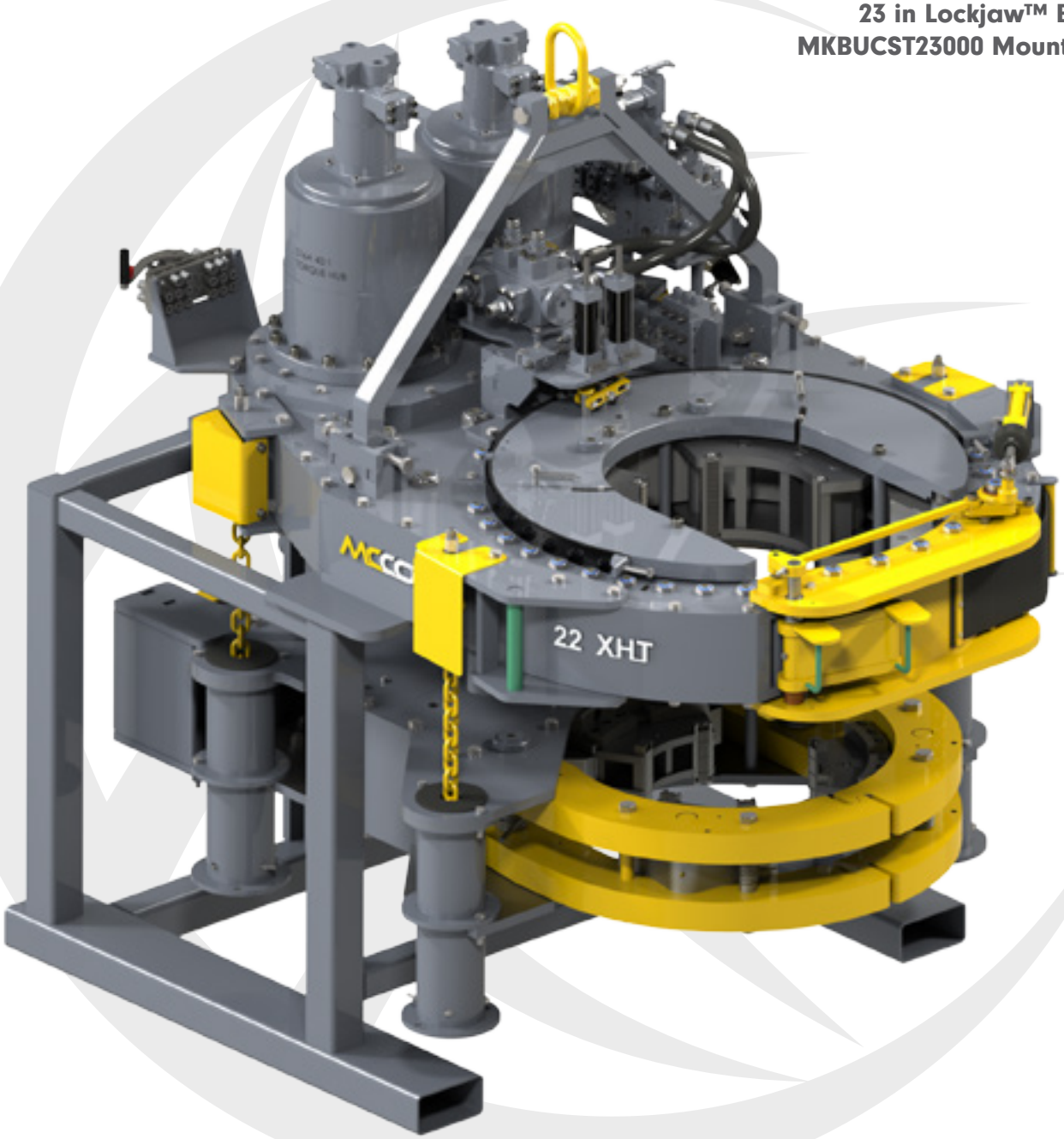
MCCOY GLOBAL

TECHNICAL MANUAL

80-220-150-23T-111-7S-00

Assembly Includes:
22000XHT 22 in 150,000 lb-ft (203,370 Nm) Hydraulic Power Tong
23 in Lockjaw™ Backup
MKBUCST23000 Mounting Kit



SPECIFICATIONS | OPERATION | MAINTENANCE | PARTS

TECHNICAL MANUAL #:12087

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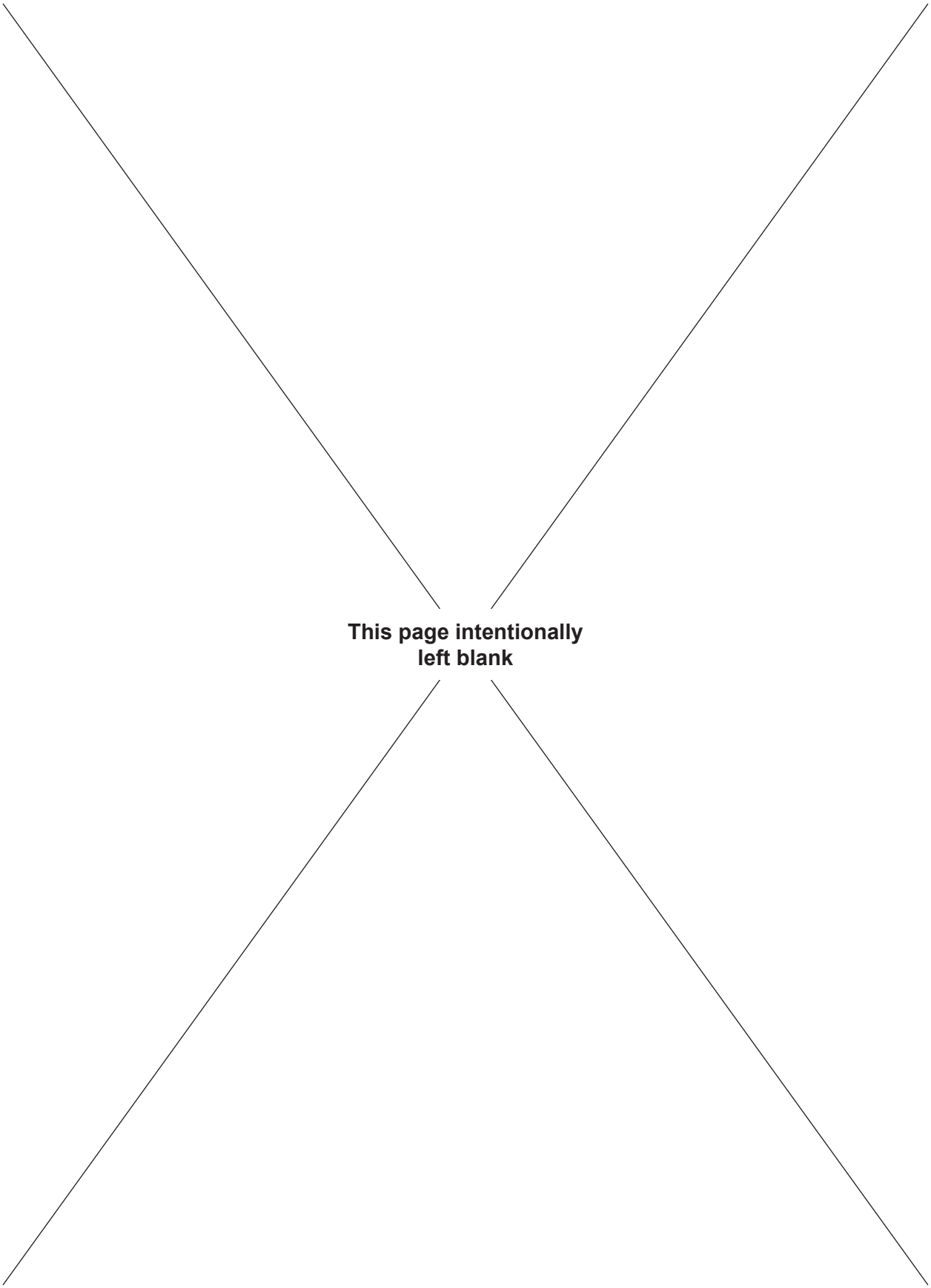
ORIGINAL INSTRUCTIONS

THIS TECHNICAL DOCUMENT APPLIES TO THE FOLLOWING MODELS:				
OVERALL MODEL: 80-220-150-23T-111-7S-00				
TONG MODEL	**BACKUP MODEL**	**MOUNTING KIT**	**REV**	**DESCRIPTION**
CLE22000XHT-14	BUCST23000	MKBUCST23000	B	22 in (559 mm) 150K lb-ft (203,370 Nm) hydraulic power tong and 23" Lockjaw™ backup, tension-style load cell. Configured for use with remote valve panel.

THIS EQUIPMENT IS EQUIPPED WITH A DOOR SWITCH DESIGNED TO INTERRUPT EQUIPMENT ROTATION WHEN THE DOOR OPENS. SEE SECTION 4 FOR PROPER TESTING PROCEDURES.

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



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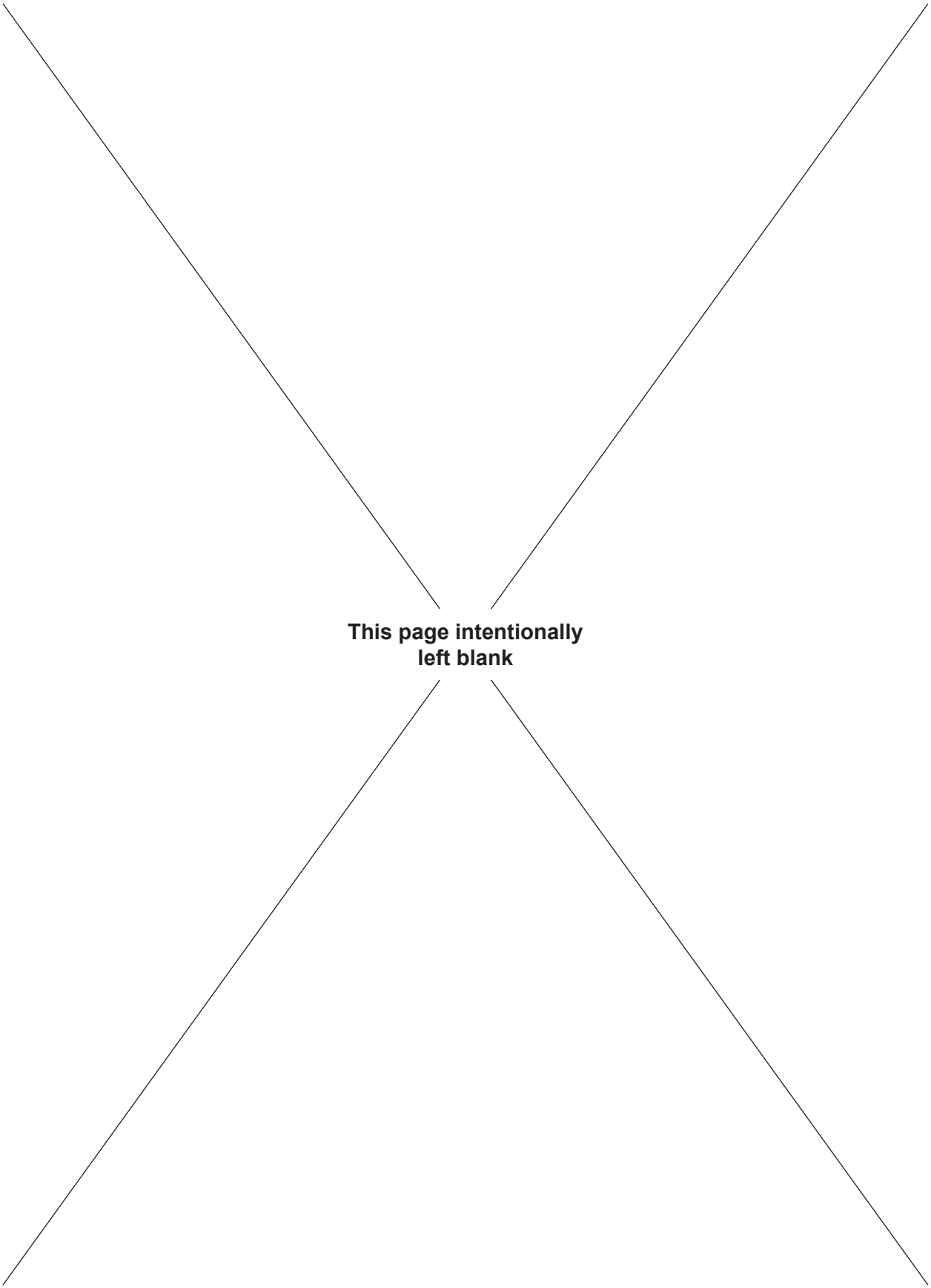
McCoy has made every effort to ensure the information contained in this document is accurate and current. This manual is intended to provide equipment operation and safety instructions for your equipment. However, McCoy does not warrant or guarantee that the information is either complete or accurate 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.



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Summary Of Revisions	
Date	**Description Of Revision**
JAN 2016	Initial release
MAR 2016	Corrected make-up/break-out illustrations, subsection 3.5.3
JUN 2016	Updated schematic BOM, updated Section 7 clamp cylinder / die adapter illustrations

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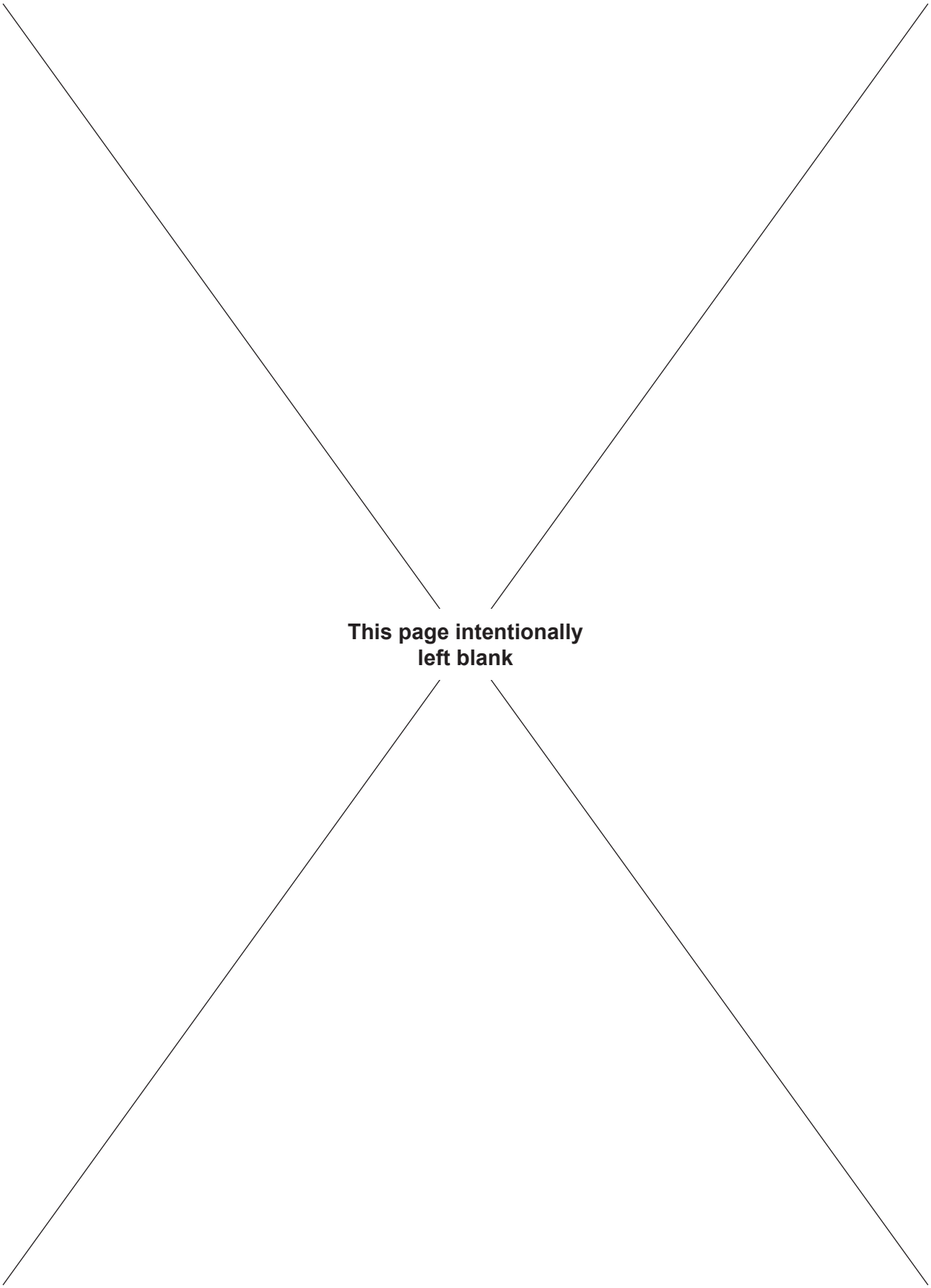

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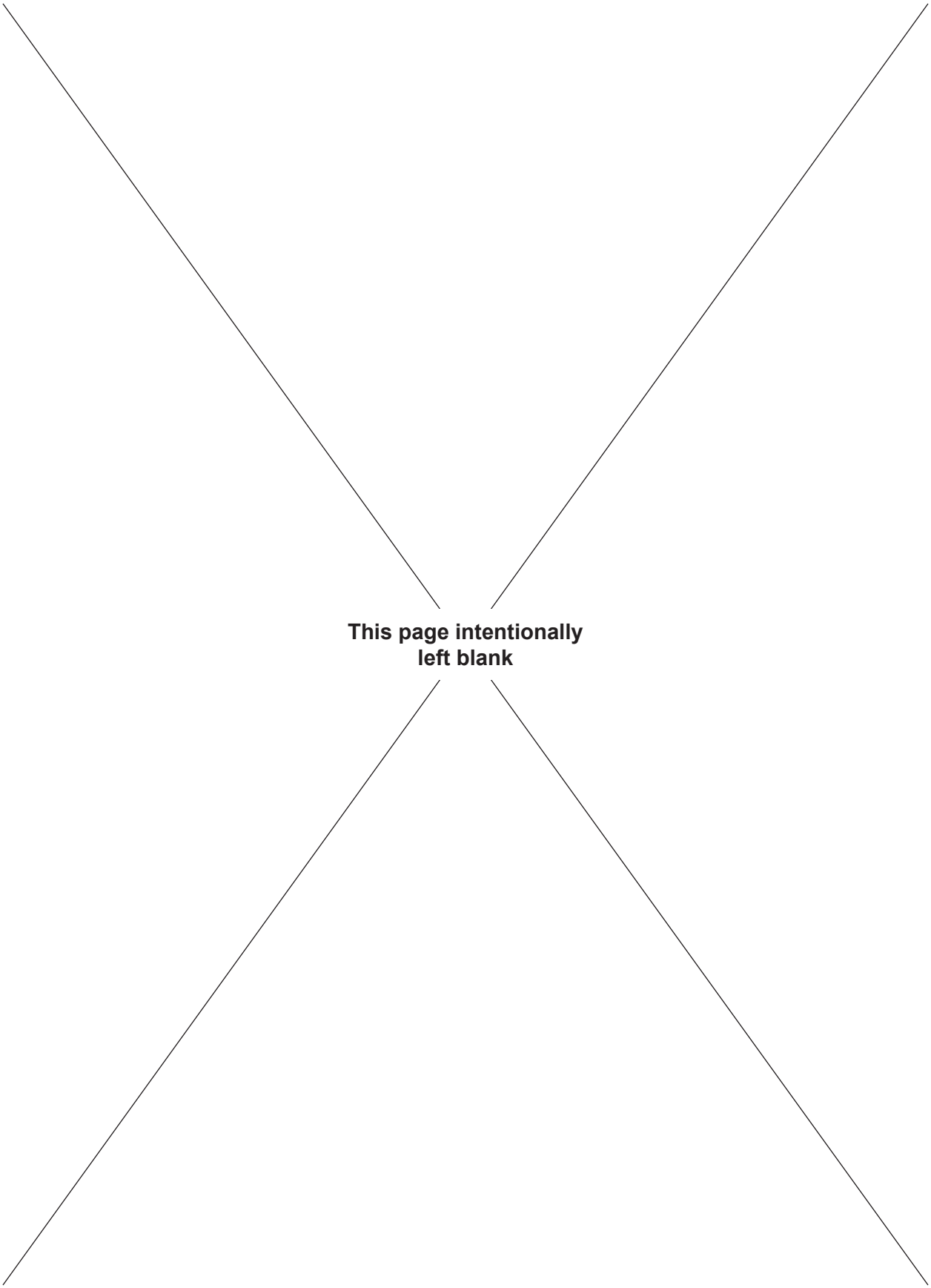
SECTION 1: INTRODUCTION



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1.0 INTRODUCTION & CONTACT INFORMATION

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

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T5L 2T2

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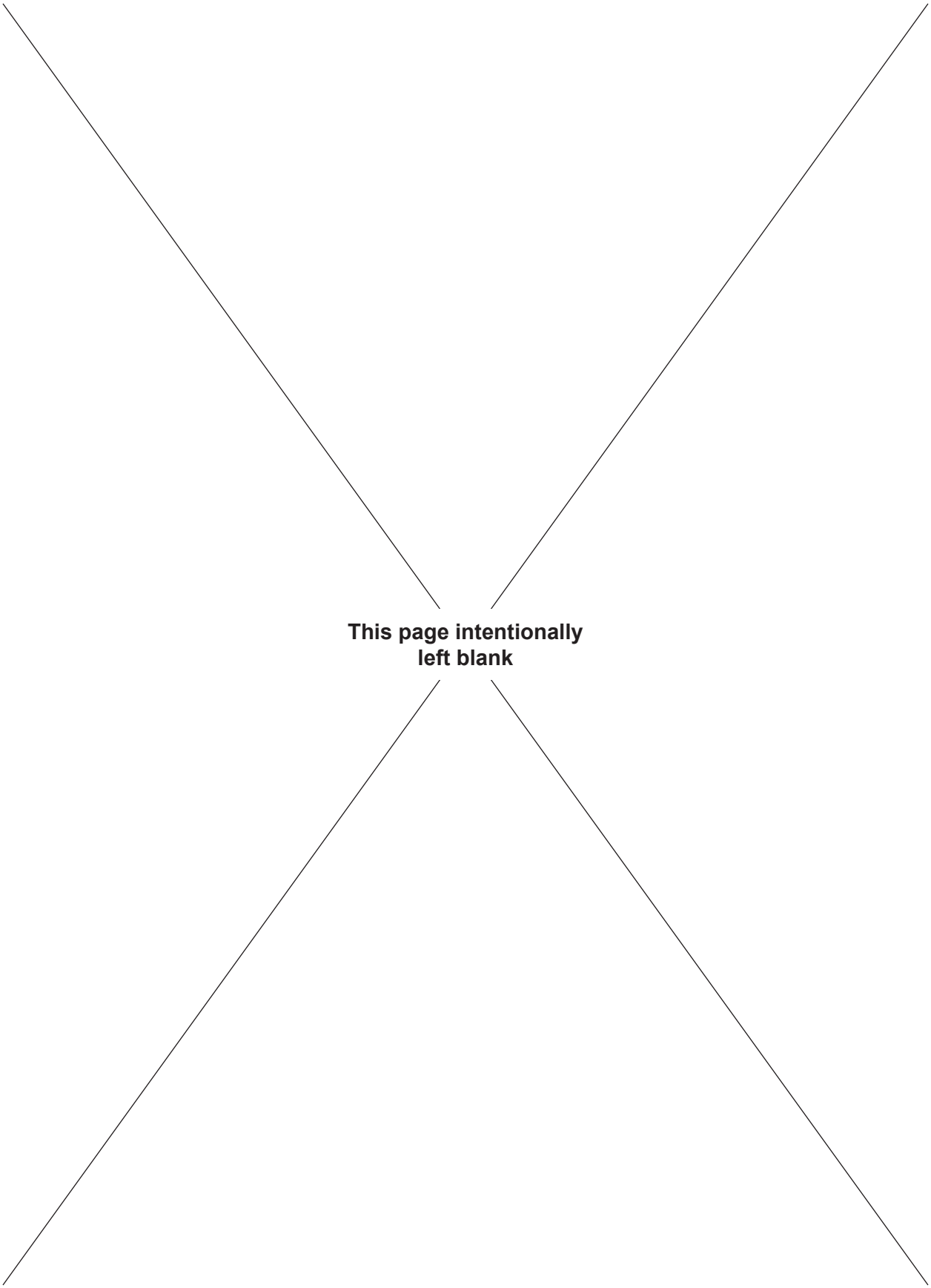
Standard Terms and Conditions of Sale (including warranty information):

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



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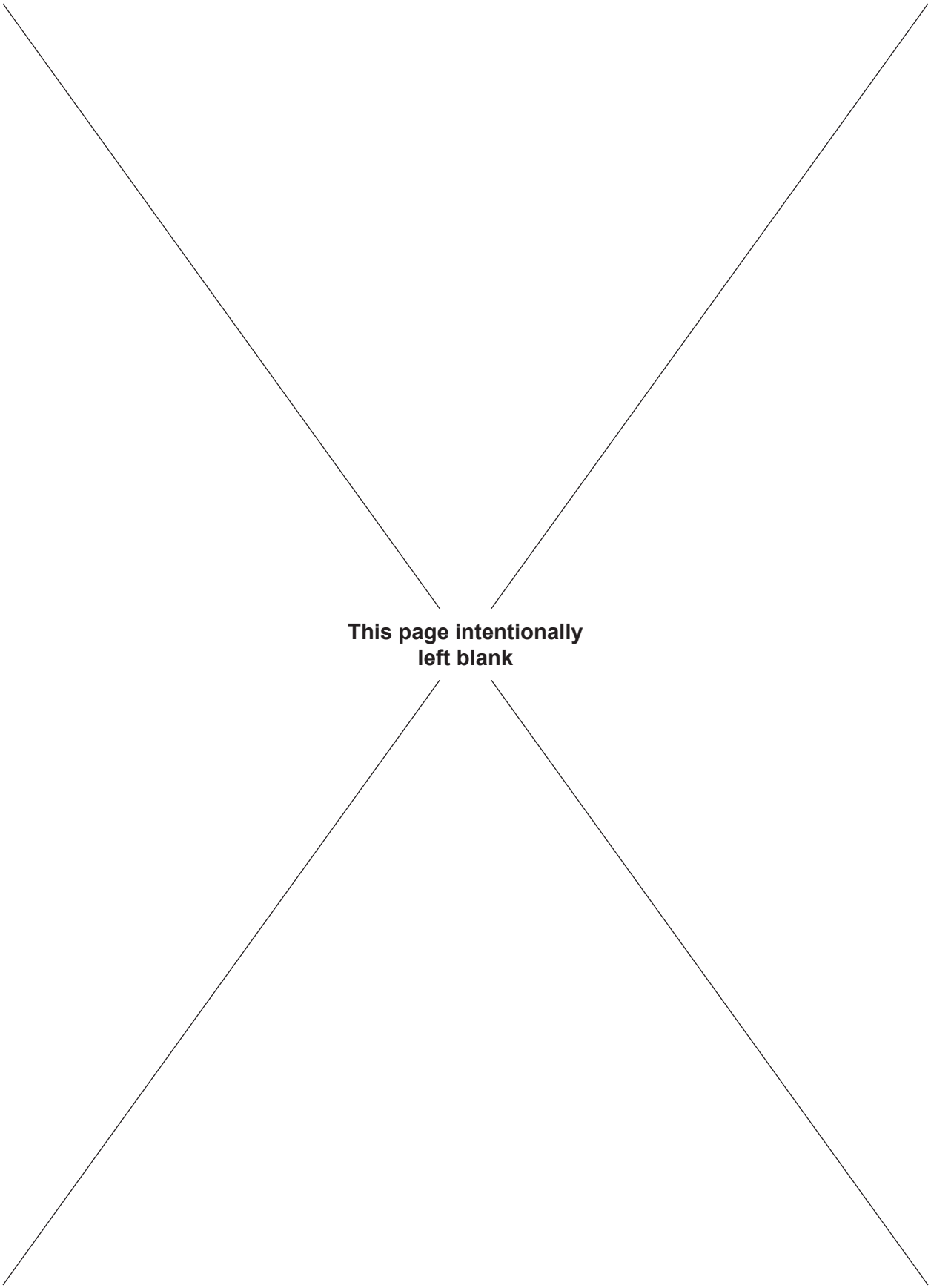
1.1 SCOPE

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

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



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1.2 GENERAL HEALTH AND SAFETY

AUTHORIZED USE ONLY!

READ THIS MANUAL BEFORE USING EQUIPMENT

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

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

1.2.1 Hazard Labels

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

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

⚠ DANGER

THIS IDENTIFIES AN EXTREME HAZARD OF PERSONAL INJURY OR DEATH

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

⚠ WARNING

THIS IDENTIFIES A WARNING REGARDING POTENTIAL INJURY OR CATASTROPHIC EQUIPMENT DAMAGE

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

⚠ CAUTION

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

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

NOTICE

THIS HIGHLIGHTS ITEMS OF IMPORTANCE UNRELATED TO PERSONAL INJURY

1.2.2 General Safe Operating Guidelines

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

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

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

1.2.2 General Safe Operation Guidelines (Continued):

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

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

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

Illustration 1.2.1: Equipment Handling Warnings

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

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

⚠ WARNING

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

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

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

⚠ WARNING

NEVER ATTEMPT TO CLAMP ONTO TUBULARS WITH INCORRECTLY SIZED DIES

⚠ WARNING

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

⚠ WARNING

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

1.2.3 Rigging and Overhead Lifting

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

⚠ DANGER

NEVER STAND BENEATH A SUSPENDED LOAD

1.2.4 Maintenance Safety

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

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

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

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

⚠ DANGER

ALWAYS MEASURE ELECTRICAL CIRCUITS TO CONFIRM DEACTIVATION BEFORE PROCEEDING WITH MAINTENANCE

⚠ WARNING

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

1.2.5 Replacement Parts

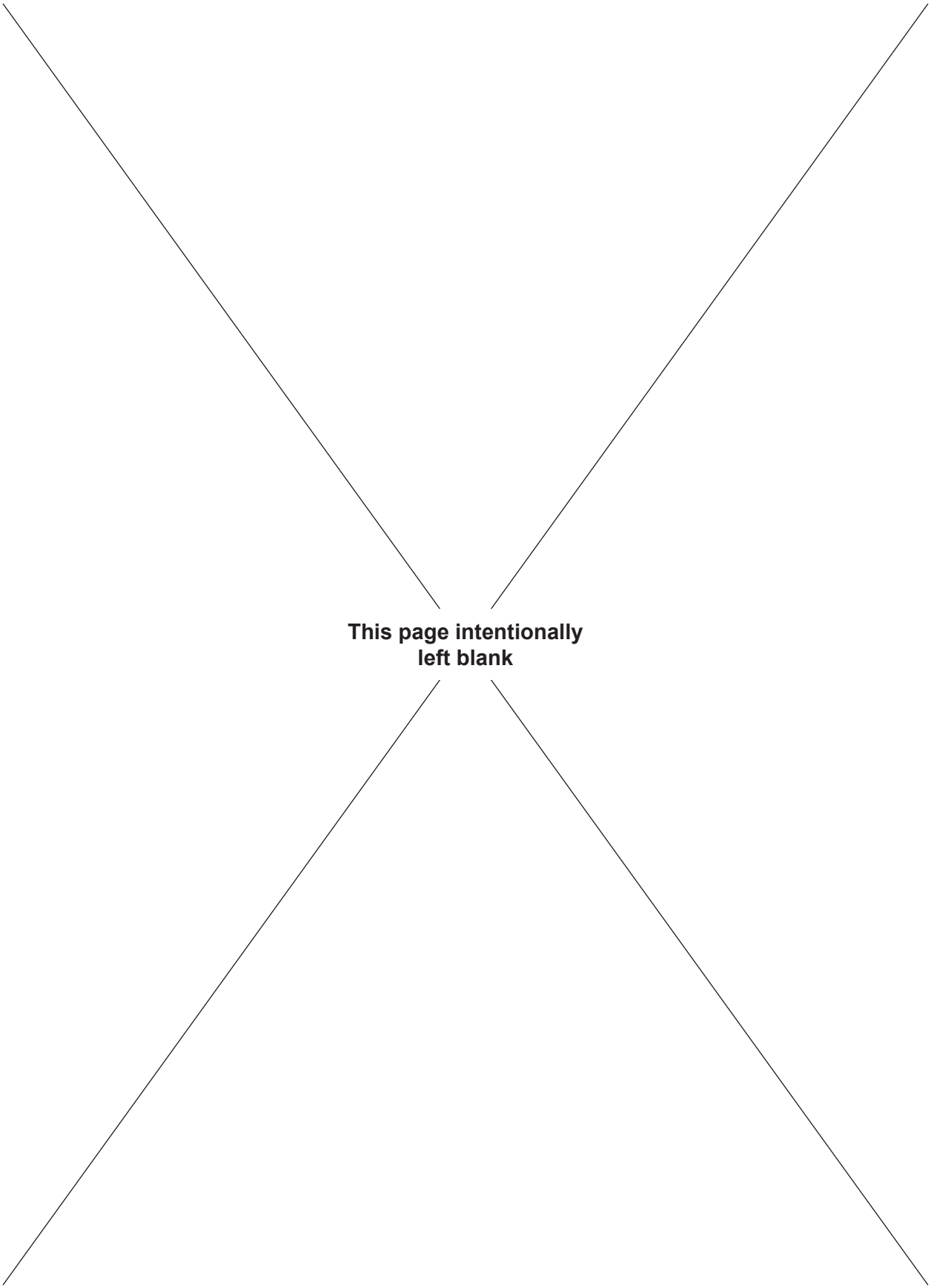
All consumable and replacement parts must meet or exceed OEM specifications in order to maintain equipment integrity. Do not replace protective equipment such as hydraulic switches, circuit breakers, and fuses without first consulting with McCoy Global. Do not replace electrical or control hardware without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

1.2.6 Environmental Impact

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

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

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



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1.3 ACRONYMS AND TERMINOLOGY

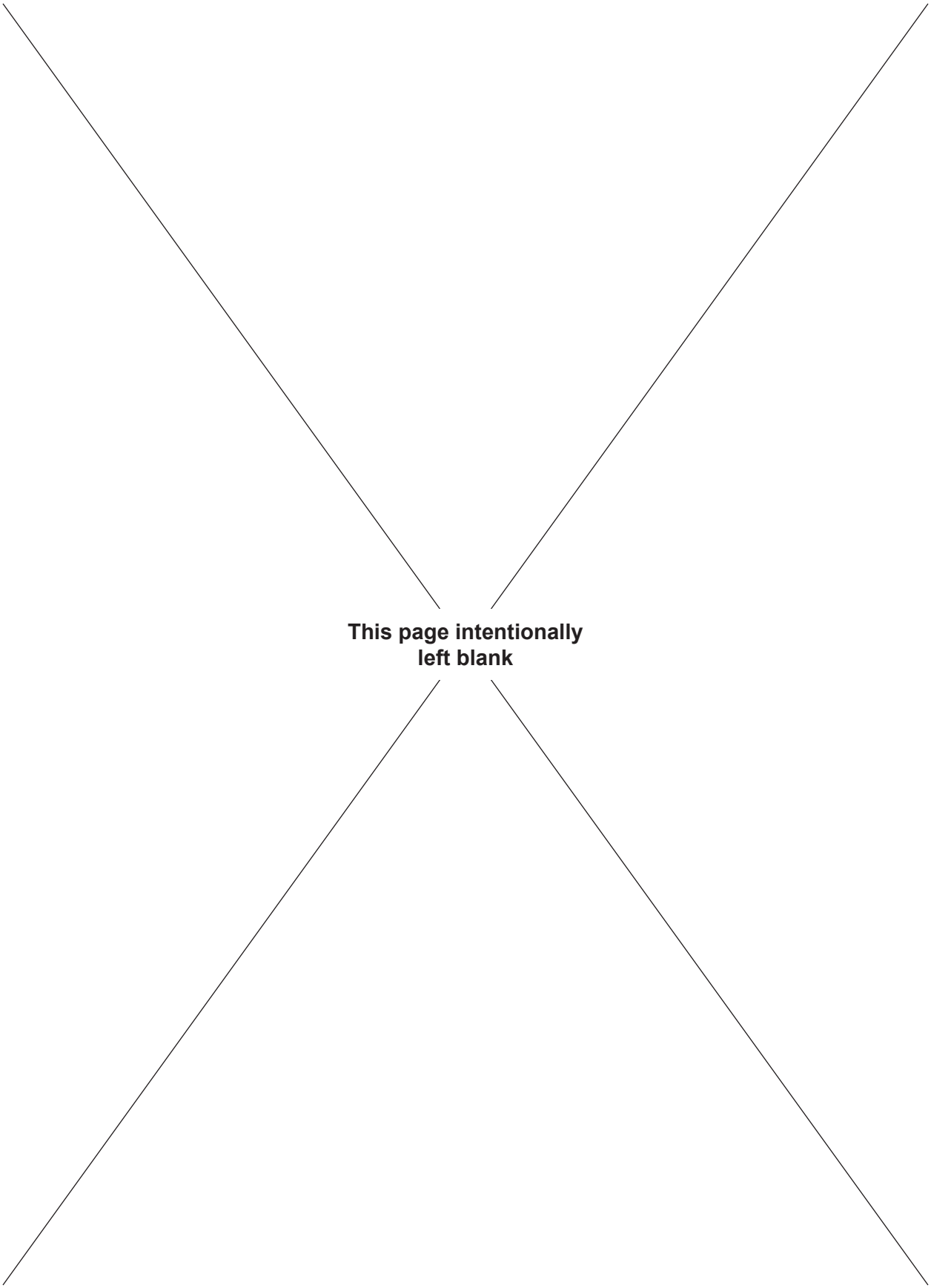
1.3.1 Acronyms and Definitions

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

1.3.2 Terms and Definitions

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

SECTION 2: EQUIPMENT & LUBRICATION SPECIFICATIONS



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2.0 EQUIPMENT DESCRIPTION

THIS TECHNICAL DOCUMENT APPLIES TO THE FOLLOWING MODELS:				
OVERALL MODEL: 80-220-150-23T-111-7S-00				
TONG MODEL	**BACKUP MODEL**	**MOUNTING KIT**	**REV**	**DESCRIPTION**
CLE22000XHT-14	BUCST23000	MKBUCST23000	B	22 in (559 mm) 150K lb-ft (203,370 Nm) hydraulic power tong and 23" Lockjaw™ backup, tension-style load cell. Configured for use with remote valve panel.

NOTICE

THIS EQUIPMENT IS EQUIPPED WITH A DOOR SWITCH DESIGNED TO INTERRUPT EQUIPMENT ROTATION WHEN THE DOOR OPENS. SEE SECTION 4 FOR PROPER TESTING PROCEDURES.

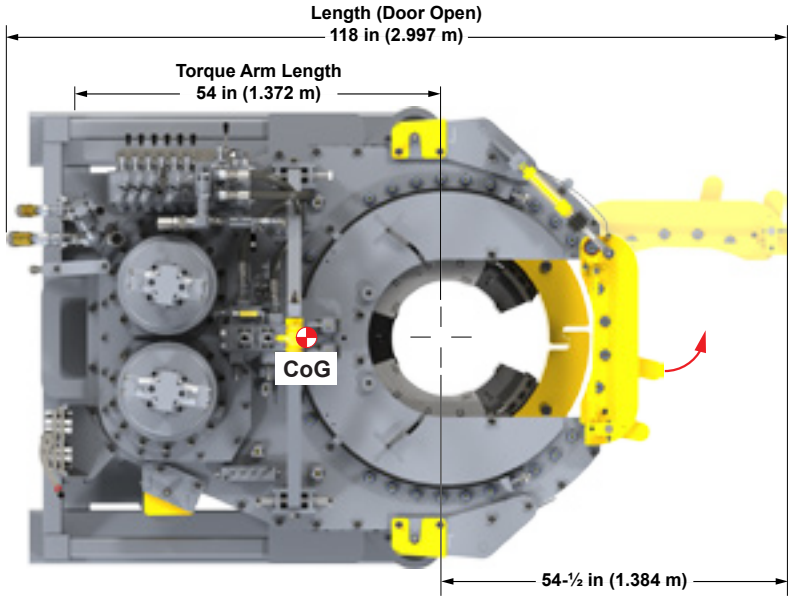
This equipment, top-level equipment number 80-220-150-23T-111-7S-00, uses hydraulic power to energize a rotating section enabling make-up (thread a connection) and breakout (un-thread a connection) of oil field casing tubulars between 10-¾ inches (273.1 mm) to 22" (558.8 mm) in diameter.

The hydraulic backup component (BUCST23000) clamps and stabilizes the stationary (box) section of tubular. The hydraulic power tong component (CLE22000XHT-14) grips the incoming casing section (the "pin") and threads the pin section in to the stationary box section until the threading force reaches a predetermined rotational torque value, which is measured by a tension load cell and indicated on the torque indicator.

The control valve assembly mounted to the power tong allows user control of all manual hydraulic control inputs (tong make/break rotation, backup clamp/un-clamp, lift cylinder raise/lower). An optional remote control panel connects to the multi-connector at the back of the equipment assembly, allowing remote control of the equipment when the control panel is used.

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

Illustration 2.0.1: CLE22000XHT 22" Tong+BUCST23000 23" Lockjaw Backup



Center of gravity shown on these assembly drawings does not include installed jaws.

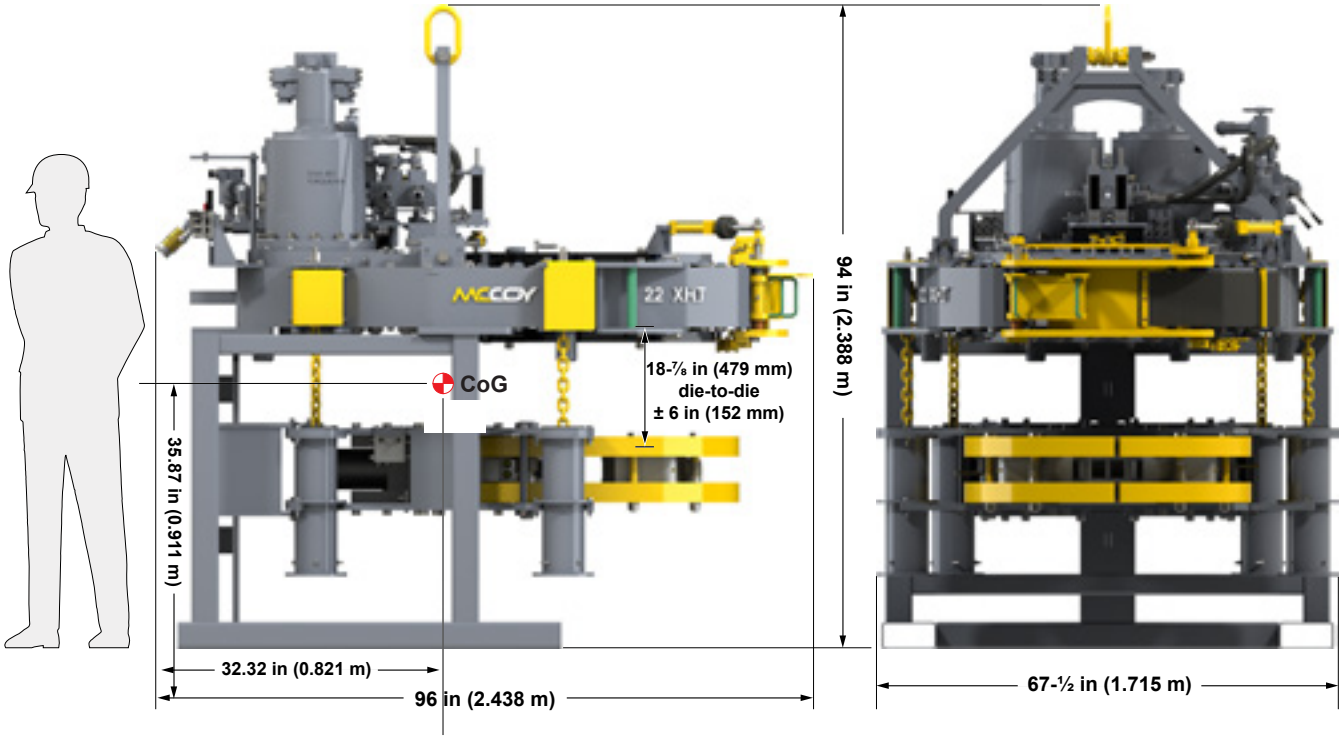


Illustration 2.0.2: CLE22000XHT+23" LJBU Major Dimensions

⚠ WARNING

A rotating cage plate assembly, backup clamp cylinders, and automated tong and backup doors present significant hazards when the equipment is active.

The areas highlighted in YELLOW on this page indicate potential pinching, crushing and snagging hazards during operation. Keep hands clear of indicated areas when equipment is energized.

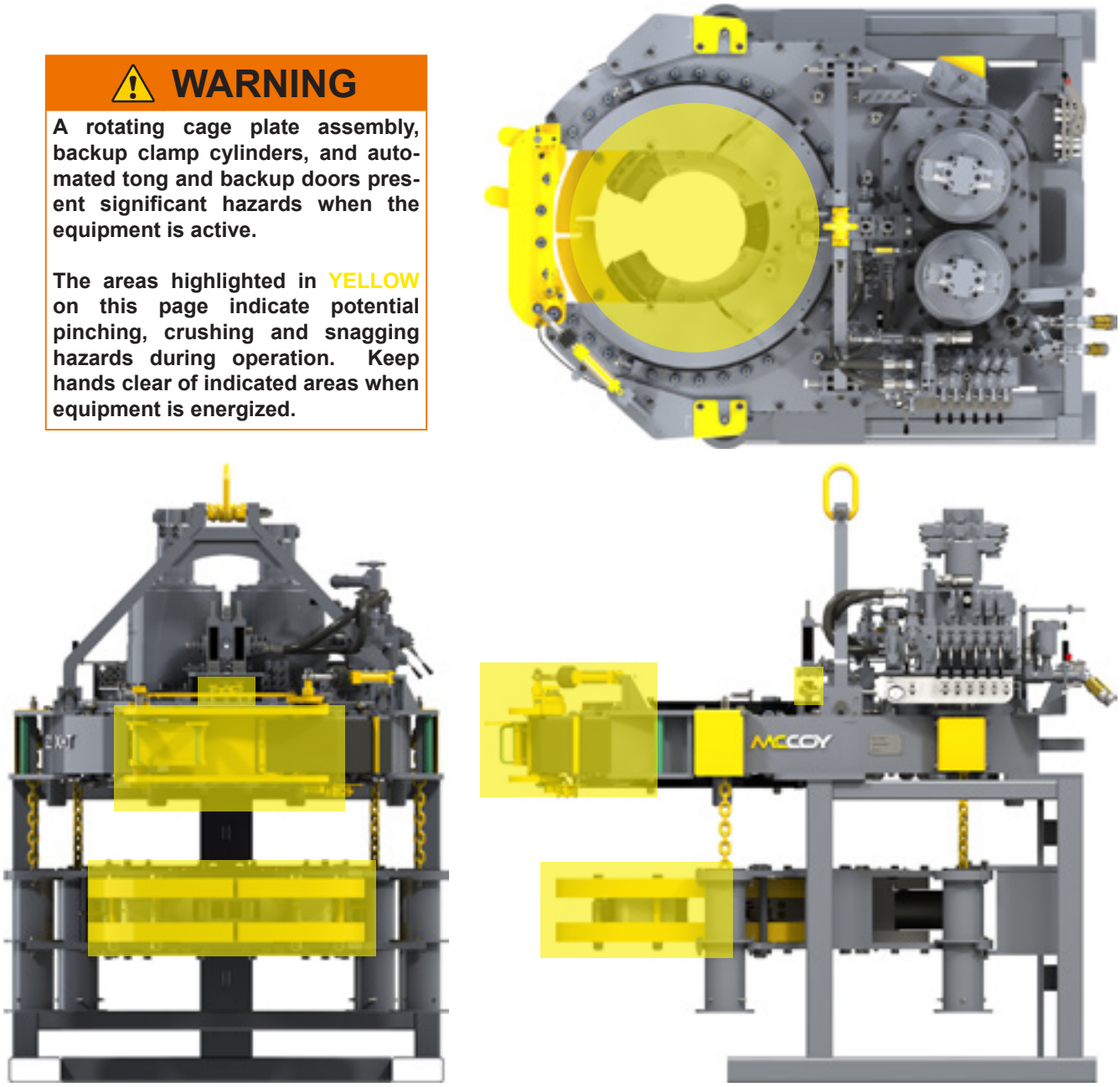


Illustration 2.0.3: CLE22000XHT+23" LJBU Additional Hazard Areas

2.1 MAJOR COMPONENT IDENTIFICATION

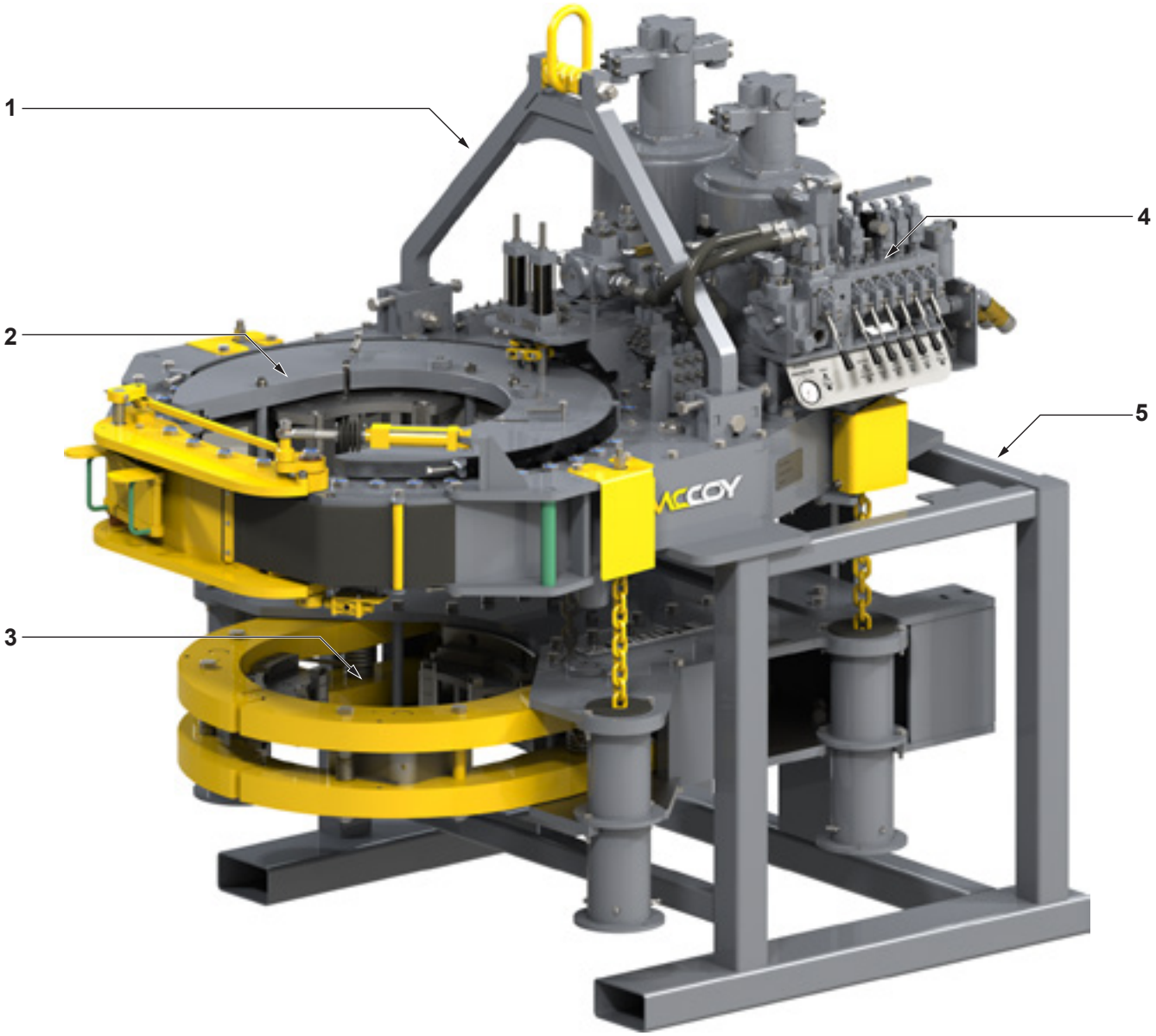


Illustration 2.1.1: CLE22000XHT+23" LJBU Component ID 01

Item	Description
1	Rigid sling
2	CLE22000XHT-14 hydraulic power tong
3	BUCST23000 Lockjaw™ backup
4	VP22000-1120-632 valve package
5	MKBUCST23000 mounting kit

2.1 MAJOR COMPONENT IDENTIFICATION (CONTINUED):

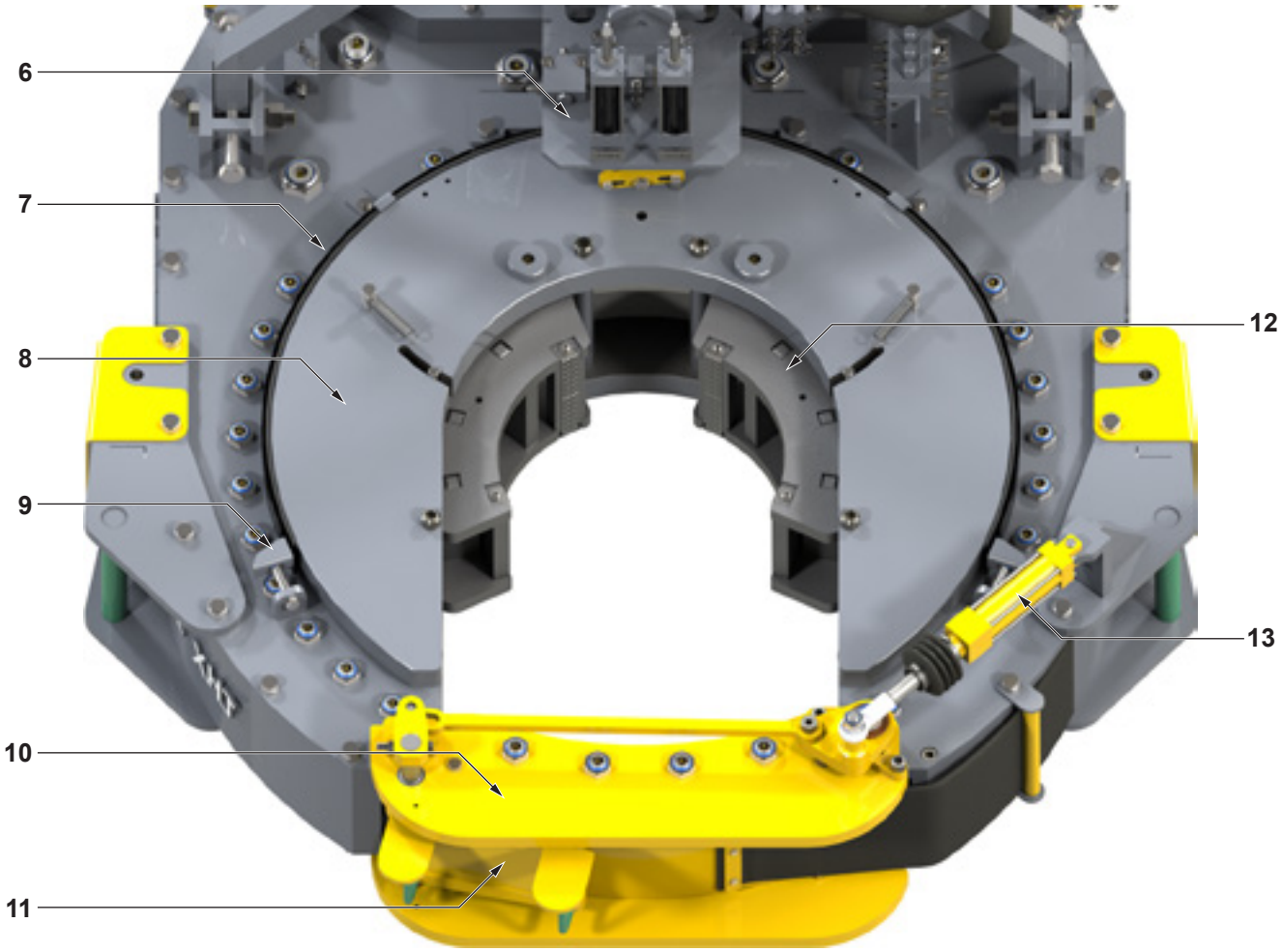


Illustration 2.1.2: CLE22000XHT+23in LJBU Component ID 02

Item	Description
6	Reversing pin assembly
7	Brake band
8	Cage plate assembly
9	Brake band adjustment
10	Tong door weldment
11	Tong door latch assembly
12	Tong jaws with die inserts
13	Hydraulic door cylinder

2.1 MAJOR COMPONENT IDENTIFICATION (CONTINUED):

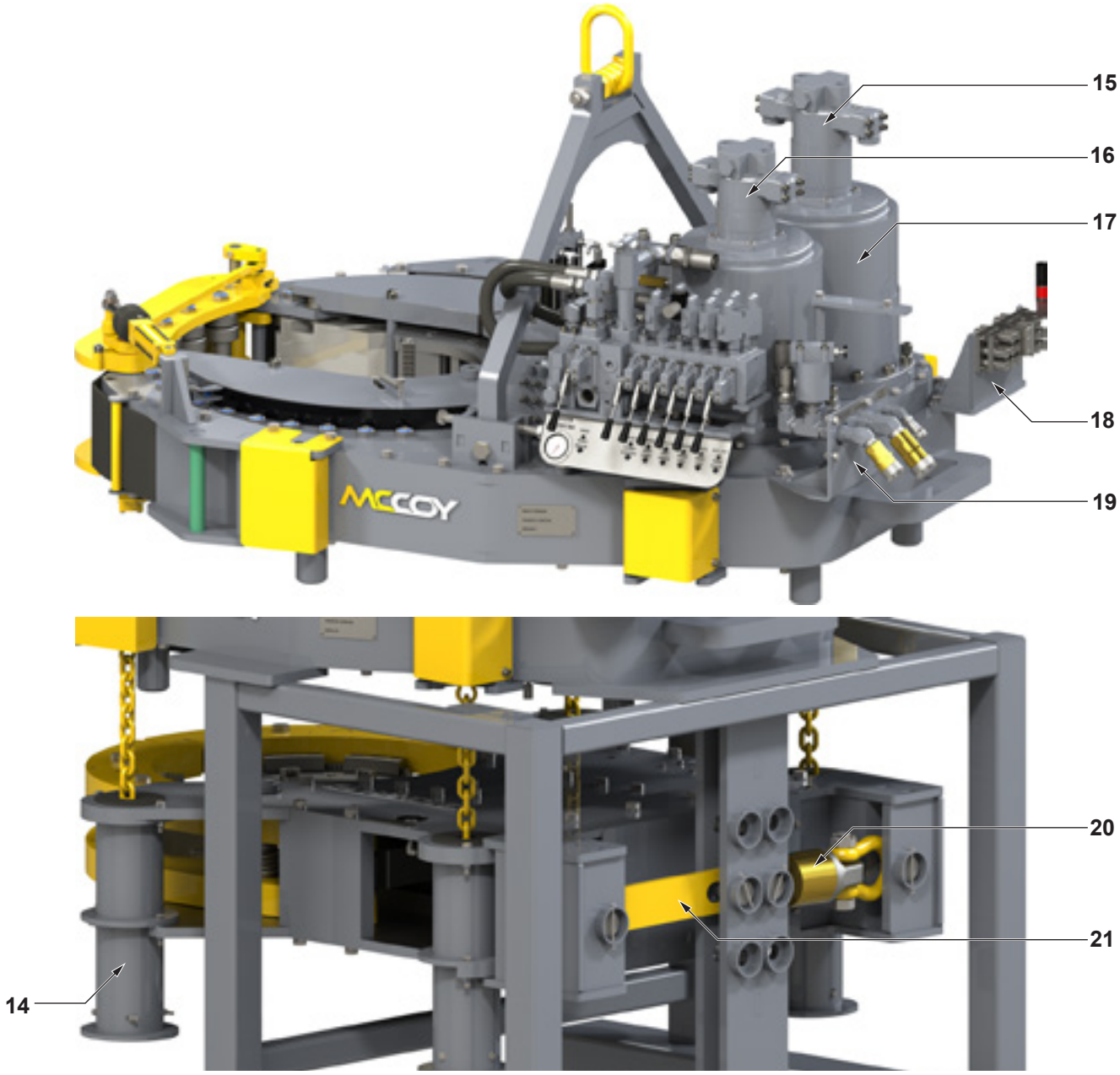


Illustration 2.1.3: CLE22000XHT+23in LJBU Component ID 03

Item	Description
14	Backup spring support assembly
15	Hydraulic motor, two speed, 9 in³
16	Hydraulic motor, two speed, 24 in³
17	Torque hub assembly
18	Stucchi multi-connector (remote panel access)
19	Rear hydraulic bulkhead
20	Tension load cell
21	Breakout bar

2.1 MAJOR COMPONENT IDENTIFICATION (CONTINUED):

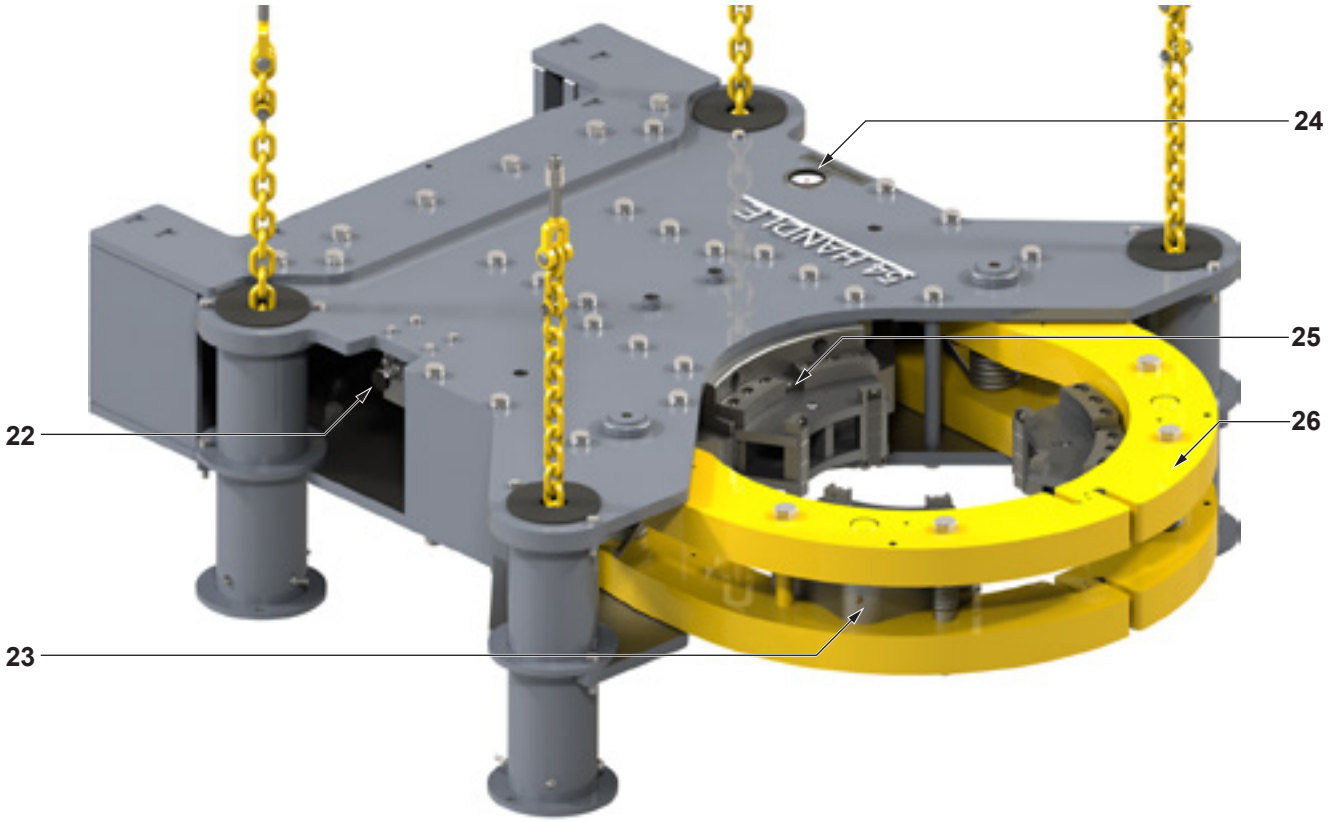


Illustration 2.1.4: CLE22000XHT+23in LJBU Component ID 04

Item	Description
22	Backup pressure adjustment
23	Door-mounted pivoting jaw
24	Backup pressure indicator
25	Backup clamp cylinder / rear jaw
26	Backup doors

2.2 EQUIPMENT SPECIFICATIONS

Torque Table

Please note that these are ideal values. Actual achieved torque is highly dependent upon tong efficiency and final position of rotary gear when full torque load is reached. Maximum torque is only available when hydraulic motors are run in parallel at full displacement (motor speed LOW), and the rotary gear remains in full contact with both idler assemblies.

Pressure	Motor Speed HIGH				Motor Speed LOW			
	Series/Parallel Valve				Series/Parallel Valve			
	Single Motor		Two Motors - Parallel		Single Motor		Two Motors - Parallel	
PSI / Bar	Lbs.-ft.	Nm	Lbs.-ft.	Nm	Lbs.-ft.	Nm	Lbs.-ft.	Nm
1200 / 82.74	9,300	12,610	35,100	47,590	19,100	25,900	66,700	90,430
1800 / 124.1	14,000	18,980	52,600	71,320	28,700	38,910	100,000	135,580
2400 / 165.5	18,700	25,350	70,200	95,180	38,200	51,790	133,300	180,730
2700 / 186.2	21,000	28,470	79,000	107,110	43,000	58,300	150,000	203,370

MAXIMUM RATED TORQUE: 150,000 LBS-FT / 203,370 NM

MAXIMUM MOTOR PRESSURE: 2700 PSI / 186.2 BAR
MAXIMUM SYSTEM PRESSURE: 3000 PSI / 206.8 BAR

Speed Table (RPM - Theoretical)

	Motor Speed LOW		Motor Speed HIGH	
	Series/Parallel Valve		Series/Parallel Valve	
Flow (GPM/LPM)	Parallel	Single Motor	Parallel	Single Motor
10 / 37.9	0.3	0.6	0.9	1.9
20 / 75.7	0.6	1.2	1.9	3.7
40 / 151.4	1.2	2.4	3.7	7.5
60 / 227.1	1.8	3.6	5.6	11.2

Maximum Hydraulic Requirements	60 GPM (227.1 LPM)
	3000 PSI (20.684 MPa)
Maximum Length (Door Closed)	97-⅞ in / 2.486 m
Maximum Height	98 in / 2.489 m
Maximum Width	67-½ in / 1.715 m
Maximum Vertical Travel (Tong)	± 6 in / 152.4 mm
Space Required On Pipe (Tong)	13 in / 330.2 mm
Torque Arm Length (Pipe center to anchor center)	54 in / 1.372 m
Gear Reduction Ratio, Turns Encounter to Ring Gear	5.5:1
Dead Weight (Approximate)	12,634 lbs / 5740 kg (jaws not included)
Tong Jaws available (inches)	All standard sizes from 10-¾” to 22”
Backup Jaws available (inches)	All standard sizes from 10-¾” to 23”
Recommend Spring Hanger	55-0000030

DANGER

ONLY USE SPRING HANGERS SUPPLIED BY MCCOY GLOBAL.

2.3 RECOMMENDED LUBRICANT SPECIFICATIONS

2.3.1 Hydraulic Fluid

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

⚠ CAUTION

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

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

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

NOTICE

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

2.3.2 Gear Fluid

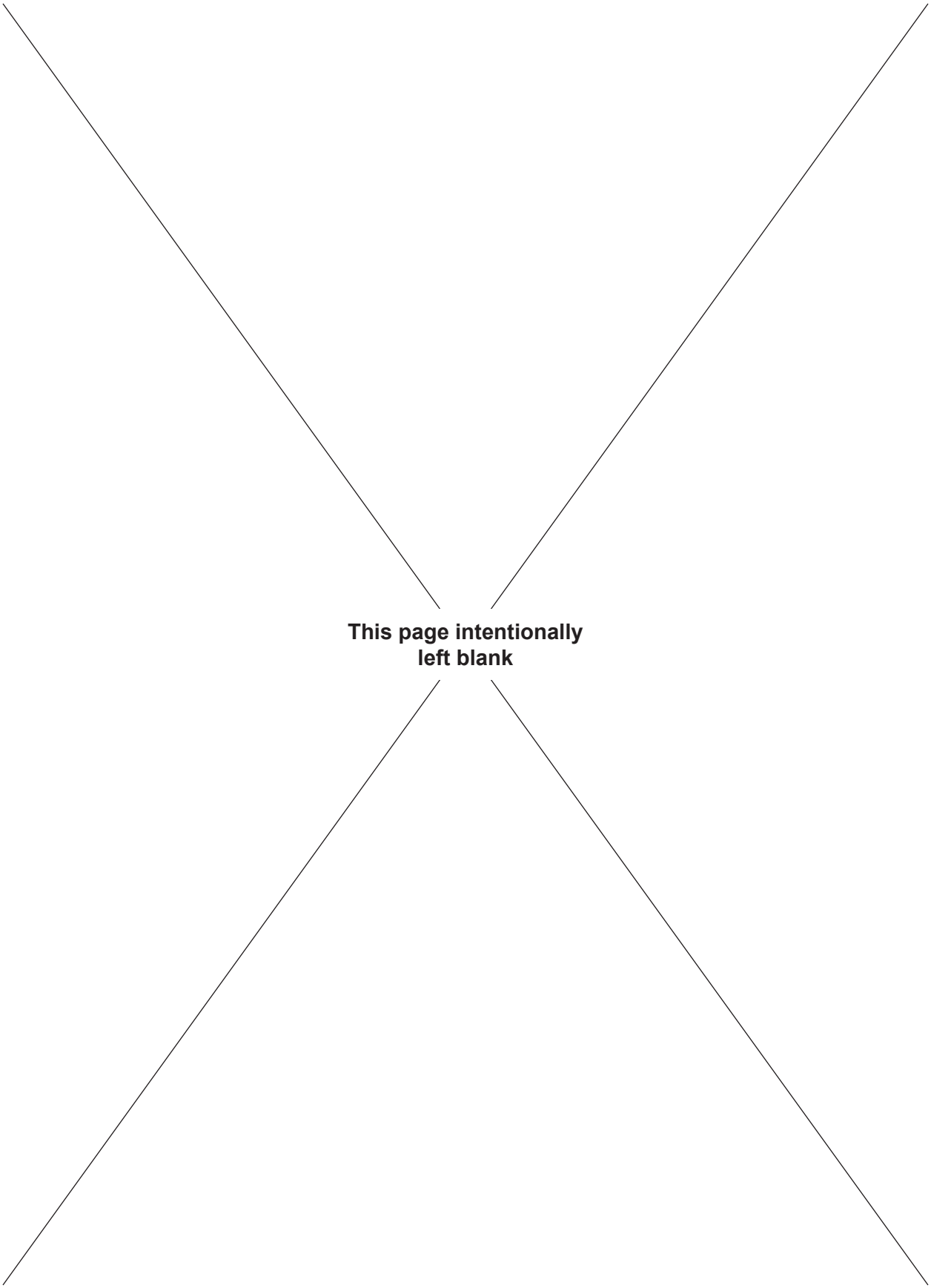
McCoy Global recommends using a high-quality universal gear fluid in gearbox and torque hub assemblies. If required, the gear fluid should meet VG150/VG220 or AGMA 4EP/5EP specifications. However, in more extreme operating conditions it may be necessary to fill the gearboxes on the equipment with gear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

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

2.3.3 Grease

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

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



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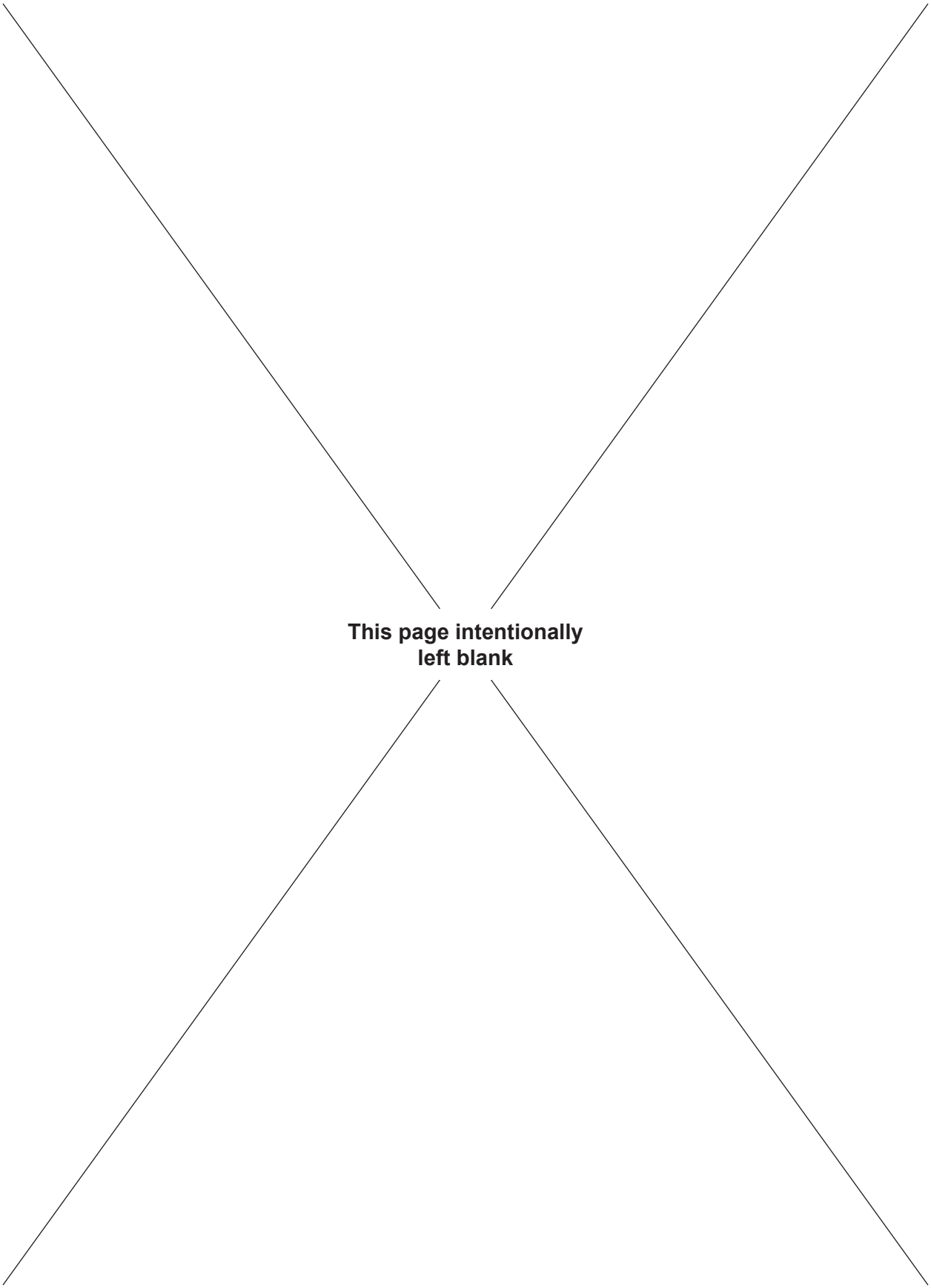
SECTION 3: INSTALLATION & COMMISSIONING



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

3.0 RECEIPT, INSPECTION, AND HANDLING OF EQUIPMENT

⚠ CAUTION

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

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

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

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

⚠ CAUTION

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

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

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

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

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

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

3.1 SLING / LOAD BEARING DEVICE SAFETY

⚠ DANGER

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

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

⚠ WARNING

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

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

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

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

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

3.1.1 Inspection Of Load-Bearing Devices and Structures

McCoy strongly recommends the following practices:

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

Removal Criteria:

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

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

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

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

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

General guidelines for the interval are:

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

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

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

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

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

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

⚠ WARNING

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

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

⚠ DANGER

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

3.1.2 Proper Use Of Load-Bearing Devices

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

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

Do not stand directly under a load during lifting.

3.1.3 Storage Of Load-Bearing Devices

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

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

3.2 LIFT CYLINDER INSTALLATION AND SAFETY

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

⚠ WARNING

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

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

3.2.1 Installation Procedure

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

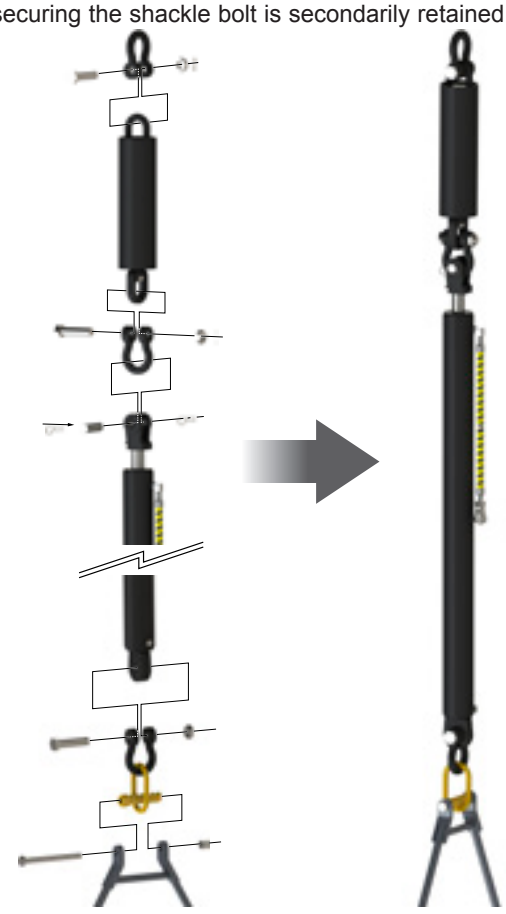


Illustration 3.2.1: Lift Cylinder & Spring Hanger Installation

3.2.2 Lift Cylinder Hydraulic Connection

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

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

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

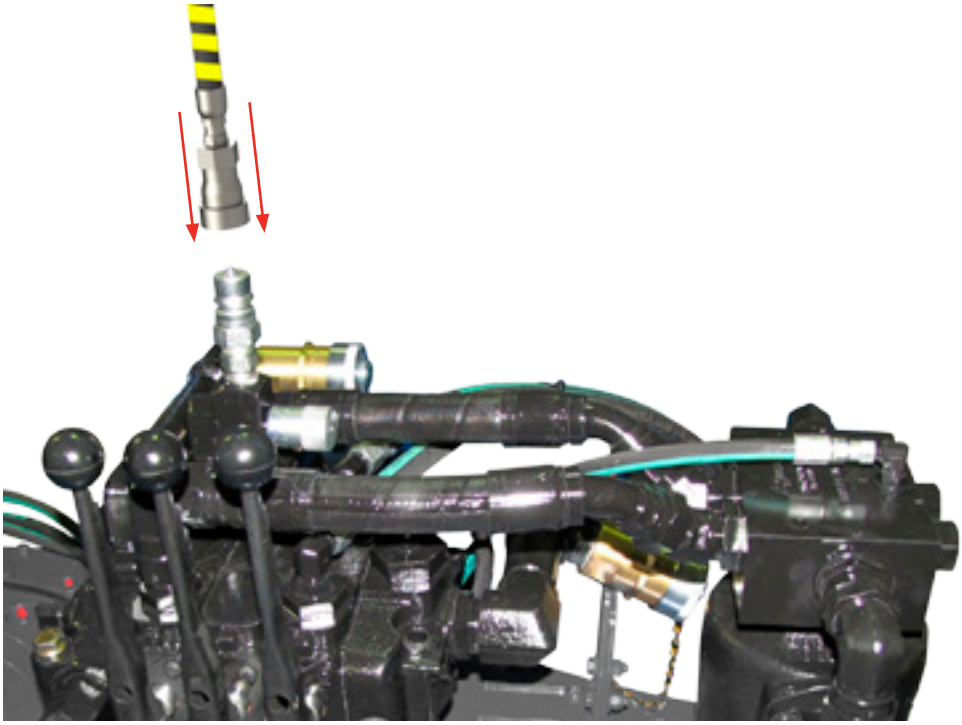


Illustration 3.2.2: Lift Cylinder Hydraulic Connection

3.2.3 Lift Cylinder Safety

⚠ WARNING

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

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

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

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

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

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

3.2.3 Lift Cylinder Safety (continued):

⚠ WARNING

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

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

⚠ WARNING

REPLACE LIFT CYLINDER HYDRAULIC LINE EVERY TWO YEARS

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

⚠ WARNING

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

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

⚠ WARNING

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

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

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

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

3.2.3 Lift Cylinder Safety (continued):

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

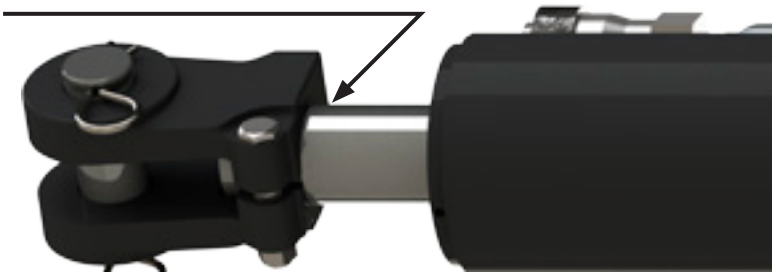


Illustration 3.2.3: Lift Cylinder Clevis Inspection

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

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

⚠ DANGER

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

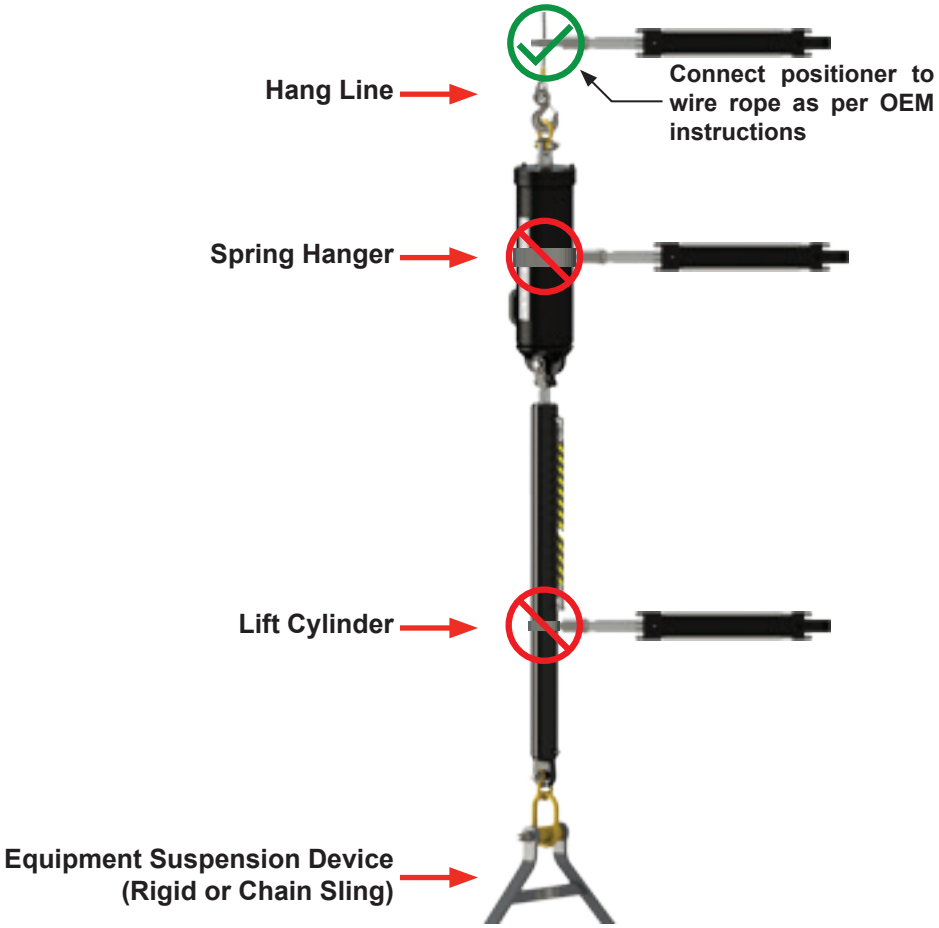


Illustration 3.2.4: Correct Installation of Positioning System

NOTICE

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

3.3 HYDRAULICS

3.3.1 Hydraulic Schematic & B.O.M.

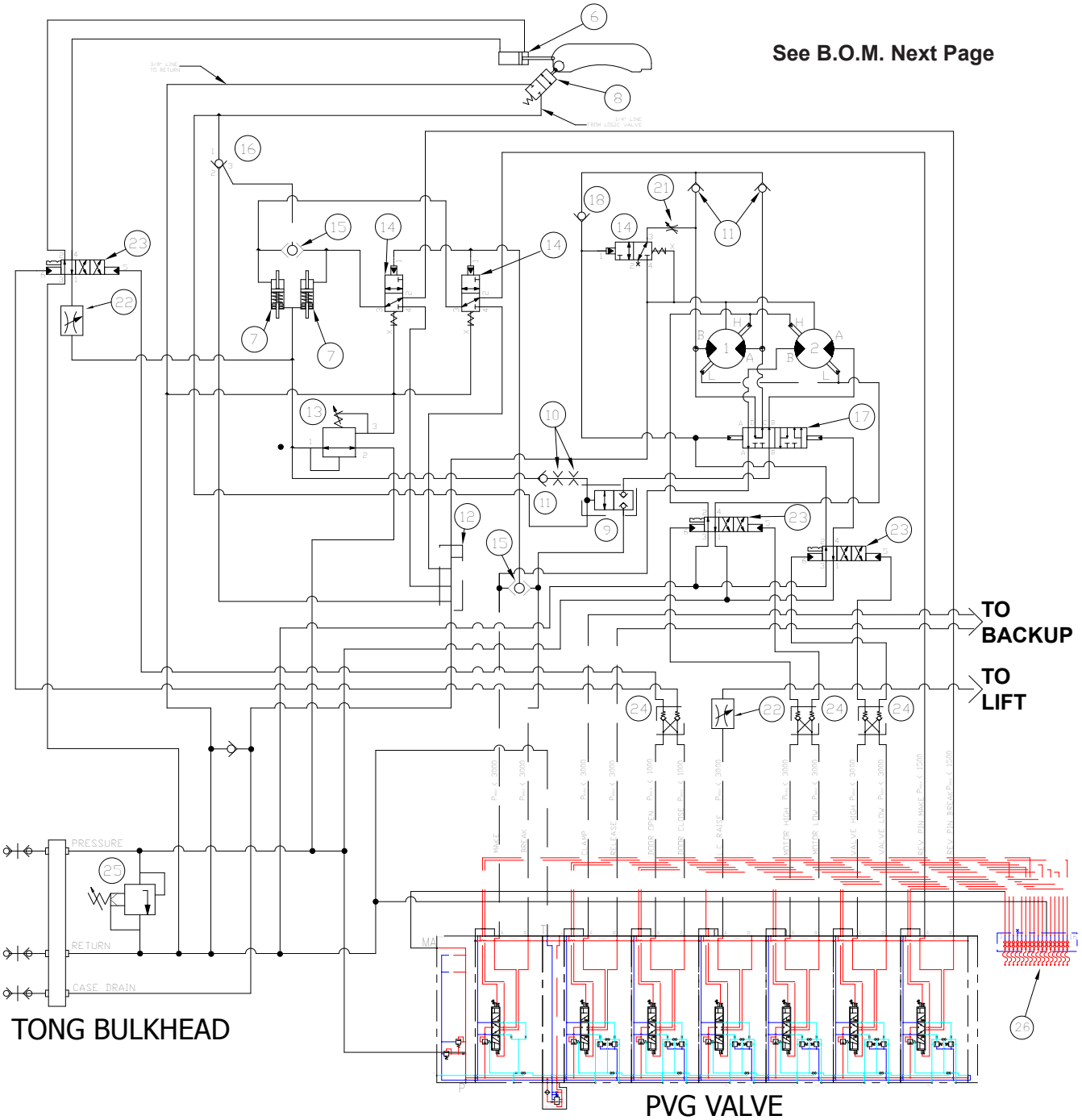


Illustration 3.3.1: Hydraulic Schematic - Page One

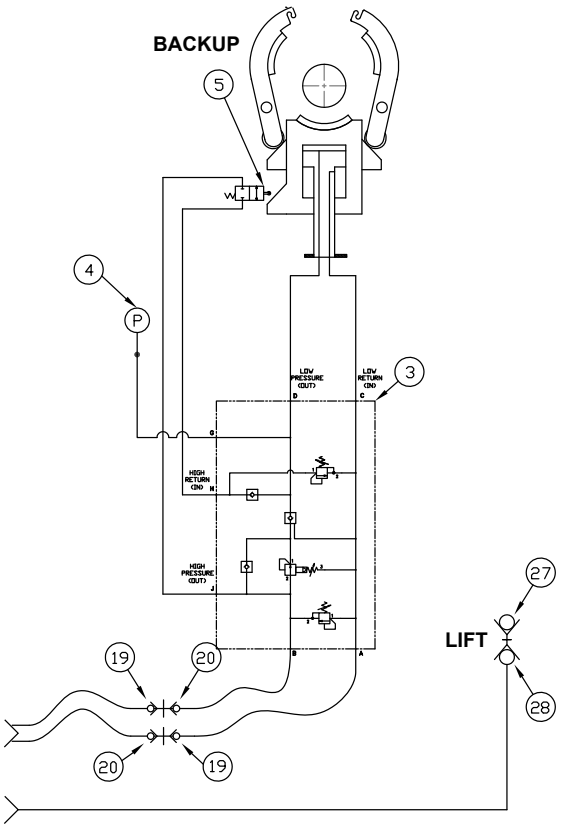


Illustration 3.3.2: Hydraulic Schematic - Page Two

Item	Description	Part Number	Item	Description	Part Number
1	24 in^3 2-speed hydraulic motor	20099-01	16	Pilot operated check valve	14790
2	9 in^3 2-speed hydraulic motor	20099-02	17	Series/parallel valve	22237
3	Backup manifold assembly	BUCS7699-01	18	Check valve, high cracking pressure	1001418
4	3000 psi pressure indicator	BAC-3M25RCFF	19	Quick-disconnect coupling	86059-M
5	Directional control valve, cam operated	SLV1000-04	20	Quick-disconnect nipple	86059-F
6	Hydraulic cylinder, door actuation	2043	21	Tamper resistant needle valve	1809
7	Hydraulic cylinder, reversing pin	1000970	22	½" flow control valve	08-9062
8	Normally-closed door switch with vent	SLV1000-01	23	Pilot valve with manifold	1003071
9	Logic valve assembly	86049	24	Pilot-operated check valve	CP410-0
10	1/32" orifice	118-B	25	Relief valve	2070
11	¼" check valve	CM4565	26	16-station quick disconnect	1003716
12	Drain manifold	CRSS22069	27	3/8" Female quick disconnect	1624
13	Pressure reducing relief valve	CP230-1B-6S	28	3/8" Male quick disconnect	1623
14	Pilot operated directional control valve	CP720-2-B-0-040-S3	29	1" Quick disconnect cap	1442
15	Shuttle valve	LSV16TN	30	1 1/4" Quick disconnect cap	1443

3.3.2 Main Hydraulic Connections

Connect the hydraulic supply, return, and case drain at the hydraulic bulkhead at the rear of the tong. Supply hydraulic pressure to your equipment through the 1" hydraulic supply connection. A 1-¼" return connection provides a return path to the power unit. The quick-connect fitting allows motor case drain to tank. The different sizes of the supply and return lines eliminates the possibility of accidental cross-connections.

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

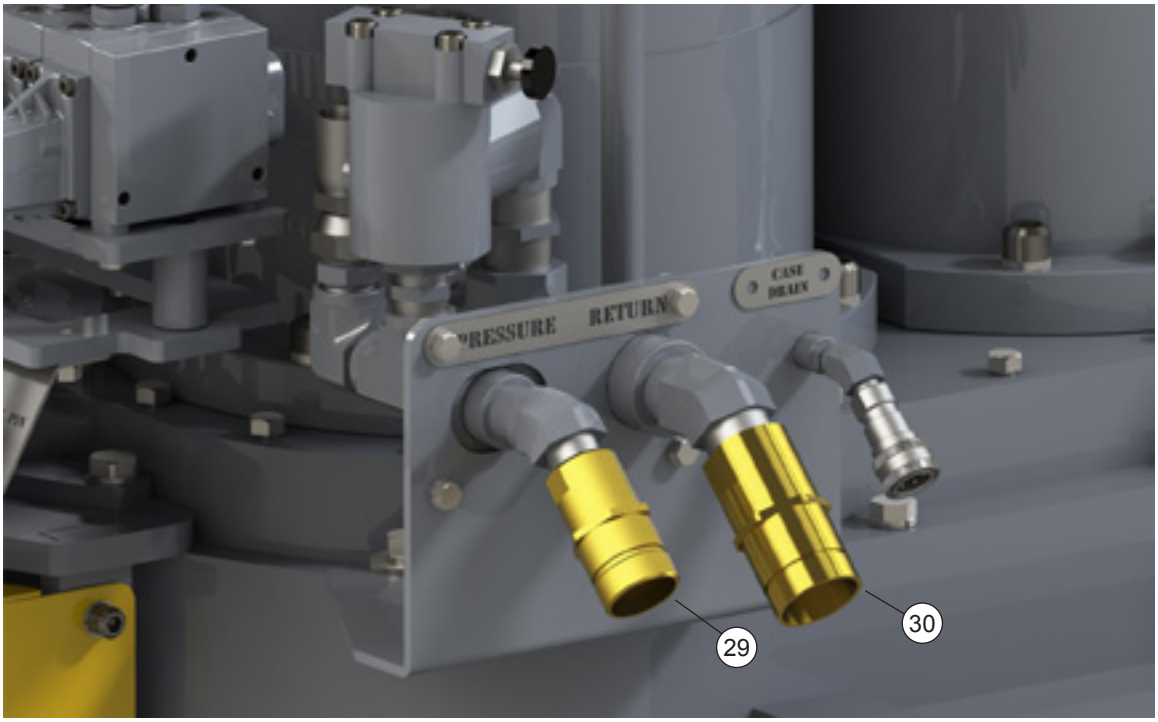


Illustration 3.3.3: Main Hydraulic Connection Bulkhead

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

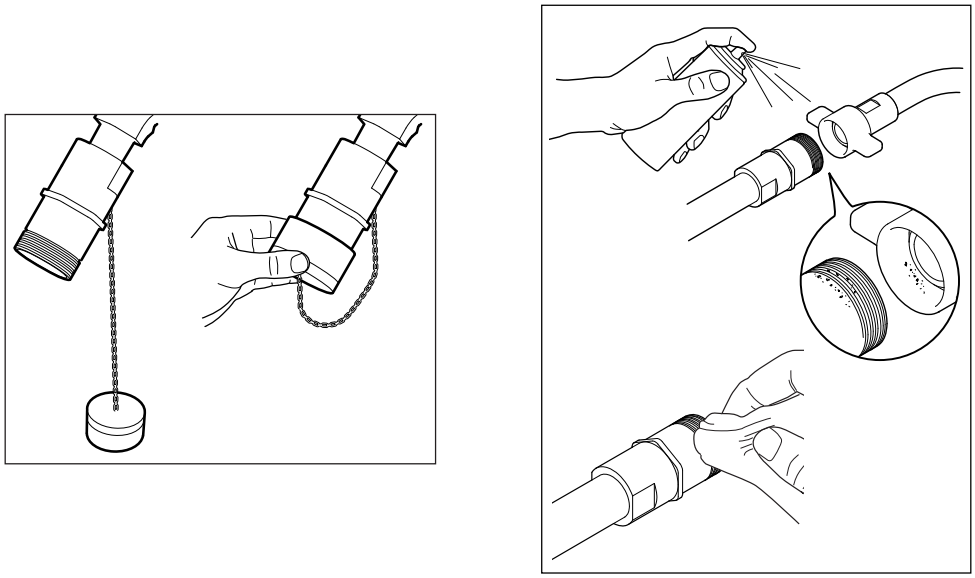


Illustration 3.3.4: Hydraulic Connections 02

3.3.2 Main Hydraulic Connections (Continued):

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

Self-sealing wing-type hydraulic disconnects should always be fully made up to the “fully engaged” indicator line on the male side of the connection. Inspect all hydraulic connections before energizing hydraulic power to ensure secure connections have been made. Supply of full hydraulic pressure without ensuring an established return line may result in system damage. Do not use a wrench to tighten connections. Do not tap on the “wings” with a hammer to tighten connection.

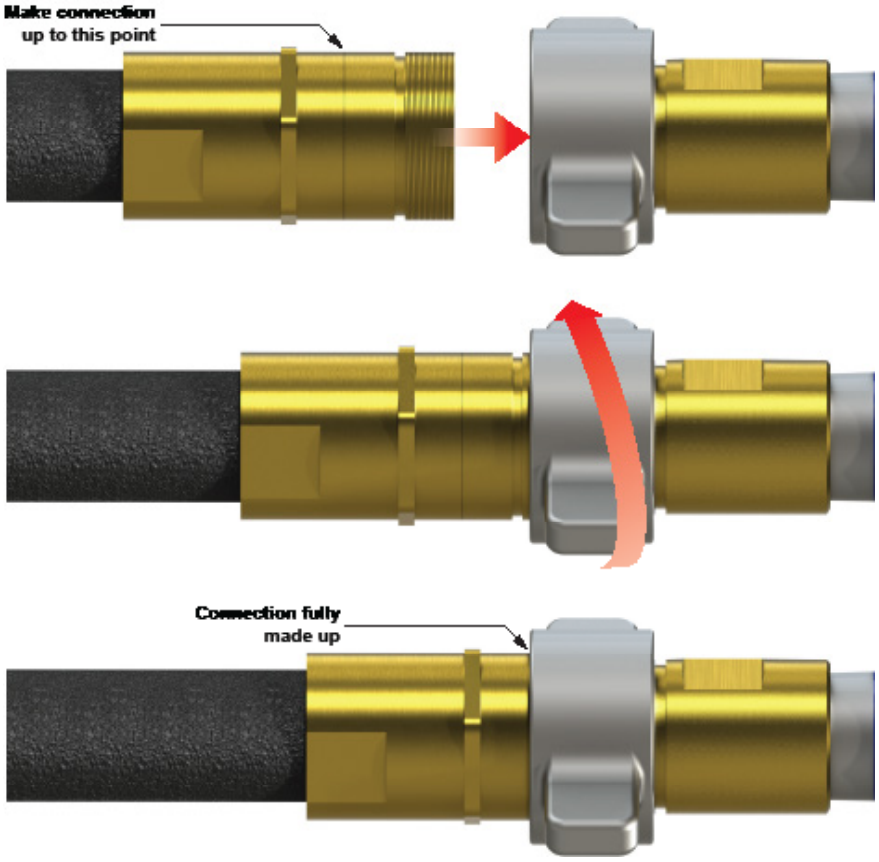


Illustration 3.3.5: Hydraulic Connections 03

⚠ WARNING

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

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

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

⚠ WARNING

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

3.3.3 Remote Control Panel Connection

This equipment may be remotely controlled using an appropriately configured hydraulic control console. Connect the equipment to the control console via the 16-station multi-connector mounted on the rear of the tong.

⚠ WARNING

ALWAYS TURN OFF HYDRAULIC POWER AND DEPRESSURIZE HYDRAULIC SYSTEM BEFORE CONNECTING OR DISCONNECTING THE MULTI-CONNECTOR.

1. Actuate the red safety lock release mechanism on the jumper assembly handle, and swing the handle to unlock the jumper from the multi-connector.

⚠ CAUTION

DO NOT ATTEMPT TO ROTATE THE LOCKING LEVER ON THE THE MULTI-CONNECTOR WITHOUT DEPRESSING THE RED SAFETY LOCK RELEASE BUTTON

2. Pull the jumper straight off the multi-connector.

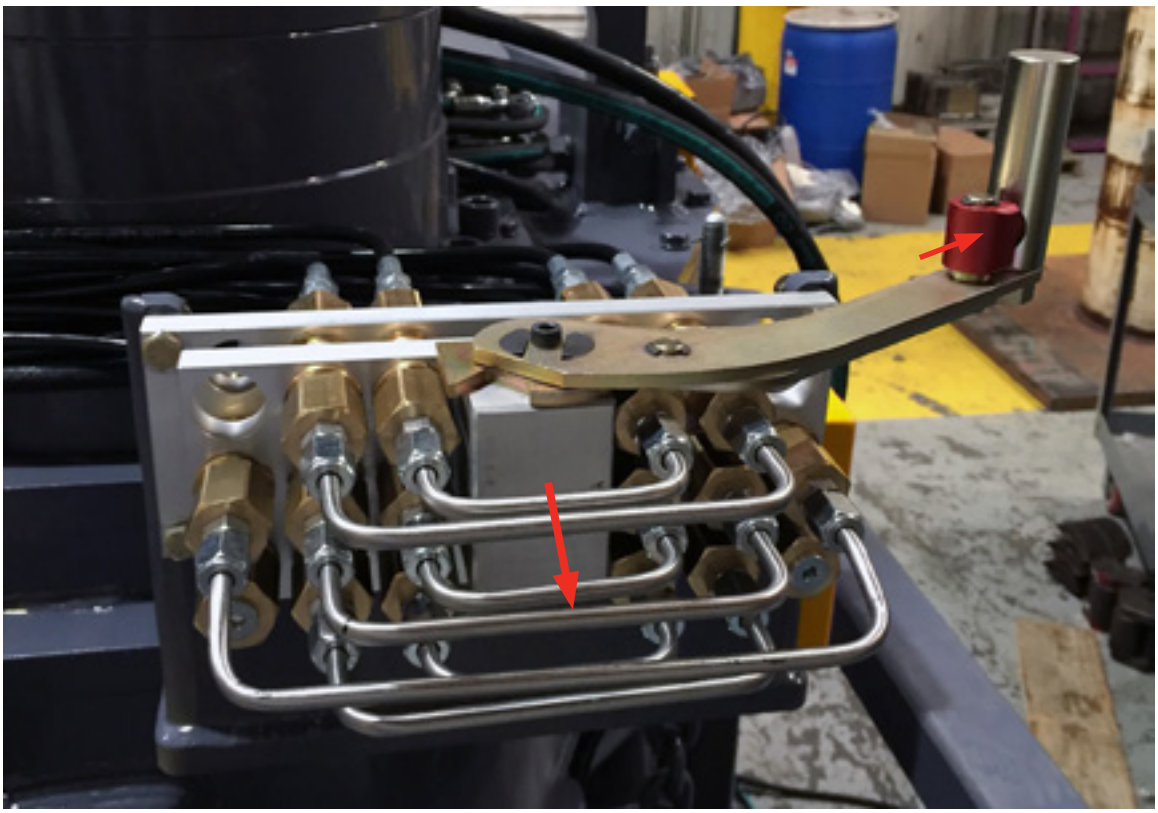


Illustration 3.3.6: Multi-connector With Installed Jumper

3. Remove protective caps from the multi-connector on the pigtail from the control console. Inspect each side of the connection and ensure all pins and receptacles are free of dirt and contamination. Clean connectors with a soft lint-free cloth if required.
4. Insert the guide pins of the mobile half of the connection in to the guide holes of the fixed half (handle half). Continued to slide the mobile half on to the fixed half until contact is made between the faces of the two couplings.

3.3.3 Remote Control Panel Connection (Continued):

5. Press the red safety release button on the handle, and rotate the lever in the locking direction. Approximately halfway through the rotation, release the red safety release button.

⚠ CAUTION

DO NOT ATTEMPT TO ROTATE THE LOCKING LEVER ON THE MULTI-CONNECTOR WITHOUT DEPRESSING THE RED SAFETY LOCK RELEASE BUTTON

Continue to rotate handle until the safety lock engages with an audible “click”. Tug the handle lightly in the “release” direction to ensure safety lock is engaged.

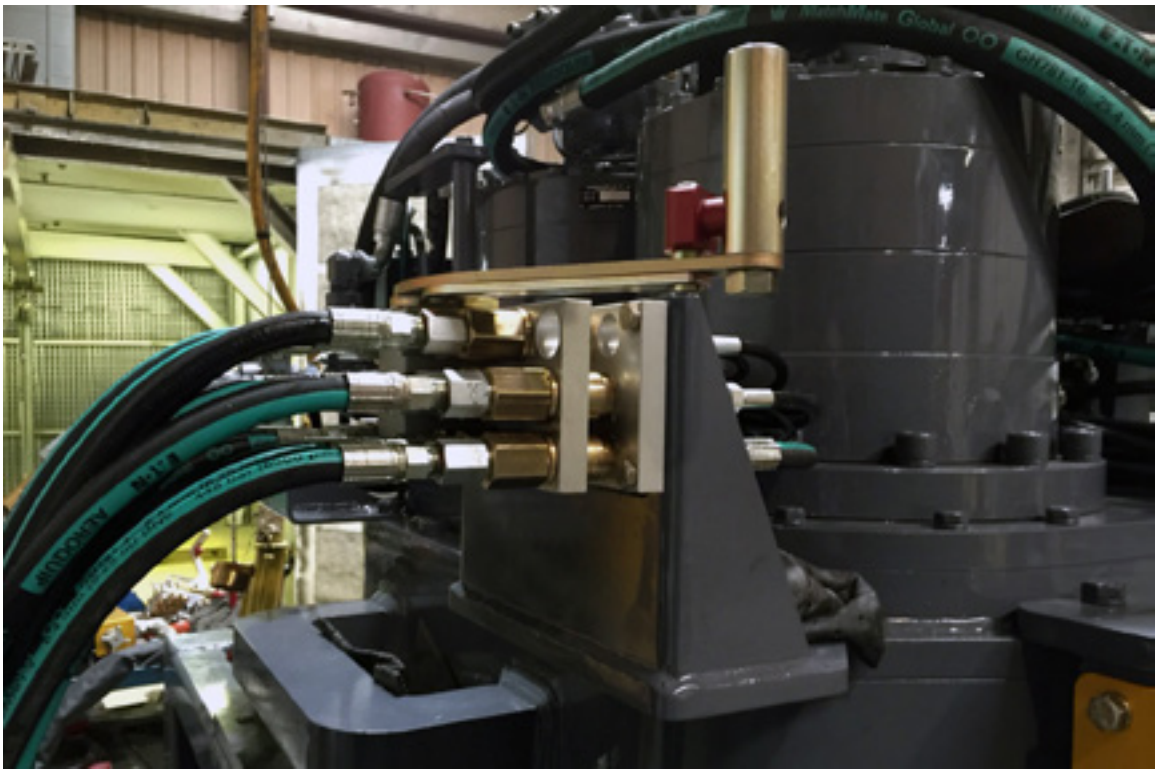


Illustration 3.3.7: Installed Control Console Pigtail

Reverse this procedure to disconnect remote hydraulic control from this equipment. Ensure the multi-connector jumper is securely installed and locked before restoring hydraulic power to the equipment.

3.4 TONG / BACKUP JAW AVAILABILITY & INSTALLATION

3.4.1 Tong Jaw Availability

The following table lists all jaw die kits that are available as standard stocked sizes for this model of tong. A single jaw die kit contains two jaws (left and right), complete with jaw pins, rollers, one set of die inserts, and die insert retainers. 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 die inserts that are available as spare parts. McCoy also offers a wide variety of specialized dies designed for custom applications. Please refer to our website for complete information.

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

⚠ DANGER

USE OF ALUMINIUM DIES IN CE-MARKED EQUIPMENT IS FORBIDDEN

⚠ WARNING

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

Standard Jaw Die Kits For CLE22000XHT

Description	Part Number	Approximate Weight (Per Single Jaw)
10-¾” Jaw Die Kit	CJDT22XHT-10750	142 lbs (64.5 kg)
11-¾” Jaw Die Kit	CJDT22XHT-11750	143 lbs (65 kg)
11-⅞” Jaw Die Kit	CJDT22XHT-11875	141 lbs (64 kg)
12-¾” Jaw Die Kit	CJDT22XHT-12750	127 lbs (57.6 kg)
13-⅜” Jaw Die Kit	CJDT22XHT-13375	127 lbs (57.6 kg)
13-⅝” Jaw Die Kit	CJDT22XHT-13625	126 lbs (57.2 kg)
14” Jaw Die Kit	CJDT22XHT-14000	133 lbs (60.3 kg)
14-½” Jaw Die Kit	CJDT22XHT-14500	121 lbs (54.9 kg)
15” Jaw Die Kit	CJDT22XHT-15000	120 lbs (54.4 kg)
16” Jaw Die Kit	CJDT22XHT-16000	122 lbs (55.3 kg)
16-½” Jaw Die Kit	CJDT22XHT-16500	112 lbs (50.8 kg)
17” Jaw Die Kit	CJDT22XHT-17000	117 lbs (53.1 kg)
18” Jaw Die Kit	CJDT22XHT-18000	106 lbs (48.1 kg)
18-⅝” Jaw Die Kit	CJDT22XHT-18625	106 lbs (48.1 kg)
18.950” Jaw Die Kit	CJDT22XHT-18950	105 lbs (47.6 kg)
20” Jaw Die Kit	CJDT22XHT-20000	98 lbs (44.5 kg)
22” Jaw Die Kit	CJDT22XHT-22000	80 lbs (36.3 kg)

Available Strip Die Inserts:

Part Number	Die Type
13-0008-314-0	Straight Tooth
13-0008-314-D	Diamond Tooth

3.4.2 Tong Jaw Die Replacement

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

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

⚠ DANGER

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

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

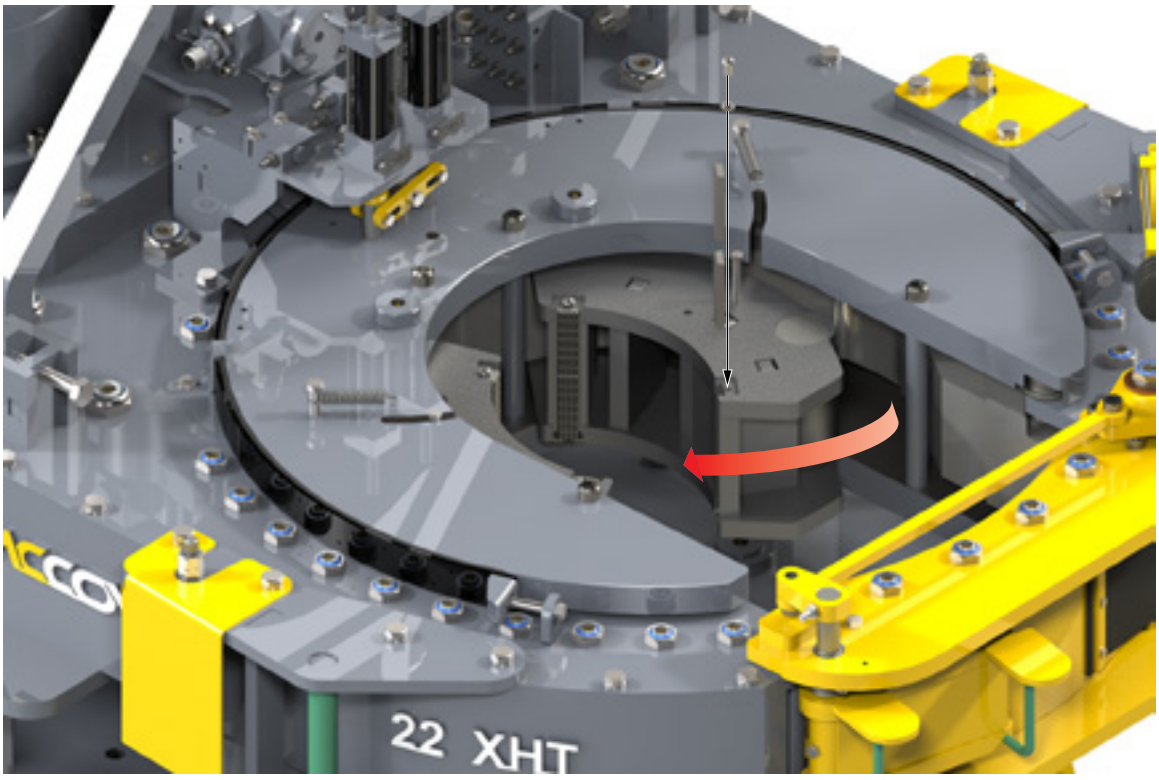


Illustration 3.4.1: Jaw Die Removal

3.4.3 Tong Jaw Installation & Removal

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

⚠ CAUTION

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

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

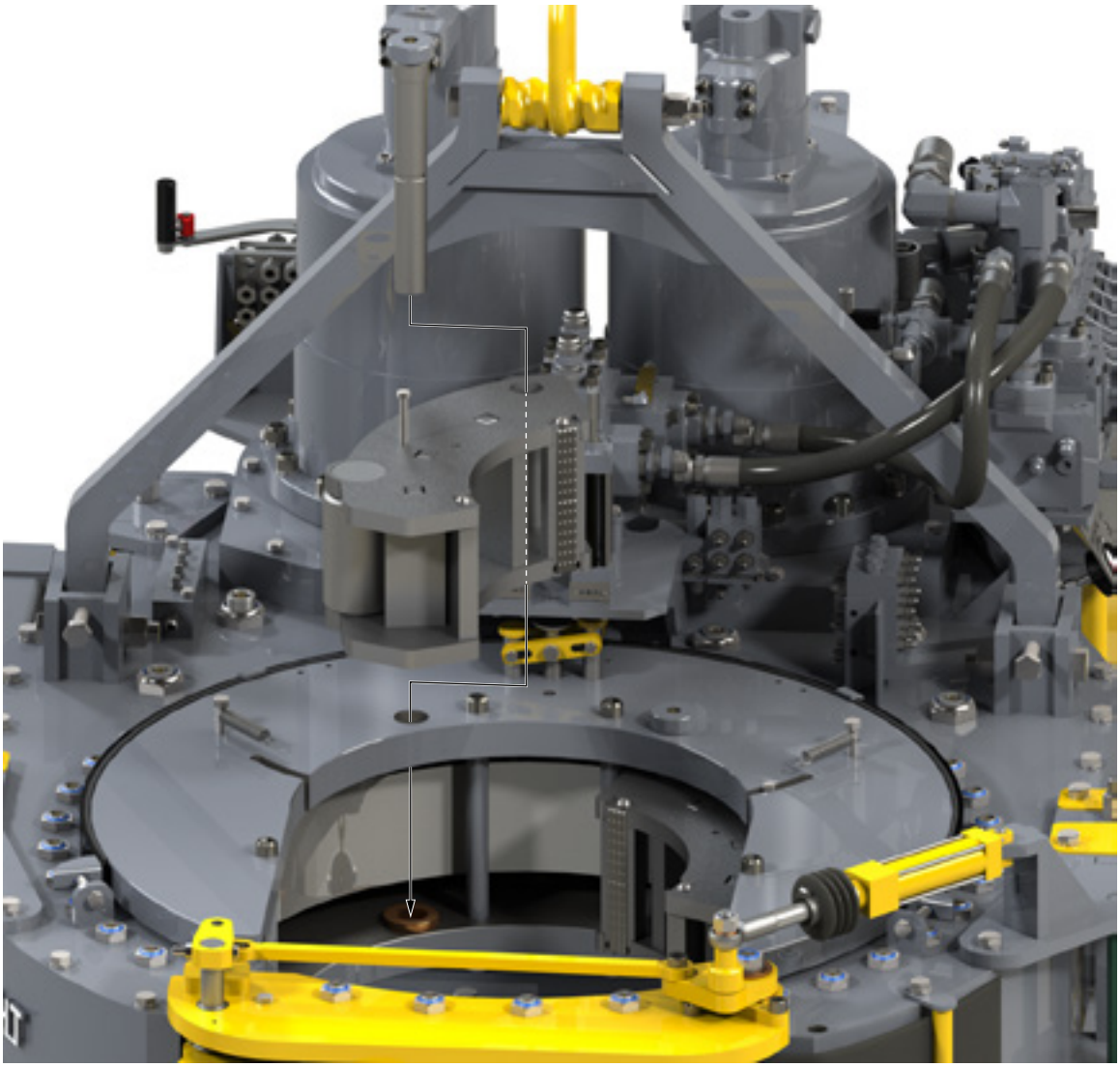


Illustration 3.4.2: Jaw Removal

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

3.4.3 Tong Jaw Installation & Removal (Continued):

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

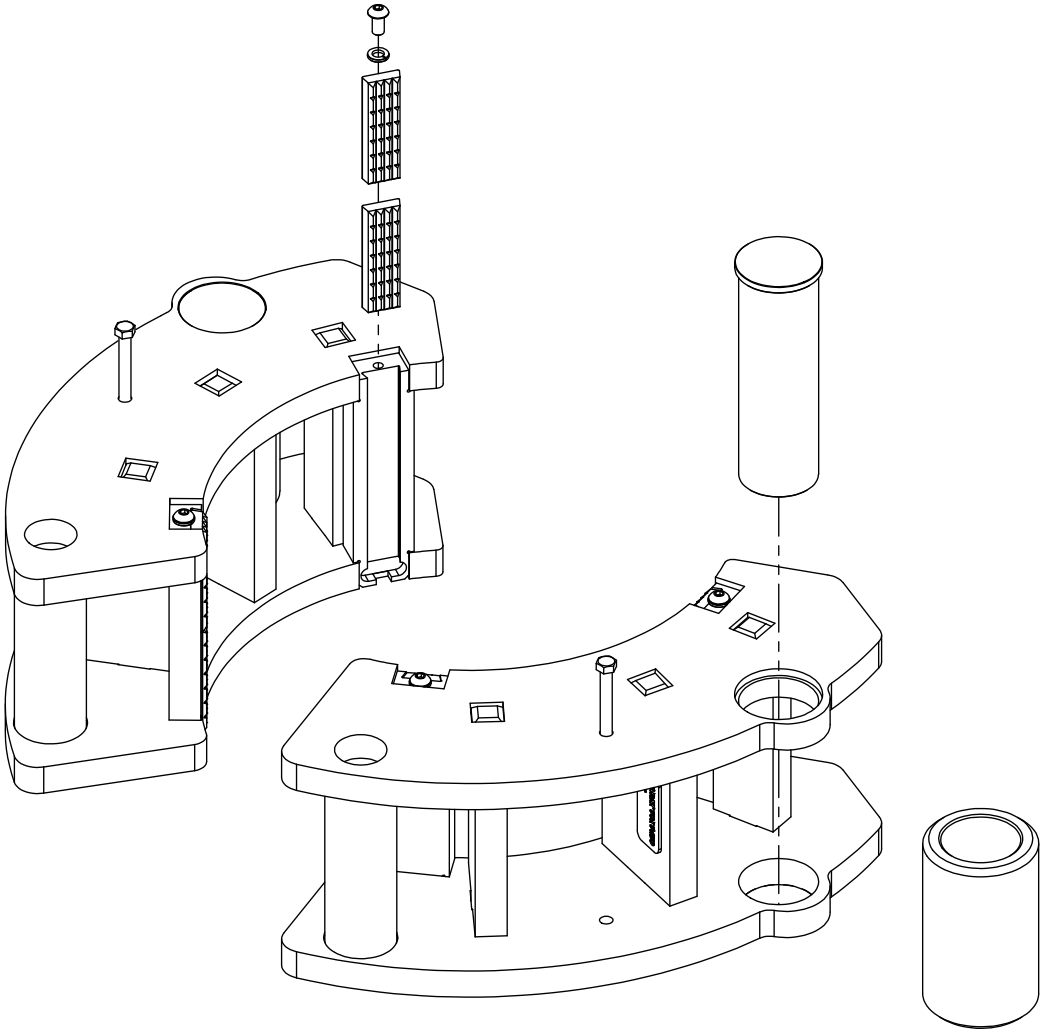


Illustration 3.4.3: Jaw Disassembly

7. Place the jaw face down (roller up) on a sturdy surface. Wearing a leather work glove, attempt to rotate the roller with the palm of your hand. Jaw rollers must spin freely to ensure proper camming action against rotary gear during engagement with the tubular. If the roller turns freely, proceed directly to step 12. Rollers that are jammed or otherwise “frozen” must be freed before installing and using jaw assemblies.
8. If equipped, remove the secondary retention from the jaw roller pin. Pin retention could be a screw, a snap ring, or a weld bead, which must be ground away before the jaw pin can be removed.
9. Extract the roller pin. If necessary use a soft metal drive and hammer to tap the jaw pin out of its seat. Removing the jaw pin allows the jaw roller to come free.
10. Apply a liberal coating of grease to the jaw pin and all surfaces of the jaw roller. Re-install the jaw pin and roller, and secure the jaw pin in the jaw weldment/casting with the appropriate fastener. NOTE: jaw pins secured by a weld bead must have the weld bead re-applied by an authorized, skilled welder.
11. Re-check the jaw roller to ensure that it turns freely.

3.4.3 Tong Jaw Installation & Removal (Continued):

12. Tong jaws are clearly marked with the size. Ensure the jaw to be installed is the proper size for the pipe to be run. Over-sized or under-sized jaws may result in jaw slippage, or cause the jaws to leave the end of the cam surface on the inside of the rotary gear. Additionally, incorrectly sized jaws will cause the pipe to be off-centre relative to the backup, resulting in eccentric rotation and potential pipe thread damage.

⚠ WARNING

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

13. Apply a generous coating of grease to the jaw roller & pin. Rotate the roller several times to distribute the grease.
14. Install the jaw assemblies one at a time. Liberally coat each jaw pivot bolt with a layer of grease before installing.

⚠ WARNING

USE OF JAWS NOT MANUFACTURED BY MCCOY IS NOT RECOMMENDED, AND MAY RESULT IN JAW SLIPPAGE JAW FAILURE, OR DAMAGE TO THE CAMMING SURFACES OF THE ROTARY GEAR.

3.4.4 Backup Jaw Availability

The following table lists all jaws available as standard stocked sizes for this model of backup. The table also lists standard die inserts that are available as spare parts. McCoy also offers a wide variety of diamond-tooth, GRITFACE®, aluminium, and wrap-around fine-tooth dies available for specialized applications.

⚠ WARNING

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

Standard Strip Jaw Die Kits For BUCST23000

Description	Part Number	Approximate Weight (Per Single Jaw)	Description	Part Number	Approximate Weight (Per Single Jaw)
11-¾” Jaw Die Kit	BUDT23X11750A	54.4 lbs (24.7 kg)	16-½” Jaw Die Kit	BUDT2316500A	52.2 lbs (23.7 kg)
11-⅞” Jaw Die Kit	BUDT23X11875A	54.4 lbs (24.7 kg)	17” Jaw Die Kit	BUDT2317000A	51.8 lbs (23.5 kg)
12.774” Jaw Die Kit	BUDT23X12774A	54.3 lbs (24.6 kg)	18” Jaw Die Kit	BUDT2318000A	51.2 lbs (23.2 kg)
13-⅜” Jaw Die Kit	BUDT23X13375A	54.2 lbs (24.6 kg)	18-⅝” Jaw Die Kit	BUDT2318625A	51 lbs (23.1 kg)
13-⅝” Jaw Die Kit	BUDT23X13625A	54.2 lbs (24.6 kg)	18.950” Jaw Die Kit	BUDT2318950A	50.7 lbs (23 kg)
14” Jaw Die Kit	BUDT23X14000A	53.8 lbs (24.4 kg)	20” Jaw Die Kit	BUDT2320000A	49.8 lbs (22.6 kg)
14-½” Jaw Die Kit	BUDT23X14500A	53.4 lbs (24.2 kg)	21” Jaw Die Kit	BUDT23X21000A	47.8 lbs (21.7 kg)
15” Jaw Die Kit	BUDT23X15000A	53.2 lbs (24.1 kg)	22” Jaw Die Kit	BUDT23X22000A	40.9 lbs (18.6 kg)
16” Jaw Die Kit	BUDT2316000A	52.6 lbs (23.9 kg)	23” Jaw Die Kit	BUDT23X23000A	32 lbs (14.5 kg)

Available Strip Die Inserts:

Die Type	Part Number
Straight Tooth	13-0008-314-0
Diamond Tooth	13-0008-314-D

3.4.5 Backup Jaw Removal

Removal of the dies are simple, requiring removal of only the top die retaining fastener. However, the backup jaws will often require removal to change jaw size or to remove jaw die inserts that are stuck in the dovetail slots. Disconnect or disable hydraulic power supply before proceeding.

⚠ DANGER

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

Remove the six hex socket head cap screws securing the two top jaw retainers, and remove the retainers. In some cases the bottom retainers may require loosening to free the jaw from the backing plate. Slide the jaw weldment up and off the backing plate (see illustration 3.4.4).

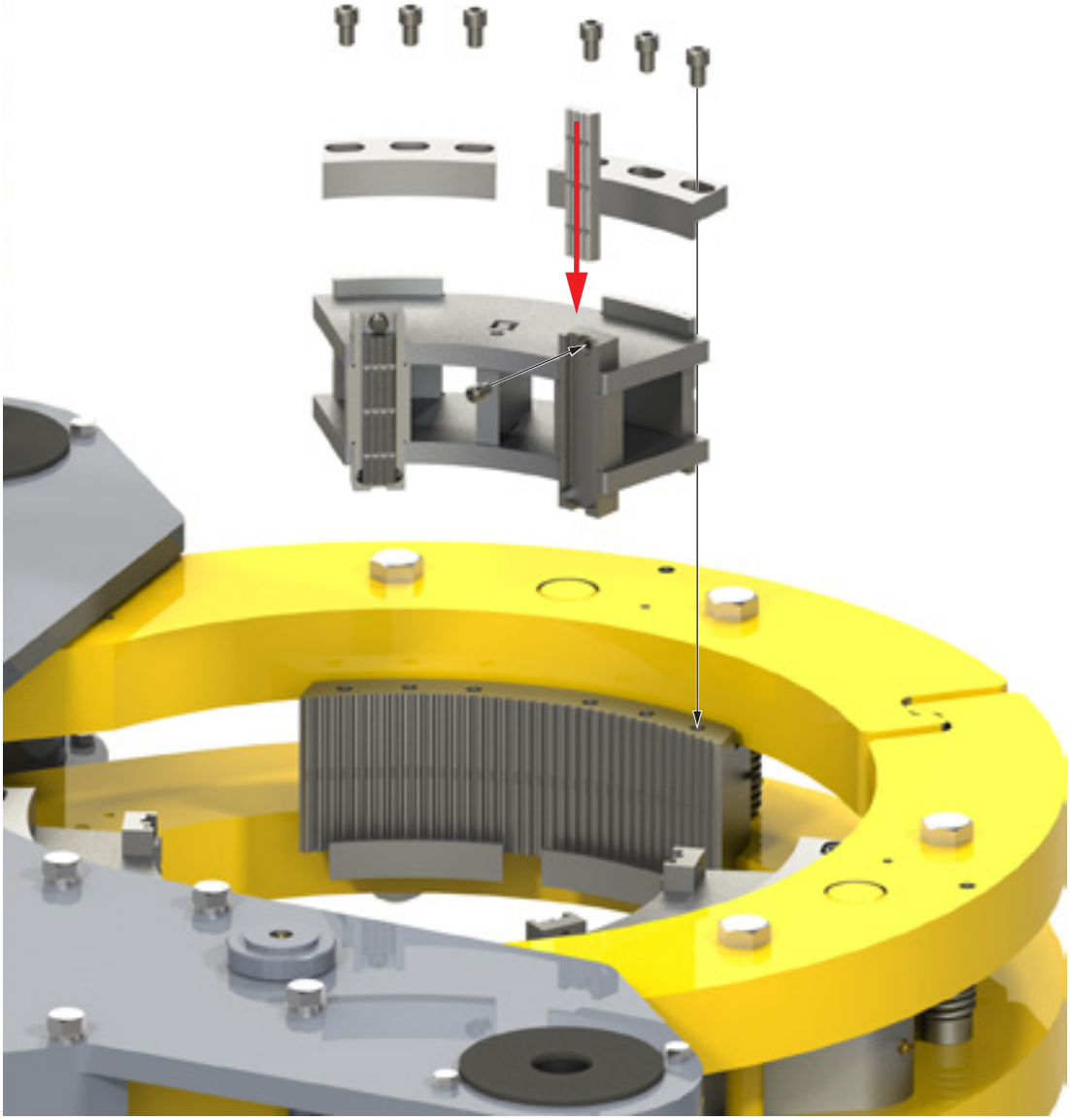


Illustration 3.4.4: BUCST23000 Lockjaw Backup Jaw / Jaw Die Removal (17" Shown)

Clean the dovetail slots in the jaw using a stiff wire brush, and treat each slot with anti-seize compound before installing new dies. When the jaws are properly prepared slide the die in to the slots, lightly tapping them into place if necessary. Replace the top die retaining fastener. Repeat for the other jaws.

If jaw replacement is required, clean the splined backing plate with a stiff wire brush before installing new jaw. Loosely install the bottom die retainer, install the jaw, then install the top retainer and keeper screws. Center the jaw on the backing plate and tighten all screws in the top and bottom retainers.

3.5 EQUIPMENT CONFIGURATION & LEVELING

3.5.1 Suspension & Restraint

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

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

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

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

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

McCoy Global recommends using backup (snub) lines on each side of your assembly to restrict motion in either direction of rotation. Snub lines must be of sufficient strength to withstand the force imparted by the maximum rated torque of the tong and backup assembly in use. Snub lines will arrest uncontrolled movement of the tong and backup in the event slipping of the backup jaws. Calculate the force on the snub lines by dividing the maximum torque of the tong by the tong's torque arm (expressed in feet). For example, a 80,000 lbs.-ft. tong with a 56 inch (4.67 ft.) torque arm will generate 17,143 lbs. of force against a snub line connected 90° to the longitudinal axis of the equipment. Select your snub lines based upon the total force and the margins of safety dictated by the policies of your company and by established engineering practices. Ultimately, calculating the force on the snub line and selection of the snub line is the complete responsibility of the customer.

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

⚠ DANGER

MCCOY GLOBAL ACCEPTS NO RESPONSIBILITY FOR DESIGNING AND SELECTING AN ADEQUATE SUSPENSION AND RESTRAINT SYSTEM FOR YOUR DRILLING EQUIPMENT. THE INSTRUCTIONS IN THIS SECTION ARE PROVIDED FOR INFORMATION PURPOSES ONLY.

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

3.5.2 Tong Leveling

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

⚠ CAUTION

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

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

⚠ WARNING

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

2. Place a level side to side across the tong as near to well center as possible, ensuring the level remains parallel with the top plate of the tong. Note whether the side-to-side level requires adjustment, and move the equipment back to the drill floor.
3. Use a thin wrench on the flat of the adjusting helix to rotate the helix in the direction required for side-to-side leveling of the tong, forcing the lift link to move in the appropriate direction toward the outer supports of the sling. The 1” nylock nut on the pin may have to be slightly loosened to allow the helix to rotate.

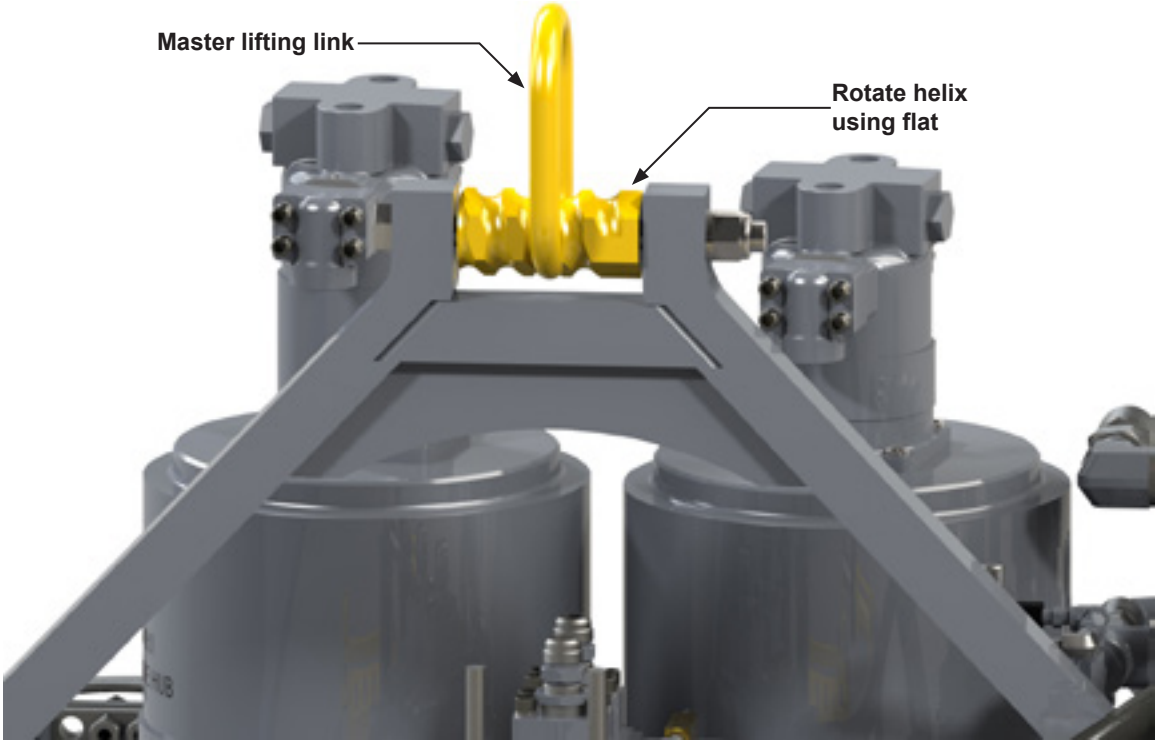


Illustration 3.5.1: Equipment Leveling 01

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

3.5.2 Tong Leveling (Continued):

8. Adjust the appropriate pair of adjustment bolts on each bracket to level the top plate. For example, rotating the front adjustment bolts (as shown in illustration 3.5.3) counter-clockwise while rotating the rear adjustment bolts clockwise raises the front of the equipment. Rotating the front adjustment bolts clockwise while rotating the rear adjustment bolts counter-clockwise lowers the front of the equipment. Adjust the bolts in each rigid sling bracket simultaneously and equally. Ensure all four adjustment bolts are in contact with the rigid sling when adjustment is complete. Tighten the locking nuts on the four bolts used for adjustment when complete.

⚠ CAUTION

ADJUST LEFT AND RIGHT RIGID SLING LEVELING ADJUSTMENTS SIMULTANEOUSLY AND EQUALLY

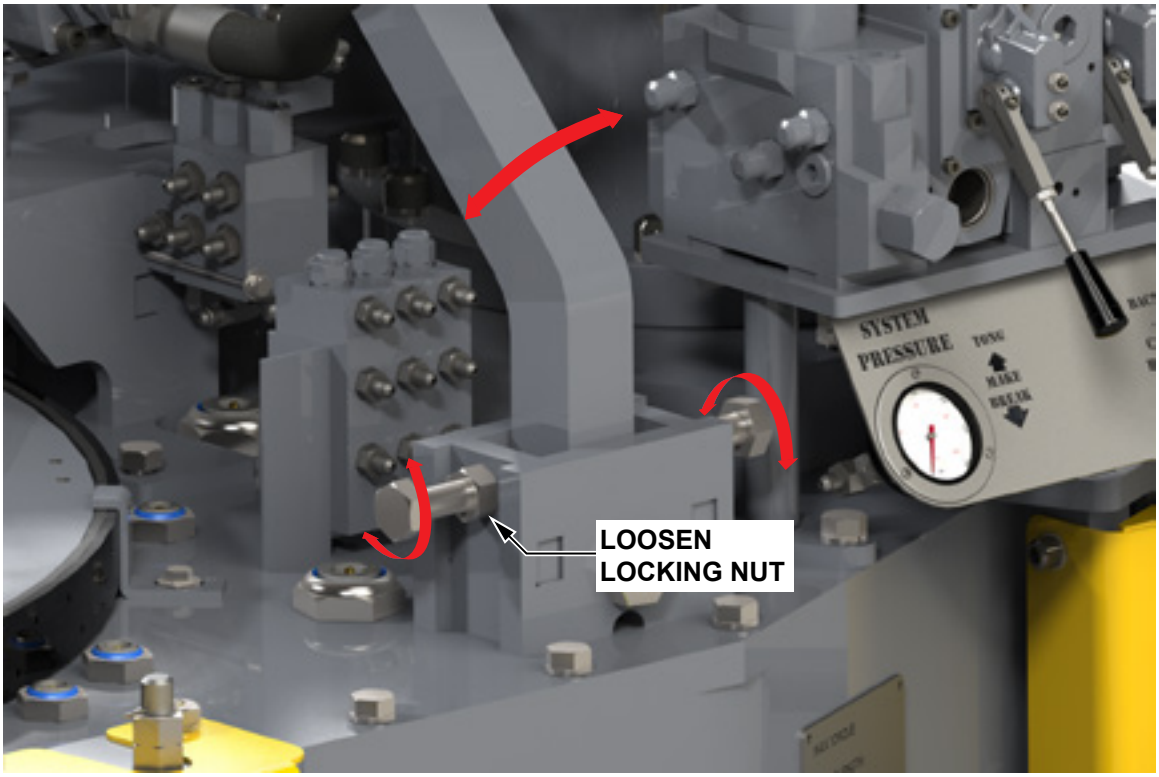


Illustration 3.5.2: Equipment Leveling 02

9. Repeat steps 5 through 8 until the equipment is level front-to-rear at well center. Double-check that the equipment has remained level side-to-side.

3.5.3 Load Cell Configuration

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

To change the torque measurement configuration (make up to break out or visa versa) simply remove the ¼” hex bolts retaining the load cell/breakout bar pins on the backup body weldment and the centre post of the frame weldment. Remove the four pins. Reverse the position of the load cell and breakout bar. Replace the four load cell/breakout bar pins, and secure the pins in the backup body weldment and centre post of the frame weldment using ¼” UNC x 4” hex bolts and ¼” UNC hex nylock nuts. For your reference Illustration 3.5.3 shows the load cell correctly configured for make up operations, and illustration 3.5.4 shows the load cell correctly configured for break out operations.

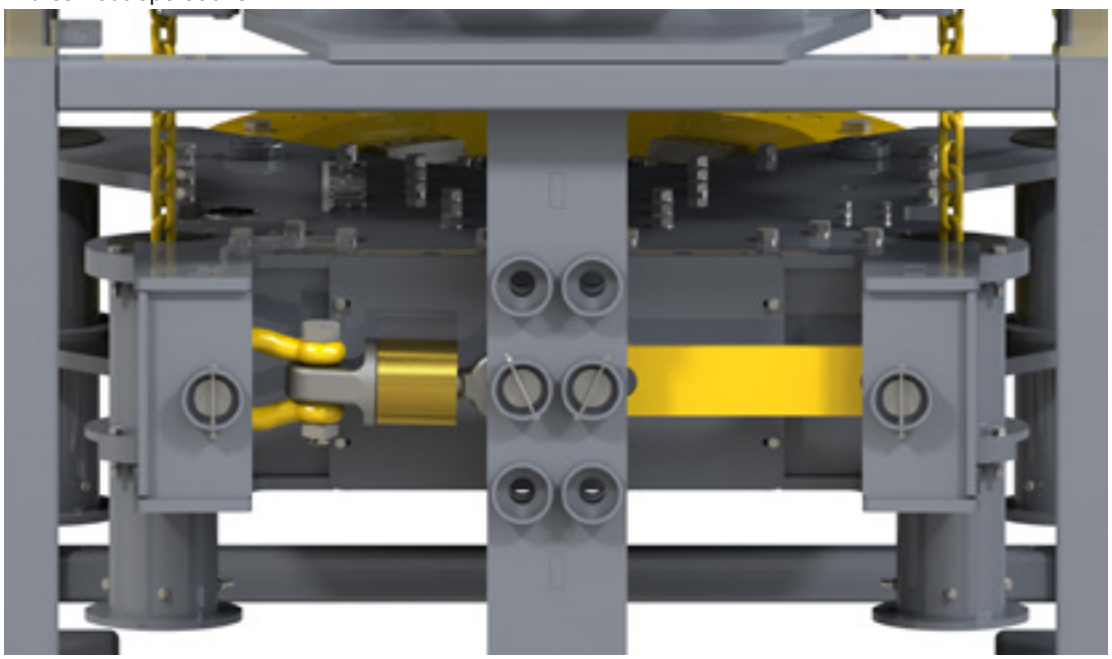


Illustration 3.5.3: Load Cell Configuration - Make Up

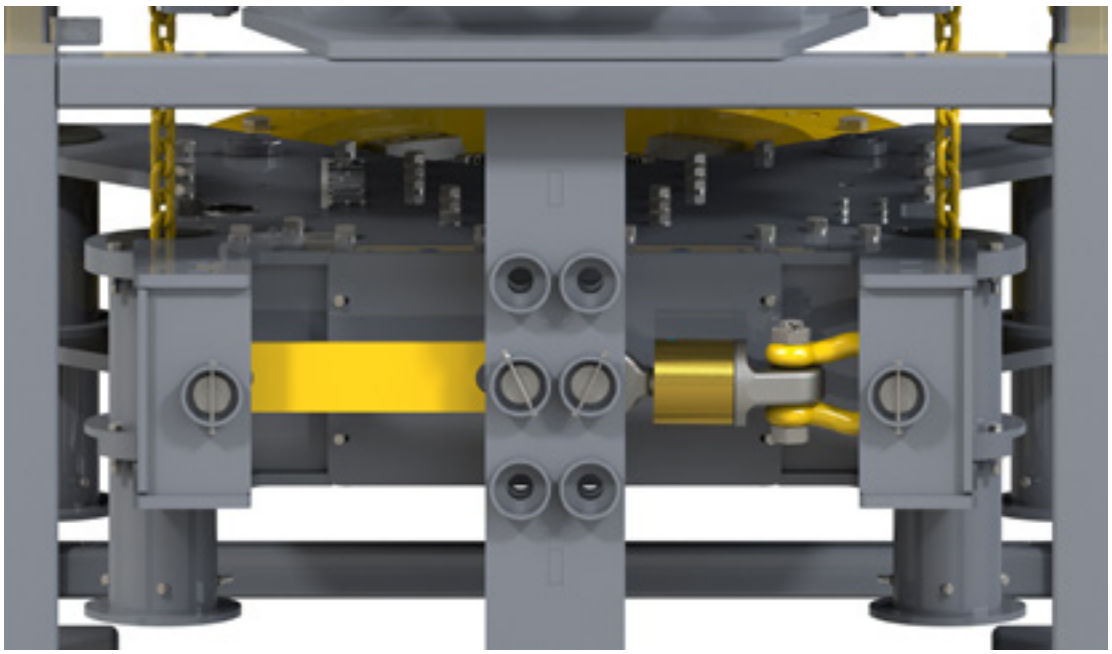


Illustration 3.5.4: Load Cell Configuration - Break Out

3.5.4 Adjusting Backup Clamping Pressure

The clamping pressure of the backup requires occasional adjustment to compensate for wear of the backup jaw die inserts and for re-setting the backup pressure to factory specification when new die inserts are installed. Occasional lowering of the backup clamping pressure may be required for thin-walled pipe or tubing, or if you are using the backup in non-marking applications.

A wide variety of operating conditions prevents McCoy from recommending an ideal backup pressure for any one type of pipe or joint; rather, the ideal pressure is only identified through a combination of “trial and error” and the operating manager’s best estimate based on their own experience.

Use this procedure to check and adjust the backup pressure:

1. The assembly must be connected to an active hydraulic fluid power source to perform this procedure.
2. Use the backup control valve to fully extend the backup clamp cylinder (see section 4 for valve operating procedures). When the cylinder is fully extended do not release the valve handle - maintain hydraulic pressure on the cylinder.
3. Backup clamping pressure is displayed on the backup pressure indicator (see illustration 3.5.6). Rotating the relief valve clockwise will increase the backup pressure, and rotating the relief valve counter-clockwise will decrease the backup pressure.

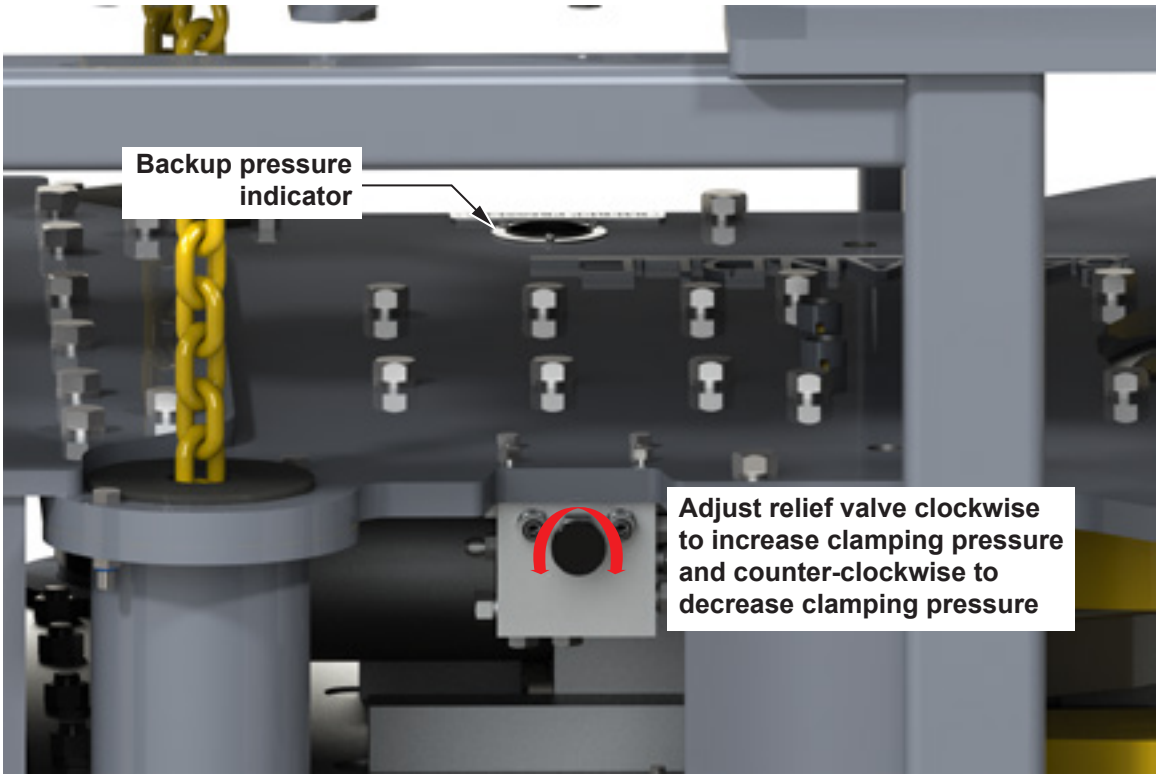


Illustration 3.5.5: Lockjaw Backup Clamp Pressure Adjust

Maximum backup pressure is the system pressure (as displayed on the system pressure indicator on the tong), or 3000 PSI (20.684 MPa), whichever is lower. Never exceed a clamping pressure of 3000 PSI (20.684 MPa).

⚠ WARNING

BACKUP CLAMPING PRESSURE MUST NEVER EXCEED 3000 PSI (20.684 MPA)

3.5.5 Backup Height Adjustment

Occasionally the height of the backup requires adjustment to accommodate different types of joints. Two types of adjustment are available: fine adjustment using the eye bolts on the hanger lugs (maximum adjustment range = 2 inches (5.08 mm)), and gross adjustment using insertion or removal of chain links and a shackle (±6" (15.24 mm) from the centre position). If required use a combination of the two adjustments to accurately set the height of your backup.

McCoy Global recommends adjusting the height of the backup so that load cell rests as near to parallel with the backup and perpendicular to the rear leg as possible upon completion of the joint, allowing the highest final torque measurement accuracy.

Follow these instructions to properly adjust the height of the backup.

FINE HEIGHT ADJUSTMENT

1. Determine the desired clearance between the lowest point on the tong and the highest point on the backup, and determine if this is achievable using the fine height adjustment available. Move to coarse adjustment if more or less clearance is required.
2. Remove the four yellow guards covering the top Y-bolts. Remove the front guards by loosening the two top bolts, and sliding the guards off. Remove the rear guards by removing the four socket head cap screws securing the guards to the rear chain sling hangers.
3. Do not remove the cotter pin through the threaded end of the Y-bolt, which is a safety device used to assure the integrity of the hanger. Loosen the locking (top) nut on each Y-bolt until it contacts the cotter pin, but does not exert any shear force on the cotter pin.
4. Rotate the adjustment (bottom) nut on each Y-bolt. Rotate clockwise to raise the backup, and counter-clockwise to lower the backup. When rotating the adjustment nut counter-clockwise, coming into contact with the top locking nut indicates the maximum adjustment in that direction.
5. Ensure the backup remains level by using a measuring tape to confirm that the distance between the top of the backup and the hanger lug is identical at each corner.
6. Tighten the top (locking) nut against the adjustment nut to lock the adjustment. Ensure the cotter pin through the threaded end of the Y-bolt remains intact.
7. Replace all guards after adjustment is complete.

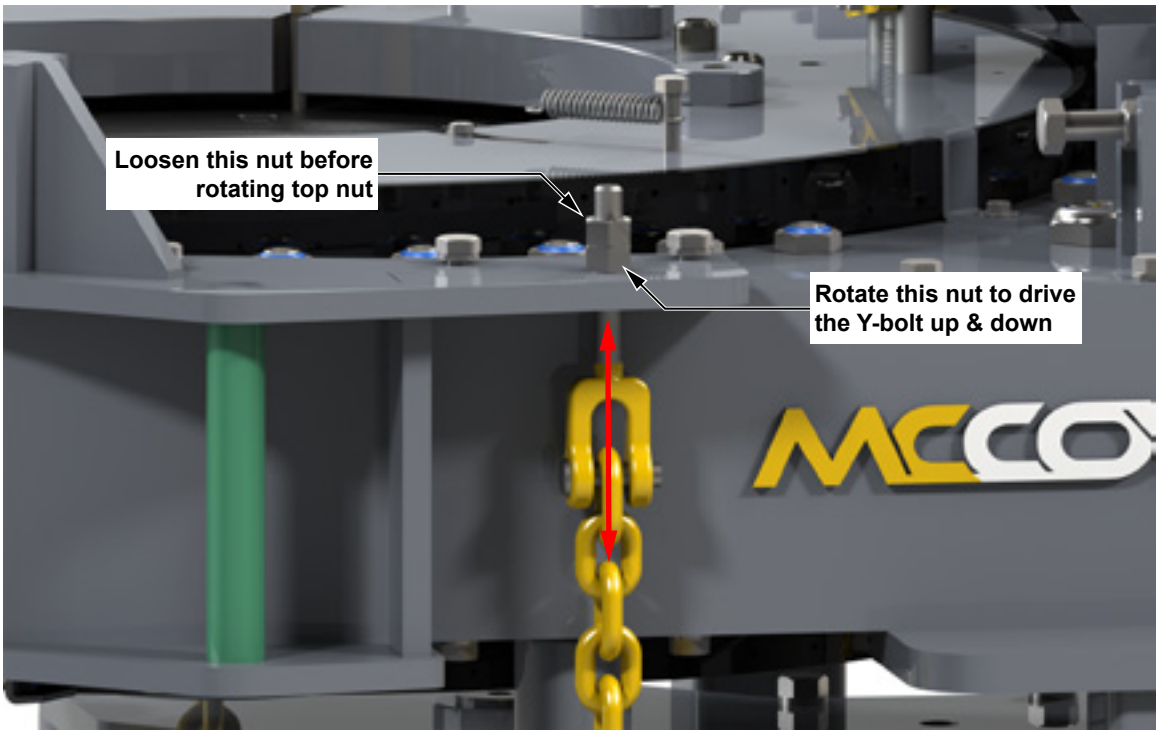


Illustration 3.5.6: Backup Fine Height Adjust

3.5.5 Backup Height Adjustment (Continued):

COARSE HEIGHT ADJUSTMENT TO HIGHEST POSITION

1. Use a set of jacks or a forklift to raise the backup so that all weight is removed from the four hangers. Following lifting, McCoy Global recommends the use of blocks under the backup to assure stability during the adjustment procedure.
2. Remove the hanger pin from each Y-bolt.
3. Separate the three-link extension chains from the existing hanger chains and the $^{7}/_{16}$" shackles.
4. Use the $^{7}/_{16}$" shackles to connect the main hanger chains to the Y-bolts using using the hanger pins extracted in step 1.
5. Use a set of jacks or a forklift to raise the backup so that all weight is removed from the blocks. Remove the blocks and slowly lower the backup until it is fully supported by the four hangers.
6. If necessary use the fine height adjustment to continue to adjust the backup to the desired height.

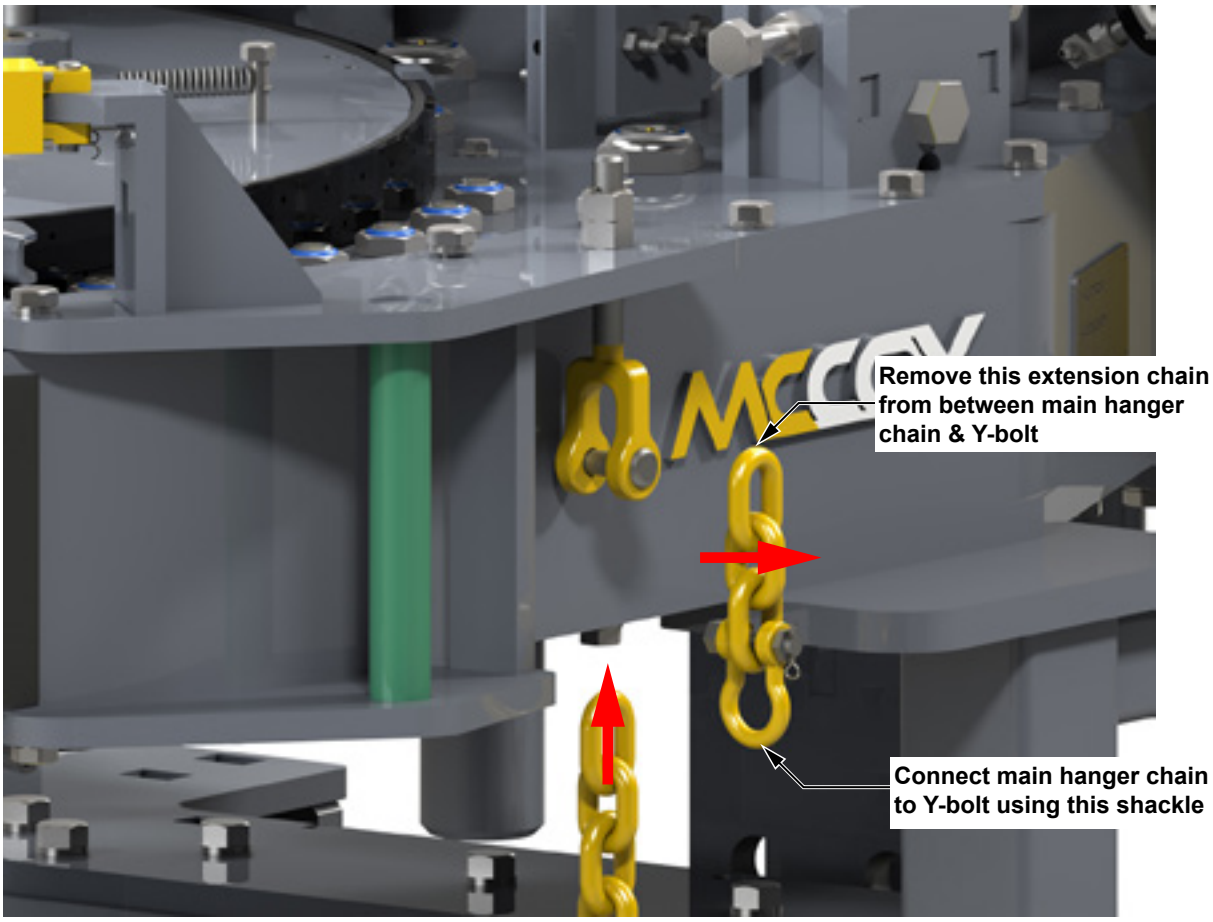


Illustration 3.5.7: Lockjaw Backup Coarse Height Adjust HIGH

3.5.5 Backup Height Adjustment (Continued):

COARSE HEIGHT ADJUSTMENT TO LOWEST POSITION

1. Use a set of jacks or a forklift to raise the backup so that all weight is removed from the four hangers. Following lifting, McCoy Global recommends the use of blocks under the backup to assure stability during the adjustment procedure.
2. Remove the hanger pin from each Y-bolt.
3. Attach a second $^{7}/_{16}$" shackle to the existing three-link extension chains. Attach a second three-link extension chain to the newly-installed shackles.
4. Connect the other end of the newly installed three-link extension chains to the Y-bolts using using the hanger pins extracted in step 1.
5. Use a set of jacks or a forklift to raise the backup so that all weight is removed from the blocks. Remove the blocks and slowly lower the backup until it is fully supported by the four hangers.
6. If necessary use the fine height adjustment to continue to adjust the backup to the desired height.

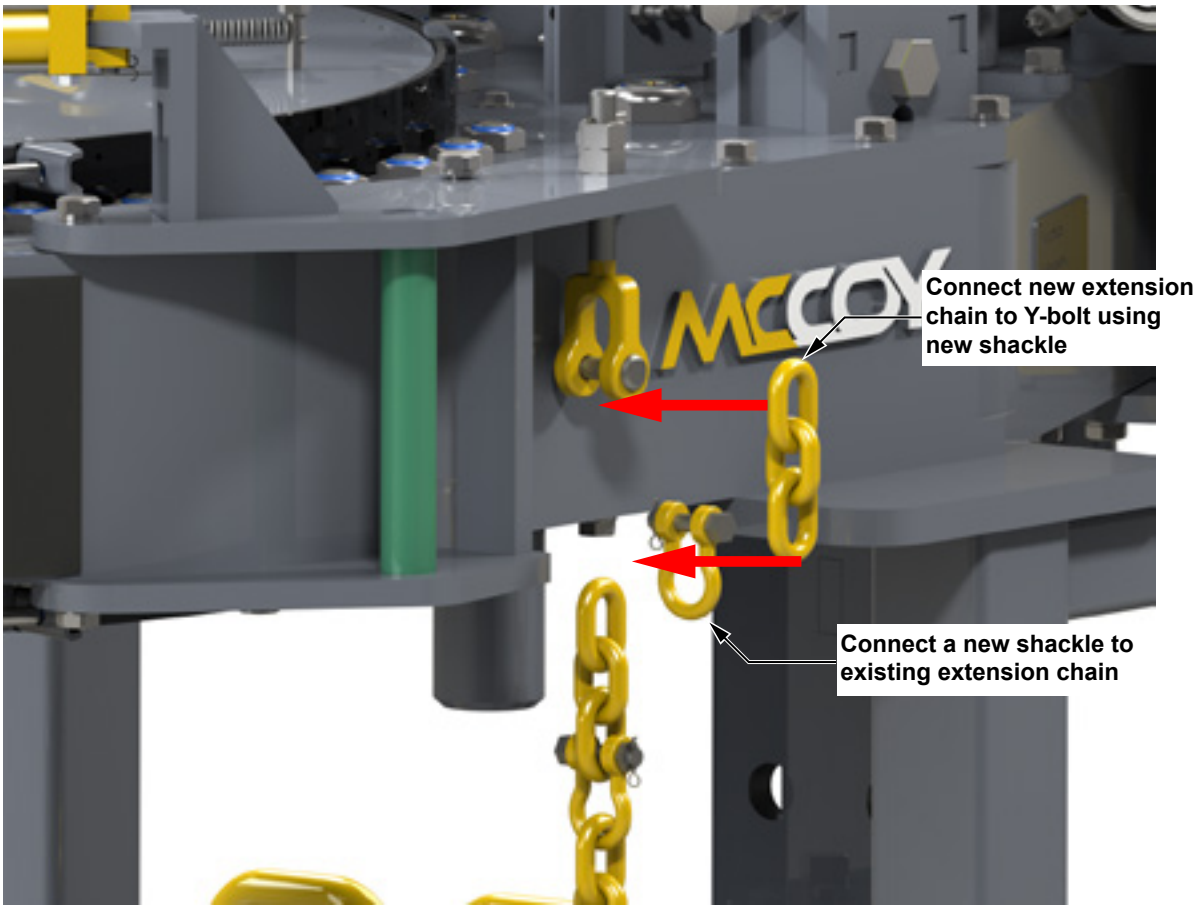
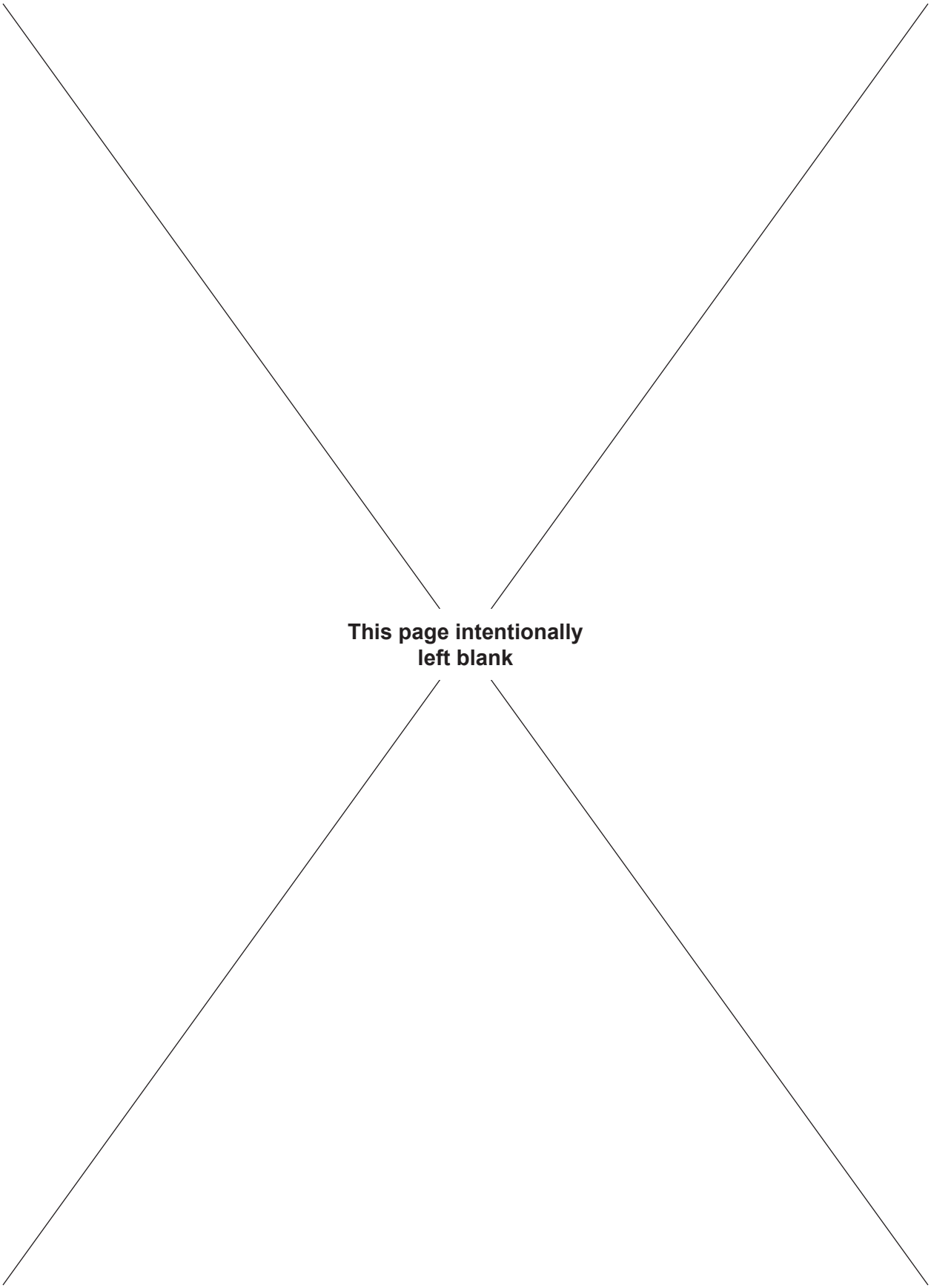


Illustration 3.5.7: Lockjaw Backup Coarse Height Adjust LOW

SECTION 4: OPERATION



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4.0 OPERATOR TRAINING

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

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

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

⚠ CAUTION

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

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

⚠ WARNING

DE-PRESSURIZE EQUIPMENT BEFORE DISCONNECTING MAIN HYDRAULIC LINES.

4.2 HYDRAULIC OPERATION

One hydraulic bulkhead equipped with quick-connects and one Stucchi hydraulic quick-connect are located on the rear of the tong (see illustration 4.2.1). Control hydraulic functions through the hydraulic connections as described below:

NOTICE

THE STUCCHI MULTI-CONNECTOR HYDRAULIC JUMPER MUST BE INSTALLED AND LOCKED IN ORDER TO USE THE CONTROL VALVES IN MANUAL MODE.

4.2.1 Manual Valve Operation

4-way proportional valves control operation of hydraulic devices on the tong assembly such as hydraulic motors and cylinders. When any one valve is “centered” or in the detent position, there is no hydraulic output from the valve. When the valve is pushed forward there is an effect, and when the valve is pulled back, there is an opposite effect. These valves feature proportional control, which means that further extension of the valve handle (thereby further opening the valve orifice) results in proportionally higher hydraulic output to the controlled device. McCoy Global recommends checking the labels attached to the control valves to determine the hydraulic effect caused by a specific deflection of the control valve handles.

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

TONG MOTOR

McCoy Global has configured the plumbing to this valve so that pushing the valve handle up will cause the tong motor and ring gear 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. Pushing the valve handle down results in counter-clockwise rotation of the motor and ring gear, which is the desired direction of rotation for breaking out a joint. Releasing the valve handle causes the tong to immediately stop rotation.

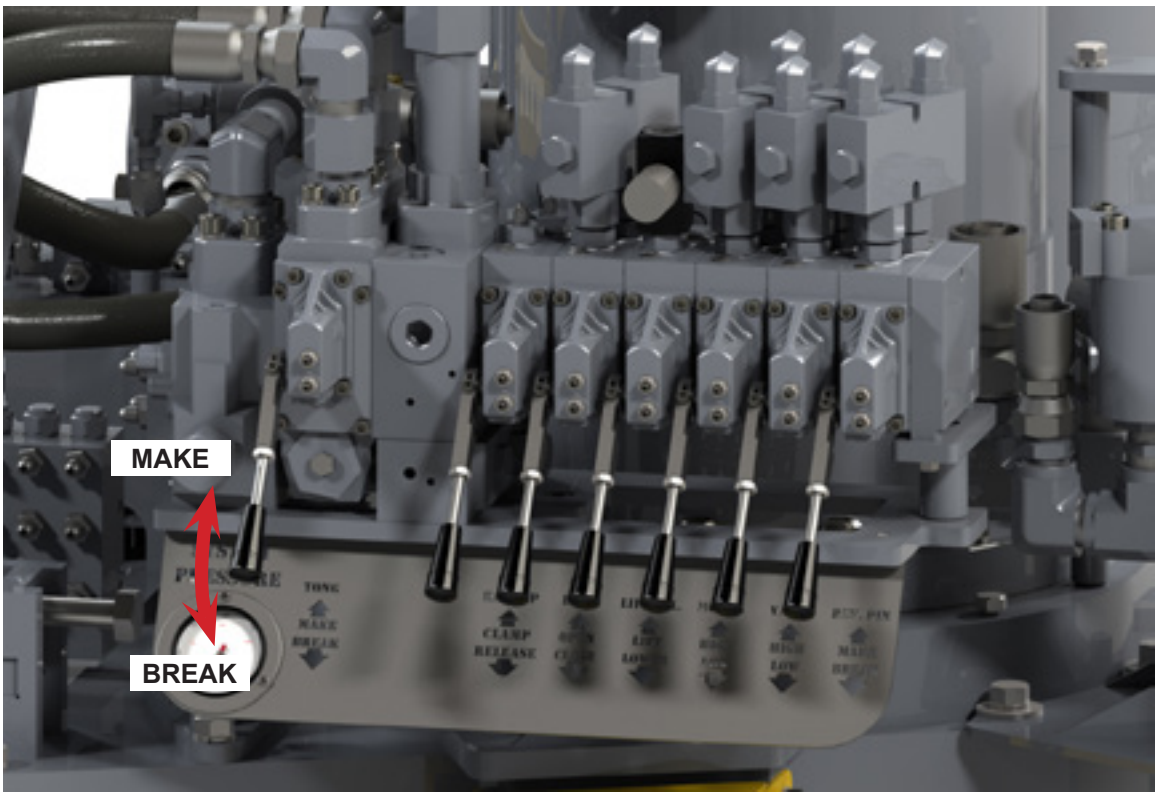


Illustration 4.0.1: Tong Make/Break Control Valve

4.2.1 Manual Valve Operation (Continued):

BACKUP DOOR / CLAMP

McCoy Global has configured the plumbing to this valve so that pushing the valve handle up extends the backup clamp cylinder causing the following actions to occur simultaneously:

- backup inner door closes. The inner door may or may not close against the tubular, depending upon the initial position of the backup on the stump.
- backup outer door closes against and locks with the inner door. The outer door may or may not close against the tubular, depending upon the initial position of the backup on the stump.
- clamp cylinder engages tubular, effectively centering the on well center and immobilizing the stump within all three jaws in the backup.

Pushing the valve handle down retracts the backup clamp cylinder causing the following actions to occur simultaneously:

- the clamp cylinder releases the tubular.
- backup outer door opens.
- backup inner door opens, releasing the tubular

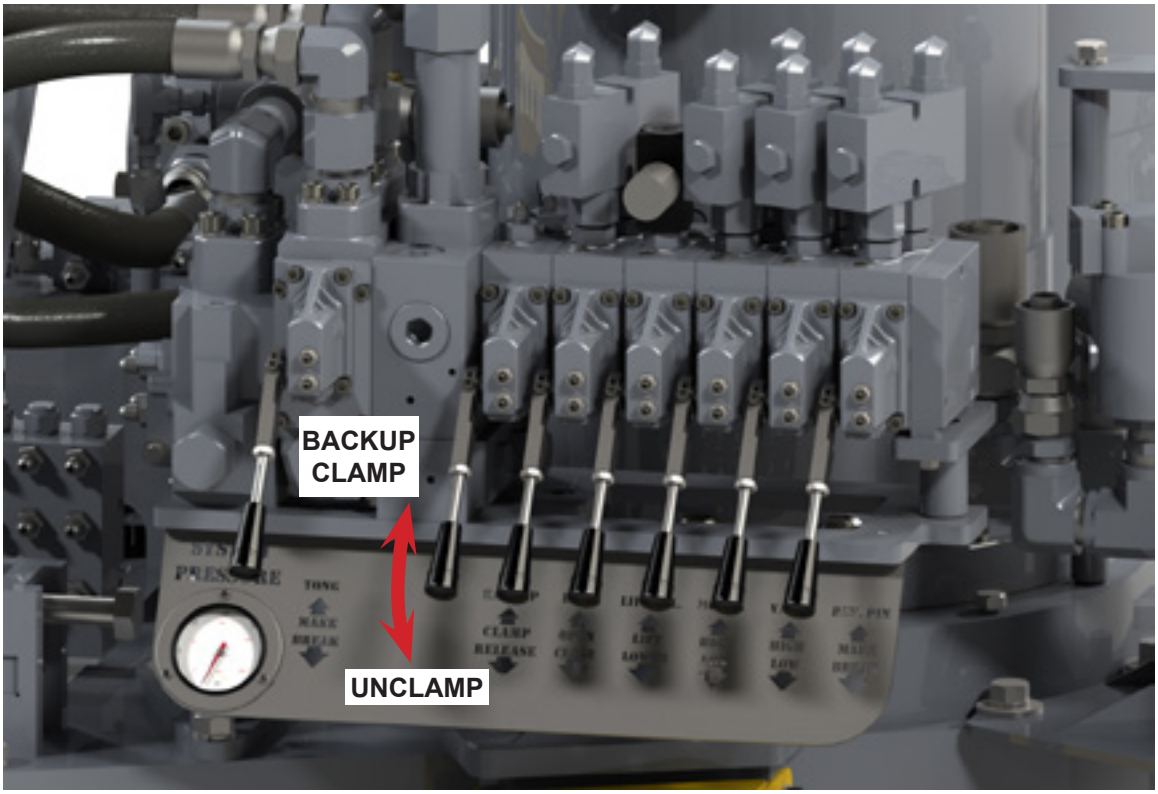


Illustration 4.0.2: Backup Clamp/Unclamp Control Valve

4.2.1 Manual Valve Operation (Continued):

TONG DOOR OPEN / CLOSE

Lifting up on this valve handle opens then tong door, while pushing down on the handle closes the tong door. Note that opening the tong door engages the door switch, inhibiting operation of the equipment until the tong door is fully closed again.

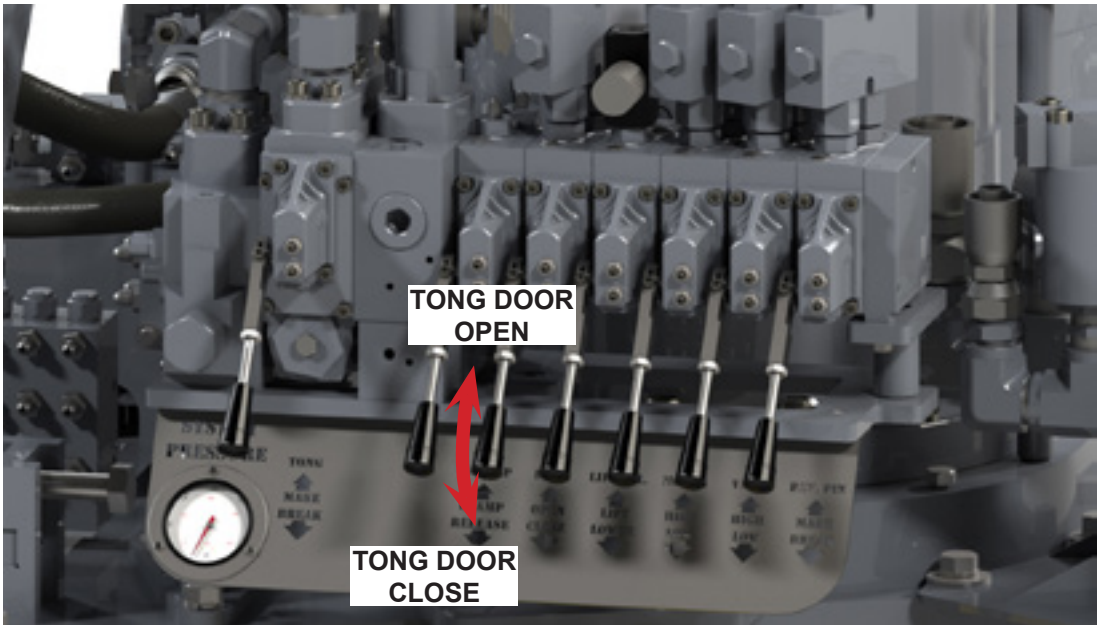


Illustration 4.0.3: Tong Door Open/Close Control Valve

LIFT CYLINDER CONTROL VALVE

This is a direct-acting valve. Pushing the valve handle up supplies hydraulic pressure to the lift cylinder, retracting the cylinder and lifting the tong vertically. Pulling the valve handle down allows the lift cylinder to extend, lowering the tong. Releasing the valve handle immediately stops the lifting or lowering action.

The needle valve on the discharge of the control valve regulates hydraulic fluid flow to the lift cylinder. Closing the needle valve (rotating the knob clockwise) will increasingly restrict the flow rate of the fluid, resulting in slower actuation of the cylinder in both directions (lifting & lowering). Note that a permanently-installed orifice in the hydraulic fluid path to the lift cylinder limits the flow of the hydraulic fluid back to tank, limiting the speed at which the lift cylinder extends.

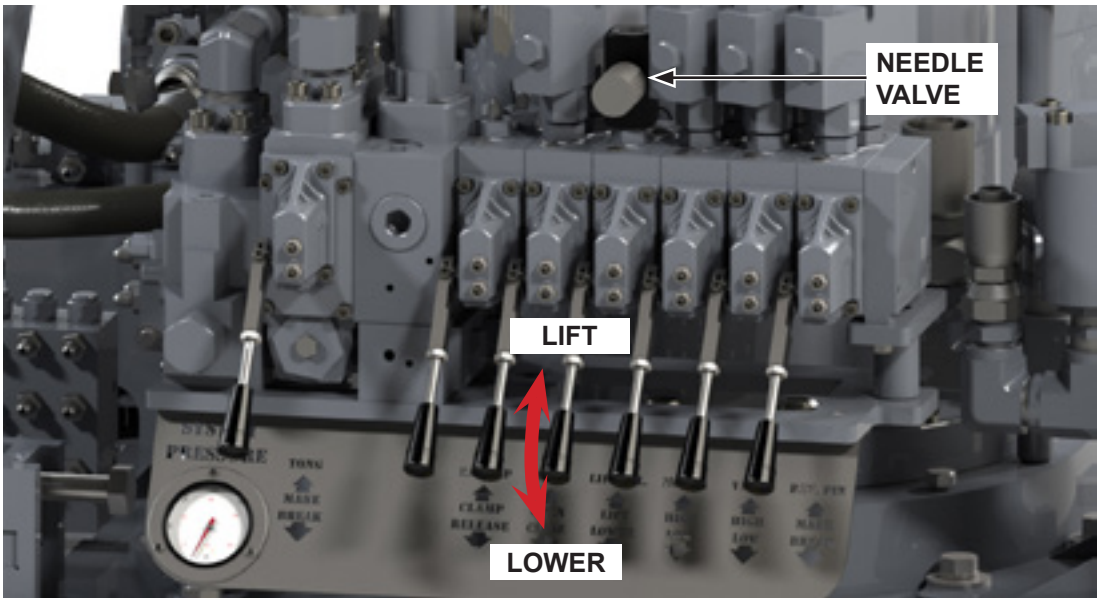


Illustration 4.0.4: Lift/Lower Control Valve

4.2.1 Manual Valve Operation (Continued):

HYDRAULIC MOTOR SPEED

Lifting up on this valve handle simultaneously shifts the spool in each motor to the half-displacement mode, ensuring that maximum rated motor speed can be reached. Allowing the valve handle to return to the centre position does not affect the action just performed. Maximum tong speed may only be achieved when the “VALVE” handle is in the “HIGH” position, and note that full torque cannot be achieved when the motor is operating at half displacement. Pushing down on the valve handle simultaneously shifts the spool in each motor to the full-displacement mode, limiting motor speed to approximately one-half of maximum rated speed and allowing full torque to be reached.

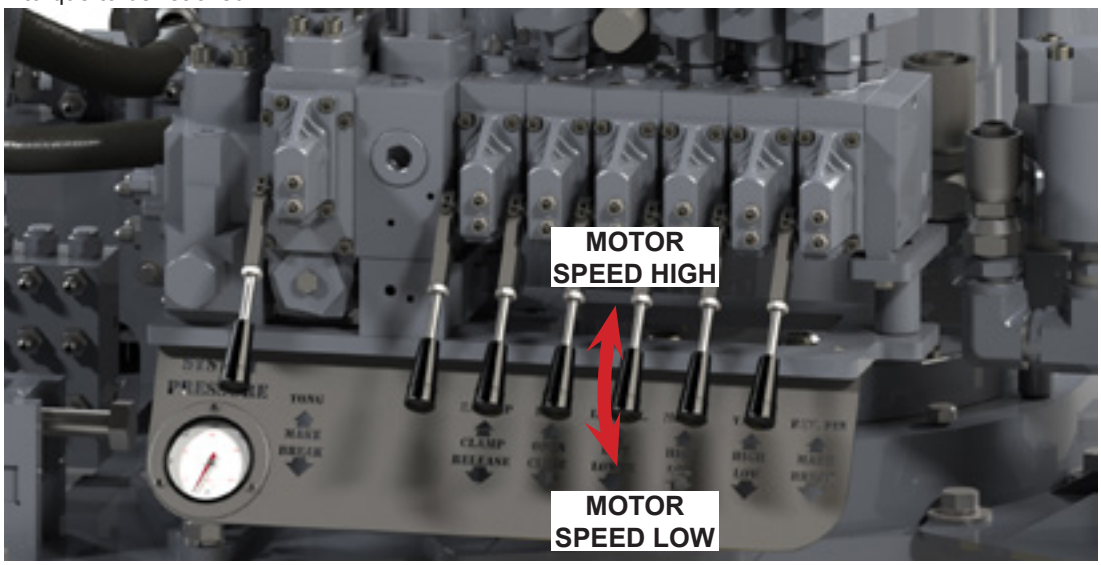


Illustration 4.0.5: Motor High Speed/Low Speed Control Valve

SERIES/PARALLEL VALVE

Lifting up on this valve handle sets the series/parallel valve to direct hydraulic flow to the hydraulic motors in single motor mode, allowing maximum tong rotation speed to be achieved. Allowing the valve handle to return to the centre position does not affect the action just performed. Maximum tong speed may only be achieved when the “MOTOR” handle is in the “HIGH” position, and note that full torque cannot be achieved when the tong is operating in “single motor” mode. Pushing down on the valve handle sets the series/parallel valve to direct hydraulic flow to the hydraulic motors in parallel, limiting the rotation speed to approximately one-half of maximum (dependent upon the speed control of the motors) allowing maximum tong torque to be achieved.

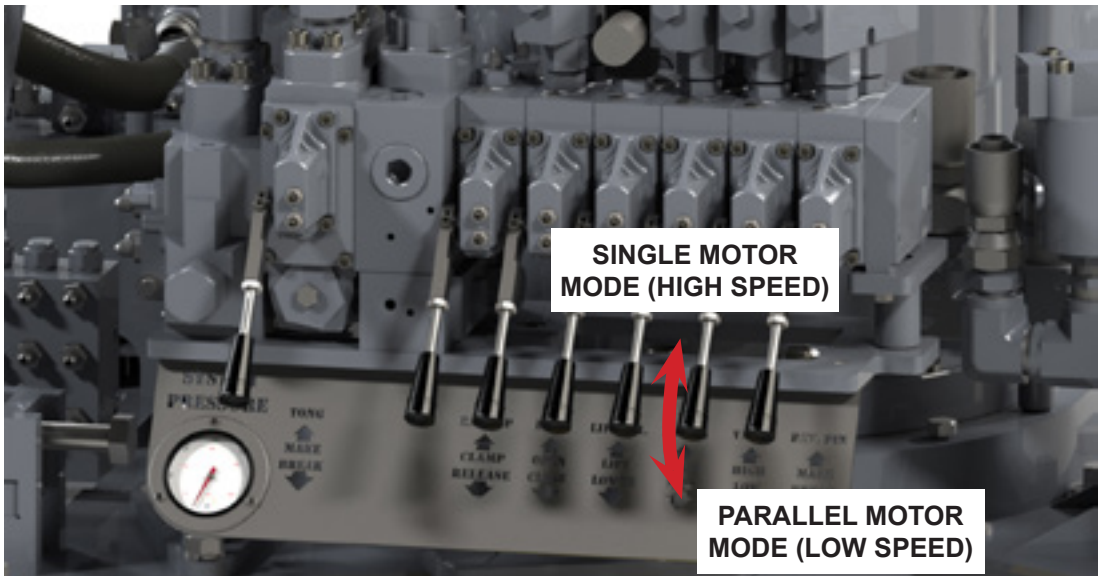


Illustration 4.0.6: Parallel Valve Control

4.2.1 Manual Valve Operation (Continued):

REVERSING PINS

⚠ WARNING

ALIGN CAGE PLATES WITH THE TONG OPENING BEFORE OPERATING REVERSING PIN CYLINDERS. ENSURE REVERSING PINS ARE FULLY ENGAGED WITH THE RING GEAR BEFORE BEGINNING ROTATION

Lifting up on this valve handle simultaneously extends the cylinder responsible for placing the “make up” reversing pin into the cage plate/rotary gear assembly, and retracts the cylinder for the “break-out” pin. The “make up” reversing pin must be engaged with the cage plate/rotary gear assembly when making up tubular connections.

Pushing down on the valve handle simultaneously extends the cylinder responsible for placing the “break out” reversing pin into the cage plate/rotary gear assembly, and retracts the cylinder for the “make up” pin. The “break out” reversing pin must be engaged with the cage plate/rotary gear assembly when breaking tubular connections.

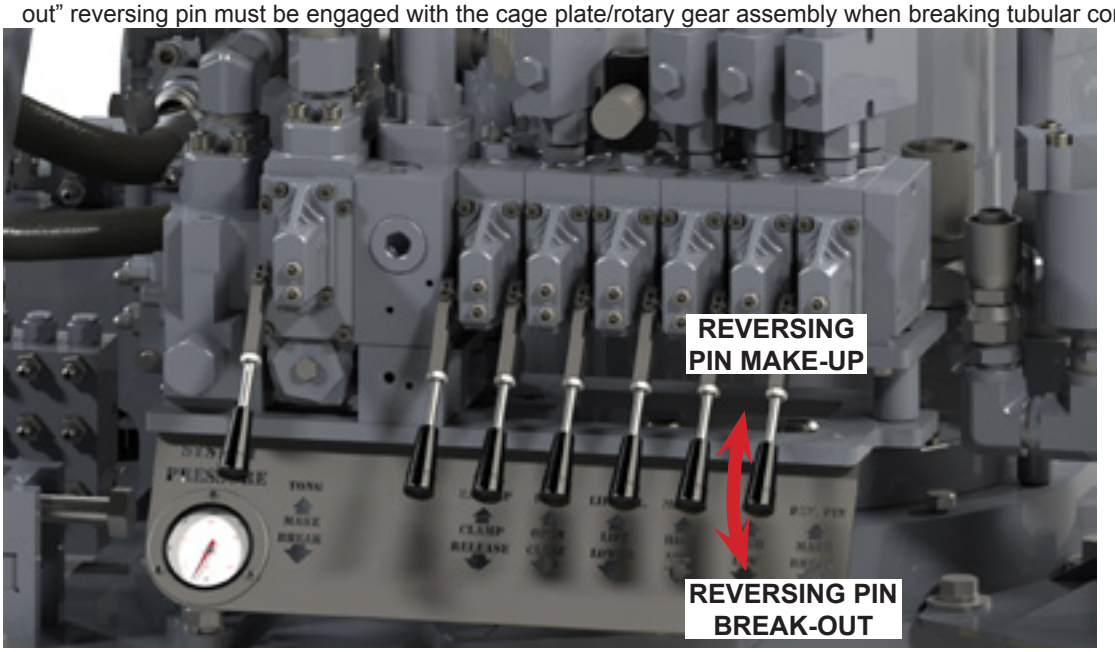


Illustration 4.0.7: Reversing Pin Control

4.2.2 Remote Hydraulic Operation

Remote hydraulic operation of this equipment is achieved through connection of the pigtail from the remote control panel to the Stucchi connector on the rear of the equipment. See subsection 3.3.3 for detailed connection instructions.

Refer to the technical manual for the hydraulic control panel for detailed operating instructions.

⚠ DANGER

NEVER OPERATE THIS EQUIPMENT REMOTELY BEFORE PERFORMING A VISUAL INSPECTION OF THE AREA AROUND THE EQUIPMENT. SERIOUS INJURIES CAN OCCUR IF PERSONNEL COME IN TO CONTACT WITH REMOTELY OPERATED COMPONENTS ON THIS EQUIPMENT.

4.3 PRE-OPERATIONAL CHECKS

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

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

⚠ WARNING

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

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

⚠ DANGER

APPLYING HYDRAULIC PRESSURE TO DOOR SWITCHES THAT ARE UNCONSTRAINED BY THE DOOR-MOUNTED CAM MAY RESULT IN FAILURE DUE TO OVER-EXCURSION OF THE SWITCH PLUNGER.

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

⚠ WARNING

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

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

i. Stop all tong rotation.

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

iii. Open the tong door.

4.3 PRE-OPERATIONAL CHECKS (CONTINUED):

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

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

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

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

⚠ DANGER

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

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

4.4 GENERAL OPERATIONAL COMMENTS

1. Position rotary gear in contact with both idler gears when breaking out joints or collars where high torques are required.
2. When making-up integral (shouldered) joints, it is essential to make up the last turn of the threads with the motors running at the lowest speed at full motor displacement. This reduces the tendency of an instant stop or a sudden increase in torque, which induces extremely high stresses on the gear train.
3. **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 failure.

⚠ WARNING

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

4. Consider the following when operating your equipment in extreme high or low temperatures:
   - Consult the power unit engine operator’s manual for all hot or cold weather operating procedures and precautions.
   - Select gear and bearing lubricants that are compatible with expected climatic conditions.
   - Select hydraulic fluid that is compatible with expected climatic conditions.
   - Allow sufficient time for hydraulic fluid to warm to operating temperature following a power unit cold start prior to activating the bypass valve to allow fluid to circulate to tong.
   - Allow for adequate drying of moisture (prior to lubricating) when cleaning tong parts in cold weather.

4.5 REVERSING PIN OPERATION

1. Use a rotation control valve to align the cage plate and rotary gear with the opening of the tong.
2. Extend the cylinder for the “make-up” reversing pin to make up tubular joints. The position of the cage plate/rotary gear assembly may require a small adjustment to ensure the pin aligns with the appropriate receiving hole in the cage plate. Ensure the “break-out” reversing pin has fully retracted from the cage plate/rotary gear assembly.
3. Extend the cylinder for the “break-out” reversing pin to break out tubular joints. The position of the cage plate/rotary gear assembly may require a small adjustment to ensure the pin aligns with the appropriate receiving hole in the cage plate. Ensure “make-up” reversing pin has fully retracted from the cage plate/rotary gear assembly.

Always ensure the cage plate and rotary gear are aligned when installing or changing the direction of the backing pin to ensure the backing pins extend into their correct locations.

⚠ WARNING

FAILURE TO PROPERLY ALIGN CAGE PLATE AND ROTARY GEAR MAY CAUSE SIGNIFICANT DAMAGE TO THE REVERSING PIN ASSEMBLY

4.6 MAKING AND BREAKING CONNECTIONS

Your equipment must be properly installed and commissioned for operation before beginning make / break operations. If required, refer to Section 3 to ensure all instructions for properly preparing your equipment for operation have been followed.

NOTICE

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

4.6.1 Making A Connection

1. Ensure hydraulic power supply to the tong is energized.
2. Ensure the load cell is properly configured for making up connections.
3. If necessary, use the “tong make/break” control handle to align the cage plate opening with the tong opening. Engage the proper reversing pin for make-up operations by operating the “rev. pin make/break” control handle in the “make” direction, and inspect to ensure the reversing pin has completely engaged with the cage plate and ring gear.
4. Use the rig pipe-handling equipment to position the fresh tubular over the stump. Use caution to ensure the connection is not, or does not become cross-threaded.
5. Open the tong door by operating the “door open/close” control valve to the “open” position.
6. Open the backup doors by operating the “backup clamp/release” valve to the “release” position.
7. Position tool over the tubular connection.
8. Operate the “backup clamp/release” in the “clamp” direction to clamp the backup on the the stationary section of the joint and close the backup doors.

⚠ CAUTION

SET BACKUP CLAMPING PRESSURE WITHIN THE RANGE DETERMINED BY THE PIPE SIZE AND WALL THICKNESS. SEE SUB-SECTION 3.4.3 FOR BACKUP PRESSURE SETTING INSTRUCTIONS

9. Operate the “door open/close” in the “close” direction to close the tong door.
10. Set the motor speed to high by moving the “motor high/low” control valve in the “high” direction. Begin rotation in the make up direction.
11. Run the tong at high speed until the joint begins to tighten (torque will begin to rapidly increase). Stop rotation. Set the tong to low speed (highest motor displacement) and if necessary, set the “valve high/low” valve to “low” to set the series/parallel valve to run motors in parallel. Resume rotation in the make-up direction. Stop rotation when the torque measurement reaches the pre-determined value, or when the WINCATT® system actuates the pressure dump valve.

4.6.1 Making A Connection (Continued):

12. Rotate the rotary gear in the break-out direction until the jaws have disengaged from the pipe/casing, and the opening of the rotary gear aligns with the door opening.
13. Open the tong door.
14. Operate the “backup clamp/release” in the “release” direction to unclamp the backup cylinder. Performing this operation will also open the outer backup door, followed by the inner backup door.
15. Move the tool away from the drill string.
16. Follow steps 4 through 15 to make up the next connection.

4.6.2 Breaking A Connection

1. Ensure tool is properly prepared for break-out operations, including checking that the tong is level and confirming the correct size of jaws are installed.
2. Configure the load cell for break out operations if break-out torque measurement is required.
3. If necessary, use the “tong make/break” control handle to align the cage plate opening with the tong opening. Engage the proper reversing pin for break-out operations by operating the “rev. pin make/break” control handle in the “break” direction, and inspect to ensure the reversing pin has completely engaged with the cage plate and ring gear.
4. Open the tong door by operating the “door open/close” control valve to the “open” position.
5. Open the backup doors by operating the “backup clamp release” valve in the “release” direction.
6. Position tool over the tubular connection, ensuring the joint is approximately centered between the tong and backup.
7. Operate the “backup clamp/release” in the “clamp” direction to clamp the backup on the the stationary section of the joint and close the backup doors.

⚠ CAUTION

SET BACKUP CLAMPING PRESSURE WITHIN THE RANGE DETERMINED BY THE PIPE SIZE AND WALL THICKNESS. SEE SUB-SECTION 3.4.3 FOR BACKUP PRESSURE SETTING INSTRUCTIONS

8. Operate the “door open/close” in the “close” direction to close the tong door.
9. Maximum break-out torque is only available when motors are operated in parallel and at full displacement. Set tong speed to low by moving the “motor high/low” control valve in the “low” direction, and set the “valve high/low” valve to “low” to set the series/parallel valve to run the motors in parallel.
10. Operate the “tong make/break” control handle slowly in the “break” direction to cam the jaws on to the tubular. **OPERATIONAL NOTE:** Do not apply break-out torque if, for any reason (slippage, for example), the rotary gear rotates past 90 degrees without gripping the tubular. Applying full torque to break out a joint when the rotary gear is not in full contact with all idler gear assemblies presents a significant hazard of catastrophic tong failure.

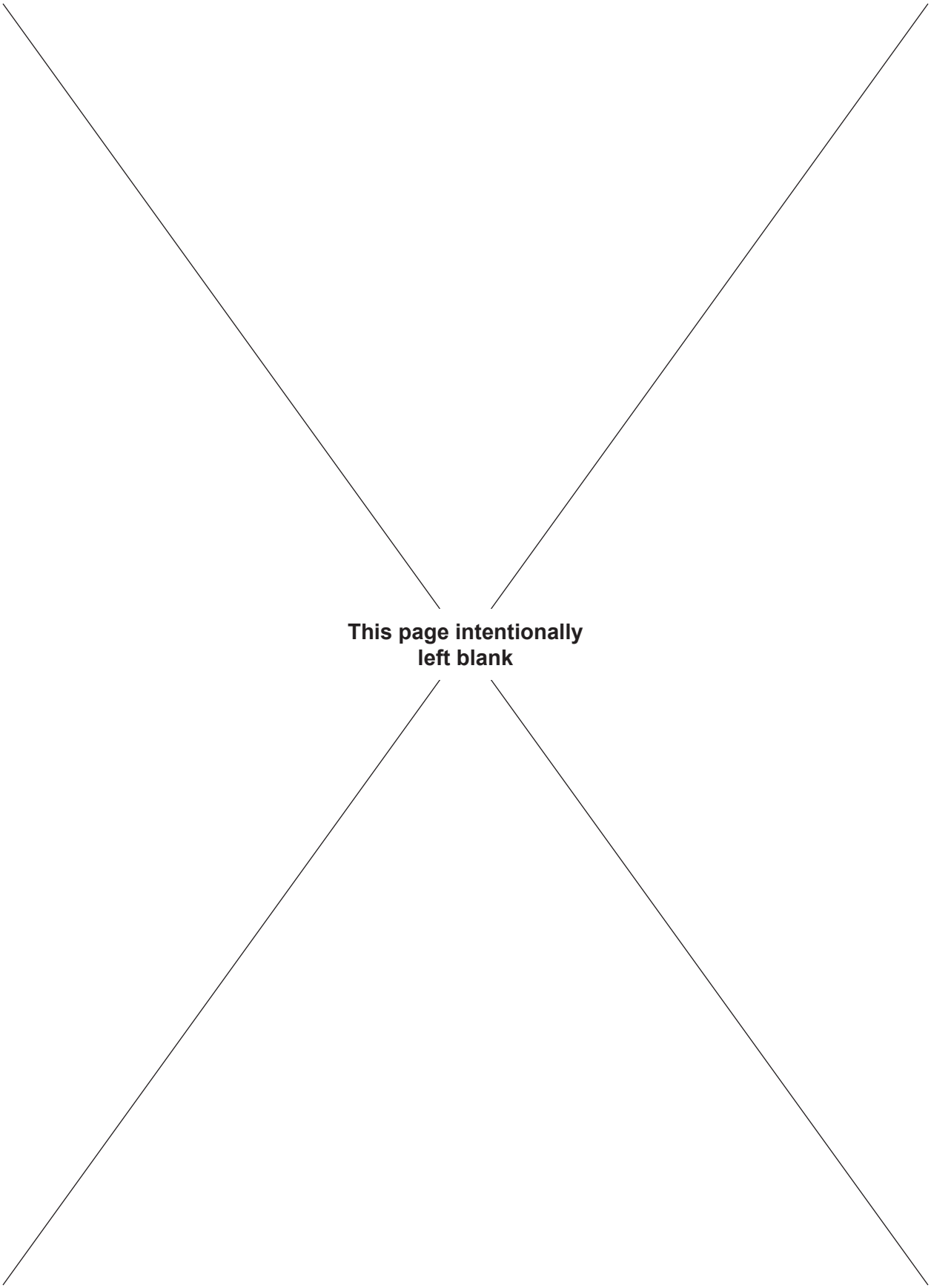
⚠ WARNING

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

10. When the tong jaws cam on to the tubing apply full torque in the break-out direction.
11. When the connection breaks stop rotation. If desired, operate the “motor high/low” control valve in the “high” direction set tong speed to high, enabling the tong to completely un-thread the connection at high speed. If even higher speed is desired, operate the “valve high/low” valve to “high” to set the series/parallel valve to series operation to apply full displacement to a single motor, achieving maximum tong speed.
13. When the connection is completely un-threaded stop rotation, then rotate in the make-up direction to release the tong jaws from the tubing.
14. Align the rotary gear and cage plate with the tong opening once the tong jaws disengage.
15. Operate the “backup clamp/release” in the “release” direction to unclamp the backup cylinder. Performing this operation will also open the outer backup door, followed by the inner backup door.

4.6.2 Breaking A Connection (Continued):

16. Move the equipment away from the string.
17. Use your rig's standard pipe handling procedures to remove and rack the freed tubing strand.
18. Repeat steps 6 through 17 as many times as necessary to break out and un-thread the desired number of connections.



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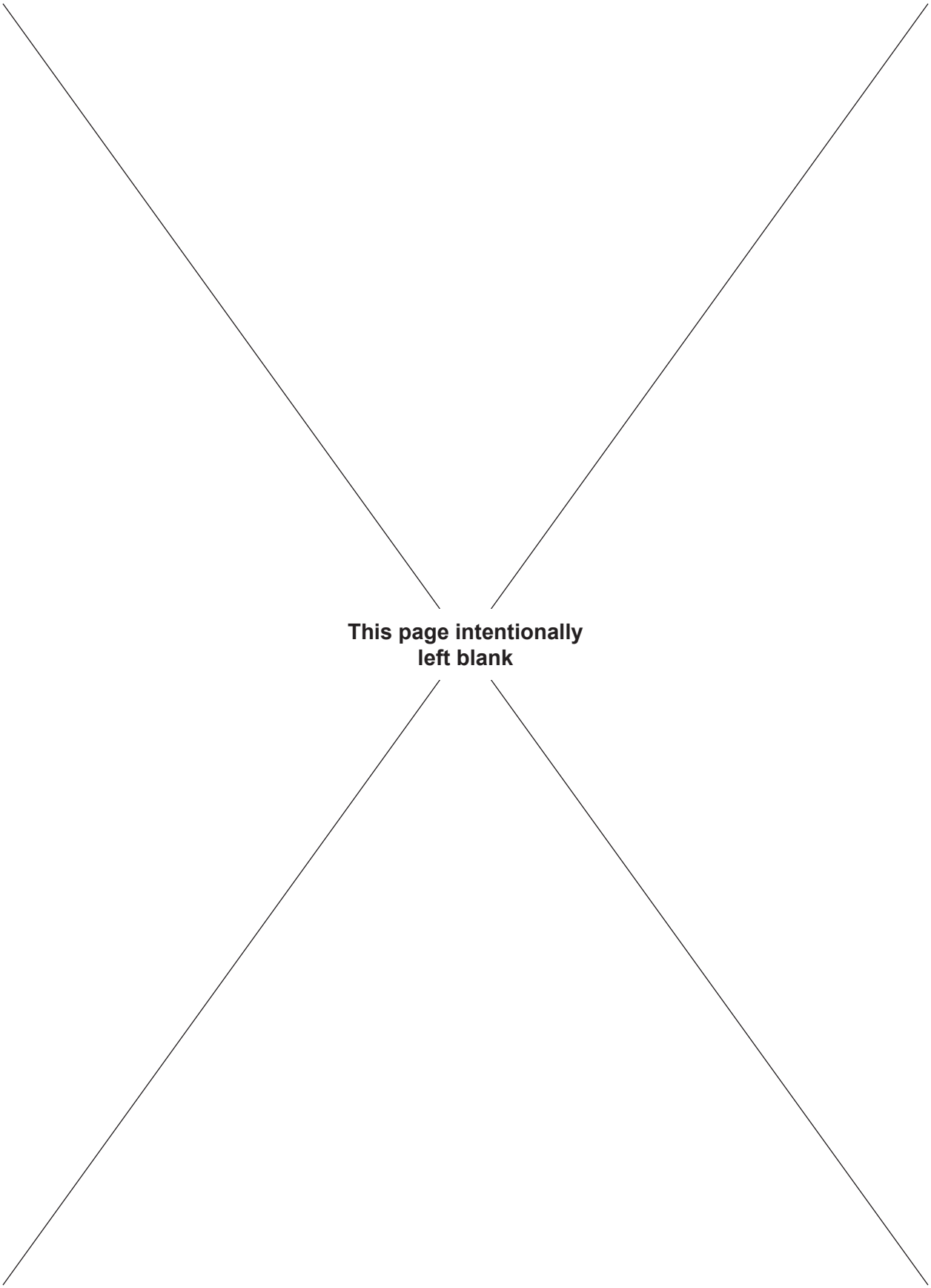
SECTION 5: MAINTENANCE



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

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

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

⚠ DANGER

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

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

⚠ WARNING

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

5.0 GENERAL MAINTENANCE SAFETY PRACTICES

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

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

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

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

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

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

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

⚠ WARNING

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

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

5.1 CLEANING

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

5.2 PREVENTIVE MAINTENANCE PRACTICES

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

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

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

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

5.3 HYDRAULIC SYSTEM MAINTENANCE

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

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

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

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

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

5.4 HYDRAULIC SYSTEM DEPRESSURIZATION

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

⚠ CAUTION

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

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

⚠ WARNING

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

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

5.5 LUBRICATION INSTRUCTIONS

In general, McCoy recommends use of a good-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. Ensure selected grease remains within its viscosity range at expected operating temperatures.

McCoy recommends liberally coating the cam surface of the rotary drive gear with grease prior to jaw installation. Periodically remove the clutch inspection plate and apply grease generously to the clutch, drive gears and shifting shaft. Coat the jaw pins and rollers with a liberal amount of anti-seize compound when installing new jaw die kits.

Lubricate your equipment before beginning each shift, and immediately following operation prior to storage. This section identifies all necessary lubrication points.

5.5.1 Cage Plate Cam Followers

Follow these instructions to properly lubricate the cam followers used as cage plate guides.

1. If not already done activate hydraulic power to your equipment.
2. Set the motor speed to low, and slowly rotate the cage plate until the opening in the cage plates exposes several cam follower assemblies mounted to the top and bottom plates of the tong.
3. Deactivate and lock out hydraulic power to your equipment before performing the lubrication service.

⚠ DANGER

DEACTIVATE AND DISCONNECT OR LOCK OUT HYDRAULIC POWER BEFORE PROCEEDING

4. Grease the exposed cam followers through the grease fittings in the end of each cam follower assembly.

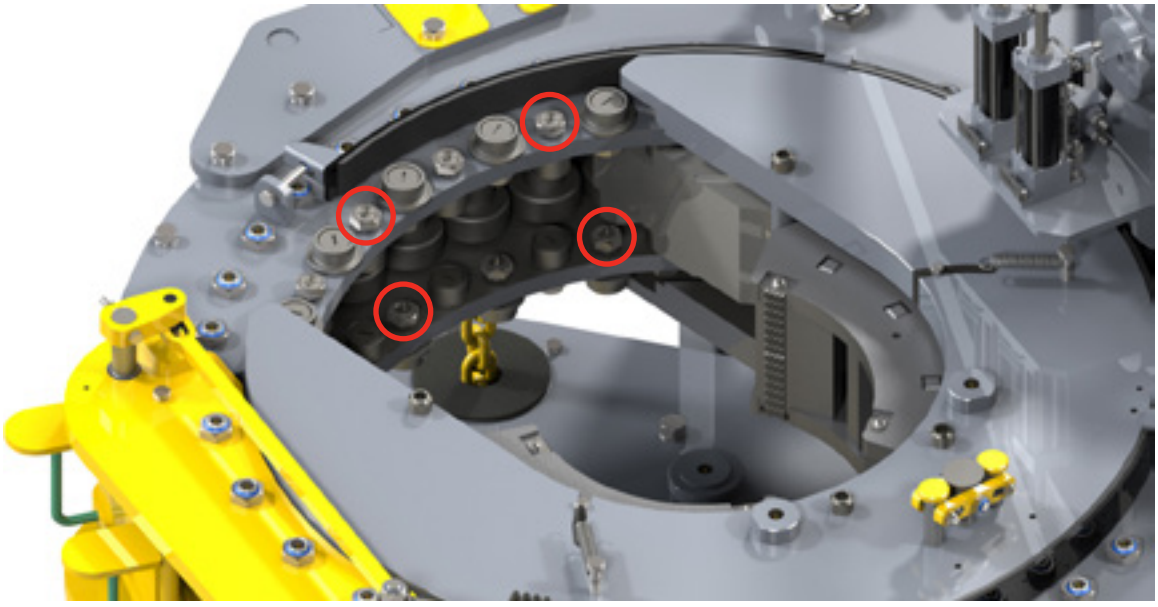


Illustration 5.5.1: Cage Plate Cam Follower Lubrication

5.5.1 Cage Plate Cam Followers (Continued):

5. Remove all personnel from the equipment. When safe to do so re-establish hydraulic power, and rotate the cage plate assembly until the next set of cam followers are exposed.
6. Repeat steps 3, 4, and 5 until all cam followers are properly lubricated.

Following conclusion of lubrication of the cam followers, McCoy recommends liberally greasing the slots in the rotary gear and cage plates (See Illustration 5.5.2).

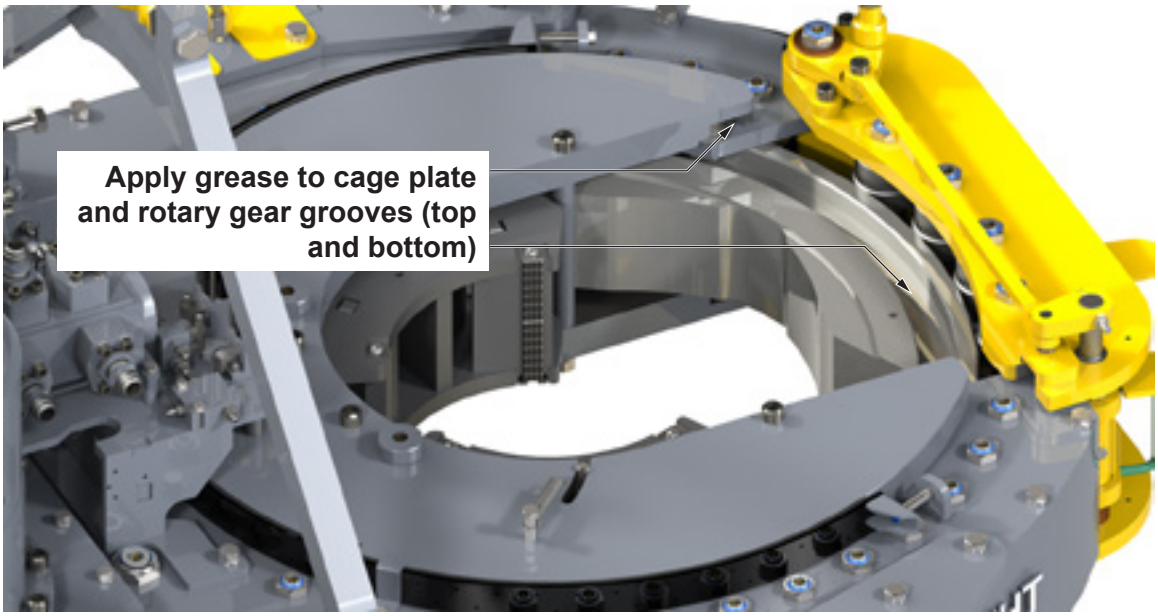


Illustration 5.5.2: Cage Plate/Rotary Gear Groove Lubrication

5.5.2 Support Rollers

Apply grease to the support roller bearings through the grease fittings recessed into the top of each support roller shaft (23 locations tong body (top), 23 locations tong body (bottom), 4 locations tong door (top), and 4 locations tong door (bottom).

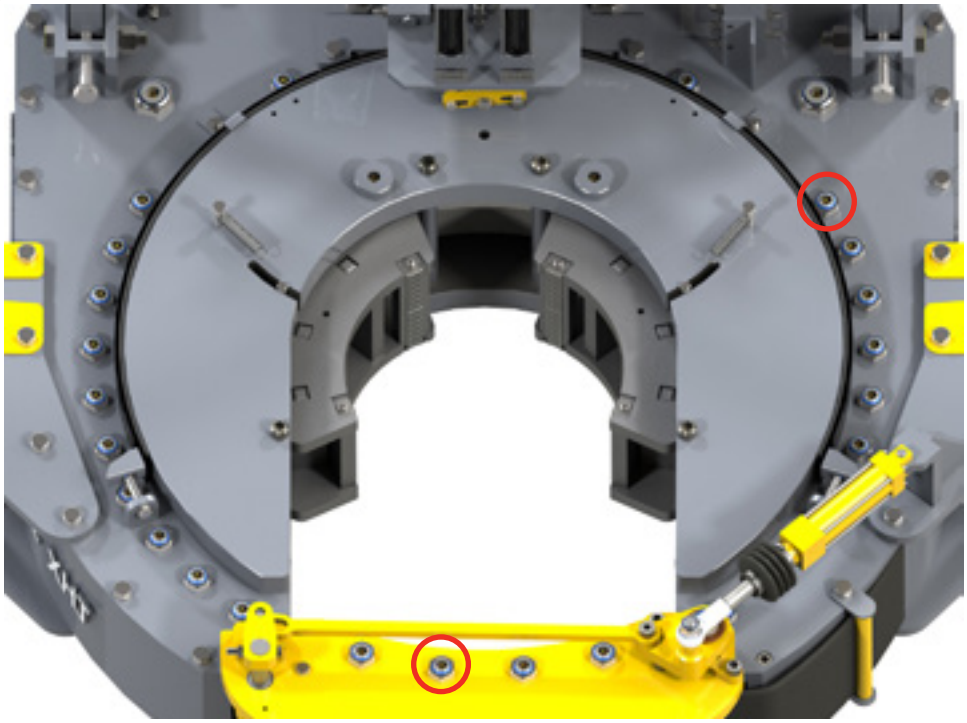


Illustration 5.5.3: Support Roller Lubrication

5.5.3 Jaw Pivot Bolts

Apply grease to the jaw pivot bolts through the grease fittings recessed into the top of each shaft (two locations total).

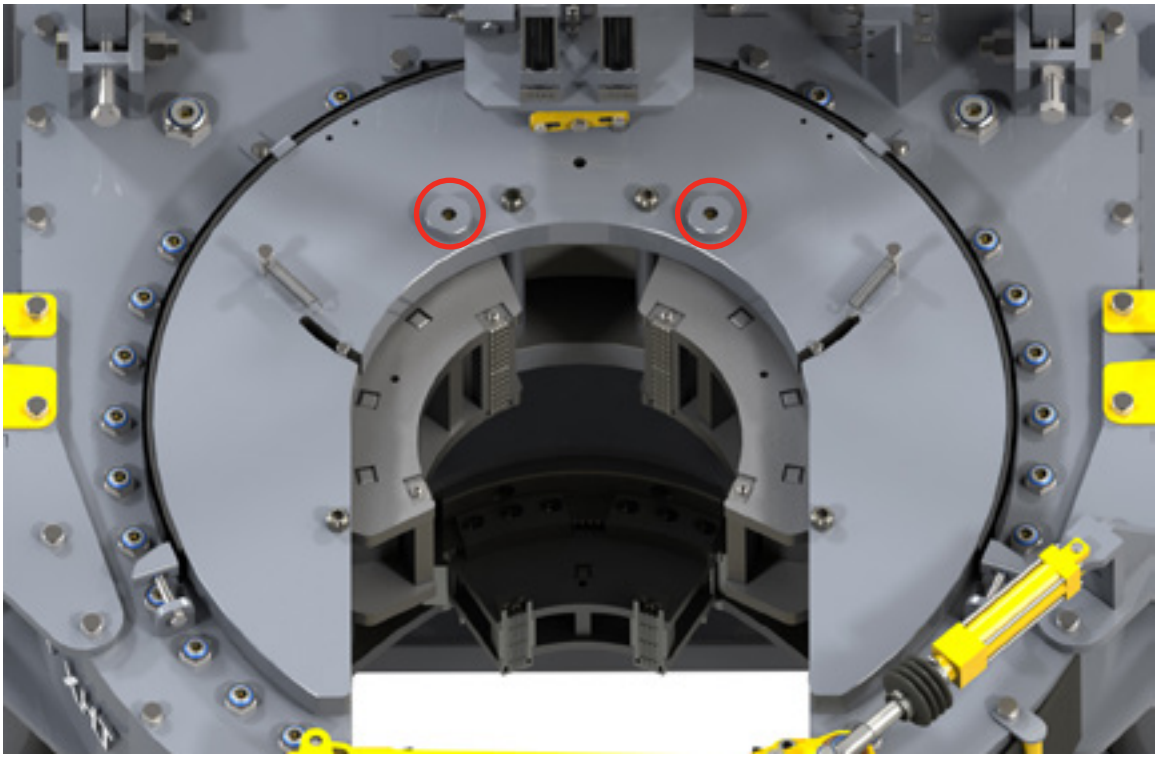


Illustration 5.5.4: Jaw Pivot Bolt Lubrication

5.5.4 Idler Bearings

Apply grease to the idler bearings through the grease fittings recessed into the top of each shaft on the top and bottom faces of the tong (eight locations total).

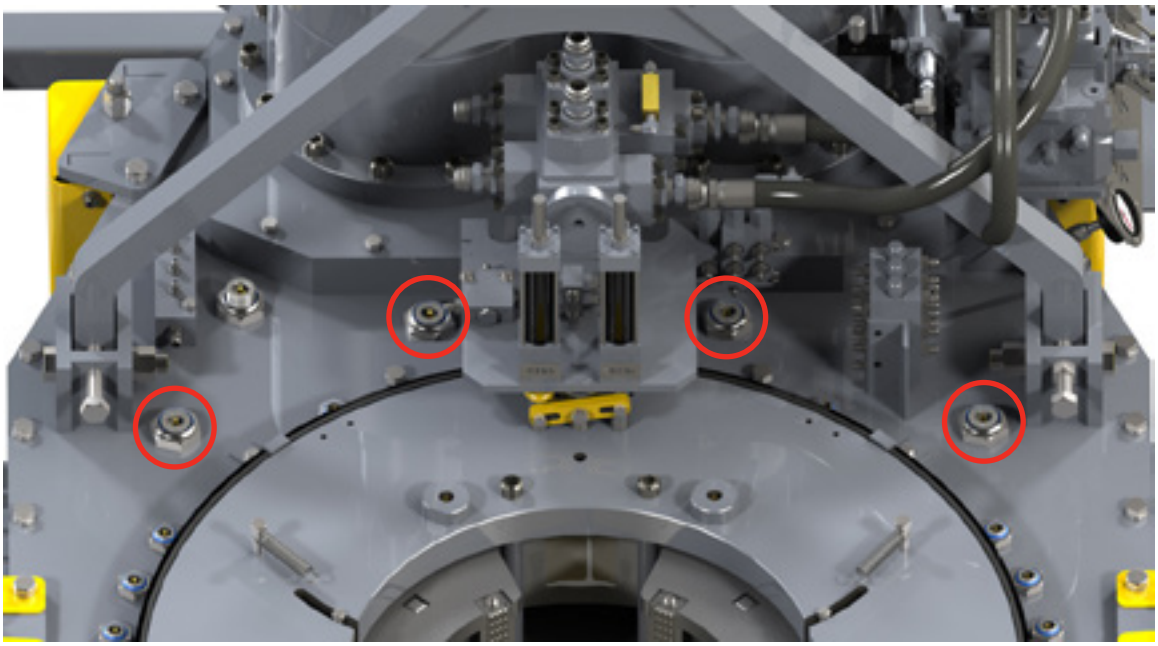


Illustration 5.5.5: Idler Gear Lubrication (Top)

5.5.4 Idler Bearings (Continued):

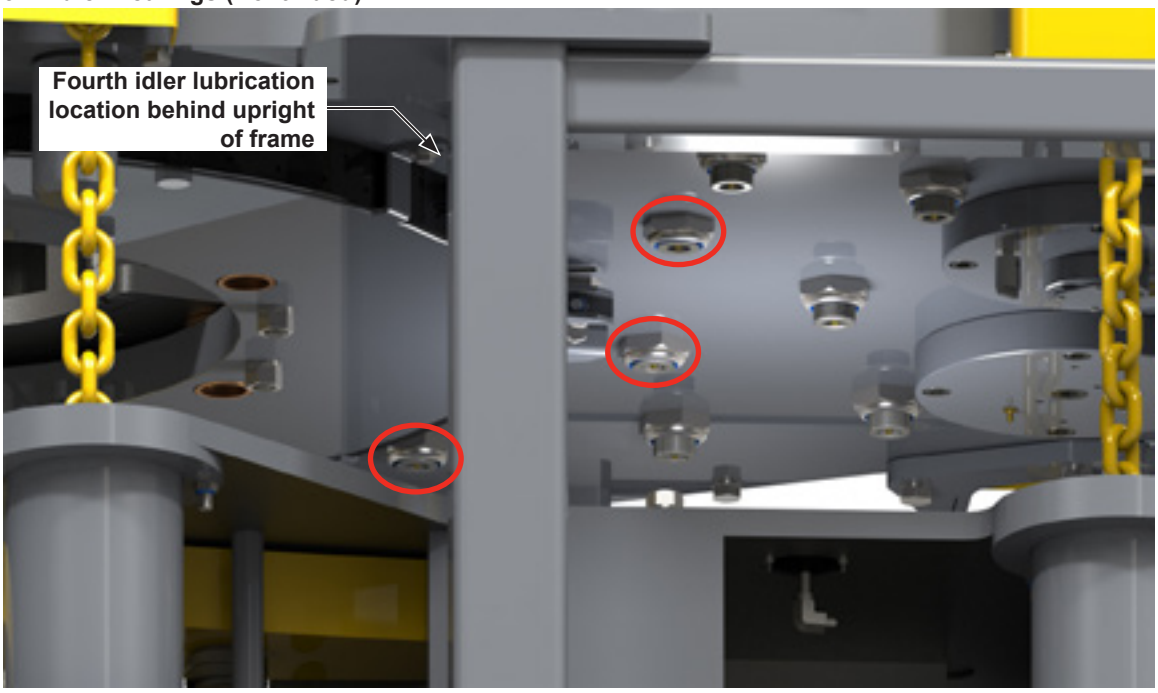


Illustration 5.5.6: Idler Gear Lubrication (Bottom)

5.5.5 Mid-Idler Bearings

Apply grease to the mid-idler bearings through the grease fittings recessed into the top of each shaft. Lubricate two locations total from the top side of the tong, and five locations total from the bottom side of the tong.

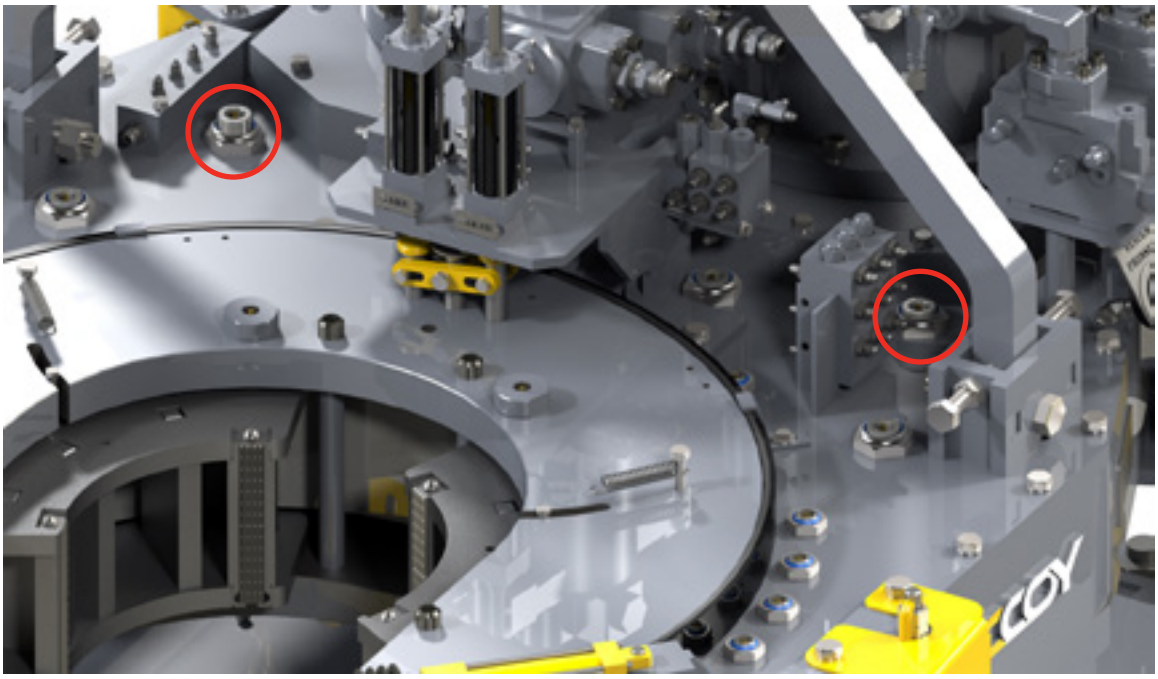


Illustration 5.5.7: Mid-Idler Lubrication (Top)

5.5.5 Mid-Idler Bearings (Continued):

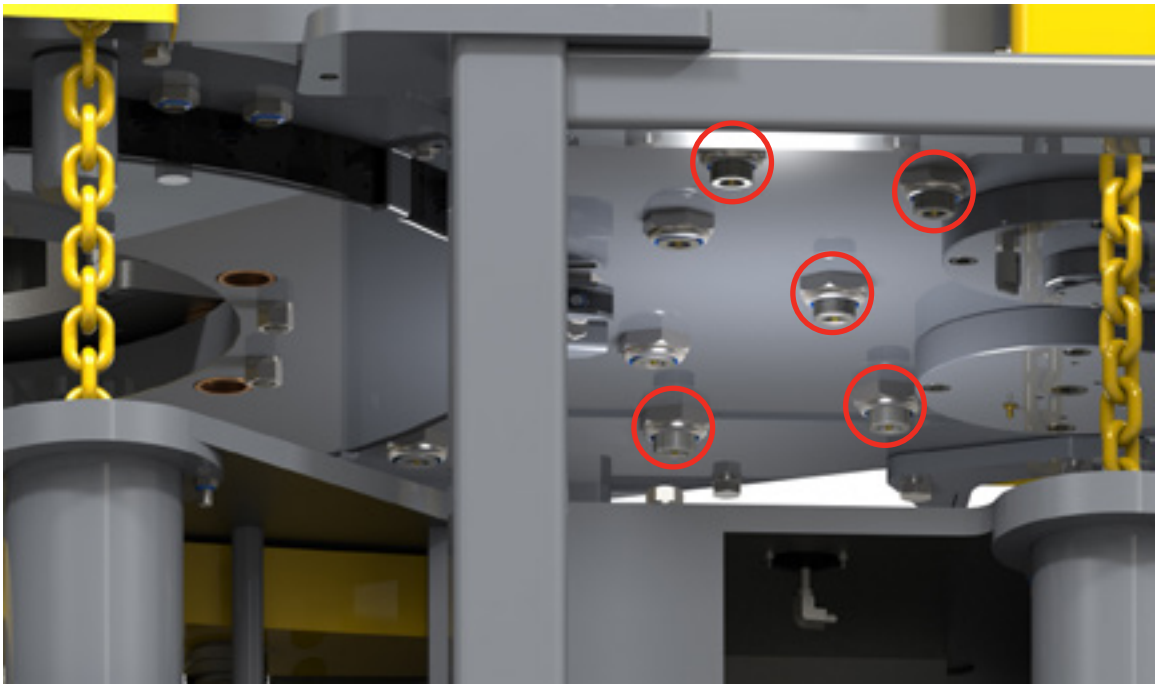


Illustration 5.5.8: Mid-Idler Lubrication (Bottom)

5.5.6 Drive Gear Lubrication

Apply grease to the bearings in the drive gear assemblies through the single grease fitting located on each drive gear bearing cap located on the bottom rear of the tong (two locations total).

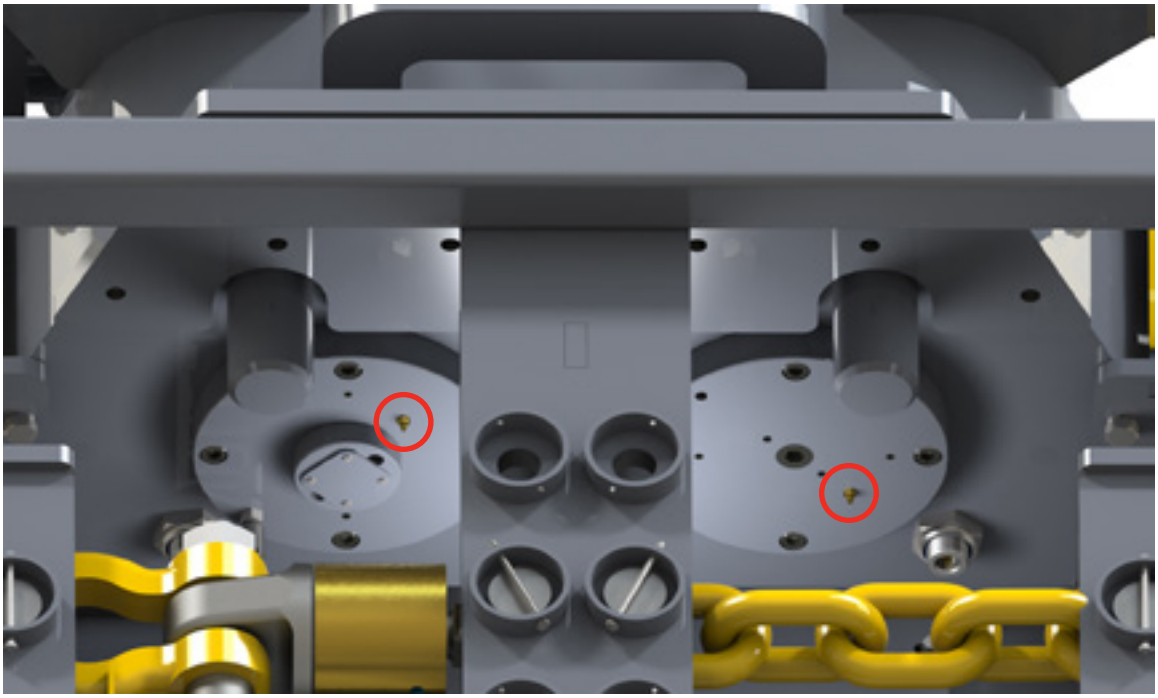


Illustration 5.5.9: Drive Gear Lubrication

5.5.7 Door Pivot Shaft Lubrication

Apply grease to the door pivot shaft through the grease fittings recessed into the top and bottom of the shaft (two locations total).

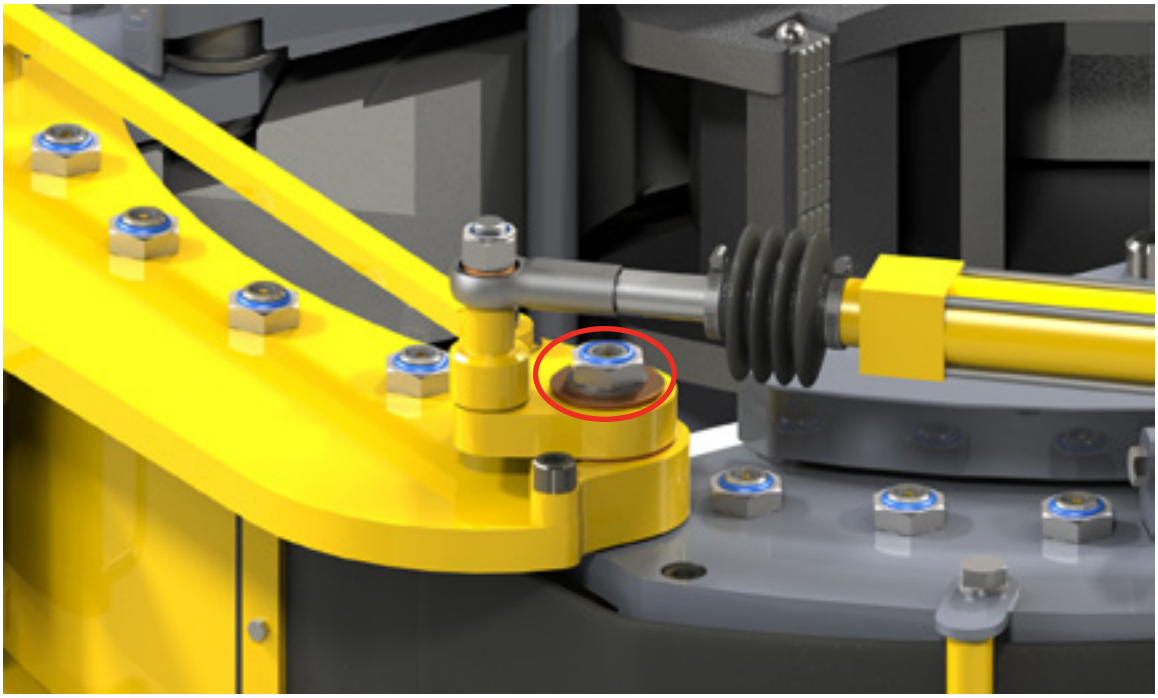


Illustration 5.5.10: Door Pivot Shaft Lubrication

5.5.8 Lockjaw Backup Door Pivot Shaft Lubrication

Apply grease to the backup door pivot shafts through the grease fittings recessed into the top and bottom of each shaft (four locations total).

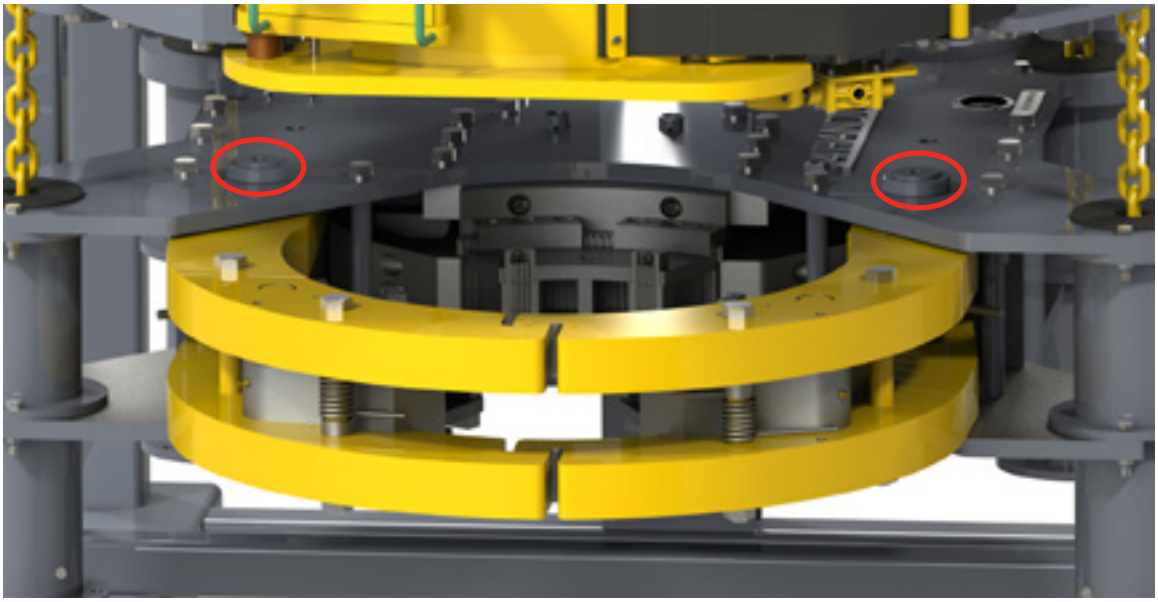


Illustration 5.5.11: Lockjaw Backup Door Pivot Shaft Lubrication

5.5.9 Lockjaw Backup Door-Mounted Jaw Pin Lubrication

Apply grease to the pivot pins securing the door-mounted jaws through the grease fittings mounted on each jaw, between the main plates of each backup door (two locations total).

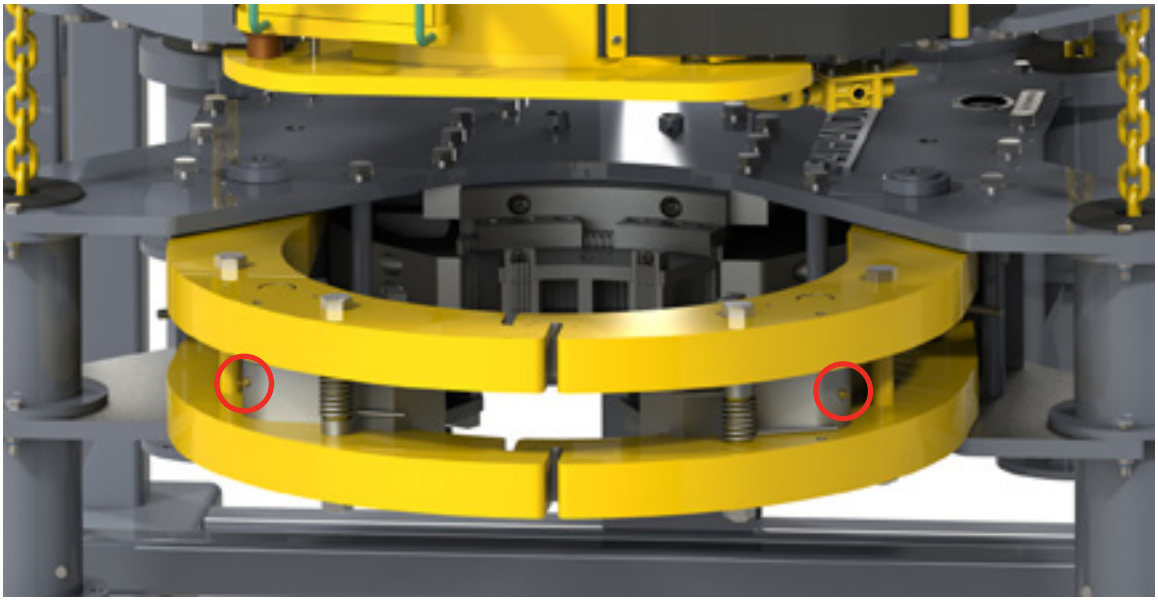


Illustration 5.5.12: Backup Door-Mounted Jaw Pin Lubrication

5.5.10 Lockjaw Backup Door/Clamp Cylinder Roller Lubrication

Apply grease to the backup door/clamp cylinder roller pins through the grease fittings recessed into the top of each shaft (two locations total). Grease can be applied to these pins only when backup doors are closed.

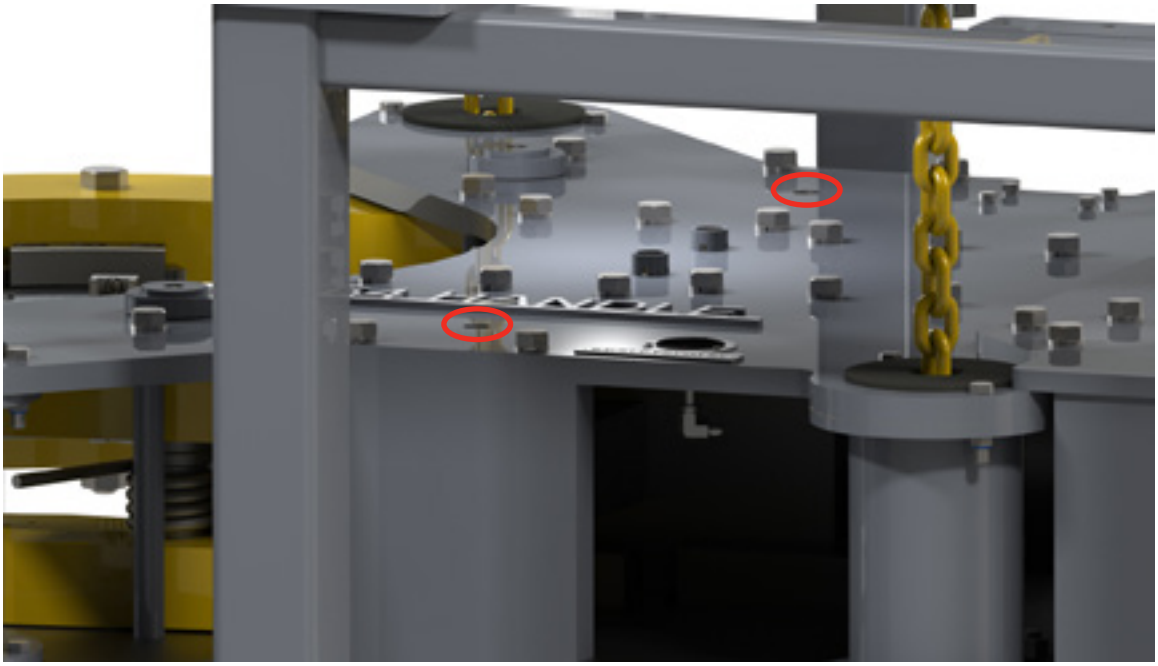


Illustration 5.5.13: Backup Door Cylinder Pin Lubrication

5.5.11 Lockjaw Backup Clamp Cylinder Lubrication

Apply grease to the clamp cylinder slide path through the two grease fittings recessed into the top backup body plate, and two grease fittings recessed into the bottom backup body plate (four locations total).

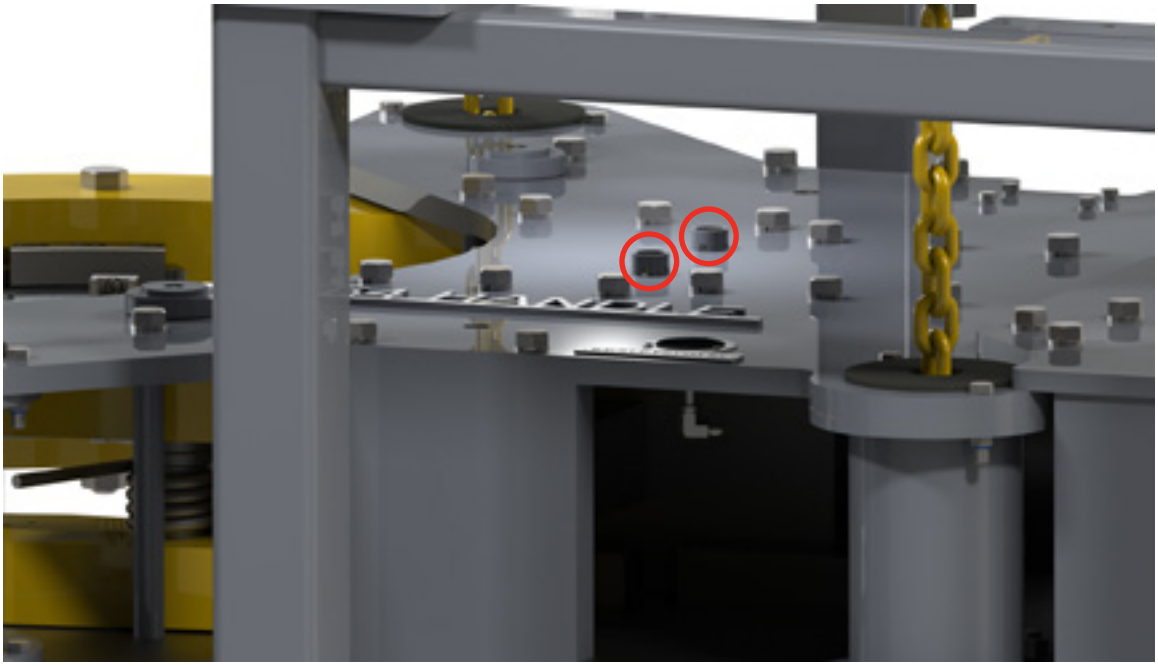


Illustration 5.5.14: Backup Clamp Cylinder Lubrication

5.5.12 Torque Hub Lubrication Instructions

Fill the torque hub prior to first use, and replace fluid after a 50-hour break-in period. Following the break-in period replace the lubricant every 1000 hours of normal operation, every 500 hours of severe operation, or every six months of operation whichever comes first. Use high quality 80W-90 universal gear lubricant containing EP additives that meet the following criteria:

Operating Conditions	Recommended Specification
-40°C to 5°C	ISO VG100 or AGMA 3EP
5°C to 40°C	VG150/VG220 or AGMA 4EP/5EP
40°C to 65°C	VG320 or AGMA 6EP
Approximate Capacity:	123 fluid oz (3.6375 l)

5.5.12.1 Torque Hub Drain Procedure:

The hydraulic motors may be removed, or may remain in place on the torque hubs depending on customer preference. Protect all splines and exposed metal surfaces from contamination or impact when removing motors. Service one torque hub at a time.

1. Construct a sturdy, level support base that will safely support the weight of a torque hub while allowing access to the drain plugs on the shaft side of the gearbox. Ensure a fluid containment pan can be placed below the gearbox before draining used fluid.
2. Disconnect the hydraulic connections from each motor.
2. Thread two ⅝” UNC eye bolts in to the top of the torque hub for hoisting purposes (see illustration 5.5.14, “Motor Mount Holes, ⅝-11 UNC-2B”).
3. Extract the twelve ¾” x 2-¾ hex socket head cap screws and ¾” lock washers securing the torque hub to the housing plate.
4. Attach a temporary lifting sling to the eye bolts at the top of the gearbox housing. Use a crane to carefully lift the gearbox straight up and off the mounting plate, and transport to the support constructed in step 1. Allow the structure to support the full weight of the gearbox, but do not allow slack in the temporary lifting sling.

5.5.12.1 Torque Hub Drain Procedure (Continued):

5. Place a containment vessel with a minimum capacity of 8 litres (2 gal) under the gearbox. Remove one ½" NPT plug (see illustration 5.5.15, "Pipe Plugs No. 1") on the shaft side of the torque hub housing. Remove both ⅜" NPT plugs (see illustration 5.5.15, "Pipe Plugs No. 3"). Allow the gearbox to drain completely.
6. Replace pipe plug on the shaft side of the gearbox housing. Dispose of drained gear lubricant according to your company's proscribed environmental protection regulations.

5.5.12.2 Torque Hub Flush Procedure:

McCoy recommends removing residual wear metals left in the gearbox following removal of used gearbox fluid, especially at the first fluid service following the initial break-in period.

1. Identify a flat, level location where the gearbox may safely be placed on its side. Do not place directly on a very hard surface such as concrete. If necessary use wood or a heavy cloth (a packing blanket, for example).
2. Use a funnel, and fill the empty gearbox with fresh gear fluid through one of the ⅜" NPT plugs on the top of the gearbox housing (see illustration 5.5.15, "Pipe Plugs No. 3"). It is not necessary to completely fill the gearbox for flushing purposes, but McCoy recommends using no less than 3 litres of fresh fluid.
3. Replace all pipe plugs in the gearbox housing.
4. Use a crane and temporary lifting sling to hoist the gearbox, and move to the location identified in Step 1. Place the gearbox gently on its side, taking care not to damage the shaft. If necessary, temporarily block it to prevent it from rolling and remove the temporary sling.
5. Remove the blocks, and carefully roll the gearbox over the flat surface at least one full revolution. Roll back the other way at least one full revolution.
6. Reconnect the lifting sling and carefully hoist the gearbox upright, taking care not to damage the shaft. Replace on the draining structure.
7. Place a containment vessel with a minimum capacity of 8 litres (2 gal) under the gearbox. Remove one ½" NPT plug (see illustration 5.5.15, "Pipe Plugs No. 1") on the shaft side of the torque hub housing. Remove both ⅜" NPT plugs (see illustration 5.5.15, "Pipe Plugs No. 3"). Allow the gearbox to drain completely.
8. Replace pipe plug on the shaft side of the gearbox housing. Dispose of drained gear lubricant according to your company's proscribed environmental protection regulations. The gearbox may now be filled with fresh fluid in preparation for return to service.

5.5.12.3 Torque Hub Fill Procedure:

1. Use a funnel, and perform an initial fill of the empty gearbox with fresh gear fluid through one of the ⅜" NPT ports on the top of the gearbox housing (see illustration 5.5.15, "Pipe Plugs No. 3"). Use a maximum of 3 litres of fresh fluid for the initial fill before checking the level of the fluid in the gearbox.
2. Fashion a dip-stick using a non-particulating rod. McCoy recommends using a clean twelve-inch length of ¼" diameter metal or plastic rod. Insert the dip-stick through the unused ⅜" NPT port on the top of the gearbox housing until the dip-stick comes into contact with the internal ring gear.
3. Add fluid two ounces (60 ml) at a time, checking the dipstick after each addition of fluid. When the dip-stick shows the fluid level has covered the ring gear, stop adding fluid.
4. Replace all plugs in the gearbox housing.
5. Attach a temporary lifting sling to the eye bolts at the top of the gearbox housing and use a crane to carefully lift the gearbox straight up and off the support. Transport to the tong, and carefully lower in to place on the gearbox mounting plate, using extreme caution to properly mate the splines on the gear shaft with the internal splines on the drive gear assembly.
6. Use twelve ¾" UNC x 2-¾ hex socket head cap screws and ¾" lock washers to secure the torque hub to the housing plate.
7. Re-connect all hydraulic connections to each motor.

5.5.12.3 Torque Hub Fill Procedure (Continued):

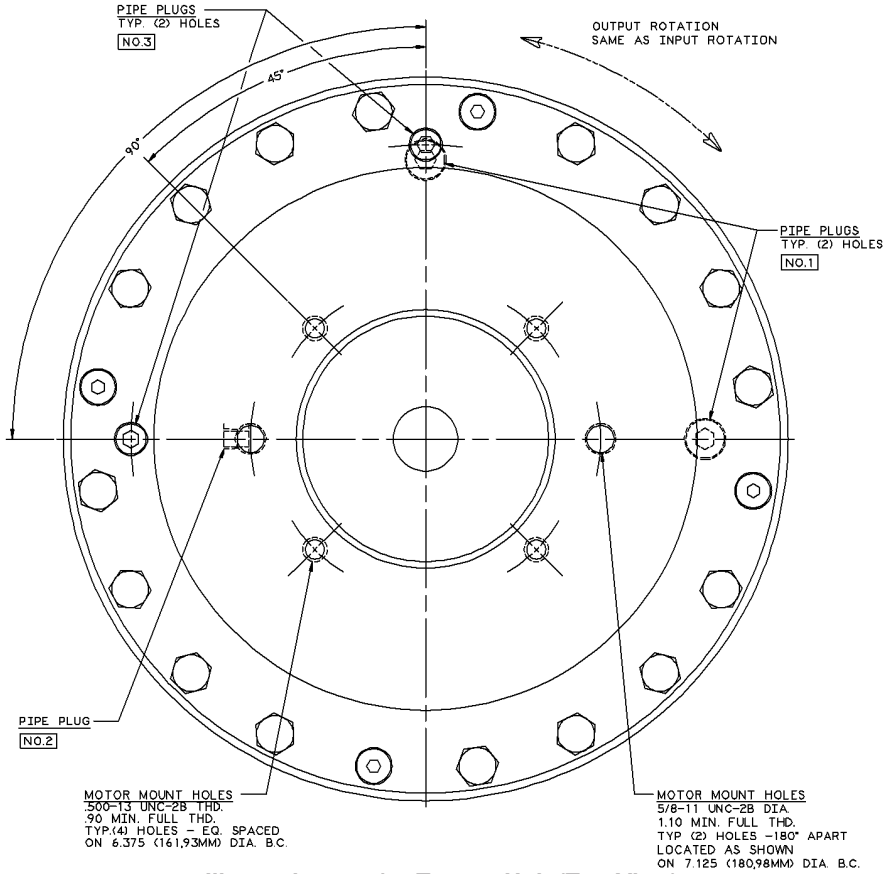


Illustration 5.5.15: Torque Hub (Top View)

5.5.13 Recommended Lubrication Amounts

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

Greasing Location	Min. Grease Amount (Each Location)
Cage plate cam followers (upper and lower)	2 shots
Cage plate / rotary gear grooves (upper and lower)	as required
Support roller bearings (upper and lower)	3 shots
Jaw pivot bolt lubrication	2 shots
Idler bearings (upper & lower)	4 shots
Mid-idler bearings (upper & lower)	4 shots
Drive gear bearings	4 shots
Door pivot shaft	3 shots
Backup door pivot shafts	3 shots
Backup door-mounted jaw pivot pins	2 shots
Backup door/clamp cylinder connection pin	3 shots
Backup clamp cylinder	4 shots

McCoy recommends liberally coating the cam surface of the rotary drive gear with grease prior to jaw installation. Periodically remove the clutch inspection plate and apply grease generously to the clutch, drive gears and shifting shaft. Coat the jaw pins and rollers with a liberal amount of anti-seize compound when installing new jaw die kits.

5.6 ADJUSTMENTS

5.6.1 Brake Band Adjustment

The brake bands must be periodically adjusted to continue to provide smooth and efficient jaw cam action. Inadequate cage plate tension will allow the cage plate to rotate with the rotary gear, resulting in poor gripping of the pipe or casing due to improper “camming” action of the tong jaws. Tightening the brake band against the cage plates will increase frictional resistance, allowing jaws to cam properly and grip the casing. Adjust the brake band using the adjustment nut and bolt set as shown in the illustration below. Do not over-tighten, as this causes excessive wear to the brake bands. Ensure all four brake bands are adjusted simultaneously and equally.

⚠ CAUTION

TOP AND BOTTOM BRAKE BANDS MUST BE ADJUSTED SIMULTANEOUSLY AND EQUALLY

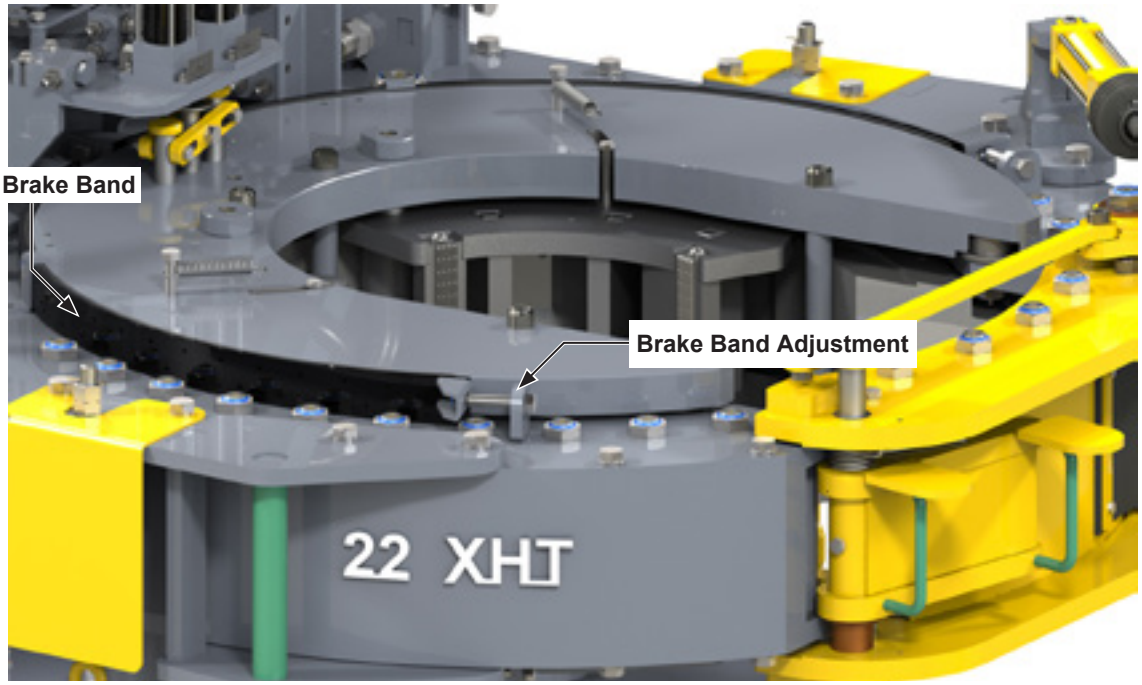


Illustration 5.6.1: Brake Band Adjustment

5.6.2 Door Switch Adjustments

The door switch systems on the tong interrupts hydraulic power to the motor when the tong door is opened, or even slightly ajar. This is a critical safety system.

The backup door switch limits hydraulic pressure to the backup clamp cylinder until the backup doors are securely latched, preventing damage to the coupling in the event of a “bad bite” by the backup, or if attempting to clamp on an oversized pipe or connection.

This procedure enables the equipment user to restore the proper tolerances between the switch and the door to allow the door switch systems to operate as designed.

5.6.2.1 Power Tong Door Switch Adjustment

1. Set the equipment up in a controlled testing environment. Do not connect hydraulic power at this time.
2. Check the mechanical operation of the hydraulic door switch:
   - Keep the tong door closed. Loosen the four nuts and bolts securing the door switch to the mounting plate, and slide the switch away from the cam actuator on the door assembly.
   - Check operation of the hydraulic switch plunger. Depress and allow it spring back several times to ensure smooth operation (see illustration 5.6.2). If the plunger binds or jams, replace the door switch.

5.6.2.1 Power Tong Door Switch Adjustment (Continued):

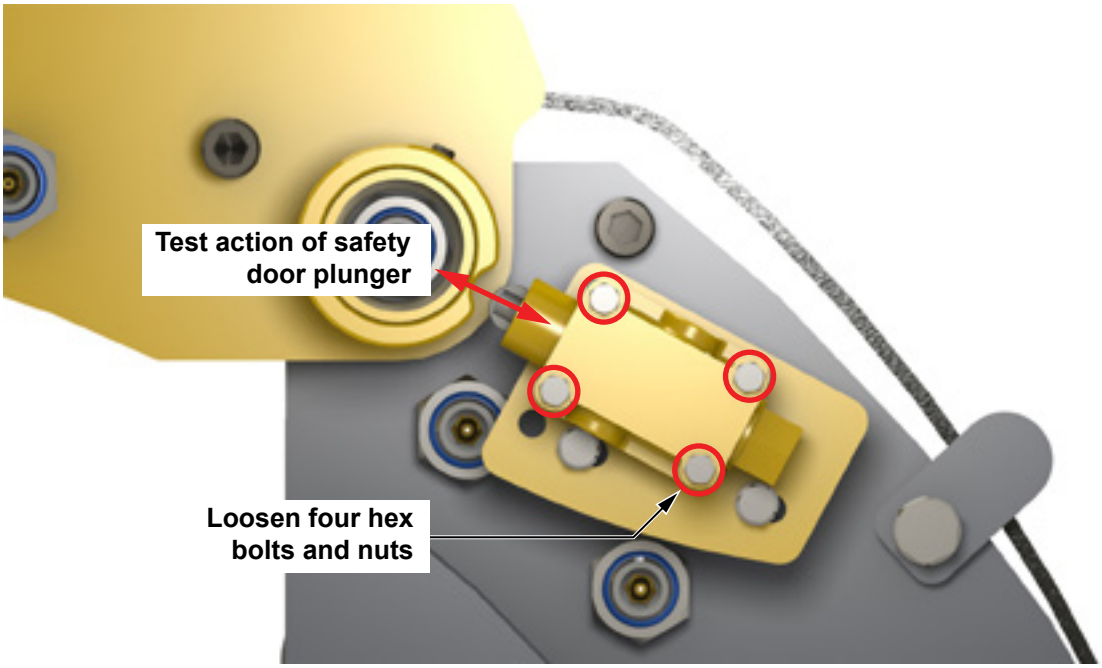


Illustration 5.6.2: Door Switch Adjustment 01

3. If necessary, align the notch on the door switch cam with the door switch plunger. Loosen the set screws securing the door switch cam to the door weldment, and rotate until the notch in the cam is centered with the plunger of the door switch (see illustration 5.6.3). When the cam has been satisfactorily aligned re-tighten the two set screws.

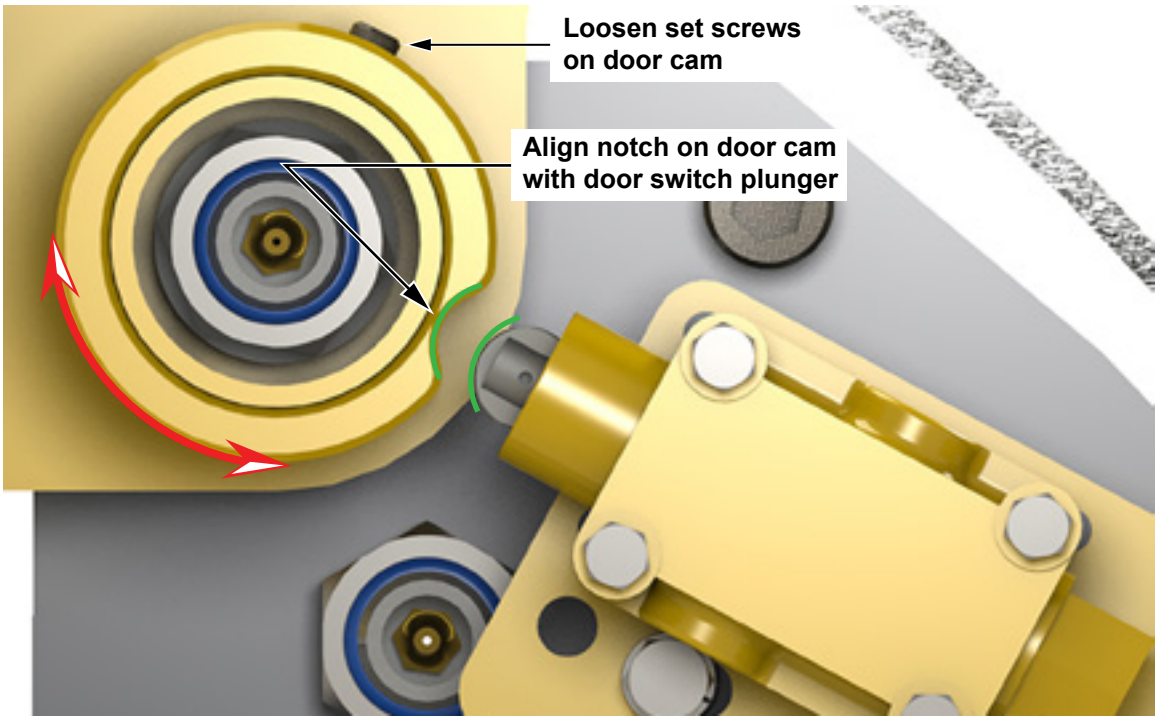


Illustration 5.6.3: Door Switch Adjustment 02

4. Slide the door switch toward the cam until the roller on the switch is in contact with the rounded notch on the cam. If the cam is not exactly centered with the roller, repeat step 3. Ensure that the roller on the switch is in contact with the cam without depressing the plunger. Tighten the four hex bolts and nuts to securely fasten the door switch in place.

5.6.2.1 Power Tong Door Switch Adjustment (Continued):

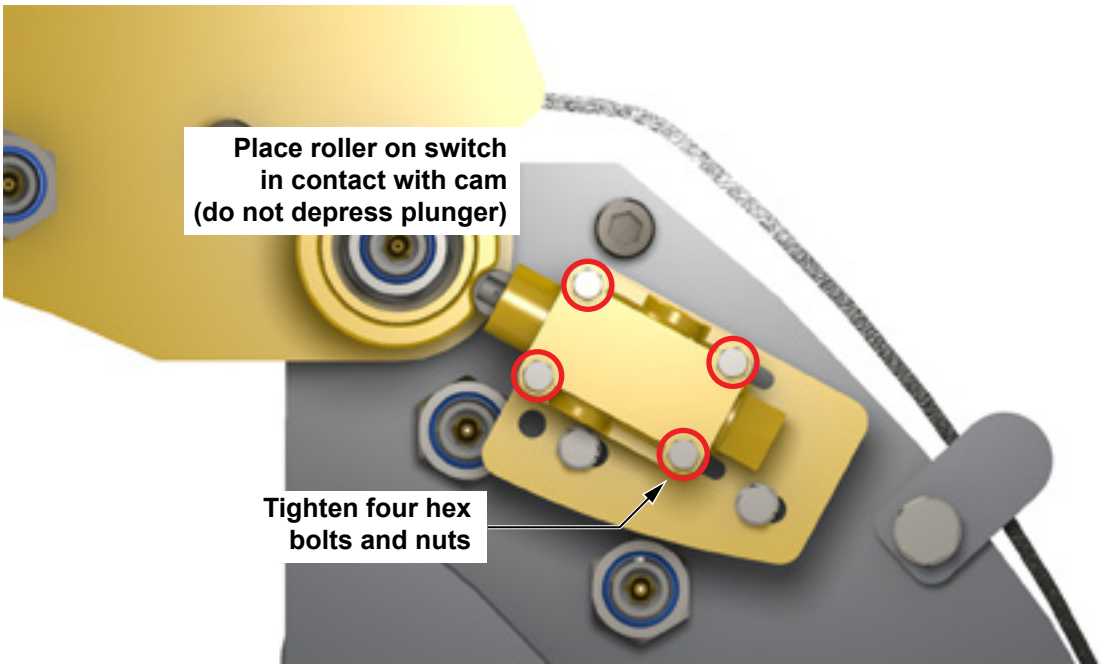


Illustration 5.6.4: Door Switch Adjustment 03

5. Test the tong door switch system. Using the correct testing procedure ensures the door switch system is fully functional without exposing the equipment to a shock load or personnel to a potential hazard. The tests also verify that the door switch valve is positively sealing.

⚠ WARNING

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

i. Set the tong to rotate at low speed.

ii. Stop all tong rotation.

iii. Open the tong door.

iv. Gradually attempt to turn the tong using the rotation control handle. Continue to gradually move the handle until the valve is fully stroked, and hold for 30 seconds. Verify the ring gear does not rotate while the rotation control is engaged. **PROCEDURAL NOTE**: a very small amount of ring gear movement is acceptable as the cartridge valve seats to stop rotation. Note that very slow rotation of the rotary gear in one direction only is normal on a 22-150K tong. If testing a 22-150K tong and slow rotation is noted during this step, the rotary gear should not rotate at all when performing step 5(v). If rotary gear rotation is not observed, then very slow rotation while performing step 5(v) is normal.

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

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

5.6.2.1 Power Tong Door Switch Adjustment (Continued):

6. Any cage plate rotation with the door in any position except closed and latched indicates that further adjustment of the door switch is necessary. As previously noted, the exception to this is the 22-150K tong, where very slow rotation in a single direction is normal. Remove hydraulic power from the tong.
7. Slightly loosen the four bolts/nuts securing the switch to the mounting plate. Using a lightweight hammer, or wooden or rubber mallet, lightly tap the switch from the back to move it towards the door cam approximately 1/32" (1 mm). Re-tighten the four mounting bolts/nuts.
8. Repeat step 5. If the door switch mechanism operates correctly and no further adjustment is required this procedure is complete. If further adjustment is required, repeat steps 6 and 7 until the door switch mechanism operates correctly. If your equipment reaches the adjustment limits before correct operation of the door switch mechanism is achieved contact the engineering department at McCoy Global for further technical advice.

5.6.2.2 Backup Door Switch Adjustment

This procedure requires two people and the following tools and equipment:

- a set of hand tools
- rubber or wooden mallet
- a test section of tubular sized to match the size of the installed jaws and dies. The test tubular may not be oversized or undersized.

⚠ DANGER

ACTIVE HYDRAULIC POWER DURING THIS PROCEDURE PRESENTS A HAZARD TO PERSONNEL. THIS PROCEDURE MUST BE PERFORMED BY A TRAINED, EXPERIENCED HYDRAULIC TECHNICIAN.

1. Set the equipment up in a controlled testing environment. Do not connect hydraulic power at this time.
2. Check the mechanical operation of the backup door hydraulic switch:
   - Keep the backup doors closed. Loosen the four nuts and bolts securing the door switch to the bottom plate of the backup, and slide the switch away from the door assembly.
   - Check operation of the hydraulic switch plunger. Depress and allow it spring back several times to ensure smooth operation (see illustration 5.6.5). If the plunger binds or jams, replace the door switch.

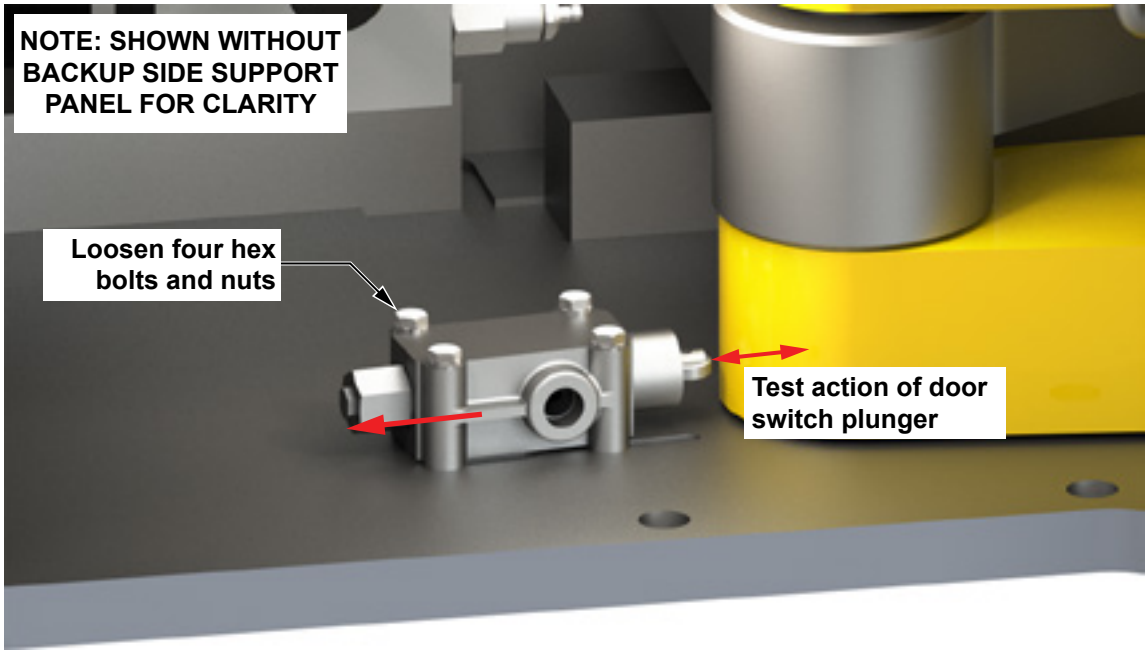


Illustration 5.6.5: Backup Door Switch Adjustment 01

5.6.2.2 Backup Door Switch Adjustment (Continued):

3. Slide the door switch until it contacts the plate of the closed backup door, but do not depress the door switch plunger. Tighten the door switch fasteners only enough that the switch doesn't move, but can still be moved with the application of a small amount of force.
4. Energize hydraulic power to the equipment.
5. Use the backup "CLAMP/UNCLAMP" manual control to open the backup doors. Note the hydraulic pressure on the backup pressure indicator. Indicated pressure with the door switch plunger fully extended must be below 1000 psi. Indicated pressure higher than 1000 psi may indicate a system failure. Contact a McCoy Global engineering department before proceeding.

⚠ CAUTION

INDICATED BACKUP PRESSURE WITH THE DOOR SWITCH PLUNGER FULLY EXTENDED SHOULD BE 1000 PSI

6. Check that the available test tubular is the same size as the installed jaws and dies. Place the test tubular in position approximately in the centre of the backup clamping zone. Closing the backup doors and extending the clamp cylinder without the use of a test tubular may result in equipment damage.

⚠ WARNING

CLOSING THE BACKUP DOORS AND EXTENDING THE CLAMP CYLINDER WITHOUT THE USE OF A TEST TUBULAR MAY RESULT IN EQUIPMENT DAMAGE.

7. Move the manual "CLAMP/UNCLAMP" control to "CLAMP" to slowly close the backup doors. Ensure the backup doors are completely closed and latched, and that all three jaws have engaged the tubular. Maintain hydraulic action by continuing to hold the control handle in the "CLAMP" position.
8. Use a rubber or wooden mallet to lightly tap the door switch, moving it in small increments toward the plate of the closed door until the backup switches to high pressure mode (displayed pressure equals equipment system pressure or 3000 psi, whichever is lower). Stop moving the door switch, release the "CLAMP/UNCLAMP" control handle, and tighten fasteners to secure the switch in place.

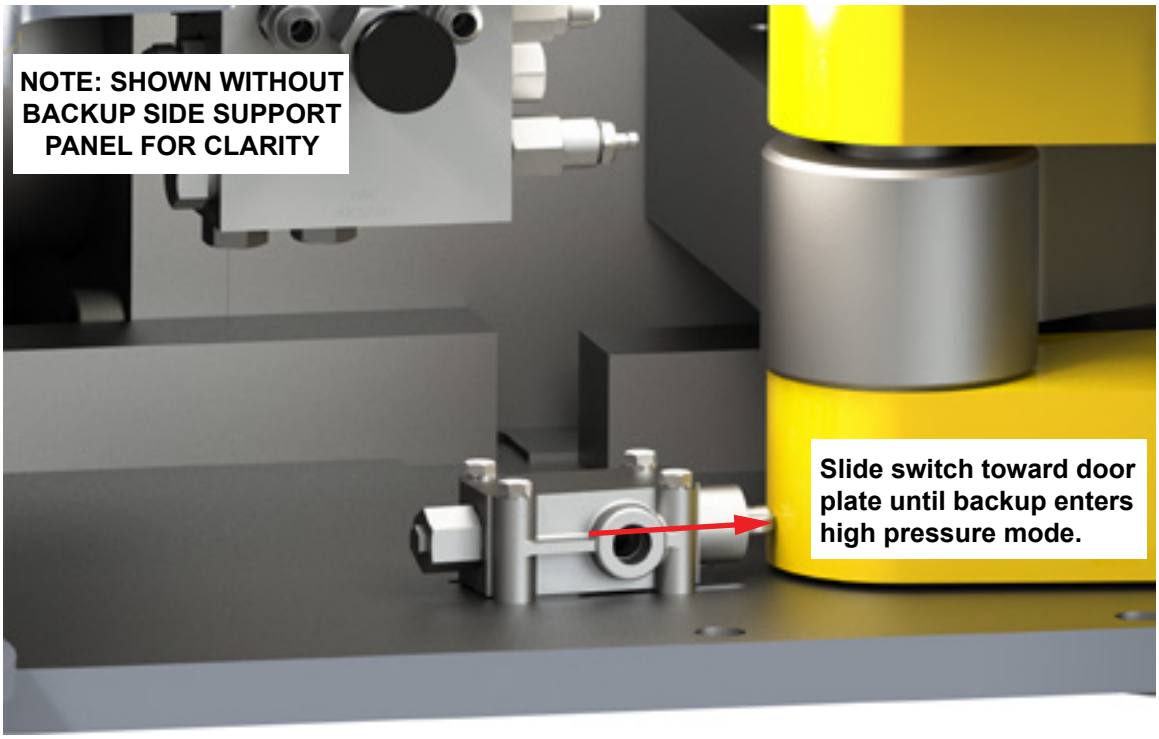


Illustration 5.6.6: Backup Door Switch Adjustment 02

5.7 RECOMMENDED PERIODIC INSPECTIONS

5.7.1 Reversing Pins

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

5.7.2 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 8: Torque/Turns Management).

5.7.3 Lifting and Load-Bearing Devices (including Spring Hanger)

Proper inspection and maintenance is essential to assure the integrity of load-bearing and lifting components. See subsection 3.1 for information on load-bearing and lifting component safety, including McCoy Global recommended inspection procedures and intervals.

5.8 ASSEMBLY PRACTICES

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. Please refer to the relevant exploded diagrams in Section 7 when assembling components in this power tong and backup.

⚠ WARNING

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

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

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

NOTICE

IMPORTANT ASSEMBLY INFORMATION

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

5.9 DAILY INSPECTION & MAINTENANCE CHECKLIST

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

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

⚠ WARNING

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

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

⚠ WARNING

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

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

4. ☐ Use a flashlight to perform a visual inspection of the gear train through 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.

5. ☐ Perform a visual inspection of the interior of the backup from the openings on the rear of the mounting frame - 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.

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

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

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

5.9 DAILY INSPECTION & MAINTENANCE CHECKLIST (CONTINUED):

9. ☐ Inspect tong for signs of premature wear, or moving parts that are rubbing (bare metal where there used to be paint is a good indication of wear).
10. ☐ Inspect 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 and backup - refer to Maintenance section of the technical manual
14. ☐ Ensure main supply and return connections to the tong are fully made up. Re-connect the remainder of the hydraulic lines, and, if applicable, the electrical line to the turns counter.

⚠ WARNING

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

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

15. ☐ Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.
16. ☐ Perform a visual inspection of pressurized hydraulic lines. Document and correct any hydraulic fluid leaks.
17. ☐ Perform a full functional test of the tong. Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.
18. ☐ Perform a visual inspection of the load cell. If using a tension load cell, replace any cracked, broken, or distorted components including links and chains.
19. ☐ If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.
20. ☐ Test door switch feature. Refer to door switch testing procedure in Section 4.3, "Pre-operational Checks".

⚠ DANGER

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

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

5.10 MONTHLY MAINTENANCE CHECKLIST

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

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

⚠ WARNING

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

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

⚠ WARNING

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

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

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

5. ☐ 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.

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

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

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

5.10 MONTHLY MAINTENANCE CHECKLIST (CONTINUED):

9. ☐ Inspect all paint - locations in which the paint has been damaged must be repaired prior to the tong being returned to service. Prepare areas to be painted to ensure they are free of grease, dirt, or solvent. Touch up using a solvent-based acrylic paint. Allow sufficient time for paint to dry before proceeding.
10. ☐ Inspect all external welds. Any weld that is cracked or separating must be repaired and repainted before returning the tong to service.
11. ☐ Perform a visual inspection of all lifting points - if visible damage is seen, including cracks, broken lugs, distorted metal, etc. replace damaged part(s) before placing tong in service. Also inspect all chains, master links, and turnbuckles - again, if any damage is noted replace the damaged part(s) before placing the tong in service. Refer to Section 3.1 of the technical manual for information on recommended testing and recertification.
12. ☐ Inspect all jaws and dies used since the last monthly inspection. Inspect jaw roller pins for signs of damage - replace pins if necessary. If damaged pins are welded in place, remove and quarantine the jaw until the weld is repaired. Ensure dies are secure in the jaw - replace worn dies if necessary. Ensure that the jaw rollers rotate freely.
13. ☐ Inspect backing pin(s). Replace cracked, broken, or bent pins.
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.
15. ☐ Extend all hydraulic cylinders, and inspect cylinder rods for signs of mechanical damage, flaking, or rust. McCoy recommends that damaged cylinders be replaced prior to storage.
16. ☐ 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.
17. ☐ Generously fill the gear train housing with grease. Perform a full lubrication per section 5.5 of this manual.
18. ☐ Ensure main supply and return connections to the tong are fully made up. Re-connect the remainder of the hydraulic lines, and, if applicable, the electrical line to the turns counter.

⚠ WARNING

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

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

19. ☐ Ensure that supply pressure is at or above the tool's specified operating pressure, and that the return pressure is less than 350 psi.
20. ☐ Perform a visual inspection of pressurized hydraulic lines. If any hydraulic fittings or hoses are leaking they must be repaired or replaced before proceeding.
21. ☐ Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, finishing with the opening of the rotary gear facing the gear train. De-energize the power unit, and perform another generous lubrication of the gear train, including the gear housing.
22. ☐ 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.
23. ☐ De-energize the power unit, and perform a third generous lubrication of the gear train, including the gear housing.
24. ☐ Rotate tong at low speed for 5 minutes while monitoring pressurized seals and hydraulic lines. If a seal, line, or fitting begins to leak while tong is rotating, it must be replaced before the equipment is returned to service.
25. ☐ Rotate tong at high speed for 5 minutes while monitoring temperature of top and bottom bearing caps. If the bearing caps are hot to the touch (higher than approximately 50°C) replace the applicable bearings. Note any unusual sounds (grinding, rubbing) may be indicative of damaged bearings (see section 7 for exploded views for all bearing locations). Monitor hydraulic inlet and outlet lines to ensure operating temperature of the hydraulic fluid does not exceed the specifications stated in Section 2.3.

5.10 MONTHLY MAINTENANCE CHECKLIST (CONTINUED):

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

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

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

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

30. ☐ Test door switch feature. Refer to door switch testing procedure in Section 4.3, “Pre-operational Checks”.

⚠ DANGER

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

31. ☐ McCoy 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.

5.11 TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING & SHIPPING

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

Store all o-rings, seals, packings, gaskets, etc. in strong moisture proof, airtight containers. Ensure that these items are not crushed, nicked, or otherwise damaged.

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

⚠ CAUTION

IN ORDER TO ENSURE SAFE SHIPMENT OF EQUIPMENT, SECURELY STRAP THE TONG TO THE FRAME.

NOTICE

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 4.L. IF FURTHER STORAGE IS REQUIRED, THE EQUIPMENT SHOULD THEN BE PUT THROUGH ANOTHER DE-COMMISSIONING PROCEDURE.

De-pressurization Procedure In Preparation For Storage:

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

⚠ WARNING

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

1. ☐ Perform an initial wash of the 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. ☐ 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.
3. ☐ 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.

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

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

5. ☐ Inspect backing pin(s). Replace cracked, broken, or bent pins.

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

7. ☐ 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, and allow sufficient time for paint to dry before proceeding.

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

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

10. ☐ Energize power unit.

11. ☐ 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.

12. ☐ 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.

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

14. ☐ 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.

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

16. ☐ If this procedure applies to a frame-mounted tool, the tong must be secured to the backup in order to remove the risk of sudden and catastrophic movement during transport. Install four supplied shipping legs (McCoy part number BUCST23024) between the tong and backup before transporting equipment. See section 3.1 for instructions for removing and installing shipping legs.

17. ☐ Depressurize the equipment in preparation for storage

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

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

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

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

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

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

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

21. ☐ McCoy 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.

⚠ CAUTION

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. 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, McCoy recommends storing your wrapped equipment in a secure, out-of-the-way location, using silica gel desiccant to reduce the humidity within the wrapping. As a guideline, use 125 g. of desiccant for each cubic meter of space, or 3.5 g. per cubic foot.

Calculation Of Required Desiccant:

1) Calculate the trapped air volume by measuring the outside dimensions of the tool to be stored, and treat that as the volume to be stored. For example, the overall external dimensions of this tool are 96.5” x 96.5” x 64.5”, which calculates to an approximate volume of 600640 in^3, or 348 ft^3 (9.854 m^3).

2) Multiply the calculated air volume, in cubic feet, by the recommended amount of desiccant (3.5 g) per cubic foot. Carrying forth the example used in the previous step, the required desiccant charge would be 3.5 g. x 348 ft^3, equaling 1218 g. Several manufacturers offer silica gel desiccant in packaged quantities of 125 grams per bag, so ten packages of desiccant distributed throughout the wrapped equipment would be required. Please keep in mind that this is a guideline only - more or less desiccant may be required in extreme environmental conditions.

For best corrosion resistance the equipment should be removed from storage and exercised on a regular basis, depending on the storage environment. McCoy 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.

5.12 TUBULAR CONNECTION EQUIPMENT RE-COMMISSIONING PROCEDURE

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

1. ☐ Remove all protective plastic wrapping. Exhausted desiccant packs within the wrapping may be disposed of with the regular garbage.
2. ☐ Wipe excess grease or heavy oil from exposed cylinder rods.
3. ☐ Perform a visual inspection of all lifting points - visibly damaged components (cracks, broken lugs, distorted metal, etc.)must be replaced or repaired before placing tong in service. Inspect all chains, master links, and turnbuckles. Damaged components must be replaced before placing the tong in service. If your company requires yearly certification of lifting equipment, ensure that the most recent test date falls within the past year. Perform recertification if necessary.
4. ☐ Remove four shipping legs from between the tong and backup (see section 3.1 for removal instructions). Store the shipping legs for future use.
5. ☐ Perform a liberal lubrication of the equipment - refer to section 4.E to determine lubrication requirements. Generously fill the gear train housing with grease through the opening in the rotary gear.
6. ☐ Connect the equipment to a hydraulic power unit. Ensure all lines are fully made up to prevent equipment damage from excessive back pressure. Do not neglect to connect the motor drain.

⚠ WARNING

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

7. ☐ Energize power unit.
8. ☐ Ensure that supply pressure is at or above the equipment'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. Leaking hydraulic fluid lines or fittings must be replaced before returning the equipment to service.
10. ☐ Perform a thorough inspection of all seals. Any seal that is leaking or "weeping" must be replaced before returning the equipment to service.
11. ☐ Rotate tong at low speed for 5 minutes while monitoring pressurized seals and hydraulic lines. If a seal, line, or fitting begins to leak while tong is rotating, it must be replaced before returning the equipment to service. Finish this step with the rotary gear opening facing the gear train. De-energize the power unit.
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 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. Perform a visual inspection and replace any cracked, broken, or distorted components including links and chains.
17. ☐ Inspect the load cell anchor pins. Replace the anchor pins if cracking or metal distortion is seen.
18. ☐ Re-energize power unit.

Continued on next page...

19. ☐ 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.

20. ☐ 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.

21. ☐ Test door switch feature. Refer to door switch testing procedure in Section 4.3, “Pre-operational Checks”.

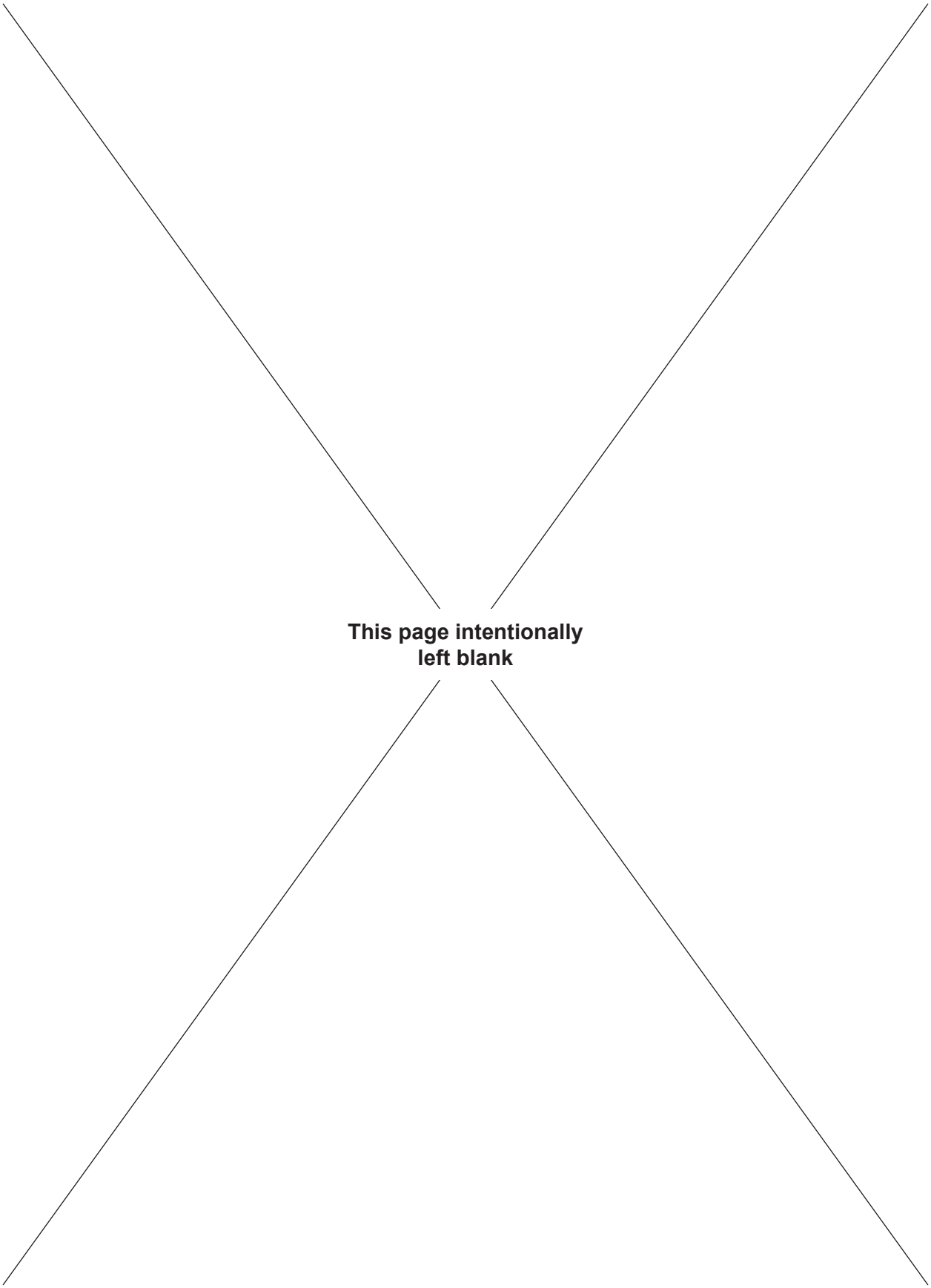
⚠ DANGER

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

22. ☐ While rotating the cage plate, ensure that the jaws properly cam. If the jaws do not cam properly, the brake bands require tightening. Incrementally adjust both the top and bottom brake bands EQUALLY until proper cam action is achieved.

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

SECTION 6: TROUBLESHOOTING



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

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

6.0 TONG WILL NOT DEVELOP SUFFICIENT TORQUE

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

NOTICE

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.

6.1 DOOR SWITCH DOES NOT OPERATE OR IS MALFUNCTIONING

	POSSIBLE PROBLEM	SOLUTION(S)
1	Door switch switch requires adjustment.	Adjust switch as per section 5.6.2
2	Door switch has failed	Test door switch for proper function and replace if necessary
3	Contamination in hydraulic lines	Ensure all flexible hydraulic lines to door switch are free-flowing
4	Pilot-to-open valve in door switch valve block is malfunctioning.	Remove each valve. Inspect seats and springs. Replace valve(s) if damage is seen on valve seats, or if spring appears to be damaged or broken.

6.2 TONG DOOR WILL NOT OPEN

	POSSIBLE PROBLEM	SOLUTION(S)
1	Tong is still clamped (under load)	Release tong jaws before opening tong door
2	No lubrication on latch claws or latch post	Lubricate latch claws and latch post using a high quality EP synthetic grease
3	Latch linkage is bent, broken, or missing	Inspect latch linkage. Replace damaged or missing components.
4	Hydraulic door cylinder is malfunctioning or has failed	Rebuild hydraulic cylinder(s) - disassemble, clean, and install new seal kit (see Section 7). Replace damaged components
		Install new hydraulic cylinder(s)

6.3 FAILURE OF JAWS TO GRIP PIPE

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

6.4 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 or rebuild hydraulic motor.
4	Bearings in gear train and rotary section are excessively worn	Overhaul tong. Contact McCoy for instructions.
5	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
6	By-pass valve not functioning	Check and repair

6.5 BACKUP WILL NOT ENGAGE PIPE, OR DOES NOT PROVIDE ADEQUATE GRIP

	POSSIBLE PROBLEM	SOLUTION(S)
1	Hydraulic clamp cylinder failure or malfunction	Rebuild hydraulic cylinder(s) - disassemble, clean, and install new seal kit. Replace all damaged components (see Pp. 7.46 - 7.47)
		Install new hydraulic cylinder(s)
2	Inadequate lubrication of clamping cylinder	Grease cylinder as per instructions in Section 5.5
3	Metal fragment has become lodged between clamping cylinder and a fixed piece of the backup (top plate, bottom plate, or slider plate).	Thoroughly inspect area around clamp cylinder and remove the metal fragment if it is accessible. **NOTE:** Removal of trapped metal fragments may require removal of the top plate of the backup. Following removal of the fragment inspect moving components to ensure the metal has not been gouged or chipped. Damaged components may require replacement to ensure smooth cylinder movement.

⚠ WARNING

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

	POSSIBLE PROBLEM	SOLUTION(S)
4	Incorrect size of die holders / jaws are being used	Double-check jaw size to ensure they are rated for the diameter of pipe or casing being run
5	Dies have become too dull to provide adequate grip	Replace dies
6	Incorrect dies are being used	Ensure dies loaded in the jaws are appropriate for the type of pipe or casing being run
7	Backup door is not closing properly	Ensure door weldments are not deformed, especially at the “locking” point.
		Ensure mechanisms attaching door weldments to clamp cylinder are intact.
		Backup door pivots or door/cylinder attachment pins require lubrication.
		Clamp cylinder is malfunctioning - see steps 1 & 2.

6.6 BACKUP DOOR WILL NOT OPEN

	POSSIBLE PROBLEM	SOLUTION(S)
1	Hydraulic clamp cylinder failure or malfunction	Rebuild hydraulic cylinder(s) - disassemble, clean, and install new seal kit. Replace all damaged components (see Pp. 7.46 - 7.47)
		Install new hydraulic cylinder(s)
2	Insufficient pressure to energize clamp cylinder	Inspect hydraulic circuit to backup clamp cylinder. Measure pressure at the cylinder if necessary. Troubleshoot hydraulic circuit if inadequate pressure is measured.
3	Door weldment is jammed by a metal fragment or other debris	Thoroughly inspect areas around door weldments and remove metal fragment if it is accessible. **NOTE**: Removal of trapped metal fragments may require removal of the top plate of the backup. Following removal of the fragment inspect the door weldments and fixed backup components to ensure the metal has not been gouged or chipped. Damaged components may require replacement to ensure smooth operation.
4	Door weldment(s) have become deformed at the “locking” point	Inspect door weldments, and replace if necessary.
5	Mechanisms attaching door weldments to clamp cylinder have failed.	Inspect door weldment connection points to ensure the mechanisms have not become deformed, or have broken. Replace if required.
6	Backup door pin has broken	Replace backup door pin
7	Backup is still under load (still clamped to tubing)	Release backup jaws

6.7 GENERAL COMMENTS

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

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

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

SECTION 7: PARTS & ASSEMBLIES

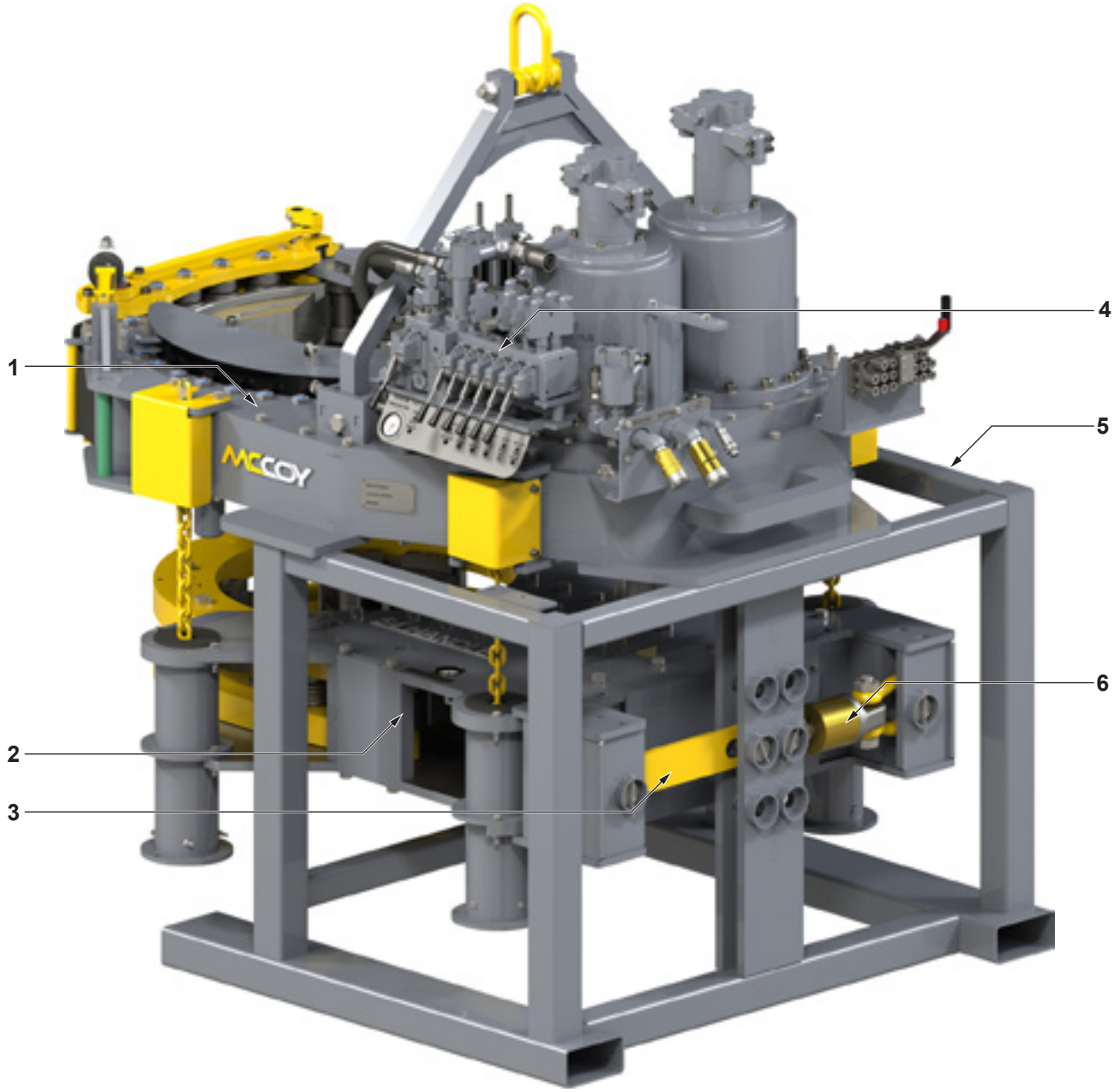

Illustration 7.1: General Assembly, 80-220-150-23T-111-7S-00

Item	Type	Description	Qty	Part Number
1	Assembly	22 in 150,000 lb-ft hydraulic power tong	1	CLE22000XHT-14
2	Assembly	23 in 150,000 lb-ft LOCKJAW™ backup	1	BUCST23000
3	Part	Breakout bar	1	BUCST15009
4	Assembly	Valve package	1	VP22000-1120-632
5	Assembly	22” x 23” mounting kit assembly	1	MKBUCST23000
6	Assembly	150,000 lbs-ft tension load cell-style torque measurement assembly	1	SM150-54-T

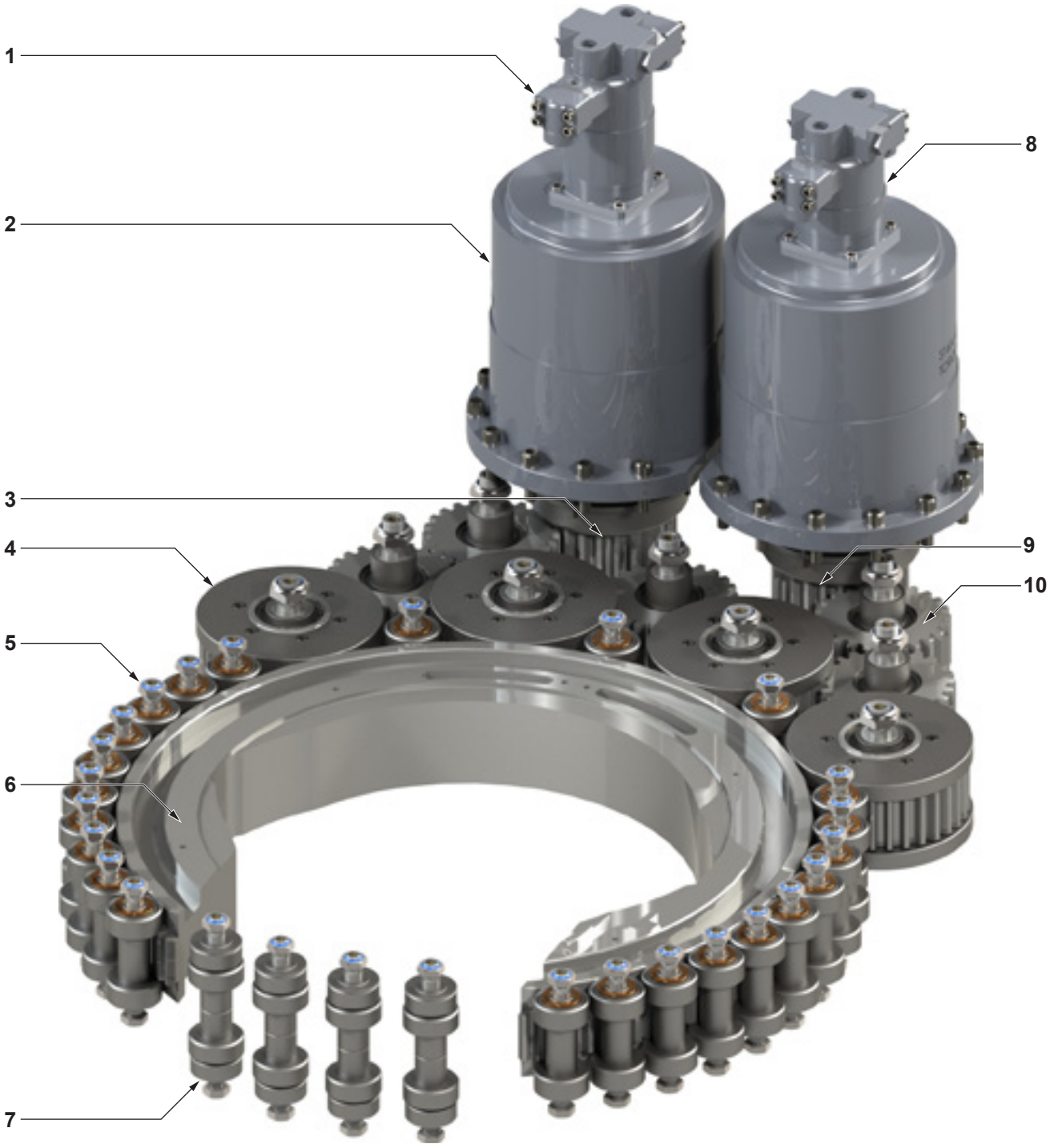

Illustration 7.2: CLE22000XHT-14 Gear Train ISO View

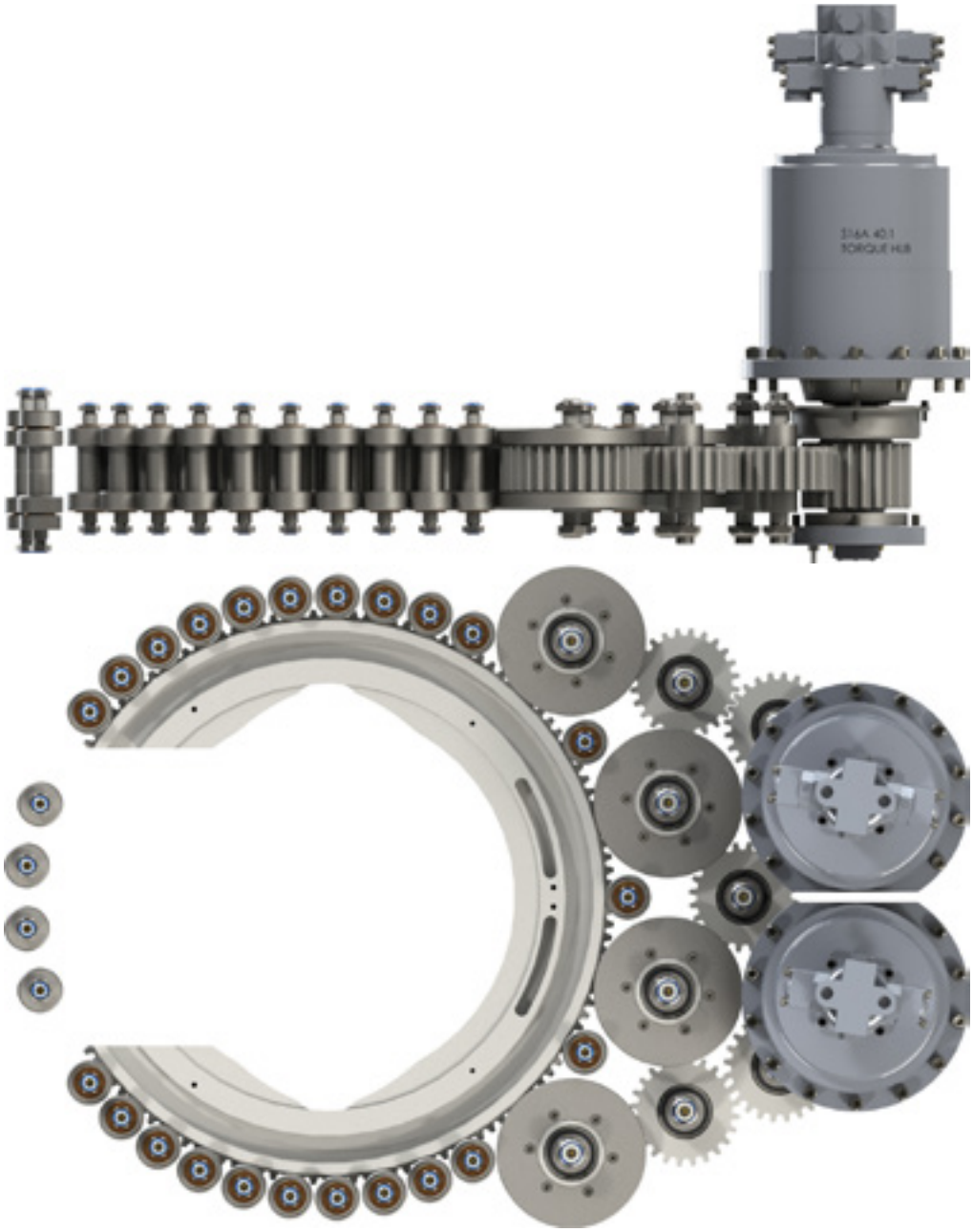

Illustration 7.3: CLE22000XHT-14 Gear Train Top & Side View

Item	Type	Description	Qty	Part Number
1	Part	Hydraulic motor, two speed, 24 in³	1	20099-01
2	Part	Torque hub	2	22215A
3	Assembly	Drive gear assembly (Pg. 7.24)	1	22208
4	Assembly	Idler assembly (Pp. 7.18 - 7.19)	4	22203
5	Assembly	Support roller assembly (Pp. 7.14 - 7.15)	23	
6	Part	Ring gear	1	22209
7	Assembly	Door-mounted support roller assembly (Pp. 7.16 - 7.17)	4	
8	Part	Hydraulic motor, two speed, 9 in³	1	20099-02
9	Assembly	Drive gear assembly (Pg. 7.25)	1	22208E
10	Assembly	Mid-idler assembly (Pp. 7.20 - 7.21)	5	22204

Please refer to the following instructions when installing the proprietary sealed roller bearing, part number 1905, in an idler assembly. This full-compliment roller design offers greater load ratings than commercially available sealed ball bearings. The ported inner race allows the bearing to be re-lubricated without disassembly while the integral elastomeric seals allow grease to be be displaced without allowing migration of contaminants into the bearing.

The corrosion-resistant elastomeric seals are suitable for use in environments that are incompatible with traditional aluminum bearing shrouds. The unique geometric design allows rollers to absorb thrust loads to maximize component life.

Nominal I.D.	4.3307 in (110 mm)
Nominal O.D.	2.3622 in (60 mm)
Nominal Ht	1.4375 in (36.5 mm)
static rating	37540 lbs (17064 kg)
dynamic rating	29230 lbs (13286 kg) *

* 1 mm cycles, 33-⅓ RPM f/500 hours

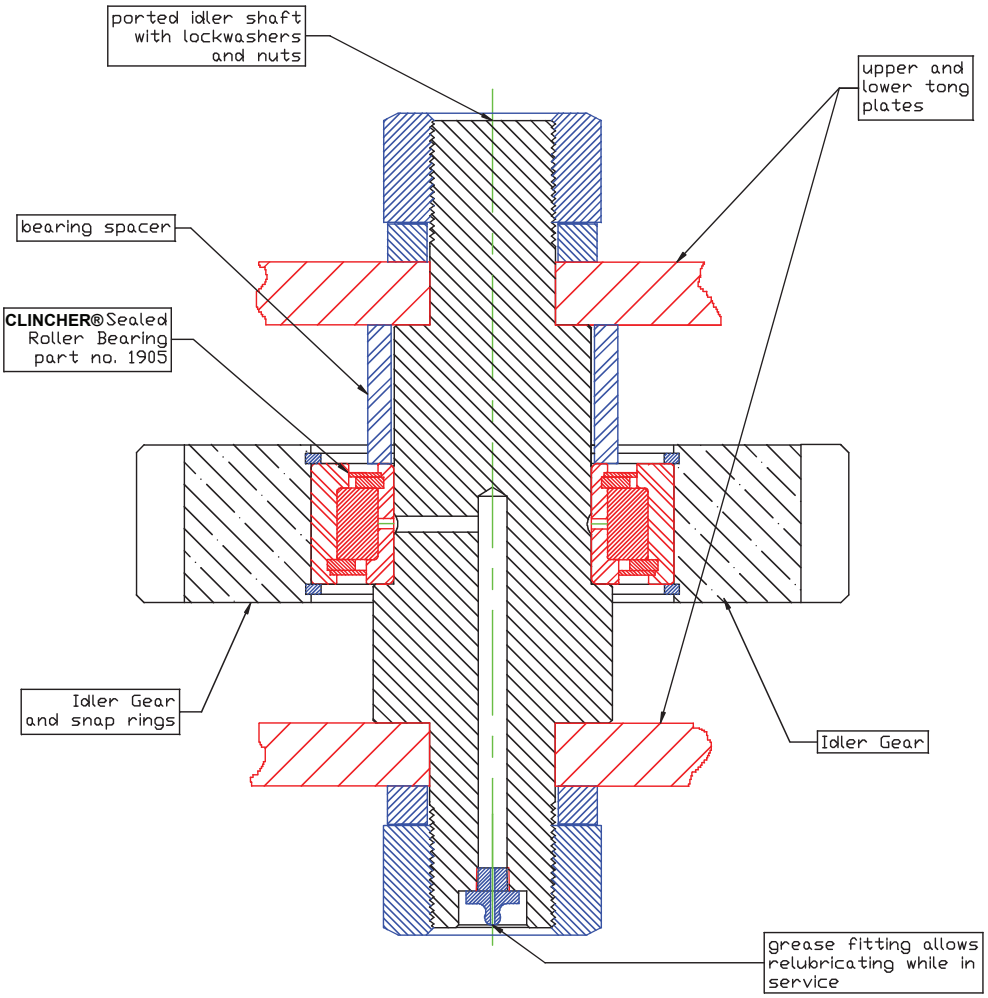

Illustration 7.4: 1905 Bearing - Section View of Typical Application

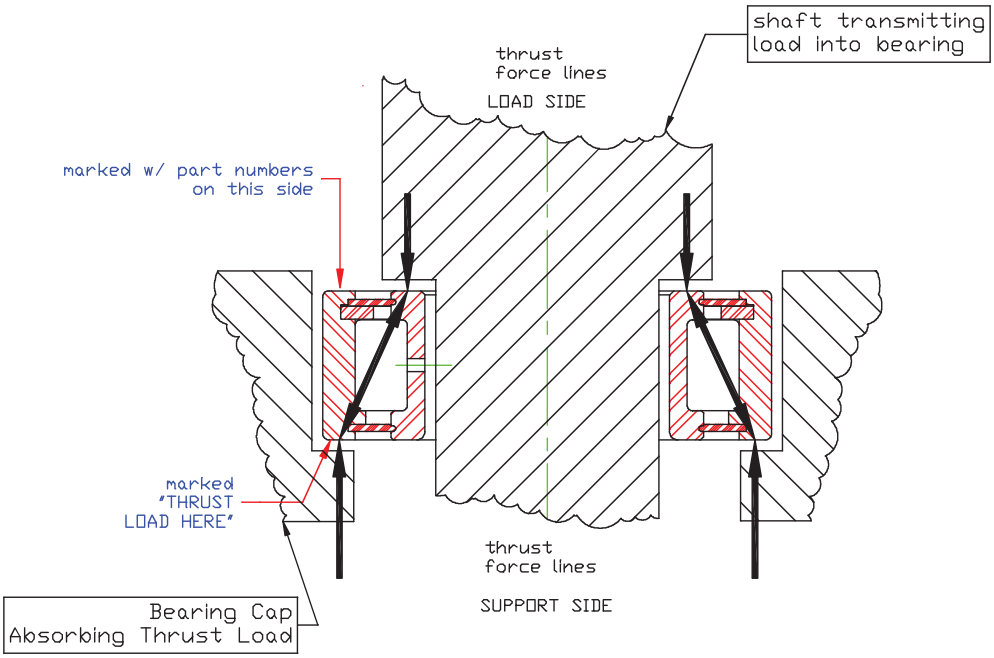

Illustration 7.5: 1905 Bearing - Bottom Bearing Cap Application

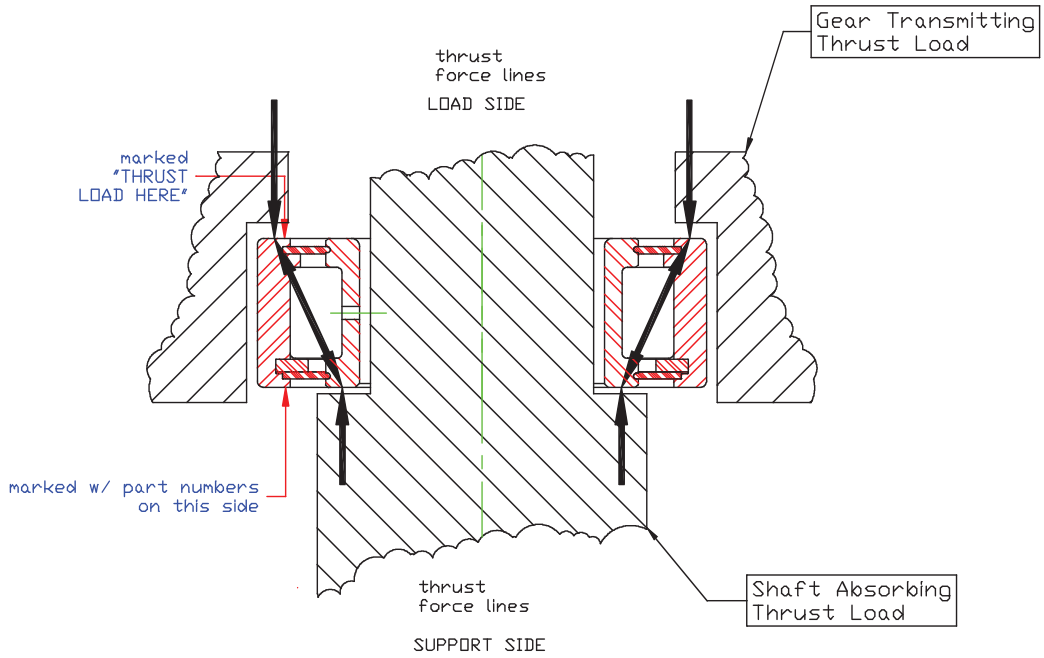

Illustration 7.6: 1905 Bearing - Gear Support Application

SEE B.O.M. PP. 7.17 - 7.18

NOTES: ALL BOLTS ARE ASSUMED LUBRICATED
UNLESS OTHERWISE SPECIFIED.

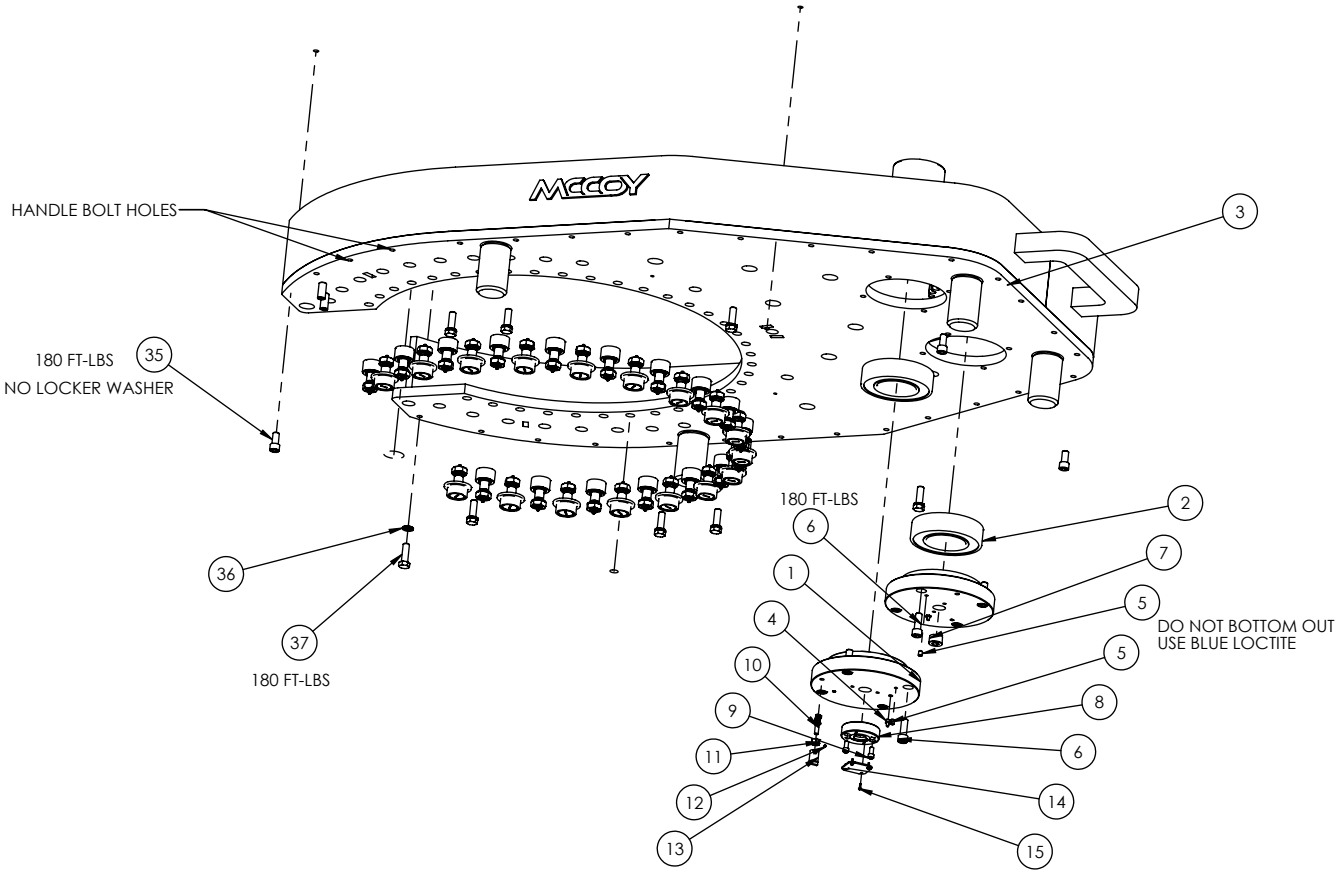

Illustration 7.7: CLE22000XHT-14 External Tong Assembly 01

NOTES:
1. PACK GEAR ASSEMLBY WITH GREASE.
2. ALL BOLTS ARE ASSUMED LUBRICATED UNLESS OTHERWISE SPECIFIED.

SEE B.O.M. PP. 7.17 - 7.18

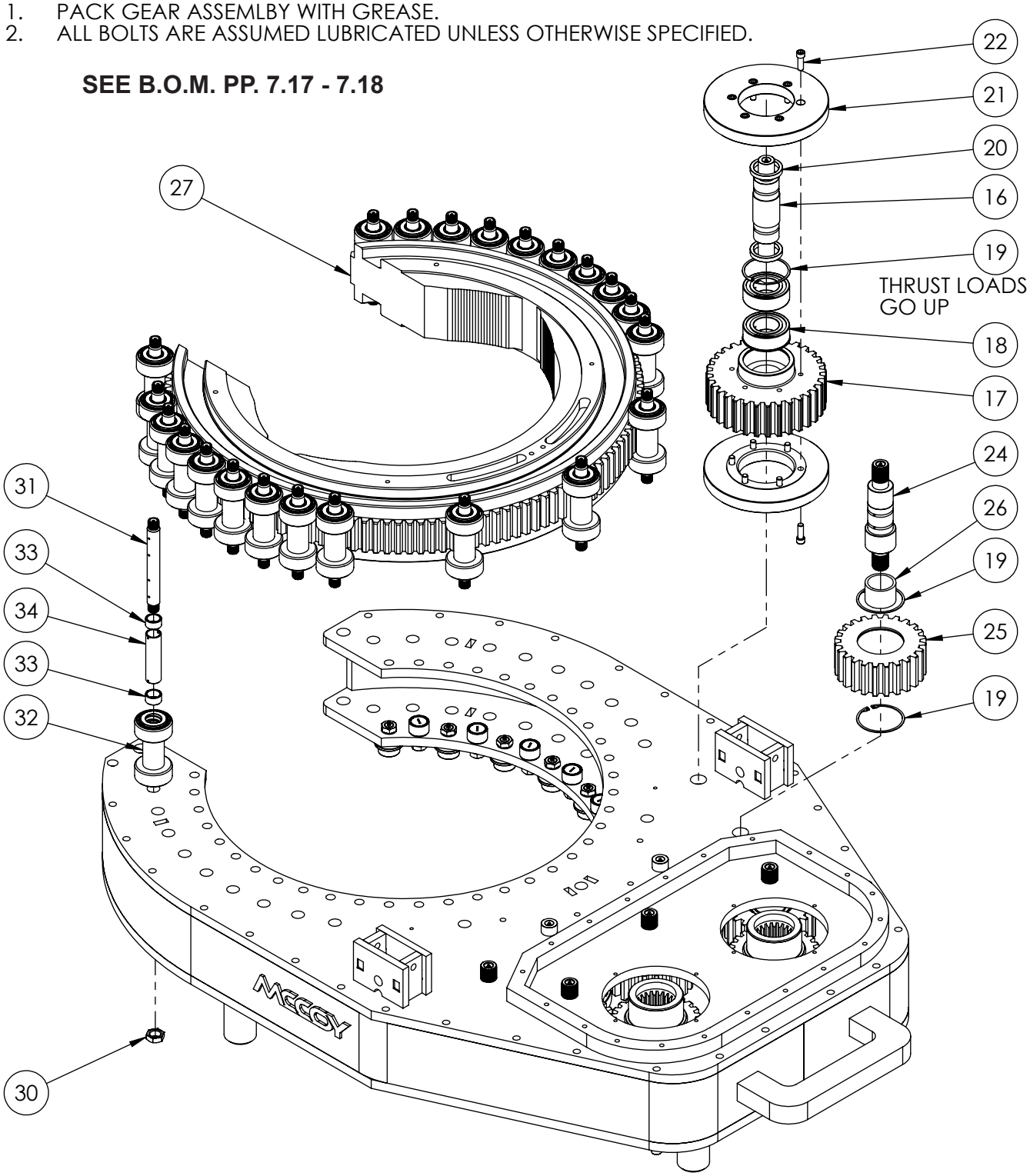

Illustration 7.8: CLE22000XHT-14 External Tong Assembly 02

SEE B.O.M. PP. 7.17 - 7.18

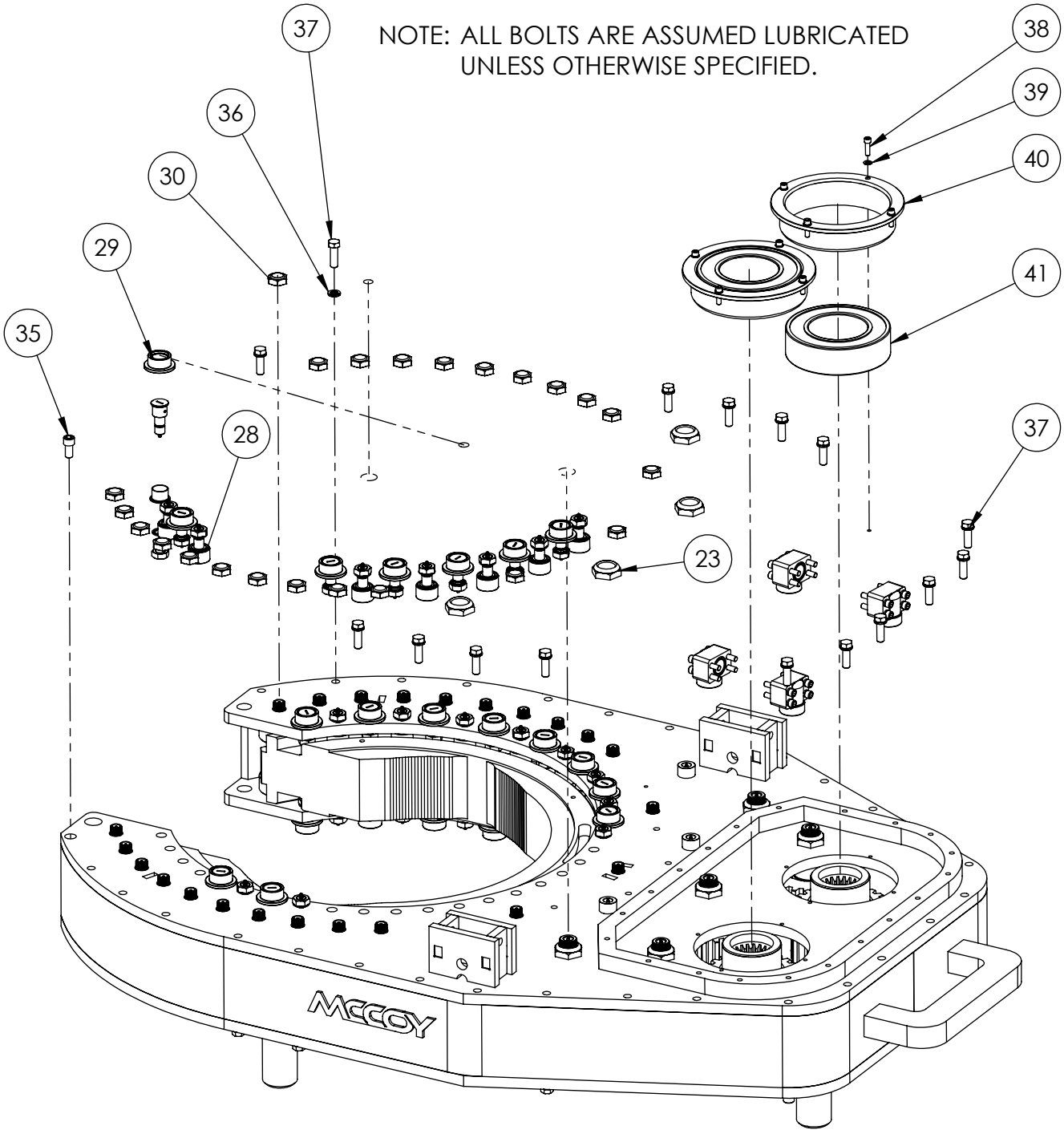

Illustration 7.9: CLE22000XHT-14 External Tong Assembly 03

NOTE: ALL BOLTS ARE ASSUMED LUBRICATED UNLESS OTHERWISE SPECIFIED.

SEE B.O.M. PP. 7.17 - 7.18

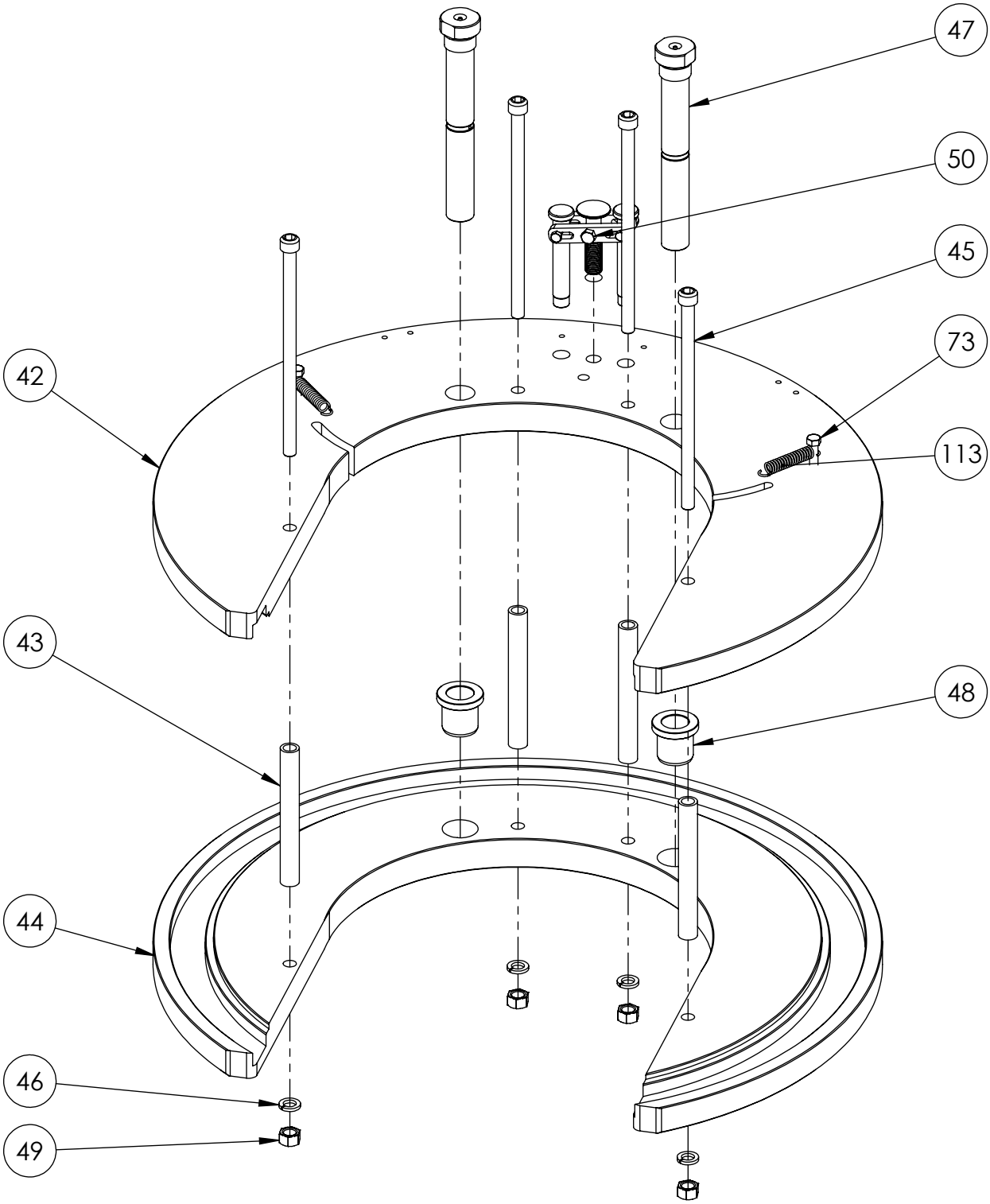

Illustration 7.10: CLE22000XHT-14 External Tong Assembly 04

SEE B.O.M. PP. 7.17 - 7.18

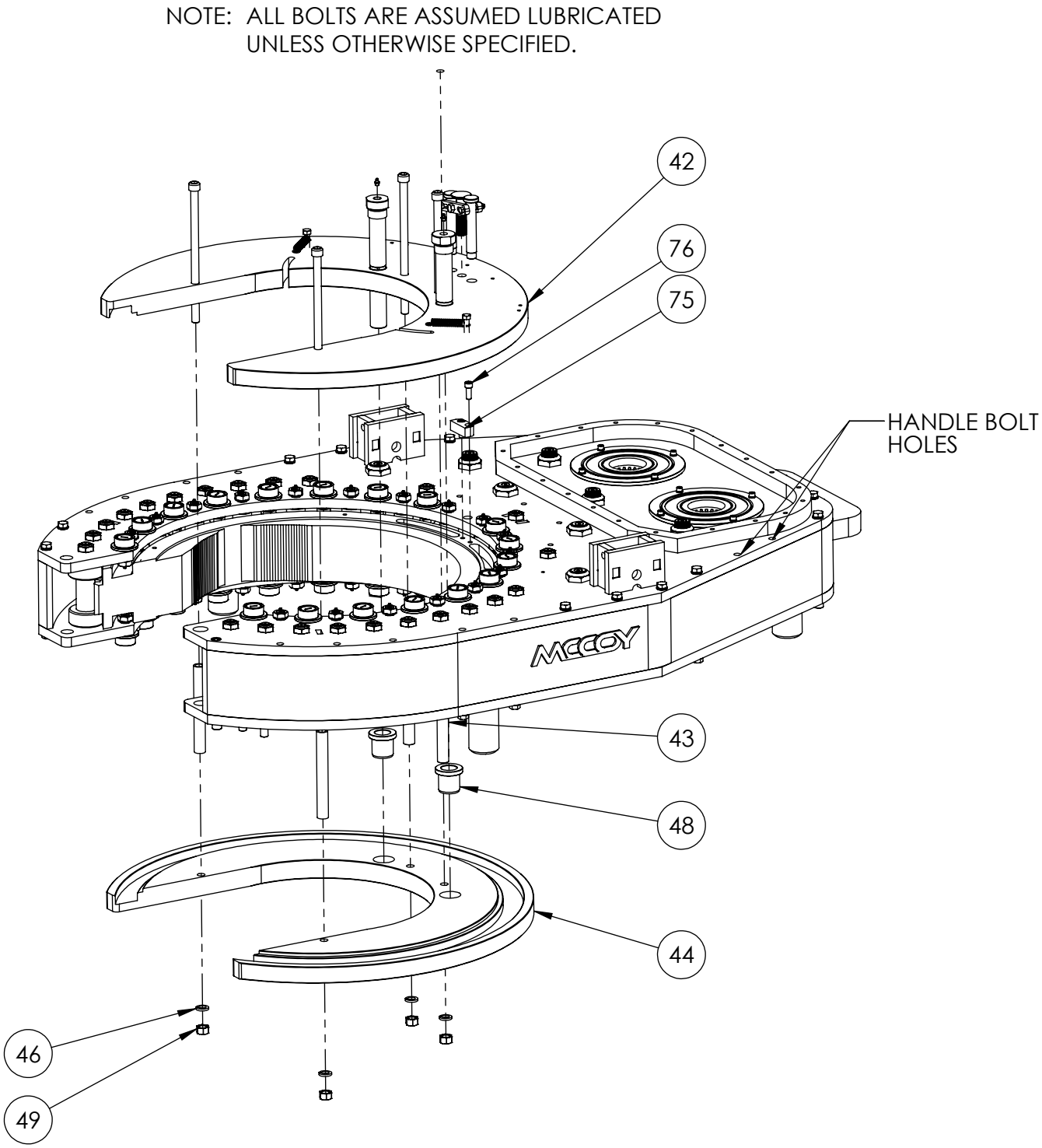

Illustration 7.11: CLE22000XHT-14 External Tong Assembly 05

SEE B.O.M. PP. 7.17 - 7.18

NOTES:

1. ALL BOLTS ARE ASSUMED LUBRICATED UNLESS OTHERWISE SPECIFIED.
2. MOTOR POSITION "B" TO FRONT.

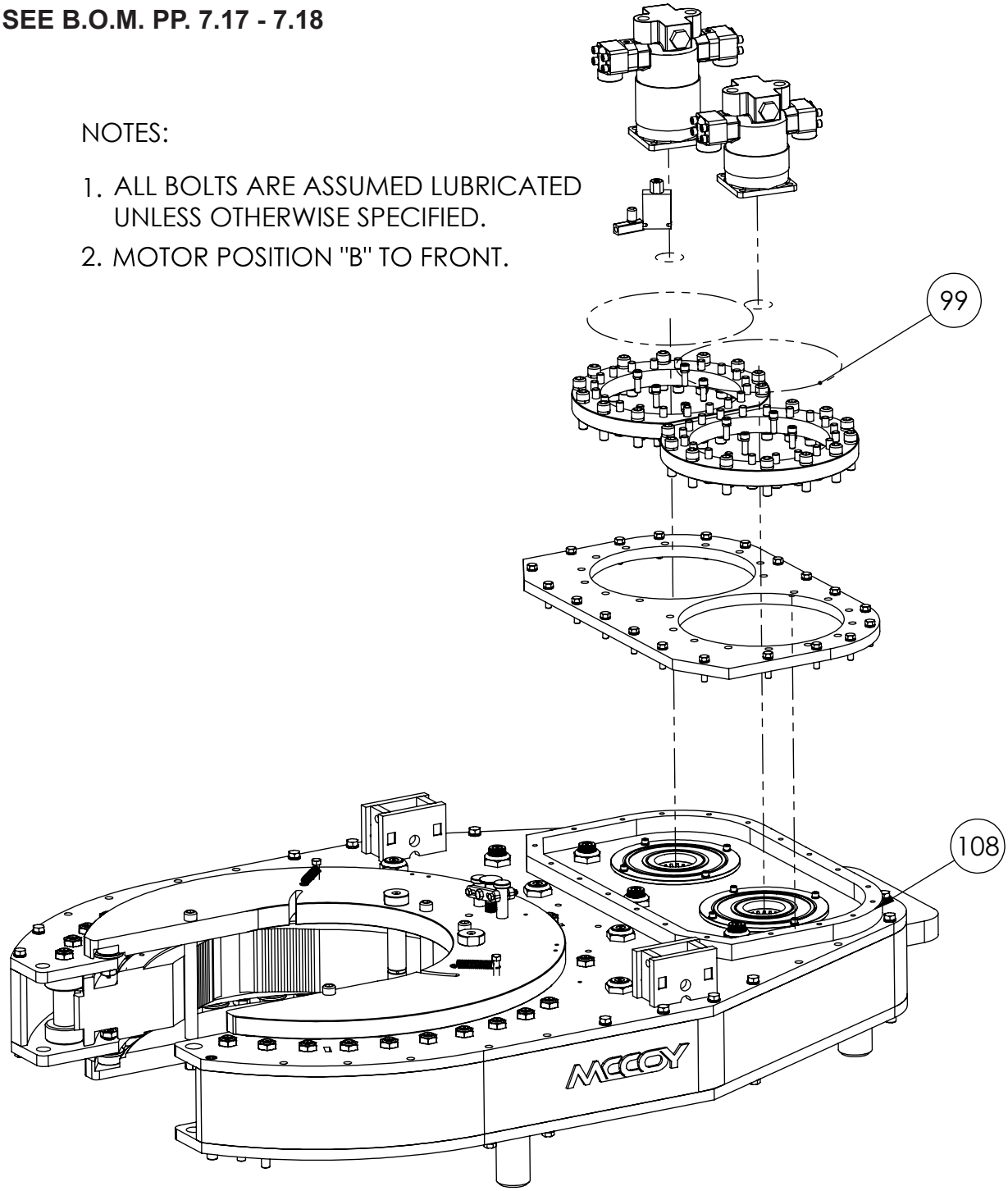

Illustration 7.12: CLE22000XHT-14 External Tong Assembly 06

SEE B.O.M. PP. 7.17 - 7.18

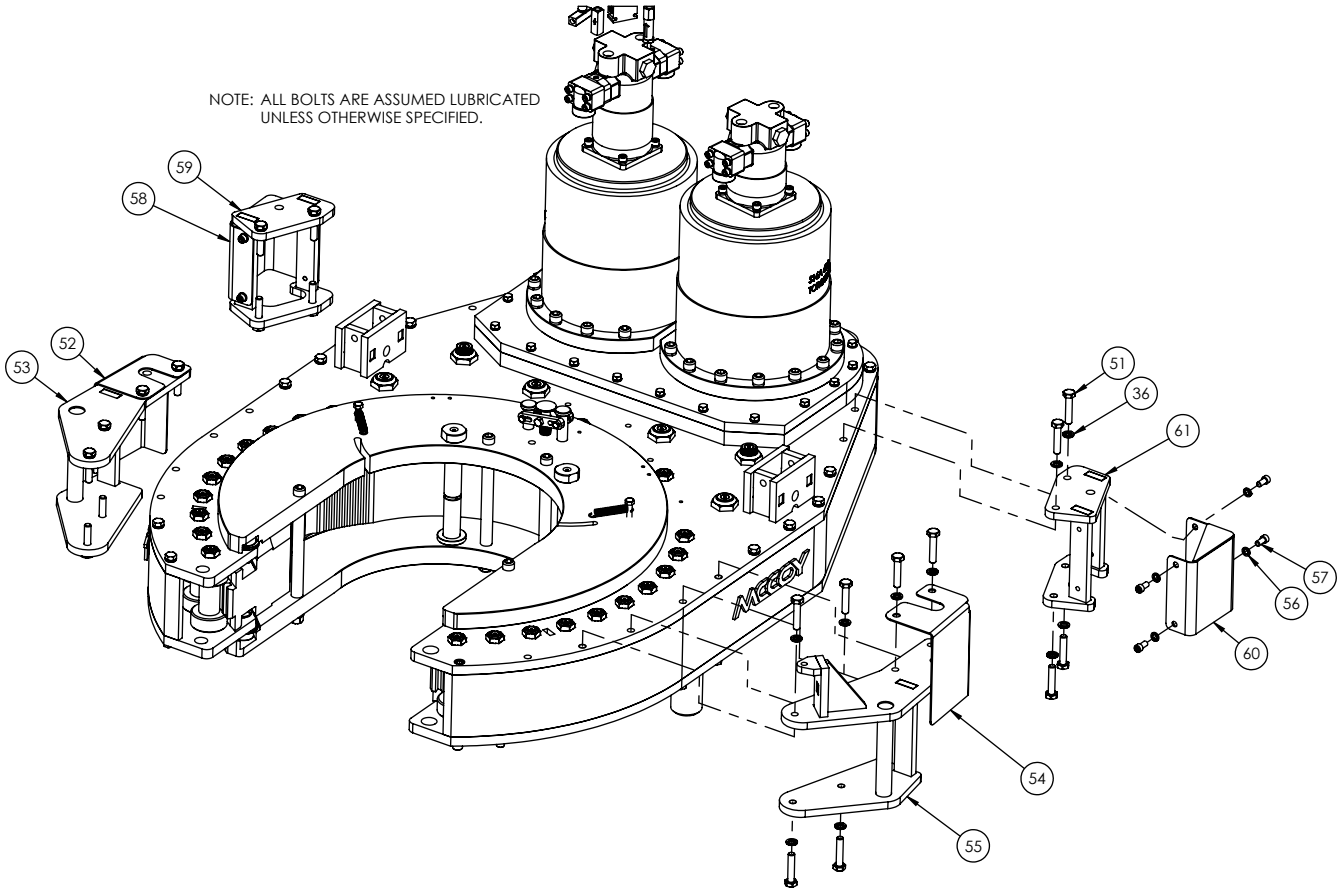

Illustration 7.13: CLE22000XHT-14 External Tong Assembly 07

SEE B.O.M. PP. 7.17 - 7.18

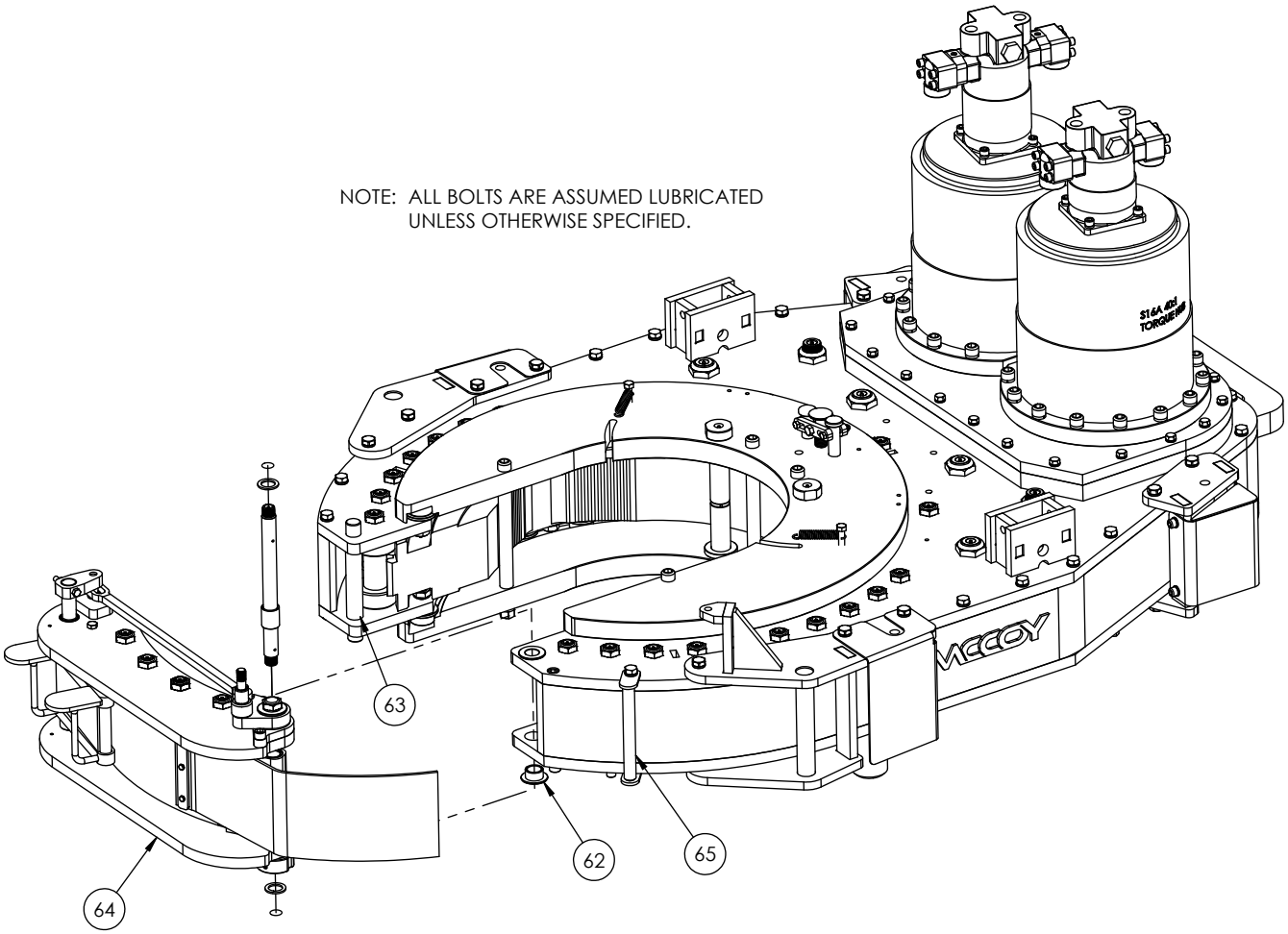

Illustration 7.14: CLE22000XHT-14 External Tong Assembly 08

SEE B.O.M. PP. 7.17 - 7.18

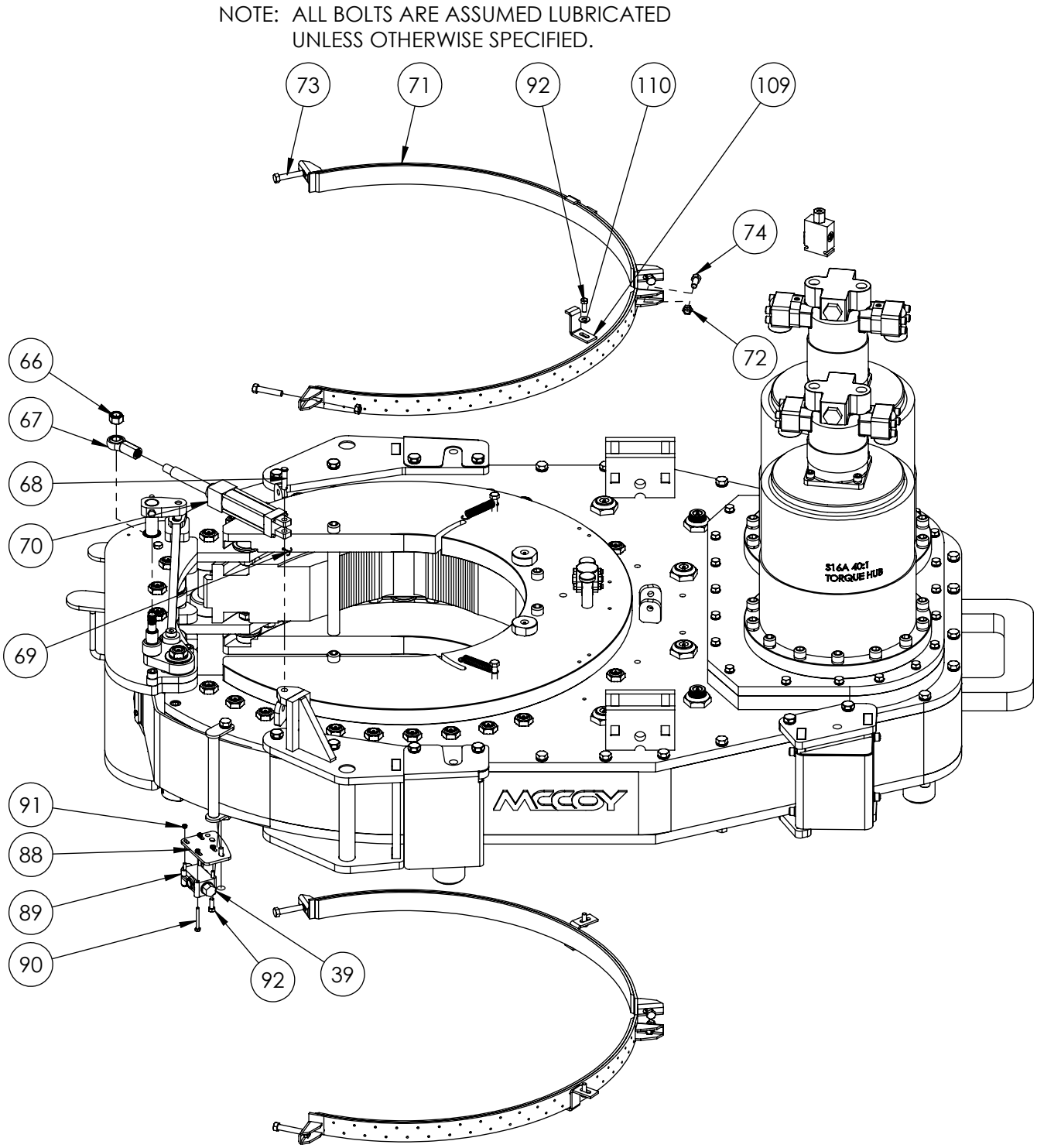

Illustration 7.15: CLE22000XHT-14 External Tong Assembly 09

SEE B.O.M. PP. 7.17 - 7.18

NOTE: ALL BOLTS ARE ASSUMED LUBRICATED UNLESS OTHERWISE SPECIFIED.

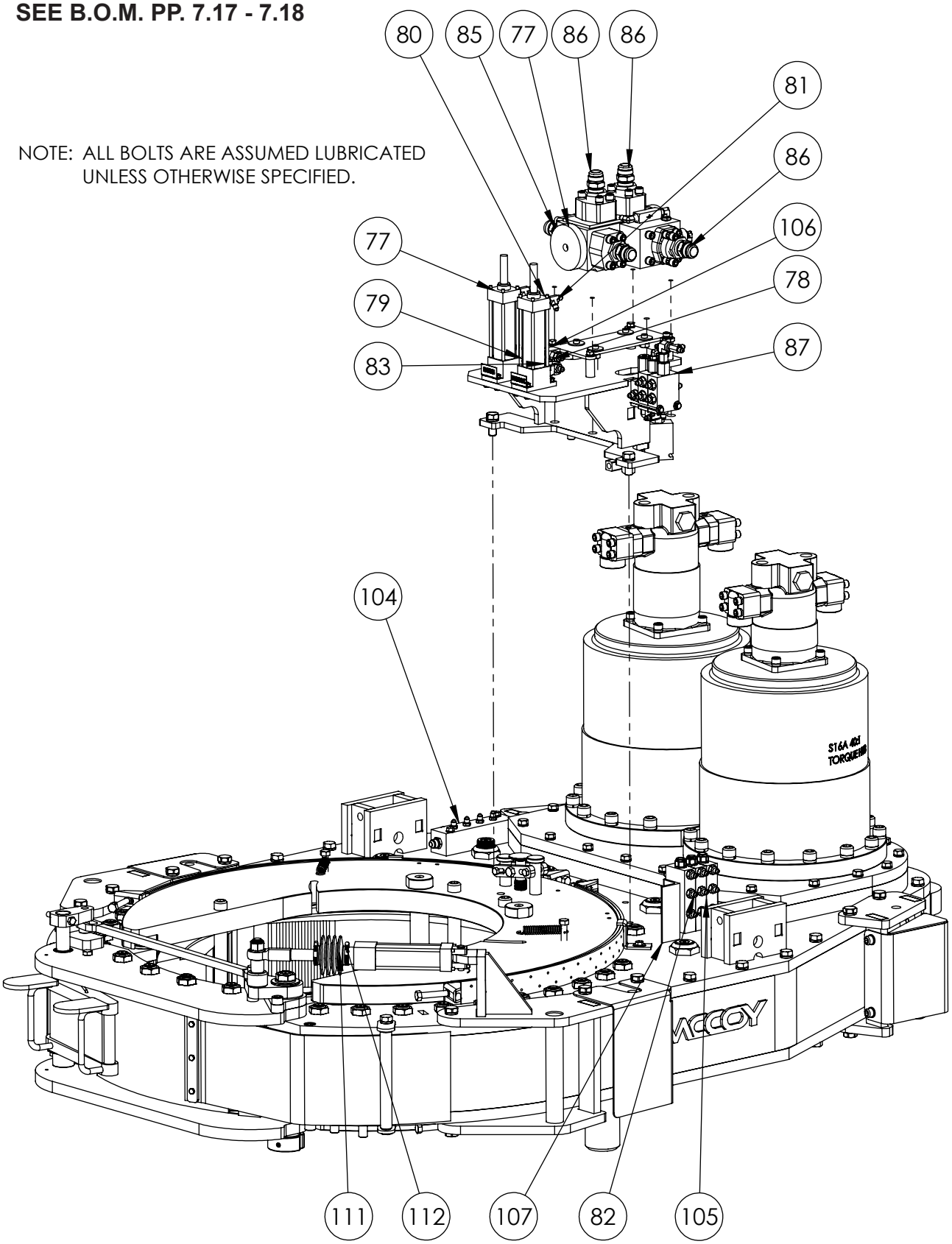

Illustration 7.16: CLE22000XHT-14 External Tong Assembly 10

SEE B.O.M. PP. 7.17 - 7.18

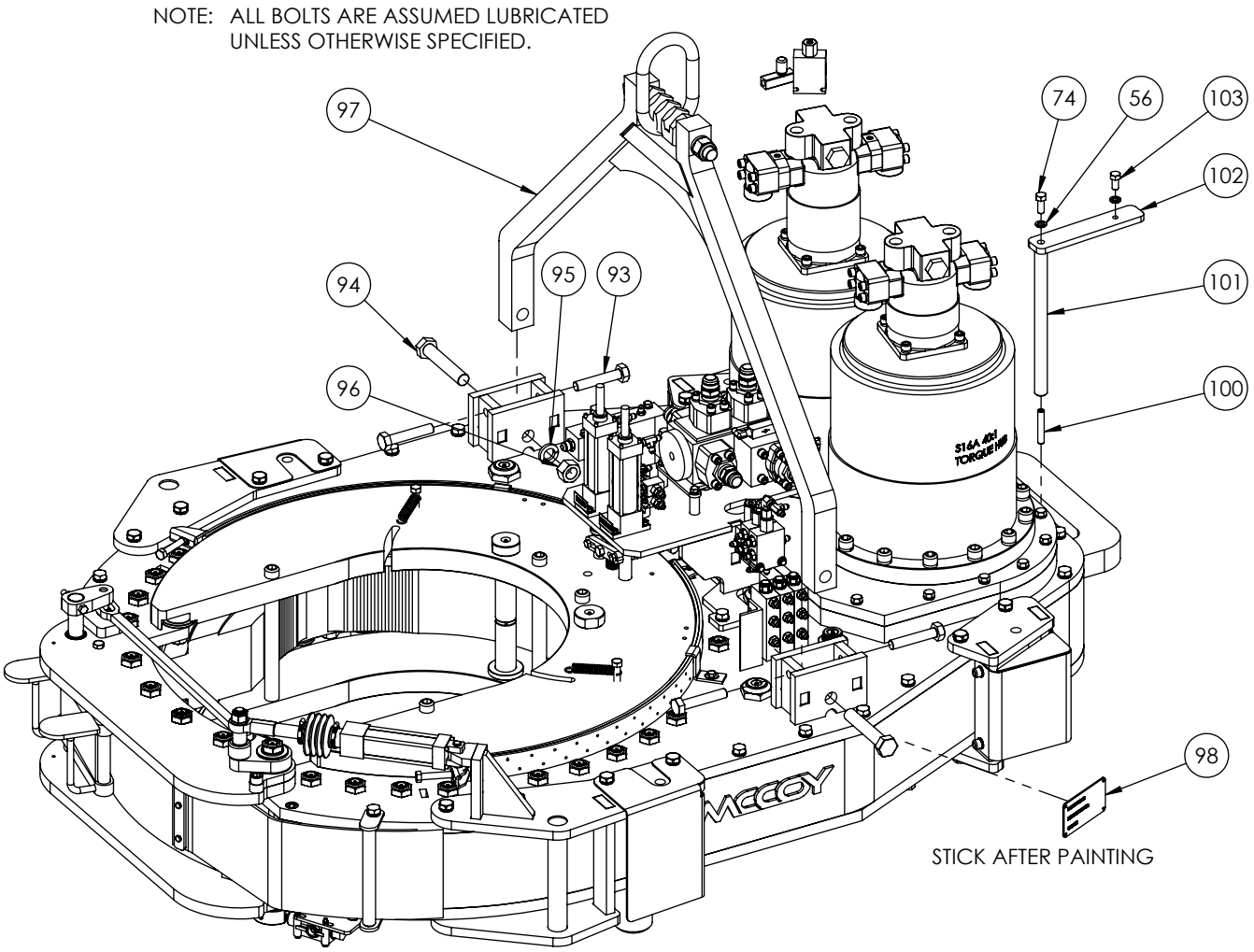

Illustration 7.17: CLE22000XHT-14 External Tong Assembly 11

BILL OF MATERIALS - TONG, EXTERNAL ASSEMBLY							
Item	Description	Qty	Part Number	Item	Description	Qty	Part Number
1	Bearing cap	2	22210	46	¾" lock washer	4	1171
2	Drive gear bearing	2	1993	47	Jaw pivot bolt	2	22223
3	Drive gear	2	22207	48	Jaw spacer	2	22024-01
4	⅛" NPT grease fitting	68	1001	49	¾" UNC hex nut	4	1176-A
5	⅜" UNC x ½" set screw	4	1029	50	Reversing pin assembly	1	22255
6	⅝" UNC x 1-¾" hex bolt	8	1154	51	⅝" UNC x 3" socket head cap screw	20	204
7	1" MNPT plug	1	1611	52	Guard plate	1	22265CL
8	Encoder mounting plate	1	51075	53	Handle weldment	1	22265L
9	⅜" UNC x ¾" socket head cap screw	2	1040-A	54	Guard plate	1	22265CR
10	Encoder coupling	1	51031	55	Handle weldment	1	22265R
11	½" UNC hex nut	1	1101	56	½" lock washer	10	1103
12	#10-32 x ¼" set screw	1	1034	57	½" UNC x 1" socket head cap screw	8	246
13	Encoder coupling	1	55144-03	58	Cover weldment	1	22264CL
14	Cover plate	1	40034	59	Spring mount weldment	1	22264L
15	#6-32 x ⅜" machine screw	4	1276-B	60	Chain cover weldment	1	22264CR
16	Idler shaft	4	82038	61	Spring mount weldment	1	22264R
17	Idler gear	4	22202	62	Door bushing	2	26680-S7
18	Bearing (see info Pp 7.6 - 7.7)	18	1905	63	Door jam	1	22615
19	Snap ring	18	1926	64	Tong door assembly	1	22258-02
20	Idler spacer	8	82063	65	Retainer weldment	1	22152
21	Idler gear	8	22206	66	¾" UNC nylock nut	1	1167
22	½" UNC x 1-½" socket head cap screw	48	1106-A	67	Ball-joint rod end	1	2044-03
23	1-½" UNF hex nylock jam nut	18	1273	68	Clevis pin	1	10041
24	Outboard idler shaft	5	73078	69	Cotter pin	1	1252B
25	Idler gear	5	22205	70	Door cylinder	1	2043
26	Outboard idler spacer	5	73088	71	Lined brake band weldment	4	26005
27	Ring gear	1	22209	72	½" UNC nylock nut	8	1087
28	Cam follower assembly	34	SSCF1875-01	73	½" UNC x 2-½" hex bolt	6	1113
29	Cam follower assembly	34	SSCFF2000-01	74	½" UNC x 1-¼" hex bolt	5	1111
30	1" UNF nylock nut	46	1213	75	Cage plate stop	1	26067
31	Dumbbell roller shaft	23	22022-A	76	½" UNC x 1-¼" socket head cap screw	2	1106
32	Dumbbell roller assembly	23	55191-02	77	Reversing cylinder assembly	1	22233-01
33	Dumbbell roller spacer	46	55192	78	¼" MJIC x ⅜" MNPT 90° fitting	1	1574
34	Roller spacer	23	73071	79	⅜" MNPT x ¼" FNPT 90° fitting	1	5504-6-4
35	⅝" UNC x 1-¼" hex bolt	4	256	80	⅜" MNPT x ¼" FNPT reducer bushing	2	1486
36	⅝" lock washer	46	1151	81	¼" MNPT x ¼" MJIC x ¼" MJIC run tee	2	4-4-4 RTX
37	⅝" UNC x 2" hex bolt	26	1160	82	⅜" MORB x ¼" MJIC fitting	24	4-6F5OX-S
38	⅜" UNC x 1-¼" socket head cap screw	8	1042	83	⅜" MORING x ¼" MJIC fitting 90° fitting	2	4-6C5OX-S
39	⅜" lock washer	10	1027	84	⅜" MORB x ¼" FJIC swivel fitting	1	6402-O-6-4
40	Bearing cap	2	22235	85	1-¼" x 1" reducer bushing	6	1499
41	Bearing	2	1994	86	1" MNPT x 1" MJIC straight fitting	6	1469
42	Top cage plate	1	22219	87	Directional valve assembly	1	CRSS22078
43	Cage plate spacer	4	22647	88	Sensor mount plate	1	76128-S2
44	Bottom cage plate	1	22220	89	Directional control valve	1	SLV1000-01
45	¾" UNC x 14" socket head cap screw	4	1253-14	90	¼" UNC x 2-¼" hex bolt	4	110

BILL OF MATERIALS - TONG, EXTERNAL ASSEMBLY (CONTINUED):							
Item	Description	Qty	Part Number	Item	Description	Qty	Part Number
91	¼" UNC nylock nut	4	212	104	Drain manifold assembly	1	CRSS22069
92	⅜" UNC x 1" hex bolt	6	1047	105	Detent valve assembly (each includes):	3	1003071
93	¾" UNC x 4" hex bolt	4	73125		Manifold block	1	1003069
94	1" UNC x 5-½" hex bolt	2	73127		Detent valve	1	1003070
95	1" lock washer	2	1218	106	Shuttle valve	1	LSV1-6T-N
96	1" UNC hex nut	2	1210	107	Check valve mount	1	1003135
97	Bail assembly	1	26728	108	Tong body weldment	1	1000600
98	Specification tag	1	CE-SPEC-TAG	109	Brake band clip	4	1003597
99	Motor housing assembly	1	22216B	110	⅜" flat washer	4	1025
100	½" UNC x 3" socket head set screw	1	55151-S4	111	Rod boot	1	14018
101	Gauge mount	1	45067-S4	112	Rod boot clamp	2	14018-S1
102	Gauge mount plate	1	55151-S1	113	Extension spring	2	71017
103	½" UNC x 1" hex bolt	1	1110	114	1-¼" CD 61 x 1" FNPT fitting	4	10060

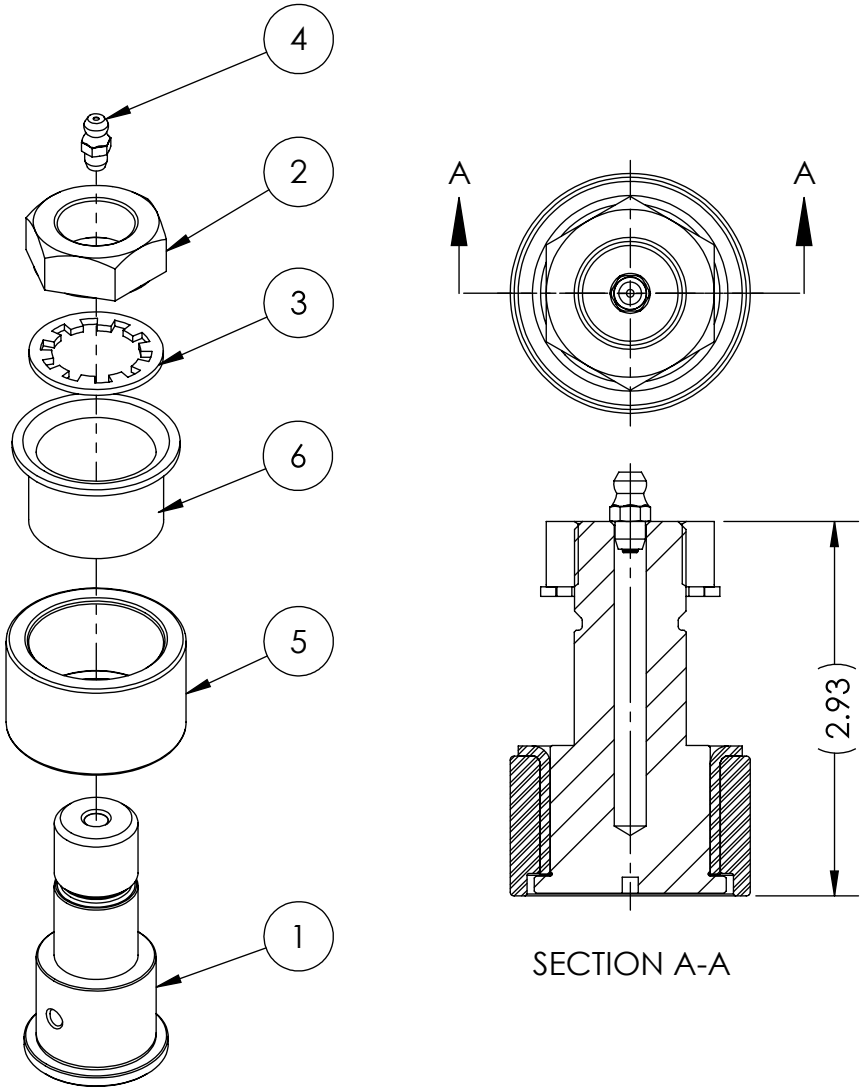

Illustration 7.18: SSCF1875 Cam Follower Assembly

Item	Type	Description	Qty	Part Number
1	Part	Cam follower stud	1	73008-02
2	Part	⅞" UNF hex jam nut	1	1178
3	Part	Internal lock washer	1	1000868
4	Part	¼" straight thread grease fitting	1	1257
5	Part	Cam follower race	1	73007
6	Part	Flanged bushing	1	73009

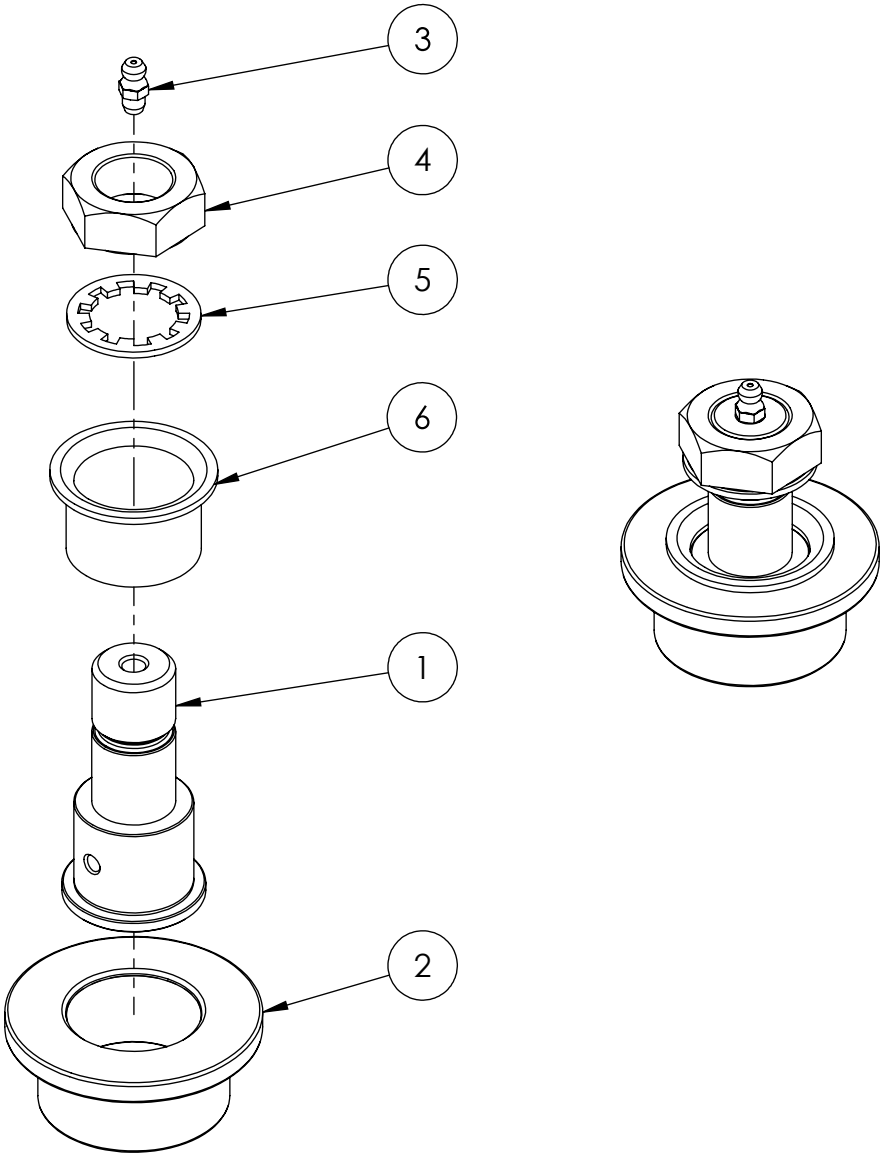

Illustration 7.19: SSCFF2000 Cam Follower Assembly

Item	Type	Description	Qty	Part Number
1	Part	Cam follower stud	1	73008-02
2	Part	Cam follower race	1	SSCFF2001
3	Part	¼" straight thread grease fitting	1	1257
4	Part	⅞" UNF hex jam nut	1	1178
5	Part	⅞" internal lock washer	1	1000868
6	Part	Flanged bushing	1	73009

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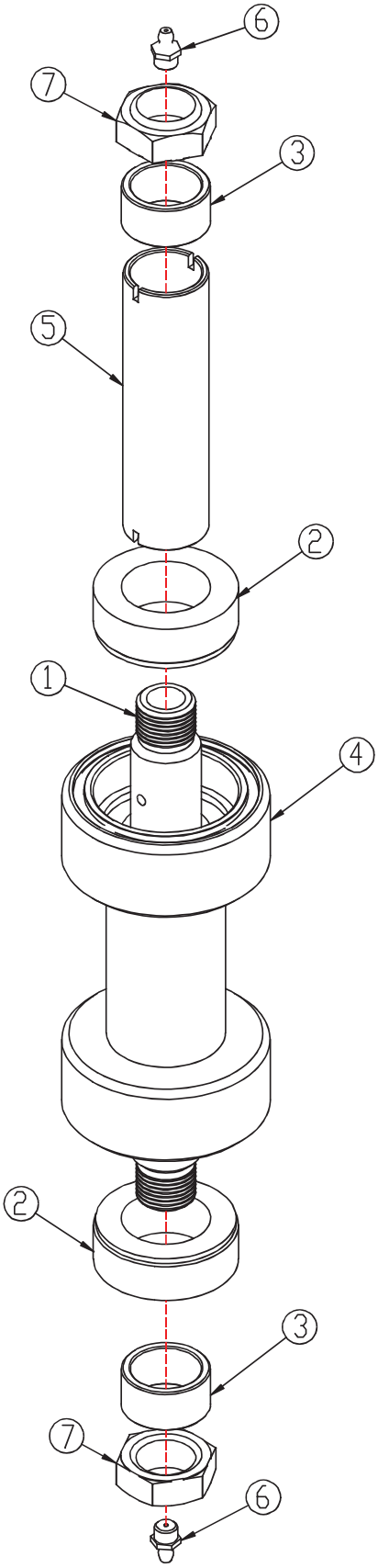


Illustration 7.20: Standard Support Roller Assembly Exploded

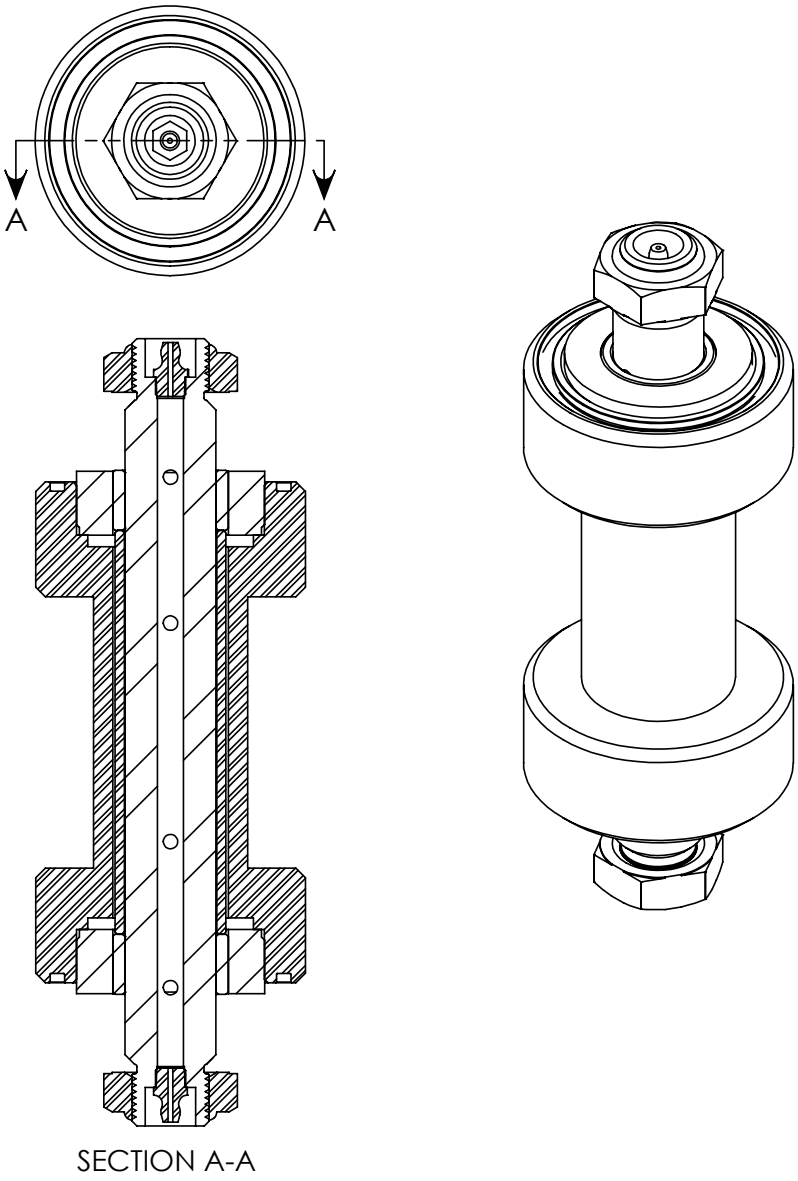


Illustration 7.21: Standard Support Roller Assembly

Item	Type	Description	Qty	Part Number
1	Part	Dumbbell roller shaft	1	22022-A
2	Part	Dumbbell roller bushing	2	55191
3	Part	Dumbbell roller spacer	2	55192
4	Part	Dumbbell roller	1	73070
5	Part	Dumbbell roller inner spacer	1	73071
6	Part	⅛" NPT grease fitting	2	1001
7	Part	1" UNF thin hex nylock nut	2	1213

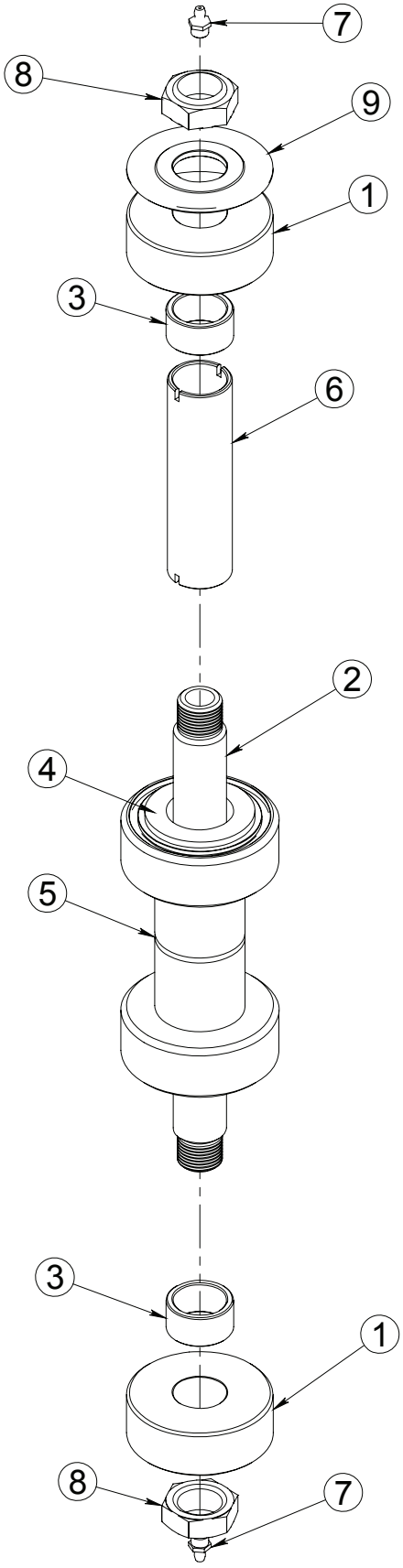
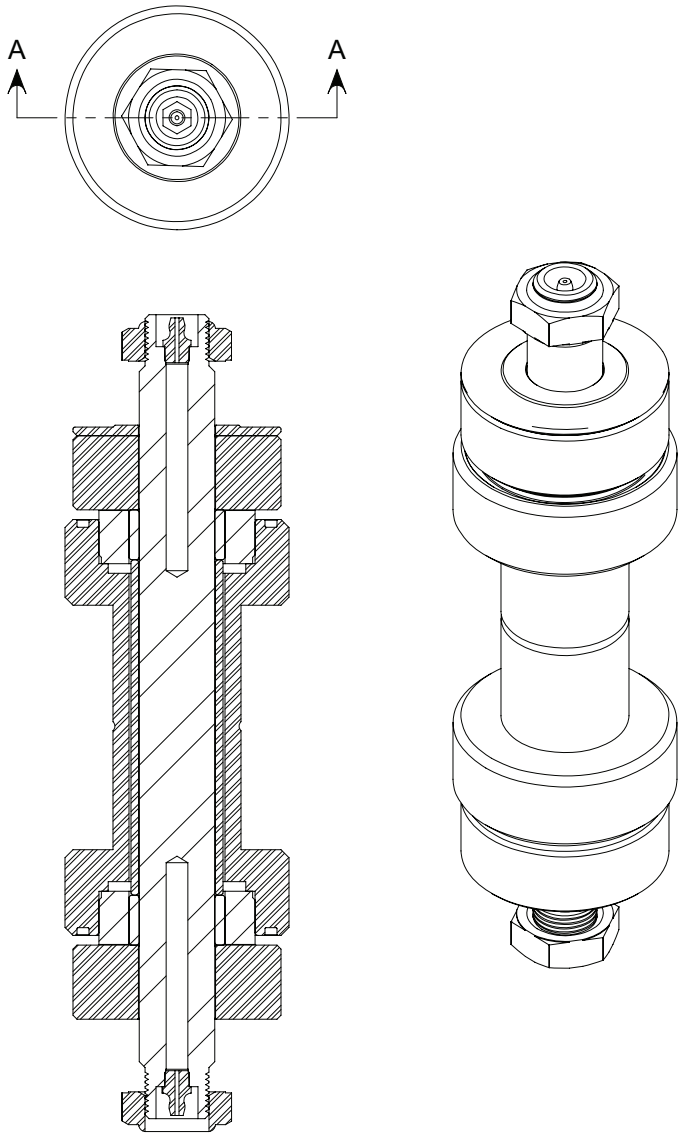


Illustration 7.22: Door-Mounted Support Roller Assembly Exploded



SECTION A-A

Illustration 7.23: Door-Mounted Support Roller Assembly

Item	Type	Description	Qty	Part Number
1	Part	Door roller spacer	2	22676
2	Part	Door-mounted dumbbell roller shaft	1	22677
3	Part	Dumbbell roller spacer	2	55192
4	Part	Dumbbell roller bushing	2	55191
5	Part	Door-mounted dumbbell roller	1	22257
6	Part	Dumbbell roller inner spacer	1	73071
7	Part	⅛” NPT grease fitting	2	1001
8	Part	1” UNF thin hex nylock nut	2	1213
9	Part	Roller seal cover	1	2095

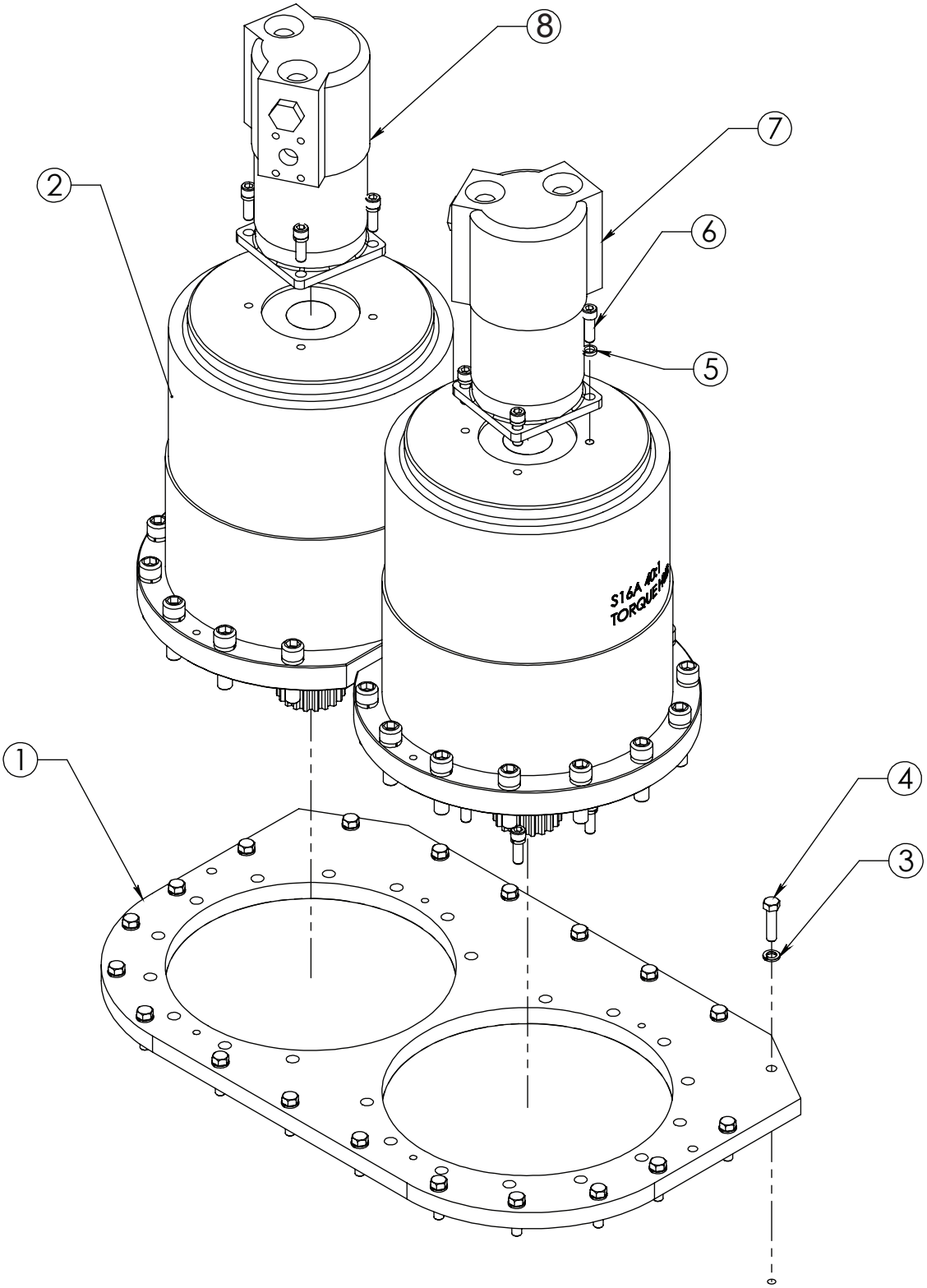


Illustration 7.24: Motor Housing Assembly Exploded

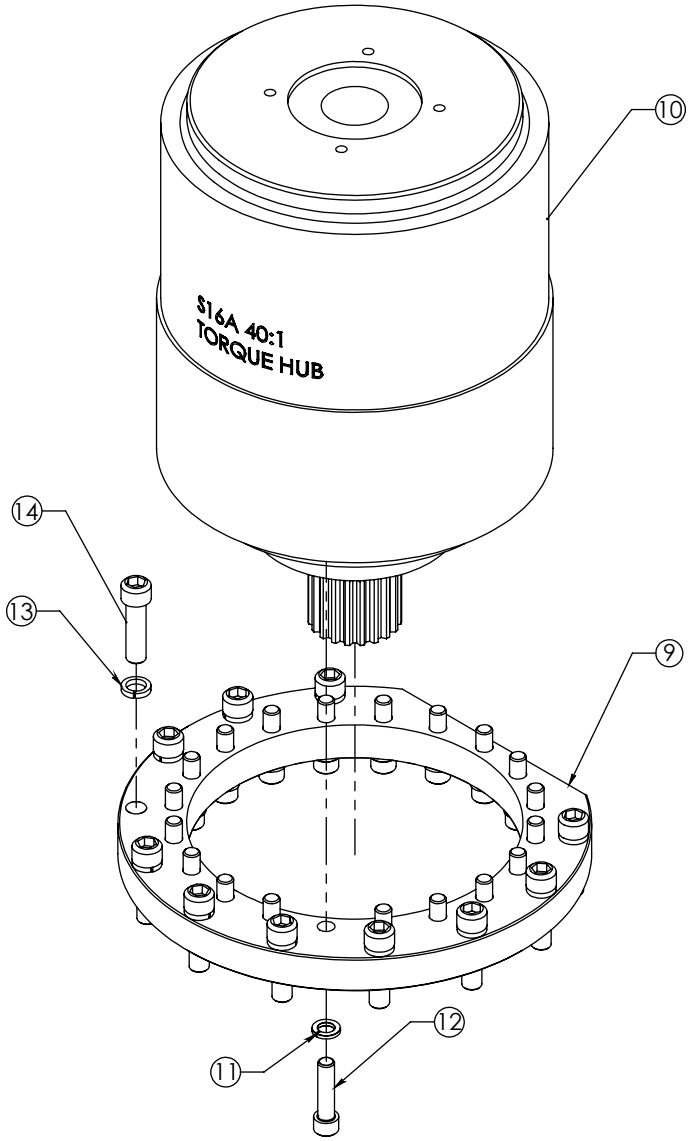


Illustration 7.25: Torque Hub Assembly

Item #	Qty.	Part Number	Part Name
1	1	22217	MOTOR HOUSING COVER
2	2	22215A	TORQUE HUB ASSEMBLY
3	20	1103	1/2" LOCKWASHER
4	20	1112-A	1/2"-13 x 2" HHCS
5	12	210	1/2" HI COLLAR LOCKWASHER
6	12	1106-A	1/2"-13 X 1 1/2" SHCS
7	1	20099-01	RINEER MOTOR 2SP. 24 cu.inch
8	1	20099-02	RINEER MOTOR 9 cu.inch
9	1	22214	TORQUE HUB PLATE
10	1	22213A	TORQUE HUB (40:1 REDUCTION RATIO)
11	20	1151	5/8 LW
12	20	259	5/8"-11 X 2 1/2" SHCS
13	11	1170-A	3/4 HI COLLAR LW
14	11	1325	3/4-10 x 2 3/4 SHCS

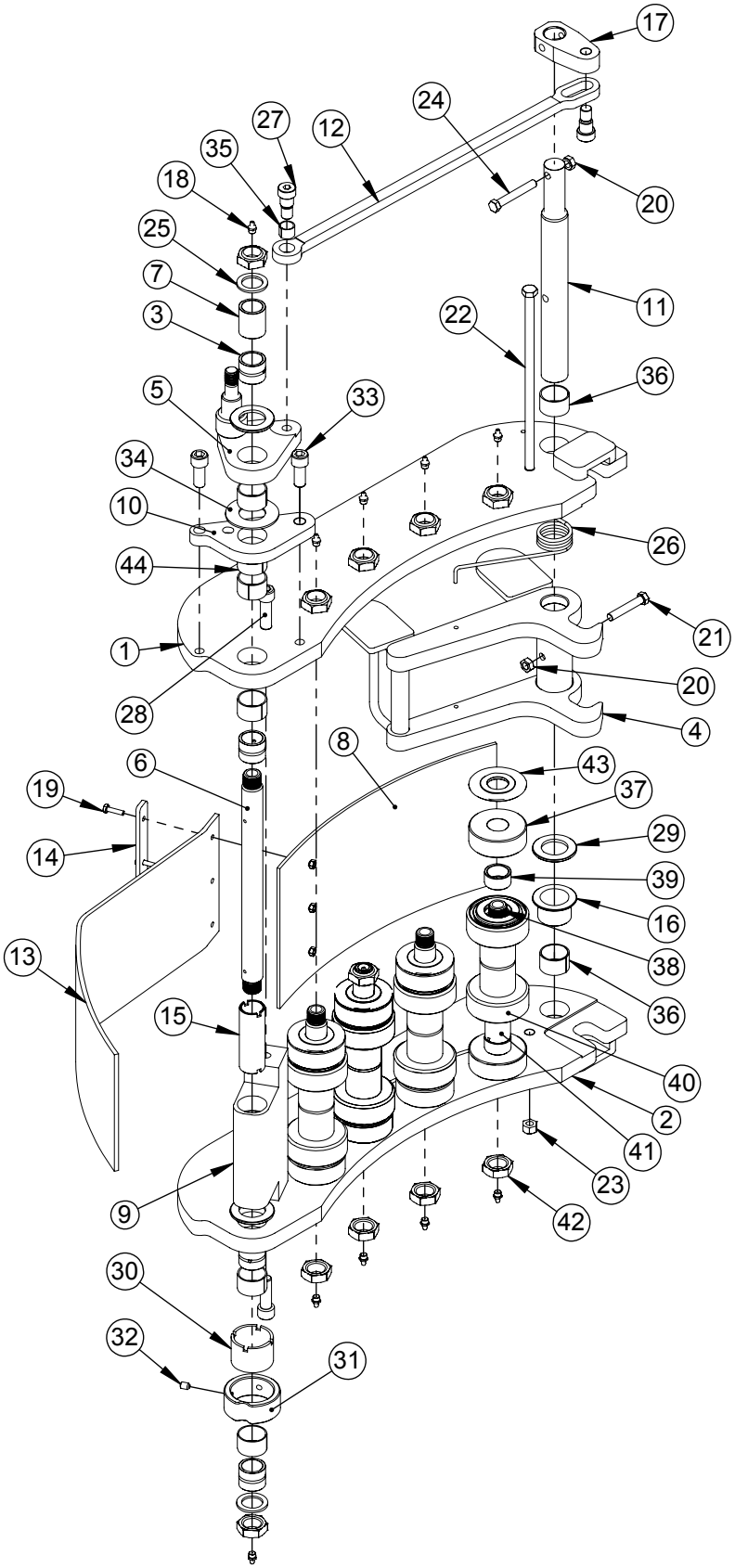
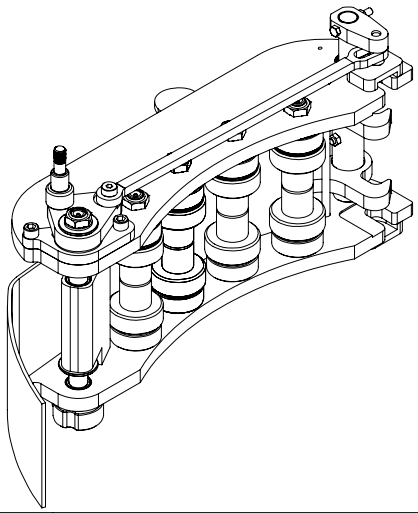


Illustration 7.26: Door Assembly Exploded



ITEM	QTY	P/N	DESCRIPTION
1	1	22687T	TOP DOOR PLATE WELDMENT
2	1	22687B	BOTTOM DOOR PLATE WELDMENT
3	4	14679	DOOR PIVOT BUSHING
4	1	14681	DOOR LATCH WELDMENT
5	1	22718	DOOR PIVOT LINKAGE WELDMENT
6	1	22058	DOOR PIVOT SHAFT
7	1	22260	DOOR PIVOT BUSHING
8	1	22680-S3	WELDMENT COVER DOOR
9	1	22680-S5	TONG DOOR HINGE
10	1	22681-S1	TONG DOOR THRUST SPACER
11	1	22683	DOOR LATCH PIVOT PIN
12	1	22686	DOOR LATCH LINKAGE
13	1	26680-S3	RUBBER FLAP
14	1	26680-S4	FLAP RETAINER
15	1	26680-S6	DUMBELL ROLLER SPACER F/CLE26000 TONG DOOR
16	1	22027-01	DOOR BUSHING
17	1	82042	ARM F/CLE9625DP TONG
18	12	1001	GREASE ZERT 1/8" NPT
19	3	105	HHCS 1/4"-20 X 1" GR8
20	2	292	NYLOCK NUT 7/16"-14 GR8
21	1	160	HHCS 7/16"-14 X 2 1/2" GR8
22	1	1133	HHCS 1/2"-13 X 12" GR 8
23	1	1101	NUT HEX 1/2-13 GR8
24	1	162	HHCS 7/16"-14 X 3" GR8
25	2	2040	TONG DOOR BUSHING F 20" CASING TONG
26	1	SMH1501-N	RIGHT HAND TORSION SPRING 1 5/8" I.D.
27	2	1676	SHOULDER BOLT 3/4" X 5/8" LG 18-8 SS 5/8-11 THREAD
28	2	1155	SHCS 5/8"-11 X 2" ALLOY GRADE
29	3	45057	DUMBELL THRUST WASHER 2 3/4" O.D.STOCK
30	1	76113-S5	DOOR SWITCH COLLAR
31	1	76131-02	DOOR SWITCH ADJ. SLEEVE 1.275" HEIGHT
32	1	1029	SET SCREW 3/8"-16 X 1/2"
33	2	257	SHCS 5/8"-11 X 1 1/2" ALLOY GRADE
34	1	14116	WASHER DOOR THRUST F/TONG CLE14000-03
35	1	82046	GARLOCK BUSHING 12DU10 3/4" ID X 5/8" F/ LINKAGE
36	7	2021	GARLOCK BUSHING 24DU16 1 1/2" ID X 1" DOOR BUSHING
37	10	22676	DOOR ROLLER SPACER 3.25" OD
38	5	22677	DOOR DUMBELL SHAFT 12.75" LONG
39	10	55192	DUMBELL ROLLER SPACER
40	5	55191-05	ROLLER BUSHING ASSEMBLY
41	5	73071	DUMBELL ROLLER SPACER F/ CLE7625DP-60
42	12	1213	NYLOCK NUT LOW PRO 1"-12 NF
43	5	2095	DUMBELL ROLLER SPACER F/20 TONG
44	1	2096	GARLOCK BUSHING MODIFIED MFG

Illustration 7.27: Door Assembly

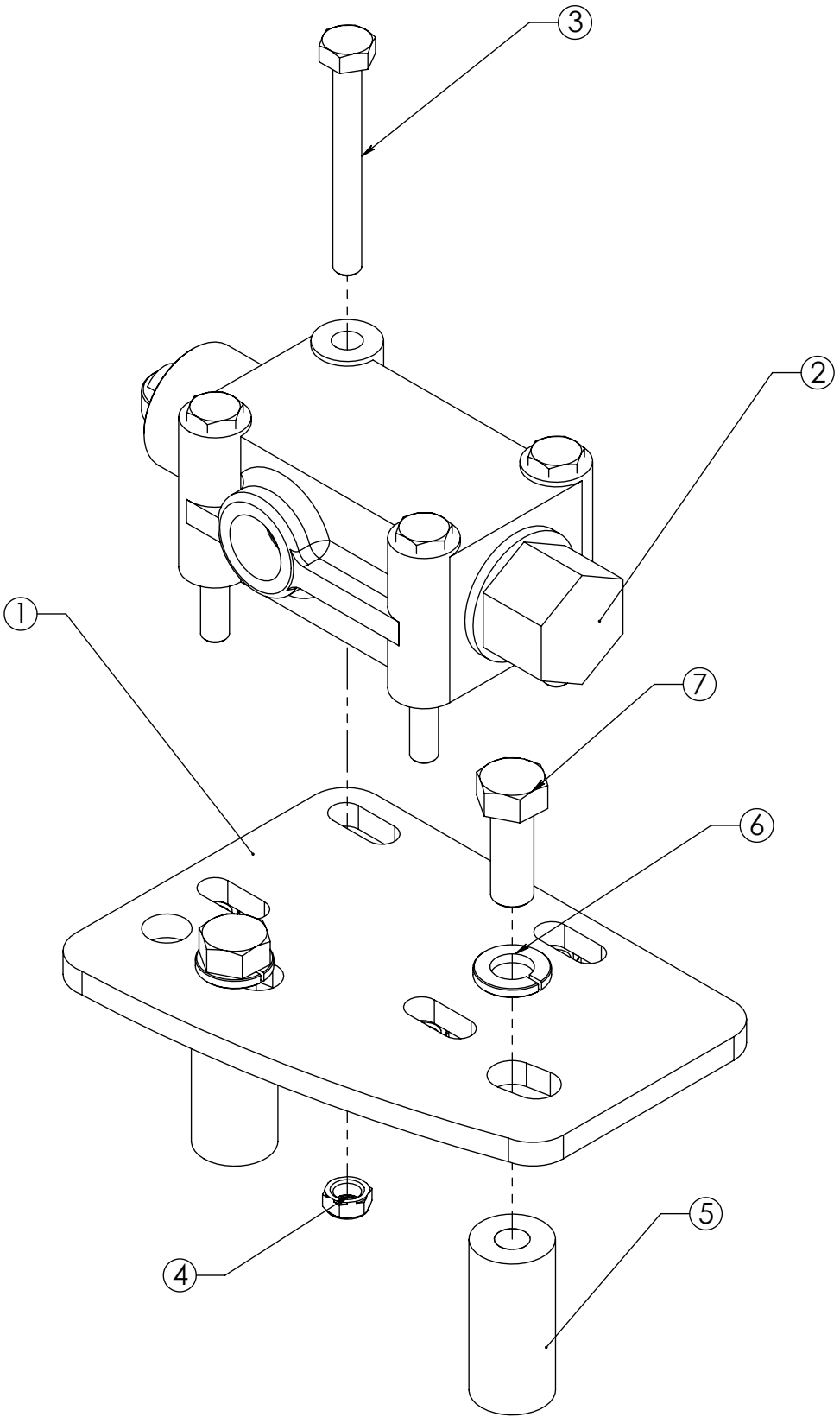


Illustration 7.28: Door Switch Assembly Exploded

Item	Type	Description	Qty	Part Number
1	Part	Backup sensor mount base	1	76128-S2
2	Part	Normally-closed self-lubricated hydraulic switch	1	SLV1000-01
3	Part	¼” UNC x 2-¼” hex cap screw	4	110
4	Part	¼” UNC hex nylock nut	4	212
5	Part	Door switch base mount	2	22246-S1
6	Part	⅜” lock washer	2	1027
7	Part	⅜” UNC x 1” hex head cap screw	2	1047

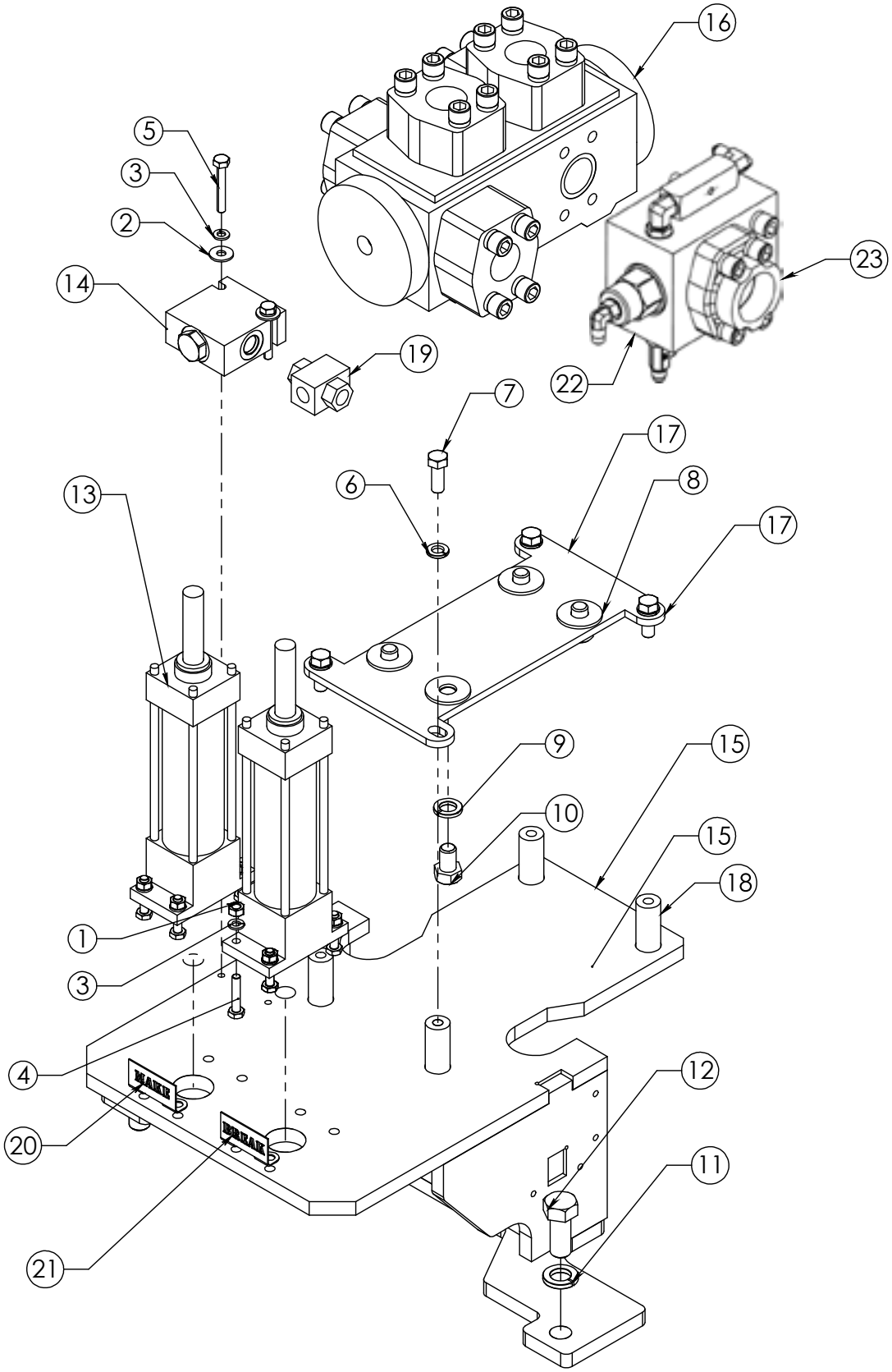


Illustration 7.29: Reversing Pin Cylinder Assembly Exploded

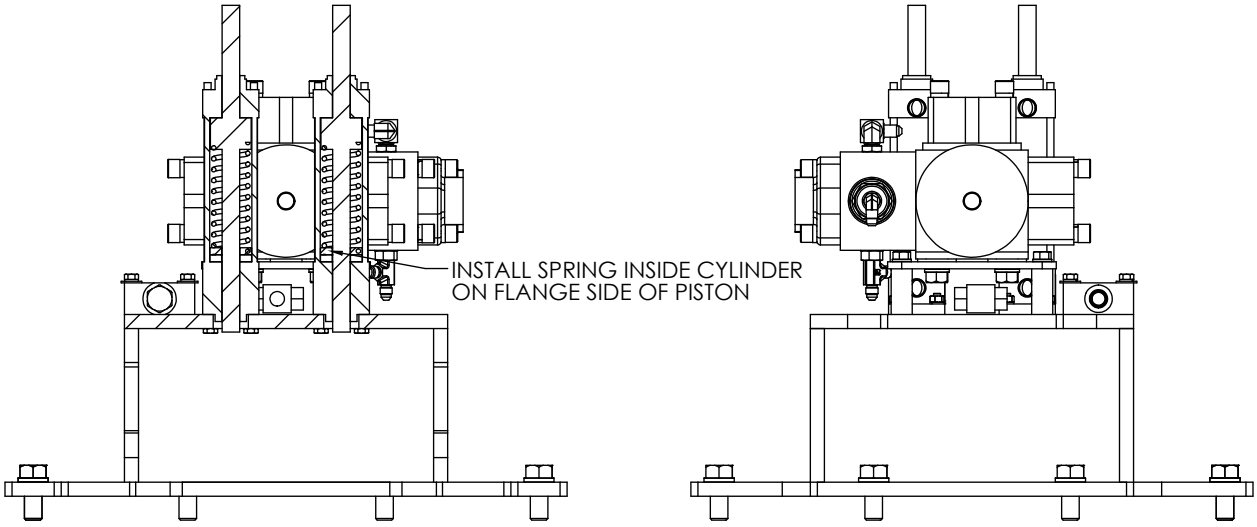


Illustration 7.30: Reversing Pin Cylinder Assembly Front View / Rear View

ITEM	QTY	P/N	DESCRIPTION
1	9	100	HEX NUT 1/4"-20 GR8
2	2	1008-B2	FLATWASHER 1/4" GR8
3	11	101	LOCKWASHER 1/4" GR8
4	9	106	HHCS 1/4"-20 X 1 1/4" GR8
5	2	108	HHCS 1/4"-20 X 1 3/4" GR8
6	4	1027	LOCKWASHER 3/8" GR8
7	4	1047	HHCS 3/8"-16 X 1" GR8
8	4	1102	FLATWASHER 1/2" GR8
9	4	1103	LOCKWASHER 1/2" GR8
10	4	1109	HHCS 1/2"-13 X 3/4" GR8
11	5	1151	LOCKWASHER 5/8" GR8
12	5	1157	HHCS 5/8"-11 X 1 1/2" GR8
13	2	1000970	REVERSING PIN CYLINDER ASSEMBLY
14	1	14790	PILOT OPERATED CHECK VALVE
15	1	22232-01	REVERSING PIN
16	1	22237-assy	ASSEMBLY LOGIC VALVE
17	1	22238-S1	SERIES-PARALLEL VALVE PLATE
18	4	22238-S2	MOUNTING POST
19	1	LSV1-6T-N	SHUTTLE VALVE
20	1	CRSS20041	"MAKE" TAG F/20" SUSPENSION SYSTEM
21	1	CRSS20042	"BREAK" TAG F/20" REMOTE TONG
22	1	86049B	LOGIC VALVE ASSEMBLY WITH BALANCED POPPET
23	1	W43-20-20U	1-1/4" FLANGE

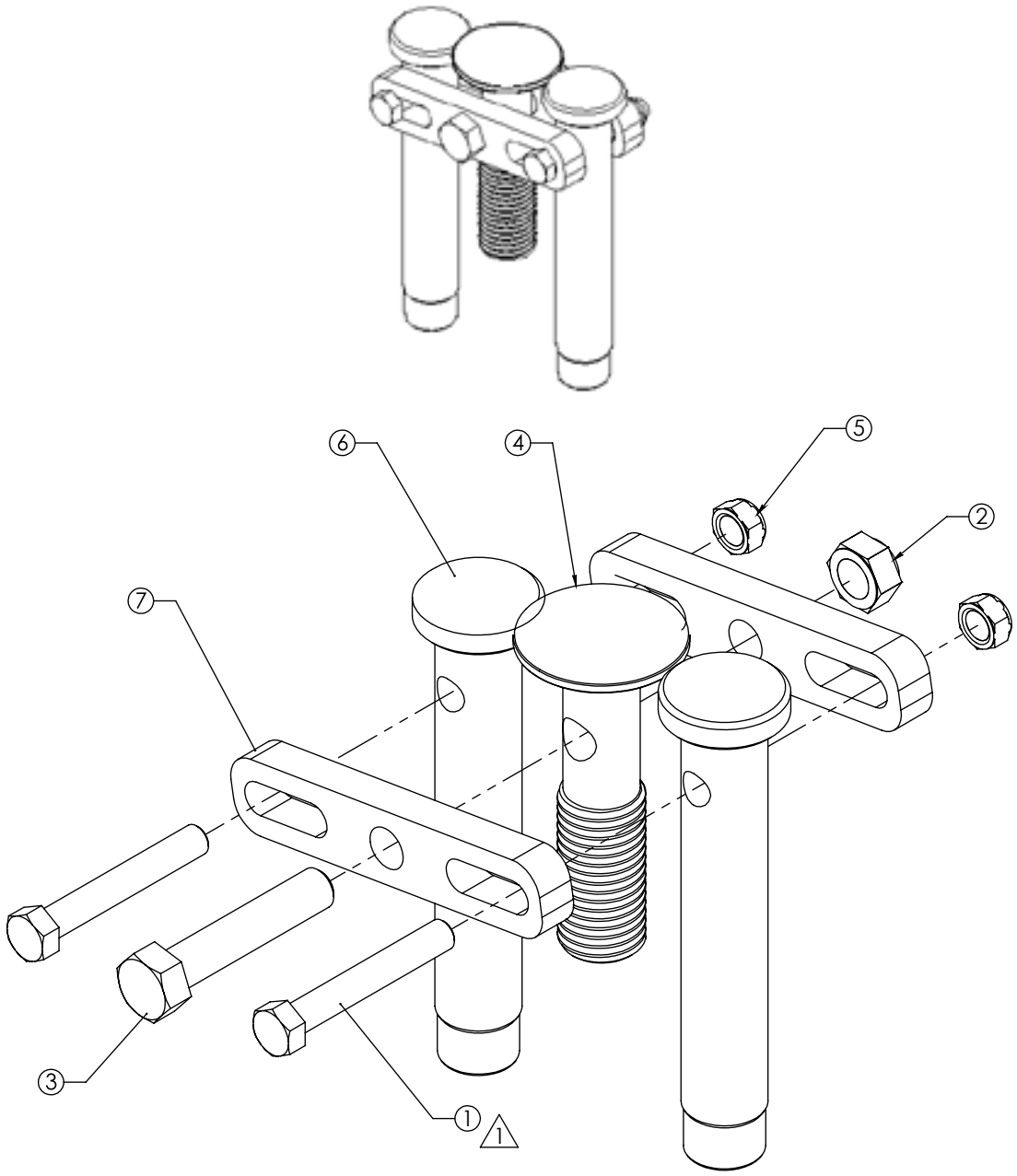


Illustration 7.31: Reversing Pin Assembly Exploded

ITEM	QTY.	P/N	DESCRIPTION
1	2	1060	SCREW, HEX HEAD, 3/8-16 X 2 1/2, GR8
2	1	1087	NUT, NYLOCK, 1/2-13
3	1	1113-A	SCREW, HEX, 1/2-13, 2 1/2, STEEL, GR8, ZINC
4	1	20064-01	STUD, PIN, REVERSING
5	2	213	NUT, NYLOCK, 3/8-16, GR8
6	2	22256	PIN, REVERSING
7	2	71073	PLATE, PIN, LOCKING

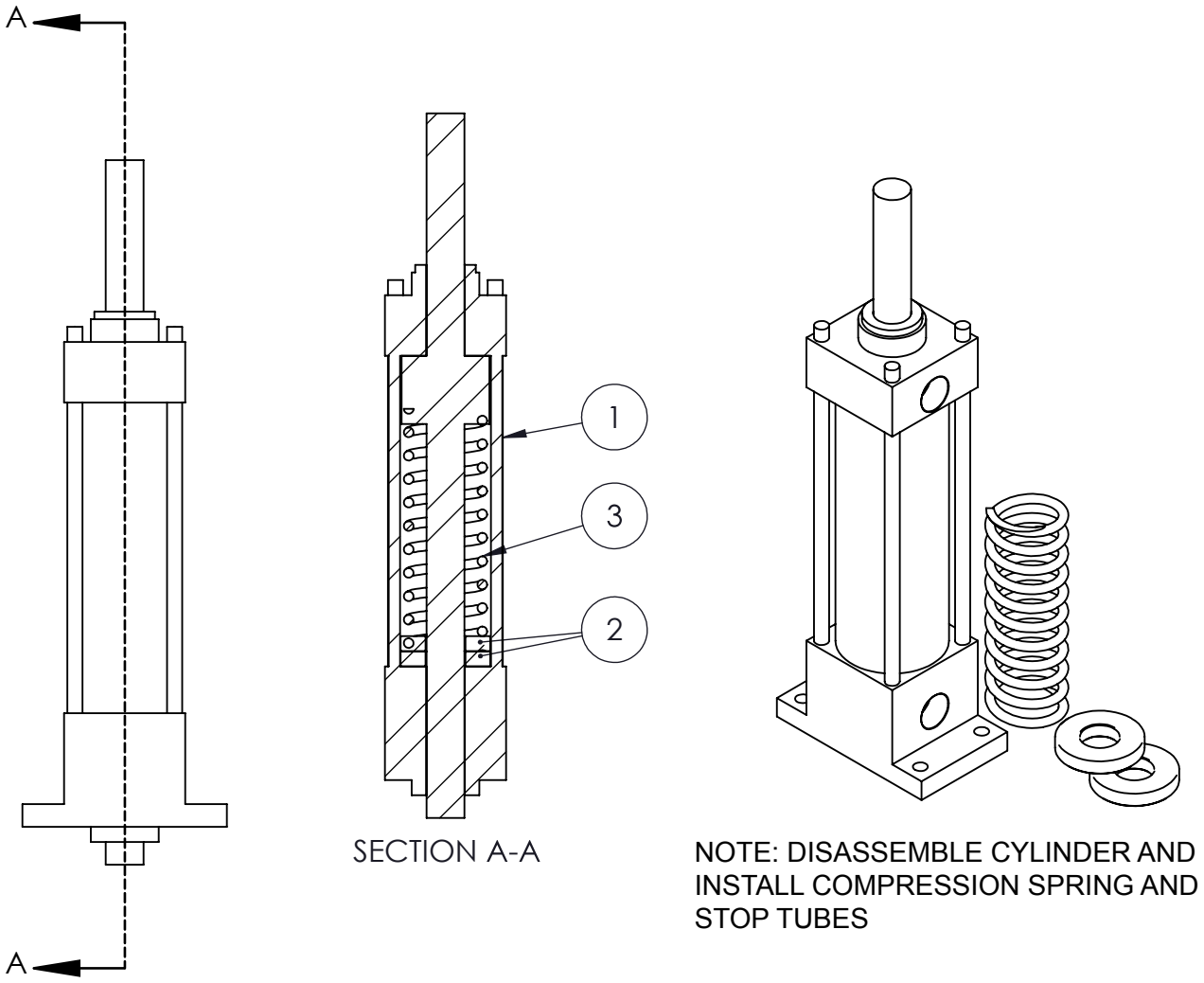


Illustration 7.32: Reversing Pin Cylinder Exploded

ITEM	QTY	P/N	DESCRIPTION
1	1	1360601	REVERSING PIN CYLINDER 1 1/2" B, 4"S W/5/8"R STAINLESS ROD
2	2	22108-01S1	CYLINDER STOP TUBE
3	1	CB2326-01	COMPRESSION SPRING, 21#

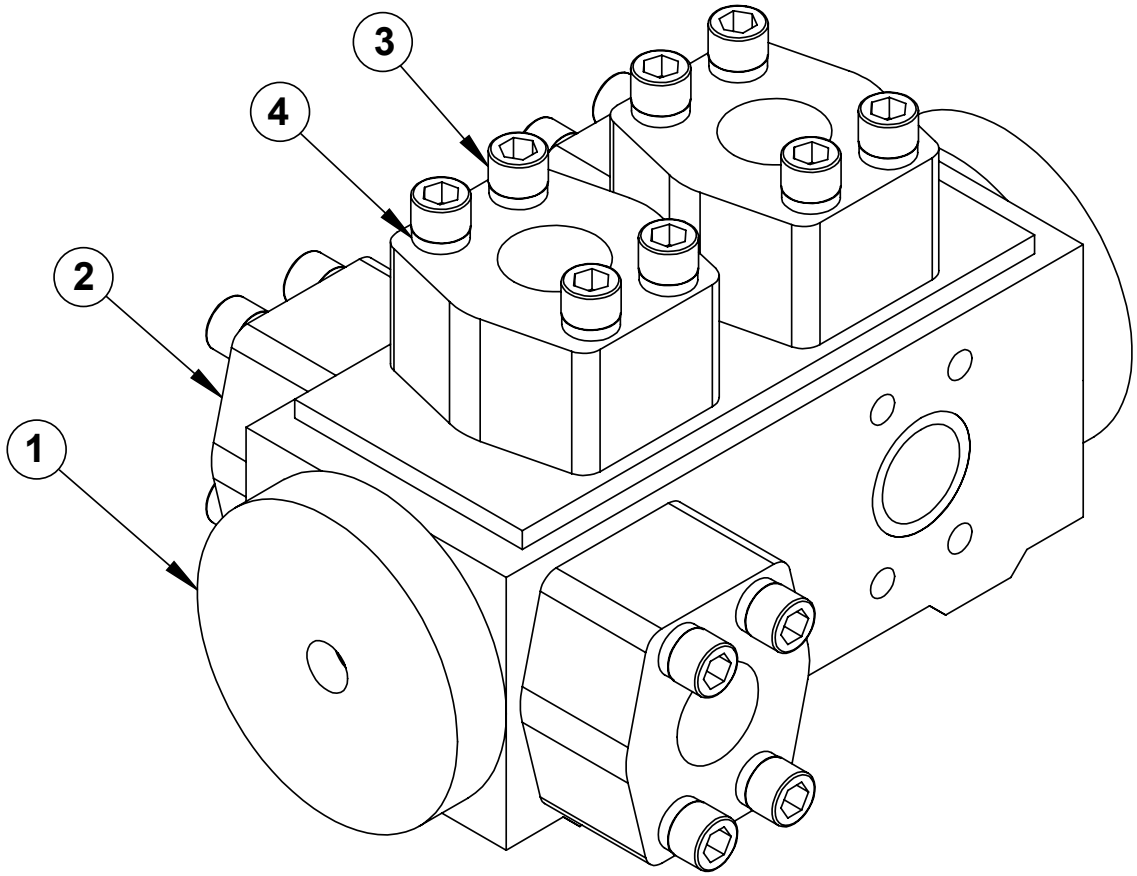


Illustration 7.33: Series/Parallel Valve Assembly

Item	Type	Description	Qty	Part Number
1	Part	Series/parallel valve	1	22237
2	Part	1-¼" SAE flange (Code 61)	5	W43-20-20U
3	Part	7/16" UNC x 2-½" hex socket head cap screw	24	1229
4	Part	7/16" hi-collar lock washer	24	1082

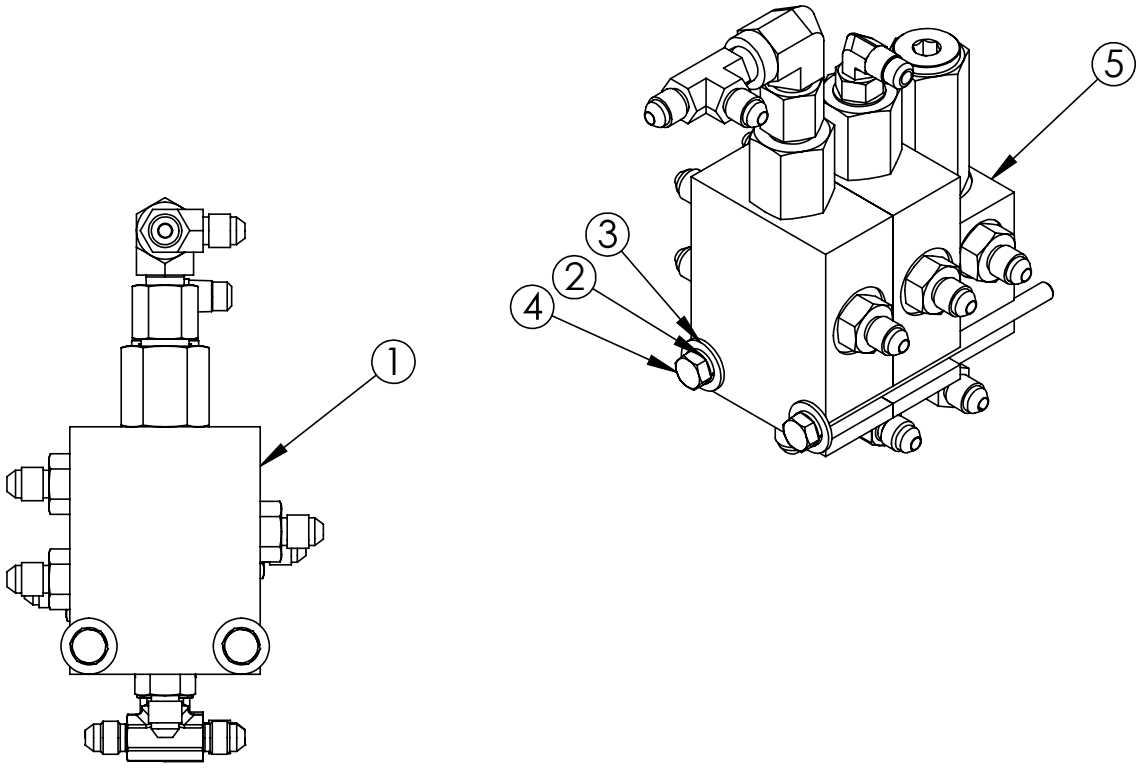


Illustration 7.34: Directional Control Valve

Item	Type	Description	Qty	Part Number
1	Part	Directional control valve, pilot-operated	2	CP720-2-B-0-040-S3
2	Part	¼" lock washer	2	101
3	Part	¼" flat washer	2	1008-B2
4	Part	½" UNC x 4-½" hex bolt	2	116
5	Part	Pressure reducing/relieving valve	1	CP230-1B-6S

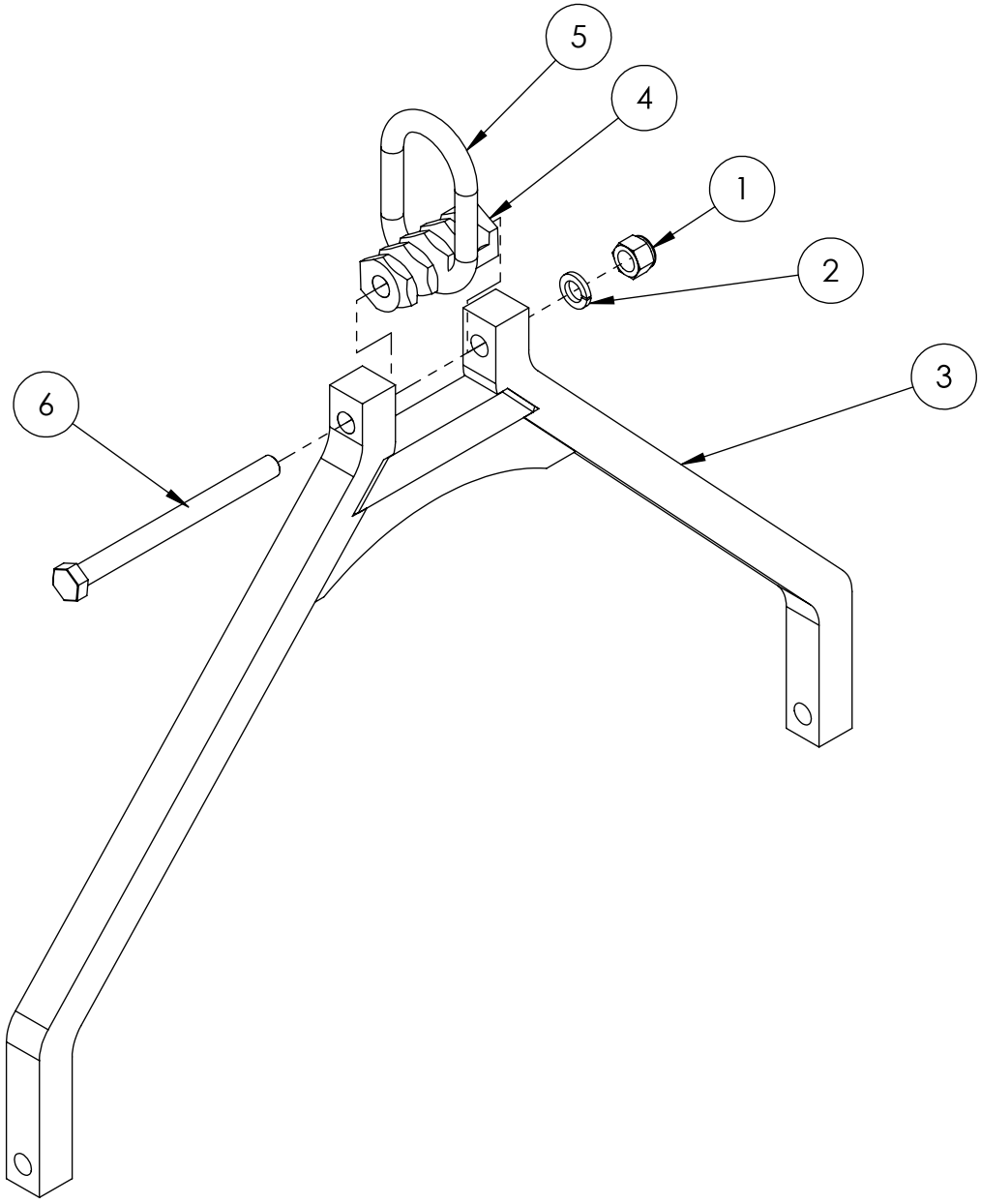


Illustration 7.35: Rigid Sling (Bail) Assembly

Item	Type	Description	Qty	Part Number
1	Part	1” UNC nylock nut	1	1224-B
2	Part	1” lock washer	1	1218
3	Weldment	Rigid sling (bail) weldment	1	26727
4	Part	Adjustment helix	1	73117
5	Part	Master lifting link	1	73118
6	Part	1” UNC x 12” heavy hex bolt	1	73126

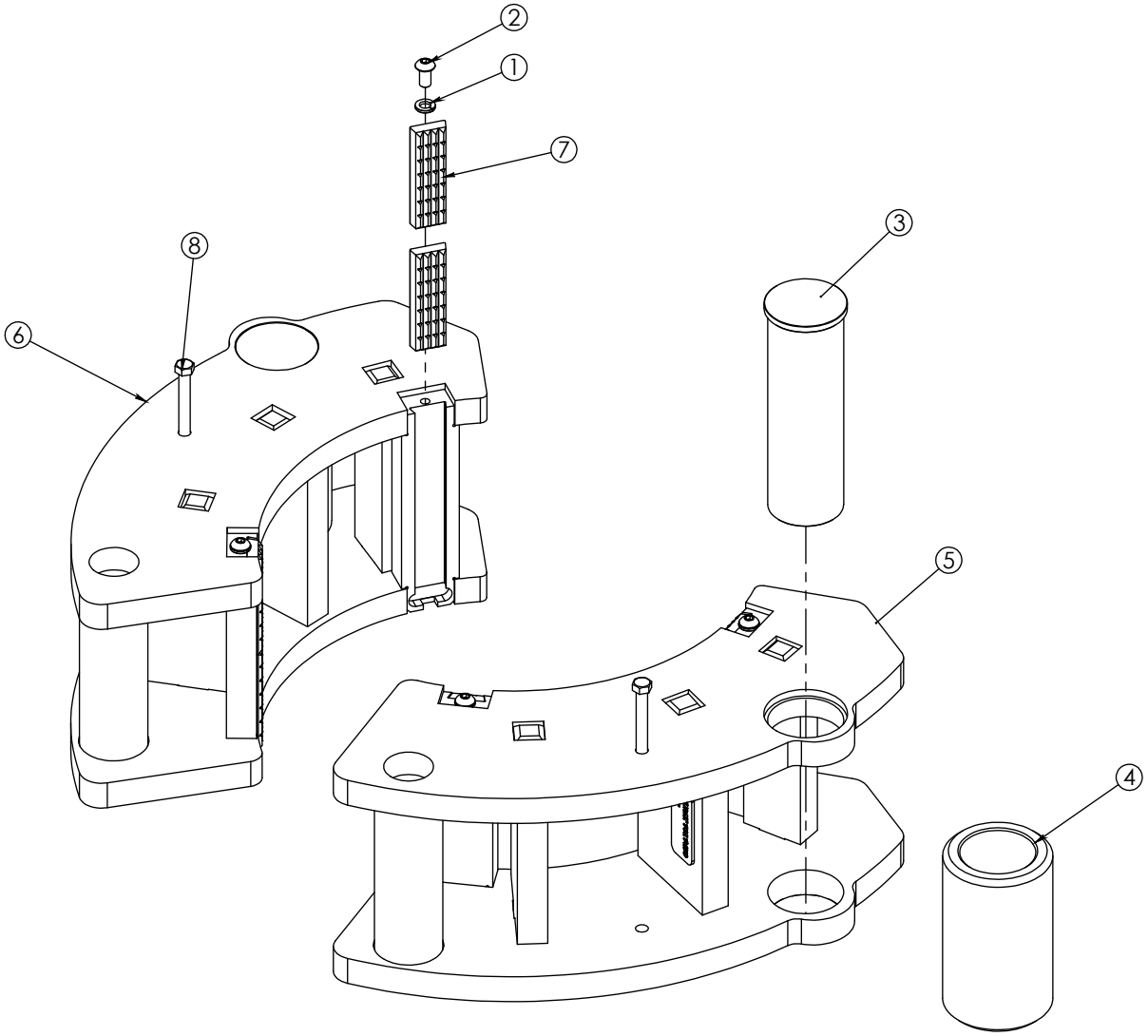


Illustration 7.36: Typical Standard Jaw Die Kit (16-½" Shown)

See Section 3.4 for a complete list of available jaw die kits and die inserts

Item	Type	Description	Qty	Part Number
1	Part	⅜" lock washer	4	1027
2	Part	⅜" UNC x ¾ button head cap screw	4	1061
3	Part	Jaw pin	2	14666-01
4	Part	Jaw roller	2	14667-01
5	Weldment	RH XHT dovetail die jaw weldment	1	22XHT-XXXXX-R(1)
6	Weldment	LH XHT dovetail die jaw weldment	1	22XHT-XXXXX-L(1)
7	Part	Jaw die(2)	8	See Section 3.3
8	Part	⅜" UNC x 3-½" hex head cap screw	2	1071

1. "XXXXX" equals jaw size. Example: "14000" equals 14" jaw weldment.
2. See section 3.4 for a complete list of available jaw dies for this equipment.

SEE B.O.M. PG. 7.47

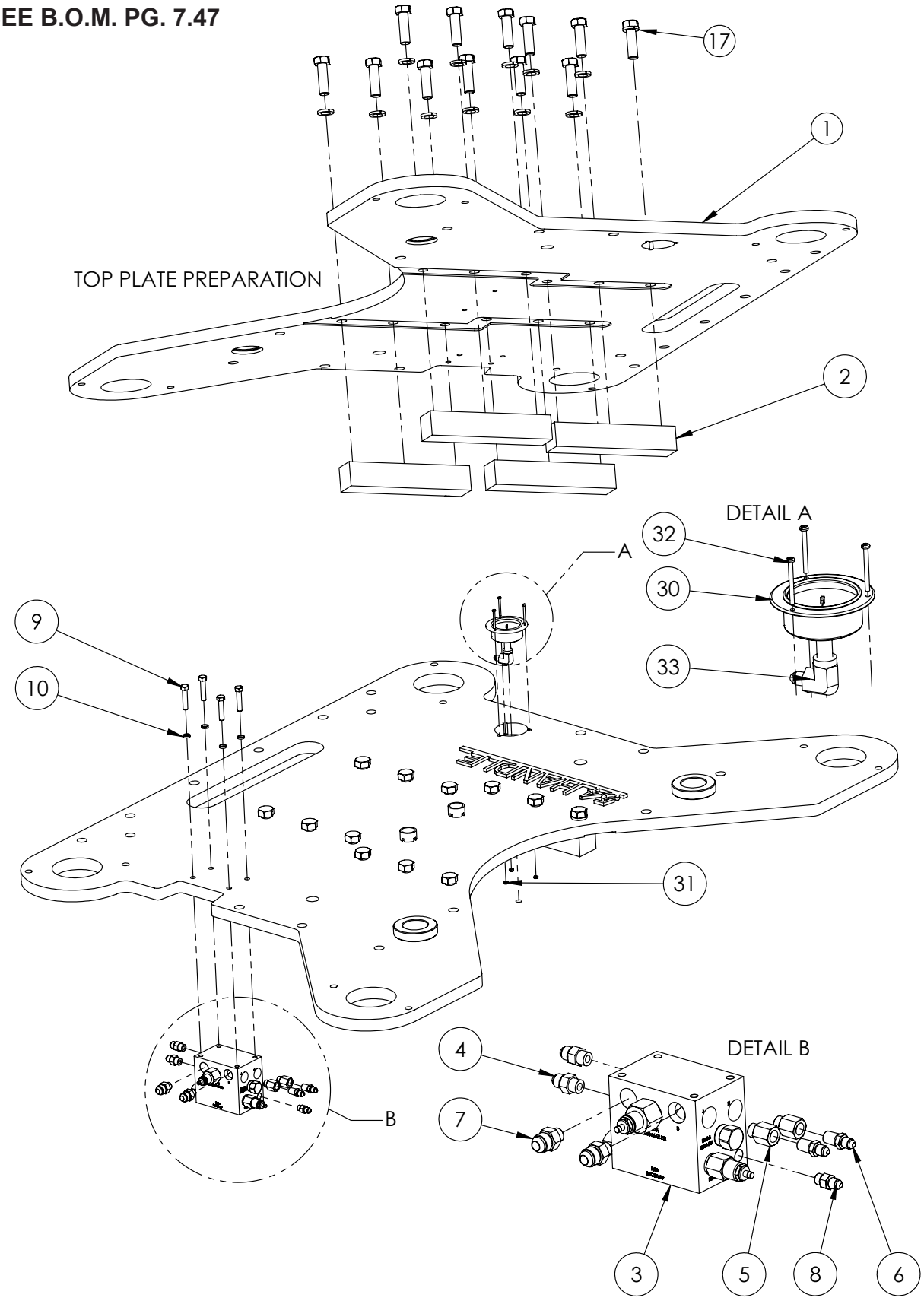


Illustration 7.37: BUCST23000 Assembly Exploded 01

SEE B.O.M. PG. 7.47

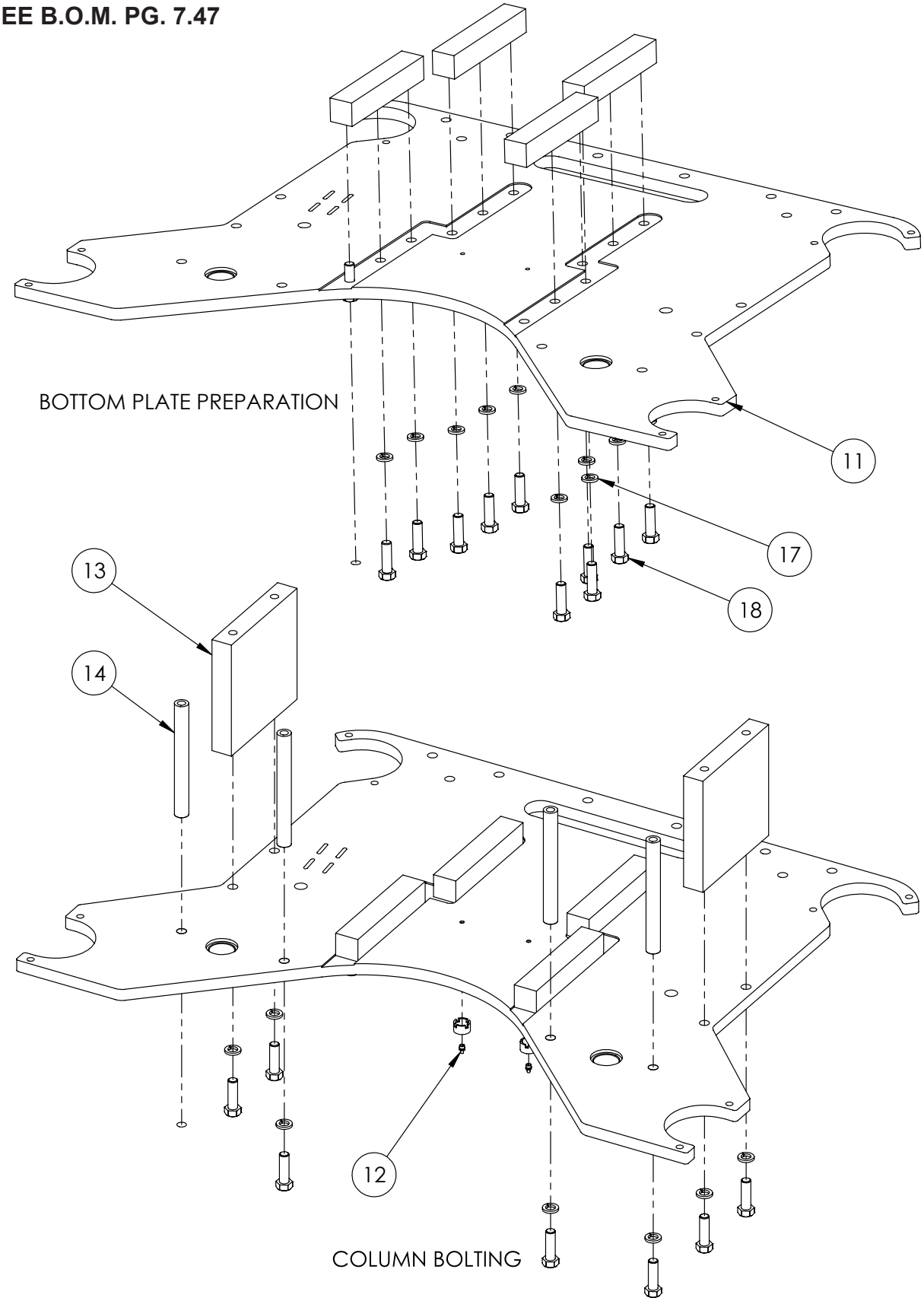


Illustration 7.38: BUCST23000 Assembly Exploded 02

SEE B.O.M. PG. 7.47

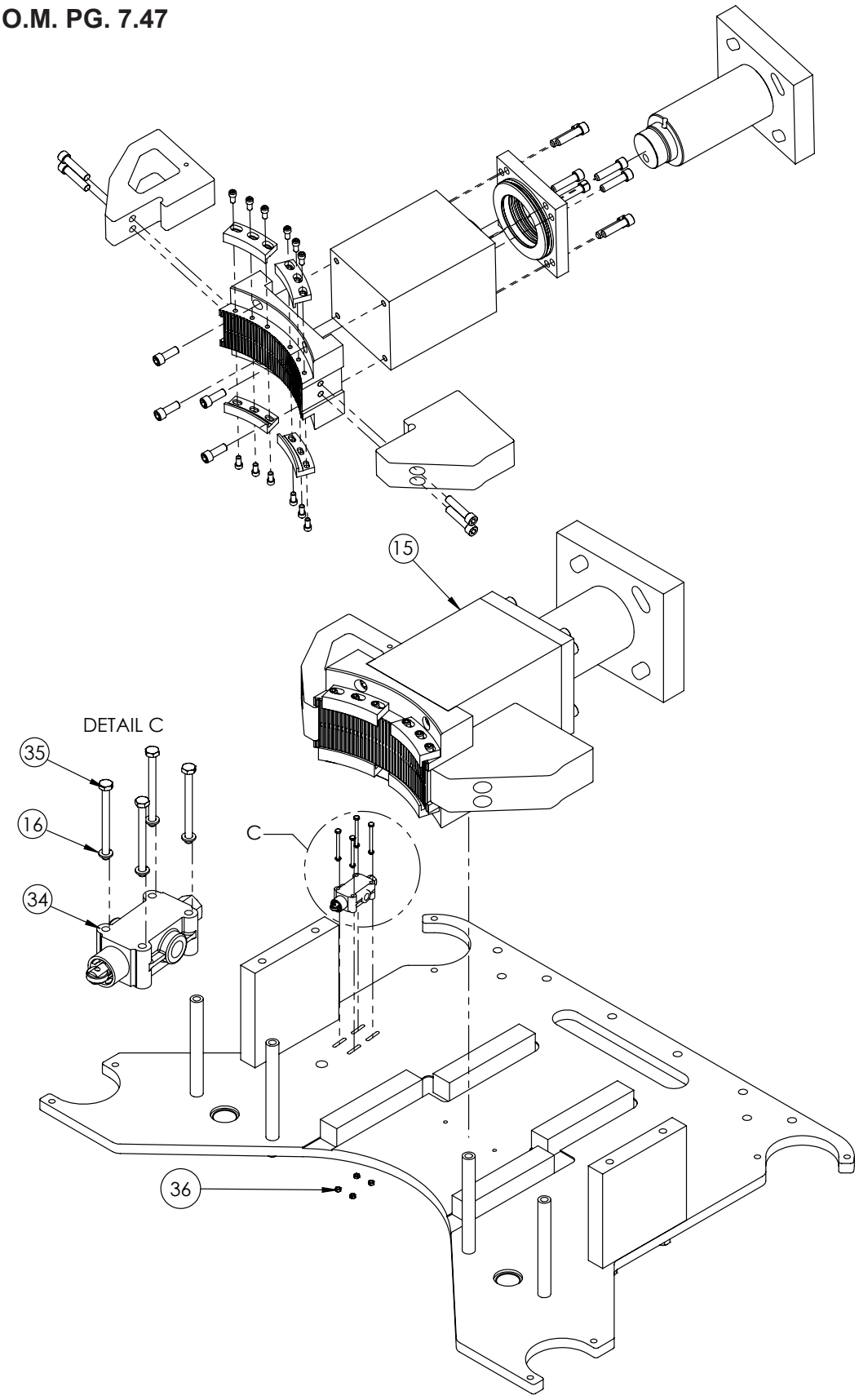


Illustration 7.39: BUCST23000 Assembly Exploded 03

SEE B.O.M. PG. 7.47

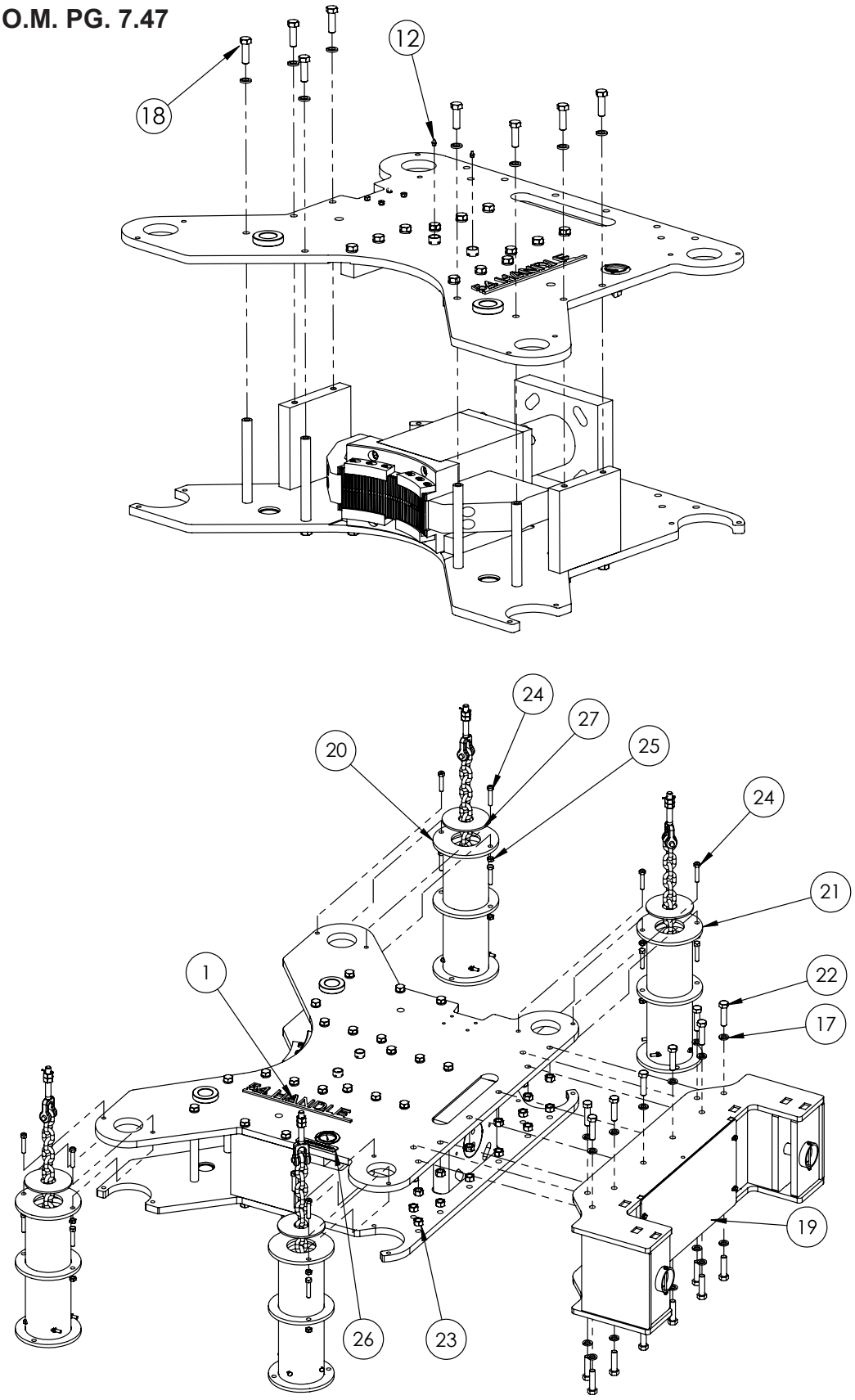


Illustration 7.40: BUCST23000 Assembly Exploded 04

SEE B.O.M. PG. 7.47

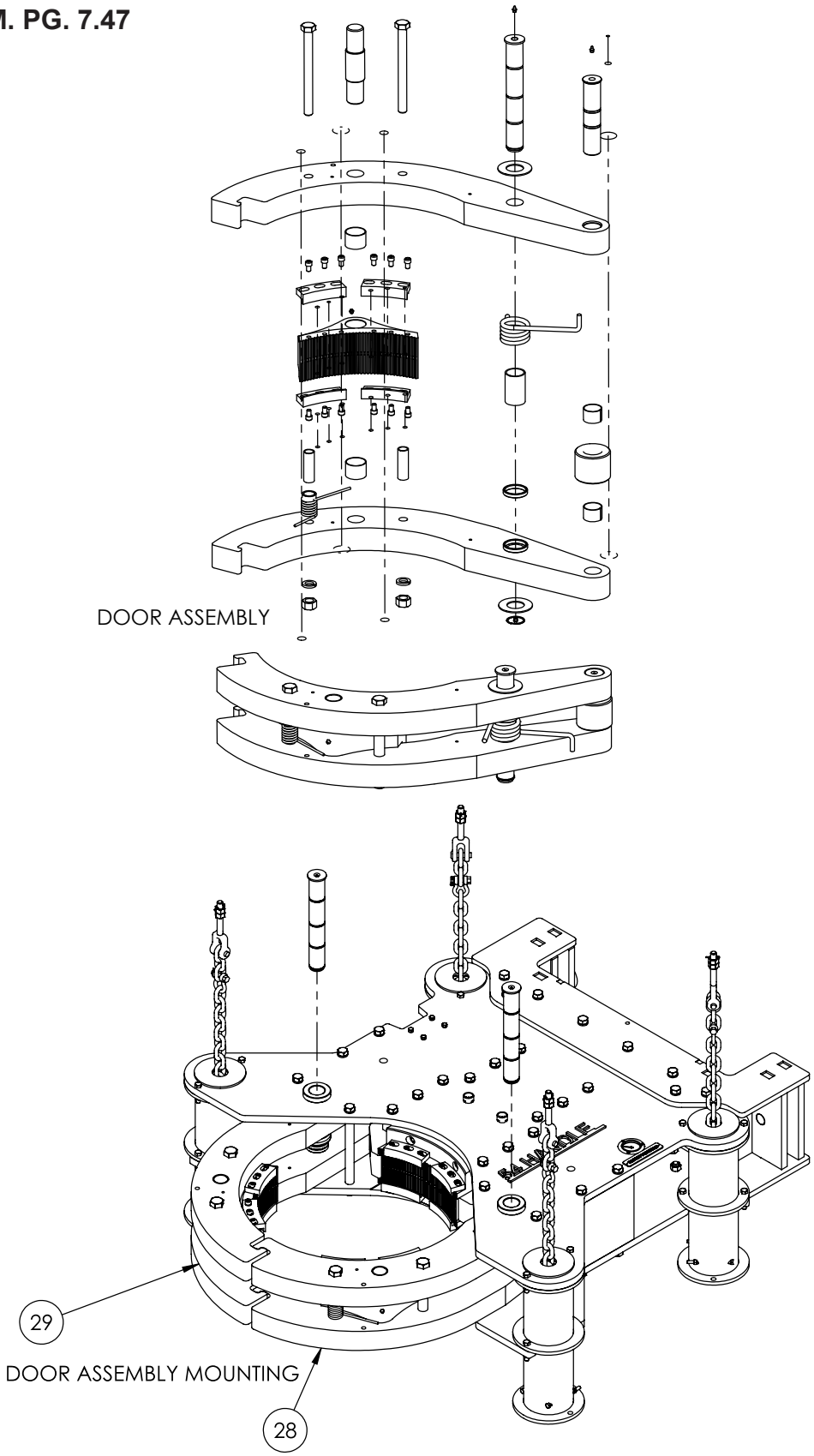
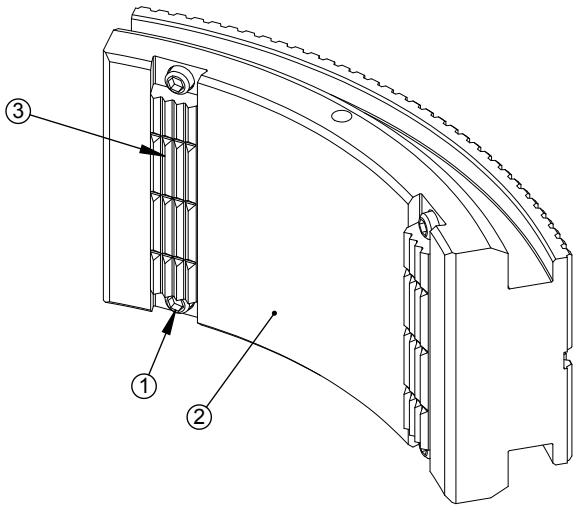


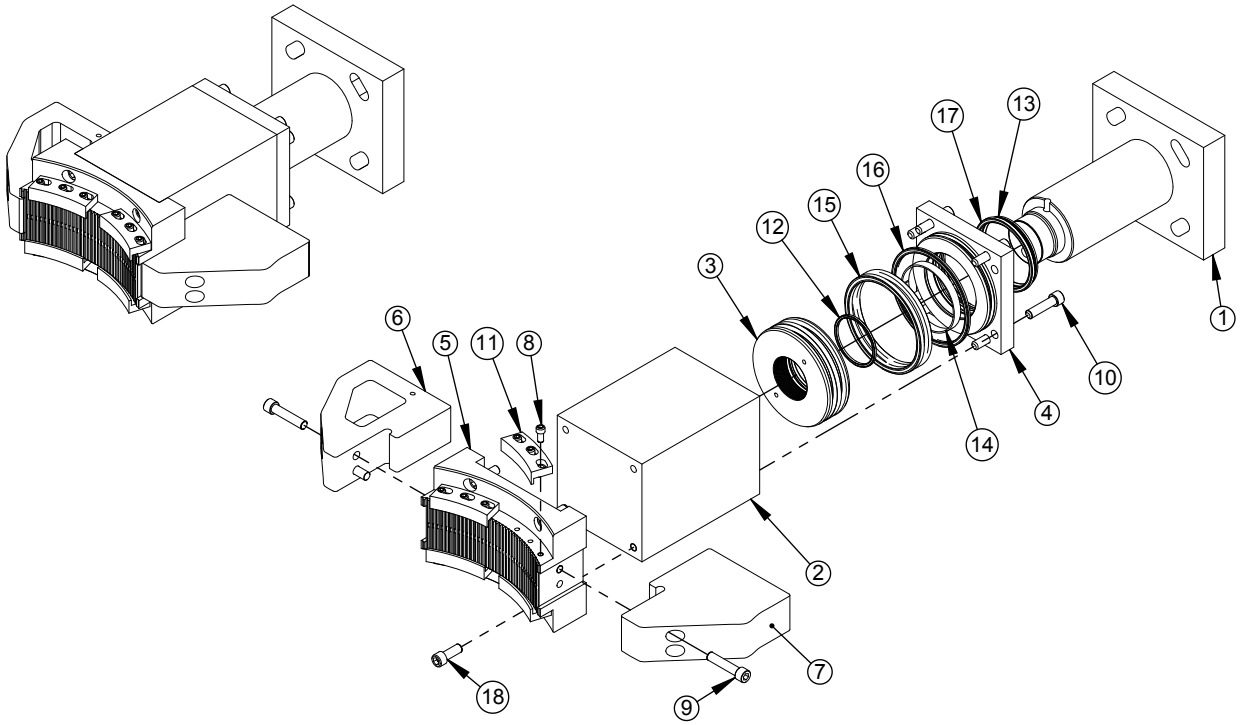
Illustration 7.41: BUCST23000 Assembly Exploded 05

Item	Type	Description	Qty	Part Number
1	Weldment	Top plate weldment	1	BUCST23007
2	Part	Cylinder guide	8	BUCS23025
3	Assembly	Manifold assembly	1	BUCS7699-01
4	Part	⅜” MORB x ⅜” MJIC straight fitting	2	1717
5	Part	⅜” MORB x ¼” FNPT straight fitting	2	1725-A
6	Part	¼” MNPT x ¼” MJIC straight fitting	2	1562
7	Part	⅜” MORB x ½” MJIC straight fitting	2	6400-8-6-O
8	Part	¼” MJIC x ¼” MORB straight fitting	1	1818
9	Part	⅜” UNC x 1-¾” hex bolt	4	141
10	Part	⅜” high-collar lock washer	4	1026
11	Weldment	Bottom plate weldment	1	BUCST23006
12	Part	⅛” NPT grease fitting	4	1001
13	Part	Side brace	2	BUCS2137-01
14	Part	Backup spacer	4	BUCS2113-06
15	Assembly	Cylinder assembly	1	BUCS23006-01
16	Part	¼” lock washer	4	101
17	Part	¾” lock washer	56	1171
18	Part	¾” UNC x 2-½” hex bolt	40	1183
19	Assembly	Fishtail assembly	1	BUCST23005
20	Assembly	Front spring assembly	1	BUCST23011
21	Assembly	Rear spring assembly	1	BUCST23012
22	Part	¾” UNC x 3” hex bolt	16	1176
23	Part	¾” UNC hex nut	16	1176-A
24	Part	½” UNC x 2-½” hex bolt	16	1113
25	Part	½” UNC nylock nut	16	1087
26	Part	Backup pressure tag	1	TAG-BACKUP-PRESSURE
27	Part	Rubber washer	4	22102
28	Assembly	Inside door assembly	1	BUCS2332-08
29	Assembly	Outside door assembly	1	BUCS2331-08
30	Part	5000 psi pressure gauge	1	BAC-5M25RCFF
31	Part	#6-32 hex nut, brass	3	1150-A
32	Part	#6-32 x 1-½” button screw, brass	3	1150-C
33	Part	¼” FNPT x ¼” MJIC 90° fitting	1	1653
34	Part	Door switch, normally closed	1	SLV1000-04
35	Part	¼” UNC x 3” hex bolt	4	113
36	Part	¼” UNC hex nut	4	100



ITEM	QTY.	P/N	DESCRIPTION
1	4	1040-A	SCREW, SOCKET HEAD CAP, 3/8 - 16, 3/4, STEEL, GR08
2	1	BUDT23X21000-01	ADAPTER, DOVETAIL, 23 X 21
3	2	DTI1602	DIE, DOVETAIL, 1.25W, .5T, 5L, STRAIGHT TOOTH

Illustration 7.42: Dovetail Die Adapter Assembly



ITEM	QTY.	P/N	DESCRIPTION
1	1	BUCS23024	ASSEMBLY, ROD
2	1	BUCS23022	CYLINDER
3	1	BUCDP9604	PISTON
4	1	BUCDP9635	GLAND
5	1	BUCS23033-02	JAW, CYLINDER
6	1	BUCS23019-01	WEDGE, DOOR, OUTSISDE
7	1	BUCS23017-01	WEDGE, DOOR
8	12	246	SCREW, SOCKET HEAD, 1/2-13, 1, ASTM A574
9	4	1303	SCREW, CAP, SOCKET HEAD, 3/4-10 X 3 1/2, ASTM A574
10	8	1320	SCREW, CAP, SOCKET HEAD, 3/4-10 X 3, ASTM A574
11	4	BUCS2309	CLIP
12	1	25004250	POLYPACK 1/4" CROSS SECTION 4 1/4 X 4 3/4 X 1/4
13	1	H6000	SEAL, WIPER, ROD
14	1	W2-6250-0750	WEARBAND
15	2	50008000	SEAL, POLYPACK, 9, 8, 1/2
16	1	37508250	POLYPACK 3/8" CROSS SECTION 8 1/4 X 9 X 3/8
17	1	37506000	SEAL, POLYPACK, 6 3/4, 6, 3/8
18	4	1332	SCREW, CAP, SOCKET HEAD, 3/4-10 X 2, ASTM A574

Illustration 7.43: Lockjaw Backup Clamp Cylinder Assembly

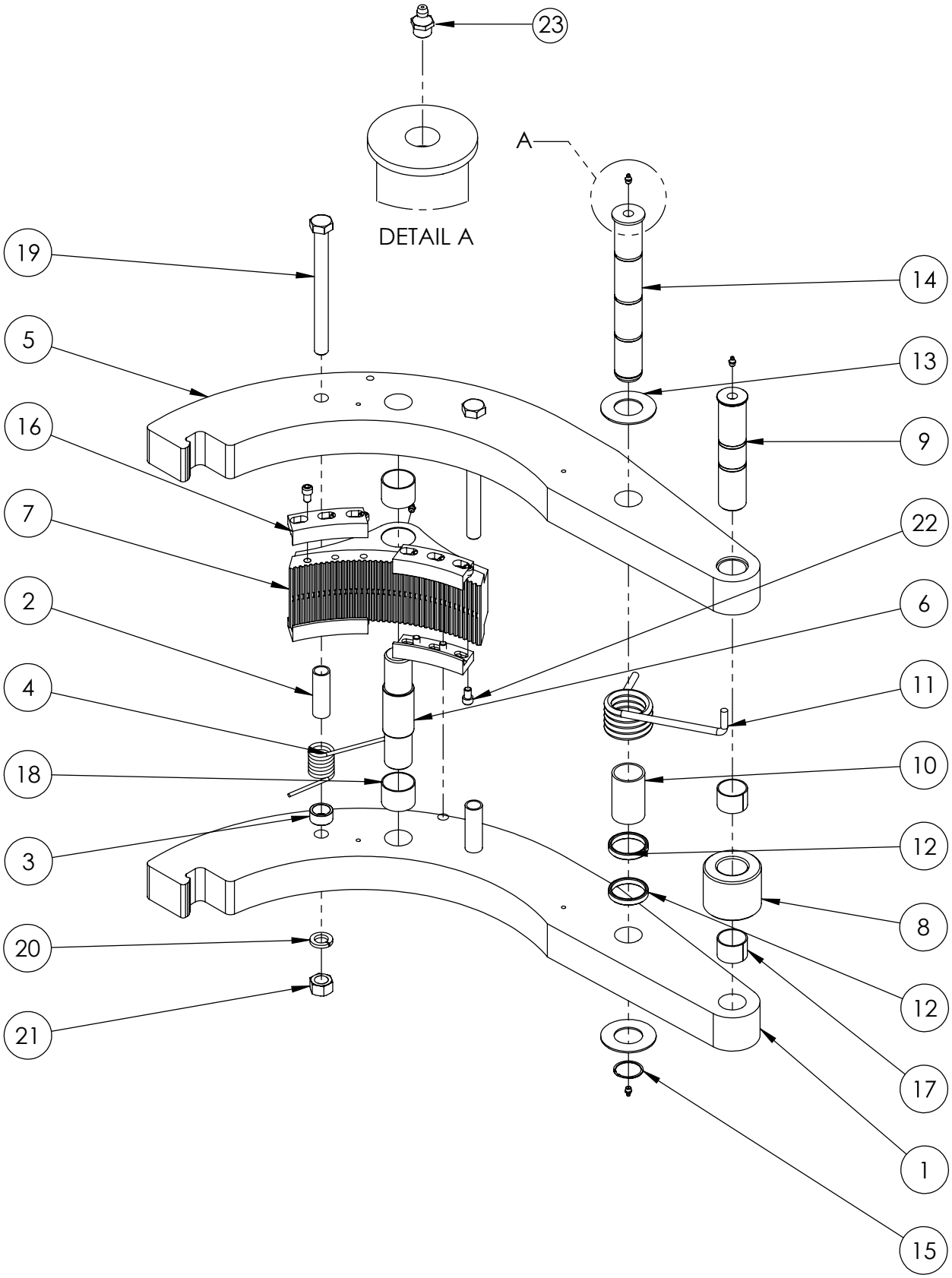


Illustration 7.44: Outside Backup Door Assembly Exploded

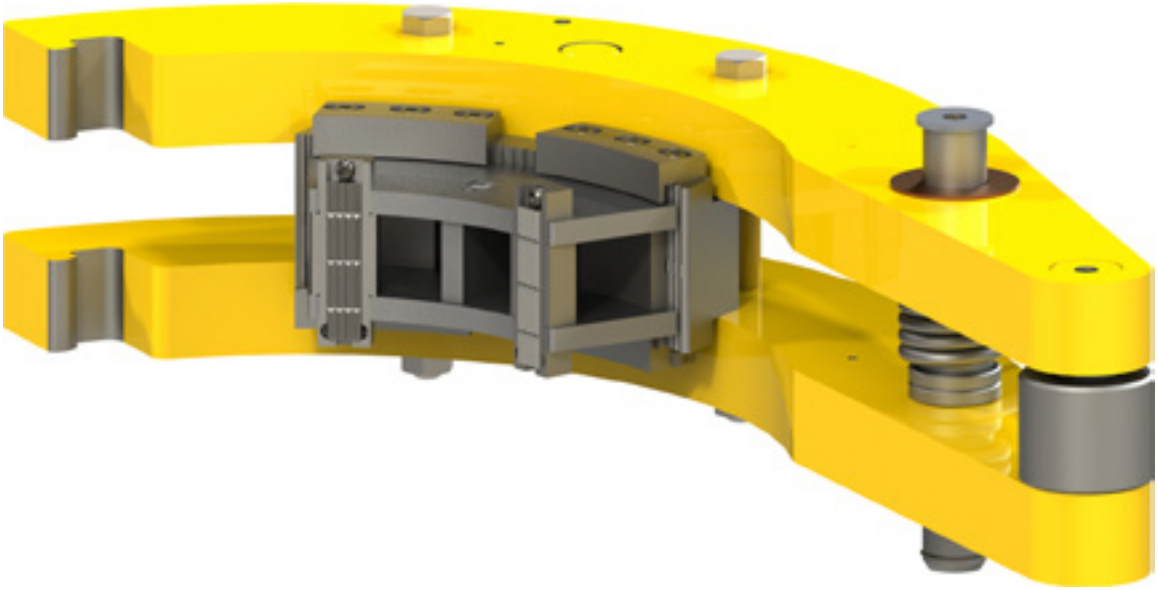


Illustration 7.45: Outside Backup Door Assembly

Item	Type	Description	Qty	Part Number
1	Part	Bottom door plate	1	BUCS2306-07
2	Part	Door spacer	2	BUCS2138
3	Part	Spring spacer	1	BUCDP2154
4	Part	Torsion spring	1	1002671
5	Part	Top door plate	1	BUCS2305-07
6	Part	Jaw pin	1	BUCS23026
7	Part	Door-mounted jaw	1	BUCS23020
8	Part	Door roller	1	BUCS2112
9	Part	Door roller pin	1	BUCS2133-04
10	Part	Spacer tube	1	BUCS21021
11	Part	Torsion spring	1	BUCS2111
12	Part	Spring spacer	2	BUCS21023
13	Part	Pivot pin spacer	2	BUCST7615
14	Part	Pivot pin	1	BUCS23027
15	Part	Retaining ring	1	BUCS2193
16	Part	Jaw die retainer	4	BUCS2309
17	Part	Bearing	2	32DU24
18	Part	Bushing	2	36DU28
19	Part	1” UNC x 8” heavy hex bolt	2	1346
20	Part	1” lock washer	2	1218
21	Part	1” UNC heavy hex nut	2	1210
22	Part	½” UNC x ¾” hex socket head cap screw	12	245
23	Part	⅛” NPT grease fitting	4	1001

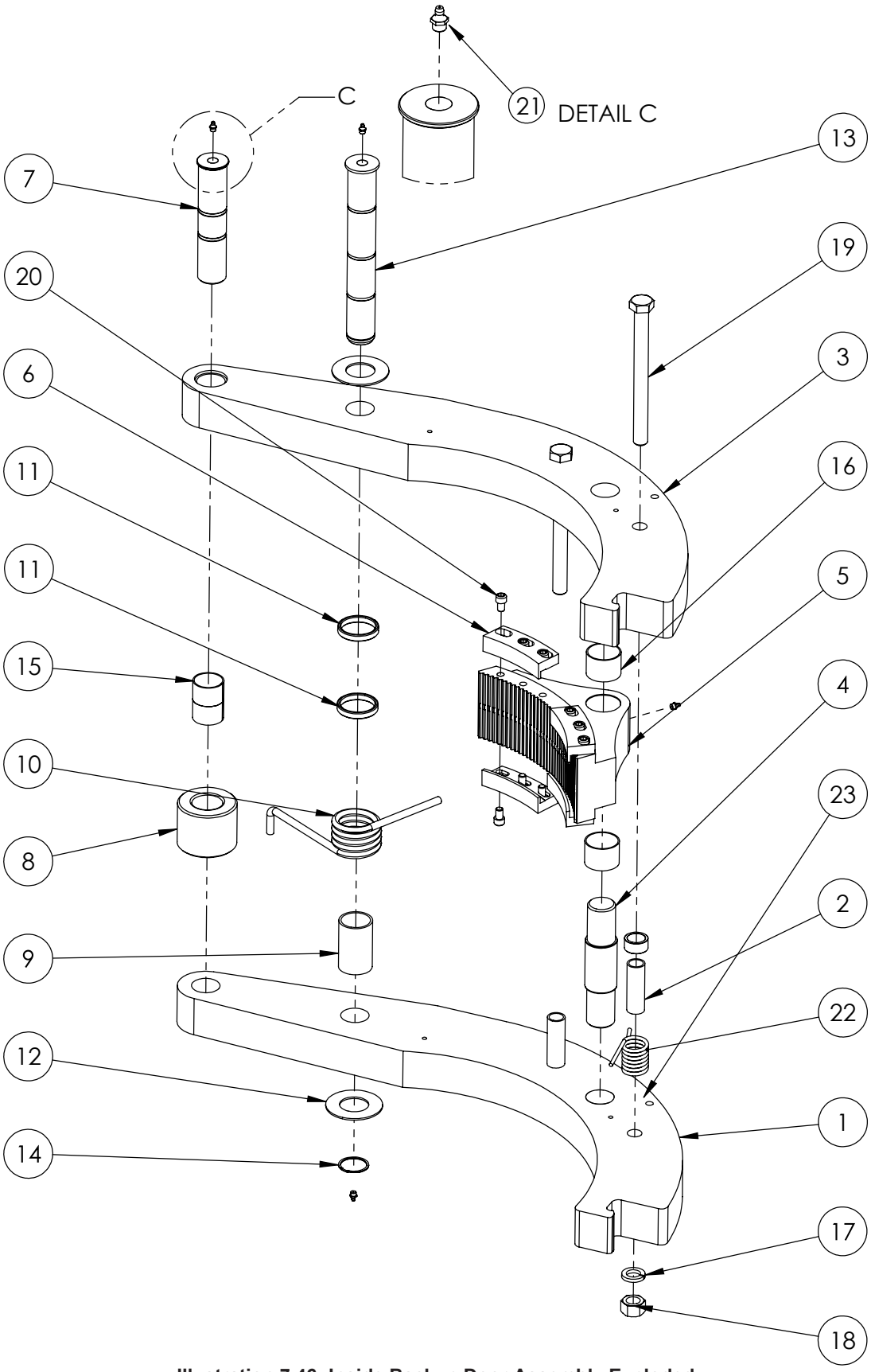


Illustration 7.46: Inside Backup Door Assembly Exploded

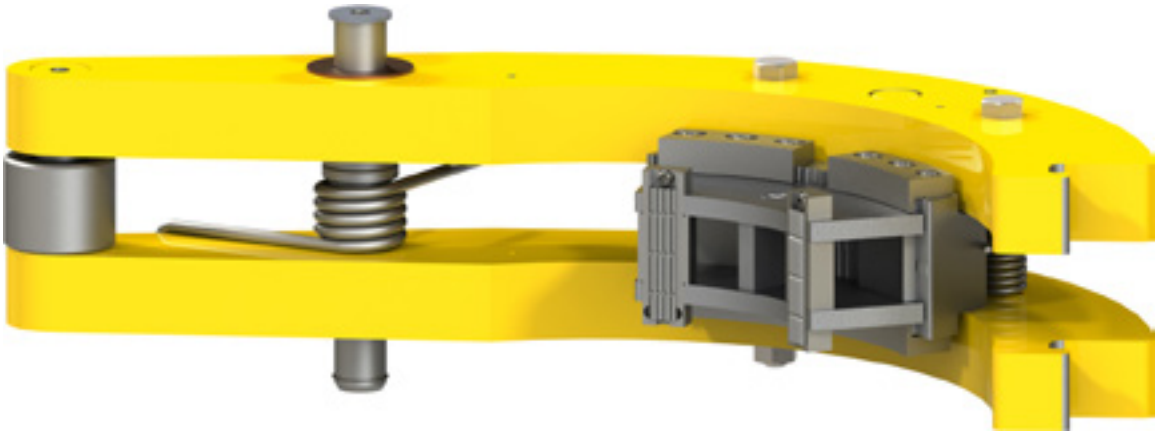


Illustration 7.47: Inside Backup Door Assembly

Item	Type	Description	Qty	Part Number
1	Part	Bottom door plate	1	BUCS2304-07
2	Part	Door spacer	2	BUCS2138
3	Part	Top door plate	1	BUCS2303-07
4	Part	Jaw pin	1	BUCS23026
5	Part	Door-mounted jaw	1	BUCS23020
6	Part	Jaw die retainer	4	BUCS2309
7	Part	Door roller pin	1	BUCS2133-04
8	Part	Door roller	1	BUCS2112
9	Part	Spacer tube	1	BUCS21021
10	Part	Torsion spring	1	BUCS2111
11	Part	Spring spacer	2	BUCS21023
12	Part	Pivot pin spacer	2	BUCST7615
13	Part	Pivot pin	1	BUCS23027
14	Part	Retaining ring	1	BUCS2193
15	Part	Bearing	2	32DU24
16	Part	Bushing	2	36DU28
17	Part	1” lock washer	2	1218
18	Part	1” UNC heavy hex nut	2	1210
19	Part	1” UNC x 8” heavy hex bolt	2	1346
20	Part	½” UNC x ¾” hex socket head cap screw	12	245
21	Part	⅛” NPT grease fitting	4	1001
22	Part	Torsion spring	1	1002671
23	Part	Spring spacer	1	BUCDP2154

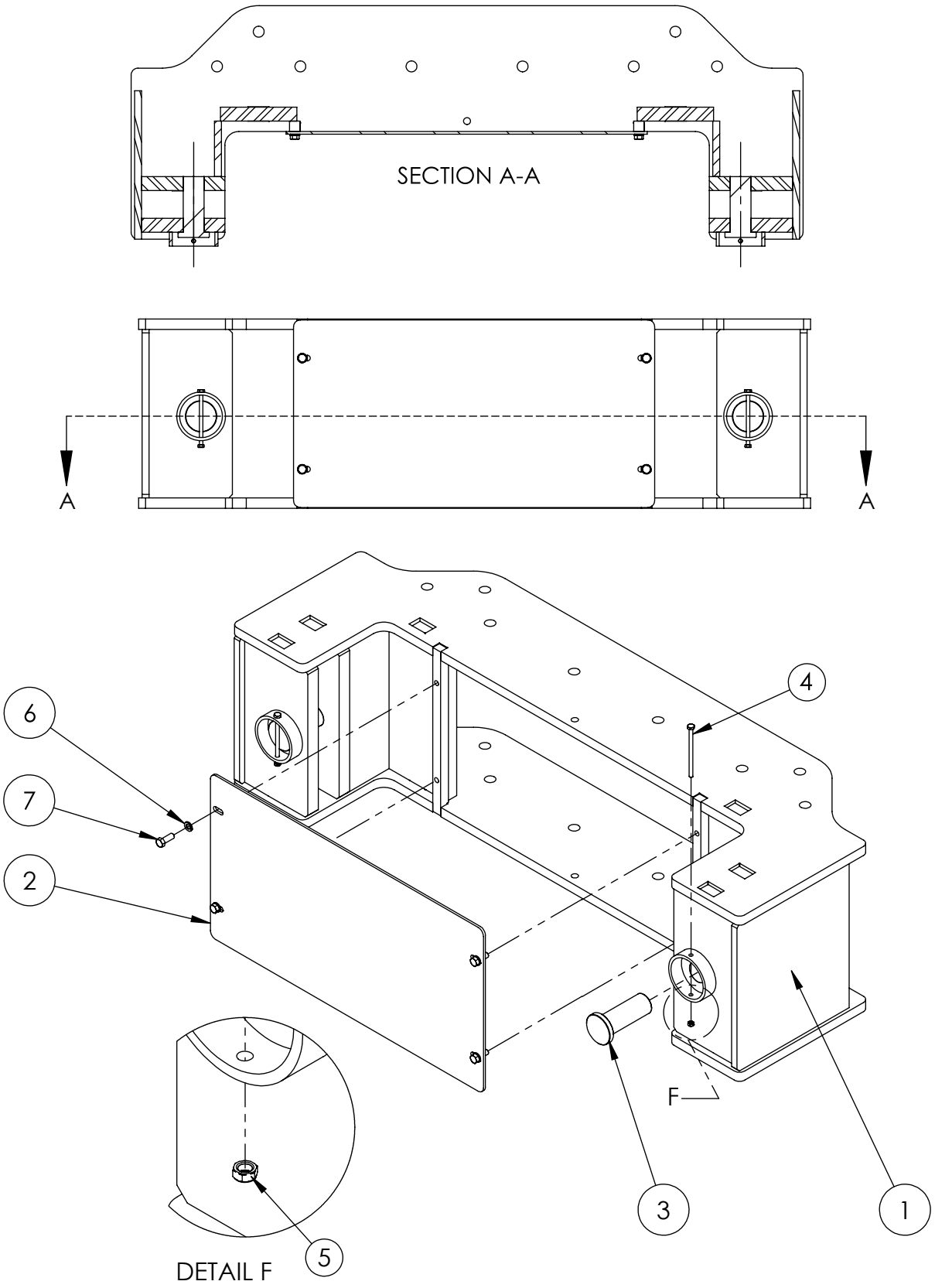


Illustration 7.48: Backup Fishtail Assembly Exploded

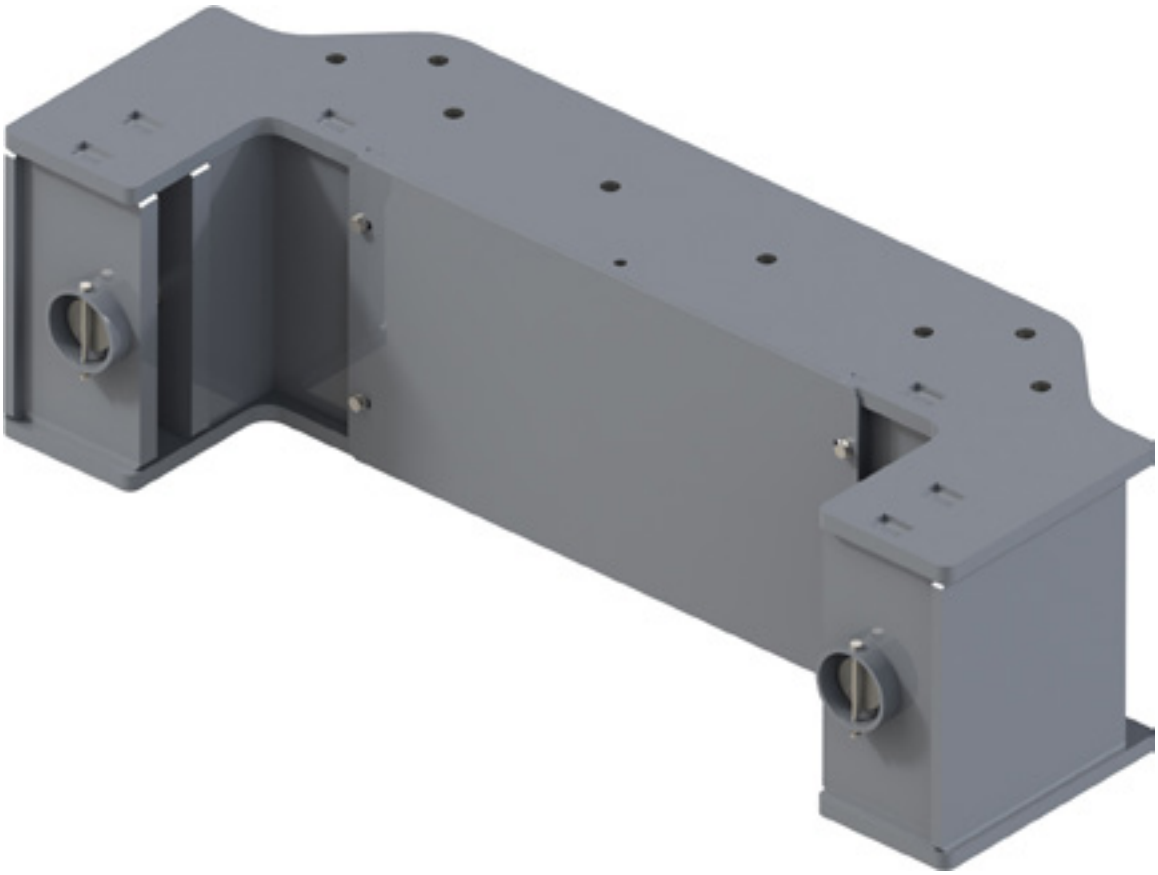


Illustration 7.49: Backup Fishtail Assembly

Item	Type	Description	Qty	Part Number
1	Weldment	Fishtail weldment	1	BUCST23003
2	Part	Cover plate	1	BUCST23008
3	Part	Hanger pin	2	RH21003
4	Part	¼” UNC x 4” hex bolt	2	115
5	Part	¼” UNC nylock nut	2	212
6	Part	⅜” lock washer	4	1027
7	Part	⅜” UNC x 1” hex bolt	4	1047

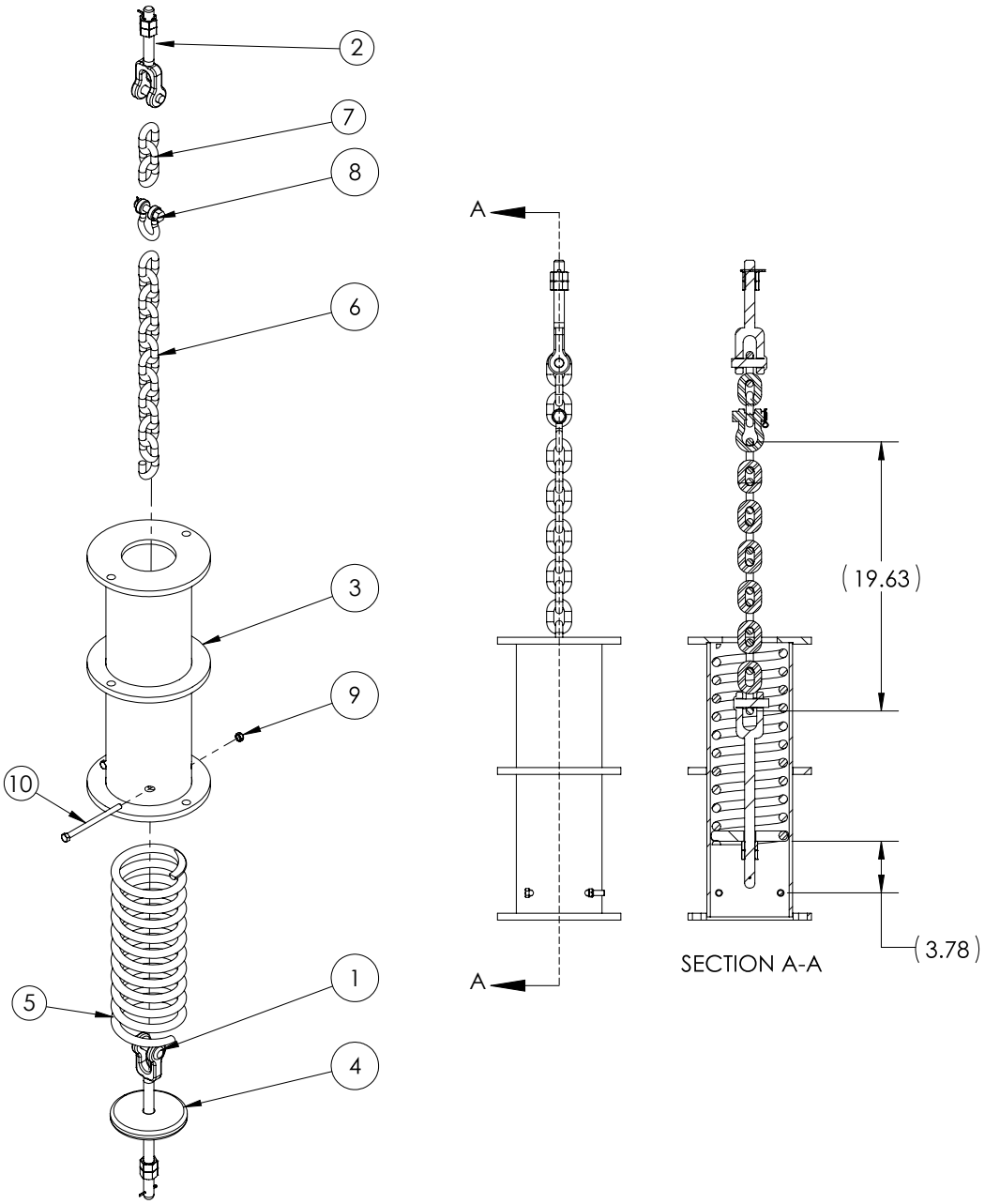


Illustration 7.50: Front Spring Assembly Exploded

Item	Type	Description	Qty	Part Number
1	Assembly	Threaded clevis assembly	1	BUCST1547
2	Assembly	Threaded clevis assembly	1	BUCST1554
3	Weldment	Spring housing weldment	1	BUCST23009
4	Part	Spring plunger cap	1	BUCST23010
5	Part	Compression spring	1	SMH1501-BB
6	Part	½" x 13" chain	1	BUCST23014
7	Part	½" chain	1	BUCST23013
8	Part	7/16" shackle	1	40027-S4
9	Part	⅜" UNC nylock nut	2	213
10	Part	⅜" UNC x 5-½" hex bolt	2	1053

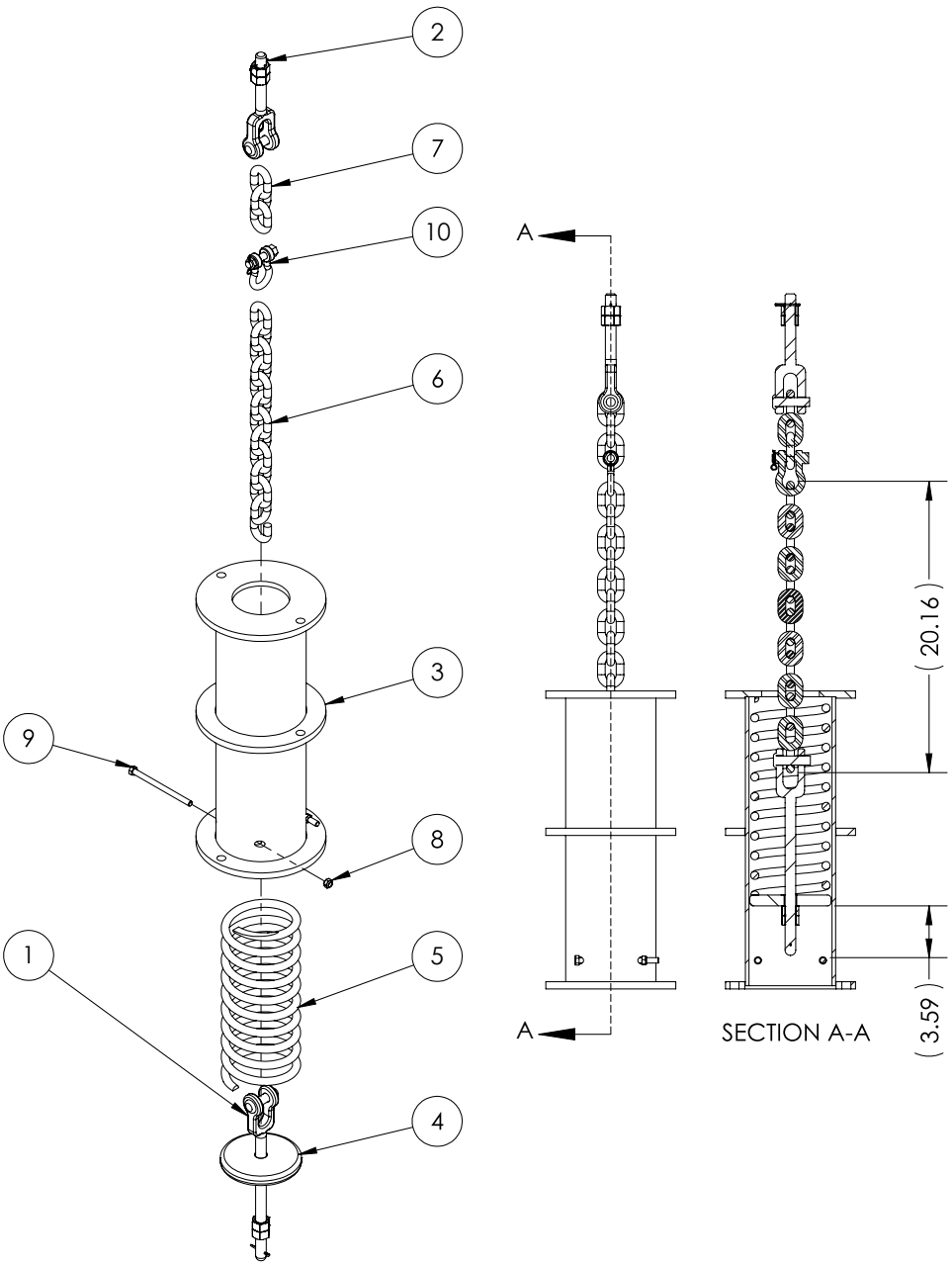
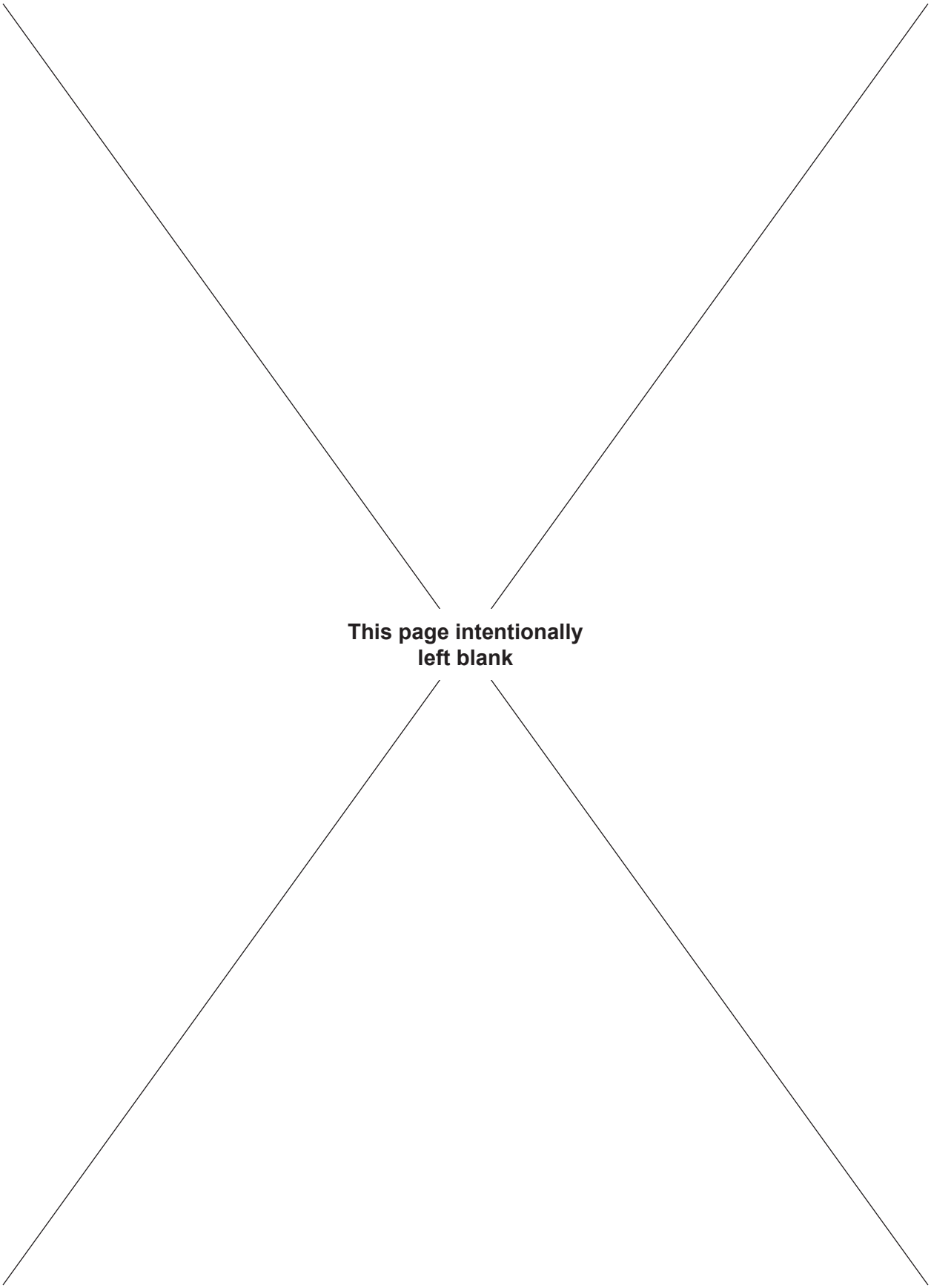


Illustration 7.51: Rear Spring Assembly Exploded

Item	Type	Description	Qty	Part Number
1	Assembly	Threaded clevis assembly	1	BUCST1547
2	Assembly	Threaded clevis assembly	1	BUCST1554
3	Weldment	Spring housing weldment	1	BUCST23009
4	Part	Spring plunger cap	1	BUCST23010
5	Part	Compression spring	1	SMH1501-CC
6	Part	½" x 13" chain	1	BUCST23014
7	Part	½" chain	1	BUCST23013
8	Part	⅜" UNC nylock nut	2	213
9	Part	⅜" UNC x 5-½" hex bolt	2	1053
10	Part	7/16" shackle	1	40027-S4



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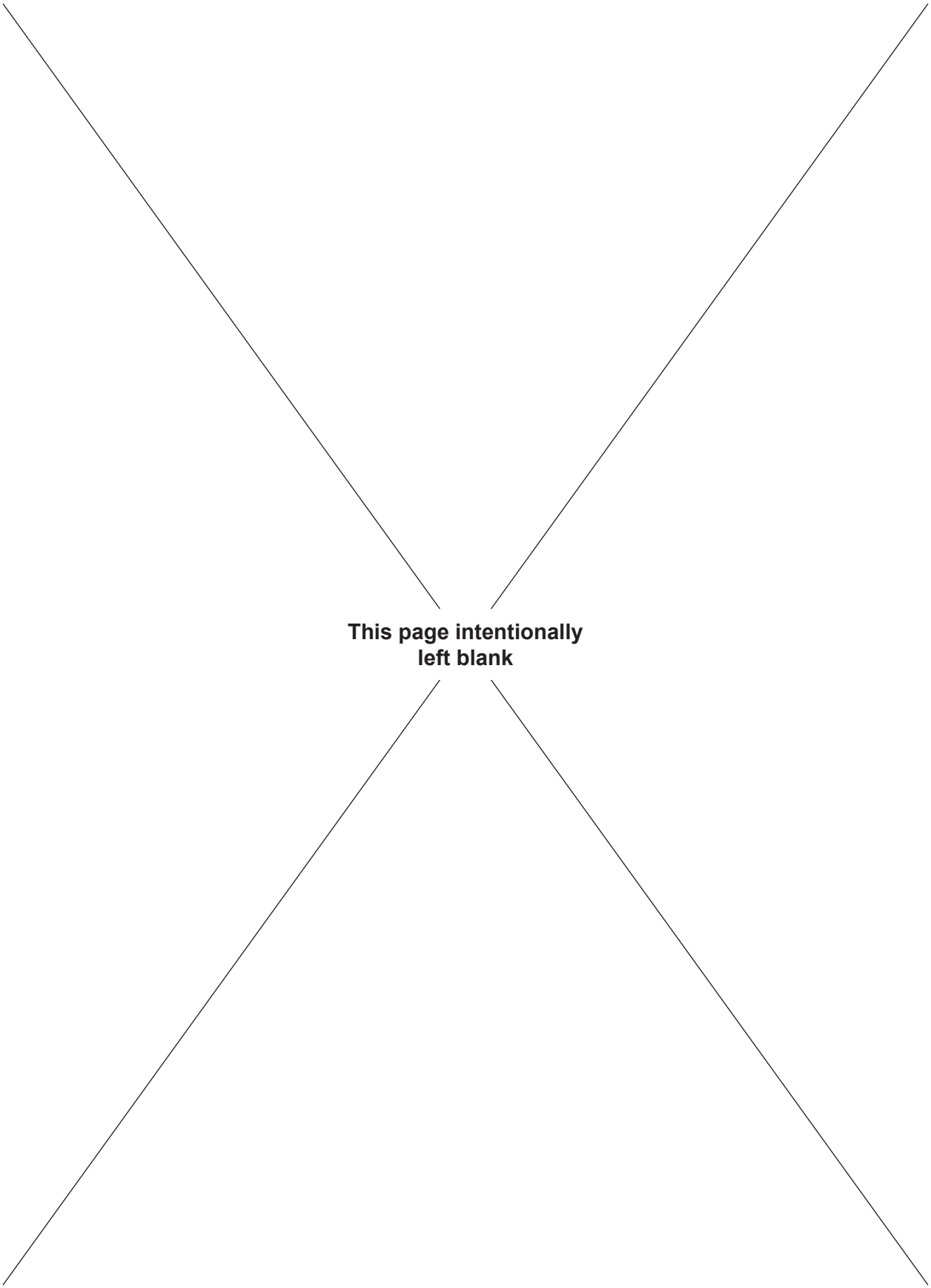
SECTION 8: TORQUE/TURNS MANAGEMENT



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8.0 BASIC TORQUE MEASUREMENT

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

Tension style and compression style load cells are available. Stand-alone tongs only use tension load cells, which are 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. Tong and backup assemblies use either tension load cells or compression load cells. Tension load cells in a tong/backup arrangement are coupled between a stationary leg or frame and the rear of the backup using load-rated shackles. A compression load cell is mounted on the rear of the backup in direct contact with a stationary rear leg or frame. In all installation configurations the load cell must be located in the centre of, and 90° to the force vector generated between the backup and the stationary leg or frame, or between the load cell and the point of restraint.

Hydraulic force generated by a load cell is transmitted to the torque gauge via a reinforced flexible hydraulic line. The gauge displays hydraulic force as torque in units of Ft.-Lbs. Use the red “peak torque” indicator to aid the operator when manually torquing joints. Set the red indicator at the desired maximum torque number, and cease rotation of the tong when the torque gauge indicator reaches the preset. 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. Assure correct torque measurement by ensuring the arm length or “handle” displayed on your torque gauge matches the arm length of the equipment in service as listed in the specifications section of the technical manual. Inaccurately calibrated or uncalibrated torque gauges may not display correct torque.

NOTICE

FOR CORRECT TORQUE MEASUREMENT THE TORQUE HANDLE INDICATED ON THE TORQUE GAUGE MUST MATCH THE TORQUE HANDLE FOR THE EQUIPMENT IN USE AS LISTED IN THE SPECIFICATIONS SECTION

Illustration 8.0.1: Torque Gauge (For Illustration Purposes Only)

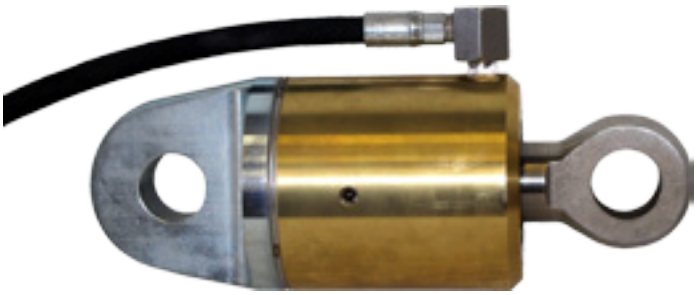


Illustration 8.0.2: Tension Load Cell

These images 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 on the next page are correct for accurate torque measurement while using the equipment for which this manual is supplied.

NOTICE

THE IMAGES DISPLAYED ARE SUPPLIED FOR ILLUSTRATION PURPOSES ONLY

8.0 BASIC TORQUE MEASUREMENT (CONTINUED):

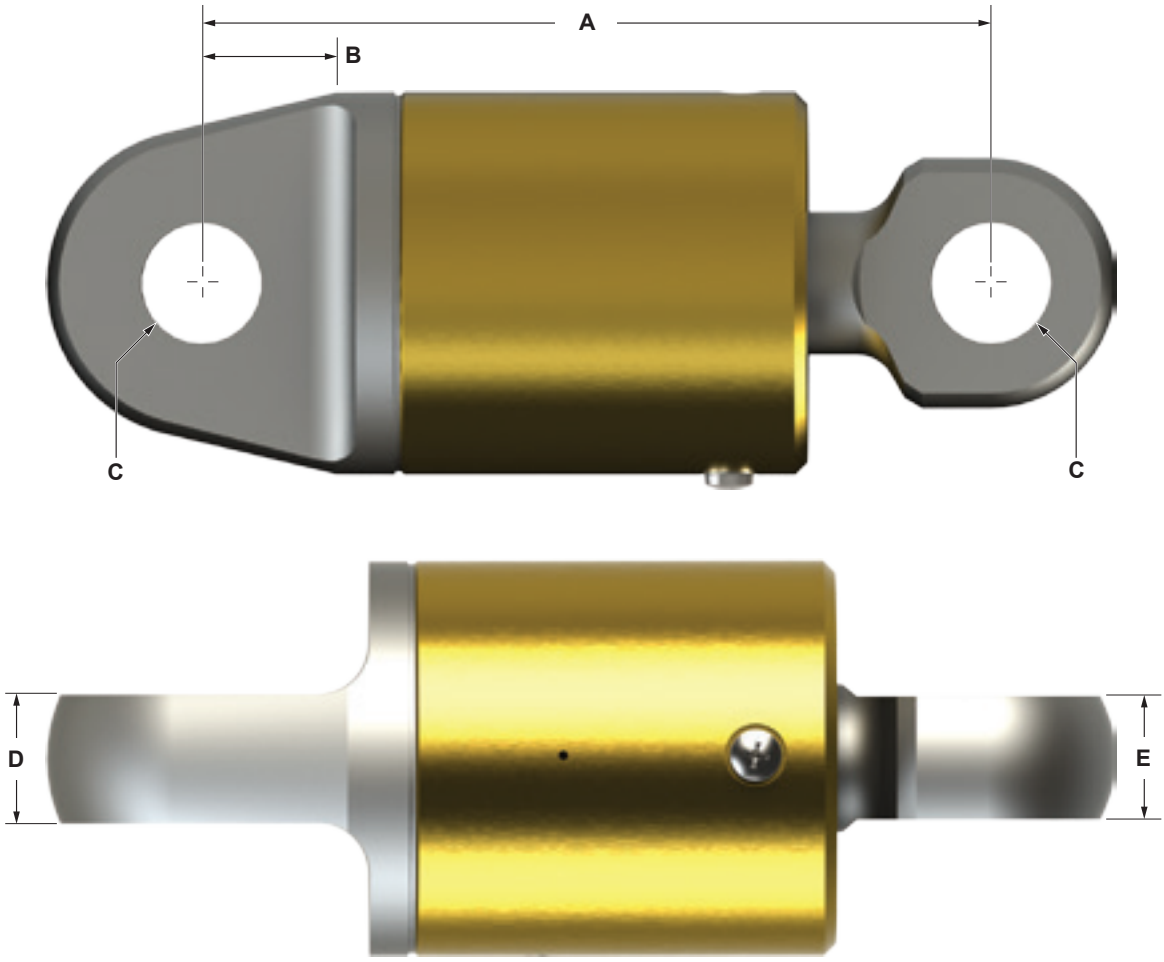
NOTICE

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

Item	Type	Description	Qty	Part Number
1	Assembly	54” arm - 150K torque gauge / tension load cell assembly	1	SM150-54-T
2	Part	Break-out bar	1	BUCST15009
3	Part	1-½” x 4” load cell anchor pin	4	RH21003

NOTICE

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



A = 12” (304.8 mm)
B = 2.56” (65 mm) min.
C = Ø 1.692” (42.98 mm)
D = 1.75” (44.5 mm)
E = 2” (50.8 mm)

Illustration 8.0.3: Tension Load Cell Dimensions

8.1 TURNS COUNTER ENCODER

McCoy Global uses a rotary encoder in conjunction with a torque/turns management computer to measure the number of revolutions of a hydraulic power tong. The electronic encoder emits a preset number of pulses per rotation depending on the encoder selected.

A computer with appropriate software is used to decode the pulses to accurately measure and display the power tong rotation. For programming purposes, see the specifications in Section 2 to determine the encoder/ring gear ratio for your specific application.

The encoder on this equipment uses a mount to adapt the encoder to the flat surface of a bearing cap on the bottom side of the tong. The encoder is directly driven from the end of a gear shaft.

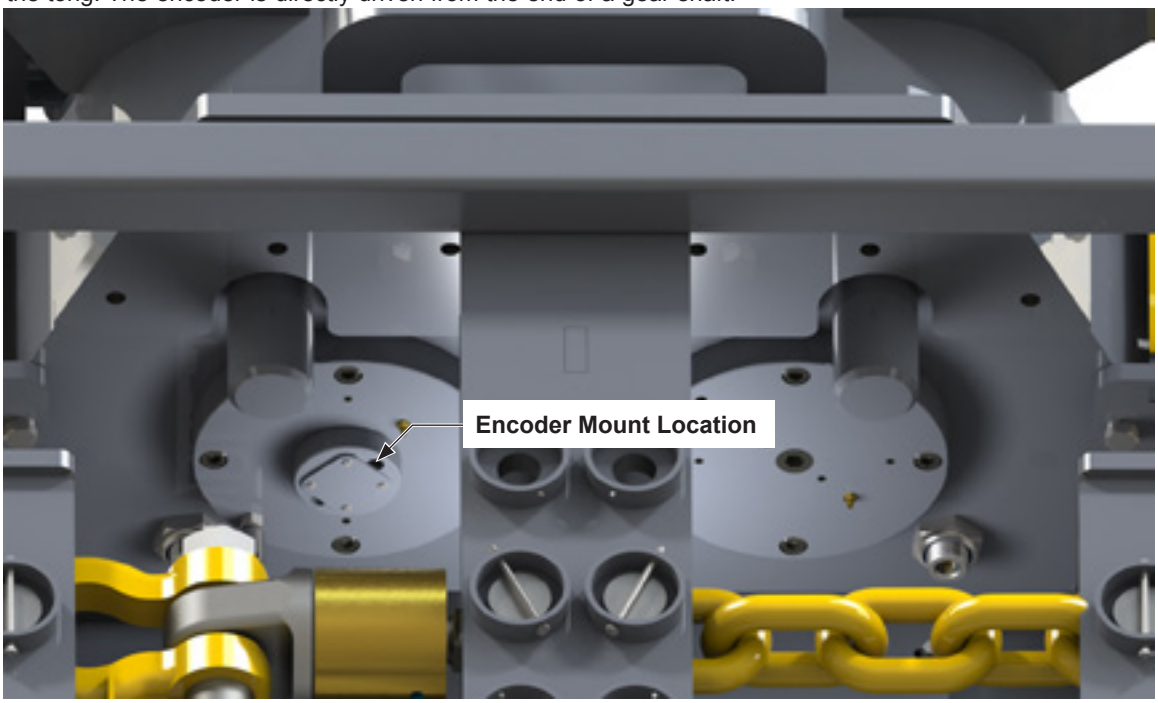


Illustration 8.1.1: Encoder Mounting Locations

McCoy provides two similar types of mounts for shaft-driven encoders: type one, using encoder mounting plate mount 51075, and type two, using encoder mounting plate 101-6878. Although these two shaft-driven encoder mounts appear similar, there are some differences. See pages 8.6 and 8.7 to determine the specific type of shaft-driven encoder with which your tong is equipped.

McCoy offers a wide selection of encoders. See the following table for a list of encoders available for your equipment.

Available Encoders:

Description	Part Number
50-count per revolution encoder	60-0070
100-count per revolution encoder	60-0068
200-count per revolution encoder	60-0072
500-count per revolution encoder	60-0068-500
50-count per revolution encoder (explosion-proof)	60-0071
100-count per revolution encoder (explosion-proof)	60-0074
200-count per revolution encoder (explosion-proof)	60-0073

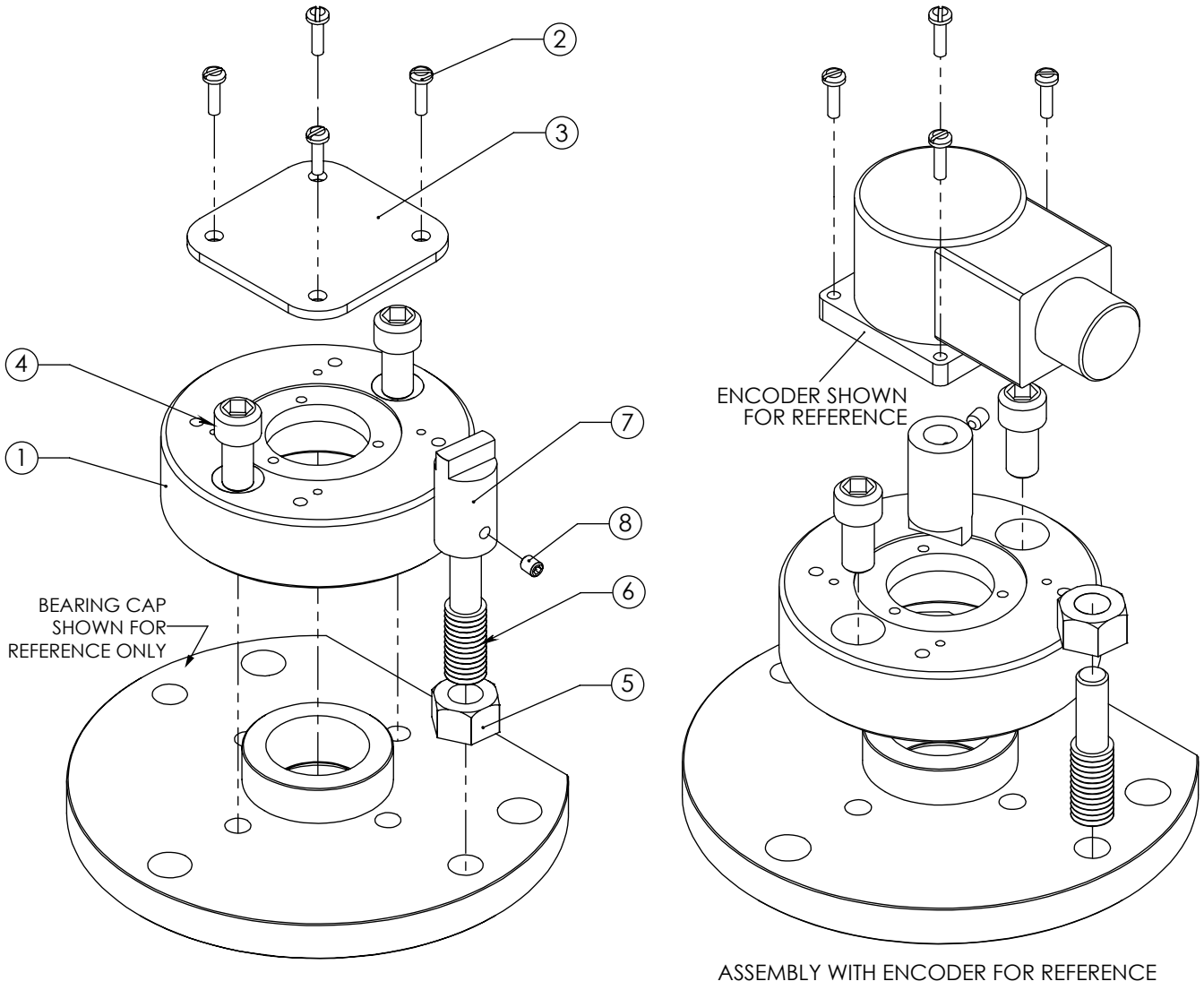


Illustration 8.1.2: Shaft-Drive Turn Counter Encoder Mount (Type 1, Assembly 55142)

Item	Type	Description	Qty	Part Number
1	Part	Encoder mounting plate	1	51075
2	Part	#6-32 x ⅜" machine screw	4	1276-B
3	Part	Cover plate	1	40034
4	Part	⅜" UNC x ¾" hex socket head cap screw	2	1040-A
5	Part	½" UNC hex nut	1	1101
6	Part	Encoder coupling mount	1	51031
7	Part	Encoder coupling	1	55144
8	Part	#10-32 x ¼" hex socket head set screw	1	1034

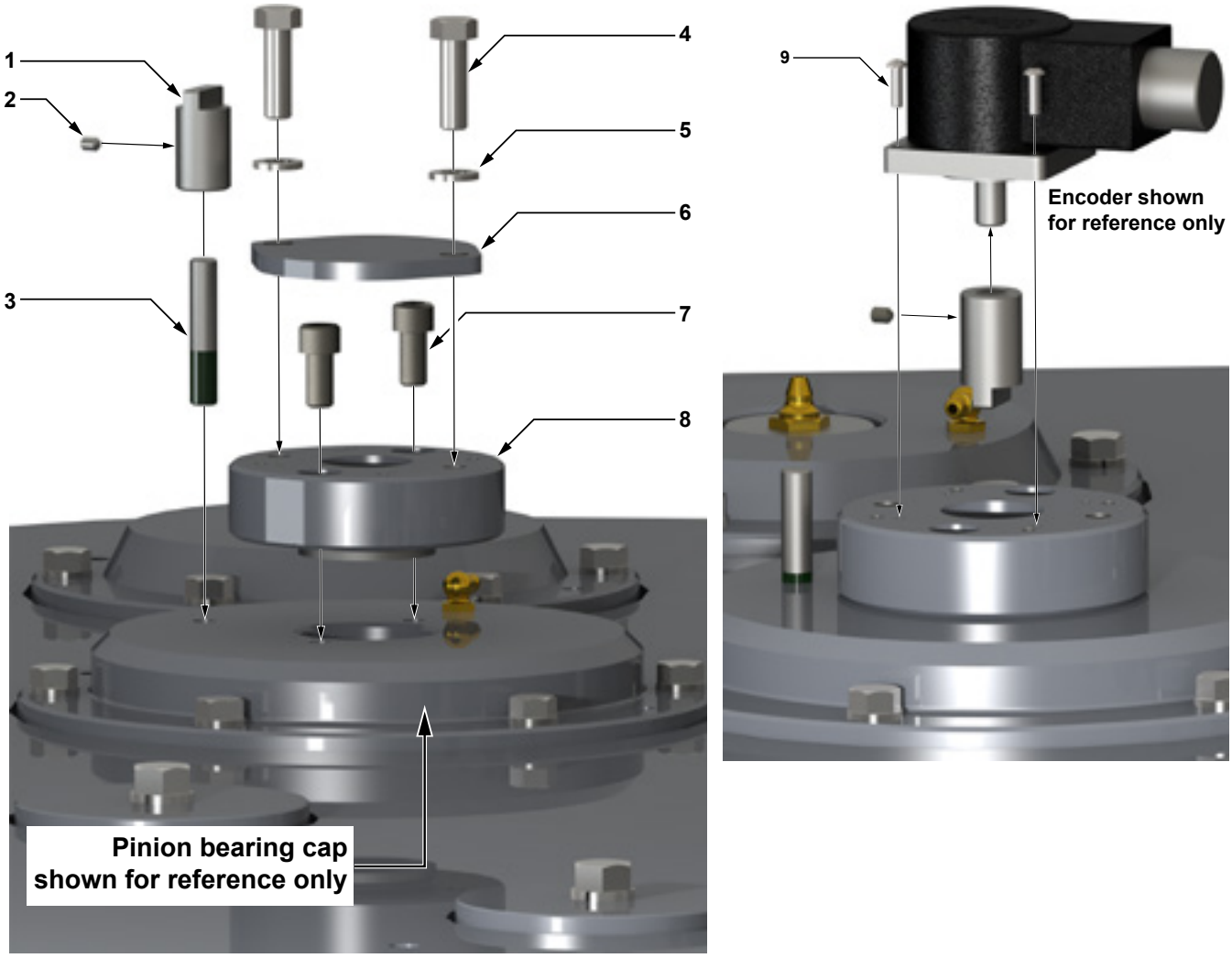


Illustration 8.1.3: Shaft-Drive Turn Counter Encoder Mount (Type 2)

Item	Type	Description	Qty	Part Number
1	Part	Encoder coupling	1	101-7258
2	Part	#10-32 x ¼" hex socket head set screw	1	09-0319
3	Part	Threaded stud	1	02-E0292
4	Part	⅜" UNC x 1-¼" hex bolt	2	09-1048
5	Part	⅜" lock washer	2	09-5106
6	Part	Cover plate	1	101-6877
7	Part	⅜" UNC x ¾" hex socket head cap screw	2	09-2044
8	Part	Encoder mounting plate	1	101-6878
9	Part	#6-32 x ½" machine screw	4	09-0338

8.1.1 Driven Encoders (Continued):

Shaft-Driven Encoder Mounts

1. Remove the encoder coupling from its mount beside the mounting location, rotate it 180°, and install on to the encoder shaft. Align the #10-32 x ¼" hex socket head set screw with the flat on the encoder shaft before tightening.

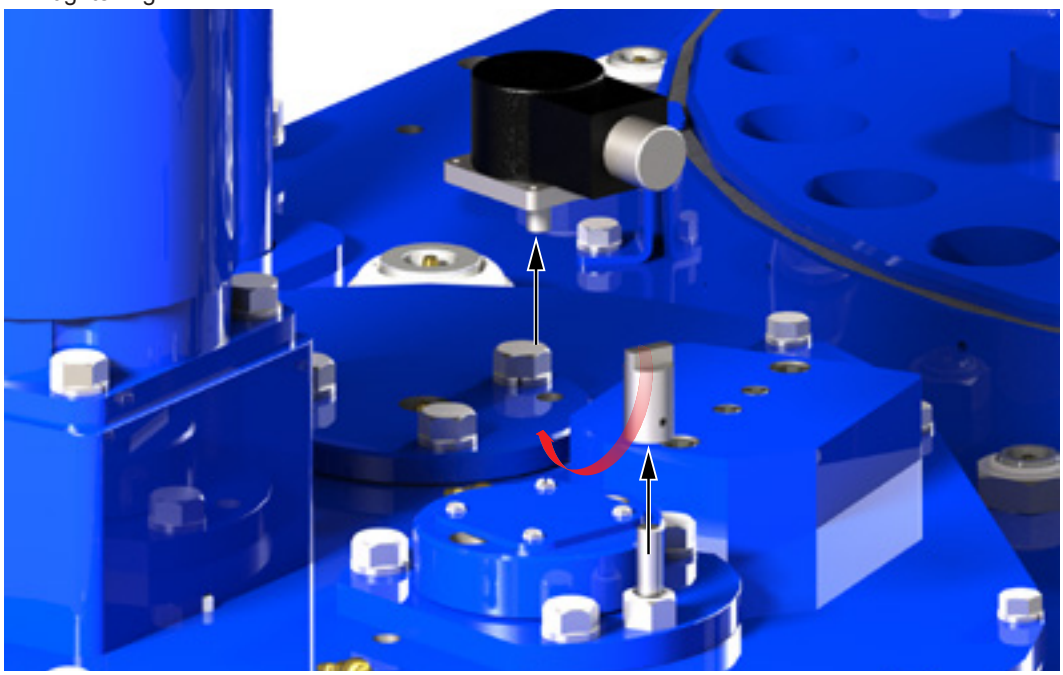


Illustration 8.1.4: Securing Encoder To Encoder Mount

2. Scribe or cut the paint seam between the cover plate and the encoder mount, which is typically pre-mounted to the bearing cap. Prying the cover plate from the top plate without scribing or cutting the paint seam risks flaking paint from the encoder mount, exposing the metal to air and introducing rust and corrosion.
3. If necessary remove the 1" UNC plug from the bearing cap, exposing the end of the gear shaft with the drive slot. The encoder mount may require temporary removal in order to accomplish this task.

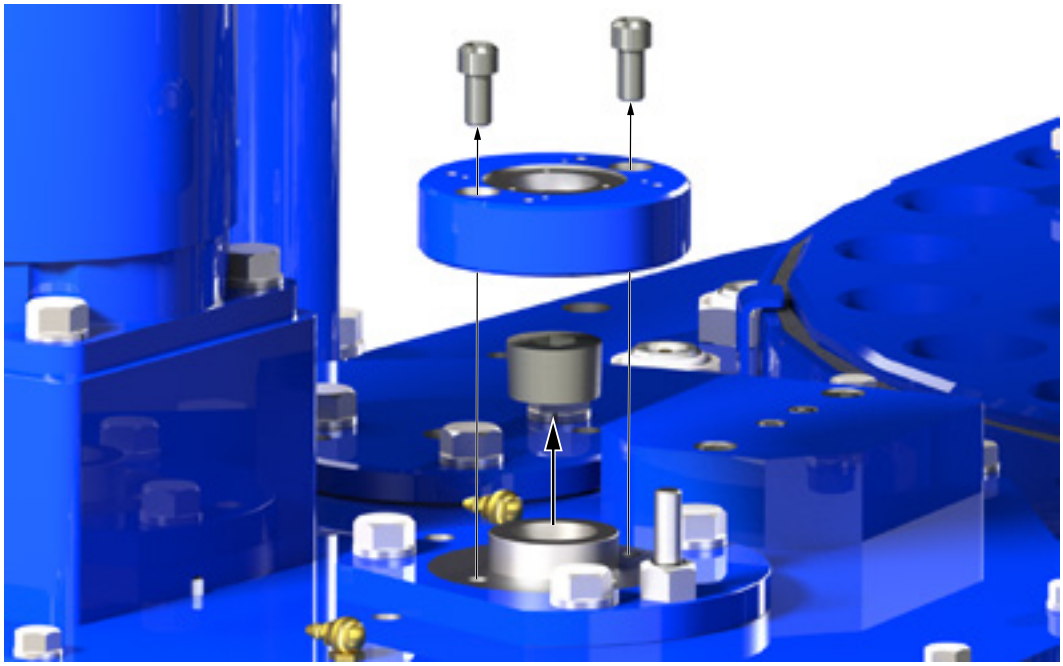


Illustration 8.1.5: Preparing Encoder Mount

8.1.1 Driven Encoders (Continued):

4. If required re-install the encoder mount on to the bearing cap using two ⅜" UNC x ¾" hex socket head cap screws.
5. Mount the encoder to the mounting plate using four #6-32 x ½" machine screws, ensuring the tab on the coupling is correctly mated with the slot at the top of the gear shaft.

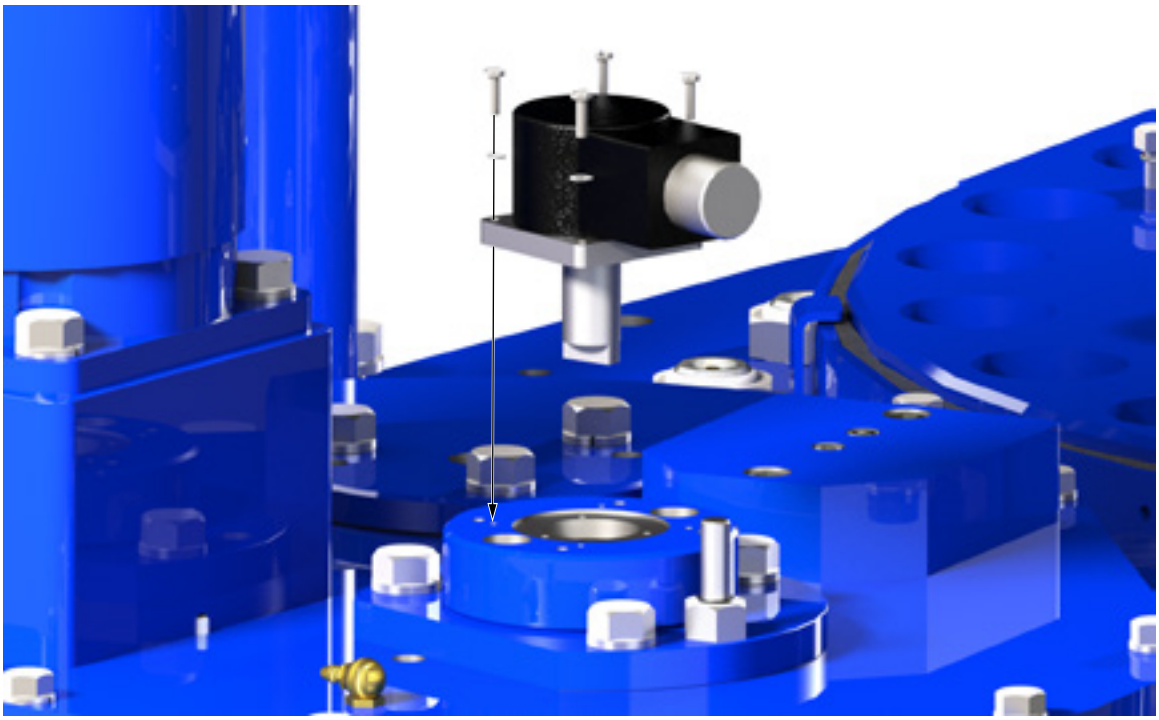


Illustration 8.1.6: Shaft-Drive Encoder Installation

8.2 TROUBLESHOOTING

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

NOTICE

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

1	SYMPTOM: NO INDICATION ON TORQUE GAUGE	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Hydraulic hose is obstructed	Check hydraulic hose for kinks
		Replace hydraulic hose
	Loss of hydraulic fluid	Recharge hydraulic fluid (see Section 8). NOTE: Ensure any breaches in the hydraulic system between the load cell and torque gauge are repaired to prevent further fluid loss.
	Internal mechanism of torque gauge is damaged	Replace gauge

2	SYMPTOM: GAUGE INDICATION UNEXPECTEDLY HIGH	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Excessive hydraulic fluid	Completely drain hydraulic fluid from torque gauge/load cell system. Recharge following the procedure in Section 8
	Internal mechanism of gauge is damaged	Replace gauge
	Incorrect torque gauge in use (not part of the original torque gauge/load cell pair)	Replace gauge with gauge properly calibrated for the load cell in service

3	SYMPTOM: GAUGE INDICATION UNEXPECTEDLY LOW	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Insufficient hydraulic fluid	Recharge hydraulic fluid (see Section 8). NOTE: Ensure any breaches in the hydraulic system between the load cell and torque gauge are repaired to prevent further fluid loss
	Obstruction in hydraulic hose	Check hydraulic hose for kinks
		Replace hydraulic hose
	Snub line not at right-angle to tong handle	Check angle of snub line and correct if necessary
	Internal mechanism of gauge is damaged	Replace gauge
	Incorrect torque gauge in use (not part of the original torque gauge/load cell pair)	Replace gauge with gauge properly calibrated for the load cell in service

4	SYMPTOM: GAUGE INDICATION IS ERRATIC OR SLUGGISH	
	POSSIBLE PROBLEM	**SOLUTION(S)**
	Insufficient hydraulic fluid in torque measurement section	Recharge hydraulic fluid (see Section 8). NOTE: Ensure any breaches in the hydraulic system between the load cell and torque gauge are repaired to prevent further fluid loss
	Loss of damping fluid in torque gauge	Top up or refill damping fluid (NOTE: Ensure leakage points in gauge are identified and repaired to prevent further loss of damping fluid)
	Air bubbles in hydraulic fluid in the torque measurement system	Bleed air from load cell and torque gauge and top up fluid (if necessary) as per Section 8
	Internal mechanism of gauge is damaged	Replace gauge

8.3 PERIODIC INSPECTION AND MAINTENANCE

NOTICE

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

8.3.1 Inspection

The torque measurement system supplied with your equipment is designed and built to provide years of trouble-free service with minimum maintenance. Periodic inspections of the load cell, hydraulic lines and fittings are recommended in order to keep the system in top operating condition. A thorough inspection should be made at each rig-up.

8.3.2 Fluid Recharge

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

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

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

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

⚠ CAUTION

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

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

NOTICE

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

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

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

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

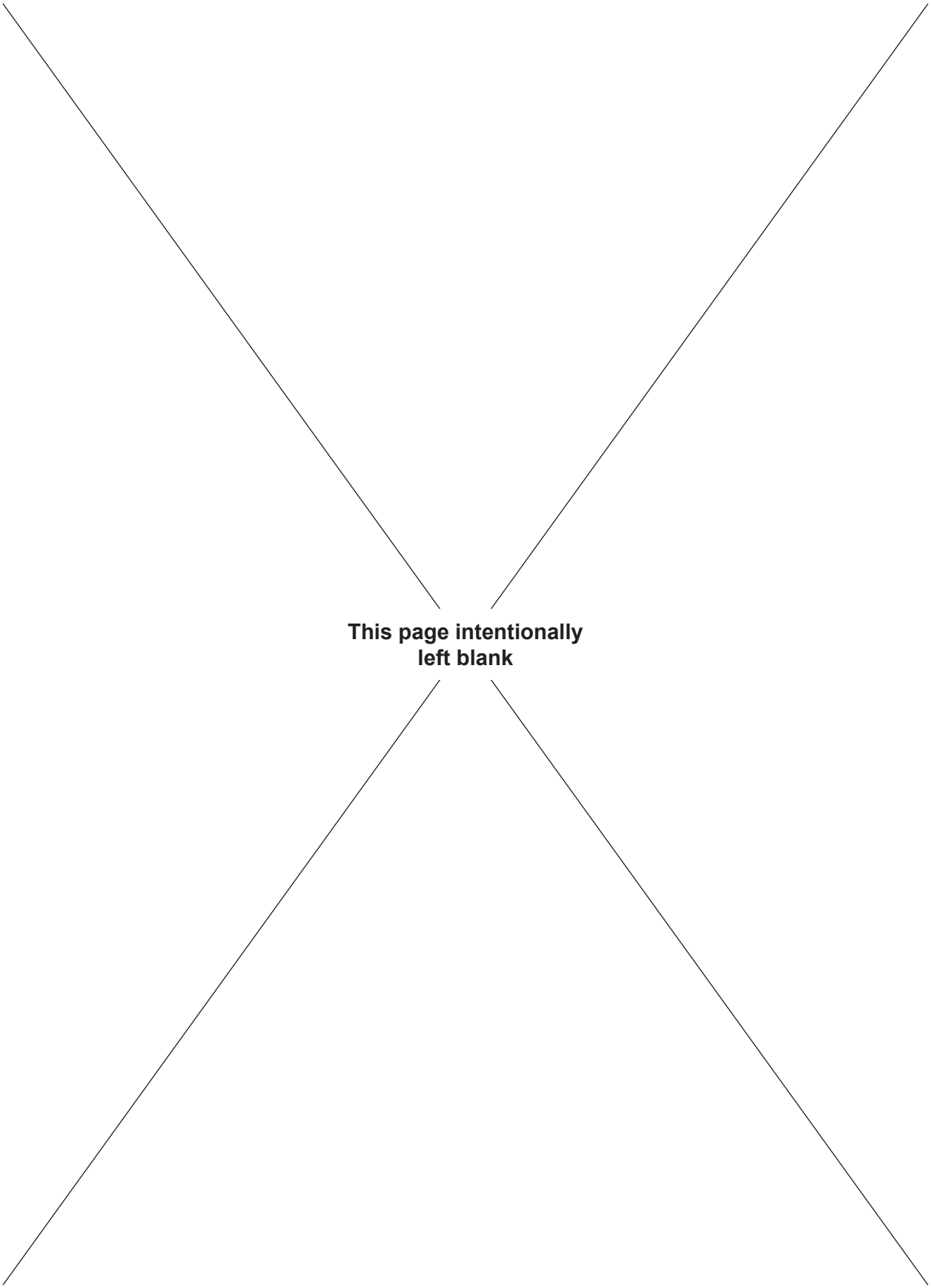
h. Remove load cell from containment vessel and wipe clean. Reclaim the hydraulic fluid (if it is clean) or dispose of all waste materials according to governmental or your company’s proscribed environmental protection regulations.

i. Disconnect the hand pump from the torque gauge.

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

8.3.3 Repair And Calibration

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



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SECTION 9: OEM DOCUMENTATION

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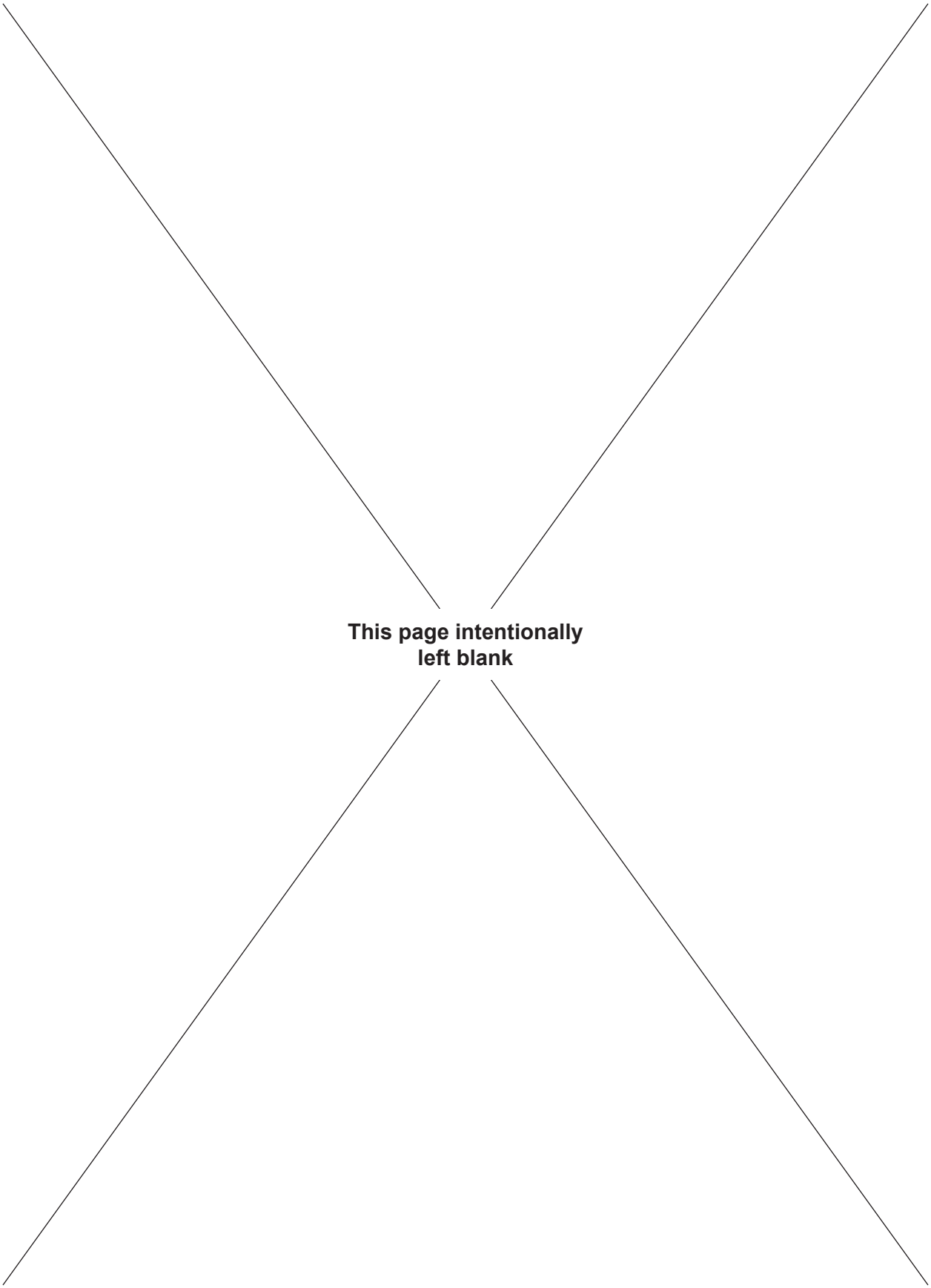

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Oerlikon/Fairfield Torque Hub

http://www.oerlikon.com/fairfield/en/services/service-policies/