that the motor gear is securely attached to the motor shaft.
9. Remove the access panel from the right rear side of the tong, and disconnect shifter shaft from the shifting fork.
10. Remove the hydraulic shifting cylinder from the motor mount. Use caution when pulling the shifting shaft up and out of the upper and lower shifter bushings.

11. Remove the reduction pinion bearing cap. If the bearing remains on the top of the reduction pinion gear shaft, leave it in place until the motor mount top plate is removed.
12. Remove the two 5/8" bolts and six 1/2" bolts securing the motor mount, and lift the motor mount off the top plate. Take care not to lose the dowel pins.
13. Remove the reduction pinion gear stack. The bottom bearing may come off the gear shaft and remain in the bottom bearing retainer.
14. Remove the outside snap ring securing the clutch drive gear to the gear shaft, and remove the drive gear.
15. Remove the clutch bearing retainer and top clutch bearing.
16. Pull the top bearing cap and spacer for the pinion drive gear by removing the four 1/2" bolts which secure the bearing cap. Thread two of the removed bolts into the extra holes on top of the bearing cap, and use them as lifting lugs to lift the bearing cap out of place.



IF THE BEARING REMAINS ATTACHED TO THE GEAR SHAFT AFTER THE BEARING CAP IS PULLED, FARR SERVICE PERSONNEL RECOMMENDS LEAVING IT IN PLACE UNTIL THE TOP TONG PLATE IS REMOVED.

17. Remove tong jaws.
18. Remove upper and lower brakeband assemblies.
19. Unsure lower cageplate is well-supported before attempting to remove cageplate assembly.



THE CAGE PLATE BOLTS ARE THE ONLY ITEMS FASTENING THE BOTTOM CAGE PLATE TO THE TONG. SUPPORT THE BOTTOM CAGE PLATE FROM BELOW PRIOR TO REMOVING CAGE PLATE BOLTS IN ORDER TO PREVENT DAMAGE TO THE BOTTOM CAGE PLATE OR PERSONAL INJURY TO THE MECHANIC

20. Remove the three 7/8" cageplate bolts and nuts, and the three cageplate spacers. Remove the top and bottom cageplates.
21. Remove the two 1-1/2" nylock nuts and 1-1/2" washers from the tops of the rotary idler shafts (leave the bottom nuts and washers in place).
22. Remove the two 1-3/8" nylock nuts from the tops of the support roller shafts (leave the bottom nuts and washers in place).
23. Remove all top plate fasteners.
24. Carefully lift the top plate straight up and off the body to gain access to the geartrain.



THE ASSEMBLY PROCEDURE IN SECTION 2 MUST BE FOLLOWED WHEN REASSEMBLING THIS TONG.

Adequate maintenance and proper fluid selection should keep hydraulic problems to a minimum. If troubleshooting is necessary, ensure that the technician is well-trained in hydraulic systems, and familiar with the equipment design, assembly and operation. Knowledge of hydraulic circuits and components is essential in isolating trouble areas and pinpointing particular faults.

The following troubleshooting guidelines are intended to be general in nature. Any faults not solved through the use of this guide should be referred to our engineering department for their evaluation and recommendations.

A. PUMP MAKES EXCESSIVE NOISE

1. **POSSIBLE PROBLEM:** Plugged or restricted intake line.
SOLUTION: Clean intake line.
2. **POSSIBLE PROBLEM:** Plugged reservoir air vent.
SOLUTION: Clean or replace.
3. **POSSIBLE PROBLEM:** Fluid viscosity too high due to ambient temperature.
SOLUTION: Replace fluid with a type that maintains the proper viscosity range in the operating environment.
4. **POSSIBLE PROBLEM:** Air leaking into system.
SOLUTION: Ensure oil pickup is well below oil surface level in reservoir. Check pump packing and line connections on intake side by pouring oil over the suspected leak. If the noise stops, the leak has been located. Tighten joints or change packing or gaskets where necessary.
5. **POSSIBLE PROBLEM:** Loose or worn parts.
SOLUTION: Replace parts. **NOTE:** Improper selection of hydraulic fluid may result in premature wear.
6. **POSSIBLE PROBLEM:** Pump misalignment with motor.
SOLUTION: Check alignment.
7. **POSSIBLE PROBLEM:** Pump running in excess of rated speed.
SOLUTION: Check manufacturer's recommended speed. Check pulleys, gears, power take-off, or drive motor.

B. HYDRAULIC SYSTEM OVERHEATING

1. *POSSIBLE PROBLEM: Excess discharge pressure (relief valve set too high).
SOLUTION: Reset relief valve in accordance with maximum pressure required. Check manufacturer's recommendations.*
2. *POSSIBLE PROBLEM: Fluid viscosity too high or too low due to extreme ambient temperatures.
SOLUTION: Replace fluid. (Check pump and motor manufacturer's recommendations.)*
3. *POSSIBLE PROBLEM: Excessive internal leakage.
SOLUTION: Repair or replace any worn parts (loose packing, etc.)*
4. *POSSIBLE PROBLEM: Excessive friction.
SOLUTION: Check pump for part interference. Pump may be assembled too tightly.*
5. *POSSIBLE PROBLEM: Leaks in pump check valve or relief valve.
SOLUTION: Repair or replace.*
6. *POSSIBLE PROBLEM: Fluid level in reservoir too low for proper cooling.
SOLUTION: Maintain proper oil level.*
7. *POSSIBLE PROBLEM: Pump discharge being restricted.
SOLUTION: Check operation of throttle valve. Check relief valve. Do not allow larger pump volumes to remain at high pressure for long periods of time. Check all self-sealing hose connections for proper engagement.*
8. *POSSIBLE PROBLEM: Hydraulic system valves restricted.
SOLUTION: Clean valves and piping.*
9. *POSSIBLE PROBLEM: Heat exchanger not cooling hydraulic fluid.
SOLUTION:*
 - *Hydraulic circuit through heat exchanger is obstructed.*
 - *Cooling coils in heat exchanger may be coated with a layer of dust.*
 - *Airflow through heat exchanger may be obstructed.*
 - *Cooling fan may be malfunctioning*

C. EXCESSIVE WEAR OF MOVING PARTS

1. *POSSIBLE PROBLEM: Abrasive contaminants entrained in the fluid.
SOLUTION: Change fluid more frequently. Replace filter element. Be sure filter is proper size.*
2. *POSSIBLE PROBLEM: Misalignment of moving parts.
SOLUTION: Inspect and realign.*
3. *POSSIBLE PROBLEM: Operating pressure rises above manufacturer's recommendations.
SOLUTION: Check relief valve and reset.*
4. *POSSIBLE PROBLEM: Viscosity of fluid too low at working temperature.
SOLUTION: Ensure fluid is compatible with operating temperature.*
5. *POSSIBLE PROBLEM: Air in system.
SOLUTION: Bleed air and check for leaks in system.*
6. *POSSIBLE PROBLEM: Excessive wear of bearings.
SOLUTION: Inspect alignment of moving parts, vibration or excessive side thrusts on shafts.*

D. TONG RUNNING TOO SLOWLY

1. *POSSIBLE PROBLEM: Pump intake line plugged.
SOLUTION: Clean intake line.*
2. *POSSIBLE PROBLEM: Reservoir oil level too low.
SOLUTION: Add oil.*
3. *POSSIBLE PROBLEM: Air leak in pump intake line.
SOLUTION: Repair leak.*
4. *POSSIBLE PROBLEM: Pump speed too slow.
SOLUTION: Check manufacturer's speed recommendations.*
5. *POSSIBLE PROBLEM: Excessively worn or damaged pump or tong.
SOLUTION: Replace worn parts by following manufacturer's recommendations.*
6. *POSSIBLE PROBLEM: Fluid viscosity too high.
SOLUTION: Some pumps will not prime if the fluid is too heavy.*



BYPASS ALL TONG CIRCUITRY TO TEST PRESSURE AND VOLUME. IF FLOW AND PRESSURE ARE TESTED OFTEN, FARR RECOMMENDS CONSTRUCTION OF A TEST RIG THAT CAN EASILY BE CONNECTED TO THE PUMP SUCTION AND DISCHARGE PORTS

7. *POSSIBLE PROBLEM: Restriction in line between power unit and tong.
SOLUTION: Check self-sealing couplings to insure they are properly engaged.*
8. *POSSIBLE PROBLEM: By-pass valve not functioning.
SOLUTION: Check and repair.*

E. TONG WILL NOT DEVELOP SUFFICIENT TORQUE

1. *Malfunctioning relief valve on unit or tong.*
 - a. *POSSIBLE PROBLEM: Relief pressure set too low.
SOLUTION: Increase setting. To check, block the oil line beyond the relief valve and determine pressure with a gauge.*
 - b. *POSSIBLE PROBLEM: Valve is stuck.
SOLUTION: Check for contamination of oil that may inhibit the way the valve actuates. Remove valve and clean, ensuring that the valve spring operates smoothly.*
 - c. *POSSIBLE PROBLEM: Valve is leaking.
SOLUTION: Check valve seat for scouring. Check oil seals. Check for particles stuck under the valve system.*
2. *POSSIBLE PROBLEM: Worn or damaged pump parts.
SOLUTION: Inspect and clean, replace all worn or broken parts.*
3. *POSSIBLE PROBLEM: Pump speed too slow.
SOLUTION: Check motor speed.*
4. *POSSIBLE PROBLEM: Fluid viscosity too high.
SOLUTION: Pump may not prime if fluid is too heavy. Replace with proper viscosity fluid.*
5. *POSSIBLE PROBLEM: Viscosity of fluid too low.
SOLUTION: System may overheat. Replace with proper viscosity fluid.*
6. *POSSIBLE PROBLEM: Fluid by-passed to reservoir.
SOLUTION: Check relief valve for proper operation. Check directional valve. Neutral position should return fluid directly to the reservoir.*
7. *POSSIBLE PROBLEM: Worn or damaged tong motor causing slippage.
SOLUTION: Replace or repair worn or damaged parts.*
8. *POSSIBLE PROBLEM: Damaged bearings or gears causing excessive drag.
SOLUTION: Repair or replace worn parts.*
9. *POSSIBLE PROBLEM: Poor hydraulic pressure at the tong or excessive back pressure in the return line.
SOLUTION: Restriction in line between power unit and tong. Inspect integrity of self-sealing couplings.*
10. *POSSIBLE PROBLEM: Defective torque gauge or load cell.
SOLUTION: Replace defective components. Ensure dampening screw has been adjusted. Ensure gauge has been calibrated to proper torque arm length.*

F. FAILURE OF JAWS TO GRIP PIPE

1. *POSSIBLE PROBLEM: Dies have become too dull.*
SOLUTION: Replace dies.
2. *POSSIBLE PROBLEM: Brake band insufficiently adjusted, not allowing jaws to cam properly.*
SOLUTION: Adjust brake bands to give proper resistance to cage plates.
3. *POSSIBLE PROBLEM: Jaw roller broken or worn.*
SOLUTION: Replace roller.



G. FAILURE OR DIFFICULTY OF TONG TO SHIFT

1. *POSSIBLE PROBLEM: Bent or broken shifter handle.
SOLUTION: Replace shifter handle.*
2. *POSSIBLE PROBLEM: Bent or broken shifter yoke.
SOLUTION: Inspect and replace shifter yoke.*
3. *POSSIBLE PROBLEM: "Frozen" or hard-to-move shifter handle.
SOLUTION: Grease shifter shaft through grease fitting.*
4. *POSSIBLE PROBLEM: Bent shifter shaft.
SOLUTION: Replace.*
5. *POSSIBLE PROBLEM: Tong pops out of gear
SOLUTION: Ensure that detent ball & spring assembly has been correctly set.*

H. GENERAL COMMENTS

The following factors contribute highly to inefficient hydraulic operation:

- 1. Failure to change fluid frequently enough, or inadequate fluid filtration.*
- 2. Unsuitable hydraulic fluid.*
- 3. Defective packing or seals in components of the hydraulic system.*
- 4. Poor or incomplete understanding of hydraulic system components and/or operation of the equipment.*



- A. Store tong in a clean, dry, ventilated area.
- B. Ensure adequate lubrication before placing in storage (See lubrication section of manual).
- C. Coat spare moving parts (gears, shafts, etc.) with a good corrosion inhibitor if required to remain in storage for long periods of time. Store parts in a clean, dry area.
- D. Store all o-rings, seals, packings, gaskets, etc. in strong moisture proof, airtight containers. Ensure that these items are not crushed, nicked, or otherwise damaged.
- E. Generously lubricate all bearings (cam followers, roller bearings, etc.) and store in a dust-free box or container, protected from moisture.

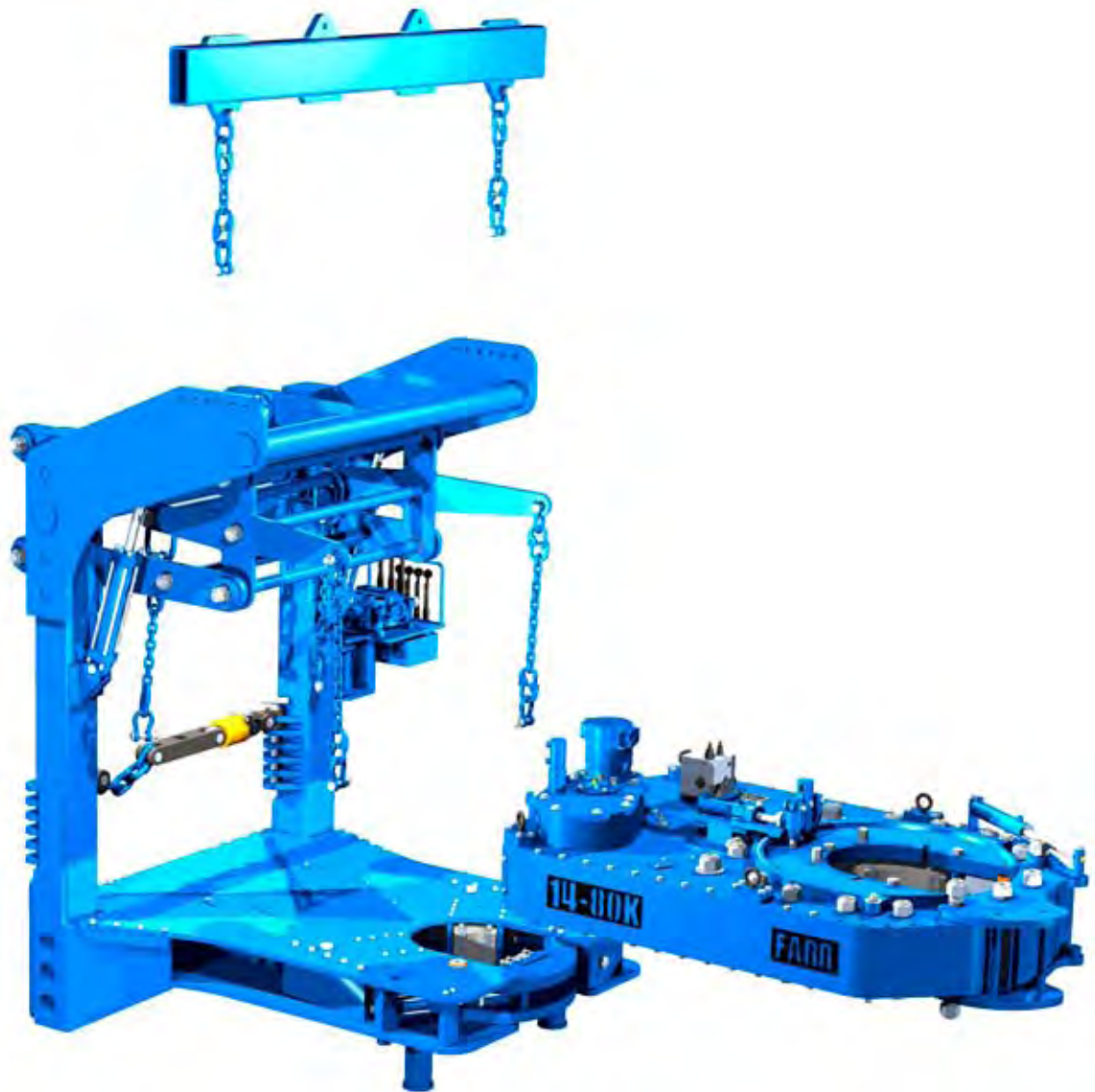
IF PROTECTED STORAGE OF THE TONG IS NOT AVAILABLE (FOR EXAMPLE, FORCED STORAGE OUTSIDE ON A DRILL SITE IN DUSTY CONDITIONS), FARR RECOMMENDS TAKING THE FOLLOWING STEPS:

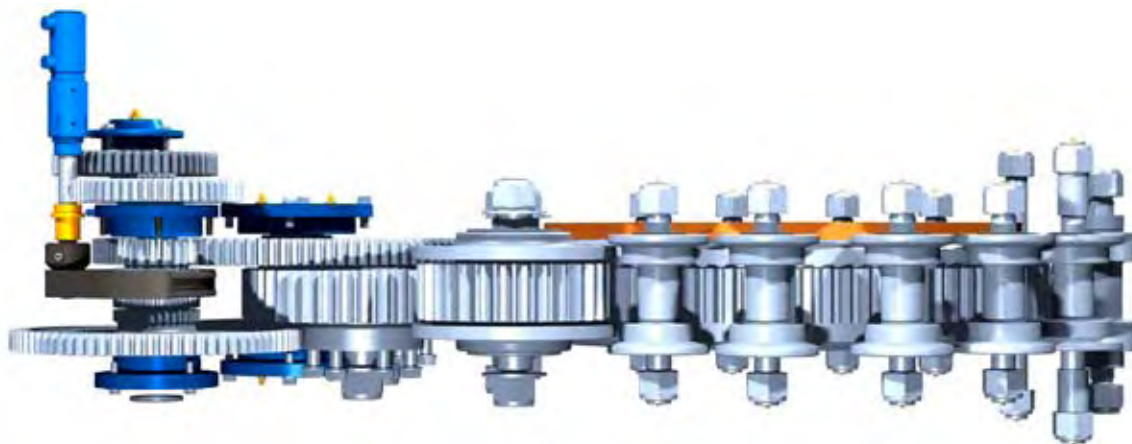
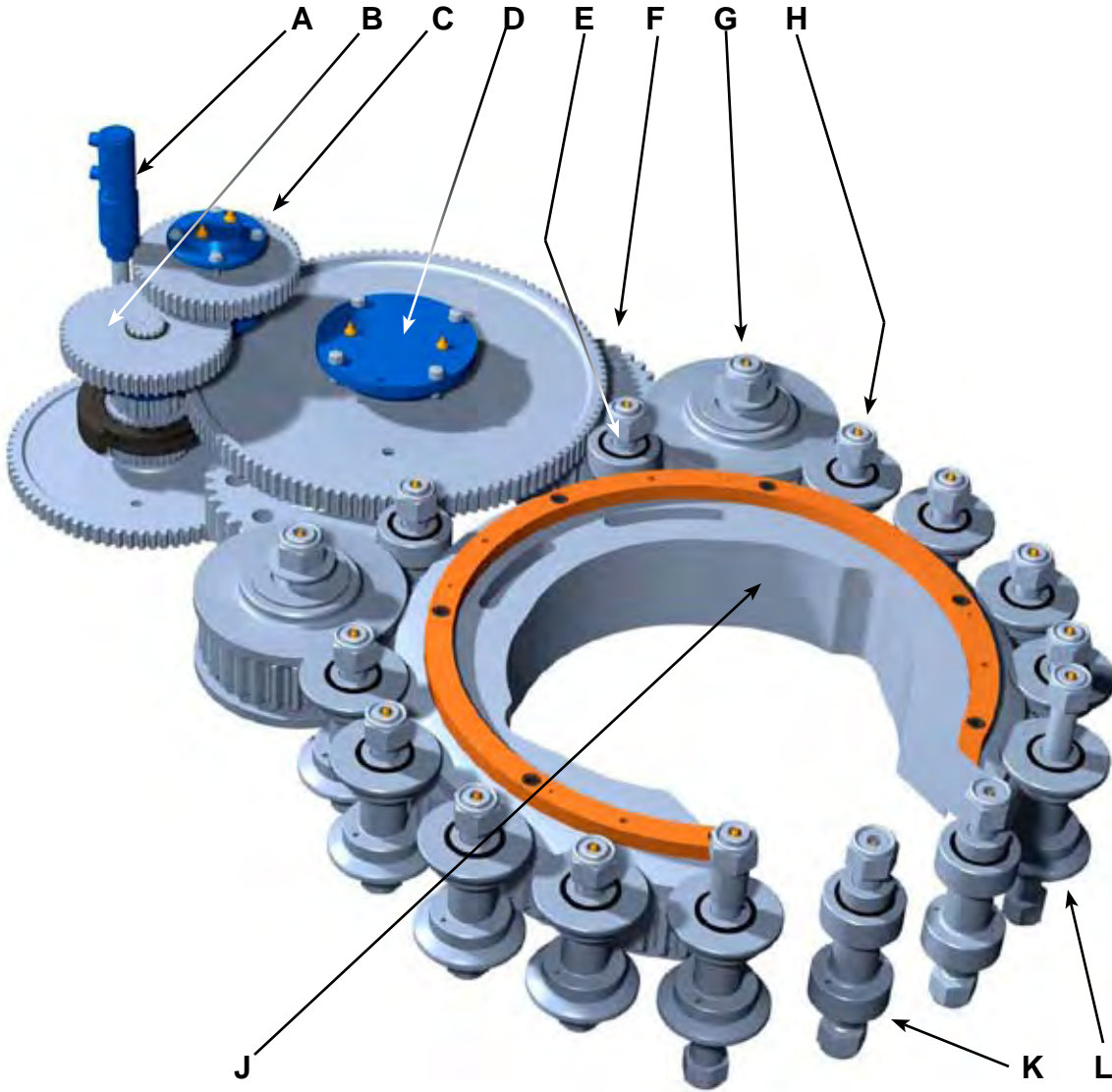
1. Generously apply grease to all fittings so that excess grease pumped through bearings acts as a seal against dust.
2. Cover or wrap tong with tarp or plastic to prevent wind-blown dust from getting into gears. If a tong has been exposed to extreme dust conditions, Farr recommends following these instructions before use:
 1. Suspend tong by body lug, remove clutch inspection plate and thoroughly wash & flush interior with solvent, diesel fuel or equivalent.
 2. Attach hydraulic hose and slowly rotate rotary gear, washing teeth of rotary and idler gears as they become exposed.
 3. Wash all sand and grit from cam follower grooves in rotary and cage plates.
 4. Wash and lubricate exposed end of shifting shaft.
 5. Wash and lightly grease cam surfaces of rotary gear.
 6. Grease teeth of rotary gear.
 7. Give every grease nipple a few shots of grease to displace any grit or sand which may have remained in bearings.

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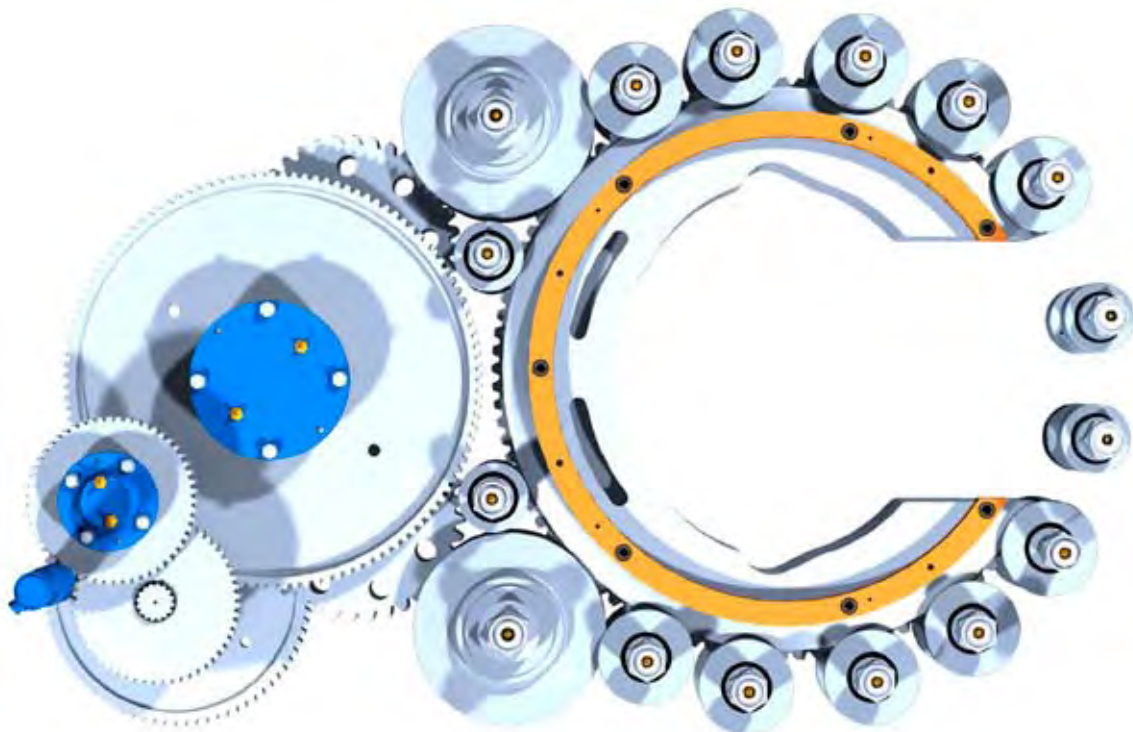
Assemblies And Parts

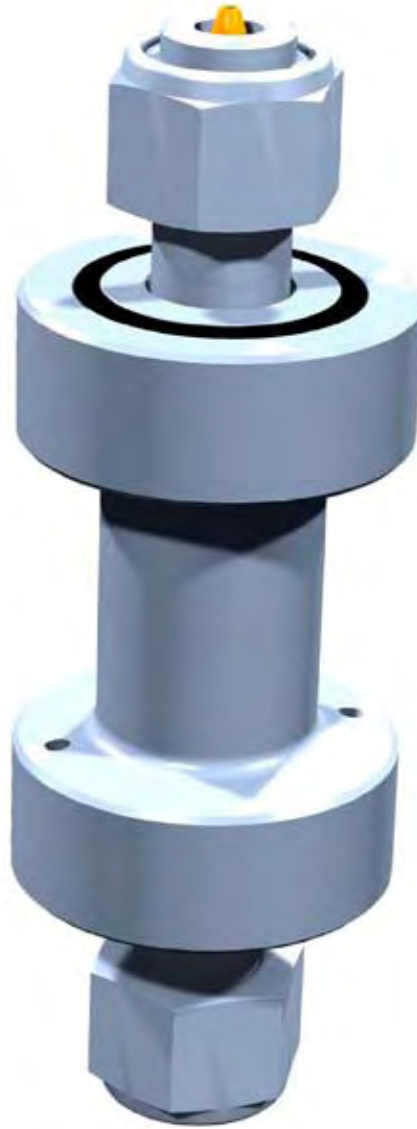




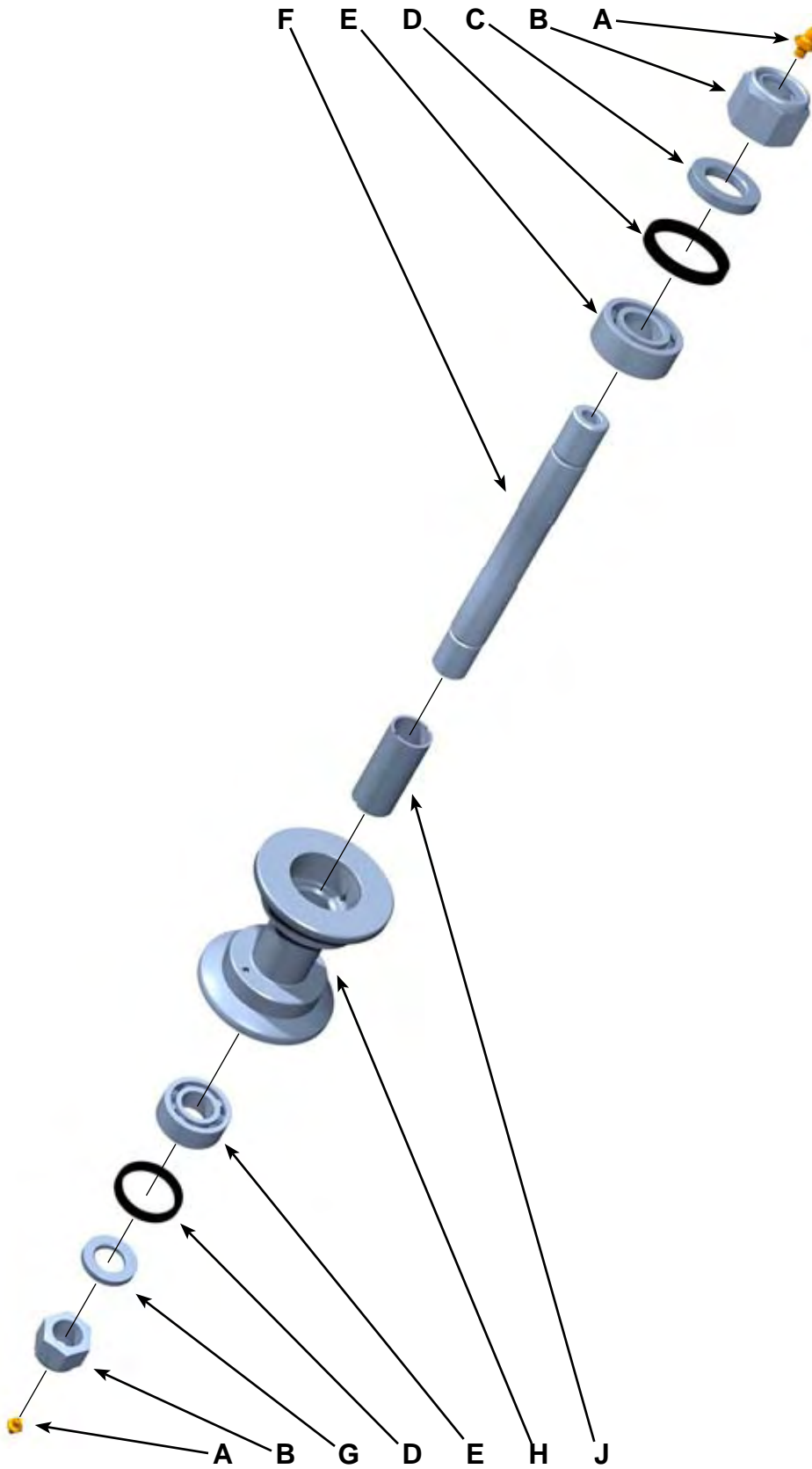
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Item	Type	Description	Qty	Part Number
A	Assembly	Hydraulic Shifter Assembly (Pp 7.22 - 7.23)	1	
B	Assembly	Clutch Assembly (Pp 7.18 - 7.19)	1	
C	Assembly	Pinion Reduction Assembly (Pp. 7.20 - 7.21)	1	
D	Assembly	Pinion Assembly (Pp. 7.16 - 7.17)	1	
E	Assembly	Rear Support Roller (Pp. 7.4 - 7.5)	2	
F	Assembly	Pinion Idler Assembly (Pp 7.14 - 7.15)	2	
G	Assembly	Rotary Idler Assembly (Pp 7.12 - 7.13)	2	
H	Assembly	Support Roller (Pp. 7.6 - 7.7)	16	
J	Assembly	Rotary Gear Assembly (See Pp. 7.28 - 7.29)	1	
K	Assembly	Door Support Roller (Pp. 7.8 - 7.9)	2	
L	Assembly	Door Pivot / Latch Roller (Pp. 7.10 - 7.11)	2	





Item	Type	Description	Qty	Part Number
A	Part	1/8" NPT Grease Fitting	2	02-0005
B	Part	1-3/8" NF Standard Nylock Nut	2	
C	Part	Roller Spacer	1	AX03-033N
D	Part	Parker J-2375 Wiper	2	08-0479
E	Part	Cylindrical Roller Bearing	2	02-0804
F	Part	Support Roller Shaft	1	AX03-031
G	Part	Roller Spacer	1	AX03-033
H	Part	Support Roller	1	AX03-032R
J	Part	Support Roller Shaft Sleeve	1	1374-134A

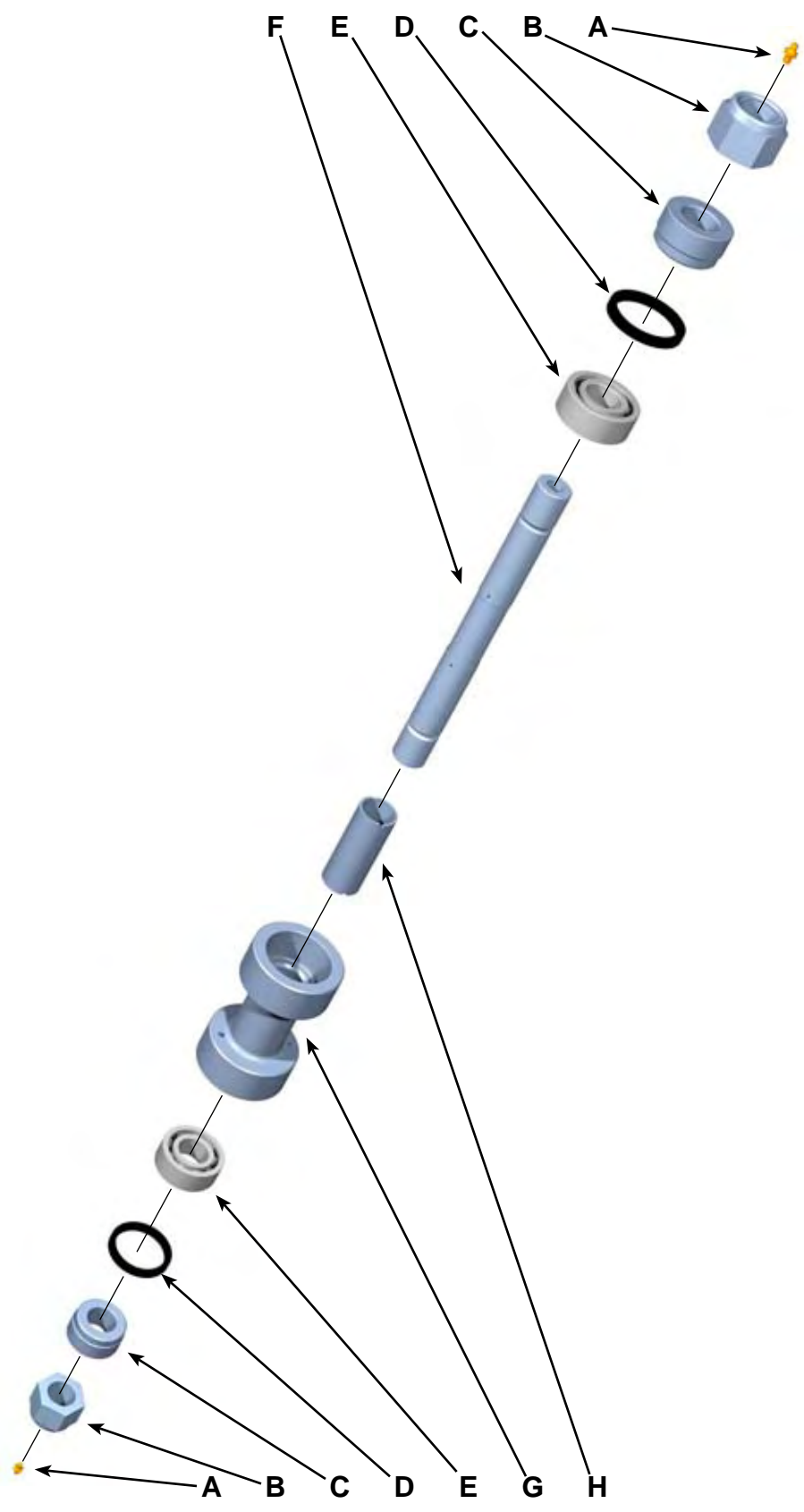


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<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
A	Part	1/8" NPT Grease Fitting	2	02-0005
B	Part	1-3/8" NF Standard Nylock Nut	2	
C	Part	Roller Spacer	1	AX03-033N
D	Part	Parker J-2375 Wiper	2	08-0479
E	Part	Cylindrical Roller Bearing	2	02-0804
F	Part	Support Roller Shaft	1	AX03-031
G	Part	Roller Spacer	1	AX03-033
H	Part	Support Roller	1	AX03-032
J	Part	Support Roller Shaft Sleeve	1	1374-134A

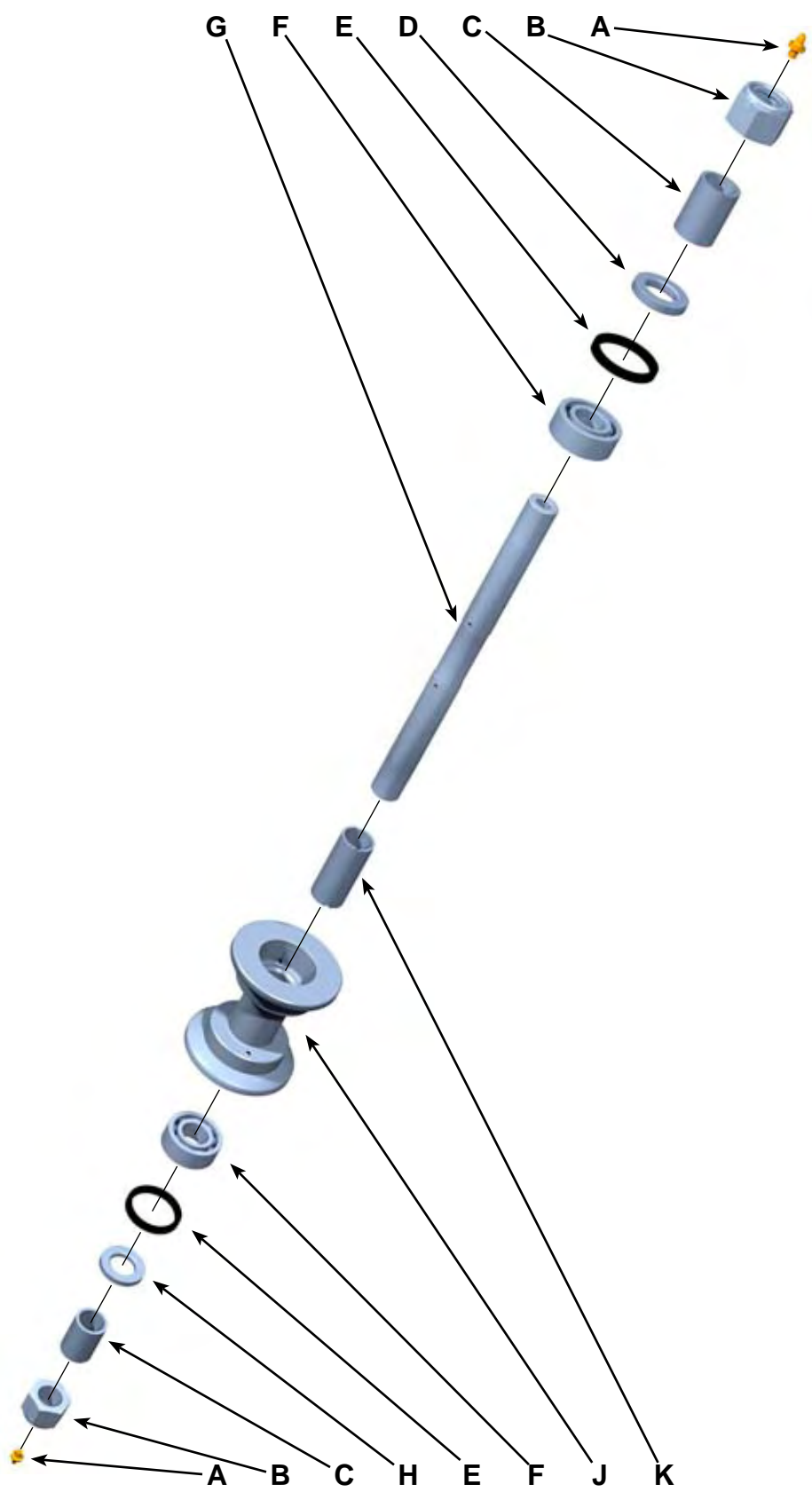


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Item	Type	Description	Qty	Part Number
A	Part	1/4" NF Straight Thread Grease Fitting	2	02-0097
B	Part	1-3/8" NF Standard Nylock Nut	2	
C	Part	Door Roller Spacer	2	AX12-071
D	Part	Parker J-2375 Wiper	2	08-0479
E	Part	Cylindrical Roller Bearing	2	02-0804
F	Part	Support Roller Shaft	1	1374-131D
G	Part	Support Roller	1	1374-135B
H	Part	Support Roller Shaft Sleeve	1	1374-134A

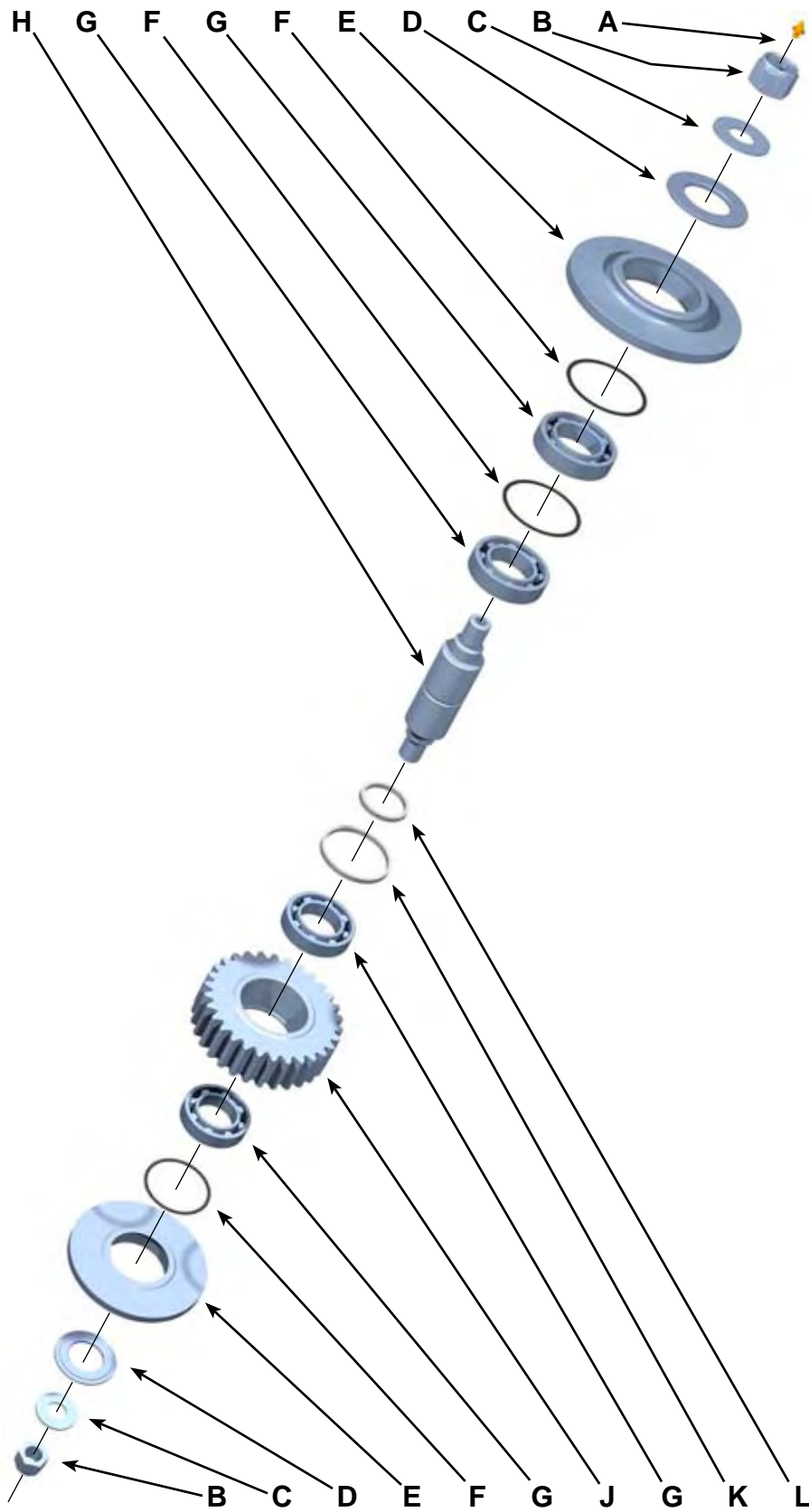


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Item	Type	Description	Qty	Part Number
A	Part	1/8" NPT Grease Fitting	2	02-0005
B	Part	1-3/8" NF Standard Nylock Nut	2	
C	Part	Door Stop Spacer **	2	AX12-04
D	Part	Roller Spacer	1	AX03-033
E	Part	Parker J-2375 Wiper	2	08-0479
F	Part	Cylindrical Roller Bearing	2	02-0804
G	Part	Latch / Door Pivot Roller Shaft	1	AX03-031F
H	Part	Roller Spacer	1	AX03-033N
J	Part	Support Roller	1	AX03-032
K	Part	Support Roller Shaft Sleeve	1	1374-134A

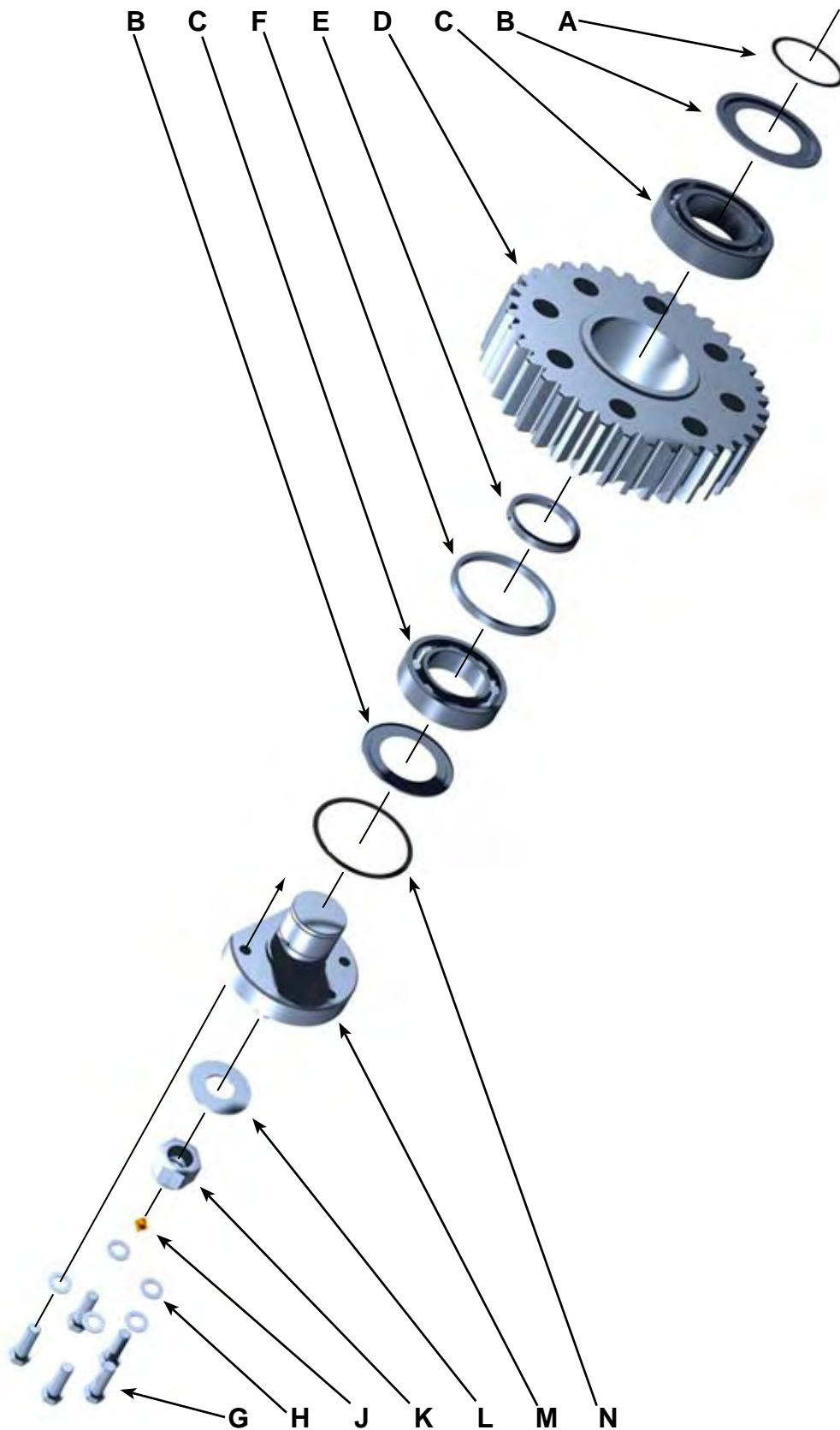
**** NOTE: This part is only used in the door latch roller - it is not used in the door pivot roller**



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<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
A	Part	1/8" NPT Grease Fitting	1	02-0005
B	Part	1-1/2" UNF Standard Nylock Nut	2	
C	Part	1-1/2" Circular Washer	2	
D	Part	Idler Gear Spacer	2	AX03-043
E	Part	Idler Gear Plate	2	AX03-042
F	Part	Bearing Retainer Ring	3	1393-110
G	Part	Cylindrical Roller Bearing	4	1393-106
H	Part	Rotary Idler Gear Shaft	1	AX03-041
J	Part	Rotary Idler Gear	1	1374-119A
K	Part	Idler Gear Spacer	1	1374-129
L	Part	Idler Gear Spacer	1	1374-128



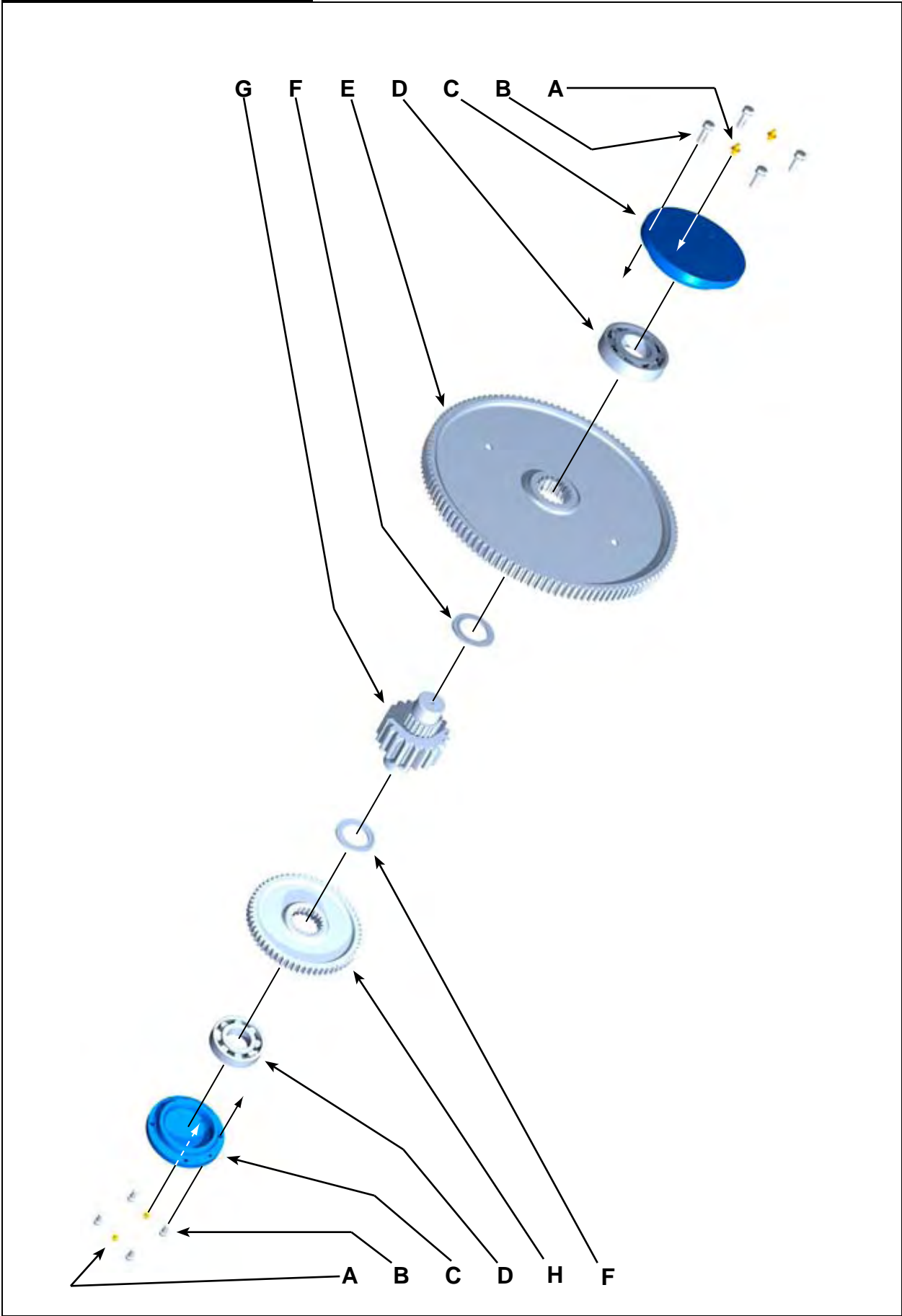
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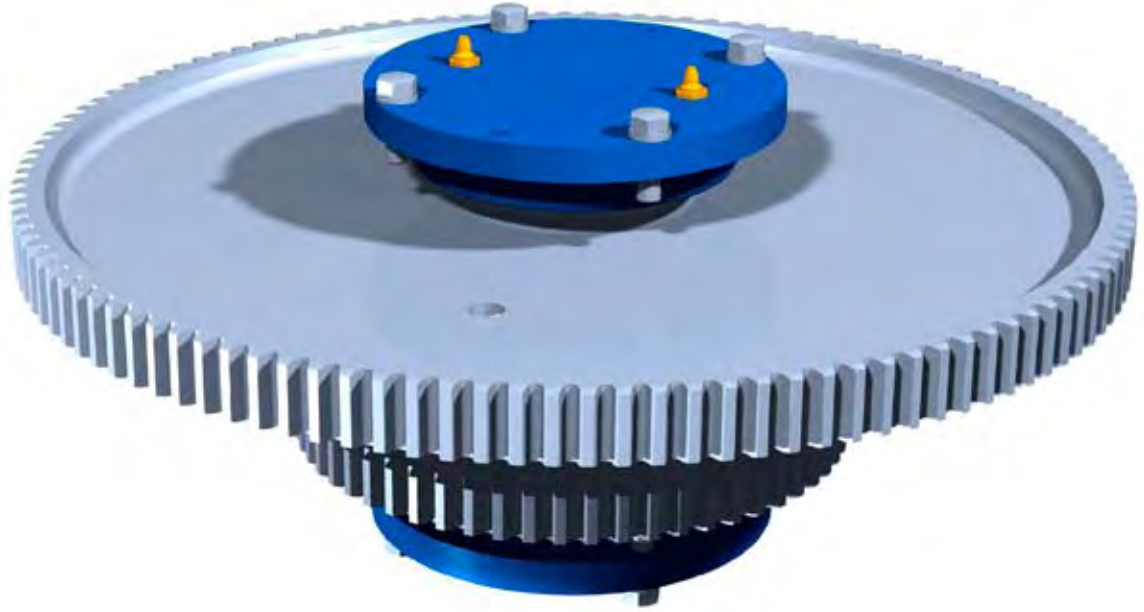
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<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
A	Part	External Retaining	1	02-0667
B	Part	Bearing Seal	2	1374-107
C	Part	Cylindrical Roller Bearing	2	1393-106
D	Part	Pinion Idler Gear	1	1374-120A
E	Part	Idler Gear Spacer	1	1374-128
F	Part	Idler Gear Spacer	1	1374-129
G	Part	3/4" NC x 2-1/2" Hex Bolt	5	
H	Part	3/4" Plain Narrow Washer	5	
J	Part	1/8" NPT Grease Fitting	1	02-0005
K	Part	1-1/2" UNC Nylock Nut	1	
L	Part	1-1/2" Circular Washer	1	
M	Part	Idler Half-Shaft	1	1374-105
N	Part	Retainer Ring	1	1393-110

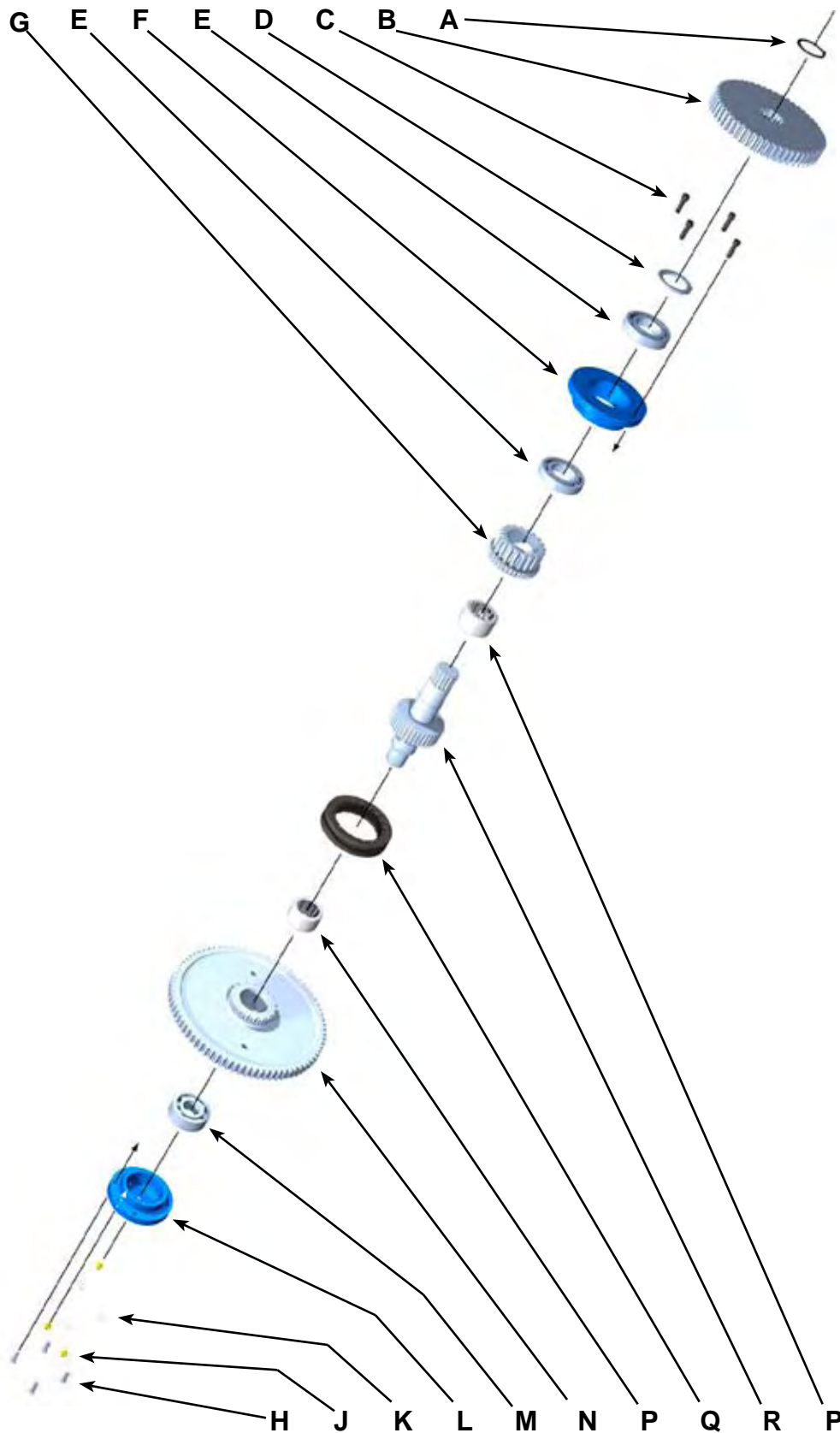


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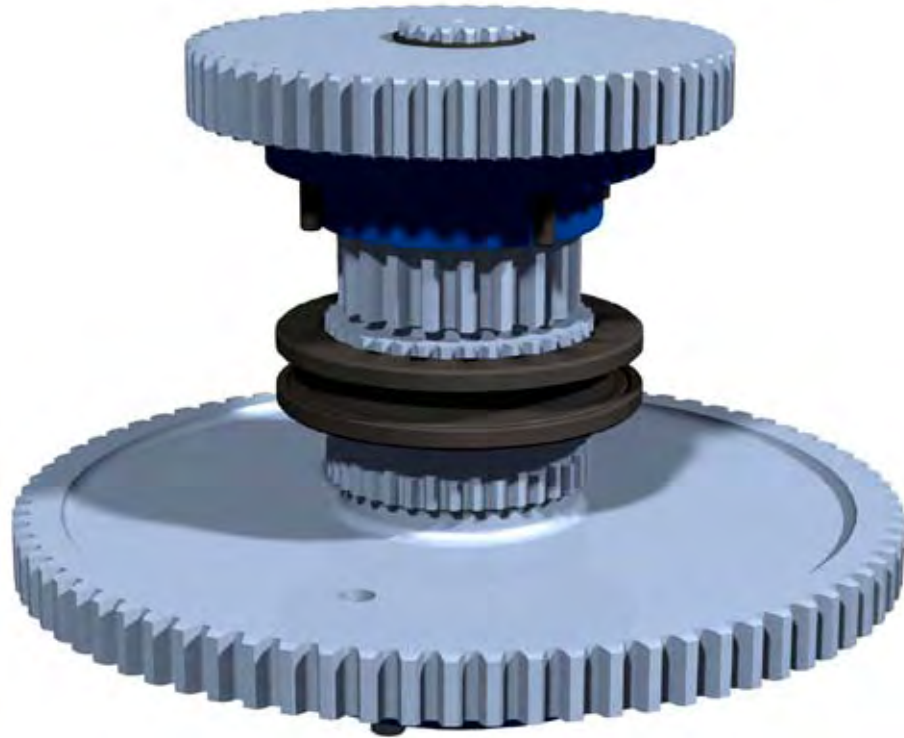


<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
A	Part	1/8" NPT Grease Fitting (2 top, 2 bottom)	4	02-0005
B	Part	1/2" UNC x 1-1/2" hex bolts c/w lockwashers	8	
C	Part	Pinion Bearing Cap	2	1374-89
D	Part	Cylindrical Roller Bearing	2	1374-93
E	Part	Low Pinion Gear	1	1374-88
F	Part	Pinion Gear Spacer	2	1374-94
G	Part	Pinion Gear	1	1374-86A
H	Part	High Pinion Gear	1	1374-87

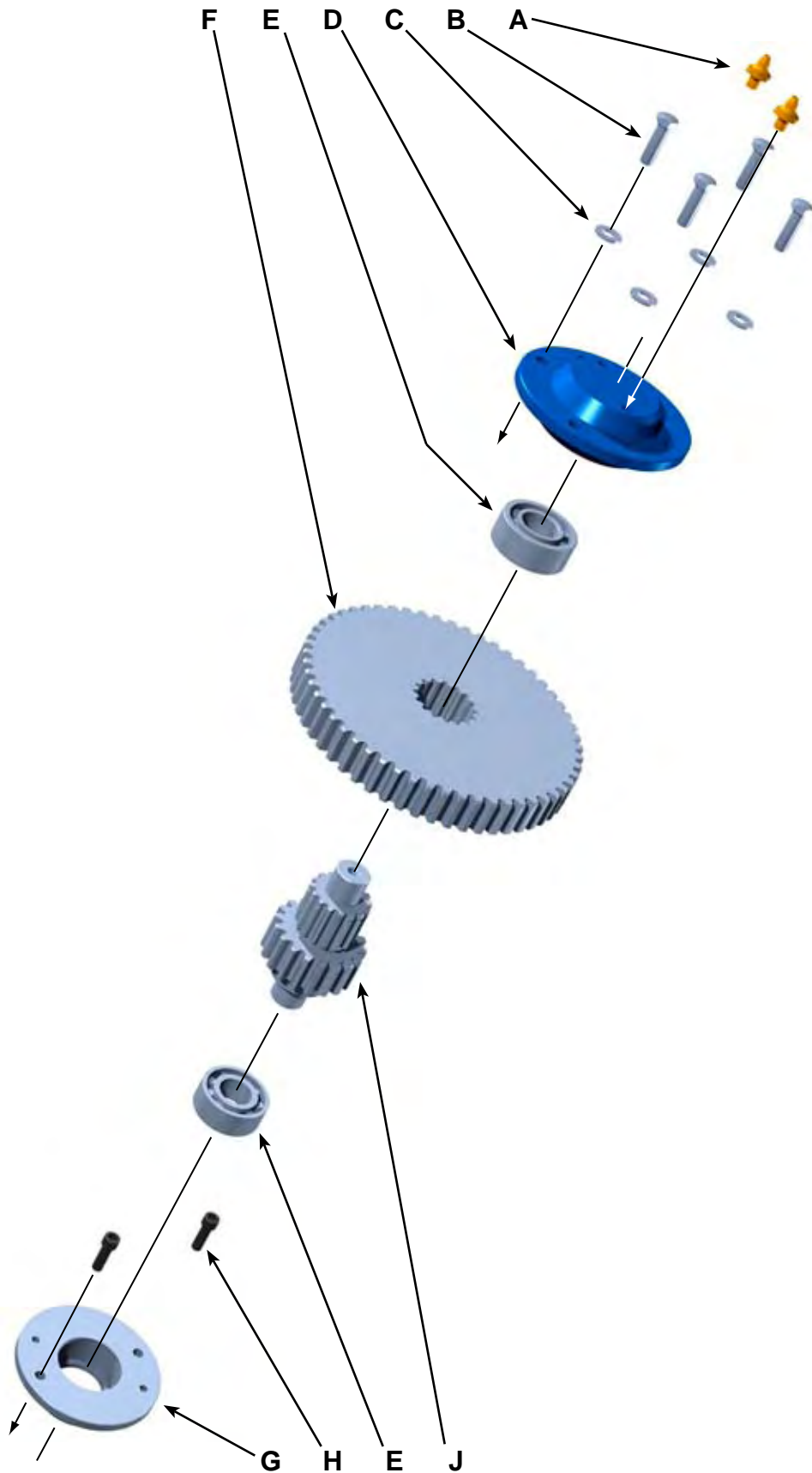


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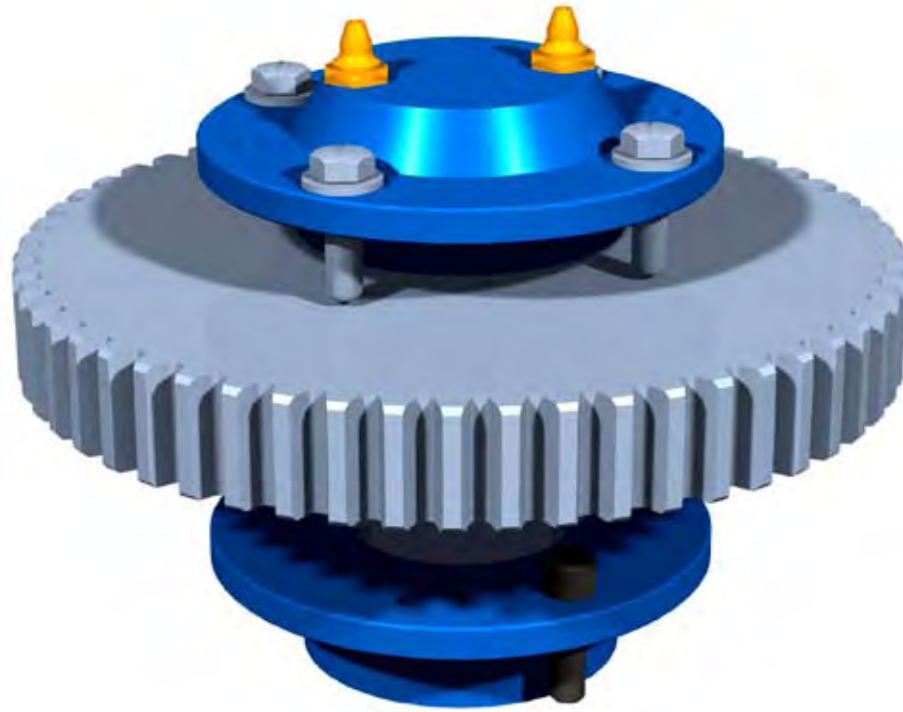


<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
A	Part	Outside Snap Ring	1	1374-50A
B	Part	Clutch Drive Gear	1	AX01-302
C	Part	3/8" NC x 1-1/4" Hex SHCS	4	
D	Part	Upper Clutch Bearing Spacer	1	1374-48
E	Part	Top Clutch Bearing	2	1374-56
F	Part	Upper Bearing Retainer	1	1374-59
G	Part	Low Clutch Gear	1	1374-52
H	Part	3/8" NC x 1-1/2" Hex Bolt	4	
J	Part	1/8" NPT Grease Fitting	3	02-0005
K	Part	3/8" Narrow Washer	4	
L	Part	Clutch Bearing Cap	1	1374-54
M	Part	Cylindrical Roller Bearing	1	1374-55
N	Part	High Clutch Gear	1	1374-51
P	Part	Needle Roller Bearing	2	1374-53
Q	Part	Shifting Collar	1	1374-62
R	Part	Splined Clutch Shaft	1	1374-50

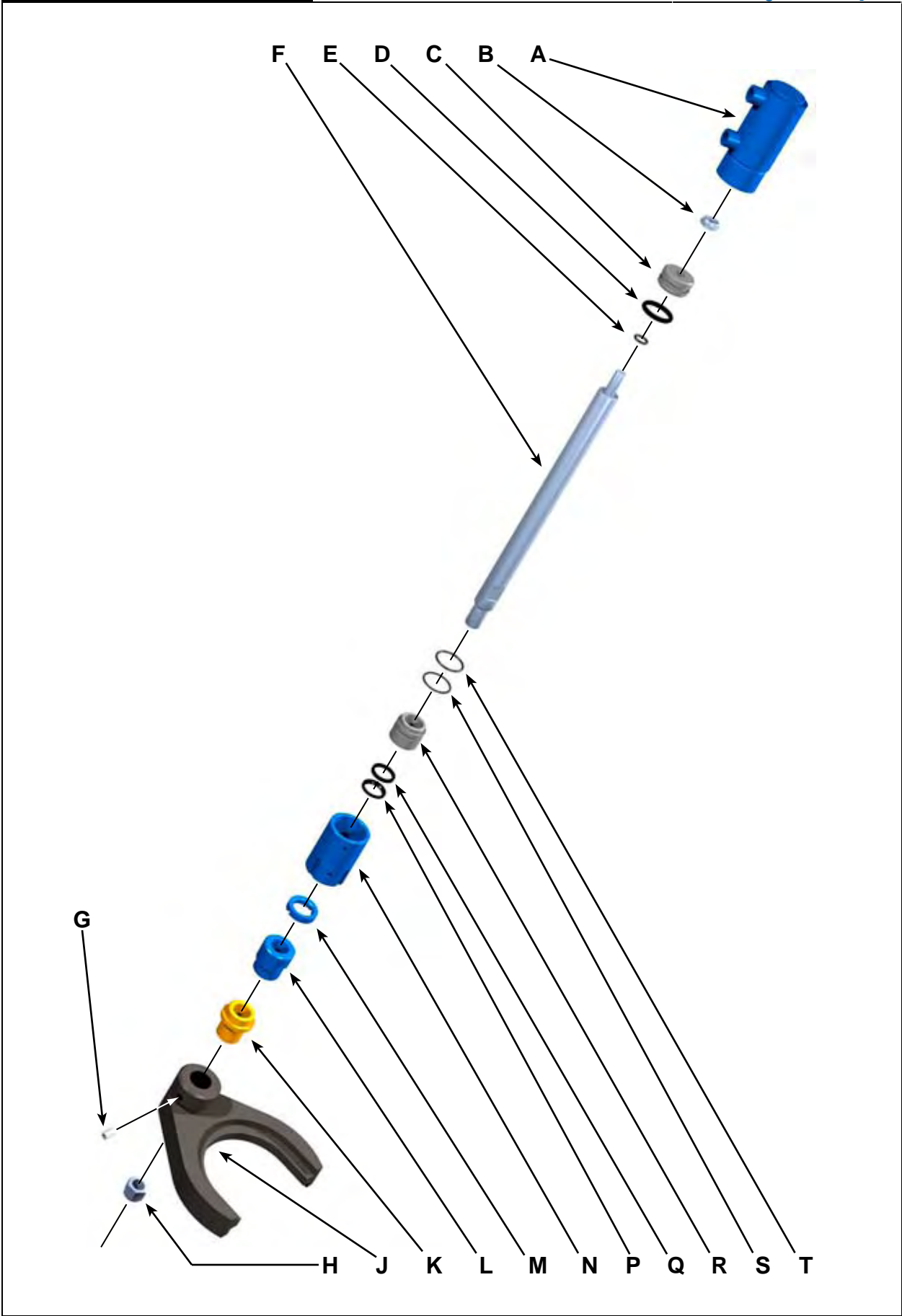


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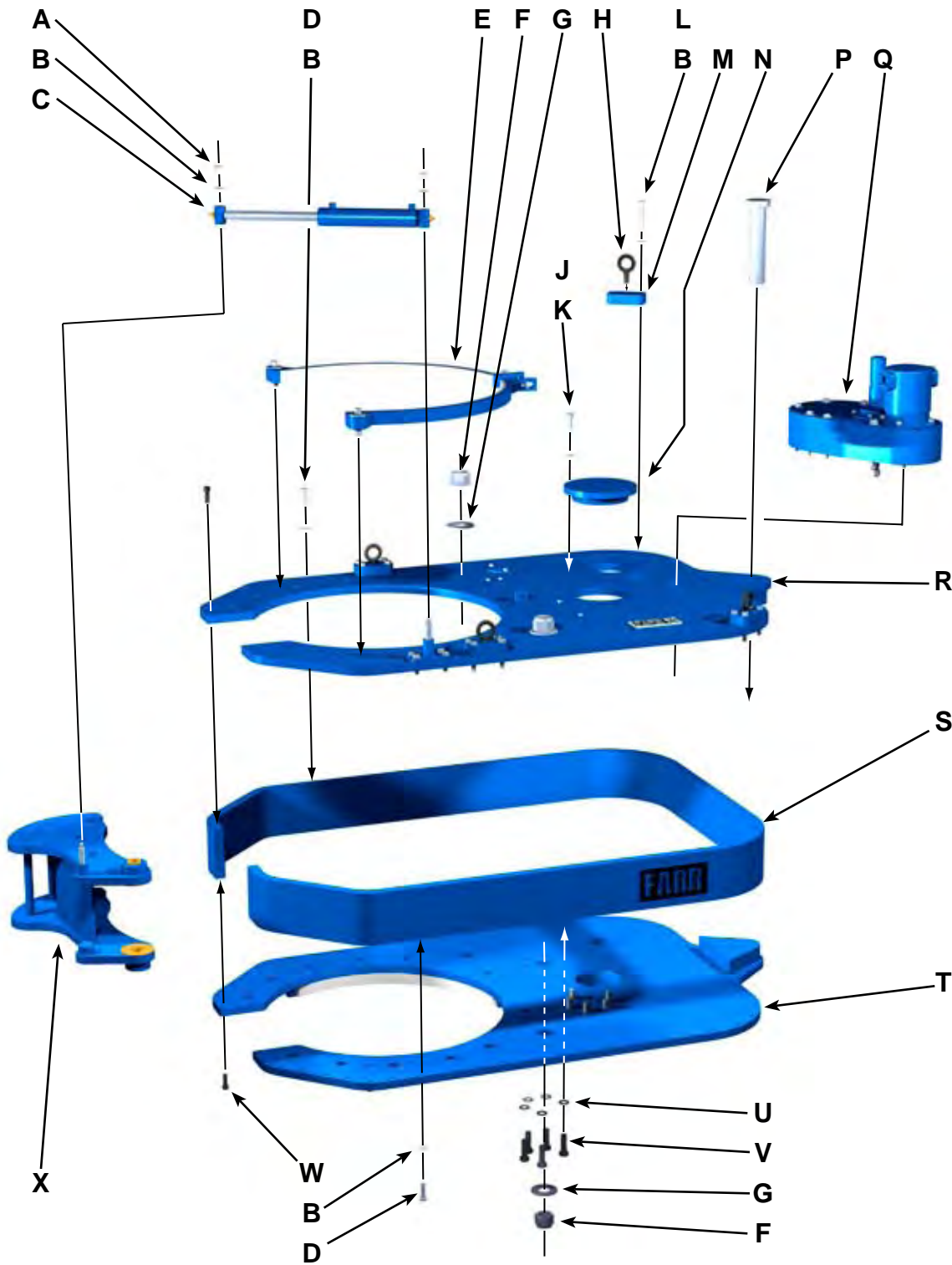
<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
A	Part	1/8" NPT Grease Fitting	2	02-0005
B	Part	3/8" NC x 1-1/4" Hex Bolt	4	
C	Part	3/8" Narrow Washer	4	
D	Part	Top Bearing Cap	1	AX01-305
E	Part	Cylindrical Bearing	2	02-0374
F	Part	Drive Gear	1	AX01-302
G	Part	Bottom Gear Retainer	1	AX01-304
H	Part	3/8" NC x 1-1/4" Hex SHCS	2	
J	Part	Reduction Pinion Gear	1	AX01-301



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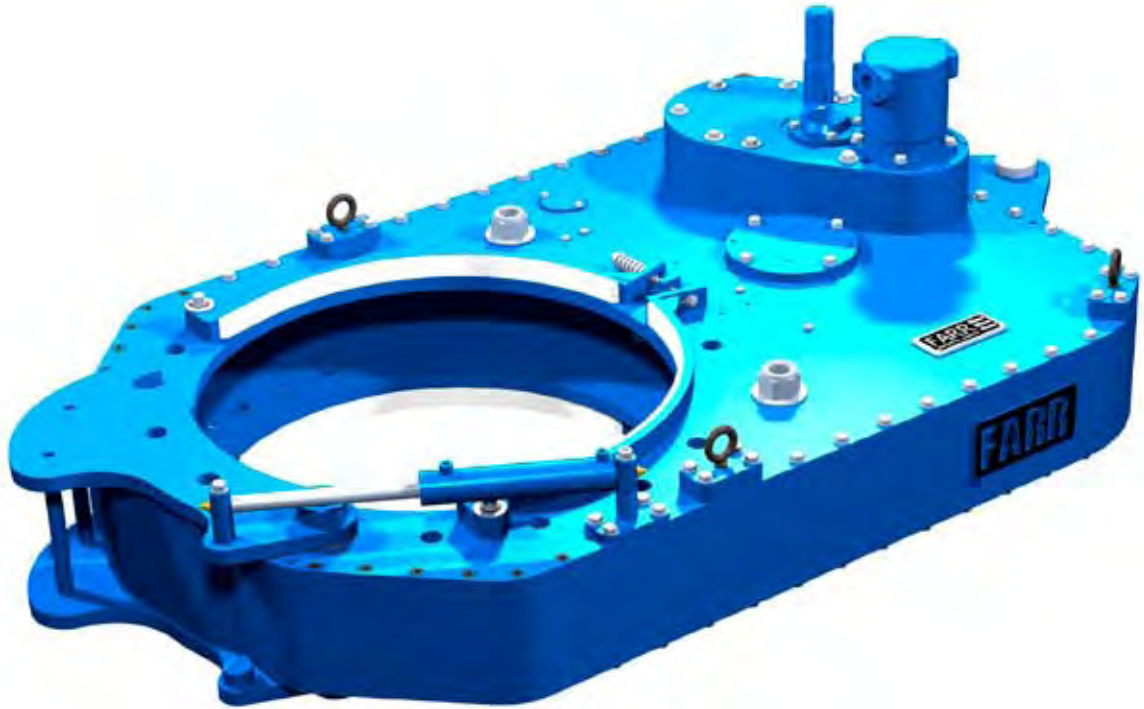
Item	Type	Description	Qty	Part Number
A	Part	1-1/8" Shifting Shaft Cylinder	1	1116-71-02
B	Part	1/2" UNF Thin Nylock Nut	1	
C	Part	Shift Cylinder Piston	1	1037-103-03B
F	Part	Shifting Shaft	1	101-1449
G	Part	3/8" NC x 7/8" Hex Cone Point Set Screw	2	
H	Part	3/4" NC Nylock Nut	1	
J	Part	Shifting Yoke	1	AX03-720
K	Part	Shifting Shaft Bushing	1	1393-78
L	Part	Cylinder Shaft Guide	1	1393-71R-02
M	Part	Gland Lock Ring	1	AF05-254
N	Part	Cylinder Shaft Coupling	1	1116-71-03
R	Part	Shifter Shaft Gland	1	1037-103-04
SEAL KIT FOR SHIFT CYLINDER (Contains the following items)				1482-71-SK
D	Seal	PSP-218 Seal (Piston)	1	
E	Seal	2-112 Rubber O-Ring (Piston)	1	
P	Seal	940-9 Shaft Wiper (Gland)	1	
Q	Seal	12501000-250E1 Polypak (Gland)	1	
S	Seal	8-125 Backup Ring (Gland)	1	
T	Seal	2-125 Rubber O-Ring (Gland)	1	



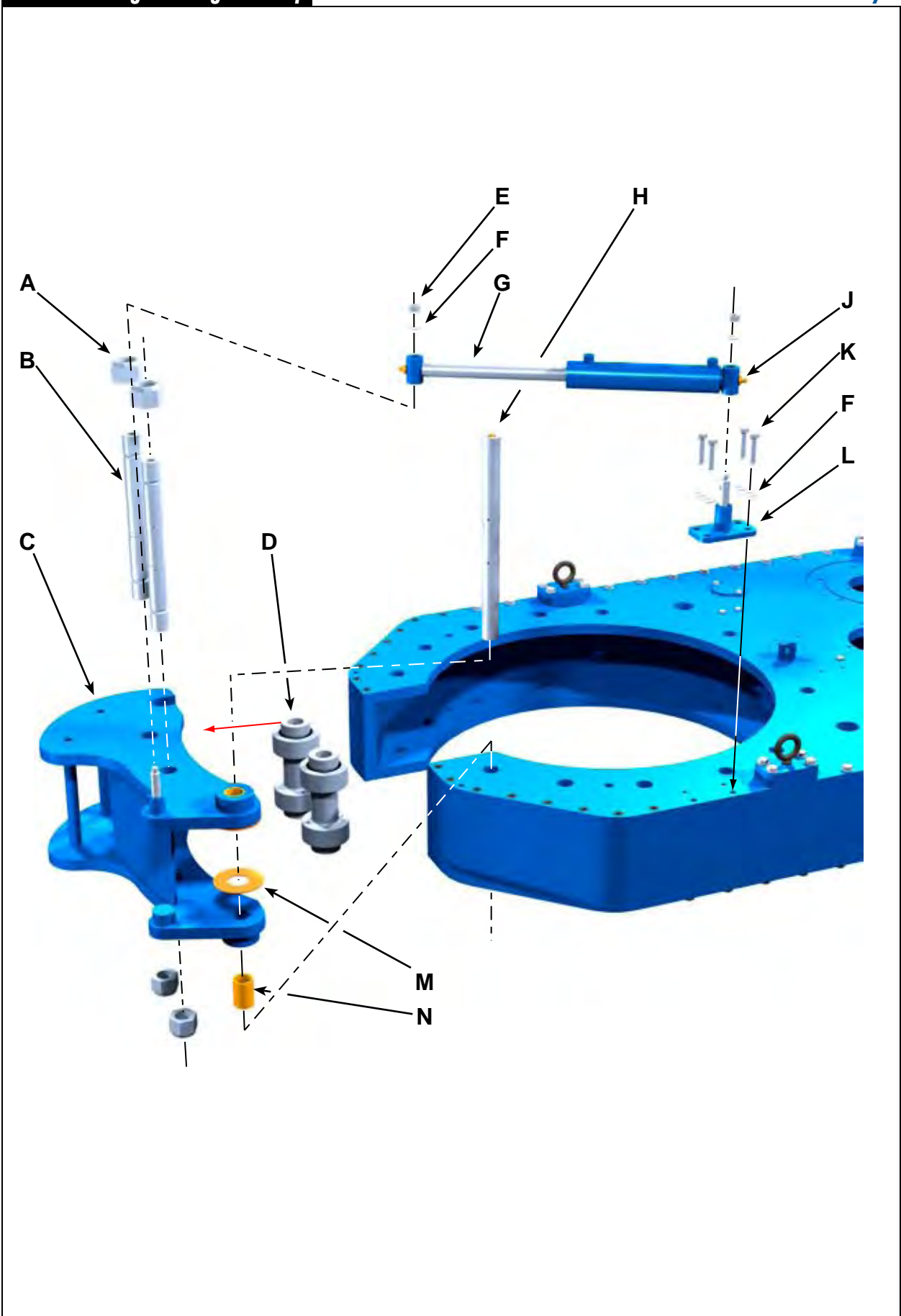
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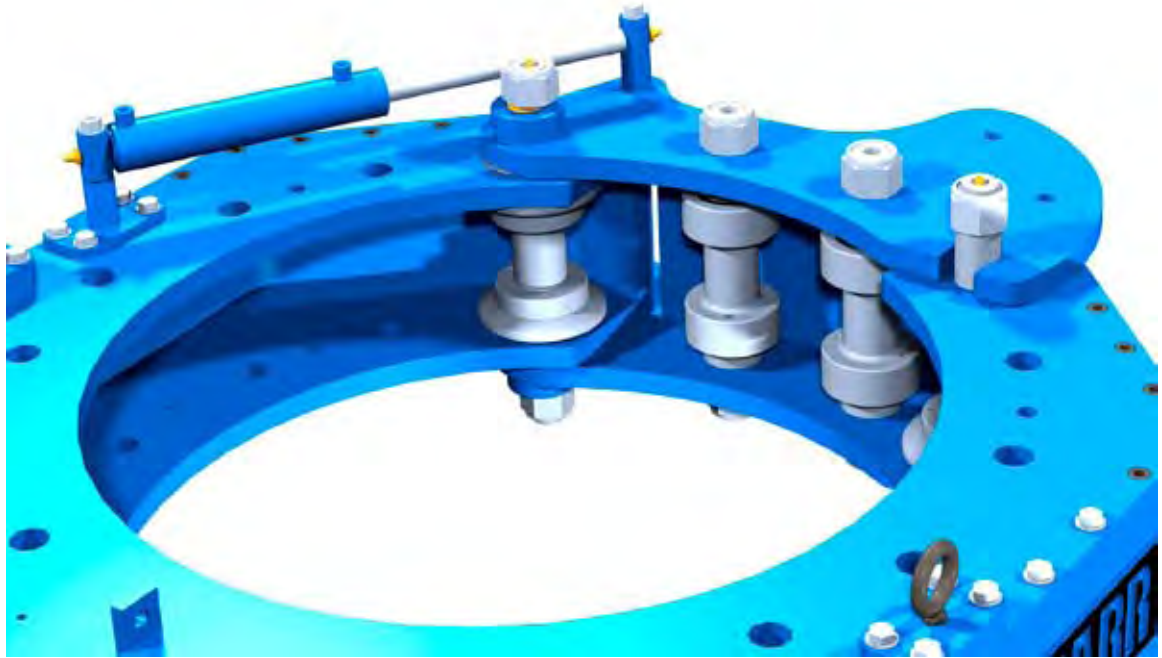
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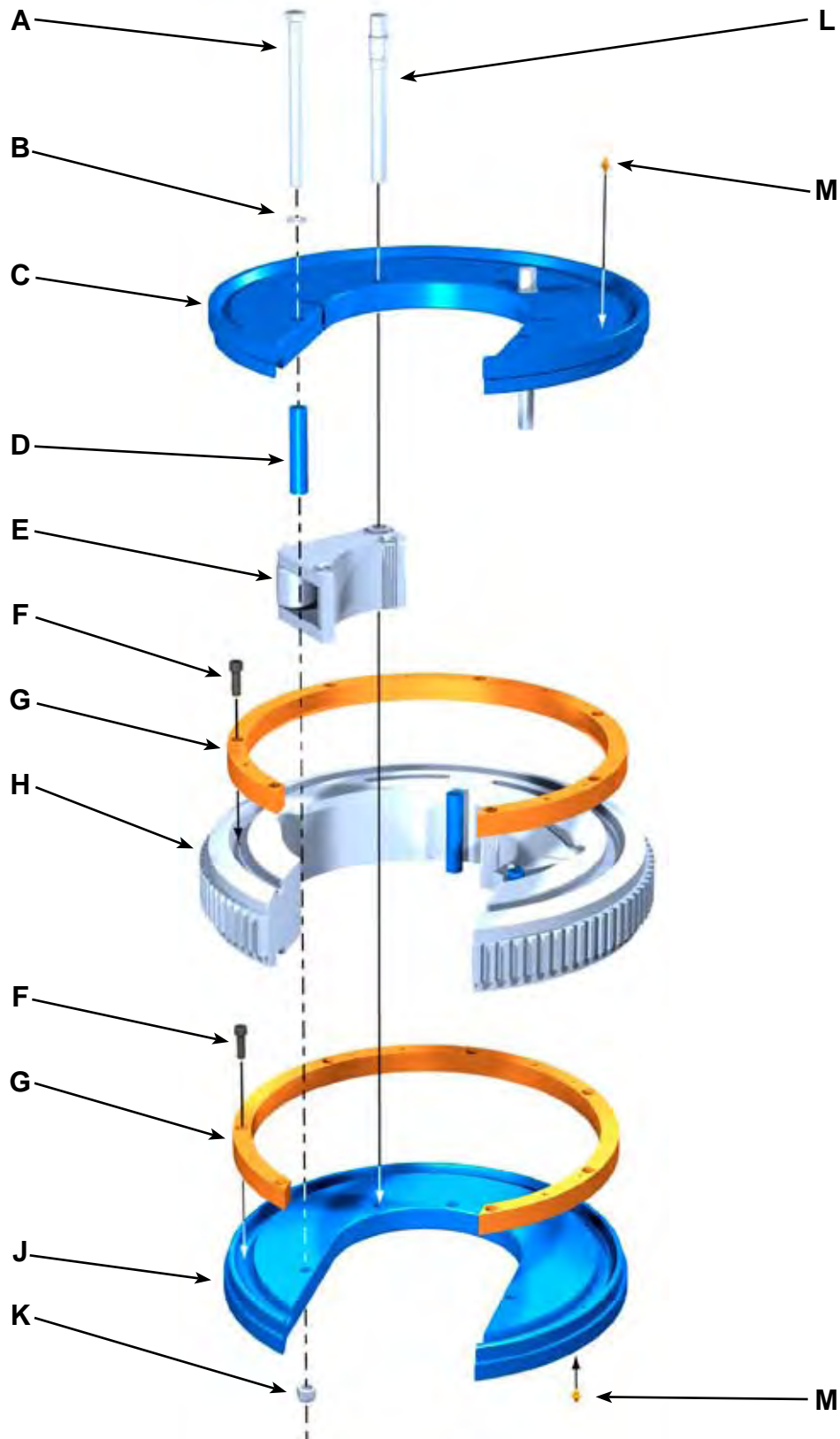
Item	Type	Description	Qty	Part Number
A	Part	1/2" Hex Jam Nut	2	
B	Part	1/2" Plain Narrow Washer	82	
C	Assembly	Door Cylinder	1	1037-103-21
D	Part	1/2" NC x 2" Hex Cap Screw	64	
E	Assembly	Lined Brakeband Assembly	4	1410A-29-00
F	Part	1-1/2" NF Nylock Nut	4	
G	Part	1-1/2" Plain Washer	4	
H	Part	Chain Hanger Eye Bolt	4	101-2055
J	Part	1/2" NC x 1-1/2" Hex Bolt	8	
K	Part	1/2" Carbon Steel Lockwasher	8	
L	Part	1/2" NC x 3-1/4" Hex Cap Screw (Chain Hanger)	8	
	Part	1/2" NC x 2-1/4" Hex Cap Screw (Chain Hanger)	8	
M	Part	Bolt-on Hanger Block	4	101-1390
N	Part	Pinion Bearing Cap	2	1374-89
P	Part	Load Cell Anchor Pin	1	AX07-003
Q	Assembly	Motor Mount Assembly (See Pp. 7.30 - 7.31)	1	
R	Part	Top Plate	1	AX07-020
S	Part	Side Body	1	101-0227
T	Part	Bottom Plate	1	AX07-010
U	Part	3/4" Plain Narrow Washer	10	
V	Part	3/4" NC x 2-1/2" Hex Bolt	10	
W	Part	1/2" NC x 1-1/2" Hex SHCS	32	
X	Part	Door Assembly (See Pp. 7.26 - 7.27)	1	



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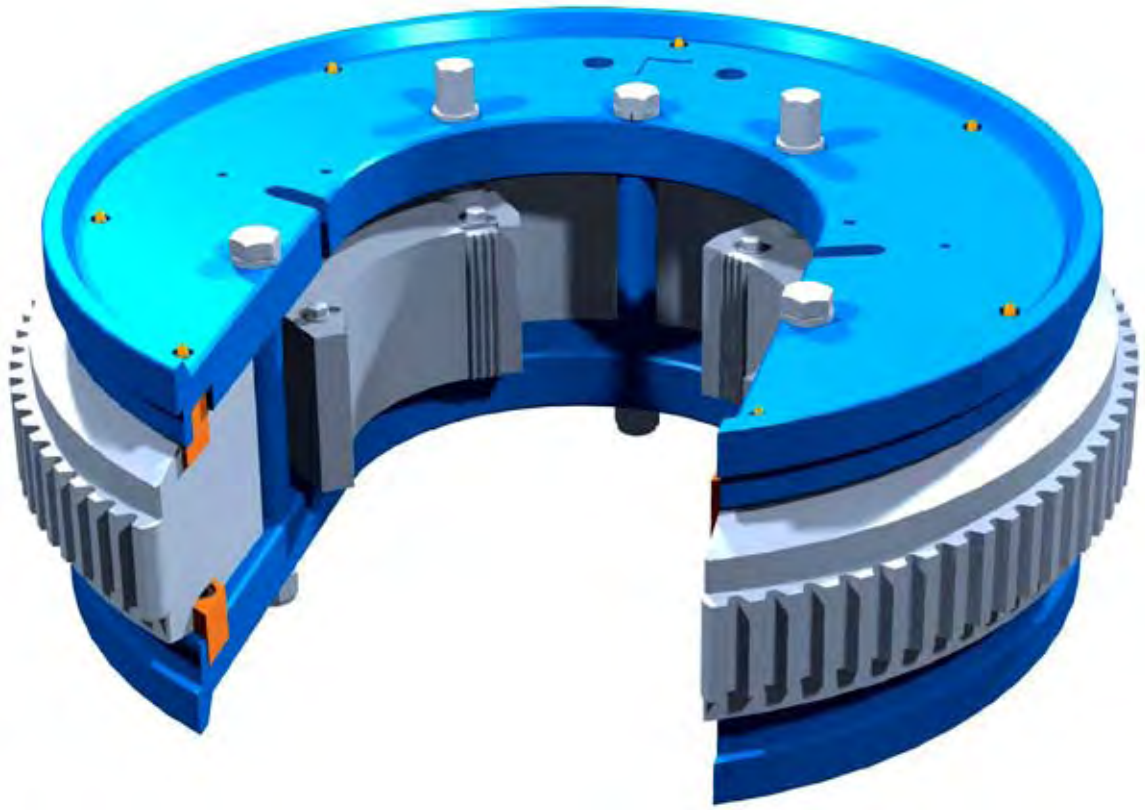
Item	Type	Description	Qty	Part Number
A	Part	1-3/8" Hex Nylock Nut	4	
B	Part	Door Roller Support Shaft	2	1374-131D
C	Weldment	Door Weldment	1	101-1972
D	Assembly	Door Support Roller Assembly	2	101-1435
E	Part	1/2" NC Hex Jam Nut	2	
F	Part	1/2" Plain Narrow Washer	6	
G	Part	Door Cylinder	1	1037-103-21
H	Part	Door Pivot Roller Shaft (Shown for illustration purposes only)		
J	Part	1/8" NPT Grease Fitting	2	02-0005
K	Part	1/2" NC x 2" Hex Cap Screw	4	
L	Weldment	Door Cylinder Mounting Post	1	101-2064
M	Part	Pivot Washer	2	AX12-07
N	Part	Door Pivot Bushing	2	AX12-006



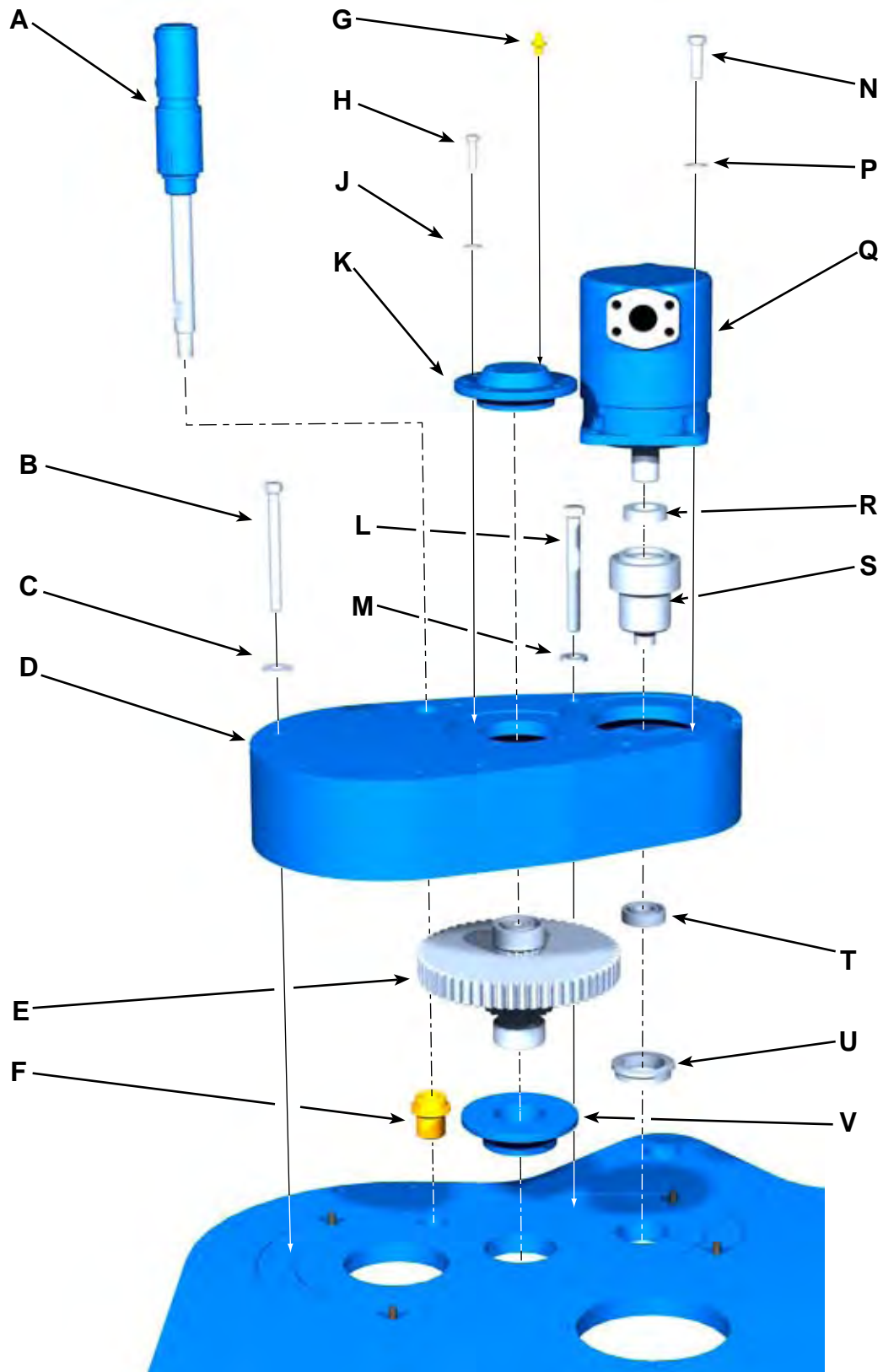
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Item	Type	Description	Qty	Part Number
A	Part	7/8" NC x 11-1/2" Hex Cap Screw	3	
B	Part	7/8" Carbon Steel Lockwasher	6	
C	Part	Top Cageplate	1	1410A-21A
D	Part	Cageplate Spacer	3	AX20-002
E	Assembly	Jaw Die Kit (14" Shown - See Pg. 3.12 for complete list of available kits)		
F	Part	5/8" NC x 2" Hex SHCS	14	
G	Part	Brass Support Ring	2	1410A-585
H	Part	Rotary Gear	1	AX01-010
J	Part	Bottom Cageplate	1	1410A-22A
K	Part	7/8" NC Hex Nylock Nut	3	
L	Part	Jaw Pivot Bolt	2	1393-28X
M	Part	1/8" NPT Grease Fitting	11	02-0005



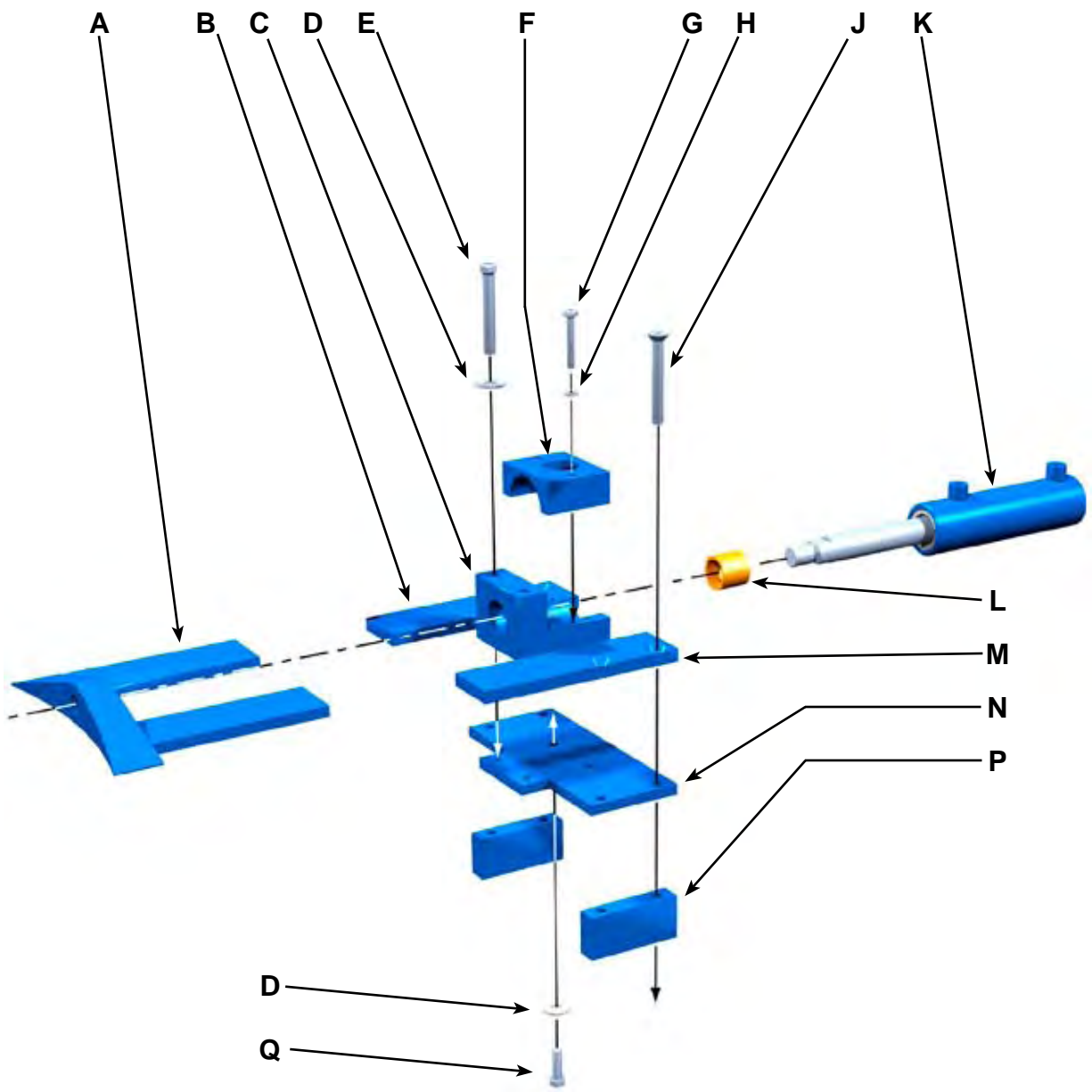
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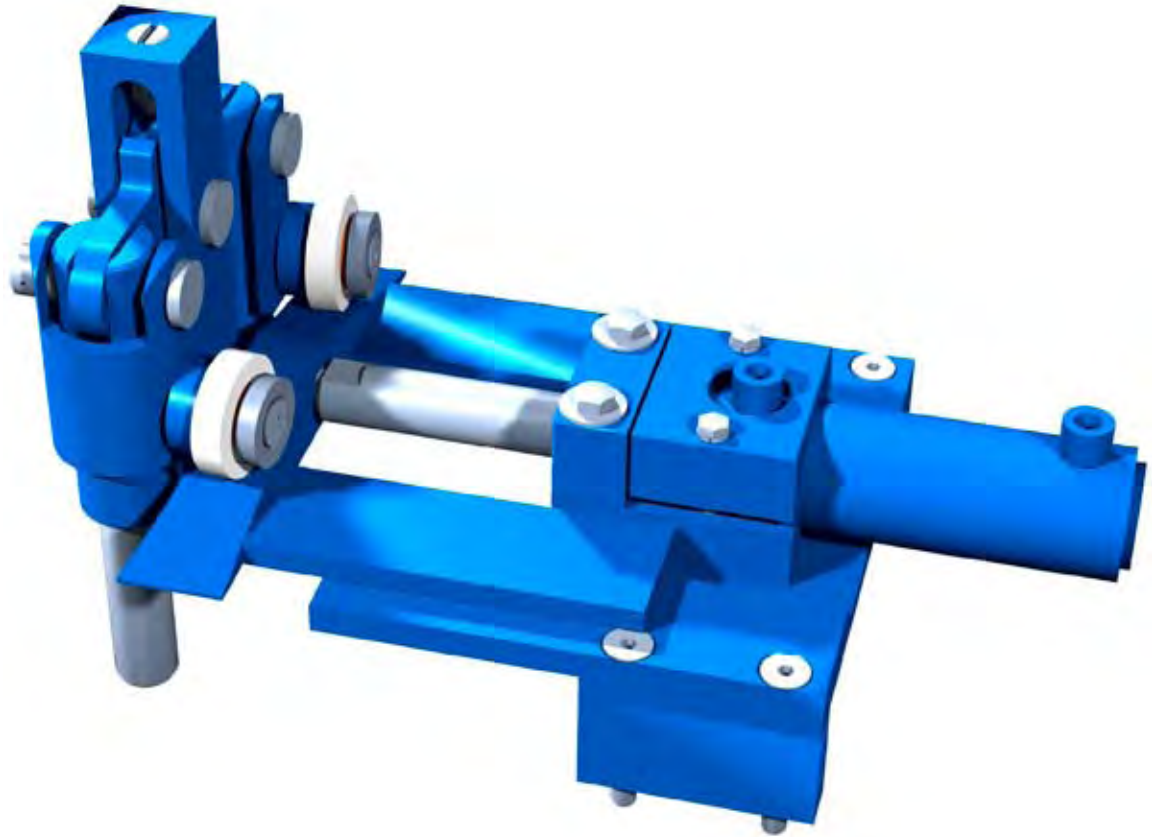
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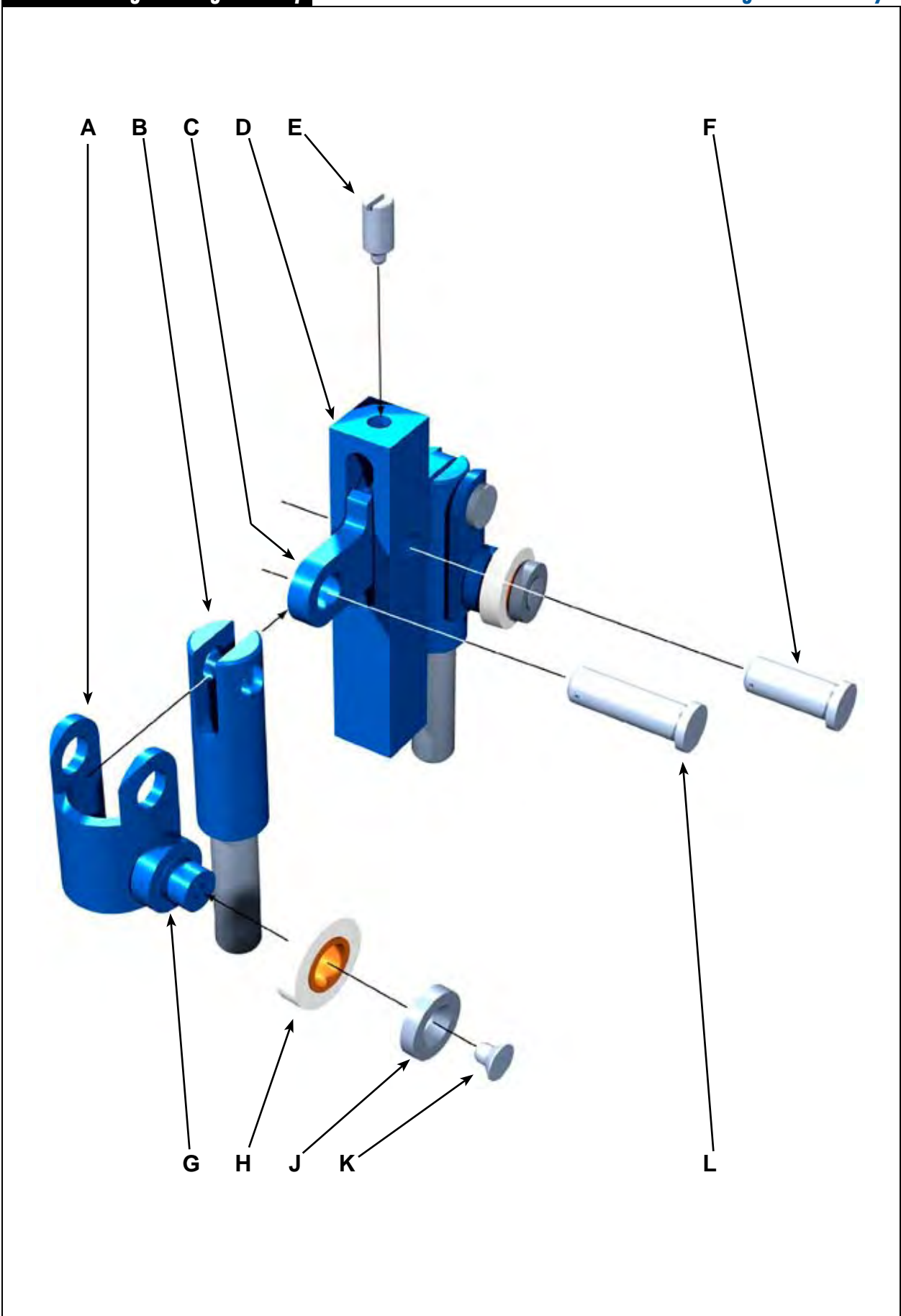
Item	Type	Description	Qty	Part Number
A	Assembly	Shifter Assembly (See Pp. 7.22 - 7.23)	1	
B	Part	1/2" NC x 5-1/2" Hex Cap Screw	6	
C	Part	1/2" Regular Circular Washer	6	
D	Part	Motor Mount	1	AX01-370A
E	Part	Reduction Pinion Gear Assembly	1	101-1444
F	Part	Shifting Shaft Bushing	1	1393-78
G	Part	1/8" NPT Grease Fitting	2	02-0005
H	Part	3/8" NC X 1-1/4" Hex Cap Screw	4	
J	Part	3/8" Plain Narrow Washer	4	
K	Part	Reduction Pinion Gear Bearing Cap	1	AX01-305
L	Part	5/8"NC x 5-1/2" Hex Cap Screw	2	
M	Part	5/8" Circular Washer	2	
N	Part	1/2" NC x 1-1/2" Hex Cap Screw	4	
P	Part	1/2" Narrow Washer	4	
Q	Part	Rineer GA-15 Motor	1	87-0006
R	Part	Motor Gear Spacer	1	AX01-307
S	Part	Motor Shaft Gear	1	AX01-306
T	Part	Cylindrical Roller Bearing	1	02-0123
U	Part	Motor Mount Bearing Retainer	1	AA04-001
V	Part	Bottom Reduction Pinion Gear Retainer	1	AX01-304



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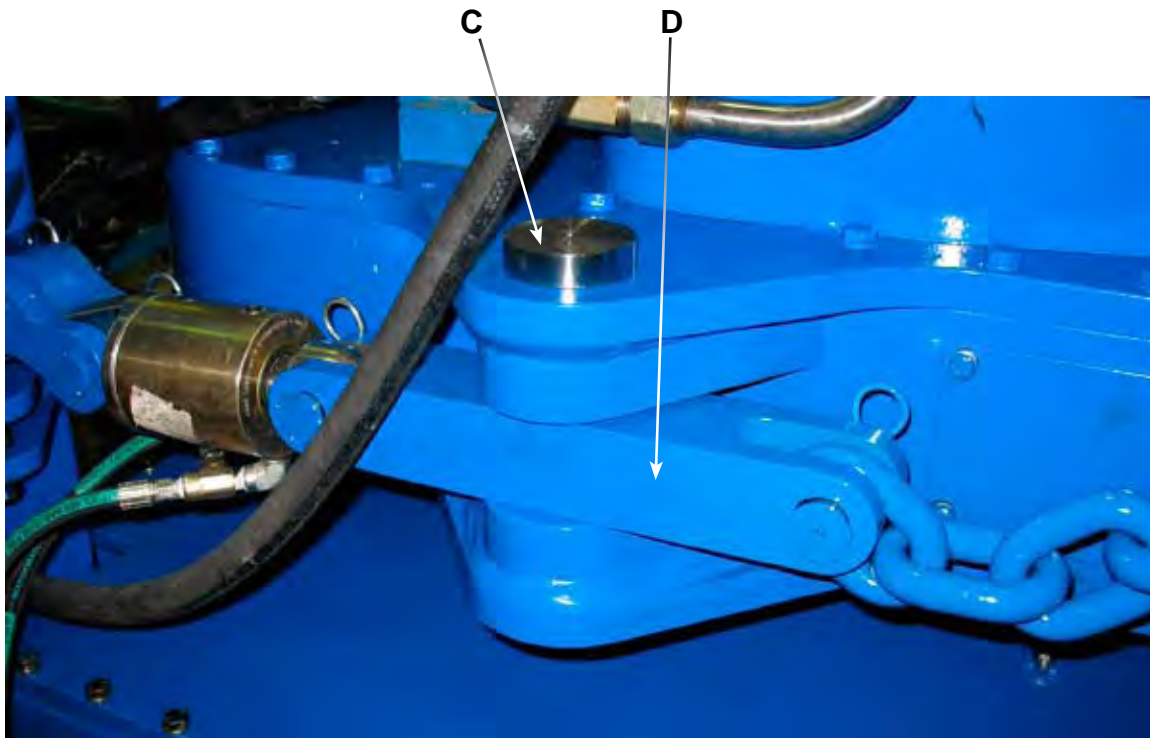
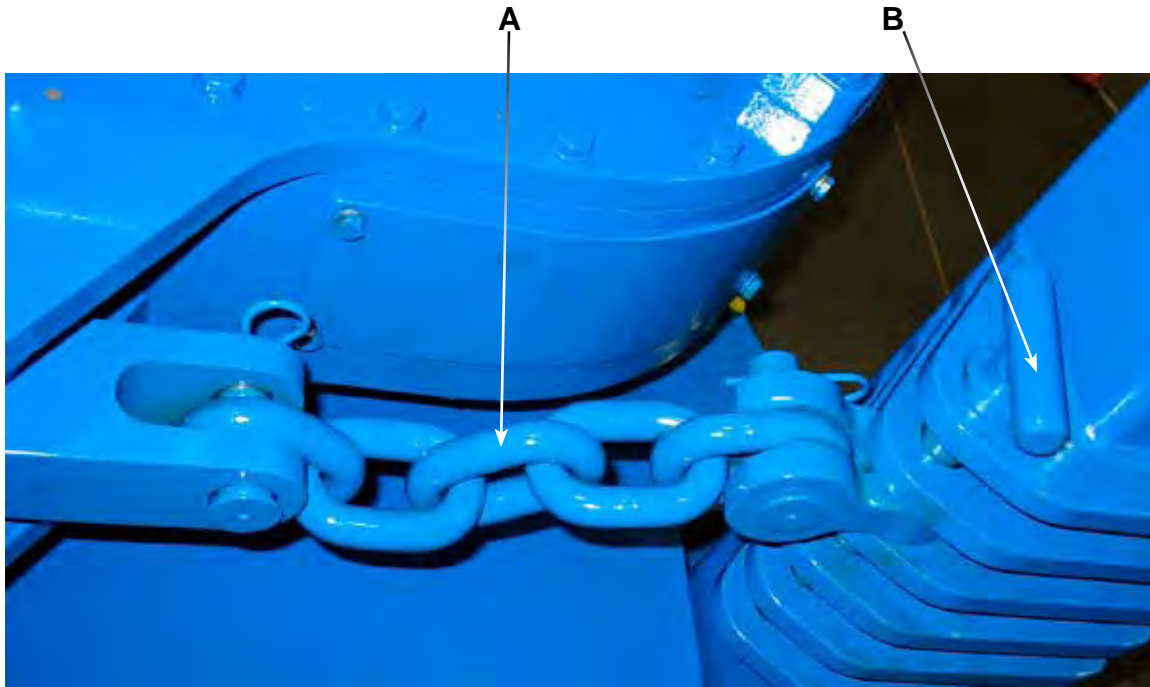


Item	Type	Description	Qty	Part Number
A	Weldment	Cylinder Mount Weldment	1	1037-100-8
B	Part	RH RBP Ramp Support Plate	1	101-1908
C	Part	Cylinder Mounting Block	1	101-0255
D	Part	3/8" Plain Washer	4	
E	Part	3/8" NC x 2-3/4" Hex Cap Screw	2	
F	Part	Cylinder Mount Cover	1	101-0735
G	Part	1/4" NC x 1-3/4" Hex Cap Screw	2	
H	Part	1/4" Carbon Steel Lockwasher	2	
J	Part	3/8" NF x 3" Hex Flat Head Cap Screw	4	
K	Assembly	RBP Cylinder	1	101-0732
L	Part	Split Bushing	1	1116-100-17B
M	Part	LH RBP Ramp Support Plate	1	101-2239
N	Part	Mounting Plate	1	1050-100-32
P	Part	Offset Mounting Plate	2	101-1457
Q	Part	3/8" NC x 1-1/4" Hex Cap Screw	2	

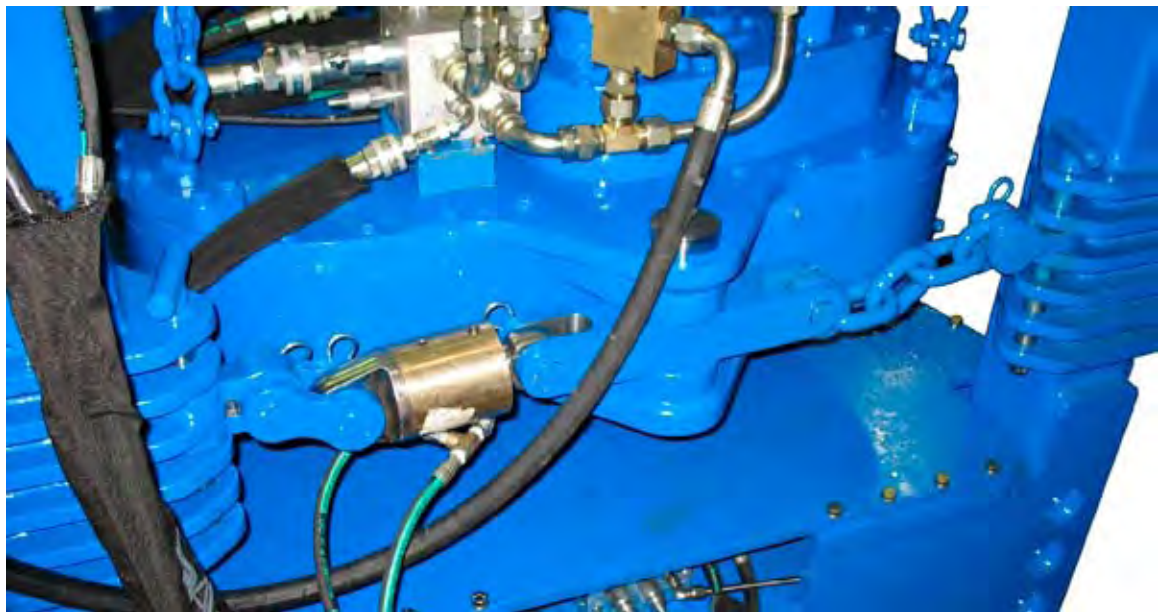
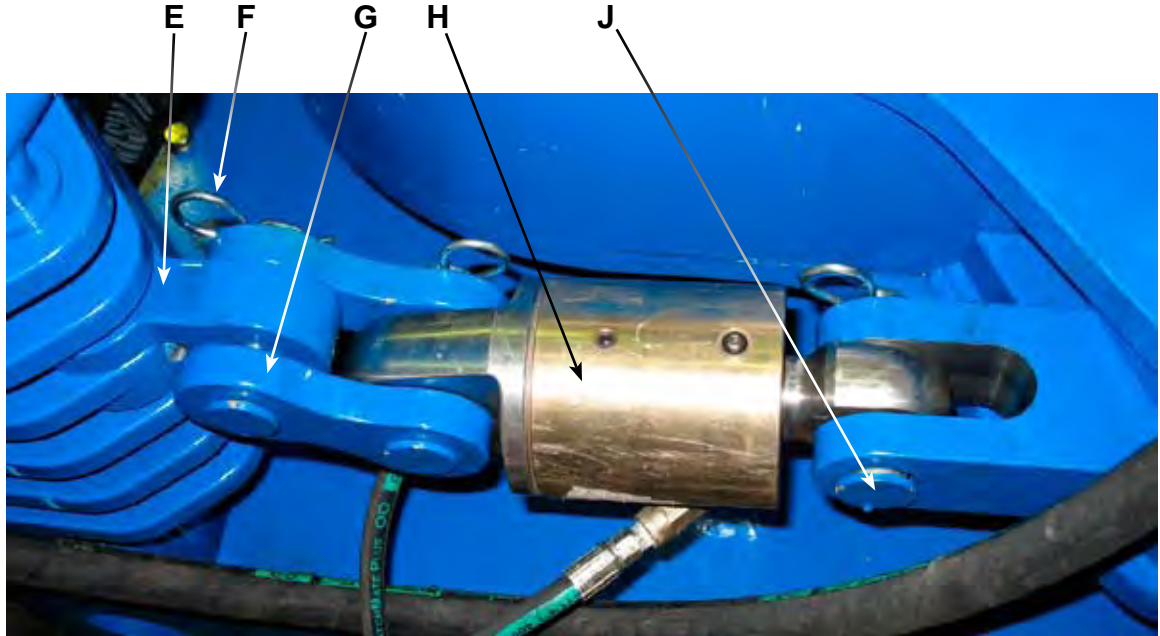


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Item	Type	Description	Qty	Part Number
A	Part	Remote Backing Pin Arm	2	1404-100-4
B	Part	Backing Pin	2	101-1456
C	Part	Remote Backing Pin Pivot Arm	1	101-1454
D	Part	Remote Backing Pin Pivot Post	1	101-1906
E	Part	Ball-Nose Spring Plunger	1	09-9149
F	Part	RBP - Short Pin	1	1438-100-08
G	Part	RBP Bearing Mount (typically welded to RBP Arm)	2	1438-100-12
H	Assembly	Remote Backing Pin Bearing Assembly	2	1404-100-14
J	Part	Remote Backing Pin Washer	2	1438-100-13
K	Part	3/8" NC x 1/2" Hex FHCS	2	
L	Part	RBP - Long Pin	2	1438-100-07
	Part	3/32" x 1" Hammer-Lock Type Cotter Pin	3	



Load cell chain links must be minimum Grade 80



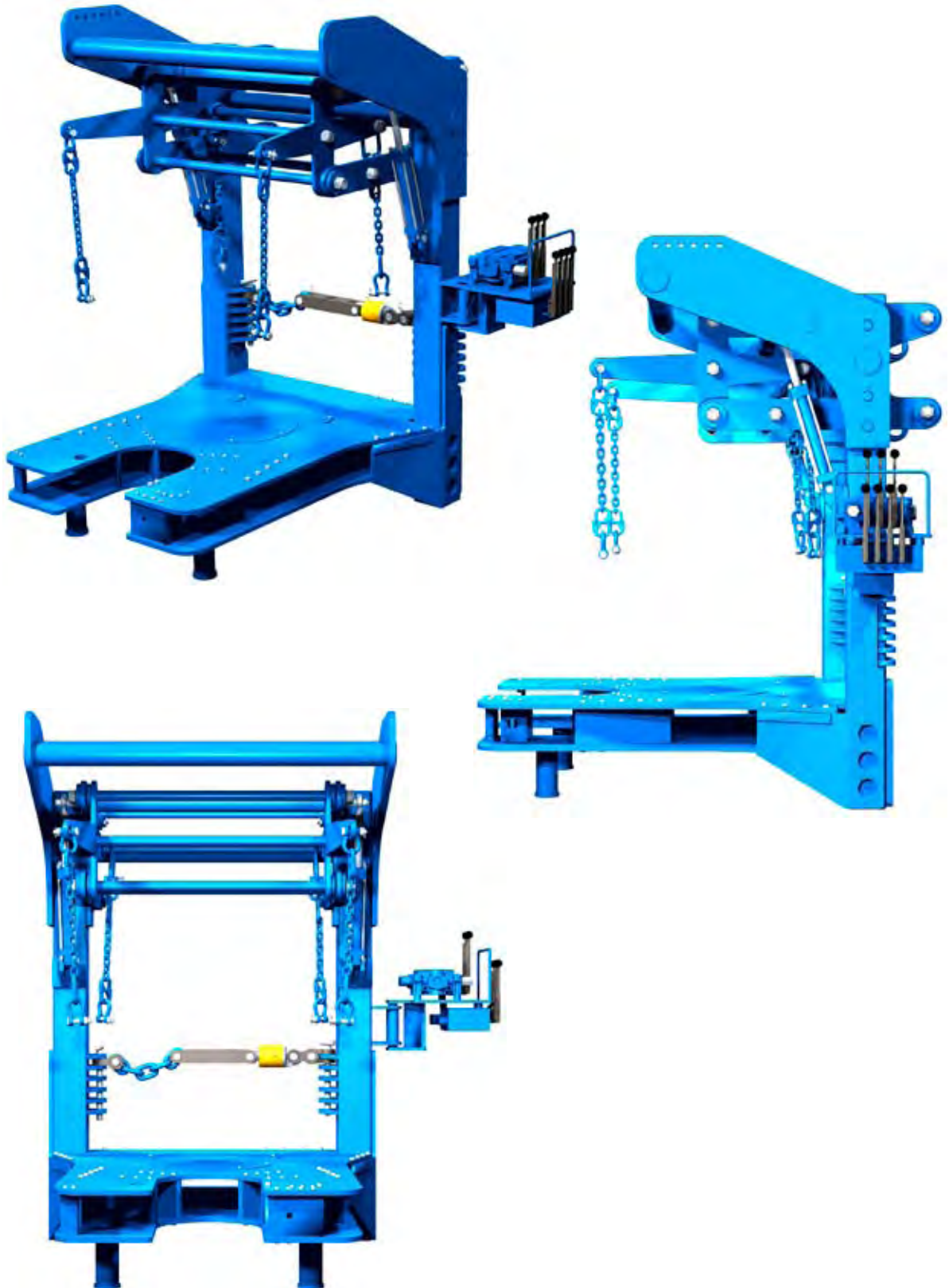
Item	Type	Description	Qty	Part Number
A	Part	5 x 7/8" Grade 80 Chain Links	1	101-2306
B	Weldment	Load Cell Pin	2	AC09-040
C	Part	Load Cell Anchor Pin	1	AX07-003
D	Part	Load Cell Tong Body Link	1	101-1401
E	Part	Load Cell Link	2	AC09-113
F	Part	3/16 x 3-1/4" Hitch Pin	5	02-0028
G	Part	Load Cell Link Plate	2	AC09-114
H	Part	4.08" Tension Load Cell	1	10-0008T
J	Part	Load Cell Pin	5	AC09-121

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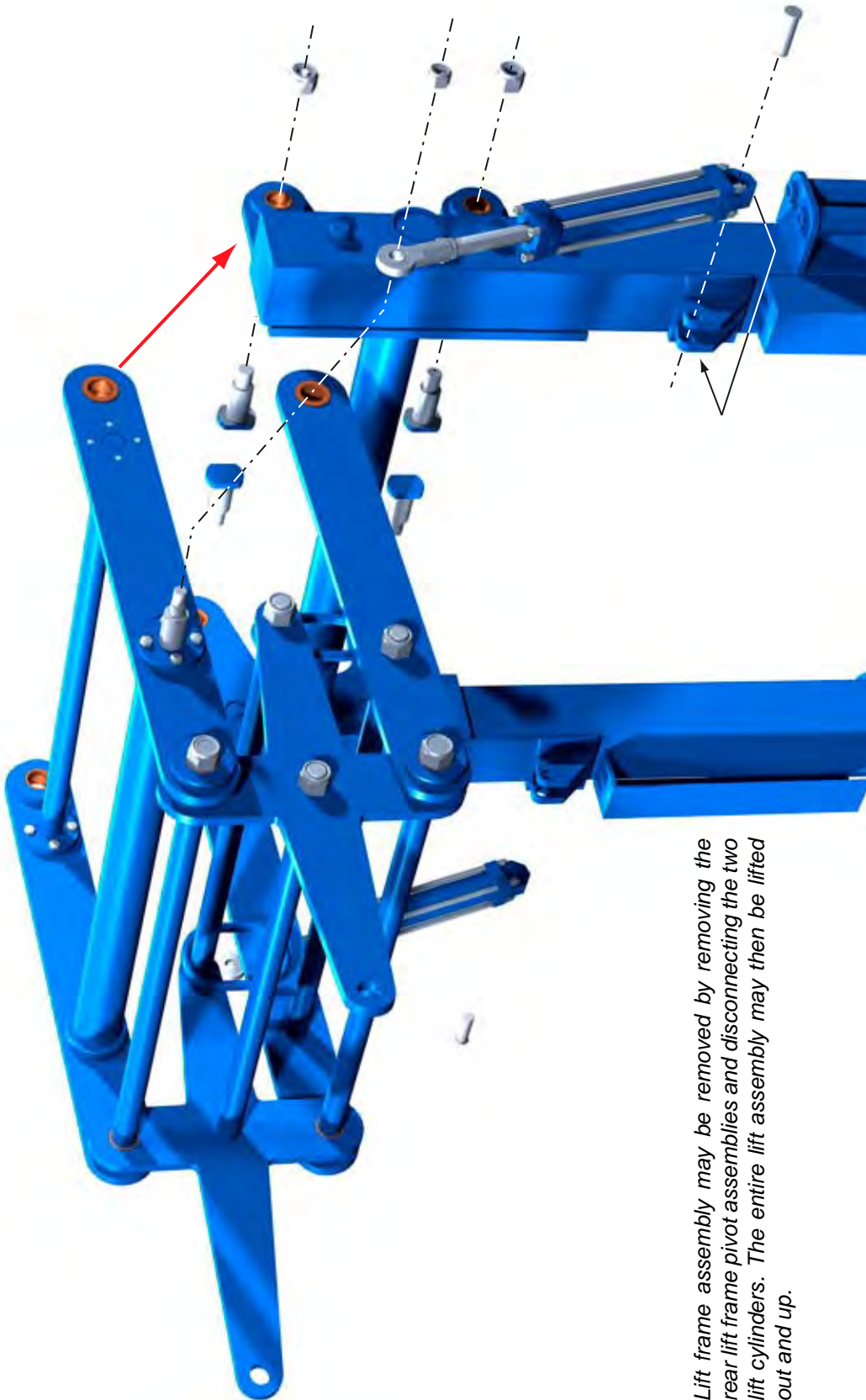


Frame Assembly

(shown without spreader bar)



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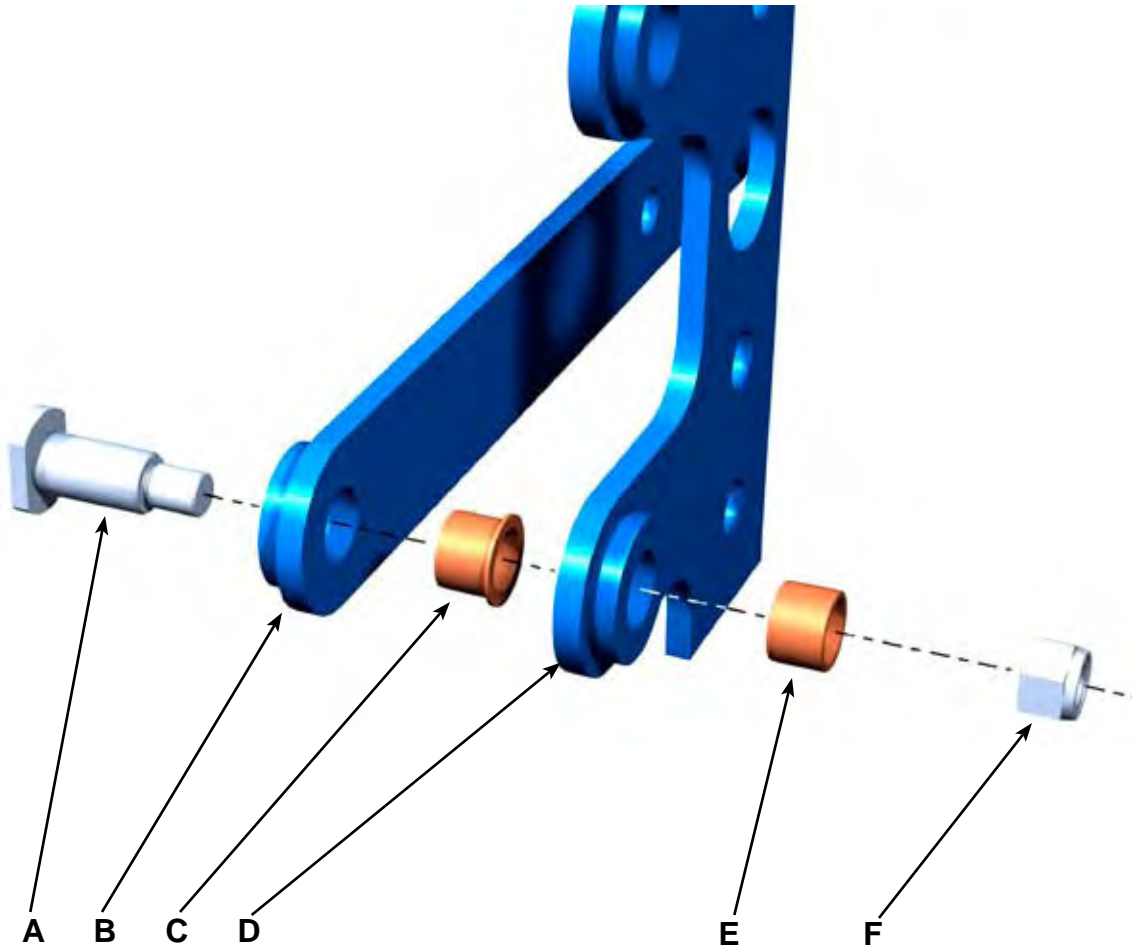


Lift frame assembly may be removed by removing the rear lift frame pivot assemblies and disconnecting the two lift cylinders. The entire lift assembly may then be lifted out and up.

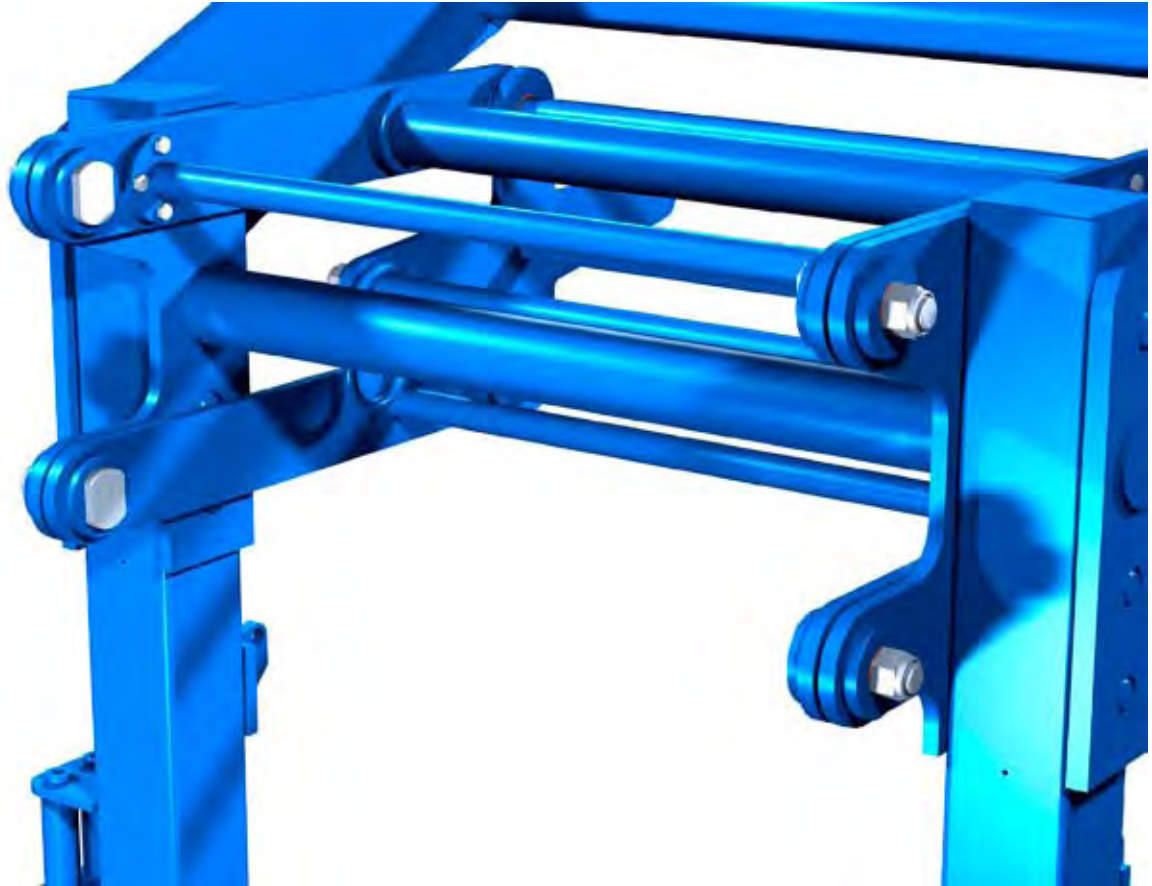
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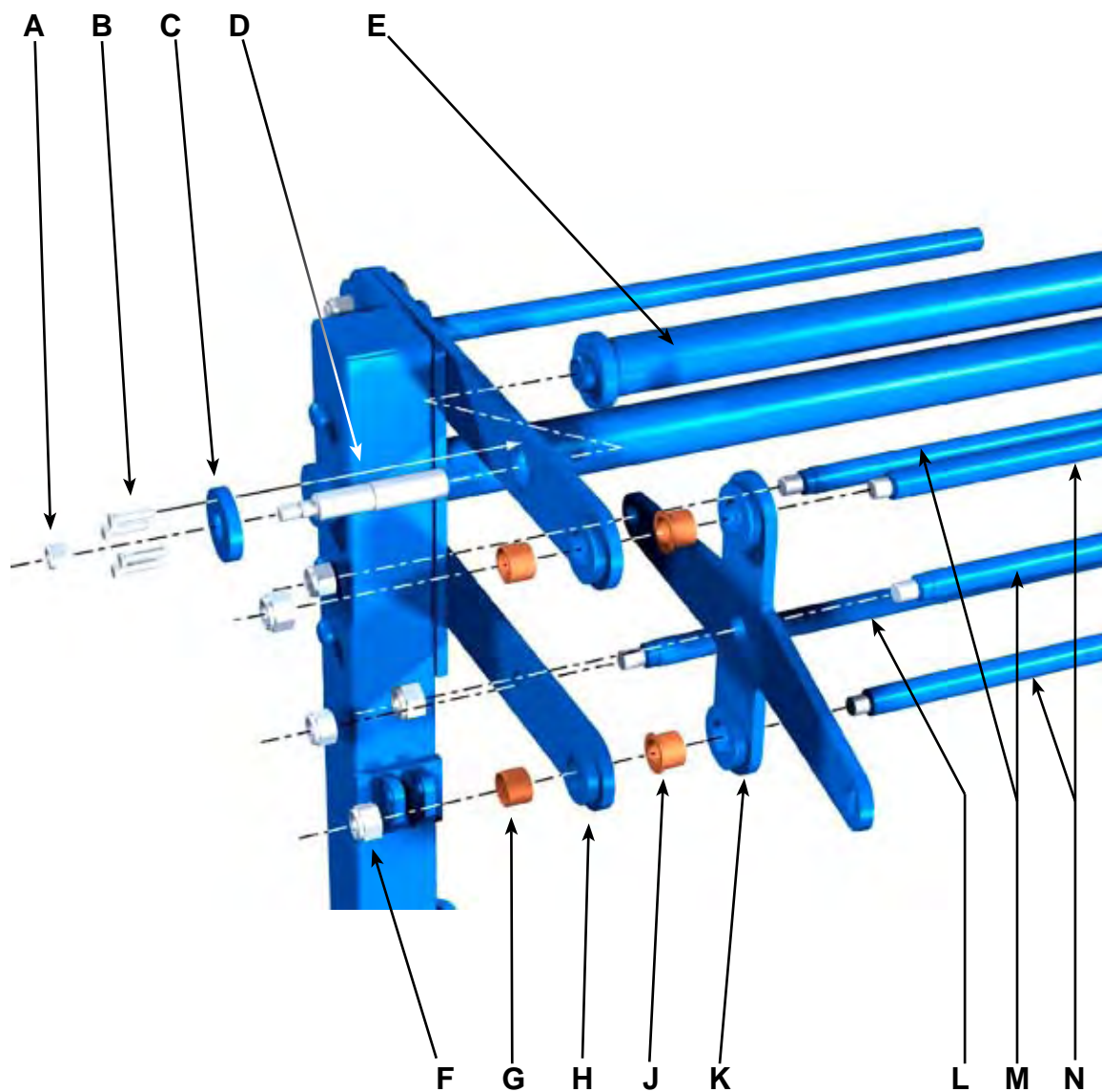
Remove the lift cross by removing the 1-1/4" nylock nuts and hydraulic pivot weldments securing the lift frame supports to the lift cross.



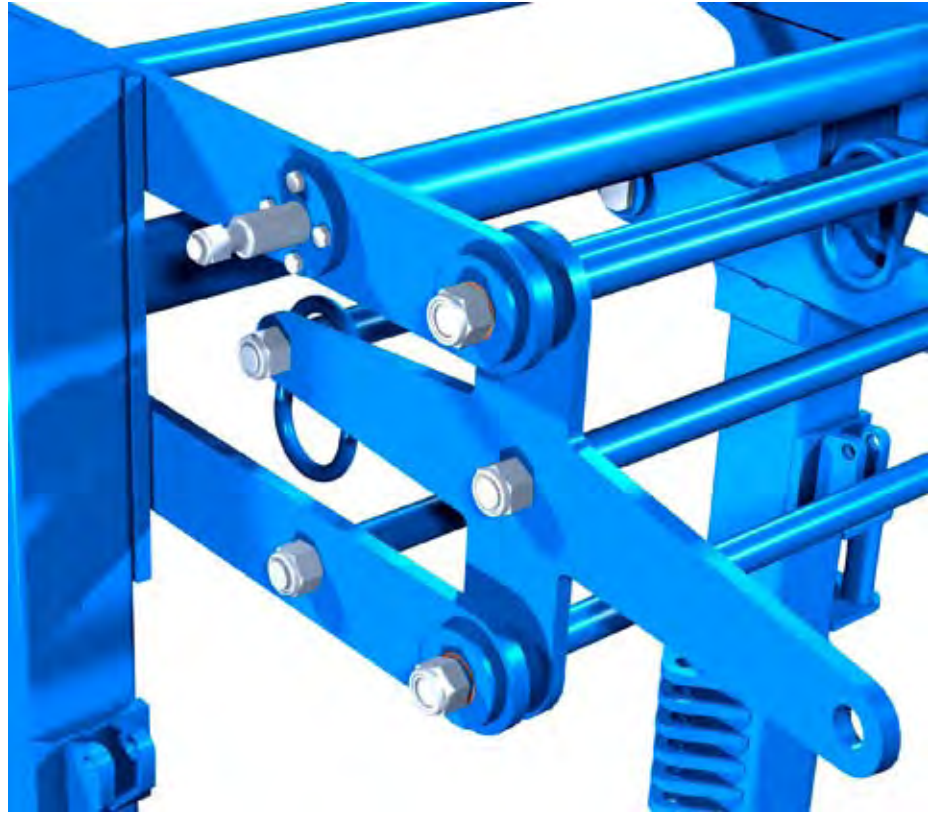
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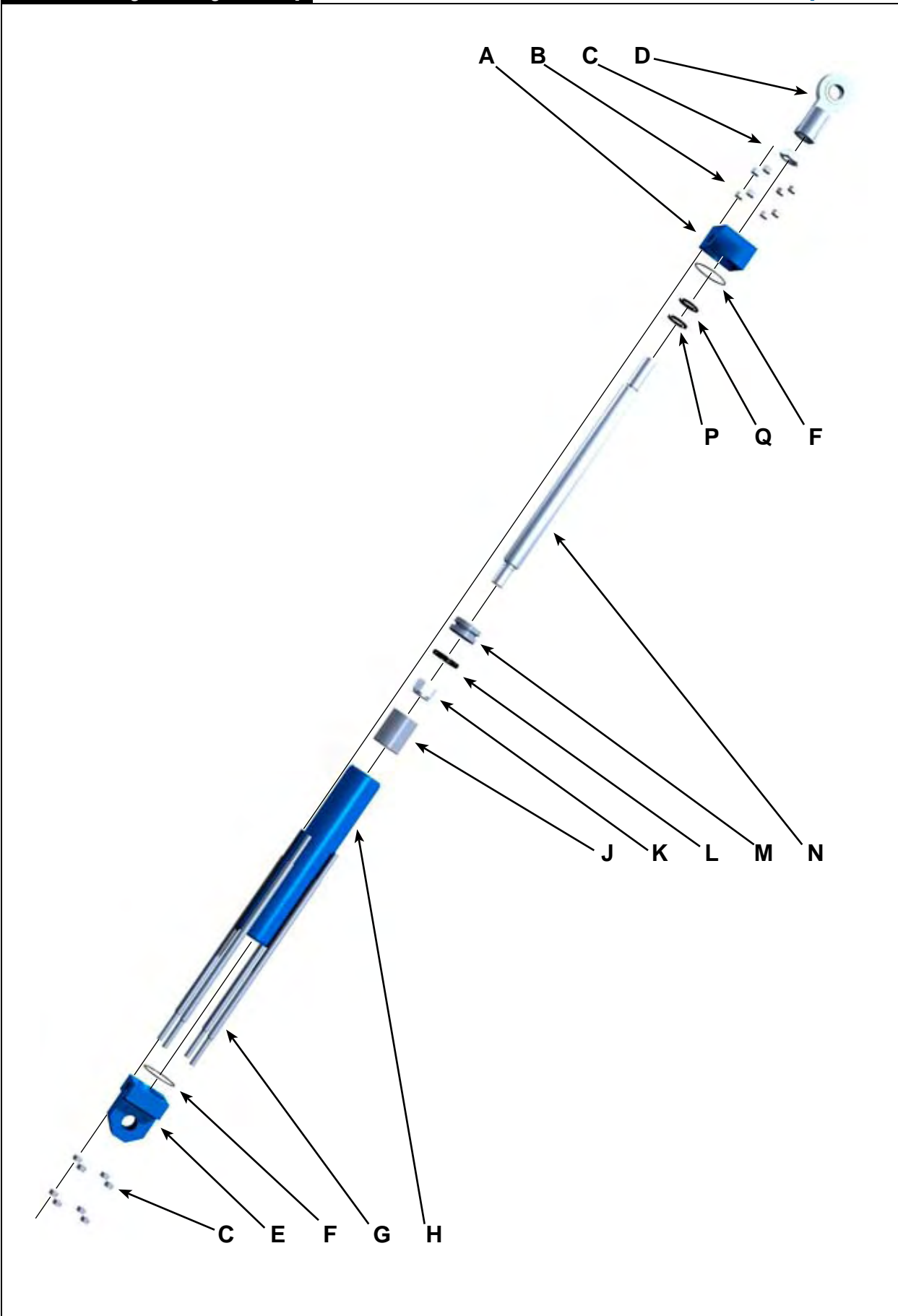
Item	Type	Description	Qty	Part Number
A	Part	Hydraulic Lift Shaft	1	101-1936
B	Weldment	Hydraulic Lift Arm	1	101-2002
C	Part	Shoulder Bushing	1	101-1395
D	Part	RH HYC Hanger Weldment	1	101-1933
	Part	LH HYC Hanger Weldment	1	
E	Part	Sleeve Bushing	1	101-1387
F	Part	1-1/4" NC Thin Nylock Nut	1	



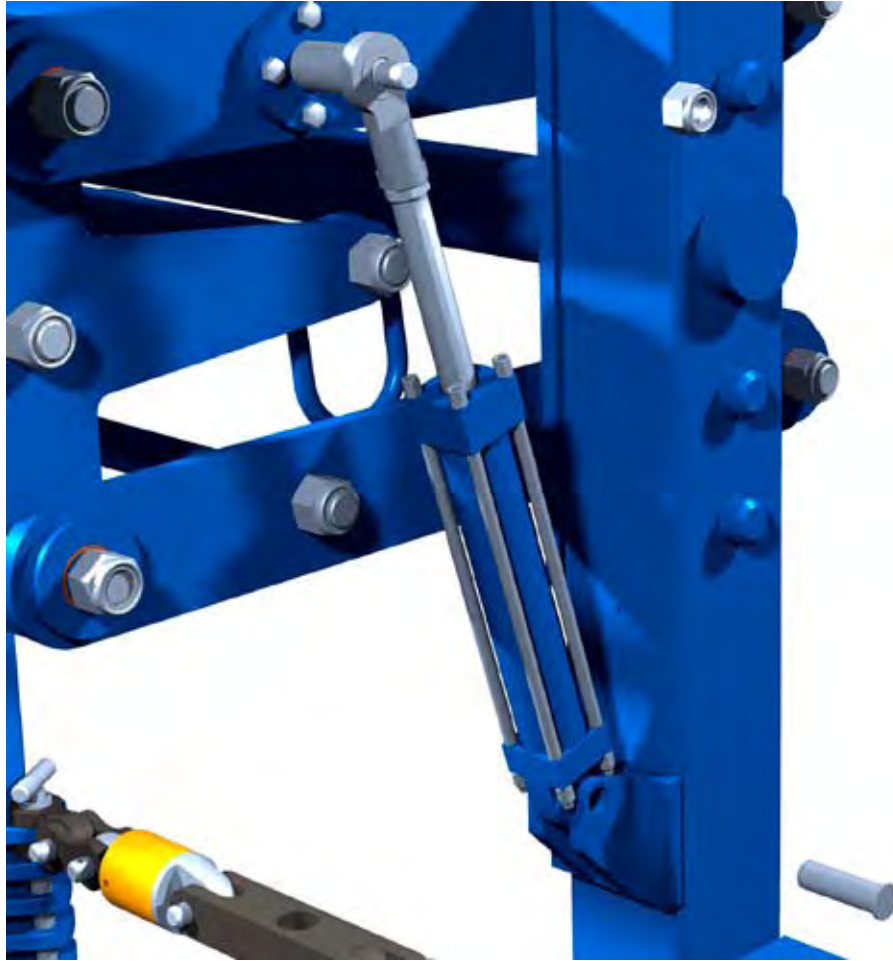
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Item	Type	Description	Qty	Part Number
A	Part	7/8" NC Nylock Nut	1	
B	Part	1/2" NC x 2-1/4" Hex Cap Screw	4	
C	Part	Hydraulic Lift Boss	1	101-1392
D	Part	Hydraulic Lift Pin	1	101-2000
E	Part	Hydraulic Lift Frame Pipe Weldment	1	101-2001
F	Part	1-1/4" NC Thin Nylock Nut	10	
G	Part	Sleeve Bushing	4	101-1387
H	Weldment	Top Hydraulic Lift Arm	2	101-2002
	Weldment	Bottom Hydraulic Lift Arm	2	101-1406
J	Part	Shoulder Bushing	4	101-1395
K	Weldment	Hydraulic Lift Cross	2	101-1426
L	Part	Hydraulic Lift Shaft	1	101-1397
M	Part	Lateral Bar	2	101-1404
N	Part	Hydraulic Lift Shaft	2	101-1402

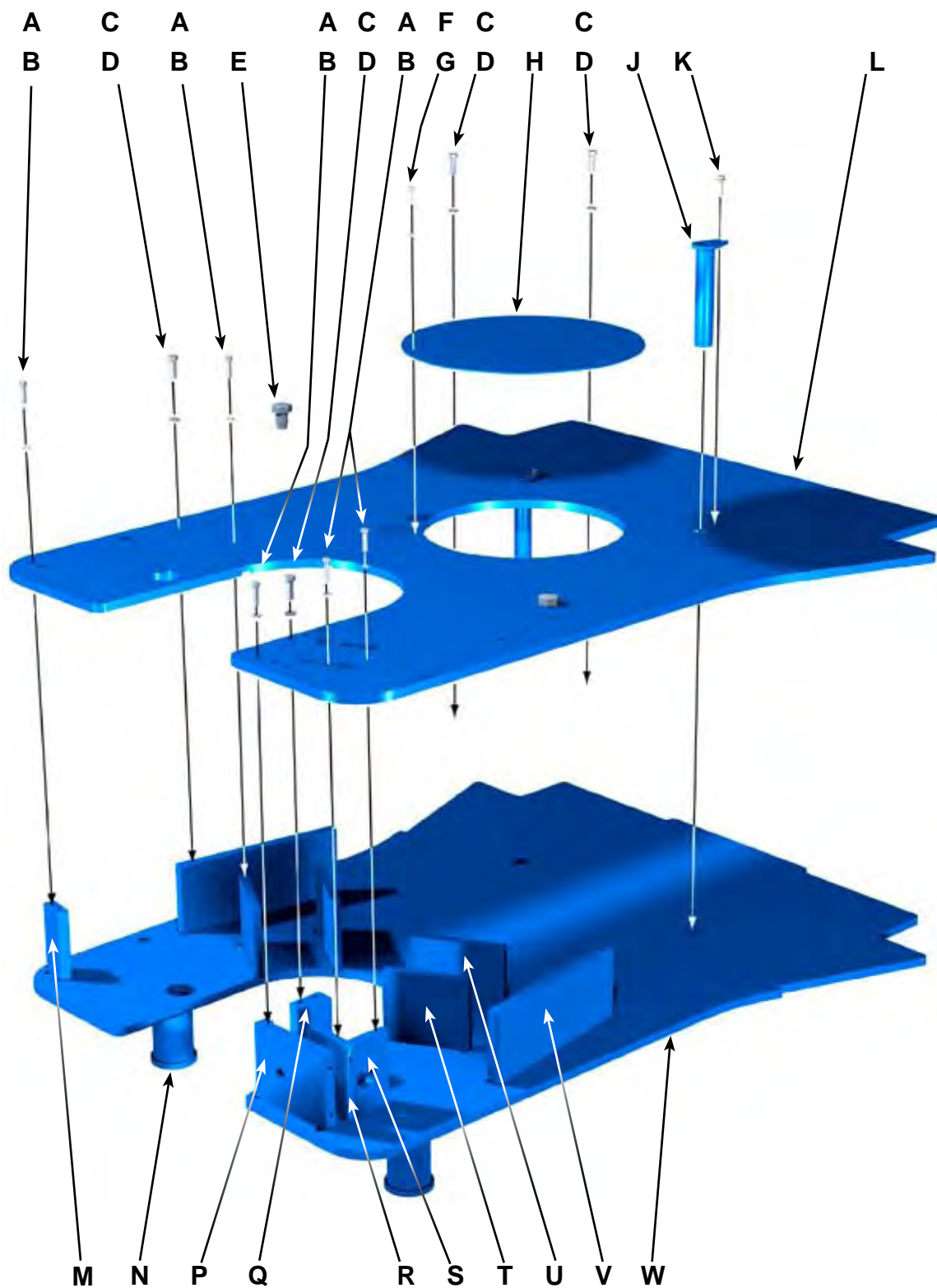


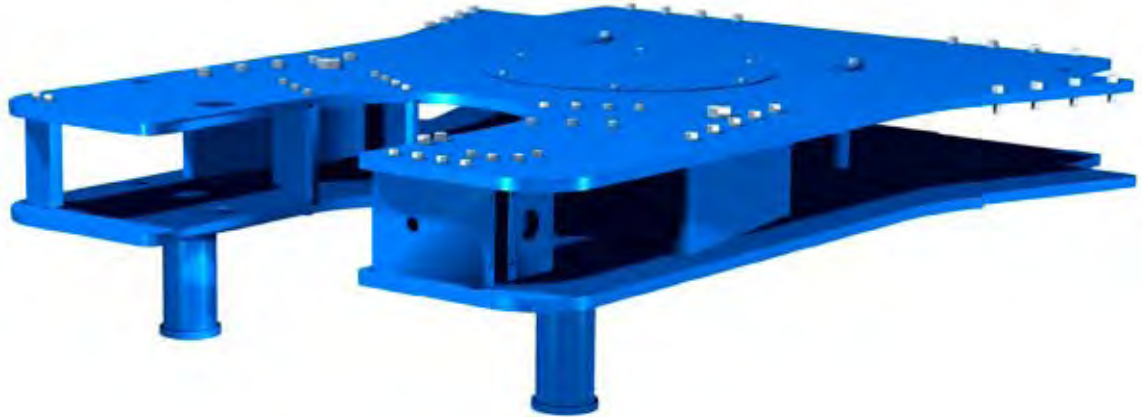
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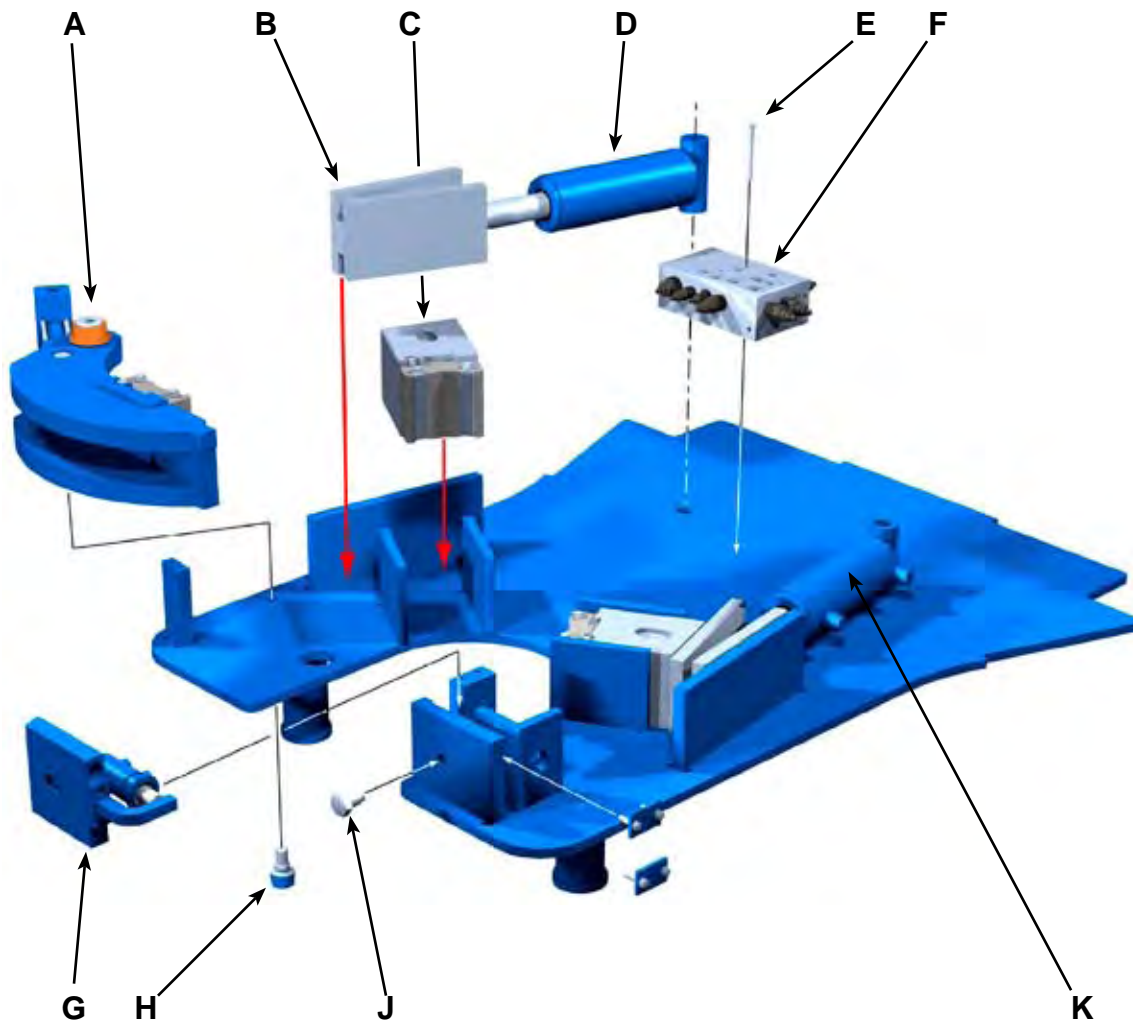
Item	Type	Description	Qty	Part Number
A	Part	Float Cylinder Rod End B (New)	1	AC05-050A
B	Part	3/8" NC Hex Nut	16	
C	Part	M24 X2 Metric Nut	1	02-0882
D	Part	Rod End	1	1408-14
E	Part	Float Cylinder Rod Head B (New)	1	AC05-020A
F	Part	2-141 Rubber O-Ring (Cylinder Seal)	2	02-0370
G	Part	3/8" NC Threaded Rod	4	AC05-060A
H	Part	Float Cylinder Barrel B (New)	1	AC05-010A
J	Part	Float Cylinder Spacer	1	AC05-070A
K	Part	7/8" NC Nylock Nut	1	
L	Part	PSP 326 Piston Seal	1	
M	Part	Piston	1	AC05-030A
N	Part	Cylinder Rod	1	AC05-040A
P	Part	12501250-250E1 POLYPAK	1	
Q	Part	940-13 Rubber Shaft Wiper	1	

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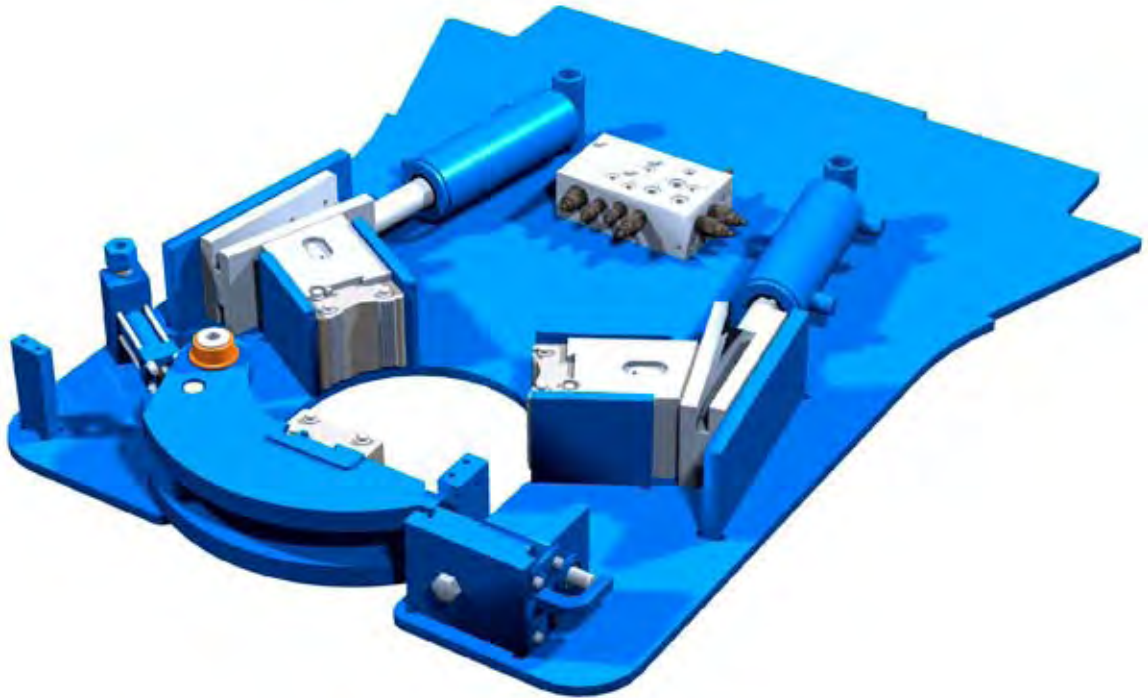


Item	Type	Description	Qty	Part Number
A	Part	3/8" NC x 1-1/2" Hex Bolt	49	
B	Part	3/8" Carbon Steel Lockwasher	49	
C	Part	1/2" NC x 1-1/2" Hex Bolt	40	
D	Part	1/2" Carbon Steel Lockwasher	40	
E	Part	Modified 1" NC Hex Bolt - Ram Retainer	2	1491-500-15
F	Part	1/4" NC x 1" Hex Bolt	6	
G	Part	1/4" Carbon Steel Lockwasher	6	
H	Part	Backup Body Cover	1	AC10-104
J	Part	Cylinder Anchor Pin Weldment	2	AF10-080
K	Part	3/8" NC x 1-1/4" Flange Head Machine Screw	2	
L	Part	Backup Body Top Plate	1	101-1389
M	Part	Door Stop (Open)	1	AD10-107
N	Part	Bottom Front Leg Weldment (Typically welded to bottom plate)	2	AD10-007
P	Part	Front Plate	1	1491-527B-04B
Q	Part	Door Stop (Closed)	1	AD10-108
R	Part	Latch Cylinder Back Plate	1	1491-527-04A
S	Part	Latch Cylinder Bracket	1	1495-510-04
T	Part	Front Ram Guide	2	1495-525-01
U	Part	Back Ram Guide	2	1495-525-02
V	Part	Wedge Slider Backing Plate	2	1491-527-02
W	Part	Backup Body Bottom Plate	1	101-1388

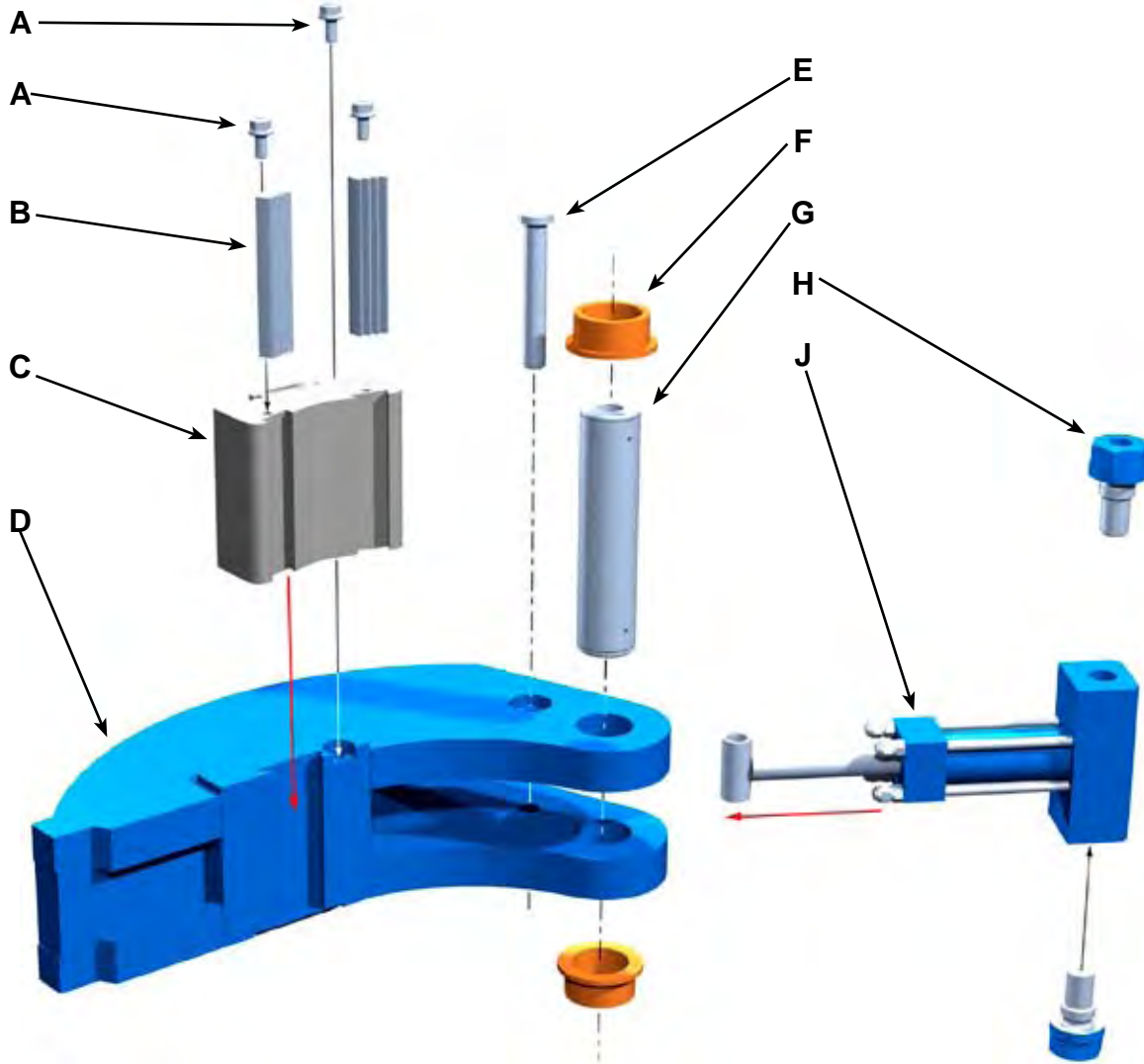


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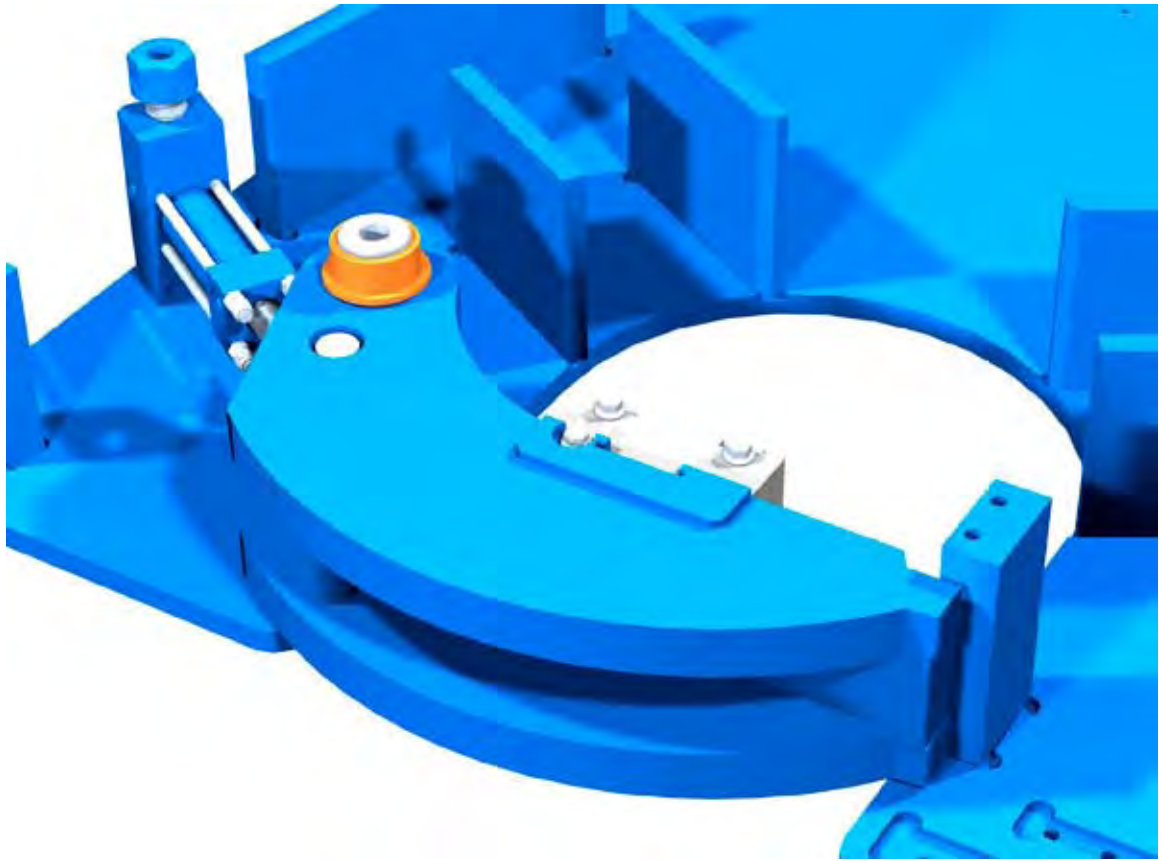
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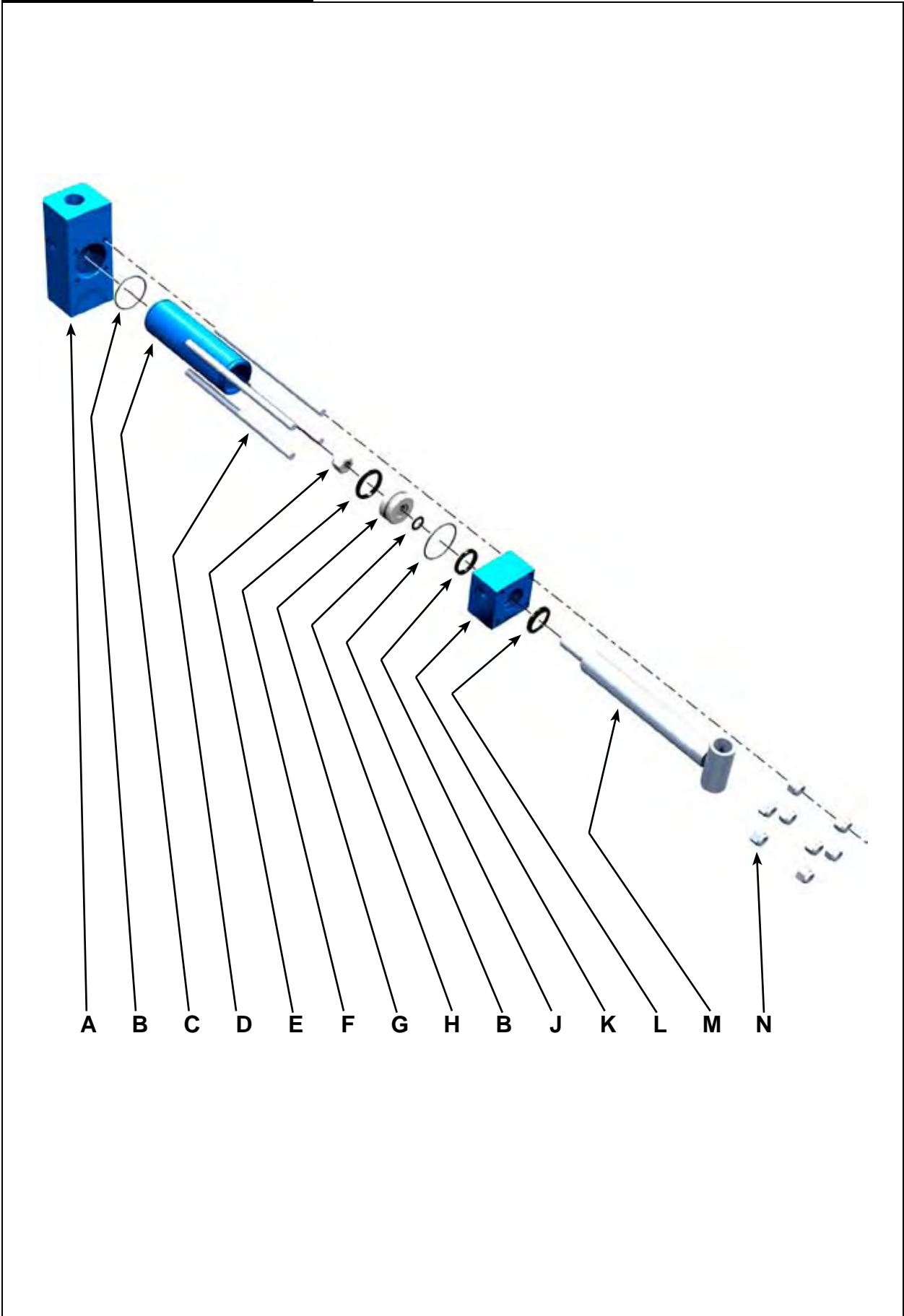
Item	Type	Description	Qty	Part Number
A	Assembly	Backup Door Assembly (See Pp. 7.50 - 7.53)	1	
B	Assembly	RH Wedge Assembly (includes slider & fasteners)	1	101-1305
	Assembly	LH Wedge Assembly (includes slider & fasteners)	1	101-1306
C	Assembly	RH Ram-Jaw Assembly (See Pp. 7.56 - 7.57)	1	
	Assembly	RH Ram Assembly	1	1495-525-08
	Assembly	Jaw Die Kit (14" Shown - See Pg. 3.13)	1	
	Assembly	LH Ram-Jaw Assembly (See Pp. 7.56 - 7.57)	1	
	Assembly	LH Ram Assembly	1	1495-525-07
	Assembly	Jaw Die Kit (14" Shown - See Pg. 3.13)	1	
D	Assembly	RH Clamp Cylinder (with spacer)	1	HYC-105B
E	Part	3/8" NC x 4" Hex Bolt	3	
F	Assembly	Backup Hydraulic Block	1	101-0742
G	Assembly	Backup Latch Assembly (See Pp. 7.54 - 7.55)	1	
H	Part	Backup Door Pivot Bolt	2	1495-516-08A
J	Part	Modified 1" Hex Head Latch Bolt	1	1491-500-15
K	Assembly	LH Clamp Cylinder (no spacer)	1	HYC-105



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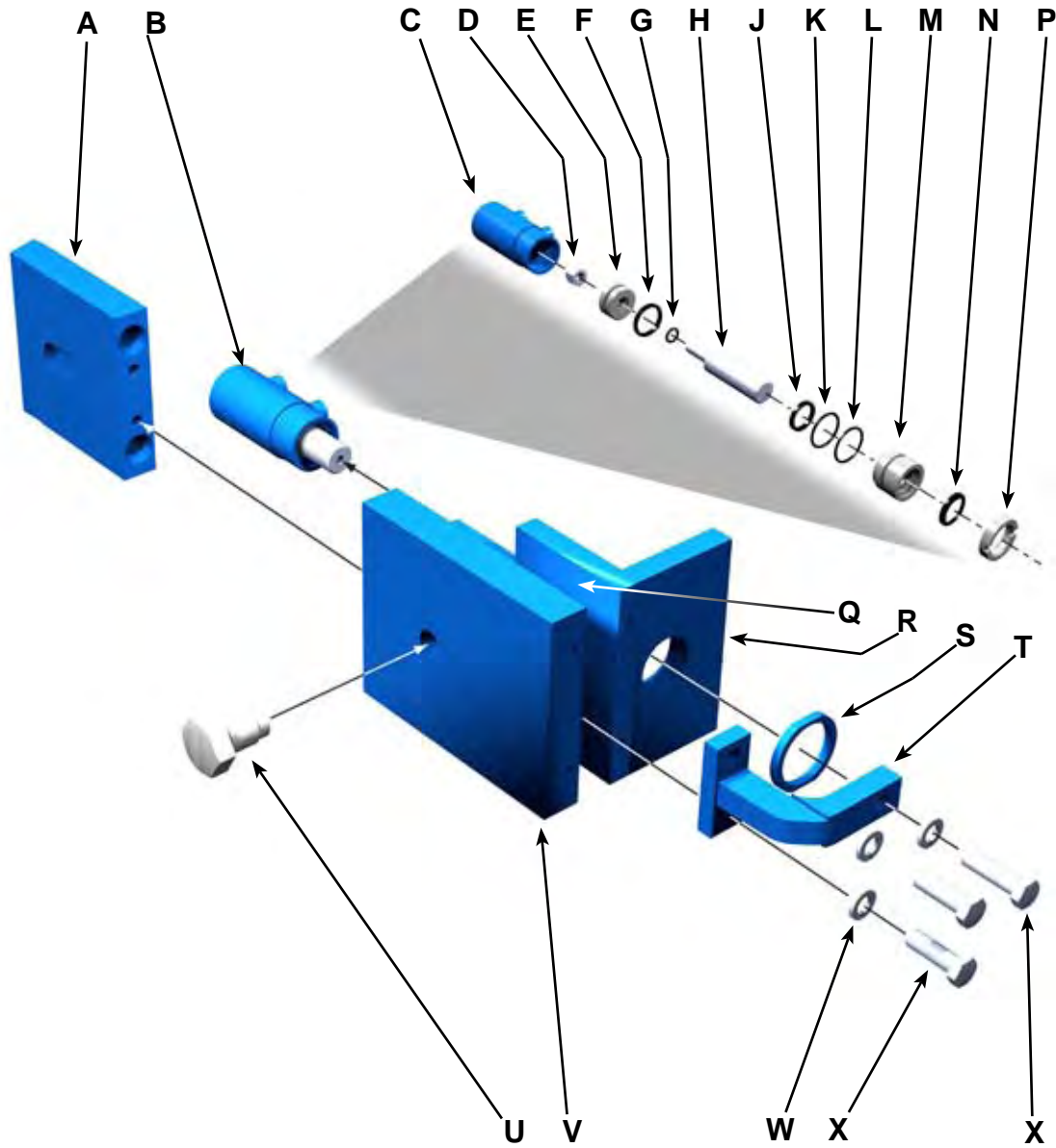


Item	Type	Description	Qty	Part Number
A	Part	3/8" NC x 3/4" Flange Head Machine Screw	3	
B	Part	Standard 5" Insert	2	12-1005
C	Part	Backup Jaw (14" Shown - See Page 3.13)	1	
D	Weldment	Backup Door Weldment	1	AD10-300
E	Part	Door Cylinder Pin	1	1495-515-05
F	Part	Door Bushing	2	1495-515-07
G	Part	Door Pin	1	1495-515-06
H	Part	Door Pivot Bolt	2	1495-516-08A
J	Assembly	Backup Door Cylinder	1	1495-516-00



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Item	Type	Description	Qty	Part Number
	Assembly	Backup Door Cylinder	1	1495-516-00
A	Part	Door Cylinder Trunnion	1	1495-516-03
C	Part	Cylinder Barrel	1	1495-516-01
D	Part	Door Cylinder Tie Rods 3/8"	4	1495-516-21
E	Part	1/2" NC Nylock Nut	1	
G	Part	Cylinder Piston	1	1037-103-03B
K	Part	Door Cylinder Rod End	1	1495-516-20
M	Part	Door Cylinder Rod	1	101-0674
N	Part	3/8" NC Nylock Nut	8	
Backup Door Cylinder Seal Kit (includes the following items)				1495-516-00-SK
B	Seal	2-031 Rubber O-Ring (Cylinder Barrel Seal)	2	
F	Seal	PSP 218 Seal (Piston)	1	
H	Seal	2-112 Rubber O-Ring (Piston)	1	
J	Seal	POLYPAK 12501000-250E1	1	
L	Seal	Shaft Wiper 940-9	1	

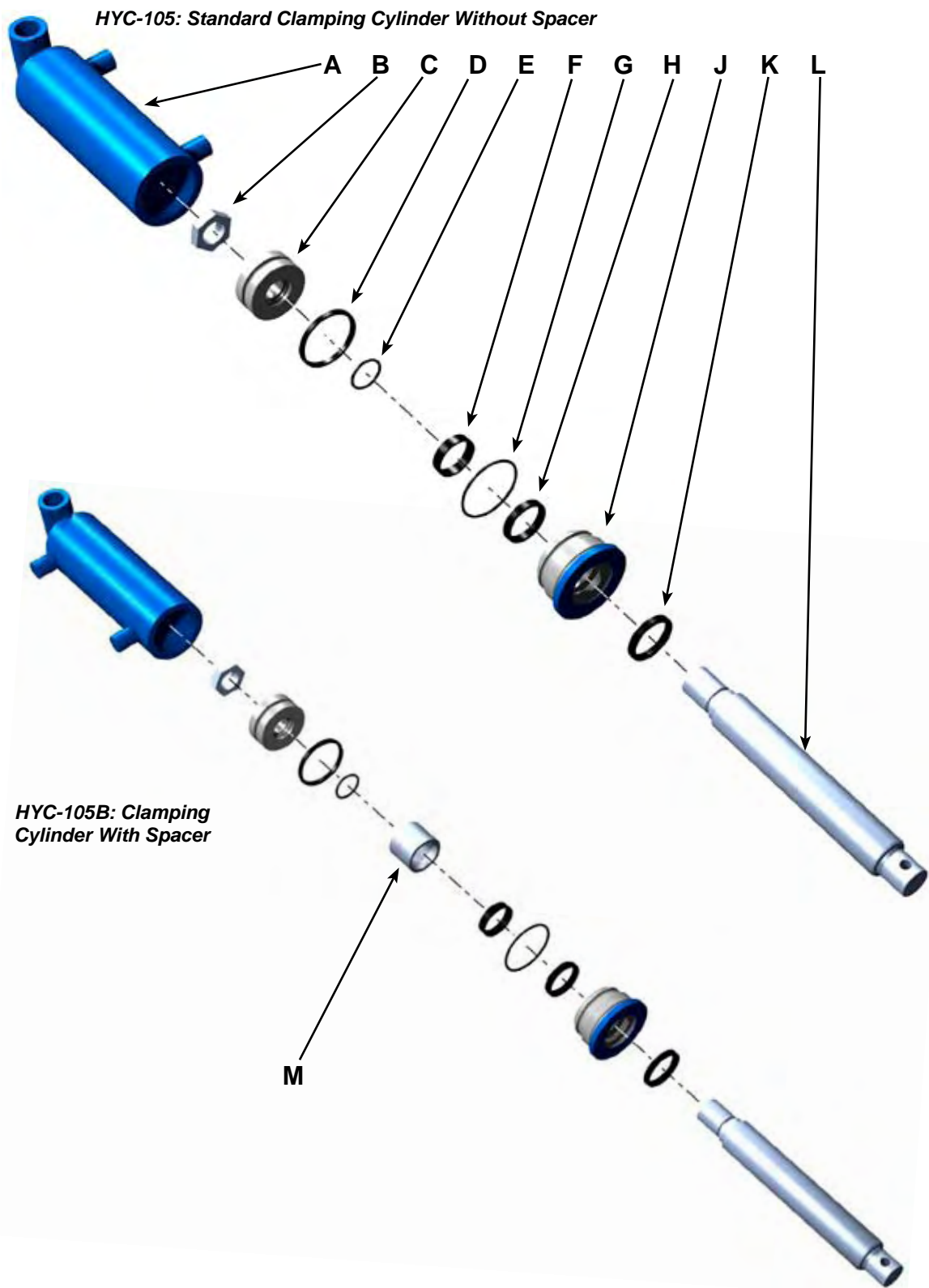


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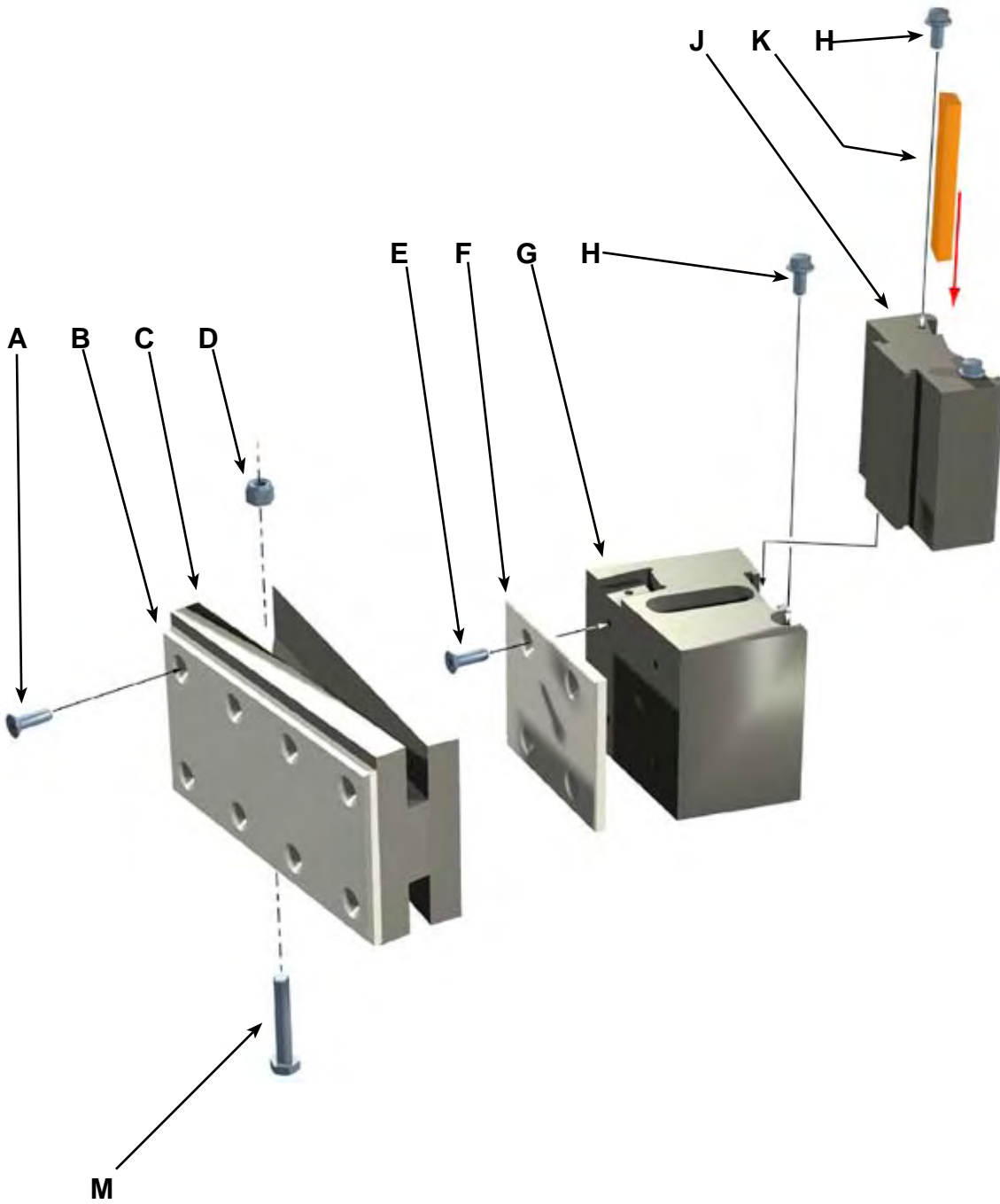


Item	Type	Description	Qty	Part Number
A	Part	Latch Plate	1	AD10-410
B	Assembly	Door Latch Cylinder	1	1495-518-00
D	Weldment	Latch Cylinder Barrel Weldment	1	1116-71-02
E	Part	1/2" NC Nylock Nut	1	
F	Part	Latch Cylinder Piston	1	1037-103-03B
H	Part	Rod	1	1495-518-11
M	Part	Gland	1	1037-103-04
P	Part	Gland Lock Ring	1	AF05-254
Q	Part	Latch Cylinder Back Plate	1	1491-527-04A
R	Part	Latch Cylinder Bracket	1	1495-510-04
S	Part	Cylinder Jam Nut	1	1495-518-12
T	Weldment	Latch Retract Hook	1	1495-530-03
U	Part	Modified 1" Hex Head Latch Bolt	1	1491-500-15
V	Part	Latch Cylinder Front Plate	1	1491-527B-04B
W	Part	1/2" Lockwasher	3	
X	Part	1/2" NC x 1-1/2" Hex Bolt	2	
Y	Part	1/2" NC x 1-3/4" Hex Bolt	2	
Backup Latch Cylinder Seal Kit (Include the following items)				1495-518-SK
F	Seal	PSP-218 Seal (Piston)	1	
G	Seal	2-112 Rubber O-Ring (Piston)	1	
J	Seal	POLYPAK12501000-250E1 (Gland)	1	
K	Seal	2-125 Rubber O-Ring (Gland)	1	
L	Seal	8-125 Rubber Backup Ring	1	
N	Seal	940-9 Rubber Shaft Wiper	1	

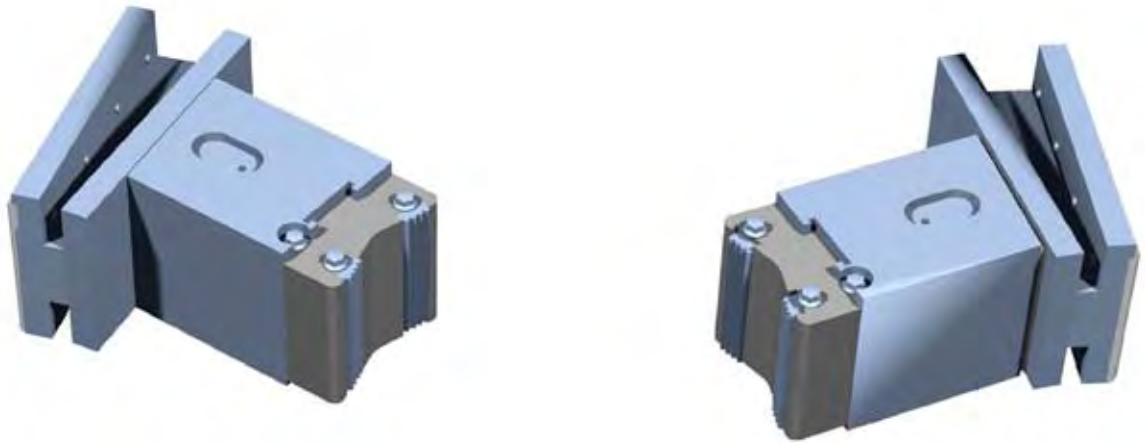
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<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
	Assembly	Clamping Cylinder	1	HYC-105
	Assembly	Clamping Cylinder With Spacer	1	HYC-105B
A	Weldment	8" Stroke Barrel Weldment	1	HYC-104-01B
B	Part	1-1/2" NF Nylock Jam Nut	1	
C	Part	3-1/2" Cylinder Piston	1	HYC-100-02
J	Part	3-1/2" Clamp Cylinder Gland	1	HYC-100-06
L	Part	Clamp Cylinder Rod	1	HYC-102-01
M	Part	Clamp Cylinder Spacer	1	HYC-102-02
Backup Clamp Cylinder Seal Kit (Include the following items)				
D	Seal	PSP-338 Seal (Piston)	1	
E	Seal	2-223 Rubber O-Ring (Piston)	1	
F	Seal	W2-2250-500 WEAR RING (Gland)	1	
G	Seal	2-236 Rubber O-Ring (Gland)	1	
H	Seal	18702000-375B POLYPAK Rod Seal (Gland)	1	
K	Seal	J2000-312 Rubber Shaft Wiper	1	



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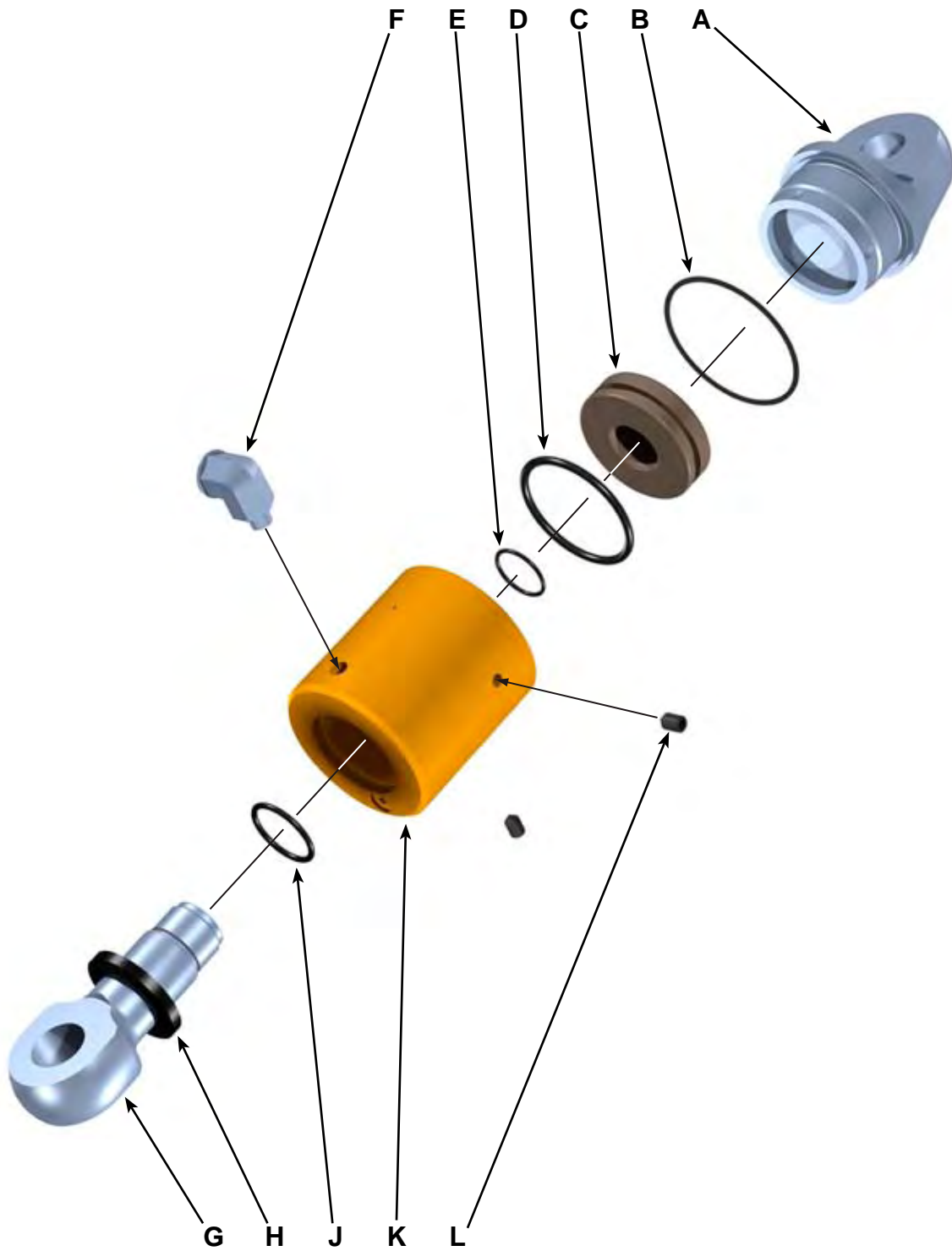
Item	Type	Description	Qty	Part Number
	Assembly	RH Ram Assembly	1	1495-525-08
	Assembly	LH Ram Assembly	1	1495-525-07
A	Part	3/8" NC x 1-1/4" Hex FHCS	16	
B	Part	Wedge Slider Plate (UC-300)	2	1491-532-01D
C	Weldment	RH Wedge Weldment	1	1491-532-01W-RH
	Weldment	LH Wedge Weldment	1	1491-532-01W-LH
D	Part	1/2" NC Nylock Nut	2	
E	Part	3/8" NC x 3/4" Hex FHCS	8	
F	Part	Ram Slider Plate (UC-300)	2	1491-525-03
G	Part	RH Ram Block	1	1495-525-05L
	Part	LH Ram Block	1	1495-525-05
H	Part	3/8" NC x 3/4" Flange Bolt	6	
J	Part	Jaw (14" Shown - See Page 3.13)	2	AD21-14000
K	Part	Standard Die Insert	2	12-1005
L	Part	1/2" NC x 3-1/4" Hex Bolt	1	

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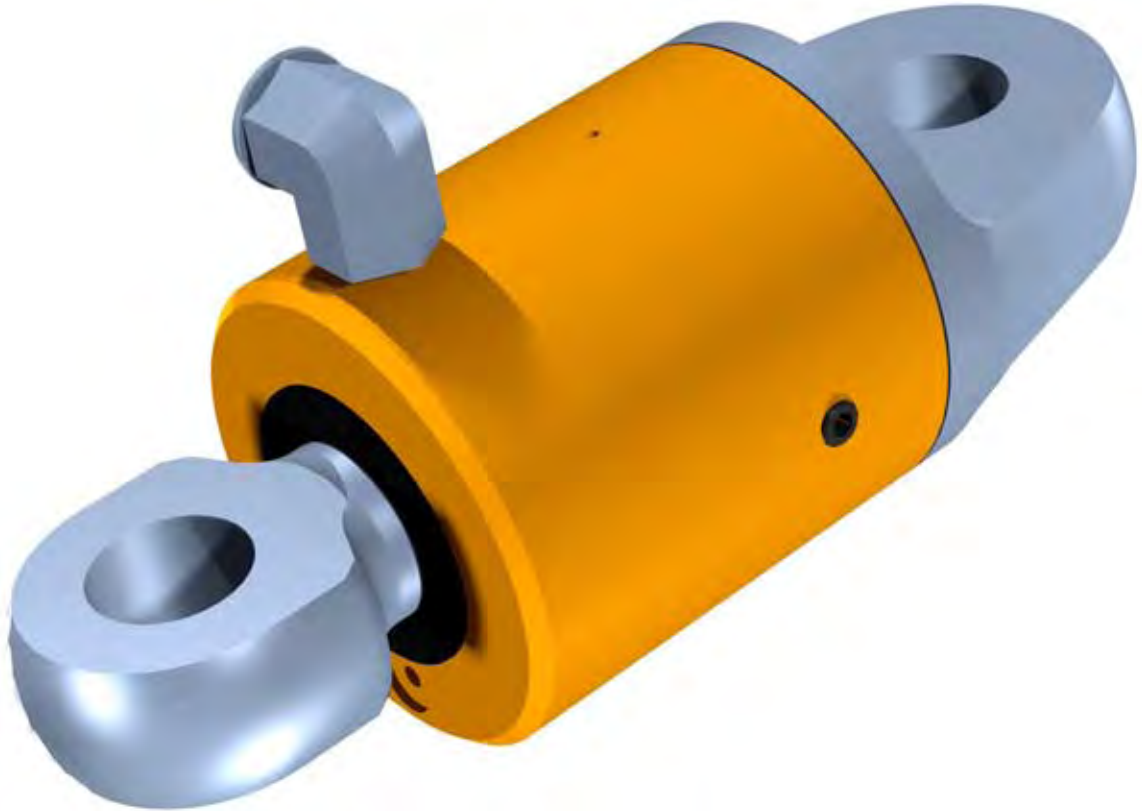
<i>Item</i>	<i>Type</i>	<i>Description</i>	<i>Qty</i>	<i>Part Number</i>
A	Assembly	50" Arm-90K Tension Load Cell and Gauge	1	10-0115T
	Part	6.53 in ² Tension Load Cell	1	10-0081
	Part	Torque Gauge - 50" Arm/90,000 Ft.-Lbs.	1	10-0027G
B	Assembly	50" Arm-15K Tension Load Cell and Gauge	1	10-0119T
	Part	4.08 in ² Tension Load Cell	1	10-0008T
	Part	Torque Gauge - 50" Arm/15,000 Ft.-Lbs.	1	10-0027G
C	Assembly	50" Arm-30K Tension Load Cell and Gauge	1	10-0119T
	Part	4.08 in ² Tension Load Cell	1	10-0008T
	Part	Torque Gauge - 50" Arm/30,000 Ft.-Lbs.	1	10-0201G
	Part	Hydraulic Hose	1	02-0069



Load Cell Exploded

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Item	Type	Description	Qty	Part Number
	Assembly	4.08 in ² Tension Load Cell	1	10-0008T
A	Part	Load Cell End	1	LC99-003
B	Part	Flange Gasket	1	02-0073
C	Part	Load Cell Piston	1	LC99-001
D	Part	2-332 O-Ring	1	02-0800
E	Part	2-124 O-Ring	1	08-0596
F	Part	1/4" MNPT x 3/8" FNPT Street Elbow	1	08-0023
G	Part	Load Cell Rod	1	LC99-02
H	Part	CR 15032 Wiper	1	08-1558
J	Part	2-222 O-Ring	1	02-0350
K	Part	Load Cell Body	1	LC99-004
L	Part	3/8" NF x 1/2" Cone Point Set Screw	2	09-0046
	Assembly	6.53 in ² Tension Load Cell	1	10-0081

Note: No user-servicable parts are available for the 6.53 in² Tension Load Cell. Return to Farr Canada for repair, or order a replacement from your sales representative.

TROUBLESHOOTING

Under normal operating conditions, and with proper maintenance, the torque gauge and load cell system are designed to give lasting trouble-free performance. Faulty indication on the gauge will very often define a fault within the gauge.



IF TROUBLESHOOTING REVEALS THAT THERE IS INSUFFICIENT FLUID IN THE SYSTEM, BEFORE RECHARGING, CHECK THAT ALL SYSTEM COMPONENTS ARE FREE FROM DAMAGE. THIS WILL ENSURE THAT FLUID LOSS WILL NOT CONTINUE AFTER RELOADING.

- | | |
|----------------------------|--|
| 1. PROBLEM: | No indication on gauge. |
| POSSIBLE SOLUTIONS: | Obstruction in hose.
Loss of hydraulic fluid.
Gauge internal mechanism damaged. |
| 2. PROBLEM: | Gauge indication too high. |
| POSSIBLE SOLUTIONS: | Excessive hydraulic fluid.
Internal mechanism of gauge is damaged. |
| 3. PROBLEM: | Gauge indication too low. |
| POSSIBLE SOLUTIONS: | Insufficient hydraulic fluid.
Snub line not at right-angle to tong handle.
Gauge internal mechanism damaged. |
| 4. PROBLEM: | Erratic or sluggish gauge indication. |
| POSSIBLE SOLUTIONS: | Pointer rubbing glass or dial.
Insufficient hydraulic fluid.
Dirty gauge movement.
Improper pointer damper adjustment.
Gauge internal mechanism damaged. |

PERIODIC INSPECTION AND MAINTENANCE**1. MAINTENANCE**

- A. Tong Torque Systems are built to give years of trouble-free service with minimum maintenance. Periodic inspections of the load cell, and hydraulic lines and fittings, are recommended in order to keep the system in top operating condition. A thorough inspection should be made at each rig-up.
- B. Recharge hydraulic system with W15/16 fluid via the filling connection at the top of the indicating gauge. Recharging must only be performed when there is no load on the load cell.

Procedure:

1. Connect hand pump to filling connection on gauge.
2. Fill hand pump bowl with W15/16 hydraulic fluid and pump fluid into the system until the piston rod on the load cell extends no more than 1/2" from the body.
3. Loosen vent screw on load cell body to permit trapped air to escape during loading.



MAINTAIN GREATER-THAN HALF FULL FLUID LEVEL IN THE HAND PUMP BOWL TO AVOID PUMPING AIR INTO THE SYSTEM. DO NOT ALLOW THE LEVEL TO FALL BELOW ONE-HALF FULL

4. Retighten load cell vent screw when the system has been adequately recharged
- C. Load cell and indicator gauge should be returned to authorized repair facility for any repairs or calibration required.

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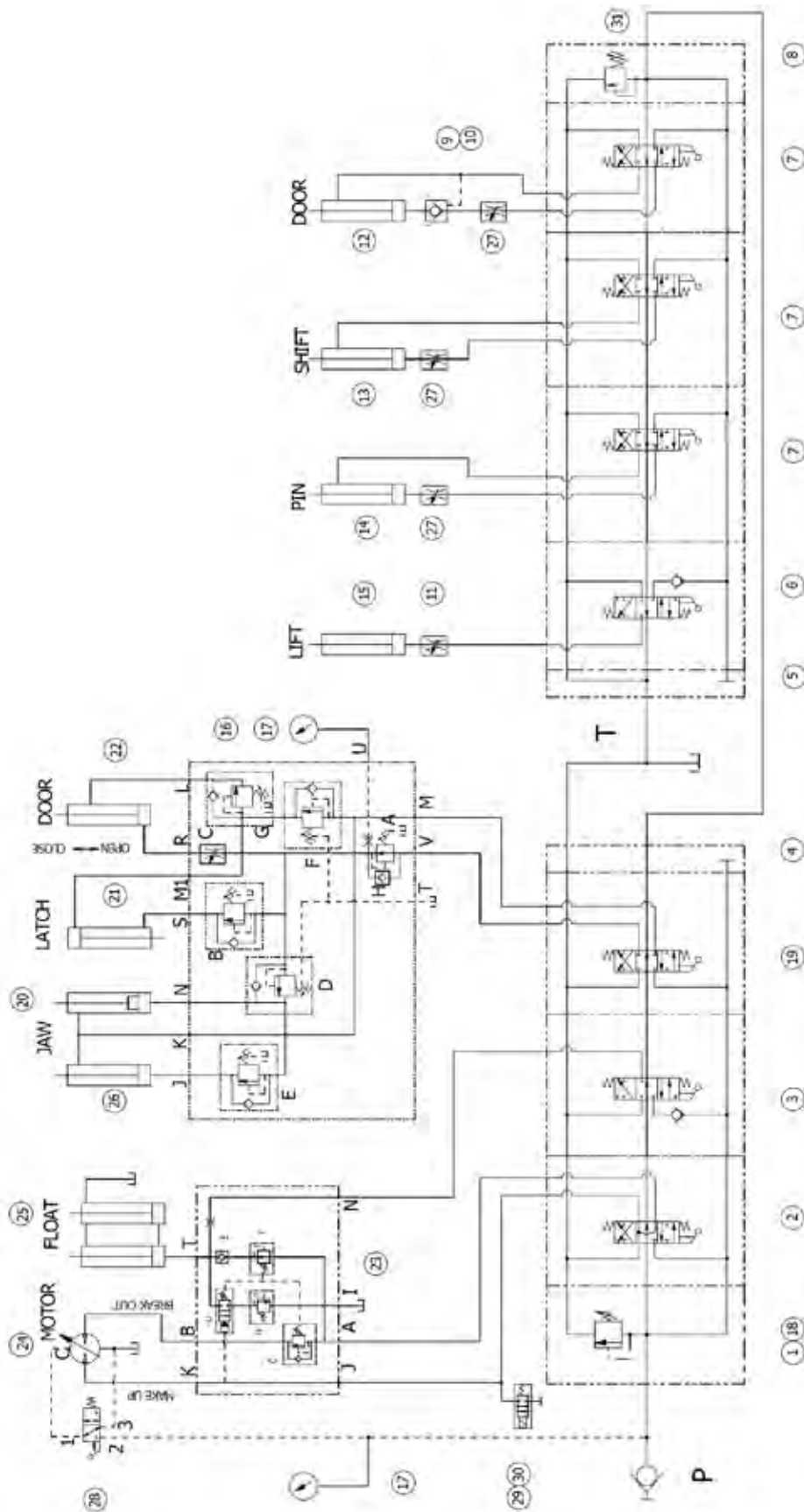


Hydraulic Section

Hydraulic Schematic

Hydraulic Motor Information

Hydraulic Valve Information



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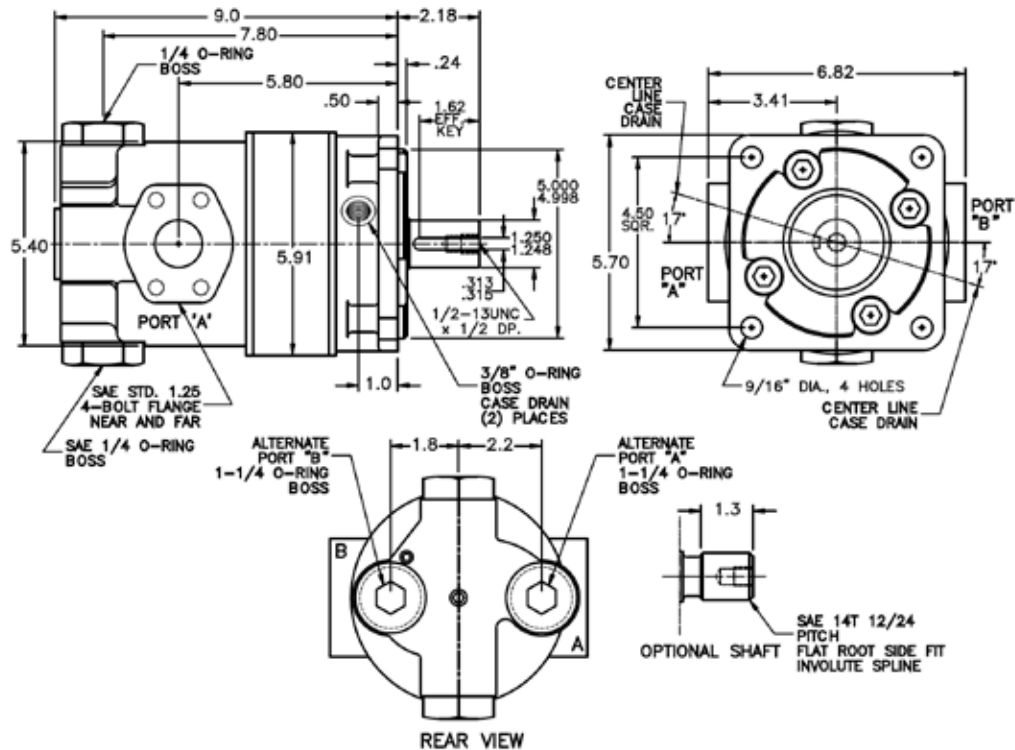
Weight = 51 lbs.

15 Series Two Speed



- All available displacements of standard motor.
- Spool valve shift from full to partial displacement.
- Standard shift ratio is 2:1 - Some special ratios available.
- Shift on the run.
- Typical applications - winch, track and wheel drives.

15 Series Two Speed Envelope



Technical Information - All Styles

VANE CROSSING VANE

The Rineer patented vane crossing vane design produces much higher volumetric and mechanical efficiencies than is possible with a standard vane type design. This design provides a sealing vane between cavities to improve mechanical and volumetric efficiencies.

STARTING AND STALL TORQUE

The Rineer motor produces torque curves which are virtually flat, with starting and stall torque equal to approximately 90-94% of theoretical torque.

MORE POWER STROKES PER REVOLUTION

The 15 Series has four stator cavities and 10 rotor vanes. Each rotor vane works in each stator cavity once per revolution, which results in 40 power strokes per revolution. This helps produce higher mechanical efficiency and flatter torque curves.

BEARING LOADING

The bearings in the 15 Series can accept radial load per the radial capacity chart. Thrust load is not recommended under most conditions. Consult with a Rineer Application Engineer for optional bearing configurations to match your application.

SEALS

Buna N seals are supplied as standard on the Rineer 15 series motors. Viton seals may be ordered as an option.

ROTATING GROUP - 1S or 1H

Under most operating conditions, 1S (standard rotating group parts) should be used. Under some high speed conditions 1H can be specified.

ROTATION

The 15 Series Motor rotates equally well in either direction and smoothly throughout its entire pressure and speed range. Looking into the end of the shaft, rotation is clockwise when oil is supplied to port "A".

HORSEPOWER LIMITATION

Maximum horsepower limitations may vary with different applications. *When using the 15 Series Motor above 75 HP, consult a Rineer Application Engineer.*

FILTRATION

25 micron minimum.

FLUID

We suggest premium grade fluids containing high quality rust, oxidation and foam inhibitors, along with anti-wear additives. For best performance, minimum viscosity should be maintained at 100 SSU or higher. Fluid temperature should not exceed 180° F. Elevated fluid temperature will adversely affect seal life while accelerating oxidation and fluid breakdown. Fire resistant fluids may be used with certain limitations. Contact Rineer for additional information.

CASE DRAIN

The 15 Series Motor is designed for either internal or external case drain. Two case drain ports are supplied. When using internal case drain, simply plug the two ports. When using external case drain, use the port at the highest elevation. We recommend case drain pressure of 35 PSI or less when using the standard seals.

CASE DRAIN CIRCULATION

Fluid should be circulated through the case when a temperature differential exists between the motor and the system in excess of 50° F. *Should this occur, contact a Rineer Application Engineer.*

MOUNTING

The mounting position is unrestricted. The shafts, pilots, and mounting faces should be within .002 TIR.

INTERMITTENT CONDITIONS

Intermittent conditions are to be less than 10% of every minute.

OTHER AVAILABLE MOTORS

For information on additional Rineer Motors, request one of the following publications:

37 Series	Publication DS371003
57 Series	Publication DS571003
125 Series	Publication DS1251003

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Technical Information - Two Speed Motor

DISPLACEMENT CHANGE

When a motor is shifted from full to partial displacement the motor is changed to 50%, 35%, or 28% of its original displacement depending on its shift ratio.

STANDARD SHIFT RATIO

The standard 15 Series displacements of 15, 13, 9.5, 8, 7, and 6 CID are available in the 15 Series Two Speed with a shift ratio of 2:1. For example, a 15 CID motor shifted to partial displacement becomes a 7.5 CID motor.

SPECIAL SHIFT RATIOS

There are two special displacements available in the 15 Series Two Speed which offer higher shift ratios, the 10.5 and the 11.5 CID. The 10.5 CID motor has a shift ratio of 3.5:1, which when shifted becomes a 3 CID motor. The 11.5 CID motor has a shift ratio of 2.875:1, which when shifted becomes a 4 CID motor.

SHIFTING METHOD

Selecting between full and partial displacement is accomplished by shifting the two-position spool valve incorporated in the motor. Motors are available in either single or double pilot configurations.

SINGLE PILOT

Single pilot motors require a pilot line to be connected to port "C". When port "C" is pressurized the spool shifts the motor to partial displacement. When port "C" is vented to tank, an internal spring shifts the spool, returning the motor to full displacement.

DOUBLE PILOT

Double pilot motors require two pilot lines. One line is connected to port "C" while the other line is connected to port "D". The motor is in full displacement when port "D" is pressurized and port "C" is vented to tank. The motor is in partial displacement when port "C" is pressurized and port "D" is vented to tank.

OPEN DURING CROSSOVER SPOOLS

Open during crossover spools allow port "A" to be directly connected to port "B" when the spool is shifting between full and partial displacement. Motors with -62 or -65 designations are open during crossover.

WARNING! IN SOME WINCH APPLICATIONS, OPEN DURING CROSSOVER SPOOLS (-62 or -65) ARE NOT RECOMMENDED.

CLOSED DURING CROSSOVER SPOOLS

Closed during crossover spools do not allow port "A" to be directly connected to port "B" when the spool is shifting between full and partial displacement. Motors with -63 or -67 designations are closed during crossover. These motors contain an internal factory preset relief valve. This valve protects the motor during shifting only and is not a system relief valve.

PILOT PRESSURE

A minimum of 100 PSI over case drain pressure is required to shift the spool. The maximum allowable pressure to port "C" or "D" is 3,500 PSI.

SHIFT ON THE RUN

The 15 Series Two Speed Motor may be shifted on the run while loaded or unloaded.

MAXIMUM SPEED

Maximum rated speed is the same for either full or partial displacement as stated in the performance data.

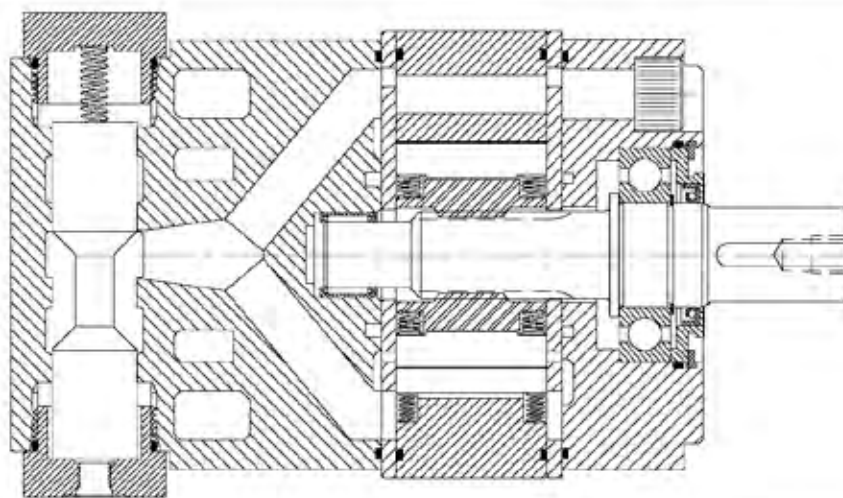
CASE DRAIN AND CROSS PORT LEAKAGE

The combined case drain and cross port leakage of the 15 Series Two Speed Motor is approximately 1 GPM per 1,000 PSI. This will vary with the oil viscosity.

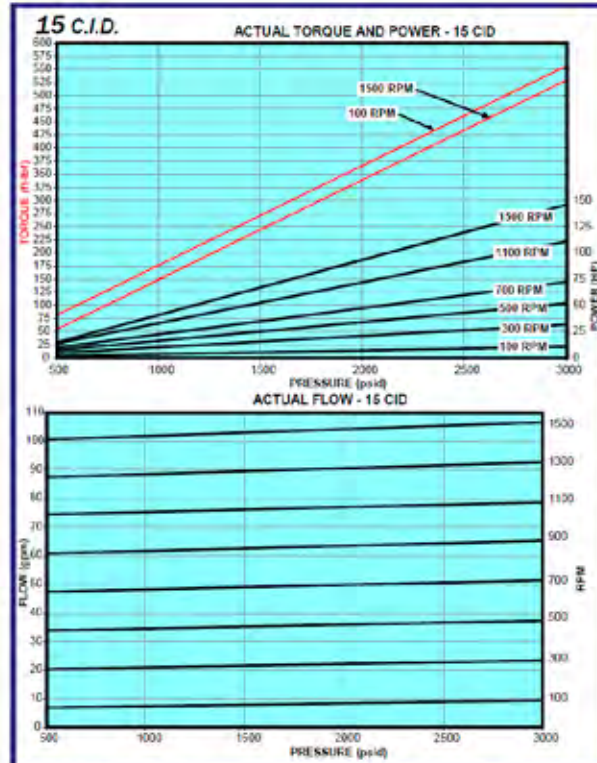
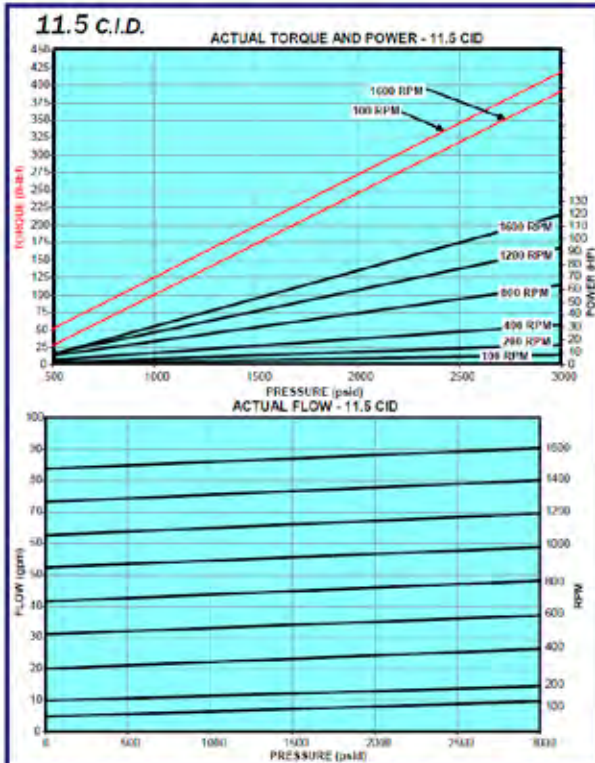
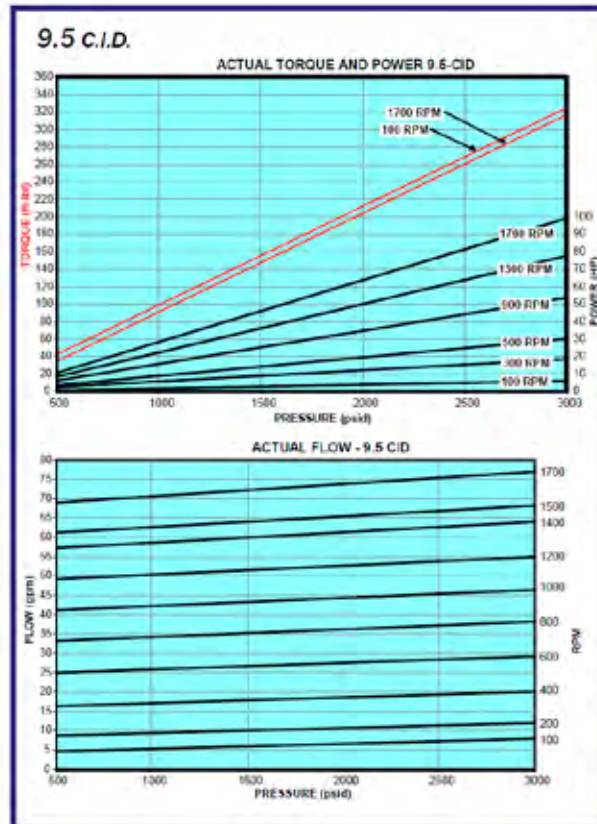
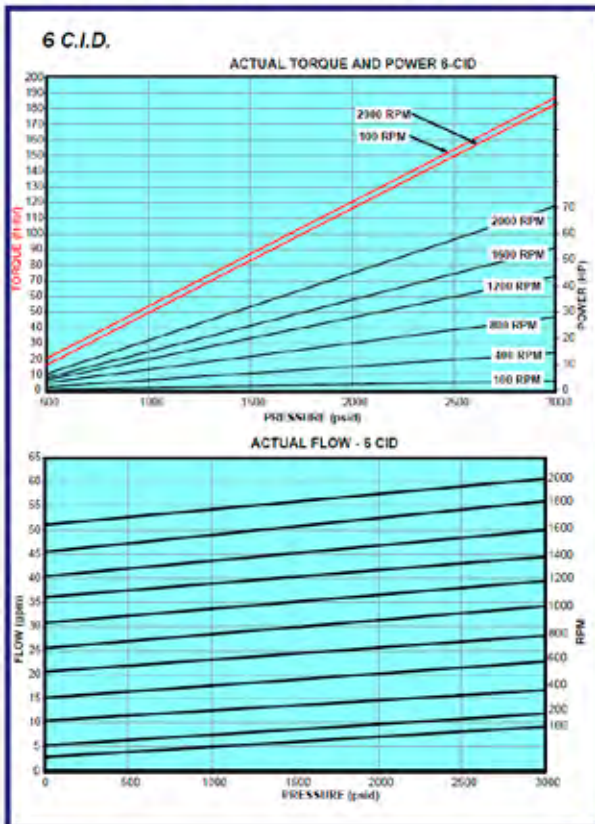
OTHER INFORMATION

All other information as specified under Technical Information also applies to the 15 Series Two Speed Motor. (See page 5)

Cross Section - Two Speed Motor



Performance Data - Selected Displacements

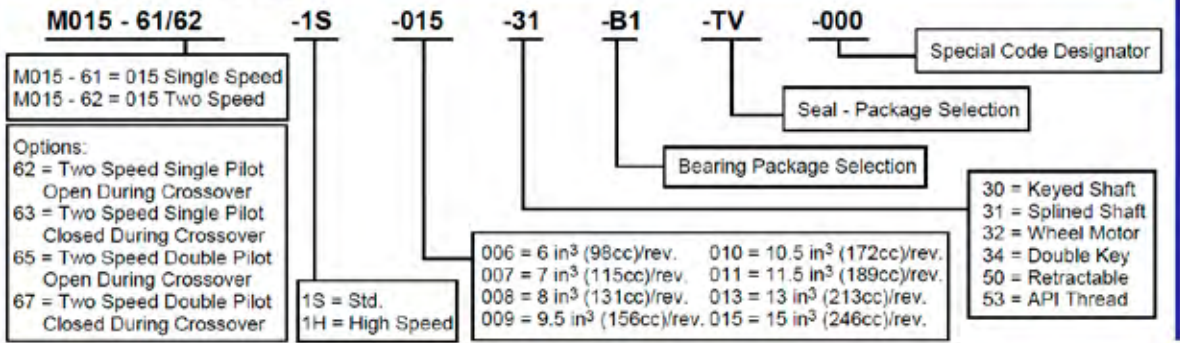


The above performance data was obtained at 140°F with ISO 46(DTE 25). These values must be maintained to obtain the performance indicated. Contact Rineer Hydraulics, Inc. for additional displacements.

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Model Code



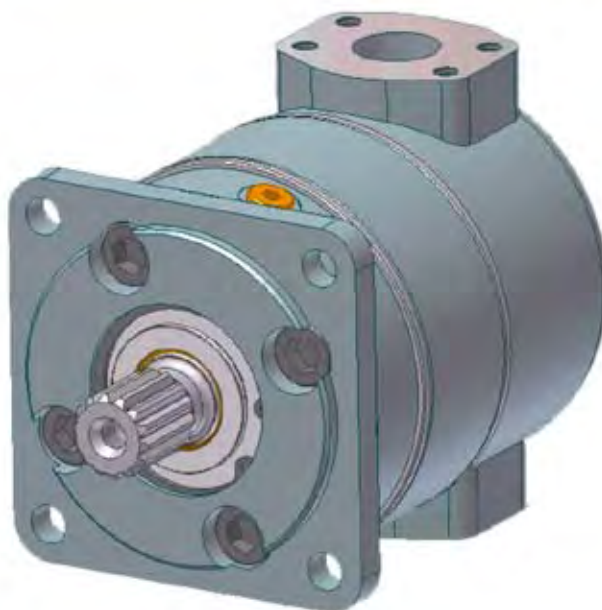
Applications



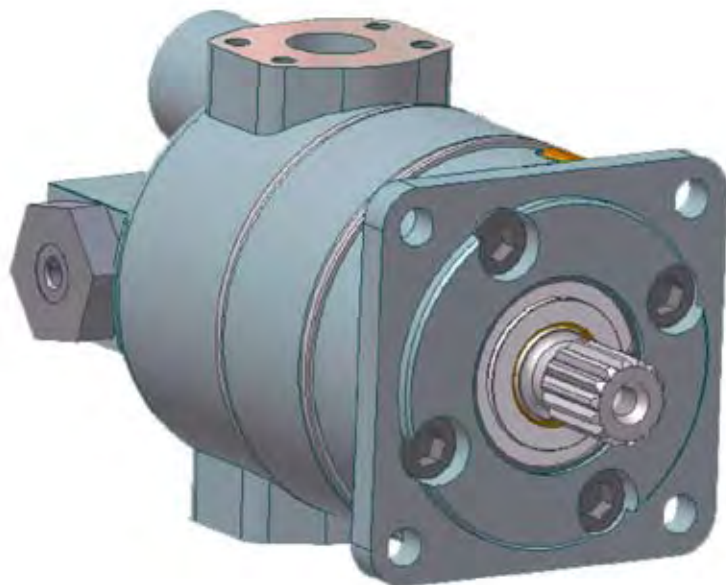


Repair Manual

15 Series



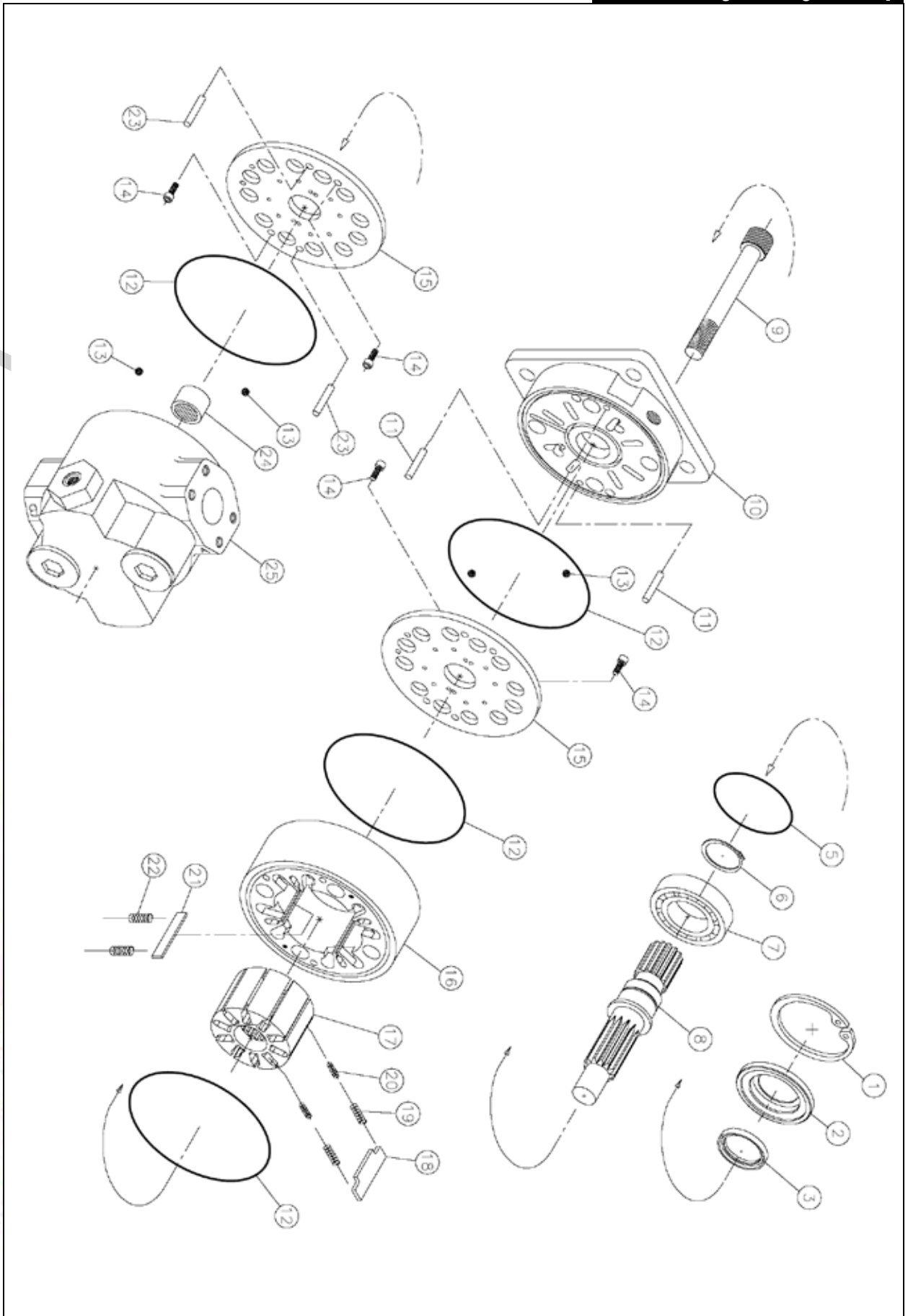
Standard Motor

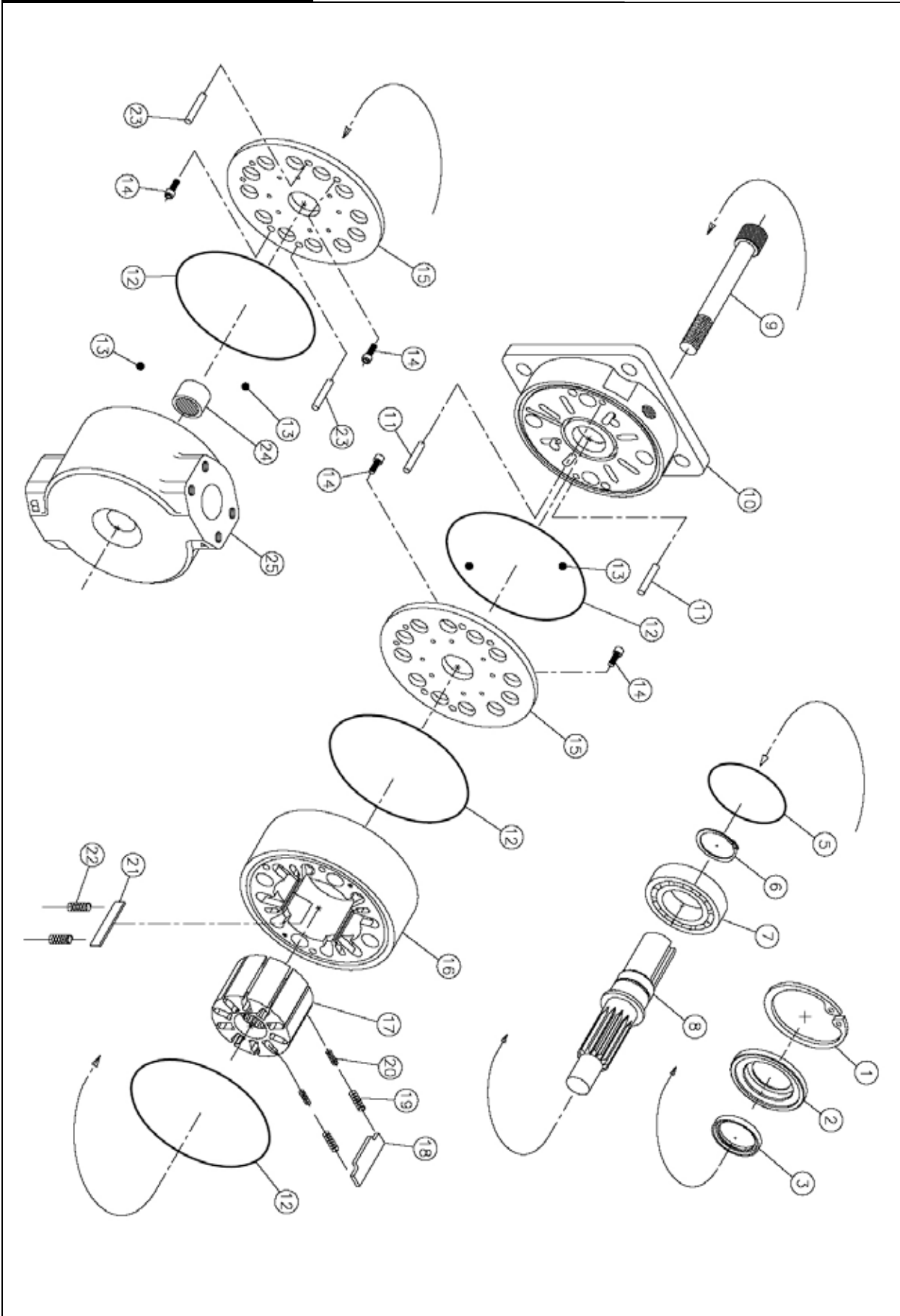


Two Speed Motor

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SERIES 15 TWO-SPEED MOTOR EXPLODED VIEW			
ITEM	PART NO.	DESCRIPTION	QTY.
1	0150111	SNAP RING, SEAL PLATE	1
2	0150135	SEAL PLATE	1
3	1250161	SEAL, SHAFT, TCN	1
4		NOT USED	
5	0150114	O-RING, SEAL PLATE	1
6	0150730	SNAP RING, BEARING	1
7	0150710	BALL BEARING	1
	0150701	SHAFT, KEYED	1
8	0150702	SHAFT, SPLINED	1
9	0150901	BOLT	4
10	0150102	FRONT HOUSING, INTERNAL	1
11	0150428	DOWEL PINS - FRONT	2
12	0150610	O-RING, MAIN	4
13	0150902	BALL CHECKS	4
14	0150620	PLATE SCREW	4
15	0150609	PLATE, TWO SPEED	2
16	0150401	STATOR, GA 15	1
	0150402	STATOR, GA 13	1
	0150403	STATOR, GA 9.5	1
	0150404	STATOR, GA 8	1
	0150407	STATOR, GA 6	1
	0150408	STATOR, GA 10.5-2S	1
	0150414	STATOR, GA 11.5-2S	1
	0150419	STATOR, GA 5	1
17	0150300	ROTOR	1
18	0150313	ROTOR VANE	10
19	0150320	ROTOR VANE SPRING OUTER	20
20	0150321	ROTOR VANE SPRING INNER	20
21	0150410	STATOR VANE	4
22	0150420	STATOR VANE SPRING	8
23	0150429	DOWEL PINS - REAR	2
24	0150720	NEEDLE BEARING	1
25	0150841	REAR HOUSING, TS #62	1
	0150842	REAR HOUSING, TS #63	1
	0150843	REAR HOUSING, TS #64	1

WARNING: RINEER RECOMMENDS FOLLOWING ALL STANDARD SHOP SAFETY PRACTICES SPECIFICALLY INCLUDING WEARING OF EYE PROTECTION.

REMOVAL OF SHAFT SEAL



1) Remove snap ring
WARNING: Use caution when removing snap ring. If released accidentally it can become an airborne hazard.



1) Two of the 3/8" bolt holes are provided with jack screw threads.
 2) Insert a piece of 1/4" round stock by 2-1/2" long into each jack screw hole
 3) Screw two 7/16-14 bolts into the jack screw threads until the bearing box is free of the motor.



1) Pry out shaft seal plate with two screw drivers.
 2) Remove seal plate o-ring from groove in bearing bore.



Lift up on the bearing box to remove from motor.

REMOVAL OF WHEEL MOTOR SEAL PLATE AND BEARING BOX



1) Loosen and remove 8 each 10-32 bolts.
 2) Pry off seal plate with screw driver.

DISASSEMBLY OF WHEEL MOTOR BEARING BOX



1) Loosen clamp screw in lock nut.
 2) Unscrew lock nut and remove.



Loosen and remove 8 each 3/8" bolts with 5/16" socket head wrench.



1) Press shaft out of bearing box.
 2) Proceed to step 9, disregarding steps 11 & 12

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WARNING: RINEER RECOMMENDS FOLLOWING ALL STANDARD SHOP SAFETY PRACTICES SPECIFICALLY INCLUDING WEARING OF EYE PROTECTION.

DISASSEMBLY OF FRONT HOUSING AND SHAFT



9

- 1) Mark one side of the motor for proper assembly, paying careful attention that the cartridge will not be installed upside down.
- 2) Secure the motor prior to loosening the 5/8-11 bolts.



10

- 1) Remove front housing
- 2) Note: Two 5/16" ball checks and one main body o-ring may be dislodged and fall free.



11

With the seal plate removed, press shaft and ball bearing out of front housing.



12

- 1) Remove snap ring from shaft.
- 2) Press shaft out of bearing.

DISASSEMBLY OF ROTOR/STATOR CARTRIDGE



13

Lift up rotor/stator cartridge and remove from the rear housing.



14

- 1) Place cartridge on any object which will hold it off the table.
- 2) Remove two each 10-32 place screws.
- 3) Remove timing plate.



15

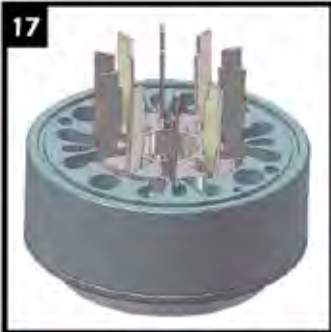
- 1) Remove o-ring and springs with a small screwdriver.
- 2) Remove dowel pins.



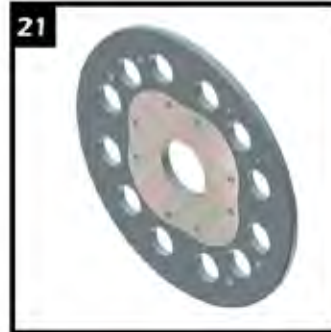
16

- 1) Replace plate on rotor/stator cartridge.
- 2) Turn rotor/stator cartridge over.
- 3) Repeat steps 14 & 15.

WARNING: RINEER RECOMMENDS FOLLOWING ALL STANDARD SHOP SAFETY PRACTICES SPECIFICALLY INCLUDING WEARING OF EYE PROTECTION.



1) Remove the rotor.
2) Remove both the rotor and stator vanes.
3) Note: On motors manufactured prior to 1987, rotor vane slots and rotor vanes should be numbered so that vanes can be reassembled in the same vane slot.



PLATES: Normal wear results in marking of timing plates which does not impair motor performance. Replacement of the timing plate is required if any smearing, galling, or heat cracks are present.

INSPECTION AND REPLACEMENT OF PARTS



Inspect all springs and seals. We recommend replacement of all seals and springs whenever the motor has been disassembled.



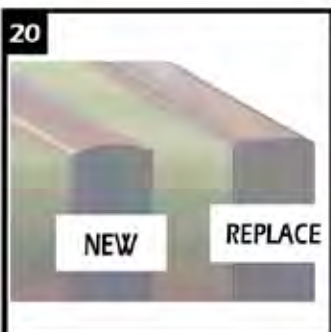
ROTOR: Normal wear results in polishing of rotor faces which does not impair motor performance. Examine the rotor vane slots closely. Polishing down in the slots is normal, but if there is any indication of a "pocket" forming in the wall of the slot, the rotor should be replaced.



Inspect all parts and replace any parts which obviously show excessive wear or damage.



STATOR: Normal wear results in polishing of cam form which does not impair motor performances. Noticeable wear may be apparent along the corner of one side of the stator vane slot. This does not necessarily require replacement of the stator, but may slightly affect volumetric efficiency.



VANES: Normal wear results in slight flattening of vane tips which does not impair motor performance. Replace vane if radius is reduced by 50%. Clearance between the rotor vane and rotor vane slot varies with the vane selection. The design allows the vane to "lean" slightly in the slot, providing the required mechanical seal.



Note: Measure the rotor and stator length to the fourth decimal point and supply measurement when ordering rotor, stator, or vanes.

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WARNING: RINEER RECOMMENDS FOLLOWING ALL STANDARD SHOP SAFETY PRACTICES SPECIFICALLY INCLUDING WEARING OF EYE PROTECTION.

ASSEMBLY OF ROTOR/STATOR CARTRIDGE



- 1) Reverse the procedures in steps 17, 16, 15, and 14
- 2) NOTE: Make sure that the radiused edge of each stator vane points to the rotor and the radiused edge of each rotor vane points to the stator.
- 3) NOTE: Make sure springs are seated in the bottom of the spring pocket in both the rotor and stator.

ASSEMBLY OF WHEEL MOTOR FRONT HOUSING



- 1) Reverse the procedures in steps 8 thru 3.
- 2) Screw lock nut onto shaft until all threads are engaged.
- 3) Tighten clamp screw until lock nut turns with a slight drag.
- 4) Tighten lock nut until desired rolling drag of bearing is obtained - see procedure Page 9.
- 5) Tighten clamp screw
- 6) Tighten all seal plate bolts.

ASSEMBLY OF FRONT HOUSING



- 1) Press bearing onto shaft
- 2) Install snap ring.

ASSEMBLY OF MOTOR



- 1) Install dowel pins into rear housing.
- 2) Install ballchecks into rear housings.
- 3) Install main body o-ring.



- Press shaft and bearing assembly into front housing by pressing on the outer race of bearing.



- 1) Place rotor/stator cartridge onto rear housing.
- 2) NOTE: Make sure assembly marks from step 3 are lined up.



- 1) Place seal in seal plate.
- 2) Place seal plate o-ring into groove in the front housing.
- 3) Press seal plate into front housing
- 4) Install snap ring
- 5) Proceed to step 30.



- 1) Install main body o-ring into front housing.
- 2) Install ball checks into front housing.
- 3) Place a small amount of grease over ball checks and o-ring.
- 4) Wipe off excess grease.

WARNING: RINEER RECOMMENDS FOLLOWING ALL STANDARD SHOP SAFETY PRACTICES SPECIFICALLY INCLUDING WEARING OF EYE PROTECTION.



- 1) Install dowel pins into rotor/stator cartridge
- 2) Pour a small amount of clean oil into the cartridge.
- 3) Install front housing onto rotor/stator cartridge.
- 4) Make sure alignment marks are lined up.

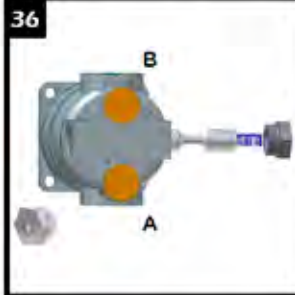


- 1) Rotate shaft in both directions to assure that the shaft turns smoothly.
- 2) Torque motor to 190 ft./lbs.
- 3) Rotate shaft again in both directions to assure that the shaft turns smoothly.



- 1) Install 5/8-11 bolts.
- 2) Torque bolts to 50 ft./lbs.

SPOOL ASSEMBLY FOR THE TWO SPEED MOTOR

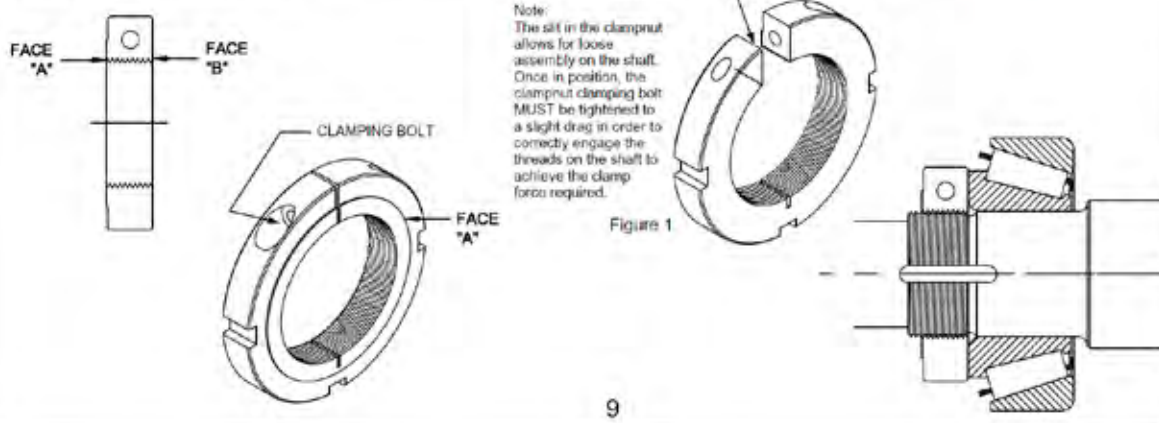


NOTE: Spool should be oriented as shown for two speed motors with model codes 62, 63, 68, & 69.

NOTE: Slight design variations may exist in motors manufactured either before or after the printing of this manual.

WHEEL MOTOR SHAFT AND BEARING ASSEMBLY PROCEDURE

- 1) Clean ALL assembly parts w/ lacquer thinner.
- 2) Dip clampnut and clamping bolt separately in lacquer thinner.
(Steps 3 thru 10 must be conducted to completion ONE assembly at a time.)
- 3) Press bearing cups into bearing housing. Make sure they are pressed completely against bearing shoulders.
- 4) Coat inner race of large cone with #609 (green) Loctite and press cone onto the shaft. Make sure the cone is completely against the shoulder of the shaft.
- 5) Insert shaft and large cone into bearing housing.
- 6) Coat inner race of small cone with #609 (green) Loctite and press small cone onto shaft.
- 7) Apply #272 (red) Loctite to the clampnut threads of the shaft. Apply #242 (blue) Loctite to the threads of the clamping bolt and install in the clampnut.
- 8) Spin clampnut onto shaft with the "B" face towards bearings. After the nut threads are fully engaged, but prior to the nut contacting the bearings, tighten the clamping bolt until there is drag on the clamping nut (see note Fig. 1). Tighten the nut until a 20 to 30 inch pound rolling torque is achieved.
- 9) Tighten clamping bolt on clampnut to 70 inch pounds and recheck rolling torque. Apply inspectors lacquer to head of the bolt.
- 10) Allow a minimum of 24 hrs. to dry.

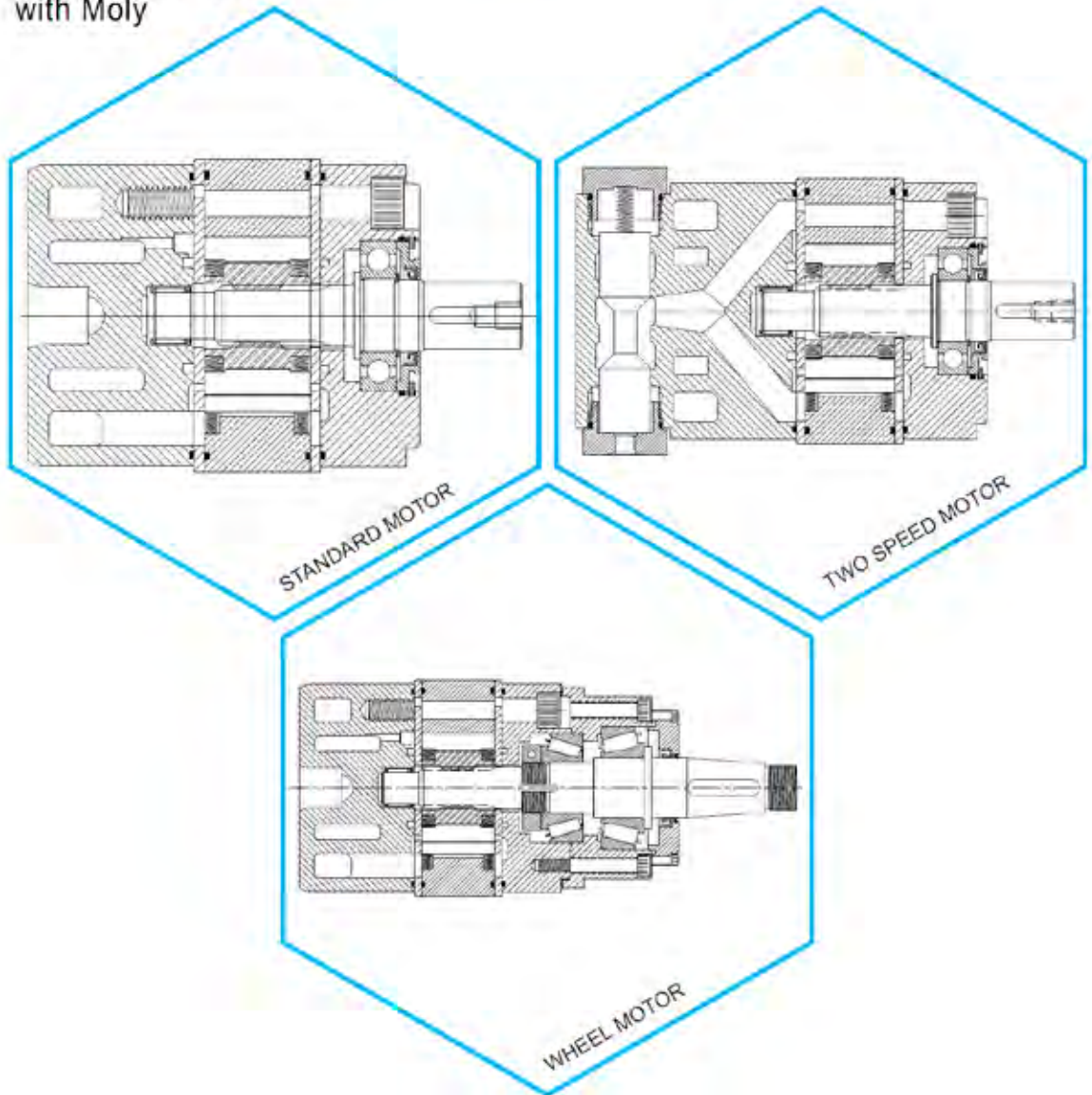


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Information:

Bolt Torque -
 Main Bolts (5/8-11): 190 ft. lbs.
 Seal Plate (3/8-16)
 (Wheel Motor only): 45 ft. lbs.
 Grease used for bolt threads
 and o-ring retention:
 Pennzoil 707L RED
 Shaft seal assembly lube:
 Mobilgrease special
 with Moly

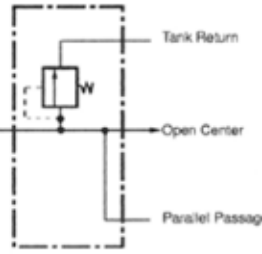
Seal Kits:
 Standard 15 series seal kit
 #0150940
 Standard 15 two speed seal kit
 #0150940
 Standard 15 wheel motor seal kit
 #0150936



Inlets (2500 psi)

End Inlet

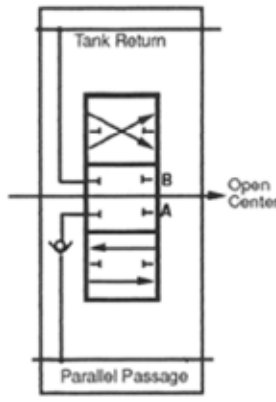
Code	End Port	Top Port
DVA35-A440	1" NPT	1" NPT
DVA35-A880	SAE-16	SAE-16
DVA35-A980	SAE-20	SAE-16
DVA35-A000	NON-PORTED HOUSING	



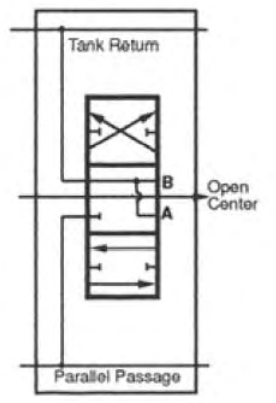
Note: For inlets with solenoid section pilot supply machining, see DVG35 inlet section E1

Schematic shown with main R/V

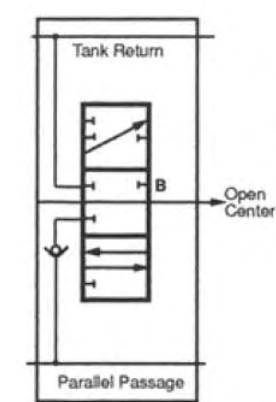
NOTE: Inlets are machined for a main R/V or R/V plug and are furnished with plastic closures. See Section G, Page 32 for inlet port plugs



DA8
Double-Acting Section
4-Way, 3-Position, Hold in Neutral
Cylinder Spool



MA8
Double-Acting Section
4-Way, 3-Position, Float in Neutral
Motor Spool



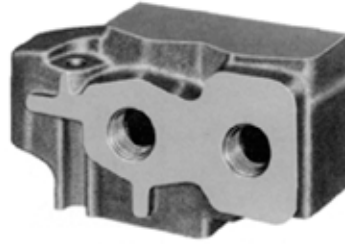
SA8
Single-Acting Section
3-Way, 3-Position, Hold in Neutral
Cylinder Spool



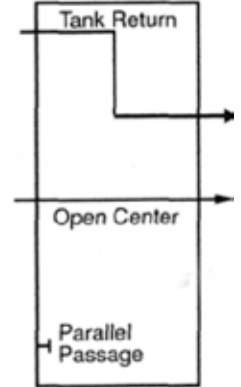
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Pressure Beyond Type



	End Port LP	End Port HP	Top Port LP	Top Port HP
DVA35-PB55	1 1/4" NPT	1 1/4" NPT	1 1/4" NPT	1 1/4" NPT
DVA35-PB90	SAE-20	SAE-20		
DVA35-PB09			SAE-20	SAE-20
DVA35-PB00	NON-PORTED HOUSING			



Lo-Boy Work Sections -- Parallel Circuits

Code	4-Way 3-Position Hold In Neutral	3-Way 3-Position Hold In Neutral	4-Way 3-Position Float In Neutral	4-Way 4-Position Float Position Detented	Port Size	Work Port NOT Machined	Spring Return	3-Position Detent	Metered Hydraulic Remote Control	Solenoid Operated	Air Shift				
DVA35-DAO	•					•	•								
DVA35-DA4	•				1"NPT		•								
DVA35-DA8	•				SAE-16		•								
DVA35-SAO		•				•	•								
DVA35-SA4		•			1" NPT		•								
DVA35-SA8		•			SAE-16		•								
DVA35-MA0			•			•	•								
DVA35-MA4			•		1" NPT		•								
DVA35-MA8			•		SAE-16		•								
DVA35-DK8-12V	•				SAE-16					12 VDC					
DVA35-DK8-24V	•				SAE-16					24 VDC					
DVA35-DX4	•				1" NPT				•						
DVA35-DX8	•				SAE-16				•						
DVA35-DV4	•				1" NPT						•				
DVA35-DV8	•				SAE-16						•				
DVA35-MX4			•		1" NPT				•						
DVA35-MX8			•		SAE-16				•						
DVA35-DB4	•				1" NPT			•							
DVA35-DB8	•				SAE-16			•							
DVA35-SB4		•			1"NPT			•							

Adjustable Relief Valve Cartridges

For Inlets and Mid-section Inlets

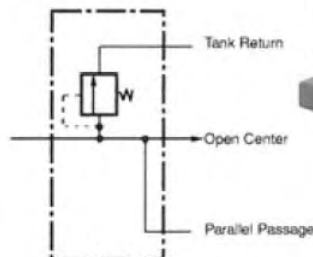


Code	Description
DVA35-MRV-1	Main R/V pressure range 800-2000 psi. Factory set @ 1500 psi @ 50 gpm
DVA35-MRV-2	Main R/V pressure range 2001-2500 psi. Factory set @2500 psi @ 50 gpm.
DVA35-MRVP	Main relief valve plug

Inlets (2500 psi)

NOTE: Inlets are machined for a main R/V or R/V plug and are furnished with plastic closures. See Section G, Page 32 for inlet port plugs

Code	End Port HP	Top Port HP	End Port LP	Top Port LP
DVA20-A440	1" NPT	1" NPT	N/A	N/A
DVA20-A880	SAE-16	SAE-16	N/A	N/A
DVA20-A000	NON-PORTED HOUSING			
Combination Inlet - Outlet				
DVA20-N4444	1" NPT	1" NPT	1" NPT	1" NPT
DVA20-N8888	SAE-16	SAE-16	SAE-16	SAE-16
DVA20-N0000	NON-PORTED HOUSING			



Schematic shown with main R/V

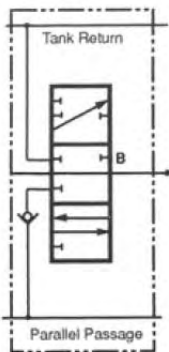
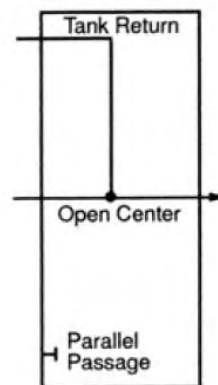


NOTE: For inlet with solenoid section pilot supply port machining, see DVG20 inlet sections, page C1.

Outlets

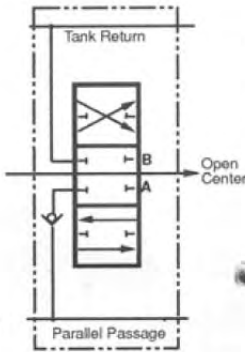
Tank Return Type

Code	End Port	Top Port
DVA20-TR44	1" NPT	1" NPT
DVA20-TR88	SAE-16	SAE-16
DVA20-TR00	NON-PORTED HOUSING	



SA7

Single-Acting Section
3-Way, 3-Position, Hold in Neutral
Cylinder Spool



DA7

Double-Acting Section
4-Way, 3-Position, Hold in Neutral
Cylinder Spool



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Lo-Boy Work Sections -- Parallel Circuits

Code	4-Way 3-Position Hold In Neutral	3-Way 3-Position Hold In Neutral	4-Way 3-Position Float In Neutral	4-Way 4-Position Float Position Detented	Port Size	Work Port NOT Machined	Spring Return	3-Position Detent	Metered Hydraulic Remote Control	Solenoid Operated	Air Shift		
DVA20-DAO	•					•	•						
DVA20-DA3	•				3/4" NPT		•						
DVA20-DA7	•				SAE-12		•						
DVA20-SAO		•				•	•						
DVA20-SA3		•			3/4" NPT		•						
DVA20-SA7		•			SAE-12		•						
DVA20-MAO			•			•	•						
DVA20-MA3			•		3/4" NPT		•						
DVA20-MB3			•		3/4" NPT			•					
DVA20-MA7			•		SAE-12		•						
DVA20-MB7			•		SAE-12			•					
DVA20-FC3				•	3/4" NPT		•						
DVA20-FC7				•	SAE-12		•						
DVA20-DK7-12V	•				SAE-12					12VDC			
DVA20-DK7-24V	•				SAE-12					24 VDC			
DVA20-DX3	•				3/4" NPT				•				
DVA20-DX7	•				SAE-12				•				
DVA20-DV3	•				3/4" NPT						•		
DVA20-DV7	•				SAE-12						•		
DVA20-MX3			•		3/4" NPT				•				
DVA20-MX7			•		SAE-12				•				
DVA20-DB3	•				3/4" NPT				•				
DVA20-DB7	•				SAE-12				•				
DVA20-WDA7	• Series				SAE-12		•						
DVA20-WMA7			• Series		SAE-12		•						

Brief Circuit Descriptions

Series Circuit

Available in DVA20 sections only.

If a machine's work cycle requires simultaneous as well as separate operation of individual hydraulic work functions, a series circuit is right for the job.

As with the other circuits, the oil flows through the open center when all spools are in neutral. There is no parallel passage in standard series sections because they feed directly from the open center passage. If more than one spool is operated, pump flow goes first to the section closest to the inlet. Return flow from the first section is fed back into the open center for use by downstream sections.

Downstream sections can be series, parallel or tandem and will operate in series with the upstream section.

In series circuits, operating pressure is cumulative. Therefore, the sum of the pressures in the circuits can not exceed the circuit or main relief valve setting.

Parallel Circuits

Parallel circuits are the most common on mobile equipment because more than one function can be operated simultaneously and at random. If two or more functions are fully operated at the same time, the one with the lightest load will assert priority because the fluid will take the path of least resistance. However, the operator can divide the flow between functions by metering the spools.

Movement of the spool meters or shuts off the flow of oil thru the open center passage and pressurizes the parallel passage. Oil is then available, at the operator's discretion, to all work ports connected to the parallel passage.

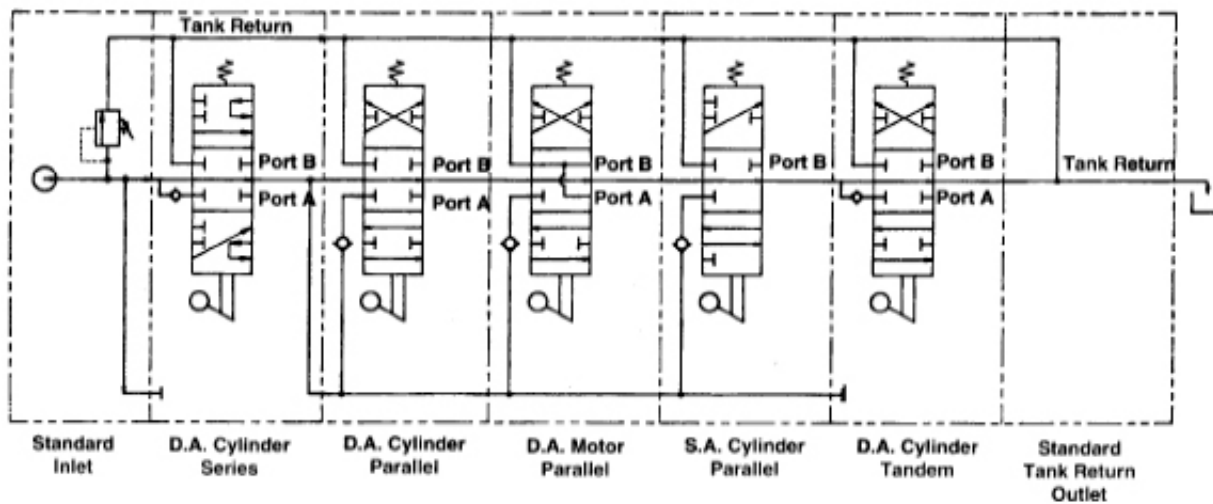
Tandem Circuits

(Not available in the program)

Tandem circuits are sometimes called priority or standard circuits by other manufacturers. Tandem sections feed from the open center passage like series sections but the return flow is directed to the tank return passage and is not available downstream.

If a tandem section is followed by a series or tandem section, operating the tandem section nearest the inlet will assert priority and downstream sections will not function.

Typical Work Section Schematics



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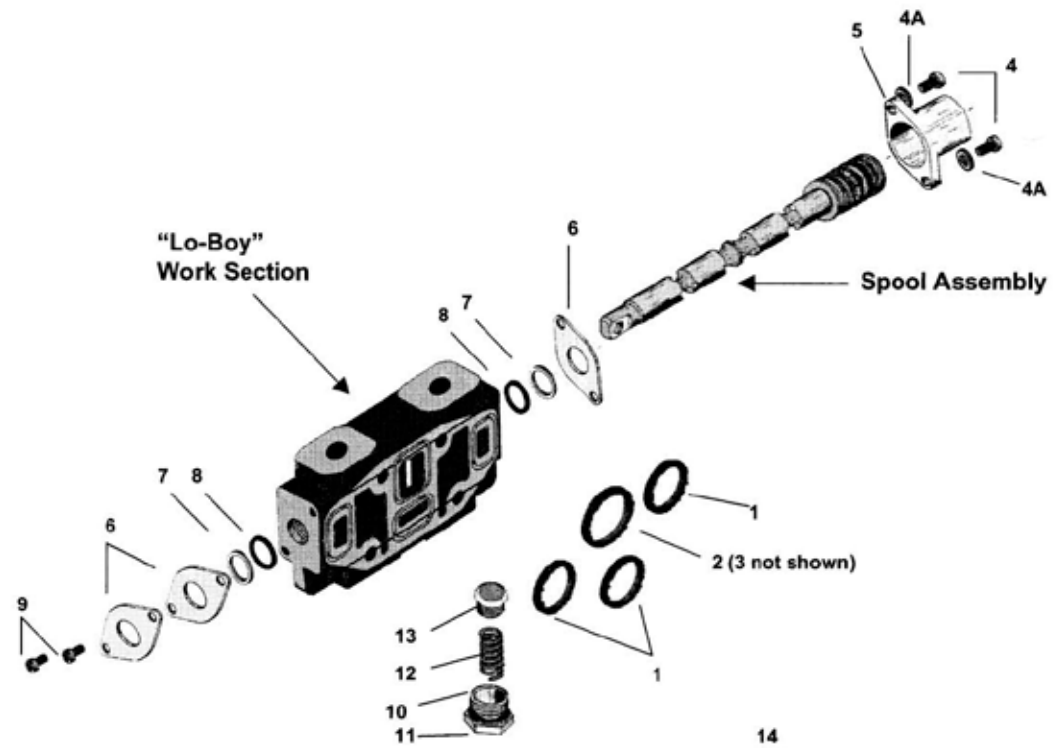


Figure 3

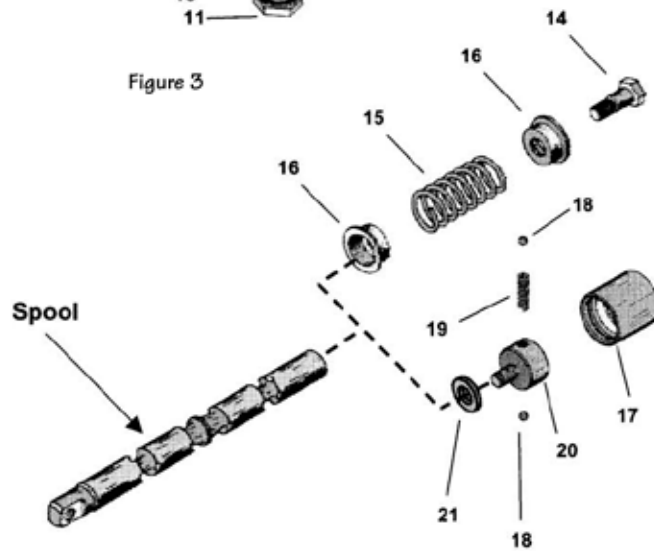
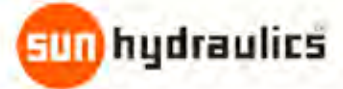


Figure 4

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VA20 / VA35 Valve Sections				
Parallel Section Seals				
Item	Type	Description	Qty	Part Number
1	Part	Square Seal For Parallel Lo-Boy Valve Section	1	02-0080
2	Part	Square Seal For Parallel Lo-Boy Valve Section	3	02-0081
PARALLEL SECTION COMPONENT PARTS - See figures 3 & 4				
4	Part	Back Cap Screw	2	02-0084S
5	Part	Back Cap	1	02-0084
6	Part	Retainer Plate	3	02-0086
7	Part	Back-Up Ring	2	02-0087
8	Part	Spool Seal	2	02-0088
9	Part	Retainer Plate Screw	2	02-0086S
10	Part	Check Valve Cap	1	
11	Part	Check Valve O-Ring Seal	1	
12	Part	Check Spring	1	
13	Part	Check Valve Poppet	1	
Parts 14 through 20 no longer available individually, must be ordered as a Spring Return kit				
	Kit	Spring Return Kit		02-0090K
14	Part	Stripper Bolt	1	
15	Part	Centering Spring	1	
16	Part	Spring Guide	2	
17	Part	Detent Sleeve	1	
18	Part	Detent Ball	2	
19	Part	Detent Spring	1	
20	Part	Detent Poppet Retainer	1	



Pilot-to-open check valve with standard pilot

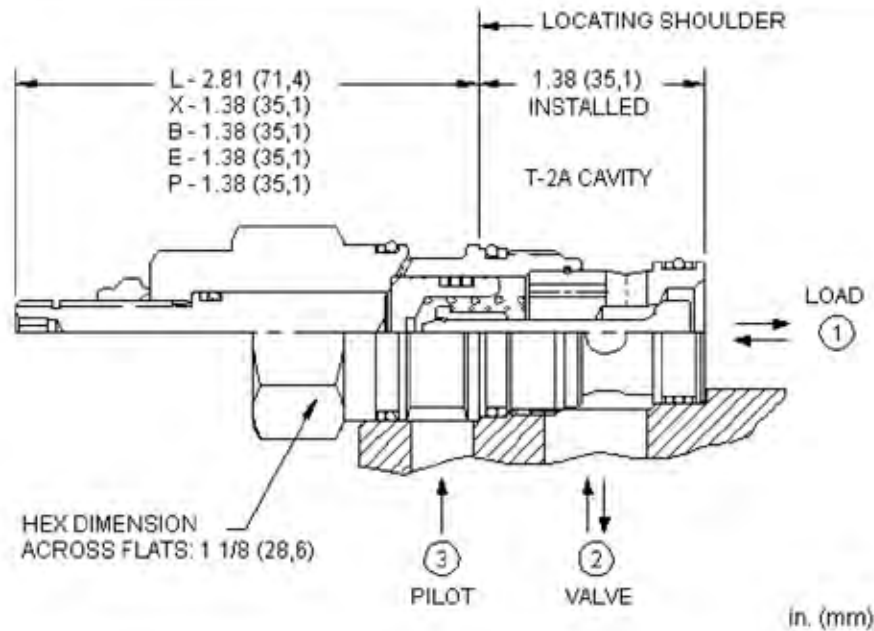
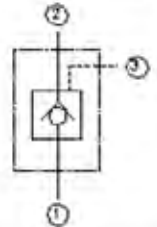
Capacity:
30
 gpm (120 L/min.)

Functional Group:
Products : Cartridges : Pilot-to-Open Check Valve : 3-Port, Non-Vented : Standard Pilot, Steel Seat

Model:
CKEB

Product Description

This valve is a pilot to open check valve. It has a non-sealed pilot, a steel seat, and is non-vented. It allows free flow from the valve (port 2) to the load (port 1) and blocks flow in the opposite direction. Pressure at the pilot (port 3) will open the valve from port 1 to port 2. Pilot pressure needed at port 3 to open the valve is directly proportional to the load pressure at port 1. Pressure at port 2 directly opposes pilot pressure.



Technical Features

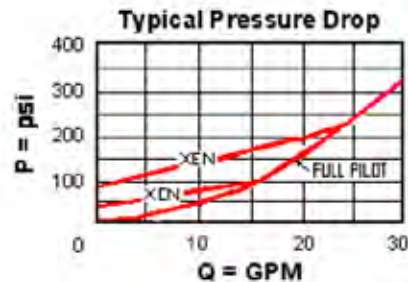
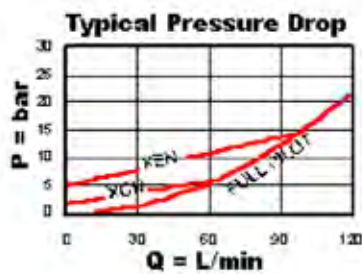
- Provides hose break protection, prevents loads from drifting and positively locks pressurized loads.
- Extremely low leakage. The seat and poppet are heat treated for long life. If the load drifts due to the valve, the seat has probably been damaged by contamination and the valve should be replaced.
- Pilot-to-open check cartridges are locking valves, not motion control valves. For motion control applications,
- Standard unsealed pilot allows air trapped in the pilot line to be purged from the circuit.
- Optional external porting out of the hex end of the cartridge is available for external piloting. In this configuration, port 3 is blocked. See Control options E, and P.
- This 3 port pilot-to-open check valve and 3 port counterbalance valves are physically interchangeable (i.e. same

use counterbalance valves.

- Stainless steel cartridge options P or W are intended for use within corrosive environments with all external components manufactured in stainless steel or titanium. Internal working components remain the same as the standard valves.
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

Technical Data

	U.S. Units	Metric Units
Cavity	T-2A	
Capacity	30 gpm	120 L/min.
Pilot Ratio	3:1	3:1
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at 110 SUS (24 cSt)	1 drops/min.	0,07 cc/min.
Series (from Cavity)	2	
Valve Hex Size	1 1/8 in.	28,6 mm
Valve Installation Torque	45 - 50 lbf ft	60 - 70 Nm
Model Weight	.50 lb	0.25 kg
Seal Kits	Buna: 990-202-007	
Seal Kits	Viton: 990-202-006	



Option Selection

CKEB-X C N

Preferred Options

Control

X Standard Pilot

Standard Options

L Manual Load Release

Cracking Pressure

C 30 psi (2 bar)

- A 4 psi (0,3 bar)
- B 15 psi (1 bar)
- D 50 psi (3,5 bar)
- E 75 psi (5 bar)
- F 100 psi (7 bar)

External Material/Seal Material

N Buna-N

- P Stainless/Buna-N
- V Viton
- W Stainless/Viton

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