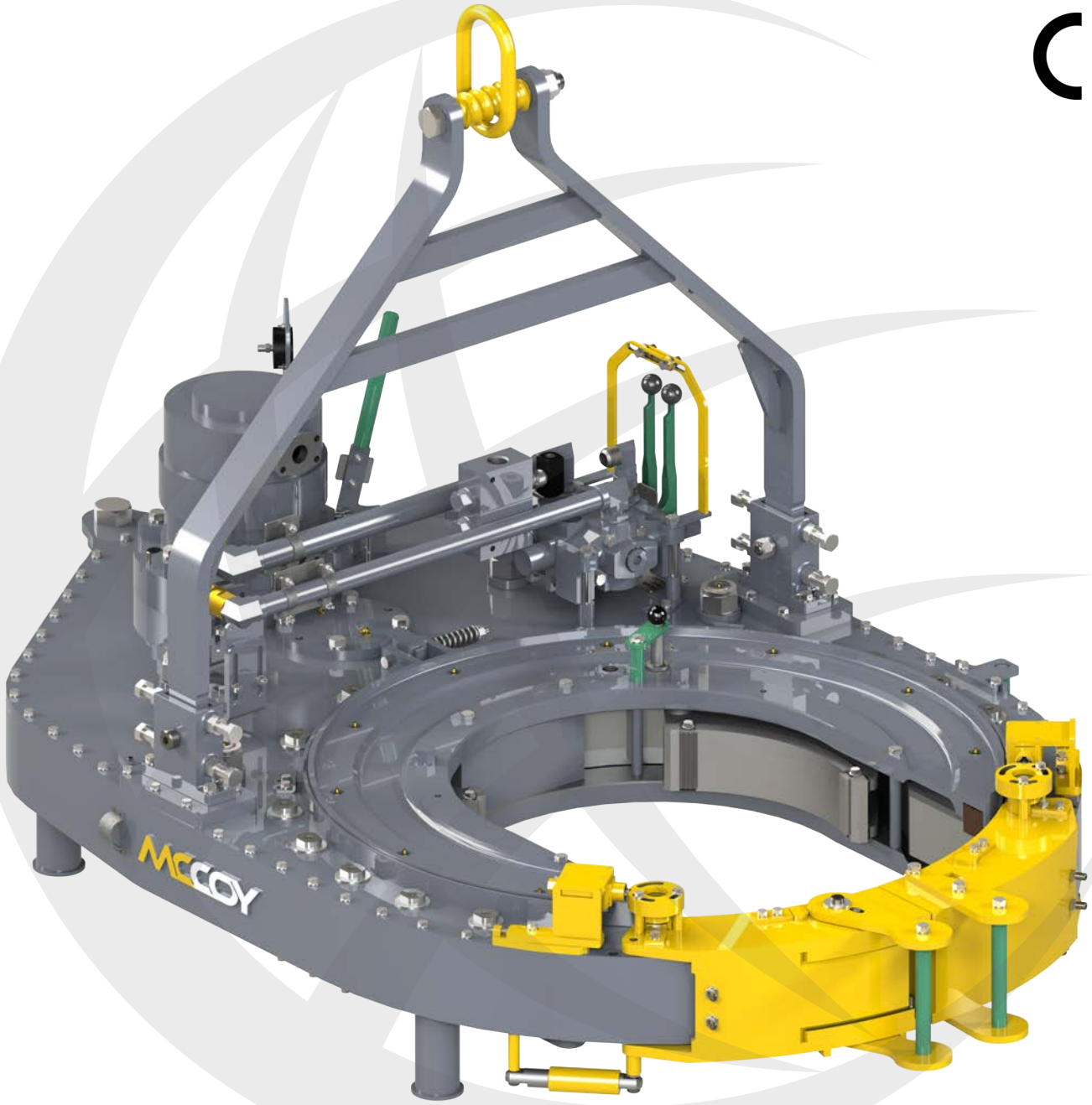
MCCOY GLOBAL

TECHNICAL MANUAL

80-1903-X HD26-60K

26" (660.4 mm) 60,000 lbs-ft Hydraulic Power Tong

CE



SPECIFICATIONS | OPERATION | MAINTENANCE | PARTS

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ORIGINAL INSTRUCTIONS

THIS TECHNICAL DOCUMENT APPLIES TO THE FOLLOWING MODELS:		
TONG MODEL	**REV**	**DESCRIPTION**
80-1903-1	8	26” power tong c/w hydraulic motor, rigid sling, motor valve, lift valve, & safety door. Equipped with rigid sling.
80-1903-3	4	26” power tong c/w hydraulic motor, rigid sling, motor valve, & lift valve. **CLOSED-CENTRE HYDRAULIC SYSTEM**

THIS EQUIPMENT IS EQUIPPED WITH A “SAFETY DOOR” ROTATION INTERLOCK SYSTEM

McCoy Global has made an effort ensure that all illustrations are accurate, but please note that some illustrations used in this manual may not exactly visually match your equipment.

PATENTED & PATENTS PENDING

EC DECLARATION OF CONFORMITY

Manufacturer Information

McCoy Global Canada
14755 – 121A Avenue, Edmonton, AB, T5L 2T2, Canada

Product Description

Product Identification: Model: 80-1903-1 Serial Number:
Product Description: HD 26000
McCoy Global Technical Construction File Reference: T113
Hydraulically powered tong, with/without backup provided as a means of making up, or breaking out, high torque tubular connections within the following specifications:

Specification	Imperial Unit	Metric Unit
Maximum Torque	60000 Ft/lbs	81360 Nm
Arm Length	55.0 Inch	139.7 Cm
Mass	3760 Lbs	1706 Kg
	Torque (Ft Lbs/N M, Estimated)	
At Pressure	2000 Psi	138 Bar
	9167 Hi	12430 Full
	60000 Lo	81360 Full
	Speed (Rpm, Estimated)	
At flow rate	60 GPM	227 LPM
	27.7 Hi	27.7 Full
	4.2 Lo	4.2 Full
Jaw size range (Inch)	9.625 From	26 to
Overall Length	89.4 In	227.1 Cm
Overall Width	56.4 In	143.3 Cm
Overall Height	60.3 In	153.2 Cm

Noise Information

Current Rev:	Author:	Created Date:	Approved by:	Approved Date:
01	C. SANCHEZ	11/27/2014	W.MONDRAGON	03/03/2015

A noise survey was performed on a McCoy Global Canada HD 26000 hydraulically powered Tong and/or Backup.

The following readings were recorded at a distance of 1.0 metres from the equipment's rotating element;

"A" weighted reading of 76.1 dB

"C" weighted reading of 80.0 dB

An **"A"** weighted reading is an average noise level. The "A" weighted reading above was recorded over a 1 minute of continuous maximum rotation.

A **"C"** weighted reading is a peak or impact noise level. The "C" weighted reading above occurred when the Tong door assembly was forcibly closed.

This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

I hereby declare that the equipment described in this document is in conformity with the essential requirements of the European Machinery Directive 2006/42/EC and the European Directive on Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (ATEX) 94/9/EC.

This equipment has been assessed and found to be in accordance with the following European Harmonised standards:

BS EN ISO 12100:2010 Safety of Machinery – General Principle for Design – Risk Assessment and Risk Reduction

BS EN 13463 Part 1 Non Electrical Equipment Intended for Use in Potentially Explosive Atmospheres – Basic Method and Requirement

BS EN 13463 Part 5 Non Electrical Equipment Intended for Use in Potentially Explosive Atmospheres – Protection by Constructional Safety "c".

BS EN 982 Safety of Machinery – Safety Requirements for Fluid Power Systems and Their Components – Hydraulics

BS EN 1127 Part 1 Explosive Atmospheres. Explosion Prevention and Protection. Basic Concepts and Methodology.

This equipment has been classified as suitable for use within a potentially explosive atmosphere as follows. CE Ex II 2 G c T6

Authorized representative:

Murray Gerwing	Product Line Manager
Name	Title
	June 9, 2015
Signature and date	

Current Rev:	Author:	Created Date:	Approved by:	Approved Date:
01	C. SANCHEZ	11/27/2014	W.MONDRAGON	03/03/2015

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McCoy Global has made every effort to ensure the information contained in this document is accurate and current. This manual is intended to provide equipment operation and safety instructions for your equipment. However, McCoy Global does not warrant or guarantee that the information is either complete or accurate in every respect and the user of the manual should consult with its McCoy Global sales representative for any clarifications and updates.

The user of the manual shall protect, indemnify, and hold harmless McCoy Global and its directors, officers, employees, and agents from and against all liability for personal injury, death, or property damage resulting directly or indirectly from the use of the information contained in this manual.

Observance of all descriptions, information and instructions set out in this manual is the full responsibility of the user. This manual is intended for guidance and informational purposes and must be used in association with adequate training and on-the-job supervision to provide safe and effective equipment use.

It is the responsibility of the user to conform to all regulations and requirements issued by an authority or agency which may affect the operation, safety or equipment integrity, that may overrule the content of this documentation.

The user will acknowledge and obey any general legal or other mandatory regulation in force relating to accident prevention, safety, and equipment integrity.

Summary Of Revisions				
Date	**Section**	**Page**	**Description Of Revision**	**Approved**
DEC 2009	N/A	N/A	Initial Release	SH
AUG 2010	N/A	N/A	Revised branding and graphical layout throughout manual	
	Intro	iii	Added Model 80-1903-1	
	6	6.34 - 6.35	Added safety door illustrations and B.O.M.s	
SEP 2011	Intro	iii	Added Model 80-1903-3	SH
	2	2.7	Added hydraulic schematic and B.O.M. for closed-centre system	
OCT 2014	ALL	ALL	Updated manual to current standard	D. Sonnier
	Intro	iii	Removed unsupported models. Added model 80-1903-4.	
		x	Added list of illustrations	
	1	1.4	Replaced illustration of tong dimensions.	
		1.5	Added illustration for model 80-1903-4 (rigid sling).	
		1.6	Updated specifications. Revised lubricant specifications.	
	2	2.3	Inserted new section 2.A, “Initial Receipt & Inspection”	
		2.5	Renumbered “Sling & Load-Bearing Device Safety” as section 2.C	
		2.9	Inserted new section 2.D, “Lift Cylinder Installation & Safety”	
		2.12	Inserted new section 2.E, “Hydraulics” which contains hydraulic schematics, hydraulic component ID, hydraulic connections, & hydraulic circuit description.	
		2.12	Replaced open-centre hydraulic schematic with updated version	
		2.13	Replaced closed-centre hydraulic schematic with updated version	
		2.17	Inserted new subsection 2.E.4 “Hydraulic Circuit Description”.	
		2.18	Renumbered “Tong Jaw Availability & Installation” as section 2.F	
		2.18	Revised sub-section 2.F.2 “Tong Jaw Installation & Removal”. Added new illustrations and revised description.	
		2.20	Renumbered “Tong Rig-up & Leveling” as section 2.G.	
		2.20	Revised subsection 2.G.1 “Suspension & Restraint”. Replaced illustrations.	
		2.22	Revised subsection 2.G.2 “Tong Leveling, Chain Sling”. Replaced illustrations.	
		2.23	Inserted new subsection 2.G.3 “Tong Leveling, Rigid Sling”.	
		2.24	Renumbered “Tong Operation” as section 2.H	
		2.24	Inserted new subsection 2.H.1 “Operator Training”.	
		2.24	Inserted new subsection 2.H.2 “Operator Safety”.	
			Removed subsection “Initial Start-up & Break-in Procedure”.	
		2.24	Revised subsection 2.H.3 “Valve Operaton”. Replaced illustrations.	
		2.26	Inserted new subsection 2.H.4 “Shifting Gears”.	
		2.26	Inserted new subsection 2.H.5 “Pre-Operational Checks”.	
		2.28	Inserted new section 2.I “Making & Breaking Connections”.	
		2.34	Renumbered “Extreme Cold Weather Operation” as section 2.J	
	3	3.3	Revised Section 3.A “General Maintenance Safety Practices”.	
		3.3	Inserted new section 3.C “General Maintenance Practices”.	
		3.4	Inserted new section 3.D, “Hydraulic System De-pressurization”	
		3.4	Renumbered “Lubrication Instructions” as section 3.E	
		3.9	Renumbered “Adjustments” as section 3.F	
		3.9	Revised subsection 3.F.1 “Brake Band Adjustment”. Replaced illustration.	
		3.10	Inserted new subsection 3.F.3 “Shifter Detent Force Adjustment”.	
		3.11	Renumbered “Recommended Periodic Checks” as section 3.G”	

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Summary Of Revisions (Continued)				
Date	**Section**	**Page**	**Description Of Revision**	**Approved**
OCT 2014	**3**	3.11	Renumbered “Removal of Top Plate for Overhaul” as section 3.H” & revised section.	D. Sonnier
		3.13 - 3.25	Renumbered “Assembly Procedures” as section 3.I. Revised “Assembly Procedure” to include rigid sling installation.	
		3.26	Inserted new section 3.J “Daily Inspection & Maintenance Checklist”.	
		3.28	Inserted new section 3.K “Monthly Inspection & Maintenance Checklist”.	
		3.31	Inserted new section 3.L “Tubular Connection Equipment Decommissioning & Shipping”.	
		3.35	Inserted new section 3.M “Tubular Connection Equipment Re-Commissioning”.	
	4	4.4	Inserted new section 4.B, “Troubleshooting: Relief Valve Incorrectly Set or Not Functioning”.	
		4.6	Inserted new section 4.C, “Safety Door Troubleshooting”.	
		4.9	Inserted new section 4.F, “Troubleshooting: Failure of Jaws to Release Pipe”.	
			Removed section “Decommissioning, Storage, & Re-Commissioning	
	5	5.8-5.9	Replaced illustrations “Door Mounted Support Roller”.	
		5.10-5.11	Replaced illustrations “Door Pivot Support Roller”.	
		5.12-5.13	Replaced illustrations & updated B.O.M. “Rotary Idler”.	
		5.14-5.15	Replaced illustrations & updated B.O.M. “Pinion Idler”.	
		5.17	Updated B.O.M. “Pinion Assembly”	
		5.19	Updated B.O.M. “Clutch Assembly”	
		5.20-5.21	Replaced illustrations & updated B.O.M. “Cage Plate Assembly”.	
		5.22-5.23	Replaced illustrations & updated B.O.M. “Shifter Assembly”.	
		5.26-5.27	Replaced illustrations & updated B.O.M. “Hydraulic Supports”.	
		5.28-5.29	Inserted new illustrations & B.O.M. “RH Door Assembly”.	
		5.30-5.31	Inserted new illustrations & B.O.M. “LH Door Assembly”.	
		5.36-5.37	Inserted new illustrations & B.O.M. “Rigid Sling”.	
	6	6.1 - 6.9	Complete revision of torque measurement section	
JUN 2015	Preamble	iv - v	Inserted EC Declaration of Conformity	D. Sonnier
	1	1.7 - 1.8	Updated subsection 1.2 to include warnings about spark generation	
	2	2.10	Updated table, subsection 2.3.1	
		2.11	Updated illustration, CE label	
	3	3.3	Updated subsection 3.0, Receipt, Inspection, & Handling of Equipment	
		3.4 - 3.6	Updated subsection 3.1, Sling/Load Bearing Device Safety	
		3.7 - 3.10	Updated subsection 3.2, Lift Cylinder Installation & Safety	
MAR 2016	2	2.9	Updated specifications and added maximum hydraulic supply warning	D. Sonnier
	3	3.11	Added maximum hydraulic supply warning	

SECTION 1: INTRODUCTION
1.0 INTRODUCTION & CONTACT INFORMATION 1.3
1.1 SCOPE 1.5
1.2 GENERAL HEALTH AND SAFETY 1.7
1.2.1 Hazard Labels 1.7
1.2.2 General Safe Operation Guidelines 1.7
1.2.3 Rigging and Overhead Lifting 1.8
1.2.4 Maintenance Safety 1.8
1.2.5 Replacement Parts 1.9
1.2.6 Environmental Impact 1.9
1.3 ACRONYMS AND TERMINOLOGY 1.11
1.3.1 Acronyms and Definitions 1.11
1.3.2 Terms and Definitions 1.12

SECTION 2: EQUIPMENT & LUBRICATION SPECIFICATIONS
2.0 EQUIPMENT DESCRIPTION 2.3
2.1 MAJOR COMPONENT IDENTIFICATION 2.6
2.2 EQUIPMENT SPECIFICATIONS 2.9
2.3 LUBRICANT SPECIFICATIONS 2.10
2.3.1 Hydraulic Fluid 2.10
2.3.2 Gear Fluid 2.10
2.3.3 Grease 2.10
2.4 CE NAMEPLATE 2.11

SECTION 3: INSTALLATION & COMMISSIONING
3.0 RECEIPT, INSPECTION, AND HANDLING OF EQUIPMENT 3.3
3.1 SLING / LOAD BEARING DEVICE SAFETY 3.3
3.1.1 Inspection Of Load-Bearing Devices and Structures 3.4
3.1.2 Proper Use Of Load-Bearing Devices 3.5
3.1.3 Storage Of Load-Bearing Devices 3.5
3.2 LIFT CYLINDER INSTALLATION AND SAFETY 3.6
3.2.1 Installation Procedure 3.6
3.2.2 Lift Cylinder Hydraulic Connection 3.7
3.2.3 Lift Cylinder Safety 3.7
3.3 HYDRAULICS 3.11
3.3.1 Hydraulic Schematic 3.11
3.3.2 Main Hydraulic Connections 3.13
3.3.3 Hydraulic Circuit Description 3.15
3.4 TONG JAW AVAILABILITY & INSTALLATION 3.16
3.4.1 Jaw Availability 3.16
3.4.2 Tong Jaw/Jaw Die Installation & Removal 3.16
3.5 EQUIPMENT CONFIGURATION & LEVELING 3.19
3.5.1 Suspension & Restraint 3.19
3.5.2 Tong Leveling 3.21
3.5.3 Load Cell Configuration 3.23

SECTION 4: OPERATION
4.0 TONG OPERATION 4.3
4.0.1 Operator Training 4.3
4.0.2 Operator Safety 4.3
4.0.3 Valve Operation 4.3
4.0.4 Shifting Gears 4.5
4.0.5 Pre-Operational Checks 4.6
4.0.6 General Operational Comments 4.7
4.1 MAKING AND BREAKING CONNECTIONS 4.8
4.1.1 Making A Connection 4.8
4.1.2 Breaking A Connection 4.11

SECTION 5: MAINTENANCE
5.0 GENERAL MAINTENANCE SAFETY PRACTICES 5.3
5.1 CLEANING 5.3
5.2 PREVENTIVE MAINTENANCE PRACTICES 5.3
5.3 HYDRAULIC SYSTEM MAINTENANCE 5.4
5.4 HYDRAULIC SYSTEM DE-PRESSURIZATION 5.4
5.5 LUBRICATION INSTRUCTIONS 5.6
5.6 ADJUSTMENTS 5.11
5.6.1 Brake Band Adjustment 5.11
5.6.2 Door Alignment 5.12

SECTION 5: MAINTENANCE
5.6 ADJUSTMENTS 5.11
5.6.3 Safety Door Switch Adjustment 5.13
5.6.4 Shifter Detent Force Adjustment: 5.15
5.7 RECOMMENDED PERIODIC INSPECTIONS 5.16
5.7.1 Door Stop Spring 5.16
5.7.2 Backing Pin 5.16
5.7.3 Shifting Shaft 5.16
5.7.4 Torque Gauge Assembly 5.16
5.7.5 Spring Hanger 5.16
5.8 REMOVAL OF TOP PLATE FOR OVERHAUL 5.17
5.9 ASSEMBLY PROCEDURES 5.19
5.10 DAILY INSPECTION & MAINTENANCE CHECKLIST 5.34
5.11 MONTHLY MAINTENANCE CHECKLIST 5.36
5.12 TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING 5.39
5.13 TUBULAR CONNECTION EQUIPMENT RE-COMMISSIONING PROCEDURE 5.44

SECTION 6: TROUBLESHOOTING
6.0 TONG WILL NOT DEVELOP SUFFICIENT TORQUE 6.3
6.1 RELIEF VALVE IS INCORRECTLY SET OR NOT FUNCTIONING 6.4
6.2 SAFETY DOOR DOES NOT OPERATE OR IS MALFUNCTIONING 6.6
6.3 TONG RUNNING TOO SLOWLY 6.7
6.4 FAILURE OF JAWS TO GRIP PIPE 6.8
6.5 FAILURE OR DIFFICULTY OF TONG TO SHIFT 6.9
6.6 GENERAL COMMENTS 6.10

SECTION 7: PARTS & ASSEMBLIES
Gear Train 7.2
Support Roller 7.4
Support Roller (Brake Band Coincidental) 7.6
Support Roller (Door-mounted) 7.8
Support Roller (Door Pivot) 7.10
Rotary Idler 7.12
Pinion Idler 7.14
Pinion 7.16
Clutch 7.18
Cage Plate Assembly 7.20
Shifting Assembly 7.22
Motor & Mount 7.24
Hydraulic Supports / Outer Body 7.26
RH Door Assembly 7.28
LH Door Assembly 7.30
Safety Door Components 7.32
Rigid Sling 7.34

SECTION 8: TORQUE/TURNS MANAGEMENT
8.0 BASIC TORQUE MEASUREMENT 8.3
8.1 TROUBLESHOOTING 8.7
8.2 PERIODIC INSPECTION AND MAINTENANCE 8.8
8.2.1 Inspection 8.8
8.2.2 Fluid Recharge 8.8
8.2.3 Reference Checking Your Torque Measurement System 8.8
8.2.4 Repair And Calibration 8.9

SECTION 9: OEM DOCUMENTATION

Illustration 1.2.1: Equipment Handling Warnings 1.8
Illustration 2.0.1: HD26-60K Power Tong 2.3
Illustration 2.0.2: HD26-60K Power Tong Dimensions 2.4
Illustration 2.0.3: HD26-60K Power Tong Additional Hazards 2.5
Illustration 2.1.1: Component Identification 01 ..... 2.6
Illustration 2.1.2: Component Identification 02 ..... 2.7
Illustration 2.1.3: Component Identification 03 ..... 2.8
Illustration 2.1.4: CE Nameplate 2.11
Illustration 3.3.1: Hydraulic Schematic 3.11
Illustration 3.3.2: Hydraulic Schematic (Closed Centre) 3.12
Illustration 3.3.3: Hydraulic Connections 01 ..... 3.13
Illustration 3.3.4: Hydraulic Connections 02 ..... 3.13
Illustration 3.3.5: Hydraulic Connections 03 ..... 3.14
Illustration 3.4.1: Jaw Removal / Installation 3.17
Illustration 3.4.2: Jaw Disassembly 3.18
Illustration 3.5.1: Tong Suspension and Load Cell Orientation 3.20
Illustration 3.5.2: Tong Leveling 01 ..... 3.21
Illustration 3.5.3: Tong Leveling 02 ..... 3.22
Illustration 3.5.4: Tong Leveling 03 ..... 3.22
Illustration 3.5.5: HD26-60K Load Cell Configuration 3.23
Illustration 4.0.1: Tong Rotation Control Valve 4.4
Illustration 4.0.2: Tong Lift Cylinder Control Valve 4.4
Illustration 4.0.3: Shifting Gears 4.5
Illustration 4.1.1: Master Lifting Link 4.8
Illustration 4.1.2: Backing Pin Set To “Make-up” Position 4.9
Illustration 4.1.3: Setting Backing Pin To “Break-Out” Position 4.11
Illustration 5.5.1: Cage Plate Guide Ring Lubrication 5.6
Illustration 5.5.2: Support Roller Lubrication 5.7
Illustration 5.5.3: Rotary Idler Lubrication 5.7
Illustration 5.5.4: Pinion Idler Lubrication 5.8
Illustration 5.5.5: Pinion Bearing Lubrication (Top Plate) 5.8
Illustration 5.5.6: Pinion Bearing Lubrication (Bottom Plate) 5.9
Illustration 5.5.7: Clutch Bearing Lubrication 5.9
Illustration 5.5.8: Shifting Shaft Lubrication 5.10
Illustration 5.5.9: Door Spring Cylinder 5.10
Illustration 5.6.1: Brake Band Adjustment 5.11
Illustration 5.6.2: Door Alignment 5.12
Illustration 5.6.3: Safety Door Adjustment 01 ..... 5.13
Illustration 5.6.4: Safety Door Adjustment 02 ..... 5.13
Illustration 5.6.5: Safety Door Adjustment 03 ..... 5.14
Illustration 5.6.6: Shifter Detent Force Adjustment 5.15
Illustration 5.7.1: Spring Hanger Inspection Area Map 5.16
Illustration 5.9.1: Tong Assembly - Lower Bearing Cap Installation 5.20
Illustration 5.9.2: Tong Assembly - Initial Support Roller Installation 5.21
Illustration 5.9.3: Tong Assembly - Rotary Gear Installation 5.21
Illustration 5.9.4: Tong Assembly 04 ..... 5.22
Illustration 5.9.5: Tong Assembly - Top Plate Fastener Installation 5.23
Illustration 5.9.6: Tong Assembly - Cage Plate Assembly 5.25
Illustration 5.9.7: Tong Assembly - Latch Claw & Spring Installation 5.26
Illustration 5.9.8: Tong Assembly - Door Latch Handle Installation 5.27
Illustration 5.9.9: Tong Assembly - Door Installation 5.28
Illustration 5.9.10: Tong Assembly - Door Roller Installation 5.29
Illustration 5.9.11: Brake Band Adjustment Installation 5.30
Illustration 5.9.12: Rotation Interlock Component Installation 5.30
Illustration 5.9.13: Door Spring Stop Cylinder Installation 5.31
Illustration 5.9.14: Rotation Interlock Switch Installation 5.32
Illustration 5.12.1: Shipping Instructions - Pallet Placement 5.42
Illustration 5.12.2: Shipping Instructions - Strapping to Pallet 5.42
Illustration 6.1.1: Relief Valve Troubleshooting - Temporary Gauge Installation 6.4
Illustration 7.1: Gear Train ISO View 7.2
Illustration 7.2: Gear Train Top & Side View 7.3
Illustration 7.3: Support Roller Exploded 7.4
Illustration 7.4: Support Roller 7.5
Illustration 7.5: Support Roller (Brake Band) Exploded 7.6
Illustration 7.6: Support Roller (Brake Band) 7.7
Illustration 7.7: Support Roller (Door-Mounted) Exploded 7.8
Illustration 7.8: Support Roller (Door-Mounted) 7.9

Illustration 7.9: Support Roller (Door Pivot) Exploded 7.10
Illustration 7.10: Support Roller (Door Pivot) 7.11
Illustration 7.11: Rotary Idler Exploded 7.12
Illustration 7.12: Rotary Idler 7.13
Illustration 7.13: Pinion Idler Exploded 7.14
Illustration 7.14: Pinion Idler 7.15
Illustration 7.15: Pinion Exploded 7.16
Illustration 7.16: Pinion 7.17
Illustration 7.17: Clutch Exploded 7.18
Illustration 7.18: Clutch 7.19
Illustration 7.19: Cage Plate Assembly Exploded 7.20
Illustration 7.20: Cage Plate Assembly 7.21
Illustration 7.21: Shifter Exploded 7.22
Illustration 7.22: Shifter 7.23
Illustration 7.23: Motor & Mount Exploded 7.24
Illustration 7.24: Motor & Mount 7.25
Illustration 7.25: Hydraulic Supports 7.26
Illustration 7.26: Hydraulic Supports 7.27
Illustration 7.27: RH Door Assembly 7.28
Illustration 7.28: Latch Components 7.29
Illustration 7.29: LH Door Assembly 7.30
Illustration 7.30: Door Assembly 7.31
Illustration 7.31: Safety Door Components 7.32
Illustration 7.32: Safety Door Assembly 7.33
Illustration 7.33: Rigid Sling Assembly Exploded 7.34
Illustration 7.34: Rigid Sling Assembly 7.35
Illustration 8.0.1: Torque Gauge (For Illustration Purposes Only) 8.3
Illustration 8.0.2: Tension Load Cell 8.3
Illustration 8.0.3: Tension Load Cell Exploded 8.5
Illustration 8.0.4: Turn Counter Encoder Mount Exploded 8.6

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SECTION 1: INTRODUCTION

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1.0 INTRODUCTION & CONTACT INFORMATION

Congratulations, and thank you for purchasing quality tubular connection equipment from McCoy Global. This unit will provide years of outstanding performance. Proper maintenance and care will extend its life and ensure years of excellent performance and reliability. The installation and commissioning, operating, and maintenance instructions in this manual will assist you in giving your equipment the care it requires. Please read the manual before installing and using your equipment. Replacement parts are readily available from McCoy Global. Should you need replacement parts, or should you experience any difficulty not covered in this manual, please contact:

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Standard Terms and Conditions of Sale (including warranty information):

http://www.mccoyglobal.com/tcs.pdf

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1.1 SCOPE

This technical manual is the main document supplied by McCoy Global for the equipment identified on Page iii of the preamble. The intent of this document is to provide descriptions of the systems, installation, commissioning and operating instructions, maintenance guidelines, spare parts information, and technical drawings and schematics (where applicable).

The OEM-recommended installation, commissioning, operation, maintenance, and troubleshooting instructions are to be regarded as guidelines, and are not intended to be a comprehensive operating guide for user specific application. Due to the wide variety of operating conditions it remains the responsibility of each equipment owner to use these guidelines together with an experienced manager to develop safe operating procedures that conform to American Petroleum Institute (or equivalent) standards, applicable State/Province or local regulations, and any corporate regulations/ operating practices.

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1.2 GENERAL HEALTH AND SAFETY

AUTHORIZED USE ONLY!

READ THIS MANUAL BEFORE USING EQUIPMENT

Only authorized, trained, and competent personnel shall operate, maintain, and repair this equipment.

Fully review this manual and comply with all safety and environmental protection instructions before operating equipment.

1.2.1 Hazard Labels

McCoy Global uses four levels of hazard / notice labels to describe items of four levels of importance:

DANGER is represented by a hazard symbol coupled with a "**DANGER**" signal word, and identifies items of the highest level of risk. Failure to heed information identified by a **DANGER** symbol may result in severe bodily injury or death.

⚠ DANGER

THIS IDENTIFIES AN EXTREME HAZARD OF PERSONAL INJURY OR DEATH

A **WARNING** is represented by a hazard symbol coupled with a bold "**WARNING**" signal word, and identifies items of medium risk. Failure to heed information identified by a **WARNING** symbol may result in significant injury to personnel, catastrophic equipment failure, or harmful environmental contamination.

⚠ WARNING

THIS IDENTIFIES A WARNING REGARDING POTENTIAL INJURY OR CATASTROPHIC EQUIPMENT DAMAGE

A **CAUTION** is represented by a hazard symbol coupled with a bold "**CAUTION**" signal word, and identifies items of low risk. Failure to heed information identified by a **WARNING** symbol may result in injury to personnel or equipment damage.

⚠ CAUTION

THIS IDENTIFIES A CAUTION REGARDING SAFE OPERATION OR THE POTENTIAL OF EQUIPMENT DAMAGE

A **NOTICE** highlights information or items of importance unrelated to personal injury that may aid the user during installation, commissioning, assembly, or operation of your equipment.

NOTICE

THIS HIGHLIGHTS ITEMS OF IMPORTANCE UNRELATED TO PERSONAL INJURY

1.2.2 General Safe Operating Guidelines

Only authorized personnel shall operate equipment delivered by McCoy Global. Equipment shall be in a proper technical condition prior to use, and shall be used only for the purpose for which it is intended. Malfunctions or damages must be rectified before operation to ensure personnel safety and avoid equipment damage.

The user is responsible for ensuring the safety of all personnel while operating any McCoy Global product. McCoy Global is not responsible for injuries or equipment damage that arises from improper use of the equipment.

McCoy Global recommends that a hazard assessment of the work area be performed by a designated safety representative before commencing operations. A designated safety representative is responsible for verifying that all operators have adequate equipment and safety training.

1.2.2 General Safe Operation Guidelines (Continued):

The area surrounding the equipment operating area must be clutter-free and free from tripping hazards, or protruding objects that may snag hoses or cables. Operating surface or drill floor must be kept free of slipping hazards like grease, oil, water, etc.

Adequate lighting of the work area is required. All warnings, labels, gauges, and signs must be clearly visible.

Equipment components painted green are safe for continuous handling. Areas painted yellow and any other equipment components that rotate or move are designated as hazardous areas. Contact with those areas must be avoided during operation.

Illustration 1.2.1: Equipment Handling Warnings

Always wear all personal protective equipment (PPE) specified by established HSE policies. Follow all safety guidelines.

Do not open the tong door while the tong is rotating or under load. Doing so may generate a shock load that could result in catastrophic equipment failure not covered by the manufacturer's warranty, and may present a hazard to personnel on the drill floor.

⚠ WARNING

DO NOT OPEN TONG DOOR WHEN TONG IS ROTATING OR UNDER LOAD

See Section 4 for the correct, safe procedure for testing the door switch on a McCoy Global power tong.

Never attempt to clamp to a tubular using incorrectly sized dies. Operators must always use the correct jaw size equipped with the proper dies. Use of incorrectly size dies poses a hazard to personnel and may damage equipment. Please see Section 3 of this manual for a list of compatible jaw die kits and replacement dies.

⚠ WARNING

NEVER ATTEMPT TO CLAMP ONTO TUBULARS WITH INCORRECTLY SIZED DIES

⚠ WARNING

BY NATURE, STEEL MACHINERY WITH ROTATING AND MOVING PARTS HAS THE POTENTIAL TO GENERATE IGNITION SOURCES, IE. SPARKS. AS OUTLINED IN THIS MANUAL, SCHEDULED MAINTENANCE, LUBRICATION, TIMELY REPLACEMENT OF WORN COMPONENTS AND MOST IMPORTANTLY, ON-SITE RISK ASSESSMENTS WITH STRINGENT STANDARD OPERATING PROCEDURES ARE ALL REQUIRED TO PREVENT THE POTENTIAL OF SPARK GENERATION.

⚠ WARNING

FAILURE TO FOLLOW THE EQUIPMENT PLACEMENT/RIG-UP PROCEDURES OUTLINED IN THIS MANUAL MAY LEAVE EQUIPMENT UNGROUNDED AND AT RISK FOR BUILDING A STATIC CHARGE. ASSESSMENT FOR PROPER GROUNDING MUST BE PERFORMED PRIOR TO OPERATION IN ORDER TO MITIGATE THE SPARK RISKS ASSOCIATED WITH STATIC DISCHARGE.

1.2.3 Rigging and Overhead Lifting

McCoy Global recommends following an industry-accepted standard such as OSHA, ASME B30.9-2006, or manufacturer's guidelines when performing any rigging and overhead lifting. Use by untrained persons is hazardous. Improper use will result in serious injury or death. Do not exceed rated capacity. Slings will fail if damaged, abused, misused, overused, or improperly maintained. Never stand beneath a suspended load.

⚠ DANGER

NEVER STAND BENEATH A SUSPENDED LOAD

1.2.4 Maintenance Safety

All personnel are responsible for performing maintenance tasks in a manner that ensures worker, equipment, and environmental safety, and may require taking additional steps that are not identified in this section.

Maintenance of equipment shall be performed only by designated qualified maintenance personnel. Do not begin a maintenance task without the proper tools or materials on hand, or the proper drawings and documentation necessary.

Isolate the location of the maintenance under way to prevent unaware personnel from inadvertently exposing themselves to a hazard. Use tape, rope, or signage to clearly indicate "off-limits" area.

Where applicable ensure electrical circuits within the affected equipment are deactivated or de-energized by an authorized, qualified person and locked out if necessary. Do not disconnect a live electrical circuit unless location is known to be non-hazardous.

⚠ DANGER

ALWAYS MEASURE ELECTRICAL CIRCUITS TO CONFIRM DEACTIVATION BEFORE PROCEEDING WITH MAINTENANCE

⚠ WARNING

WHEN REPAINTING EQUIPMENT, THE PAINT COAT BEING APPLIED SHOULD NEVER EXCEED 2MM IN THICKNESS. EXCEEDING THIS THICKNESS MAY FACILITATE STATIC CHARGE BUILDUP AND PRESENT A POSSIBLE SPARK RISK ASSOCIATED WITH STATIC DISCHARGE.

1.2.5 Replacement Parts

All consumable and replacement parts must meet or exceed OEM specifications in order to maintain equipment integrity. Do not replace protective equipment such as hydraulic switches, circuit breakers, and fuses without first consulting with McCoy Global. Do not replace electrical or control hardware without consulting with McCoy Global. Using non-OEM replacement parts without the approval of McCoy Global may void equipment warranty.

1.2.6 Environmental Impact

McCoy Global equipment uses materials that may be harmful to the environment if improperly disposed of (hydraulic fluid, grease, fuel, electrical components, etc.). Dispose of all materials according to established environmental protection regulations in conjunction with published federal, state, provincial, and civic legislation.

In all cases observance of the following is the full responsibility of the user:

- **all descriptions, information and instructions set out in this manual**
- **any regulation or requirement issued by an authority or agency which may influence operation, safety or integrity of the equipment that overrules the content of this document.**
- **any legal or other mandatory regulation in force governing accident prevention or environmental protection.**

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1.3 ACRONYMS AND TERMINOLOGY

1.3.1 Acronyms and Definitions

ACRONYM	DEFINITION
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ATEX	Appareils destinés à être utilisés en **AT**mosphères **EX**plosibles
BDC	Bottom dead centre
CBU	**CLINCHER**®-style backup
CE	Conformité Européenne
CCW	Counter-clockwise
COG	Centre of gravity
CW	Clockwise
DS	Driller's side
EU	European Union
HMI	Human-machine interface
HPU	Hydraulic power unit
HSE	Health, Safety, and Environmental (context: protection)
ID	Inside diameter
ISO	International Organization for Standardization
JDK	Jaw die kit
JSA	Job safety assessment
LH	Left-hand
LJBU	LOCKJAW™ backup
MBU	"McCoy style" backup
N/A	Not applicable or Not available (context-dependant)
NLGI	National Lubricating Grease Institute
ODS	Off-driller's side
OEM	Original equipment manufacturer
OSHA	Occupational Safety and Health Administration
OD	Outside diameter
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
PSI	Pounds per square inch (pressure)
RH	Right-hand
VAC	Volts, alternating current
VDC	Volts, direct current

1.3.2 Terms and Definitions

TERM	DEFINITION
ATEX-certified	Conforms with the EU “ATEX” directive for equipment operated within an explosive atmosphere.
Backup	The component of a tong-backup arrangement that mechanically attaches to the stationary side of a tubular connection and provides resistance to the tong when making up or breaking out a joint.
Box	The female side of a pipe connection
Break Out	Loosening, un-threading, and disconnecting a connection (typically a tubular connection). The term may also apply to a general threaded connection.
CE-marked	CE compliant. Conforms with the essential requirements of the applicable Conformité Européenne directives.
Clamp	To grasp the stationary side of a pipe joint with a backup.
Die	A component of a jaw die kit that provides the mechanical contact between the tong and the tubular.
Joint	Also called a “pipe joint”. A threaded tubular connection.
Load Cell	A hydraulic device that transmits a proportional signal to a torque gauge for the purpose of measuring connection torque.
Make Up	Threading together a connection (typically a tubular connection) and tightening to a specified torque. The term may also apply to a general threaded connection.
Pin	The male side of a pipe connection
Ring Gear	The rotating component, mechanically coupled to a hydraulic motor through a gear train, which provides rotation to the pin-side of a tubular connection through the use of jaw assemblies
Door Switch	A device mechanically connected to the door of a hydraulic power tong that uses hydraulic switching to prevent rotation of the cage plates when the tong door is open.
Sling	A rigid or non-rigid device used to hoist a piece of equipment using a crane.
Tank	Hydraulic fluid reservoir
Tong	The component of a tong-backup arrangement that mechanically attaches to the tubular connection and rotates the tubular to make up or break out a connection
Un-clamp	To release the stationary side of a pipe joint with a backup.
WINCATT®	Data acquisition and torque/turns management system manufactured by McCoy Global
Headstock	The tong assembly on a horizontal bucking unit
Tailstock	The backup assembly on a horizontal bucking unit

SECTION 2: EQUIPMENT & LUBRICATION SPECIFICATIONS

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2.0 EQUIPMENT DESCRIPTION

This technical document applies to the following models:		
TONG MODEL	**REV**	**DESCRIPTION**
80-1903-1	08	26” 60,000 lbs-ft hydraulic power tong equipped with rigid sling, motor control valve section & lift cylinder control valve section. Configured for use with tension load cell.
80-1903-3	04	26” 60,000 lbs-ft hydraulic power tong equipped with rigid sling, motor control valve section, & lift cylinder control valve section. Equipped with closed-center hydraulic system. Configured for use with tension load cell.

THIS EQUIPMENT IS EQUIPPED WITH A “SAFETY DOOR” ROTATION INTERLOCK SYSTEM. SEE SECTION 4.3 FOR PROPER TESTING PROCEDURES

This equipment uses hydraulic power to energize a rotating section enabling make-up (thread a connection) and break-out (un-thread a connection) of oil field casing tubulars between 9-⅝ inches (244.5 mm) and 26 inches (660.4 mm) in diameter.

The hydraulic power tong (80-1903-X) grips the incoming casing section (the “pin”) and threads the pin section in to the stationary box section until the threading force reaches a predetermined rotational torque value, which is measured by a tension load cell and indicated on the torque indicator.

The control valve assembly mounted to the power tong allows user control of all manual hydraulic control inputs (tong make/break rotation, lift cylinder raise/lower).

Hydraulic interlock switches mounted in proximity with the tong doors automatically inhibit tong rotation if the doors on the power tong are not completely closed.

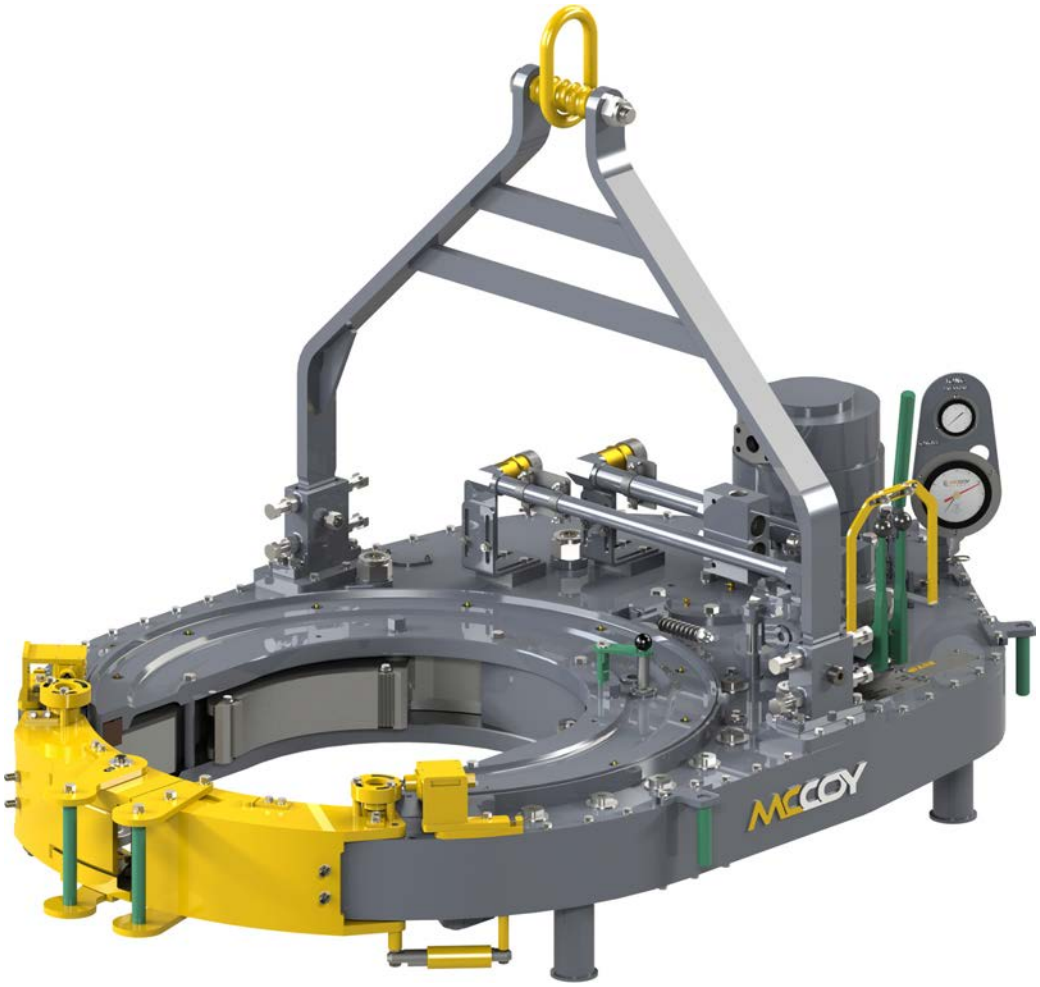


Illustration 2.0.1: HD26-60K Power Tong

2.0 EQUIPMENT DESCRIPTION (CONTINUED):

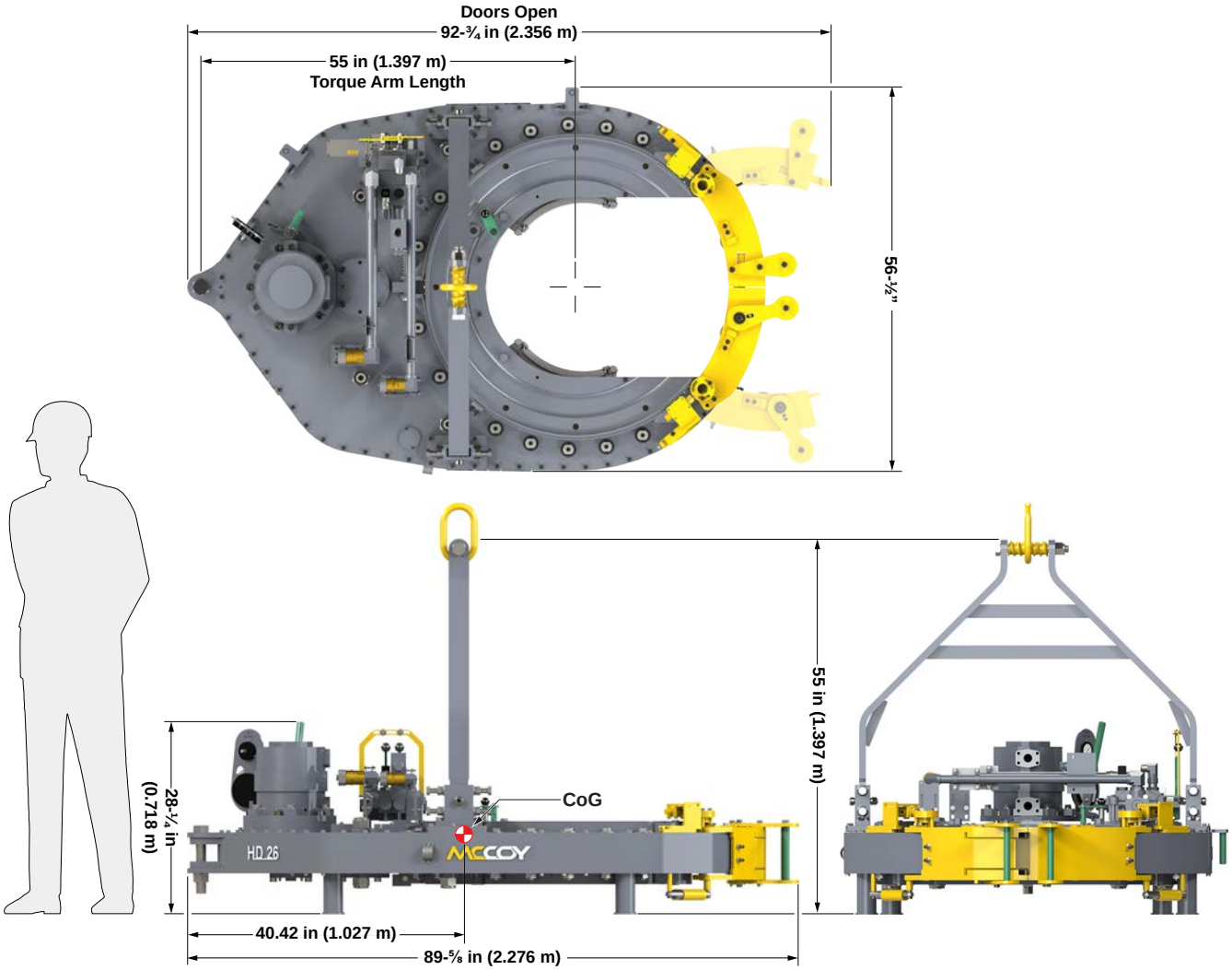


Illustration 2.0.2: HD26-60K Power Tong Dimensions

2.0 EQUIPMENT DESCRIPTION (CONTINUED):

⚠ WARNING

In addition to the **HAZARD** areas of this equipment that are coated **YELLOW**, the rotating cage plate assembly poses a significant hazard when the equipment is active. Keep hands clear of the cage plate when equipment is energized. **SAFE** areas to handle while the equipment is energized are indicated by **GREEN** coating

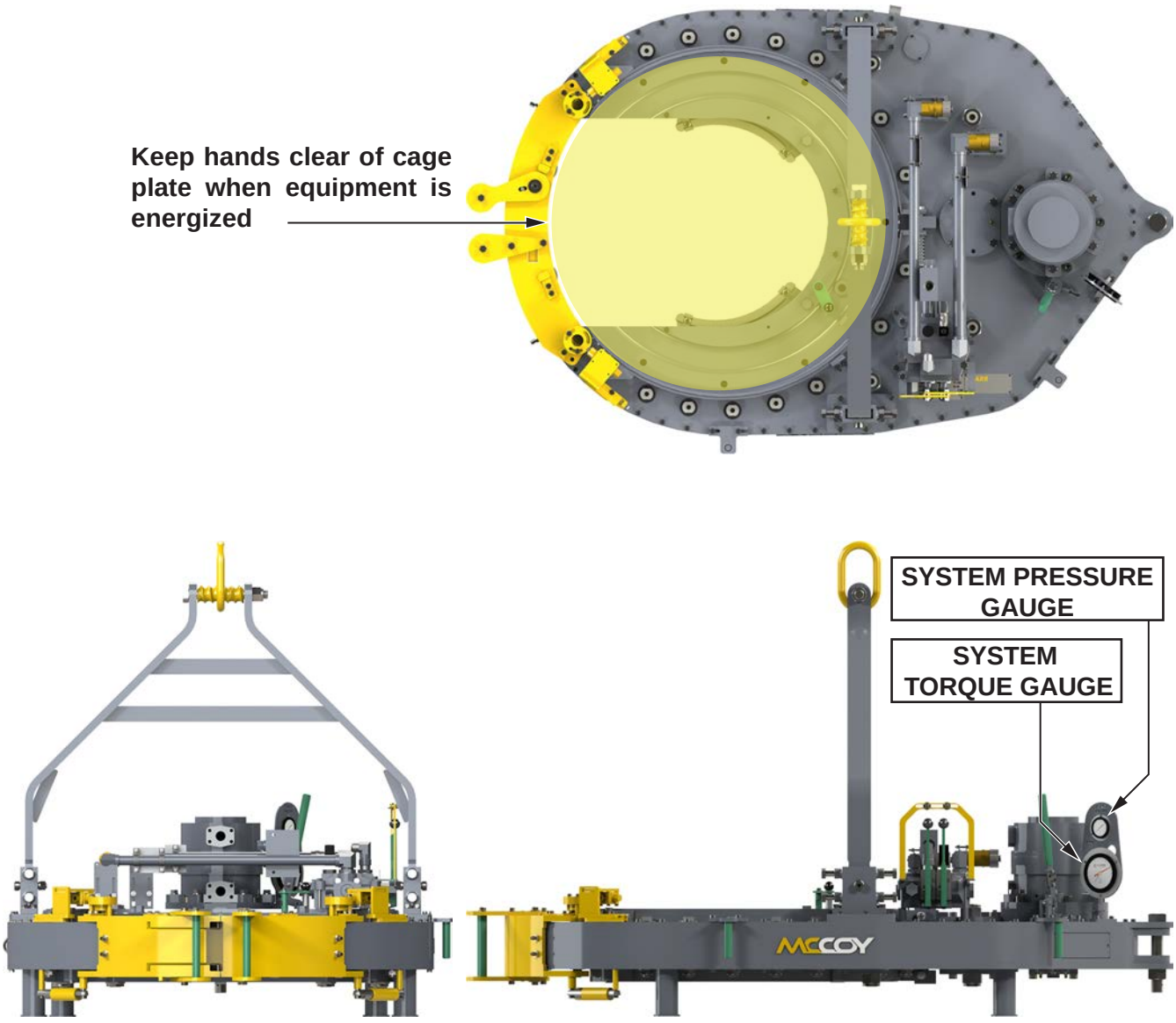


Illustration 2.0.3: HD26-60K Power Tong Additional Hazards

2.1 MAJOR COMPONENT IDENTIFICATION

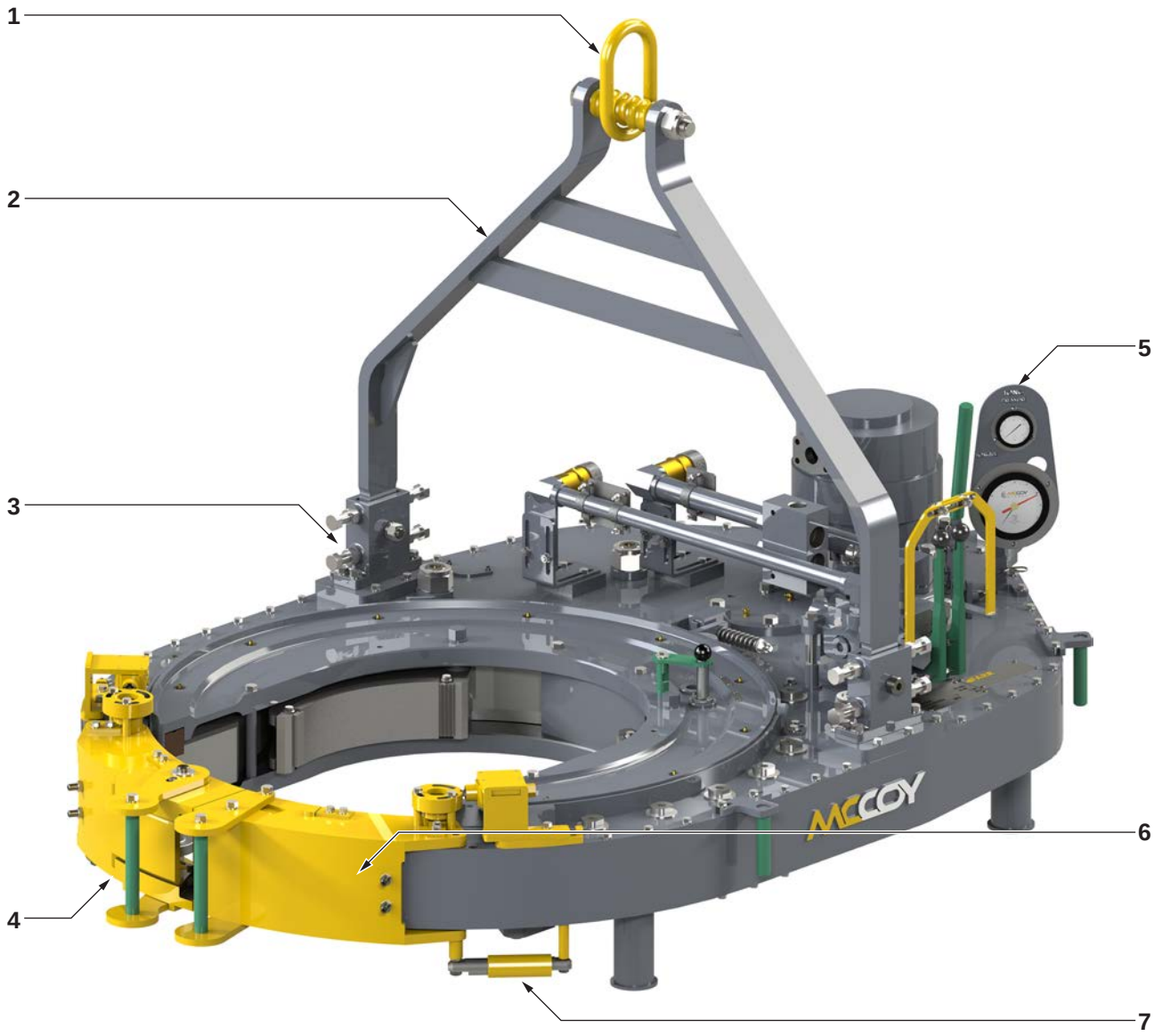


Illustration 2.1.1: Component Identification 01

Item	Description
1	Master lifting link
2	Rigid sling
3	Tong longitudinal level adjustment
4	RH door assembly
5	Torque / pressure gauge panel
6	LH door assembly
7	Tong door spring stop cylinder

2.1 MAJOR COMPONENT IDENTIFICATION (CONTINUED):

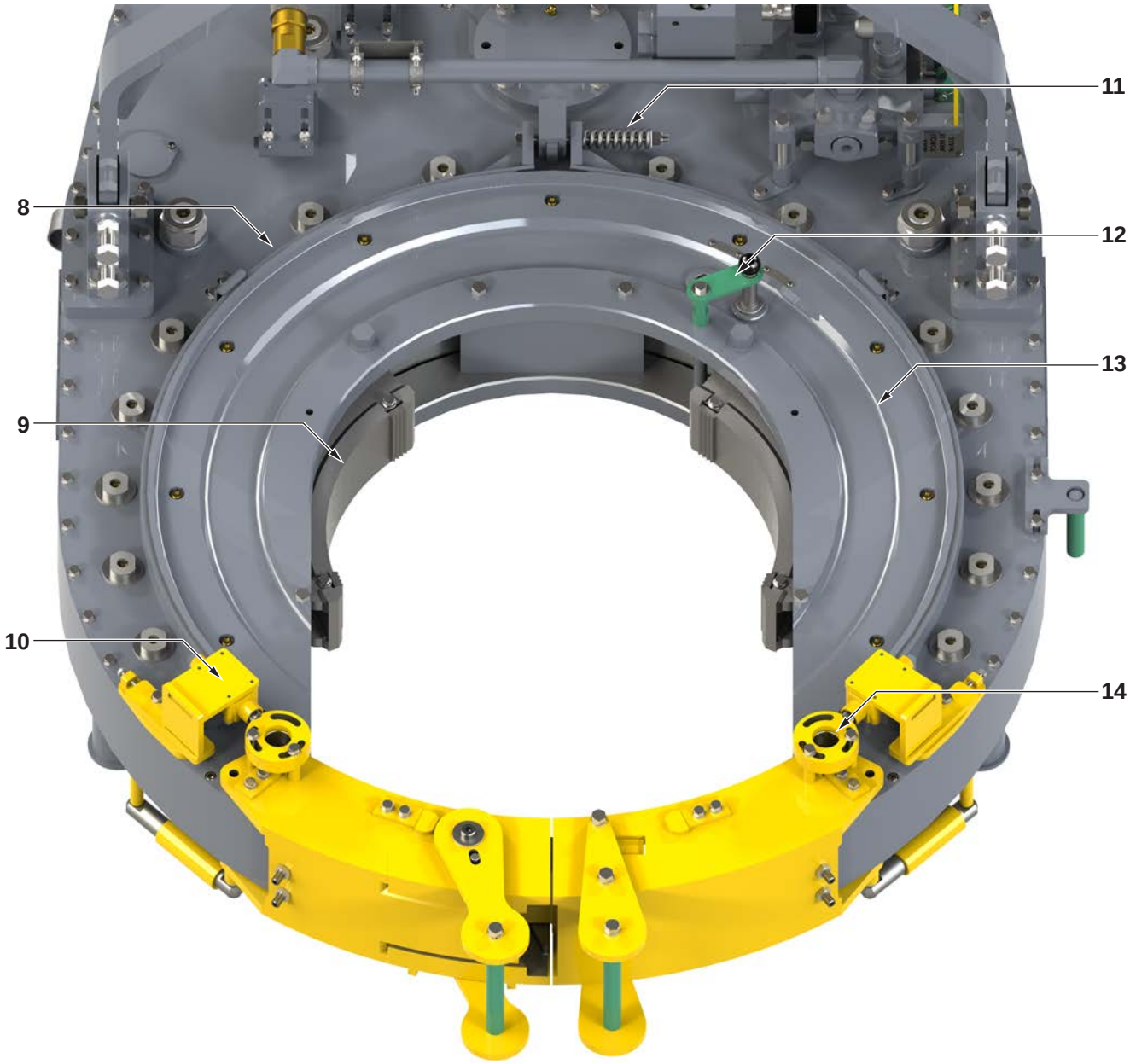


Illustration 2.1.2: Component Identification 02

Item	Description
8	Brake band
9	Jaw assembly with die inserts
10	Rotation interlock switch & guard assembly
11	Brake band adjustment assembly
12	Manual backing pin assembly
13	Cage plate assembly
14	Rotation interlock cam assembly

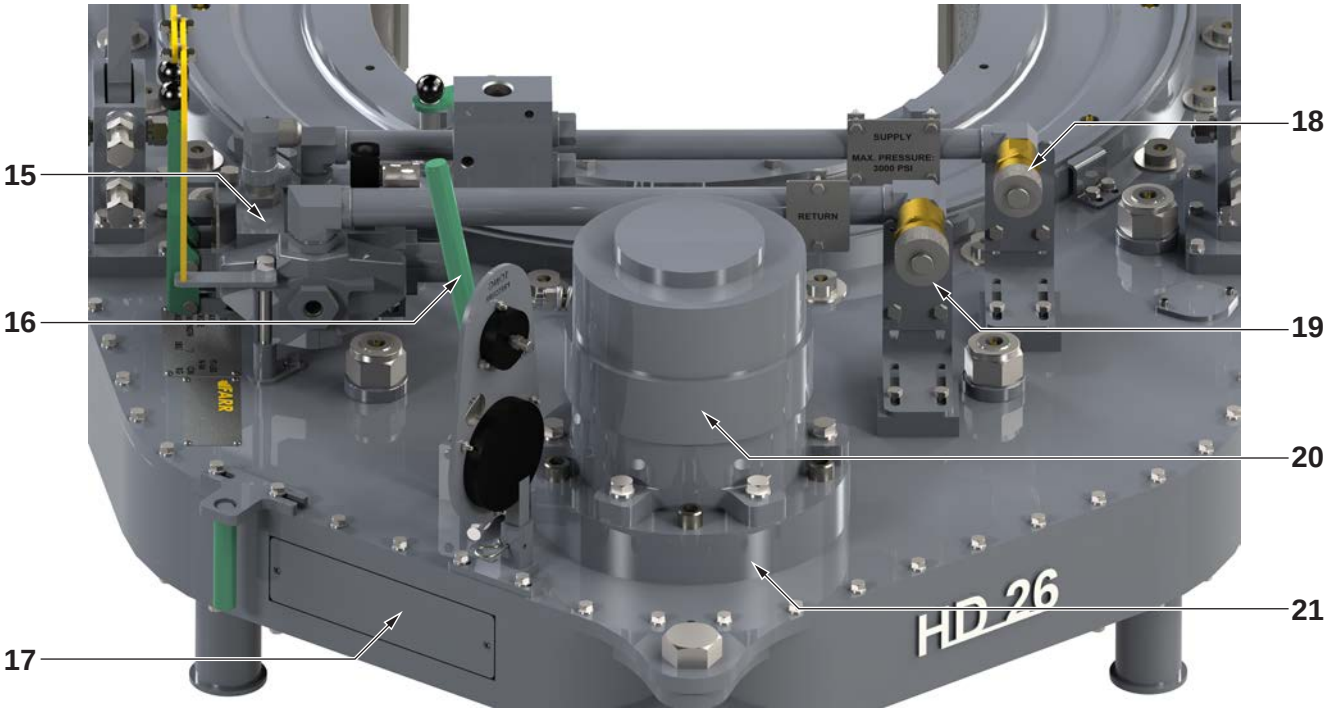


Illustration 2.1.3: Component Identification 03

Item	Description
15	Hydraulic valve bank
16	Manual gear shifter
17	Clutch/shifting shaft access panel
18	Hydraulic inlet fitting (1”)
19	Hydraulic outlet fitting (1-1/4”)
20	Hydraulic motor
21	Motor mount

2.2 EQUIPMENT SPECIFICATIONS

Torque Table

Please note that these are ideal values. Actual achieved torque is highly dependant upon tong efficiency and final position of rotary gear when full torque load is reached. Maximum torque is only available in low gear and full motor displacement.

Pressure	High Gear		Low Gear	
PSI / MPa	Lb-ft	Nm	Lb-ft	Nm
1000 / 6.89	2900	4000	19200	26100
1500 / 10.34	5400	7300	35200	47800
2000 / 13.79	7800	10600	51300	69500
2275 / 15.57	9200	12400	60000	81400
MAXIMUM RATED TORQUE: 60,000 LB-FT / 81,350 Nm				
REQUIRED SYSTEM PRESSURE: 2275 PSI (15.57 MPa)				
MAXIMUM SYSTEM PRESSURE: 2500 PSI / 17.24 MPa				
MAXIMUM SYSTEM FLOW: 60 USGPM / 227.1 LPM				

Speed Table

Flow (GPM/LPM)	Low Gear (RPM)	High Gear (RPM)
10 / 37.9	0.8	5
20 / 75.7	1.5	10
40 / 151.4	3.0	20
60 / 227.1	4.5	30

⚠ DANGER

DO NOT EXCEED MAXIMUM SPECIFIED FLOW OR PRESSURE

Maximum hydraulic requirements	60 GPM (227.1 LPM)
	2500 PSI (17.237 MPa)
Maximum allowable hydraulic return line pressure	200 PSI (1.378 MPa)
Length (doors closed)	89-⅝ in / 2.2765 m
Height (not including master lifting link)	55 in / 1.397 m
Maximum width	56-½ in / 1.4351 m
Space required on pipe	Unlimited (tong comes off pipe)
Torque arm length (pipe center to anchor center)	55 in / 1.397 m
Gear reduction ratio, turn counter encoder to ring gear	22.5:1
Dead weight (approximate, jaws not included)	3775 lb / 1712.3 kg
Maximum rigid sling load	5000 lb / 2268 kg
Sound level (dBa)	79.2 dB A @ 1m / 85 dB C @ 1m
Jaws available (inches)	All standard sizes from 9-⅝" to 26" (See Pg. 3.14)
Recommended spring hanger	85-0106HDS (Capacity = 5,900 lbs / 2,676 kg)

⚠ DANGER

ONLY USE SPRING HANGERS SUPPLIED BY MCCOY GLOBAL.

2.3 RECOMMENDED LUBRICANT SPECIFICATIONS

2.3.1 Hydraulic Fluid

McCoy Global recommends using high-quality hydraulic fluid containing rust & oxidation inhibitors and foam suppressant that meets the following requirements. Operating this equipment using hydraulic fluid that does not meet these requirements greatly accelerates equipment damage due to (but not limited to) premature component wear, premature seal failure, cavitation, and fluid starvation.

⚠ CAUTION

OPERATING THIS EQUIPMENT USING HYDRAULIC FLUID THAT DOES NOT MEET THE LISTED REQUIREMENTS GREATLY ACCELERATES EQUIPMENT DAMAGE.

Hydraulic Fluid Standards	
Characteristic	**Requirement**
Maximum viscosity at cold startup	<1000 cSt (<4600 SUS)
Operating viscosity range	100 to 16 cSt (170 to 80 SUS)
Minimum viscosity (intermittent periods only)	10 cSt (60 SUS)
Hydraulic fluid operating temperature range	86 - 140°F (30 - 60°C) - measured in main reservoir
Maximum fluid temperature	180°F (82°C)
Fluid cleanliness	Filtered to ISO 4406:1999 (22/18/13)

Hydraulic fluid should be chosen with due regard to expected climactic conditions and equipment load. Note that this equipment may have been tested using hydraulic fluid that does not meet operational requirements beyond those specified in the above table. Therefore, McCoy recommends purging and flushing the equipment's hydraulic system before connecting to a hydraulic supply.

NOTICE

MCCOY GLOBAL RECOMMENDS PURGING AND FLUSHING THE EQUIPMENT'S HYDRAULIC SYSTEM BEFORE CONNECTING TO A HYDRAULIC SUPPLY.

2.3.2 Gear Fluid

McCoy Global recommends using a high-quality universal gear fluid in gearbox and torque hub assemblies. If required, the gear fluid should meet VG150/VG220 or AGMA 4EP/5EP specifications. However, in more extreme operating conditions it may be necessary to fill the gearboxes on the equipment with gear fluid more suitable to the ambient operating environment. Refer to the following table to determine McCoy Global's recommendations for gear fluid selection.

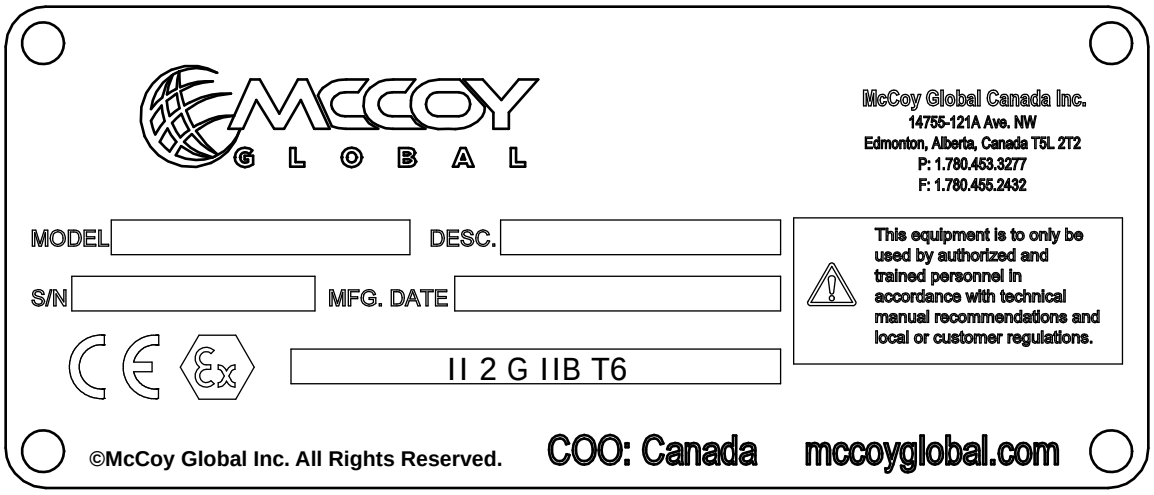
Gear Fluid Standards	
Operating Condition	**Requirement**
-4°F to 41°F (-20°C to 5°C)	meets ISO VG100 or AGMA 3EP specifications
41°F to 104°F (5°C to 40°C)	meets VG150/VG220 or AGMA 4EP/5EP specifications
greater than 104°F (40°C)	meets VG320 or AGMA 6EP specifications

2.3.3 Grease

McCoy Global recommends use of a high-quality EP multi-purpose grease with an NLGI consistency grade of "2" and an NLGI performance grade of "GC-LB" for general lubrication of bearings and metal-to-metal contact.

McCoy Global recommends thoroughly greasing the equipment before first use as per the lubrication instructions in Section 5.

2.4 CE NAMEPLATE



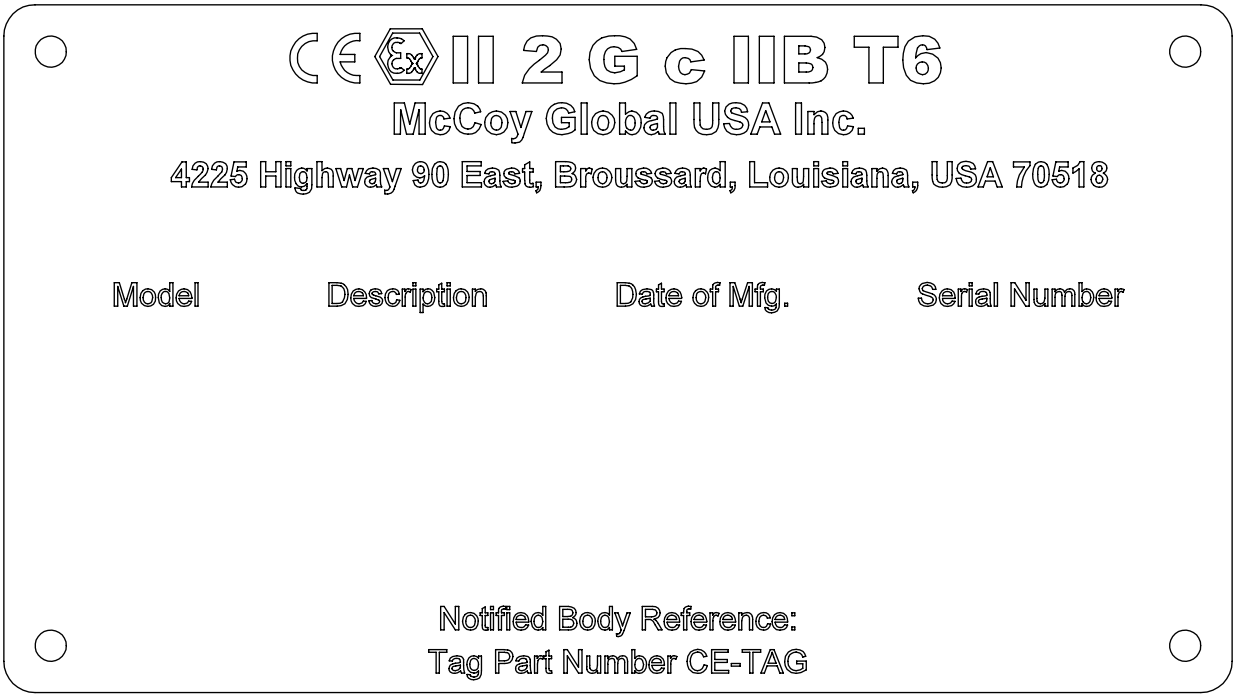


Illustration 2.1.4: CE Nameplates

CE compliant. Conforms with the essential requirements of the applicable Conformité Européenne directives.

EU Explosive Atmosphere certified

II Equipment Group (surface, non-mining)

2 Equipment Category - high level of protection

Gc Gas Group (Acetylene & Hydrogen) - Certified for use in an acetylene / hydrogen environment

T6 Maximum surface temperature of 85 °C.

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SECTION 3: INSTALLATION & COMMISSIONING

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Adequate setup and proper hydraulic connections are essential in ensuring reliable operation of McCoy equipment. For best results and long term reliability, read and obey the installation and commissioning instructions in this section.

3.0 RECEIPT, INSPECTION, AND HANDLING OF EQUIPMENT

⚠ CAUTION

THIS EQUIPMENT HAS BEEN THOROUGHLY TESTED AND INSPECTED AT THE FACTORY. HOWEVER, MCCOY ADVISES INSPECTING EQUIPMENT FOR SHIPPING DAMAGE UPON RECEIPT AND TESTING EQUIPMENT BEFORE RELEASING TO AN OPERATIONAL ENVIRONMENT.

Upon receipt inspect packaging materials for shipping damage. Shipping damage may include (but not be limited to) perforation of a crate, misshapen crate, crushed corners, missing hardware, scraped or bent metal, and impact or orientation indicators (like a “tip’n’tell”). Record all shipping damage on the shipping manifest and ensure shipping company and McCoy are immediately contacted.

Remove all protective shipping materials including plastic wrap, desiccant packs, padding, etc and perform a visual inspection of the equipment. Check structural components for bending or buckling indicative of vertical impact. Immediately identify any shipping damage to the shipping company, and correct all damage before connecting equipment to a hydraulic power source.

McCoy recommends connecting the equipment to a hydraulic power source and testing complete functionality of the equipment in a controlled environment before releasing to an operational environment.

⚠ CAUTION

MCCOY GLOBAL RECOMMENDS TESTING THIS EQUIPMENT BEFORE RELEASING TO AN OPERATIONAL ENVIRONMENT.

This equipment may have been factory-tested using hydraulic fluid that does not meet operational requirements of the end user, and variances in ambient temperature may have an effect on factory-adjusted components. McCoy Global recommends purging and flushing the hydraulic system before connecting to aftermarket hydraulic power systems.

Perform a complete lubrication of the equipment as outlined in section 5.5 “Lubrication Instructions”.

Test the rotation interlock (safety door) function. See section 4.2 “Pre-operational Checks” for instructions on properly testing the safety door and, if required, sub-section 5.6.3 “Safety Door Switch Adjustment” for instructions to properly adjust the safety door switch.

Test and (if required) adjust the operation of the brake bands. See sub-section 5.6.1 “Brake Band Adjustment” for instructions to properly test and adjust the brake bands.

Perform a complete functional test of the equipment. Note that rotating the power tong(s) without an applied load does not accurately reflect the performance of the tong. McCoy Global recommends performing a “stump test” in order to determine full functionality of the equipment under load before releasing to an operational environment, including successfully reaching the specified torque of the equipment.

3.1 SLING / LOAD BEARING DEVICE SAFETY

DANGER

A "LOAD-BEARING DEVICE" IS A CHAIN SLING, RIGID SLING, SPREADER BAR ASSEMBLY, FRAME, OR ANY OTHER DEVICE THAT BEARS THE PARTIAL OR TOTAL WEIGHT OF THE EQUIPMENT FOR WHICH THIS MANUAL HAS BEEN PRODUCED

THE LOAD-BEARING DEVICE SUPPLIED BY MCCOY GLOBAL IS DESIGNED TO SUPPORT THE EQUIPMENT DESCRIBED IN THIS MANUAL. MCCOY GLOBAL WILL NOT GUARANTEE THE ABILITY OF THE LOAD-BEARING DEVICE TO SUPPORT ANY OTHER PART, ASSEMBLY OR COMBINATION OF PARTS AND ASSEMBLIES. MCCOY GLOBAL WILL NOT GUARANTEE THE ABILITY OF THE LOAD-BEARING DEVICE TO LIFT OR SUPPORT THE EQUIPMENT DESCRIBED IN THIS MANUAL IF THERE ARE ANY MODIFICATIONS TO THE LOAD-BEARING DEVICE, OR ANY ADDITIONS TO THE EQUIPMENT DESCRIBED IN THIS MANUAL THAT ADD WEIGHT TO THE EQUIPMENT, UNLESS SUPPLIED BY MCCOY GLOBAL.

WARNING

WHEN RE-ASSEMBLING LOAD-BEARING DEVICES (CHAIN SLINGS, RIGID SLINGS, BACKUP LEGS, ETC.) NOTE THAT THE ASSOCIATED FASTENERS MUST BE TIGHTENED TO THE CORRECT TORQUE SPECIFIED FOR THAT SIZE OF FASTENER (SEE MAINTENANCE SECTION). ANY THREADED FASTENER IN A LOAD-BEARING DEVICE MUST BE SECURED WITH RED OR BLUE LOCTITE™.

REPLACEMENT FASTENER (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.) USED DURING MAINTENANCE OR OVERHAUL MUST BE GRADE 8 OR EQUIVALENT UNLESS OTHERWISE SPECIFIED.

McCoy Global recommends following an industry-accepted standard such as OSHA, ASME B30.9-2006, or manufacturer's guidelines when performing any rigging and overhead lifting. Use by untrained persons is hazardous. Improper use will result in serious injury or death. Do not exceed rated capacity. Slings will fail if damaged, abused, misused, overused, or improperly maintained.

- Use only Grade 80 or Grade 100 alloy chain for overhead lifting applications.
- Working Load Limit (WLL) is the maximum allowable load in pounds or kilograms which may be applied to the load-bearing device, when the device is new or in "as new" condition, and when the load is uniformly and directly applied. The WLL must never be exceeded.
- The Working Load Limit or Design factor may be affected by wear, misuse, overloading, corrosion, deformation, intentional alterations, sharp corner cutting action and other use conditions.
- Shock loading and extraordinary conditions must be taken into account when selecting alloy chain slings.

See OSHA Regulation for Slings 1910.184, ANSI/ASME B30.9-"SLINGS", ANSI/ASME B30.10-"HOOKS" and ANSI/ASME B30.26 "RIGGING HARDWARE" for additional information.

3.1.1 Inspection Of Load-Bearing Devices and Structures

McCoy strongly recommends the following practices:

A complete inspection of new load-bearing devices and attachments shall be performed by a qualified, designated person prior to initial use. Each component shall be examined individually, taking care to expose and examine all surfaces including the inner link surface. In addition, daily inspection of fastenings and attachments shall be performed by a designated person. If damage or defects are found at either inspection, the damaged or defective component shall be quarantined from service until it can be properly repaired or replaced.

Removal Criteria:

A load-bearing device shall be removed from service if conditions such as the following are present:

- Cracks or breaks
- Evidence of tampering is seen - for example, tamper-proof nuts are missing.
- Signs of impact on load-bearing components, including spreader bars, lifting lugs, rigid slings & rigid sling weldments, and legs & leg mounts.
- Broken or damaged welds.
- Excessive wear, nicks, or gouges.
- Excessive pitting of the components due to rust and/or corrosion

3.1.1 Inspection Of Load-Bearing Devices and Structures (Continued):

Inspect all lugs and fixing points for signs of elongation and/or bending, or for material build-up around the hole. Repair or replace components that appear distorted. Ensure all hardware is tight and in good condition. Replace missing hardware if necessary. All hardware must be free of rust and corrosion. Additional inspections shall be performed where service conditions warrant (a maritime environment, for instance). Periodic inspection intervals shall not exceed one year. The frequency of periodic inspections should be based on:

- Frequency of use of the load-bearing device.
- Severity of service conditions
- Experience gained on the service life of load-bearing devices used in similar circumstances.

General guidelines for the interval are:

- Normal Service - yearly
- Severe Service - monthly to quarterly
- Special Service - as recommended by a qualified person

McCoy recommends that all users of lifting or load-bearing assemblies establish inspection criteria, or adopt a relevant inspection standard assigned to a competent inspection body. McCoy recommends an inspection schedule similar to that listed in the following table.

Test / Examination			
Time / Interval	**Proof Load Test(s)[1]**	**Non-Destructive Examination (NDE) of Lifting Points**	**Thorough Visual Examination**
Initial Certification By McCoy	YES	YES	YES
Interval Not Exceeding 6 Months	NO	At discretion of inspection body	YES
Interval Not Exceeding 12 Months	NO	YES	YES
Interval Not Exceeding 24 Months	YES	YES	YES
Following Substantial Repair or Alteration[2]	YES	YES	YES

1. Load test(s) as established by end user's inspection criteria. McCoy recommends testing to two times MGW (maximum gross weight) or in the case of spring hangers, as indicated in Section 5.
2. For the purposes of this standard, a substantial repair or modification is defined as any repair and/or modification that has been carried out which may, in the opinion of the inspection body, affect the load-bearing elements of the container or lifting device, or elements that contribute directly to its structural integrity.

Refer to the following table to determine proper test load when pull-testing spring hangers,

Model Number	WLL (lbs)	WLL (kg)	Test Load (lbs)	Test Load (kg)
85-0106X (SX)	1200	544	2500	1133
85-0106XXH	2400	1088	5000	2267
85-0106HDS	5900	2676	7900	3583
85-0106HD	11500	5216	15500	7030
55-0000030	13,000	5906	36,000	16,356

⚠ WARNING

IF THE LOAD-BEARING DEVICE HAS BEEN MECHANICALLY DAMAGED OR OVERLOADED, IT MUST BE IMMEDIATELY REMOVED FROM SERVICE AND QUARANTINED UNTIL IT HAS BEEN RECERTIFIED.

Record the inspection dates and results in a visible location, including a description of the condition of the load-bearing equipment. To avoid confusion, do not list the date of the next test or examination, only the most recent.

⚠ DANGER

THIS INFORMATION IS TO BE USED AS A GENERAL GUIDELINE ONLY. DETERMINING SITE SPECIFIC INSPECTION FREQUENCY AND METHODOLOGY IS ULTIMATELY THE RESPONSIBILITY OF THE END USER.

3.1.2 Proper Use Of Load-Bearing Devices

Whenever any load-bearing device is used, the following practices shall be observed.

- Load-bearing devices that are damaged or defective shall not be used.
- Slings shall not be shortened with knots or bolts or other makeshift devices.
- Sling legs shall not be kinked.
- Load-bearing devices shall not be loaded in excess of their rated capacities.
- Slings shall be securely attached to their load.
- Load-bearing devices shall be protected from snagging, and shall not be further obstructed by any object.
- Suspended loads shall be kept clear of all obstruction.
- All employees shall be kept clear of loads about to be lifted and of suspended loads.
- Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.
- Shock loading is prohibited.

Do not stand directly under a load during lifting.

3.1.3 Storage Of Load-Bearing Devices

Proper storage of out-of-service load bearing devices is important to ensure full integrity of the device once it is returned to service. McCoy recommends observing the following practices.

- Wipe off all excess grease. Use a solvent-based cleaner on rags to wipe all external surfaces to remove residual grease or hydraulic fluid. Once the outside surfaces have been de-greased, wipe all external surfaces with clean water to remove residual solvent.
- McCoy recommends that an anti-corrosive agent such as Tectyl® 506 be applied to all external surfaces. Refer to manufacturer data sheets for proper application and safety information. Allow the anti-corrosive coating ample time to dry - refer to manufacturer data sheets for drying times at room temperature.
- Store in a clean, dry location. When returning to service, note that a full inspection of the device must be performed.

3.2 LIFT CYLINDER INSTALLATION AND SAFETY

Follow these instructions for safely and securely installing the lift cylinder. Where not supplied, use shackles that are safely rated for the maximum lifting capacity of the spring hanger.

⚠ WARNING

TEST LIFT CYLINDER BEFORE INSTALLATION. REFER TO THE LIFT CYLINDER TECHNICAL MANUAL FOR DETAILED TESTING AND OPERATING PROCEDURES, AND DETAILED SAFETY GUIDELINES.

IF USING A SPRING HANGER ITS WEIGHT MUST BE ACCOUNTED FOR WHEN CALCULATING TOTAL SUSPENDED WEIGHT.

3.2.1 Installation Procedure

1. Attach an appropriate shackle to the fixed end of the spring hanger. Ensure the nut securing the shackle bolt is secondarily retained by a cotter pin.
2. Use a crane to hoist the spring hanger by the shackle installed in the previous step. Install a second shackle to the rod end of the spring hanger. Ensure the nut securing the shackle bolt is secondarily retained by a cotter pin.
3. Lay the lift cylinder on its side near the hoisted spring hanger. Remove the two R-clips securing the clevis pin in the clevis of the lift cylinder, and remove the clevis pin.
4. Insert the shackle on the bottom of the spring hanger inside the lift cylinder clevis, and secure it in the clevis with the clevis pin. Replace the two R-clips in the clevis pin.
5. Hoist the lift cylinder and spring hanger.
6. If not already done, remove the supplied shackle from the lift cylinder.
7. Place the shackle around the master lifting link on the tong sling, and re-attach the shackle to the lift cylinder. Ensure the nut securing the shackle bolt is secondarily retained by a cotter pin.

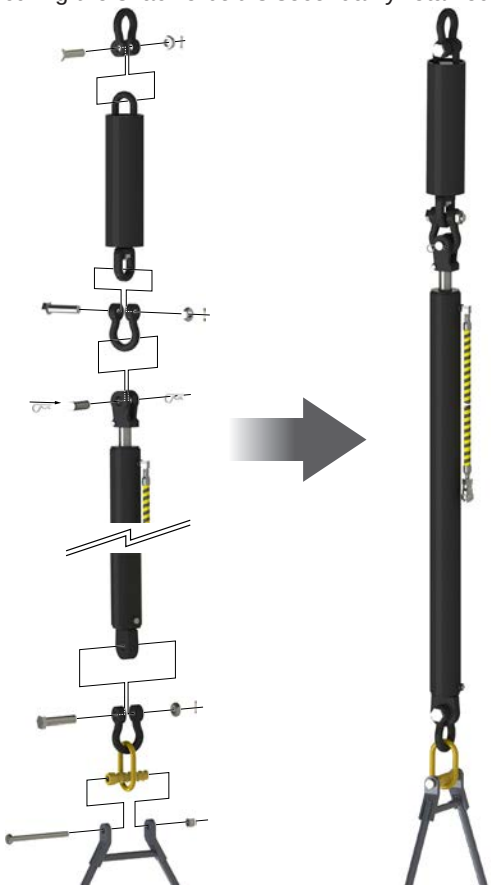


Illustration 3.2.1: Lift Cylinder & Spring Hanger Installation

3.2.2 Lift Cylinder Hydraulic Connection

Inspect the hydraulic hose before connection, ensuring the line is free of ruptures, cracks, cuts, or other damage. Inspect the female quick-connect fitting to ensure it is free from damage. Connect the female quick-connect on the lift cylinder hydraulic hose to the male quick-connect fitting attached to the needle valve on the tong valve bank. Once the fitting has snapped into place give the hydraulic line a light tug upwards to ensure the fitting is securely seated.

If not already done, connect the main hydraulic supply to the power tong (see sub-section 3.3.2 for proper hydraulic connection procedure). Energize the hydraulic supply to the power tong.

Lift the power tong approximately three inches off the work surface, and suspend the tong for approximately thirty seconds. Following the suspension alternately lift and lower the tong slightly to confirm that lift and lower functions each operate correctly.

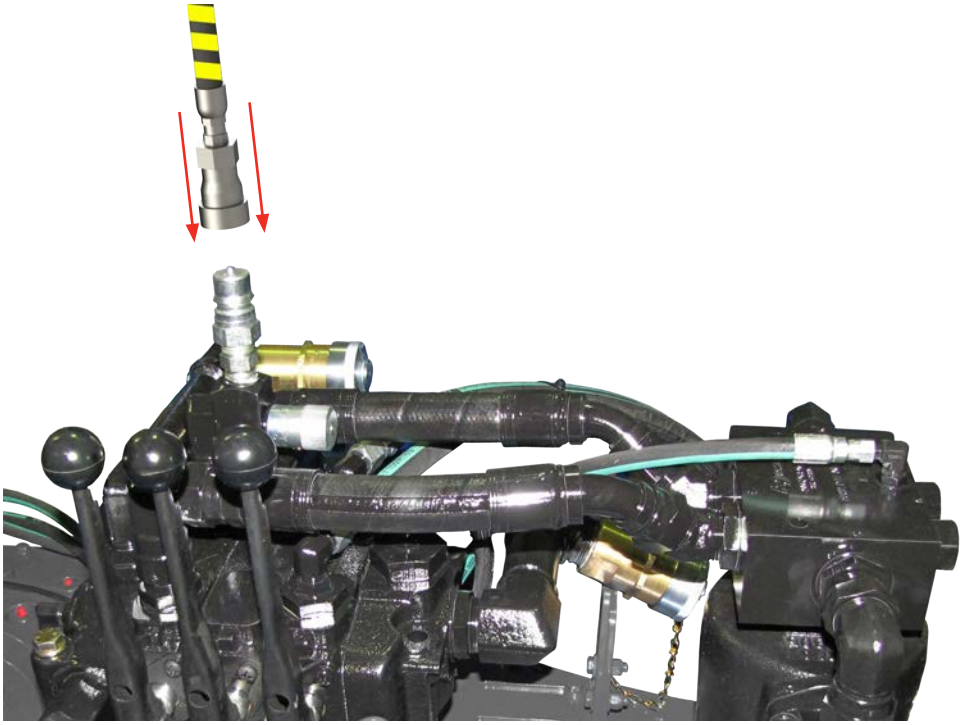


Illustration 3.2.2: Lift Cylinder Hydraulic Connection

3.2.3 Lift Cylinder Safety

⚠ WARNING

A CLEARLY IDENTIFIED REMOTE POWER PACK EMERGENCY STOP MUST BE INSTALLED IN THE IMMEDIATE VICINITY OF THE TONG OPERATOR.

McCoy Global recommends following an industry-accepted standard such as OSHA, ASME B30.9-2006, or manufacturer's guidelines when performing any rigging and overhead lifting. Use by untrained persons is hazardous. Improper use may result in serious injury or death. Do not exceed rated capacity.

Working Load Limit (WLL) is the maximum allowable load in pounds or kilograms which may be applied to the load-bearing device, when the device is new or in "as new" condition, and when the load is uniformly and directly applied. The WLL must never be exceeded.

The Working Load Limit or Design factor may be affected by wear, misuse, overloading, corrosion, deformation, intentional alterations, sharp corner cutting action and other use conditions.

See OSHA Regulation for Slings 1910.184, ANSI/ASME B30.9-"SLINGS", ANSI/ASME B30.10-"HOOKS" and ANSI/AMSE B30.26 "RIGGING HARDWARE" for additional information.

The flexible line providing hydraulic power to the lift cylinder has been equipped with abrasion-resistant, high visibility protective wrap. The high visibility wrap allows operators to easily see monitor the position of the hydraulic line at all times, and can easily see if the line appears to become entangled or snagged.

3.2.3 Lift Cylinder Safety (continued):

⚠ WARNING

IMMEDIATELY CEASE LIFT CYLINDER OPERATION IN THE EVENT OF ENTANGLEMENT OF THE HYDRAULIC LINE WITH FIXED RIG COMPONENTS OR TONG SUPERSTRUCTURE.

The protective wrap also prevents wear of the hydraulic line though abrasion. Do not remove the protective wrap from the lift cylinder line, and replace protective wrap if it is missing, torn, or split. Regardless of use or condition, the hydraulic line supplying the lift cylinder must be replaced every two years.

⚠ WARNING

REPLACE LIFT CYLINDER HYDRAULIC LINE EVERY TWO YEARS

The control valve section on the power tong is equipped with an internal check valve, preventing sudden drop of the tong in the event of hydraulic power failure. A speed-limiting orifice is installed directly in the hydraulic inlet port of the lift cylinder. The orifice limits flow of hydraulic fluid from the lift cylinder through the control valve, preventing sudden drop of the lift cylinder in the event of a ruptured hydraulic line. Do not remove the speed-limiting orifice, and only replace with an identical orifice supplied by McCoy.

⚠ WARNING

DO NOT REMOVE THE SPEED-LIMITING ORIFICE FROM THE LIFT CYLINDER HYDRAULIC INLET PORT

The working load limit (WLL) is clearly stenciled on to the side of the lift cylinder. Do not use lift cylinder if the WLL stencil has been rubbed off or intentionally removed. Locate the test certificate that accompanied the cylinder to the job site or, if necessary, obtain a copy of the test certificate from the location at which the original certificate has been stored. The lift cylinder must be clearly re-marked with the WLL before it is released to an operating environment.

⚠ WARNING

DO NOT USE A LIFT CYLINDER WITH A MISSING OR DEFACED WLL STENCIL.

McCoy Global cautions its customers to use proper placement of equipment positioning systems when moving tubular connection equipment on and off well center.

Application of lateral force against any component of the lift cylinder, or any other rigid component of the hanging system, may impart an over-turning moment to the lift cylinder rod end at the connection point to the clevis. This over-turning moment has the potential to introduce stress fractures.

McCoy Global recommends inspection of the lift cylinders at the beginning of each shift prior to hoisting to ensure that the integrity of the rod ends has not been compromised. Lift cylinders found to have fractures or deformations must immediately be quarantined until repaired and recertified (see illustration 3.2.3).

3.2.3 Lift Cylinder Safety (continued):

Inspect this area of the rod end to ensure that it is free of cracks, fractures, or deformed components

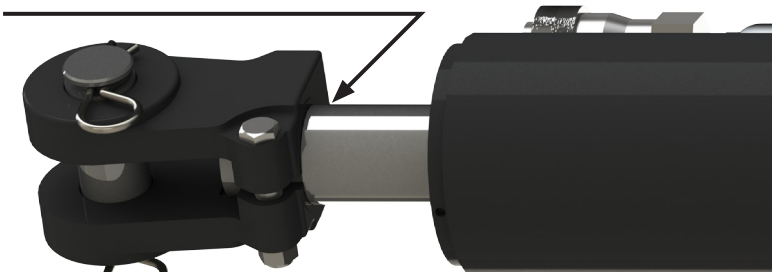


Illustration 3.2.3: Lift Cylinder Clevis Inspection

Do not attach any device capable of exerting a lateral (side-to-side) load to any component of the lift cylinder or spring hanger. Do not place a lateral (side-to-side) load on any component of a lift cylinder or spring hanger while a load is suspended.

Positioning system or device must be placed against the hanging line in order to maintain vertical orientation of the suspended equipment.

⚠ DANGER

DO NOT PLACE LATERAL FORCE AGAINST ANY COMPONENT OF THE LIFT CYLINDER OR SPRING HANGER WHEN MOVING YOUR TUBULAR CONNECTION EQUIPMENT ON AND OFF WELL CENTRE.

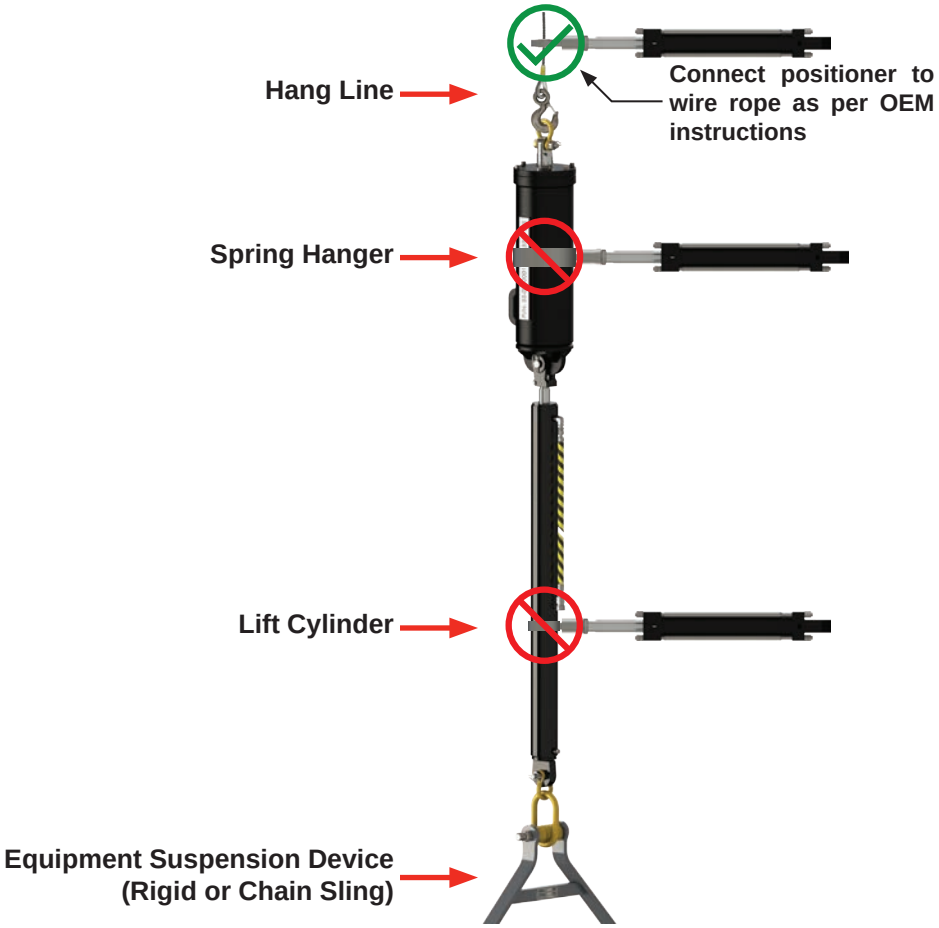


Illustration 3.2.4: Correct Installation of Positioning System

NOTICE

CONTINUED USE OF A LIFT CYLINDER THAT SUBJECTS IT TO LOADS OUTSIDE OF ITS INTENDED APPLICATION (VERTICAL LOADS ONLY) SHALL BE AT THE CUSTOMER'S SOLE RISK AND LIABILITY

3.3 HYDRAULICS

3.3.1 Hydraulic Schematic

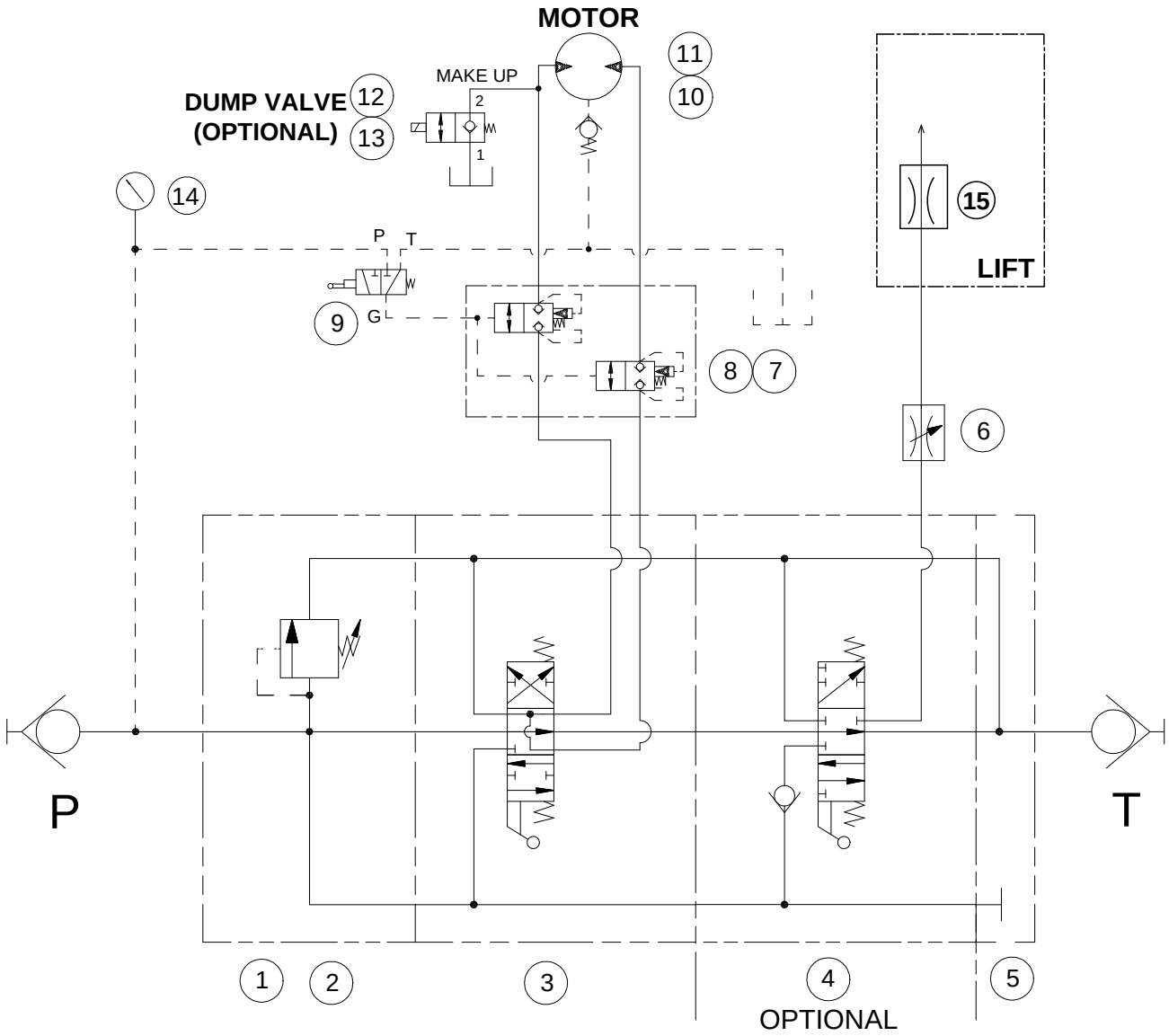


Illustration 3.3.1: Hydraulic Schematic

DANGER

DO NOT EXCEED MAXIMUM SPECIFIED FLOW OR PRESSURE. REFER TO THE SPECIFICATIONS IN SECTION 2

Item	Description	Part Number	Item	Description	Part Number
1	Inlet Section	10-9023		Safety Door Valve Block	101-0727
2	Relief Valve	10-9029	9	Safety Door Switch	02-E0190
3	Valve Section (Motor)	10-9020	10	1/2” FNPT Check Valve	02-9228
4	Valve Section (Lift)	10-9021	11	Hydraulic Motor	87-0158
5	Outlet Section	10-9022	12	Dump Valve (Optional)	08-9284
5A	Outlet Section (Closed Center)	08-1825	13	Dump Valve Body (Optional)	08-9283
6	Flow Control Valve	08-9062	14	3000 psi Pressure Gauge	02-0245
7	Pilot-To-Operate Cartridge Valve	08-1625	15	Lift cylinder orifice	CE-ORIFICE

3.3.1 Hydraulic Schematics (Continued):

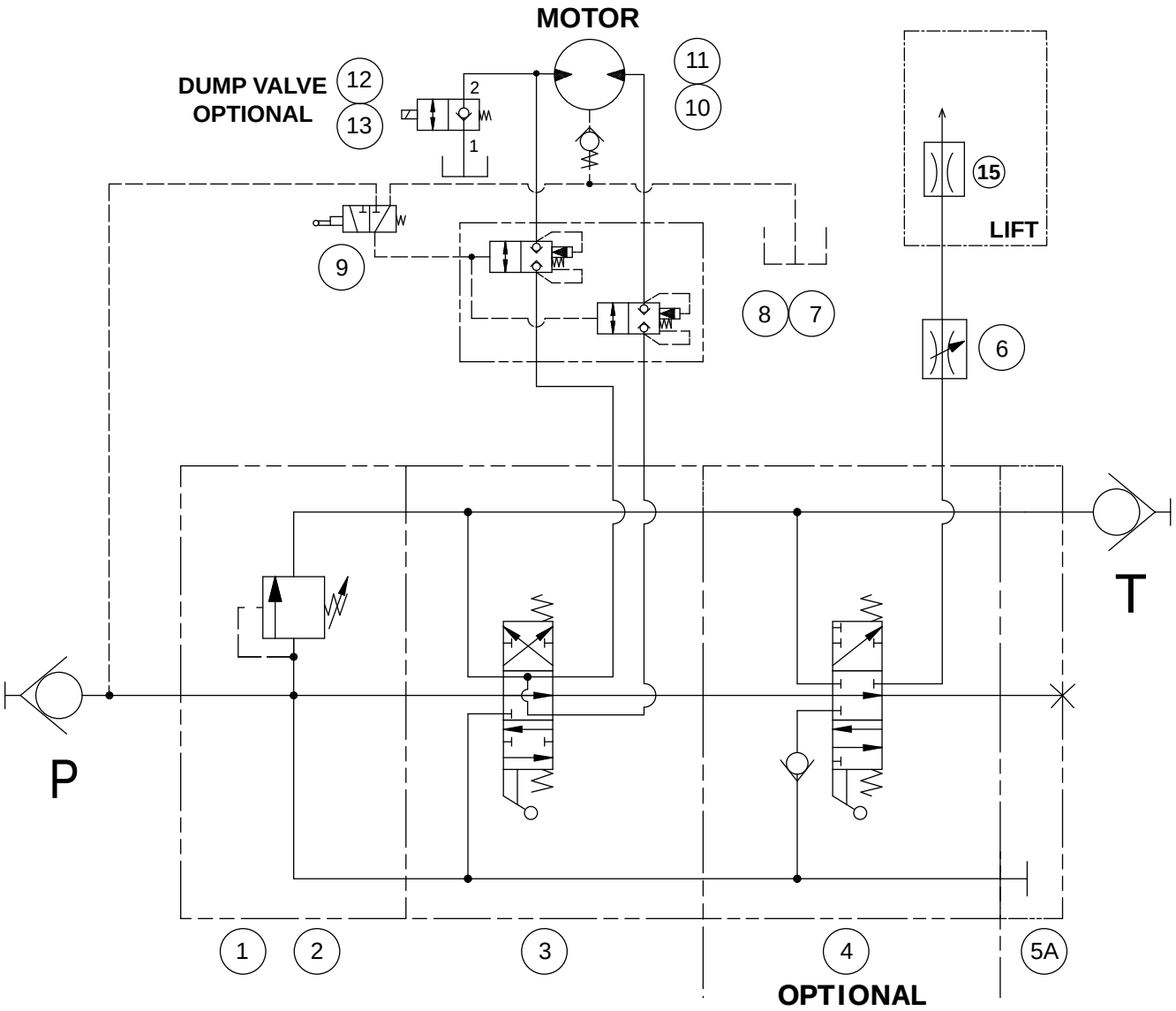


Illustration 3.3.2: Hydraulic Schematic (Closed Centre)

3.3.2 Main Hydraulic Connections

Supply hydraulic pressure to your equipment through the 1” hydraulic supply connection. A 1-¼” return connection provides a return path to the power unit. Typically a ⅜” or ½” female quick-connect fitting allows motor case drain to tank.. The different sizes of the supply and return lines eliminates the possibility of accidental cross-connections.

Ancillary devices (hydraulic motors, hydraulic cylinders, etc.) are connected through the hydraulic control valve block.

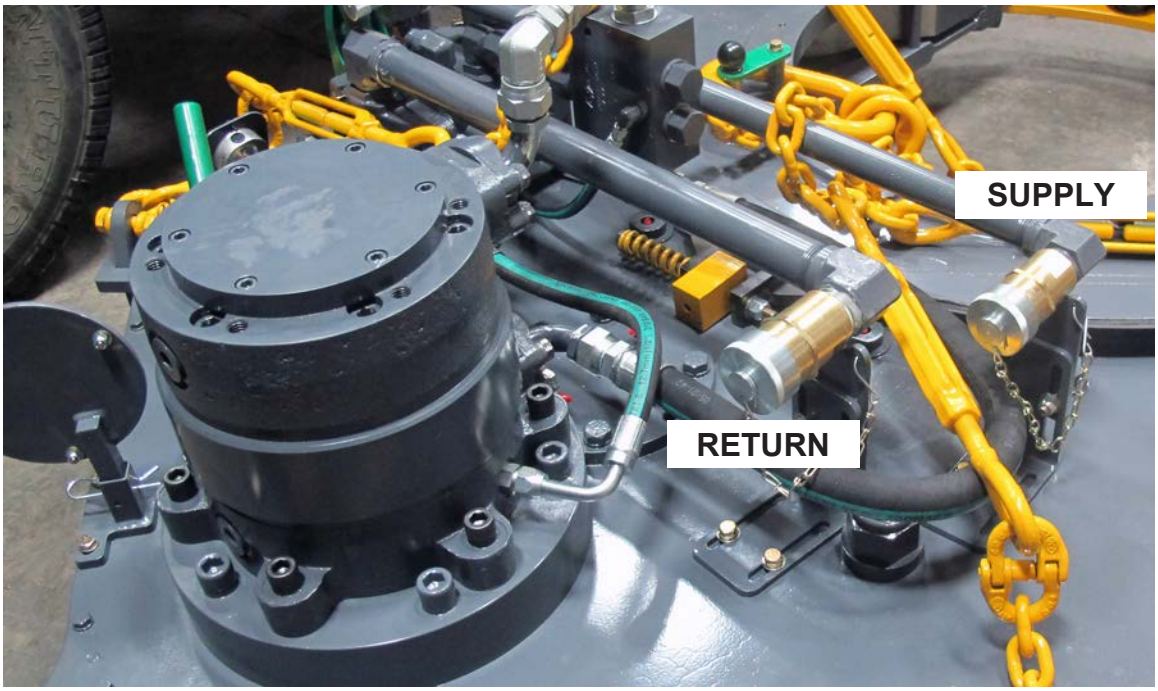


Illustration 3.3.3: Hydraulic Connections 01

Inspect all connectors for damage, debris, or other contaminants before performing hydraulic connections. Clean connectors using compressed air, or an approved cleaning solvent and lint-free cloth. Always cover disconnected fittings with a clean brass or plastic dust cap, typically attached to each connector with a lightweight chain or flexible line. These caps provide significant protection from dust, dirt, other contaminants, and impact damage.

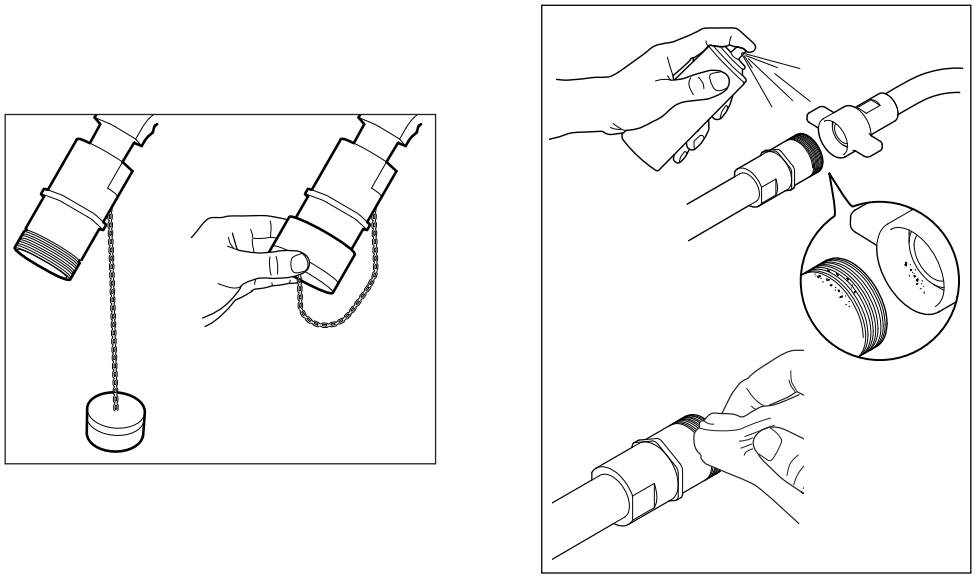


Illustration 3.3.4: Hydraulic Connections 02

3.3.2 Main Hydraulic Connections (Continued):

Perform hydraulic connection when the power unit is not running, or when the hydraulic pump is disengaged. Wing-type connections are self-sealing, and must always be made up to the connection line on the male connector to prevent partial closure of the integral check valve.

Self-sealing wing-type hydraulic disconnects should always be fully made up to the “fully engaged” indicator line on the male side of the connection. Inspect all hydraulic connections before energizing hydraulic power to ensure secure connections have been made. Supply of full hydraulic pressure without ensuring an established return line may result in system damage.

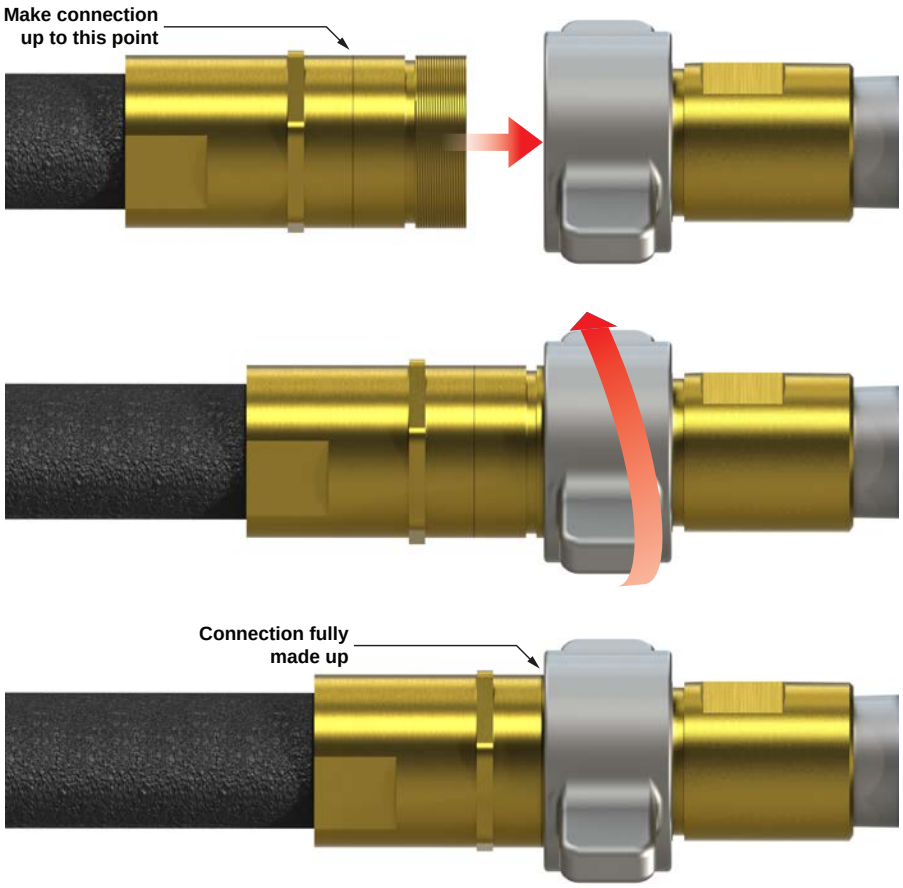


Illustration 3.3.5: Hydraulic Connections 03

⚠ WARNING

A CLEARLY IDENTIFIED REMOTE POWER PACK EMERGENCY STOP MUST BE INSTALLED IN THE IMMEDIATE VICINITY OF THE TONG OPERATOR.

Inspect these connections upon activation of the power unit. Leaking components must be repaired before releasing the tong to the operational environment. Deactivate the power unit and de-pressurize the hydraulic system according to the procedure in Section 5.4. Disconnect the main hydraulic connections and inspect all four connectors (two male, two female) for damage or debris. If the connectors cannot be cleaned or easily repaired, McCoy Global recommends replacement of the leaking connector. Note that damage to one of the connectors may have caused damage to its mate.

Turn off power unit and depressurize hydraulic system before disconnecting the main hydraulic lines under normal working conditions. See Section 5.4 for hydraulic system depressurization. McCoy Global recommends placing protective caps over the exposed connectors to protect them from water and impact damage.

⚠ WARNING

ALWAYS TURN OFF HYDRAULIC POWER AND DEPRESSURIZE HYDRAULIC SYSTEM BEFORE DISCONNECTING MAIN HYDRAULIC LINES.

3.3.3 Hydraulic Circuit Description

Refer to the hydraulic schematic in section 3.3.1 for assistance identifying components described in this circuit description.

The main hydraulic power source supplies hydraulic fluid to the hydraulic valve block inlet section through a 1” threaded positive-shutoff connection. Hydraulic fluid circulates through the inlet section, the motor control section, the optional lift section, and the outlet section at maximum tong pressure before returning to the hydraulic fluid reservoir (the “tank”) through a 1-¼” threaded positive-shutoff connection. The system relief valve is factory adjusted to limit the maximum operating pressure of the tong to that which will allow maximum torque. Maximum operating pressure and maximum torque are listed in the specifications on page 2.10.

The motor control valve section features proportional control. Actuating the valve handle on the motor control section directs hydraulic fluid to the hydraulic motor through the safety door cartridge integrated into the inlet valve causing rotation of the motor. During normal operation pilot pressure from the safety door switch directs pilot pressure to actuate the safety door cartridge, allowing full hydraulic power to the motor. The configuration of the plumbing between the motor valve section and the motor determines the direction of rotation for a given valve action. McCoy Global normally configures the plumbing on this tong so that pushing the valve control handle towards the centre of the tong supplies hydraulic pressure to the “clockwise rotation” side of the motor, which is the desired direction of rotation for making up a tubular connection.

Conversely, pulling the valve control handle towards the operator supplies hydraulic pressure to the “counter-clockwise rotation” side of the motor, which is the desired direction of rotation for breaking out a tubular connection. Releasing the valve handle enables the valve to go to a neutral position, directing all hydraulic fluid to the outlet section and “back to tank”. The proportional nature of the valve allows the motor speed to be controlled depending on the position of the valve, regardless whether the motor is being run in the make-up or break-out direction, or whether the motor is in the high speed or low speed state.

A check valve installed on the case drain line between the motor and the main tank return line, or the internal case drain, protects the motor from excess pressure in the event of blockage in the tank line.

Actuating the valve handle on the lift cylinder section directs hydraulic fluid to the lift cylinder, which is connected to the master link on the rigid sling and provides raising and lowering functions to the tong and backup assembly. Although the lift cylinder is designed to be a double-acting cylinder, normally only the “lift” side is connected to hydraulic pressure from the lift cylinder valve. Actuating the lift cylinder valve in the “lower” direction provides a path to tank for the hydraulic fluid in the lift cylinder and allows the load suspended on the lift cylinder to force the hydraulic fluid from the cylinder, through the valve. In other words the “lowering” action is a function of gravity, not active hydraulics. The position of the lift cylinder valve controls the rate at which the cylinder lowers the tong and backup assembly. An adjustable needle valve on the pressure line to the lift cylinder allows an operator to set the rate at which hydraulic fluid is supplied to the lift cylinder, thus controlling the maximum rate at which the cylinder raises and lowers. A breather port in the opposite side of the lift cylinder allows the cylinder to breathe as the piston in the lift cylinder moves. The configuration of the plumbing between the lift cylinder valve section and the cylinder determines the action of the lift cylinder for a given valve action. McCoy Global normally configures the plumbing on this tong so that pushing the valve control handle towards the centre of the tong supplies hydraulic pressure to the lift cylinder, which causes the cylinder to retract, thus providing a lifting action. Pulling the valve control handle towards the operator allows a path back to tank, which allows gravity to extend the cylinder and lowers the equipment. However, in all cases users should check the direction labels on the hydraulic control valve to determine the valve deflection direction required to perform the desired hydraulic operation. Allowing the handle to go to neutral stops all hydraulic fluid movement to or from the lift cylinder.

Hydraulic fluid at maximum tong pressure flows from the valve inlet section to the safety door switch. During normal operation the depressed plunger on the safety door switch allows a hydraulic pilot signal through the switch to the safety door element. This pilot pressure actuates the safety door cartridge, allowing full system pressure to the motor when the motor control valve is manipulated. Opening either tong door causes the plunger on the safety door switch to fully extend, diverting all hydraulic fluid from the safety door switch to the tank line, interrupting pilot pressure to the safety door cartridge. The safety door cartridge immediately inhibits system pressure to the motor. Full hydraulic power to the motor cannot be restored until the plunger on the safety door switch is depressed by completely closing and latching the tong door.

Units equipped with a WINCATT® dump valve are monitored by the WINCATT® torque management system, which is connected to the dump valve by an electrical cable. Achieving user-specified torque during connection operations causes the WINCATT® system to generate an electrical signal, energizing the solenoid (item 12 on the hydraulic schematic) in the dump valve body (item 13 on the hydraulic schematic) and opening the dump valve to “dump” system pressure directly to tank.

3.4 TONG JAW AVAILABILITY & INSTALLATION

3.4.1 Jaw Availability

The following table lists all jaw die kits that are available as standard stocked sizes for this model of tong. McCoy Global offers a good selection of standard jaw sizes. However, please note that we can custom-engineer and manufacture any size of jaw within the range of the tong. Jaw systems are available to allow use of die inserts intended for specialized applications. Call our sales office for information on jaw and die systems designed for higher or lower grip, or non-marking applications.

The table lists standard flat die inserts that are available as spare parts. However, a wide variety of diamond-tooth, GRITFACE®, aluminium, and wrap-around fine-tooth dies are available for specialized applications. Please refer to our website for complete information:

http://www.mccoyglobal.com/dies-inserts

DANGER

USE OF ALUMINIUM DIES IN CE-MARKED EQUIPMENT IS FORBIDDEN

WARNING

NEVER ATTEMPT TO CLAMP ONTO TUBULARS WITH INCORRECTLY SIZED DIES. OPERATORS MUST BE AWARE OF THE SIZE OF TUBULAR TO BE GRIPPED AND THAT THE JAW AND DIE SYSTEM IN USE IS PROPERLY SIZED. USE OF INCORRECTLY SIZE DIES POSES A HAZARD TO PERSONNEL AND EQUIPMENT.

Description	Part Number	Description	Part Number
9-5/8” Jaw Die Kit	1482-JDK-540	18-5/8” Jaw Die Kit	1482-JDK-570
10-3/4” Jaw Die Kit	1482-JDK-545	18-3/4” Jaw Die Kit	1482-JDK-571
11-3/4” Jaw Die Kit	1482-JDK-550	19-1/2” Jaw Die Kit	1482-JDK-573
13-3/8” Jaw Die Kit	1482-JDK-558	20” Jaw Die Kit	1482-JDK-575
13-1/2” Jaw Die Kit	1482-JDK-559	22” Jaw Die Kit	1482-JDK-580
13-5/8” Jaw Die Kit	1482-JDK-561	24” Jaw Die Kit	1482-JDK-585
14” Jaw Die Kit	1482-JDK-560	24-1/2” Jaw Die Kit	1482-JDK-587
16” Jaw Die Kit	1482-JDK-565	25” Jaw Die Kit	1482-JDK-590
18” Jaw Die Kit	1482-JDK-568	26” Jaw Die Kit	1482-JDK-595
Standard 5” Replacement Die	13-0008-500-0		

3.4.2 Tong Jaw/Jaw Die Installation & Removal

Worn jaw dies can usually be replaced without removing the tong jaws. Replacement of dies is simple and straightforward, and may be performed on the drill floor in a few simple steps.

1. Remove hydraulic power from the equipment. Although opening the tong door inhibits rotation, McCoy Global recommends completely isolating the equipment from hydraulic power in order to prevent accidental rotation in the event of component failure.

DANGER

ISOLATE TONG FROM HYDRAULIC POWER BEFORE PROCEEDING WITH JAW OR JAW DIE REPLACEMENT.

2. Rotate the jaw towards pipe centre to fully expose jaw die keeper fasteners. **NOTE:** die keeper fasteners my be located on the bottom of the jaw, depending upon jaw orientation at installation.
3. Extract the keeper fasteners and, if required, use a hammer and soft metal drive to lightly tap the worn dies from the top or bottom (depending on orientation) to remove.
4. Clean the dovetail die slots using a metal brush.
5. Treat the new dies with anti-seize compound before installing.
6. Insert the new jaw dies in to the jaw(s), and secure in place using the keeper fasteners.

3.4.2 Tong Jaw/Jaw Die Installation & Removal (Continued):

Tong jaws often require removal to change jaw size or replace worn jaw die inserts. Follow these instructions to remove tong jaws.

1. Remove hydraulic power from the equipment. Although opening the tong door inhibits rotation, McCoy Global recommends completely isolating the equipment from hydraulic power in order to prevent accidental rotation in the event of component failure.
2. Remove one jaw at a time. Support the jaw being removed from the bottom. If required use a temporary lifting sling and crane to support the jaw assembly.
3. Remove the jaw pivot bolt.
4. Slide the jaw assembly toward the centre of the cage plate assembly, and, once clear of the cage plates, remove and transport to a secure location.

⚠ CAUTION

JAWS MAY PRODUCE METAL SLIVERS. WEAR STURDY WORK GLOVES WHEN HANDLING JAW DIE KITS.

5. Repeat steps 2 through 4 for the second jaw.

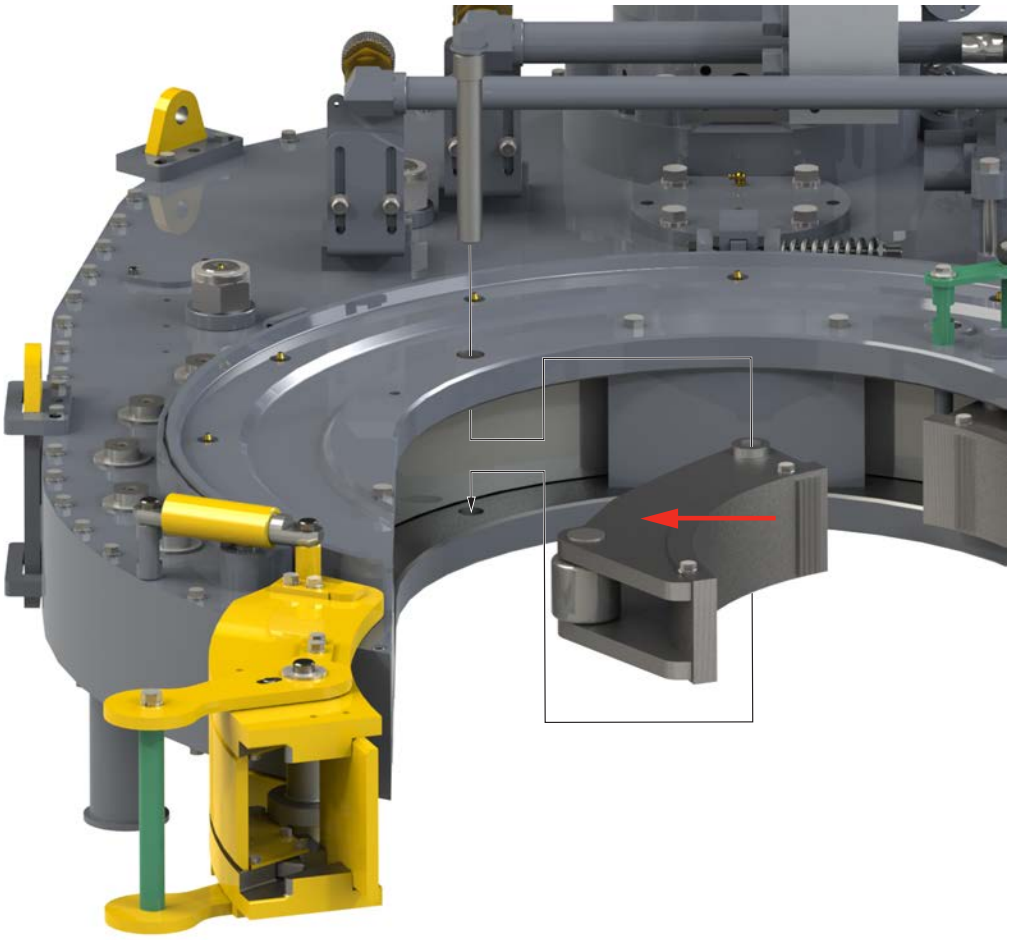


Illustration 3.4.1: Jaw Removal / Installation

6. Inspect each of the two incoming jaw assemblies:
   - Inspect each jaw weldment or casting for cracks or other damage, including (but not limited to) chipped metal and missing welds. Do not use cracked or otherwise damaged jaws. Cracked or otherwise damaged jaws must be clearly tagged and quarantined. Subcomponents of each jaw assembly (rollers, roller pins, jaw dies) may be removed and re-used, providing the subcomponents are free of damage.

3.4.2 Tong Jaw/Jaw Die Installation & Removal (Continued):

6. Inspect each of the two incoming jaw assemblies (continued):

- Place the jaw face down (roller up) on a sturdy surface. Wearing a leather work glove, attempt to rotate the roller with the palm of your hand. Jaw rollers must spin freely to ensure proper camming action against rotary gear during engagement with the tubular. If the roller turns freely, proceed directly to step 7. Rollers that are jammed or otherwise “frozen” must be freed before installing and using jaw assemblies:

  i. Extract the fasteners retaining the jaw roller pin. In most cases this will be a keeper screw, but in some cases the jaw pin is secured using a retaining ring. Occasionally the jaw pin is secured using a weld bead. In these instances the weld bead must be ground away before the jaw pin can be removed.

  ii. Extract the roller pin. If necessary use a soft metal drive and hammer to tap the jaw pin out of its seat. Removing the jaw pin allows the jaw roller to come free.

Illustration 3.4.2: Jaw Disassembly

iii. Inspect the jaw pin and jaw roller for damage which may include (but is not limited to) distortion of shape (out of round), corrosion, cracks, flat spots, or chips. Damaged components must be replaced.

iv. Thoroughly clean the jaw components using a solvent-based cleaner. If necessary use a stiff brush to clean the jaw weldment/casting, including the jaw pivot through holes and the jaw roller pin through holes. A stiff brush may also be required to clean retaining ring grooves on the jaw pin (where applicable).

3.4.2 Tong Jaw/Jaw Die Installation & Removal (Continued):

6. Inspect each of the two incoming jaw assemblies (continued):
   v. Apply a liberal coating of grease to the jaw pin and all surfaces of the jaw roller. Re-install the jaw pin and roller, and secure the jaw pin in the jaw weldment/casting with the appropriate fastener. NOTE: jaw pins secured by a weld bead must have the weld bead re-applied by an authorized, skilled welder.
   vi. Re-check the jaw roller to ensure that it turns freely.
7. Apply a generous coating of grease to the jaw roller & pin. Rotate the roller several times to distribute the grease.
8. Install the jaw assemblies one at a time. Liberally coat each jaw pivot bolt with a layer of grease before installing.

3.5 EQUIPMENT CONFIGURATION & LEVELING

3.5.1 Suspension & Restraint

Suspend the tong from a location as near to the centre of the drill rotary as possible, and from a location high enough on the mast to ensure easy handling. Suspending the equipment lower in the rig increases the effort required to move the tong to and from the connection point.

The suspension line may be extended over a pulley and balanced by a counterweight equal to the weight of the tong, or simply tied off in the derrick to form a dead line. When using a dead line arrangement it is necessary to use a McCoy Global spring hanger assembly (see specification page for recommended spring hanger). The spring hanger compensates for the downward movement of the casing as the thread is made-up, and imparts additional force to the suspension cable as the internal spring(s) is (are) deflected. The following table lists the working load limit (WLL) and test load for McCoy Global spring hangers. In all cases hang lines must be rated to support the total weight of the suspended equipment PLUS the additional force imparted as a result of spring hanger deflection. **For design purposes consider the "test loads" listed below as being the maximum total weight of equipment plus spring hanger deflection force.**

Model Number	WLL (lbs)	WLL (kg)	Test Load (lbs)	Test Load (kg)
85-0106X (SX)	1200	544	2500	1133
85-0106XXH	2400	1088	5000	2267
85-0106HDS	5900	2676	7900	3583
85-0106HD	11500	5216	15500	7030

Refer to the specification page in this manual for information on the recommended spring hanger for this application. McCoy Global will not guarantee or specify spring hangers other than what has been supplied by McCoy Global.

Many applications use a lift cylinder for adjusting the height of the tong. Ensure the weight of the lift cylinder is known if it has not been included in the total weight of the tong.

All forces upon the suspension line must be considered when calculating necessary strength of the suspension line. The weight of the tong, the weight of the lift cylinder, the weight of the spring hanger, and the force imparted on the suspension line by the spring hanger must all be added together in order to arrive at the total force supported by the suspension line. Select your suspension line based upon the total force and the margins of safety dictated by the policies of your company and by established engineering practices. Ultimately, calculating the force on the suspension line and selection of the suspension line is the complete responsibility of the customer.

McCoy Global recommends using backup (snub) lines on each side of your assembly to restrict motion in either direction of rotation. Snub lines must be of sufficient strength to withstand the force imparted by the maximum rated torque of the tong and backup assembly in use. Snub lines will arrest uncontrolled movement of the tong and backup in the event slipping of the backup jaws. Calculate the force on the snub lines by dividing the maximum torque of the tong by the tong's torque arm (expressed in feet). For example, a 60,000 lbs.-ft. tong with a 55 inch (4.58 ft.) torque arm will generate 13,091 lbs of force against a snub line connected 90° to the longitudinal axis of the equipment. Select your snub lines based upon the total force and the margins of safety dictated by the policies of your company and by established engineering practices. Ultimately, calculating the force on the snub line and selection of the snub line is the complete responsibility of the customer.

Snub lines must be securely connected to the rear of the tong and backup assembly, and tied off to a suitably rated anchor. When properly installed the snub line should be taut enough to allow very little movement, preventing the tong from generating excessive force on the lines by "snapping" tight when rotation is applied.

3.5.1 Suspension & Restraint (Continued):

DANGER

MCCOY GLOBAL ACCEPTS NO RESPONSIBILITY FOR DESIGNING AND SELECTING AN ADEQUATE SUSPENSION AND RESTRAINT SYSTEM FOR YOUR DRILLING EQUIPMENT. FAILURE TO FOLLOW THE INSTRUCTIONS PROVIDED IN THIS SECTION MAY RESULT IN SERIOUS INJURY TO THE OPERATOR.

ALL SELECTED FASTENERS, SHACKLES, CLAMPS, ETC. USED FOR CONSTRUCTING THE SUSPENSION AND SNUB LINES MUST BE RATED FOR THE CALCULATED FORCES.

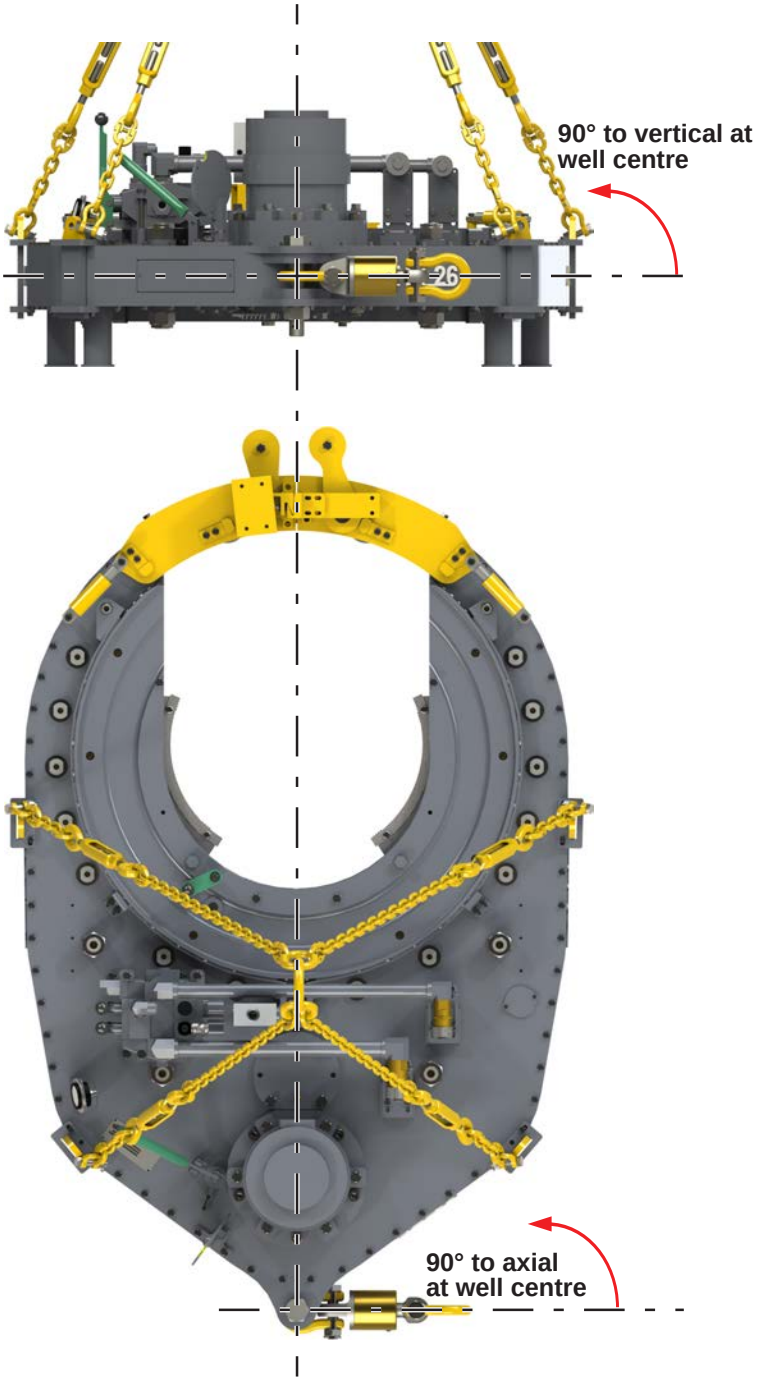


Illustration 3.5.1: Tong Suspension and Load Cell Orientation

3.5.2 Tong Leveling

The tong must be leveled side-to-side and front-to-rear at well-center before placing into service. The following guidelines will assist you when leveling your tong.

⚠ CAUTION

FAILURE TO ENSURE TONG IS LEVEL AT WELL-CENTER MAY RESULT IN JAW SLIPPAGE OR FAILURE OF JAW COMPONENTS

1. Position the equipment with the center of the rotary assembly over well center (in the correct operating position for making or breaking connections).

⚠ WARNING

ONLY USE THE MASTER LINK TO SUSPEND THE TONG ASSEMBLY. THE RIGID SLING IS DESIGNED FOR VERTICAL LIFTING ONLY.

2. Place a level axially (side to side) across the tong as near to well center as possible, ensuring the level remains parallel with the top plate of the tong. Note whether the side-to-side level requires adjustment, and move the equipment back to the drill floor.
3. Use a thin wrench on the flat of the adjusting helix to rotate the helix in the direction required for side-to-side leveling of the tong, forcing the lift link to move in the appropriate direction toward the outer supports of the sling. The 3/4" nylock nut on the pin may have to be slightly loosened to allow the helix to rotate.

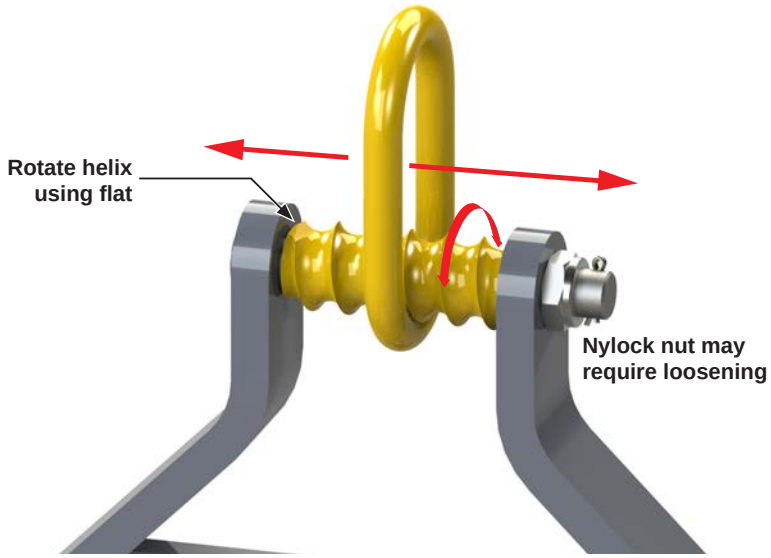


Illustration 3.5.2: Tong Leveling 01

4. Repeat steps 1 through 3 until the level shows that the tong is level side-to-side at well-center.
5. Position the equipment with the center of the rotary assembly over well center (in the correct operating position for making or breaking connections).
6. Place a level lengthwise (front to back) along the tong as near to well center as possible, ensuring that it remains parallel with the top plate of the tong. Note whether the front-to-back level requires adjustment, and move the equipment back to the drill floor.
7. Loosen the four ¾" locking nuts on the adjusting bolts on both rigid sling brackets (total of eight nuts). Completely loosen all four adjusting bolts in each bracket (total of eight bolts - see illustration 3.5.3).

3.5.2 Tong Leveling (Continued):

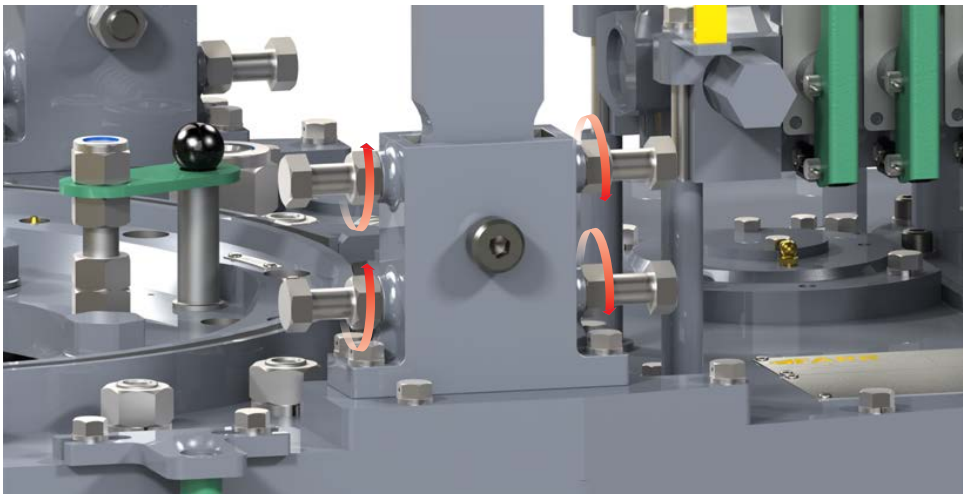


Illustration 3.5.3: Tong Leveling 02

8. Adjust the appropriate pair of adjustment bolts on each bracket to level the top plate. For example, adjusting the top rear and the bottom front adjustment bolts (as shown in illustration 3.5.4) raises the nose of the tong, while adjusting the top front and bottom rear adjustment bolts lowers the nose of the tong. Adjust the bolts in each rigid sling bracket simultaneously and equally. Tighten the locking nuts on the four bolts used for adjustment

⚠ CAUTION

ADJUST LEFT AND RIGHT RIGID SLING LEVELING ADJUSTMENTS SIMULTANEOUSLY AND EQUALLY

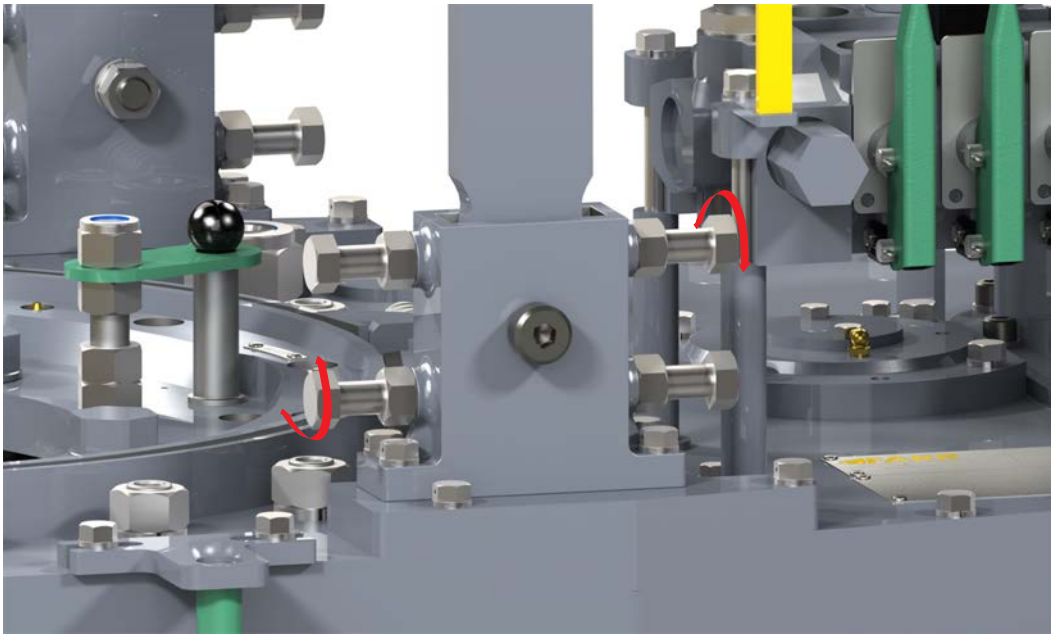


Illustration 3.5.4: Tong Leveling 03

9. Thread the remaining four adjustment bolts (two per side) in to the adjustment brackets until they make contact with the rigid sling weldment with the brackets. Tighten the remaining four locking nuts.
10. Repeat steps 5 through 9 until the equipment is level front-to-rear at well center. Double-check that the equipment has remained level side-to-side.

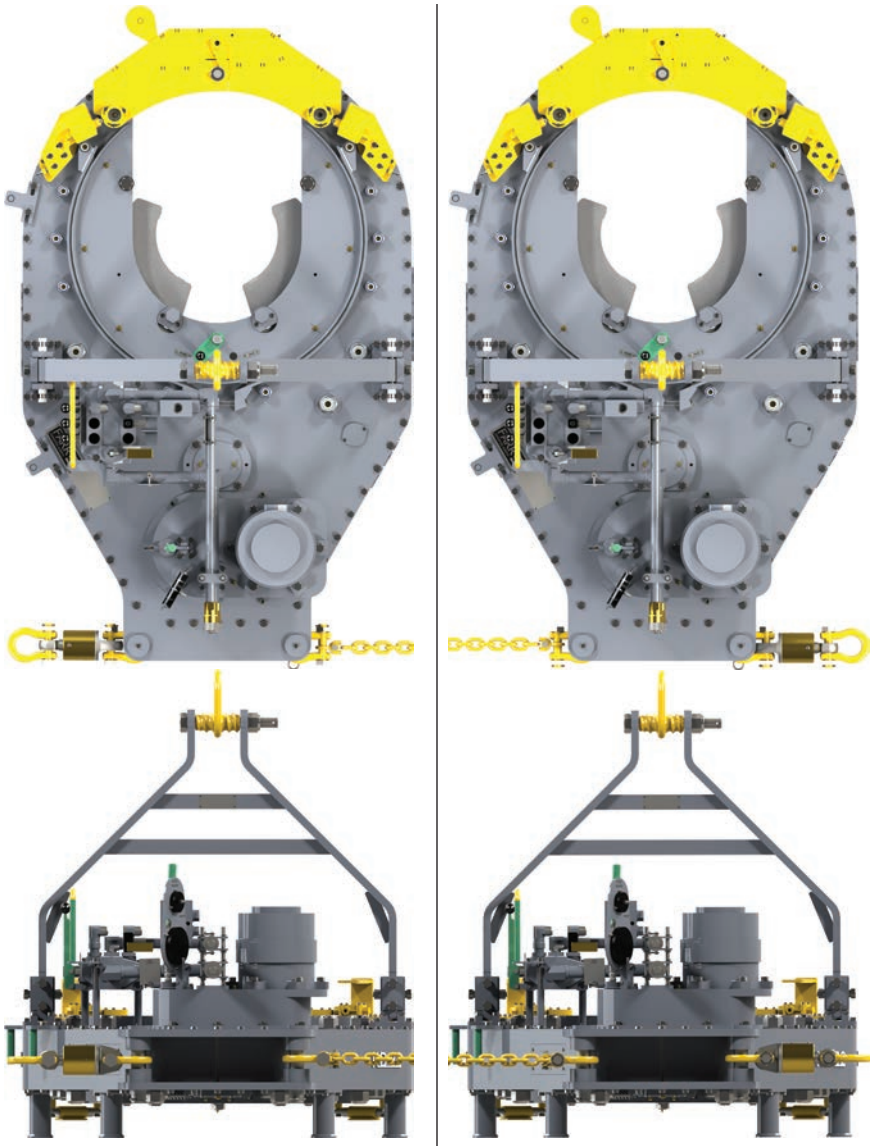
3.5.3 Load Cell Configuration (Continued):

The tension load cell, coupled to the backup assembly and the frame weldment using shackles, provides the hydraulic signal to the calibrated torque indicator. The load cell attaches to the backup body and the frame weldment using shackles. A “breakout chain”, used for arresting motion of the backup when breaking out a connection, connects the opposite side of the backup body to the frame weldment.

To change the torque measurement configuration (make up to break out or visa versa) simply remove the ¼” hex bolts retaining the load cell pins on each side of the backup body weldment and the retaining plate securing the two load cell pins on the centre post of the frame weldment. Remove the four pins (2 of 1-½” x 4”, and two of 1-½” x 4-⅛”). Reverse the position of the load cell and restraint chain. Replace the four load cell pins, and secure the pins in the backup body weldment using one ¼” UNC x 4” hex bolt and one ¼” UNC hex nylock nut per side, and the pin retaining plate for the two load cell pins in the centre post of the frame weldment. For your reference Illustration 3.5.6 shows how to correctly configure the load cell for make-up and break-out operations.

NOTICE

ENSURE LOAD CELL IS PERPENDICULAR TO TONG VERTICAL AND HORIZONTAL AXIS WHEN TONG IS AT WELL CENTER FOR MOST ACCURATE TORQUE MEASUREMENT.



Load cell & snub line configured for make-up operations

Load cell & snub line configured for break-out operations

Illustration 3.5.5: HD26-60K Load Cell Configuration

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SECTION 4: OPERATION

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4.0 TONG OPERATION

4.0.1 Operator Training

Many companies set qualification standards that must be met before equipment may be operated without supervision. McCoy Global recommends operator training, which typically consists of operation of the equipment under the supervision of a trained equipment operator until a satisfactory level of competence is achieved. Typical operator training should include:

- Introduction to and general description of equipment
- Technical specifications and performance data
- Operating instructions
- Control systems and interlocks
- Operating hazards
- Checks and inspections

4.0.2 Operator Safety

McCoy Global recommends that a hazard assessment of the work area and affected equipment be performed by a designated safety representative before commencing operations. A designated safety representative is responsible for verifying that all operators have adequate equipment and safety training.

The safety door system is the primary device protecting the tong operator and nearby personnel from the rotary gear. Confirm the correct operation of the safety door before every job. Never disable the safety door device.

⚠ DANGER

NEVER DISABLE OR BYPASS THE TONG SAFETY DOOR SYSTEM

The area surrounding the tong operating area must be clutter-free and free from tripping hazards, or protruding objects that may snag hydraulic hoses on the tong, backup, lift cylinder, or torque measurement system. Operating surface or drill floor must be kept free of slipping hazards like grease, oil, water, etc.

Adequate lighting of the work area is required. All warnings, labels, gauges, and signs must be clearly visible

The components of the tong commonly manipulated or requiring control input are painted green, and are safe for continuous handling. Areas painted yellow are designated as hazardous areas, and contact with those areas must be avoided during operation. Always wear all personal protective equipment (PPE) specified by your company's HSE policy, and follow all of your company's safety guidelines.

⚠ CAUTION

ALWAYS WEAR APPROVED PERSONAL PROTECTIVE EQUIPMENT (PPE) WHEN OPERATING HYDRAULICALLY-POWERED EQUIPMENT.

Ensure hydraulic power is deactivated and tong hydraulics are de-pressurized before disconnecting the main hydraulic lines. McCoy Global recommends depressurizing the tong hydraulic system before connecting or disconnecting quick-connect fittings.

⚠ WARNING

DEPRESSURIZE EQUIPMENT BEFORE DISCONNECTING MAIN HYDRAULIC LINES.

4.0.3 Valve Operation

4-way proportional valves control operation of hydraulic devices on the tong assembly such as 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 when the valve is pulled back, there is an opposite effect. These 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. McCoy Global recommends checking the labels attached to the control valves to determine the hydraulic effect caused by a specific deflection of the control valve handles.

The following illustrations demonstrate the type and effect of the hydraulic valves with which this tong is may be equipped.

4.0.3 Valve Operation (Continued):

TONG MOTOR

This is a proportional valve. McCoy Global normally configures the plumbing to this valve so that pushing the valve handle forward will cause the tong motor to rotate in a clockwise direction (as seen from the top of the tong). This is the desired direction of rotation for making up a joint. Pulling the valve handle in the opposite direction results in counter-clockwise rotation, which is the desired direction of rotation for breaking out a joint. Releasing the valve handle causes the tong to immediately stop rotation.

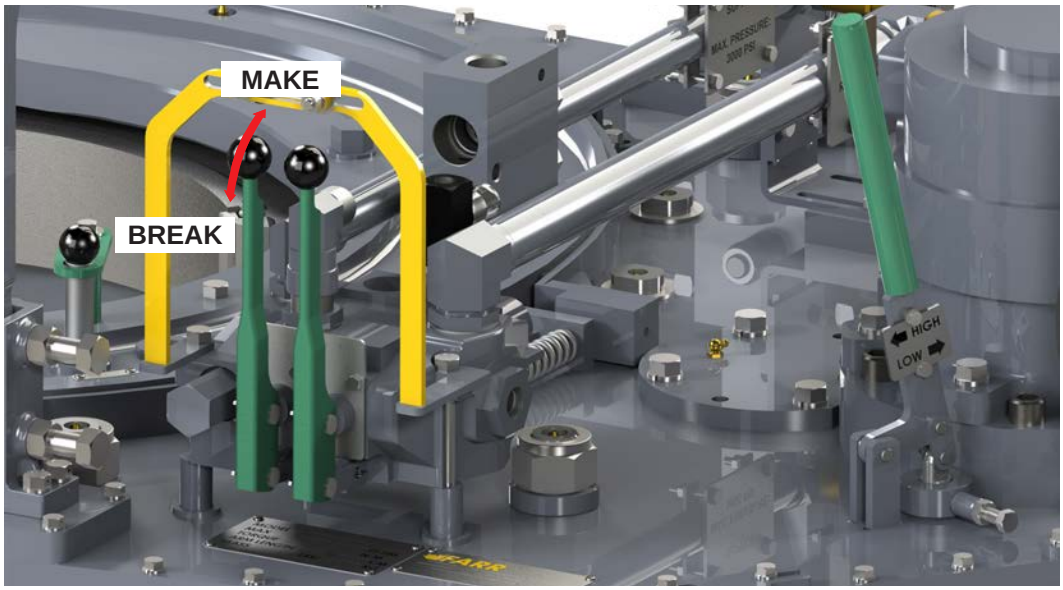

Illustration 4.0.1: Tong Rotation Control Valve

LIFT CYLINDER CONTROL VALVE

This is a direct-acting valve. McCoy Global normally configures the plumbing to this valve so that pushing the valve handle towards the center of the tong causes the lift cylinder to lift the tong vertically. Pulling the valve handle toward the operator causes the lift cylinder to lower the tong. Releasing the valve handle immediately stops the lifting or lowering action.

The needle valve on the discharge of the control valve regulates hydraulic fluid flow to the lift cylinder. Closing the needle valve (rotating the knob clockwise) will increasingly restrict the flow rate of the fluid, resulting in slower actuation of the cylinder in both directions (lifting & lowering).

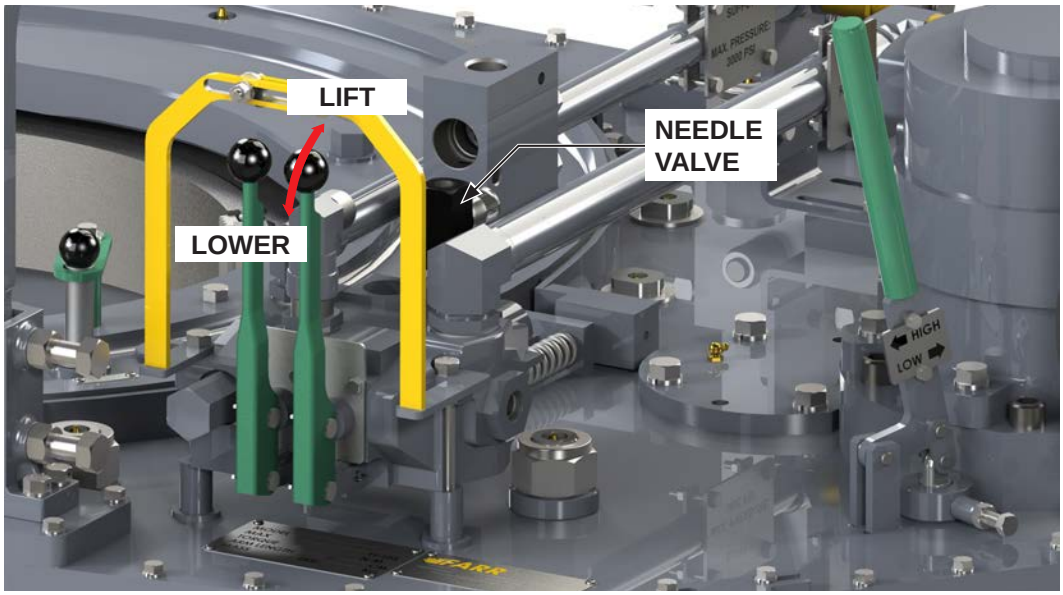

Illustration 4.0.2: Tong Lift Cylinder Control Valve

4.0.4 Shifting Gears

The shifting shaft has three “detent” positions identifying the low speed/high torque position, the “neutral” or free-spinning position, and the high speed/low torque position. The detent strength may be adjusted by releasing the locknut on the detent tube and increasing or relaxing pressure on the detent spring. Ensure the locknut is tightened once the desired detent pressure has been set.

To shift to the high-speed gear, move the shifting handle toward tong centre from neutral position. To shift to the low-speed gear, move the shifting handle away from tong centre through the neutral detent to its lowest position. Note that the high clutch gear or the low clutch gear may not be exactly aligned when shifting, so the operator may need to “bump” the motor control handle slightly to turn the main clutch gear shaft and shifting collar into alignment. This is most effective when applying a small amount of pressure on the gear shift lever in the direction you want to shift the tong, ensuring the shifting collar will “catch” when the main clutch gear aligns with either the high or low clutch gear (see Illustration 4.0.4).

⚠ WARNING

SHIFTING TONG WHILE ROTATING THE MOTOR AND CAGE PLATE MAY RESULT IN CATASTROPHIC GEAR TRAIN FAILURE

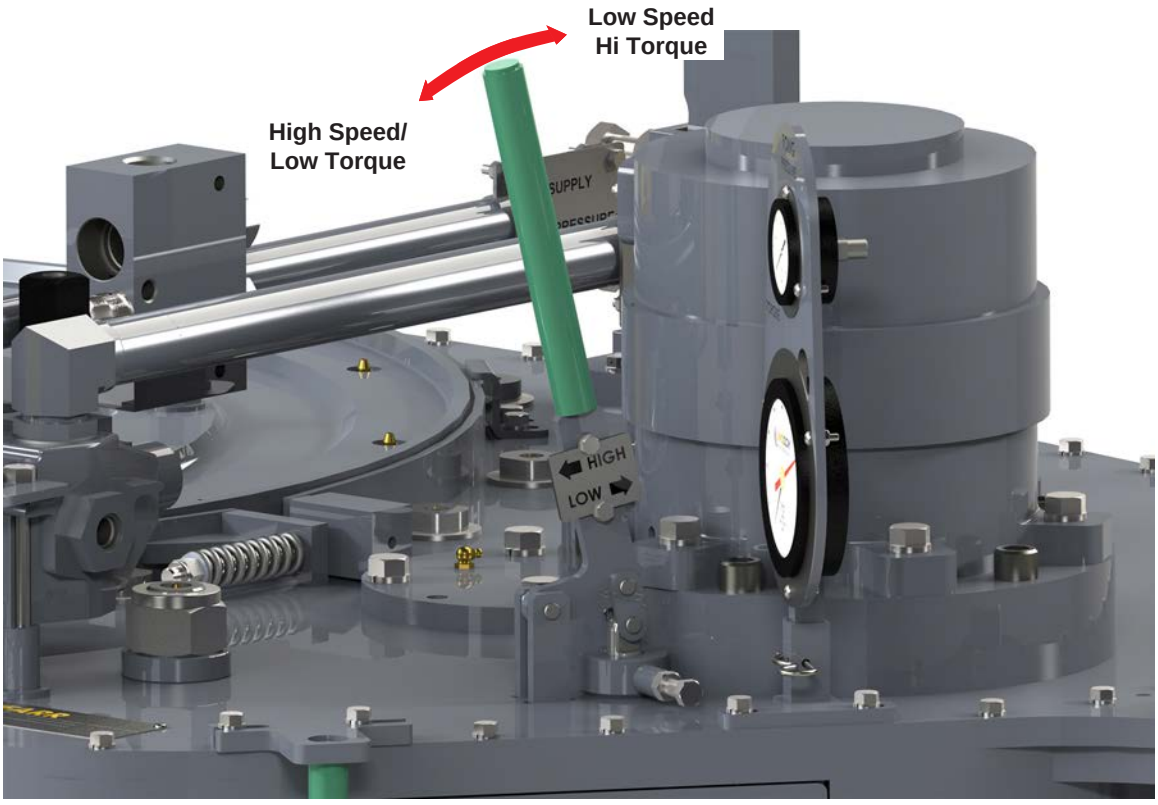

Illustration 4.0.3: Shifting Gears

4.0.5 Pre-Operational Checks

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

1. Connect the tong to a hydraulic power source in a controlled environment. Ensure the power unit's operating parameters are within the specifications as identified on Pg. 2.10., and the hydraulic connections from the power source are properly and securely made up (see sub-section 3.3.2). Do not neglect to connect the motor drain line.
2. Energize hydraulic power to the equipment. Inspect all hydraulic connections. Be aware that a restriction in the pressure supply hose will result in high pressure within the power unit hydraulic system, which may activate a hydraulic governor in a stand-alone power unit and increase the engine speed to as high as maximum RPM. A restriction in the return line will result in high pressure within both the power unit and the tong hydraulic system, and may cause failure of the motor seal.

⚠ WARNING

A CLEARLY IDENTIFIED REMOTE POWER PACK EMERGENCY STOP MUST BE INSTALLED IN THE IMMEDIATE VICINITY OF THE TONG OPERATOR.

3. If using a stand-alone hydraulic power unit allow hydraulic system to warm by circulating fluid for about 10 minutes, then slowly close the bypass valve to allow hydraulic fluid to circulate through the hoses and tong. Ensure circulating pressure does not exceed 200 psi.
4. Inspect all hydraulic hoses and connections on the tong. Immediately correct any hydraulic fluid leaks.
5. Inspect all gauges. Replace leaking or cracked gauges, or any gauge not registering a reading.
6. Confirm that all load-bearing pins and R-clip retainers are installed and in good condition (rigid sling pins, lift cylinder pins).
7. Confirm all hydraulic hoses (with the exception of the supply & return to the backup) are securely fastened to the tong, and are not in contact with the cage plate or creating a snagging hazard.
8. Test the tong door sensor/shutdown (safety door) system. The safety door system is an integral safety feature that must not be bypassed or disabled. Operating the power tong with a malfunctioning or non-operating door sensor/shutdown system exposes the operator and rig personnel to potentially fatal injury. do not operate tong with a malfunctioning or non-operating door sensor/shutdown system. Routinely testing the sensor/shutdown system operation before mobilizing and at each shift change ensures protection of drill floor personnel.

A rotating tong potentially stores a large amount of kinetic energy in the gear train. Testing the sensor/shutdown system by suddenly opening the tong door to stop rotation will generate a shock load that could result in catastrophic equipment failure not covered by the manufacturer's warranty, and may present a hazard to personnel on the drill floor.

⚠ WARNING

TESTING THE SENSOR/SHUTDOWN SYSTEM BY SUDDENLY OPENING THE TONG DOOR TO STOP ROTATION WILL GENERATE A SHOCK LOAD THAT COULD RESULT IN CATASTROPHIC EQUIPMENT FAILURE NOT COVERED BY THE MANUFACTURER'S WARRANTY, AND MAY PRESENT A HAZARD TO PERSONNEL ON THE DRILL FLOOR

The following procedure outlines the correct, safe procedure for testing the door sensor/tong shutdown system on a McCoy Global power tong. Using the correct testing procedure ensures the sensor/shutdown system is fully functional without exposing the equipment to a shock load or personnel to a potential hazard. The tests also verify that the shut down valve is positively sealing and rules out the possibility that contaminated hydraulic fluid or erosion is preventing the valve from completely shutting off the motor's supply of hydraulic fluid.

i. Stop all tong rotation.

ii. Shift the tong to low gear (see sub-section 4.0.4).

iii. Open the tong door.

4.0.5 Pre-Operational Checks (Continued):

iv. Gradually attempt to turn the tong using the rotation control handle. Continue to gradually move the handle until the valve is fully stroked, and hold for 30 seconds. Verify the ring gear does not rotate while the rotation control is engaged. **PROCEDURAL NOTE:** a very small amount of ring gear movement is acceptable as the cartridge valve seats to stop rotation.

v. Release the valve handle and allow the valve to go to the neutral position. Gradually attempt to turn the tong in the opposite direction until the valve is fully stroked, and hold the handle in the fully stroked position for 30 seconds. Verify the ring gear does not rotate while the rotation control is engaged. **PROCEDURAL NOTE:** a very small amount of ring gear movement is acceptable as the cartridge valve seats to stop rotation.

vi. Ensure tong door is fully opened. Move the rotation control handle to approximately 50% of its full stroke. Have an assistant slowly close the tong door while continuing to hold the directional control valve at 50%. Rotation should commence only once tong door is fully closed.

If the safety door does not operate as designed, the safety door switch may require adjustment, or further troubleshooting of the safety door system may be required. See Section 5.6.5 for safety door switch adjustment procedures, and Section 6.2 for safety door troubleshooting instructions.

⚠ DANGER

DO NOT OPERATE TONG WITH A MALFUNCTIONING OR NON-OPERATING SAFETY DOOR SYSTEM.

The safety door switch is protected from impact by a sturdy metal guard, painted yellow. This guard must be inspected before each use of the tong. All components of the guard must be in place, and all fasteners securing the guard must be intact and tight. Ensure wire ties (where applicable) on safety door components are present and secure, and do not show signs of tampering.

4.0.6 General Operational Comments

1. Full break-out torque is only achievable when the rotary gear is in full contact with both idler gears. Position rotary gear in contact with both idler gears when preparing to break connections or collars where high torques are required. Do not apply break-out torque if, for any reason (slippage, for example), the rotary gear rotates past 90 degrees without gripping the tubular. Applying full torque to break out a joint when the rotary gear is not in full contact with both idler gear assemblies presents a significant hazard of catastrophic tong failure.

⚠ WARNING

DO NOT APPLY BREAK-OUT TORQUE IF THE ROTARY GEAR IS NOT IN FULL CONTACT WITH BOTH IDLER GEAR ASSEMBLIES.

3. 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.

4. DO NOT employ the “snap break” method of breaking-out joints when pulling a string. The extremely high stress placed on the gear train frequently causes gear breakage.

⚠ WARNING

THE “SNAP-BREAK” METHOD OF BREAKING CONNECTIONS IS HAZARDOUS TO RIG PERSONNEL AND EQUIPMENT

5. Consider the following when operating your equipment in temperatures below 0°C (32°F)

- Select gear and bearing lubricants that are compatible with expected climatic conditions.
- Select hydraulic fluid that is compatible with expected climatic conditions.
- Allow sufficient time for hydraulic fluid to warm to operating temperature following a power unit cold start prior to activating the bypass valve to allow fluid to circulate to tong.
- Allow for adequate drying of moisture (prior to lubricating) when cleaning tong parts in cold weather.

4.1 MAKING AND BREAKING CONNECTIONS

NOTICE

THESE OPERATING PROCEDURES ASSUME THE USER HAS PROPERLY SET UP AND PREPARED THE EQUIPMENT FOR OPERATION AS PER SECTION 3 OF THIS MANUAL.

Set up and prepare your equipment for operation as per Section 3 of this manual. Refer to the following sections:

- 3.2 - Lift Cylinder Installation
- 3.3.2 - Hydraulic Connections
- 3.4 - Tong Jaw Installation
- 3.5 - Equipment Configuration and Leveling

Your tong and backup assembly should be properly suspended, connected to a hydraulic power source, and ready to make or break connections at this point.

4.1.1 Making A Connection

1. Ensure hydraulic power supply to the tong is energized. The master link on the rigid sling must be used to suspend the tong. Do not suspend the tong from any other point.

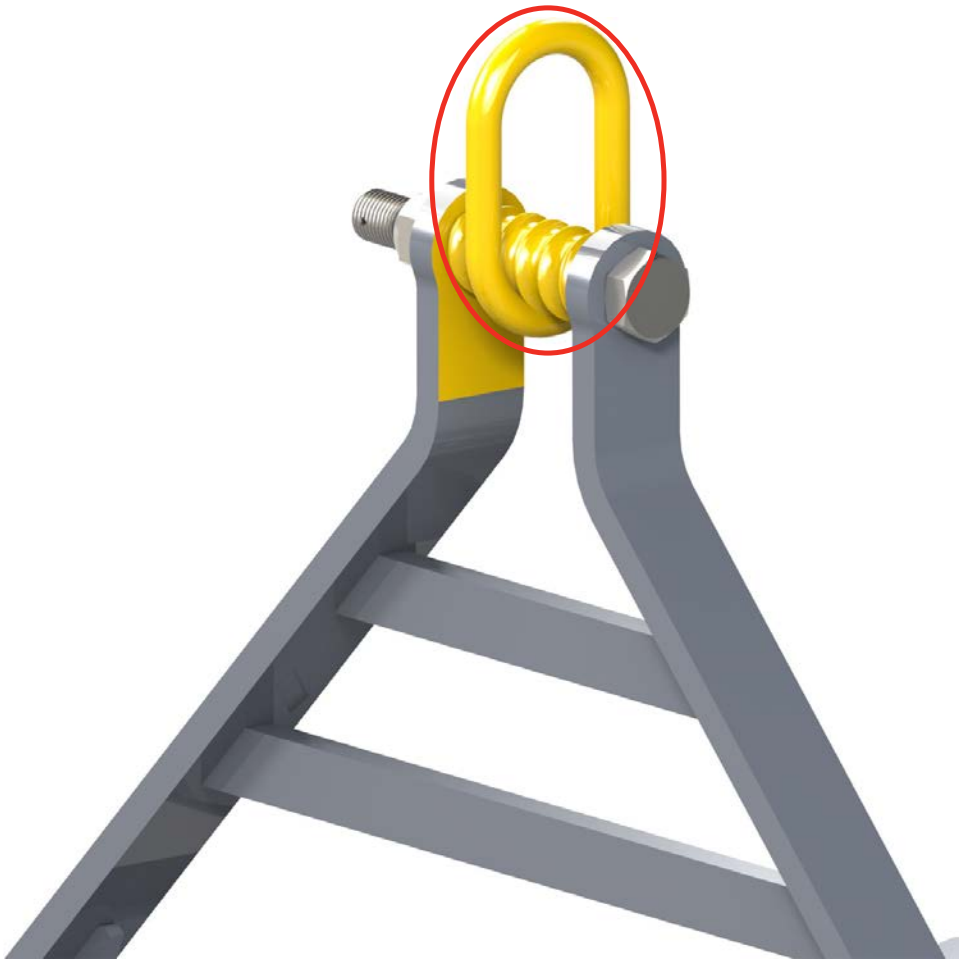

Illustration 4.1.1: Master Lifting Link

⚠ WARNING

THE MASTER LINK MUST BE USED TO SUSPEND THE TONG ASSEMBLY

4.1.1 Making A Connection (Continued):

2. Ensure the backing pin is in the “makeup” position. From the front of the tong, the backing pin correctly configured for makeup will be in the 10 o’clock position (see Illustration 4.1.2). If it is not, simply lift up and place in the correct position. The cage plate opening must be aligned with the door opening when setting the backing pin position.

Illustration 4.1.2: Backing Pin Set To “Make-up” Position

3. Properly configure the load cell and snub line(s) for making up connections. The “snub line” is a length of wire rope or chain connecting the rear of the tong body opposite to the load cell to a sturdy anchor on the drill floor (see Section 3.5.3) which arrests unanticipated and uncontrolled rotation of the assembly. The load cell and snub line(s) must be rated for the applied torque plus whatever safety margins stated by your own operating policies. The load cell and snub line connection point(s) on the drill floor must be sturdy enough to absorb all applied forces generated by tong rotation. When making up joints connect the load cell to the the driller’s side of the tong, which is the left side of the tong as seen from the rear. For accurate torque measurement the load cell connection line must be perpendicular to the vertical, and perpendicular to the centre-line of the tong
4. Use the rig’s pipe-handling equipment to position the fresh tubular in position over the stump.
5. Grasp the tong latch handle, and pull to release the latch. Swing the latch side door open, followed by the second door. Opening the tong door activates the rotation interlock (safety door) system and prevents rotation of the cage plate.
6. If necessary use the lift cylinder hydraulic control to lift the equipment from the drill floor. Check the label on the hydraulic control valve assembly to determine the proper direction of handle deflection to lift the equipment. Note that rig personnel are required to stabilize the equipment as it is being lifted so it does not swing and collide with other rig equipment..

⚠ CAUTION

RIG PERSONNEL MUST STABILIZE THE EQUIPMENT AS IT IS LIFTED FROM THE DRILL FLOOR

Position the tong over the connection. Use the lift cylinder hydraulic control to properly adjust the height of the tong on the connection.

7. Firmly close the LH tong door, followed by the RH tong door. Tug on the LH door handle to ensure the door latch has properly and securely engaged.
8. Shift the tong to high gear (see subsection 4.0.4) to thread the connection at high speed. Do not shift gears while the tong is rotating.

⚠ WARNING

SHIFTING TONG WHILE ROTATING THE MOTOR AND CAGE PLATE MAY RESULT IN CATASTROPHIC GEAR TRAIN FAILURE

4.1.1 Making A Connection (Continued):

9. Check the label on the hydraulic control valve assembly to determine the proper direction of handle deflection on the motor hydraulic control valve to rotate the tong in the make-up direction. Slowly push the valve handle in the make-up direction to cam the jaws on to the tubular.
10. When the tong jaws cam on to the tubular push the rotation control handle in the make-up to its limit to thread the connection together at high speed. As the joint becomes fully made up the increasing torque demand will stall the motor, and displayed torque will rapidly begin to increase.
11. Stop rotation, and shift to low gear (low speed/high torque). See Section 4.0.4 for instructions for shifting to low gear. This will enable the tong to produce adequate torque for making up the joint to specification. Do not shift gears while the tong is rotating.

⚠ WARNING

SHIFTING TONG WHILE ROTATING THE MOTOR AND CAGE PLATE MAY RESULT IN CATASTROPHIC GEAR TRAIN FAILURE

12. Push the rotation control handle to its limit in the make-up direction to complete the connection at low speed/high torque. Monitor the torque gauge during rotation, and stop rotation upon reaching the specified make-up torque. Reversing the rotation control valve (in the break-out direction) releases the tong jaws from the tubular. **OPERATING NOTE:** releasing the tong jaws may release compression energy stored in the spring hanger springs during make-up, causing the tong to “jump” upwards to its pre-connection level.

⚠ CAUTION

COMPRESSION ENERGY STORED IN THE SPRING HANGER SPRINGS MAY CAUSE THE TONG TO “JUMP” SLIGHTLY WHEN TONG JAWS ARE RELEASED.

13. When tong jaws are free align the opening in the rotary gear with the mouth of the tong, and open the tong doors.
14. Free the tong from the drill string. Note that rig personnel may be required to stabilize the tong as it completely releases from the drill string. Guide the tong away from the string and use the lift cylinder control to lower it to the drill floor if desired.
15. Repeat steps 4 through 14 until the desired number of connections are made up.

4.1.2 Breaking A Connection

NOTICE

YOUR TONG SHOULD BE PROPERLY SUSPENDED, CONNECTED TO A HYDRAULIC POWER SOURCE, EQUIPPED WITH PROPERLY SIZED JAWS, AND READY TO BREAK CONNECTIONS.

1. Ensure hydraulic power supply to the tong and backup is energized. The master link on the rigid sling must be used to suspend the tong. Do not suspend the tong from any other point. See Illustration 4.1.1.
2. Set the backing pin for “breakout” operation. Lift up on the backing pin and rotate it to the “breakout” position, which is 2 o’clock as seen from the front of the tong. The opening in the rotary gear must be aligned with the tong door opening in order to properly set the backing pin (see Illustration 4.1.3).

Illustration 4.1.3: Setting Backing Pin To “Break-Out” Position

3. Properly configure the load cell for breaking out connections (see Section 3.5.3). The load cell must be transferred to the off-driller’s side (the right hand side as seen from the rear of the tong), and the snub line must be transferred to the driller’s side to perform break-out operations. Load cell and snub lines must be rated for the applied torque plus whatever safety margins stated by your own operating policies. The load cell and snub line connection points on the drill floor must be sturdy enough to absorb all applied forces.
4. Grasp the tong latch handle, and pull to release the latch. Swing the latch side door open, followed by the second door. Opening either tong door activates the rotation interlock (safety door) system and prevents rotation of the cage plate.
5. If necessary use the lift cylinder hydraulic control to lift the tong from the drill floor. Pushing the control handle away from the operator retracts the cylinder to lift the tong.

⚠ CAUTION

RIG PERSONNEL MUST STABILIZE THE TONG AS IT IS LIFTED FROM THE DRILL FLOOR

6. Move the tong on to the tubing joint. Use the lift cylinder to ensure the tong is at the correct location above the connection joint.
7. Firmly close the LH tong door, followed by the RH tong door. Tug on the LH door handle to ensure the door latch has properly and securely engaged.

4.1.2 Breaking A Connection (Continued):

8. Breakout torque is only available when the tong is in low gear. Shift the tong to low gear (see subsection 4.0.4). Do not shift gears while the tong is rotating.

⚠ WARNING

SHIFTING TONG WHILE ROTATING THE MOTOR AND CAGE PLATE MAY RESULT IN CATASTROPHIC GEAR TRAIN FAILURE

9. Pull the motor control valve toward the operator to rotate the cage plate in the break-out direction, and cam the jaws on to the tubular. **OPERATIONAL NOTE:** Do not apply break-out torque if, for any reason (slippage, for example), the rotary gear rotates past 90 degrees without gripping the tubular. Applying full torque to break out a joint when the rotary gear is not in full contact with both idler gear assemblies presents a significant hazard of catastrophic tong failure.

⚠ WARNING

DO NOT APPLY BREAK-OUT TORQUE IF THE ROTARY GEAR IS NOT IN FULL CONTACT WITH BOTH IDLER GEAR ASSEMBLIES.

10. Stop rotation when the connection breaks, and shift to high gear (see Section 4.0.4 for instructions to shift to high gear). This will enable the tong to completely un-thread the connection at high speed.
11. Pull the rotation control handle all the way out to completely un-thread the connection. Reverse the rotation control (push the handle away from operator) to release the tong jaws from the tubing.
12. When the tong jaws disengage align the opening in the rotary gear with the mouth of the tong, and open the tong door.
13. Free the tong from the drill string. Note that rig personnel may be required to stabilize the tong as it completely releases from the drill string. Guide the tong away from the string and use the lift cylinder control to lower it to the drill floor if desired.

⚠ CAUTION

RIG PERSONNEL MUST STABILIZE THE TONG AS IT IS FREED FROM THE TUBULAR.

14. Use your rig's standard pipe handling procedures to remove and rack the freed tubing stand.
15. Repeat steps 5 through 14 as many times as necessary to break out and un-thread the desired number of connections.

SECTION 5: MAINTENANCE

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McCoy Global recognizes that minor on-site repairs and modifications are required to maintain peak operating condition of this equipment, or to reconfigure the equipment to suit the operating environment. Examples of minor repairs are:

- replacement of damaged hoses, cables, and fittings
- replacement of malfunctioning pressure gauges and valves
- replacement of fasteners

Any replacement component must be an identical component supplied by McCoy Global. Fasteners must be Grade 8 or equivalent, unless otherwise specified by McCoy Global. All repairs must be performed by authorized, skilled personnel. Any attempt to make unauthorized repairs to equipment beyond the minor repairs described above exposes personnel to potential hazards and may cause catastrophic equipment failure. Contact McCoy Global if any question about the nature of repairs arises.

⚠ DANGER

UNAUTHORIZED REPAIRS TO EQUIPMENT EXPOSES PERSONNEL TO POTENTIAL HAZARDS AND MAY CAUSE CATASTROPHIC EQUIPMENT FAILURE.

By nature, steel machinery with rotating and moving parts have the potential to generate ignition sources, ie. sparks. As outlined in this manual, scheduled maintenance, lubrication, timely replacement of worn components and most importantly, on-site risk assessments with stringent standard operating procedures are all required to prevent the potential of spark generation.

⚠ WARNING

USE THE MAINTENANCE INFORMATION IN THIS MANUAL TO DEVELOP AND IMPLEMENT PROCEDURES TO HELP ELIMINATE SPARK GENERATION

5.0 GENERAL MAINTENANCE SAFETY PRACTICES

The practices identified here are intended as a guideline. All personnel are responsible for performing their tasks in a manner that ensures worker, equipment, and environmental safety, and may require taking additional steps that are not identified in this section.

Equipment maintenance shall be performed only by designated qualified maintenance personnel. Wear approved eye wear and footwear, and follow all safety guidelines. Do not begin a maintenance task without the proper tools or materials on hand, or the proper drawings and documentation necessary.

Schedule planned maintenance with operators to avoid conflicts, unnecessary downtime, and the danger of accidental equipment activation. Notify operations when maintenance procedures are complete and equipment functionality is restored.

Isolate the location of the maintenance under way to prevent unaware personnel from inadvertently exposing themselves to a hazard. Use tape, rope, or signage to clearly indicate “off-limits” area.

Replacement of large, heavy individual parts and/or heavy structural components must be performed using an approved lifting device of sufficient lifting capacity. Use care when attaching the lifting device. Safeguard area to avoid endangering personnel or equipment.

All spare parts must meet or exceed OEM specifications in order to maintain equipment integrity, especially protective equipment.

Ensure equipment is isolated from hydraulic power before commencing maintenance operations.

⚠ WARNING

DO NOT PERFORM MAINTENANCE UNTIL TUBULAR CONNECTION EQUIPMENT HAS BEEN COMPLETELY ISOLATED FROM HYDRAULIC POWER

This equipment uses materials that may be harmful to the environment if improperly disposed of (hydraulic fluid, grease, etc.). Dispose of all materials according to environmental protection regulations.

5.1 CLEANING

Clean equipment thoroughly with a high quality petroleum-based cleaning agent after each job, prior to storage. McCoy Global recommends that the equipment be periodically partially disassembled so that internal components can be properly cleaned. Ensure that cleaning solvents and chemicals are captured to prevent environmental contamination. Dispose of all materials according to environmental protection regulations.

5.2 PREVENTIVE MAINTENANCE PRACTICES

Regular maintenance programs must be established to assure safe, dependable operation of this equipment and to avoid costly repairs. The following maintenance procedures provide information required to properly maintain your equipment. This equipment may require more or less maintenance depending upon the frequency of use and the operational field conditions.

These maintenance procedures are designed for equipment operating at normal operating temperatures for 10 hours per day. McCoy Global recommends that the inspection and maintenance procedures in this section be performed as recommended in the maintenance checklists, or in conjunction with a qualified technician's best estimates of when this equipment is due for this maintenance.

OEM component manufacturers (for example: motors, valves, etc.) may specify maintenance tasks and intervals over and above what McCoy Global recommends as part of their recommended procedures. These additional tasks may be performed or ignored at the user's discretion.

McCoy Global recommends tracking all maintenance activity including the lubrication schedule and replacement of hoses or cables. A maintenance log is a valuable tool that can be used for easily retrieving maintenance history or identifying trends that require correction.

5.3 HYDRAULIC SYSTEM MAINTENANCE

Poor hydraulic fluid maintenance is a leading cause of hydraulic equipment failure. Contaminants are introduced to the hydraulic system through several sources including dirty hydraulic connections, dirty hydraulic cylinder rods, and through the wear of internal components. Failure to remove contaminants through the use of a maintained filtration system will contribute to rapid wear of system components. McCoy recommends protecting equipment by filtering to ISO 4406:1999 standards.

Premature fouling of particulate filters within the prime mover or ancillary hydraulic power unit indicates a high level of contaminants, and requires immediate hydraulic fluid laboratory analysis to identify the contaminants. High levels of wear metals in the fluid may be symptomatic of impending failure of a component in the hydraulic system. Early identification of the potential failure enables the user to schedule preventive repairs, preventing costly breakdown maintenance.

Fluid that has been repeatedly and consistently overheated will provide much poorer response and overall performance than fluid in a temperature-managed hydraulic system. McCoy recommends the use of hydraulic heaters and/or coolers to maintain the fluid temperature within the operating temperature range specified in Section 2. Maintaining adequate fluid level in the hydraulic reservoir helps dissipate heat in the hydraulic system. Fluid repeatedly heated to high temperatures (above 80°C) is subject to rapid depletion of the additives that prevent oxidation and water emulsification, leading to the build-up of sludge, gum, and varnish. These contaminants will build up on internal surfaces of the hydraulic system causing "sticky" operation or clogging orifices and small passages. Water entrained in the fluid will react with components in the hydraulic system to produce rust and increase the rate of oxidation of the fluid.

Schedule hydraulic fluid analysis regularly as part of a preventive maintenance routine. Test particulate content using a portable fluid analysis kit and compare the fluid sample to new hydraulic fluid. Fluid that is discolored or has a strong odor should be sent to a qualified laboratory for detailed analysis. Hydraulic fluid that is no longer capable of operating within the parameters specified by this manual must be replaced in conjunction with a complete hydraulic system flush.

Fluid that is unused for a long period of time should be tested before circulating through the hydraulic system. Hydraulic systems operated in environments experiencing extreme temperature variances are susceptible to condensation within in the oil reservoir. Over a period of time, the condensation will accumulate in the bottom of the reservoir. This condensation should be drawn off as required, or at six month intervals.

5.4 HYDRAULIC SYSTEM DEPRESSURIZATION

McCoy Global recommends that the hydraulic system be depressurized prior to maintenance on any hydraulic component. Perform the following steps to ensure the dangers posed by hydraulic fluid under pressure are minimized.

⚠ CAUTION

ENSURE ADEQUATE CONTAINMENT IS IN PLACE TO PREVENT ENVIRONMENTAL CONTAMINATION FROM RESIDUAL HYDRAULIC FLUID

1. Rotate the tong to the “open throat” position. Ensure tong and backup doors (if equipped) are closed. Fully extend the lift cylinder
2. De-energize the power unit.
3. Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.
4. Remove the hydraulic SUPPLY line from the equipment.
5. Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.

⚠ WARNING

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICIAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

6. Disconnect the hydraulic RETURN line from the equipment.
7. Disconnect remaining hoses such as case drains, or lines connected to the turns counter encoder.

5.5 LUBRICATION INSTRUCTIONS

Use a quality multipurpose bearing lubricant that will remain within its viscosity range at expected operating temperatures. In addition, McCoy Global recommends the following lubrication procedure at the completion of each job prior to storage.

McCoy Global 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.

Coat the jaw pins and rollers with a liberal amount of anti-seize compound when installing new jaw die kits.

5.5.1 Cage Plate Guide Rings

Lubricate the guide rings through the eight grease fittings on each of the top and bottom cage plates (nine locations top, eight locations bottom).

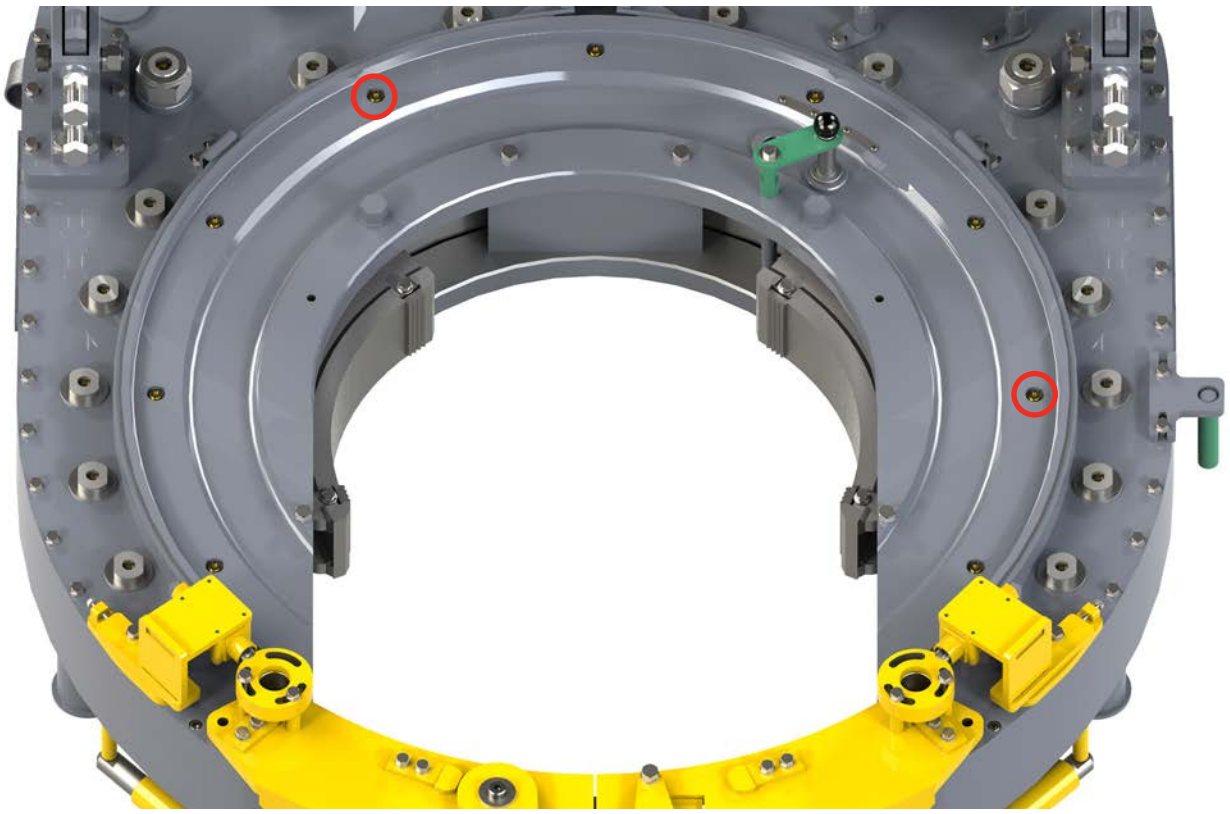

Illustration 5.5.1: Cage Plate Guide Ring Lubrication

5.5.2 Support Roller Bearings

Supply grease to these bearings through the grease fittings in the top ends of the support roller shafts and door pivot roller shafts, located around the perimeter of the cage plate on the top of the tong (8 locations top, 8 locations bottom).

Illustration 5.5.2: Support Roller Lubrication

5.5.3 Rotary Idler Bearings

Apply grease to these bearings through the grease fittings in the top ends of the rotary idler shafts located on the left and right sides of the tong (2 locations total).

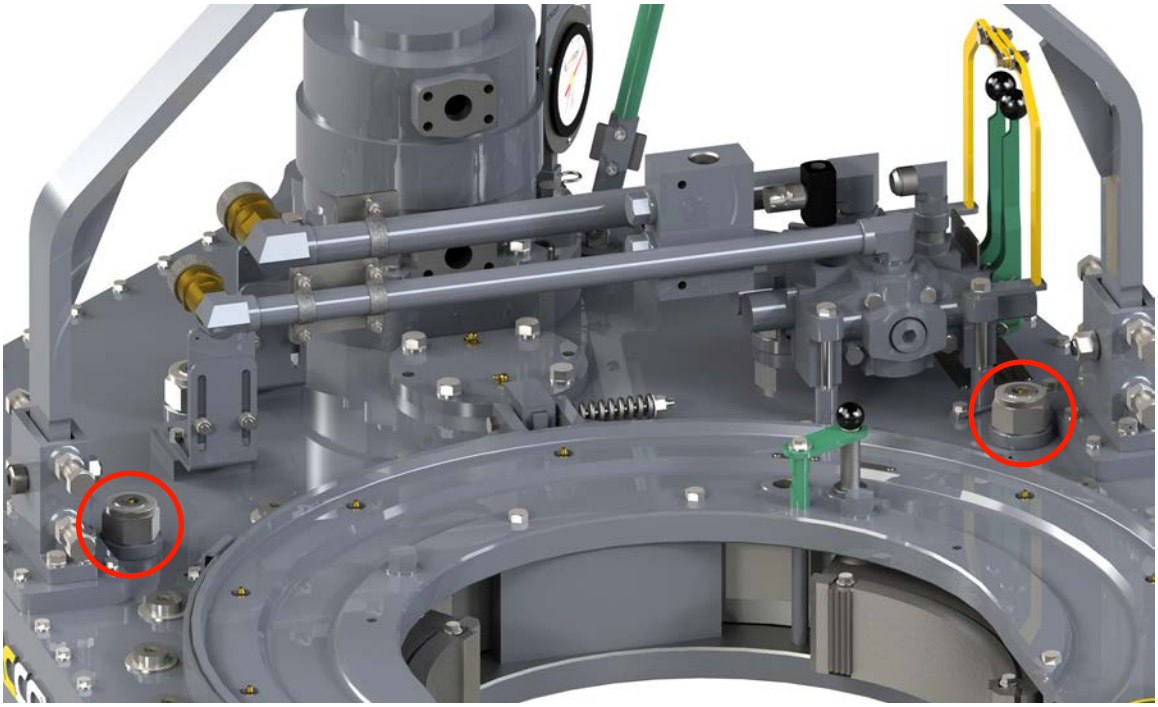

Illustration 5.5.3: Rotary Idler Lubrication

5.5.4 Pinion Idler Bearings

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

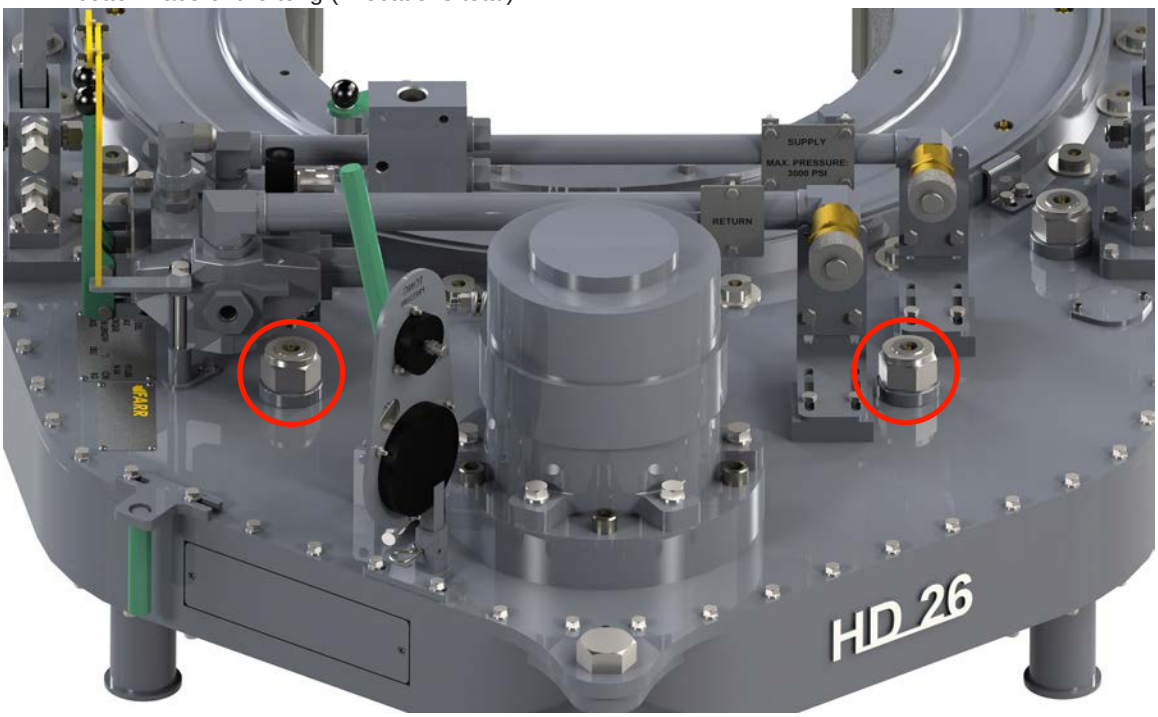

Illustration 5.5.4: Pinion Idler Lubrication

5.5.5 Pinion Bearings

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

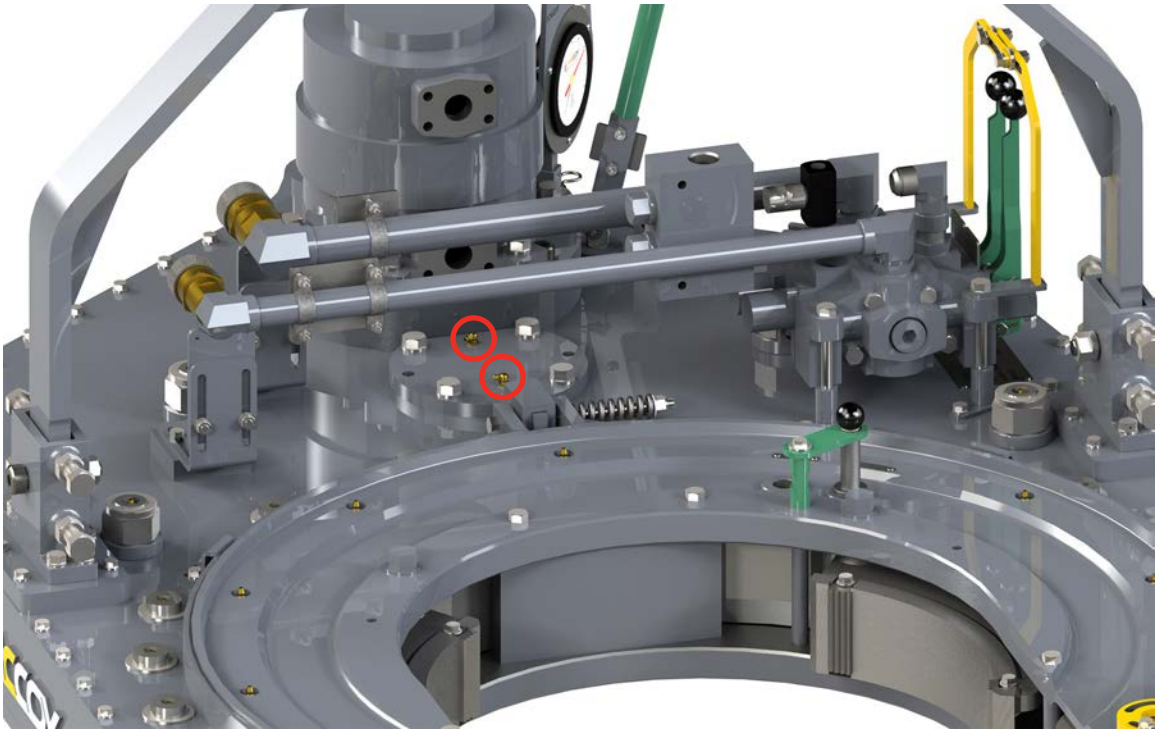

Illustration 5.5.5: Pinion Bearing Lubrication (Top Plate)

5.5.5 Pinion Bearings (continued):

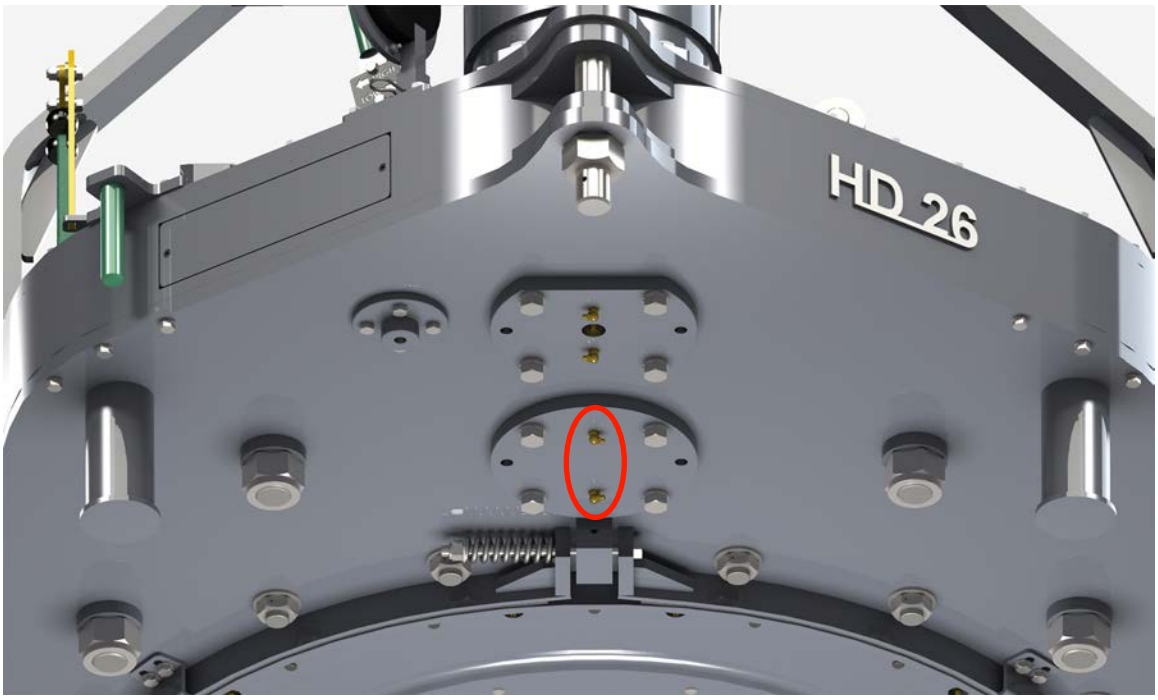

Illustration 5.5.6: Pinion Bearing Lubrication (Bottom Plate)

5.5.7 Clutch Shaft

Apply grease to the clutch bearings through the two grease fittings located on the clutch bearing cap on the bottom face of the tong, and the single grease fitting recessed into the end of the clutch shaft. (three locations total). NOTE: A protective plug may have been inserted into the end of the clutch shaft over the grease fitting prior to shipping - this plug may be removed for normal operation.

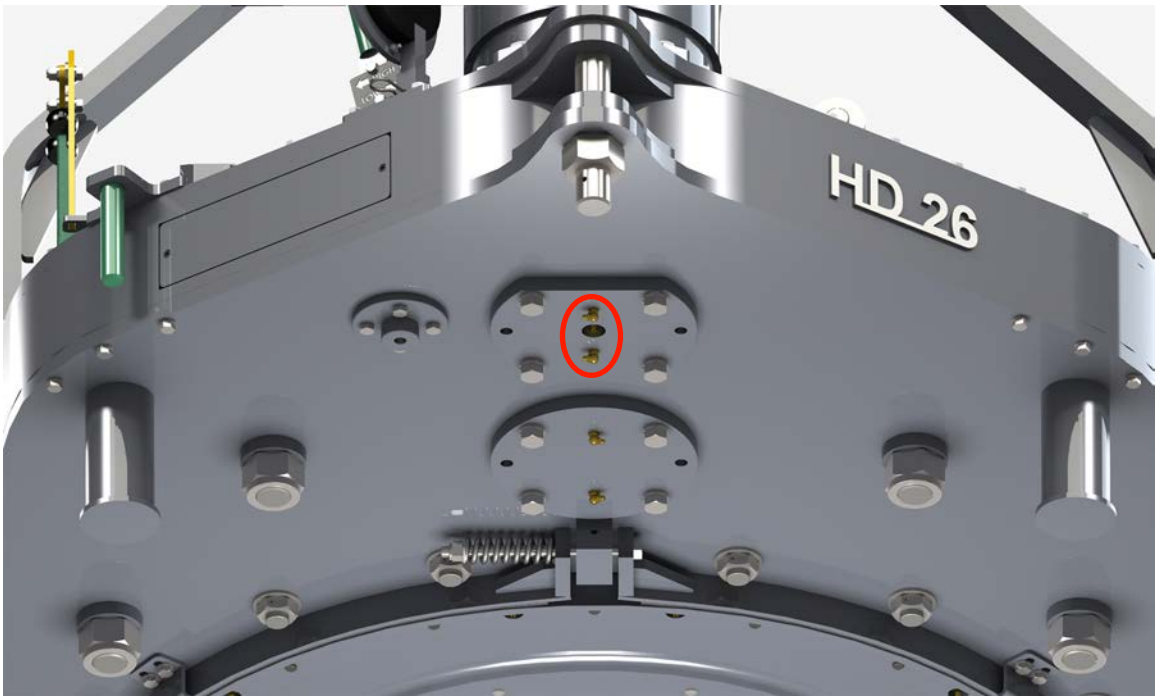

Illustration 5.5.7: Clutch Bearing Lubrication

5.5.8 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 assembly.

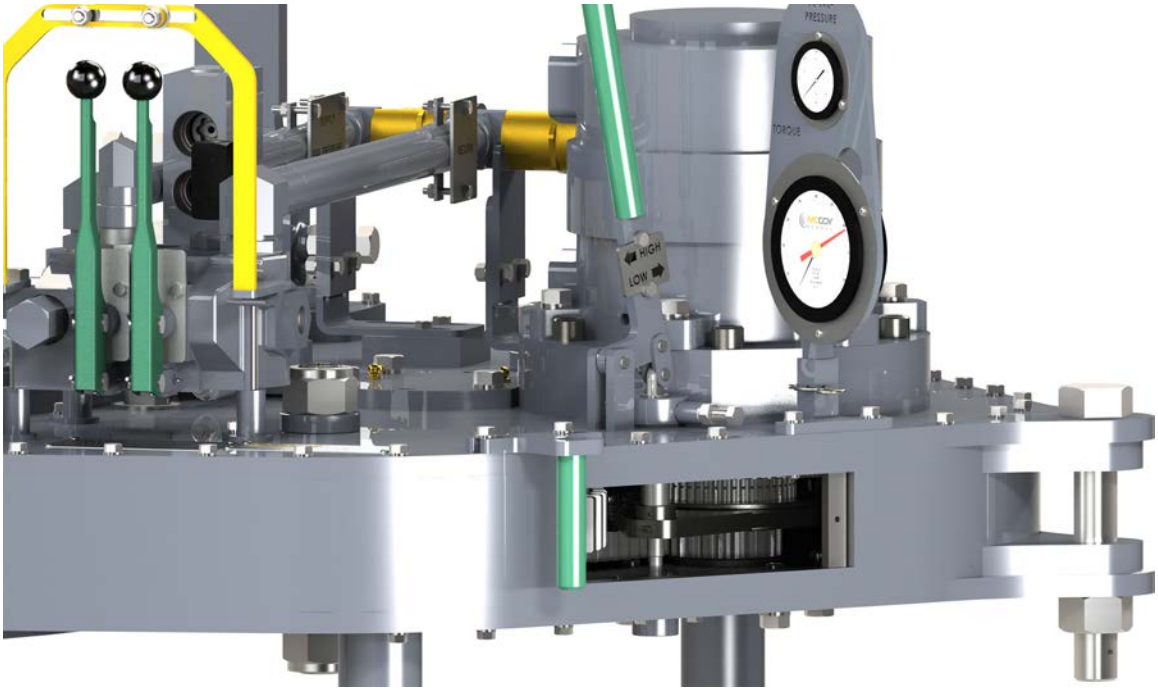

Illustration 5.5.8: Shifting Shaft Lubrication

5.5.9 Door Stop Spring Cylinder

Periodically disassemble the door stop cylinders and coat the spring and cylinder with a general purpose lubricating oil.

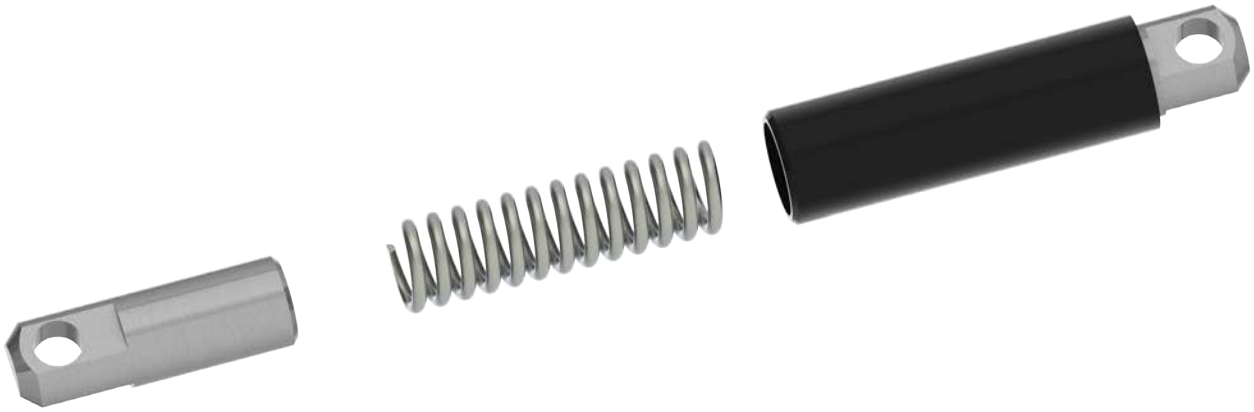

Illustration 5.5.9: Door Spring Cylinder

⚠ CAUTION

THE DOOR STOP CYLINDER SPRINGS MAY RETAIN ENERGY FROM BEING COMPRESSED. USE A CLAMP TO CONTAIN THE ENDS OF THE CYLINDERS WHEN THEY ARE REMOVED, AND RELIEVE THE SPRING TENSION GRADUALLY.

5.5.10 Recommended Lubrication Amounts

McCoy Global recommends lubricating your equipment before beginning each shift, and immediately following operation prior to storage. The grease amounts listed in the table below are estimated minimums, and should be used as a guideline when establishing a lubrication routine as part of a maintenance schedule.

5.5.10 Recommended Lubrication Amounts (Continued):

Greasing Location	Min. Grease Amount (Each Location)
Cage plate guide rings (upper and lower)	2 shots
Support roller bearings (upper and lower)	3 shots
Rotary idler bearings	4 shots
Pinion idler bearings	4 shots
Pinion gear bearings	4 shots
Clutch bearing (bearing cap)	3 shots
Clutch bearing (centre shaft)	6 shots

McCoy Global recommends liberally coating the cam surface of the rotary drive gear with grease prior to jaw installation. Periodically remove the clutch inspection plate and apply grease generously to the clutch, drive gears and shifting shaft. Coat the jaw pins and rollers with a liberal amount of anti-seize compound when installing new jaw die kits. Apply a small amount of grease to the door latch claws, post, and stops as necessary to maintain smooth operation.

5.6 ADJUSTMENTS

5.6.1 Brake Band Adjustment

Periodically adjust the brake bands to compensate for brake lining wear, ensuring continued smooth and efficient jaw cam action. Inadequate cage plate tension will allow the cage plate to rotate with the rotary gear, resulting in poor gripping of the pipe or casing due to improper “camming” action of the tong jaws. Tightening the brake band against the cage plates will increase frictional resistance, allowing jaws to cam properly and grip the casing. Adjust the brake band using the adjustment nut and bolt set as shown in the illustration below, using the following procedure:

1. Rotate the cage plate until it faces the front of the tong.
2. Tighten the top and bottom brake bands a quarter turn each. Ensure both brake bands are adjusted simultaneously and equally.

⚠ CAUTION

TOP AND BOTTOM BRAKE BANDS MUST BE ADJUSTED SIMULTANEOUSLY AND EQUALLY

3. Rotate the cage plate in the make-up direction. If the jaws cam out, the procedure is complete. If jaws do not cam out, repeat steps 1 & 2.
4. Continue to repeat steps 1 through 3 until the jaws properly cam.

Over-tighten will cause excessive wear to the brake bands. Do not over-tighten brake bands.

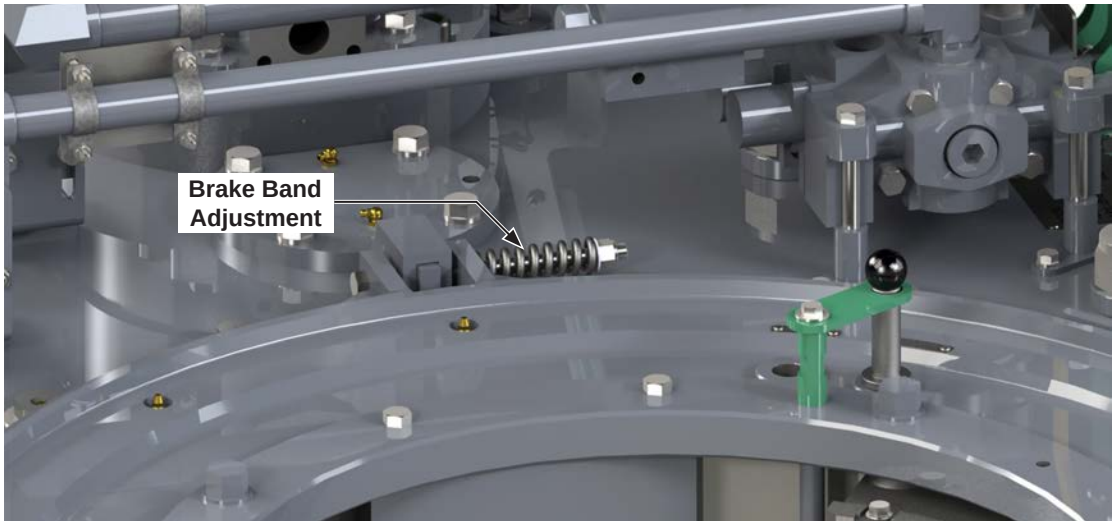

Illustration 5.6.1: Brake Band Adjustment

5.6.2 Door Alignment

Over time the tong doors may become misaligned, which can result in symptoms such as binding during opening and closing, or the doors may not open or fully close.

⚠ CAUTION

THE DOOR IS AN IMPORTANT PART OF THE STRUCTURAL INTEGRITY OF THE TONG. IT IS IMPERATIVE TO KEEP A SECURE FIT AT THE DOOR IN ORDER TO MAINTAIN PROPER GEAR ALIGNMENT, AND TO MINIMIZE THE POSSIBILITY OF DAMAGE TO THE GEAR TRAIN WHEN OPERATING THE TONG AT SPECIFIED TORQUE. A CLOSED DOOR ALSO ENSURES SAFETY OF OPERATING PERSONNEL.

Two set screws and locking jam nuts mounted on each door weldment provide adjustment of each door for optimum alignment when in the closed position.

Align the doors using the following procedure:

Initial Alignment

Ensure tong doors are closed, and inspect how one door aligns with the other at the point at which they meet. If misalignment is seen, choose one or the other door to adjust. Use a box-end wrench to loosen the jam nuts locking the set screws on the door weldment. Use a hex key to turn the hex head set screws either clockwise or counter-clockwise to adjust the door. Note that the top and bottom of the door weldment may not need to be adjusted equally - each set screw should be adjusted independently until the doors are aligned.

Final Alignment

Rotate the cage plate, and stop it when the inside circumference of the door is completely covered. Perform three measurements (see illustration below):

1) From the insides of the outer edge of each door weldment to the cage plate (2 measurements total).

2) From the exact centre point (where the two doors meet) to the cage plate.

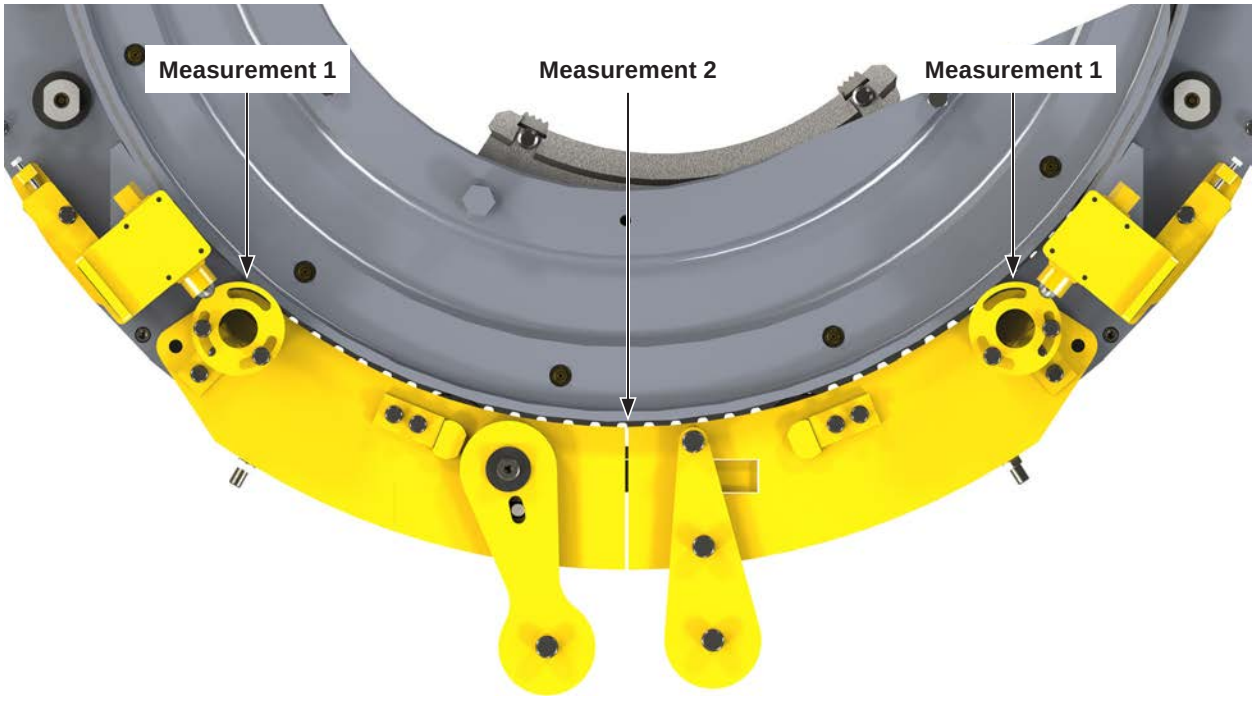

Illustration 5.6.2: Door Alignment

The three measurements should be equal. If the centre measurement is less than the two outside measurements, loosen all four locking nuts on the set screws, and turn all four set screws EQUALLY clockwise, until the centre measurement is equal to the two outer measurements. If the centre measurement is more than the two outside measurements, loosen all four locking nuts on the set screws, and turn all four set screws EQUALLY counter-clockwise, until the centre measurement is equal to the two outer measurements. Ensure that the locking nuts are tightened when this procedure is complete.

5.6.3 Safety Door Switch Adjustment

The safety door switch interrupts hydraulic power to the motor when the tong door is opened, or even slightly ajar. This is a critical safety system. Over time, normal use of the equipment results in a worn switch plunger or worn cam where it contacts the switch plunger, allowing enough clearance between the switch plunger and the door that the safety door system does not inhibit operation as designed when the door opens. This procedure enables the equipment user to restore the proper tolerances between the switch and the door to allow the safety door system to operate as designed.

1. Set the tong up in a controlled testing environment. Do not connect hydraulic power at this time.
2. Check the mechanical operation of the safety door hydraulic switch:

- Keep the tong door closed. Loosen the four nuts and bolts securing the safety door switch to the mounting plate. Loosen the locking nut on the adjustment bolt. Completely back off the adjustment bolt. Slide the switch and mounting plate away from the cam actuator on the door assembly.

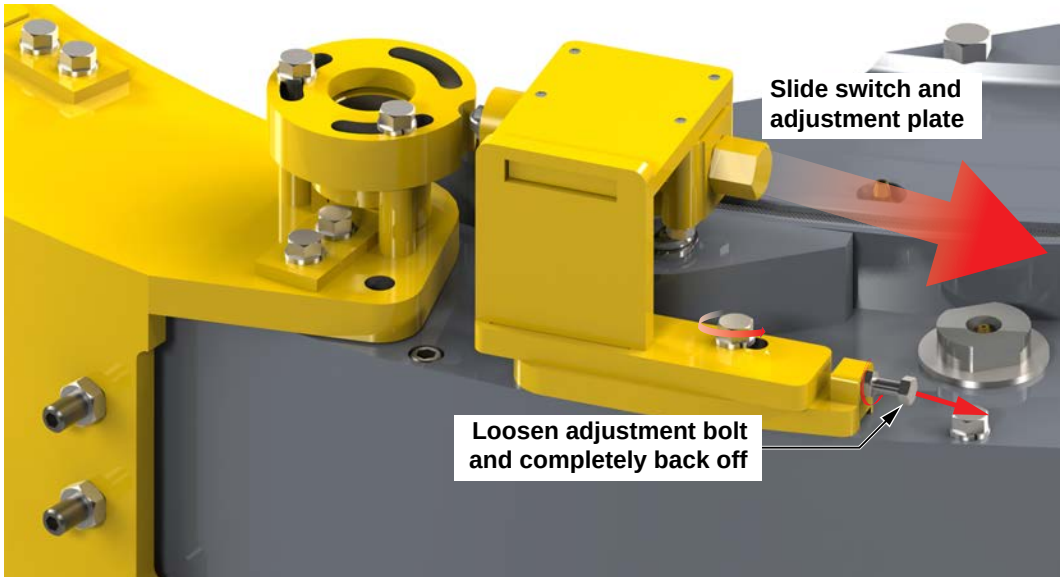

Illustration 5.6.3: Safety Door Adjustment 01

- Check operation of the hydraulic switch plunger. Depress and allow it spring back several times to ensure smooth operation (see illustration 5.6.4). If the plunger binds or jams, replace the safety door switch.

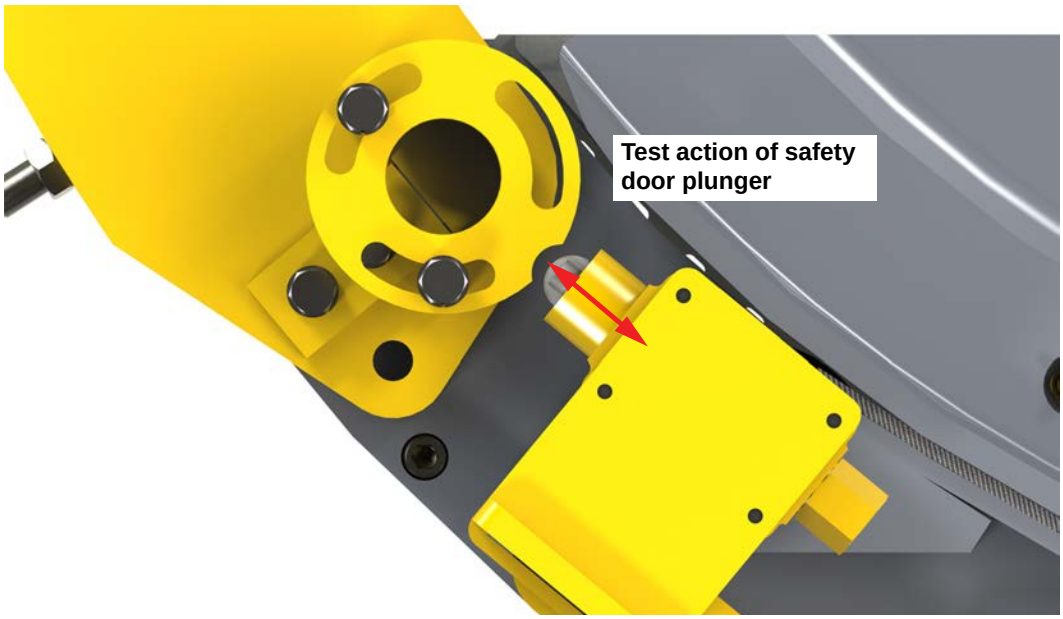

Illustration 5.6.4: Safety Door Adjustment 02

5.6.3 Safety Door Switch Adjustment (Continued):

3. If necessary, align (or re-align) the notch on the safety door cam with the safety door switch plunger. Loosen the three hex head bolts securing the safety door cam to the door weldment, and rotate until the notch in the cam is centered with the plunger of the safety door switch (see illustration 5.6.4). When the cam has been satisfactorily aligned re-tighten the three hex bolts.

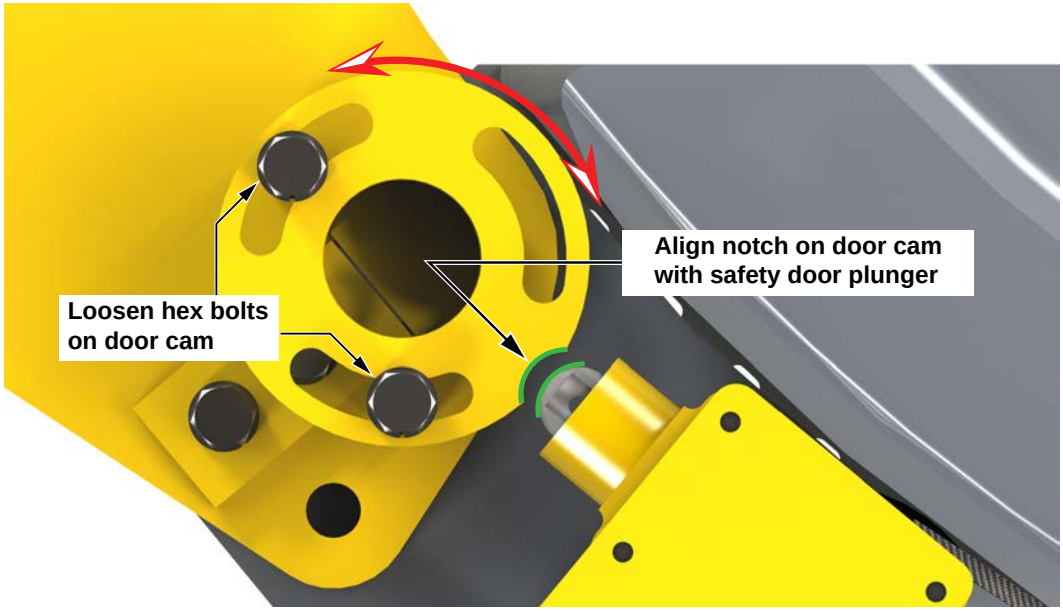

Illustration 5.6.5: Safety Door Adjustment 03

4. Slide the safety door switch toward the cam until the roller on the switch is in contact with the rounded notch on the cam. If the cam is not exactly centered with the roller, repeat step 3. Ensure that the roller on the switch is in contact with the cam without depressing the plunger. Tighten the four hex bolts to securely fasten the safety door switch in place.
5. Thread the adjustment bolt in until the end of the bolt comes in to contact with the adjustment plate. Double-check to ensure the roller on the safety door switch plunger remains in contact with the safety door cam. Use the locking nut to lock the adjustment bolt in place.
6. Test the tong door sensor/shutdown (safety door) system. Using the correct testing procedure ensures the sensor/shutdown system is fully functional without exposing the equipment to a shock load or personnel to a potential hazard. The tests also verify that the shut down valve is positively sealing.

⚠ WARNING

SUDDENLY OPENING THE TONG DOOR TO STOP ROTATION WILL GENERATE A SHOCK LOAD THAT COULD RESULT IN CATASTROPHIC EQUIPMENT FAILURE NOT COVERED BY THE MANUFACTURER'S WARRANTY, AND MAY PRESENT A HAZARD TO PERSONNEL ON THE DRILL FLOOR

i. Set the tong to rotate at low speed.
ii. Stop all tong rotation.
iii. Open the tong door.
iv. Gradually attempt to turn the tong using the rotation control handle. Continue to gradually move the handle until the valve is fully stroked, and hold for 30 seconds. Verify the ring gear does not rotate while the rotation control is engaged. **PROCEDURAL NOTE**: a very small amount of ring gear movement is acceptable as the cartridge valve seats to stop rotation.
v. Release the valve handle and allow the valve to go to the neutral position. Gradually attempt to turn the tong in the opposite direction until the valve is fully stroked, and hold the handle in the fully stroked position for 30 seconds. Verify the ring gear does not rotate while the rotation control is engaged. **PROCEDURAL NOTE**: a very small amount of ring gear movement is acceptable as the cartridge valve seats to stop rotation.

5.6.3 Safety Door Switch Adjustment (Continued):

vi. Ensure tong door is fully opened. Move the rotation control handle to approximately 50% of its full stroke. Have an assistant slowly close the tong door while continuing to hold the directional control valve at 50%. Rotation should commence only once tong door is fully closed and latched.

7. Any cage plate rotation with the door in any position except closed and latched indicates that further adjustment of the safety door switch is necessary. Remove hydraulic power from the tong.

8. Slightly loosen the four bolts securing the switch mounting plate. Loosen the locking nut on the adjustment bolt. Rotate the adjustment bolt clockwise to move the switch and mounting plate towards the door cam approximately 1/32" (1 mm). Immediately re-tighten the four mounting bolts, then tighten the locking nut on the adjustment bolt.

9. Repeat step 6. If the safety door mechanism operates correctly and no further adjustment is required this procedure is complete. If further adjustment is required, repeat steps 6 through 8 until the safety door mechanism operates correctly. If your equipment reaches the adjustment limits before correct operation of the safety door mechanism is achieved contact the engineering department at McCoy Global for further technical advice.

⚠ DANGER

DO NOT OPERATE TONG WITH A MALFUNCTIONING OR NON-OPERATING SAFETY DOOR SYSTEM.

5.6.4 Shifter Detent Force Adjustment:

Over time wear to the shifting shaft, wear to the detent ball, and loss of spring tension in the detent spring may result in a loose or "sloppy" fit within the top shifter bushing. The detent pressure may be increased or otherwise adjusted by loosening the $^{7}/_{16}$" UNF locking jam nut, and threading in the $^{7}/_{16}$" UNF detent bolt to increase the spring force. Should adequate detent action not be achieved, the shifting shaft, detent ball, or detent spring (or possibly all three) may need to be replaced (see Pp. 7.22 - 7.23).

Illustration 5.6.6: Shifter Detent Force Adjustment

5.7 RECOMMENDED PERIODIC INSPECTIONS

5.7.1 Door Stop Spring

The springs inside the spring stop cylinders must be of sufficient strength to hold the doors in the open position when opened. Replace the spring inside the cylinder when the door stop cylinder is no longer of sufficient strength to hold the door open.

⚠ CAUTION

THE DOOR STOP CYLINDER SPRINGS MAY RETAIN ENERGY FROM BEING COMPRESSED. USE A CLAMP TO CONTAIN THE ENDS OF THE CYLINDERS WHEN THEY ARE REMOVED, AND RELIEVE THE SPRING TENSION GRADUALLY.

5.7.2 Backing Pin

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

5.7.3 Shifting Shaft

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

5.7.4 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 critical to note the arm length of the tong, as indicated in the “Specifications” section. McCoy Global recommends that the torque gauge assembly be calibrated annually. Periodically check to ensure the load cell is filled with oil (see Section 8).

5.7.5 Spring Hanger

Proper inspection and maintenance of the spring hanger is essential to assure the integrity of this load-bearing component. As a minimum, McCoy Global recommends the following procedures and intervals:

Interval	Recommended Procedure
Every six months	Visually inspect all external welds per API Spec 7K.
Once per year	Six-month visual inspection plus magnetic particle inspection of the areas identified in illustration 5.7.1
Every two years	Pull test at top and bottom connection points to 7,900 lbs (3580 kg), and hold for five (5) minutes, followed by six-month visual inspection and annual MPI.

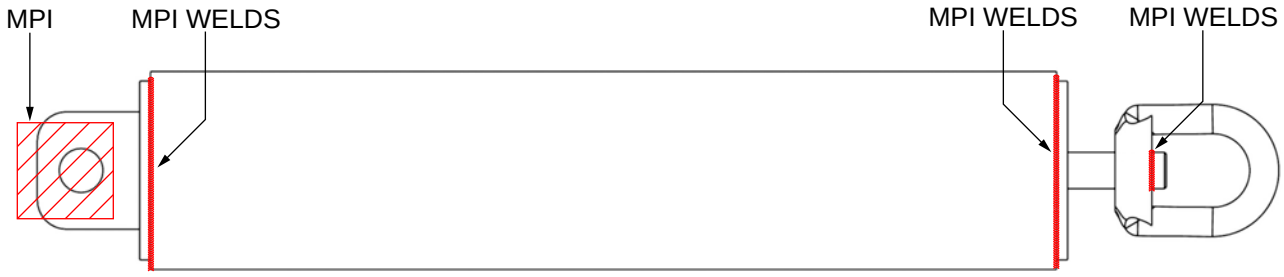

Illustration 5.7.1: Spring Hanger Inspection Area Map

5.8 REMOVAL OF TOP PLATE FOR OVERHAUL

Separate the tong and backup using the disassembly instructions specified in the following procedure. Following separation of the tong and backup access the gear train by removing the top plate of the tong.

NOTICE

ALL MAINTENANCE AND OVERHAUL SHOULD BE PERFORMED FROM THE TOP. THE BOTTOM PLATE OF THE TONG IS TYPICALLY WELDED TO THE SIDE BODY AND CANNOT BE REMOVED.

⚠ WARNING

REPLACEMENT FASTENERS (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.) USED DURING MAINTENANCE OR OVERHAUL MUST BE GRADE 8 OR EQUIVALENT.

FASTENERS USED FOR MAINTENANCE OR OVERHAUL OF LOAD-BEARING COMPONENTS (CHAIN SLINGS, RIGID SLINGS, LEGS) MUST BE TIGHTENED TO THE PROPER TORQUE

1. Construct a sturdy support structure that is capable of supporting the entire weight of the tong assembly (weight = 3775 lbs / 1712.3 kg) with safety margins as dictated by your company's HSE policies. A set of metal horses works well for this application.
2. Connect the master link of the rigid sling to a crane. Hoist the tong and transport to the support structure constructed in Step 1. Place the full weight of the tong on the structure, but do not disconnect the crane from the master link.
3. Remove the six ½" drilled hex bolts and ½" lock washers securing each rigid sling mounting lug to the top plate of the tong (total of twelve). Use the crane to transport the rigid sling assembly to a secure storage site. See Section 3.1 for recommendations for storing your rigid sling.
4. If not already done, remove the mounted jaws and jaw pivot bolts.
5. Disconnect the hydraulic connections to the motor, and disconnect the hydraulic connections from the safety door switch at the valve bank. Disconnect the hydraulic line at the pressure gauge. Contain hydraulic fluid spilled from disconnected lines and dispose in accordance with your company's environmental policies.
6. Remove the three ½" x 4-½" bolts securing the hydraulic valve bank to the mounting posts. Undo the restraints securing the inlet and outlet lines connections to their supports, and use a crane and temporary sling to lift the hydraulic valve section away from the tong.
7. Remove the three valve bank mounting posts, the hydraulic inlet and outlet supports, and the pressure gauge from the top plate.
8. Remove the gauge mount weldment from the motor mount weldment by removing the R-shaped hitch pin, and remove the torque gauge mount assembly from the top plate.
9. Remove the top and bottom brake band adjustment bolts.
10. Remove two top brake band weldments by removing the outside retaining rings on the top of the brake band-coincidental support roller shafts and the brake band retainers securing the brake band weldments to the top plate.
11. The door spring stop cylinders may contain stored energy due to compression of the spring. One at a time, clamp the end of the door spring cylinders and remove the shoulder bolts. Gradually release the clamp to safely relieve the stored energy. The rear spring stop cylinder spacers will come loose when the spring stop cylinders and shoulder bolts are removed.

⚠ CAUTION

THE DOOR STOP CYLINDER SPRINGS MAY RETAIN ENERGY FROM BEING COMPRESSED. USE A CLAMP TO CONTAIN THE ENDS OF THE CYLINDERS WHEN THEY ARE REMOVED, AND RELIEVE THE SPRING TENSION GRADUALLY.

12. Remove door assemblies. For the purposes of removal the safety door components may be left in place on each door assembly.
    - Unlatch and open each door slightly.
    - Remove the door pivot shaft retainers from the top plate of each door weldment.
    - Use a crane and temporary sling to support the door being removed.
    - Use an adjustable wrench and un-thread the shaft from the bottom plate of the door.

5.8 REMOVAL OF TOP PLATE FOR OVERHAUL (CONTINUED):

12. Remove door assemblies (continued):
    - Once the shaft comes free of the threads use a soft alloy material (e.g. brass rod, etc.), if necessary, to lightly tap each shaft through the support roller assembly until it comes free at the top. Use caution that the threads on the ends of the support roller shafts are not damaged.
    - Remove the door assembly
13. Remove the clevis pins securing the shifter handle weldment to the shifter shaft links and lug weldment, and remove handle. The links may remain attached to the shifting shaft.
14. Remove the six hex cap screws and lock washers securing the motor to the motor mount, then lift the motor up and away from the motor mount. Inspect the external splines on the motor shaft as well as the internal splines on the clutch shaft. Repair or replace if damaged.
15. Back off the shifter detent bolt until the spring and ball are not placing any force on the shifter shaft.
16. Remove the access panel from the left rear side. Un-thread the nut securing the shifting shaft to the shifting fork until it comes free. Remove the shifting shaft by rotating and pulling up out of the bottom shifter bushing, the shifting fork, and the top shifter bushing.
17. Remove the five hex socket head cap screws securing the motor mount to the top plate and remove the motor mount.
18. Remove the two remaining external retaining rings from the bottoms of the brake band-coincidental support roller shafts. Remove the thin nylock nuts and narrow flat washers from the bottoms of the remaining support roller shafts around the cage plate assembly.
19. Extract the support roller shafts. Use a soft alloy material (e.g. brass rod, etc.), if necessary, to lightly tap each shaft through the support roller assembly until it comes free at the top. Use caution that the threads on the ends of the support roller shafts are not damaged.
20. Remove the ⅜" x ¾" hex bolt securing the backing pin retainer to top of the rear cage plate bolt. Remove the backing pin knob followed by the backing pin retainer and backing pin.

⚠ WARNING

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

21. Ensure the bottom cage plate is supported before beginning cage plate disassembly. Remove the rear cage plate bolt. Remove the four ½" x 8" hex bolts securing the top cage plate to the bottom cage plate.
22. Remove the top cage plate, rear spacer, and three tubular spacers. Remove the bottom cage plate. Do not damage the manganese bronze guide rings mounted to the top of the rotary gear and bottom cage plate.
23. Pull the top pinion gear bearing cap by removing the four ⅝" hex bolts and lock washers which secure the bearing cap. Thread two of the removed bolts into the extra holes on top of the bearing cap, and use them to press the bearing cap out of place.

NOTICE

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

24. Remove the four 1-½" hex nylock nuts from the top of each idler shaft. Remove the four idler pads.
25. Remove the hex head bolts and hex socket head cap screws around the perimeter of the tong that secure the top plate weldment to the side body.
26. Lift the top plate straight up until the dowel pins are cleared.

NOTICE

LIFT THE TOP PLATE STRAIGHT UP TO AVOID SNAPPING THE DOWEL PINS. A SNAPPED OR OTHERWISE DAMAGED DOWEL PIN CAN BE EXTREMELY DIFFICULT TO REMOVE

27. Use a crane and temporary sling to lift the top plate away from the tong, exposing the gear case.

5.9 ASSEMBLY PROCEDURES

Although the assembly of McCoy Global hydraulic power tongs is straightforward, and can be accomplished without the use of special tools, the instructions in this subsection are presented as a guide only and are similar to the assembly sequence our technician would use while assembling the tong in our plant.

NOTE ON INSTALLATION PRACTICES: Ensure all bearings are liberally greased before installing over a shaft or into gears or bearing caps. When inserting a shaft through a support roller assembly ensure shaft is greased. Also ensure all metal-to-metal contact in the gear train is adequately greased. When graphics are not used in the assembly process, please refer to the relevant exploded diagrams in Section 7.

⚠ WARNING

ALL FASTENERS USED DURING REASSEMBLY OF LOAD-BEARING COMPONENTS (CHAIN SLINGS, RIGID SLINGS, BACKUP LEGS) MUST BE TIGHTENED TO THE CORRECT TORQUE. THREADED FASTENERS USED IN LOAD-BEARING DEVICES MUST BE SECURED WITH RED LOCTITE™.

TIGHTENING TORQUE GUIDE (DRY)			
SAE GRADE 8 - FINE THREAD			
SIZE	CLAMP LOAD	PLAIN	PLATED
¼ - 28 (.250)	3,263	14 ft. lbs.	10 ft. lbs.
5/16- 24 (.3125)	5,113	27 ft. lbs.	20 ft. lbs.
⅜ - 24 (.375)	7,875	49 ft. lbs.	37 ft. lbs.
7/16 - 20 (.4375)	10,650	78 ft. lbs.	58 ft. lbs.
½ - 20 (.500)	14,400	120 ft. lbs.	90 ft. lbs.
9/16 - 18 (.5625)	18,300	172 ft. lbs.	129 ft. lbs.
⅝ - 18 (.625)	23,025	240 ft. lbs.	180 ft. lbs.
¾ - 16 (.750)	33,600	420 ft. lbs.	315 ft. lbs.
⅞ - 14 (.875)	45,825	668 ft. lbs.	501 ft. lbs.
1 - 12 (1.000)	59,700	995 ft. lbs.	746 ft. lbs.
1 - 14 (1.000)	61,125	1019 ft. lbs.	764 ft. lbs.
1-⅛ - 12 (1.125)	77,025	1444 ft. lbs.	1083 ft. lbs.
1-¼ - 12 (1.125)	96,600	2012 ft. lbs.	1509 ft. lbs.
1-⅜ - 12 (1.375)	118,350	2712 ft. lbs.	2034 ft. lbs.
1-½ - 12 (1.500)	142,275	3557 ft. lbs.	2668 ft. lbs.
SAE GRADE 8 - COARSE THREAD			
SIZE	CLAMP LOAD	PLAIN	PLATED
¼ - 20 (.250)	2,850	12 ft. lbs.	9 ft. lbs.
5/16- 18 (.3125)	4,725	25 ft. lbs.	18 ft. lbs.
⅜ - 16 (.375)	6,975	44 ft. lbs.	33 ft. lbs.
7/16 - 14 (.4375)	9,600	70 ft. lbs.	52 ft. lbs.
½ - 13 (.500)	12,750	106 ft. lbs.	80 ft. lbs.
9/16 - 12 (.5625)	16,350	153 ft. lbs.	115 ft. lbs.
⅝ - 11 (.625)	20,325	212 ft. lbs.	159 ft. lbs.
¾ - 10 (.750)	30,075	376 ft. lbs.	282 ft. lbs.
⅞ - 9 (.875)	41,550	606 ft. lbs.	454 ft. lbs.
1 - 8 (1.000)	54,525	909 ft. lbs.	682 ft. lbs.
1-⅛ - 7 (1.125)	68,700	1288 ft. lbs.	966 ft. lbs.
1-¼ - 7 (1.125)	87,225	1817 ft. lbs.	1363 ft. lbs.
1-⅜ - 6 (1.375)	103,950	2382 ft. lbs.	1787 ft. lbs.
1-½ - 6 (1.500)	126,450	3161 ft. lbs.	2371 ft. lbs.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

⚠ WARNING

IMPORTANT ASSEMBLY INFORMATION

DO NOT TORQUE NYLOCK NUTS. NYLOCK NUTS ARE NOT USED FOR CLAMPING PURPOSES AND SHOULD ONLY BE TIGHTENED UNTIL METAL-TO-METAL CONTACT IS MADE AND VERTICAL MOTION IS ELIMINATED. OVER-TIGHTENING WILL RESULT IN PREMATURE BUSHING FAILURE AND WILL INHIBIT ROTATION, AND MAY IMPART EXCESS STRESS ON ROTATING COMPONENTS. NYLOCK NUTS ARE SINGLE-USE ITEMS. DO NOT RE-USE NYLOCK NUTS.

REPLACEMENT FASTENER (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.) USED DURING MAINTENANCE OR OVERHAUL MUST BE GRADE 8 OR EQUIVALENT UNLESS OTHERWISE SPECIFIED.

APPLY A THIN LAYER OF GREASE TO THE SURFACE OF EACH MOVING PART DURING ASSEMBLY TO AID IN THE ASSEMBLY PROCESS.

1. Construct a suitable stationary support, capable of withstanding the entire weight of a completed tong. A set of sturdy metal horses works well in this application.
2. Use a crane and a temporary lifting sling to place the tong body top-down on the work horses so that that bottom plate faces up.
3. Press a pinion bearing (PN 02-0106) in to the bottom pinion bearing cap (PN 1037-C-33), and install the bearing cap and bearing in the bottom plate of the tong using four ½" lock washers and four ½" UNC x 1-½" hex bolts.
4. Press a clutch bearing (PN 02-0105) in to the clutch bearing cap (PN 1037-C-17), and install the bearing cap and bearing in the bottom plate of the tong.

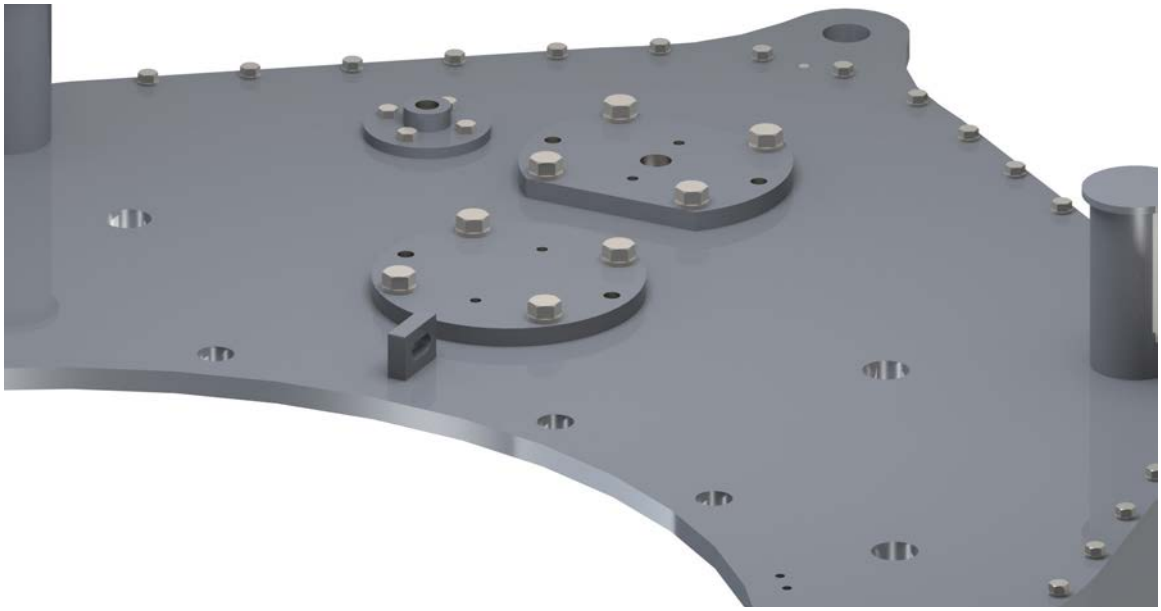

Illustration 5.9.1: Tong Assembly - Lower Bearing Cap Installation

5. Install the lower shifter bearing (1037C-21B) in to the bottom plate of the tong adjacent to the clutch bearing cap using four ⅜" UNC x 1-¼" hex bolts and four ⅜" lock washers.
6. Use a crane and a temporary lifting sling to turn the tong body over. Place the metal horses at the extreme ends of the bottom plate, but ensure the tong body is safely supported.
7. Insert support roller inner spacer (PN 1037-C-134) into each of the eighteen body-mounted support ("dumb bell") rollers (PN 1482-135). Do not assemble door-mounted support rollers at this time. Press two support roller bearings (PN 02-0094) into each end of each support roller (18 assemblies total). Once the assembly of the support rollers is complete, slide a bearing spacer (PN 101-3871) over each of the fourteen "shouldered" support roller shafts (PN 101-3939). Temporarily slide the support roller shafts into each assembly for assistance in correctly positioning each support roller.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

8. When the fourteen shafts have been inserted through the support roller assemblies, slide a second bearing spacer over the end of each shaft. Slide the two “un-shouldered” shafts (brake band anchor shafts) (PN 1037-131-02) through the remaining two support roller assemblies, and slide a bearing spacer over each end. NOTE: Do not include the two door pivot rollers or the two door rollers in this step.
9. Install six support roller assemblies plus shafts along one side of the body case. Insert shafts through the bottom plate, but do not install the bottom nylock nuts or, where used, the narrow flat washers.

Illustration 5.9.2: Tong Assembly - Initial Support Roller Installation

10. Thread two ½” UNC eye bolts in to the top of the rotary gear (PN 1482-1), directly across from each other. Use a crane and temporary lifting sling to lift and install the rotary gear. Ensure one side of the rotary gear is supported by the support rollers installed in Step 9, and have the opening in the rotary gear oriented as shown illustration 5.9.3. Leave the crane and lifting sling attached temporarily to assist with moving the rotary gear.

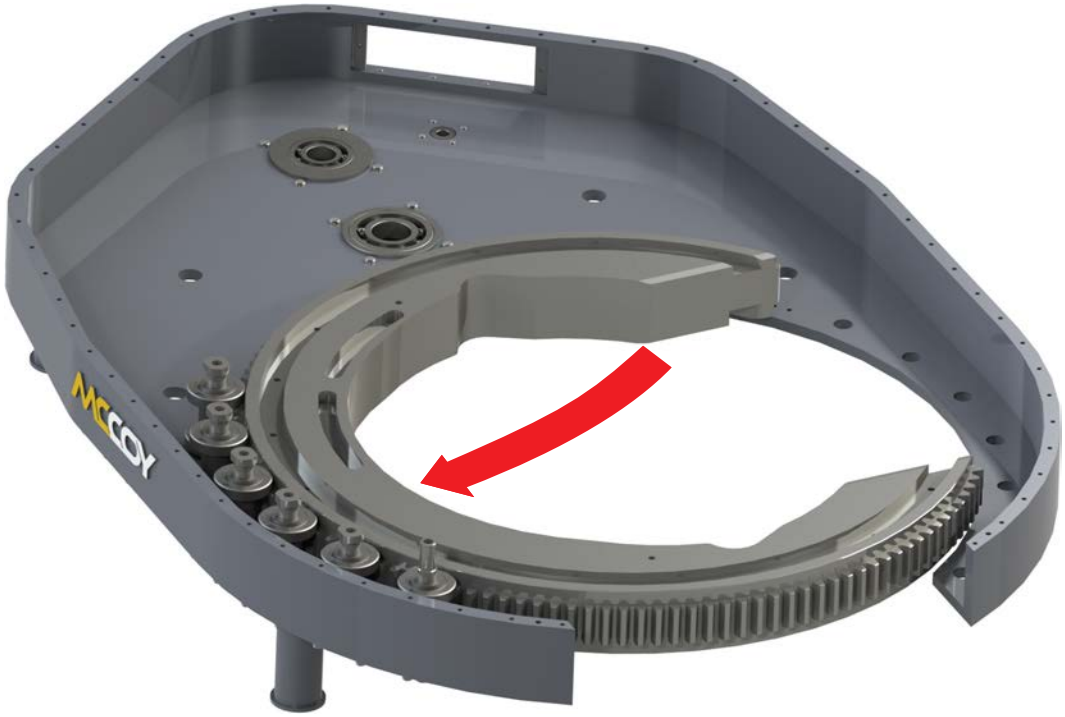

Illustration 5.9.3: Tong Assembly - Rotary Gear Installation

5.9 ASSEMBLY PROCEDURES (CONTINUED):

11. Install support roller assemblies in the locations exposed by the opening in the rotary gear, with the exception of the door pivot and door latch support rollers. Continue to rotate the rotary gear, installing support roller assemblies in the rotary gear opening as it is rotated. Finish with the rotary gear aligned with the front opening. The temporary lifting sling and eye bolts can be removed at this time.

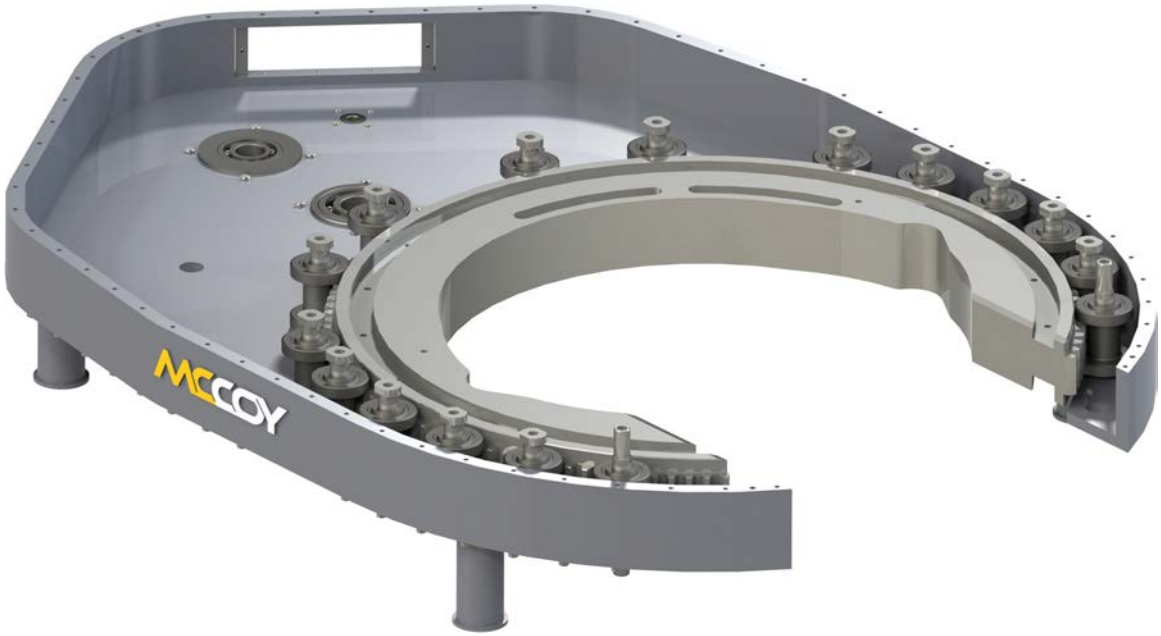

Illustration 5.9.4: Tong Assembly 04

12. Install a retaining ring (PN 02-0009) into each of the two rotary idler gears (PN 1037-D59). Press one each of the idler bearings (PN 02-0011) into each of the rotary idler gears, followed by a second retainer ring in each. Slide each rotary idler gear and bearing assembly over an idler shaft (PN 1050-D5-117) and centre as well as you are able.
13. Slide a bearing seal (PN 02-0010) over each end of the rotary idler shafts, ensuring that the “lip” on the seals are towards the centre bearing, followed by an idler spacer (PN 1050-D5-121) over each end of the shafts.
14. Install each rotary idler in their respective locations in the bottom plate and mesh with the rotary gear. NOTE: when the rotary idler assemblies are placed vertically, the bearing seal and idler spacer on the bottom side will have to be held in place by hand as the assembly is lowered through the bottom plate. Once the assembly is through the bottom plate, place an idler pad (PN 1037-A-8) over the bottom end of each shaft, and secure the pads with a 1-½” UNF hex nylock nut.
15. Slide low pinion gear (PN 1037-D-32) over bottom end of pinion gear shaft (PN 1037-D-15), and place end of pinion gear shaft into previously installed pinion bearing. Ensure the gear keys (PN 1037-D-15A), are placed into the pinion gear shaft before installing gear (two keys per gear).
16. Install a retaining ring (PN 02-0009) into each of the two pinion idler gears (PN 1037-D-1). Press one each of the idler bearings (PN 02-0011) into each of the pinion idler gears, followed by a second retainer ring in each. Slide each rotary idler gear and bearing assembly over an idler shaft (PN 1050-D5-117) and centre as well as you are able.
17. Slide a bearing seal (PN 02-0010) over each end of the rotary idler shafts, ensuring that the “lip” on the seals are towards the centre bearing, followed by an idler spacer (PN 1050-D5-121) over each end of the shafts.
18. Install each rotary idler in their respective locations in the bottom plate and mesh with the pinion gear shaft. NOTE: when the rotary idler assemblies are placed vertically, the bearing seal and idler spacer on the bottom side will have to be held in place by hand as the assembly is lowered through the bottom plate. Once the assembly is through the bottom plate, place an idler pad (PN 1037-A-8) over the bottom end of each shaft, and secure the pads with a 1-½” UNF hex nut (PN 101-3923).
19. Slide clutch bearing (PN 02-0104) over the bottom end of the splined clutch shaft (PN 1037-D-38), and install two upper clutch bearings (PN 02-0103) over the top side of the clutch shaft. Press bearings tight to the center gear on the splined clutch shaft.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

20. Slide the low clutch gear (PN 1037-D-40) over the lower bearing so that the larger diameter of the low clutch gear is tight to the center gear on the clutch shaft, and place end of clutch shaft into the clutch bearing installed in Step 4. Mesh the low clutch gear with the low pinion gear as it is installed.
21. Place the shifting collar (PN 1037-D-34) over the middle section of the clutch shaft.
22. Slide the high clutch gear (PN 1037-D-41) over the two top clutch bearings.
23. If not already done, insert the two remaining gear keys in the pinion gear shaft. Install the high pinion gear (PN 1037-D-12) over the top of the pinion gear shaft, meshing with the high clutch gear as it is installed.
24. Place the shifting fork weldment (PN 1037-D-27) up against the shifting shifting collar, roughly in its final position.
25. Carefully remove all the support roller shafts, ensuring the support roller assemblies do not shift position as you are doing so - also ensure the top support roller bearing spacers remain in place when the shafts are removed.
26. Locate the three un-threaded holes in the side body of the tong, one in the rear centre of the side body and one just to either side of the front opening. If old dowel pins are in place, remove them before installation of the top plate. If the dowel pins are in any way damaged or deformed McCoy Global recommends replacing them with new ⅜" x 1-¼" hardened dowel pins. If necessary clean the dowel pin holes, and do not insert dowel pins until after the top plate has been installed.
27. Use a temporary lifting sling and crane to maneuver the top plate weldment (PN AX07-020) into position and place on to the side body over the support roller shafts and rotary idler shafts. ASSEMBLY NOTE: Take care that the threads on the ends of the shafts are not damaged. The support roller shafts may need to be tapped with a rubber mallet to re-centre them between the top and bottom plates.
28. Insert the three positioning dowel pins through the top plate into their respective holes in the side body. Use a hammer to tap the dowel pins until they are flush with the top plate.
29. Install the top plate fasteners. Secure the top plate with thirty-six ⅜" UNC x 1-½" hex bolts and ⅜" lock washers, and six ⅜" UNC x 1" hex socket cap screws. Do not install fasteners in the rigid sling bracket installation location, the two tong handle mounting locations, the two rotation interlock switch mounting plate installation locations, and the torque gauge mount installation location indicated in illustration 5.9.5.

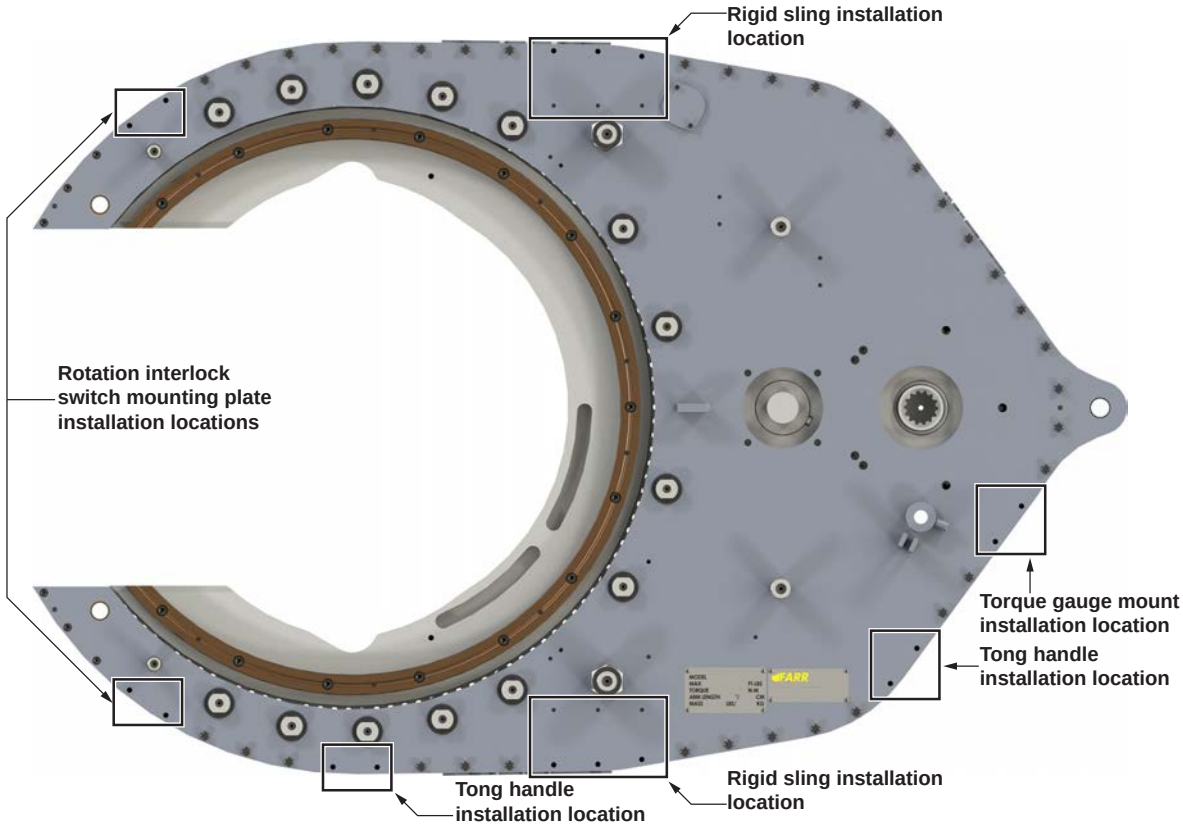

Illustration 5.9.5: Tong Assembly - Top Plate Fastener Installation

5.9 ASSEMBLY PROCEDURES (CONTINUED):

30. Slide a 1-⅛" narrow flat washer over the end of each "shouldered" support roller shafts, and re-insert the fourteen shafts through their proper locations. **ASSEMBLY NOTE:** Do not install a shouldered support roller shaft in the brake band-coincidental location - see the gear train layout on Pp. 5.5 - 5.6 for an illustration of locations. Once the shafts have been installed slide a 1" narrow flat washer over the bottom of each shaft, and secure each shaft with a 1" UNF thin nylock nut. **ASSEMBLY NOTE:** Tighten nylock nuts on support roller shafts only enough to eliminate vertical movement. Do not over-tighten.
31. Insert the two remaining "un-shouldered" support roller shafts through their proper locations in the top plate. Temporarily leave these two shafts unsecured.
32. Slide the remaining idler pads over the top of the four idler shafts, and secure each with the remaining 1-½" UNF nylock nuts. **ASSEMBLY NOTE:** Tighten nylock nuts on idler shafts only enough to eliminate vertical movement. Do not over-tighten.
33. Press the remaining bearing in the pinion assembly into the top pinion bearing cap (PN 1037-C-10), and install the bearing cap in the top plate of the tong using four ⅝" lock washers and four ⅝" UNC x 1-½" hex cap screws. Note that the flat on the bearing cap faces toward the rear of the tong.
34. Place a ⅞" UNF hex jam nut on top of the lower shifter bushing inside the gear case (through the access panel on the left-hand rear side of the tong). Threat the threads of the shifting shaft (PN 1037-C-20A) with red Loctite™. Insert the shifting shaft through the top shifter bushing, the shifting fork, the ⅞" UNF hex jam nut, in to the bottom shifter bushing. Thread the ⅞" jam nut on to the shifting shaft until the shifting fork is firmly anchored to the shoulder on the shifting shaft. Align the flats on top of the shifting shaft with the two shifter lugs.
35. Insert the shifter detent ball (PN 02-0018) and shifter detent spring (PN 997-0-64) into the shifter detent tube. Thread a 7/16" UNF jam nut on to a 7/16" UNF x 1-1/4" hex bolt. Thread the 7/16" x 1-1/4" hex bolt in to the shifter detent tube.
36. Install the motor mount (PN 1426-7) ensuring that the large flat on the motor mount is oriented toward the pinion bearing cap. Secure with five ¾" UNC x 1-¼" hex socket head cap screws and ¾" lock washers.
37. Insert the clutch shaft spacer (PN 1037-42) into the motor mount on to the top of the splined clutch shaft.
38. Install hydraulic motor (PN 87-0158). Use caution to make sure the external splines on the motor shaft are properly aligned with the internal splines in the clutch shaft, and secure with five ⅝" UNC x 2-½" hex bolts and ⅝" lock washers.
39. Install a guide ring (PN 1482-23) into the top of the rotary gear using fifteen ½" UNC x 2-¼" hex socket head cap screws.
40. Install the second guide ring onto the inside of the bottom cage plate (PN 101-3574) using fifteen ½" NC x 2-¼" hex socket head cap screws.
41. Apply a layer of grease to the guide ring mounted to the bottom cage plate. Support the bottom cage plate under the rotary gear, mating the guide ring with the slot on the gear.
42. Apply a layer of grease to the guide ring mounted to the rotary gear. Position the top cage plate weldment over the tong opening, mating the guide ring with the slot in the top cage plate weldment. Place the rear cage plate spacer (PN 1482-21-1) and the three tubular cage plate spacers (PN 1482-38) between the two cage plates and secure to each other using five ½" UNC x 8-½" hex bolts (see illustration 5.9.6).

5.9 ASSEMBLY PROCEDURES (CONTINUED):

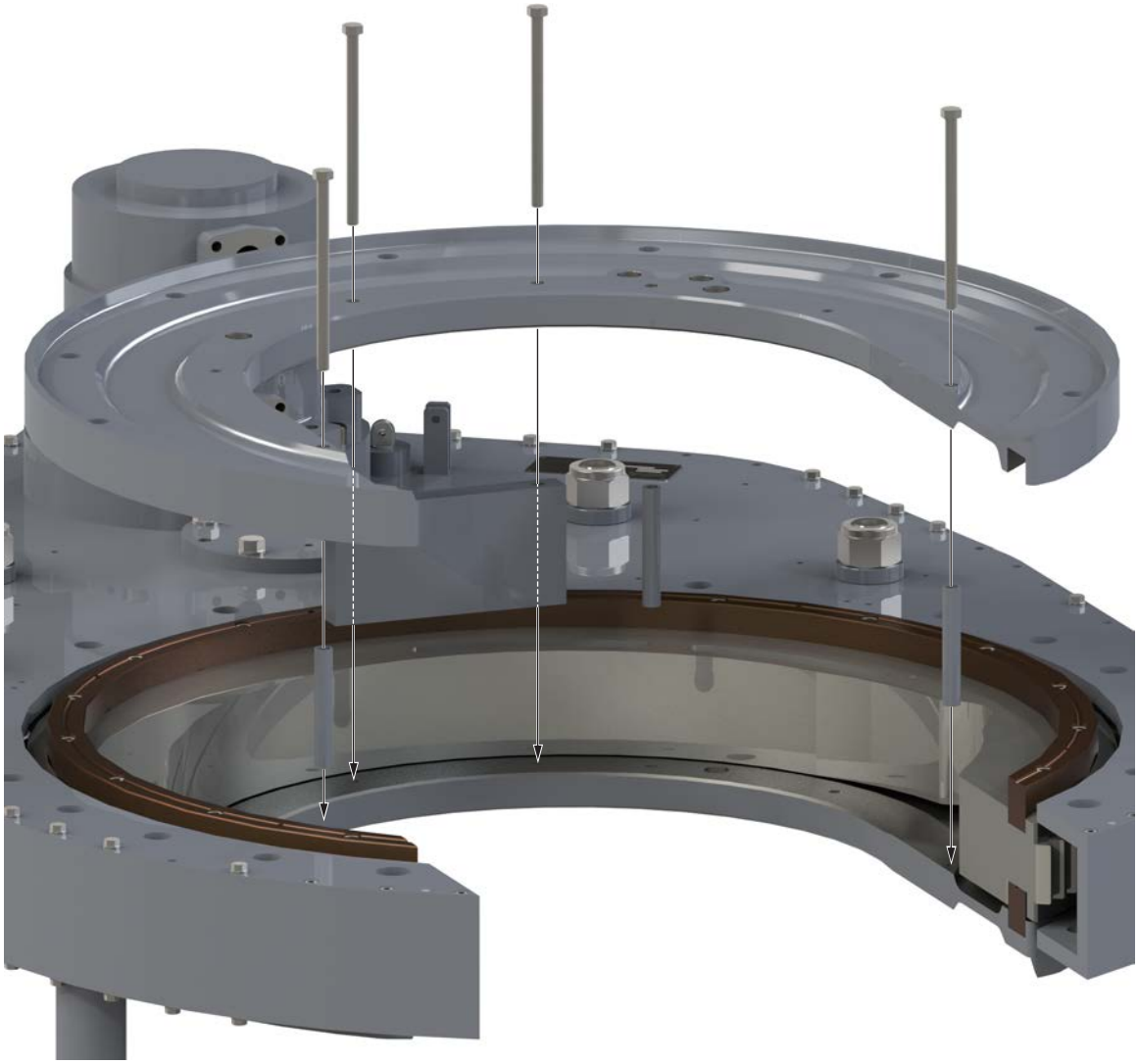

Illustration 5.9.6: Tong Assembly - Cage Plate Assembly

43. Connect the “toe” of the shifting handle weldment (PN 1037-D-20B) to the shifting lugs on the top plate of the tong using a 5/16” x 1” clevis pin, and secure the clevis pin with a 0.093” x 1-⅛” R-clip.
44. Connect the “heel” of the shifting shaft to the shifting shaft using two shifting links (PN 02-0120), and two 5/16” x 1-½” clevis pins secured with 0.093” x 1-⅛” R-clips.
45. Install the lower latch weldment (PN 101-1333) and latch spring (PN 1482-11A-12) into the RH door weldment as shown in the following illustration. Note that for reasons of clarity, the door stiffener plate is not shown. Once the latch and spring are in place, install a latch cover plate and secure with six ¼” x 1” hex bolts and ¼” lock washers. Repeat for the top latch weldment and latch spring (see illustration 5.9.7).

5.9 ASSEMBLY PROCEDURES (CONTINUED):

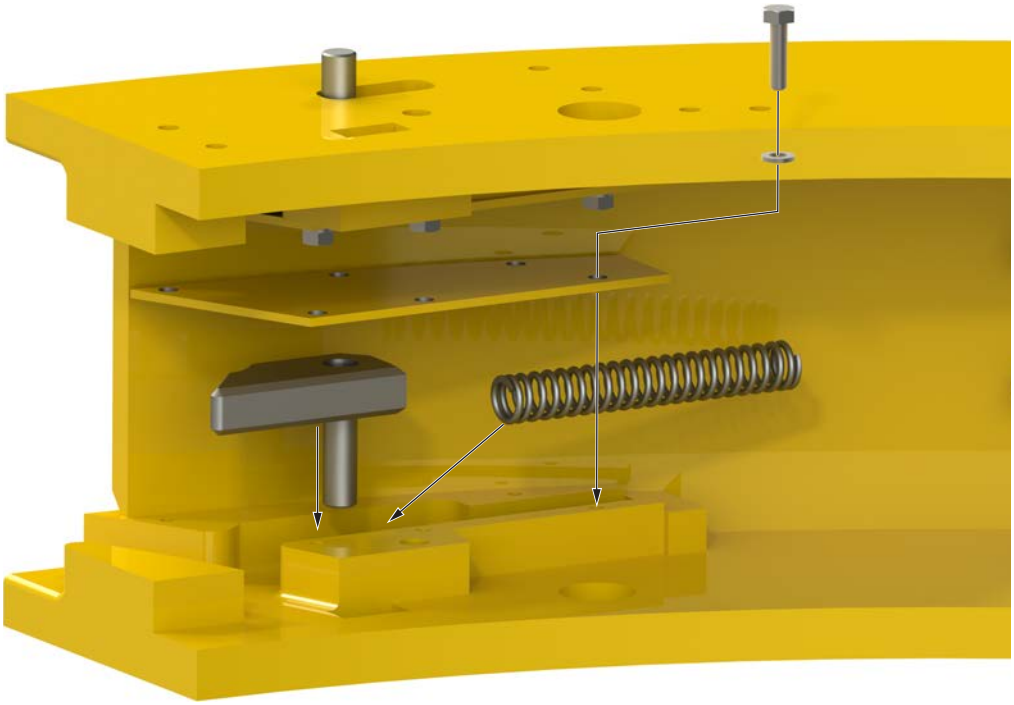

Illustration 5.9.7: Tong Assembly - Latch Claw & Spring Installation

46. Insert a sleeve bushing (PN 02-0520) in to the latch handle plate (PN 1482-11A-07) and the bottom plate of the door latch weldment (PN 101-1927).
47. Secure the door latch handle weldment (PN 101-1927) to the bottom plate of the RH door weldment using a ⅝" UNC x ¾" hex socket head UNC shoulder bolt and ⅝" wide flat washer. **ASSEMBLY NOTES:** Ensure flat bushing (PN 1482-12-08) is placed between the bottom plate of the door weldment and the bottom plate of the door weldment (see illustration 3.I.9). Ensure the pin on the bottom door latch pin extends through the latch handle weldment.
48. Secure the latch handle plate to the latch handle weldment and the top plate of the RH door assembly using a ½" UNC x 1-¼" hex bolt and ½" lock washer and a ⅝" UNC x ¾" hex socket head UNC shoulder bolt and ⅝" wide flat washer. **ASSEMBLY NOTES:** Ensure flat bushing (PN 1482-12-08) is placed between the latch handle plate and the top plate of the door weldment (see illustration 5.9.8). Ensure the pin on the top door latch pin extends through the latch handle plate.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

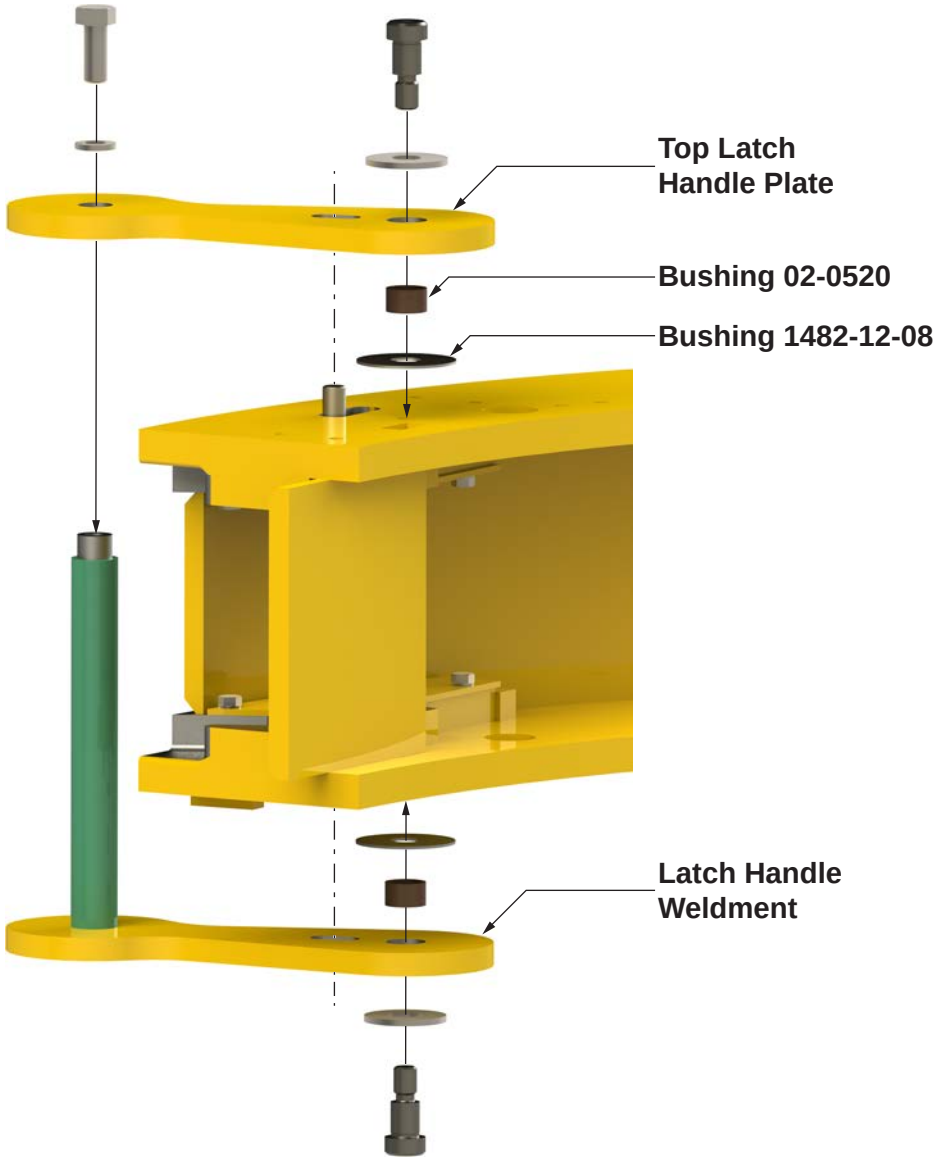

Illustration 5.9.8: Tong Assembly - Door Latch Handle Installation

49. Press door pivot sleeve bushings (PN 101-4670) into the top and bottom tong body plates at the door pivot locations (total of four locations). See illustration 5.9.9 next page.
50. Install the two remaining support roller assemblies at the door pivot locations inside the body plates. Do not neglect to install the two bearing spacers on each side of the assemblies.
51. Using a crane and temporary lifting sling, align the pivot holes in the RH door assembly with the door pivot rollers mounted in the tong. **ASSEMBLY NOTE:** Ensure a flat door bushing (PN 02-E0077) is installed between the inside of each door plate and each body plate before inserting pivot roller shaft. See illustration 5.9.9 next page.
52. Install the door pivot shaft (PN 1482-11-04). Use caution when inserting through the support roller components. Use an adjustable wrench on the flats of the shaft to thread in to the bottom plate of the door weldment. When the door pivot roller is fully inserted, back it off (if necessary) until the large flat on the shaft is perpendicular to the locking plate location. Secure the shaft with a pin lock plate (PN 1482-11-05), two ⅜" UNC x 1" hex bolts and two ⅜" lock washers.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

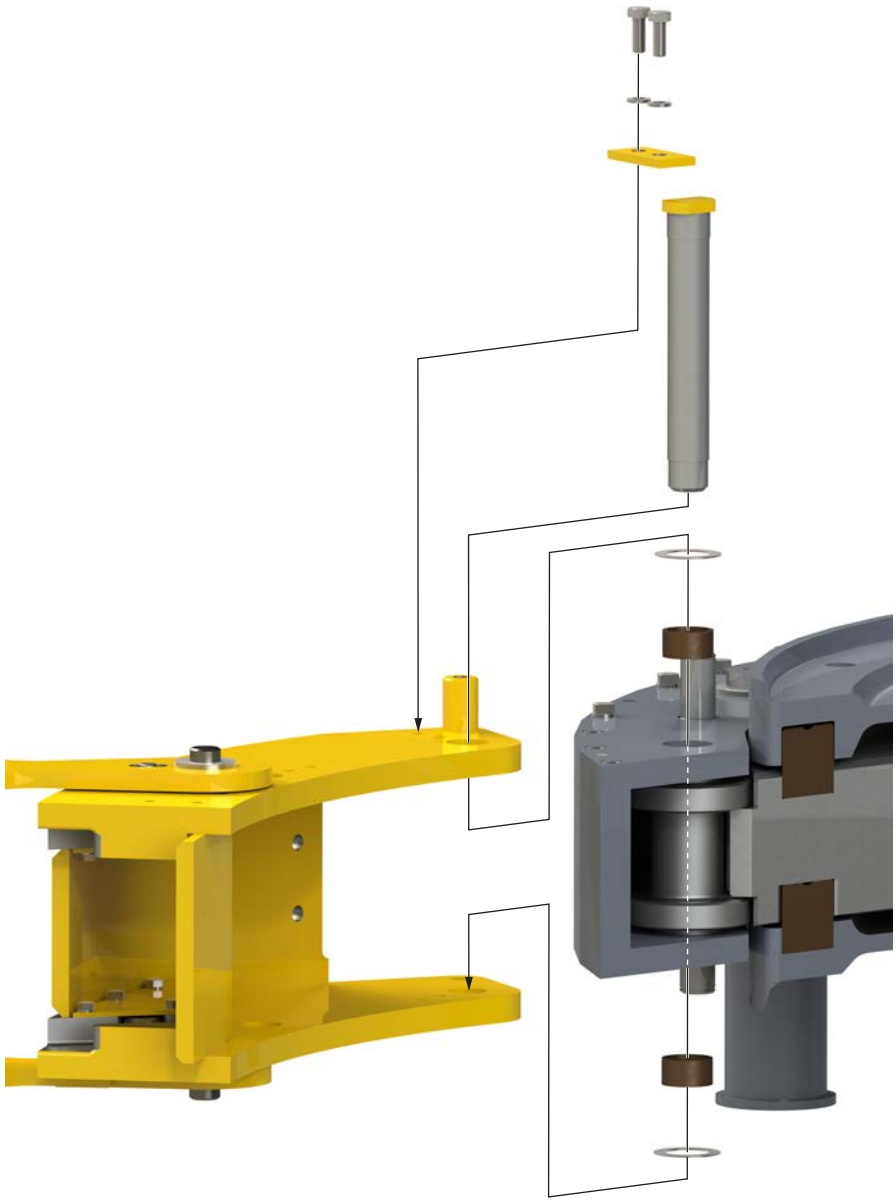

Illustration 5.9.9: Tong Assembly - Door Installation

53. Repeat the door installation procedure with the left-hand door assembly.
54. Insert an inner door roller spacer (PN 1482-11-08) in to each of the two door-mounted dumbbell rollers (PN 1482-11-03). Press support roller bearings (PN 02-0096) into both ends of the two door-mounted support roller assemblies.
55. Install one door-mounted support roller assembly into each door assembly, ensuring the door roller spacers (PN 1482-11-06) are used on each side of the roller assembly inside the door plates (see illustration 5.9.10).
56. Install the door roller shafts (PN 1482-11-04). Use caution when inserting through the door roller components. Use an adjustable wrench on the flats of the shaft to thread in to the bottom plate of each door weldment. When the door roller shaft is fully inserted, back it off (if necessary) until the large flat on the shaft is perpendicular to the locking plate location. Secure the shaft with a pin lock plate (PN 1482-11-05), two ⅜" UNC x 1" hex bolts and two ⅜" lock washers.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

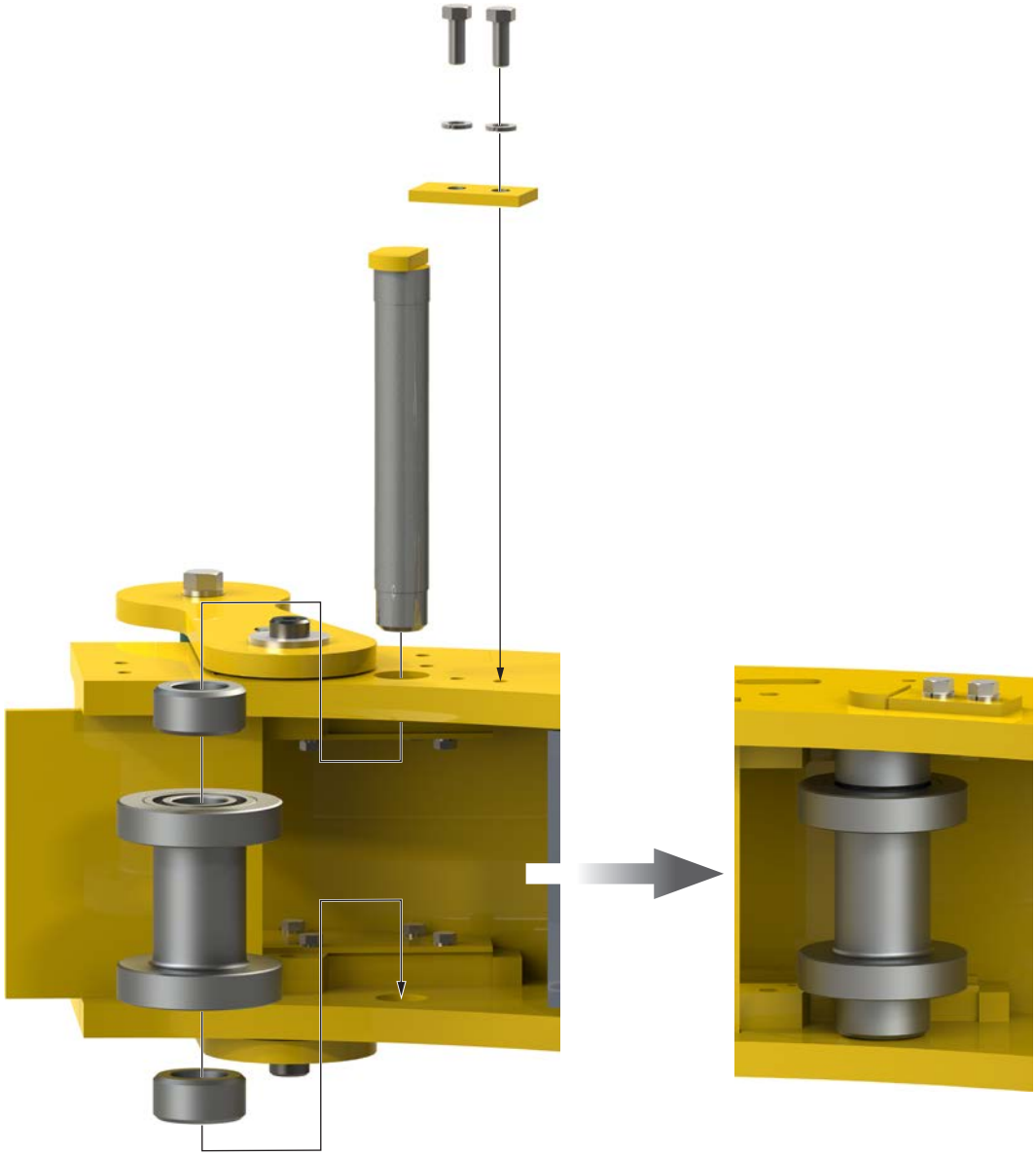

Illustration 5.9.10: Tong Assembly - Door Roller Installation

57. Secure the LH door handle weldment (PN 101-1926) to the bottom of the left-hand door weldment using two ½" UNC x 1-¼" hex bolts and ½" lock washers.
58. Secure the door handle top plate (PN 1482-11B-06) the left-hand door handle weldment using a ½" UNC x 1-¼" hex bolt and ½" lock washer.
59. The safety door switch protector weldment must be installed when securing the top door handle latch plate to the left-hand door weldment. Position the safety door switch protector weldment (PN 101-1239) in place on the left-hand door weldment over the top door handle latch plate, and secure with two ½" UNC x 1-¼" hex bolts and ½" lock washers, and two ½" UNC x 1" hex bolts and ½" lock washers.
60. Place the anchor end of a lined brake band weldment (PN 1482-29-01) over the top of each remaining support roller shafts. Secure the anchor end of each brake band weldment to the support roller with a 1" external retaining ring, and secure each brake band weldment to the top plate using a brake band retainer clip (PN 101-1631) and two ⅜" UNC x 1" hex bolts and ⅜" lock washers). Repeat the procedure on the bottom of the tong with the remaining brake band weldments.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

61. Thread a ⅜" UNC x 1-¼" hex socket head set screw into each brake band guide (PN 101-3586) - do not thread far enough that it protrudes into the inside.
62. Place a brake band guide over the top brake band lug (welded to the top plate directly behind the top cage plate), and insert a ½" UNC x 8" adjustment bolt through the tabs on both brake band weldments and the brake band tab and guide. Slide a brake band spring (PN 1404-29-04) over the end of the bolt, followed by a ½" narrow flat washer and a ½" UNC thin nylock nut. Repeat this step for the bottom brake bands.

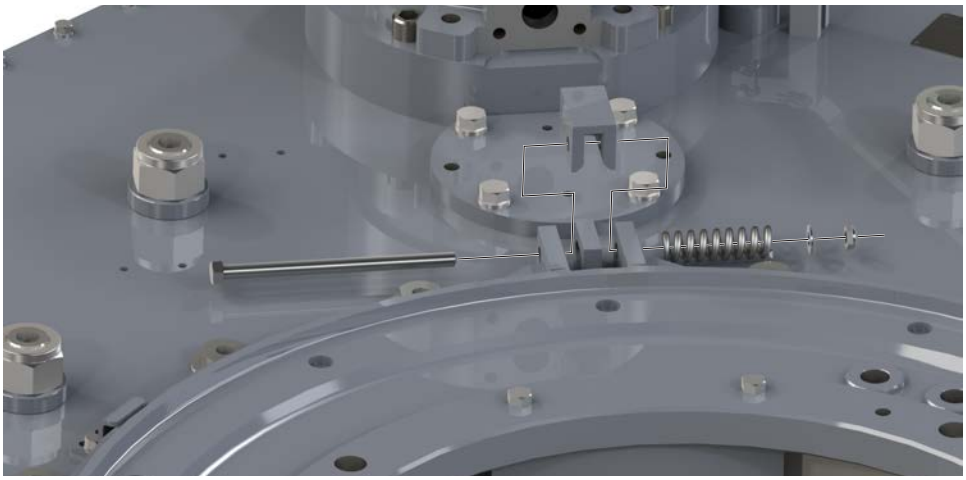

Illustration 5.9.11: Brake Band Adjustment Installation

63. Thread the set screws into the brake band guides just until the set screw contacts the brake band lug welded to the top plate. Once tong operation commences, the position of the guide may be adjusted to compensate for irregularities in brake band operation such as noise or uneven action of the brake bands.
64. Secure the rotation interlock sleeve bushing (PN 101-6402) and rotation interlock cam (PN 101-6403) to the top plate of each door weldment over the door pivot pins using two rotation interlock cam spacers (PN 101-6401), two ⅜" UNC x 3" hex bolts, and two ⅜" lock washers.

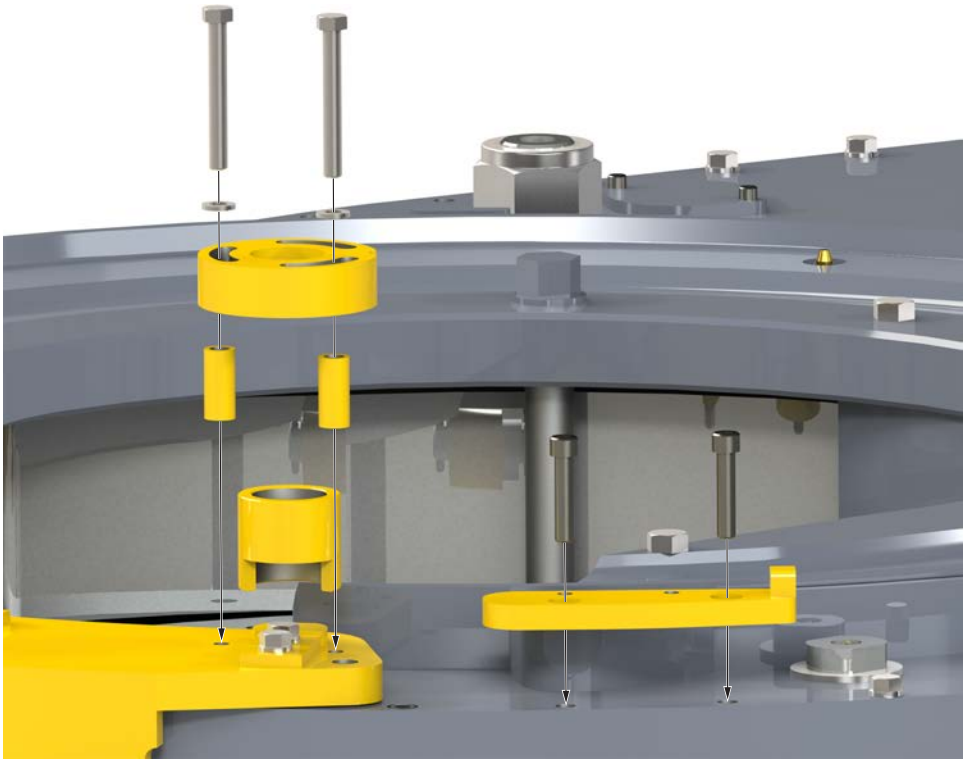

Illustration 5.9.12: Rotation Interlock Component Installation

5.9 ASSEMBLY PROCEDURES (CONTINUED):

65. Install LH rotation interlock adjustment plate weldment (PN 101-6397) and RH rotation interlock adjustment plate weldment (PN 101-6411) to the top plate of the tong adjacent to each brake band-coincidental support roller using two ⅜" UNC x 1-¾" hex socket head cap screws per weldment (see illustration 5.9.12).
66. Attach one side of a door spring stop cylinder (PN 101-6241) to the mounting post on the bottom of each door weldment using a ⅝" x ¾" hex socket head UNC shoulder bolt and a ½" lock washer. Attach the other side of each door spring stop cylinder to the bottom plate of the tong using one ½" x 3-¾" hex socket head cap screw, one ⅜ loc washer, and one door mount spacer (PN 101-6548). **ASSEMBLY NOTE:** The door spring stop cylinders may require a small amount of compression to facilitate installation. Use a clamp to compress the cylinder the required amount, and maintain compression until the cylinder is fully installed.

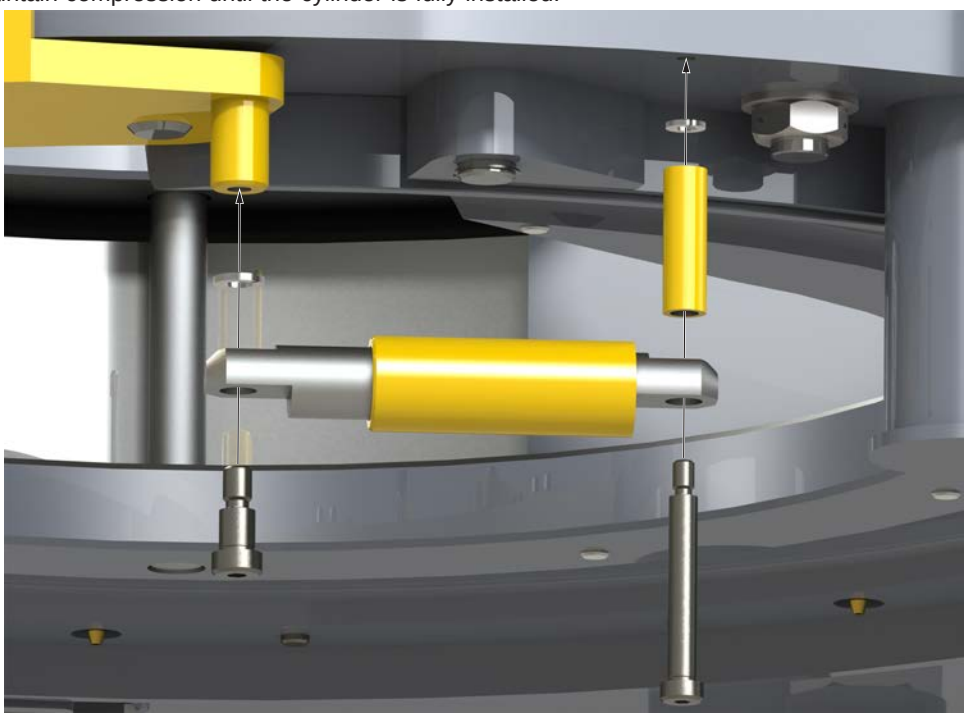

Illustration 5.9.13: Door Spring Stop Cylinder Installation

67. Attach a rotation interlock switch (PN 02-E0190) to the underside of the top plate of each switch guard weldment (LH weldment = PN 101-6399, RH weldment = PN 101-6405) using four ¼" UNC x 2" hex bolts and four ¼" lock washers per switch (see illustration 5.9.14 next page).
68. Attach each rotation interlock switch/guard assembly to the interlock mounting plate (previously installed in step 65) using two ⅜" UNC x 1" hex bolts and two ⅜" lock washer per assembly (see illustration 5.9.14 next page).

5.9 ASSEMBLY PROCEDURES (CONTINUED):

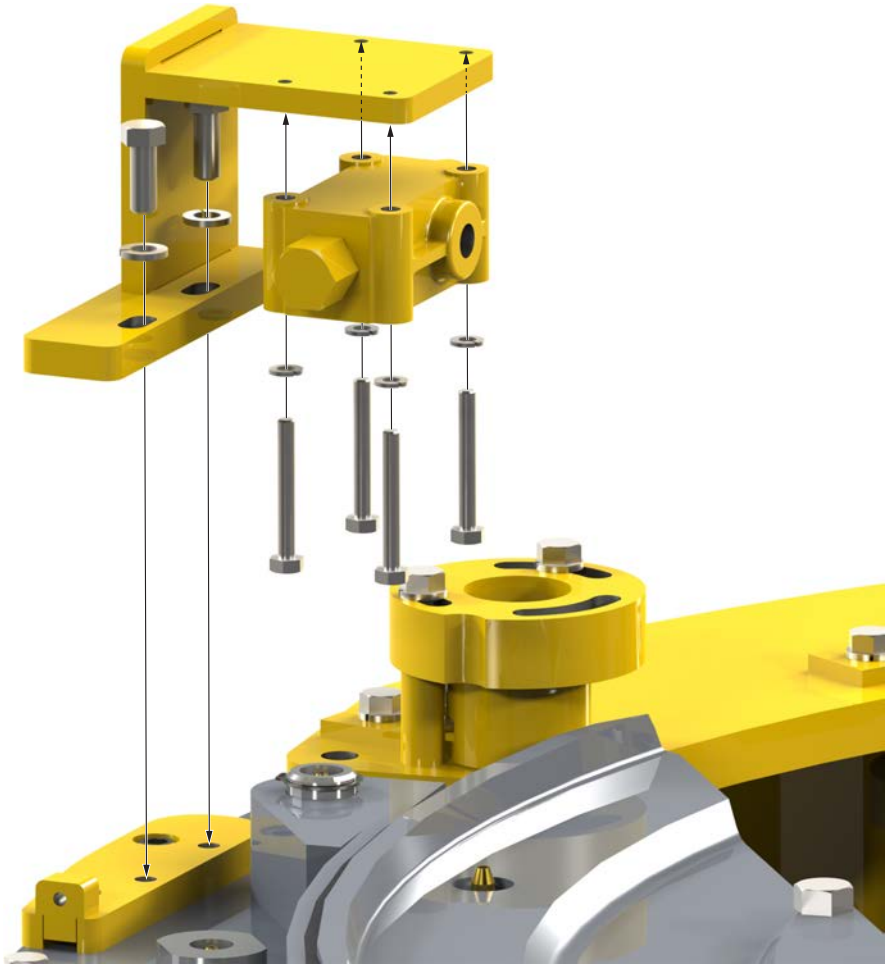

Illustration 5.9.14: Rotation Interlock Switch Installation

69. Thread a ¼" UNC hex nut fully on to a ¼" UNC x 1" hex bolt. Thread the bolt in to the threaded post on a rotation interlock switch mounting plate (previously installed in step 65) to serve as a switch adjustment bolt. Repeat this process for the other interlock switch mounting plate.
70. Treat the threads on the rear cage plate bolt (PN 1037-36) with red Loctite™. Insert the third cage plate spacer between the top and bottom cage plates at the backing pin pivot location. Insert the rear cage plate bolt from the top, through the spacer and thread in to the bottom cage plate until the shoulder bottoms out on the top cage plate.
71. Insert the backing pin (PN 1482-39) in to one of the two backing pin holes in the top cage plate. Place the backing pin retainer (PN 1482-54) on to the rear cage plate bolt and the backing pin, ensuring the larger diameter hole in the retainer encircles the backing pin.
72. Secure the backing pin retainer to the rear cage plate bolt using a ⅜" UNC x ¾" hex bolt and ⅜" wide flat washer. Thread the backing pin knob (PN 02-0017) on to the threads on top of the backing pin.
73. Install three hydraulic valve mount weldments (PN 101-1322) to the top plate of the tong using one ⅜" UNC x 1" hex bolt and ⅜" lock washer per mount. **INSTALLATION NOTE:** final position of the three valve mount weldments can only be permanently fixed once the valve assembly is installed.
74. Secure the torque gauge mount weldment (PN 101-1530) to the top plate of the tong just above the shifter/clutch access panel using two ⅜" UNC x 2" hex bolts and ⅜" lock washers. If necessary see illustration 5.9.5 for further location information.
75. Attach the two hydraulic support bases (PN 101-0023) and the hydraulic support base spacers (PN 101-0021) to the top plate of the tong using two ⅜" UNC x 2" hex bolts and ⅜" lock washers per support. See pages 7.26 - 7.27 for an illustration.

5.9 ASSEMBLY PROCEDURES (CONTINUED):

76. Attach an adjustable hydraulic support (PN 101-0022) to each support base using two ⅜" UNC x 1" hex bolts, ⅜" narrow flat washers, and ⅜" UNC thin nylock nuts.
77. Attach a rigid sling bracket mounting plate (PN 101-6919) to the top plate of the tong in the rigid sling mounting locations. Use three ⅜" UNC x 2" drilled hex bolts (PN 101-6972) and ⅜" lock washers along the outsides of the weldments, and three ⅜" UNC x 1-½" drilled hex bolts (PN 101-6079) and ⅜" lock washers along the insides of the plates.
78. Attach a rigid sling leveling/mounting bracket (PN 101-6393) to each rigid sling bracket mounting plate using four ½" UNC x 1-¾" drilled hex bolts (PN 101-6459) and four ½" lock washers.
79. If not already done, slide the master lifting link (PN 02-9128) over the adjustment helix (PN 1095-220), and install the adjustment helix in the rigid sling weldment (PN 101-6918) using the rigid sling bolt (PN 02-E0267) and a 1-¼" UNC nylock nut.
80. Use a crane to hoist the rigid sling weldment using the master lifting link. Install the bottom tabs of the rigid sling weldment in to each leveling/mounting bracket using a 1" x 2-½" hex socket head UNC shoulder bolt, ¾" UNC hex nut, and ¾" lock washer per bracket.
81. Attach two handle weldments (PN 101-6102) to the top plate using two ⅜" UNC x 2" hex bolts and ⅜" lock washers per weldment. If necessary see illustration 5.9.5 for further location information.
82. Use a crane and temporary lifting sling to lift the hydraulic valve assembly to the tong. Secure to the valve mounts using three ½" UNC x 4-½" hex bolts and ½" narrow flat washers. INSTALLATION NOTE: adjust the position of the valve mounts to facilitate installation of the valve assembly. When the position of the valve assembly is finalized tighten the hex bolts securing the valve mounts to the top plate.
83. Install grease fittings:
    a) Install nine ⅛" NPT grease fitting (PN 02-0005) into the top cage plate for support ring lubrication. Install eight ⅛" NPT grease fitting (PN 02-0005) into the bottom cage plate for support ring lubrication.
    b) Install one ¼" straight thread grease fitting (PN 02-0097) into the top of each support roller shaft, excluding the door pivot rollers and the two door-mounted support rollers (16 locations total).
    c) Install one ⅛" NPT grease fitting (PN 02-0005) into each rotary idler shaft and one ⅛" NPT grease fitting into each pinion idler shaft on the top of the tong (four locations total).
    d) Install two ⅛" NPT 90° grease fittings (PN 02-0093) in the top pinion bearing cap and two in the bottom pinion bearing cap (four locations total).
    e) Install one ⅛" NPT grease fitting (PN 02-0005) into the end of the clutch shaft in the centre of the clutch bearing cap, and install two ⅛" NPT 90° grease fittings (PN 02-0093) in the clutch pinion bearing cap.

5.10 DAILY INSPECTION & MAINTENANCE CHECKLIST

McCoy Global recommends that the following inspection and maintenance procedures be performed before each use, and at least once per day when the tong is in steady use, in the order in which they are listed.

1. ☐ Rotate cage plate/rotary gear until the opening in the rotary gear faces towards the rear of the tong.

⚠ WARNING

DO NOT PERFORM ANY FURTHER ACTIONS OR MAINTENANCE WHILE THE TONG IS CONNECTED TO ANY HYDRAULIC POWER SUPPLY. MCCOY GLOBAL RECOMMENDS THAT ALL HYDRAULIC LINES ARE FULLY DISCONNECTED, AND RESIDUAL HYDRAULIC PRESSURE IS BLED OFF. ENSURE ADEQUATE CONTAINMENT IS IN PLACE TO PREVENT ENVIRONMENTAL CONTAMINATION FROM RESIDUAL HYDRAULIC FLUID.

2. ☐

Depressurize Hydraulic System In Preparation For Maintenance:

1. Rotate the tong to the “open throat” position. Ensure tong and backup doors (if equipped) are closed. Fully extend the lift cylinder
2. De-energize the power unit.
3. Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.
4. Remove the hydraulic SUPPLY line from the equipment.
5. Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.
7. Disconnect the hydraulic RETURN line from the equipment.
8. Disconnect remaining hoses such as case drains, or lines connected to the turns counter.

⚠ WARNING

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICIAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

3. ☐ Remove the majority of dirt and grease build-up from the tong, backup, and frame assembly using a hose with spray nozzle, or a pressure washer set to the “low pressure” mode. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid and dirty grease.

4. ☐ Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.

5. ☐ Use a flashlight to perform a visual inspection of the gear train through the access panel and the opening of the rotary gear. If gear damage or chips of metal are seen, the tong should be removed from service and overhauled to avoid further damage.

6. ☐ Perform a visual inspection of all fasteners and protruding body pieces (example: hydraulic valve mounts, inlet & outlet line supports, tong legs, shifter handle pivot lugs). Tighten or replace loose or missing fasteners. McCoy Global recommends that damaged or missing body parts be repaired or replaced as soon as possible.

7. ☐ Inspect the jaws and dies on the tong and backup. Inspect the jaw roller pins for signs of damage - replace pins if necessary. If the pins are welded in place, replace the entire jaw assembly. Ensure dies are secure in the jaw - replace worn dies if necessary. Ensure that the jaw rollers rotate freely. Check to ensure the size of the loaded jaws match the size of casing or pipe you are running.

8. ☐ Perform a visual inspection of all lifting points - if visible damage is seen, including cracks, broken lugs, distorted metal, etc. replace damaged part(s) before placing tong in service. Also inspect all chains, master links, and turnbuckles - again, if any damage is noted replace the damaged part(s) before placing the tong in service.

9. ☐ Inspect tong for signs of premature wear, or moving parts that are rubbing (bare metal where there used to be paint is a good indication of wear).

5.10 DAILY INSPECTION & MAINTENANCE CHECKLIST (CONTINUED):

10. ☐ Inspect backing pin(s). If cracked, broken, or bent it (they) must be replaced.
11. ☐ Inspect top and bottom brake band linings - replace if necessary. Unequal wear of the brake bands indicates that the brake band tension is not evenly adjusted. Refer to the maintenance section of the manual for instructions on properly adjusting brake bands.
12. ☐ Perform a visual inspection of all hydraulic lines. Replace flexible lines if they appear to be cracked, fatigued, or have visible signs of wear from contact with a rigid object.
13. ☐ Perform a complete lubrication of the tong - refer to Maintenance section of the technical manual
14. ☐ Ensure main supply and return connections to the tong are fully made up. Re-connect the remainder of the hydraulic lines, and, if applicable, the electrical line to the turns counter.

⚠ WARNING

FAILURE TO ENSURE THAT THE SELF-SEALING SUPPLY AND RETURN LINES ARE FULLY MADE UP MAY RESULT IN CATASTROPHIC EQUIPMENT FAILURE.

If using a stand-alone power unit, start it now - refer to the power unit technical manual for startup procedures. Listen to power unit for a moment to see if there are any unusual mechanical sounds (rubbing, grinding, excessive pump noise). If using a diesel unit, allow sufficient time for the engine to reach operating temperature before increasing engine RPM. Once engine is warm, gradually increase engine RPM until operating speed is reached.

15. ☐ Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.
16. ☐ Perform a visual inspection of pressurized hydraulic lines. Document and correct any hydraulic fluid leaks.
17. ☐ Perform a full functional test of the tong (see subsection 4.0.5). Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.
18. ☐ Perform a visual inspection of the load cell. If using a tension load cell, replace any cracked, broken, or distorted components including links and chains.
19. ☐ If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.
20. ☐ Test safety door feature. Refer to safety door testing procedure in subsection 4.0.5, "Pre-operational Checks".

⚠ DANGER

DO NOT OPERATE TONG WITH A MALFUNCTIONING OR NON-OPERATING SAFETY DOOR SYSTEM.

21. ☐ While rotating the cage plate, ensure that the jaws properly cam. If the jaws do not cam properly, the brake bands need to be tightened. Incrementally adjust both the top and bottom brake bands EQUALLY until proper cam action is achieved (see section 5.6.1).

5.11 MONTHLY MAINTENANCE CHECKLIST

The following maintenance checklist is intended as a guideline rather than a definitive maintenance schedule. Your equipment may require more, or less, maintenance depending upon the frequency of use, the percentage of maximum torque that your equipment is routinely subjected to, and the field conditions under which your equipment operates. McCoy Global recommends that the following inspection and maintenance procedures be performed monthly, or in conjunction with your maintenance foreman's experience and best estimate of when your equipment is due for this maintenance.

1. ☐ Rotate cage plate/rotary gear until the opening in the rotary gear faces towards the rear of the tong.

⚠ WARNING

DO NOT PERFORM ANY FURTHER ACTIONS OR MAINTENANCE WHILE THE TONG IS CONNECTED TO ANY HYDRAULIC POWER SUPPLY. MCCOY GLOBAL RECOMMENDS THAT ALL HYDRAULIC LINES ARE FULLY DISCONNECTED, AND RESIDUAL HYDRAULIC PRESSURE IS BLED OFF. ENSURE ADEQUATE CONTAINMENT IS IN PLACE TO PREVENT ENVIRONMENTAL CONTAMINATION FROM RESIDUAL HYDRAULIC FLUID.

2. ☐

DEPRESSURIZE HYDRAULIC SYSTEM IN PREPARATION FOR MAINTENANCE:

1. Rotate the tong to the "open throat" position. Ensure tong and backup doors (if equipped) are closed. Fully extend the lift cylinder
2. De-energize the power unit.
3. Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.
4. Remove the hydraulic SUPPLY line from the equipment.
5. Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.
7. Disconnect the hydraulic RETURN line from the equipment.
8. Disconnect remaining hoses such as case drains, or lines connected to the turns counter.

⚠ WARNING

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICIAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

3. ☐ Clean the exterior of the equipment thoroughly, using either a water hose with a spray nozzle or a pressure washer using a low-pressure wash wand, or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents.

4. ☐ Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.

5. ☐ Clean the interior spaces of the equipment thoroughly, using either a water hose with a spray nozzle (do not use a pressure washer), or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents. Make a note if any metal shavings or metal pieces are flushed out of the gear train cavity - if shavings or metal pieces are seen the tong must be overhauled before it is returned to service.

6. ☐ Inspect all fasteners and fastener safety wires (if equipped). Replace any missing fasteners - use Grade 8 bolts only unless otherwise specified. Re-torque all external fasteners to SAE specifications.

7. ☐ Repair or replace any damaged or missing external body parts, such as torque gauge mounts, hydraulic supports, safety door protectors, etc.

8. ☐ Perform a visual inspection of all protruding body pieces (example: hydraulic valve mounts, inlet & outlet line supports, tong legs, shifter handle pivot lugs). Tighten or replace loose or missing fasteners. McCoy Global recommends that damaged or missing body parts be repaired or replaced as soon as possible.

5.11 MONTHLY MAINTENANCE CHECKLIST (CONTINUED):

9. ☐ Inspect tong for signs of premature wear, or moving parts that are rubbing (bare metal where there used to be paint is a good indication of wear.
10. ☐ Inspect all paint - locations in which the paint has been damaged must be repaired prior to the tong being returned to service. Prepare areas to be painted to ensure they are free of grease, dirt, or solvent. Touch up using a solvent-based acrylic paint. Allow sufficient time for paint to dry before proceeding.
11. ☐ Inspect all external welds. Any weld that is cracked or separating must be repaired and repainted before returning the tong to service.
12. ☐ Perform a visual inspection of all lifting points - if visible damage is seen, including cracks, broken lugs, distorted metal, etc. replace damaged part(s) before placing tong in service. Also inspect all chains, master links, and turnbuckles - again, if any damage is noted replace the damaged part(s) before placing the tong in service. Refer to Section 3.1 of the technical manual for information on recommended testing and recertification.
13. ☐ Inspect all jaws and dies used since the last monthly inspection. Inspect jaw roller pins for signs of damage - replace pins if necessary. If damaged pins are welded in place, remove and quarantine the jaw until the weld is repaired. Ensure dies are secure in the jaw - replace worn dies if necessary. Ensure that the jaw rollers rotate freely.
14. ☐ Inspect backing pin(s). Replace cracked, broken, or bent pins.
15. ☐ Inspect top and bottom brake band linings - replace if necessary. Unequal wear of the brake bands indicates that the brake band tension is not evenly adjusted. Refer to the maintenance section of the manual for instructions on properly adjusting brake bands.
16. ☐ Test the door stop spring cylinder(s). Ensure the springs retain sufficient strength to be able to assist the opening of the door, and to keep the door open. The springs should also help to “snap” the door shut.
17. ☐ Perform a visual inspection of all hydraulic lines. Replace flexible lines if they appear to be cracked, fatigued, or have visible signs of wear from contact with a rigid object. If your tong is equipped with rigid hydraulic lines, replace any line that is dented or appears to be stressed or cracked.
18. ☐ Generously fill the gear train housing with grease. Perform a full lubrication per section 5.5 of this manual.
19. ☐ Ensure main supply and return connections to the tong are fully made up. Re-connect the remainder of the hydraulic lines, and, if applicable, the electrical line to the turns counter.

⚠ WARNING

FAILURE TO ENSURE THAT THE SELF-SEALING SUPPLY AND RETURN LINES ARE FULLY MADE UP MAY RESULT IN CATASTROPHIC EQUIPMENT FAILURE.

If using a stand-alone power unit, start it now - refer to the power unit technical manual for startup procedures. Listen to power unit for a moment to see if there are any unusual mechanical sounds (rubbing, grinding, excessive pump noise). If using a diesel unit, allow sufficient time for the engine to reach operating temperature before increasing engine RPM. Once engine is warm, gradually increase engine RPM until operating speed is reached.

20. ☐ Ensure that supply pressure is at or above the equipment’s specified operating pressure, and that the return pressure is less than 350 psi.
21. ☐ Perform a visual inspection of pressurized hydraulic lines. If any hydraulic fittings or hoses are leaking they must be repaired or replaced before proceeding.
22. ☐ Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, finishing with the opening of the rotary gear facing the gear train. De-energize the power unit, and perform another generous lubrication of the gear train, including the gear housing.
23. ☐ Energize power unit. Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, ending with the opening of the rotary gear facing the gear train.
24. ☐ De-energize the power unit, and perform a third generous lubrication of the gear train, including the gear housing.
25. ☐ Rotate tong at low speed for 5 minutes while monitoring pressurized seals and hydraulic lines. If a seal, line, or fitting begins to leak while tong is rotating, it must be replaced before the equipment is returned to service.

5.11 MONTHLY MAINTENANCE CHECKLIST (CONTINUED):

26. ☐ Rotate tong at high speed for 5 minutes while monitoring temperature of top and bottom bearing caps. If the bearing caps are hot to the touch (higher than approximately 50°C) replace the applicable bearings. Note any unusual sounds (grinding, rubbing) may be indicative of damaged bearings (see section 7 for exploded views for all bearing locations). Monitor hydraulic inlet and outlet lines to ensure operating temperature of the hydraulic fluid does not exceed the specifications stated in Section 2.3.

27. ☐ Install load cell. Perform a visual inspection of the load cell components and replace any cracked, broken, or distorted items including links and chains. Check oil level in load cell and fill if necessary (refer to Section 8 of the technical manual).

28. ☐ Inspect the load cell anchor pins. Replace the anchor pins if cracking or metal distortion is seen.

29. ☐ While rotating the cage plate, ensure that the jaws properly cam. If the jaws do not cam properly, the brake bands need to be tightened. Incrementally adjust both the top and bottom brake bands EQUALLY until proper cam action is achieved. Refer to the section 5.6.1 for instructions on properly adjusting brake bands.

30. ☐ Perform a full functional test of the tong including, if applicable, backup components, lift cylinder, and float frame components. Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.

31. ☐ Test safety door feature. Refer to safety door testing procedure in subsection 4.0.5, “Pre-operational Checks”.

⚠ DANGER

DO NOT OPERATE TONG WITH A MALFUNCTIONING OR NON-OPERATING SAFETY DOOR SYSTEM.

32. ☐ McCoy Global recommends that an anti-corrosive agent such as Tectyl® 506 be applied to all external unpainted surfaces (and chain slings) EXCEPT cylinder rods, jaw rollers, and rotary gear camming surfaces. Refer to manufacturer data sheets for proper application and safety information.

Once all of the above maintenance checklist items have been satisfactorily completed the equipment may be returned to service.

5.12 TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING

Perform the following decommissioning procedures when removing tubular connection equipment from service, with the intent of short to long-term storage. These procedures are essential for ensuring proper protection of the equipment from environmental attack, and to aid in the quick turnaround when returning the equipment to service.

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.

Do not perform any further actions or maintenance while the tong is connected to any hydraulic power supply. McCoy Global recommends that all hydraulic lines are fully disconnected, and residual hydraulic pressure is bled off. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid.

NOTICE

IN ORDER TO MAINTAIN THE INTEGRITY OF INSTALLED SEALS, MCCOY GLOBAL RECOMMENDS THAT THE MAXIMUM STORAGE INTERVAL NOT EXCEED ONE YEAR. AT LEAST ONCE PER YEAR ALL TUBULAR CONNECTION EQUIPMENT IN LONG-TERM STORAGE SHOULD BE RECOMMISSIONED AS PER SECTION 4.L. IF FURTHER STORAGE IS REQUIRED, THE EQUIPMENT SHOULD THEN BE PUT THROUGH ANOTHER DE-COMMISSIONING PROCEDURE.

De-pressurization Procedure In Preparation For Storage:

1. Rotate the tong so that the opening in the rotary gear faces the gear train (towards the rear of the tong). Ensure tong and backup doors are closed.
2. De-energize the hydraulic power supply.
3. Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.
4. Remove the hydraulic SUPPLY line from the equipment.
5. Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.
7. Disconnect the hydraulic RETURN line from the equipment.
8. Disconnect all remaining quick-connect hoses.
9. Disconnect all remaining connections from the equipment - for example, load cell connections, turns counter connections, dump valve connections. Ensure the equipment is completely free of all connections before beginning storage preparations.

⚠ WARNING

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICIAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

1. ☐ Perform an initial wash of the equipment in order to remove the majority of dirt and grease build-up. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid and dirty grease.
2. ☐ Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.
3. ☐ Clean the interior of the tong thoroughly, using either water (do not use a pressure washer), or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents. Make a note if any metal shavings or metal pieces are flushed out of the gear train cavity - if shavings or metal pieces are seen the tong must be overhauled before it is returned to service.
4. ☐ Clean the exterior of the equipment thoroughly, using either water (do not use a pressure washer), or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents.
5. ☐ Inspect all fasteners and fastener safety wires (if equipped). Replace any missing fasteners - use Grade 8 bolts only. Re-torque all external fasteners to SAE specifications.
6. ☐ Inspect backing pin(s). Replace cracked, broken, or bent pins.

5.12 TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING (CONTINUED):

7. ☐ Repair or replace any damaged or missing external body parts, such as torque gauge mounts, hydraulic supports, safety door protectors, etc.

8. ☐ Inspect all paint - locations in which the paint has been damaged must be repaired prior to the tong being returned to service. Prepare areas to be painted to ensure they are free of grease, dirt, or solvent. Touch up using a solvent-based acrylic paint - “McCoy Grey” is paint color number RAL7015, “McCoy Yellow” (hazard areas) is RAL1007, and McCoy Green is RAL6029 (contact McCoy Global sales for paint number for custom paint applications). Allow sufficient time for paint to dry before proceeding.

9. ☐ Perform a liberal lubrication of the equipment - refer to section 5.5 in this manual to determine lubrication points. Generously fill the gear train housing with grease through the opening in the rotary gear.

10. ☐ Connect the equipment to a hydraulic power unit. Ensure all quick-connect control lines are securely connected to prevent equipment damage from excessive back pressure. Do not neglect to connect the motor drain.

11. ☐ Energize hydraulic power to the equipment.

12. ☐ Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, ending with the opening of the rotary gear facing the gear train. De-energize the power unit, and perform another generous lubrication of the gear train, including the gear housing.

13. ☐ Energize hydraulic power to the equipment. Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, ending with the opening of the rotary gear facing the gear train.

14. ☐ De-energize the power unit, and perform a third generous lubrication of the gear train, including the gear housing.

15. ☐ Energize hydraulic power to the equipment, and rotate the tong for a final time, one minute in one direction, stop, and reverse the direction of rotation for another minute, this time ending with the rotary gear in the “open throat” position.

16. ☐ Extend all hydraulic cylinders, and inspect cylinder rods for signs of mechanical damage, flaking, or rust. McCoy Global recommends that damaged cylinders be replaced prior to storage.

17. ☐ Depresurize the equipment in preparation for storage

1. Rotate the tong to the “open throat” position.
2. Exercise each hydraulic cylinder several times - open the tong and backup doors, retract and extend the reversing pins, retract and extend the float cylinders. Finish with all cylinders except for the door cylinders in their fully retracted position. The general idea is to have as little of the chrome cylinder rods exposed as possible.
3. De-energize the power unit.
4. Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.
5. Remove the hydraulic SUPPLY line from the equipment.
6. Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.
7. Connect a low-pressure air supply line (10 PSI or less) to the hydraulic supply line, and force a small amount of the remaining hydraulic fluid from the valve assembly - this will allow for thermal expansion of the hydraulic fluid if the equipment is stored or transported in high ambient temperatures. Failure to do this may result in damaged or destroyed seals in the equipment.
8. Disconnect the hydraulic RETURN line from the equipment.
9. Disconnect all remaining quick-connect hoses.
10. Disconnect all remaining connections from the equipment - for example, load cell connections, turns counter connections, dump valve connections. Ensure the equipment is completely free of all connections before beginning storage preparations.

⚠ WARNING

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICIAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

5.12 TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING (CONTINUED):

18. ☐ Repair or replace all leaking hydraulic fittings or hoses before proceeding.

19. ☐ Use a solvent-based cleaner on rags to wipe all external surfaces to remove all residual grease or hydraulic fluid. Once the exterior surfaces have been de-greased, wipe all external surfaces with clean water to remove residual solvent.

20. ☐ McCoy Global recommends that an anti-corrosive agent such as Tectyl® 506 be applied to all external surfaces EXCEPT cylinder rods (including chain slings). Refer to manufacturer data sheets for proper application and safety information. Allow the anti-corrosive coating ample time to dry - refer to manufacturer data sheets for drying times at room temperature.

⚠ CAUTION

DO NOT ALLOW ANTI-CORROSIVE AGENTS TO CONTACT CYLINDER RODS. CYLINDER ROD DAMAGE WILL OCCUR.

21. ☐ Apply grease or heavy oil to all exposed cylinder rods.

22. ☐ Allow the anti-corrosive coating ample time to dry - refer to manufacturer data sheets for drying times at room temperature.

23. ☐ Wrap entire assembly in 100 gauge (1 mil) corrosion-inhibiting wrap, at least 3 layers thick. Attempt to ensure that the equipment is well-sealed within the wrapping, including the bottom.

If possible, store in a sealed, climate controlled environment. If isolated storage is not available, McCoy Global recommends storing your wrapped equipment in a secure, out-of-the-way location, using silica gel desiccant to reduce the humidity within the wrapping. As a guideline, use 125 g. of desiccant for each cubic meter of space, or 3.5 g. per cubic foot.

Calculation Of Required Desiccant:

1. Calculate the trapped air volume by measuring the outside dimensions of the equipment to be stored, and treat that as the volume to be stored. For example, the approximate external dimensions of this equipment are 102” x 92” x 67.5”, which calculates to an approximate volume of 633420 in^3, or 367 ft^3 (10.392 m^3).
2. Multiply the calculated air volume, in cubic feet, by the recommended amount of desiccant per cubic foot. Carrying forth the example used in the previous step, the required desiccant charge would be 3.5 g. x 367 ft^3, equaling 1.285 kg. Several manufacturers offer silica gel desiccant in packaged quantities of 125 grams per bag, so ten to eleven packages of desiccant would be required. Please keep in mind that this is a guideline only - more or less desiccant may be required in extreme environmental conditions.

For best corrosion resistance the equipment should be removed from storage and exercised on a regular basis, depending on the storage environment. McCoy Global recommends that for equipment stored in a salt-water maritime or exposed dusty environment, repeat steps 9 through 24 monthly. For equipment stored in isolated storage in a non-maritime environment, repeat steps 9 through 24 quarterly. Replace desiccant packs at this time - depleted desiccant packs may be treated as regular dunnage.

Shipping Instructions:

The following procedure lists the steps to be followed to prepare your tong for shipping.

1. If not already done remove accessories (tong jaws, load cell, torque gauge, etc.) McCoy Global recommends wrapping these items in protective wrap and placing in a separate wooden crate.
2. Place the equipment on a sturdy pallet constructed of 4” x 4” cross-members and 2” x 4” flooring. Ensure the pallet is large enough to accommodate the wooden crate containing the tong accessories (see illustration 5.12.1)

5.12 TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING (CONTINUED):

Illustration 5.12.1: Shipping Instructions - Pallet Placement

3. Securely strap the equipment in place using metal strapping (see Illustration 5.12.2). Place strapping as close to the cross-members under the equipment legs as possible, and use caution not to entrap any flexible hydraulic hoses beneath the strapping (guide strapping through beneath the hydraulic hoses). Use the following guidelines to determine the strapping requirements:

Illustration 5.12.2: Shipping Instructions - Strapping to Pallet

5.12 TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING (CONTINUED):

3. Securely strap the equipment in place (continued):

   Assemblies weighing 1000 lbs. (454 kg.) or less:

   3/4” x 0.029” metal strapping, 3320 lbs. (1509 kg.) tensile strength
   Minimum two straps

   Assemblies weighing more than 1000 lbs. (454 kg.) or less:

   1-1/4” x 0.031” metal strapping, 5500 lbs. (2500 kg.) tensile strength
   Minimum two straps for assemblies weighing less than 5000 lbs. (2273 kg.)
   Minimum three straps for assemblies weighing more than 5000 lbs. (2273 kg.)

   Before tightening strapping, place strapping protectors wherever the metal strapping comes into contact with the equipment.

   Place the wooden crate containing the tong accessories on the crate next to the equipment. Strap the crate to the pallet using 3/4” x 0.029” metal strapping. If it is not practical to place larger loose items in a wooden crate, ensure they are also securely strapped to the pallet using 3/4” x 0.029” metal strapping.

4. Use a large polyethylene shipping bag (sometimes called a pallet cover) to completely enclose the equipment. Seal polyethylene bag to the pallet using 1 mil polyethylene wrap. Use the wrap to conform the plastic cover to the general shape of the equipment, but do not wrap so tight that sharp edges on the equipment perforate the cover.

5. McCoy Global recommends enclosing the equipment in a sturdy shipping crate which is securely fastened to the pallet.

5.13 TUBULAR CONNECTION EQUIPMENT RE-COMMISSIONING PROCEDURE

Perform the following recommissioning procedures when removing tubular connection equipment from short or long-term storage back into regular service. These procedures are essential for ensuring proper equipment preparation and operation. The following procedures also assume that the decommissioning and storage procedures recommended by McCoy Global have been strictly observed.

1. ☐ Remove all protective plastic wrapping. Exhausted desiccant packs within the wrapping may be disposed of with the regular garbage. Remove all remaining shipping and/or storage material including straps, blocks, plugs, wire-ties, etc. Ensure the backup floats freely on its suspension chains.
2. ☐ Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.
3. ☐ Wipe excess grease or heavy oil from exposed cylinder rods.
4. ☐ Perform a visual inspection of all lifting points - visibly damaged components (cracks, broken lugs, distorted metal, etc.)must be replaced or repaired before placing tong in service. Inspect all chains, master links, and turn-buckles. Damaged components must be replaced before placing the tong in service. If your company requires yearly certification of lifting equipment, ensure that the most recent test date falls within the past year. Perform recertification if necessary.
5. ☐ Perform a liberal lubrication of the equipment - refer to section 5.5 to determine lubrication requirements. Generously fill the gear train housing with grease through the opening in the rotary gear.
6. ☐ Connect the equipment to a hydraulic power unit. Ensure all lines are fully made up to prevent equipment damage from excessive back pressure. Do not neglect to connect the motor drain.

⚠ WARNING

FAILURE TO ENSURE THAT THE SELF-SEALING SUPPLY AND RETURN LINES ARE FULLY MADE UP MAY RESULT IN CATASTROPHIC EQUIPMENT FAILURE.

7. ☐ Energize hydraulic power to the equipment. Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.
8. ☐ Perform a thorough inspection of pressurized hydraulic lines and fittings. Leaking hydraulic fluid lines or fittings must be replaced before returning the equipment to service.
9. ☐ Perform a thorough inspection of all seals. Any seal that is leaking or "weeping" must be replaced before returning the equipment to service.
10. ☐ Rotate tong at low speed for 5 minutes while monitoring pressurized seals and hydraulic lines. If a seal, line, or fitting begins to leak while tong is rotating, it must be replaced before returning the equipment to service. Finish this step with the rotary gear opening facing the gear train. De-energize the power unit.
11. ☐ Inspect all flexible hydraulic lines for signs of wear, blistering, or any other signs of potential failure - replace if signs of potential failure are identified.
12. ☐ Inspect the gear train housing. If the amount of grease is inadequate, liberally grease the gear train through the access panel, and through the opening in the rotary gear.
13. ☐ Inspect top and bottom brake band linings - replace if necessary. Unequal wear of the brake bands indicates that the brake band tension is not evenly adjusted. Refer to the maintenance section of the manual for instructions on properly adjusting brake bands. Ensure that all grease is wiped from brake band linings and the parts of the cage plates that come into contact with the brake band linings
14. ☐ Re-install access panel. Install a set of pre-inspected jaws that are the correct size for the pipe or casing being run.
15. ☐ Install load cell. Perform a visual inspection and replace any cracked, broken, or distorted components including links and chains.
16. ☐ Inspect the load cell anchor pins. Replace the anchor pins if cracking or metal distortion is seen.
17. ☐ Re-energize hydraulic power to the equipment.

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5.13 TUBULAR CONNECTION EQUIPMENT RE-COMMISSIONING PROCEDURE (CONTINUED):

18. ☐ Perform a full functional test of the equipment including, if applicable, backup components and float frame components. Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.

19. ☐ Test safety door feature. Refer to safety door testing procedure in subsection 4.0.5, “Pre-operational Checks”.

⚠ DANGER

DO NOT OPERATE TONG WITH A MALFUNCTIONING OR NON-OPERATING SAFETY DOOR SYSTEM.

20. ☐ While rotating the cage plate, ensure that the jaws properly cam. If the jaws do not cam properly, the brake bands require tightening. See subsection 5.6.1 for instructions for adjusting the brake bands.

21. ☐ When all of the previous steps are completed, you may return your re-commissioned equipment to service.

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SECTION 6: TROUBLESHOOTING

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Adequate maintenance and proper fluid selection is essential for minimizing hydraulic-related failures. All troubleshooting must be performed by a technician trained in hydraulic systems, and familiar with the equipment design, assembly and operation.

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

6.0 TONG WILL NOT DEVELOP SUFFICIENT TORQUE

	POSSIBLE PROBLEM	SOLUTION(S)
1	Malfunctioning relief valve on tong hydraulic circuit	Troubleshoot relief valve as per subsection 6.1 or OEM instructions.
2	Directional valve is leaking	Check directional valve. Neutral position should return fluid directly to the reservoir. Replace or repair valve to ensure correct operation
3	Power unit is not producing adequate pressure	Troubleshoot power unit (see user's manual for your particular unit)
4	Poor hydraulic pressure at the tong despite adequate pressure at the power unit, or excessive back pressure in the return line.	Restrictions exist in line between power unit and tong. Inspect integrity of self-sealing couplings to ensure they are allowing full fluid flow. Check to ensure no other restrictions exist (contaminated catch screens or filters, for example)
5	Fluid viscosity is not appropriate (too high or too low)	Ensure hydraulic fluid being used is the viscosity recommended by McCoy Global. Power unit pump may not prime if fluid is too heavy, and the hydraulic system will overheat if fluid is too light. Replace with proper viscosity fluid
		Hydraulic fluid viscosity is affected by environmental conditions. Ensure the fluid being used is suitable for high or low temperatures. Replace with proper viscosity fluid for the operating conditions if necessary
6	Worn or damaged tong motor causing slippage	Replace or repair worn or damaged motor
7	Damaged bearings or gears causing excessive drag	Replace or repair worn or damaged gears or bearings
8	Jaws slipping on pipe	Ensure jaw dies are not worn to the point that they cannot grip. Ensure the correct sized jaws are in use
9	Torque gauge is indicating incorrectly	Incorrect gauge is being used. Ensure gauge is the proper range, and has been properly calibrated for the arm length of the equipment in use
		Gauge has been damaged. Check gauge operation and calibration on independent system
		Gauge has mistakenly been married to an incorrect load cell
10	Load cell is measuring incorrectly	Incorrect load cell is being used
		Air is trapped in torque measuring circuit (load cell, hydraulic line, or gauge). Refer to torque measurement troubleshooting in Section 8.1 of this manual
		Load cell has been damaged. Replace load cell, or return to McCoy Global for repair and re-calibration

NOTICE

MCCOY GLOBAL GUARANTEES CALIBRATION OF A LOAD CELL/TORQUE GAUGE ASSEMBLY FOR A PERIOD OF ONE YEAR. MCCOY GLOBAL SUGGESTS THAT THE LOAD CELL/TORQUE GAUGE ASSEMBLY BE RETURNED TO THE FACTORY FOR RE-CALIBRATION ON A YEARLY BASIS.

	POSSIBLE PROBLEM	SOLUTION(S)
11	Incorrect motor speed selected (applies to 2-speed motors only)	Maximum torque can only be developed when LOW motor speed (maximum hydraulic displacement) is selected.
12	Incorrect tong gear selected	Maximum torque can only be developed when LOW motor gear is selected

6.1 RELIEF VALVE IS INCORRECTLY SET OR NOT FUNCTIONING

	POSSIBLE PROBLEM	SOLUTION(S)
1	Relief pressure set too low, resulting in insufficient tong torque	Adjust setting (See following procedure):
	Relief pressure set too high, resulting in crushed pipe or gear train failure	

a. If your tong is equipped with a system pressure indicator proceed to step “f”. If your tong does not have a system pressure indicator, a temporary 0 - 3000 PSI indicator must be installed on the hydraulic inlet.

b. Isolate your tong from hydraulic power, and depressurize following the procedure in section 5.4.

c. Tee in a temporary indicator at the safety door supply pressure port. Ensure all hydraulic connections are performed by a qualified hydraulic technician.

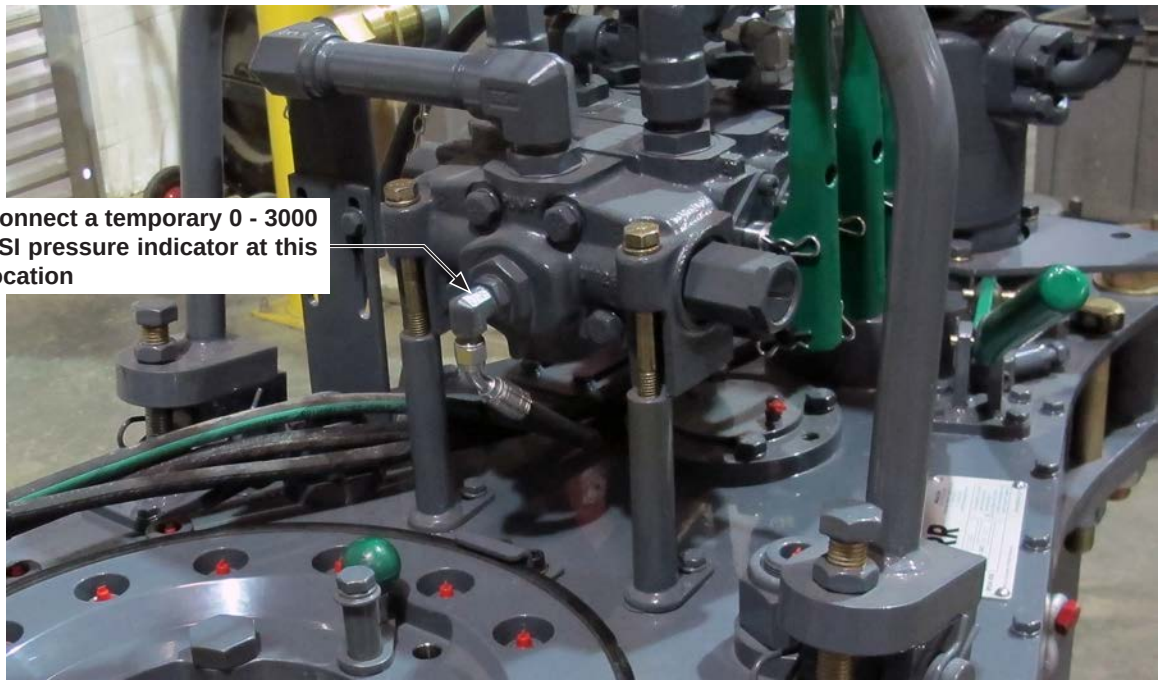

Illustration 6.1.1: Relief Valve Troubleshooting - Temporary Gauge Installation

d. Re-establish hydraulic power to your tong. Ensure that no equipment functions are active.

e. Loosen the locking nut on the pressure relief valve.

f. Open the tong door to activate the safety door system and inhibit tong rotation.

g. Activate motor control valve. Observe the pressure displayed on the pressure indicator. Adjust the relief valve until the pressure indicated is at the maximum system pressure specified on the specifications page (maximum system pressure is the pressure at which your tong achieves its specified torque).

⚠ WARNING

DO NOT ADJUST PRESSURE RELIEF TO A SETTING THAT ALLOWS HIGHER THAN MAXIMUM SYSTEM PRESSURE. DOING SO CREATES A POTENTIAL FOR SERIOUS INJURY OR DEATH, AND MAY CAUSE CATASTROPHIC EQUIPMENT FAILURE.

h. Release the motor control valve and tighten the locking nut on the pressure relief valve.

i. Isolate your tong from hydraulic power, and depressurize following the procedure in section 5.4

j. Close the tong door, and remove the temporary pressure indicator. Restore the safety door pressure supply line to factory specifications. Verify that safety door is operating correctly (see subsection 4.0.5, step #8).

Continued on next page...

6.1 RELIEF VALVE IS INCORRECTLY SET OR NOT FUNCTIONING (CONTINUED):

	POSSIBLE PROBLEM	SOLUTION(S)
2	Relief cannot be adjusted to maximum system pressure (high fluid bypass results in low system pressure	Debris on valve seat
		Valve spring is broken
		Valve spring has lost spring force due to continuous tension

PROCEDURE:

a. Isolate tong from hydraulic power, and depressurize following the procedure in section 5.4

b. Loosen the locking nut on the pressure relief valve.

c. Use a large flat-head screwdriver to completely un-thread the poppet and spring from the relief assembly.

d. Inspect the relief valve spring, poppet, and valve seat.

e. If no debris is found in relief valve and if seat and poppet are undamaged, replace relief valve spring.

f. Reassemble relief valve.

g. Relief valve must be re-set to allow maximum system pressure. Follow the procedure in Step 1 of this section to properly adjust relief valve.

h. If maximum system pressure still cannot be reached, replace the entire relief valve assembly.

6.2 SAFETY DOOR DOES NOT OPERATE OR IS MALFUNCTIONING

	POSSIBLE PROBLEM	SOLUTION(S)
1	Safety door switch requires adjustment.	Adjust switch as per subsection 5.6.5.
2	Safety door switch has failed	Test safety door switch for proper function and replace if necessary
3	Contamination in hydraulic lines	Ensure all three flexible hydraulic lines to safety door switch are free-flowing
4	Pilot-to-open valve in safety door valve block is malfunctioning.	Remove each valve. Inspect seats and springs. Replace valve(s) if damage is seen on valve seats, or if spring appears to be damaged or broken.

6.3 TONG RUNNING TOO SLOWLY

	POSSIBLE PROBLEM	SOLUTION(S)
1	Obstruction in tong hydraulic circuit preventing adequate flow	Inspect self-sealing couplings to ensure they are properly engaged
		The main hydraulic lines (supply and discharge) to the tong are obstructed. Remove and clean if required
2	Power unit is not producing adequate flow or pressure	Troubleshoot power unit (see user's manual for your particular unit)
3	Tong motor is excessively worn and is leaking hydraulic fluid past the vanes	Replace motor, or rebuild as per OEM instructions
4	Bearings in gear train and rotary section are excessively worn	Overhaul tong. See Section 5.8 of this manual for instructions for exposing the gear box and support roller assemblies.
5	Shifter has malfunctioned and the tong is not shifting to high gear	Inspect and repair shift mechanism as necessary
6	Hydraulic fluid viscosity too high	Ensure hydraulic fluid meets McCoy Global specifications
		Ensure hydraulic fluid is appropriate for climatic conditions, especially during cold-weather operation
7	By-pass valve not functioning	Check and repair

6.4 FAILURE OF JAWS TO GRIP PIPE

	POSSIBLE PROBLEM	SOLUTION(S)
1	Dies have become too dull to provide adequate grip	Replace dies
2	Incorrect jaws are being used	Double-check jaw size to ensure they are rated for the diameter of pipe or casing being run
3	Incorrect dies are being used	Ensure dies loaded in the jaws are appropriate for the type of pipe or casing being run
4	Brake band(s) is (are) insufficiently adjusted, not allowing jaws to cam properly	Adjust brake bands to give proper resistance to cage plates
5	Jaw roller broken or worn	Remove jaw assembly and inspect. Replace rollers that are visibly “flat-spotted” or otherwise damaged

6.5 FAILURE OR DIFFICULTY OF TONG TO SHIFT

	POSSIBLE PROBLEM	SOLUTION(S)
1	Bent or broken shifter yoke	Inspect components through inspection door. Replace shifter yoke if necessary.
2	Bent or broken shifter shaft	Replace shifting shaft.
3	Locking nuts on shifting shaft have loosened and position of yoke has changed	Reposition yoke and re-tighten locking set screws.
4	Shifting yoke has come loose from shifting shaft	Inspect yoke and inspect for damage. If free of damage, replace on shaft and tighten locking nuts
5	Shifting mechanism requires adjustment	Adjust shifting mechanism - see Section 5.6.4

6.6 GENERAL COMMENTS

The following factors generally contribute to poor hydraulic operation and premature wear of equipment:

1. Contaminated hydraulic fluid due to overuse, overheating, or inadequate fluid filtration.
2. Unsuitable hydraulic fluid, especially in extreme climatic conditions.
3. Defective packing or seals in components of the hydraulic system.
4. Poor or incomplete hydraulic system training. Users must be fully qualified to operate the equipment, and have complete understanding of the hydraulic system.

McCoy Global recommends construction of a test rig that can easily be connected to the main suction and discharge ports of the power unit when hydraulic troubleshooting procedures involve flow and pressure tests at the power unit.

SECTION 7: PARTS & ASSEMBLIES

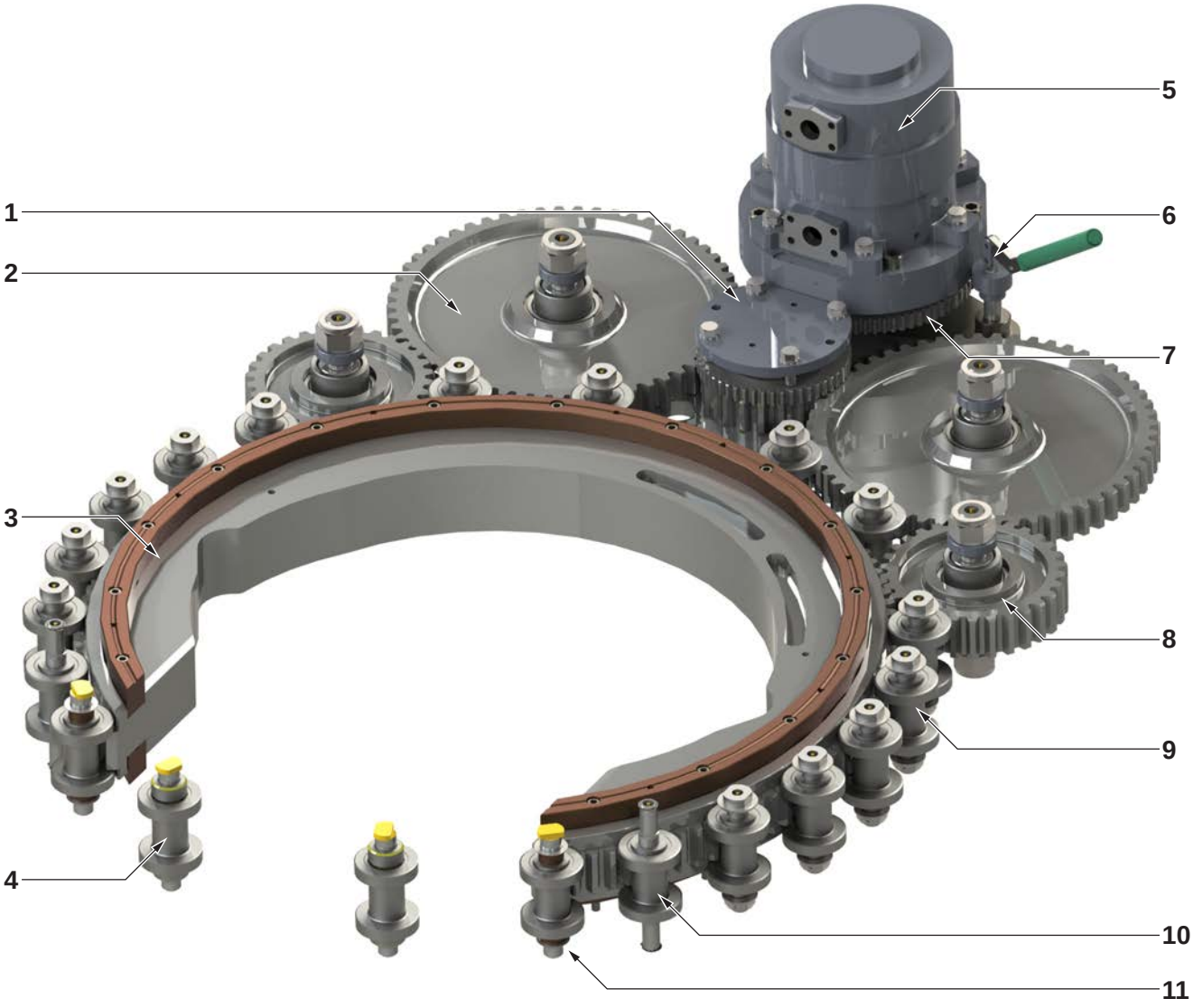

Illustration 7.1: Gear Train ISO View

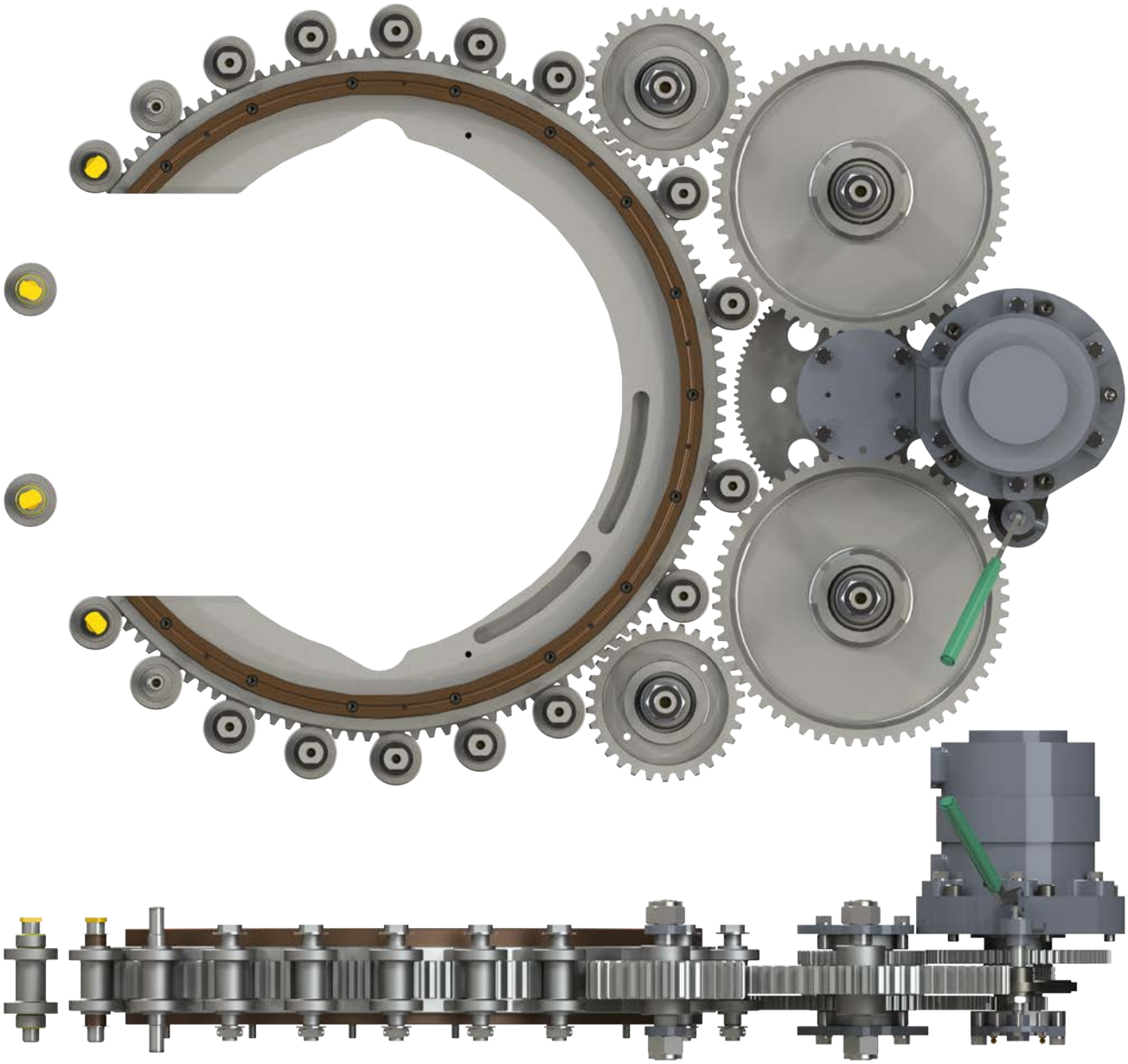

Illustration 7.2: Gear Train Top & Side View

Item	Type	Description	Qty	Part Number
1	Assembly	Pinion assembly (Pp. 7.16 - 7.17)	1	
2	Assembly	Pinion idler assembly (Pp 7.14 - 7.15)	2	
3	Part	Rotary gear	1	1482-1
4	Assembly	Door-mounted support roller assembly (Pp. 7.8 - 7.9)	2	
5	Part	Hydraulic motor	1	87-0158
6	Assembly	Shifter (Pp 7.26 - 7.27)	1	
7	Assembly	Clutch assembly (Pp 7.18 - 7.19)	1	
8	Assembly	Rotary idler assembly (Pp 7.12 - 7.13)	2	
9	Assembly	Support roller (Pp. 7.4 - 7.5)	14	
10	Assembly	Support roller - brake band (Pp. 7.6 - 7.7)	2	
11	Assembly	Door pivot roller (Pp 7.10 - 7.11)	2	

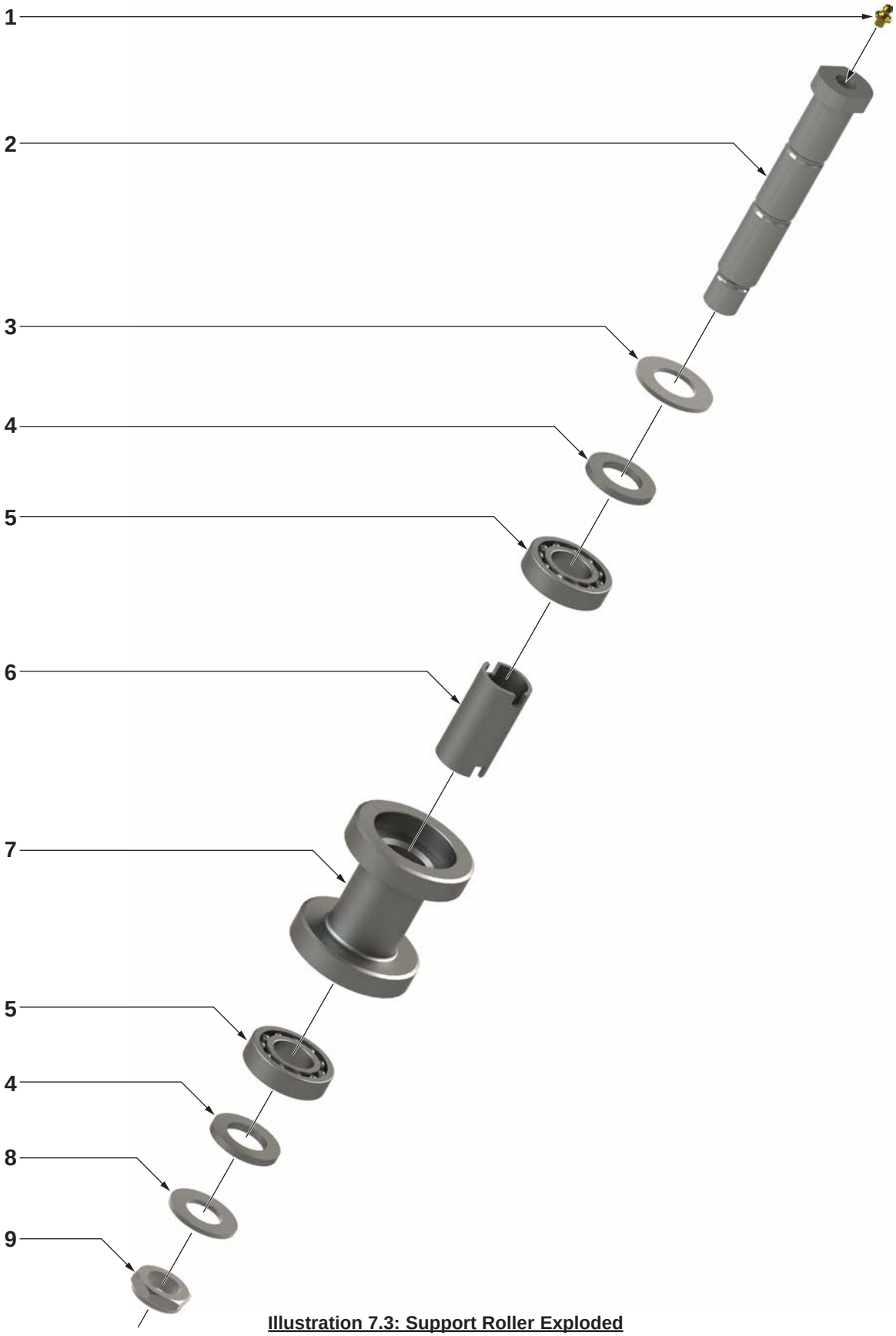

Illustration 7.3: Support Roller Exploded

Illustration 7.4: Support Roller

Item	Type	Description	Qty	Part Number
1	Part	¼”-28 straight thread grease fitting	1	02-0097
2	Part	Support roller shaft	1	101-3939
3	Part	1-⅛” narrow flat washer	1	02-0471
4	Part	Support roller bearing spacer	2	101-3871
5	Part	Bearing	2	02-0094
6	Part	Support roller inner spacer	1	1037-C-134
7	Part	Support roller	1	1482-135
8	Part	1” narrow flat washer	1	09-5120
9	Part	1” UNS thin nylock nut	1	09-9167

⚠ CAUTION

DO NOT SUBSTITUTE NYLOCK NUTS. SEE IMPORTANT ASSEMBLY INFORMATION ON PAGE 5.20

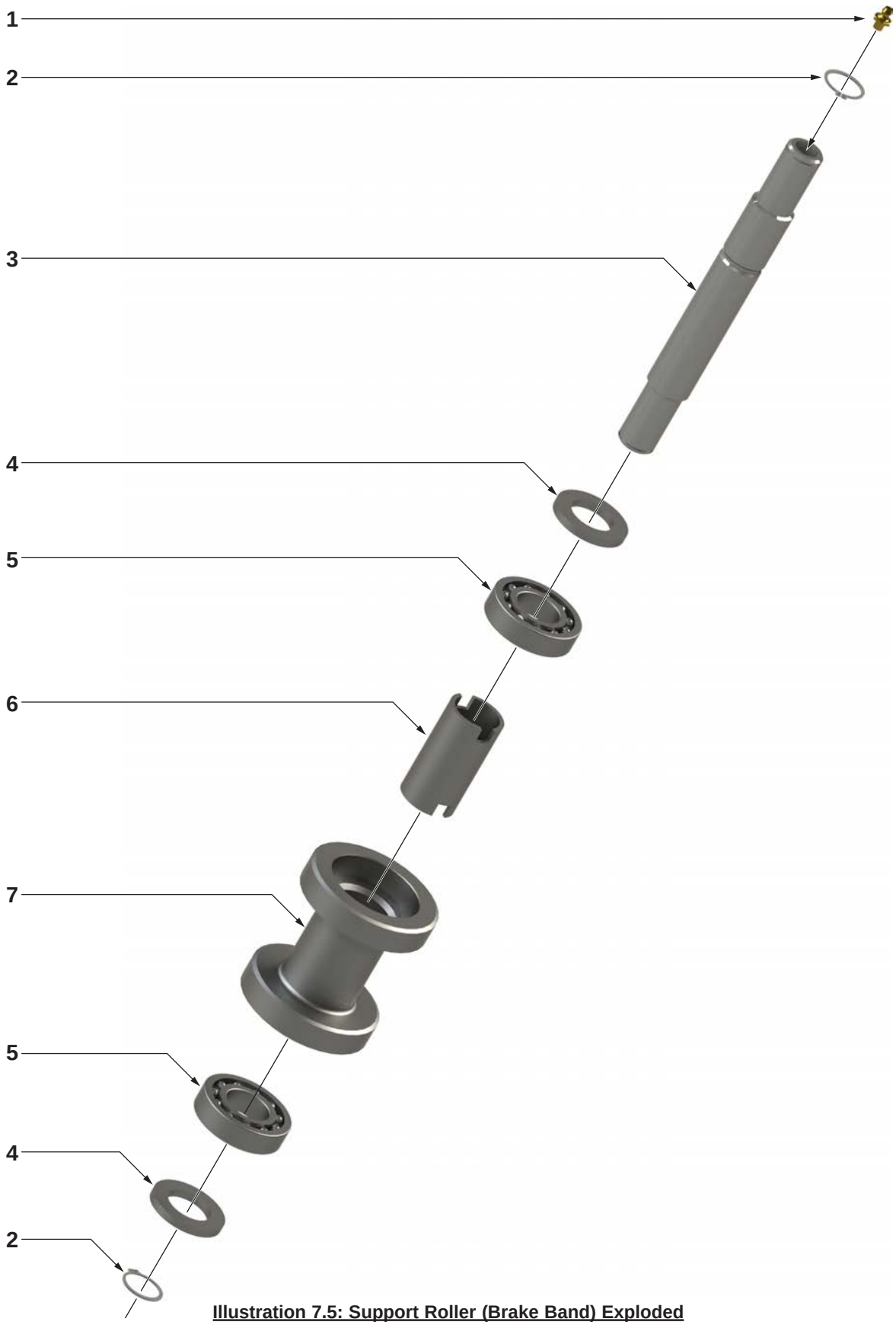

Illustration 7.5: Support Roller (Brake Band) Exploded

Illustration 7.6: Support Roller (Brake Band)

Item	Type	Description	Qty	Part Number
1	Part	¼”-28 straight thread grease fitting	1	02-0097
2	Part	1” external retaining ring	2	02-0057
3	Part	Support roller shaft	1	1037-131-02
4	Part	Support roller bearing spacer	2	101-3871
5	Part	Bearing	2	02-0094
6	Part	Support roller inner spacer	1	1037-C-134
7	Part	Support roller	1	1482-135

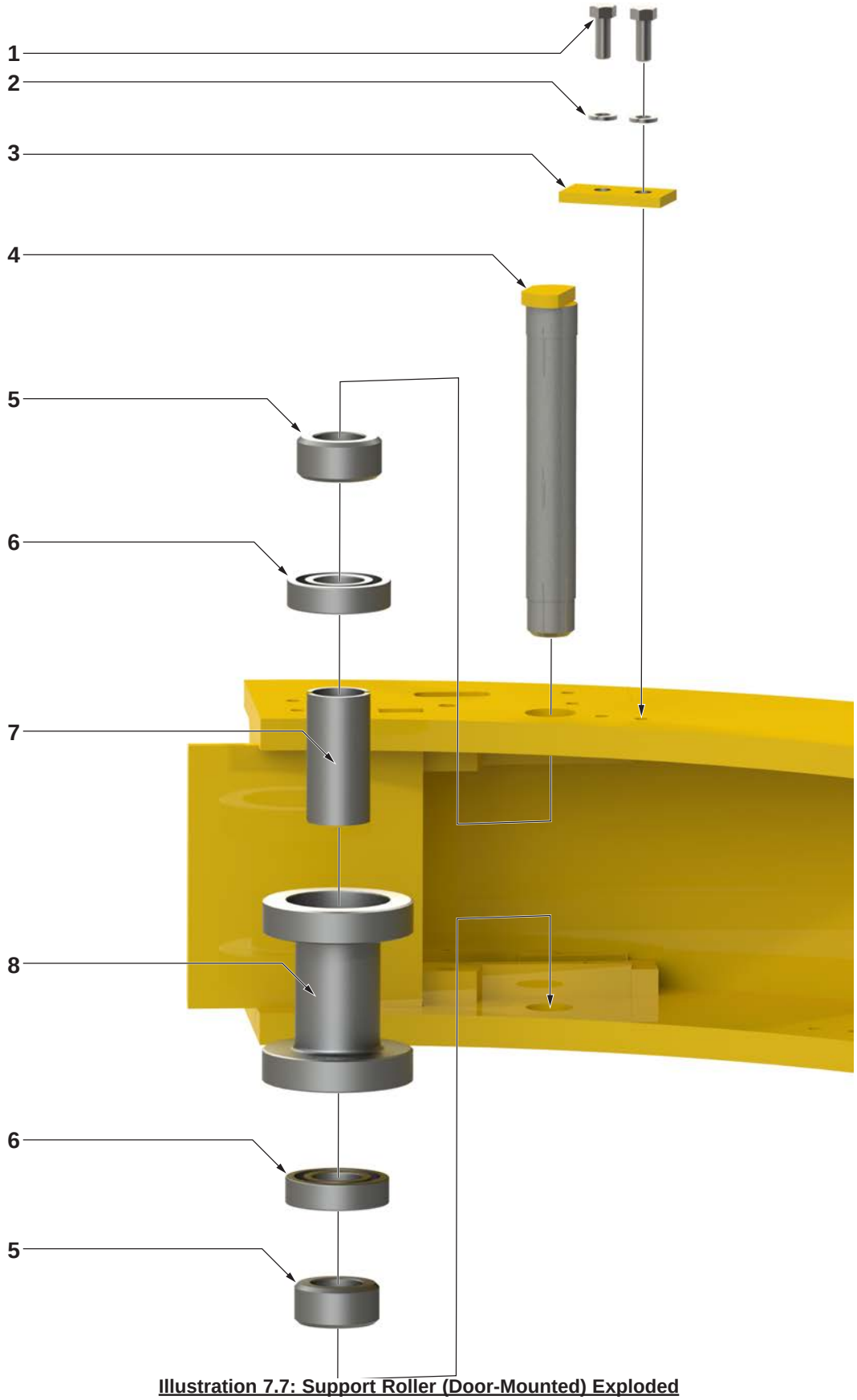

Illustration 7.7: Support Roller (Door-Mounted) Exploded

Illustration 7.8: Support Roller (Door-Mounted)

Item	Type	Description	Qty	Part Number
	Part	⅜” UNC x 1” hex bolt	2	09-1046
	Part	⅜” lock washer	2	09-5106
	Part	Roller shaft retainer	1	1482-11-05
	Part	Support roller shaft (door-mounted)	1	1482-11-04
	Part	Door roller spacer	2	1482-11-06
	Part	Bearing	2	02-0096
	Part	Door roller inner spacer	2	1482-11-08
	Part	Support roller	1	1482-11-03

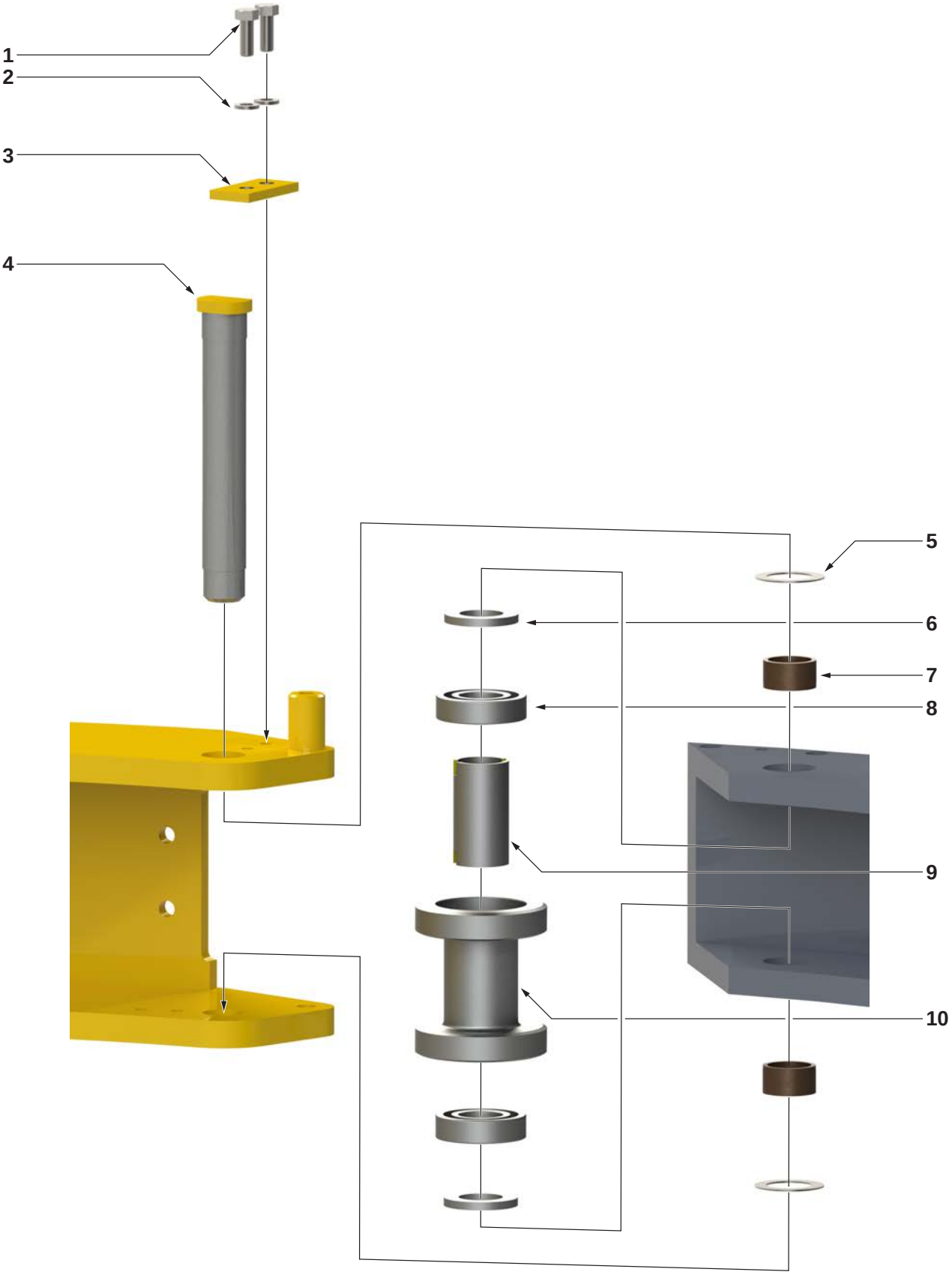

Illustration 7.9: Support Roller (Door Pivot) Exploded

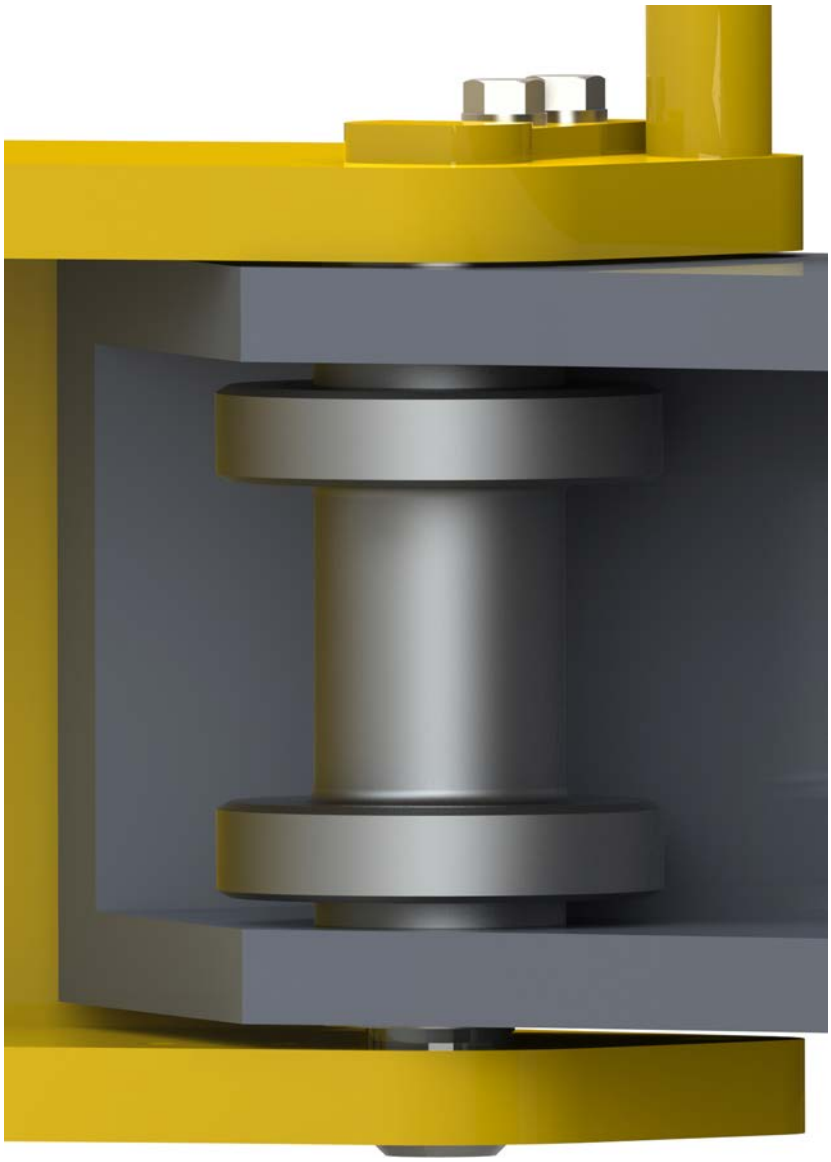

Illustration 7.10: Support Roller (Door Pivot)

Item	Type	Description	Qty	Part Number
1	Part	⅜” UNC x 1” hex bolt	2	09-1046
2	Part	⅜” lock washer	2	09-5106
3	Part	Roller shaft retainer	1	1482-11-05
4	Part	Roller shaft	1	1482-11-04
5	Part	Shimming washer	2	02-E0077
6	Part	Roller bearing spacer	2	101-3871
7	Part	Door bushing	2	101-4670
8	Part	Bearing	2	02-0096
9	Part	Support roller spacer	1	1037-C-134
10	Part	Support roller	1	1482-135

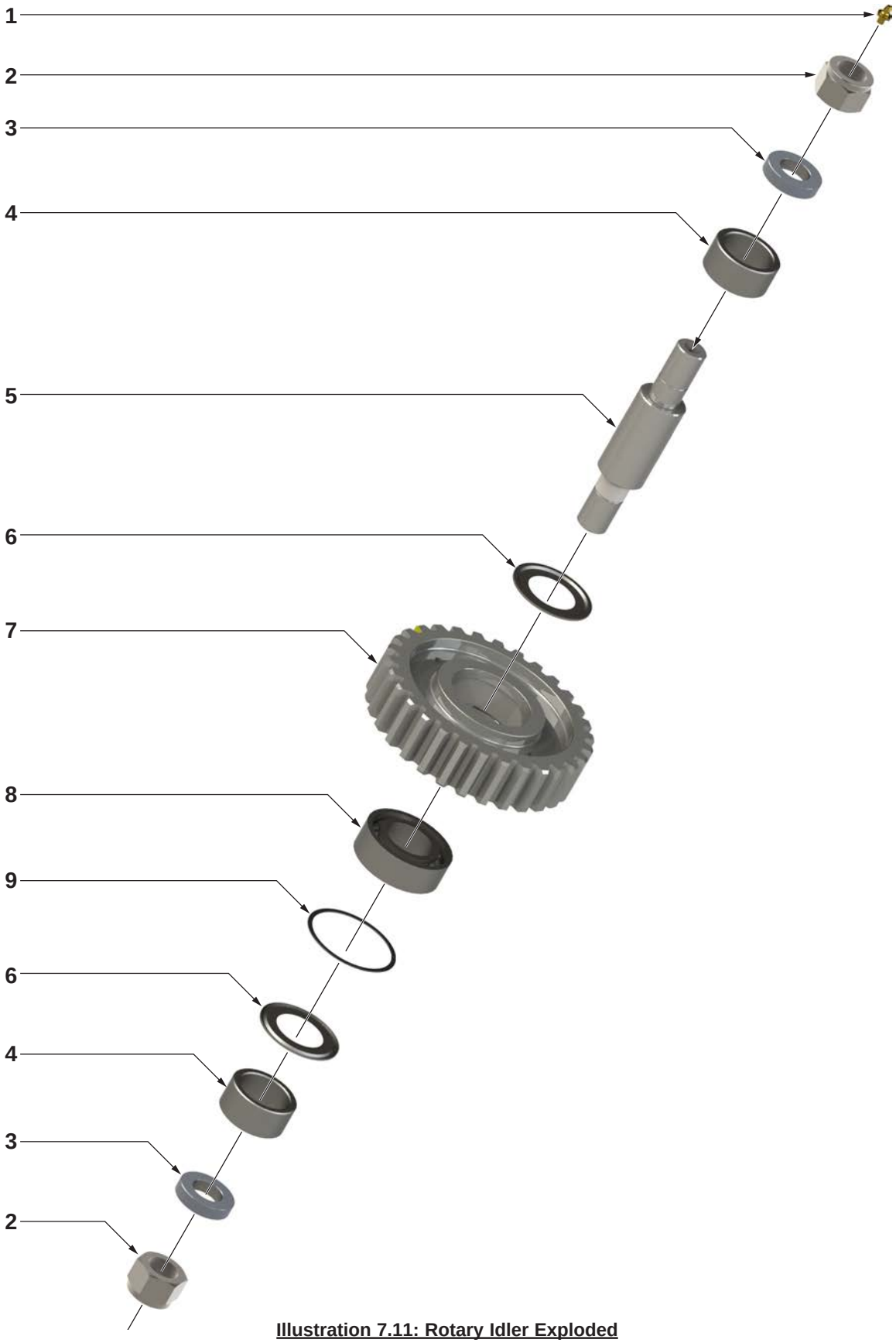

Illustration 7.11: Rotary Idler Exploded

Illustration 7.12: Rotary Idler

Item	Type	Description	Qty	Part Number
1	Part	⅛” NPT grease fitting	1	02-0005
2	Part	1-½” UNF nylock nut	2	09-5740
3	Part	Idler pad	2	997-D20-125
4	Part	Idler bearing spacer	2	1050-D5-121
5	Part	Rotary idler shaft	1	1050-D5-117
6	Part	Idler bearing seal	2	02-0010
7	Part	Rotary idler gear	1	1037-D59
8	Part	Idler bearing	1	02-0011
9	Part	Idler gear retainer	2	02-0009

⚠ CAUTION

DO NOT SUBSTITUTE NYLOCK NUTS. SEE IMPORTANT ASSEMBLY INFORMATION ON PAGE 5.20

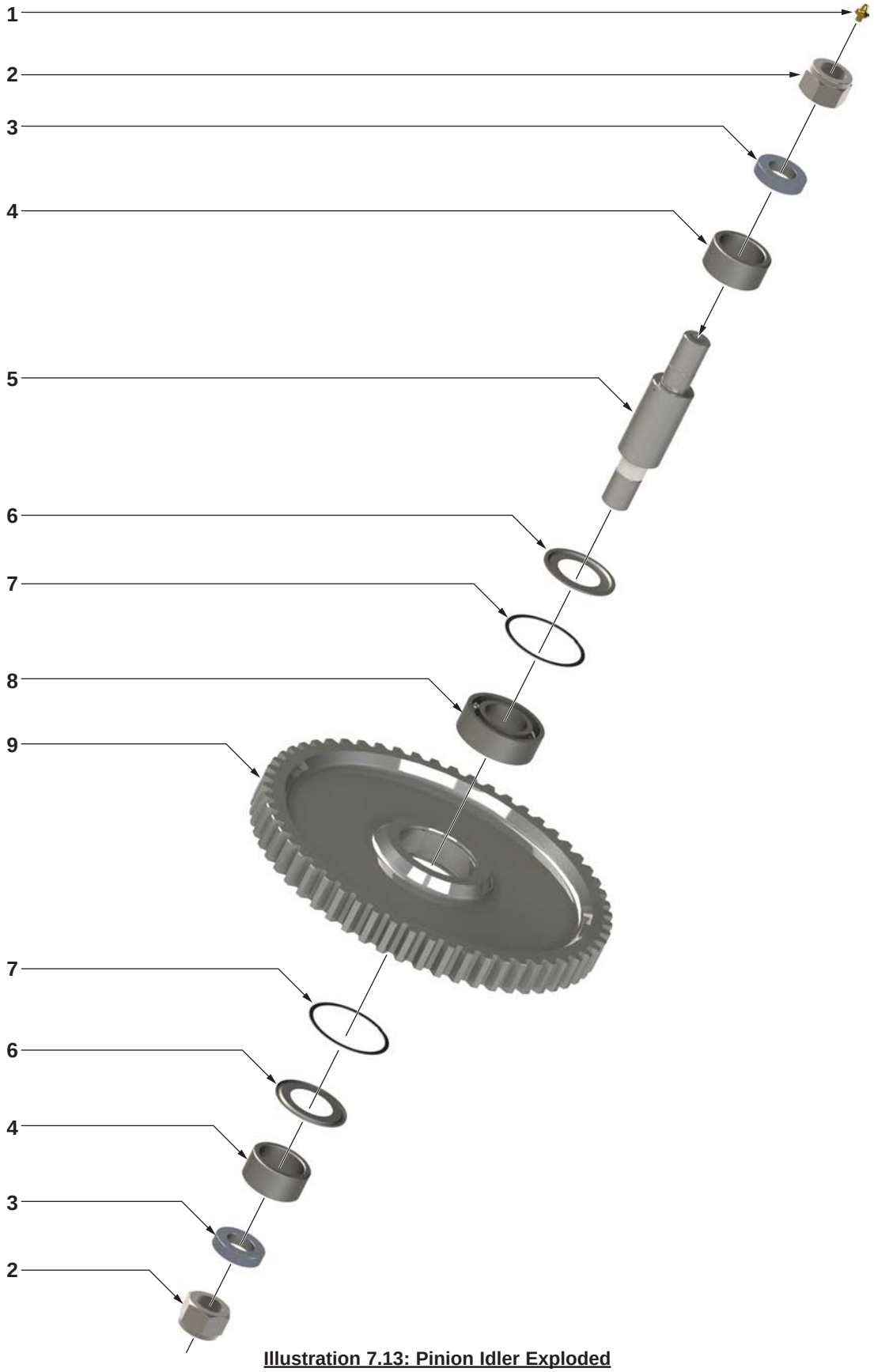

Illustration 7.13: Pinion Idler Exploded

Illustration 7.14: Pinion Idler

Item	Type	Description	Qty	Part Number
1	Part	⅛” NPT grease fitting	1	02-0005
2	Part	1-½” UNF nylock nut	2	09-5740
3	Part	Idler pad	2	997-D20-125
4	Part	Idler bearing spacer	2	1050-D5-121
5	Part	Rotary idler shaft	1	1050-D5-117
6	Part	Idler bearing seal	2	02-0010
7	Part	Idler gear retainer	2	02-0009
8	Part	Idler bearing	1	02-0011
9	Part	Rotary idler gear	1	1482-D-1

⚠ CAUTION

DO NOT SUBSTITUTE NYLOCK NUTS. SEE IMPORTANT ASSEMBLY INFORMATION ON PAGE 5.20

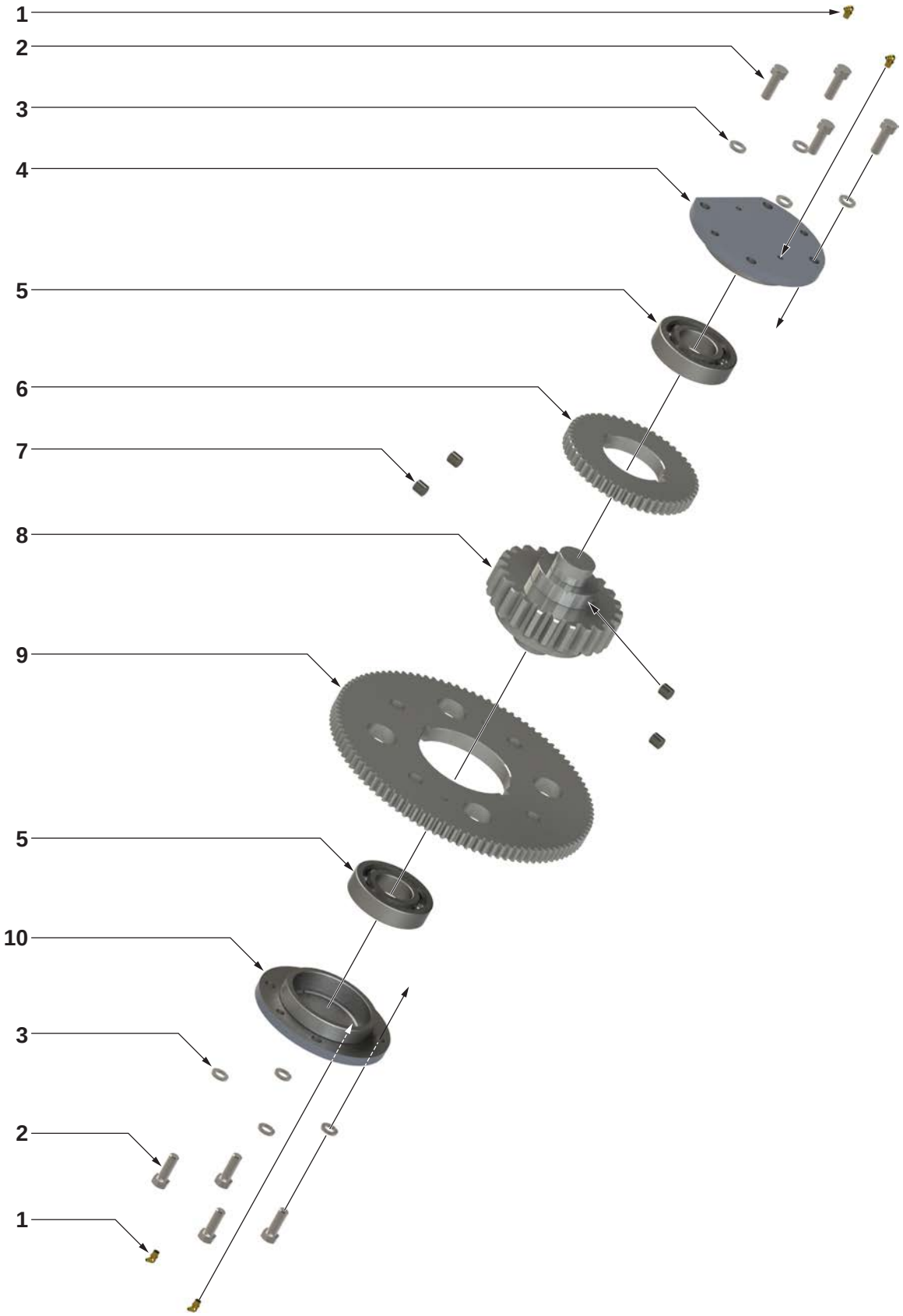

Illustration 7.15: Pinion Exploded

Illustration 7.16: Pinion

Item	Type	Description	Qty	Part Number
1	Part	⅛” NPT 90° grease fitting	4	02-0093
2	Part	⅝” UNC x 1-¾” hex bolt	8	09-1232
3	Part	⅝” lock washer	8	09-5114
4	Part	Top bearing cap	1	1037-C-10
5	Part	Bearing	2	02-0106
6	Part	High pinion gear	1	1037-D-12
7	Part	Pinion gear key	4	1037-D-15A
8	Part	Pinion gear	1	1037-D-15
9	Part	Low pinion gear	1	1037-D-32
10	Part	Bottom bearing cap	1	1037-C-33

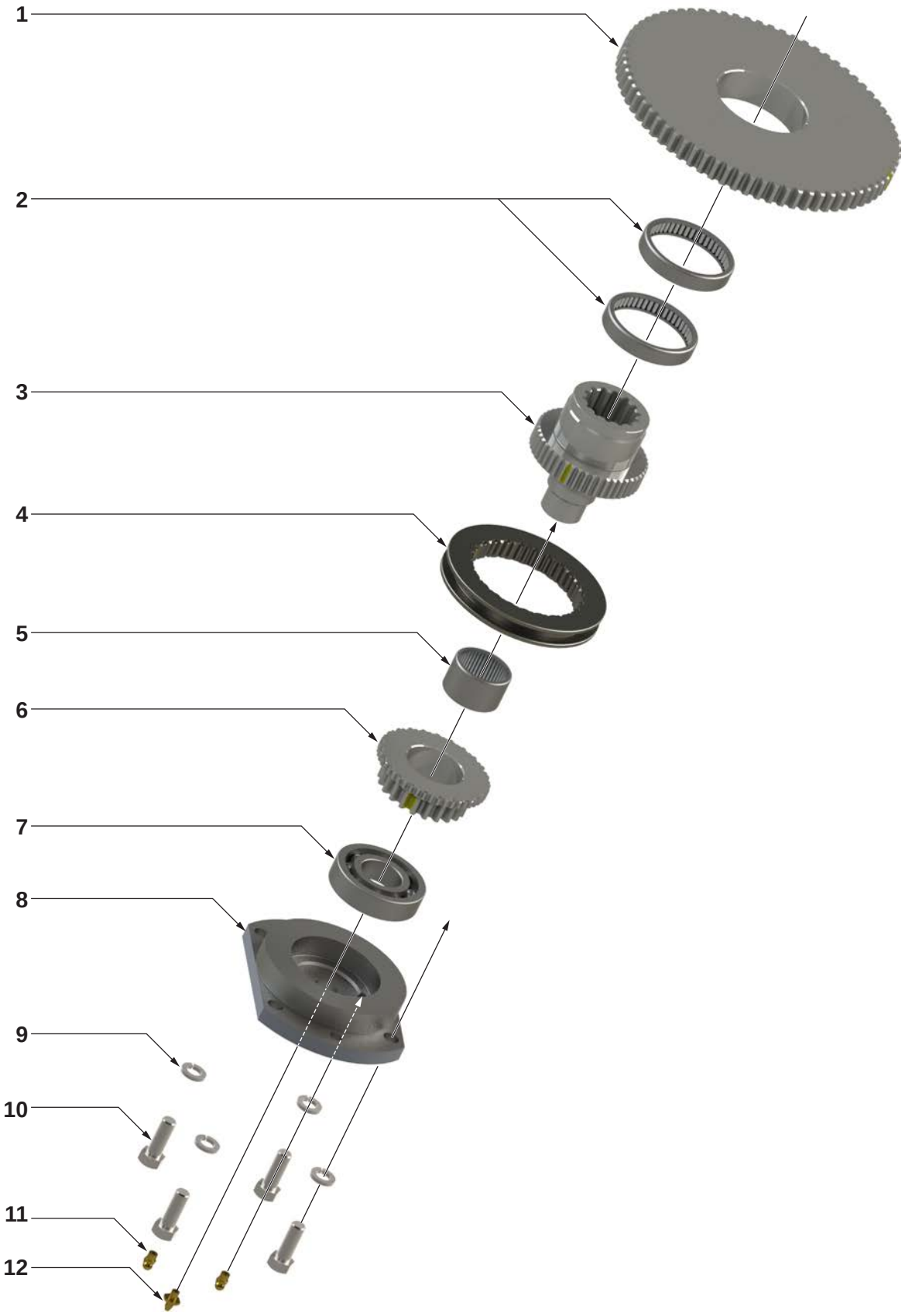

Illustration 7.17: Clutch Exploded

Illustration 7.18: Clutch

Item	Type	Description	Qty	Part Number
1	Part	High clutch gear	1	1037-D-41
2	Part	High clutch gear bearing	2	02-0103
3	Part	Splined clutch shaft	1	1482-D-38
4	Part	Shifting collar	1	1037-D-34
5	Part	Low clutch gear bearing	1	02-0104
6	Part	Low clutch gear	1	1037-D-40
7	Part	Clutch shaft bearing	1	02-0105
8	Part	Clutch bearing cap	1	1037-C-17
9	Part	⅝” lock washer	4	09-5114
10	Part	⅝” UNC x 1-¾” hex bolt	4	09-1232
11	Part	⅛” NPT 90° grease fitting	4	02-0093
12	Part	⅛” NPT grease fitting	1	02-0005

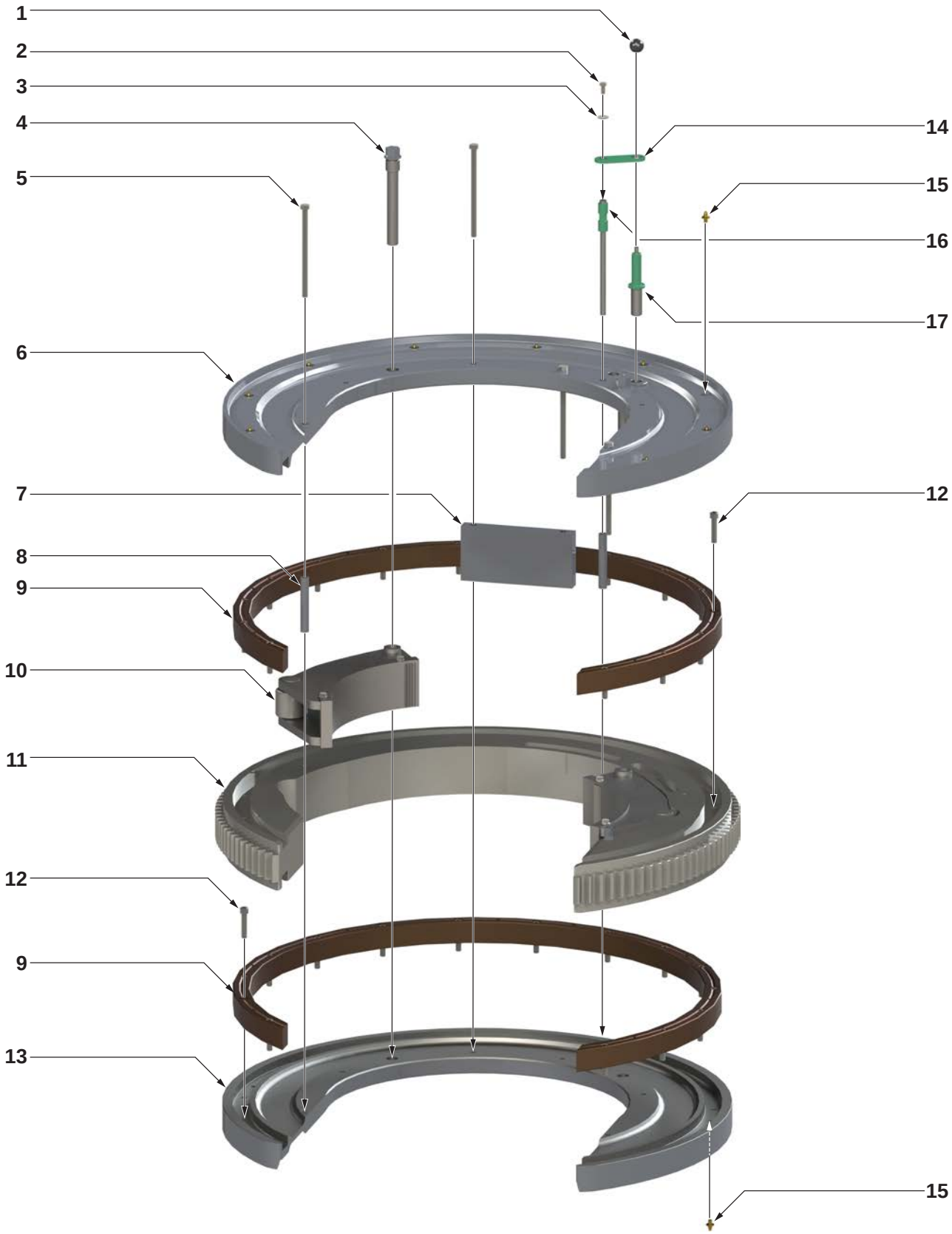

Illustration 7.19: Cage Plate Assembly Exploded

Illustration 7.20: Cage Plate Assembly

Item	Type	Description	Qty	Part Number
1	Part	Backing pin knob	1	02-0017
2	Part	⅜" UNC x ¾" hex bolt	1	09-1044
3	Part	⅜" washer	1	09-5006
4	Part	Jaw pivot bolt	2	1050-C5-28
5	Part	½" UNC x 8-½" hex bolt	4	09-1200
6	Part	Top cage plate weldment	1	101-1842
7	Part	Rear cage plate spacer	1	1482-21-1
8	Part	Cage plate spacer	3	1482-38
9	Part	Brass guide ring	2	1482-23
10	Assembly	Jaw assembly (see Pg. 3.14)	2	
11	Part	Rotary gear	1	1482-1
12	Part	½" UNC x 2-¼" socket head cap screw	30	09-2175
13	Part	Bottom cage plate	1	1482-22
14	Part	Backing pin retainer	1	1482-54
15	Part	⅛" NPT grease fitting	17	02-0005
16	Part	Rear cage plate bolt	1	1037-36
17	Part	Backing pin	1	1482-39

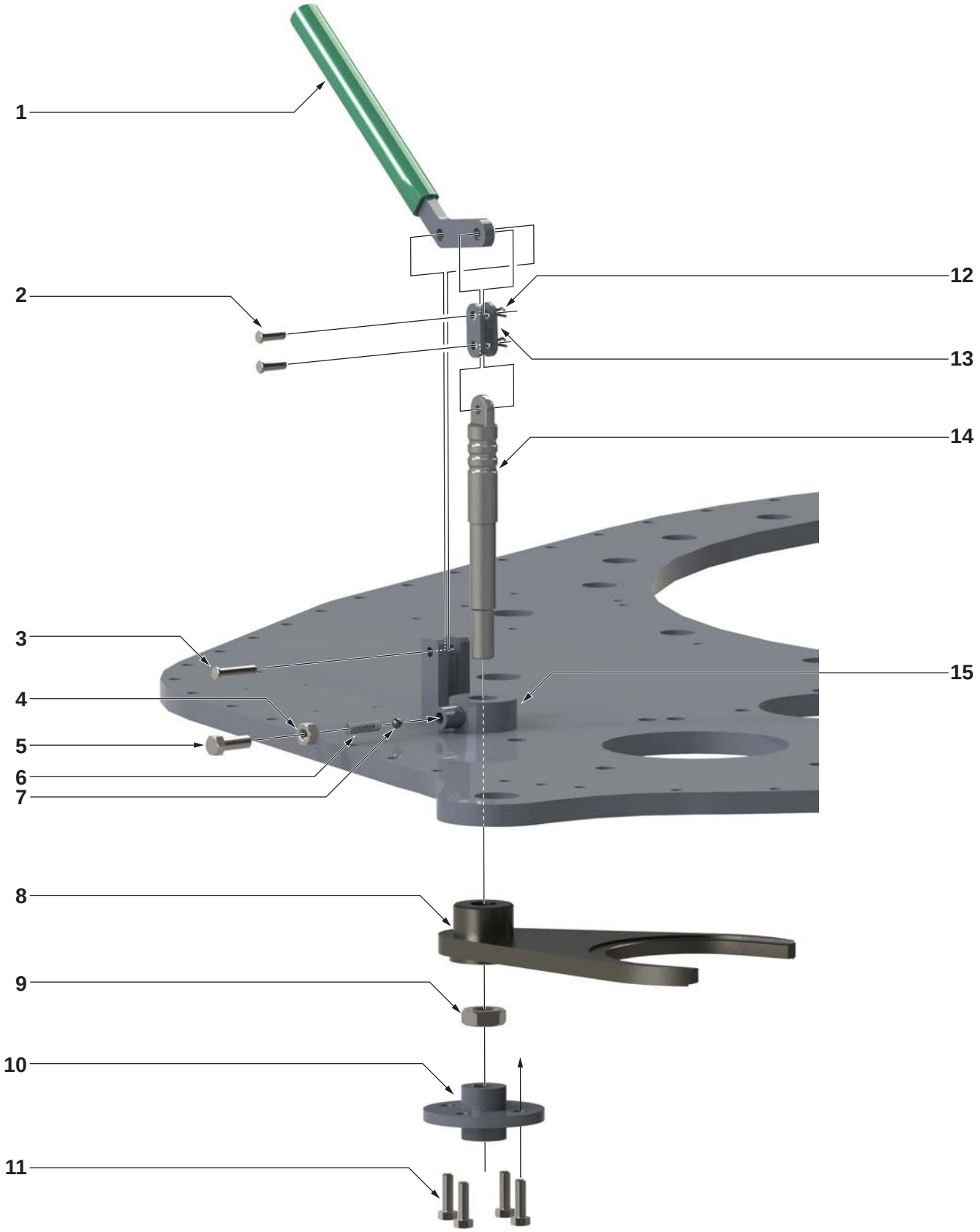

Illustration 7.21: Shifter Exploded

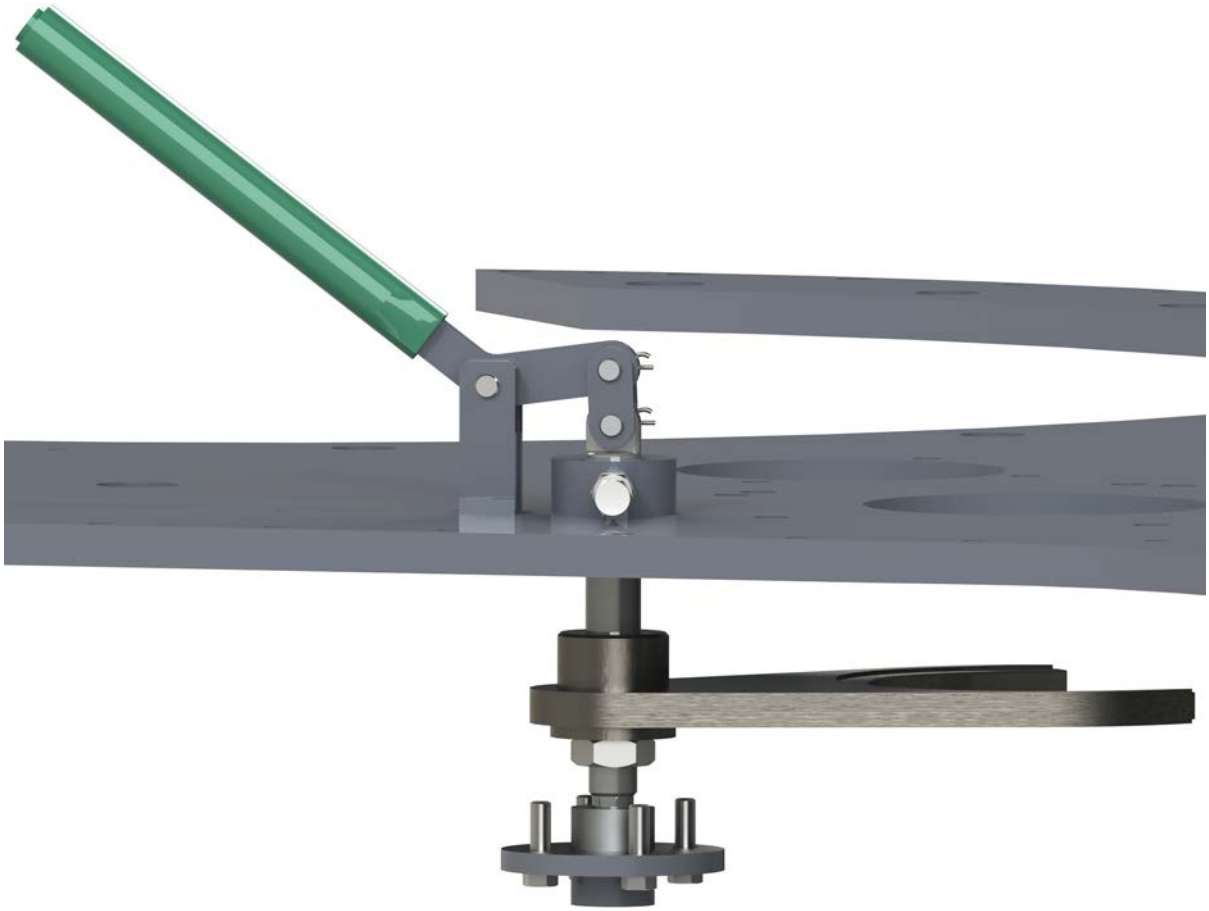

Illustration 7.22: Shifter

Item	Type	Description	Qty	Part Number
1	Weldment	Shifting handle	1	1037-D-20B
2	Part	5/16" x 1" clevis pin	2	02-0020
3	Part	5/16" x 1-½" clevis pin	1	09-0256
4	Part	⅞" UNF thin hex jam nut	1	09-1489
5	Part	7/16" UNF x 1-¼" hex bolt	1	09-1608
6	Part	Shifter detent force spring	1	997-0-64
7	Part	Shifter detent force ball	1	02-0018
8	Part	Shifting yoke	1	1037-D-27
9	Part	⅞" UNF hex jam nut	1	09-1489
10	Part	Bottom shifting bushing	1	1037C-21B
11	Part	⅜" UNC x 1-¼" bolt	4	09-1048
12	Part	.093" x 1-⅛" hitch pin	3	
13	Part	Shifting linkage	2	02-0120
14	Part	Shifting shaft	1	1037-C-20A
15	Weldment	Top shifter weldment (typically welded to top plate)	1	1037-C-21

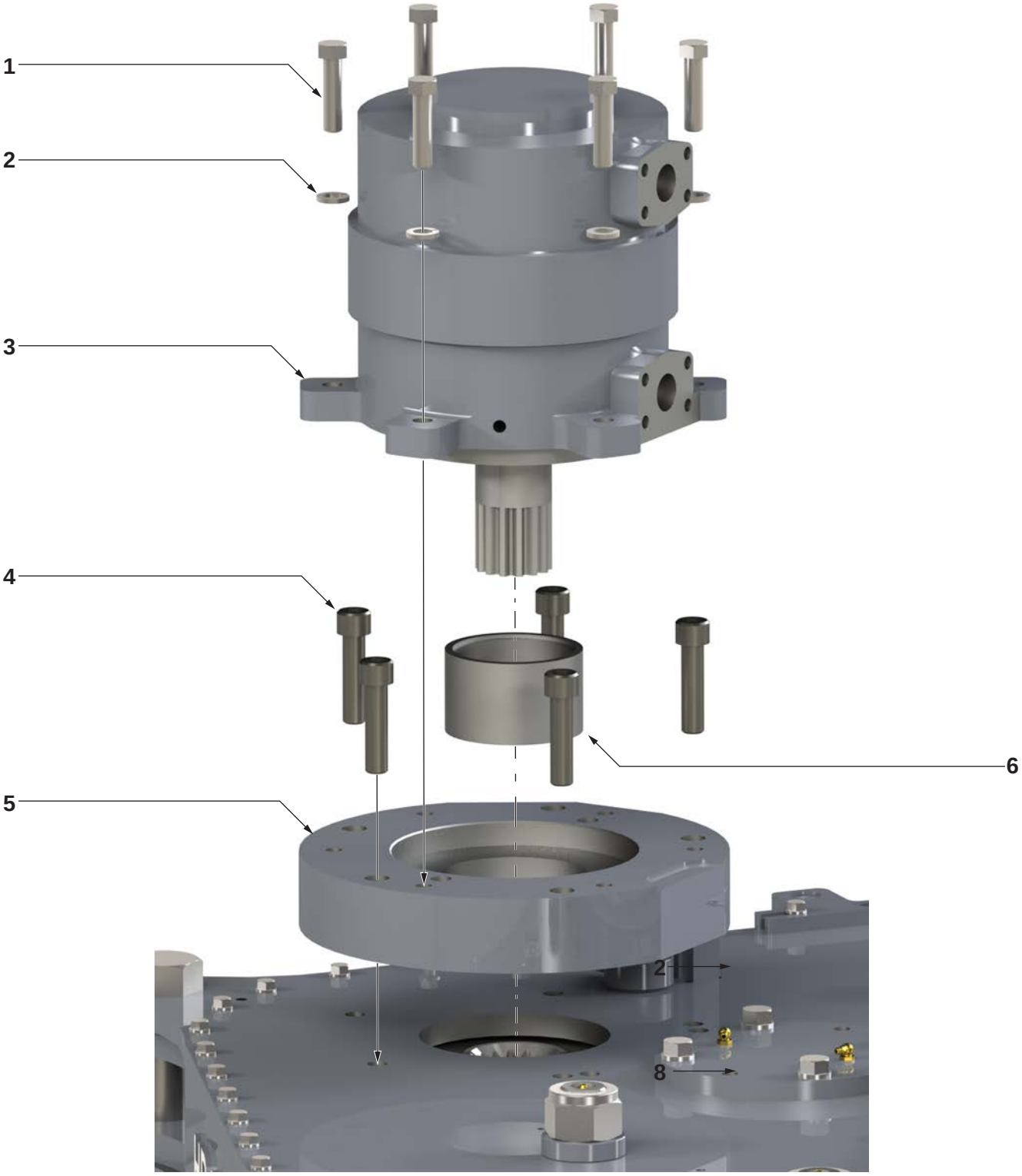

Illustration 7.23: Motor & Mount Exploded

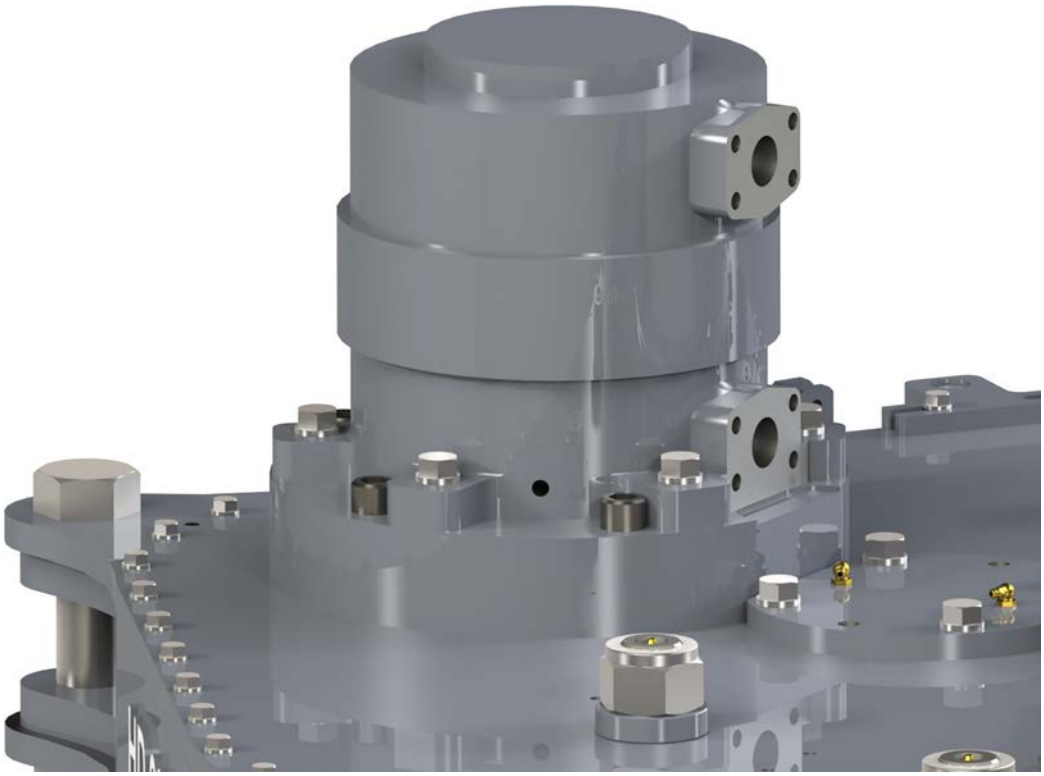

Illustration 7.24: Motor & Mount

Item	Type	Description	Qty	Part Number
1	Part	⅝” UNC x 2-½” hex bolt, GR 8	6	09-0081
2	Part	⅝” lock washer, GR 8	6	09-5114
3	Part	Hydraulic motor	1	87-0158
4	Part	¾” UNC x 3” hex socket head cap screw, GR 8	5	09-2298
5	Part	Motor mount	1	1426-7
6	Part	Top clutch spacer	1	1037-42

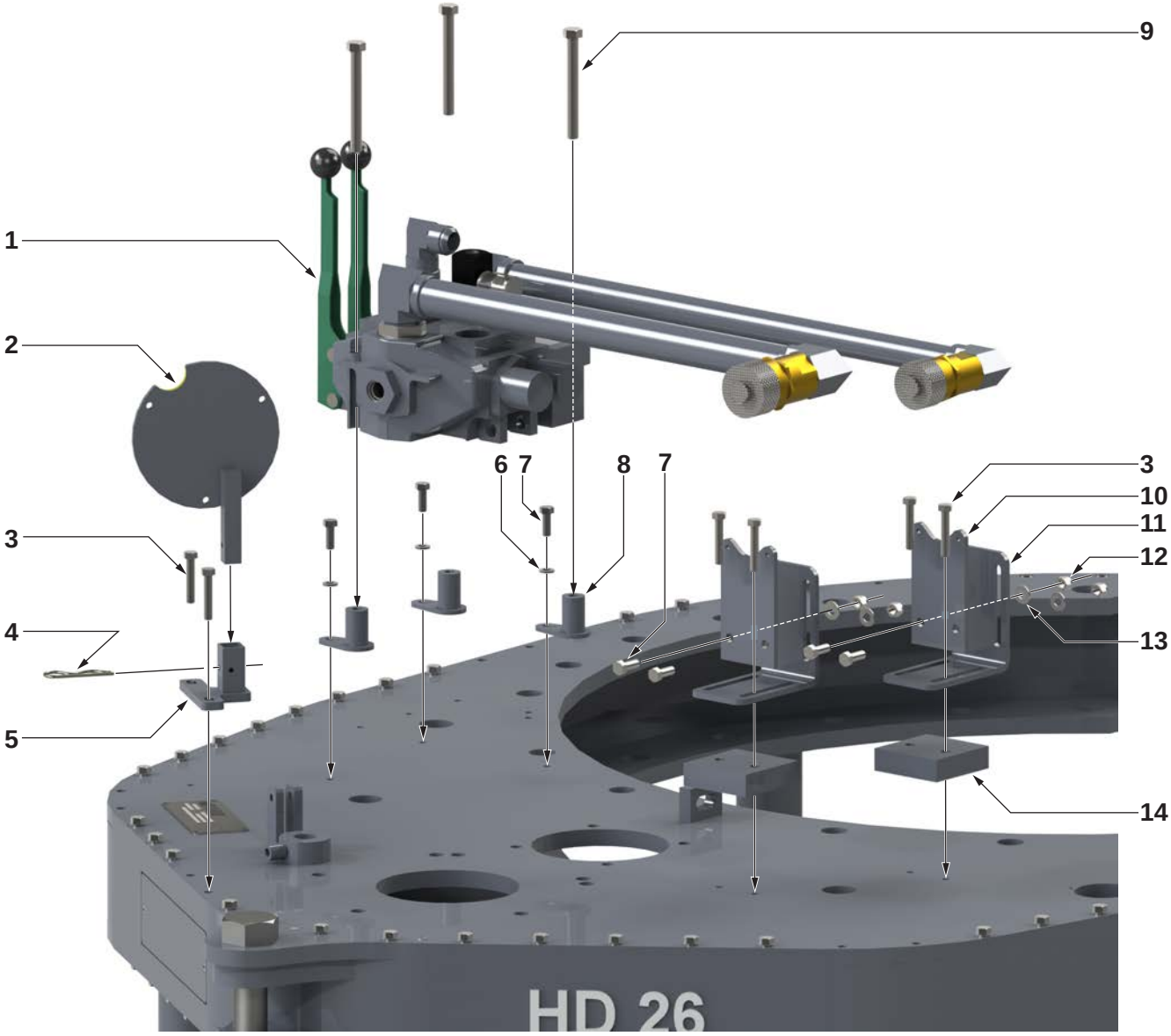

Illustration 7.25: Hydraulic Supports

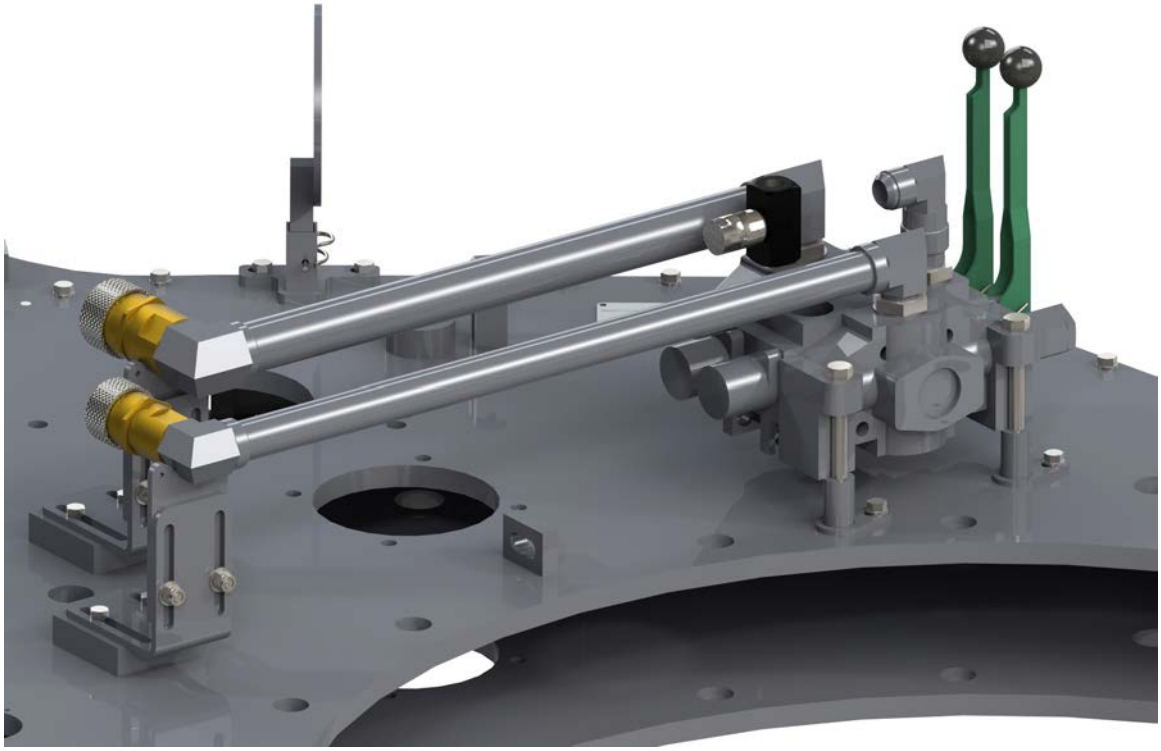

Illustration 7.26: Hydraulic Supports

Item	Type	Description	Qty	Part Number
1	Assembly	Hydraulic valve assembly	1	101-1612
2	Weldment	Torque gauge mount weldment	1	1500-09-03A
3	Part	⅜" UNC x 2" hex bolt	6	09-1054
4	Part	$^{5}/_{16}$" x 2-$^{15}/_{16}$" R-Clip	1	02-0981
5	Weldment	Torque gauge holder weldment	1	101-1530
6	Part	⅜" lock washer	3	09-5106
7	Part	⅜" UNC x 1" hex bolt	3	09-1046
8	Weldment	Valve mount weldment	3	101-1322
9	Part	½" UNC x 4-½" hex bolt	3	09-1184
10	Part	Adjustable hydraulic support	2	101-0022
11	Part	Hydraulic support base	2	101-0023
12	Part	⅜" UNC hex nylock nut	4	09-5607
13	Part	⅜" narrow flat washer	4	09-5124
14	Part	Hydraulic support base spacer	2	101-0021

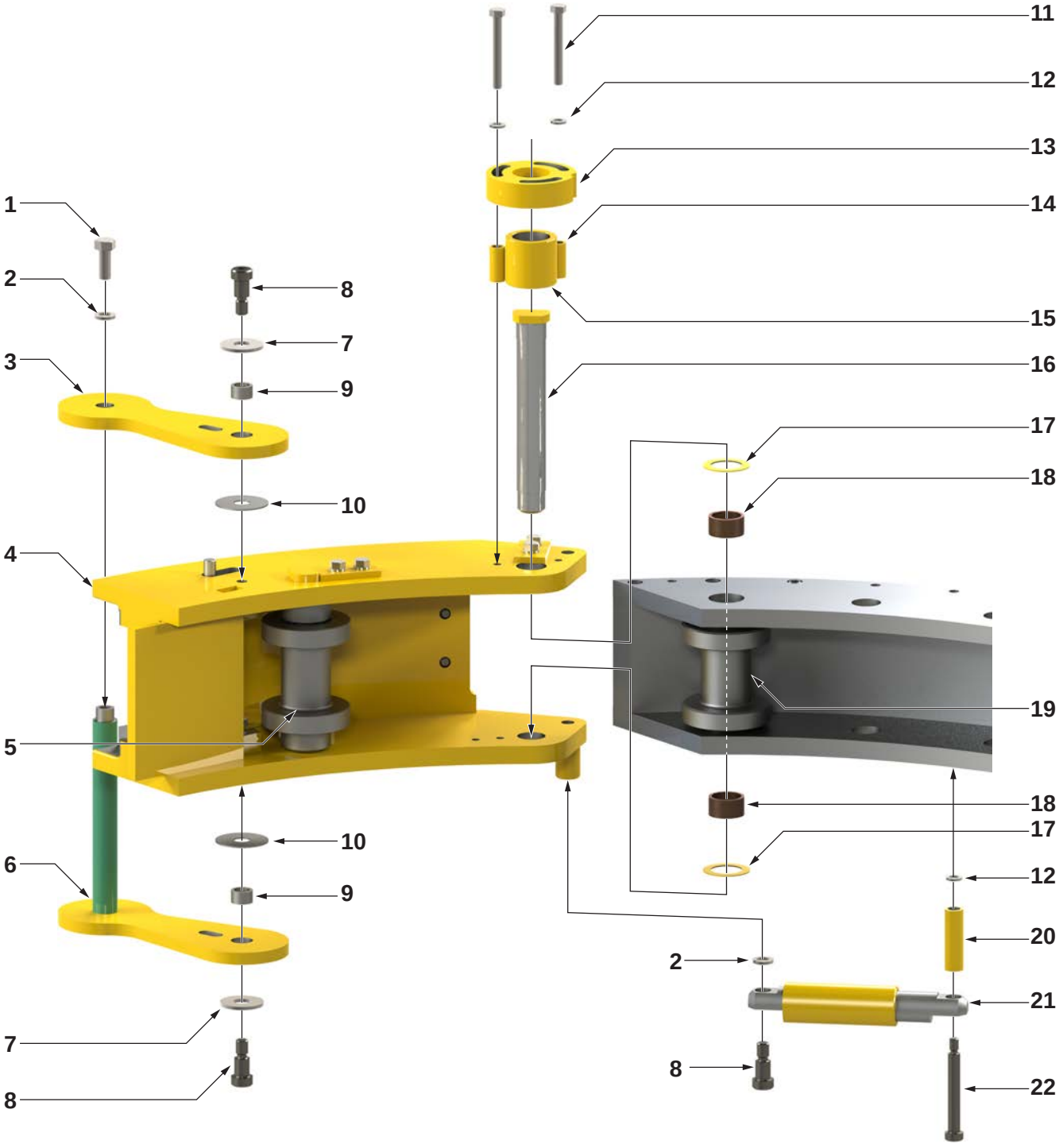

Illustration 7.27: RH Door Assembly

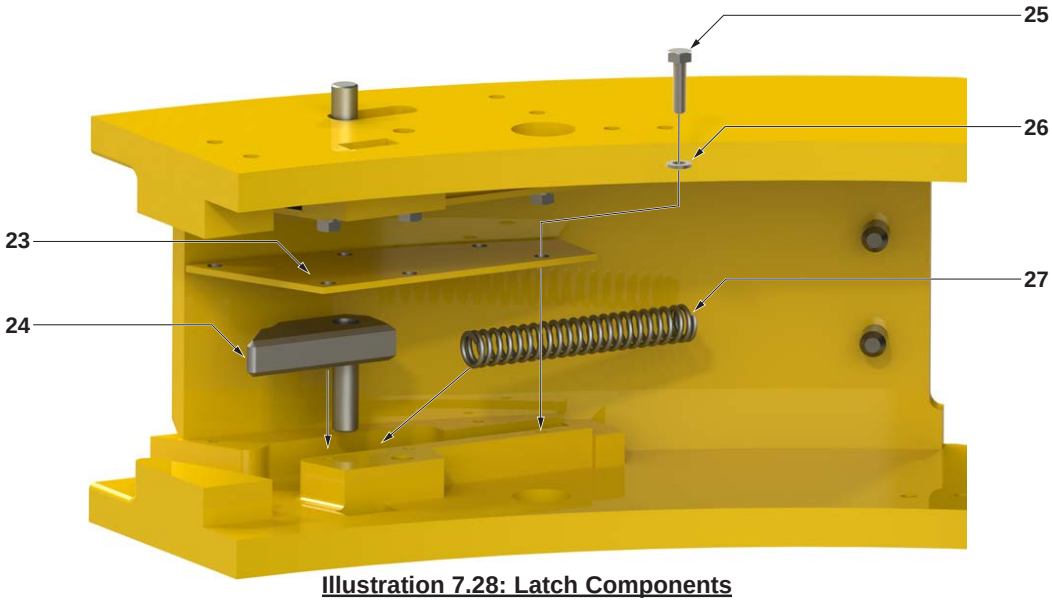

Illustration 7.28: Latch Components

Item	Type	Description	Qty	Part Number
1	Part	½" UNC x 1-¼" hex bolt	2	09-1168
2	Part	½" lock washer	3	09-5110
3	Part	Latch handle top plate	1	1482-11A-07
4	Weldment	RH door weldment	1	1482-11A-00M
5	Assembly	Door support roller assembly (see Pp 7.8 - 7.9)	2	101-1469
6	Weldment	Door handle weldment	1	101-1927
7	Part	⅝" flat washer	2	09-5006
8	Part	⅝" x ¾" hex socket UNC shoulder bolt	2	09-0049
9	Part	Door latch bushing	2	02-0520
10	Part	Door bushing	2	1482-12-08
11	Part	⅜" UNC x 3" hex bolt	2	09-1058
12	Part	⅜" lock washer	3	09-5106
13	Part	Rotation interlock door cam	1	101-6403
14	Part	Rotation interlock door spacer	2	101-6401
15	Part	Rotation interlock door bushing	1	101-6402
16	Part	Door pivot roller shaft	1	1482-11-04
17	Part	Door bushing, flat	2	02-E0077
18	Part	Door bushing, sleeve	2	101-4670
19	Assembly	Door pivot roller (see Pp 7.10 - 7.11)	2	101-1648
20	Part	Rear spring stop cylinder mount	1	101-6548
21	Assembly	Door spring stop cylinder	2	1037-A4-144
22	Part	½" x 3-¼" hex socket UNC shoulder bolt	1	
23	Part	Door latch lock lid	2	1482-11A-10
24	Part	Latch claw (bottom)	1	101-1333
	Part	Latch claw (top)	1	101-1488
25	Part	¼" UNC x 1" hex bolt	12	09-1007
26	Part	¼" lock washer	12	09-5102
27	Part	Latch spring	2	1482-11A-12

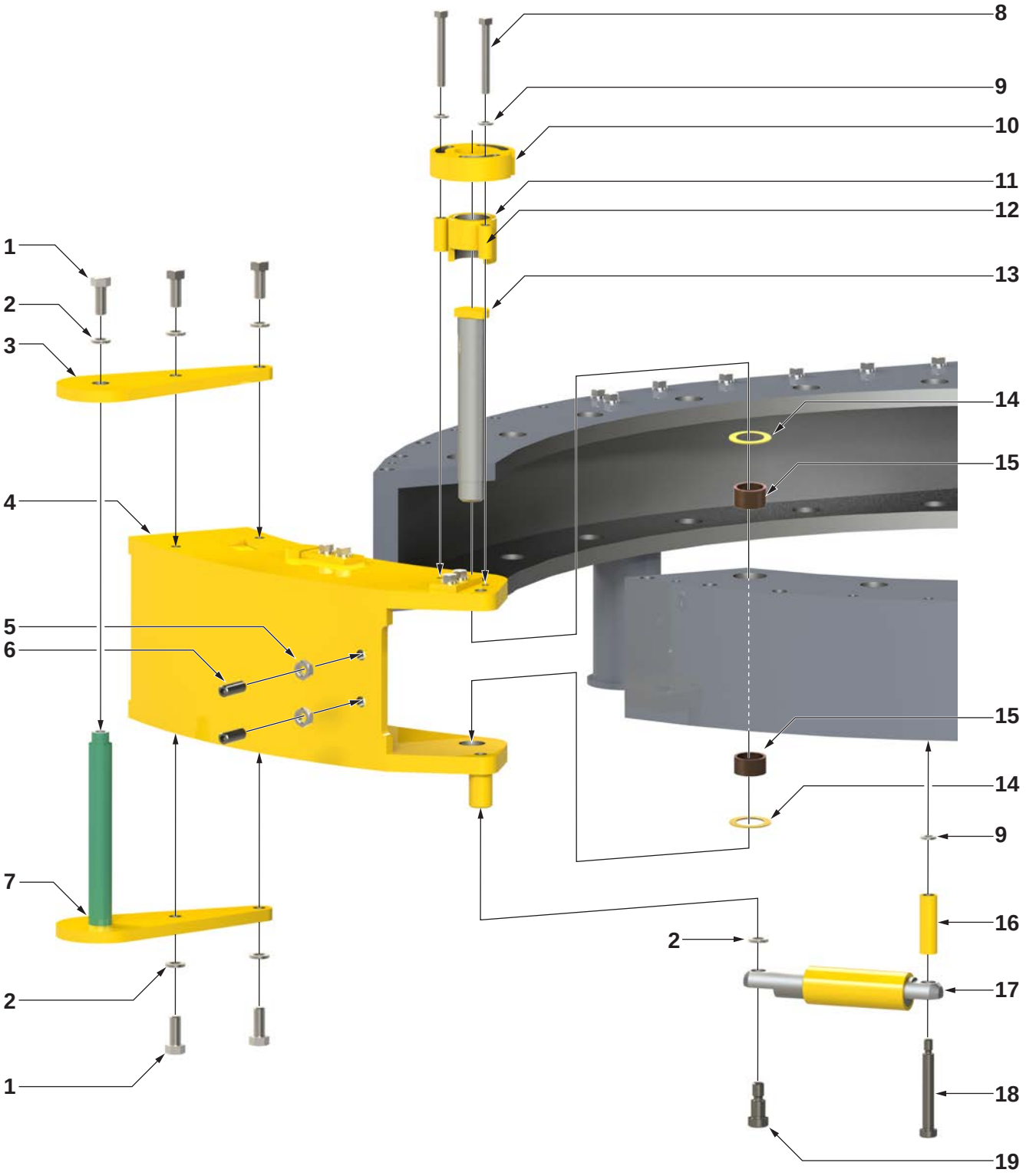

Illustration 7.29: LH Door Assembly

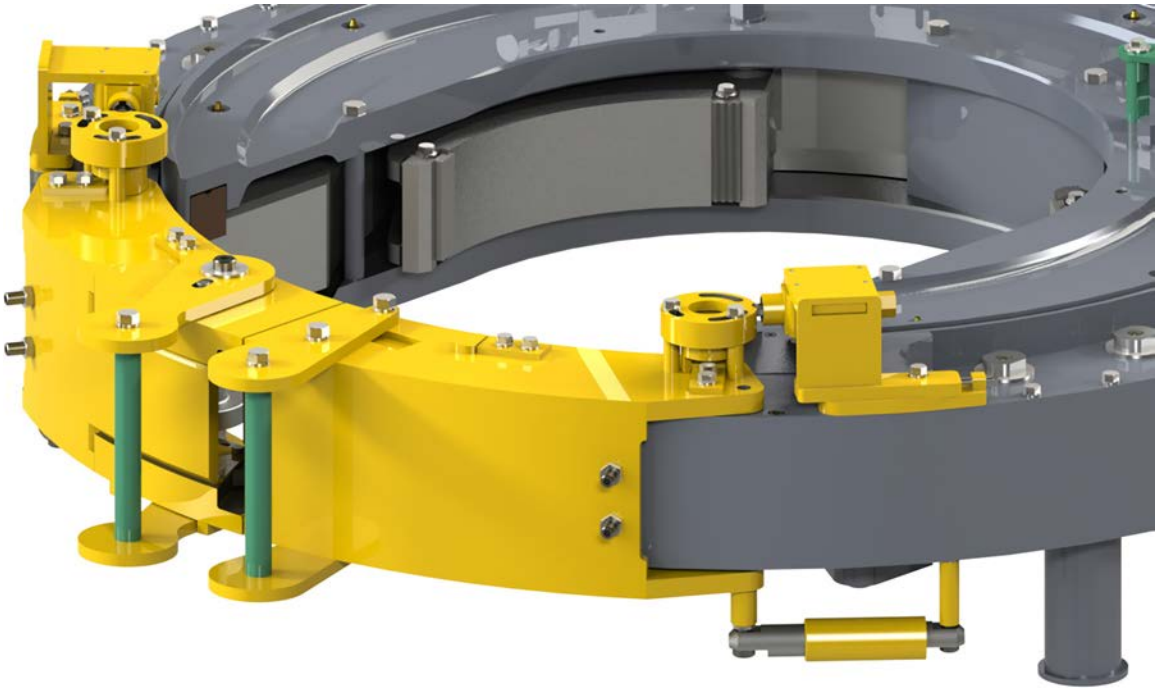

Illustration 7.30: Door Assembly

Item	Type	Description	Qty	Part Number
1	Part	½" UNC x 1-¼" hex bolt	5	09-1168
2	Part	½" lock washer	5	09-5110
3	Part	Door handle top plate	1	1482-11B-06
4	Weldment	LH door weldment	1	1482-11B-00M
5	Part	½" UNC hex jam nut	2	09-5810
6	Part	½" UNC x 1-½" hex socket head flat point set screw	2	
7	Weldment	Door handle weldment	1	101-1926
8	Part	⅜" UNC x 3" hex bolt	2	09-1058
9	Part	⅜" lock washer	3	09-5106
10	Part	Rotation interlock door cam	1	101-6403
11	Part	Rotation interlock door bushing	1	101-6402
12	Part	Rotation interlock door spacer	2	101-6401
13	Part	Door pivot roller shaft	1	1482-11-04
14	Part	Door bushing, flat	2	02-E0077
15	Part	Door bushing, sleeve	2	101-4670
16	Part	Rear spring stop cylinder mount	1	101-6548
17	Assembly	Door spring stop cylinder	2	1037-A4-144
18	Part	½" x 3-¼" hex socket UNC shoulder bolt	1	
19	Part	½" x ⅝" hex socket UNC shoulder bolt	1	09-1342

NOTE: Items 5 & 6 are also used in the RH door assembly

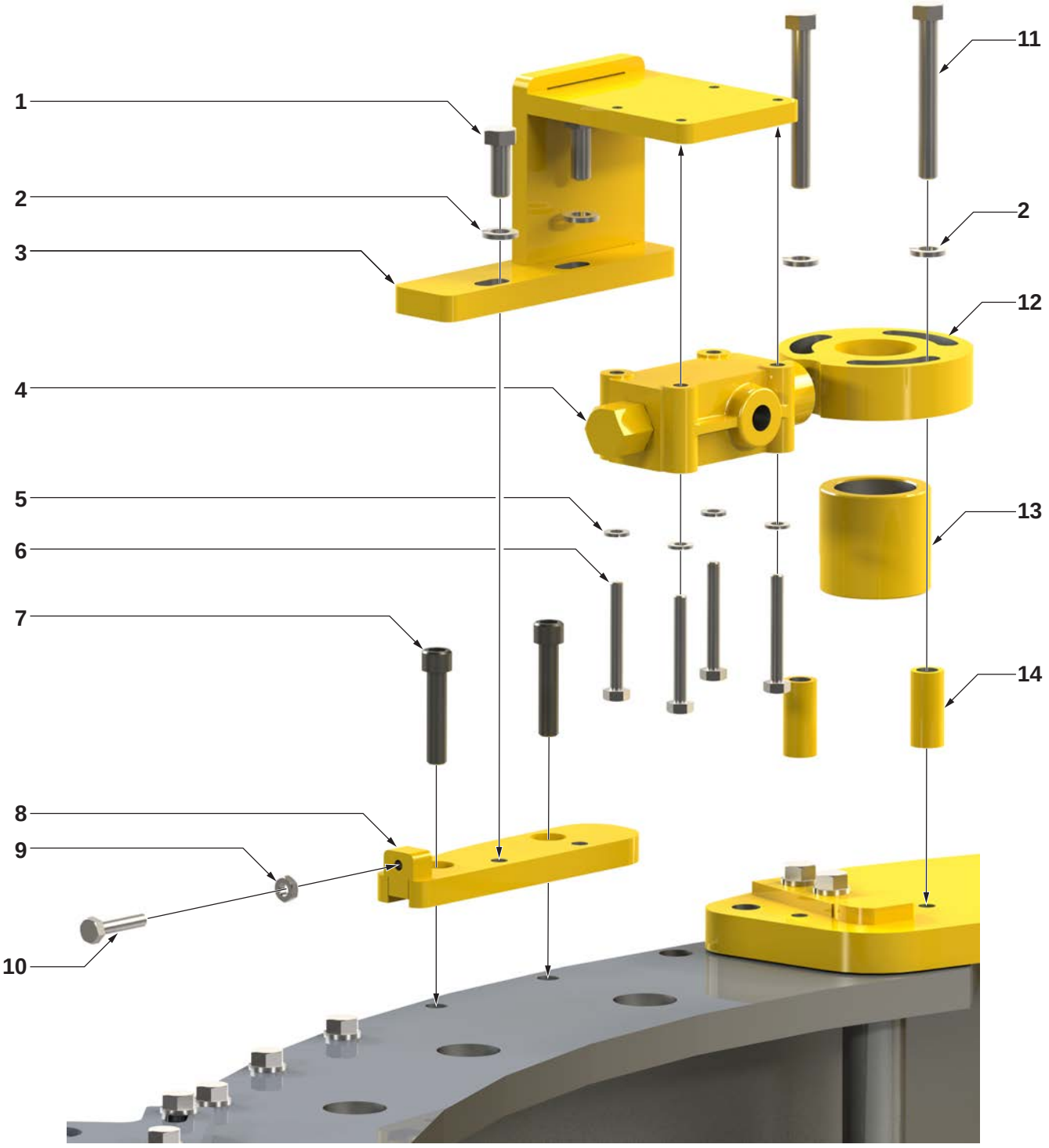

Illustration 7.31: Safety Door Components

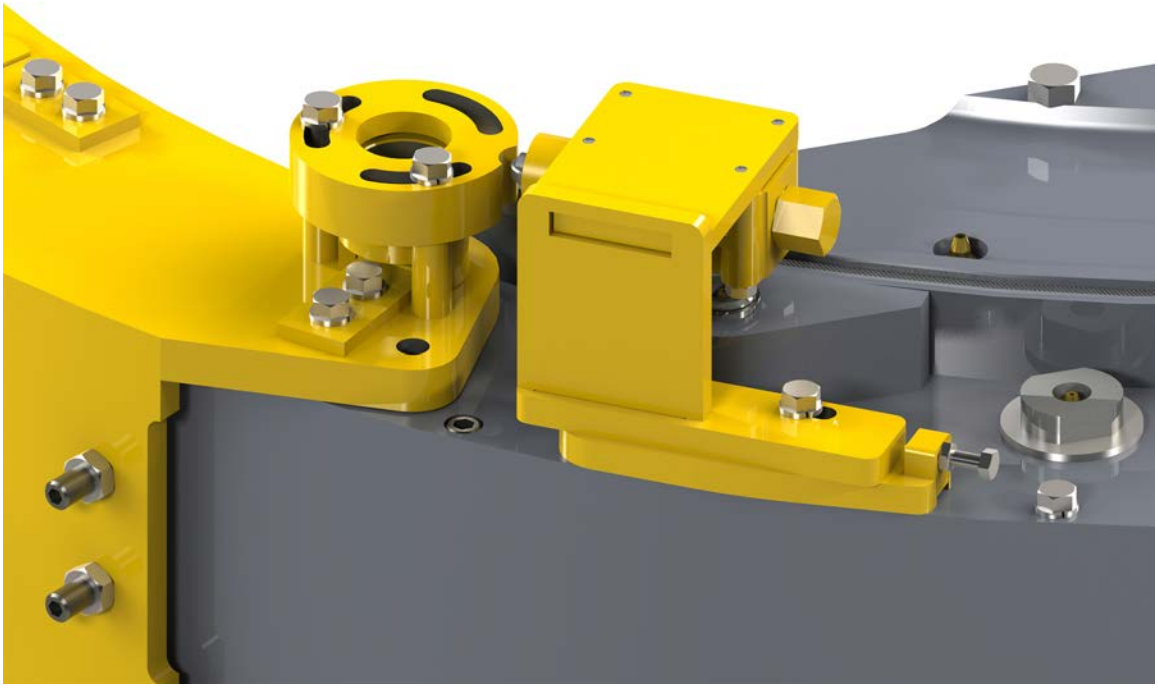

Illustration 7.32: Safety Door Assembly

Item	Type	Description	Qty	Part Number
1	Part	⅜” UNC x 1” hex bolt	4	09-1046
2	Part	⅜” lock washer	8	09-5106
3	Weldment	LH safety door switch guard	1	101-6399
	Weldment	RH safety door switch guard	1	101-6405
4	Part	Safety door switch	2	02-E0190
5	Part	¼” lock washer	8	09-5102
6	Part	¼” UNC x 2” hex bolt	8	09-1015
7	Part	⅜” UNC x 1-¾” hex socket head cap screw	4	09-2052
8	Weldment	LH safety door switch mount / adjustment plate	1	101-6397
	Weldment	RH safety door switch mount / adjustment plate	1	101-6411
9	Part	¼” UNC hex jam nut	2	09-9131
10	Part	¼” UNC x 1-¼” hex bolt	2	09-1009
11	Part	⅜” UNC x 3” hex bolt	4	09-1054
12	Part	Safety door cam	2	101-6403
13	Part	Safety door bushing	2	101-6402
14	Part	Safety door cam spacer	4	101-6401

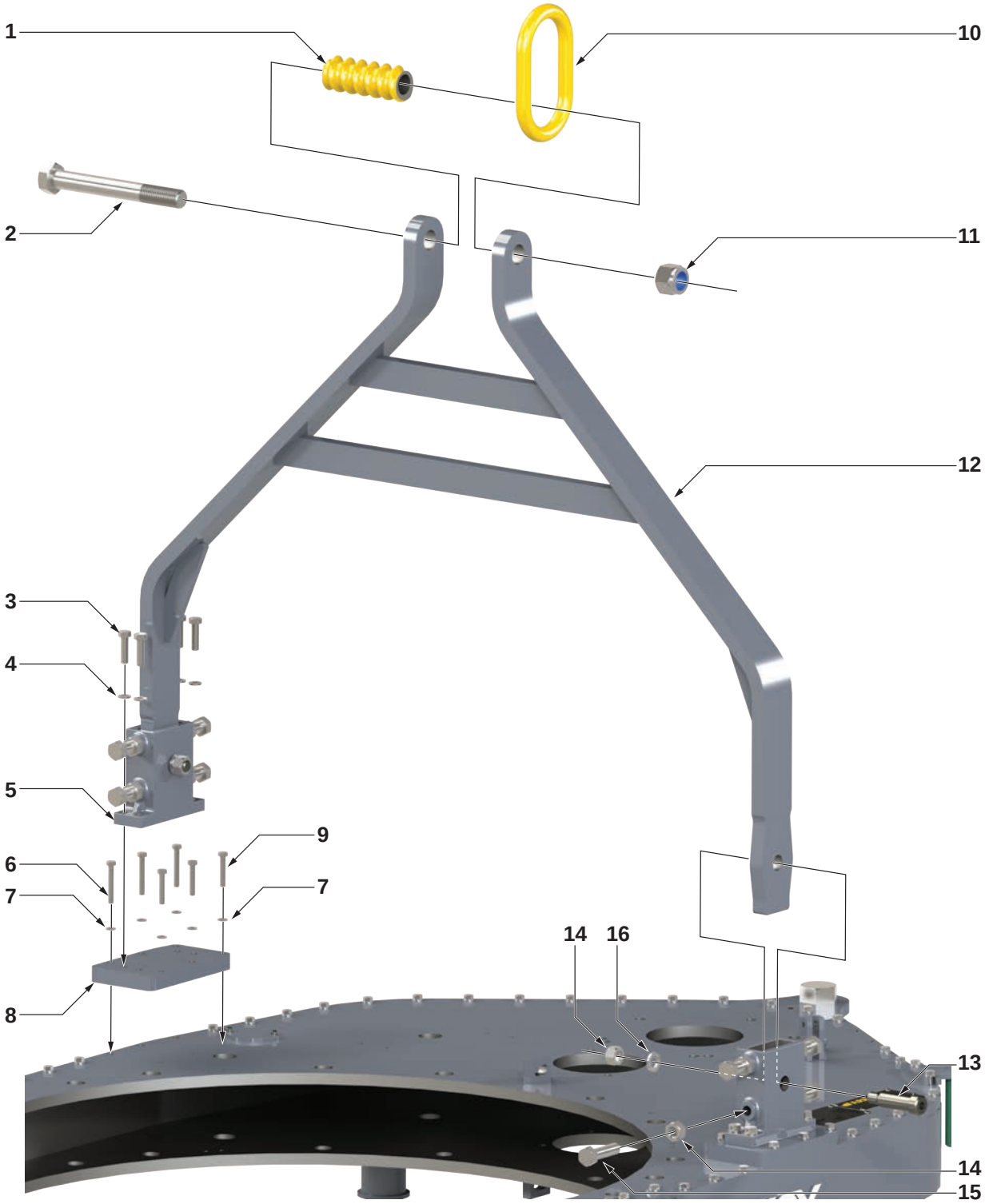

Illustration 7.33: Rigid Sling Assembly Exploded

⚠ WARNING

ALL FASTENERS USED DURING REASSEMBLY OF LOAD-BEARING COMPONENTS (CHAIN SLINGS, RIGID SLINGS, BACKUP LEGS) MUST BE TIGHTENED TO THE CORRECT TORQUE. THREADED FASTENERS USED IN LOAD-BEARING DEVICES MUST BE SECURED WITH RED LOCTITE™.

Illustration 7.34: Rigid Sling Assembly

Item	Type	Description	Qty	Part Number
1	Part	Adjustment helix	1	1095-220
2	Part	Rigid sling helix bolt	1	02-E0267
3	Part	½" UNC x 1-¾" drilled hex bolt	8	101-6459
4	Part	½" lock washer	16	09-5108
5	Weldment	Rigid sling mounting bracket	2	101-6393
6	Part	⅜" UNC x 2-½" drilled hex bolt	6	101-6972
7	Part	⅜" lock washer	12	09-5106
8	Part	Rigid sling mounting plate	2	101-6919
9	Part	⅜" UNC x 2" drilled hex bolt	6	101-6079
10	Part	Master lifting link	1	02-9128
11	Part	1-½" UNC nylock nut	1	09-5739
12	Weldment	Rigid sling weldment	1	101-6918
13	Part	1" x 2-½" hex socket head UNC shoulder bolt	2	09-9991
14	Part	¾" UNC hex nut	10	09-5818
15	Part	¾" UNC x 2-½" hex bolt	8	09-1296
16	Part	¾" lock washer	2	09-5118

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SECTION 8: TORQUE/TURNS MANAGEMENT

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8.0 BASIC TORQUE MEASUREMENT

Basic torque measurements are performed using a simple hydraulic measurement system. A hydraulic load cell connects to a calibrated torque gauge through a reinforced flexible hydraulic hose. The torque gauge is factory-calibrated to display accurate torque measurements for a tong or tong and backup assembly with a particular arm length. The arm length is a measurement from the centre of the pipe or casing to the centre of the force being applied to the load cell.

Two load cell options are available. A tension load cell is typically used with a suspended stand-alone tong. This application requires that the load cell be attached to the rear of the tong as part of the restraint line that opposes the force generated when the tong makes up or breaks out a joint. A compression load cell is used in a tong and backup assembly, and is typically located on the rear of the backup between the backup and a stationary frame. The load cell must be located in the centre of the compression force vector generated between the backup and the frame.

Hydraulic force generated by a load cell is transmitted to the torque gauge via a reinforced flexible hydraulic line. The hydraulic force is displayed as torque in units of Ft.-Lbs. The torque gauge has a red “peak torque” indicator that tracks with the torque gauge needle to the point of highest torque, and remains at the point of highest torque until manually reset. Note that every model of tong and tong and backup assembly has a unique arm length, and the torque gauge must be calibrated for that arm length. Torque gauges that are not calibrated for the arm length of the equipment in service will not display correct torque. To ensure correct torque measurement, ensure the arm length or “handle” as displayed on your torque gauge matches the arm length of the equipment in service as listed on the specifications page of the technical manual.

The images on this page are for illustration purposes only and may not accurately represent the torque gauge and load cell that have been supplied with your equipment.

NOTICE

THE IMAGES DISPLAYED ARE SUPPLIED FOR ILLUSTRATION PURPOSES ONLY

Illustration 8.0.1: Torque Gauge
(For Illustration Purposes Only)

Illustration 8.0.2: Tension Load Cell

Torque gauges and load cells are supplied as a matched calibrated pair. Substituting one or the other will render the calibration inaccurate even if the actual model numbers appear to be identical. The serial numbers of matching load cell and torque gauges are clearly identified on the calibration certificate. Should you suspect the accuracy of your torque measurements, or wish to replace either component the pair should be returned to the factory for re-calibration before placing into service.

⚠ CAUTION

TORQUE GAUGES AND LOAD CELLS ARE FACTORY-SUPPLIED SUPPLIED AS MATCHED CALIBRATED PAIRS. IF REPLACING EITHER COMPONENT THE LOAD CELL AND TORQUE GAUGE MUST BE RETURNED TO THE FACTORY FOR RE-CALIBRATION BEFORE PLACED INTO SERVICE.

8.0 BASIC TORQUE MEASUREMENT (CONTINUED:)

The images on the preceding page are for illustration purposes only and may not accurately represent the torque gauge and load cell that have been supplied with your equipment. Please note that the parts listed in the following table are correct for accurate torque measurement while using the equipment for which this manual is supplied.

NOTICE

THE TORQUE GAUGE USED IS FULLY DEPENDANT UPON THE ARM LENGTH AND TORQUE RANGE OF THE EQUIPMENT IN USE. THE PART NUMBERS LISTED IN THE FOLLOWING TABLE ARE CORRECT FOR ACCURATELY MEASURING TORQUE USING THE EQUIPMENT FOR WHICH THIS MANUAL IS SUPPLIED.

Type	Description	Qty	Part Number
Assembly	55” Arm 70K Tension Load Cell and Torque Gauge Assembly	1	10-0082T
Assembly	Tension Load Cell	1	10-0008T
Part	Torque Gauge, 70000 Lbs-Ft.	1	10-0082G
Part	Street Elbow	1	08-0304
Part	FPT Tee	1	08-0903
Part	Nipple Ext Pipe / Ext Pipe 4-4S	1	08-0190
Part	1” Plain Narrow Washer	1	09-5120
Part	5 Ft. Hose Assembly	1	02-0069

NOTICE

LOAD CELLS ARE NOT USER SERVICEABLE. DAMAGED TORQUE MEASUREMENT COMPONENTS MUST BE RETURNED TO THE FACTORY FOR REPAIR AND RE-CALIBRATION.

Item	Type	Description
	Assembly	Tension Load Cell, 4.08 in^2
1	Part	1/4" NC x 1/2" Binding Head Machine Screw
2	Part	Stat-O-Seal
3	Part	O-Ring
4	Part	O-Ring
5	Part	Load Cell Piston
6	Part	Flange Gasket
7	Part	Load Cell End
8	Part	Load Cell Rod
9	Part	Wiper
10	Part	O-Ring
11	Part	Load Cell Body
12	Part	3/8" NC x 3/8" Cup Point Hex Set Screw
Seal Kit		Replacement Seal Kit 4.08 in^2 *Tension Load Cell*

This is the standard tension load cell supplied by McCoy Global. Contact our sales department for information about optional application-specific tension load cells.

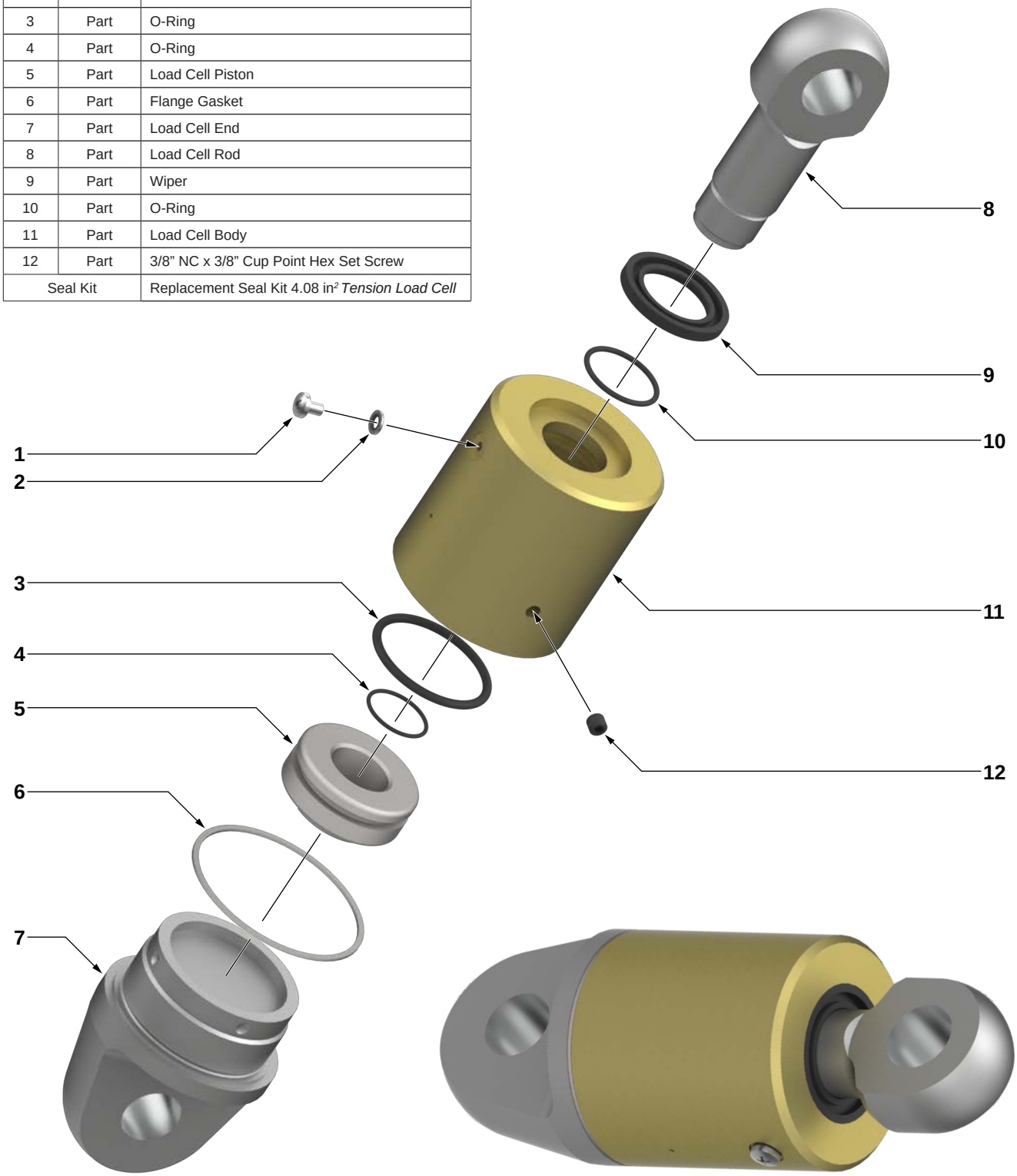
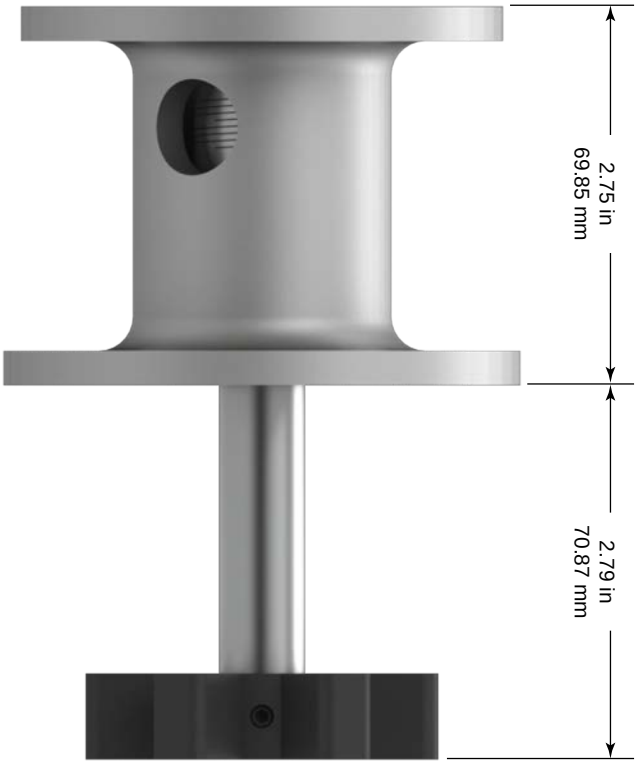
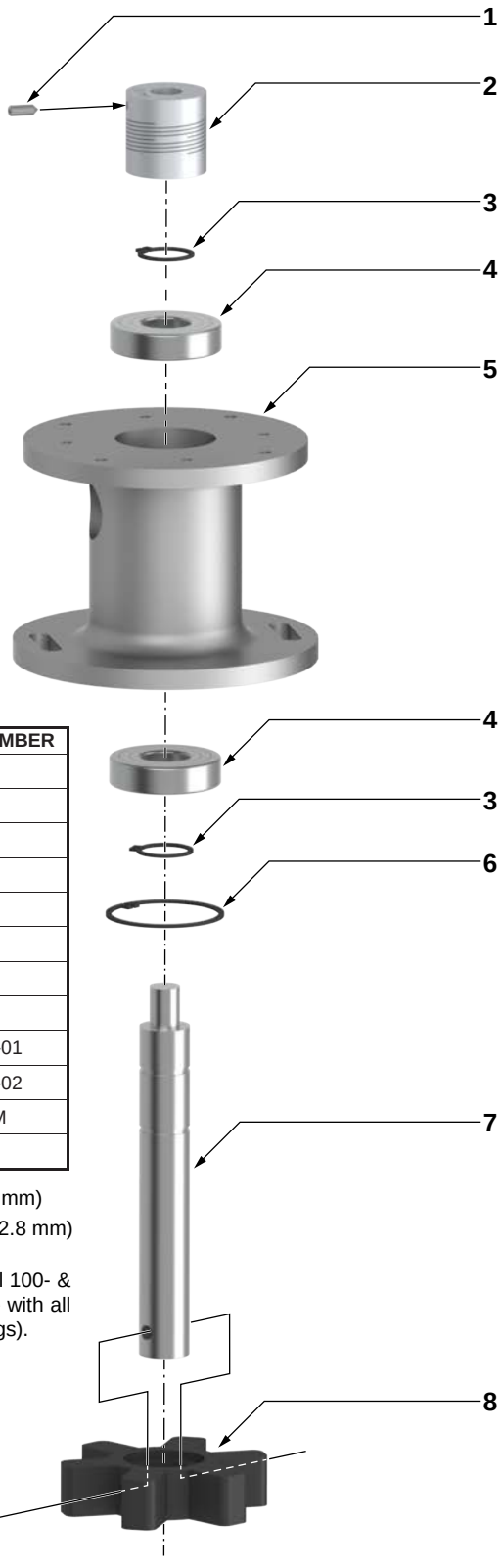


Illustration 8.0.3: Tension Load Cell Exploded





ITEM	TYPE	DESCRIPTION	QTY	PART NUMBER
	Assembly	Encoder mount	1	60-0001
	Assembly	Encoder mount, long encoder shaft	1	60-0001A
1	Part	6-32 x ⅜" hex socket head set screw	4	
2	Part	Helical flexible encoder shaft coupling	1	60-0130N
3	Part	Internal retainer ring	2	1376-13
4	Part	Bearing	2	1376-05
5	Part	Encoder housing	1	1392-104A
6	Part	Internal retainer ring	1	02-0436
7	Part	Encoder shaft, 60-0001 mount	1	1392-103A-01
	Part	Encoder shaft, 60-0001A mount	1	1392-103A-02
8	Part	Encoder gear	1	01-0320A-M
9	Part	10-24 x 1-¼" hex socket head set screw	1	

Min / max encoder shaft length, encoder # 60-0001: 0.67 in (17 mm) to 0.92 in (23.4 mm)
Min / max encoder shaft length, encoder # 60-0001A: 1.04 in (26.4 mm) to 1.29 in (32.8 mm)

Encoder mounts accomodate all standard 100-, 200-, & 500-count encoders, and all 100- & 200-count EX encoders supplied by McCoy Global for use with WINCATT®. For use with all configured McCoy tongs with the exception of models 80-0001-X (SL4500 "slim" tongs).

Illustration 8.0.4: Turn Counter Encoder Mount Exploded

8.1 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.

NOTICE

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	SYMPTOM: NO INDICATION ON TORQUE GAUGE	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Hydraulic hose is obstructed	Check hydraulic hose for kinks
		Replace hydraulic hose
	Loss of hydraulic fluid	Recharge hydraulic fluid (see Section 8.2). NOTE: Ensure any breaches in the hydraulic system between the load cell and torque gauge are repaired to prevent further fluid loss.
	Internal mechanism of torque gauge is damaged	Replace gauge
2	SYMPTOM: GAUGE INDICATION UNEXPECTEDLY HIGH	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Excessive hydraulic fluid	Completely drain hydraulic fluid from torque gauge/load cell system. Recharge following the procedure in Section 8.2
	Internal mechanism of gauge is damaged	Replace gauge
	Incorrect torque gauge in use (not part of the original torque gauge/load cell pair)	Replace gauge with gauge properly calibrated for the load cell in service
3	SYMPTOM: GAUGE INDICATION UNEXPECTEDLY LOW	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Insufficient hydraulic fluid	Recharge hydraulic fluid (see Section 8.2). NOTE: Ensure any breaches in the hydraulic system between the load cell and torque gauge are repaired to prevent further fluid loss
	Obstruction in hydraulic hose	Check hydraulic hose for kinks
		Replace hydraulic hose
	Snub line not at right-angle to tong handle	Check angle of snub line and correct if necessary
	Internal mechanism of gauge is damaged	Replace gauge
	Incorrect torque gauge in use (not part of the original torque gauge/load cell pair)	Replace gauge with gauge properly calibrated for the load cell in service
4	SYMPTOM: GAUGE INDICATION IS ERRATIC OR SLUGGISH	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Insufficient hydraulic fluid in torque measurement section	Recharge hydraulic fluid (see Section 8.2). NOTE: Ensure any breaches in the hydraulic system between the load cell and torque gauge are repaired to prevent further fluid loss
	Loss of damping fluid in torque gauge	Top up or refill damping fluid (NOTE: Ensure leakage points in gauge are identified and repaired to prevent further loss of damping fluid)
	Air bubbles in hydraulic fluid in the torque measurement system	Bleed air from load cell and torque gauge and top up fluid (if necessary) as per Section 8.2
	Internal mechanism of gauge is damaged	Replace gauge

8.2 PERIODIC INSPECTION AND MAINTENANCE

NOTICE

ONLY QUALIFIED, DESIGNATED PERSONNEL ARE PERMITTED TO PERFORM MAINTENANCE ON THE TORQUE MEASUREMENT SYSTEM.

8.2.1 Inspection

The torque measurement system supplied with your equipment is designed and built to provide years of trouble-free service with minimum maintenance. Periodic inspections of the load cell, 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.

8.2.2 Fluid Recharge

Recharge hydraulic system with W15/16 fluid through the check valve on the torque indicating gauge. Recharging must only be performed when there is no load on the load cell. Refer to the illustrations on pages 6.3 & 6.4 for guidance if required.

a. Place the torque indicating gauge higher than the load cell. Remove the brass 1/4” cap from the fitting on the check valve on the top of the gauge.

b. Connect the hand pump to the check valve fitting.

c. Elevate the load cell so it is higher than the torque gauge and hand pump.

⚠ CAUTION

UNCONTAINED SPILLAGE OF THE HYDRAULIC FLUID IN THIS SYSTEM MAY CONTRAVENE GOVERNMENTAL ENVIRONMENTAL REGULATIONS, OR THE ENVIRONMENTAL REGULATIONS AND POLICIES OF YOUR COMPANY. MCCOY GLOBAL HIGHLY RECOMMENDS PLACING YOUR LOAD CELL IN A CONTAINMENT BASIN BEFORE PROCEEDING WITH THE BLEEDING & REFILLING PROCESS.

d. Fill hand pump bowl with W15/16 hydraulic fluid.

NOTICE

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

e. Remove the vent plug screw and Stat-O-Seal (items 1 and 2 on Illustration 8.0.3) to allow trapped air to escape.

f. Pump fluid into the system until no more air is seen escaping from the vent port.

g. Replace the vent plug screw and Stat-O-Seal and tighten securely.

h. Remove load cell from containment vessel and wipe clean. Reclaim the hydraulic fluid (if it is clean) or dispose of all waste materials according to governmental or your company’s proscribed environmental protection regulations.

i. Disconnect the hand pump from the torque gauge.

j. Replace the brass cap on the torque gauge check valve fitting.

8.2.3 Reference Checking Your Torque Measurement System

The following steps define a process for determining if your torque measurement system is correctly measuring and indicating within an expected range. This procedure is best suited for performing in a shop or location removed from the drill floor, within range of a crane. This is a reference check and not a calibration. Calibrations must be performed at an authorized calibration facility.

Tension Load Cell

a. Locate a known weight in the range of approximately 500 to 1000 lbs (227 to 455 kg), and move the weight next to the tong and backup assembly.

b. Remove the tension load cell from the tong, but do not disconnect from the torque gauge.

Continued on next page...

8.2.3 Reference Checking Your Torque Measurement System (Continued):

Tension Load Cell (continued):

c. Suspend the load cell, piston side up, from a crane capable of supporting the known weight in Step 3a.

d. Connect the rod side of the load cell to the known weight, and use the crane to hoist the weight from the surface to be suspended freely.

e. Perform a simple calculation to determine the expected indication on the torque gauge based on the known hoisted weight. This is a calculation that must be performed using imperial units (eg., pounds and feet). The calculation is: [KNOWN WEIGHT] x [ARM LENGTH (in feet)]. For example, if the arm length is 36 inches and the hoisted weight is 1000 lbs the calculation is:

1000 x (36/12) = 3000

Therefore, the expected indication on the torque gauge should be 3000 lbs-ft.

8.2.4 Repair And Calibration

Return the load cell and indicator gauge to the authorized repair facility for repairs and calibration.

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SECTION 9: OEM DOCUMENTATION

The manufacturer information contained in this section has been obtained from publicly available web sites and has been provided for information purposes only. McCoy Global does not guarantee the accuracy of the information contained in this section. All original copyrights claimed by the manufacturer(s) apply.

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Rineer Hydraulic Motors:

http://www.rineer.com/WEBPAGES_2005/REPAIRMAN/REP125_COVFRT_2K3.html

Parker Series VA/VG Series Valves

http://www.parker.com/literature/Hydraulic%20Valve%20Division/hydraulicvalve/Service-Installation/Mobile/Commercial%20Service%20Literature/Bul%20HY14-2004-M1%20VA%20VG%20DCV.pdf