MCCOY GLOBAL

TECHNICAL MANUAL

80-0421-13 KT5½

5-½” (140 mm) 18,700 lbs-ft Hydraulic Power Tong
6-¼” (159 mm) CLINCHER® Backup

CE

SPECIFICATIONS | OPERATION | MAINTENANCE | PARTS

MCCOYGLOBAL.COM

ORIGINAL INSTRUCTIONS

THIS TECHNICAL DOCUMENT APPLIES TO THE FOLLOWING MODELS:				
OVERALL MODEL	**TONG MODEL**	**BACKUP MODEL**	**REV**	**DESCRIPTION**
80-0421-13	80-0420-28	85-0398	0	5-½" configured power tong & compression load cell-style 6-¼" CLINCHER® backup. Tong equipped with hydraulic motor control, lift control, backup control, & rigid sling.
80-0421-14	80-0420-29	85-0398	0	5-½" configured power tong & compression load cell-style 6-¼" CLINCHER® backup. Tong equipped with hydraulic motor control, lift control, backup control, & rigid sling. **CLOSED CENTRE HYDRAULICS**

THIS EQUIPMENT USES A DOOR SWITCH SYSTEM DESIGNED TO INTERRUPT TONG ROTATION WHEN TONG DOOR IS OPENED

McCoy 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: 80-0421-13 Serial Number: 20150159 & 20150160

Product Description: KT 5500-6250 CBU

McCoy Global Technical Construction File Reference: T104

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	18700 Ft/lbs	25357 Nm
Arm Length	32.0 Inch	81.3 Cm
Mass	2130 Lbs	966 Kg
	Torque (Ft Lbs/N M, Estimated)	
At Pressure	2250 Psi	155 Bar
	3740 Hi	5071 Full
	18700 Lo	25357 Full
	Speed (Rpm, Estimated)	
At flow rate	60 GPM	227 LPM
	77.0 Hi	77.0 Full
	15.4 Lo	15.4 Full
Jaw size range (Inch)	2 3/8 From	5 1/2 to
Overall Length	52.0 In	132.1 Cm
Overall Width	37.0 In	94.0 Cm
Overall Height	72.6 In	184.5 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 KT 5500-6250 CBU 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 88.7 dB

"C" weighted reading of 88.2 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:

Rajiur Rahman	Engineering Supervisor
Name	Title
	May 22, 2015
Signature and date	

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

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.

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: 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

⚠ 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.

⚠ 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.

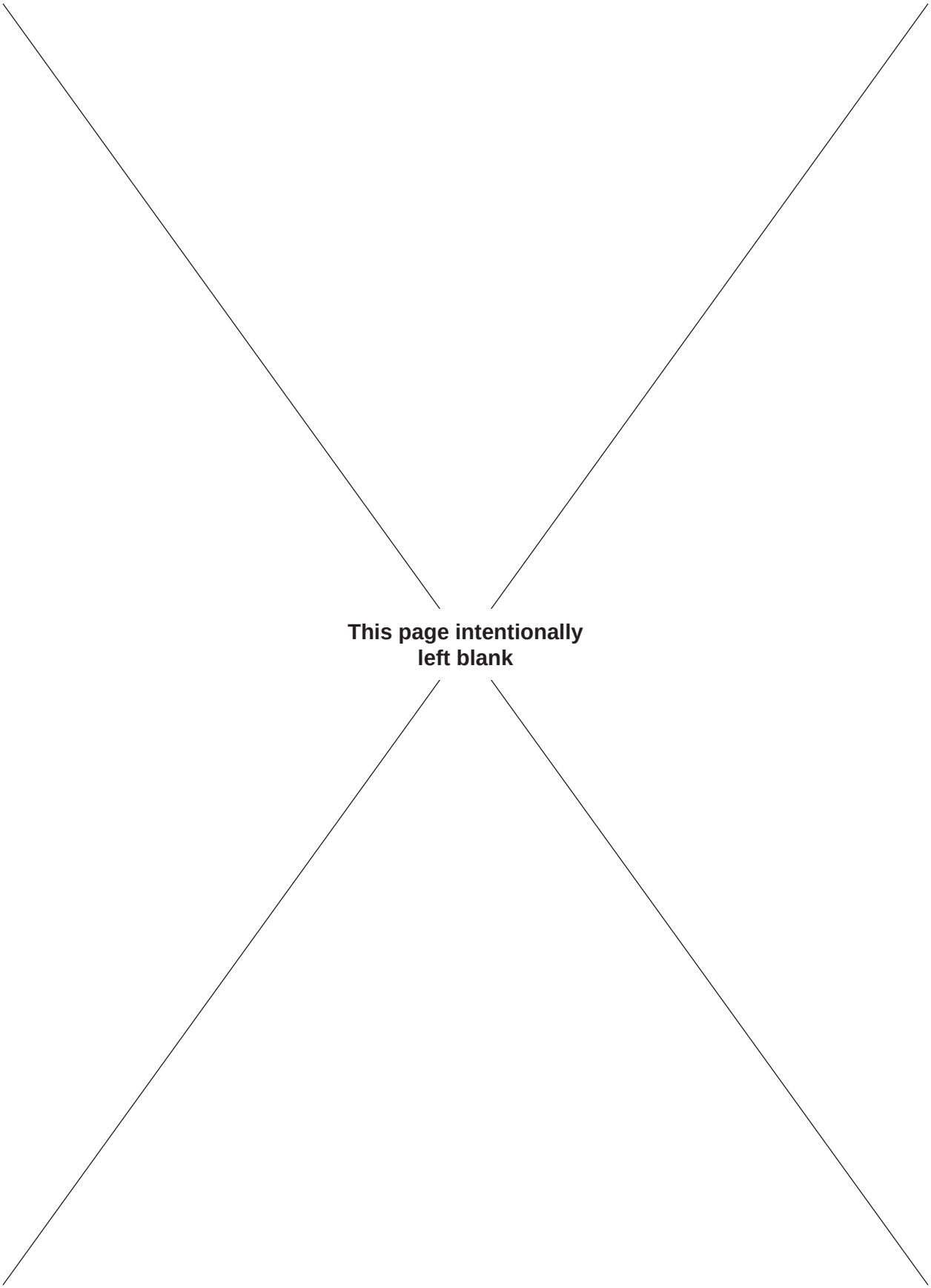
McCoy has made every effort to ensure the information contained in this document is accurate and current. This manual is intended to provide equipment operation and safety instructions for your equipment. However, McCoy does not warrant or guarantee that the information is either complete or accurate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

The user of the manual shall protect, indemnify, and hold harmless McCoy 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.


This page intentionally
left blank

Summary Of Revisions				
Date	**Section**	**Page**	**Description Of Revision**	**Approved**
Jan 2014			Initial release	R. Rahman
JUN 2015	Preamble	iii	Updated model number	D. Sonnier
		iv-v	Added EC Declaration of Conformity	
		vi	Inserted warnings regarding spark generation	
	1	1.3	Updated company contact information	
		1.7	Updated CE label illustration	
	6	6.44-6.45	Updated rigid sling assembly drawings and B.O.M.	
MAR 2016	Preamble	iii	Added model 80-0421-14	D. Sonnier
	1	1.6	Updated specifications and added maximum hydraulic supply warning	
		1.7	Updated lubricant specifications	
	2	2.13	Updated B.O.M. to include closed-centre hydraulic components. Added macimum hydraulic supply warning	
		2.14	Added hydraulic schematic, closed-centre hydraulics	

SECTION ONE: INTRODUCTION
Introduction & Contact Information 1.3
Equipment Specifications 1.4
Lubricant Specifications 1.7

SECTION TWO: INSTALLATION & COMMISSIONING
2.A INITIAL RECEIPT AND INSPECTION OF EQUIPMENT 2.3
2.B MAJOR COMPONENT IDENTIFICATION 2.3
2.C SLING / LOAD BEARING DEVICE SAFETY 2.7
2.C.1 Inspection Of Slings 2.8
2.C.2 Proper Use Of Load-Bearing Devices 2.9
2.C.3 Storage Of Load-Bearing Devices 2.9
2.D LIFT CYLINDER INSTALLATION 2.10
2.D.1 Installation Procedure 2.10
2.D.2 Lift Cylinder Connection 2.11
2.D.3 Lift Cylinder Safety 2.11
2.E HYDRAULICS
2.E.1 Hydraulic Schematic & B.O.M. 2.13
2.E.2 Hydraulic Component Identification 2.14
2.E.3 Main Hydraulic Connections 2.16
2.F TONG JAW AVAILABILITY & INSTALLATION
2.F.1. Jaw Availability 2.17
2.F.2. Jaw Removal 2.18
2.F.3 Standard Jaw Die Removal 2.19
2.F.4 Wraparound Jaw Die Removal 2.20
2.F.5 Backup Jaw Availability 2.20
2.F.6 CLINCHER® Backup Jaw Removal/Installation 2.21
2.G TONG RIG-UP & LEVELING
2.G.1 Suspension & Restraint 2.23
2.G.2 Tong Leveling 2.24
2.G.3 Load Cell Configuration 2.25

SECTION THREE: OPERATION
3.A TONG OPERATION 3.3
3.A.1 Operator Training 3.3
3.A.2 Operator Safety 3.3
3.A.3 Valve Operation 3.3
3.A.4 Shifting Gears 3.6
3.A.5 Pre-Operational Checks 3.6
3.A.6 General Comments 3.7
3.B MAKING AND BREAKING CONNECTIONS 3.8
3.B.1 Making A Connection 3.8
3.B.2 Breaking and Un-threading Connections 3.11
3.C EXTREME COLD WEATHER OPERATION 3.13

SECTION FOUR: MAINTENANCE
4.A GENERAL MAINTENANCE SAFETY PRACTICES 4.3
4.B CLEANING 4.3
4.C PREVENTIVE MAINTENANCE 4.3
4.D HYDRAULIC SYSTEM DE-PRESSURIZATION 4.4
4.E LUBRICATION INSTRUCTIONS 4.4
4.F ADJUSTMENTS
4.F.1 Brake Band Tension Adjustment: 4.11
4.F.2 Shifter Detent Force Adjustment: 4.11
4.F.3 Safety Door Switch Adjustment 4.12
4.G RECOMMENDED PERIODIC CHECKS
4.G.1 Door Stop Spring 4.13
4.G.2 Backing Pin 4.13
4.G.3 Shifting Shaft 4.13
4.G.4 Torque Gauge Assembly 4.13
4.H REMOVAL OF TOP PLATE FOR OVERHAUL 4.14
4.I ASSEMBLY PROCEDURES 4.16
4.J DAILY INSPECTION & MAINTENANCE CHECKLIST (POWER TONG) 4.32
4.K DAILY INSPECTION & MAINTENANCE CHECKLIST (BACKUPS) 4.34
4.L MONTHLY MAINTENANCE CHECKLIST - POWER TONG 4.35
4.M TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING 4.38
4.N TUBULAR CONNECTION EQUIPMENT RE-COMMISSIONING PROCEDURE 4.43

SECTION FIVE: TROUBLESHOOTING
5.A TONG WILL NOT DEVELOP SUFFICIENT TORQUE 5.3
5.B RELIEF VALVE IS INCORRECTLY SET OR NOT FUNCTIONING 5.4
5.C SAFETY DOOR DOES NOT OPERATE OR IS MALFUNCTIONING 5.6
5.D TONG RUNNING TOO SLOWLY 5.7
5.E FAILURE OF JAWS TO GRIP PIPE 5.8
5.F FAILURE OR DIFFICULTY OF TONG TO SHIFT 5.9
5.G GENERAL TROUBLESHOOTING COMMENTS 5.10

SECTION SIX: PARTS AND ASSEMBLIES
Parts List - Critical Spares 6.3
Parts List - Recommended One-Year Spares 6.5
Parts List - Parts Required For Rebuild 6.6
Gear Train Layout 6.8
Support Roller 6.10
Rotary Idler 6.12
Pinion Idler 6.14
Pinion Assembly 6.16
Clutch Assembly 6.18
Shifter Assembly 6.20
Cage Plate Assembly 6.22
1064-JDK-XX Standard Tong Jaws 6.24
1064-WJK-350/550 Wrap-around Tong Jaws 6.26
Brake Band Assembly 6.28
Motor & Motor Mount Assembly 6.30
Tong Body Assembly 6.32
Hydraulic Supports 6.34
Hydraulic Assembly 6.36
Tong Door Latch Assembly 6.38
Tong Door Assembly 6.40
Safety Door Components 6.42
Rigid Sling Assembly 6.44
Leg Assemblies 6.46
Backup 6.48
CLINCHER® Cylinders 6.50

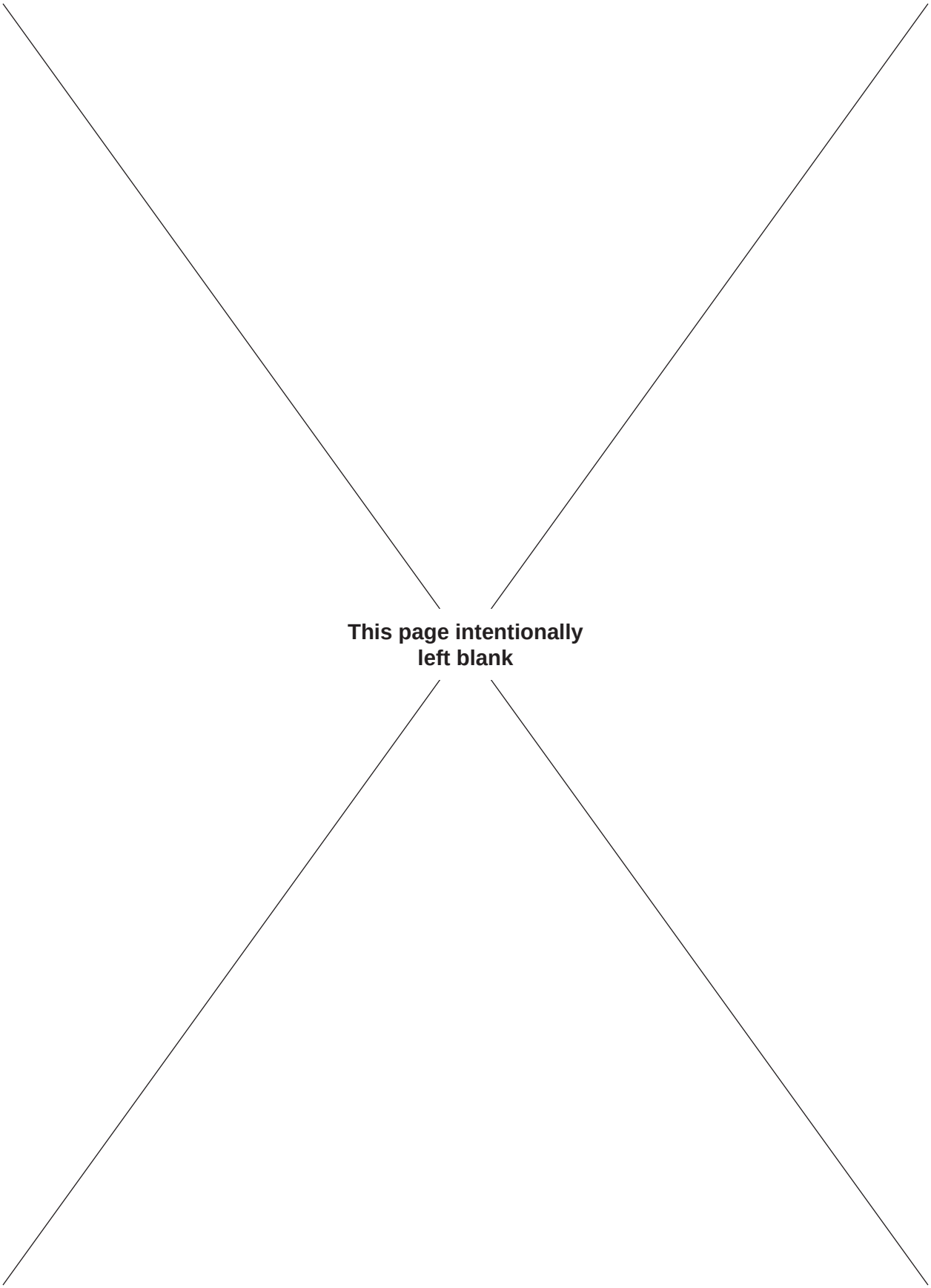
SECTION SEVEN: TORQUE MEASUREMENT
7.A BASIC TORQUE MEASUREMENT 7.3
7.B TROUBLESHOOTING 7.7
7.C PERIODIC INSPECTION AND MAINTENANCE 7.8
7.C.1 Inspection 7.8
7.C.2 Fluid Recharge 7.8
7.C.3 Reference Checking Your Torque Measurement System 7.8
7.C.4 Repair And Calibration 7.9

SECTION EIGHT: OEM DOCUMENTATION

Illustration 1.A.1: KT5-½ Tong & 6-¼" CLINCHER© Backup 1.3
Illustration 1.A.2: KT5-½ Tong & 6-¼" CLINCHER© Backup Dimensions 1.4
Illustration 1.A.3: KT5-½ Tong & 6-¼" CLINCHER© Backup Hazard Areas 1.5
Illustration 1.A.4: FARR® CE Nameplate 1.7
Illustration 2.B.1: KT5500+CBU Component ID 01 ..... 2.3
Illustration 2.B.2: KT5500+CBU Component ID 02 ..... 2.4
Illustration 2.B.3: KT5500+CBU Component ID 03 ..... 2.5
Illustration 2.B.4: KT5500+CBU Component ID 04 ..... 2.6
Illustration 2.C.1: Sling Angle 2.7
Illustration 2.D.1: Lift Cylinder & Spring Hanger Installation 2.10
Illustration 2.D.2: Lift Cylinder Hydraulic Connection 2.11
Illustration 2.E.1: KT5500+CBU Hydraulic Schematic 2.13
Illustration 2.E.2: KT5500+CBU Hydraulic Component ID 01 ..... 2.14
Illustration 2.E.3: KT5500+CBU Hydraulic Component ID 02 ..... 2.14
Illustration 2.E.4: KT5500+CBU Hydraulic Component ID 03 ..... 2.15
Illustration 2.E.5: KT5500+CBU Hydraulic Component ID 04 ..... 2.15
Illustration 2.E.6: KT5500+CBU Hydraulic Component ID 05 ..... 2.16
Illustration 2.E.7: KT5500+CBU Hydraulic Connections 01 ..... 2.16
Illustration 2.E.8: KT5500+CBU Hydraulic Connections 02 ..... 2.17
Illustration 2.F.1: KT5500+CBU Jaw Removal 2.18
Illustration 2.F.2: KT5500 Standard Jaw Die Removal 2.19
Illustration 2.F.3: KT5500 Wraparound Jaw Die Removal 2.20
Illustration 2.F.4: KT5500+CBU CLINCHER© Cylinder Extension 2.21
Illustration 2.F.5: KT5500+CBU Wraparound Die Removal / Installation 2.21
Illustration 2.F.6: KT5500+CBU Rear Backup Jaw Extension 2.22
Illustration 2.G.1: Tong Leveling (Side-To-Side) 2.24
Illustration 2.G.2: Tong Leveling, Front-To-Back 2.24
Illustration 2.G.4: Load Cell Configuration, Break-Out 2.25
Illustration 2.G.3: Load Cell Configuration, Make-Up 2.25
Illustration 3.A.1: Tong Motor Control Valve 3.4
Illustration 3.A.2: Lift Cylinder Control Valve 3.4
Illustration 3.A.3: Lift Cylinder Needle Valve 3.5
Illustration 3.A.4: Backup Control Valve 3.5
Illustration 2.H.4: Shifting Gears 3.6
Illustration 3.B.1: Rigid Sling Master Link 3.8
Illustration 3.B.2: Backing Pin Configured For "Make-up" Operations 3.9
Illustration 3.B.3: Rotation Control Valve - Making Up Connection 3.10
Illustration 3.B.4: Backing Pin Configured For "Make-up" Operations 3.11
Illustration 3.B.5: Rotation Control Valve - Breaking Out Connection 3.12
Illustration 4.E.1: Cam Follower Lubrication 4.4
Illustration 4.E.2: Support Roller Bearing Lubrication 4.5
Illustration 3.D.3: Rotary Idler Bearing Lubrication 4.5
Illustration 3.D.4: Pinion Idler Bearing Lubrication 4.6
Illustration 4.E.5: Pinion Bearing Lubrication (Top) 4.6
Illustration 4.E.6: Pinion Bearing Lubrication (Bottom) 4.7
Illustration 4.E.7: Clutch Bearing Lubrication 4.7
Illustration 4.E.8: Motor Gear / Clutch Drive Gear Lubrication 4.8
Illustration 4.E.9: Shifting Shaft Lubrication 4.8
Illustration 4.E.10: Door Latch Bushing Lubrication 4.9
Illustration 4.E.11: Door Pivot Bushing Lubrication 4.9
Illustration 4.E.13: Load Cell Lubrication 4.10
Illustration 4.E.12: CLINCHER© Cylinder Lubrication 4.10
Illustration 4.F.1: Brake Band Adjustment 4.11
Illustration 4.F.2: Shifter Detent Force Adjustment 4.11
Illustration 4.F.3: Safety Door Adjustment 01 ..... 4.12
Illustration 4.F.4: Safety Door Adjustment 02 ..... 4.12
Illustration 4.F.5: Safety Door Adjustment 03 ..... 4.13
Illustration 4.I.1: Tong Assembly - Initial Support Roller Installation 4.17
Illustration 4.I.2: Tong Assembly - Rotary Gear Installation 4.17
Illustration 4.I.3: Tong Assembly - Top Plate Fastener Installation 4.19
Illustration 4.I.4: Tong Assembly - Top Shifter Bushing Installation 4.19
Illustration 4.I.5: Tong Assembly - Brake Band Weldment Installation 4.20
Illustration 4.I.6: Tong Assembly - Front Leg Mount Weldment Installation 4.21
Illustration 4.I.7: Tong Assembly - Latch Installation 01 ..... 4.22
Illustration 4.I.8: Tong Assembly - Latch Installation 02 ..... 4.23
Illustration 4.I.9: Tong Assembly - Latch Installation 03 ..... 4.24
Illustration 4.I.10: Tong Assembly - Door Installation 4.25

Illustration 4.I.11: Tong Assembly - Door Stop Spring Cylinder Installation 4.26
Illustration 4.I.12: Tong Assembly - Valve Assembly Installation 4.27
Illustration 4.I.13: Tong Assembly - Leveling Bolt Installation 4.27
Illustration 4.I.14: Rear Backup Support Spring Installation 4.28
Illustration 4.I.15: Rear Leg Installation 4.29
Illustration 4.I.16: Tong Assembly - Front Leg Installation 4.30
Illustration 4.M.1: Shipping Instructions - Pallet 4.40
Illustration 4.M.2: Shipping Instructions - Wrapping Chain Sling 4.41
Illustration 4.M.3: Shipping Instructions - Backup Support 4.41
Illustration 4.M.4: Shipping Instructions - Strapping Equipment To Pallet 4.42
Illustration 5.B.1: Relief Valve Troubleshooting - Temporary Gauge Installation 5.4
Illustration 6.1: KT-5-½" Gear Train ISO View 6.8
Illustration 6.2: KT-5-½" Gear Train Top / Side Views 6.9
Illustration 6.3: KT-5-½" Support Roller Exploded 6.10
Illustration 6.4: KT-5-½" Standard Support Roller 6.11
Illustration 6.5: KT-5-½" Rotary Idler Exploded 6.12
Illustration 6.6: KT-5-½" Rotary Idler 6.13
Illustration 6.7: KT-5-½" Pinion Idler Exploded 6.14
Illustration 6.8: KT-5-½" Pinion Idler 6.15
Illustration 6.9: KT-5-½" Pinion Exploded 6.16
Illustration 6.10: KT-5-½" Pinion 6.17
Illustration 6.11: KT-5-½" Clutch Exploded 6.18
Illustration 6.12: KT-5-½" Clutch 6.19
Illustration 6.13: KT-5-½" Shifter Exploded 6.20
Illustration 6.14: KT 5-½" Shifter 6.21
Illustration 6.15: KT-5-½" Cage Plate Exploded 6.22
Illustration 6.16: KT-5-½" Cage Plate Assembly 6.23
Illustration 6.17: KT-5-½" 1064-JDK-XX Jaw Die Kits Exploded 6.24
Illustration 6.18: 1064-JDK-XX 2-⅜" to 5" Jaw Die Kit 6.25
Illustration 6.19: 1064-JDK-95-S 5-½" Jaw Die Kit 6.25
Illustration 6.20: KT-5-½" Wrap-Around Jaw Die Kits Exploded 6.26
Illustration 6.21: 1064-WJK-350 Wrap-Around Jaw Die Kit 6.27
Illustration 6.22: 1064-WJK-550 Wrap-Around Jaw Die Kit 6.27
Illustration 6.23: KT-5-½" Brake Bands Exploded 6.28
Illustration 6.24: Brake Bands 6.29
Illustration 6.25: KT-5-½" Motor & Mount Exploded 6.30
Illustration 6.26: Motor & Mount 6.31
Illustration 6.27: KT-5-½" Tong Body Exploded 6.32
Illustration 6.28: Tong Body 6.33
Illustration 6.29: KT-5-½" Hydraulic Supports 6.34
Illustration 6.30: KT-5-½" Hydraulic Valve Assembly Exploded 6.36
Illustration 6.31: KT-5-½" Hydraulic Valve Assembly 6.37
Illustration 6.32: KT-5-½" Door Latch Assembly Exploded 6.38
Illustration 6.33: KT-5-½" Door Latch Assembly 6.39
Illustration 6.32: KT-5-½" Door Assembly Exploded 6.40
Illustration 6.33: KT-5-½" Door Assembly 6.41
Illustration 6.34: KT-5-½" Safety Door Components Exploded 6.42
Illustration 6.35: KT-5-½" Safety Door Assembly 6.43
Illustration 6.36: KT-5-½" Rigid Sling Exploded 6.44
Illustration 6.37: KT-5-½" Rigid Sling Assembly 6.45
Illustration 6.38: Leg Assemblies Exploded 6.46
Illustration 6.39: Front Leg Weldment Installation 6.47
Illustration 6.40: 6-¼" Backup Exploded 6.48
Illustration 6.41: 6-¼" Backup 6.49
Illustration 6.42: 6-¼" Clincher Cylinder Exploded 6.50
Illustration 6.43: 6-¼" Clincher Cylinder 6.51
Illustration 7.A.1: Torque Gauge 7.3
Illustration 7.A.2: Tension Load Cell 7.3
Illustration 7.A.3: Compression Load Cell 7.3
Illustration 7.A.4: Compression Load Cell Exploded 7.5
Illustration 7.A.5: Turn Counter Encoder Mount Exploded 7.6

SECTION 1: INTRODUCTION & SPECIFICATIONS


This page intentionally
left blank

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:

McCoy Global Canada

14755 121A Avenue
Edmonton, Alberta, Canada
T5L 2T2

Phone: 780.453.3277
Fax: 780.455.2432

McCoy Global USA - Tongs & Bucking Units

4225 HWY 90 East
Broussard, LA, USA
70518

Phone: 337.837.8847
Fax: 337.837.8839

McCoy Global USA - Service

6530 Petropark Drive
Houston, TX, USA
77041

Phone: 281.377.4264

McCoy Global UK Ltd.

Units 9/10 Ocean Trade Center
Minto Avenue, Altens Industrial Estate
Aberdeen, AB12 3JZ
United Kingdom

Phone: +44.1224.245140
Fax: +44.1224.890176

McCoy Global Singapore PTE Ltd.

49 Tuas View Loop
Singapore, 637701
Republic of Singapore

Phone: +44.1224.245140
Fax: +44.1224.890176

McCoy Global S.A.R.L

Warehous No. FZS1BJ03
Jebel Ali Free Zone - South Zone
Dubai, United Arab Emirates

Phone: +971.4803.6900
Fax: +971.4803.6909

Email Sales: dcsales@mccoyglobal.com

www.mccoyglobal.com

Technical manuals are produced and published by McCoy Global Inc.. McCoy Global has made an effort ensure that all information in this document is accurate, but please note that some illustrations used in this manual may not visually match actual purchased equipment. If you believe information in this publication is missing or erroneous, please contact one of our Technical Publications Departments at McCoy Global Canada or McCoy Global USA Tongs & Bucking Units.

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

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

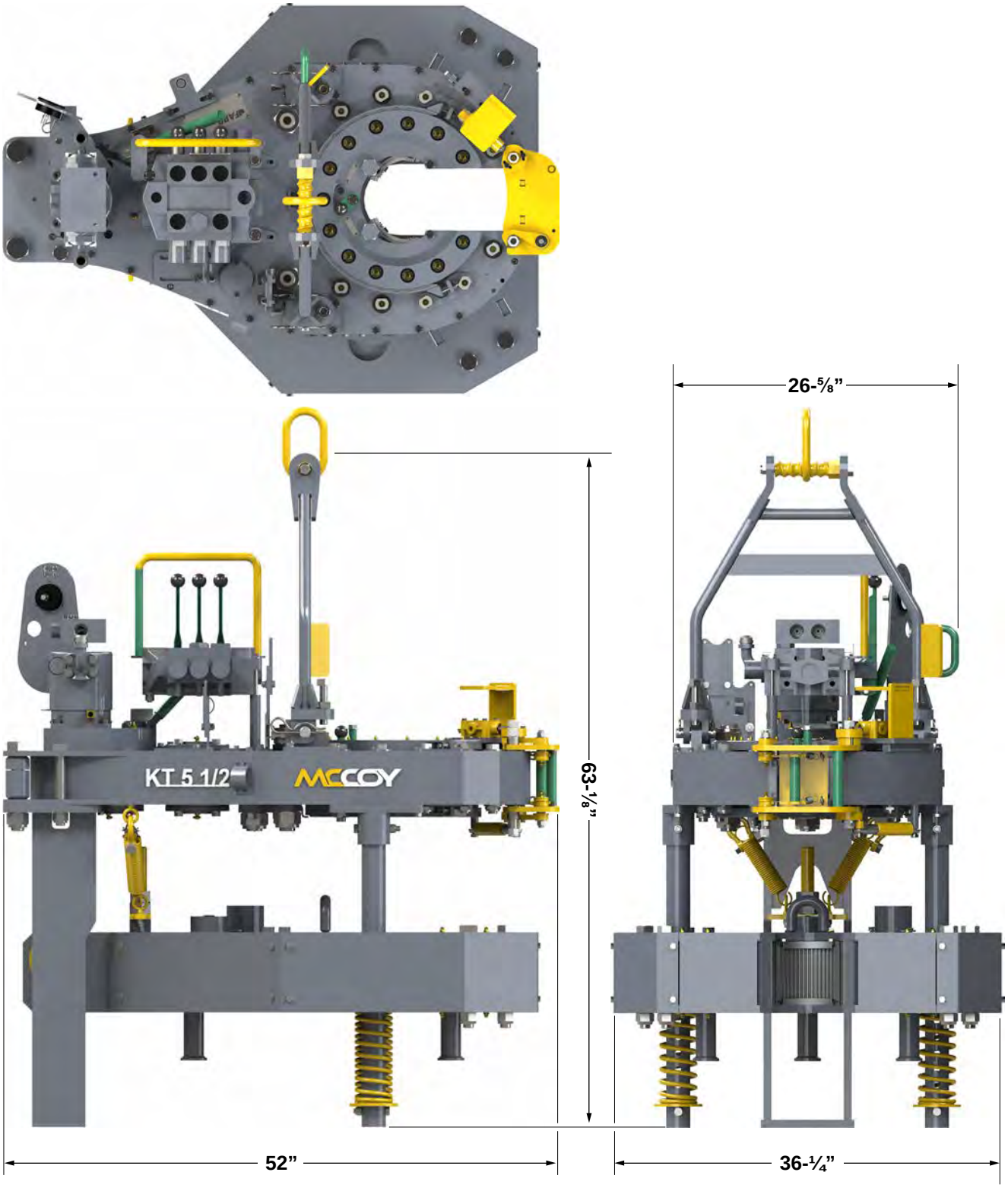


ILLUSTRATION 1.A.2: KT5-½ TONG & 6-¼” CLINCHER© BACKUP DIMENSIONS

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

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

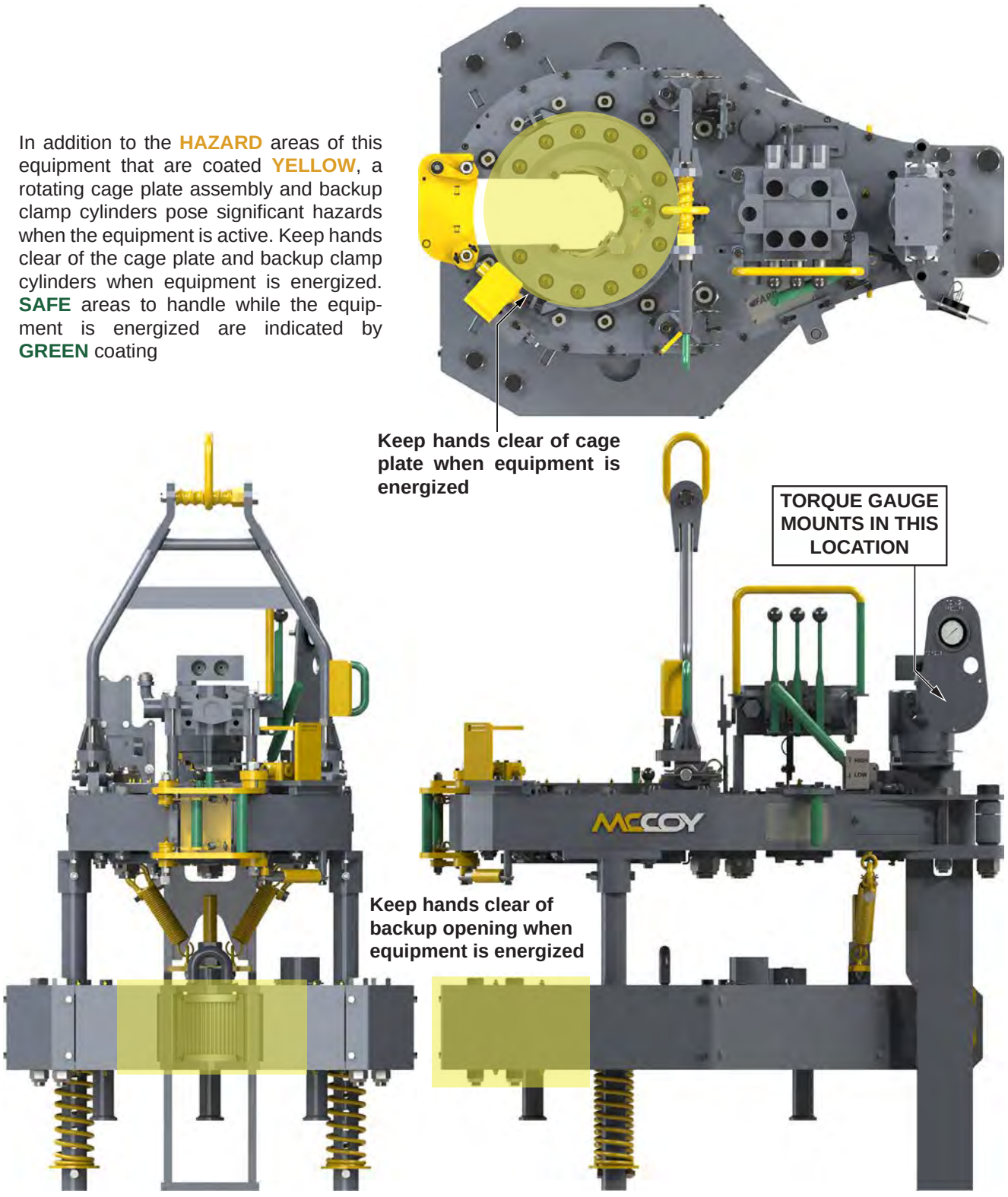


ILLUSTRATION 1.A.3: KT5-½ TONG & 6-¼" CLINCHER© BACKUP HAZARD AREAS

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 Speed Gear			
	HI		LO	
PSI / MPa	Lb-ft	Nm	Lb-ft	Nm
1000 / 6.89	1530	2074	7650	10372
1400 / 9.66	2250	3050	11250	15253
1800 / 12.41	2970	4027	14845	20127
2250 / 15.51	3780	5125	18700	24345
MAXIMUM RATED TORQUE: 18700 LBS-FT / 24345 Nm				
REQUIRED SYSTEM PRESSURE: 2250 PSI / 15.51 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	2.7	13.4
20 / 75.71	5.4	26.8
40 / 151.4	10.7	53.6
60 / 227.1	16.1	80.5

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)
Maximum Dimensions	**Length (Door Closed)**	52 in / 1.321 m
	Height	63-⅛ in / 1.603 m
	Width	36-¼ in / 0.921 m
Maximum Elevator Diameter		Unlimited (tong comes off pipe)
Space Required On Pipe		8 in / 203.2 mm
Torque Arm Length (Pipe center to anchor center)		32” / 813 mm
Gear reduction ratio, turn counter encoder to ring gear		8.333:1
Dead Weight (Approximate)		2025 lbs / 920 kg (jaws not included)
Maximum Allowable Rigid Sling Load		2400 lbs / 1091 kg
Sound Level (dBa)		97 dB A @ 1m / 96 dB C @ 1m
Tong Jaws available (inches)		All standard sizes from 2-⅜” to 5-½” (See Pp. 2.17 - 2.18)
Backup Jaws available (inches)		All standard sizes from 2-⅜” to 6-¼” (See Pg. 2.20)
Recommended Spring Hanger		85-0106XXH (Max Capacity = 2400 lbs / 1091 kg)

DANGER

ONLY USE SPRING HANGERS SUPPLIED BY MCCOY GLOBAL.

RECOMMENDED LUBRICANT SPECIFICATIONS

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.

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

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.

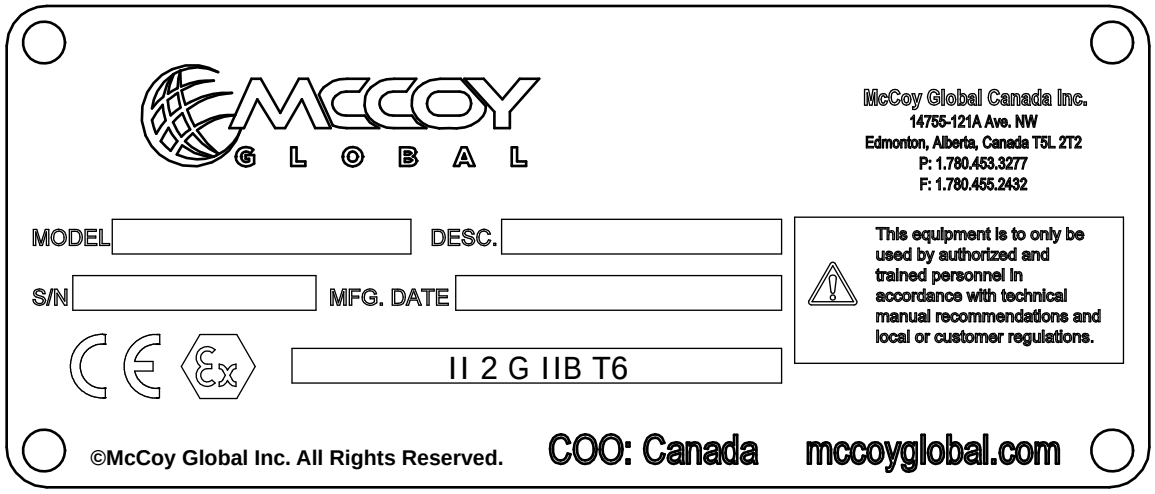


ILLUSTRATION 1.A.4: CE NAMEPLATE

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

EU Explosive Atmosphere certified

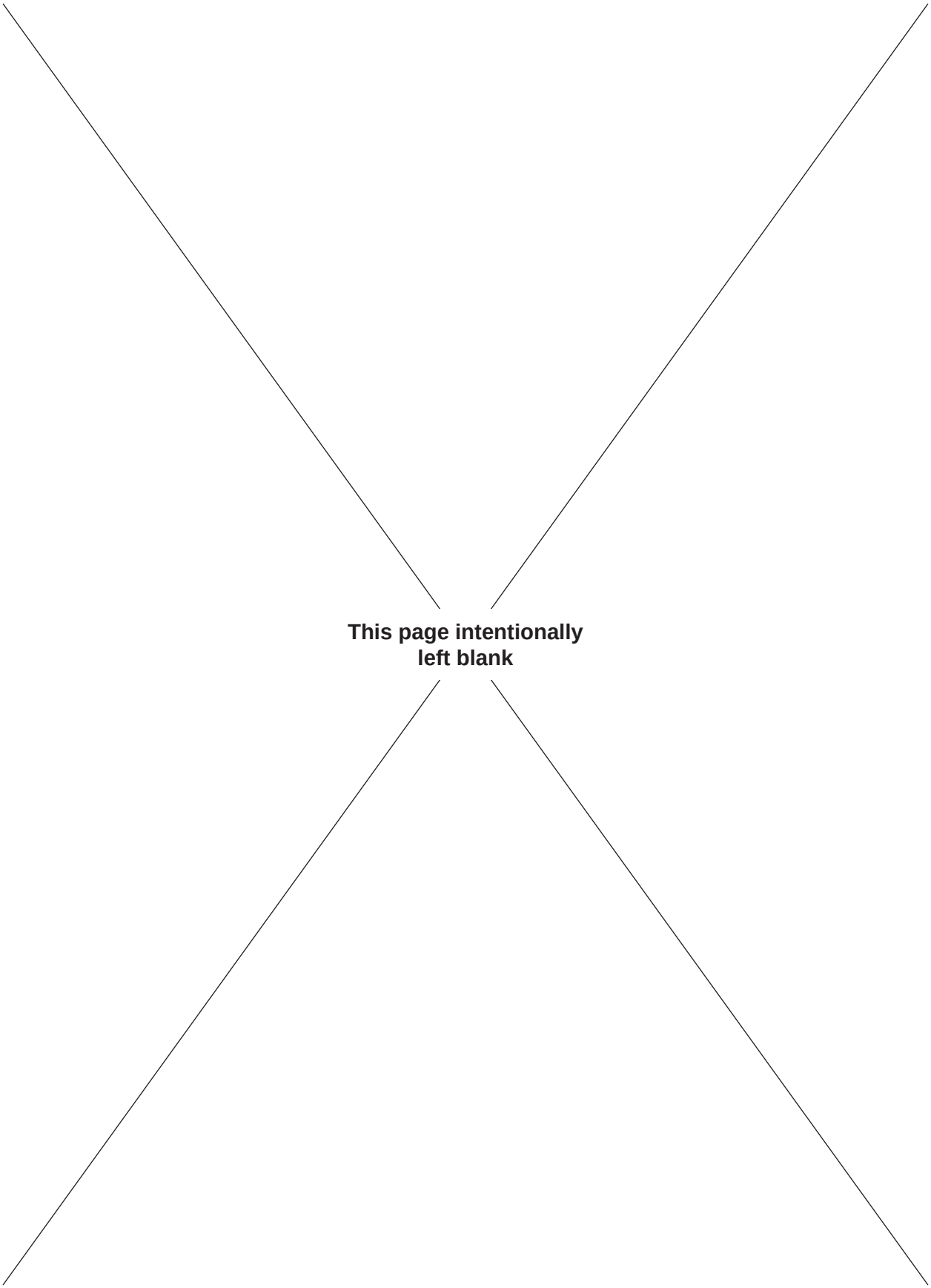
II Equipment Group (surface, non-mining)

2 Equipment Category - high level of protection

Gc Gas Group (Acetylene & Hydrogen) - Certified for use in acetylene and hydrogen environments

T6 Maximum surface temperature of 85 °C.

SECTION 2: INSTALLATION & COMMISSIONING


This page intentionally
left blank

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

2.A INITIAL RECEIPT AND INSPECTION OF EQUIPMENT

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

Perform a visual inspection following removal of all packaging material. Immediately identify any shipping damage to the shipping company, and correct all damage before connecting equipment to a hydraulic power source.

2.B MAJOR COMPONENT IDENTIFICATION

ILLUSTRATION 2.B.1: KT5500+CBU COMPONENT ID 01

Item	Description
1	5-½" hydraulic power tong
2	Rear leg assembly
3	Front leg assembly
4	Master lifting link
5	Rigid sling
6	6-¼" **CLINCHER®** backup

2.B MAJOR COMPONENT IDENTIFICATION (CONTINUED):

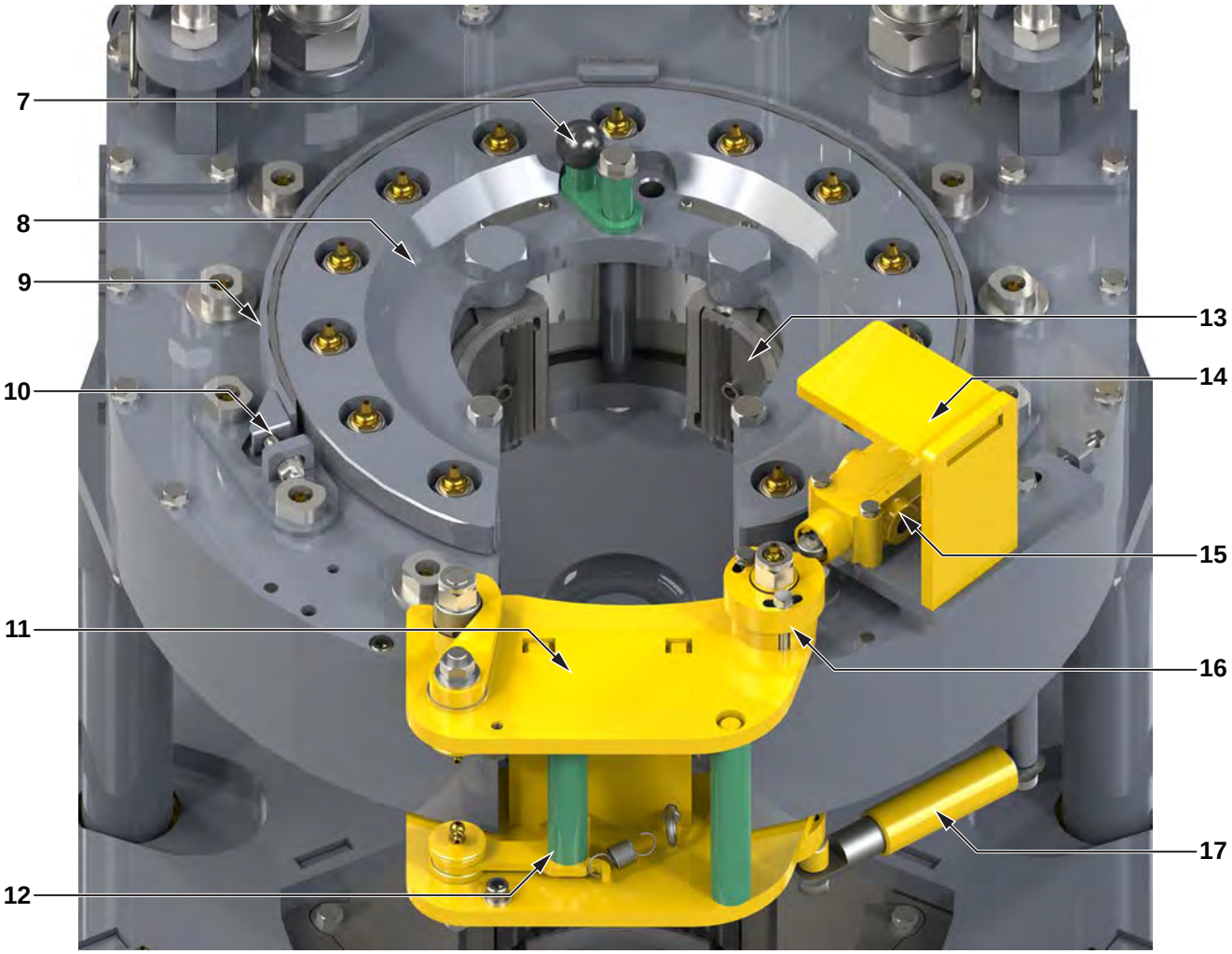


ILLUSTRATION 2.B.2: KT5500+CBU COMPONENT ID 02

Item	Description
7	Backing pin assembly
8	Cage plate assembly
9	Brake band
10	Brake band adjustment
11	Tong door weldment
12	Tong door latch assembly
13	Tong jaws with die inserts
14	Safety door switch guard
15	Safety door switch
16	Safety door cam
17	Tong door stop spring cylinder

2.B MAJOR COMPONENT IDENTIFICATION (CONTINUED):

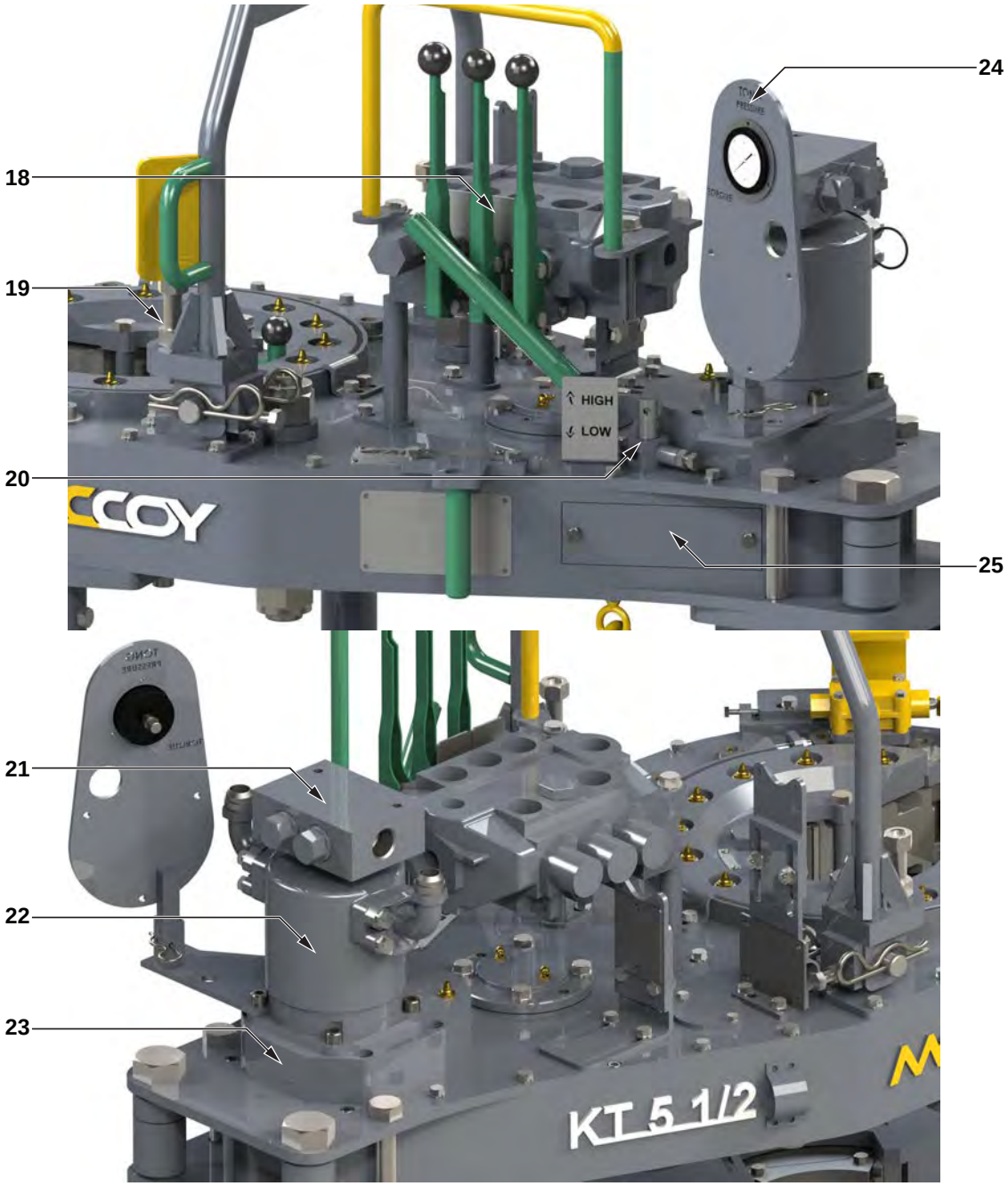


ILLUSTRATION 2.B.3: KT5500+CBU COMPONENT ID 03

Item	Description
18	Hydraulic valve bank assembly
19	Tong leveling adjustment
20	Manual shift assembly
21	Safety door valve & valve block
22	Hydraulic motor
23	Motor mount
24	Torque/pressure gauge mount
25	Access panel

2.B MAJOR COMPONENT IDENTIFICATION (CONTINUED):

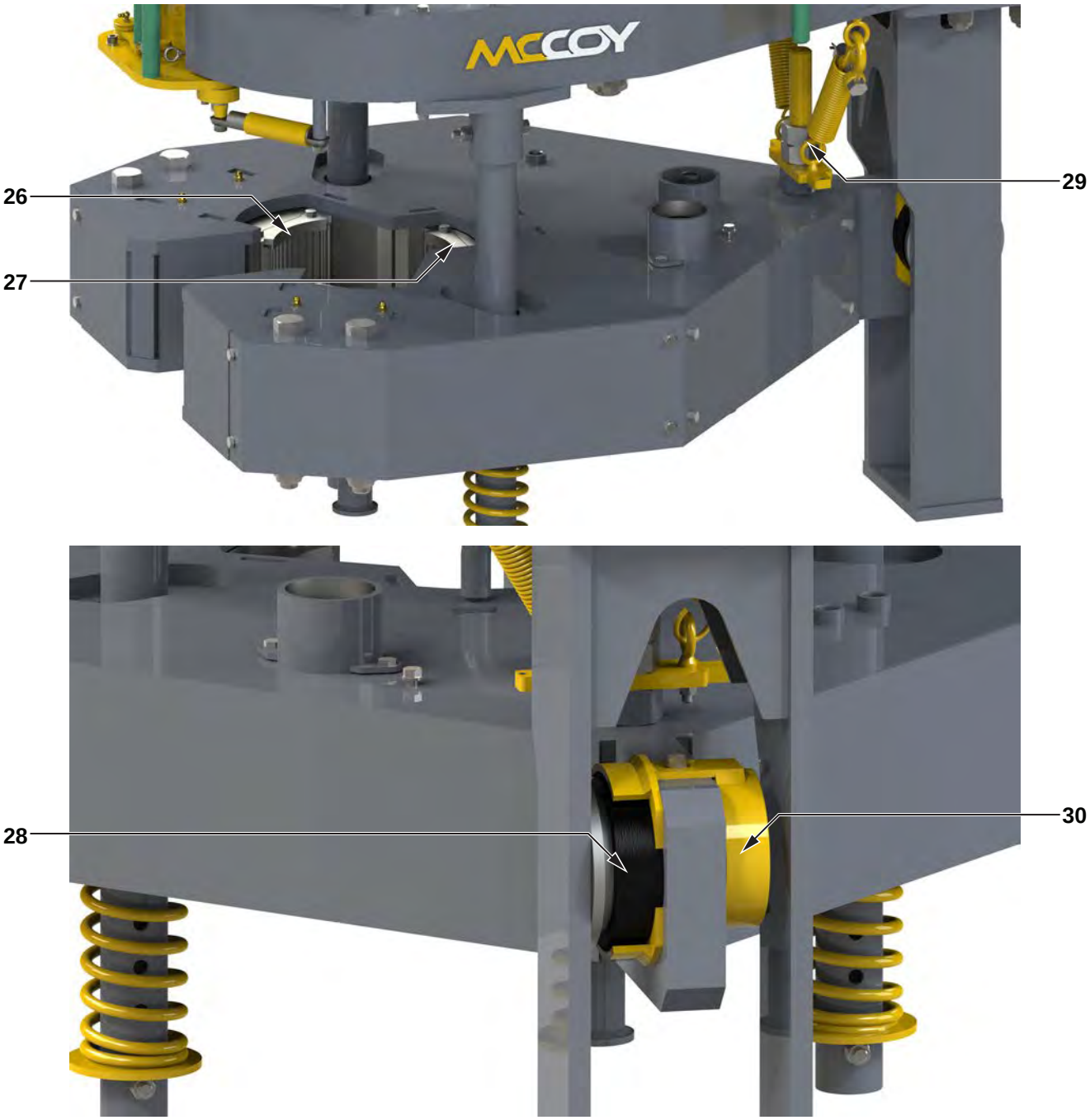


ILLUSTRATION 2.B.4: KT5500+CBU COMPONENT ID 04

Item	Description
26	**CLINCHER®** cylinder
27	Fixed backup jaw
28	Compression load cell
29	Rear backup suspension spring assembly
30	Load cell holder weldment

2.C SLING / LOAD BEARING DEVICE SAFETY

THE SUPPLIED LOAD-BEARING DEVICE (CHAIN SLING, RIGID SLING, SPREADER BAR ASSEMBLY, FRAME, OR ANY OTHER DEVICE THAT BEARS THE PARTIAL OR TOTAL WEIGHT OF THE EQUIPMENT DESCRIBED IN THIS MANUAL) HAS BEEN SPECIFIED OR DESIGNED TO SUPPORT THE EQUIPMENT DESCRIBED IN THIS DOCUMENT. MCCOY WILL NOT GUARANTEE THE ABILITY OF THE LOAD-BEARING DEVICE TO SUPPORT ANY OTHER PART, ASSEMBLY OR COMBINATION OF PARTS AND ASSEMBLIES, OR ANY ADDITIONS TO THE EQUIPMENT DESCRIBED IN THIS MANUAL THAT ADD WEIGHT TO THE EQUIPMENT, UNLESS SUPPLIED BY MCCOY.

MCCOY GLOBAL DOES NOT GUARANTEE THE INTEGRITY OF MODIFIED OR DAMAGED LOAD-BEARING DEVICES, UNLESS THOSE MODIFICATIONS ARE PERFORMED BY MCCOY.

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.

- Only grade 80 or grade 100 alloy chain should be used for overhead lifting applications.
- Working Load Limit (WLL) is the maximum allowable load in pounds 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.
- Working Load Limit (WLL) is the maximum working load for a specific minimum sling angle, measured from the horizontal plane. The Working Load Limit is identified on the sling.
- 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/AMSE B30.26 "RIGGING HARDWARE" for additional information.

THE MINIMUM SLING ANGLE (THE ANGLE OF THE LEG OF THE SLING MEASURED FROM THE HORIZONTAL) MUST NEVER FALL LOWER THAN THE ANGLE SPECIFIED FOR THE SLING IN USE

ILLUSTRATION 2.C.1: SLING ANGLE

2.C SLING / LOAD BEARING DEVICE SAFETY (CONTINUED):

2.C.1 Inspection Of Slings

Farr 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 link and component shall be examined individually, taking care to expose and examine all surfaces including the inner link surface. The sling shall be examined for conditions such as those listed in the removal criteria below. In addition, daily inspection of slings, 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:

- Missing or illegible sling identification.
- Cracks or breaks
- Evidence of tampering is seen - sling tag has been modified or obscured, or 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. Refer to the chart below to ensure minimum thickness on chain links supplied is not be below the values listed:

Minimum Allowable Chain Link Thickness at Any Point			
Nominal Chain Size		**Minimum Thickness**	
Inches	MM	Inches	MM
7/32	5.5	0.189	4.80
9/32	7	0.239	6.07
5/16	8	0.273	6.93
3/8	10	0.342	8.69
1/2	13	0.443	11.26
5/8	16	0.546	13.87
3/4	20	0.687	17.45
7/8	22	0.750	19.05
1	26	0.887	22.53
1-1/4	32	1.091	27.71
Refer To ASME B30.9			

- Stretched, bent, twisted, or deformed chain links or components.
- Evidence of heat damage.
- Excessive pitting or corrosion.
- Lack of ability of chain or components to hinge (articulate) freely.
- Weld splatter.
- For hooks, removal criteria as stated in ASME B30.10
- Other conditions, including visible damage, that cause doubt as to the continued use of the sling.

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 during sling use where service conditions warrant. 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
- Nature of lifts being made
- Experience gained on the service life of load-bearing devices used in similar circumstances.

Guidelines for the interval are:

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

2.C SLING / LOAD BEARING DEVICE SAFETY (CONTINUED):

Units designed and manufactured in accordance with EN 12079 and DNV 2.7-1 should be tested and examined in accordance with the following schedule of examination and test. The user of the load-bearing device shall place a permanent placard or plate upon which the type and date of the last test shall be recorded. To avoid confusion, the plate shall not carry the date of the next test or examination, only the most recent.

Test / Examination				
Time / Interval	Lifting Tests[1]	Non-Destructive Examination (NDE) of Lifting Points	Thorough Visual Examination	Suffix To Be Marked On Plate Attached To Unit
Initial Certification By McCoy	YES	YES	YES	T
Interval Not Exceeding 12 Months	At the discretion of inspection body	At the discretion of inspection body	YES	T or VN[3]
Interval Not Exceeding 60 Months	At the discretion of inspection body	YES	YES	T or VN
Following Substantial Repair or Alteration[4]	YES	YES	YES	T

1. Lifting test as per S 7.3 BS EN 12079 or DNV 2.7-1 May 1995
2. T = Proof Test, non-destructive examination; VN = non destructive examination and visual examination; V = visual examination.
3. Dependant upon whether non-destructive examination has been carried out.
4. 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.

OBSERVED OR SUSPECTED MECHANICAL MECHANICAL DAMAGE TO A LOAD-BEARING DEVICE, OR OVERLOADING OF A THE LOAD-BEARING DEVICE HAS BEEN OVERLOADED REQUIRES REMOVAL FROM SERVICE AND QUARANTINING OF THE DEVICE UNTIL RECERTIFIED

Written records of the most recent periodic inspection shall be maintained, and shall include the condition of the sling.

2.C.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.

2.C.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. Farr 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.
- Farr 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.

2.D LIFT CYLINDER INSTALLATION

The lift cylinder is not orientation-specific; that is, the lift cylinder will function the same way independent of which end is connected to the crane and which end is connected to the main lifting lug of the tong (or the spring hanger, if used). However, McCoy recommends orienting the lift cylinder with the hydraulic hose connection at the bottom of the cylinder to ensure the hose is not stressed when cylinder is at full extension.

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

ENSURE TO ACCOUNT FOR THE WEIGHT OF THE SPRING HANGER WHEN CALCULATING TOTAL SUSPENDED WEIGHT.

2.D.1 Installation Procedure

1. Use a crane to hoist the lift cylinder by the shackle, ensuring the hydraulic hose connection is at the bottom of the cylinder when it is hoisted.
2. Remove the two R-clips securing the clevis pin, and remove the clevis pin.
3. Orient the spring hanger so the piston will extend down during thread make-up, preventing water and debris from gathering around the seal.
4. Place the welded U-connection inside the clevis. Replace the clevis pin, and secure the clevis pin with the two R-clips.
5. Hoist the lift cylinder and spring hanger.
6. Place a 1” shackle around the master lifting link on the tong sling. Secure the shackle to the extending end of the spring hanger using the 1-⅛” UNC x 4-¾” modified hex bolt and 1-⅛” UNC hex jam nut. Secure the jam nut to the bolt using a $^{3}/_{16}$” x 1-¼” cotter pin.

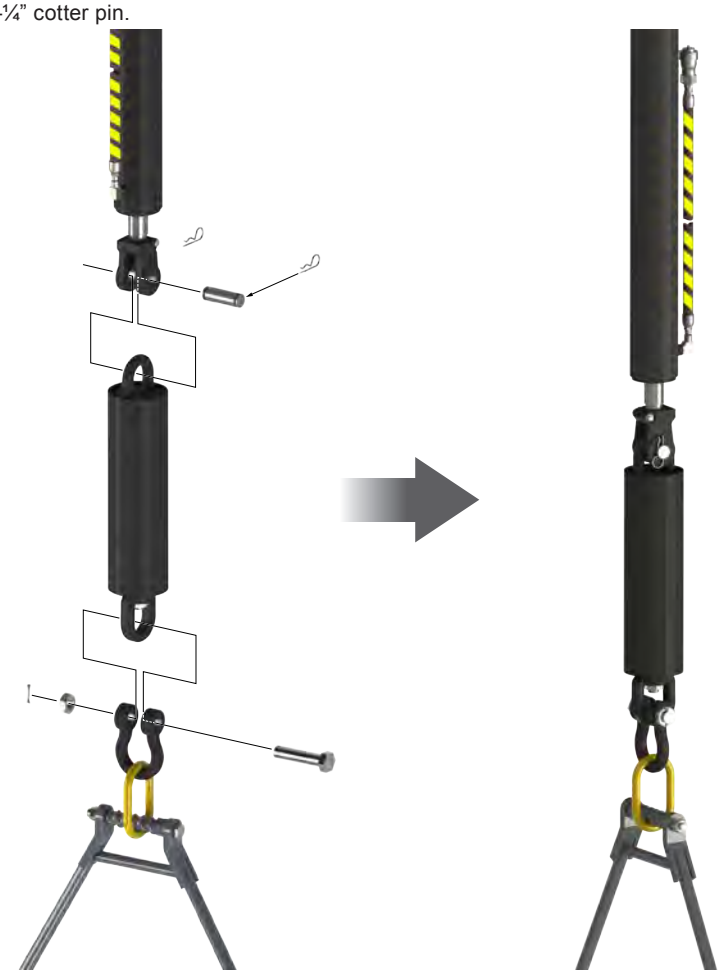


ILLUSTRATION 2.D.1: LIFT CYLINDER & SPRING HANGER INSTALLATION

2.D.2 Lift Cylinder 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 section 2.F 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.

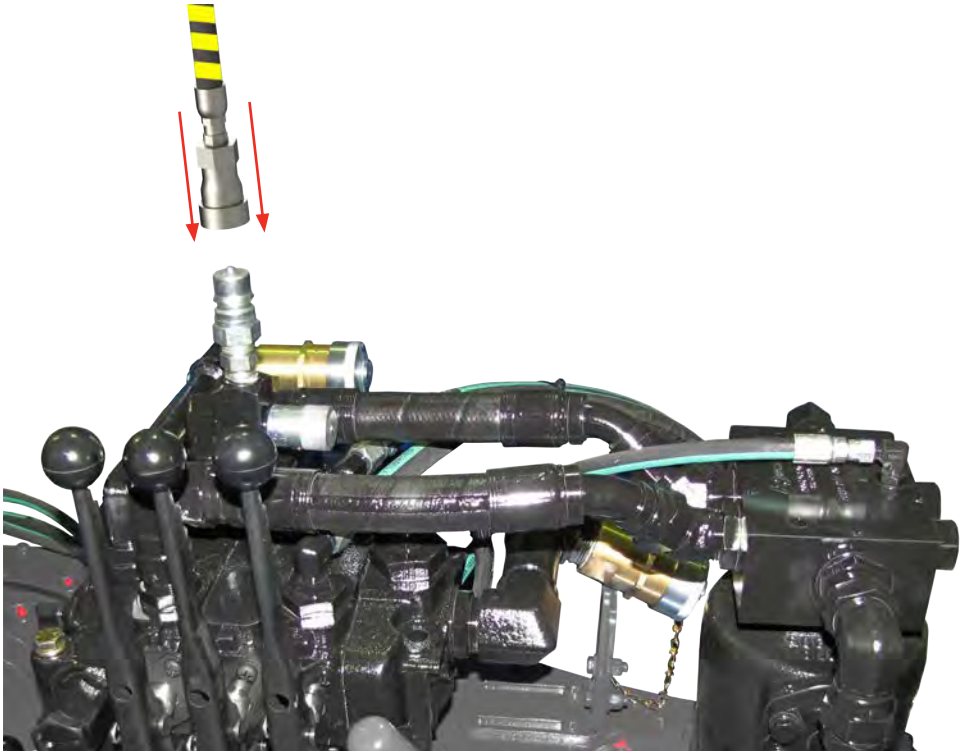


ILLUSTRATION 2.D.2: LIFT CYLINDER HYDRAULIC CONNECTION

2.D.3 Lift Cylinder Safety

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 will result in serious injury or death. Do not exceed rated capacity.

Working Load Limit (WLL) is the maximum allowable load in pounds 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.

2.D.3 Lift Cylinder Safety (continued):

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.

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.

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 in the breather port of the lift cylinder. The orifice prevents sudden drop of the lift cylinder in the event of a ruptured hydraulic line, limiting the speed at which the cylinder extends and the tong drops to a safe rate. Do not remove the speed-limiting orifice, and only replace with an identical orifice supplied by McCoy.

DO NOT REMOVE THE SPEED-LIMITING ORIFICE FROM THE LIFT CYLINDER BREATHER 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.

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

2.E HYDRAULICS

2.E.1 Hydraulic Schematic & B.O.M.

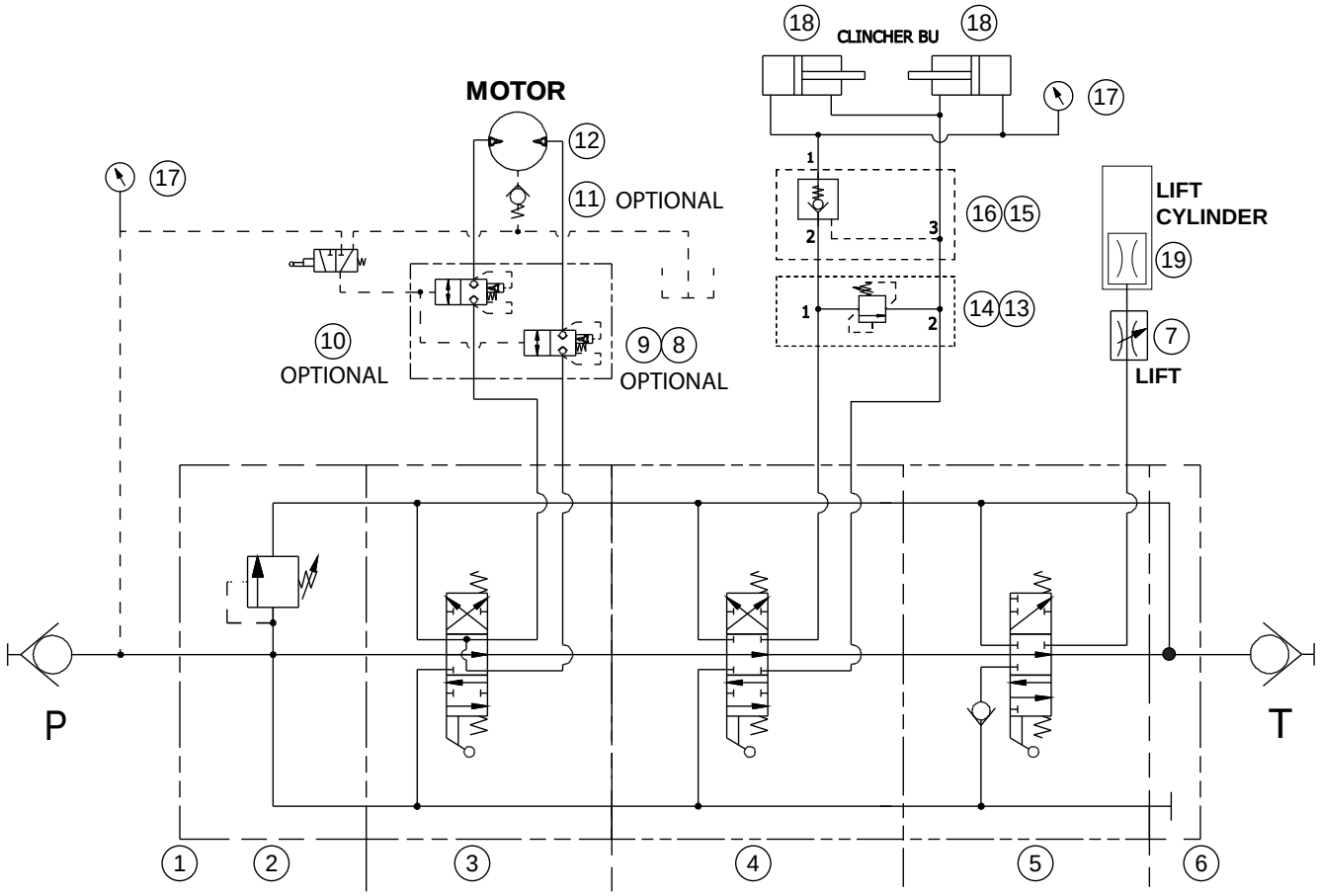


ILLUSTRATION 2.E.1: KT5500+CBU HYDRAULIC SCHEMATIC

Item	Description	Part #	Item	Description	Part #
1	Inlet valve section	10-9016	10	Door switch	02-E0190
2	Relief valve	10-0084	11	Check valve	02-9022
3	Motor valve section	10-9014	12	Hydraulic Motor	87-0110
4	Backup clamp/unclamp valve section	10-9019	13	Relief Valve, Backup	08-1180
5	Lift cylinder valve section	10-9019	14	Relief Valve Block, Backup	08-1839
6	Outlet section, SAE PORT	10-0086	15	Check Valve, Backup	08-0481
6A	Outlet section, SAE PORT, CLOSED CENTRE	08-1825	16	Check Valve Block, Backup	08-1327
7	Flow control valve	08-9062	17	3000 psi Pressure Gauge	02-0245
8	Pilot-to-operate cartridge valve	08-1625	18	CLINCHER® Backup Cylinder	1403-00-00B
9	Door switch valve block	101-0727	19	Lift cylinder orifice	CE-ORIFICE

⚠ DANGER

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

2.E.1 Hydraulic Schematic & B.O.M (Continued):

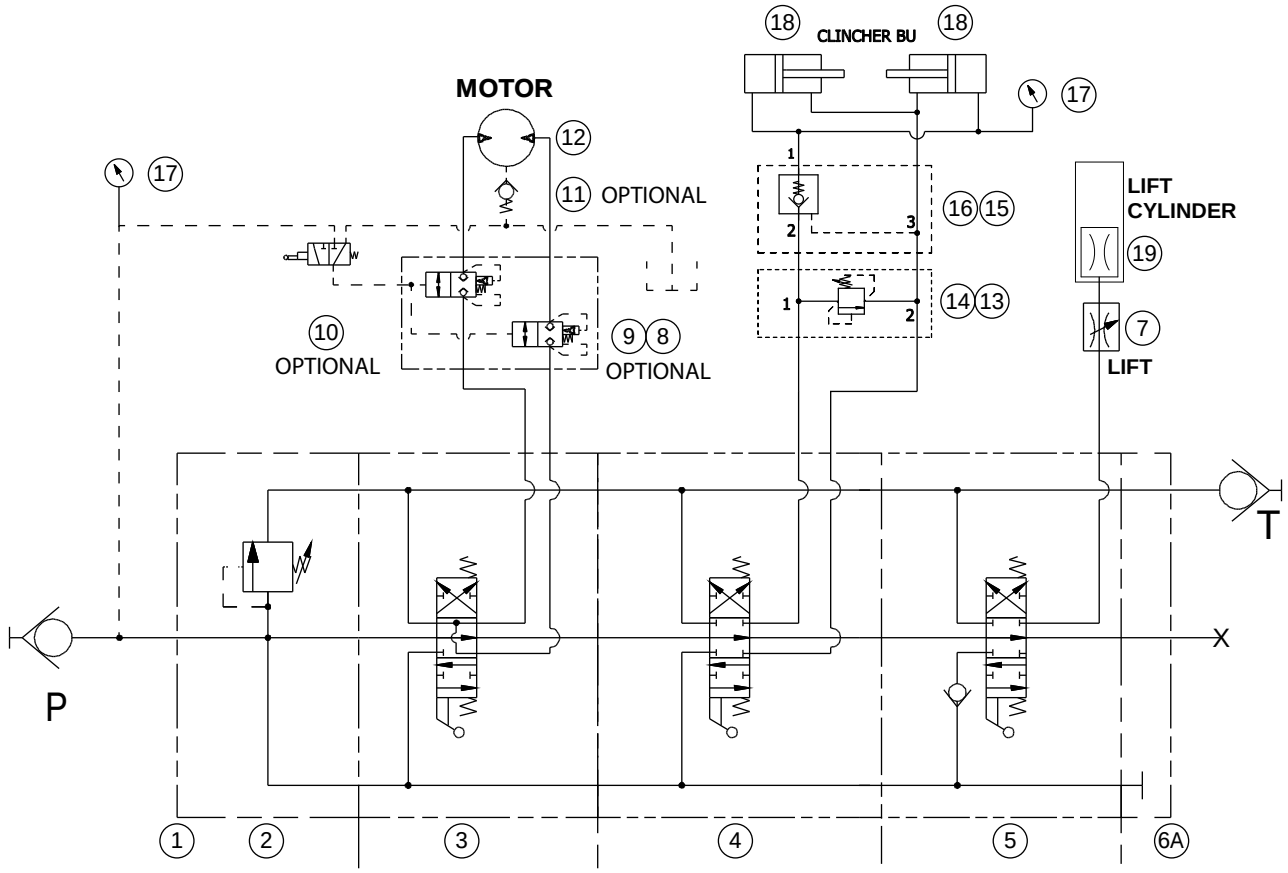


ILLUSTRATION 2.E.2: KT5500+CBU HYDRAULIC SCHEMATIC (CLOSED CENTRE)

2.E.2 Hydraulic Component Identification

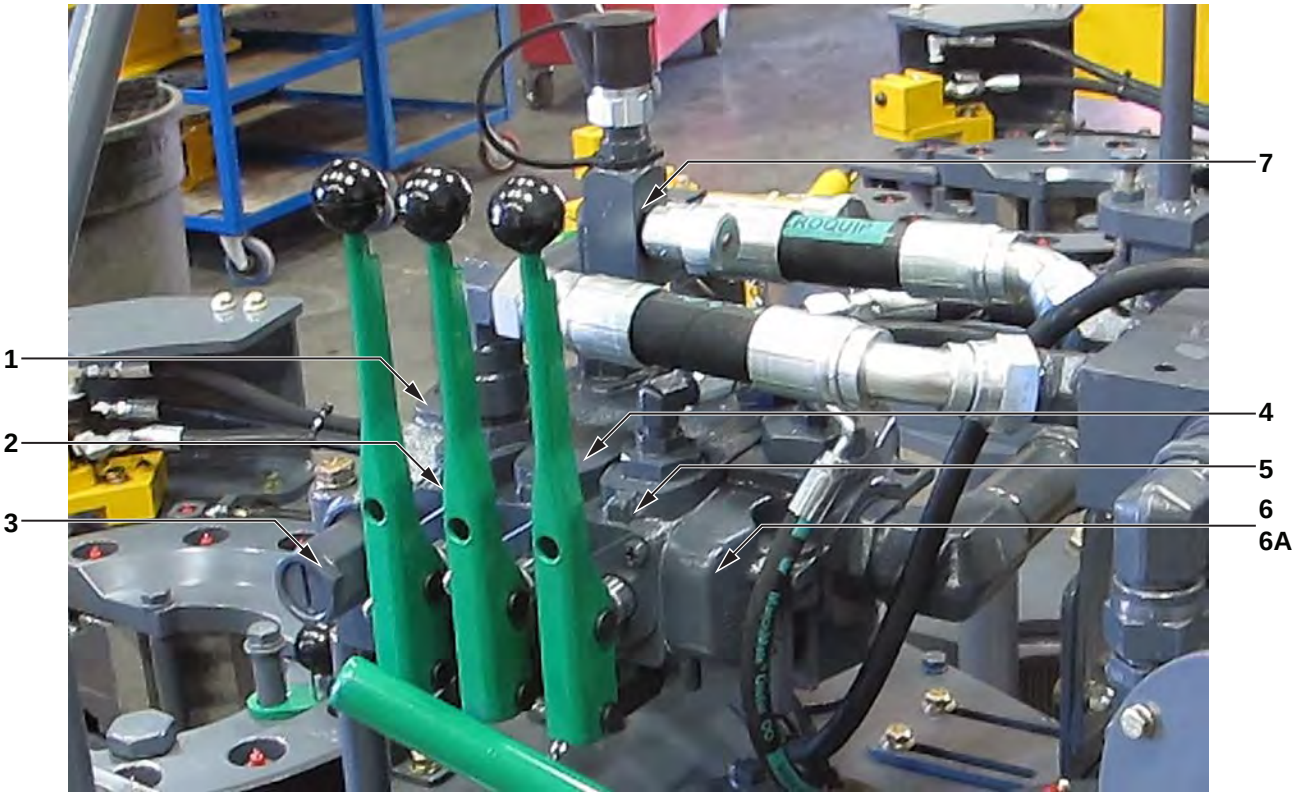


ILLUSTRATION 2.E.3: KT5500+CBU HYDRAULIC COMPONENT ID 01

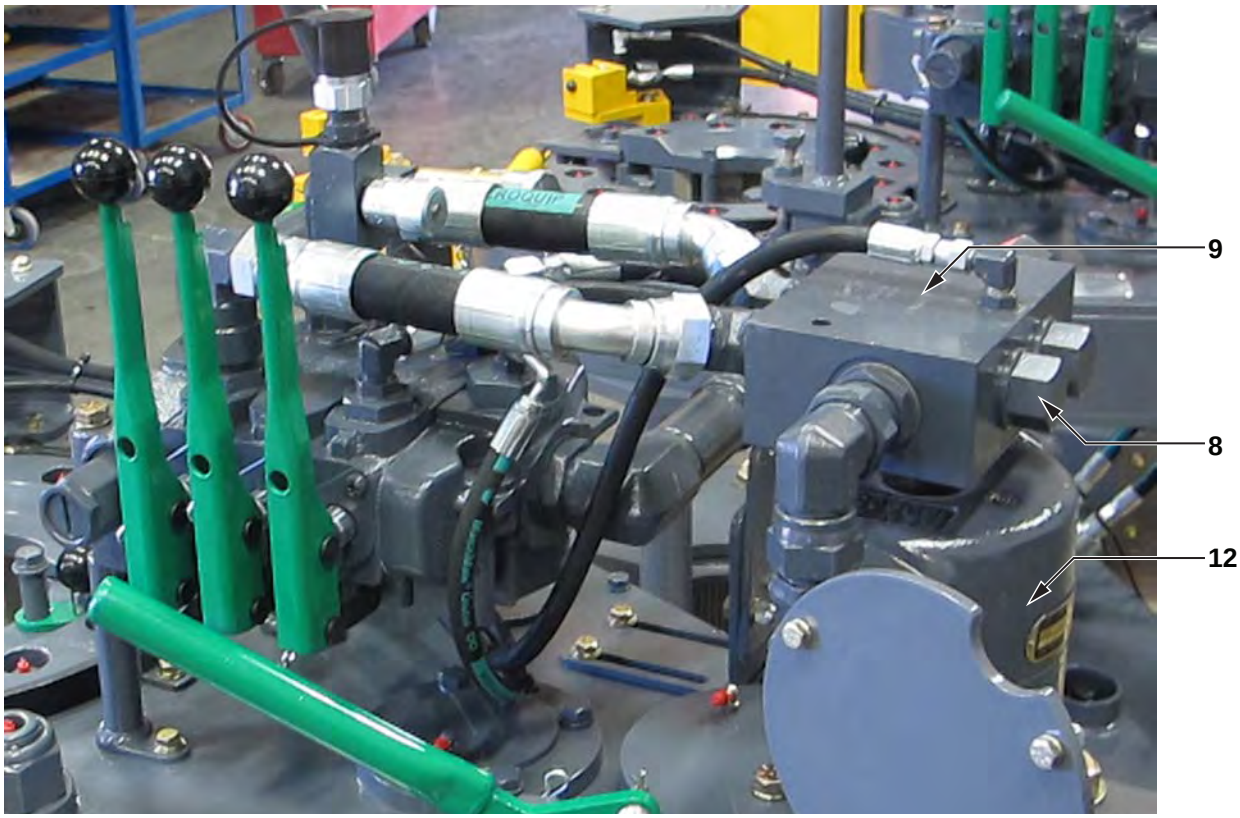


ILLUSTRATION 2.E.4: KT5500+CBU HYDRAULIC COMPONENT ID 02

2.E.2 Hydraulic Component Identification (continued):

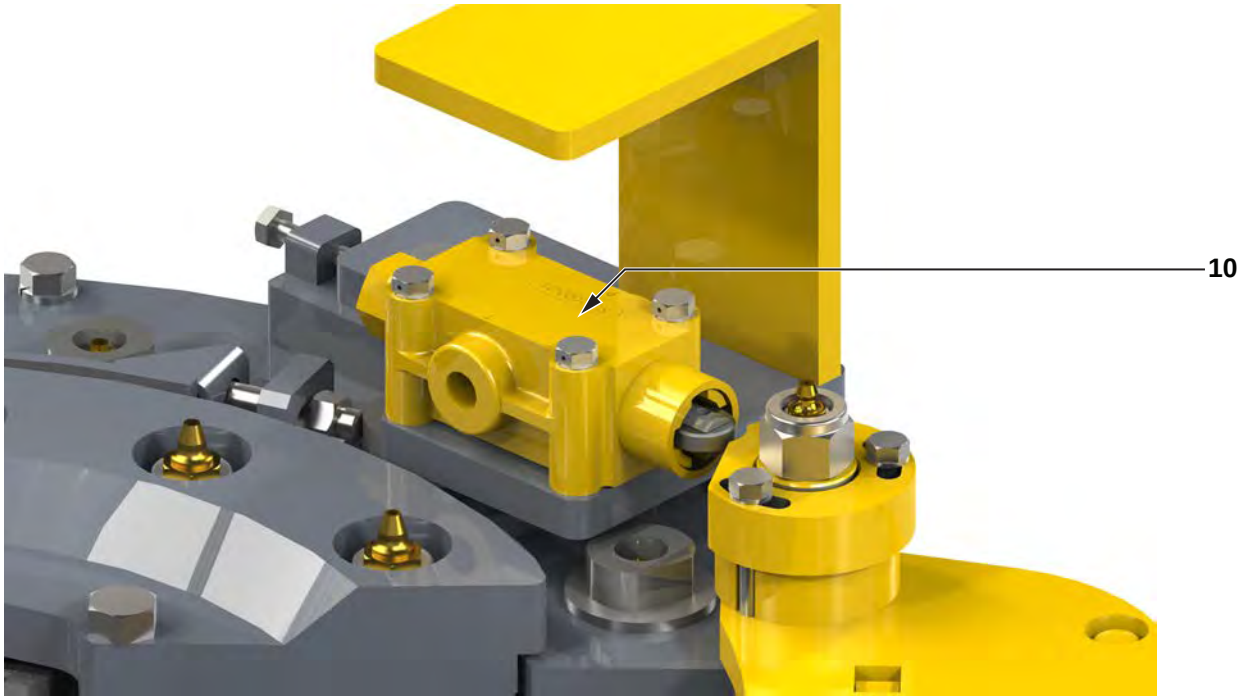


ILLUSTRATION 2.E.5: KT5500+CBU HYDRAULIC COMPONENT ID 03

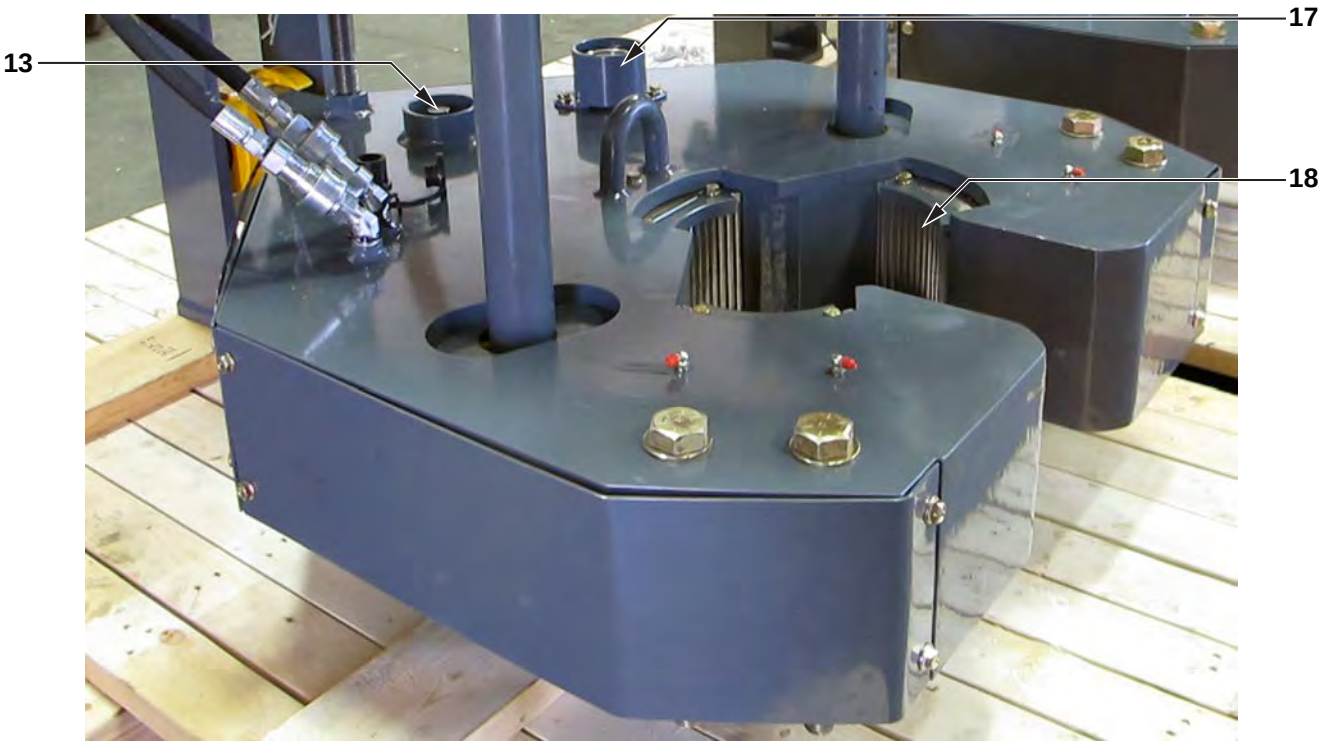


ILLUSTRATION 2.E.6: KT5500+CBU HYDRAULIC COMPONENT ID 04

2.E.2 Hydraulic Component Identification (continued):

ILLUSTRATION 2.E.7: KT5500+CBU HYDRAULIC COMPONENT ID 05

2.E.3 Main Hydraulic Connections

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

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

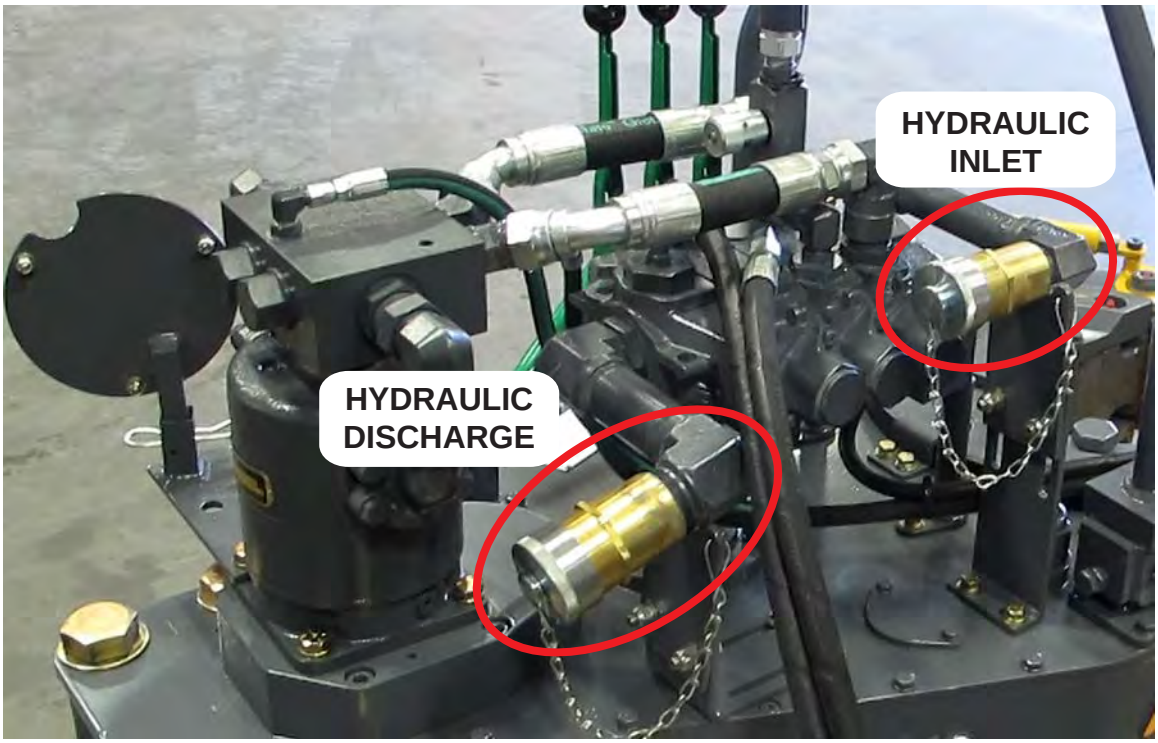


ILLUSTRATION 2.E.8: KT5500+CBU HYDRAULIC CONNECTIONS 01

2.E.3 Main Hydraulic Connections (continued):

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

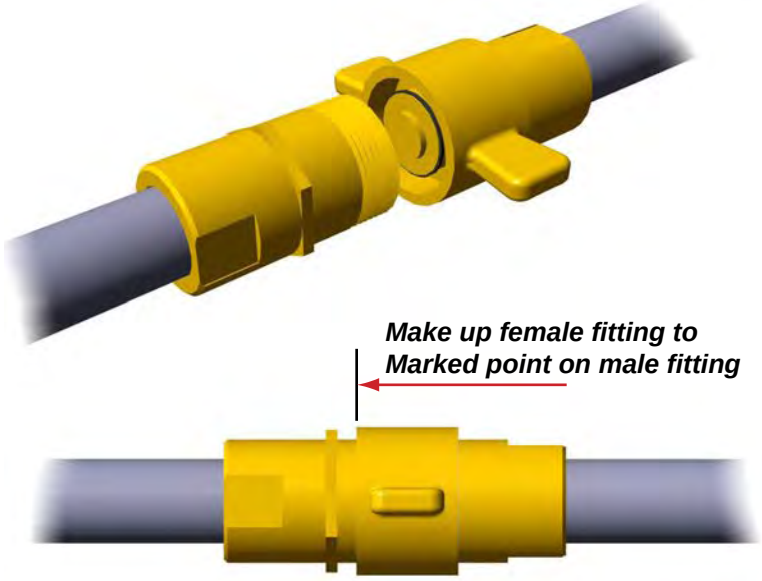


ILLUSTRATION 2.E.9: KT5500+CBU HYDRAULIC CONNECTIONS 02

2.F TONG JAW AVAILABILITY & INSTALLATION

2.F.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 contoured, flat and wraparound 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

STANDARD JAW DIE KITS (Inserts Not Included)	
Description	**Part Number**
2 - ⅜” Jaw Die Kit (1)	1064-JDK-65
2 - ⅞” Jaw Die Kit (2)	1064-JDK-70
3” Jaw Die Kit	1064-JDK-71
3 - ½” Jaw Die Kit	1064-JDK-75
4” Jaw Die Kit	1064-JDK-80
4 - ½” Jaw Die Kit	1064-JDK-85
5” Jaw Die Kit	1064-JDK-90
5 - ½” Jaw Die Kit (3)	1064-JDK-95-S
(1) Uses 2.375” Contour Die	12-0004
(2) Uses 2.875” Contour Die	12-0007
(3) Uses 1” x 3.875” Flat Die	12-0006-314-0
All other Standard Die Kits use 1-¼” x 3.875” Flat Die	13-0008-314-0
Continued On Next Page	

2.F.1. Jaw Availability (continued):

WRAPAROUND JAW DIE KITS (Inserts Not Included)	
Description	**Part Number**
2-3/8" - 3-1/2" Wraparound Jaw Die Kit	1064-WJK-350
4" - 5-1/2" Wraparound Jaw Die Kit	1064-WJK-550
2-3/8" Wraparound Insert (for use in 1064-WJK-350)	12-2001
2-7/8" Wraparound Insert (for use in 1064-WJK-350)	12-2003
3-1/2" Wraparound Insert (for use in 1064-WJK-350)	12-2006
4" Wraparound Insert (for use in 1064-WJK-550)	12-2007
4-1/2" Wraparound Insert (for use in 1064-WJK-550)	12-2009
5" Wraparound Insert (for use in 1064-WJK-550)	12-2011
5-1/2" Wraparound Insert (for use in 1064-WJK-550)	12-2012

2.F.2. Jaw Removal

The tong jaws will often require removal to change jaw size or replace worn jaw die inserts. Support the jaw being removed from the bottom, and use a wrench to loosen and remove the jaw pivot bolt. Slide the jaw away from the rotary gear towards the centre of the cage plate assembly, and lift clear of the tong. Repeat for the other jaw. Note that removal process for jaws with wraparound dies is identical.

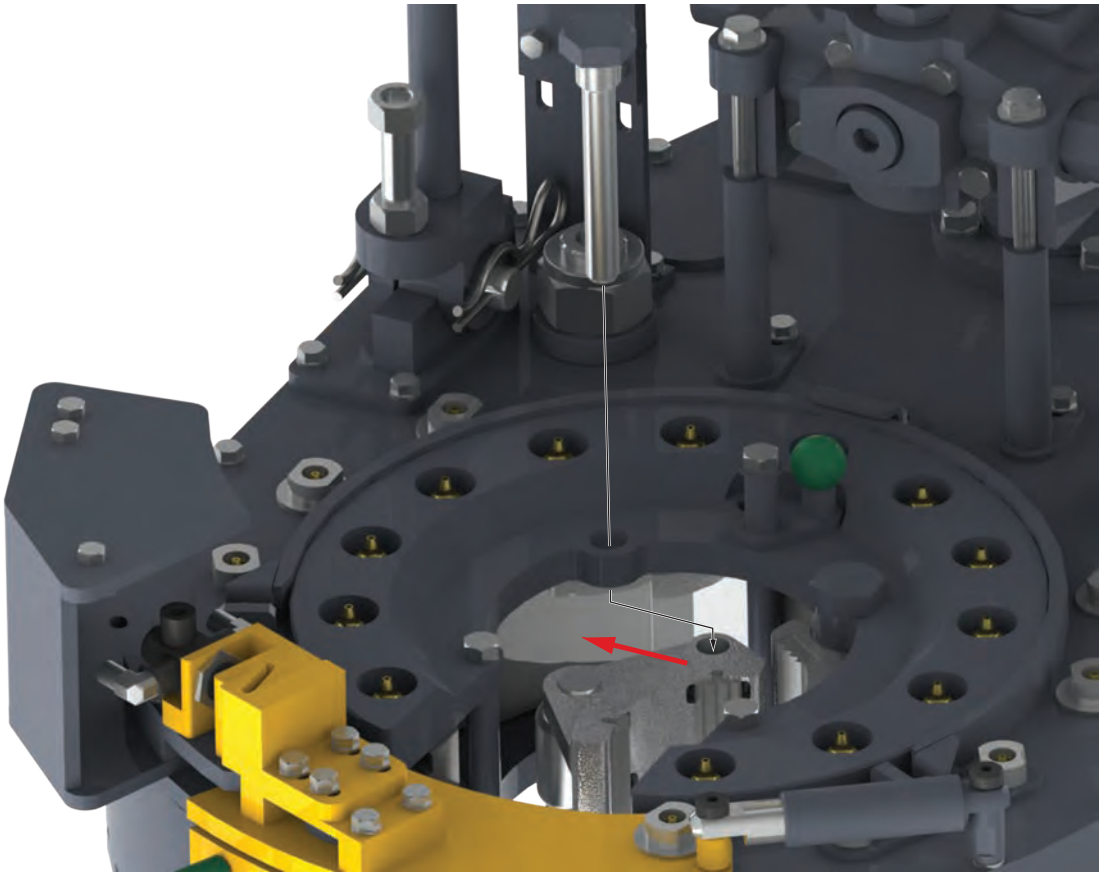


ILLUSTRATION 2.F.1: KT5500+CBU JAW REMOVAL

2.F.3 Standard Jaw Die Removal

Replace all four jaw dies (two in each jaw) as a set - do not use a mixture of new and used dies.

1. Remove the top flanged keeper screws
2. Insert a narrow punch through the slot at the bottom of the jaw groove, and lightly tap the die from the bottom until it loosens enough to remove. Slide the used die up and out of the jaw.
3. Use a stiff-bristled or wire brush to clean the die grooves in the jaw.
4. Insert the new dies from the top. If necessary use a lightweight hammer to tap the dies from the top until they are completely seated.
5. Replace the top flanged keeper screws.

ILLUSTRATION 2.F.2: KT5500 STANDARD JAW DIE REMOVAL

2.F.4 Wraparound Jaw Die Removal

Replace both wraparound jaw dies (one in each jaw) as a set - do not use a mixture of new and used dies. This procedure is identical for solid jaws and roller-type jaws.

1. Use a socket wrench to partially remove the two rear jaw die retainer bolts - leave at least ¼" of thread engaged.
2. Use a lightweight hammer to alternately tap the end of each bolt until the die breaks free from the jaw face.
3. Completely remove the rear retainer bolts and remove the used die.
4. Extract the front jaw die retainers. Turn the used die face-down on a sturdy surface. Use a hammer and soft-metal drive to lightly tap the threaded die retaining lugs free of the die.
5. Use a stiff-bristled or wire brush to clean the front face of the jaw.
6. Align the new die with the front of the jaw, and insert the front jaw retainers.
7. Secure the jaw from the rear with the two jaw die retaining bolts.

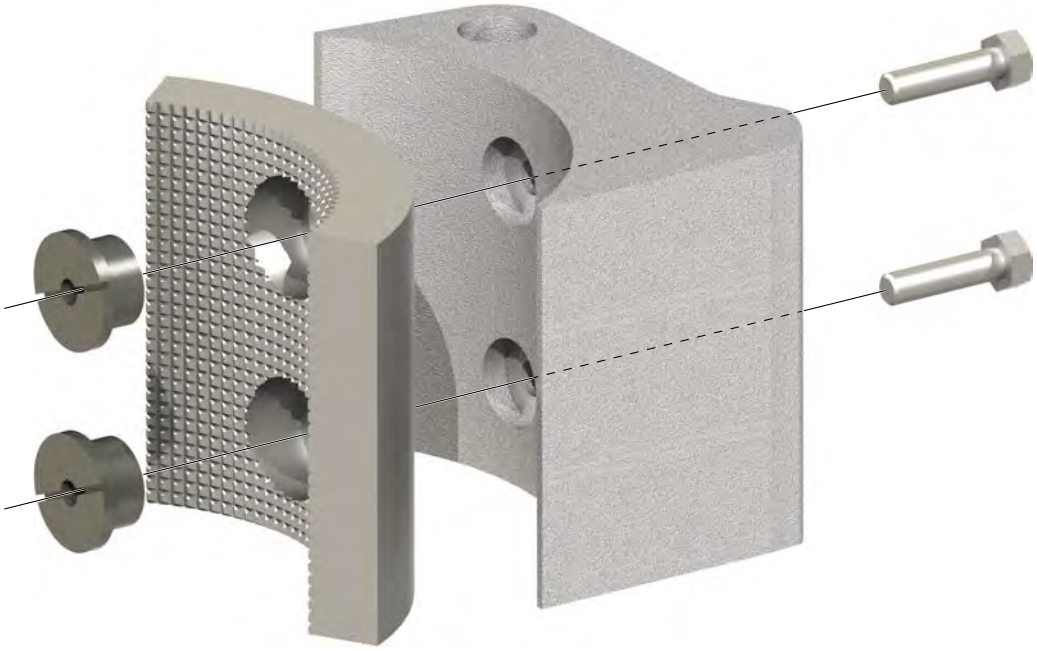


ILLUSTRATION 2.F.3: KT5500 WRAPAROUND JAW DIE REMOVAL

2.F.5 Backup Jaw Availability

The following table lists all inserts that are available as standard sizes for the 6-¼" CLINCHER® backup. If your desired size is not listed, Farr can engineer custom jaw sizes - contact sales for further information.

Description	Part Number	Description	Part Number
2.375" CLINCHER® Backup Insert	BUC76252375	4.75" CLINCHER® Backup Insert	BUC76254750
2.707" CLINCHER® Backup Insert	BUC76252707	5" CLINCHER® Backup Insert	BUC76255000
2.875" CLINCHER® Backup Insert	BUC76252875	5.25" CLINCHER® Backup Insert	BUC76255250
3.375" CLINCHER® Backup Insert	BUC76253375	5.5" CLINCHER® Backup Insert	BUC76255500
3.50" CLINCHER® Backup Insert	BUC76253500	6" CLINCHER® Backup Insert	BUC76256000
4" CLINCHER® Backup Insert	BUC76254000	6.075" CLINCHER® Backup Insert	BUC76256075
4.50" CLINCHER® Backup Insert	BUC76254500	6.25" CLINCHER® Backup Insert	BUC76256250

2.F.6 CLINCHER® Backup Jaw Removal/Installation

1. Extend **CLINCHER®** cylinders enough so that the hex flat-head cap screws securing the die retainer tabs are well exposed. Turn off hydraulic power.

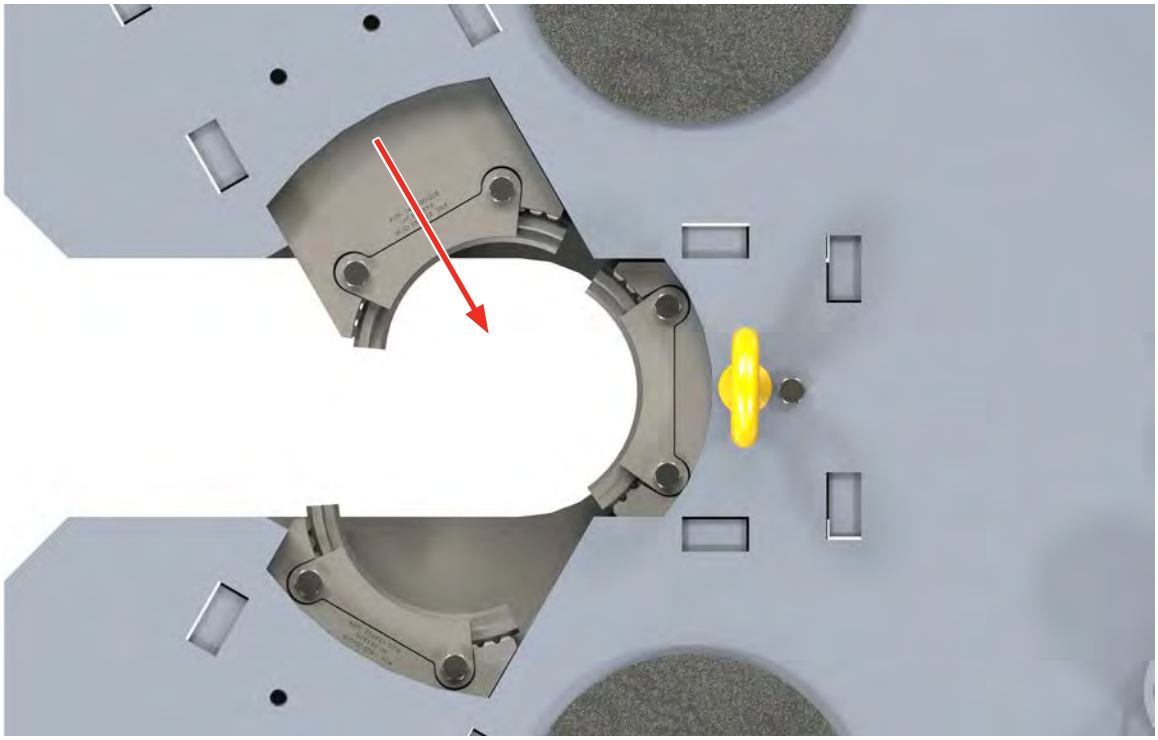


ILLUSTRATION 2.F.4: KT5500+CBU CLINCHER© CYLINDER EXTENSION

2. Remove the two hex flat-head cap screws securing the die retainer tab on the top of the **CLINCHER®** die.
3. Remove the top die retainer tabs.
4. Slide the die straight up, and remove.

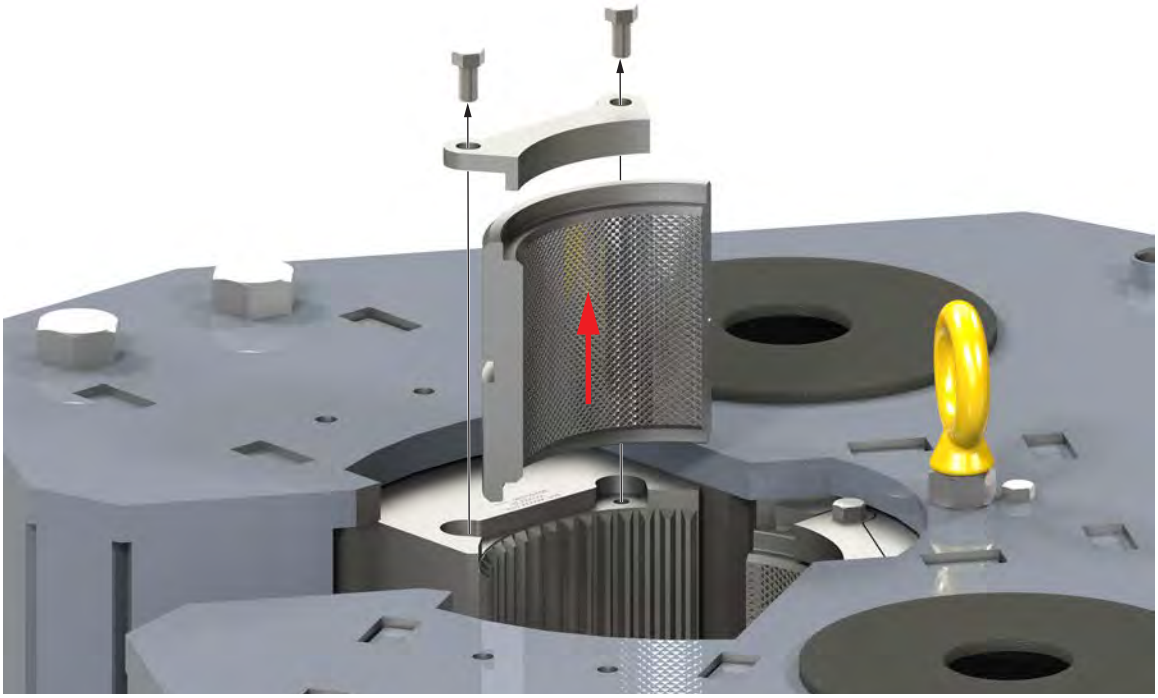


ILLUSTRATION 2.F.5: KT5500+CBU WRAPAROUND DIE REMOVAL / INSTALLATION

2.F.4 CLINCHER® Backup Jaw Removal/Installation (continued):

To remove the die from the rear jaw, ensure both cylinders are retracted. Remove the hex bolt securing the rear jaw assembly, then slide rear jaw forward enough so that the flat-head cap screws securing the die retainer tab is well exposed. Remove the die following the same procedures as for the **CLINCHER®** cylinders.

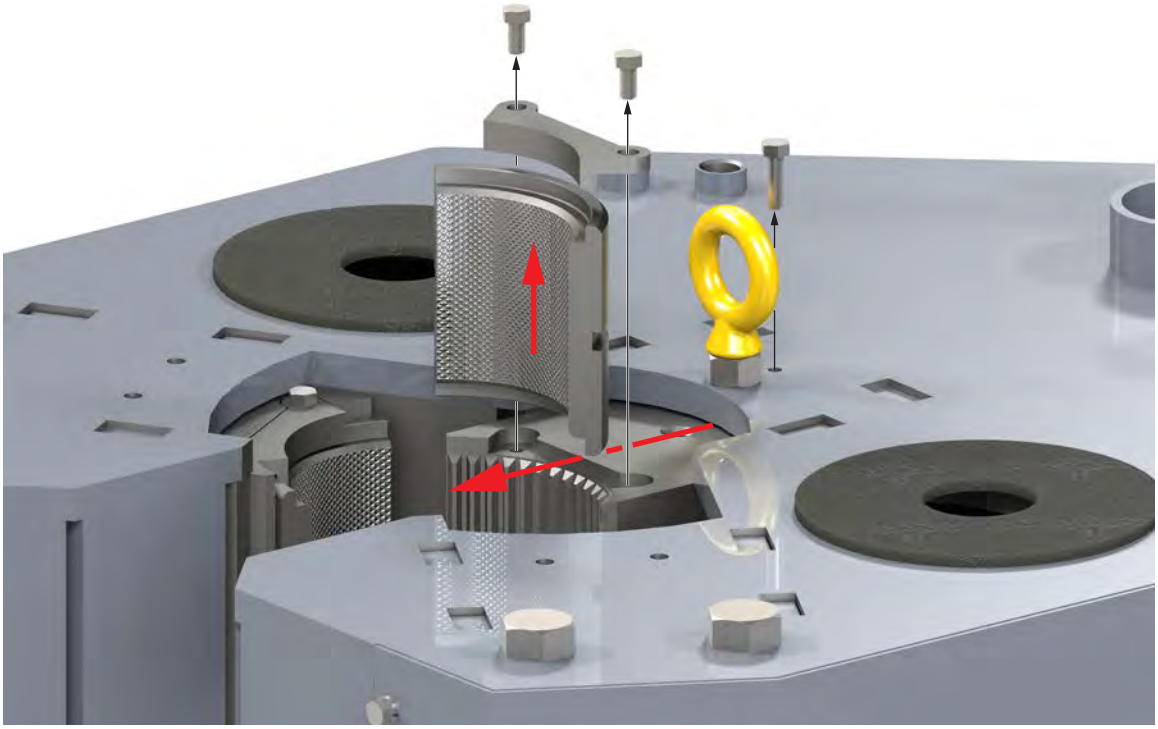


ILLUSTRATION 2.F.6: KT5500+CBU REAR BACKUP JAW EXTENSION

Reverse this procedure to install or replace jaws.

2.G TONG RIG-UP & LEVELING

2.G.1 Suspension & Restraint

Suspend the tong and backup 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. The lower the point from which the tong is suspended, the more effort will be required to move the tong and backup assembly on to and off the connection.

The suspension line may be extended over a pulley and balanced by a counterweight equal to the weight of the tong and backup, or simply tied off in the derrick to form a dead line. When using a dead line arrangement it is necessary to use a FARR spring hanger assembly (see specification page for recommended spring hanger). This spring hanger compensates for the downward movement of the casing as the thread is made-up, and imparts additional force to the suspension cable:

- a “single spring” hanger typically applies 420 lbs. (191 kg.) to the suspension line for every inch of thread made up
- a “double spring” hanger typically applies 840 lbs. (382 kg.) to the suspension line for every inch of thread made up

If you do not know which specific spring hanger is in use, check 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.

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 dual backup (snub) lines of sufficient strength to withstand the force imparted by the maximum rated torque of the tong and backup assembly in use. The 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 25,000 lbs.-ft. tong with a 32 inch (2.667 ft.) torque arm will generate 9375 lbs. of force against the snub line. 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 suitable anchor.

MCCOY GLOBAL ACCEPTS NO RESPONSIBILITY FOR DESIGNING AND SELECTING AN ADEQUATE SUSPENSION AND RESTRAINT SYSTEM FOR YOUR DRILLING EQUIPMENT

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

2.G.2 Tong Leveling

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

1. Place a level axially (side to side) across the tong, ensuring that it is parallel with the surface of the tong. Use a thin wrench on the flat of the adjusting helix to rotate the helix, forcing the lift link to move towards the outer supports of the sling. The 1" jam nut on the pin may have to be slightly loosened to allow the helix to rotate. Adjust the helix until the level shows that the tong is level side-to-side - retighten the nut if necessary

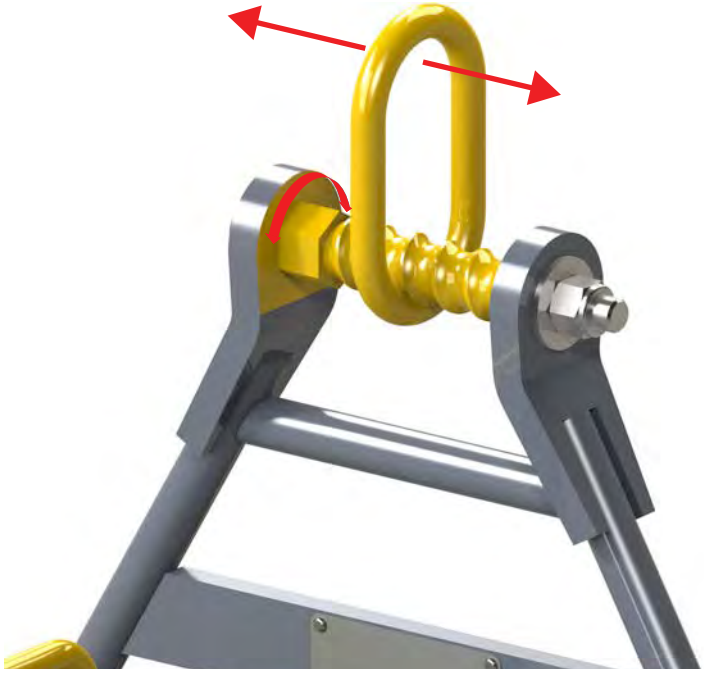


ILLUSTRATION 2.G.1: TONG LEVELING (SIDE-TO-SIDE)

2. Place a level lengthwise (front to back) along the tong, ensuring that it is parallel with the surface of the tong. Loosen the 3/4" jam nuts on the adjusting bolts on rigid sling brackets. Completely loosen the adjusting bolts. Turn each adjusting bolt equally until tong hangs level front-to-back. Lock adjusting bolts in place with the jam nuts.

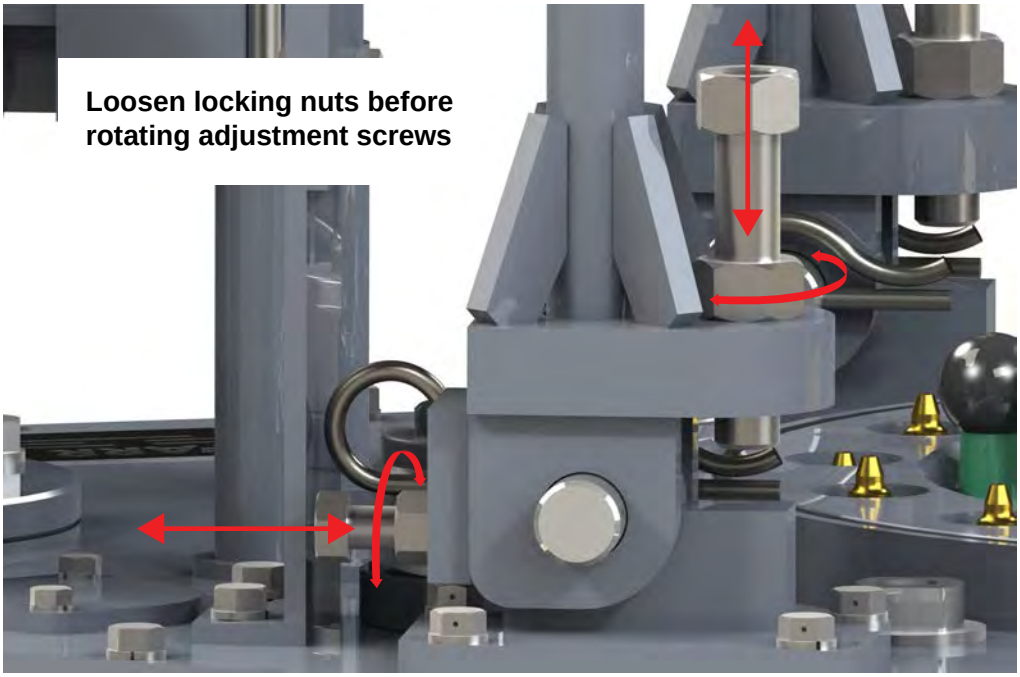


ILLUSTRATION 2.G.2: TONG LEVELING, FRONT-TO-BACK

2.G.3 Load Cell Configuration

The backup is directly coupled to the compression load cell via the backup body paddle. The load cell hanger is simply hung on the paddle and secured through the top of the “U” by a bolt and washer set, and in normal operation does not need to be adjusted or removed. The assembly in the first of the following two illustrations has been configured in the “make-up” configuration; to convert the assembly to the “break-out” configuration remove the bolt and washer set securing the load cell holder to the paddle, and move the entire assembly to the other side of the paddle.

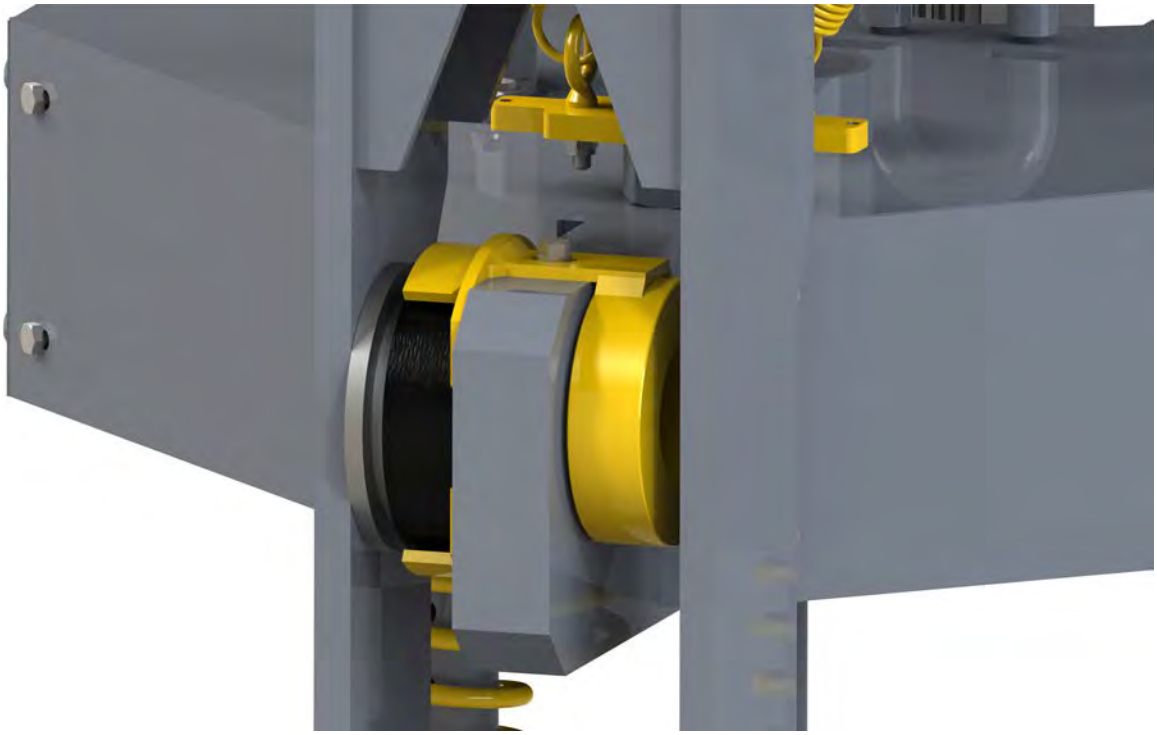


ILLUSTRATION 2.G.3: LOAD CELL CONFIGURATION, MAKE-UP

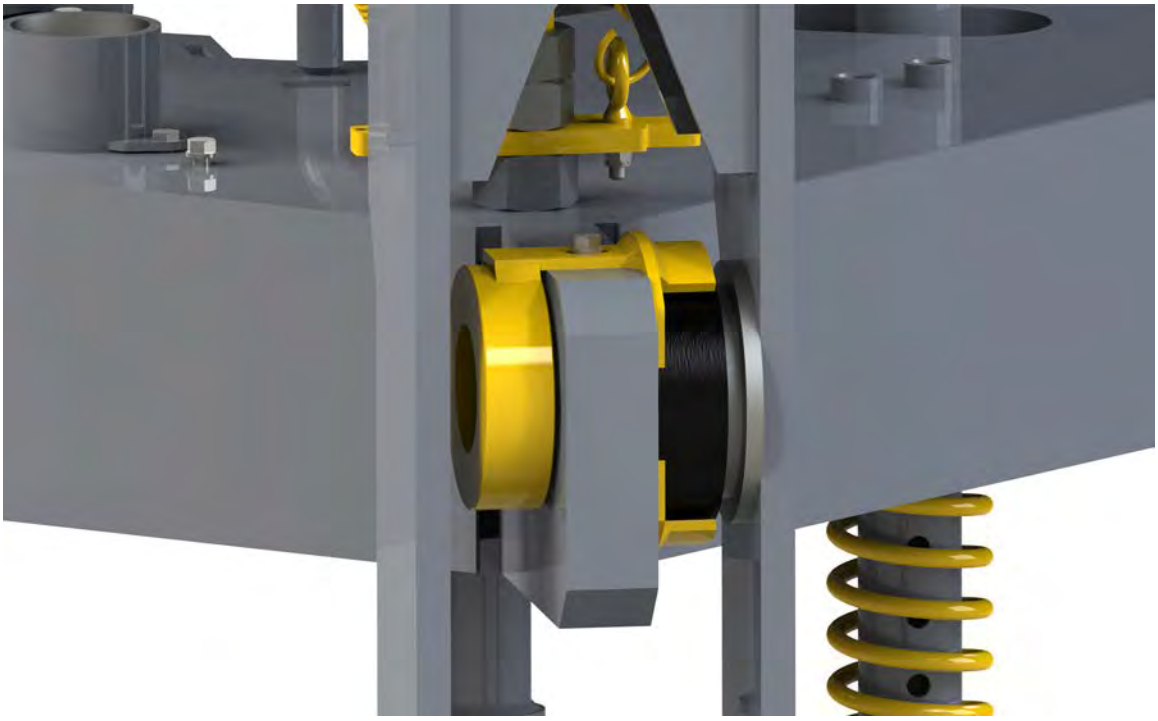
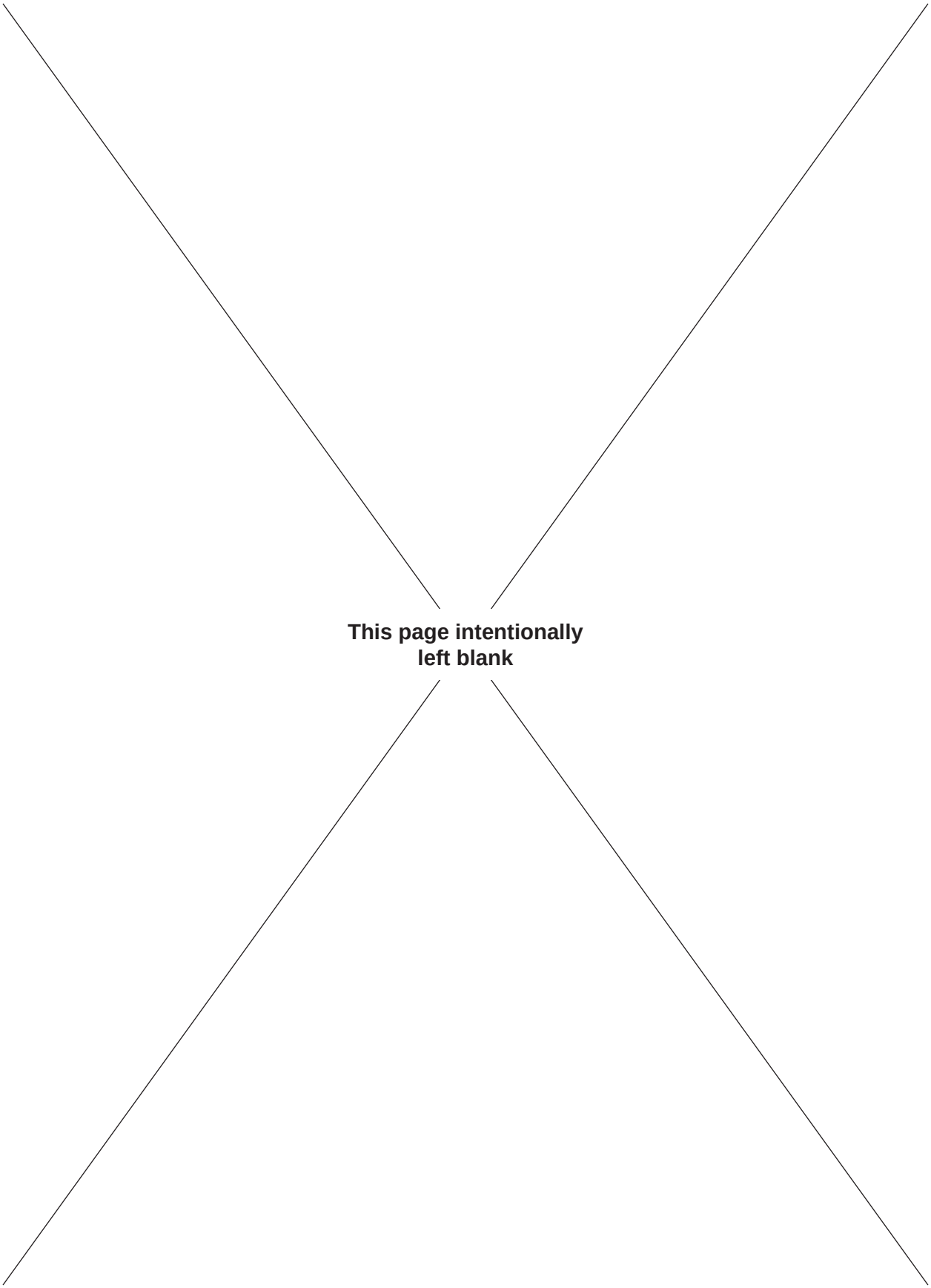


ILLUSTRATION 2.G.4: LOAD CELL CONFIGURATION, BREAK-OUT

SECTION 3: OPERATION


This page intentionally
left blank

3.A TONG OPERATION

3.A.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

3.A.2 Operator Safety

McCoy 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.

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.

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.

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 recommends depressurizing the tong hydraulic system before connecting or disconnecting quick-connect fittings.

DEPRESSURIZE EQUIPMENT BEFORE DISCONNECTING MAIN HYDRAULIC LINES.

3.A.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.

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

3.A.3 Valve Operation (continued):

TONG MOTOR

This is a proportional valve. 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.

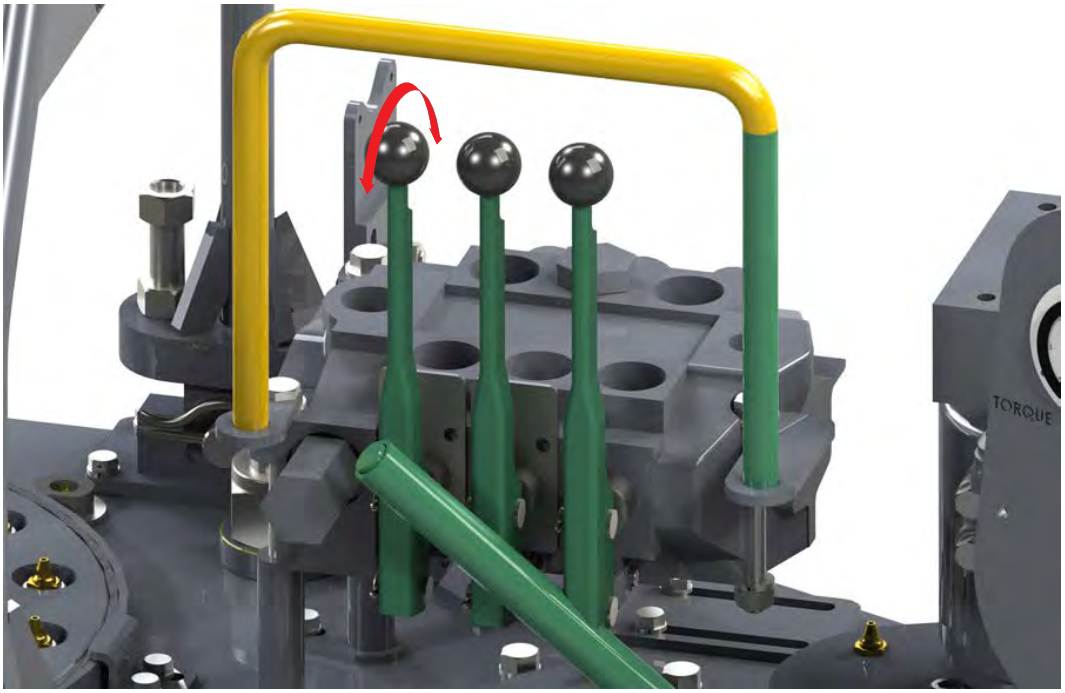


ILLUSTRATION 3.A.1: TONG MOTOR CONTROL VALVE

LIFT CYLINDER

This is a direct-acting valve. Pushing on the lift cylinder control valve handle (toward the center of the tong) will cause the equipment to lift, while pulling on the lift cylinder control valve handle (toward the operator) will cause the equipment to lower.

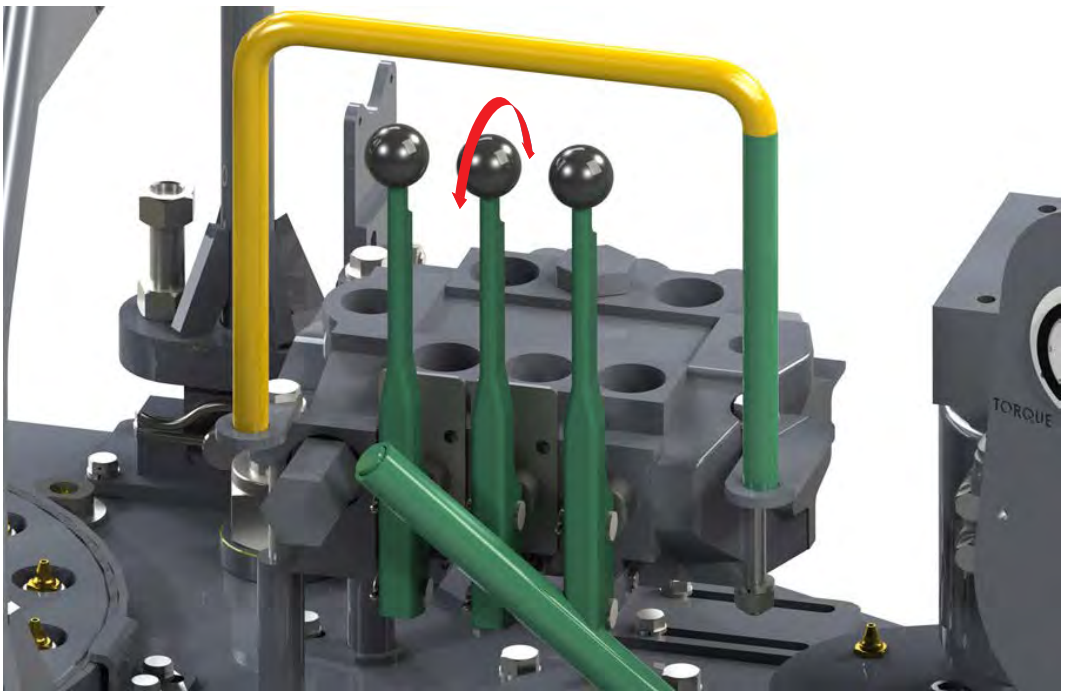


ILLUSTRATION 3.A.2: LIFT CYLINDER CONTROL VALVE

3.A.3 Valve Operation (continued):

LIFT CYLINDER NEEDLE VALVE (See illustration 3.A.3)

This needle 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).

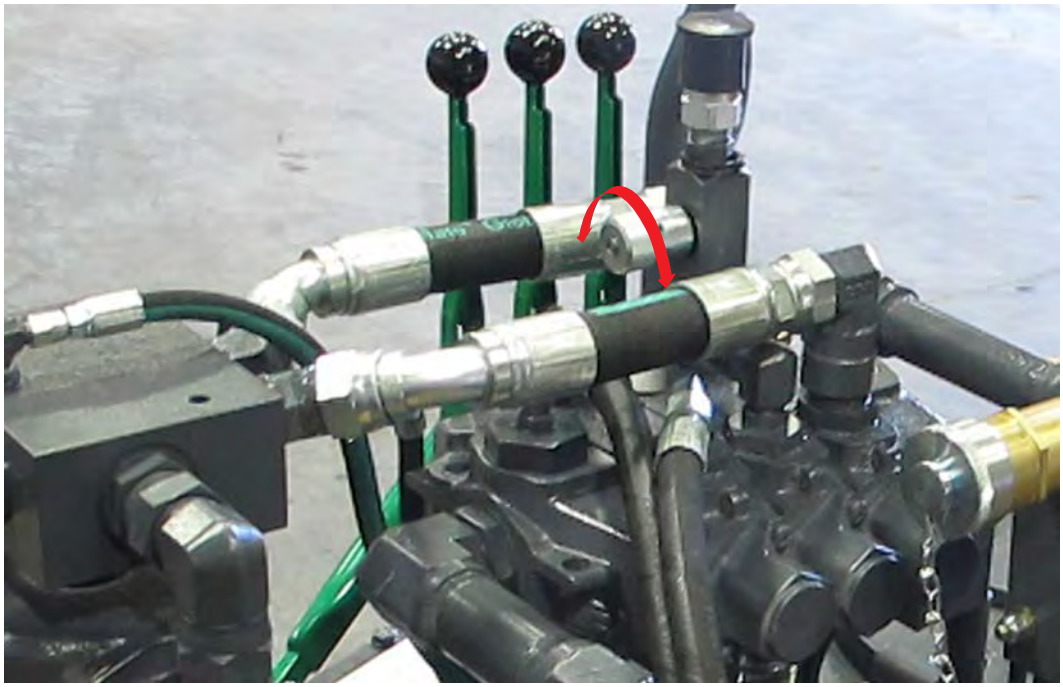


ILLUSTRATION 3.A.3: LIFT CYLINDER NEEDLE VALVE

BACKUP

Pushing this valve forward will extend the **CLINCHER®** cylinders toward pipe center. Pulling backward, towards the operator, will retract the cylinders.

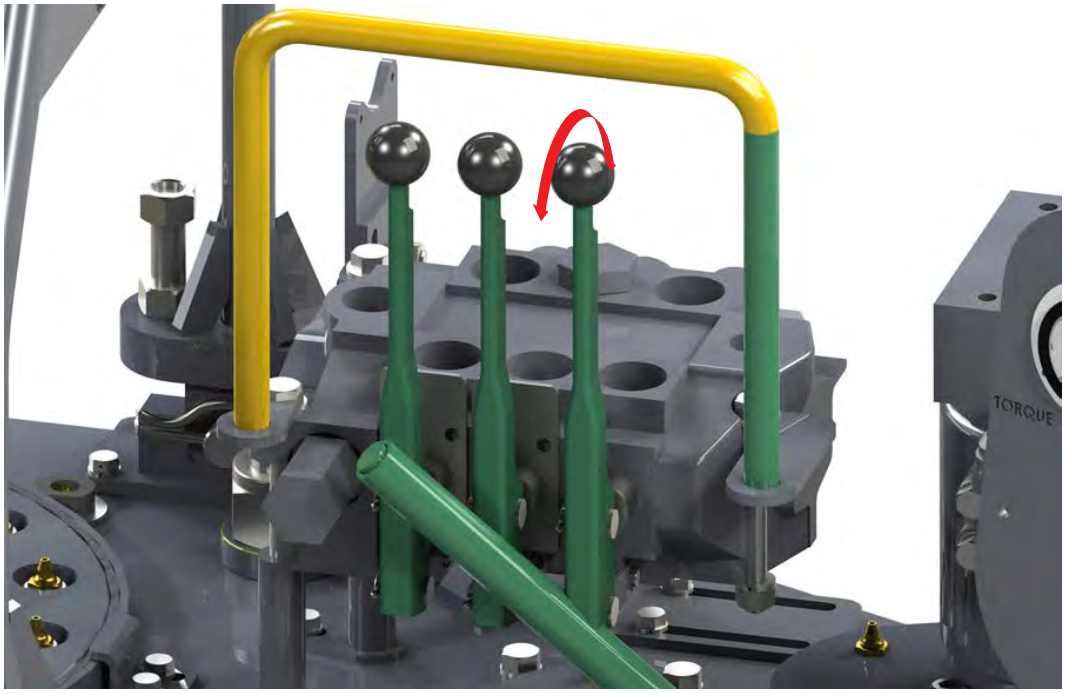


ILLUSTRATION 3.A.4: BACKUP CONTROL VALVE

3.A.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 upward from neutral position. To shift to the low-speed gear, move the shifting handle down 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.

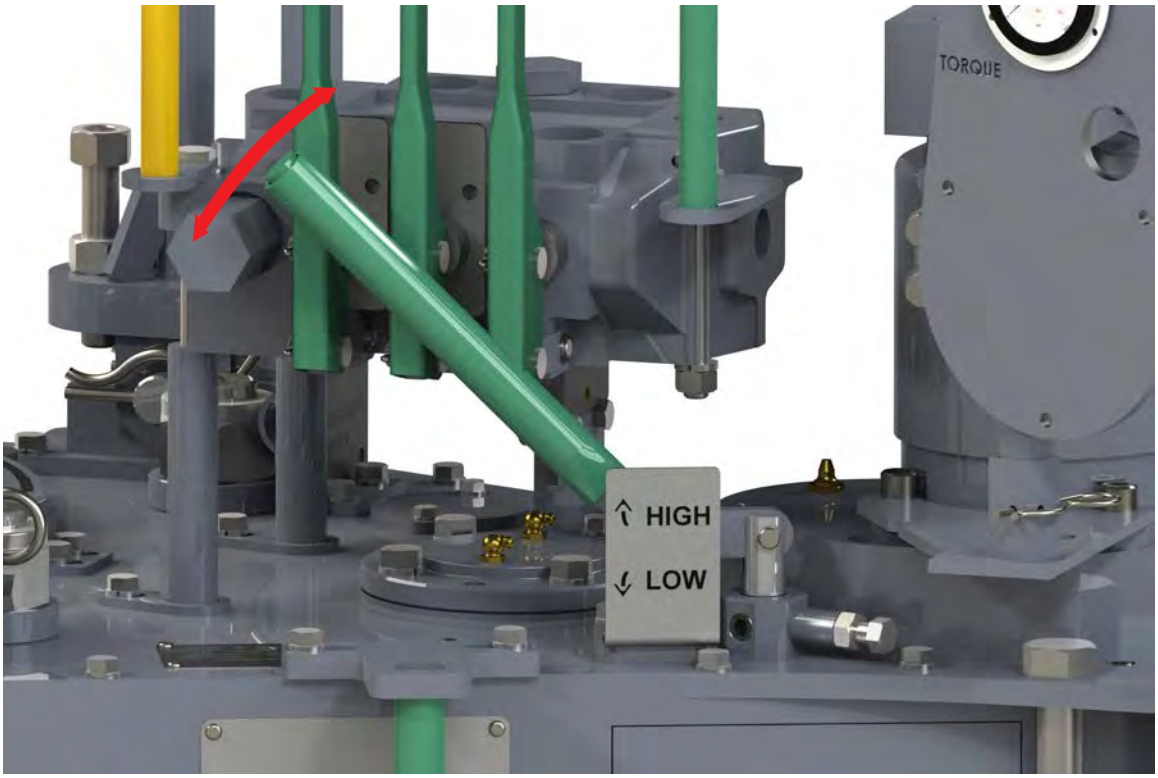


ILLUSTRATION 2.H.4: SHIFTING GEARS

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

3.A.5 Pre-Operational Checks

McCoy 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. 1.3. Ensure the hydraulic connections from the power unit are properly and securely made up (see Section 2.E). Do not neglect to connect the motor drain line.
2. Start the power unit as specified by the power unit operator’s manual. Open the Bypass Valve on the hydraulic system, and inspect all pressure and return line hose connections to ensure correct and secure installation. A restriction in the pressure supply hose will result in high pressure within the power unit hydraulic system, which will activate the hydraulic governor and increase the engine speed to as high as maximum RPM. A restriction in the return line will result in high pressure within the power unit and the tong hydraulic system, causing engine speeds as high as maximum RPM, and possible failure of the motor seal.

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

3.A.5 Pre-Operational Checks (continued):

3. 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. Ensure the tong door is securely closed before rotating tong.

DOOR MUST BE CLOSED AND SECURELY LATCHED BEFORE TONG ROTATION IN ORDER TO ASSURE THE SAFETY OF OPERATING PERSONNEL.

9. Shift the tong to low gear (see Section 2.H.4) and rotate the tong slowly forward for approximately a minute. Stop the tong and then reverse the rotation direction for approximately another minute. Stop the tong, shift to high gear, and operate in high gear for approximately another minute. Stop the tong and rotate in the opposite direction in high gear for approximately another minute. If at any time abnormal operation is suspected (surging, grinding, squealing, or other noises deemed to be unusual, or failure to operate) discontinue operation of the tong and contact McCoy Global immediately.
10. Re-inspect all hydraulic lines and connections on the tong, and correct all leaks.
11. The safety door system is the prime protective measure separating the operator from the rotary gear, and must be in working condition when operating tong. Carefully inspect the safety door components, and test the operation of the safety door using the following procedure:
    a. Keep non-essential personnel clear of the unit under test. This test procedure will only include two people: one to run the control valve and one to operate the door.
    b. Ensure the tong door is securely closed.
    c. Shift to LOW gear.
    d. Begin rotating the tong (direction of rotation is not important).
    e. Open the tong door while rotating the tong. The tong must immediately and completely stop rotating as soon as the door is opened.
    f. Continue to apply rotation control, and open & close the door throughout its complete range. Slowly close the door until it latches. Rotation must not begin until the door is completely closed and securely latched.

    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 3.F.4 for safety door switch adjustment procedures, and Section 4.D for safety door troubleshooting instructions.

    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.

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

3.A.6 General Comments

Position rotary gear in contact with both idler gears when making up or breaking out joints or collars when torque in excess of 50% of the rated torque is required.

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 stress upon the gear train.

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 and creates a safety hazard on the drill floor.

DO NOT USE THE “SNAP BREAK” METHOD TO BREAK OUT JOINTS

3.B MAKING AND BREAKING CONNECTIONS

THESE OPERATING PROCEDURES ASSUME THE USER HAS PROPERLY SET UP AND PREPARED THE EQUIPMENT FOR OPERATION AS PER SECTIONS 2D, 2E, AND 2F OF THIS MANUAL.

Set up and prepare your equipment for operation as per Section 2 of this manual Refer to the following sections:

- 2.D - Lift Cylinder Installation
- 2.E.3 - Hydraulic Connections
- 2.F - Tong Jaw Installation
- 2.G.1 - Tong Rig-up and Leveling (Suspension)
- 2.G.2 - Tong Rig-up and Leveling (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.

3.B.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 directly from the rigid sling.

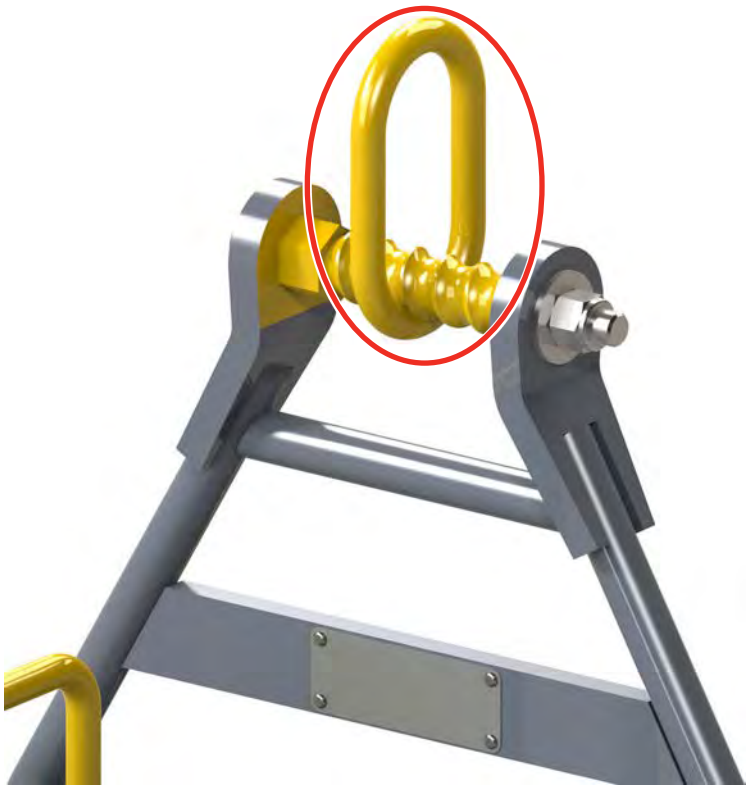


ILLUSTRATION 3.B.1: RIGID SLING MASTER LINK

THE MASTER LINK MUST BE USED TO SUSPEND THE TONG ASSEMBLY

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 2.H.2 next page). 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.

3.B.1 Making A Connection (continued):

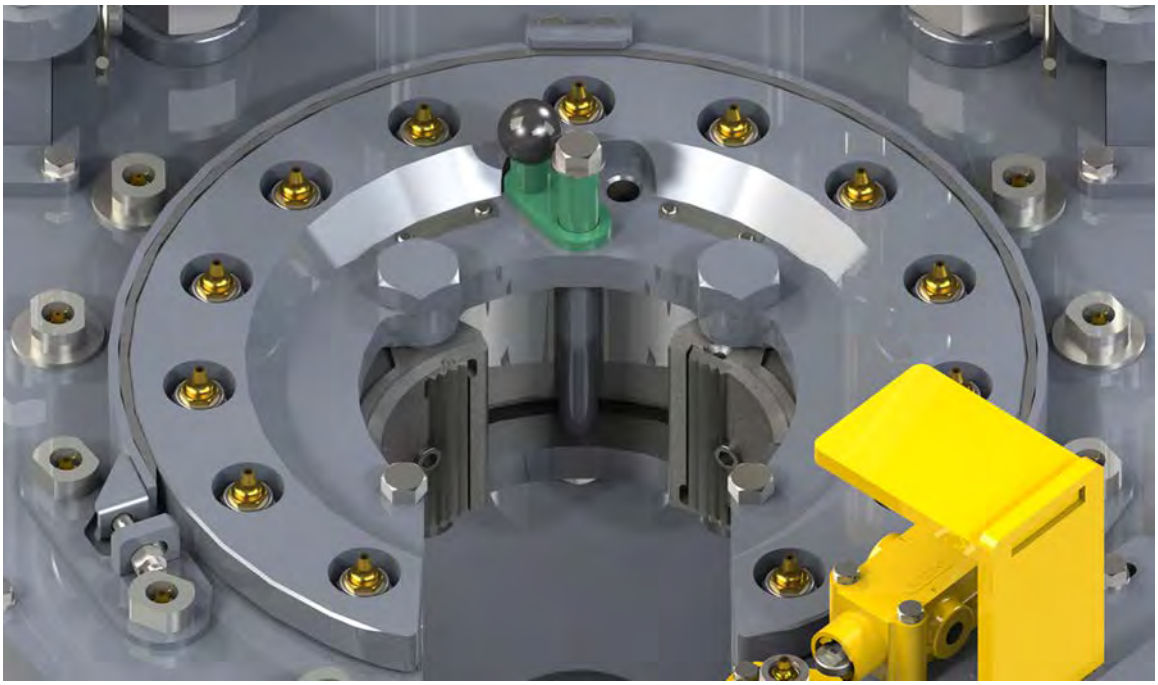


ILLUSTRATION 3.B.2: BACKING PIN CONFIGURED FOR "MAKE-UP" OPERATONS

3. Properly configure the load cell for making up connections (see Section 2.H.3 & 2.H.4). Connect snub lines to the rear of the tong to arrest uncontrolled rotation of the assembly in the event of backup jaw slippage. The snub lines must be rated for the applied torque plus whatever safety margins stated by your own operating policies. The snub line connection points on the drill floor must be sturdy enough to absorb all applied forces.
4. Grasp the tong door latch handle and pull to release the latch and open the door. Opening the tong door will activate the safety door system and prevent rotation of the cage plate.
5. Actuate the lift cylinder control valve to lift the assembly from the drill floor. Pushing on the lift cylinder control valve handle (toward the center of the tong) will cause the equipment to lift. Note that rig personnel are required to stabilize the tong and backup as it is being lifted so it does not swing and collide with other rig equipment.

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

6. Manually engage the threads of the tubing connection being made up. Ensure threads are not cross-threaded.
7. Move the tong and backup assembly on to the tubing joint. Use the lift cylinder to ensure the assembly is at the correct height so that the backup jaws are located below the connection point, and the tong jaws are located above the connection joint.
8. Firmly close the tong door. Ensure the door is securely latched (tug on the door handle to ensure it remains latched).
9. Ensure tubing is roughly centered within the tong and backup jaws - rig personnel are required to stabilize the tong and backup around the connection until the jaws have been clamped shut. Actuate the backup clamping valve (push it toward the centre of the tong) to clamp the backup jaws on to the tubing below the connection point. **OPERATING NOTE:** the backup control is "clamp and release", meaning that once the backup jaws are clamped, the jaws remain under clamping pressure until the operator manipulates the backup control handle to release pressure .
10. Shift the tong to high gear, low torque (see section 3.A.4 for shifting instructions).

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

3.B.1 Making A Connection (continued):

11. Gently push the rotation control valve toward the centre of the tong to slowly rotate the cage plate in the make-up direction until the tong jaws cam on to the tubing.

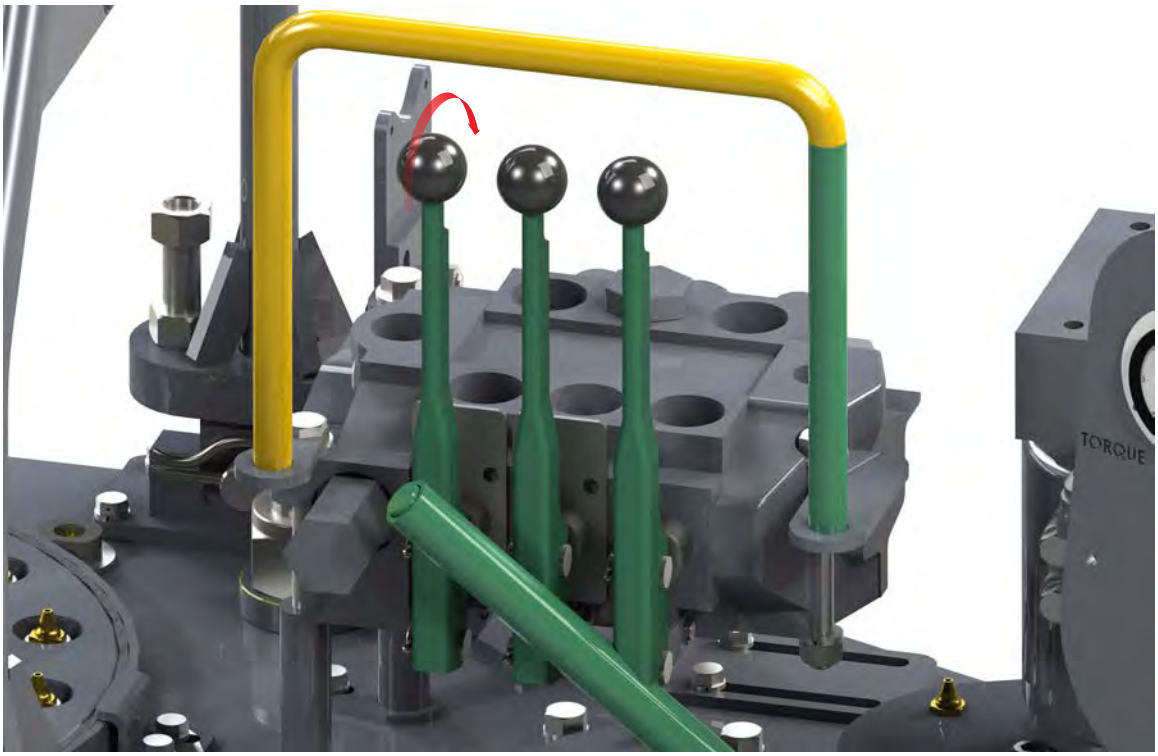


ILLUSTRATION 3.B.3: ROTATION CONTROL VALVE - MAKING UP CONNECTION

12. When the tong jaws cam on to the tubing push the rotation control handle all the way in 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 increase.
13. Stop rotation, and set motor to low speed and shift to low gear (low speed/high torque - See Section 3.A.4 for shifting to low gear). This will enable the tong to produce adequate torque to make up the joint to specification.
14. Push the rotation control handle all the way in to complete the connection at low speed/high torque. Observe the torque gauge - when the specified make-up torque is reached stop rotation. If your system is equipped with an automatic dump valve the system pressure will “dump” to tank when the preset torque has been reached, and all rotation will stop. Reverse the rotation control valve (in the break-out direction) to release the tong jaws from the tubing.

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

15. Release backup clamping pressure and retract the backup jaws by pulling the backup control valve toward the operator
16. Unlatch and open the tong door to free the assembly from the tubing. Note that rig personnel may be required to stabilize the equipment as it completely releases from the tubing. Guide the assembly away from the string. Pull the lift cylinder control valve toward the operator to lower the equipment to the drill floor.
17. Repeat steps 5 through 16 to continue making up connections.

3.B.2 Breaking and Un-threading Connections

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.

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 directly from the rigid sling (see illustration 3.B.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.

ILLUSTRATION 3.B.4: BACKING PIN CONFIGURED FOR “MAKE-UP” OPERATONS

3. Configure the load cell for break-out operation (see Section see Section 2.G.3 for detailed instructions for configuring the load cell on your equipment).
4. Connect snub lines to the rear of the tong to arrest uncontrolled rotation of the assembly in the event of backup jaw slippage. The snub lines must be rated for the applied torque plus whatever safety margins stated by your own operating policies. The snub line connection points on the drill floor must be sturdy enough to absorb all applied forces.
5. Grasp the tong door latch handle and pull to release the latch and open the door. Opening the tong door will activate the safety door system and prevent rotation of the cage plate.
6. Actuate the lift cylinder control valve to lift the assembly from the drill floor. Pushing on the lift cylinder control valve handle (toward the center of the tong) will cause the equipment to lift. Note that rig personnel are required to stabilize the tong and backup as it is being lifted so it does not swing and collide with other rig equipment.

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

7. Move the tong and backup assembly on to the tubing joint. Use the lift cylinder to ensure the assembly is at the correct height so that the backup jaws are located below the connection point, and the tong jaws are located above the connection joint.
8. Firmly close the tong door. Ensure the door is securely latched (tug on the door handle to ensure it remains latched).
9. Ensure tubing is roughly centered within the tong and backup jaws - rig personnel are required to stabilize the tong and backup around the connection until the jaws have been clamped shut. Actuate the backup clamping valve (push it toward the centre of the tong) to clamp the backup jaws on to the tubing below the connection point. **OPERATING NOTE:** the backup control is “clamp and release”, meaning that once the backup jaws are clamped, the jaws remain under clamping pressure until the operator manipulates the backup control handle to release pressure .

3.B.2 Breaking and Un-threading Connections (continued):

10. Break-out torque is only available in low gear. See section 3.A.4 for instructions for shifting your tong.

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

11. Slowly rotate the cageplate in the break-out direction until the tong jaws “cam” on to the pipe.

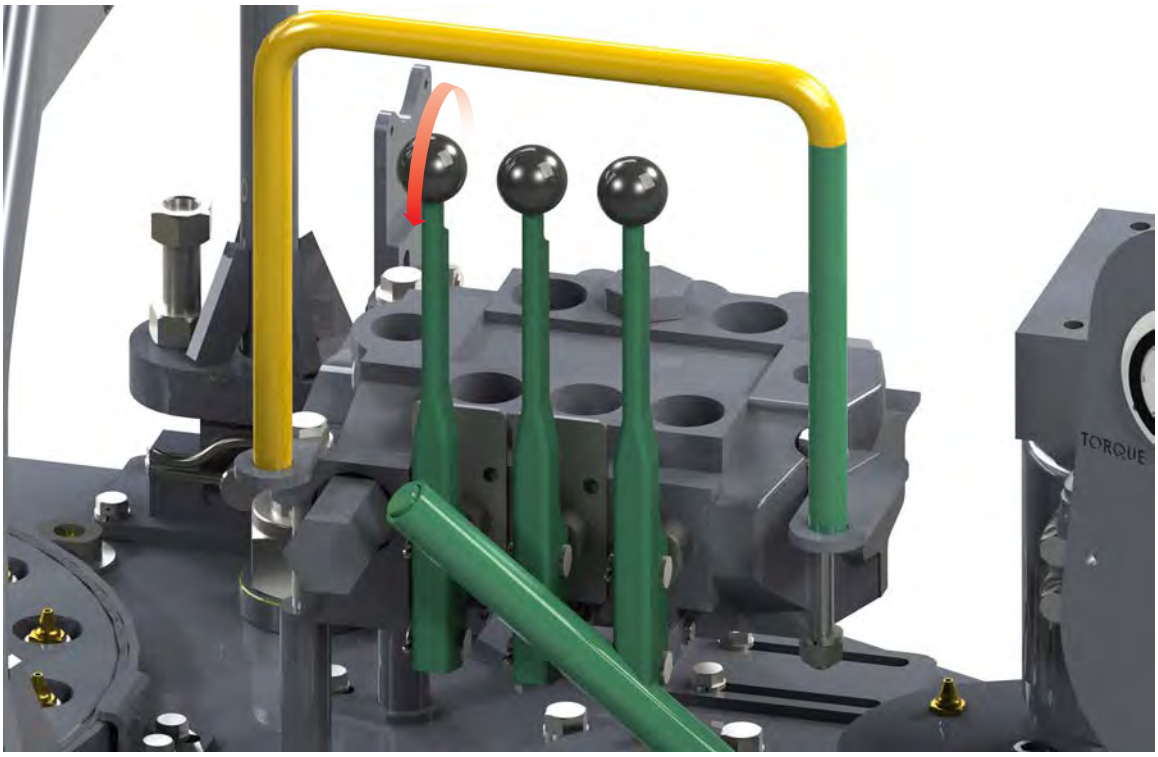


ILLUSTRATION 3.B.5: ROTATION CONTROL VALVE - BREAKING OUT CONNECTION

12. Once the jaws cam on to the pipe pull the rotation control handle all the way out to ensure full breakout torque is being delivered to the joint.
13. When the joint releases, stop rotation and shift tong to high gear (see Section 3.A.4 to properly shift the tong to high gear). Pull rotation control valve toward the operator to completely un-thread the connection. Do not shift gears while the tong is rotating.

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

14. Once the joint is completely un-threaded stop rotation. Reverse the rotation control valve (in the make-up direction) to release the tong jaws from the tubing.
15. Pull the backup clamp control valve toward the operator to release backup clamping pressure and retract the backup clamp cylinders.
16. Unlatch and open the tong door to free the assembly from the tubing. Note that rig personnel may be required to stabilize the equipment as it completely releases from the tubing. Guide the assembly away from the string and use the lift cylinder control to lower it to the drill floor.

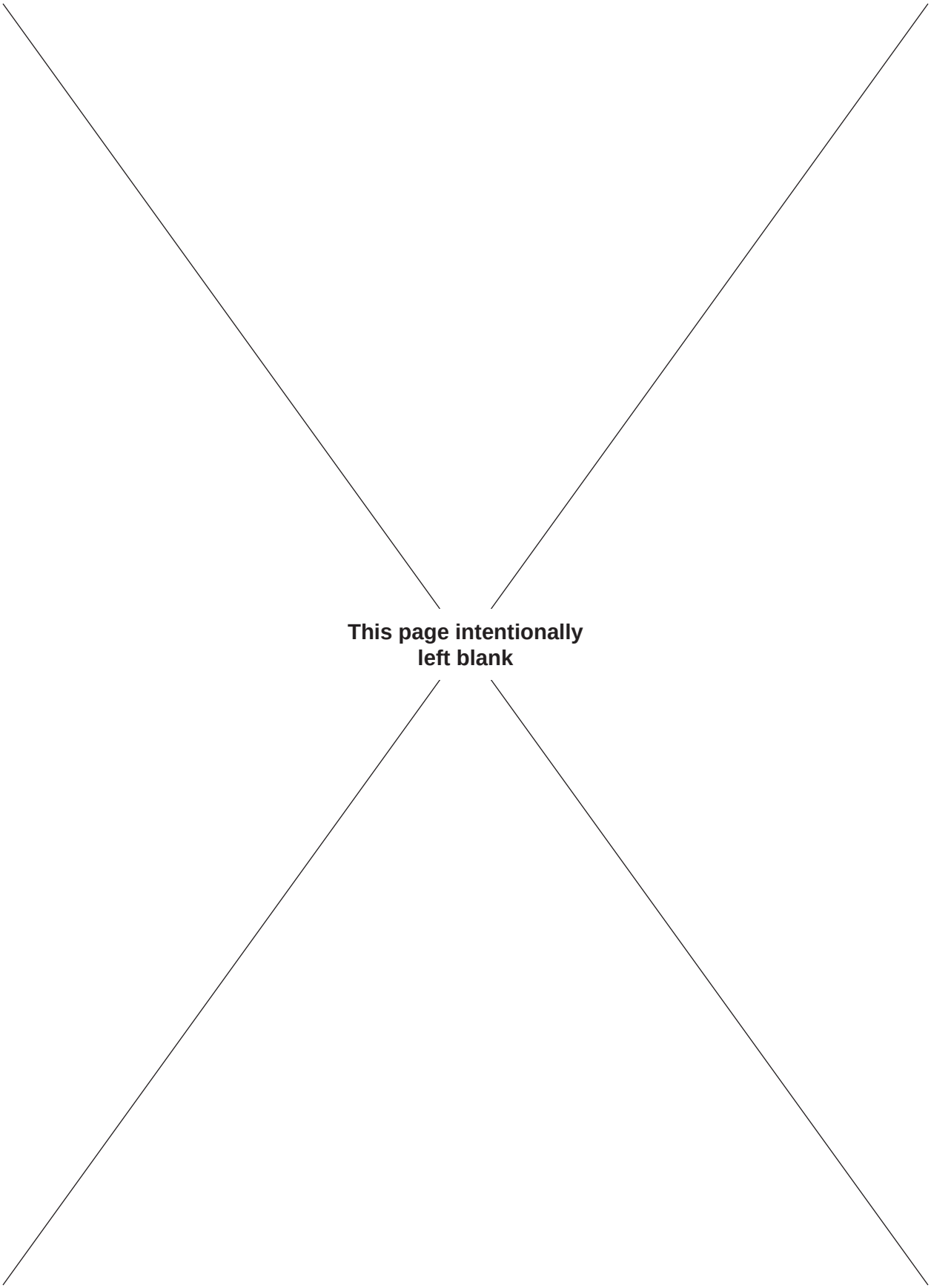
RIG PERSONNEL MUST STABILIZE THE TONG AS IT IS LOWERED TO THE DRILL FLOOR

3.B.2 Breaking and Un-threading Connections (continued):

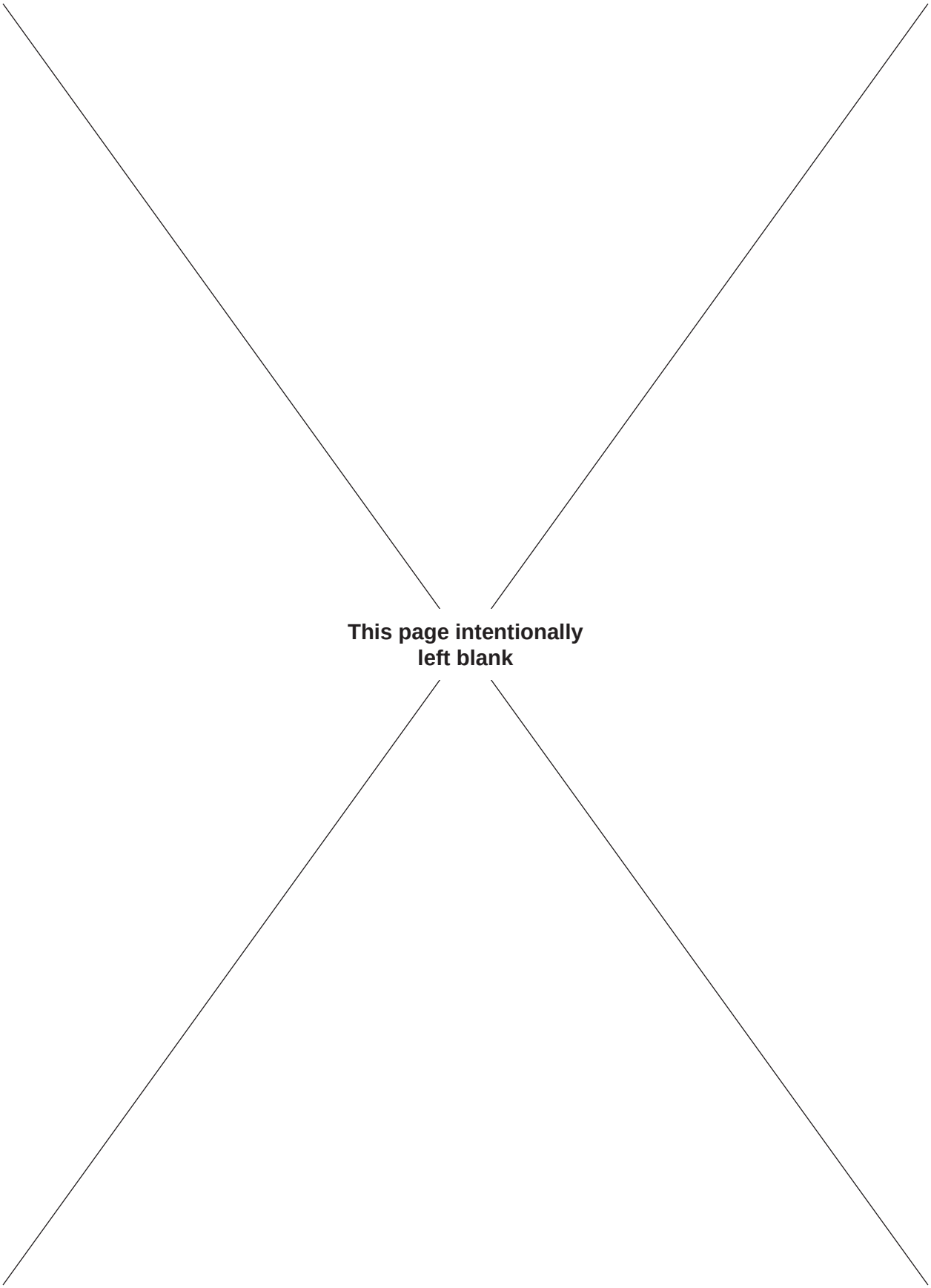
17. Use your rig's standard pipe handling procedures to remove and rack the freed tubing section or stand.
18. Repeat steps 6 through 17 as many times as necessary to break out and un-thread the desired number of connections

3.C EXTREME COLD WEATHER OPERATION

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


This page intentionally
left blank

SECTION 4: MAINTENANCE


This page intentionally
left blank

McCoy Global recognizes that minor on-site repairs and modifications are required to maintain peak operating condition of your equipment, or to match your equipment with the operating environment. Examples of minor repairs are

- replacement of damaged hydraulic hoses and fittings.
- replacement of malfunctioning pressure gauges and valves.
- replacement of door cylinders
- replacement of fasteners

Any replaced component must be an identical component supplied by McCoy Global. Replaced fasteners must be Grade 8 or equivalent, or whatever fastener is specified by McCoy.

4.A 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 of your company's 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, and 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

McCoy recommends that disconnection of hydraulic connectors be performed with the power unit off and the hydraulic circuit depressurized.

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

4.B CLEANING

Clean tong thoroughly cleaned with a good petroleum-based cleaning agent after each job, prior to storage. Farr recommends that the motor and valve assembly be periodically removed, along with the top tong plate, so that guides, rollers and gears can be properly cleaned. Ensure that cleaning solvents and chemicals are captured to prevent environmental contamination, and dispose of all materials according to your company's proscribed environmental protection regulations.

4.C PREVENTIVE MAINTENANCE

Regular maintenance programs are necessary, and must be established to assure safe, dependable operation of your Hydraulic Tubular Connection System and to avoid costly breakdown maintenance. The following maintenance procedures provide information required to properly maintain your equipment. Your equipment may require more, or less maintenance depending upon the frequency of use and the field conditions under which your equipment operates. McCoy has also provided recommended maintenance checklists. The intervals in the maintenance checklists are designed for equipment operating at 10°C to 35°C ambient temperature for 10 hours per day. McCoy recommends that the inspection and maintenance procedures in this section be performed as recommended in the maintenance checklists, or in conjunction with your maintenance foreman's experience and best estimate of when your equipment is due for this maintenance.

Purchased components included with your hydraulic tubular connection equipment (for example: motors, valves, etc.) may specify maintenance tasks and intervals over and above what McCoy recommends as part of their recommended procedures. Users of this equipment may choose to perform or ignore these additional tasks at their discretion.

Premature fouling of particulate filters within your prime mover or ancillary hydraulic power unit requires immediate hydraulic fluid laboratory analysis to prevent premature wear of hydraulic system due to high levels of wear metals in the fluid.

McCoy Global recommends tracking all maintenance activity including the lubrication schedule. This may be a simple as keeping a paper log, or using a software-based maintenance tracking utility. A maintenance log is a valuable tool that can be used for easily retrieving maintenance history or identifying trends that require correction.

4.D HYDRAULIC SYSTEM DE-PRESSURIZATION

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

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

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

4.E LUBRICATION INSTRUCTIONS

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

McCoy 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.

4.E.1 Cam Followers

Apply grease to the grease fittings recessed in both the top and bottom cage plates (26 locations total - 13 top / 13 bottom).

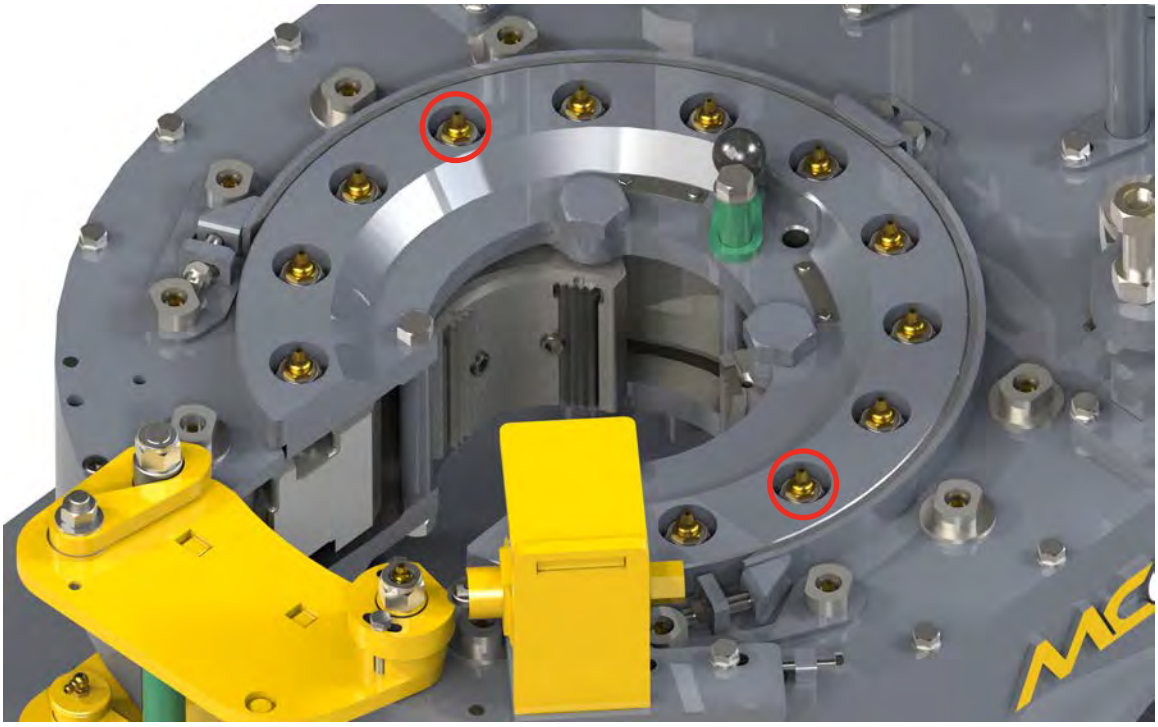


ILLUSTRATION 4.E.1: CAM FOLLOWER LUBRICATON

4.E LUBRICATION INSTRUCTIONS (CONTINUED):

4.E.2 Support Roller Bearings

Apply grease to the support roller bearings through the grease fittings recessed into the top of each support roller shaft (ten locations total).

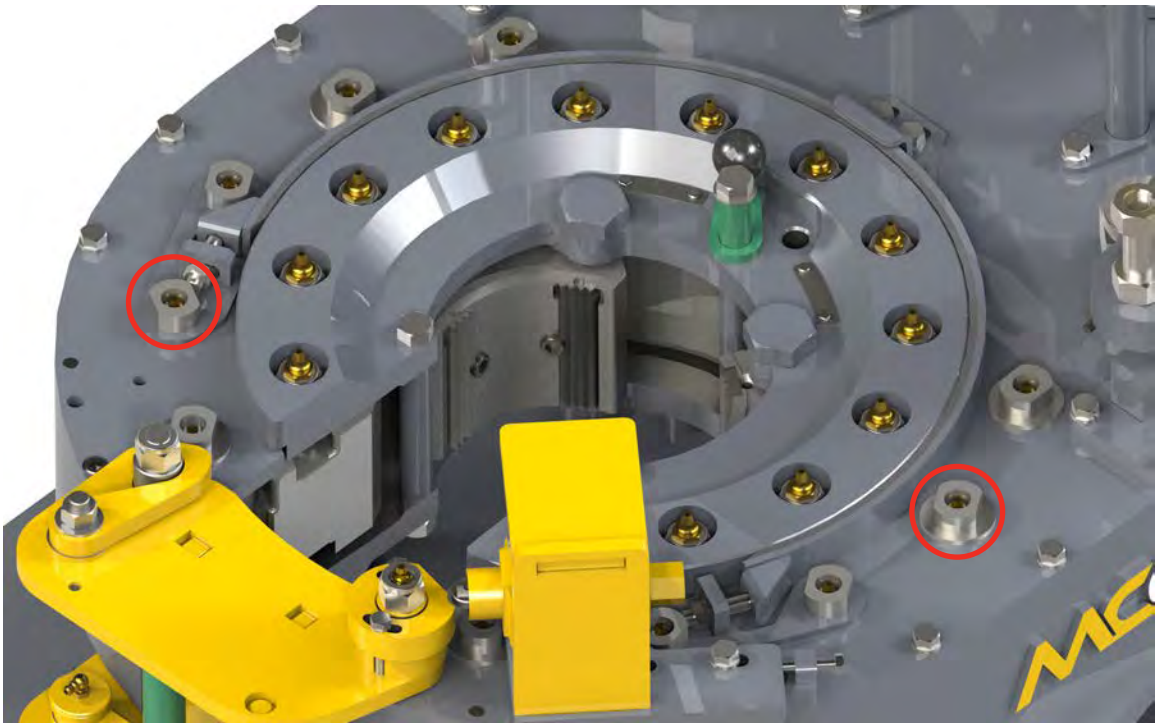


ILLUSTRATION 4.E.2: SUPPORT ROLLER BEARING LUBRICATION

4.F.3 Rotary Idler Bearings

Apply grease to the rotary idler bearings through the grease fittings recessed into the top of each shaft on the top face of the tong (two locations total).

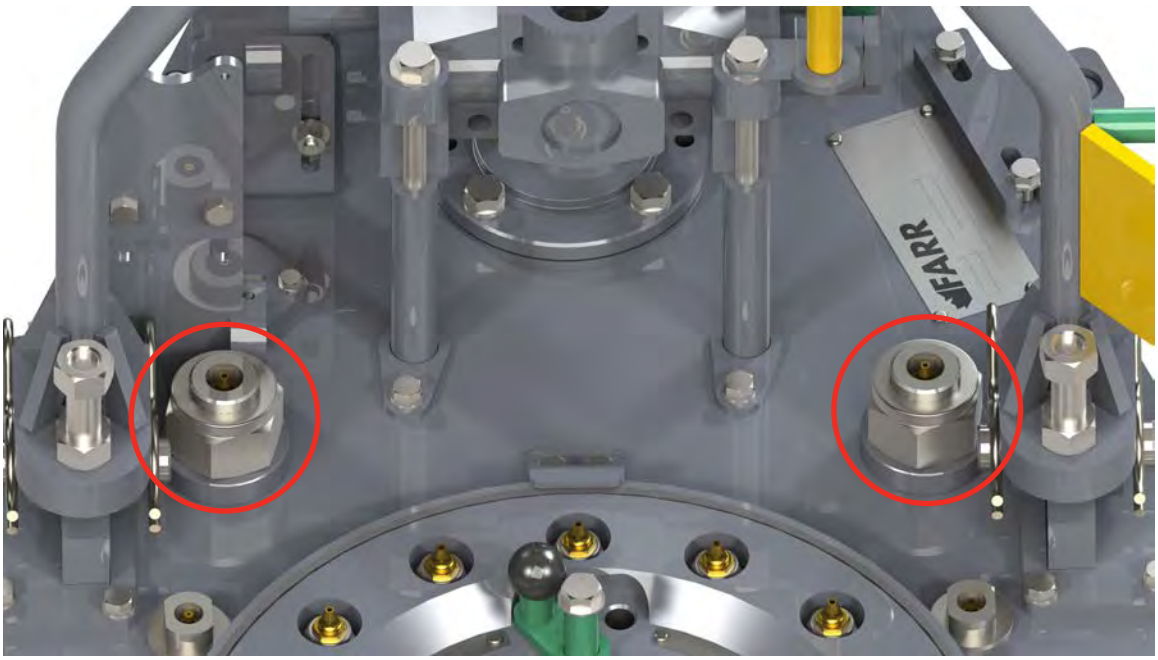


ILLUSTRATION 3.D.3: ROTARY IDLER BEARING LUBRICATION

4.E LUBRICATION INSTRUCTIONS (CONTINUED):

4.E.4 Pinion Idler Bearing Lubrication

Apply grease to the pinion idler bearing through the grease fitting recessed into the top of the half-shaft, located on the bottom face of the tong (one location only).

ILLUSTRATION 3.D.4: PINION IDLER BEARING LUBRICATION

4.E.5 Pinion Bearing Lubrication

Apply grease to the pinion bearings through the grease fittings located on the bearing caps on the top and bottom faces of the tong (two locations top, two locations bottom).

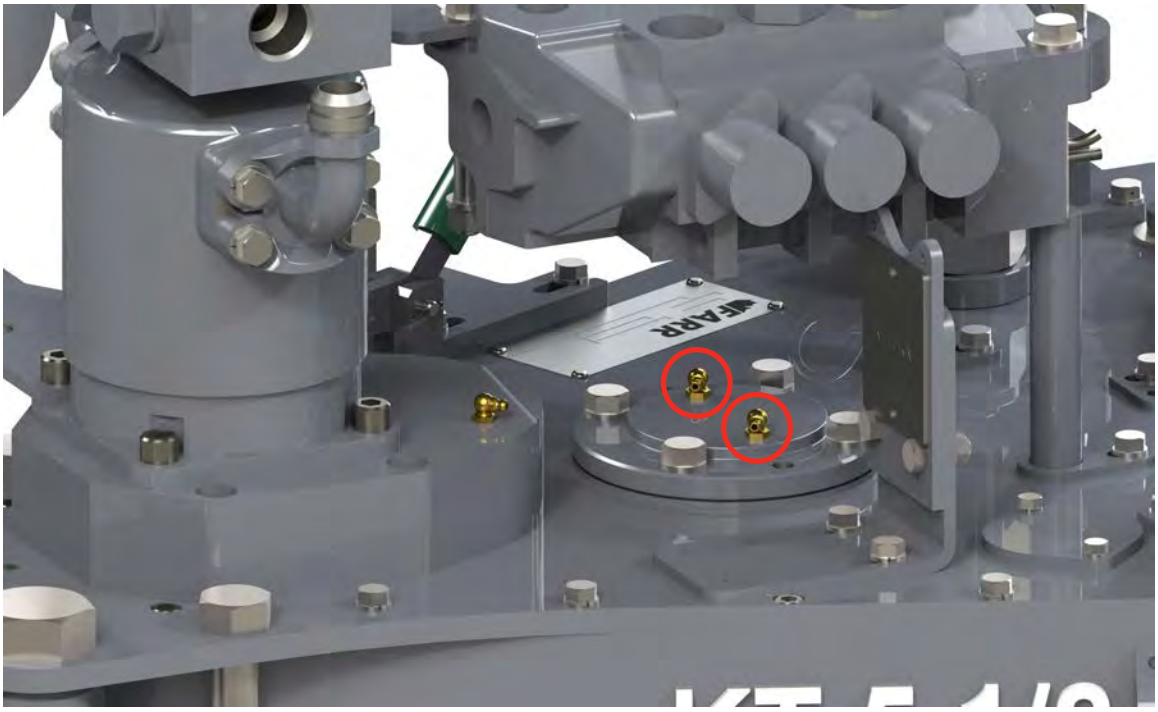


ILLUSTRATION 4.E.5: PINION BEARING LUBRICATION (TOP)

4.E LUBRICATION INSTRUCTIONS (CONTINUED):

4.E.5 Pinion Bearing Lubrication (continued):

ILLUSTRATION 4.E.6: PINION BEARING LUBRICATION (BOTTOM)

4.E.6. Clutch Bearings

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).

ILLUSTRATION 4.E.7: CLUTCH BEARING LUBRICATION

4.E LUBRICATION INSTRUCTIONS (CONTINUED):

4.E.7 Motor Mount

Apply grease to the motor gear/clutch drive gear through the grease fitting located on the top of the motor mount (one location only).

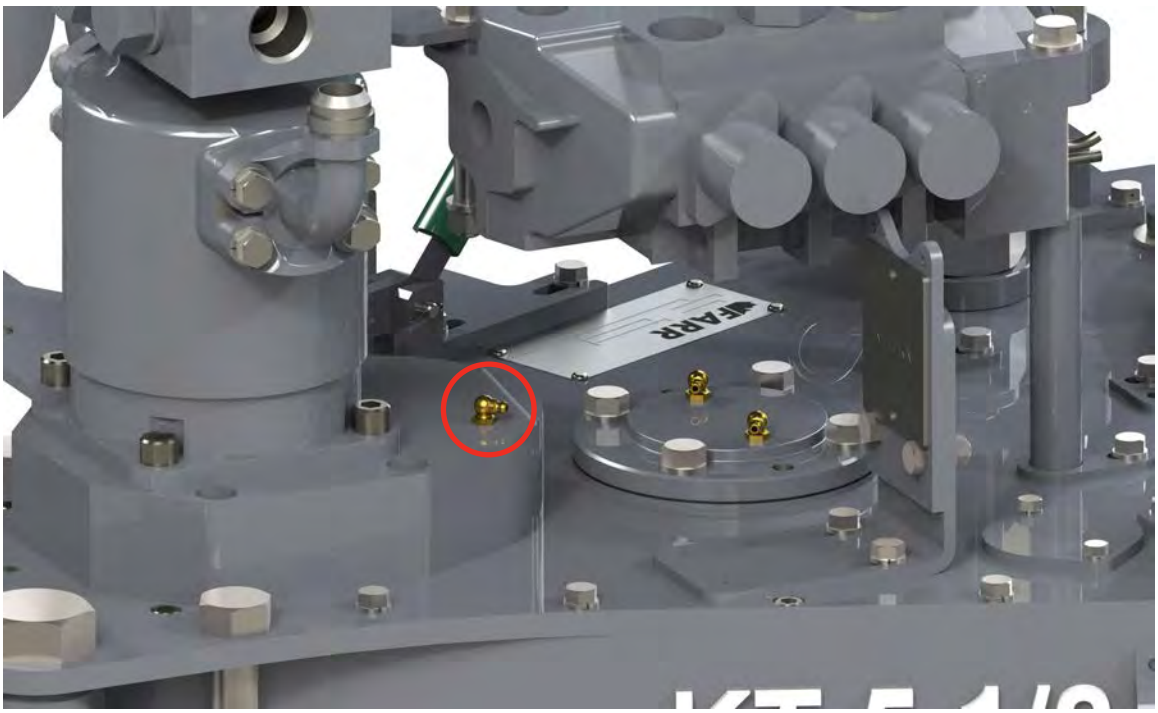


ILLUSTRATION 4.E.8: MOTOR GEAR / CLUTCH DRIVE GEAR LUBRICATION

4.E.8 Shifting Shaft

Apply grease to the shifting shaft and top shifting shaft bushing. The shaft and shifting yoke can be accessed through the cover plate on the side of the tong.

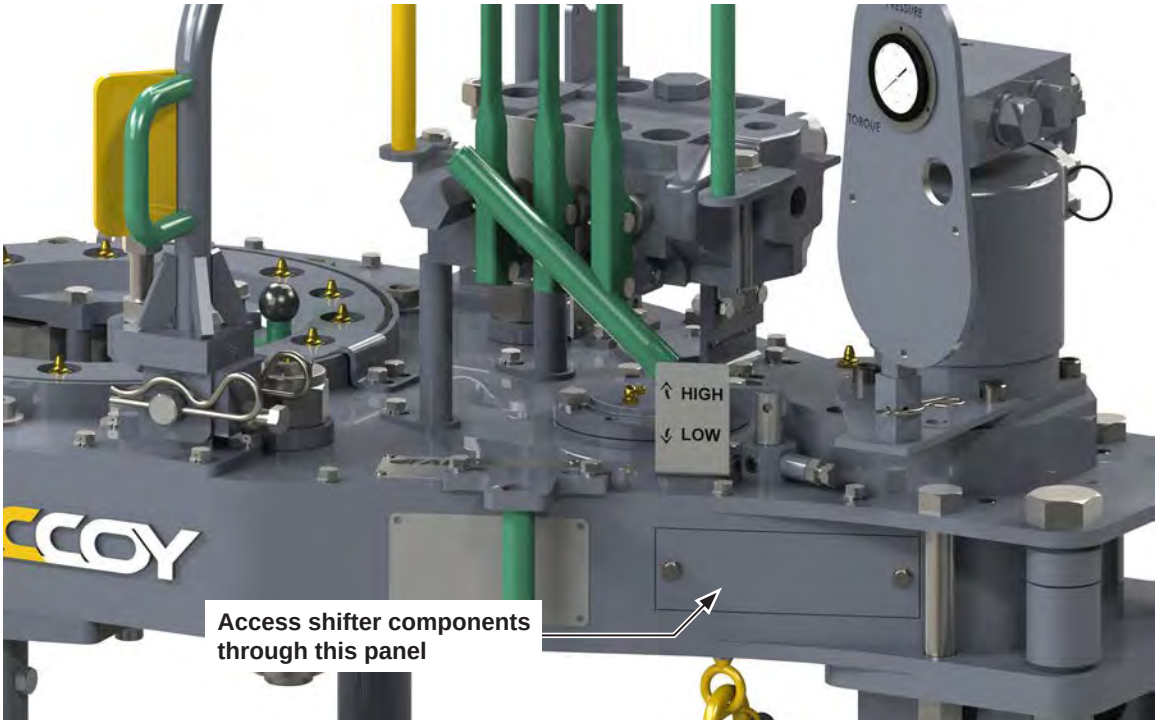


ILLUSTRATION 4.E.9: SHIFTING SHAFT LUBRICATION

4.E LUBRICATION INSTRUCTIONS (CONTINUED):

4.E.9 Door Latch

Apply grease to the door latch bushings through the grease fittings located in the latch handle assembly (two locations total).

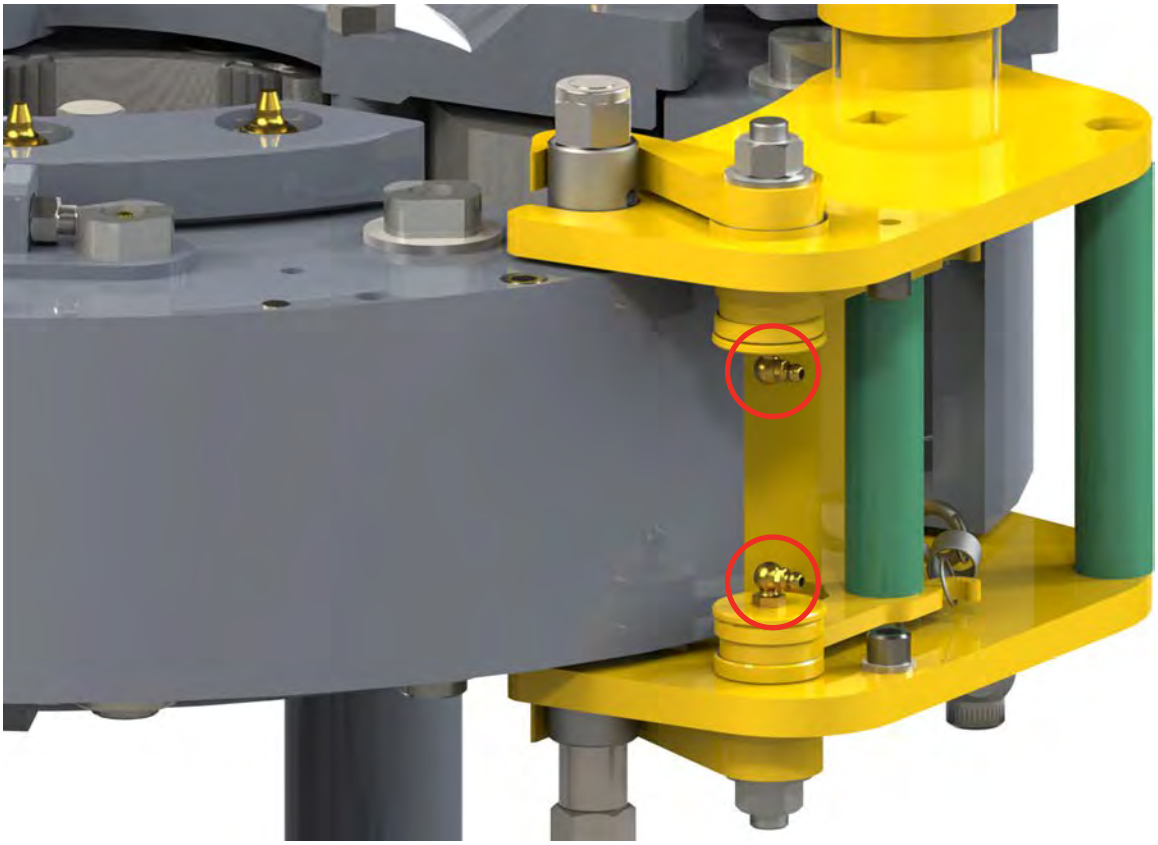


ILLUSTRATION 4.E.10: DOOR LATCH BUSHING LUBRICATION

4.E.10 Door Pivot

Apply grease to the door pivot bushings through the grease fitting located in the end of the door pivot post (one location total).

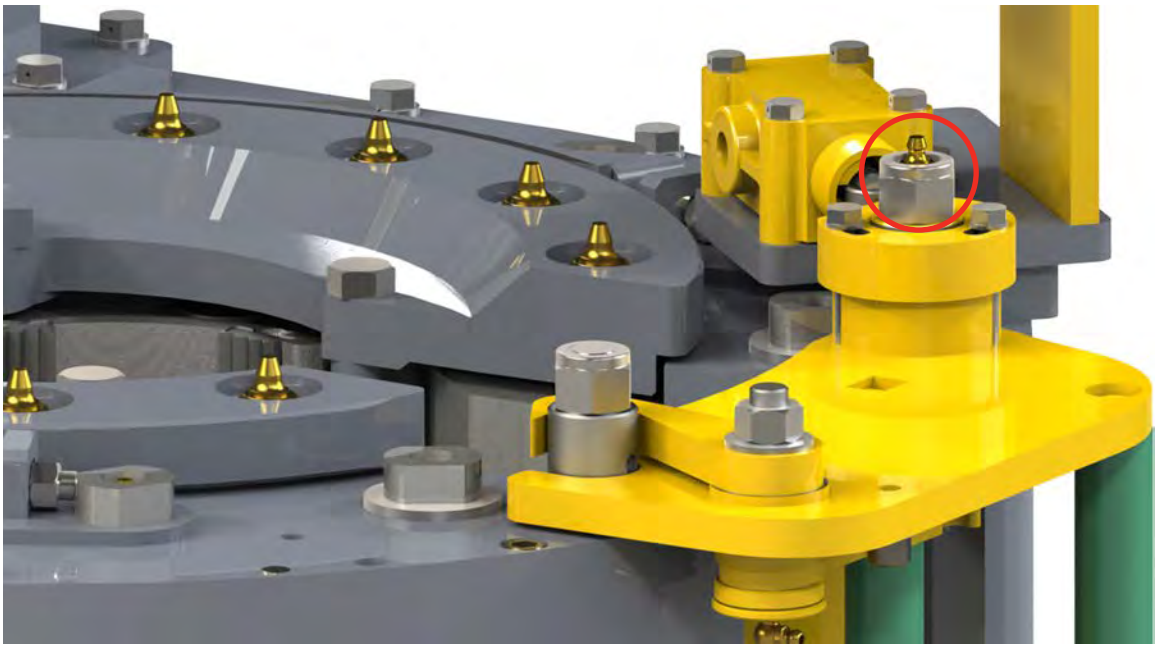


ILLUSTRATION 4.E.11: DOOR PIVOT BUSHING LUBRICATION

4.E LUBRICATION INSTRUCTIONS (CONTINUED):

4.E.11 CLINCHER® Cylinders

Apply grease to the external surfaces of the clincher cylinders through the grease fittings in the top and bottom body plates (eight locations total).

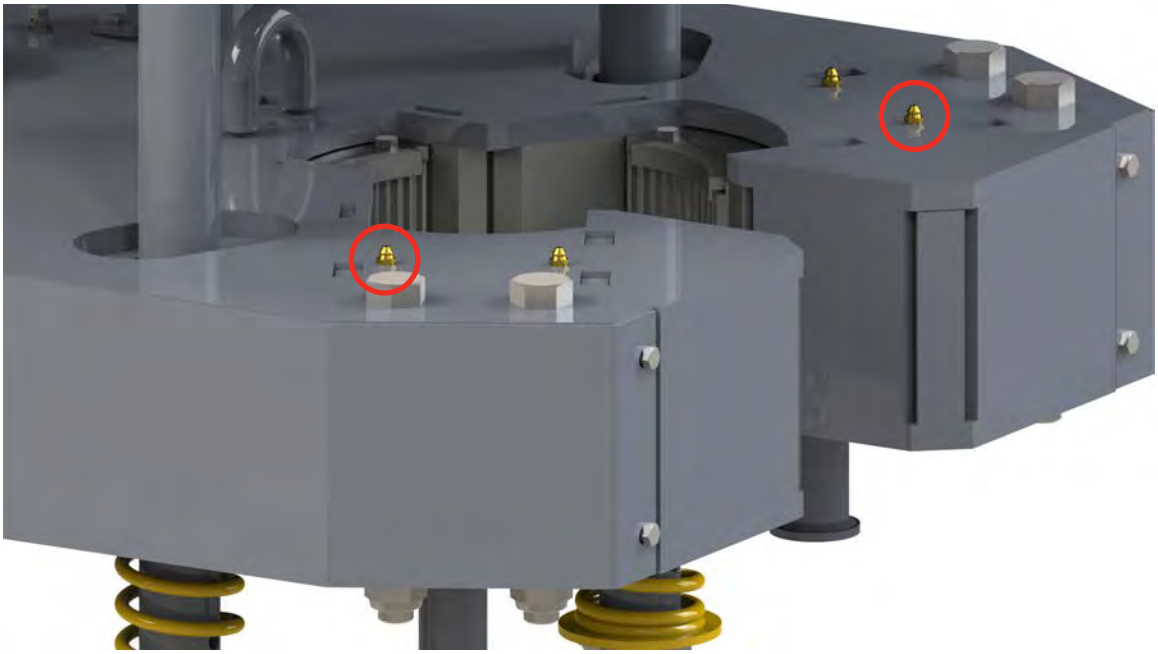


ILLUSTRATION 4.E.12: CLINCHER© CYLINDER LUBRICATION

4.E.12 Compression Load Cell

Apply grease to the flat surfaces of the compression load cell where contact is made with the rear leg and the paddle of the backup.

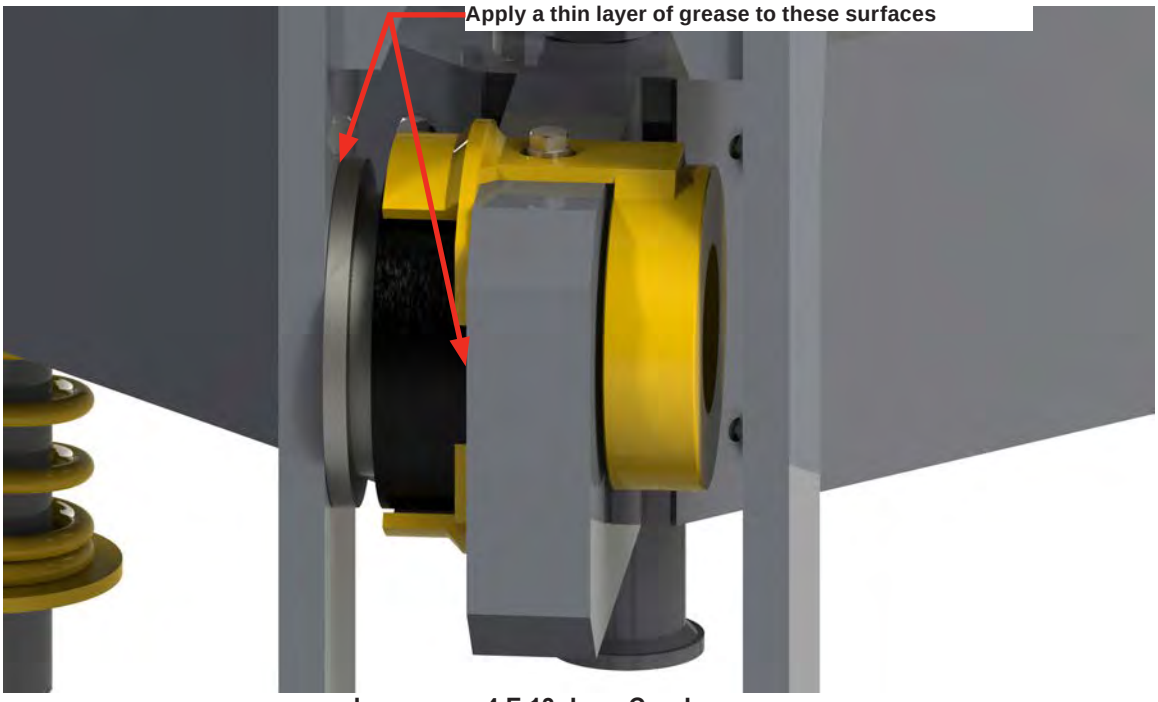


ILLUSTRATION 4.E.13: LOAD CELL LUBRICATION

McCoy 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 coating of grease applied to the clutch, drive gears and shifting shaft.

4.F ADJUSTMENTS

4.F.1 Brake Band Tension Adjustment:

The top and bottom brake bands must be periodically adjusted to continue to provide smooth and efficient jaw cam action. If the cage plate turns with the rotary gear, the jaws will not cam properly and, therefore, will not bite on the tubing or casing. Tightening the brake band against the cage plates will increase frictional resistance, allowing jaws to cam properly and grip the casing. Adjust the brake band using the adjustment nut and bolt set as shown in the illustration below. Use caution, as over-tightening will cause excessive wear to the brake bands.

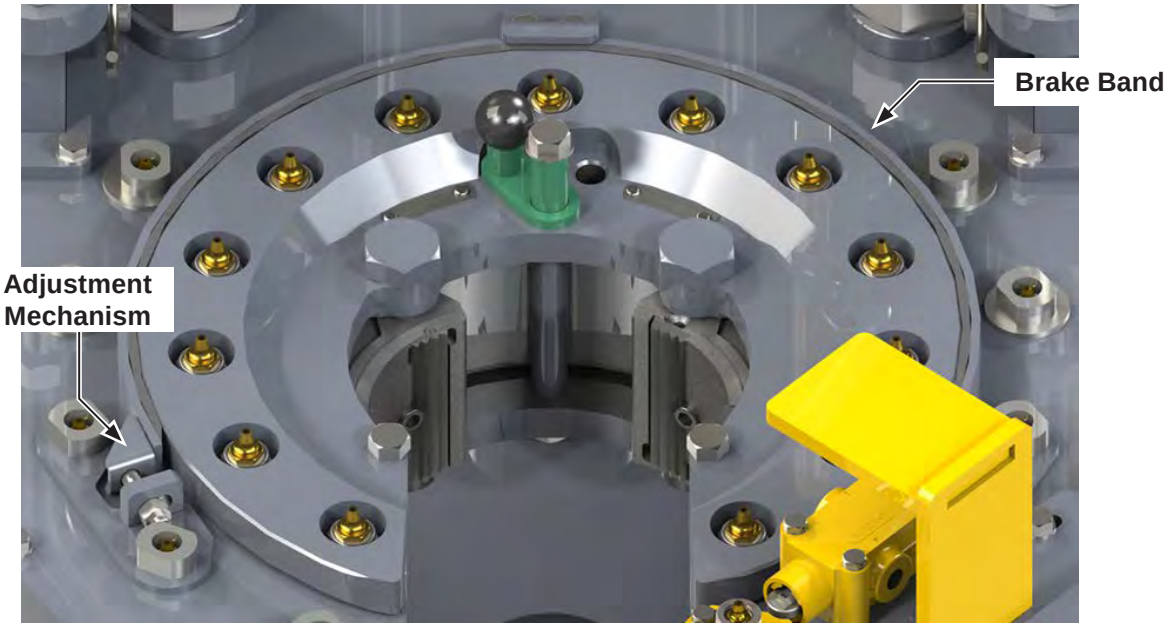


ILLUSTRATION 4.F.1: BRAKE BAND ADJUSTMENT

TOP AND BOTTOM BRAKE BANDS MUST BE ADJUSTED SIMULTANEOUSLY AND EQUALLY

4.F.2 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 turning the 7/16” UNF detent bolt. 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. 6.20 - 6.21).

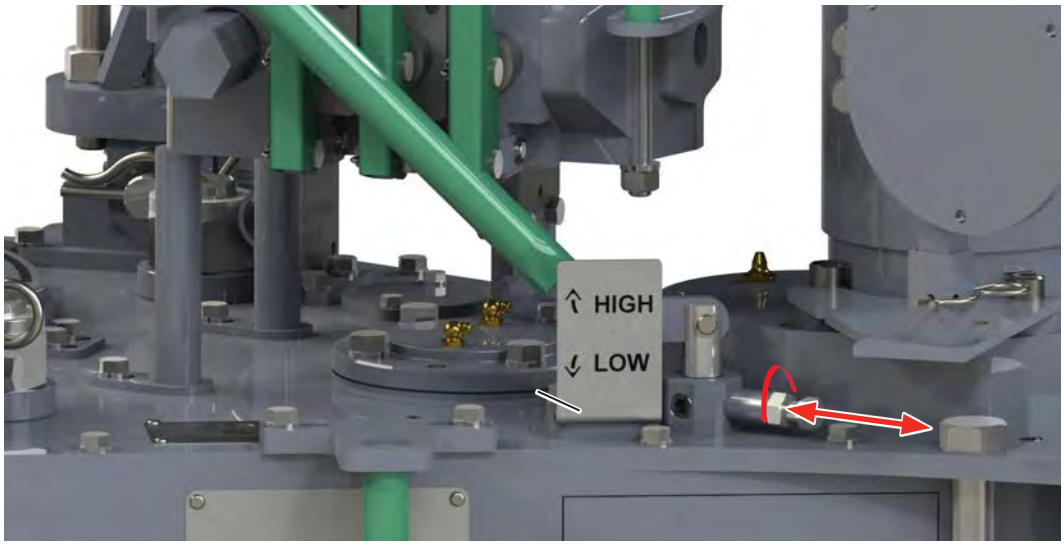


ILLUSTRATION 4.F.2: SHIFTER DETENT FORCE ADJUSTMENT

4.F.3 Safety Door Switch Adjustment

The safety door switch should interrupt hydraulic power to the motor when the tong door is opened, or even slightly ajar. This is a critical safety system, and proper adjustment is necessary to maintain the intended function. If the rotary gear does not stop immediately and completely stop rotating when the door is opened, remove the tong from service and perform the adjustments in this section. Over time, normal use of the equipment may result in a worn switch plunger or worn door where it contacts the switch plunger, resulting in enough clearance between the switch plunger and the door to cause the hydraulic switch to engage and inhibit tong rotation even with the door closed. This procedure will enable the equipment user to re-establish 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. Open the tong door and check operation of the safety door switch plunger. Depress and allow it spring back several times to ensure smooth operation. If the plunger binds or jams, replace the safety door switch.

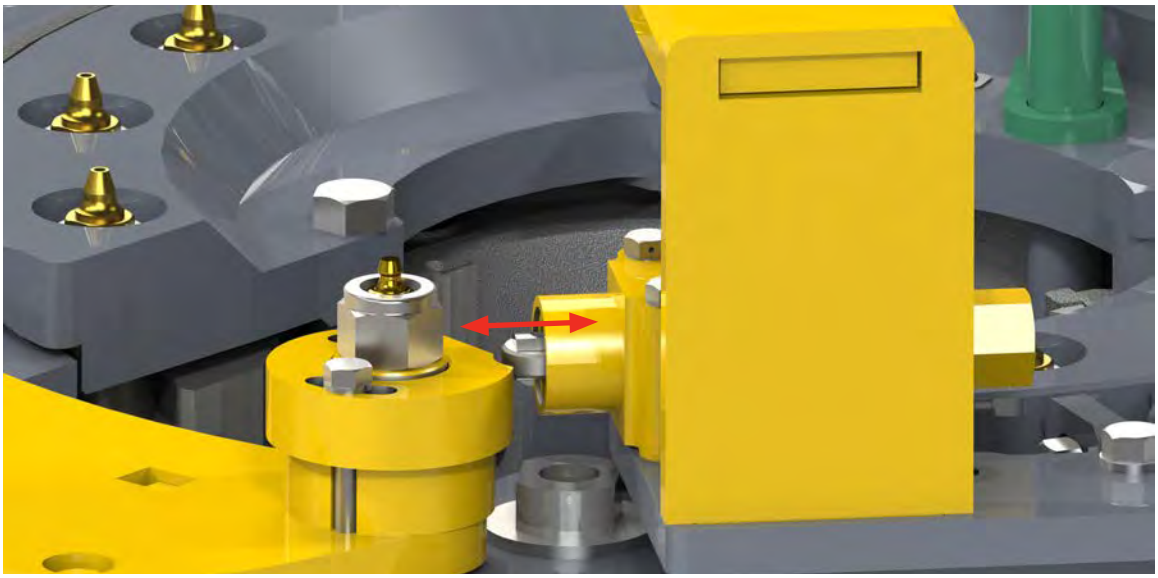


ILLUSTRATION 4.F.3: SAFETY DOOR ADJUSTMENT 01

3. If necessary, align (or re-align) the notch on the safety door cam with the safety door switch plunger. Loosen the two bolts securing the safety door cam to the door plate and rotate until the notch in the cam is perpendicular to the travel of, and just in contact with the plunger of the safety door switch.

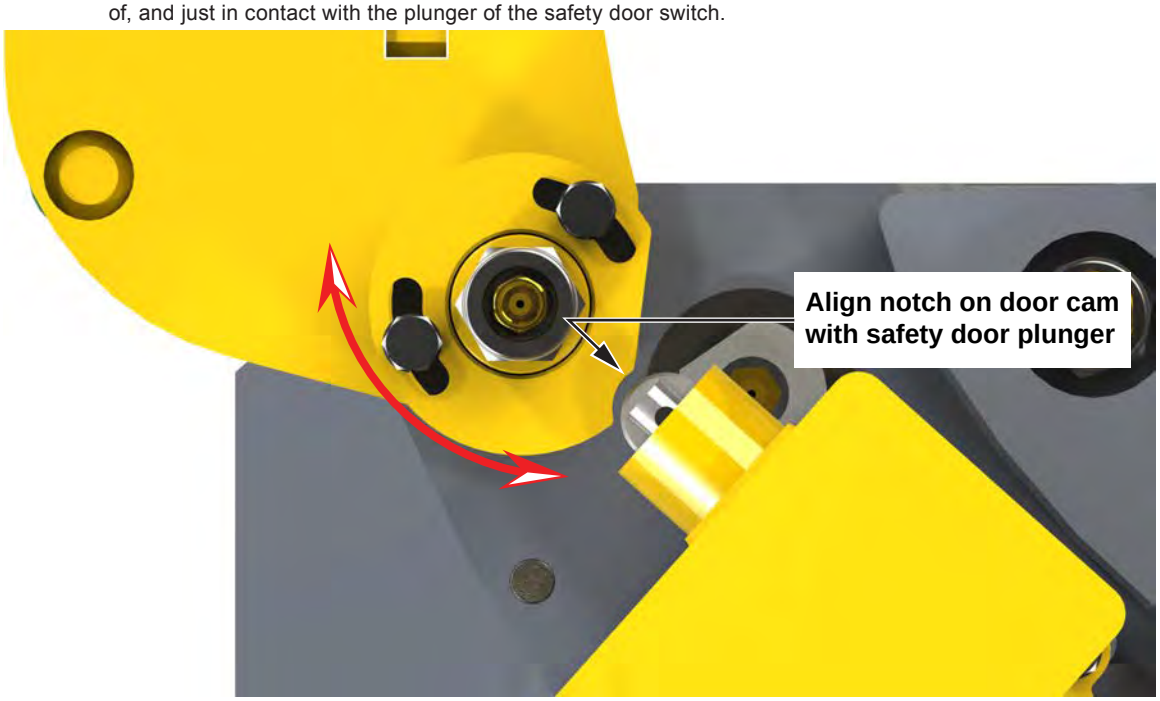


ILLUSTRATION 4.F.4: SAFETY DOOR ADJUSTMENT 02

4.F.3 Safety Door Switch Adjustment (Continued):

4. Connect hydraulic power to the tong.
5. Ensure the door is closed and all personnel are clear. Begin rotating the cage plate. Open the tong door - the cage plate should immediately and completely stop.
6. Release all controls, and close the tong door again. Ensure the cage plate rotates with the door closed.
7. If cage plate continues to rotate with the door open, further adjustment of the safety door switch is necessary. Remove hydraulic power from the tong.
8. Lateral adjustment is achieved by adjusting the position of the safety door switch mounting block/guard weldment. Loosen the two mounting bolts on the weldment slightly and rotate the adjustment screw on the back of the weldment to move the weldment. Adjust the weldment in small increments (approximately $^{1}/_{16}$" / 2 mm) between tests. Retighten the mounting bolts after completing the lateral adjustment .

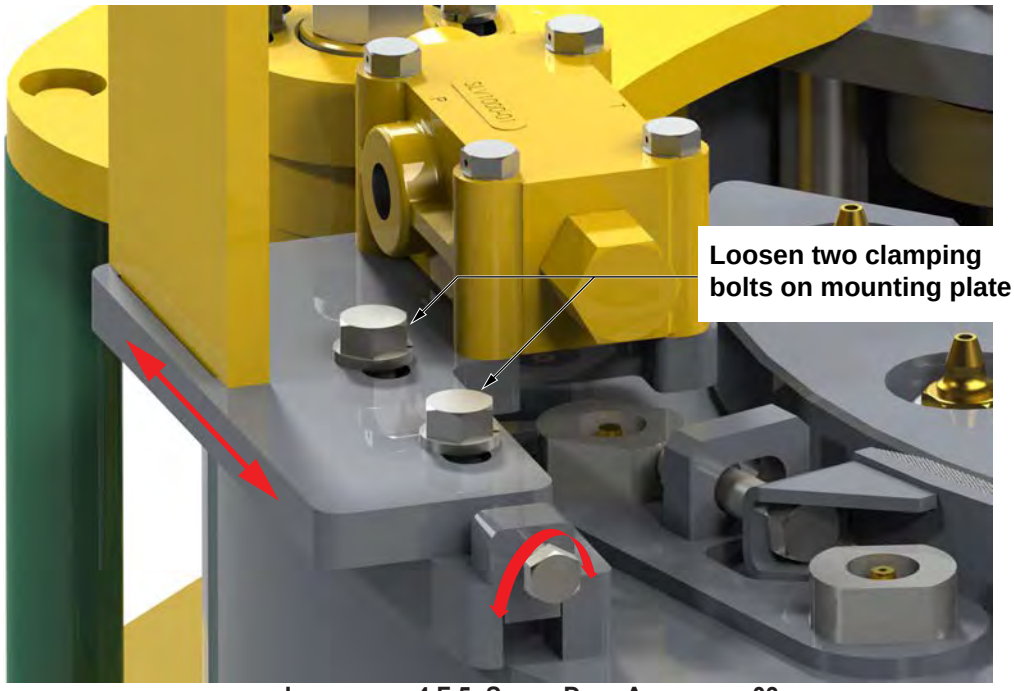


ILLUSTRATION 4.F.5: SAFETY DOOR ADJUSTMENT 03

9. Repeat steps 4 through 7. If the safety door mechanism operates correctly and no further adjustment is required this procedure is complete. If further adjustment is required, repeat steps 8 and 9 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.

4.G RECOMMENDED PERIODIC CHECKS

4.G.1 Door Stop Spring

The spring inside the actuator cylinder must be of sufficient strength to enable the door latch mechanism to snap closed properly, and to hold the door in the open position when opened. Door stop spring fatigue will result in sluggish latch operation. Replace the latch spring inside the cylinder when this occurs.

4.G.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 either pin is bent.

4.G.3 Shifting Shaft

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

4.G.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 recommends that the torque gauge assembly be calibrated yearly. Periodically check to ensure the load cell is filled with oil (see Section 6).

4.H REMOVAL OF TOP PLATE FOR OVERHAUL

The tong may be overhauled following the disassembly instructions in the following procedure. Access to the gear train is possible by removing the top plate of the tong.

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.

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.

SEPARATION OF TONG FROM BACKUP

1. Suspend tong assembly with crane. Construct a support structure that will support the weight of the backup. Lower the tong/backup assembly onto the constructed support until all weight is removed from front leg suspension springs.
2. Disconnect all hydraulic lines from the backup.
3. Remove the nylock nut and bolt sets from the bottom of the front legs, and slide the lower spring caps and front leg coil springs off each leg. Note that the top spring caps will remain within the backup body assembly.
4. Disconnect the two rear backup support springs connecting the backup to the rear leg (not applicable for low-profile compression-style backup).
5. Remove the load cell assembly.
6. Lift tong and legs up and away from the backup, and set tong onto a flat work surface that will support the weight of the tong, and allow access to the bottom plate- ensure that the legs do not have any weight on them.

REMOVAL OF LEG ASSEMBLIES.

7. Remove the rear leg assembly by removing two 1-1/4” x 8” hex bolt and nut sets and two 7/8” x 9” hex bolt and nut sets.
8. Remove the front leg assemblies by removing the 1/2” x 3-3/4” bolts and nut set on each leg, and slide leg tubes out of leg mount weldments.

REMOVAL OF TOP PLATE

9. Remove the rigid sling assembly by disconnecting the leveling devices from the hanger brackets.
10. Remove the two rigid sling hanger brackets.
11. Disconnect the three hydraulic connections from the motor. Undo the restraints securing the inlet and outlet lines from their supports, and lift the hydraulic valve section away from the tong. Remove the inlet and outlet support pieces.
12. Remove top brake band assembly (leave adjustment lug weldments in place for now).
13. Remove the tong door stop cylinder.
14. Remove door assembly by removing the door roller shaft. Support door assembly as the roller shaft is removed. Remove the nut from the top of the roller shaft, and use a soft alloy material (e.g. brass rod, etc.) to lightly tap the shaft down through the support roller assembly until it comes free at the bottom. Use caution that the threads on the ends of the support roller shafts are not damaged. Do not lose the door shoulder bushings.
15. Remove the hitch pin securing the torque gauge holder to the torque gauge mount weldment, and remove the mount.
16. Remove the four hex socket head cap screws securing the motor and the torque gauge mount weldment. Remove the torque gauge mount weldment, then lift the motor up and away from the motor mount. Inspect the motor gear, located at the bottom of the motor shaft, for gear clashing or tooth damage. Also, ensure that the motor gear is securely attached to the motor shaft.
17. Remove the cotter pin and clevis pin connecting the shifter handle to the shifter shaft (it is not necessary to disconnect the handle from the pivot lug weldment).
18. Unbolt the pivot lug weldment from the top plate, and remove the pivot lug and handle assembly.
19. Remove the four hex socket head cap screws securing the motor mount to the top plate. Use care not to dislodge and lose the two positioning dowels.
20. Remove the snap ring securing the drive gear to the top of the clutch shaft. Carefully remove the drive gear from the clutch shaft.
21. Remove the two 10-24 x 3/4” hex socket head cap screws securing the top clutch bearing retainer to the top plate.
22. Remove the top clutch bearing retainer, and bearing retainer spacer. The top clutch bearing and clutch bearing bushing may come off with the bearing retainer.

4.H REMOVAL OF TOP PLATE FOR OVERHAUL (CONTINUED):

23. Pull the top bearing cap and spacer for the pinion drive gear by removing the four 1/2" bolts which secure the bearing cap. Thread two of the removed bolts into the extra holes on top of the bearing cap, and use them as lifting lugs to lift the bearing cap out of place.

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

16. Remove the jaw pivot bolts and the jaw assemblies.
17. Ensure the bottom cage plate is supported before beginning this step. Remove the two front cage plate bolt and nut sets. Remove the backing pin assembly and the rear cage plate bolt, and the cage plate spacers. The top and bottom cageplates may now be removed - Note that the cam followers are fastened to the top and bottom cage plates, so use caution not to damage them.

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

18. Remove the top nuts and pads for the rotary idler gears.
19. Remove the remaining top roller shaft nuts. Note that the top brake band adjustment lug weldments are removed at this point.
20. Loosen, but do not remove the detent bolt on the top shifter lug weldment. Once the force from the detent ball has been removed from the shifter shaft, the top shifter bushing can be un-threaded from the top plate. Take care not to lose the detent ball when the bushing comes free of the shaft.
21. Remove the hex head bolts and hex flat head cap screws around the perimeter of the tong that secure the top plate.
22. With all the above steps taken, the top tong plate can be lifted off providing access to the inside of the gear case.

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

4.I ASSEMBLY PROCEDURES

Although the assembly of McCoy 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 6.

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			
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.

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

4.I ASSEMBLY PROCEDURES (CONTINUED):

1. Position the tong body gear case on a suitable stationary support such that the bottom body plate is accessible.
2. Assemble ten support roller “dumbbell” assemblies:
   - Insert an inner support roller spacer (PN 1064-183) into each dumbbell support roller (PN 1064-181).
   - Press a support roller bearing (PN 02-0099) into each end of the dumbbell rollers.
   - Slide a support roller bearing spacer (PN 1064-182) over each support roller shaft (6 x PN 101-3942, 4 x PN 101-3944).
   - Insert a support roller shaft through completely through each dumbbell assembly.
3. Place four support roller assemblies along one side of the cage plate opening.

ILLUSTRATION 4.I.1: TONG ASSEMBLY - INITIAL SUPPORT ROLLER INSTALLATION

4. Install rotary gear (PN 1064-D1), making sure the backing pin slots are on the side facing up. Ensure one side is supported by the support rollers installed in Step 3, and the opening in the rotary gear is oriented toward an open support roller space as shown in the following illustration.

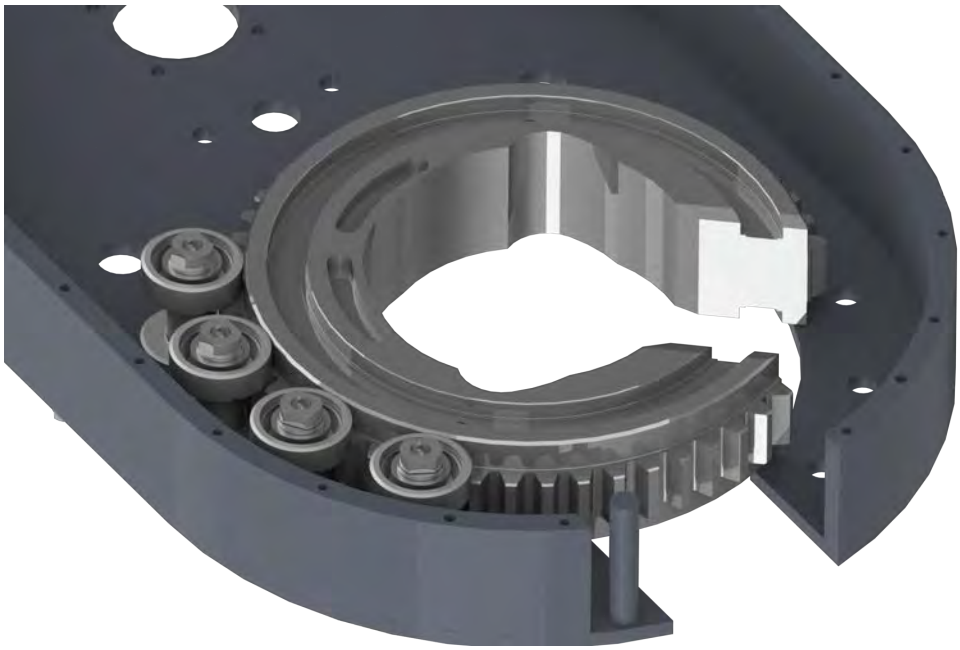


ILLUSTRATION 4.I.2: TONG ASSEMBLY - ROTARY GEAR INSTALLATION

4.I ASSEMBLY PROCEDURES (CONTINUED):

5. Install support roller assemblies in the locations exposed by the opening in the rotary gear. 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 opening in the bottom plate.
6. Press pinion bearing (PN 02-0007) into bottom pinion bearing cap (PN 997-D15-89), and install bearing cap into bottom plate of tong using four ½" UNC x 1-¼" hex cap screws and four ½" lock washers. ASSEMBLY NOTE: Do not neglect to install the clutch bearing cap spacer (PN 1400-89A) between the bearing cap and the bottom plate of the tong.
7. Press bottom clutch bearing (PN 02-0004) into clutch bearing cap (PN 997-D11-54), and install bearing cap into bottom plate of tong using four ⅜" UNC x 1-¼" hex cap screws and four lock washers. ASSEMBLY NOTE: Do not neglect to install the clutch bearing cap spacer (PN 1400-54A) between the bearing cap and the bottom plate of the tong.
8. Install a retainer clip (PN 02-0009) into all three idler gears (PN 997-A2-119). Press an idler bearing (PN 02-0011) into each gear and secure with a second retainer clip.
9. Lightly grease the larger circumference of the two rotary idler shafts (PN 997-D19-117) and slide them through two bearing and gear assemblies, centering the gear on the shaft.
10. Slide two bearing seals (PN 02-0010) over each end of the idler shafts and press against the retainer clips. See the exploded view of the rotary idler assembly on pp. 6.12 - 6.13 for correct orientation of the bearing seals.
11. Slide a bearing spacer (PN 997-D20-121) over each end of the rotary idler shafts.
12. Place each rotary idler assembly through the bottom plate, ensuring the ends of the shafts with the threaded holes for the grease fittings are pointed upward.
13. Place an idler pad (PN 1400-125) over the bottom side of each rotary idler shaft, and secure each with a 1-½" UNF nylock nut.
14. Place high pinion gear (PN 997-A4-87) shoulder side down over the lower bearing and bearing cap, centering as best as able.
15. Install pinion gear shaft (PN 997-A7-86) into the spline of the bottom pinion gear, and the lower pinion bearing.
16. Slide 4 needle bearings (PN 02-0003) onto clutch shaft (PN 997-A8-50), two on either side of the center gear. Press bearings firmly against centre gear.
17. Slide high clutch gear (PN 997-A1-51) over the bottom end of the clutch shaft, and seat gear on the needle bearings, ensuring the smaller diameter on the high clutch gear is oriented toward the center gear on the clutch shaft. Place lower end of clutch shaft into the lower clutch bearing that has been pre-mounted in the lower body plate, and mesh the high clutch gear with the high pinion gear.
18. Install shifting collar (PN 997-A9-62) over the top of the clutch shaft and mesh with the center clutch gear.
19. Slide the shifting fork (PN 101-6166) over the end of the shifting shaft (PN 101-5999), and secure the fork in place with three ¼" UNC x ⅜" hex socket head set screws (see Pp. 6.20 - 6.21 for set screw installation illustration). Place the end of the shifting shaft in the lower shifter bushing (typically welded to the bottom plate) and mesh the shifting fork with the shifting collar.
20. Slip the low clutch gear (PN 997-A1-52) over the top of the clutch shaft and seat on remaining two needle bearings, ensuring the smaller diameter on the high clutch gear is oriented toward the center gear on the clutch shaft.
21. Slide the pinion idler half-shaft (PN 997-D17-105) through the remaining idler gear assembly. Place a bearing seal over the end of the half-shaft, and secure the gear assembly to the half-shaft with a retainer ring (PN 02-0008).
22. Place the end of the pinion idler half-shaft through the bottom plate and mesh the pinion idler gear with the two rotary idler gears. Secure the half-shaft to the bottom plate with the half-moon idler pad (PN 1400-109), three ⅝" UNC x 2-¼" hex bolts and ⅝" lock washers, and a 1-½" UNF hex nylock nut.
23. Install the low pinion gear (PN 997-A5-88) shoulder side up over the top of the pinion gear shaft, meshing with the low clutch gear.
24. Carefully remove all support roller shafts, using caution not to shift the position of the installed support roller assemblies or to damage the threads on the end of the shafts.
25. Locate the three un-threaded holes in the side body of the tong, one in the rear centre 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 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.
26. Use a temporary lifting sling and crane to maneuver the top plate (PN 1400-7T) into position, and place on to the side body. Insert the three positioning dowel pins (PN 09-0021) 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.

4.I ASSEMBLY PROCEDURES (CONTINUED):

27. Secure the top plate with fourteen ⅜" UNC x 1-½" hex bolts and ⅜" lock washers, and five ⅜" UNC x 1" low-head height hex socket head cap screws. Do not install fasteners coincidental with the rigid sling brackets (shown circled in green) or the door cylinder post (shown circled in red).

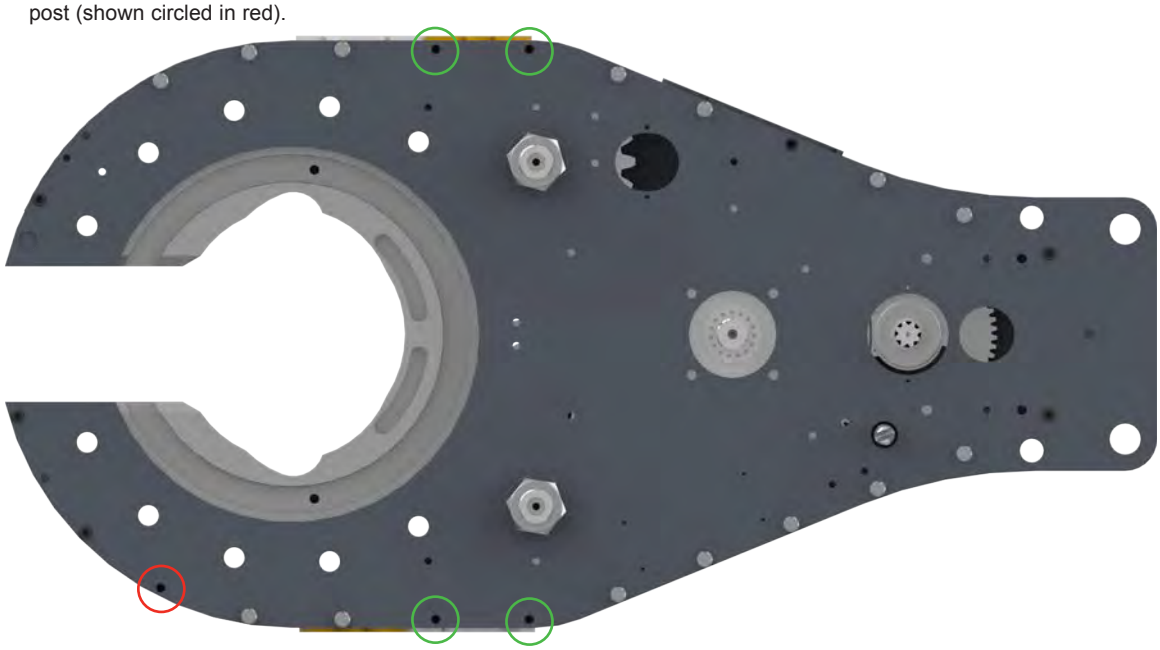


ILLUSTRATION 4.I.3: TONG ASSEMBLY - TOP PLATE FASTENER INSTALLATION

28. Slide the clutch bearing retainer spacer (PN 1400-59A) over the bottom of the top clutch bearing retainer (PN 997-D11-59), and mount top clutch bearing retainer and spacer to the top plate with two #10-24 x ¾" hex socket head cap screws.
29. Press top clutch bearing (PN 02-0002) into top clutch bearing retainer. Insert clutch bearing bushing (PN 997-60) shoulder side up between bearing and clutch shaft.
30. Secure clutch drive gear (PN 997-A3-61) to the top of the clutch shaft with retaining snap ring (PN 02-0001).
31. Install rotary idler pads (PN 997-D20-125) over the top of the rotary idler shafts and secure with 1-½" UNF hex nylock nuts.
32. Press remaining pinion bearing into the top pinion bearing cap (PN 997-D15-89) and secure over the top of the pinion gear shaft with four ½" UNC x 1-¼" hex bolts and ½" lock washers.
33. Slide the top shifter bushing (PN 101-0020) over the shifting shaft and thread in to the top plate until snug.
34. Thread the detent tube (PN 101-0019) into the top shifter bushing as shown. Thread three ⅝" UNC x ⅝" hex socket set screws into the remaining three ports in the top shifter bushing - do not bottom out the set screws on the shifting shaft, or the shaft will not move.

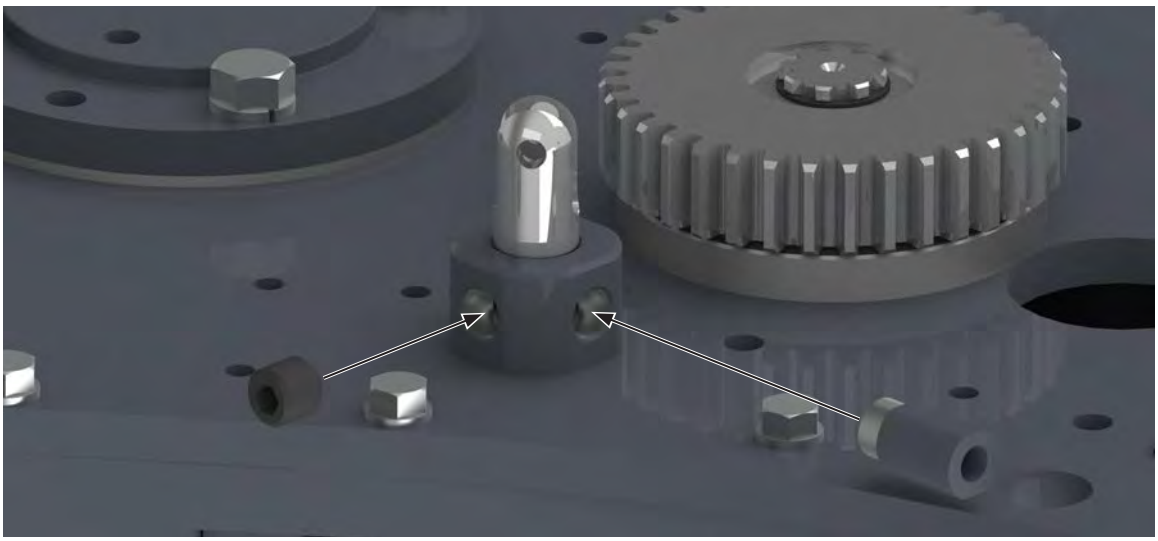


ILLUSTRATION 4.I.4: TONG ASSEMBLY - TOP SHIFTER BUSHING INSTALLATION

4.I ASSEMBLY PROCEDURES (CONTINUED):

35. Insert the detent ball (PN 02-0018) through the end of the detent tube attached to the top shifter bushing, followed by the detent spring (PN 997-0-64) Thread a 7/16" UNF jam nut on to a 7/16" UNF x 1-¼" hex bolt, and then thread the end of the bolt into the detent tube on the top shifter bushing.
36. Insert two 5/16" x ¾" production ground dowel pins into the top plate, one on either side of the motor shaft and gear cut-out, directly behind the clutch assembly.
37. Position the motor mount (PN 1400-150) over the dowel pins and secure to the top plate using four ½" UNC x 2" hex socket head cap screws.
38. Insert a 5/16" x 5/16" x 1-½" square key into the key slot on the motor shaft. Secure the motor gear (PN 997-A10-149) to the hydraulic motor shaft using two ⅜" UNC x ⅜" flat point hex socket set screws. Ensure that the motor gear is oriented so that the machined end of the motor gear (the end in which the set screws are threaded) is flush with the end of the motor shaft.
39. Mount hydraulic motor (PN 87-0110) to motor mount. Secure the RH side of the motor (as seen from the back of the tong) with two ½" UNC x 1-¼" hex socket head cap screws and ½" lock washers. The torque gauge holder weldment (PN 1500-09-04A) is secured by the two LH motor screws - position the torque gauge holder weldment in place, and secure it and the LH side of the motor with two ½" UNC x 1-½" hex socket head cap screws and ½" lock washers.
40. Attach the two #20 (1-¼") x JIC 1" flange elbows (PN 02-9216) to the motor ports using two #20 split flange kits (PN 02-9217).
41. Attach the shifter lug weldment (PN 101-0016) to the top plate of the tong next to the top shifter bushing weldment using four ⅜" UNC x 1-¼" hex bolts and ⅜" lock washers.
42. Connect the shifter handle weldment's (PN 1037-D-20B) pivot point to the pivot point of the shifter lug weldment using a 5/16" x 1-½" clevis pin. Connect the end of the shifter handle weldment to the top of the shifter shaft using a 5/16" x 1" clevis pin. Secure the clevis pins with .093" X 1.125" hitch pins or cotter pins.
43. Position the two top brake band lug weldments (RH Lug Weldment = PN 101-0132, LH Lug Weldment = PN 101-0134) on the top plate over the holes for the support roller shafts as shown in the following illustration. Insert four "short" support roller shafts (PN 101-3942) through the weldments and support roller components until the shoulders of the shafts are tight to the lug weldments. Slide the two bottom brake band lug weldments (LH Lug Weldment = PN 101-0132, RH Lug Weldment = PN 101-0134) over the bottom of the support roller shafts and secure with 7/8" UNF thin nylock nuts. **ASSEMBLY NOTE:** The support roller assemblies coincidental with the brake band lug weldments DO NOT use flat washers.

ILLUSTRATION 4.I.5: TONG ASSEMBLY - BRAKE BAND WELDMENT INSTALLATION

4.I ASSEMBLY PROCEDURES (CONTINUED):

44. Slide a ⅞" narrow flat washer over the remaining "short" support roller shaft (PN 101-3942) and four "long" support roller shafts (PN 101-3944). Insert the short shaft into the support roller assembly directly in front of the RH brake band lug weldment, and insert the four "long" shafts into the four remaining support roller assemblies (two per side directly behind each brake band lug weldment). Secure the bottoms of the short support roller shaft directly in front of the RH brake band lug weldment with a ⅞" narrow flat washer and ⅞" UNF thin nylock nut. Do not place fasteners on the four long shafts at this time.
45. Install thirteen cam followers (PN 02-0016) into the bottom cage plate (PN 1400-22) Secure each with a ⅝" UNF nylock jam nut.
46. Install thirteen cam followers (PN 02-0016) into the top cage plate (PN 1400-21) Secure each with a ⅝" UNF nylock jam nut.
47. Support the bottom cage plate in position beneath the rotary gear, ensuring the cam followers are nested within the groove in the rotary gear. Place the top cage plate in position over the rotary gear, ensuring the cam followers are nested within the groove in the rotary gear
48. Place cage plate spacers (PN 1064-38) between the two cage plates at their connection points, one in the rear centre, and one each side just inside the rotary gear.
49. Slide a ½" narrow flat washer followed by the backing pin spacer (PN 101-4093) over a ½" UNC x 8" hex bolt. Slide the larger diameter hole in the backing pin retainer (PN 101-4095) over the backing pin spacer.
50. Attach the bottom cage plate to the top cage plate. Use two ½" UNC x 6" hex bolts at the front, and the ½" x 8" bolt and spacer assembly in the rear ensuring the backing pin spacer remains between the head of the bolt and the top of the top cage plate.
51. Thread the ⅜ UNC x 1-½" threaded stud (PN 101-4097) into the backing pin (PN 101-4042).
52. Insert the backing pin and stud through the bottom of the backing pin retainer installed in Step 49. Slide the short backing pin spacer (PN 101-4096) over the top of the stud, and thread the backing pin knob (PN 02-0017) on to the top of the threaded stud. Lift the backing pin and insert into one of the two receptacles in the rear of the top cage plate.
53. Install the top and bottom lined brake band lug weldments (1064-D4-29). Secure the brake bands to the top and bottom plates using one brake band retainer (PN 101-0140) and two ⅜" UNC x ¾" hex bolts and ⅜" lock washers at the rear of each brake band, and a ⅜" UNF x 2" hex bolt and ⅜" UNF hex nylock nut at each brake band lug weldment.
54. Install the front leg mount mount weldments (LH side = PN 101-2152, RH side = PN 101- 2153) to the bottom of the tong over the exposed support roller shafts using two ⅞" UNF thin nylock nuts and two ⅜" UNC x 2" hex bolts and ⅜" lock washers per side.

ILLUSTRATION 4.I.6: TONG ASSEMBLY - FRONT LEG MOUNT WELDMENT INSTALLATION

4.I ASSEMBLY PROCEDURES (CONTINUED):

55. Install the bottom latch pivot assembly in to the door weldment (refer to illustraton 4.I.7):
    a. Slide door latch spacer (PN 101-6108) over a latch pin (PN 101-6107).
    b. Slide the door latch pin through a latch arm (PN 101-6049), aligning the tab in the latch arm with the slot in the latch pin.
    c. Slide a second latch spacer (PN 101-6108) over the latch pin.
    d. Insert the latch pin assembly through the bottom plate of the door weldment (PN 101-6069).
    e. Slide a latch spacer (101-6053) over the end of the latch pin.
    f. Slide a latch claw (PN 101-6050) over the end of the latch pin, and secure with a ½" narrow flat washer and a ½" UNC hex nylock nut.
56. Insert one end of the door latch handle (PN 101-6052) in to the bottom door latch arm.

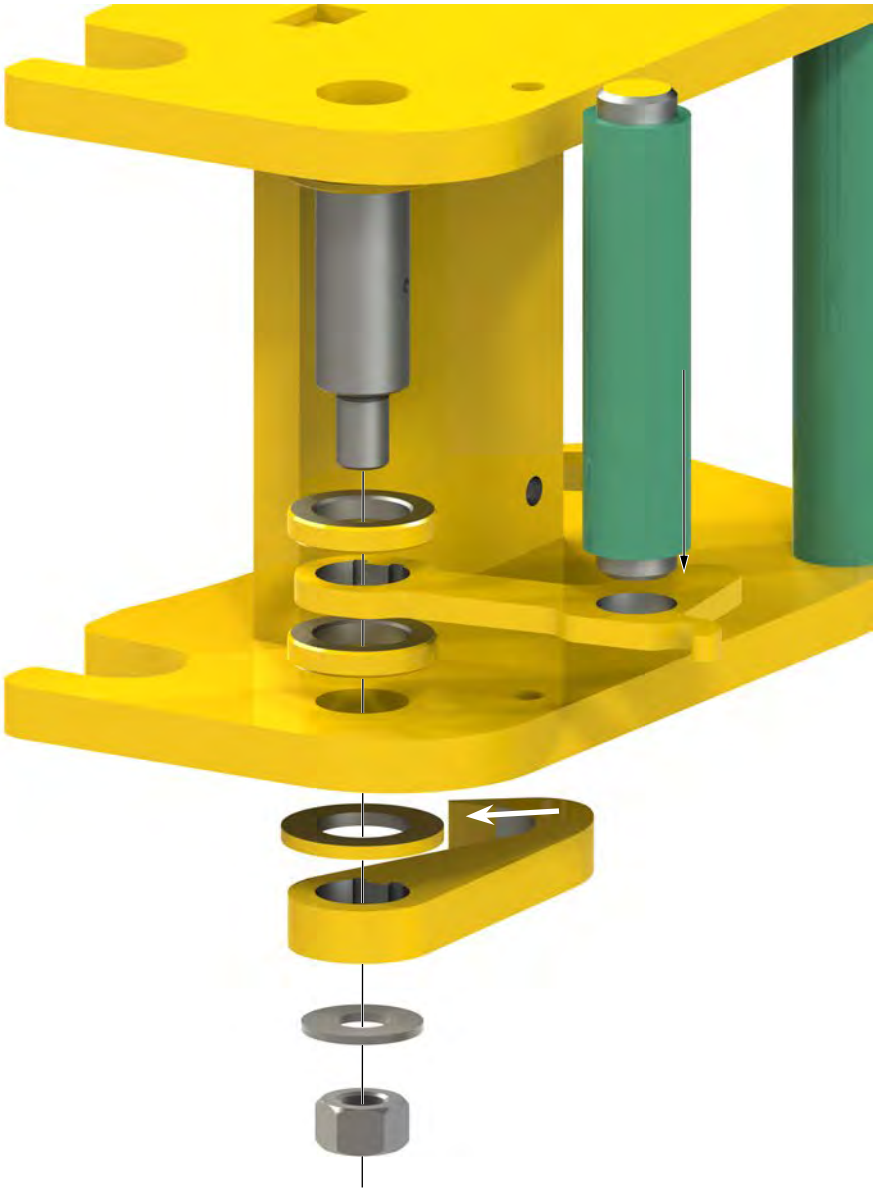


ILLUSTRATION 4.I.7: TONG ASSEMBLY - LATCH INSTALLATION 01

4.I ASSEMBLY PROCEDURES (CONTINUED):

57. Install the top latch pivot assembly (refer to illustration 4.I.8:

    a. Slide door latch spacer (PN 101-6108) over a latch pin (PN 101-6107).

    b. Press the second door latch arm on to the top of the door latch handle, and insert a latch spacer (PN 101-6108) between the latch arm and the underside of the top plate of the door weldment. Slide the door latch pin through the top latch arm and the top plate of the door weldment, aligning the tab in the latch arm with the slot in the latch pin.

    c. Slide a latch spacer (101-6053) over the end of the top latch pin.

    d. Slide a latch claw (PN 101-6050) over the end of the latch pin, and secure with a ½" narrow flat washer and a ½" UNC hex nylock nut.

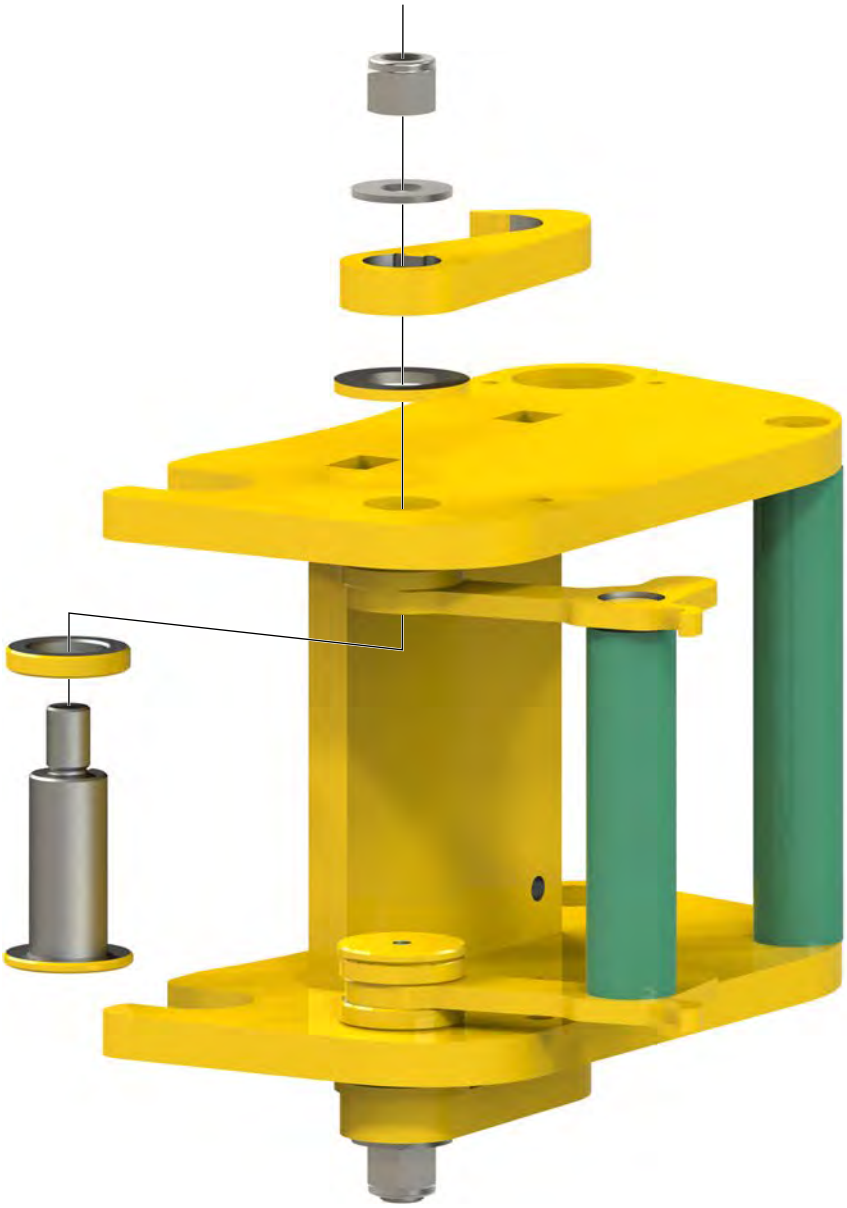


ILLUSTRATION 4.I.8: TONG ASSEMBLY - LATCH INSTALLATION 02

4.I ASSEMBLY PROCEDURES (CONTINUED):

58. Install a ⅜" UNC x ½" hex socket head cap screw and a ⅜" lock washer in to the bottom of the top door plate and and top of the bottom door plate to act as latch handle stops (refer to illustration 4.I.9).
59. Install two eye bolt spring retainers (PN 101-2077) in to the vertical plate of the door weldment (refer to illustration 4.I.9). Connect a latch spring (PN 02-E0252) between the latch arms and the spring retainers.

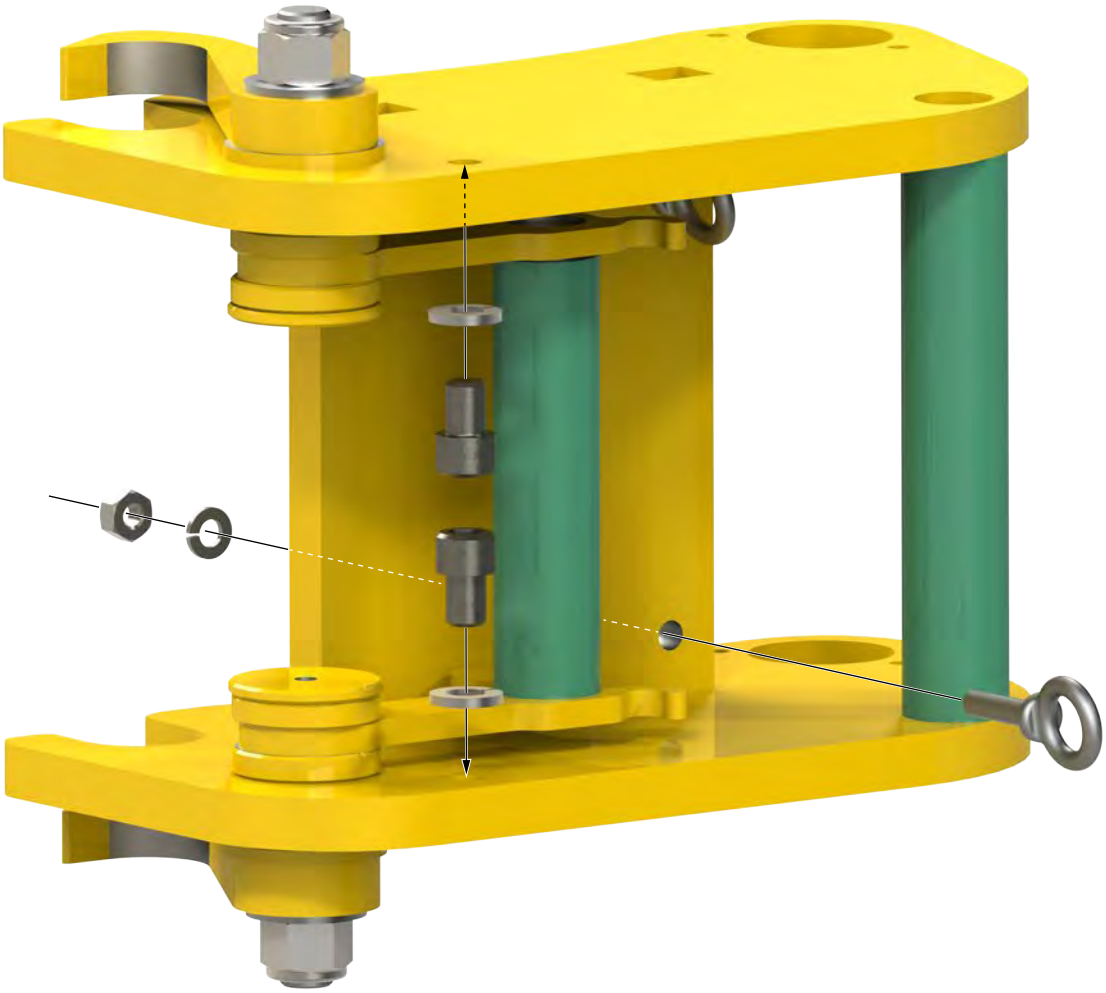


ILLUSTRATION 4.I.9: TONG ASSEMBLY - LATCH INSTALLATION 03

60. Press a bronze shouldered door bushing (PN 101-6123) in to the top and bottom plates of the door weldment (refer to exploded diagram on page 6.38).
61. Attach the safety door cam (101-6146) and top door pivot sleeve (101-6124) to the top door plate over the shoulder bushing using two ¼" UNC x 2" hex bolts and ¼ lock washers, ensuring the notch in the safety door cam is oriented in the direction of the safety door switch mounting location.
62. Attach the bottom door pivot sleeve (PN 101-6128) to the bottom door plate over the shoulder bushing using two ¼" UNC x 1-¼" hex bolts and ¼ lock washers.
63. Thread a ⅝" UNC hex nylock nut on to one end of the door latch post (101-6130). Slide a door latch spacer (PN 101-6127) over the latch post, and slide the post through both tong body plates in the latch location next to the tong opening. Refer to the exploded diagrams on page 6.36 if required. Slide the second latch spacer over the bottom of the latch post and secure with another ⅝" UNC hex nylock nut.

4.I ASSEMBLY PROCEDURES (CONTINUED):

64. Install the assembled tong door Refer to the exploded diagrams on page 6.38 if required:
    a. Thread a ⅝" UNC hex nylock nut on to one end of the door pivot shaft (101-6129).
    b. Slide the top door shaft spacer sleeve (PN 101-6128) over the door pivot shaft,
    c. Align the door assembly with the body plates of the tong. Insert a flat door bushing (PN 101-6125) between the top and bottom plates of the tong door weldment and the top and bottom plates of tong (see illustration 4.I.10).
    d. Insert the door pivot shaft through the door assembly and the top and bottom plates of the tong.
    e. Slide the bottom door pivot shaft spacer sleeve (PN 101-6129) over the bottom of the door pivot shaft and secure with a ⅝" UNC hex nylock nut. Tighten top and bottom nylock nuts tight against the top and bottom spacer sleeves. Swing the door open and closed a few times to ensure the door moves smoothly.

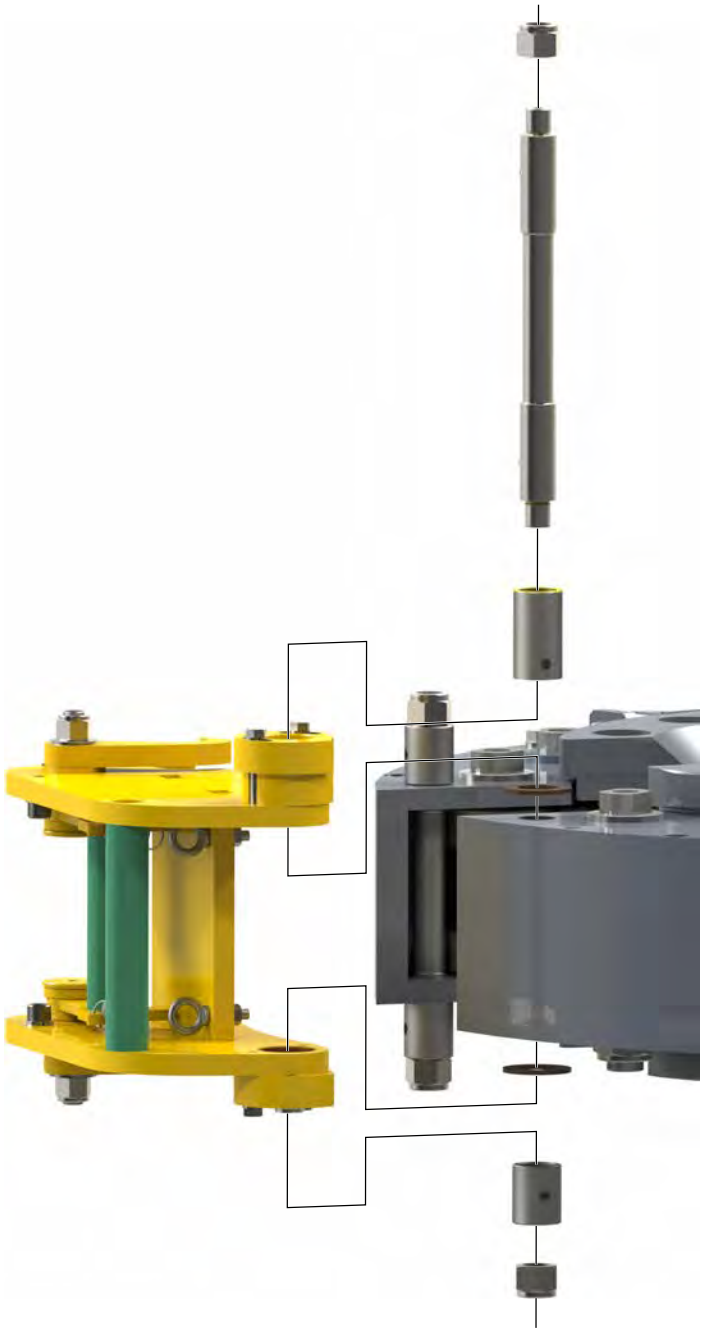


ILLUSTRATION 4.I.10: TONG ASSEMBLY - DOOR INSTALLATION

4.I ASSEMBLY PROCEDURES (CONTINUED):

65. Install door spring stop cylinder (PN 101-0069). Attach the front of the cylinder to the bottom door sleeve using the front mounting lug (PN 101-6058) and a ½" x 1-¼" hex socket head UNC shoulder bolt, and attach the rear of the cylinder to the bottom plate using the rear door cylinder mounting lug (PN 101-6060) and a ½" x 2-¾" hex socket head UNC shoulder bolt.

ILLUSTRATION 4.I.11: TONG ASSEMBLY - DOOR STOP SPRING CYLINDER INSTALLATION

66. Attach the safety door switch mounting plate weldment (PN 101-6160) to the top plate of the tong adjacent to the pivot corner of the tong door using two ⅜" UNC x 1-¾" hex socket head cap screws.
67. Attach the safety door hydraulic switch (PN 02-E0190) to the safety door switch guard weldment (PN 101-6141) using four ¼" UNC x 2" drilled-head hex bolts (PN 101-6072) and four ¼" lockwashers.
68. Attach the safety door switch guard weldment to the mounting plate weldment using two ⅜" UNC x 1-¼" hex bolts and ⅜" lock washers.
69. Thread a ¼" UNC x 1-¼" hex bolt or hex socket head cap screw into the threaded receptacle at the back of the safety door mounting plate weldment. Use this cap screw to adjust the position of the safety door switch in relation to the safety door cam.
70. Mount the left and right rigid sling mounting lugs (left-hand PN = 101-0150, right-hand PN = 101-0151) to the top plate of the tong using two ⅜" UNC x 1-¾" drilled-head bolts (PN 101-6080) on the outside edge of each mounting lug, and two ⅜" UNC x 1" drilled-head hex bolts (PN 101-6157) on the inside edge of each mounting lug.
71. Mount the inlet coupling support assembly (PN 1050-C-175) to the top plate between the RH pinion idler and RH rotary idler, using two ⅜" UNC x 1" hex bolts and ⅜" lock washers. Attach the outlet coupling support base (PN 101-0023) to the top plate right of the pinion bearing cap using two ⅜" UNC x 1" hex bolts and ⅜" lock washers, and attach the adjusting plate (PN 101-0022) to the support base using two ⅜" UNC x 1" hex bolts, two ⅜" flat washers, and two ⅜" UNC nylock nuts.
72. Install two hydraulic valve mount weldments (PN 101-1442) to the top plate on either side of the brake band retainer using one ⅜" UNC x 1" hex bolt and ⅜" lock washer per weldment.
73. Install the valve handle guard weldment (PN CE-HANDLE-3) over the valve handles while securing the valve bank to the valve mounting posts using two ½" UNC x 4-½" hex bolts and two ½" narrow flat washers. Secure the rear of the valve handle guard weldment to the rear of the DVA valve assembly using an additional ½" UNC x 4-½" hex bolts and ½" narrow flat washer, and one ½" UNC hex nut and ½" lock washer (see illustration 4.I.12).

4.I ASSEMBLY PROCEDURES (CONTINUED):

ILLUSTRATION 4.I.12: TONG ASSEMBLY - VALVE ASSEMBLY INSTALLATION

74. Slide the master lifting link (PN 02-0516) over the adjustment helix (PN 1053-1-H), and install the adjustment helix in the rigid sling weldment (PN 101-0656) using a ¾" UNC x 9" hex bolt and ¾" UNC nylock nut, and two ¾" narrow flat washers.
75. Use a crane to hoist the rigid sling weldment by the master link. Connect the rigid sling weldment to the rigid sling mounting lugs with rigid sling pins (PN 1053-C-1C). Secure each pin with two 0.148" x 2.938" hitch pins.
76. Thread a ¾" UNC hex nut on to each of two rigid sling leveling adjustment weldments (PN 1053-C-1L). Thread the leveling adjustment weldments into the front of the rigid sling weldment mounting brackets, roughly adjusting them so the rigid sling is approximately perpendicular to the top plate of the tong (see illustration 4.I.13).
77. Thread ½" UNC hex nuts on to two ½" UNC x 1-¾" hex bolts. Thread the bolts into the rear of the rigid sling weldment mounting brackets. (see illustration 4.I.13).

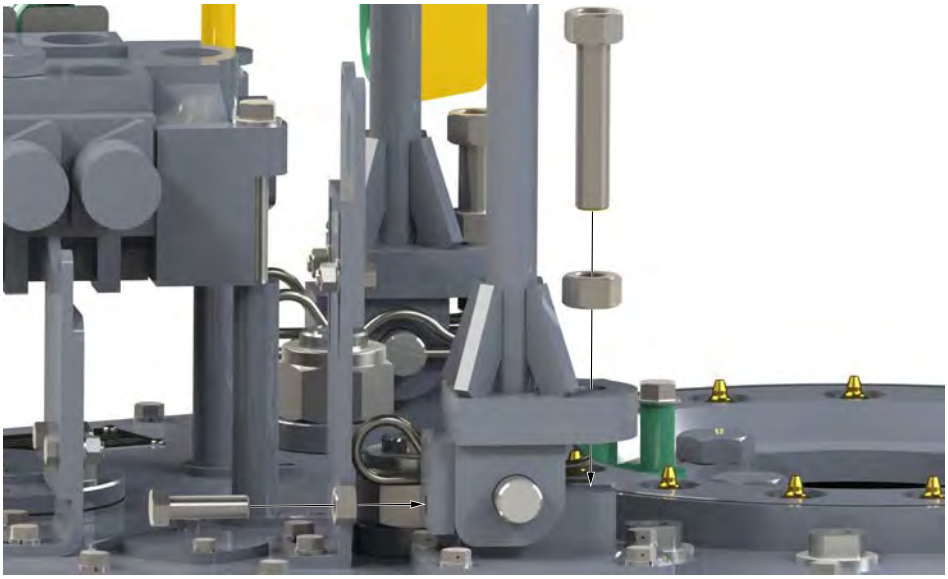


ILLUSTRATION 4.I.13: TONG ASSEMBLY - LEVELING BOLT INSTALLATION

4.I ASSEMBLY PROCEDURES (CONTINUED):

78. Thread a 1-¼" UNC heavy hex nut on to the 1-¼" UNC x 8" threaded rod (PN 997-500-03).
79. Coat approximately 2" of thread on the bottom of the threaded rod with blue Loctite®. Screw the coated part of the threaded rod into the heavy hex bolt welded to the top plate of the backup until the rod bottoms out. Lock the threaded rod in place using the heavy hex nut threaded on to the rod in the previous step.
80. Attach two 3/8" UNC eye bolts to the suspension spring bracket (1483-500-00-04) using 3/8" UNC hex nylock nuts. Slide the suspension spring bracket on to the 1-¼" threaded rod.
81. Coat approximately 4" of thread at the top of the threaded rod with blue Loctite®. Thread a 1-¼" UNC heavy hex nut on to the threaded rod.
82. Attach one end of each suspension spring (PN 1302-905-06) to each eye bolt on the suspension spring bracket.

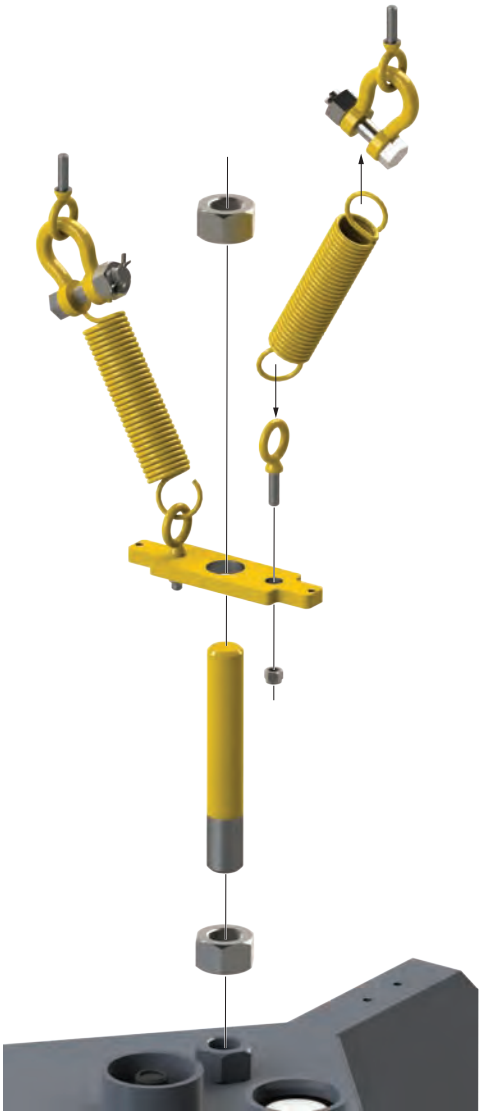


ILLUSTRATION 4.I.14: REAR BACKUP SUPPORT SPRING INSTALLATION

83. Position rear leg weldment (101-1457) on a flat surface near the tong assembly location.
84. Use a crane to hoist the tong assembly off the assembly surface using the rigid sling and master lifting link. Bring the tong into contact with the rear leg, ensuring the crane continues to support the entire weight of the tong.
85. Insert two spacers (PN 101-1546) between the bosses on the top and bottom plates at the rear of the tong.

4.I ASSEMBLY PROCEDURES (CONTINUED):

86. Insert two 1-¼" UNC x 8" heavy hex bolts and two ⅞" UNC x 7" heavy hex bolts through the top plate. Secure the heavy hex bolts using two 1-¼" UNC hex nylock nuts and two ⅞" UNC hex nylock nuts. See page 4.16 for tightening torque.

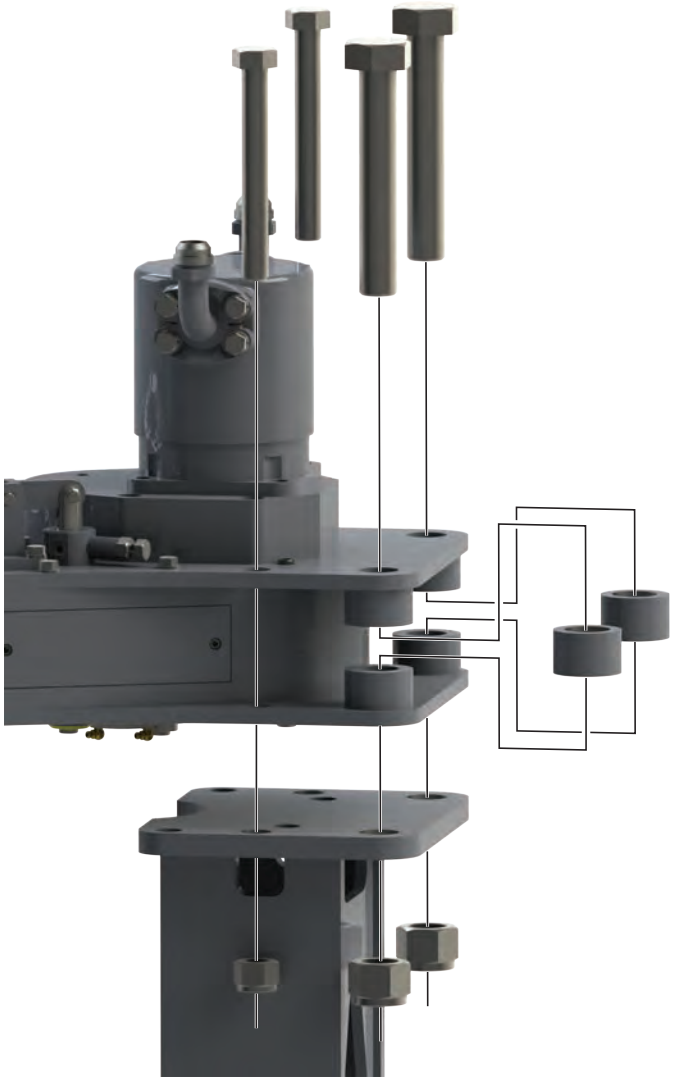


ILLUSTRATION 4.I.15: REAR LEG INSTALLATION

87. Remove the side panels from the backup.
88. Use a crane and temporary sling to hoist the backup assembly (weight = 734 lbs / 334 kg) on to a suitable support structure next to the assembly location of the tong. Minimum height for the backup supports must be 36" in order to allow clearance for installing the front legs.
89. Use a crane to hoist the tong and rear leg assembly and place in position over the backup. Lower the tong until it is approximately 18 to 24 inches from the backup. **ASSEMBLY NOTE:** The rear leg must be guided so that the "paddle" on the backup sits between the vertical plates of the rear leg as the tong and rear leg assembly are lowered over the backup.
90. Hold a top spring cap (PN 101-4489) under the top plate of the backup, and insert a front leg tube (PN 1364-909) from the bottom of the backup, through the spring cap, and in to the leg mount weldment on the tong. Secure the leg tube with a ½" UNC x 3-½" hex bolt, ½" narrow flat washer, and a ½" UNC nylock nut. Repeat for the other leg tube (refer to illustration 4.I.16)

4.I ASSEMBLY PROCEDURES (CONTINUED):

91. Slide a leg spring (PN 1302-905-08) over the bottom of each leg tube, followed by a bottom spring cap (PN 1302-905-03A). Secure each leg spring and bottom spring cap to the leg tube using a ½" UNC x 3" hex bolt, ½" narrow flat washer, and a ½" UNC nylock nut.

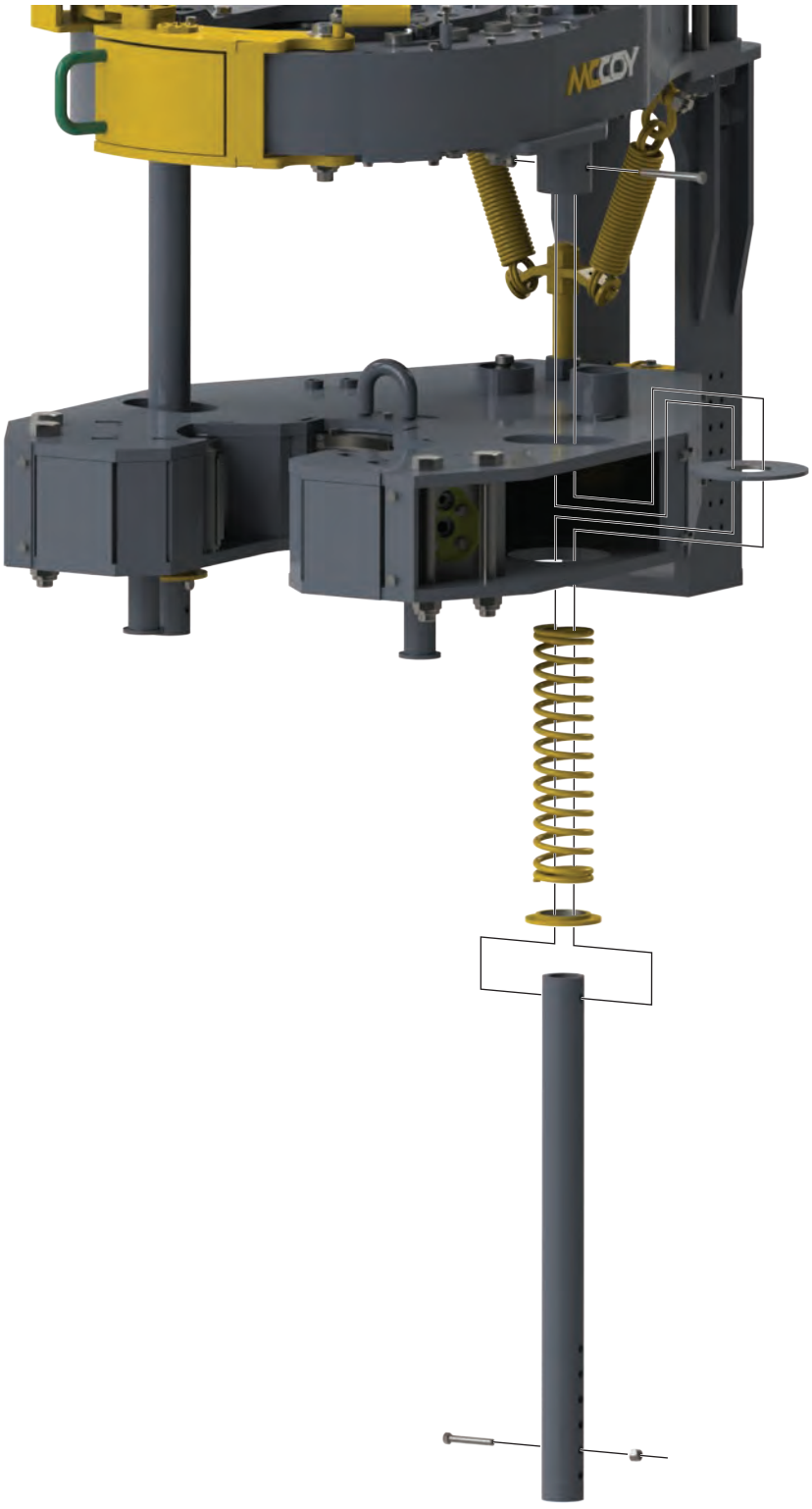


ILLUSTRATION 4.I.16: TONG ASSEMBLY - FRONT LEG INSTALLATION

4.I ASSEMBLY PROCEDURES (CONTINUED):

92. Connect one end of each backup rear suspension spring (PN 1302-905-06) to the eye bolts on the bottom of the tong using ½" shackles (PN 02-9063).
93. Connect the other end of each rear backup support spring to the v-bracket installed in step 82. Secure the end of the spring to the v-bracket using a spring retainer (PN 1480-500-00-04B) and a cotter pin. Repeat for the second spring.
94. Hoist tong and backup assembly off the backup supports, and lower assembly so that it sits on its legs.
95. Replace the backup side panels.
96. Install grease fittings:
    a. Install one ¼" straight thread grease fitting (PN 02-0097) into the top side of each support roller shaft, including the door pivot rollers (10 locations total).
    b. Install one ¼" straight thread grease fitting (PN 02-0097) into the top side of the latch adjustment cam.
    c. Install one ⅛" NPT grease fitting (PN 02-0005) into the top of each idler shaft or half-shaft (three locations total).
    d. Install one ⅛" NPT grease fitting (PN 02-0005) into the end of the clutch shaft, in the centre of the clutch bearing cap.
    e. Install two ⅛" NPT 90° grease fittings (PN 02-0093) in each pinion bearing cap (four locations total).
    f. Install two ⅛" NPT 90° grease fittings (PN 02-0093) in clutch bearing cap (two locations total).
    g. Install one 1/8" NPT 90° grease fitting (PN 02-0093) or one 1/8" NPT 45o grease fitting (PN 02-0006) in the top of the motor mount.
    h. Install two ⅛" NPT 90° grease fittings (PN 02-0093) into the top plate of the backup directly above each clamping cylinder, and two into the bottom backup plate directly beneath each of the clamping cylinders (eight locations total).
    i. Install drive-in grease fittings (PN 02-0012) into the ends of each cage plate cam follower (26 locations total).

4.J DAILY INSPECTION & MAINTENANCE CHECKLIST (POWER TONG)

Farr 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.

DO NOT PERFORM ANY FURTHER ACTIONS OR MAINTENANCE WHILE THE TONG IS CONNECTED TO ANY HYDRAULIC POWER SUPPLY. FARR 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.

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.
2. ☐ 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.
6. Disconnect the hydraulic RETURN line from the equipment.
7. Disconnect remaining hoses such as case drains.

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. ☐ Perform an initial wash of the tong 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.

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. Replace access panel when inspection is complete.

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. Farr recommends that damaged or missing body parts be repaired or replaced.

7. ☐ Inspect the jaws and dies. 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.

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 greasing 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.

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

15. ☐ 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. If using a compression load cell, replace any component that has been crushed or otherwise distorted through compression. Inspect hydraulic line, fittings, and diaphragm seals for fluid leaks.

16. ☐ If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.

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.

17. ☐ Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.

18. ☐ Perform a visual inspection of pressurized hydraulic lines. Document and correct any hydraulic fluid leaks.

19. ☐ Perform a full functional test of the tong (refer to section 2.I.4).

20. ☐ Test safety door feature (if equipped). Open the tong door(s), and attempt to rotate the cage plate at low speed (low gear) in both directions (makeup and breakout). If cage plate begins rotating, the safety door mechanism is not functional, and the tong must be removed from service until the safety door mechanism can be repaired. If the safety door is operating correctly, cage plate rotation will not be inhibited once the door is closed and latched.

NEVER OPERATE YOUR EQUIPMENT WITH A BYPASSED OR MALFUNCTIONING SAFETY DOOR

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.

4.K DAILY INSPECTION & MAINTENANCE CHECKLIST (BACKUPS)

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

Do not perform any maintenance while the tong and backup assembly is connected to any hydraulic power supply. Farr Canada 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.

ALL UNITS

1. ☐ Perform an initial wash of the backup in order to remove the majority of dirt and grease build-up.
2. ☐ Perform an external inspection. Check to ensure there are no loose or missing fasteners - replace if necessary.
3. ☐ Check to see if backup is parallel to the tong - if the backup is resting at an angle, one of the front leg springs is likely broken or fatigued to the point it must be replaced.

WEDGE BACKUP ONLY

4. ☐ Remove access cover from top plate. Perform a visual inspection ot the interior of the backup - use a flashlight if necessary. Premature wear where there are moving parts (bare metal where there used to be paint, and metal shavings in the grease are good indicators) may show where a component needs to be adjusted, or if necessary, replaced.
5. ☐ Inspect latch mechanism to ensure the door latch plate completely engages the door. Adjust or replace if necessary.
6. ☐ Grease UC-300 slider pads, ram guides, door cylinder pivots, and door pivots.

CLINCHER BACKUP ONLY

4. ☐ Use a flashlight to perform a visual inspection of the interior of the backup - remove one side panel if necessary. Premature wear where there are moving parts (bare metal where there used to be paint, and metal shavings in the grease are good indicators) may show where a component needs to be adjusted, or if necessary replaced. Replace any removed panels when inspection is complete.
5. ☐ Grease clincher cylinder guides using the grease fittings on the top body plate.
6. ☐ Ensure the splines on the clincher cylinder faces, and on the rear of the die are clean and free of debris before inserting clincher die. If die are already installed, ensure fasteners in the die retainers are tightly secured.
7. ☐ Inspect rear spring hanger assembly. Ensure all eye bolts, shackles, and cotter pins are in place and in good condition.
8. ☐ Inspect clincher cylinders for hydraulic fluid leaks once the system pressure has been restored.

FARR-STYLE BACKUP ONLY

4. ☐ Inspect cam ring gear for broken teeth.
5. ☐ Lubricate the cam follower array.
6. ☐ Inspect the jaws and dies. 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.
7. ☐ Inspect front and rear cam cylinder supports. Repair or replace any parts that are broken, cracked, or bent.
8. ☐ Inspect rear spring hanger assembly. Ensure all eye bolts, shackles, and cotter pins are in place and in good condition.
9. ☐ Open the backup door and inspect the condition of the latch. Repair or replace damaged latch components. If latch appears to be in good condition, close the door, then tug firmly on it to ensure the door remains latched.

ALL UNITS (AFTER STARTING POWER UNIT)

10. ☐ Perform a visual inspection of pressurized hydraulic lines - document and correct any hydraulic fluid leaks.
11. ☐ Perform a full functional test of the backup. Document and correct hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are in use on the backup.

4.L MONTHLY MAINTENANCE CHECKLIST - POWER TONG

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. Farr 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.

DO NOT PERFORM ANY FURTHER ACTIONS OR MAINTENANCE WHILE THE TONG IS CONNECTED TO ANY HYDRAULIC POWER SUPPLY. FARR 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.

DEPRESSURIZE HYDRAULIC SYSTEM IN PREPARATION FOR MAINTENANCE:

1) De-energize the power unit.
2) Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.

2. ☐ 3) Remove the hydraulic SUPPLY line from the equipment.

4) Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.
5) Disconnect the hydraulic RETURN line from the equipment.
6) Disconnect remaining hoses such as case drains, or lines connected to the turns counter.

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 tool thoroughly, using either water (if using a pressure washer ensure a low-pressure wash wand is used), 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 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.

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 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.

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 - "McCoy Grey" is paint color number RAL7015, "McCoy Yellow" (hazard areas) is RAL1007, and McCoy Green is RAL6029 (contact Farr sales for paint number for custom paint applications). Allow sufficient time for paint to dry before proceeding.

11. ☐ Visually inspect all load-bearing 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 2.C of the technical manual (Sling/Load Bearing Device Safety) for information on recommended testing and recertification.

13. ☐ Remove hydraulic motor and rotate the gear train by hand, and use a flashlight to perform a visual inspection of the gear train through the access panel and the opening of the rotary gear while the gear train is being rotated. If gear damage or chips of metal are seen, the tong should be removed from service and overhauled to avoid further damage. Replace access panel when inspection is complete.

14. ☐ Inspect all jaws and dies in use for the maintenance interval. Remove pin & roller, and inspect for signs of damage - replace pins if necessary. If the pins are welded in place & the welds are found to be damaged, remove and quarantine the jaw until the weld is repaired. Clean the pins and rollers, and reassemble using a liberal coating of anti-seize compound. Ensure dies are secure in the jaw & die retainers are present. Replace worn dies if necessary. Ensure that the jaw rollers rotate freely.

15. ☐ Inspect backing pin(s). If cracked, broken, or bent it (they) must be replaced.

16. ☐ Inspect top and bottom brake band linings - replace if lining is found to be flaking or is missing pieces of material. 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.

17. ☐ Inspect door springs. 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.

18. ☐ Inspect backup springs (if applicable). The rear extension springs (where used) should be equally extended, and the front leg springs should be equally compressed. Ensure that neither of the rear backup springs have been over-extended and lack sufficient tension to adequately support the backup. Ensure that neither of the front leg springs (or, when installed, the single rear backup leg spring) have been over-compressed, and still retain enough spring strength to support the front of the backup.

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

20. ☐ 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.

21. ☐ Generously fill the gear train housing with grease through the access panel, and also through the opening in the rotary gear. Perform a full lubrication - refer to Maintenance section of manual to determine lubrication points.

22. ☐ Ensure main supply and return connections to the tong are fully made up. Re-connect the remainder of the hydraulic lines.

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.

23. ☐ Ensure that supply pressure is at or above the tong’s specified operating pressure, and that the return pressure is less than 350 psi.

24. ☐ Perform a visual inspection of pressurized hydraulic lines. If any hydraulic fittings or hoses are leaking they must be repaired or replaced before proceeding.

25. ☐ Rotate tong for one minute in both high and low gear. Stop the tong and reverse the direction of rotation for another minute in both high and low gear, 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.

26. ☐ Energize power unit. Rotate tong for one minute in both high and low gear. Stop the tong and reverse the direction of rotation for another minute in both high and low gear, ending with the opening of the rotary gear facing the gear train.

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

28. ☐ Rotate tong in low gear 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.

29. ☐ Rotate tong in high gear 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. Likewise if the tong is making unusual noises check for damaged bearings (see Maintenance Manual for all bearing locations).

30. ☐ Install load cell. If using a tension load cell, perform a visual inspection and replace any cracked, broken, or distorted components including links and chains. If using a compression load cell, replace any component that has been crushed or otherwise distorted through compression. Inspect load cell for damage or signs of stress. Check oil level in load cell and fill if necessary (refer to technical manual Section 7 or Section 8).

31. ☐ If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.

32. ☐ If applicable, the weld securing the single load cell anchor to the bridge bar main plate must be inspected (compression load cell only). If the integrity of the weld has been compromised, the tong must be removed from service until the weld is repaired. The load cell beam will need to be disconnected and removed so the weld is visible. Before re-installing the beam, liberally grease the anchor pin before reinserting into the load cell beam.

33. ☐ 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 maintenance section of the manual for instructions on properly adjusting brake bands.

34. ☐ Perform a full functional test of the tong including, if applicable, backup components, lift cylinder, and float frame components (refer to Section 2.I.4). Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.

35. ☐ Test safety door feature (if equipped). Begin rotating the tong at low speed, and open the tong door(s). If rotation does not immediately stop, this is an indication that the safety door mechanism is not operating correctly and the tong must be removed from service until the mechanism is repaired. Repeat the test while operating the tong in the opposite direction. If the safety door is operating correctly, cage plate rotation will not be inhibited once the door is closed and latched.

NEVER OPERATE YOUR EQUIPMENT WITH A BYPASSED OR MALFUNCTIONING SAFETY DOOR

36. ☐ Farr 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 tool may be returned to service.

4.M 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. Farr 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.

IN ORDER TO MAINTAIN THE INTEGRITY OF INSTALLED SEALS, MCCOY 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 3.M. IF FURTHER STORAGE IS REQUIRED, THE EQUIPMENT SHOULD THEN BE PUT THROUGH ANOTHER DE-COMMISSIONING PROCEDURE.

DEPRESSURIZATION 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 (if equipped) are closed. Fully extend the lift cylinder (if equipped). If mounted in a frame, retract the float cylinders (if equipped).
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.

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-INDUCED INJURIES

1. ☐ Perform an initial wash of the tool 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 tool 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. Replace any missing fasteners - use Grade 8 bolts only. Re-torque all external fasteners to SAE specifications.
6. ☐ Inspect backing pin(s). If cracked, broken, or bent it (they) must be replaced.
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 storage. 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 number RAL7015. Allow sufficient time for paint to dry before proceeding.
9. ☐ Perform a liberal lubrication of the equipment - refer to Maintenance section of manual to determine lubrication points. Generously fill the gear train housing with grease through the access panel, and also through the opening in the rotary gear.
10. ☐ 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.
11. ☐ Energize power unit.

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 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.

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

15. ☐ Energize power unit, 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. Farr recommends that damaged cylinders be replaced prior to storage.

17. ☐ If you are using a frame-mounted tool, the tong must be lowered onto the backup in order to remove the risk of sudden and catastrophic movement when pressure is removed from the float cylinders. Cover the top of the backup with protective cloth to protect the paint on the backup. Place two wooden beams across the top of the tong, ensuring that the beams have a minimum size of 4" x 4" x the width of the tong. Cover the tops of the wooden beams with more protective cloth to prevent paint damage to the tong. When lowering the tong onto the beams, ensure that the beams come into flat contact with the bottom of the tong, away from bearing caps, brake bands, or other protrusions on the bottom of the tong. Ensure that the tong hanger chains are loose, but not dangling into contact with the hangers or top plate of the tong.

DEPRESSURIZATION PROCEDURE FOR STORAGE:

1) Rotate the tong to the "open throat" position.
2) Exercise each hydraulic cylinder several times - open the tong and backup doors (if equipped), retract and extend the remote backing pin ramp (if equipped), retract and extend the float cylinders. Leave 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 remaining hoses such as case drains, or lines connected to the turns counter.

18. ☐ If any hydraulic fittings or hoses are leaking they must be repaired or replaced before proceeding.

19. ☐ Wipe all excess grease from outside of equipment. Replace the access door panel. 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.

20. ☐ Farr recommends that chain slings be removed and stored separately. Rigid slings and other rigid suspension devices may remain in place.

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

22. ☐ Farr 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.

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

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

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

If possible, store in a sealed, climate controlled environment. If isolated storage is not available, Farr 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 metre of space, or 3.5 g. per cubic foot (see calculations next page).

CALCULATION OF REQUIRED DESICCANT

1. Calculate the trapped air volume by measuring the outside dimensions of the tool to be stored, and treat that as the volume to be stored. For example, the external dimensions of a KT20000 20” power tong are 80.25” x 50.5” x 28”, which calculates to an approximate volume of 113500 in^3, or 66 ft^3 (1.87 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 66 ft^3, equaling 231 g. Several manufacturers offer silica gel desiccant in packaged quantities of 125 grams per bag, so two 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. Farr 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 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. McCoy recommends placing a 2” x 6” board across the width of the tong under the legs (see Illustration 3.M.1). Ensure the pallet is large enough to accommodate the wooden crate containing the tong accessories.

ILLUSTRATION 4.M.1: SHIPPING INSTRUCTIONS - PALLET

SHIPPING INSTRUCTIONS (CONTINUED):

3. Use a crane to support the chain sling (if equipped). Wrap the chain sling with bubble wrap or another similar protective wrapping, and secure the wrapping with tape. Lower the wrapped chain sling so it sits inside the opening of the tong.

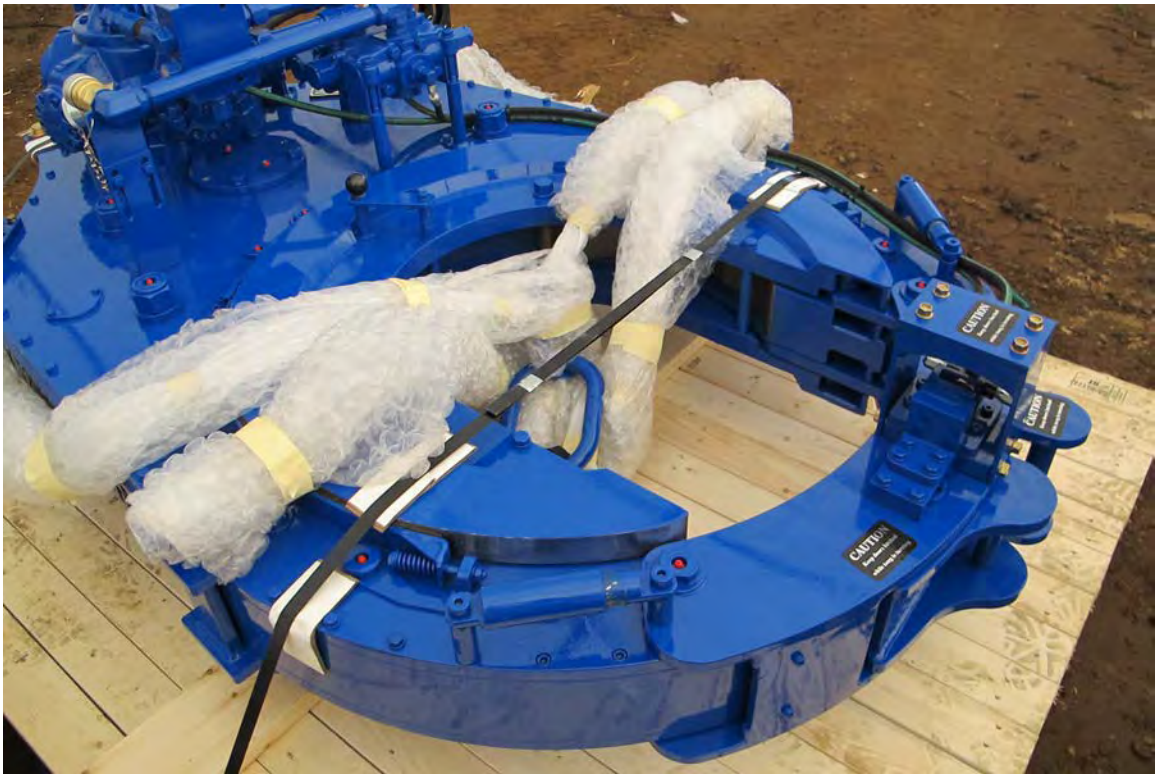


ILLUSTRATION 4.M.2: SHIPPING INSTRUCTIONS - WRAPPING CHAIN SLING

4. Do not allow the backup (if equipped) to "float" on its support springs during shipping. Build a sturdy wooden support structure under the front and back of the backup to support the weight of the backup and release the compression on the springs. Strap the backup to the support blocks and pallet independent of the tong, using minimum ¾" x 0.029" metal strapping in at least two locations. Place strapping as close to the backup supports as possible, and use caution not to entrap any flexible hydraulic hoses beneath the strapping. Before tightening strapping, place strapping protectors wherever the metal strapping comes into contact with the equipment.

ILLUSTRATION 4.M.3: SHIPPING INSTRUCTIONS - BACKUP SUPPORT

SHIPPING INSTRUCTIONS (CONTINUED):

5. Securely strap the equipment in place using metal strapping. 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:

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

   ¾" x 0.029" metal strapping, 3320 lbs. (1509 kg.) tensile strength
   Minimum two straps

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

   1-¼" 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 ¾" x 0.029" metal strapping (see Illustration 4.M.4).

ILLUSTRATION 4.M.4: SHIPPING INSTRUCTIONS - STRAPPING EQUIPMENT TO PALLET

   If it is not practical to place larger loose items in a wooden crate, ensure they are also securely strapped to the pallet using ¾" x 0.029" metal strapping.

6. 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.

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

4.N 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 Farr have been strictly observed.

1. ☐ Remove all protective plastic wrapping. If there are desiccant packs with the assembly, they may be disposed of with the regular garbage.
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. ☐ If applicable, re-connect chain sling to lifting lugs. 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. 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 Maintenance section of manual to determine lubrication points. Generously fill the gear train housing with grease through the access panel, and also 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.

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

7. ☐ Energize power unit.
8. ☐ Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.
9. ☐ Perform a thorough inspection of pressurized hydraulic lines and fittings. Any leaking hydraulic fluid lines or fittings must be replaced before the equipment is returned to service.
10. ☐ Perform a thorough inspection of all seals. Any seal that is leaking or "weeping" must be replaced before the equipment is returned to service.
11. ☐ Rotate tong in low gear 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. Finish this step with the rotary gear opening facing the gear train. De-energize the power unit.
12. ☐ 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.
13. ☐ 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.
14. ☐ 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
15. ☐ Re-install access panel. Install a set of pre-inspected jaws that are the correct size for the pipe or casing being run.
16. ☐ Install load cell. If using a tension load cell, perform a visual inspection and replace any cracked, broken, or distorted components including links and chains. If using a compression load cell, replace any component that has been crushed or otherwise distorted through compression.
17. ☐ If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.
18. ☐ If applicable, the weld securing the single load cell anchor to the bridge bar main plate must be inspected (compression load cell only). If the integrity of the weld has been compromised, the tong must be removed from service until the weld is repaired. The load cell beam will need to be disconnected and removed so the weld is visible. Before re-installing the beam, liberally grease the anchor pin before reinserting into the load cell beam.
19. ☐ Re-energize power unit.

20. ☐ 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.

21. ☐ If using a frame-mounted tong and backup system, raise the tong off the beams that it is resting upon. Remove the beams and protective cloths - inspect the paint on top of the backup and the bottom of the tong to ensure it has not been damaged by the beam.

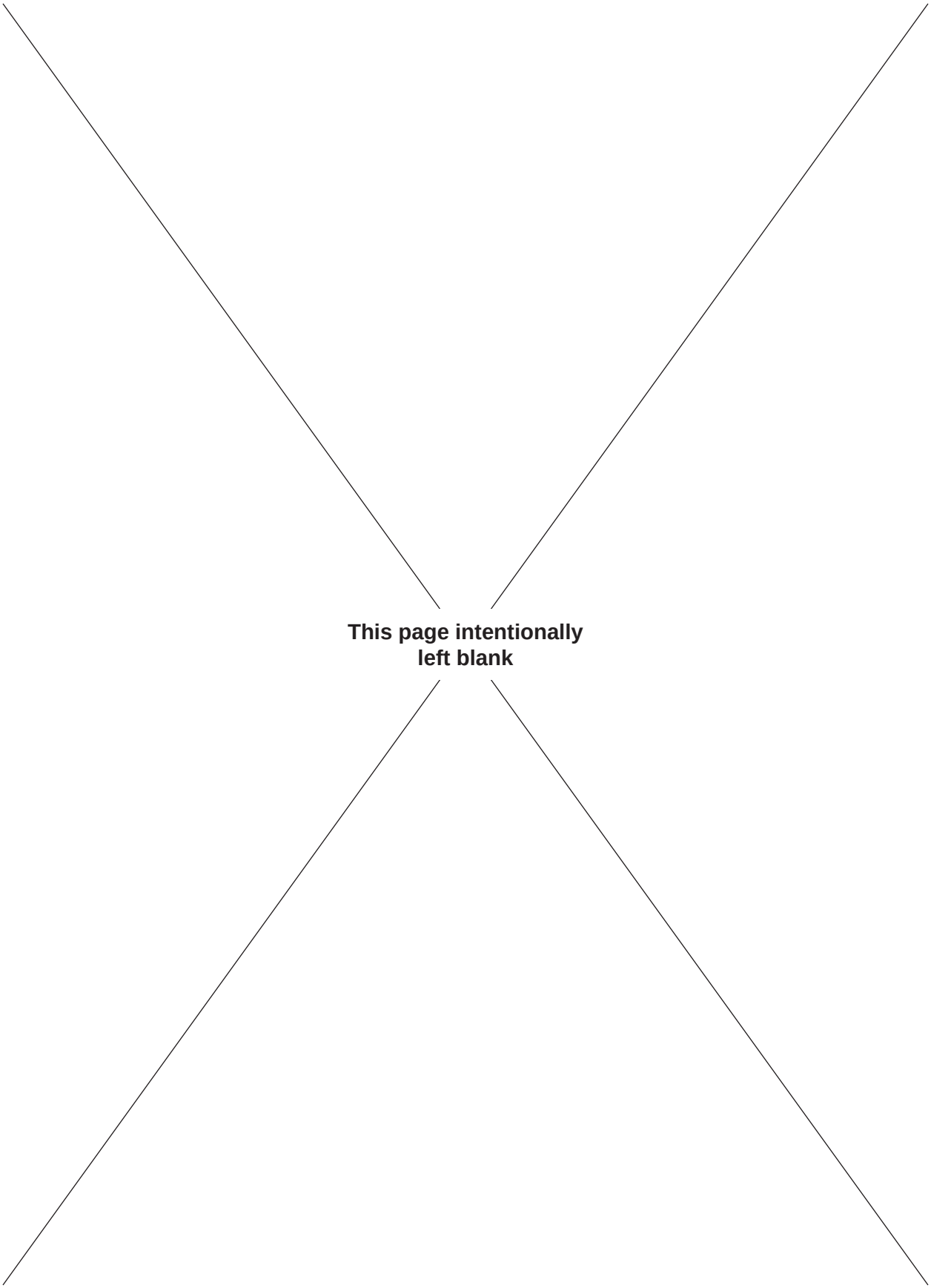
22. ☐ Test safety door feature (if equipped). Open the tong door(s), and attempt to rotate the cage plate at low speed (low gear) in both directions (makeup and breakout). If cage plate begins rotating, the safety door mechanism is not functional, and the tong must be removed from service until the safety door mechanism can be repaired. If the safety door is operating correctly, cage plate rotation will not be inhibited once the door is closed and latched.

NEVER OPERATE YOUR EQUIPMENT WITH A BYPASSED OR MALFUNCTIONING SAFETY DOOR

23. ☐ 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.

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

SECTION 5: TROUBLESHOOTING


This page intentionally
left blank

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.

5.A TONG WILL NOT DEVELOP SUFFICIENT TORQUE

	POSSIBLE PROBLEM	SOLUTION(S)
1	Malfunctioning relief valve on tong hydraulic circuit	See Section 5.B, Relief Valve Troubleshooting
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 6 of this manual
		Load cell has been damaged. Replace load cell, or return to McCoy for repair and re-calibration

MCCOY GLOBAL GUARANTEES CALIBRATION OF A LOAD CELL/TORQUE GAUGE ASSEMBLY FOR A PERIOD OF ONE YEAR. MCCOY 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

5.B 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 4.D.

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

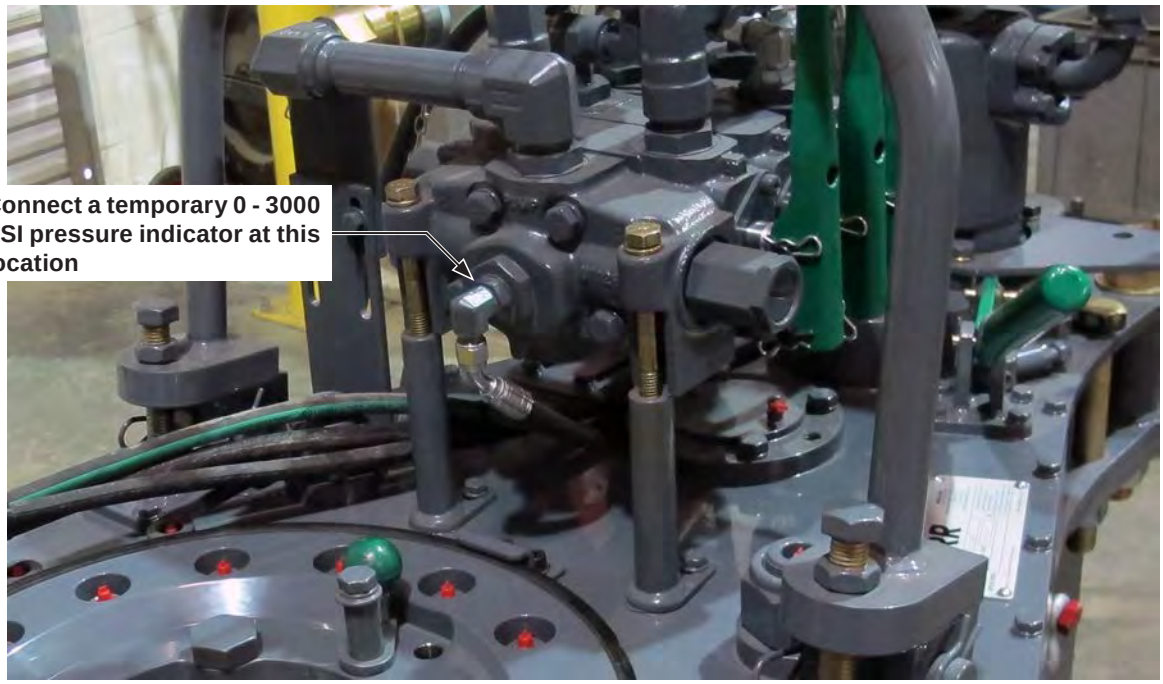


ILLUSTRATION 5.B.1: RELIEF VALVE TROUBLESHOOTING - TEMPORARY GAUGE INSTALLATION

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).

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 4.D.

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 item “k”, section 3.A.5).

Continued on next page ...

5.B 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 your tong from hydraulic power, and depressurize following the procedure in section 4.D

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.

5.C SAFETY DOOR DOES NOT OPERATE OR IS MALFUNCTIONING

	POSSIBLE PROBLEM	SOLUTION(S)
1	Safety door switch requires adjustment.	Adjust switch as per section 4.F.3
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.

5.D 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 in Section 8 of this manual
4	Bearings in gear train and rotary section are excessively worn	Overhaul tong. See Section 4 of this manual for instructions on accessing the gear train for overhaul purposes.
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

5.E 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

5.F FAILURE OR DIFFICULTY OF TONG TO SHIFT

	POSSIBLE PROBLEM	SOLUTION(S)
1	Bent or broken shifter handle	Replace shifter handle
2	“Frozen” or hard-to-move shifter handle	Grease shifter shaft
3	Bent or broken shifter yoke	Inspect components through inspection door. Replace shifter yoke if necessary.
4	Bent or broken shifter shaft	Replace
5	Locking nuts on shifting shaft have loosened and position of yoke has changed	Reposition yoke and re-tighten locking nuts
6	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
7	Tong pops out of gear	Ensure that detent ball & spring assembly has been correctly set

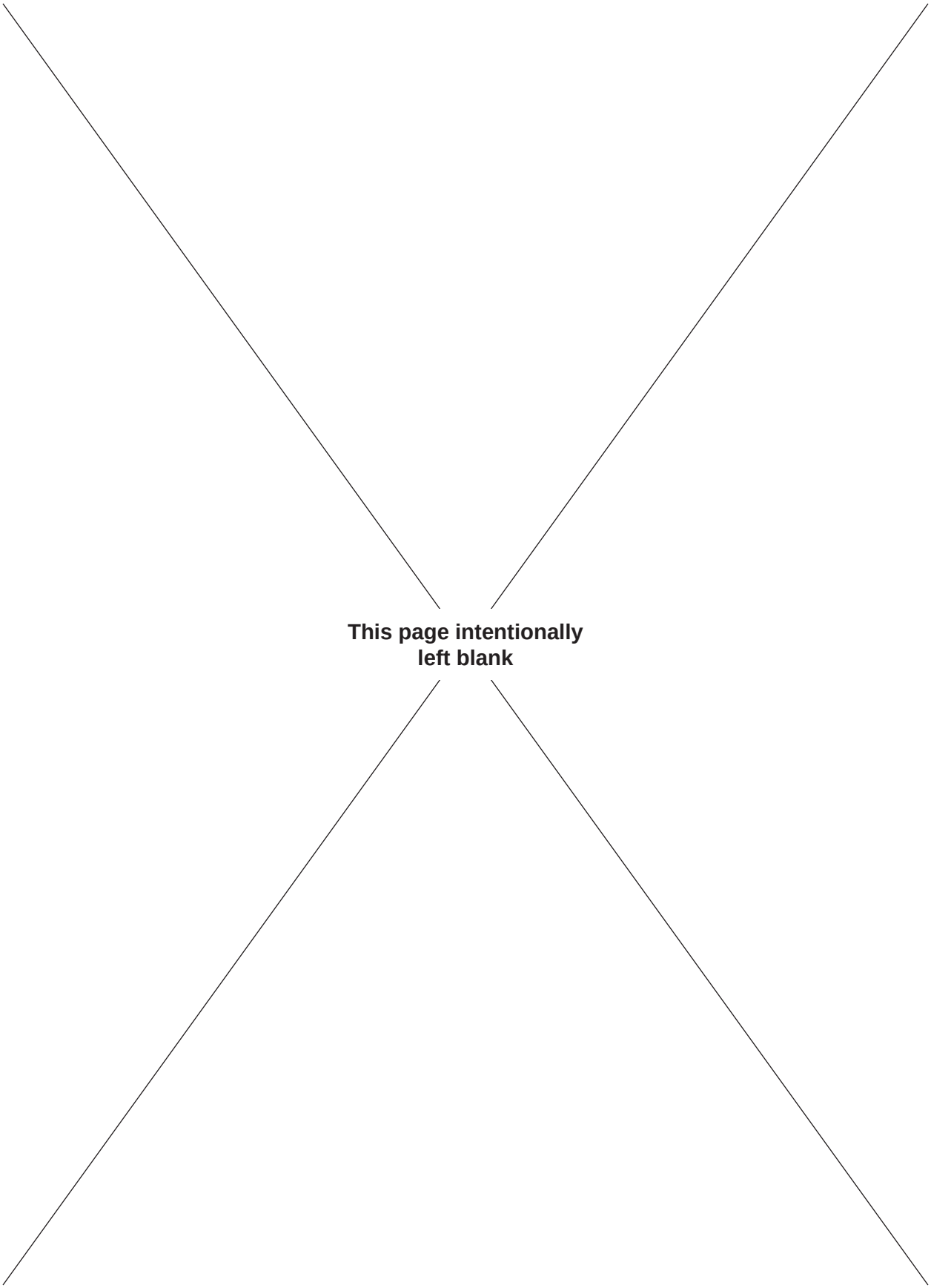
5.G GENERAL TROUBLESHOOTING COMMENTS

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.

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

SECTION 6: ASSEMBLIES & PARTS


This page intentionally
left blank

CRITICAL SPARE PARTS

The critical spare parts listed on pages 6.3 and 6.4 identifies those parts that, if missing or damaged, results in one of the following possibilities:

- exposure of the operator(s) to a hazard while operating the equipment
- the equipment cannot be operated in a safe manner
- the equipment is inhibited from operating at all

McCoy recommends having the specified quantities of all critical spare parts on hand at all time.

The quantities listed in the tables on the following two pages are ***total*** quantities that McCoy recommends having on hand at all times. See individual parts & assemblies pages to see the quantity of each part required for each assembly.

ITEMS ON THE CRITICAL SPARE PARTS LIST MARKED IN RED INDICATE ESSENTIAL HEALTH & SAFETY ITEMS. FAILURE TO REPLACE DAMAGED ESSENTIAL HEALTH & SAFETY ITEMS WILL PRESENT IMMEDIATE DANGER TO PERSONNEL OR EQUIPMENT. HAVE THESE ITEMS ON HAND AT ALL TIMES. STOP WORK AND QUARANTINE TONG UPON DISCOVERY OF DAMAGED OR DEFECTIVE HEALTH AND SAFETY COMPONENTS UNTIL PARTS CAN BE REPLACED.

MISC TONG & BACKUP PARTS		
Description	**Part Number**	**Qty. Required**
Jaw pivot bolt	1064-28	2
Backing pin	101-4094	1
Lined brake band weldment	1064-D4-29	2
DVA35 handle assembly	01-0409	1
Latch claw	101-6050	2
Door latch spring	02-E0252	2
Safety door cam	101-6146	1
Rigid sling adjustment helix	1095-220	1
Rigid sling master lifting link	02-9128	1
RH rigid sling mounting plate	101-6888	1
LH rigid sling mounting plate	101-6889	1
Rigid sling mounting foot	101-6393	2
Rear backup suspension spring	1302-905-06	1
Front leg spring	1302-905-08	1
Rear backup jaw	1401-08	1
BEARINGS & BUSHINGS		
Description	**Part Number**	**Qty. Required**
Cam follower (cage plate)	02-0016	5
FASTENERS & FITTINGS		
Description	**Part Number**	**Qty. Required**
⅝" UNF thin nylock nut (cage plate cam followers)	09-5915	5
Master link suspension pin	02-E0267	1
½" UNC x 1-¾" drilled-head hex bolt (rigid sling)	101-6459	8
1-¼" hex nylock nut (rigid sling main hanger)	09-1484	1
1" x 2-½" hex socket UNC shoulder bolt	09-0331	2
HYDRAULIC COMPONENTS		
Description	**Part Number**	**Qty. Required**
Relief Cartridge (Safety Door)	08-1625	1
Hydraulic valve handle	01-0409	1
Relief valve (includes seals)	10-0010R	1
DVA35 valve seal kit	07-0004	1

Continued on next page...

CRITICAL SPARE PARTS (CONTINUED)		
HYDRAULIC COMPONENTS (Continued)		
Description	**Part Number**	**Qty. Required**
Motor seal kit	87-7110	1
Safety door switch	02-E0190	1
Relief Valve (backup)	08-1180	1
Check Valve (backup)	08-0481	1
CLINCHER® Cylinder	1401-00-00	1
Hydraulic Hose - Lift Cylinder Supply	02-0934H	1
High-Visibility Protective Wrap, Lift Cylinder Hydraulic Hose	02-E0203	1
Hydraulic Hose Assembly - Backup 55" "A" Side	02-1011	1
Hydraulic Hose Assembly - Backup 52" "B" Side	02-1012	1
High-Visibility Protective Wrap, Backup Hydraulic Hose	02-E0204	1
JAW COMPONENTS		
Description	**Part Number**	**Qty. Required**
Jaw Pin	101-1581	2
Jaw roller (applies to standard jaw die kits 1064-JDK-65, 1064-JDK-70, 1064-JDK-75, and 1064-JDK-90)	997-JR-200	2
Jaw roller (applies to standard jaw die kit 1064-JDK-71)	997-JR-1875	2
Jaw roller (applies to standard jaw die kit 1064-JDK-80 and 1064-JDK-85)	997-JR-2063	2
Jaw roller retainer, 5-½" standard jaw die kit	101-5840	2
Jaw roller, 5-½" standard jaw die kit only	101-6163	2
Jaw roller, wraparound jaw, 2-⅜" to 3-½"	997-JR-200	2
Jaw die, contoured, for 2-⅜" jaw die kit only	12-0004	♦
Jaw die, contoured, for 2-⅞" jaw die kit only	12-0007	♦
Jaw die, flat, for 3" through 5" jaw die kits	13-0008-314-0	♦
1" x 3.875" flat die, 5-½" jaw dit kit only	12-0006-314-0	♦
Wraparound jaw die insert, 2-⅜"	12-2001	♦♦
Wraparound jaw die insert, 2-⅞"	12-2003	♦♦
Wraparound jaw die insert, 3-½"	12-2006	♦♦
Wraparound jaw die insert, 4"	12-2007	♦♦
Wraparound jaw die insert, 4-½"	12-2009	♦♦
Wraparound jaw die insert, 5"	12-2011	♦♦
Wraparound jaw die insert, 5-½"	12-2012	♦♦

♦ Stock 48 spare die inserts for each size of standard jaw used

♦♦ Stock 2 spare wrap-around dies for each size of wrap-around jaw used

RECOMMENDED (ONE YEAR) SPARE PARTS

McCoy suggests stocking the spare parts listed in the table on page 6.5. Although these are not critical spare parts, stocking these components may significantly decrease equipment down time in the event of long lead times from the factory.

The quantities listed in the table on page 6.5 are ***total*** quantities of each part that McCoy recommends stocking. See individual parts & assemblies pages to see the quantity of each part required for each assembly.

MISC TONG PARTS		
Description	**Part Number**	**Qty. Recommended**
Shifting shaft	101-5999	1
Top shifter bushing (threaded)	101-0020	1
Detent ball	02-0018	1
Detent spring	997-0-64	1
Cage plate spacer	1064-38	3
Rear brake band retainer	101-0140	1
Top RH/bottom LH brake band lug weldment	101-0132	1
Top LH/bottom RH Brake band lug weldment	101-0134	1
Door latch shaft	101-6107	2
Door stop spring cylinder	101-0069	1
Door stop spring cylinder	101-0069	1
Top leg spring cap	101-4489	1
Bottom leg spring cap	1302-905-03A	1
Suspension spring bracket	1483-500-00-04	1
0-3000 PSI ¼" NPT gauge	02-0245	1
BEARINGS & BUSHINGS		
Description	**Part Number**	**Qty. Recommended**
Tapered support roller bearing	02-0099	4
Pinion bearing	02-0007	2
Top clutch bearing	02-0002	1
Bottom clutch bearing	02-0004	1
FASTENERS & FITTINGS		
Description	**Part Number**	**Qty. Recommended**
5/16" x 1-½" clevis pin (shifting handle pivot)	09-0256	1
5/16" x 1" clevis pin (shifting shaft connection)	02-0020	1
7/16" UNF hex jam nut (shifting shaft detent force adjustment)	09-5508	1
7/16" UNF x 1-¼" hex bolt (shifting shaft detent force adjustment)	09-1608	1
⅜" UNC x 1-½" threaded dowel pin (backing pin assembly)	101-4097	1
½" UNC hex nylock nut (latch claw retainer)	09-5610	2
½" narrow flat washer (latch claw retainer)	09-5010	2
½" x 2-¾" hex socket head UNC shoulder bolt (rear door cylinder retainer)	09-0155	1
½" x 1-¼" hex socket head UNC shoulder bolt (front door cylinder retainer)	09-0117	1
¼" UNC x 2" drilled-head hex bolt (safety door switch)	101-6072	4
⅜" UNC x 1" drilled-head hex bolt (inside rigid sling brackets)	101-6157	4
⅜" UNC x 1-¾" drilled-head hex bolt (outside rigid sling brackets)	101-6080	4
⅜" UNC shoulder pattern 2-A eye bolt	02-0262	1
Shackle assembly	02-9063	1

PARTS REQUIRED FOR OVERHAUL

McCoy recommends replacing all parts listed in the tables on pages 6.6 - 6.7 when overhauling your equipment.

The parts indicated in red indicate essential health and safety items. McCoy strongly recommends replacing these components when overhauling your equipment.

The quantities listed in the table on page 6.6 - 6.7 are ***total*** quantities of each part that McCoy recommends stocking for the purpose of overhauling your tong. See individual parts & assemblies pages to see the quantity of each part required for each assembly.

ITEMS ON THE CRITICAL SPARE PARTS LIST MARKED IN RED INDICATE ESSENTIAL HEALTH & SAFETY ITEMS. MCCOY STRONGLY RECOMMENDS REPLACING ALL ESSENTIAL HEALTH & SAFETY ITEMS WHEN OVERHAULING YOUR EQUIPMENT.

MISC TONG PARTS		
Description	**Part Number**	**Qty. Required**
¼" UNF straight-thread grease fitting	02-0097	
Grease fitting, ⅛" NPT	02-0005	
⅛" NPT 90° grease fitting	02-0093	
¼" - 28 straight thread 90° grease fitting	02-9272	2
Support roller shaft	101-3942	8
Support roller shaft (coincident with front leg mounts)	101-3944	4
Support roller sleeve	1064-182	12
Support roller shaft spacer	1064-183	12
Support roller	1064-181	12
Idler bearing seal	02-0010	5
Drive shaft / clutch gear	997-A3-61	1
Low clutch gear	997-A1-52	1
Shifting collar	997-A9-62	1
Clutch shaft	997-A8-50	1
High clutch gear	997-A1-51	1
Shifting shaft	101-5999	1
Shifting fork	101-6166	1
Detent ball	02-0018	1
Detent spring	997-0-64	1
Jaw pivot bolt	1064-28	2
Backing pin	101-4094	1
Lined brake band weldment	1064-D4-29	2
Square 5/16" x 5/16" x 1-½" key	01-0317	1
Motor gear	997-A10-149	1
Latch claw	101-6050	2
Door latch spacer (thin)	101-6053	2
Door latch spacer (thick)	101-6108	4
Door latch shaft	101-6107	2
Door latch spring	02-E0252	2
Latch post	101-6130	1
Door pivot post	101-6129	1
Latch post / door pivot spacer	101-6127	3
Top door pivot spacer	101-6126	1
Door stop spring cylinder	101-0069	1
Safety door cam	101-6146	1
Rigid sling adjustment helix	1095-220	1
Rigid sling master lifting link	02-9128	1

Continued on next page...

MISC TONG PARTS (Continued):		
Description	**Part Number**	**Qty. Required**
Master link suspension pin	02-E0267	1
Rear backup suspension spring	1302-905-06	2
Front leg spring	1302-905-08	2
Die retainer (top)	101-2982	2
Die retainer (bottom)	101-2291	2
BEARINGS & BUSHINGS		
Tapered roller bearing (support rollers)	02-0099	24
Idler bearing	02-0011	3
Pinion bearing	02-0007	2
Top clutch bearing	02-0002	1
Needle bearing (clutch)	02-0003	4
Bottom clutch bearing	02-0004	1
Top clutch bearing bushing	997-60	1
Cam follower (cage plate)	02-0016	26
Flat door bushing	101-6125	2
Shouldered door bushing	101-6123	2
FASTENERS & FITTINGS		
Description	**Part Number**	**Qty. Required**
⅞" narrow flat washer (support rollers)	09-5123	12
⅞" UNF hex thin nylock nut (support rollers)	09-5722	12
Bearing retainer ring (idlers)	02-0009	5
Outside snap ring (clutch drive gear retainer)	02-0001	1
¼" UNC x ⅜" hex socket set screw (shifting fork fasteners)	09-0107	3
7/16" UNF hex jam nut (shifter detent force adjustment)	09-5508	1
7/16" UNF x 1-¼" hex bolt (shifter detent force adjustment)	09-1608	1
⅝" UNF thin nylock nut (cage plate cam followers)	09-5915	26
⅜" UNC x ⅜" hex socket set screw (motor gear fasteners)	09-0106	2
½" UNC hex nylock nut (latch shaft fasteners)	09-5610	2
½" narrow flat washer (latch shaft fasteners)	09-5010	2
HYDRAULIC COMPONENTS		
Description	**Part Number**	**Qty. Required**
Motor seal kit	87-7110	1
DVA35 Seal Kit	07-0004	3
CLINCHER® Cylinder Seal Kit	1401-00-00-SK	2
Relief Cartridge (DVA35)	10-0010R	1
Relief Cartridge (Safety Door)	08-1625	1
Safety door switch	02-E0190	1
Relief Valve (Backup)	08-1180	1
Check Valve (Backup)	08-0481	1
Hydraulic Hose - Lift Cylinder Supply	02-0934H	1
High-Visibility Protective Wrap, Lift Cylinder Hydraulic Hose	02-E0203	1
Hydraulic Hose Assembly - Backup 55" "A" Side	02-1011	1
Hydraulic Hose Assembly - Backup 52" "B" Side	02-1012	1
High-Visibility Protective Wrap, Backup Hydraulic Hose	02-E0204	2

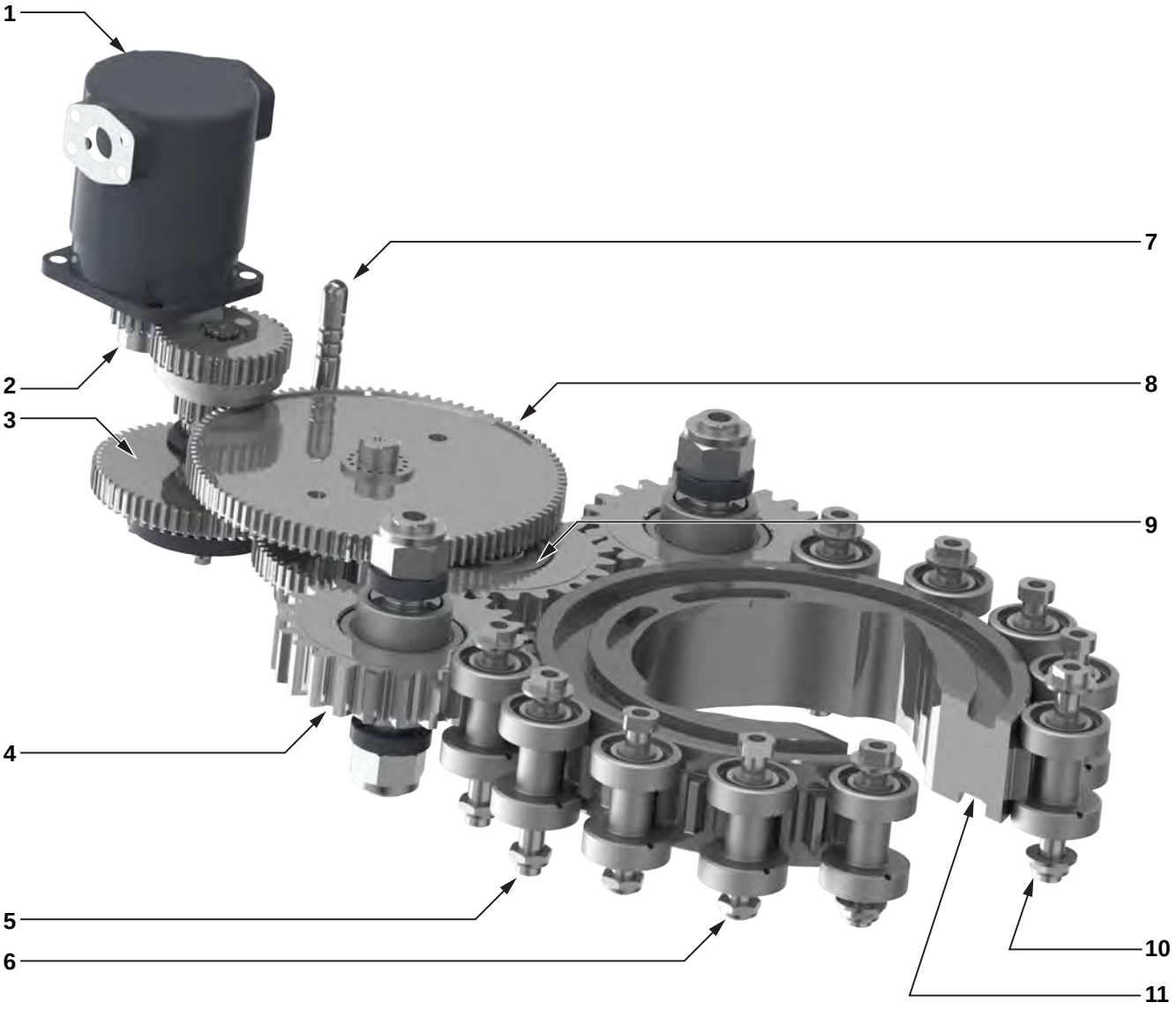


ILLUSTRATION 6.1: KT-5-½" GEAR TRAIN ISO VIEW

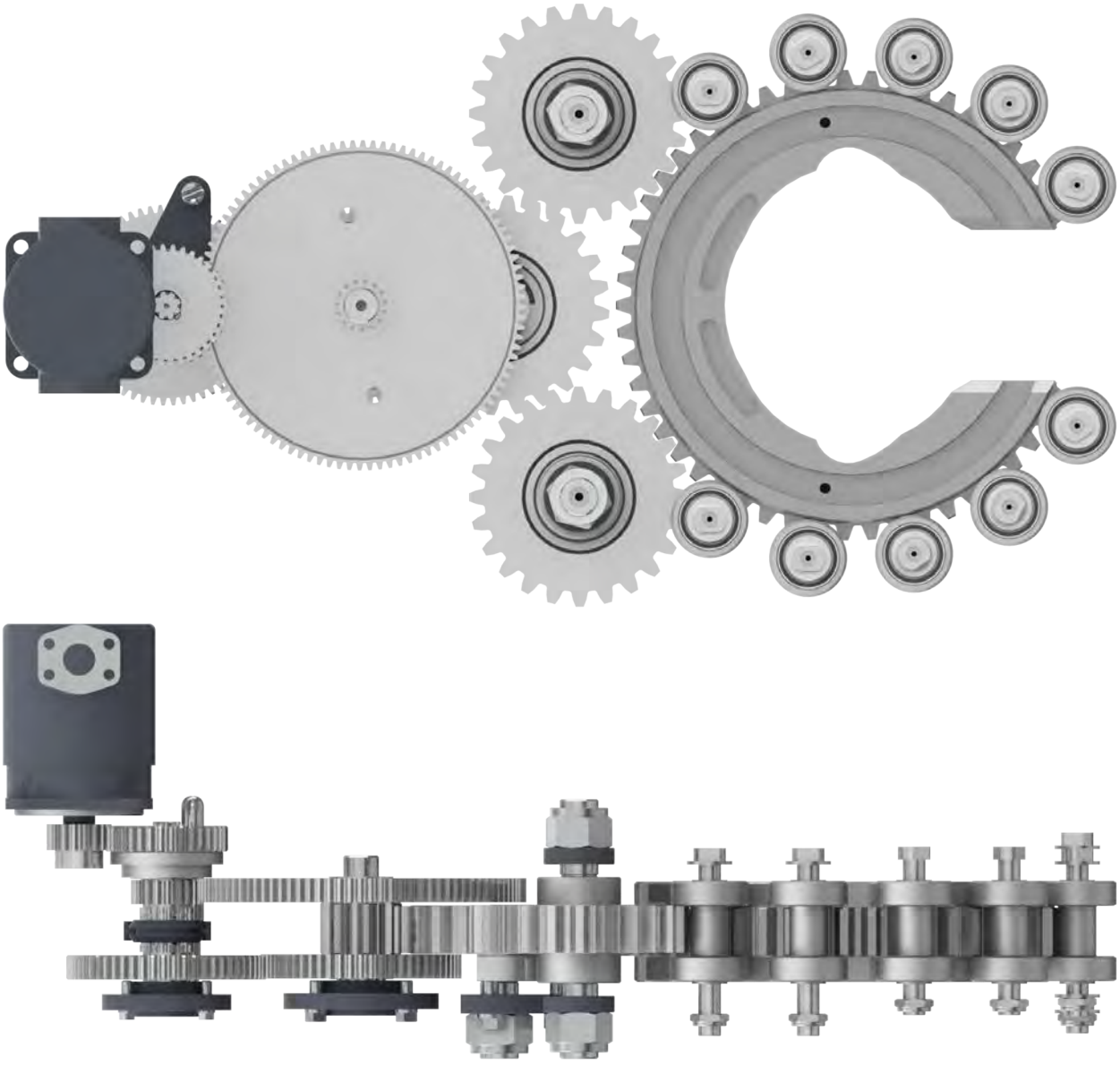


ILLUSTRATION 6.2: KT-5-½" GEAR TRAIN TOP / SIDE VIEWS

Item	Type	Description	Qty	Part Number
1	Part	Hydraulic motor	1	87-0110
2	Part	Motor gear	1	997-A10-149
3	Assembly	Clutch assembly (Pp. 6.18 - 6.19)	1	
4	Assembly	Rotary idler assembly (Pp. 6.12 - 6.13)	2	
5	Assembly	Support roller, extended shaft for front leg mount (Pp. 6.10 - 6.11)	4	
6	Assembly	Support roller (Pp. 6.10 - 6.11)	5	
7	Assembly	Shifter shaft assembly (Pp. 6.20 - 6.21)	1	
8	Assembly	Pinion assembly (Pp. 6.16 - 6.17)	1	
9	Assembly	Pinion Idler assembly (Pp. 6.14 - 6.15)	1	
10	Assembly	Door pivot support roller (Pp. 6.10 - 6.11)	1	
11	Part	Rotary gear	1	1064-D1

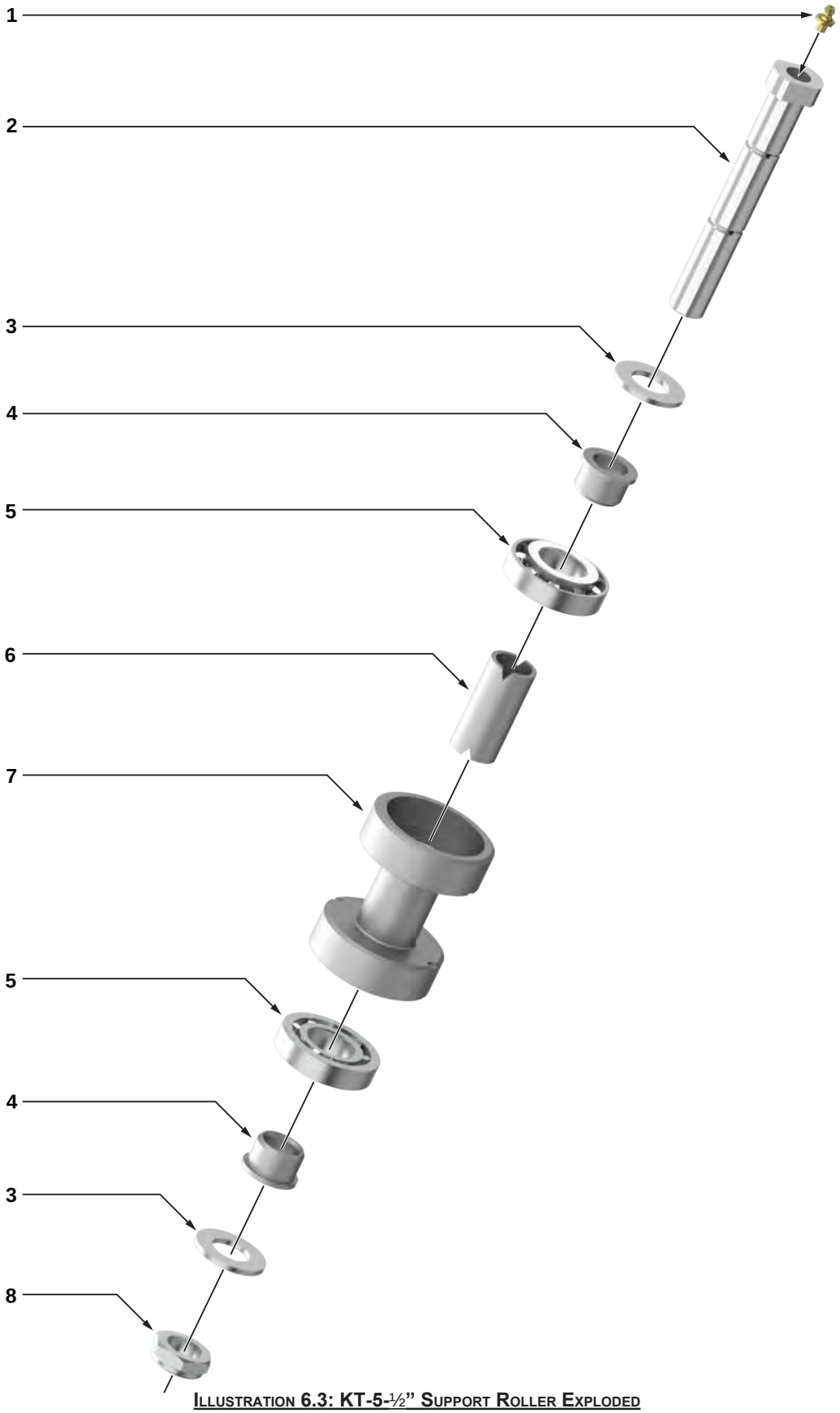


ILLUSTRATION 6.3: KT-5-½" SUPPORT ROLLER EXPLODED

ILLUSTRATION 6.4: KT-5-½" STANDARD SUPPORT ROLLER

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	¼" UNF straight-thread grease fitting	1	02-0097			1
2	Part	Support roller shaft	1	101-3942			1
	Part	Support roller shaft (coincident with front leg mounts) (1)	1	101-3944			1
3	Part	⅞" narrow flat washer (2)	2	09-5123			2
4	Part	Support roller sleeve	2	1064-182			2
5	Part	Tapered roller bearing	2	02-0099		2	2
6	Part	Support roller shaft spacer	1	1064-183			1
7	Part	Support roller	1	1064-181			1
8	Part	⅞" UNF hex thin nylock nut	1	09-5722			1

(1) Use "long" support roller shafts (PN 101-3944) in four locations where coincident with the front leg mount weldments.

(2) Top and bottom flat washers are not used where the support roller shaft is coincidental with the brake band lug weldments. Bottom flat washers are not used where the support roller shaft is coincidental with the front leg mount weldments.

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. OVERTIGHTENING WILL RESULT IN PREMATURE BUSHING FAILURE AND WILL INHIBIT ROTATION, AND MAY IMPART EXCESS STRESS ON ROTATING COMPONENTS.

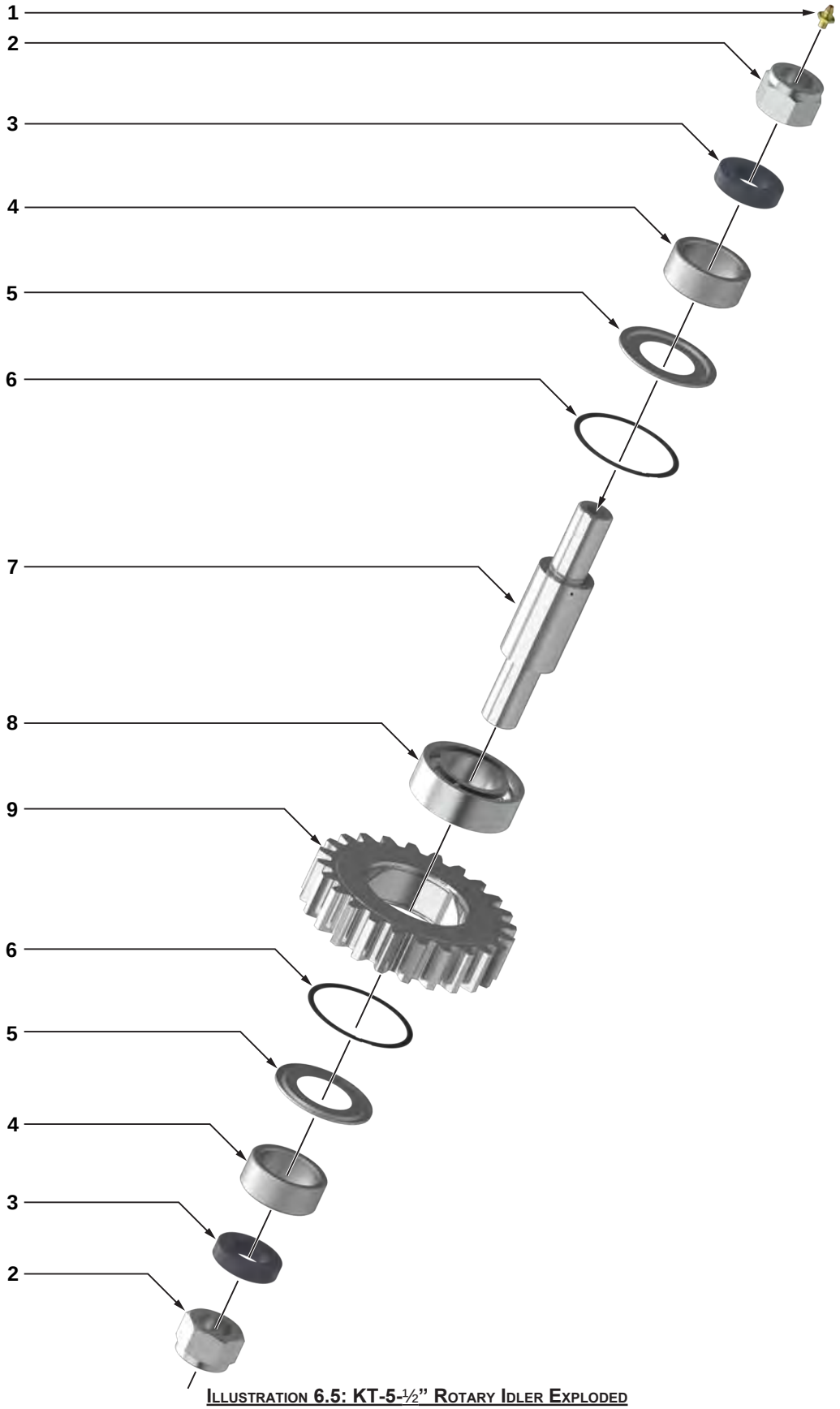


ILLUSTRATION 6.5: KT-5-½" ROTARY IDLER EXPLODED

ILLUSTRATION 6.6: KT-5-½" ROTARY IDLER

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	Grease fitting, ⅛" NPT	1	02-0005			1
2	Part	1-½" UNF nylock nut	2	09-5740			
3	Part	Rotary idler pad	2	997-D20-125			
4	Part	Idler bearing spacer	2	997-D20-121			2
5	Part	Bearing seal	2	02-0010			2
6	Part	Bearing retainer ring	2	02-0009			2
7	Part	Idler shaft	1	997-D19-117			
8	Part	Idler bearing	1	02-0011			1
9	Part	Idler gear	1	997-A2-119			

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. OVERTIGHTENING WILL RESULT IN PREMATURE BUSHING FAILURE AND WILL INHIBIT ROTATION, AND MAY IMPART EXCESS STRESS ON ROTATING COMPONENTS.

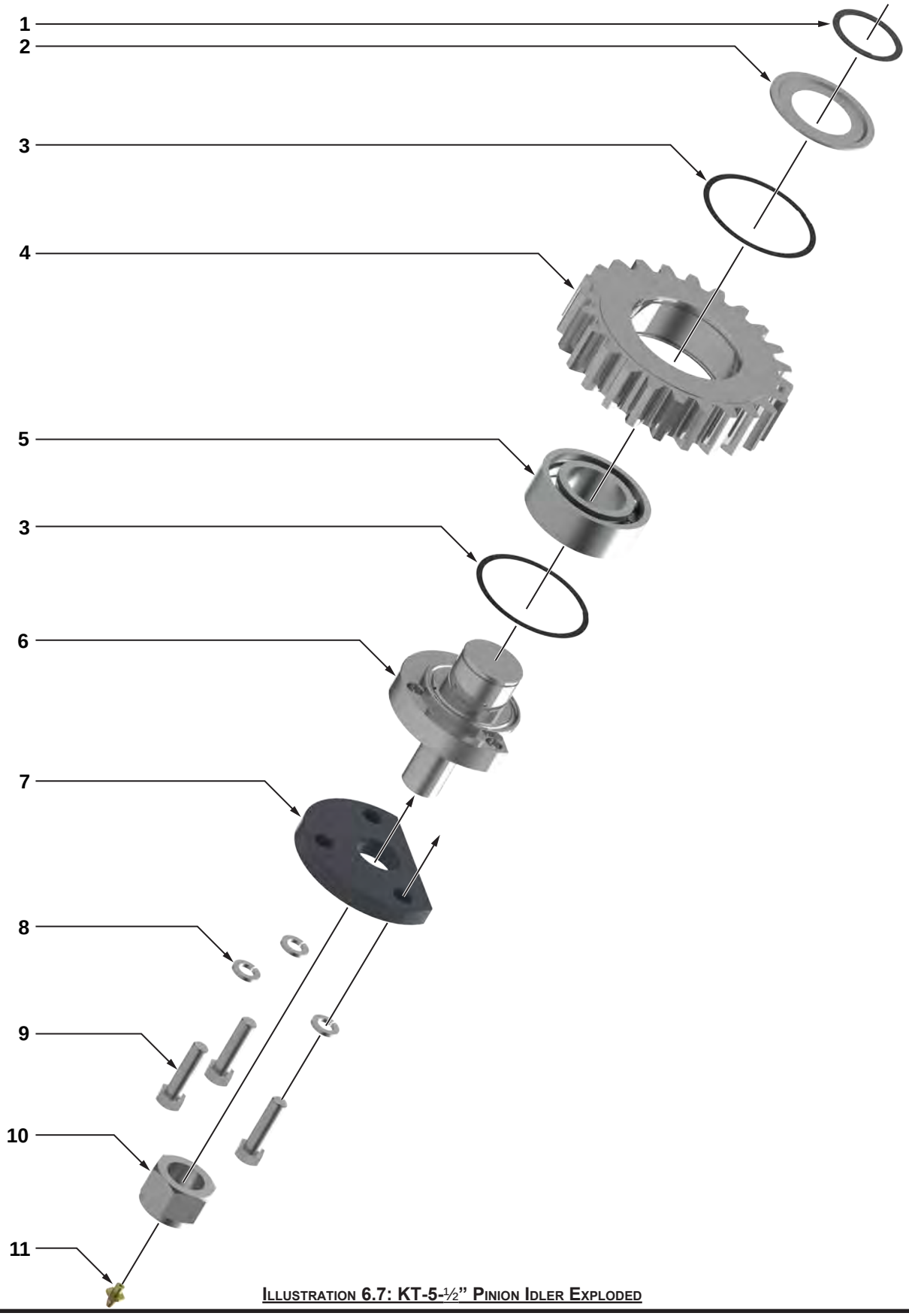


ILLUSTRATION 6.7: KT-5-½" PINION IDLER EXPLODED

ILLUSTRATION 6.8: KT-5-½" PINION IDLER

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	Idler bearing retainer	1	02-0008			1
2	Part	Bearing seal	1	02-0010			1
3	Part	Retainer ring	2	02-0009			2
4	Part	Idler gear	1	997-A2-119			
5	Part	Idler bearing	1	02-0011			1
6	Part	Idler half shaft	1	997-D17-105			
7	Part	Pinion idler pad	1	1400-109			
8	Part	⅝" carbon steel lock washer	3	09-5114			
9	Part	⅝" UNC x 2-¼" hex bolt	3	09-1235			
10	Part	1-½" UNF nylock nut	1	09-5740			
11	Part	Grease fitting, ⅛" NPT	1	02-0005			1

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. OVERTIGHTENING WILL RESULT IN PREMATURE BUSHING FAILURE AND WILL INHIBIT ROTATION, AND MAY IMPART EXCESS STRESS ON ROTATING COMPONENTS.

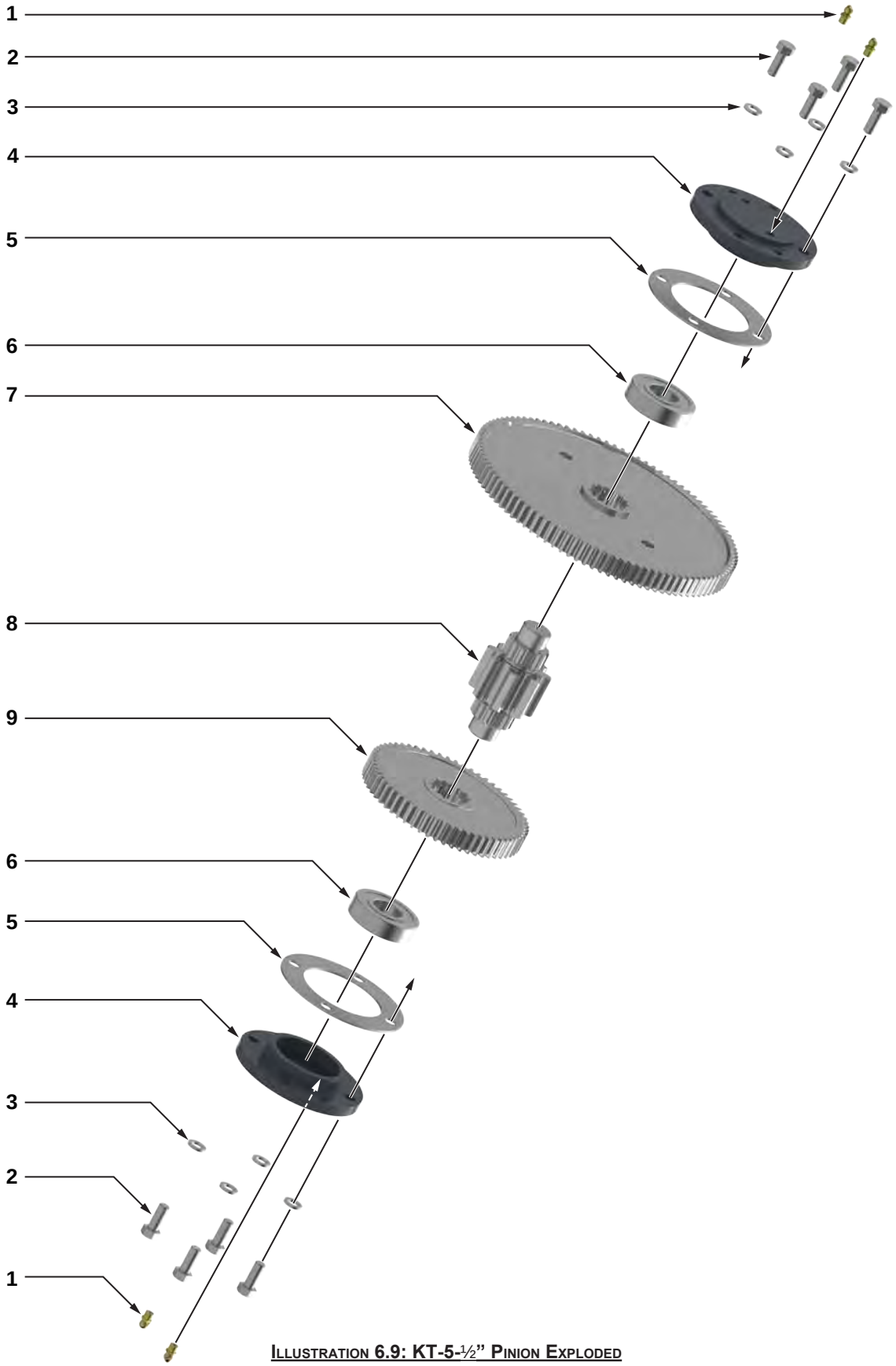


ILLUSTRATION 6.9: KT-5-½" PINION EXPLODED

ILLUSTRATION 6.10: KT-5-½" PINION

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	⅛" NPT 90° grease fitting	4	02-0093			4
2	Part	½" UNC x 1-¼" hex bolt	8	09-1168			
3	Part	½" lock washer	8	09-5110			
4	Part	Pinion bearing cap	2	997-D15-89			
5	Part	Pinion bearing spacer	2	1400-89A			
6	Part	Pinion bearing	2	02-0007		2	2
7	Part	Low pinion gear	1	997-A5-88			
8	Part	Pinion gear	1	997-A7-86			
9	Part	High pinion gear	1	997-A4-87			

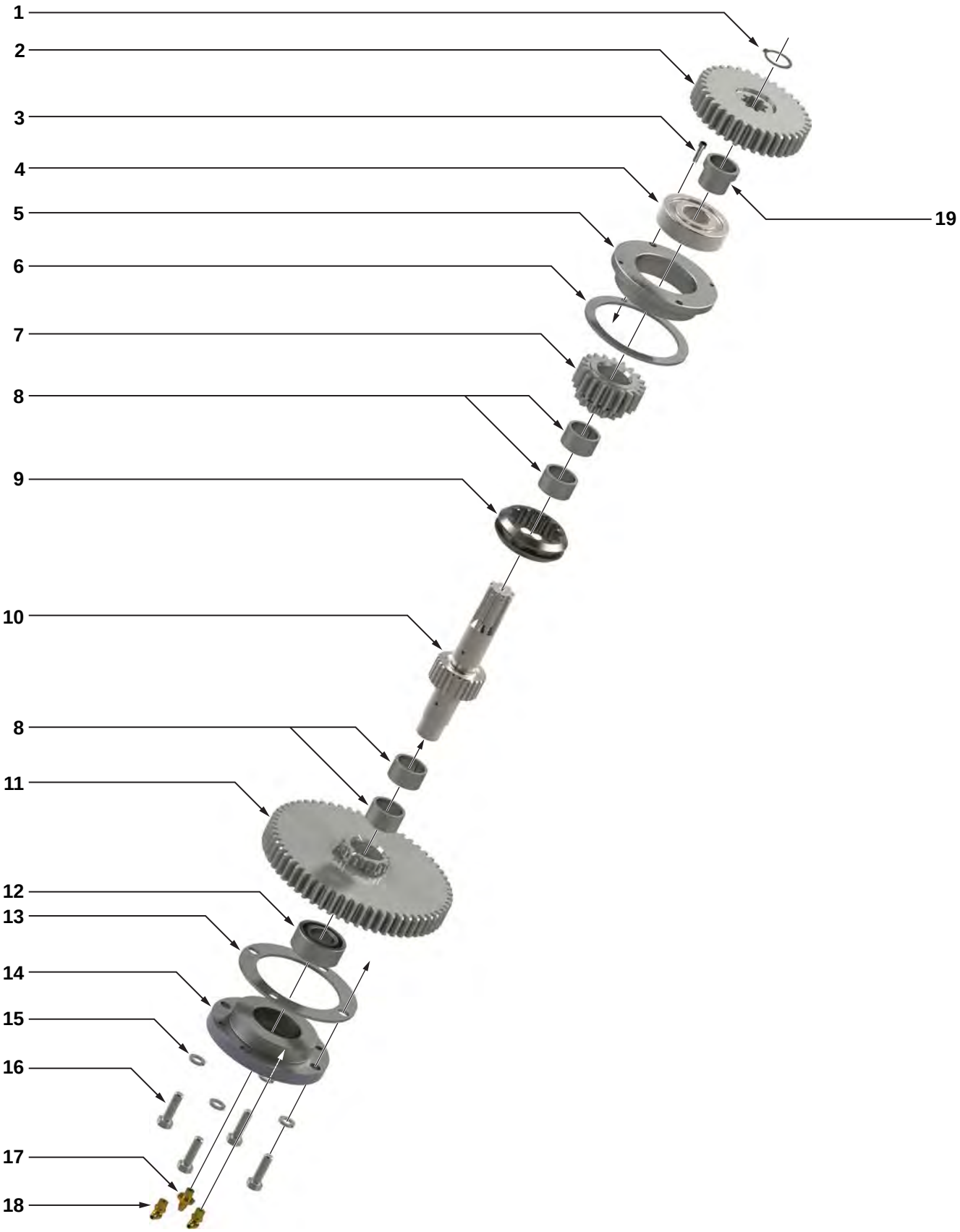


ILLUSTRATION 6.11: KT-5-½" CLUTCH EXPLODED

ILLUSTRATION 6.12: KT-5-½" CLUTCH

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	Outside snap ring	1	02-0001			1
2	Part	Drive shaft / clutch gear	1	997-A3-61			1
3	Part	#10-24 x ¾" hex socket head cap screw	2	09-0001			
4	Part	Top clutch bearing	1	02-0002		1	1
5	Part	Top clutch bearing retainer	1	997-D11-59			
6	Part	Top clutch bearing retainer spacer	1	1400-59A			
7	Part	Low clutch gear	1	997-A1-52			1
8	Part	Needle bearing	4	02-0003			4
9	Part	Shifting collar	1	997-A9-62			1
10	Part	Clutch shaft	1	997-A8-50			1
11	Part	High clutch gear	1	997-A1-51			1
12	Part	Bottom clutch bearing	1	02-0004		1	1
13	Part	Clutch bearing cap spacer	1	1400-54A			
14	Part	Clutch bearing cap	1	997-D11-54			
15	Part	⅜" lock washer	4	09-5106			
16	Part	⅜" UNC x 1-¼" hex bolt	4	09-1048			
17	Part	Grease fitting, ⅛" NPT	1	02-0005			1
18	Part	Grease fitting, ⅛" NPT x 90°	2	02-0093			2
19	Part	Clutch bearing bushing	1	997-60			1

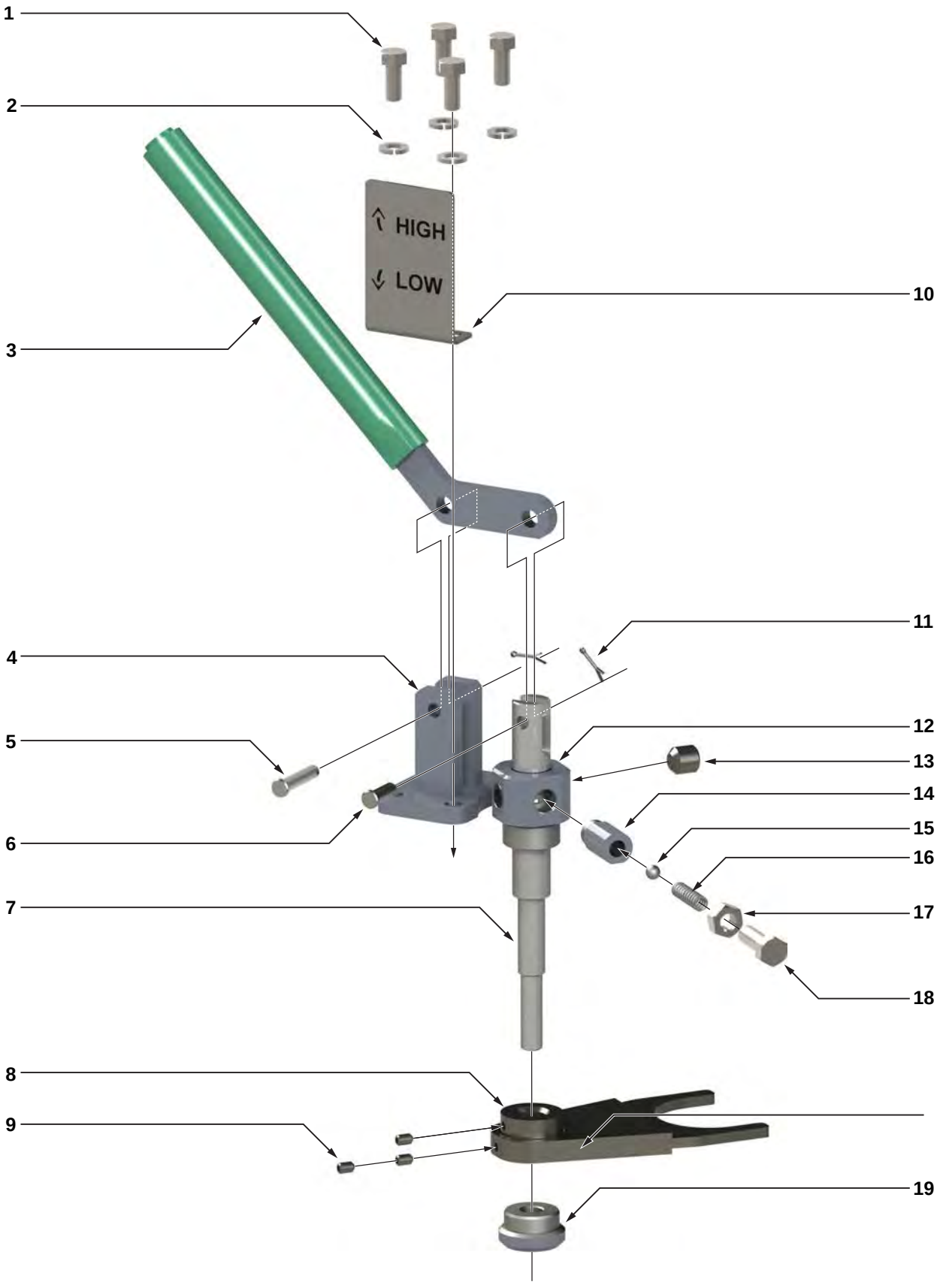


ILLUSTRATION 6.13: KT-5-½" SHIFTER EXPLODED

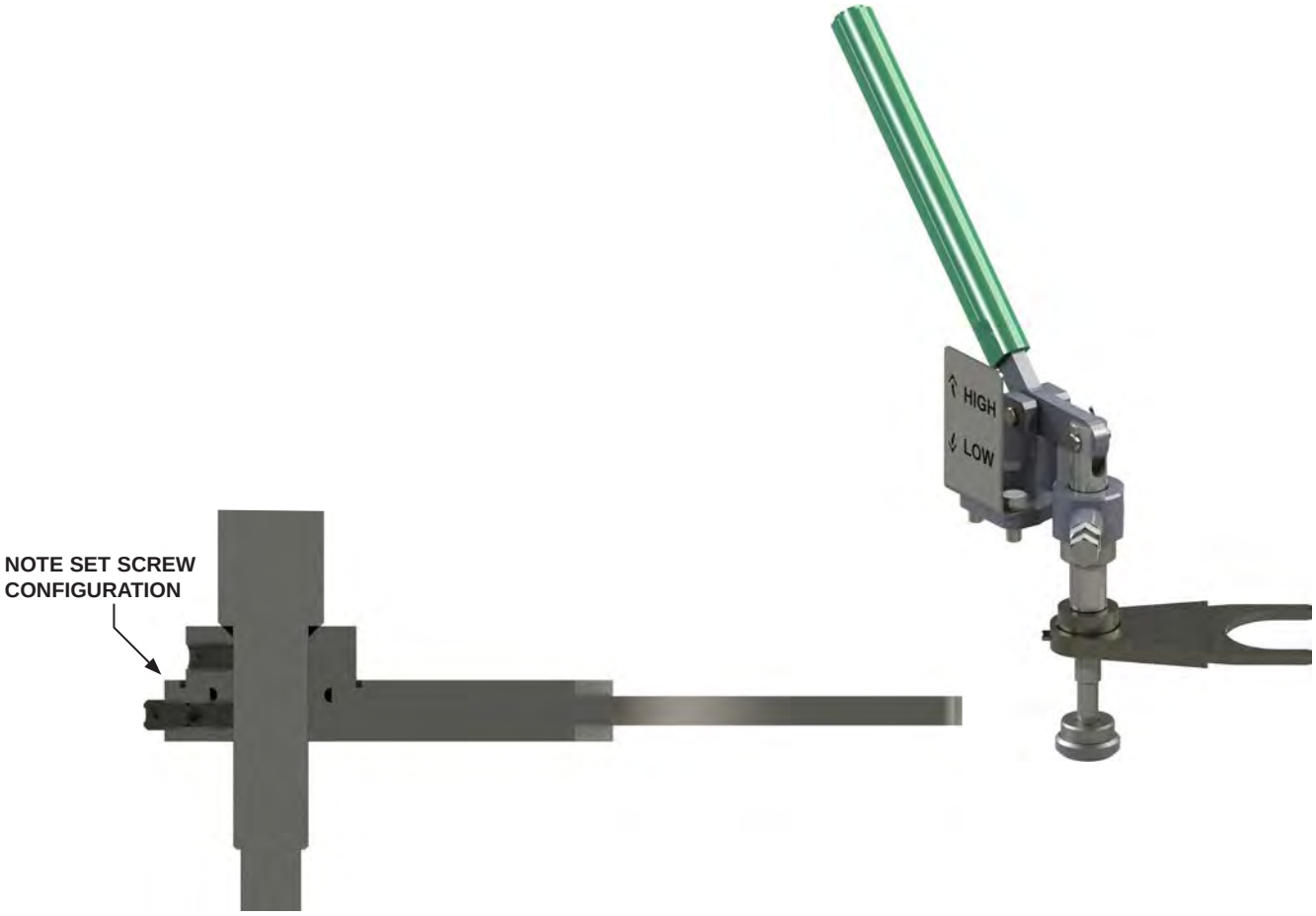


ILLUSTRATION 6.14: KT 5-½" SHIFTER

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Ass'y)		
					Critical	One-Year	Overhaul
1	Part	⅜" UNC x 1" hex bolt	4	09-1046			
2	Part	⅜" lock washer	4	09-5106			
3	Weldment	Shifting handle weldment	1	1037-D-20B			
4	Weldment	Shifter lug weldment (bolted)	1	101-0016			
5	Part	5/16" x 1-½" clevis pin	1	09-0256		1	
6	Part	5/16" x 1" clevis pin	1	02-0020		1	
7	Part	Shifting shaft	1	101-5999		1	1
8	Weldment	Shifting fork	1	101-6166			1
9	Part	¼" UNC x ⅜" hex socket set screw	3	09-0107			
10	Part	Shifter label	1	101-5546			
11	Part	Cotter pin / hitch pin	2				2
12	Part	Top shifter bushing (threaded)	1	101-0020		1	1
13	Part	⅝" UNC x ⅝" hex socket set screw	3				
14	Part	Threaded shifter detent tube	1	101-0019			1
15	Part	Detent ball	1	02-0018		1	1
16	Part	Detent spring	1	997-0-64		1	1
17	Part	7/16" UNF hex jam nut	1	09-5508		1	1
18	Part	7/16" UNF x 1-¼" hex bolt	1	09-1608		1	1
19	Part	Bottom shifter bushing (typically welded to bottom plate	1	1064-B1-95			

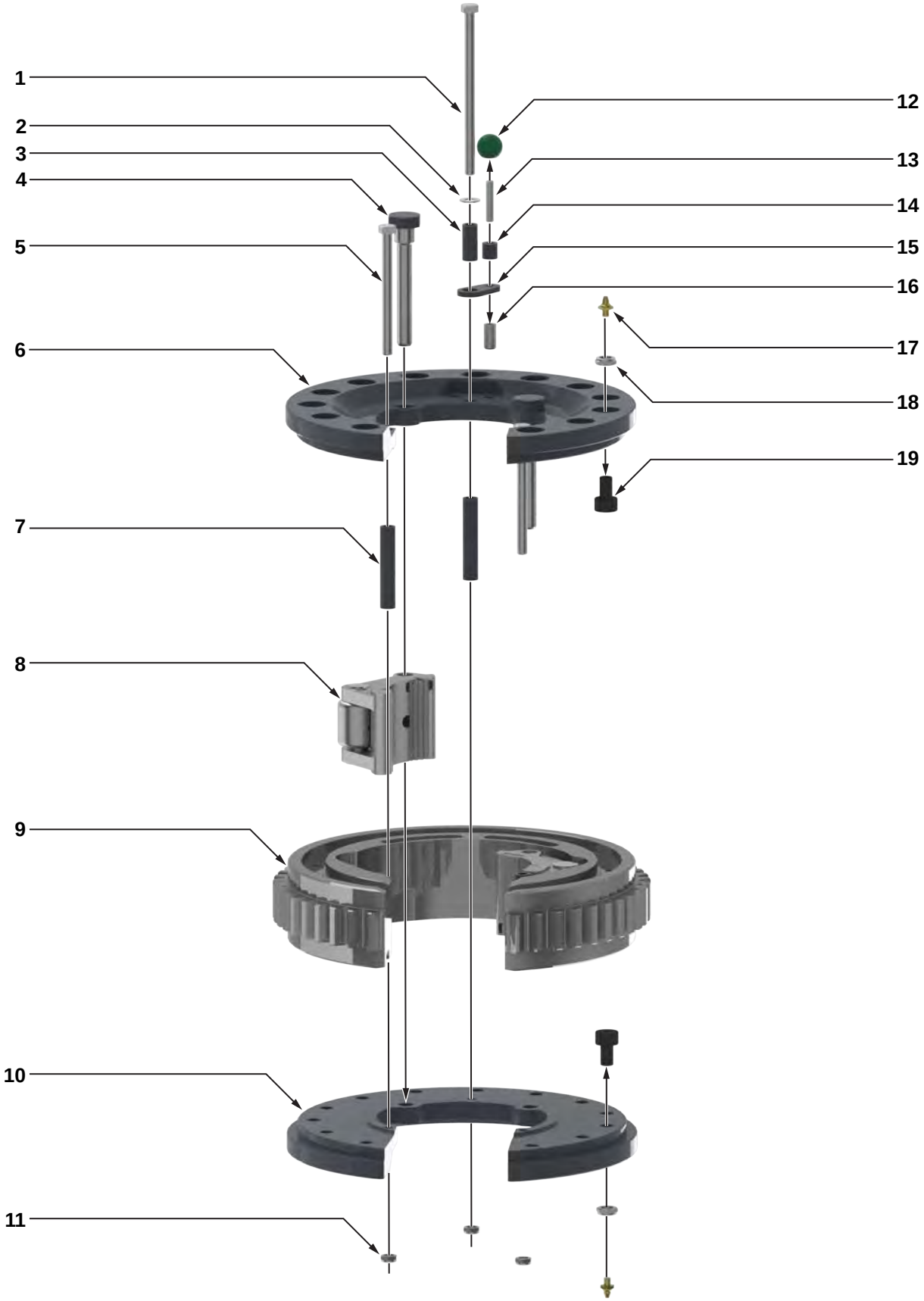


ILLUSTRATION 6.15: KT-5-½" CAGE PLATE EXPLODED

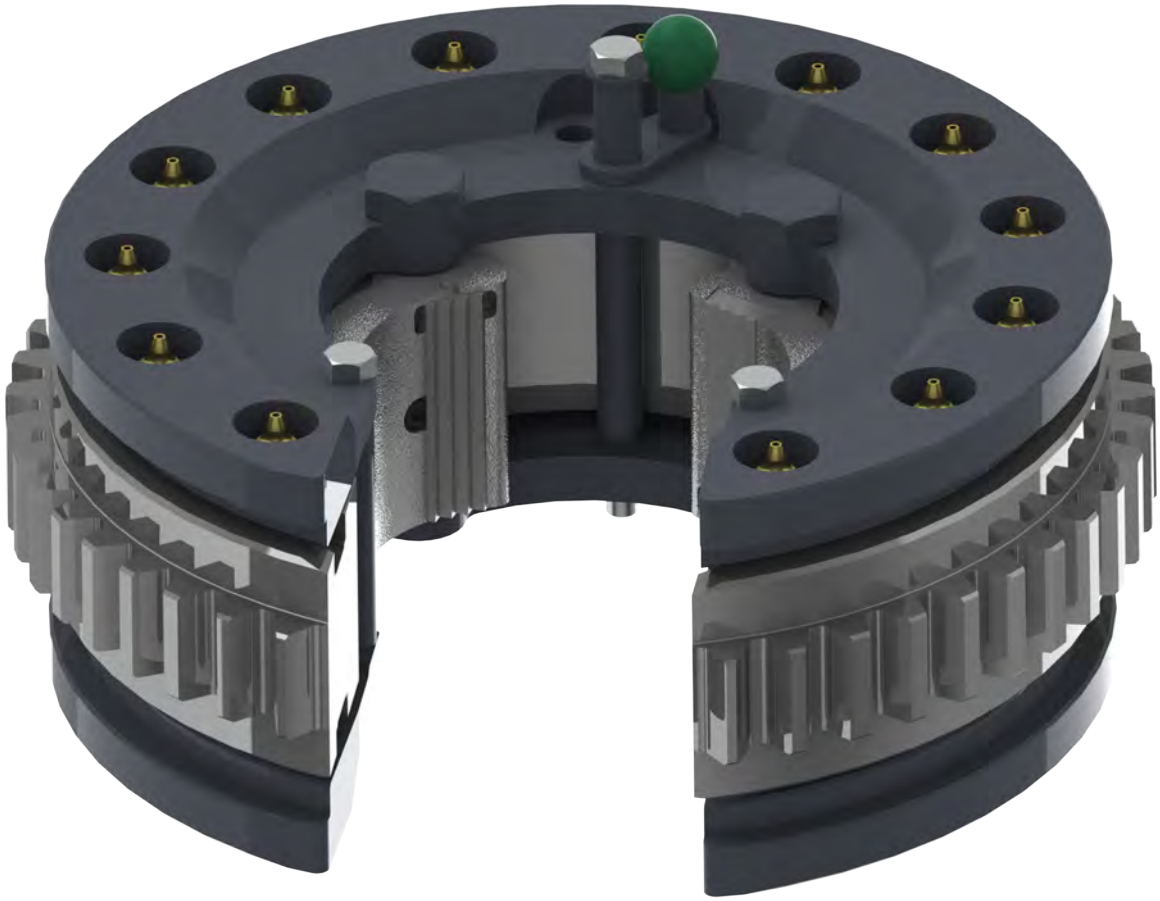


ILLUSTRATION 6.16: KT-5-½" CAGE PLATE ASSEMBLY

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	½" UNC x 8" hex bolt	1	09-1198			
2	Part	½" narrow flat washer	1	09-5119			
3	Part	Backing pin spacer	1	101-4093			1
4	Part	Jaw pivot bolt	2	1064-28	2		2
5	Part	½" UNC x 6" hex bolt	2	09-1190			
6	Part	Top cage plate	1	1400-21			
7	Part	Cage plate spacer	3	1064-38		3	
8	Assembly	Jaw assembly (5-½" shown - see Pp. 6.24 - 6.26)	2				
9	Part	Rotary gear	1	1064-D1			
10	Part	Bottom cage plate	1	1400-22			
11	Part	½" UNC thin nylock nut	3	09-5610S			
12	Part	Backing pin knob	1	02-0017			1
13	Part	⅜" UNC x 1-½" threaded dowel pin	1	101-4097		1	
14	Part	Backing pin spacer	1	101-4096			1
15	Part	Backing pin retainer	1	101-4095			1
16	Part	Backing pin	1	101-4094	1		1
17	Part	FITTING, GREASE, STRAIGHT 3/16 DRIVE	26	02-0012			26
18	Part	⅝" UNF thin nylock nut	26	09-5915	5		26
19	Part	Cam follower	26	02-0016	5		26

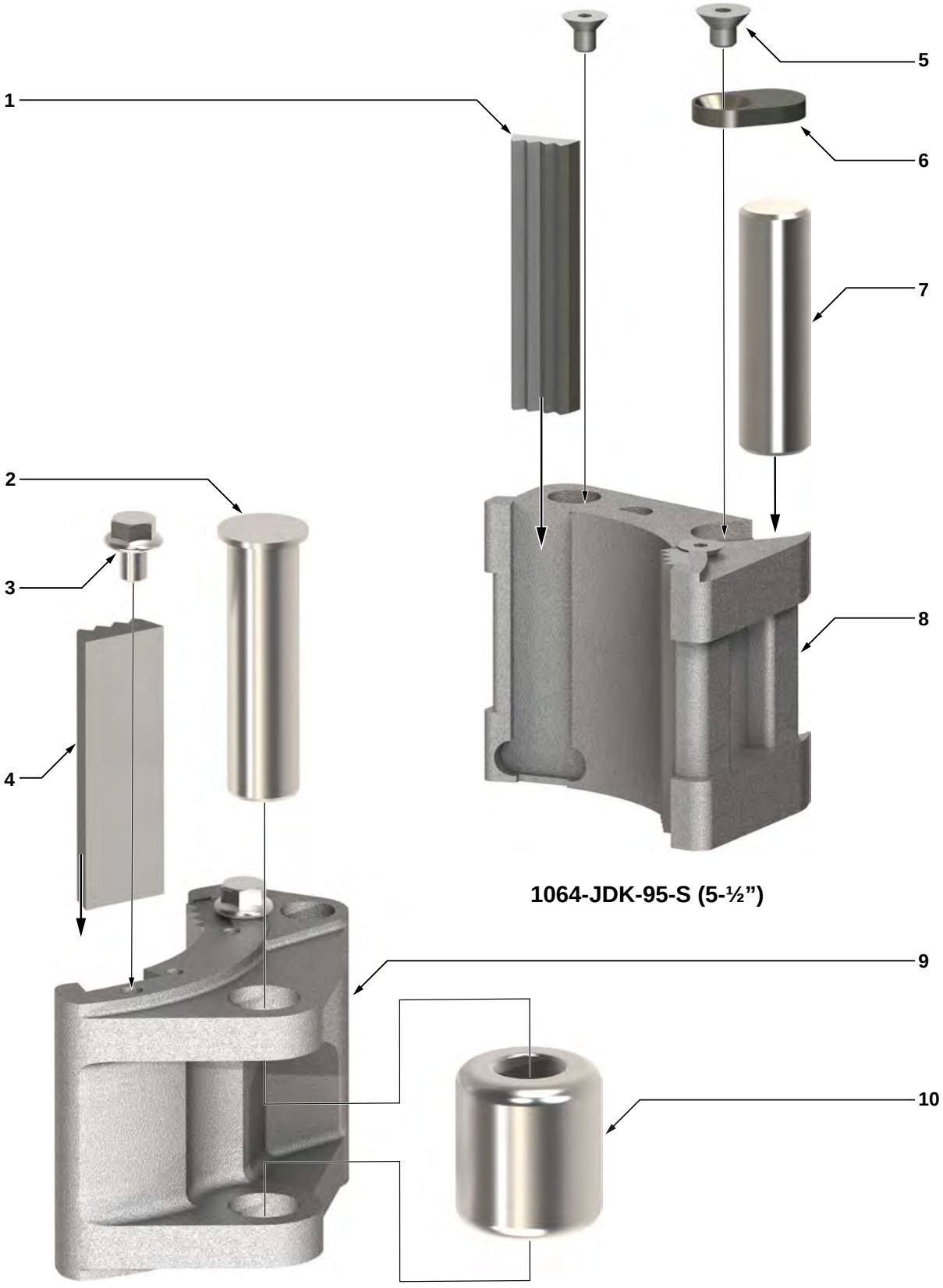


ILLUSTRATION 6.17: KT-5-½" 1064-JDK-XX JAW DIE KITS EXPLODED

ILLUSTRATION 6.18: 1064-JDK-XX 2-⅜" TO 5" JAW DIE KIT

ILLUSTRATION 6.19: 1064-JDK-95-S 5-½" JAW DIE KIT

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	1" x 3.875" flat die, 5-½" jaw dit kit only	2	12-0006-314-0	♦		
2	Part	Jaw pin	1	101-1581	1		
3	Part	⅜" UNC x ½" flanged jaw die retainer bolt	2	09-0229			
4	Part	Jaw die, contoured, for 2-⅜" jaw die kit only	2	12-0004	♦		
	Part	Jaw die, contoured, for 2-⅞" jaw die kit only	2	12-0007	♦		
	Part	Jaw die, flat, for 3" through 5" jaw die kits	2	13-0008-314-0	♦		
5	Part	5/16" UNC x ½" hex socket flat head screw	2	09-1338			
6	Part	Jaw roller retainer, 5-½" jaw die kit	1	101-5840	1		
7	Part	Jaw roller, 5-½" jaw die kit only	1	101-6163	1		
8	Weldment	5-½" jaw weldment	1	1064-J-5500			
9	Part	2-⅜" to 5" jaw casting	1	1064-JC-XXX			
10	Part	Jaw roller	1	997-JR-200 (1)	1		
	Part	Jaw roller	1	997-JR-1875 (2)	1		
	Part	Jaw roller	1	997-JR-2063 (3)	1		

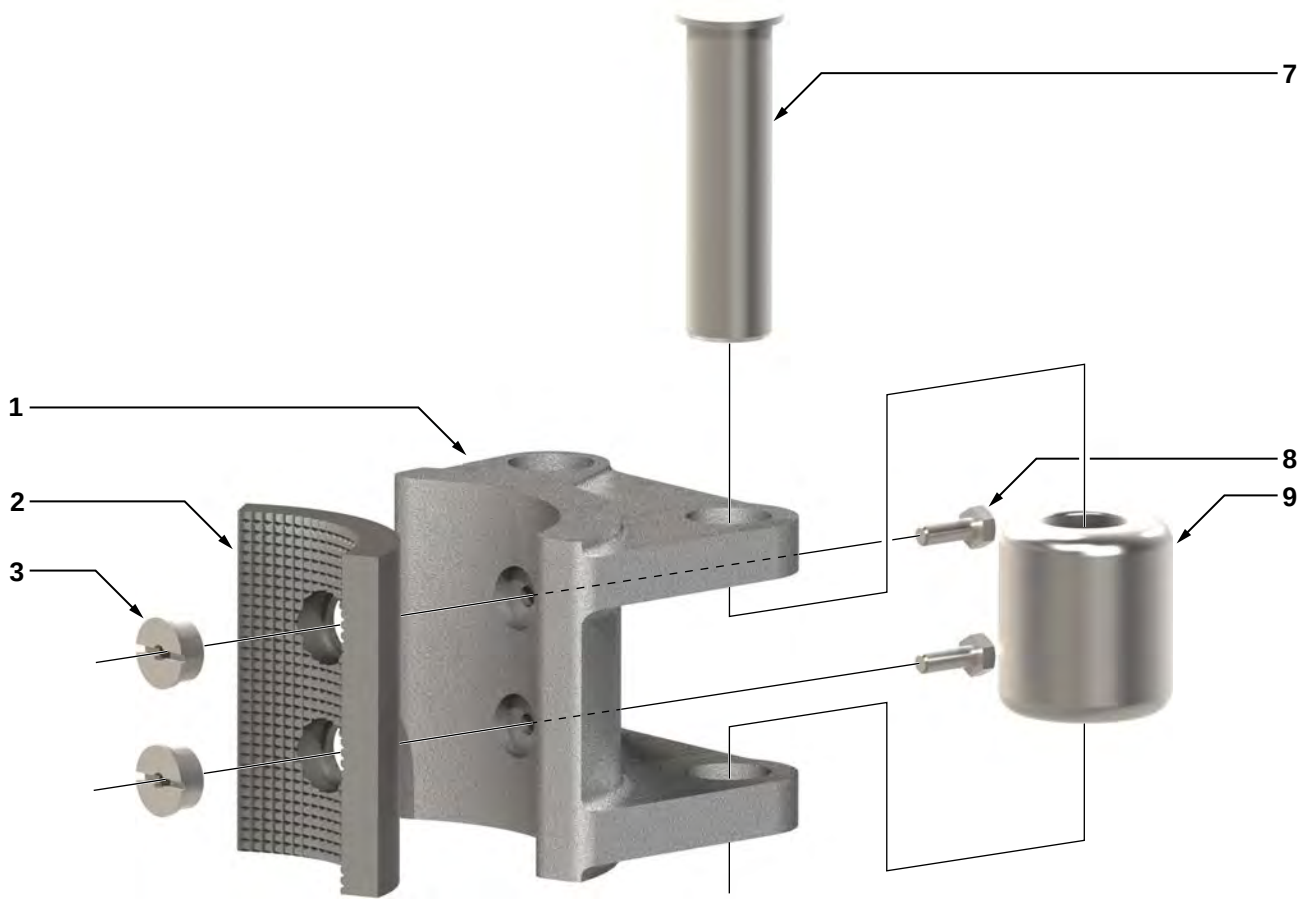
♦ Stock 48 jaw dies for every jaw size in use

(1) Applies to standard jaw die kits 1064-JDK-65, 1064-JDK-70, 1064-JDK-75, and 1064-JDK-90.

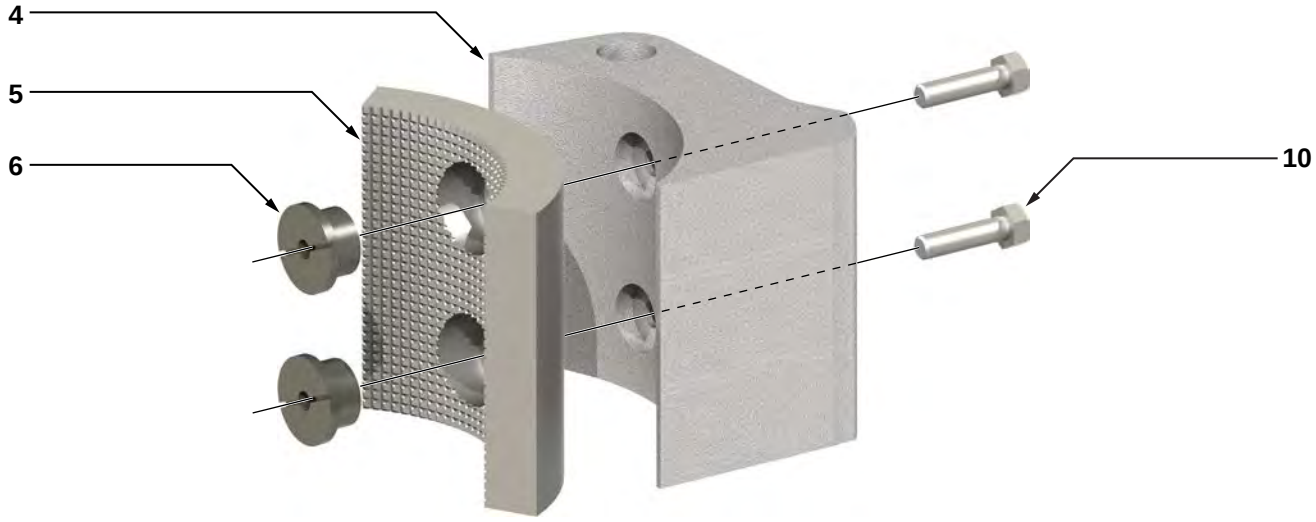
(2) Applies to standard jaw die kit 1064-JDK-71.

(3) Applies to standard jaw die kit 1064-JDK-80 and 1064-JDK-85.

Contact your sales representative to determine the appropriate jaw roller part number for all jaw die kits not listed above.



1064-WJK-350



1064-WJK-550

ILLUSTRATION 6.20: KT-5-½" WRAP-AROUND JAW DIE KITS EXPLODED

ILLUSTRATION 6.21: 1064-WJK-350 WRAP-AROUND JAW DIE KIT

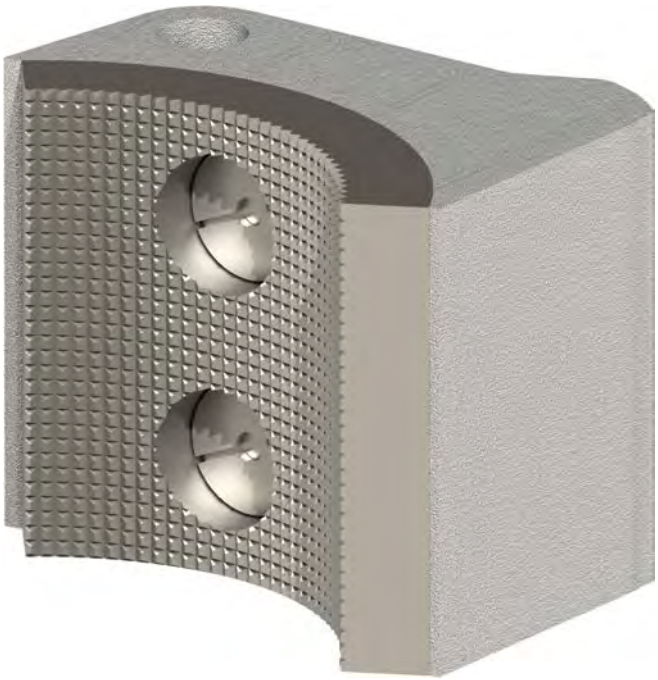


ILLUSTRATION 6.22: 1064-WJK-550 WRAP-AROUND JAW DIE KIT

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Weldment	Wraparound jaw, 2-⅜" to 3-½"	1	1064-WJ-350			
2	Part	Wraparound jaw die insert, 2-⅜"	1	12-2001	♦		
	Part	Wraparound jaw die insert, 2-⅞"	1	12-2003	♦		
	Part	Wraparound jaw die insert, 3-½"	1	12-2006	♦		
3	Part	¾" die retainer button, ¼" UNC	2	29-50	2		
4	Part	Solid wraparound jaw, 4" to 5-½"	1	1064-WJ-550			
5	Part	Wraparound jaw die insert, 4"	1	12-2007	♦		
	Part	Wraparound jaw die insert, 4-½"	1	12-2009	♦		
	Part	Wraparound jaw die insert, 5"	1	12-2011	♦		
	Part	Wraparound jaw die insert, 5-½"	1	12-2012	♦		
6	Part	⅞" die retainer button, $^{5}/_{16}$" UNC	2	10-94	2		
7	Part	Jaw pin	1	101-1581	1		
8	Part	¼" UNC x ¾" hex bolt	2	09-1005			
9	Part	Jaw roller	1	997-JR-200	1		
10	Part	$^{5}/_{16}$" UNC x 1-¼" hex bolt	2	09-1028			

♦ Stock one complete set of spare wrap-around jaw dies (2 dies per set) for every size in use

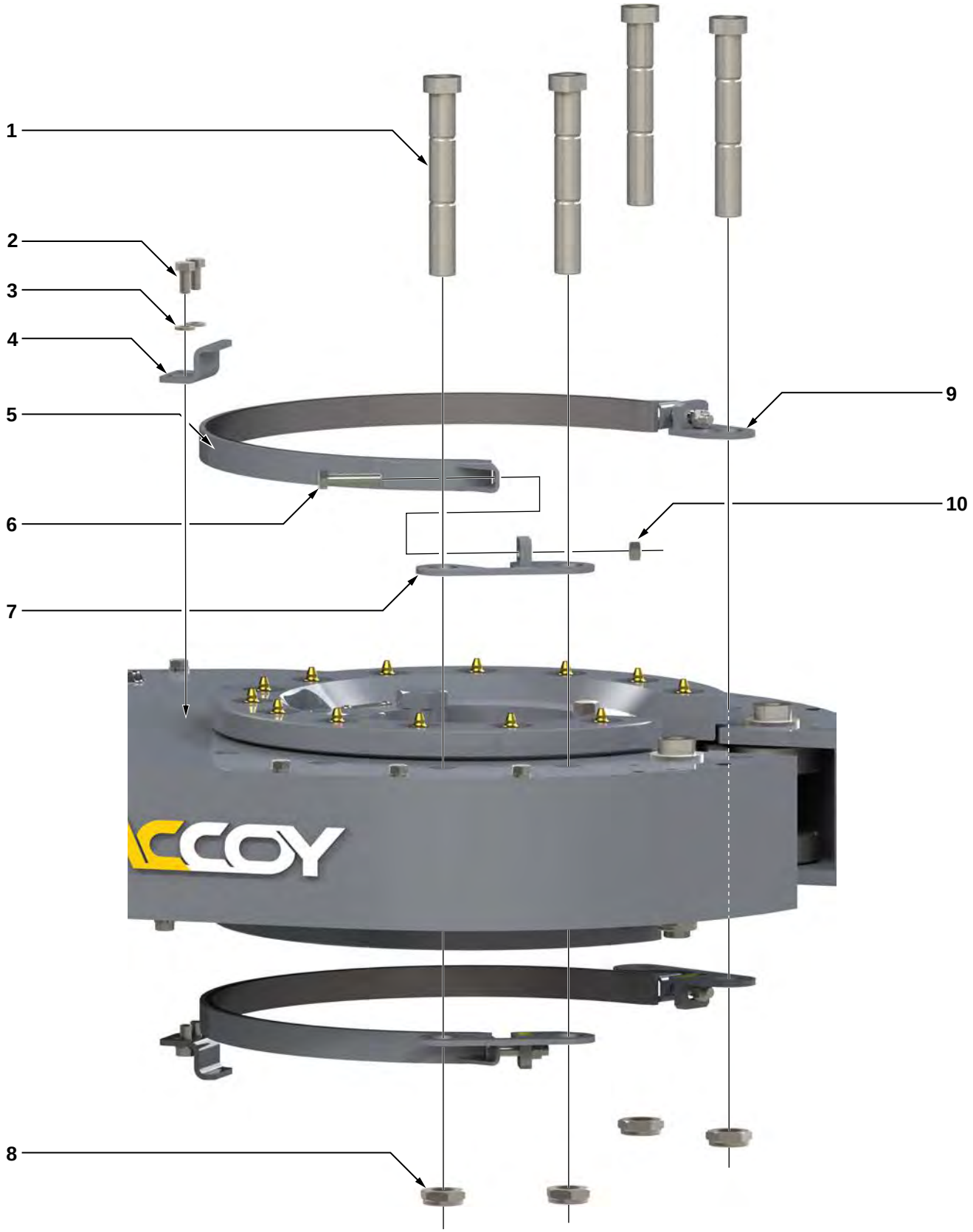


ILLUSTRATION 6.23: KT-5-½" BRAKE BANDS EXPLODED

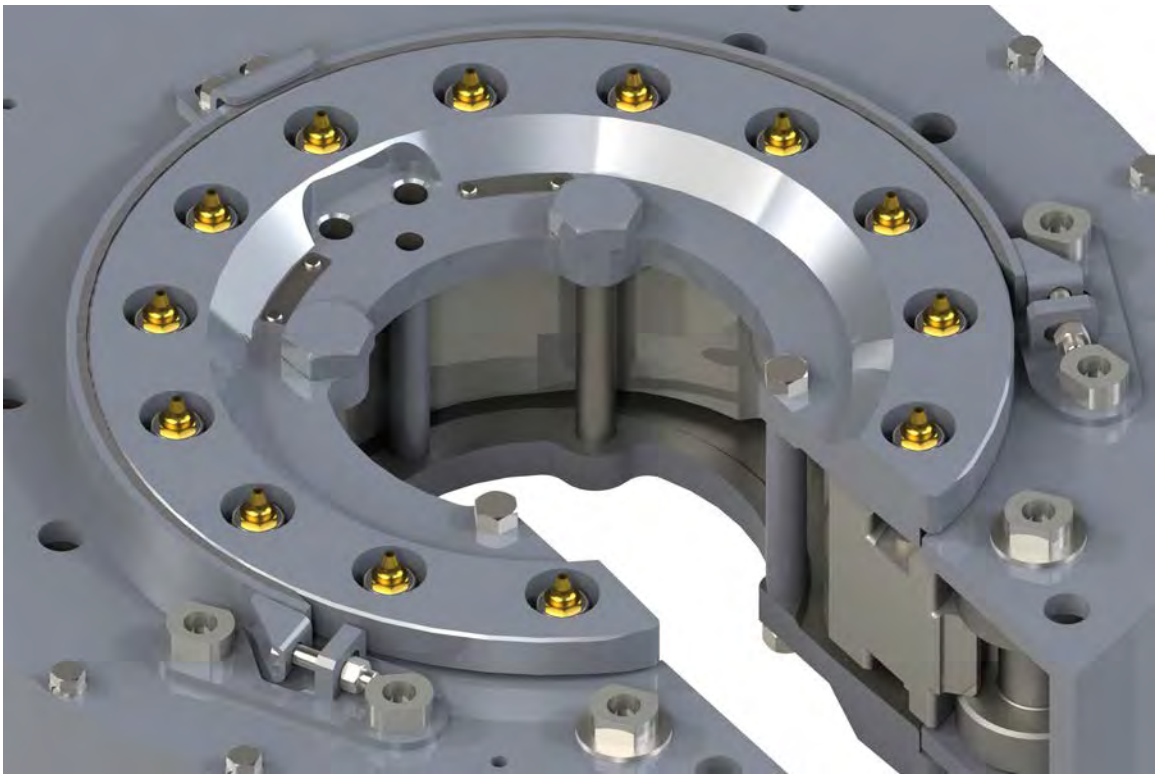


ILLUSTRATION 6.24: BRAKE BANDS

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	Support roller shaft (shown for illustration purposes)	4	101-3942			
2	Part	⅜" UNC x ¾" hex bolt	4	09-1044			
3	Part	⅜" lock washer	4	09-5106			
4	Part	Brake band retainer	1	101-0140		1	
5	Weldment	Lined brake band weldment	2	1064-D4-29	2		2
6	Part	⅜" UNC x 1-¾" hex bolt	4	09-1557			
7	Weldment	Top RH/bottom LH brake band lug weldment	2	101-0132		1	
8	Part	⅞" UNF narrow nylock nut (shown for illustration purposes)	4	09-5722			
9	Weldment	Top LH/bottom RH Brake band lug weldment	2	101-0134		1	
10	Part	⅜" UNC hex nylock nut	4	09-5607			

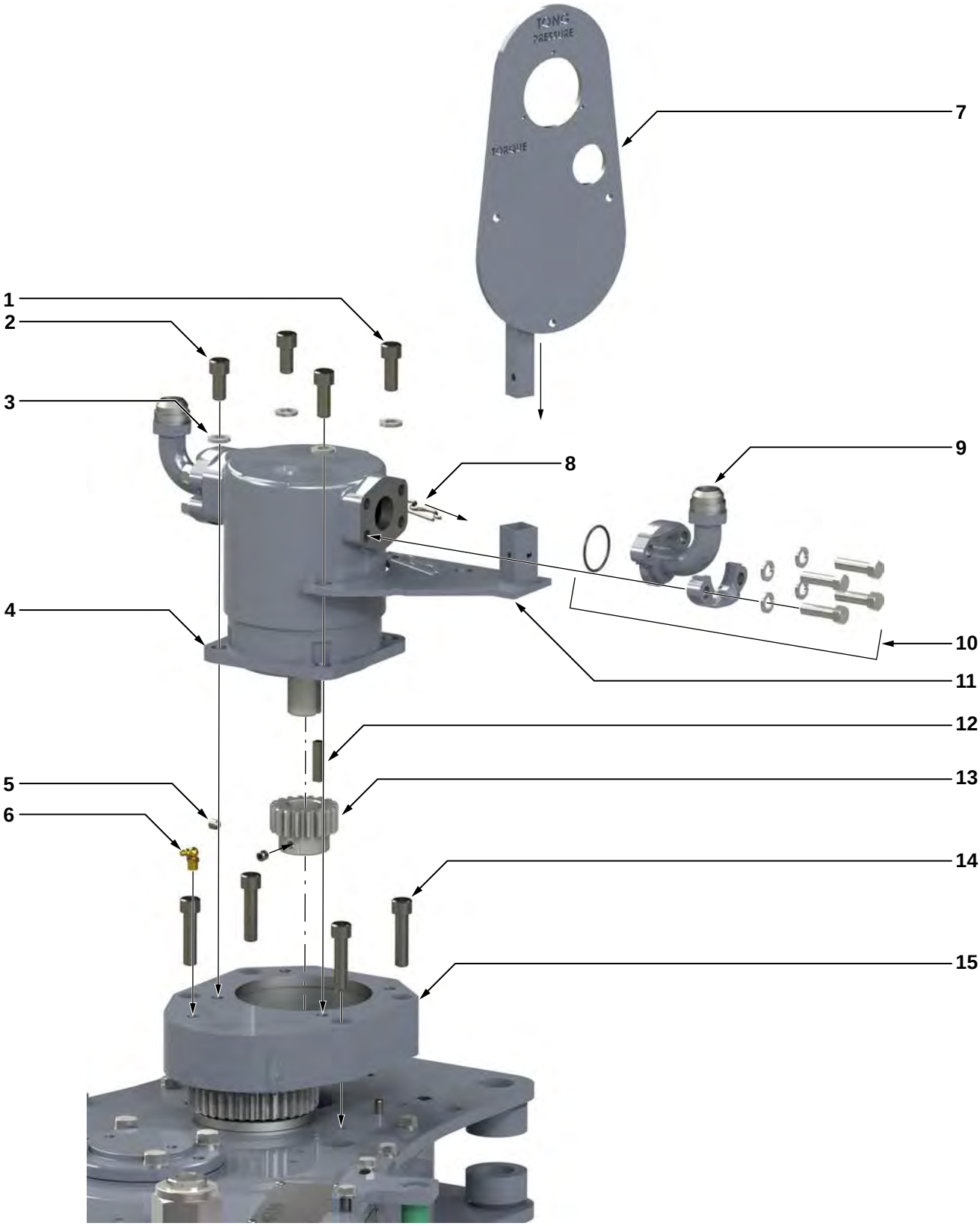


ILLUSTRATION 6.25: KT-5-½" MOTOR & MOUNT EXPLODED

ILLUSTRATION 6.26: MOTOR & MOUNT

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	½" UNC x 1-¼" hex socket head cap screw	2	09-2168			
2	Part	½" UNC x 1" hex socket head cap screw	2	09-2166			
3	Part	½" lock washer	4	09-5110			
4	Part	Hydraulic motor	1	87-0110			
5	Part	⅜" UNC x ⅜" hex socket set screw	2	09-0106			2
6	Part	⅛" NPT 90° grease fitting	1	02-0093			1
7	Weldment	Torque gauge mount weldment	1	101-6122			
8	Part	0.148 X 2.938 hitch pin	1	09-0090			
9	Part	#20 (1-¼")/JIC 1" flange elbow	2	02-9216			
10	Part	#20 (1-¼") split flange kit	2	02-9217			
	Part	O-Ring	1				
	Part	#20 (1-¼") split flange	2				
	Part	7/16" lock washer	4				
	Part	7/16" UNC x 1-½" hex bolt	4				
11	Weldment	Torque gauge holder weldment	1	1500-09-04A			
12	Part	Square 5/16" x 5/16" x 1-½" key	1	01-0317			1
13	Part	Motor gear	1	997-A10-149			1
14	Part	½" UNC x 2" hex socket head cap screw	4	09-0234			
15	Part	Motor mount	1	1400-150			
16	Kit	Motor seal kit	87-7110		1		1

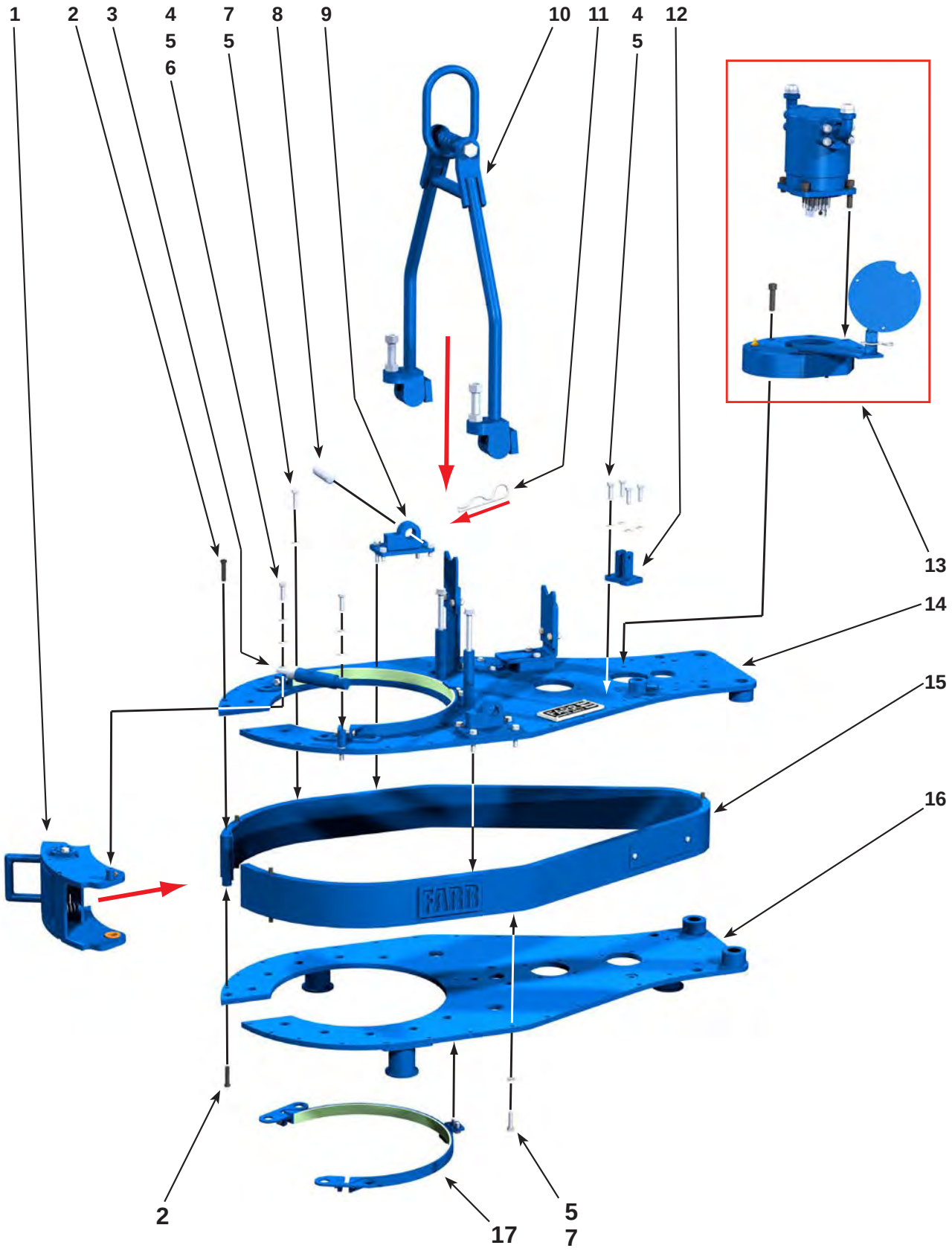


ILLUSTRATION 6.27: KT-5-½" TONG BODY EXPLODED

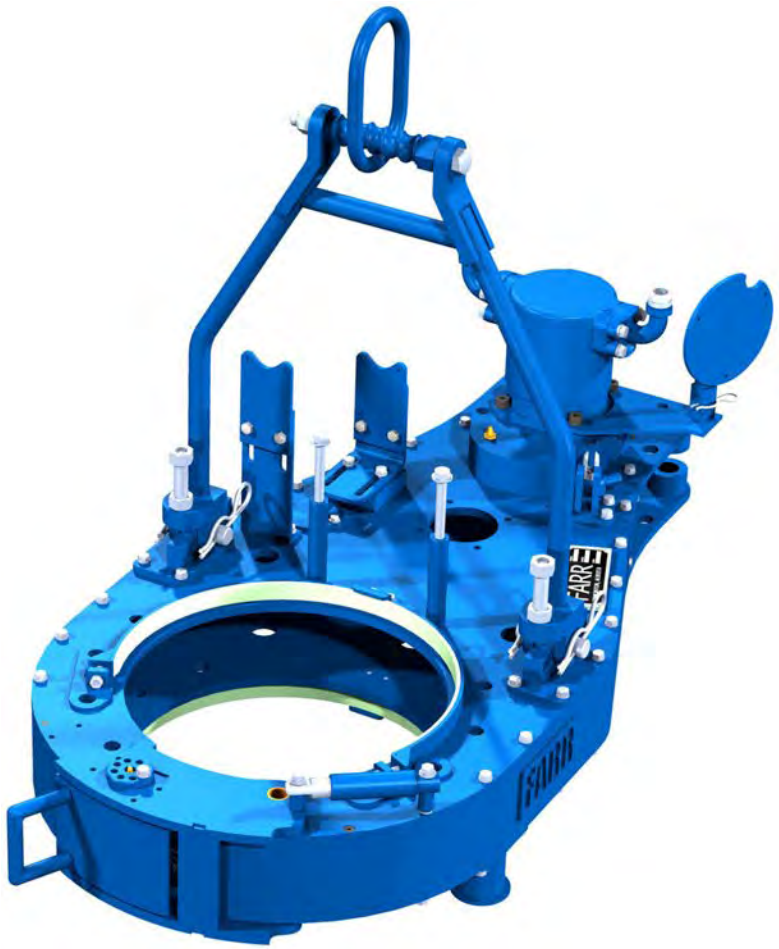


ILLUSTRATION 6.28: TONG BODY

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Assembly	Door assembly (see Pp. 7.30 - 7.31)	1				
2	Part	⅜" UNC x 1-¾" hex socket head cap screw	5	09-2052			
3	Assembly	Door cylinder assembly	1	101-0069			
4	Part	⅜" UNC x 1-¼" hex bolt	2	09-1048			
5	Part	⅜" carbon steel lock washer	39	09-5106			
6	Part	⅜" narrow flat washer	2	09-5124			
7	Part	⅜" UNC x 1-½" hex bolt	29	09-1050			
8	Part	Rigid sling pin	2	1053-C-1C			
9	Weldment	Rigid sling bracket	2	101-0151			
10	Assembly	Rigid sling (see Pp. 7.32 - 7.33)	1				
11	Part	Hitch pin, ¼" x 5"	4	09-9075			
12	Weldment	Shifter lug weldment	1	101-0016			
13	Assembly	Motor & motor mount (See Pp. 7.26 - 7.27)	1				
14	Part	Top plate	1	1400-7T			
15	Weldment	Side body weldment	1	101-0236			
16	Part	Bottom plate	1	1400-7B			
17	Part	Brake band assembly (See Pp. 7.24 - 7.25)	2				

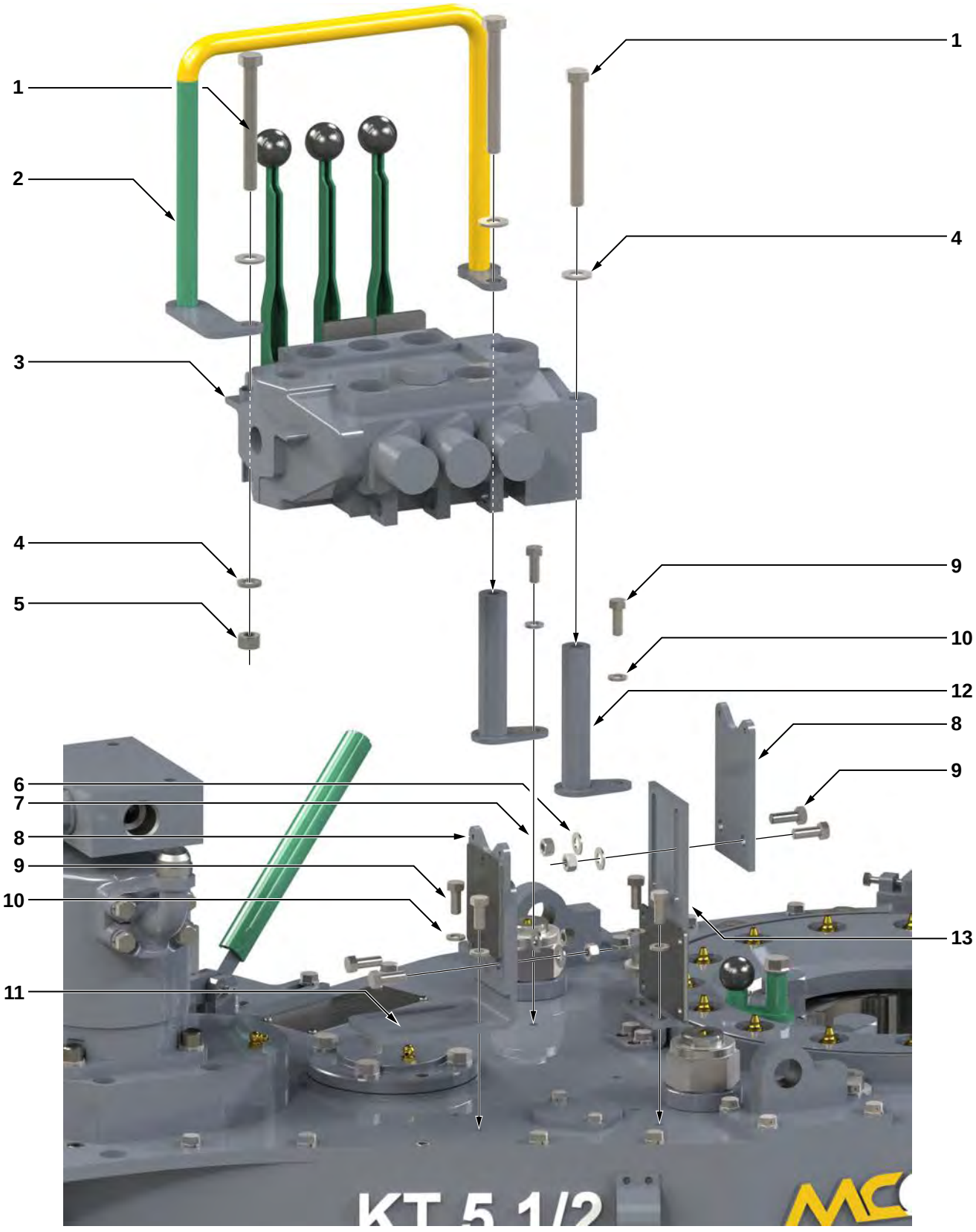


ILLUSTRATION 6.29: KT-5-½" HYDRAULIC SUPPORTS

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	½" UNC x 4-½" hex bolt	3	09-9119			
2	Weldment	Valve guard weldment	1	CE-HANDLE-3			
3	Assembly	DVA35 valve assembly (see Pp. 2.13 - 2.16)	1				
4	Part	½" lock washer	1	09-5110			
5	Part	½" UNC hex nut	1	09-9124			
6	Part	⅜" narrow flat washer	4	09-5124			
7	Part	⅜" UNC hex nylock nut	4	09-5607			
8	Part	Adjustable support plate	2	101-0022			
9	Part	⅜" UNC x 1" hex bolt	10	09-1046			
10	Part	⅜" lock washer	6	09-5106			
11	Part	Hydraulic support base (discharge)	1	101-0023			
12	Weldment	Hydraulic valve support post	2	101-1442			
13	Weldment	Hydraulic support base (inlet)	1	101-1138			

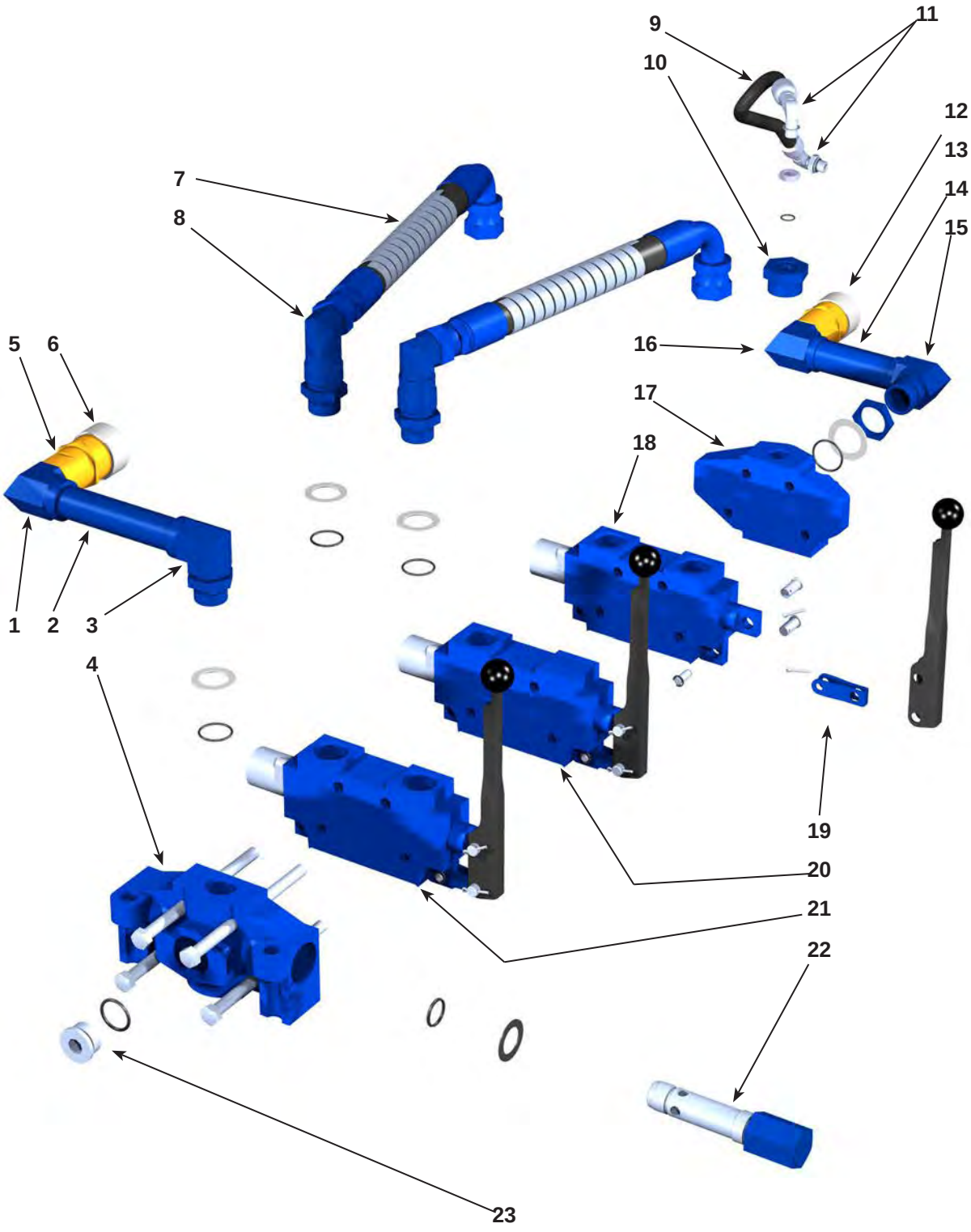


ILLUSTRATION 6.30: KT-5-½" HYDRAULIC VALVE ASSEMBLY EXPLODED

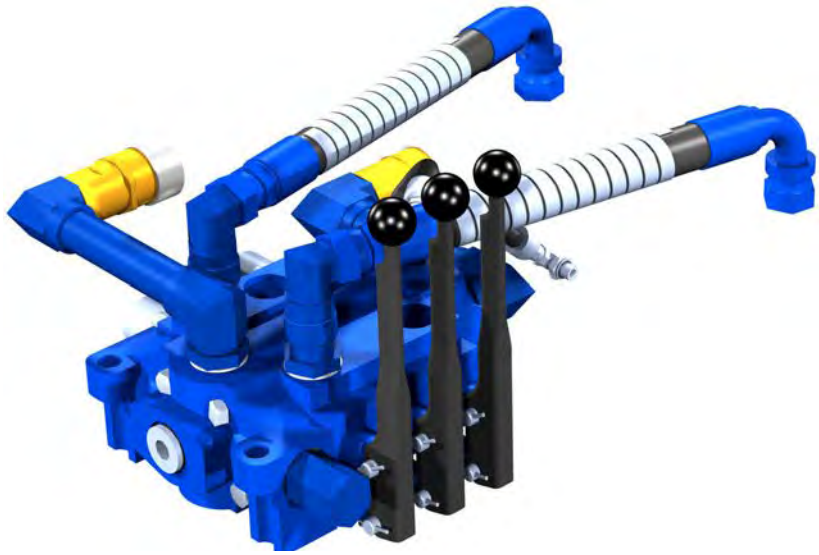


ILLUSTRATION 6.31: KT-5-½" HYDRAULIC VALVE ASSEMBLY

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	M-NPT/F-NPT 90° 1" fitting	1	02-9221			
2	Part	1" long nipple	1	101-0079			
3	Assembly	M-ORB/F-NPT 90° 1" fitting (includes seals)	1	02-9206			
4	Part	Hydraulic inlet section	1	10-9016			
5	Part	Male 1" quick coupler fitting	1	02-9214			
6	Part	1" dust cap	1	02-9213			
7	Assembly	1" hydraulic connection hose assembly	2	08-1724			
8	Assembly	M-ORB/JIC LONG 90° 1" (includes seals)	1	02-9210			
9	Assembly	Motor drain hose assembly	1	101-0072			
10	Part	ORB hex bushing	1	10-9001			
11	Assembly	M-ORB/JIC 90° ⅜" fitting (includes seals)	2	02-9200			
12	Part	1-¼" dust cap	1	02-9212			
13	Part	Male 1-¼" quick coupler fitting	1	02-9215			
14	Part	1-¼" long nipple	1	101-0070			
15	Assembly	M-ORB/F-NPT 90° 1-¼" fitting (includes seals)	1	02-9202			
16	Part	M-NPT/F-NPT 90° 1-¼" fitting	1	02-9220			
17	Part	Hydraulic outlet section	1	10-0086			
18	Part	Backup valve section	1	10-9019			
19	Assembly	Handle assembly	3	01-0409	1		
	Part	Hydraulic valve handle	1	01-0409-HANDLE			
	Part	Valve Handle link	2	01-0409-LINK			
	Part	Hydraulic handle pin	2	01-0409-PIN1			
	Part	Hydraulic handle auxilliary pin	1	01-0409-PIN2			
	Part	Valve handle C-clip	2	01-0409-CIRCLIP			
	Part	Cotter pin	2	01-0409-COTTER			
20	Part	Lift cylinder valve section	1	10-9015			
21	Part	Motor control valve section	1	10-9014			
22	Assembly	Relief valve (includes seals)	1	10-0010R	1		1
23	Part	1" ORB plug (includes o-ring)	1	02-9222			
24	Kit	DVA35 valve seal kit	07-0004		1		3

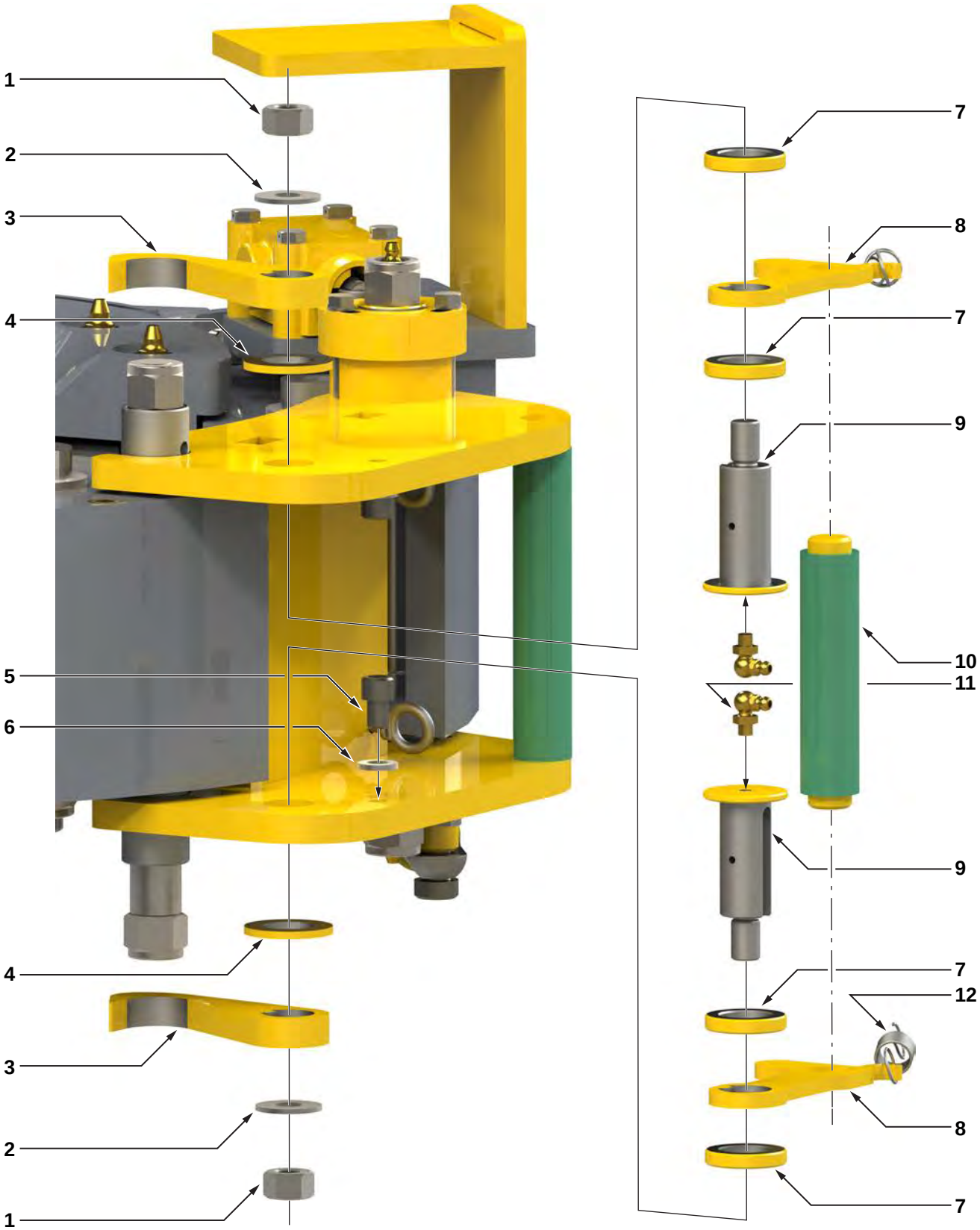


ILLUSTRATION 6.32: KT-5-½" DOOR LATCH ASSEMBLY EXPLODED

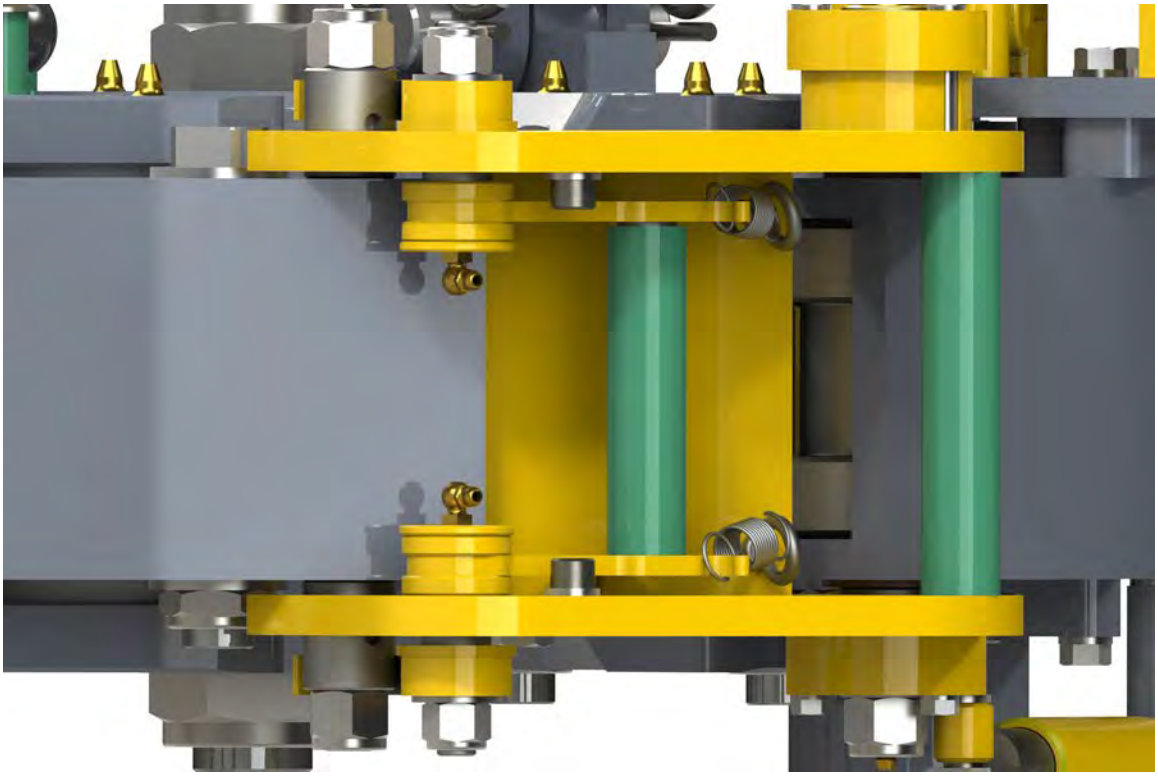


ILLUSTRATION 6.33: KT-5-½" DOOR LATCH ASSEMBLY

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	½" UNC hex nylock nut	2	09-5610		2	2
2	Part	½" narrow flat washer	2	09-5010		2	2
3	Part	Latch claw	2	101-6050	2		2
4	Part	Door latch spacer	2	101-6053			2
5	Part	⅜" UNC x ¾" hex socket head cap screw (latch handle stop)	2	09-2044			
6	Part	⅜" lock washer	2	09-5106			
7	Part	Door latch spacer	4	101-6108			4
8	Part	Door latch lever	2	101-6049			
9	Part	Door latch shaft	2	101-6107		2	2
10	Part	Door latch handle	1	101-6052			
11	Part	¼" - 28 straight thread 90° grease fitting	2	02-9272			2
12	Part	Door latch spring	2	02-E0252	2		2

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. OVERTIGHTENING WILL RESULT IN PREMATURE BUSHING FAILURE AND WILL INHIBIT ROTATION, AND MAY IMPART EXCESS STRESS ON ROTATING COMPONENTS.

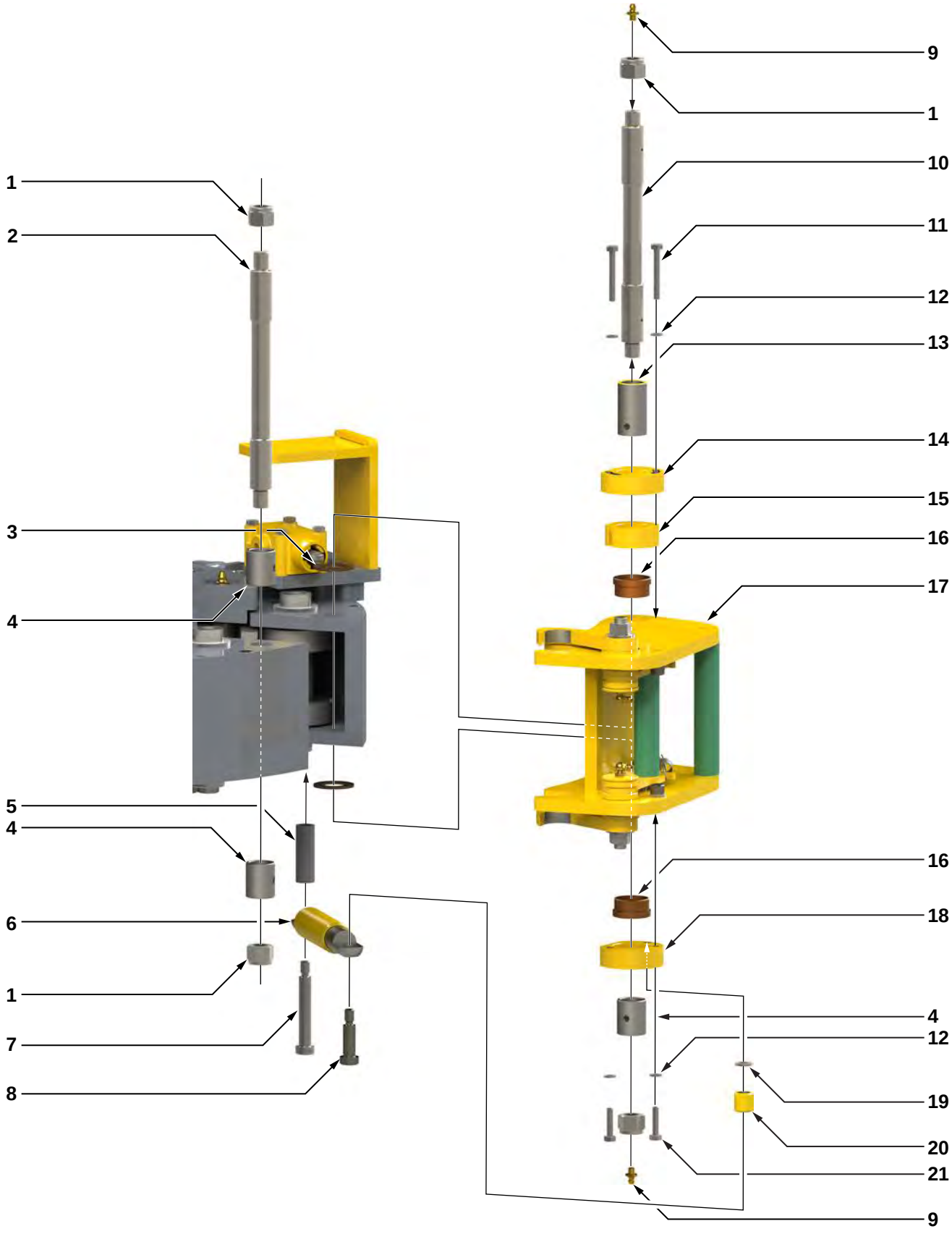


ILLUSTRATION 6.32: KT-5-½" DOOR ASSEMBLY EXPLODED

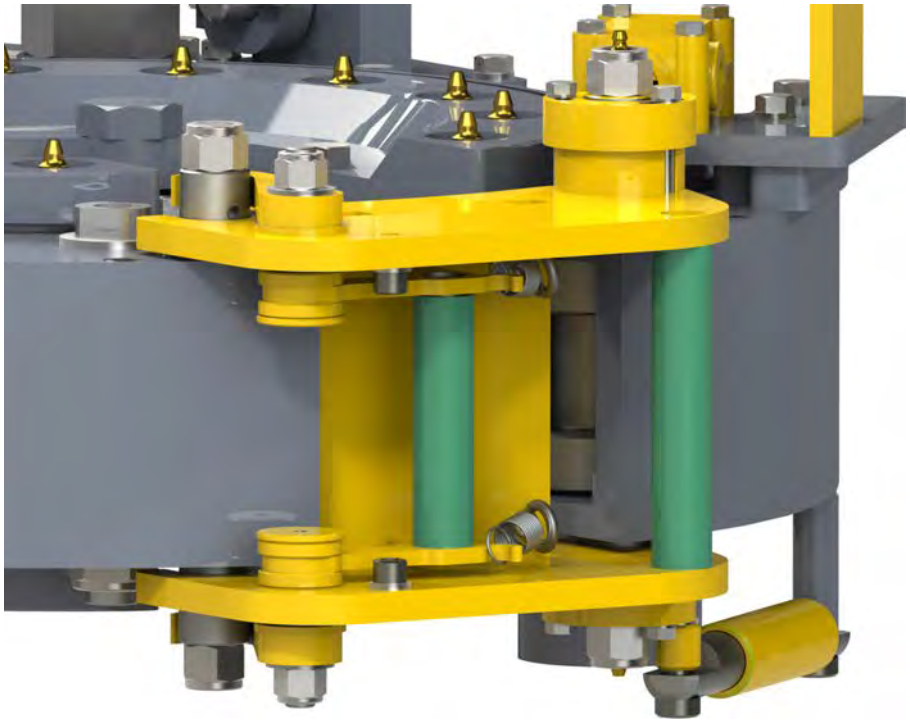


ILLUSTRATION 6.33: KT-5-½" DOOR ASSEMBLY

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	⅝" UNC hex nylock nut	4	09-5614			
2	Part	Latch post	1	101-6130			1
3	Part	Bushing	2	101-6125			2
4	Part	Latch post / door pivot spacer	3	101-6127			3
5	Part	Rear door cylinder mounting lug	1	101-6060			
6	Part	Door stop spring cylinder	1	101-0069		1	1
7	Part	½" x 2-¾" hex socket head UNC shoulder bolt	1	09-0155		1	
8	Part	½" x 1-¼" hex socket head UNC shoulder bolt	1	09-0117		1	
9	Part	¼"-28 straight thread grease fitting	2	02-0097			2
10	Part	Door pivot post	1	101-6129			1
11	Part	¼" UNC x 2" hex bolt	2	09-1015			
12	Part	¼" lock washer	4	09-5102			
13	Part	Top door pivot spacer	1	101-6126			1
14	Part	Safety door cam	1	101-6146	1		1
15	Part	Top door cam sleeve	1	101-6124			
16	Part	Shouldered door bushing	2	101-6123			2
17	Weldment	Door weldment	1	101-6069			
18	Part	Bottom sleeve	1	101-6128			
19	Part	⅜" lock washer	1	09-5106			
20	Part	Front door cylinder mounting lug	1	101-6058			
21	Part	¼" UNC x 1-¼" hex bolt	2	09-1009			

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. OVERTIGHTENING WILL RESULT IN PREMATURE BUSHING FAILURE AND WILL INHIBIT ROTATION, AND MAY IMPART EXCESS STRESS ON ROTATING COMPONENTS.

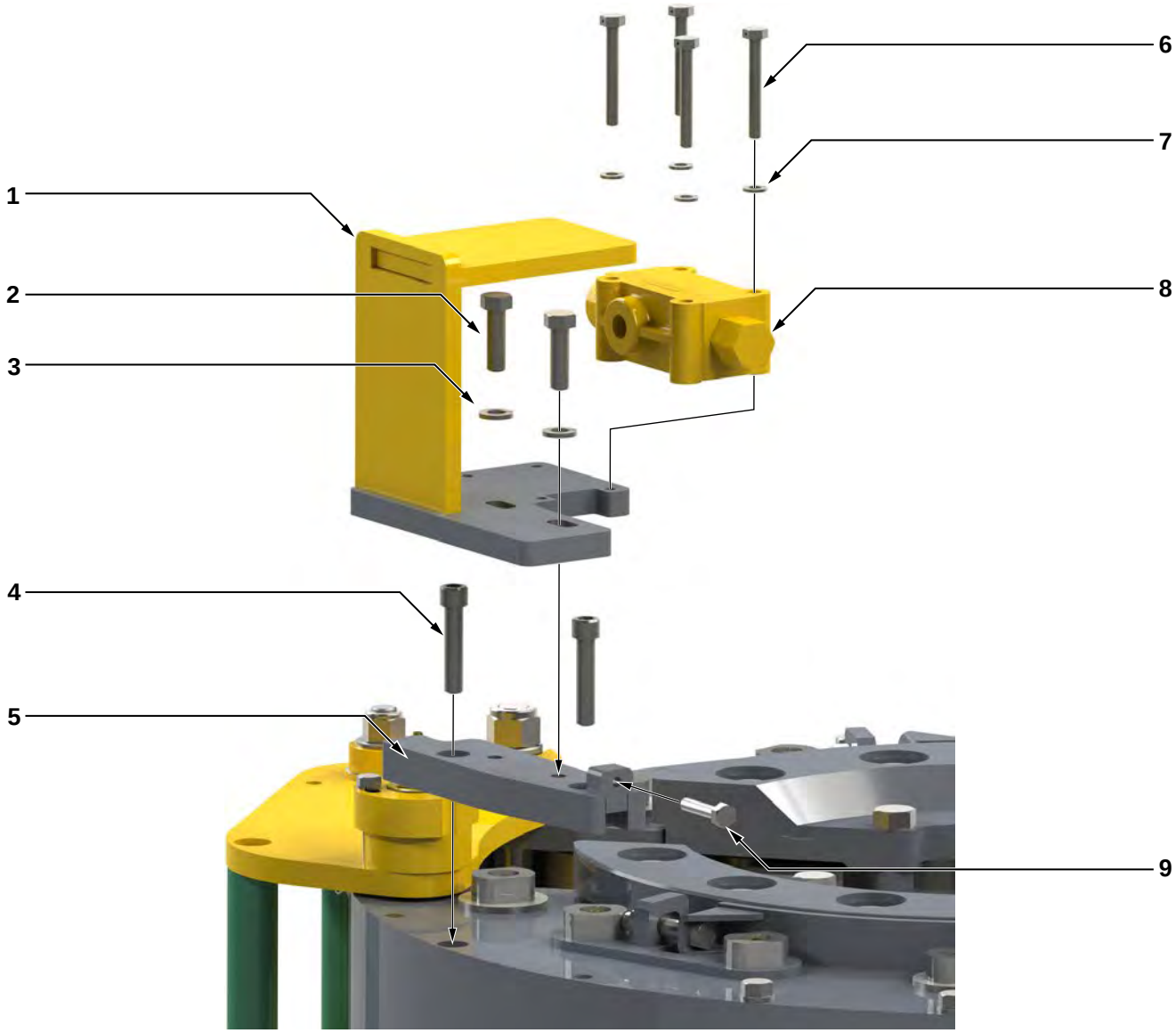


ILLUSTRATION 6.34: KT-5-½" SAFETY DOOR COMPONENTS EXPLODED

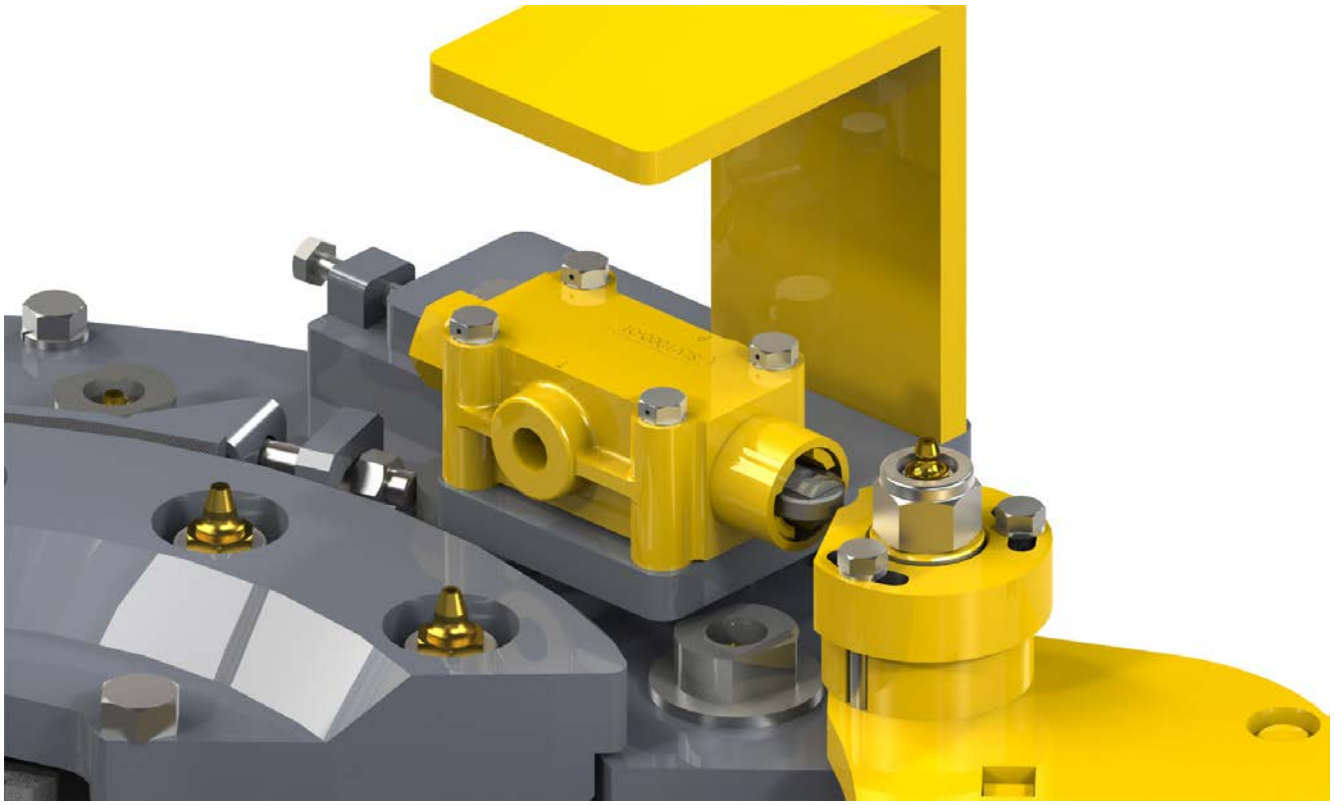


ILLUSTRATION 6.35: KT-5-½" SAFETY DOOR ASSEMBLY

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Weldment	Safety door guard weldment	1	101-6141			
2	Part	⅜" x 1-¼" hex bolt	2	09-1048			
3	Part	⅜" lock washer	2	09-5106			
4	Part	⅜" UNC x 1-¾" hex socket head cap screw	2	09-2052			
5	Weldment	Safety door switch mounting plate weldment	1	101-6160			
6	Part	¼" UNC x 2" drilled-head hex bolt	4	101-6072		4	
7	Part	¼" lock washer	4	09-5102			
8	Part	Safety door switch	1	02-E0190	1		1
9	Part	¼" UNC x 1-¼" hex bolt	1	09-1009			

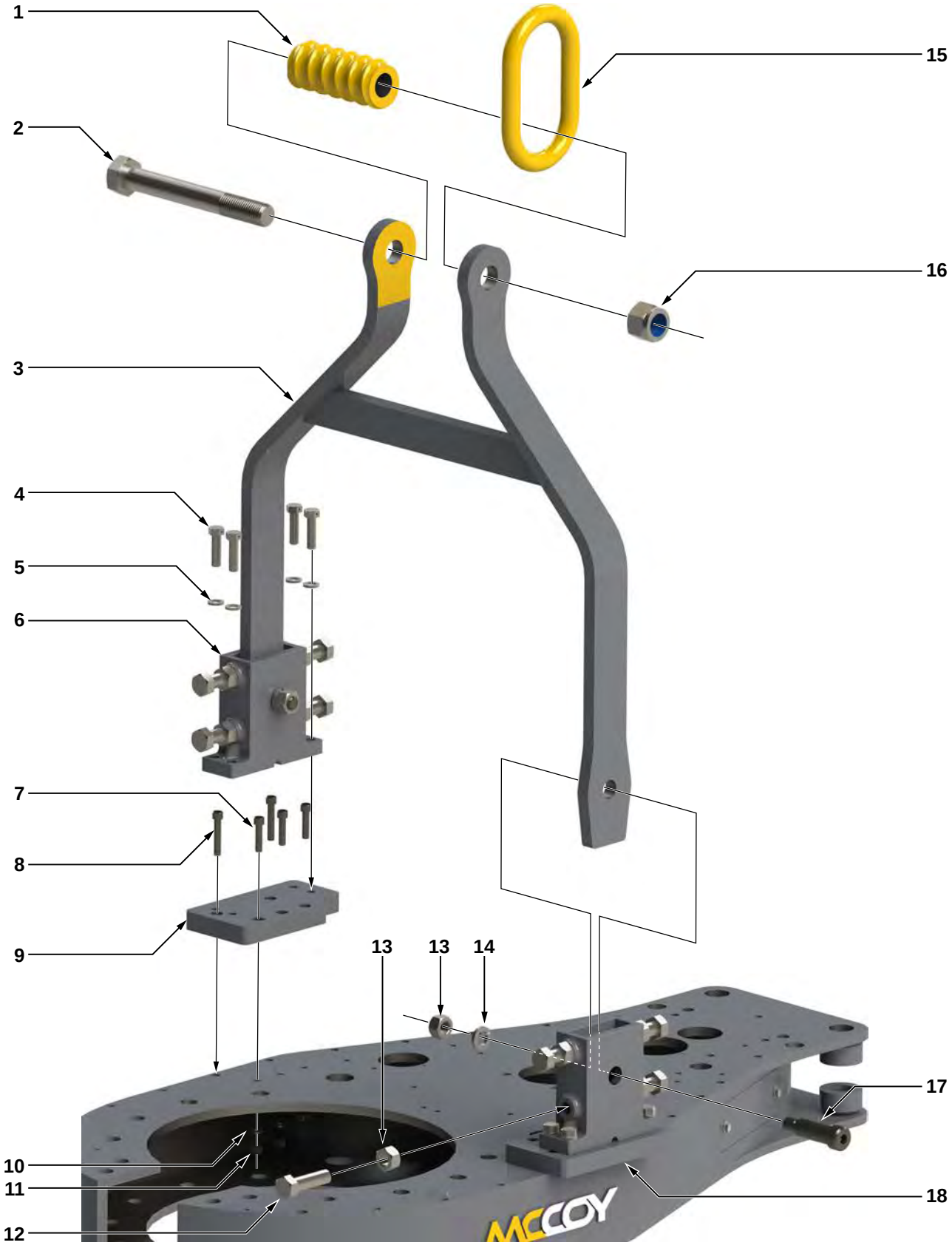


ILLUSTRATION 6.36: KT-5-½" RIGID SLING EXPLODED

ILLUSTRATION 6.37: KT-5-½" RIGID SLING ASSEMBLY

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Assembly)		
					Critical	One-Year	Overhaul
1	Part	Adjustment helix	1	1095-220	1		1
2	Part	Master link suspension pin	1	02-E0267	2		2
3	Weldment	Rigid sling	1	101-6887			
4	Part	½" UNC x 1-¾" drilled-head hex bolt	8	101-6459	8		8
5	Part	½" lock washer	8	09-5110			
6	Part	Rigid sling mounting foot	2	101-6393	1		2
7	Part	⅜" UNC x 1-½" hex socket head cap screw	6	09-2051			
8	Part	⅜" UNC x 2" hex socket head cap screw	4	09-2054			
9	Part	RH rigid sling mounting plate	1	101-6888	1		1
10	Part	⅜" lock washer	6	09-5106			
11	Part	⅜" UNC hex nut	6	09-5806			
12	Part	¾" UNC x 2-¾" hex bolt	8	09-0329			
13	Part	¾" UNC hex nut	10	09-5818			
14	Part	¾" lock washer	2	09-5118			
15	Part	Master lifting link	1	02-9128	1		1
16	Part	1-¼" hex nylock nut	1	09-1484	1		1
17	Part	1" x 2-½" hex socket UNC shoulder bolt	2	09-0331	2		2
18	Part	LH rigid sling mounting plate	1	101-6889	1		1

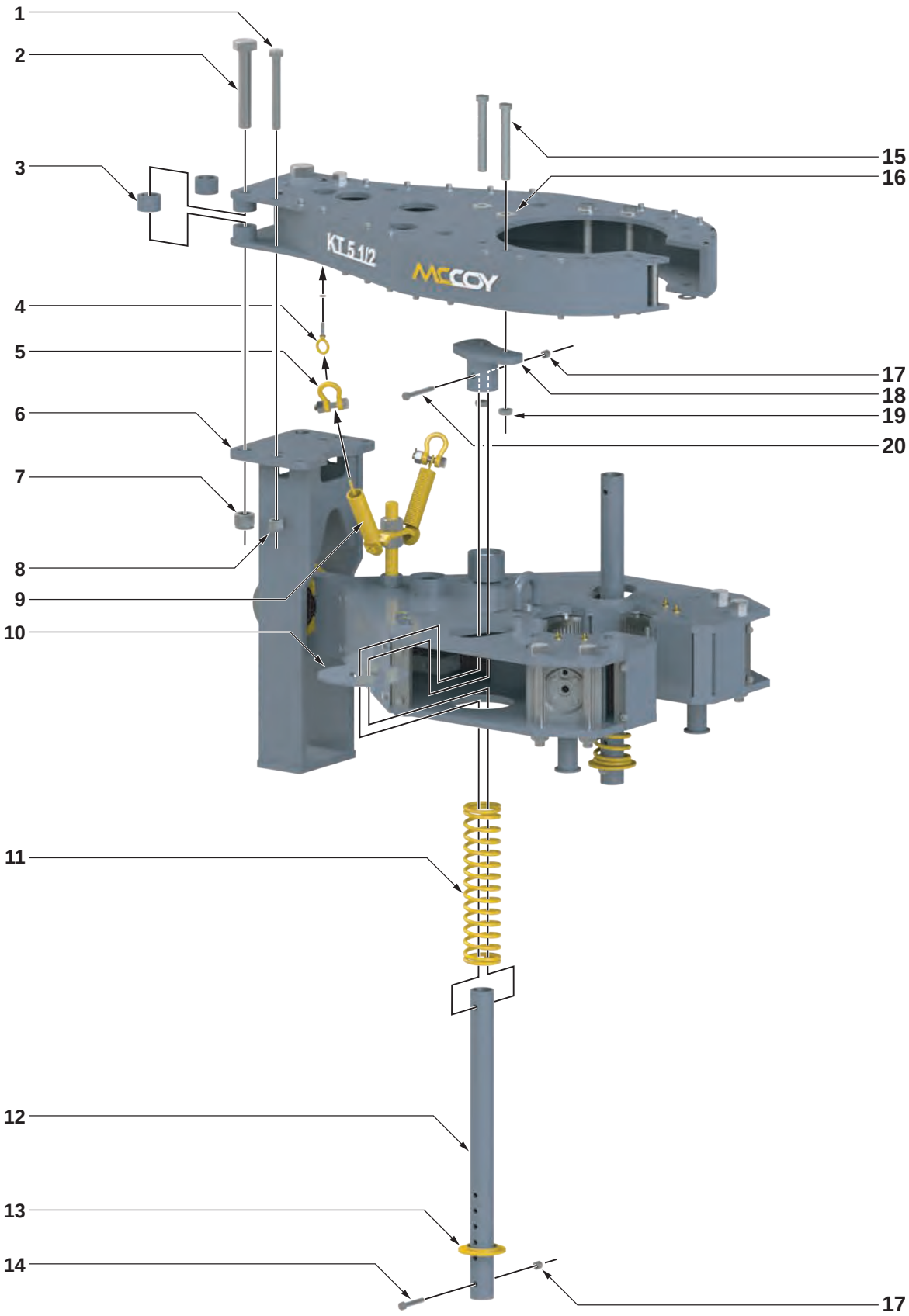


ILLUSTRATION 6.38: LEG ASSEMBLIES EXPLODED

ILLUSTRATION 6.39: FRONT LEG WELDMENT INSTALLATION

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Ass'y)		
					Critical	One-Year	Overhaul
1	Part	⅞" UNC x 7" heavy hex bolt	2	09-7777			
2	Part	1-¼" UNC x 7-½" heavy hex bolt	2	09-9164			
3	Part	Spacer	2	101-1546			
4	Part	⅜" UNC shoulder pattern 2-A eye bolt	2	02-0262		1	
5	Assembly	Shackle assembly	2	02-9063		1	
6	Weldment	Rear leg weldment	2	101-1547			
7	Part	1-¼" UNC hex nylock nut	2	09-1484			
8	Part	⅞" UNC hex nylock nut	2	09-9177			
9	Part	Rear backup suspension spring	2	1302-905-06	1		2
10	Part	Top leg spring cap	2	101-4489		1	
11	Part	Front leg spring	2	1302-905-08	1		2
12	Part	Front leg tube	2	1364-909			
13	Part	Bottom leg spring cap	2	1302-905-03A		1	
14	Part	½" UNC x 3" hex bolt	2	09-1178			
15	Part	Support roller shaft (supp. roller assembly component)	4	101-3944			
16	Part	⅞" narrow flat washer (support roller assembly component)	4	09-5123			
17	Part	½" UNC hex nylock nut	4	09-5610			
18	Weldment	RH front leg mount weldment	1	101-2153			
19	Part	⅞" UNF hex thin nylock nut (support roller assembly component)	4	09-5722			
20	Part	½" UNC x 4" hex bolt	2	09-1182			
21	Weldment	LH front leg mount weldment	1	101-2152			
22	Part	⅜" UNC x 2-¼" hex bolt	4	09-1055			
23	Part	⅜" lock washer	4	09-5106			

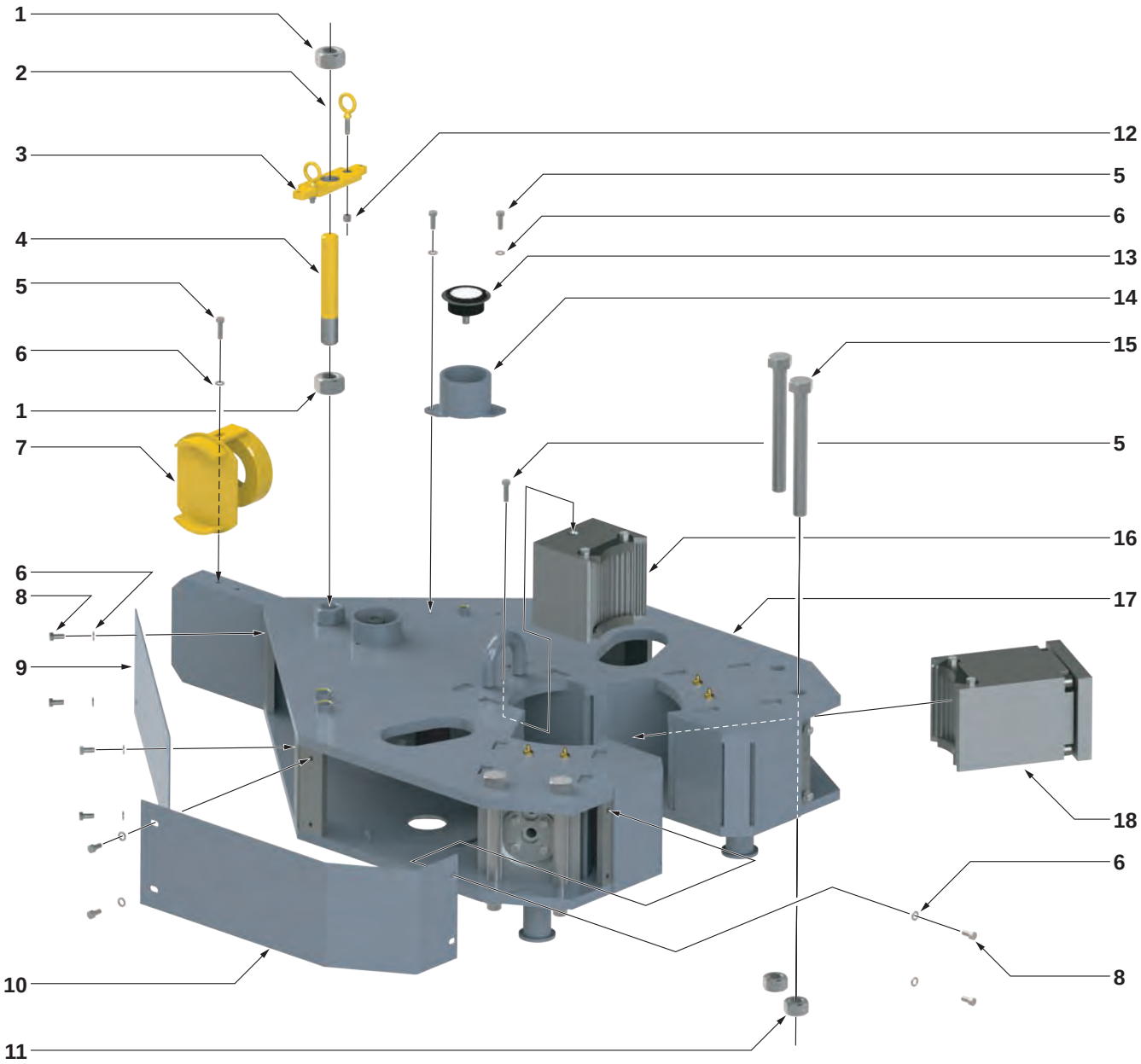


ILLUSTRATION 6.40: 6-¼" BACKUP EXPLODED

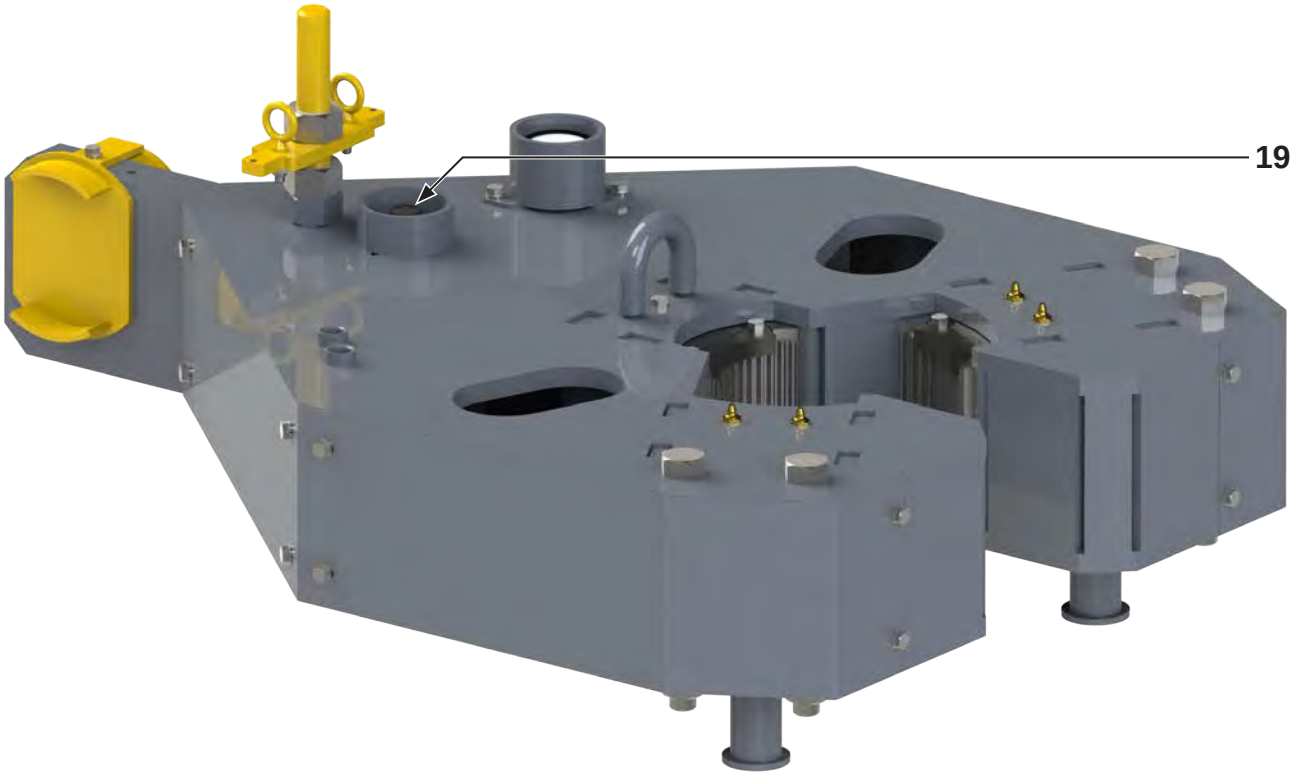
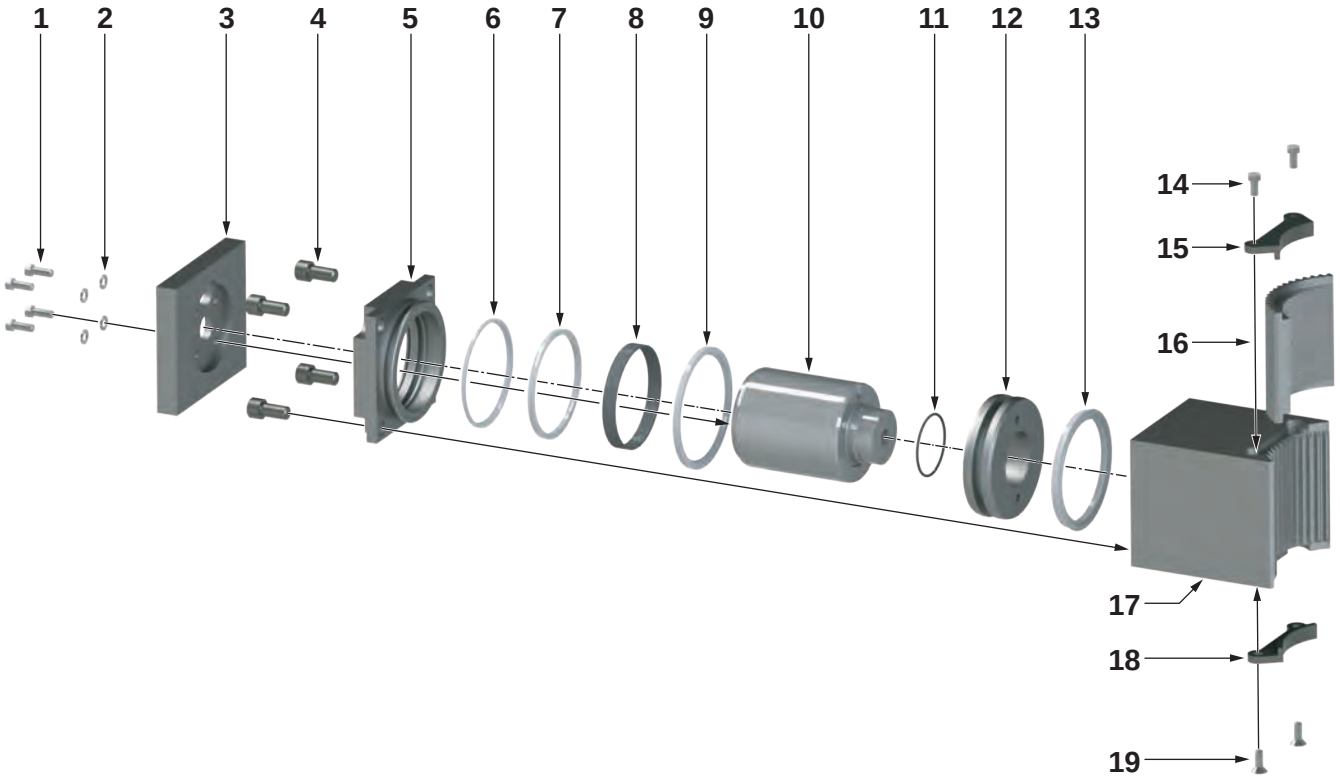


ILLUSTRATION 6.41: 6-¼" BACKUP

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Ass'y)		
					Critical	One-Year	Overhaul
1	Part	1-¼" UNC heavy hex nut	2	09-5832			
2	Part	⅜" UNC eye bolt	2	02-0262	1		
3	Part	Suspension spring bracket	1	1483-500-00-04		1	
4	Part	1-¼" UNC x 8" threaded rod	1	101-1993			
5	Part	⅜" UNC x 1-¼" hex bolt	4	09-1048			
6	Part	⅜" lock washer	20	09-5106			
7	Weldment	Load cell holder weldment	1	01-9116B			
8	Part	⅜" UNC x ¾" hex bolt	16	09-1044			
9	Part	Side panel 1	2	1421-500-11B			
10	Part	Side panel 2	2	1483-500-00-01			
11	Part	1" UNC nylock nut	4	09-5725			
12	Part	⅜" UNC hex nylock nut	2	09-5607			
13	Part	0-3000 PSI ¼" NPT gauge	1	02-0245		1	
14	Weldment	Gauge protector weldment	1	1483-500-18			
15	Part	1" UNC x 8-½" hex bolt	4	09-0287			
16	Part	Rear jaw	1	1401-08	1		
17	Weldment	Backup body weldment	1	101-5273			
18	Assembly	CLINCHER® cylinder assembly	2	1401-00-00B			
19	Part	Relief valve	1	08-1180	1		1
20	Part	Relief valve manifold (not shown)	1	08-1839			
21	Part	Check valve (not shown)	1	08-0481	1		1
22	Part	Check valve body (not shown)	1	08-1327			



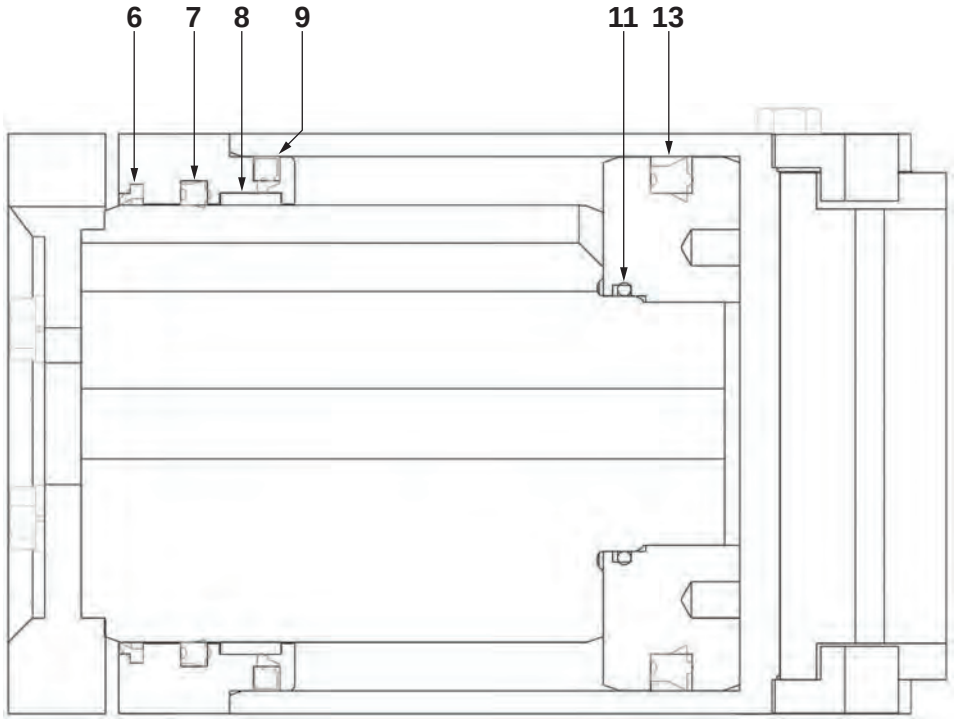
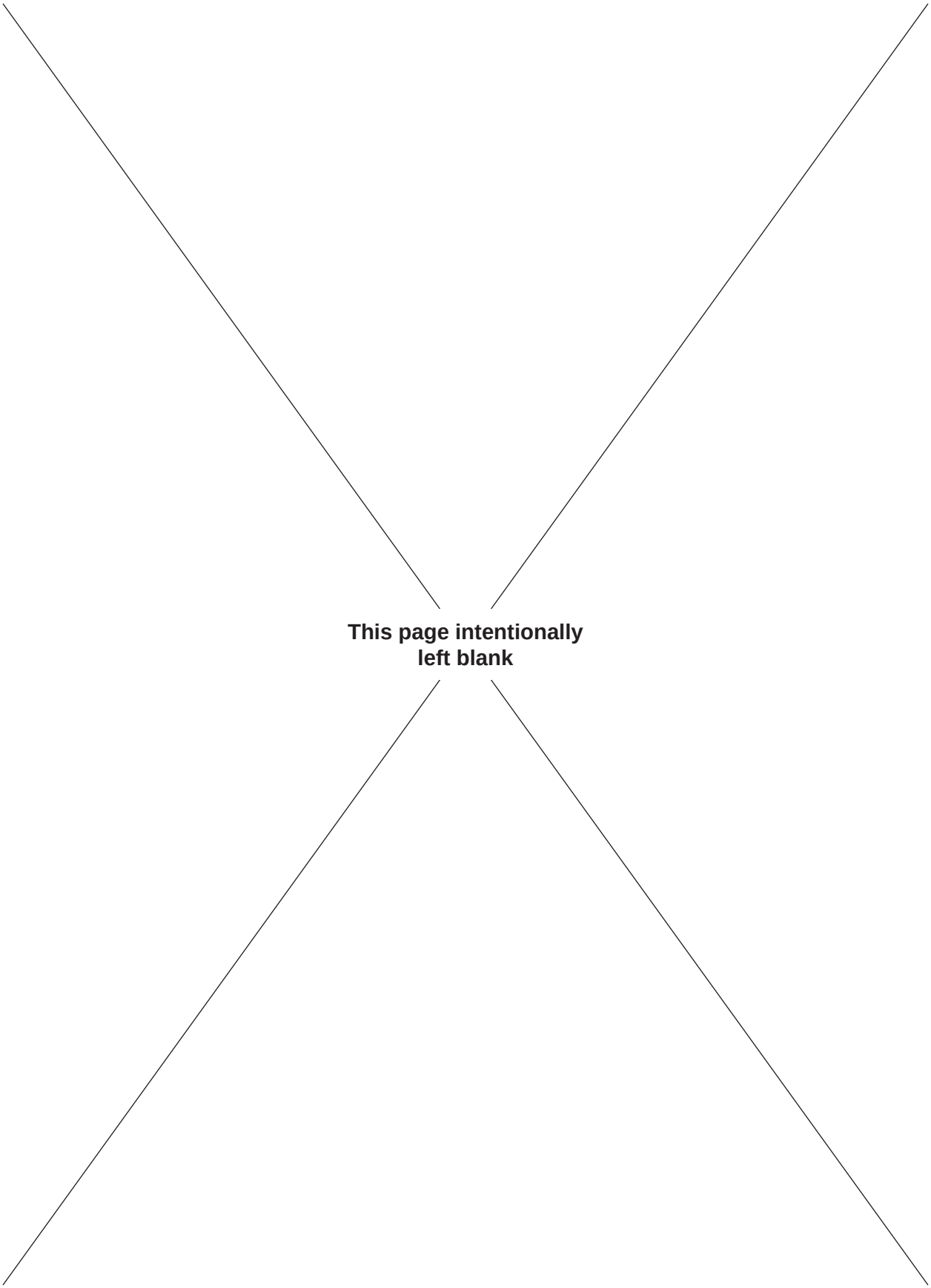


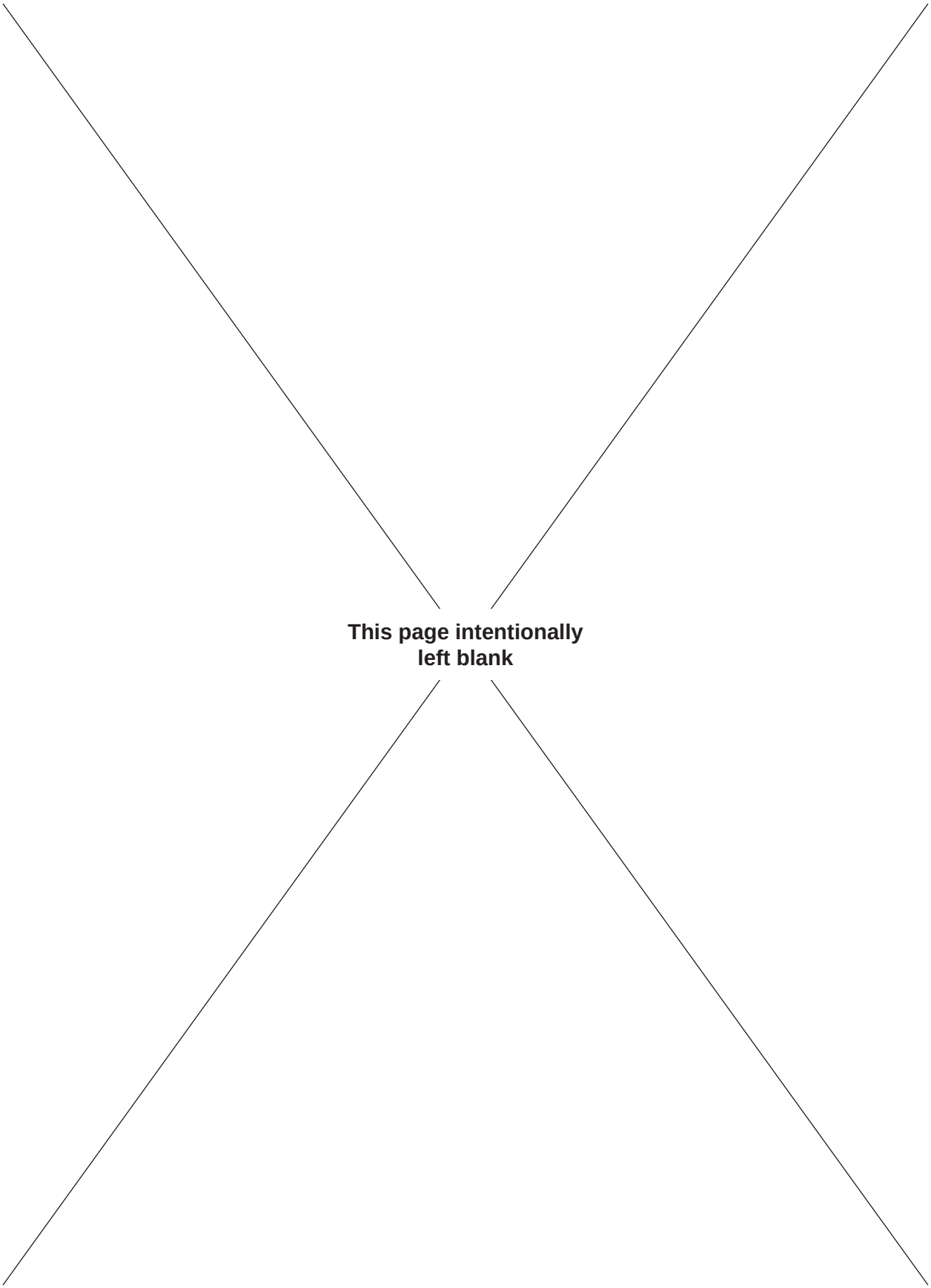
ILLUSTRATION 6.42: 6-¼" CLINCHER CYLINDER EXPLODED

ILLUSTRATION 6.43: 6-¼" CLINCHER CYLINDER

Item	Type	Description	Qty	Part Number	Recommended Spares (Per Ass'y)		
					Critical	One-Year	Overhaul
	Part	**CLINCHER®** cylinder	2	1401-00-01B	1		
1	Part	⅜" UNC x 1" hex bolt	4	09-1170			
2	Part	⅜" carbon steel lock washer	4	09-5106			
3	Part	Backing plate	1	1401-03B			
4	Part	⅝" UNC x 1-¼" hex socket head cap screw	4	09-0240			
5	Part	Cylinder gland	1	1401-06B			
10	Part	Cylinder rod	1	1401-04B			
12	Part	Cylinder piston	1	1401-05B			
14	Part	⅜" UNC x ¾" hex bolt	2	09-1044			
15	Part	Die retainer (top)	3	101-2982	3		3
16	Part	Wraparound insert (See Pp. 2.19)	1				
17	Part	Cylinder housing	1	1401-01B			
18	Part	Die retainer (bottom)	3	101-2291	3		3
19	Part	3/8" UNF x 1" hex socket flat head cap screw	2	09-4046			
	Kit	**CLINCHER® Cylinder Seal Kit**		**1401-00-00-SK**		1	2
6	Seal	Wiper	1				
7	Seal	Polypak	1				
8	Seal	Wear ring	1				
9	Seal	Polypak	1				
11	Seal	O-ring	1				
13	Seal	Polypak	1				


This page intentionally
left blank

SECTION 7: TORQUE MEASUREMENT


This page intentionally
left blank

7.A 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 tool 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 tool 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.

THE IMAGES DISPLAYED ARE SUPPLIED FOR ILLUSTRATION PURPOSES ONLY

ILLUSTRATION 7.A.1: TORQUE GAUGE (FOR ILLUSTRATION PURPOSES ONLY)

ILLUSTRATION 7.A.2: TENSION LOAD CELL

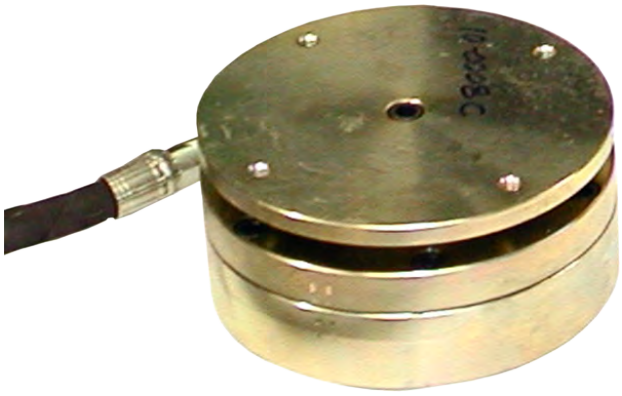


ILLUSTRATION 7.A.3: COMPRESSION LOAD CELL

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.

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.

7.A 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.

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 TABLES ARE CORRECT FOR ACCURATELY MEASURING TORQUE USING THE EQUIPMENT FOR WHICH THIS MANUAL IS SUPPLIED.

Item	Type	Description	Qty	Part #
	Assembly	32” Arm-20K Compression Load Cell and Gauge	1	10-0029C
A	Part	8 in^2 Compression Load Cell c/w hoses & fittings	1	10-0008C
B	Part	Torque Gauge, 20,000 Ft.-Lbs., 32” Arm	1	10-0029G
C	Part	Hydraulic Hose	1	02-0069

LOAD CELLS ARE NOT USER SERVICEABLE. ILLUSTRATION 7.A.4 IS PROVIDED FOR INFORMATION PURPOSES ONLY. DAMAGED LOAD CELLS MUST BE RETURNED TO THE FACTORY FOR REPAIR AND RE-CALIBRATION.

Compression Load Cell, 8 in²					
Item	Type	Description	Item	Type	Description
A	Part	5/16” UNC x 1” Hex Socket Head Cap Screw	E	Part	Diaphragm
B	Part	Load Plate	F	Part	Diaphragm Casing
C	Part	5/16” UNC x 3/4” Hex Socket Head Cap Screw	G	Part	Street Elbow
D	Part	Retainer Ring	H	Part	1/4” NPT Brass Plug

This is the standard hydraulic compression load cell supplied by McCoy Drilling & Completions | Farr. Contact our sales department for information about optional application-specific compression load cells.

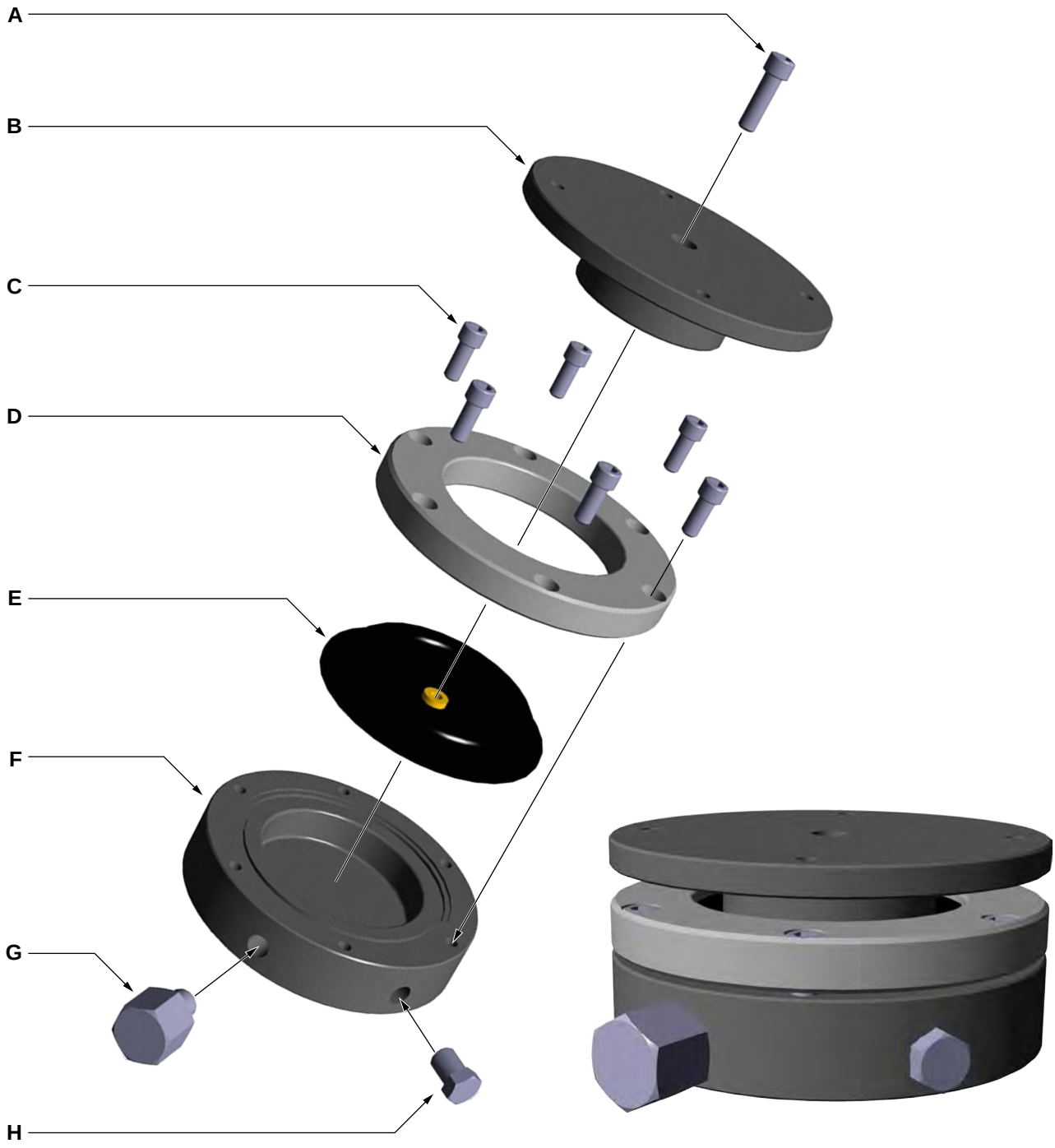
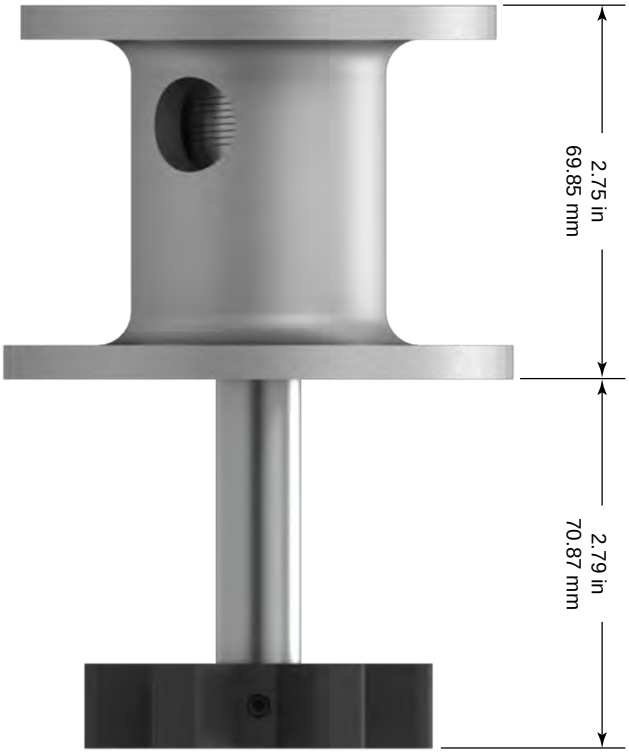
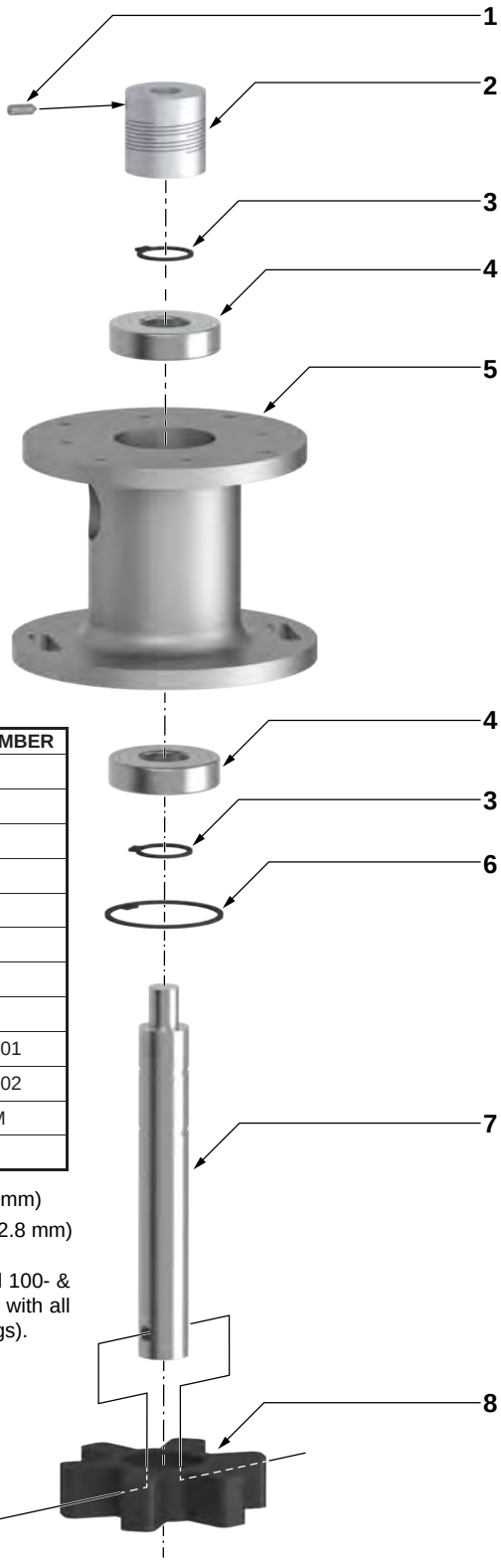


ILLUSTRATION 7.A.4: COMPRESSION LOAD CELL EXPLODED





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 7.A.5: TURN COUNTER ENCODER MOUNT EXPLODED

7.B TROUBLESHOOTING

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

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

1	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 7.C). 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 7.C
	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 7.C). 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 7.C). 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 7.C
	Internal mechanism of gauge is damaged	Replace gauge

7.C PERIODIC INSPECTION AND MAINTENANCE

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

7.C.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.

7.C.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.

1. 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.
2. Connect the hand pump to the check valve fitting.
3. Elevate the load cell so it is higher than the torque gauge and hand pump.

UN-CONTAINED SPILLAGE OF THE HYDRAULIC FLUID IN THIS SYSTEM MAY CONTRAVENE GOVERNMENTAL ENVIRONMENTAL REGULATIONS, OR THE ENVIRONMENTAL REGULATIONS AND POLICIES OF YOUR COMPANY. FARR CANADA CORP. HIGHLY RECOMMENDS PLACING YOUR LOAD CELL IN A CONTAINMENT BASIN BEFORE PROCEEDING WITH THE BLEEDING & REFILLING PROCESS.

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

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

5. Remove the vent plug screw and Stat-O-Seal (Items C and D on Illustration 6.A.4, or item H on Illustration 6.A.5) to allow trapped air to escape.
6. Pump fluid into the system until no more air is seen escaping from the vent port.
7. Replace the vent plug screw and Stat-O-Seal and tighten securely.
8. 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.
9. Disconnect the hand pump from the torque gauge.
10. Replace the brass cap on the torque gauge check valve fitting.

7.C.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

1. 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.
2. Remove the tension load cell from the tong, but do not disconnect from the torque gauge.
3. Suspend the load cell, piston side up, from a crane capable of supporting the known weight in Step 3a.
4. 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.
5. 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 the arm length expressed in imperial units (feet). The calculation is: [KNOWN WEIGHT] x [ARM LENGTH AS DISPLAYED ON THE TONG PLACARD (in feet)]. For example, if the arm length is 32 inches and the hoisted weight is 1000 lbs the calculation is:

   1000 x (32/12) = 2667

   Therefore, the expected indication on the torque gauge should be 2667 lbs-ft.

7.C.3 Reference Checking Your Torque Measurement System (continued):

Tension Load Cell (continued):

5. Perform a simple calculation (continued):

Calculations for a metric torque measurement system using tension load cell are as follows:

[KNOWN WEIGHT (in kg)] x [2.2] x [ARM LENGTH INDICATED ON TONG PLACARD] (in feet)] x [1.356]. For example, if the arm length is 32 inches and the hoisted weight is 500 kg the calculation is:

[500] x [2.2] x [(32/12)] x [1.356] = 3977.6

Therefore, the expected indication on the torque gauge should be approximately 3980 lbs-ft.

Compression Load Cell

1. Locate a known weight, and move the weight next to the tong and backup assembly.
2. Remove the compression load cell from the tong, but do not disconnect from the torque gauge.
3. Place the compression load cell, piston side down, on a sturdy surface such as a concrete shop floor.
4. Use a crane to hoist the known weight on to the rod end of the compression load cell. This is a small area, so an ideal known weight should be relatively small and dense. A block of solid metal or concrete is preferred. The weight must be centered exactly on the rod end of the load cell to ensure even and accurate compression. Do not use a tall unrestrained known weight that could topple. Do not disconnect the known weight from the crane, but ensure the crane exerts no upward force on the weight. The attached crane prevents an un-centered weight from toppling.
5. Perform a simple calculation to determine the expected indication on the torque gauge based on the known weight on the load cell. This is a calculation that must be performed using the arm length expressed in imperial units (feet). The calculation is: [KNOWN WEIGHT] x [ARM LENGTH (in feet)]. For example, if the arm length is 32 inches and the known weight is 500 lbs the calculation is:

   [500] x [(32/12)] = 1333.3

   Therefore, the expected indication on the torque gauge should be approximately 1333 lbs-ft.

   If you are using a metric torque measure system calculations are as follows:

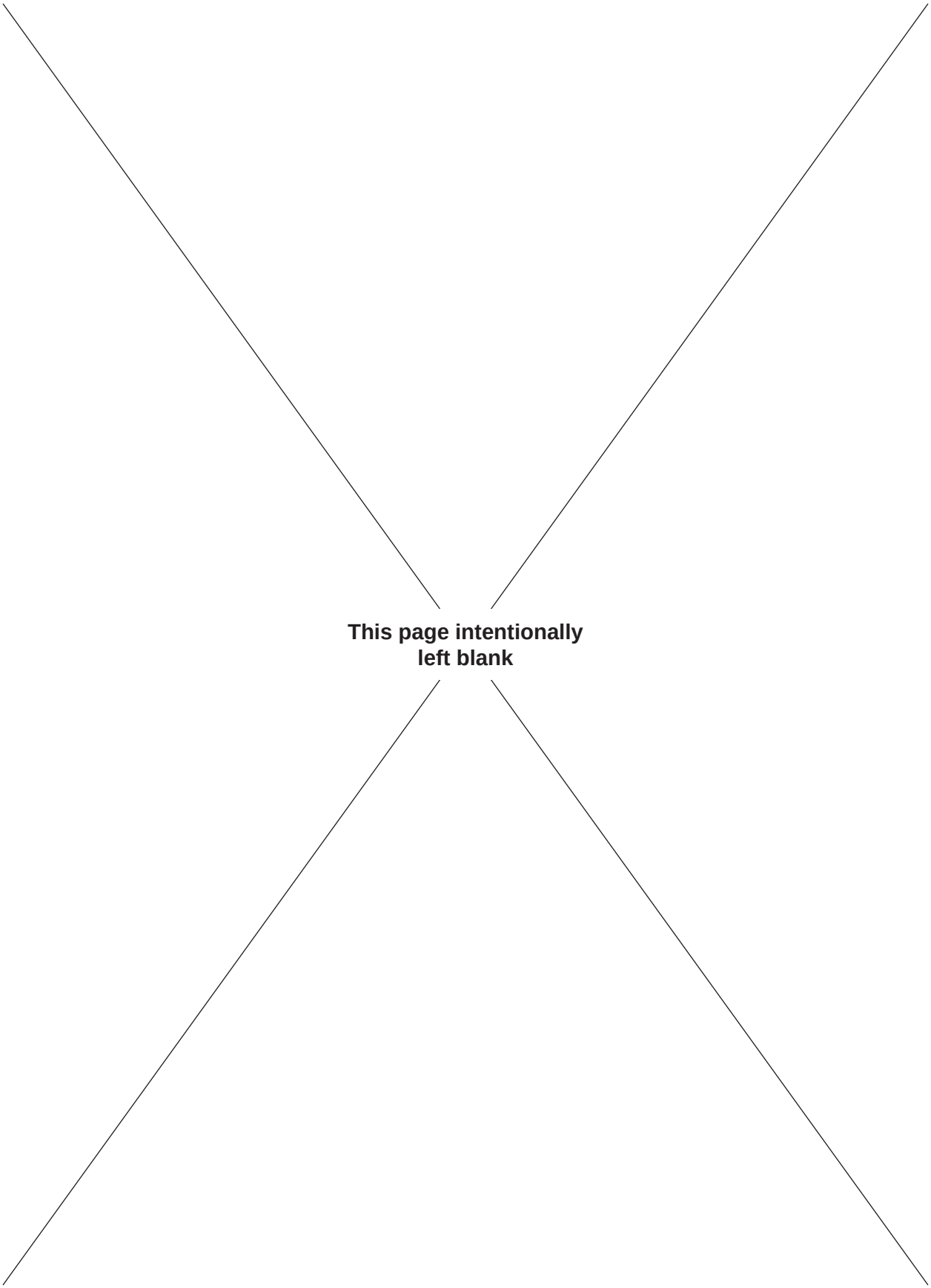
   [KNOWN WEIGHT (in kg)] x [2.2] x [ARM LENGTH (in feet)] x [1.356]. For example, if the arm length is 32 inches and the known weight is 250 kg the calculation is:

   [250] x [2.2] x [(32/12)] x [1.356] = 1988.8

   Therefore, the expected indication on the torque gauge should be approximately 1990 Nm.

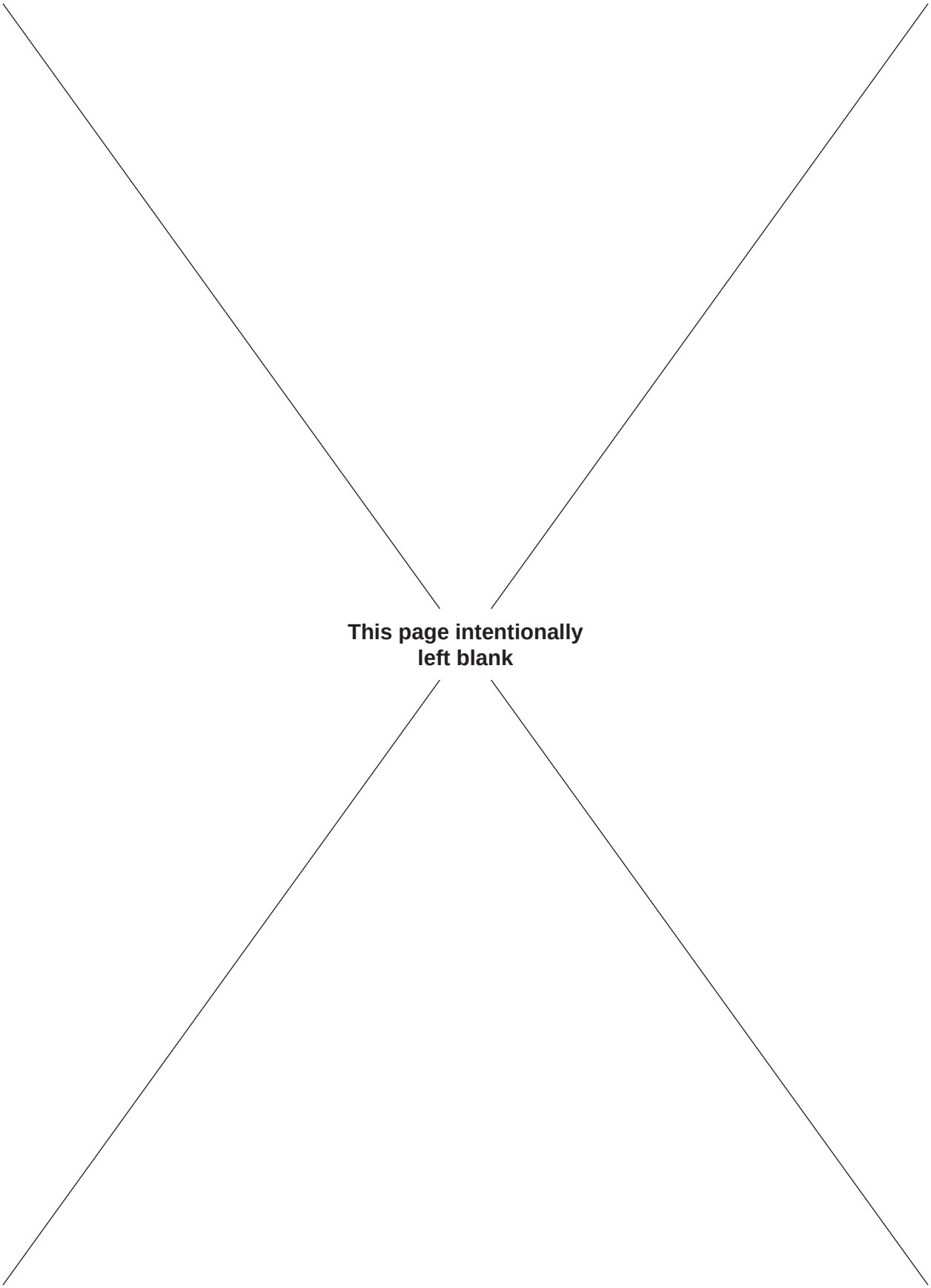
7.C.4 Repair And Calibration

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


This page intentionally
left blank

SECTION 8: 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 does not guarantee the accuracy of the information contained in this section. All original copyrights claimed by the manufacturer(s) apply.


This page intentionally
left blank

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