CASING RUNNING TOOL

by MCCOY

DWCRTII Manual

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Project Name: DWCRT II 450T
Internal Size: 4-1/2"-26" 450 Ton

Section 1 - **Contents**

Appendices

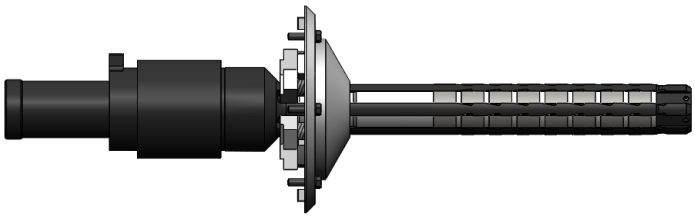
1.1 DWCRT Description

The McCoy Casing Running Tool (DWCRT) by McCoy is a mechanically operated Casing Running Tool that attaches to the Top Drive quill and uses controlled movements of the Top Drive to rotate and reciprocate the Casing for makeup/breakout operations, hoisting, as well as drilling with casing and cementing operations. Using this tool displaces the need for a tong, fill and circulating equipment, as well as conventional hoisting elevators.

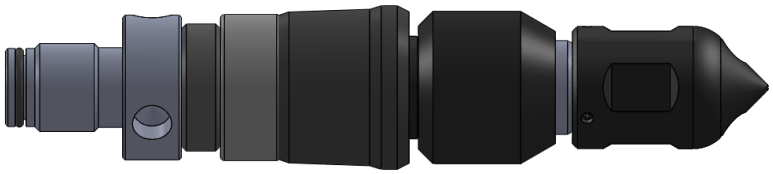
The tool's operating temperature range is between -40°F to 180°F. The main components of DWCRT are shown in the figure below:

Head Assembly: Mechanical device that converts rotation from the Top Drive into axial movement of the Gripping Actuator or Mandrel. It can include an optional compensator (which allows unrestricted axial movement of the CRT to make up thread loss or gain when making-up or breaking-out connections) to assist on setting or releasing the tool in a controlled manner.

Gripping Assembly: Used in conjunction with Head Assembly to transmit axial and rotational movement generated from Top Drive to the Casing. Available in external or internal grip for a variety of Casing diameters and weights.

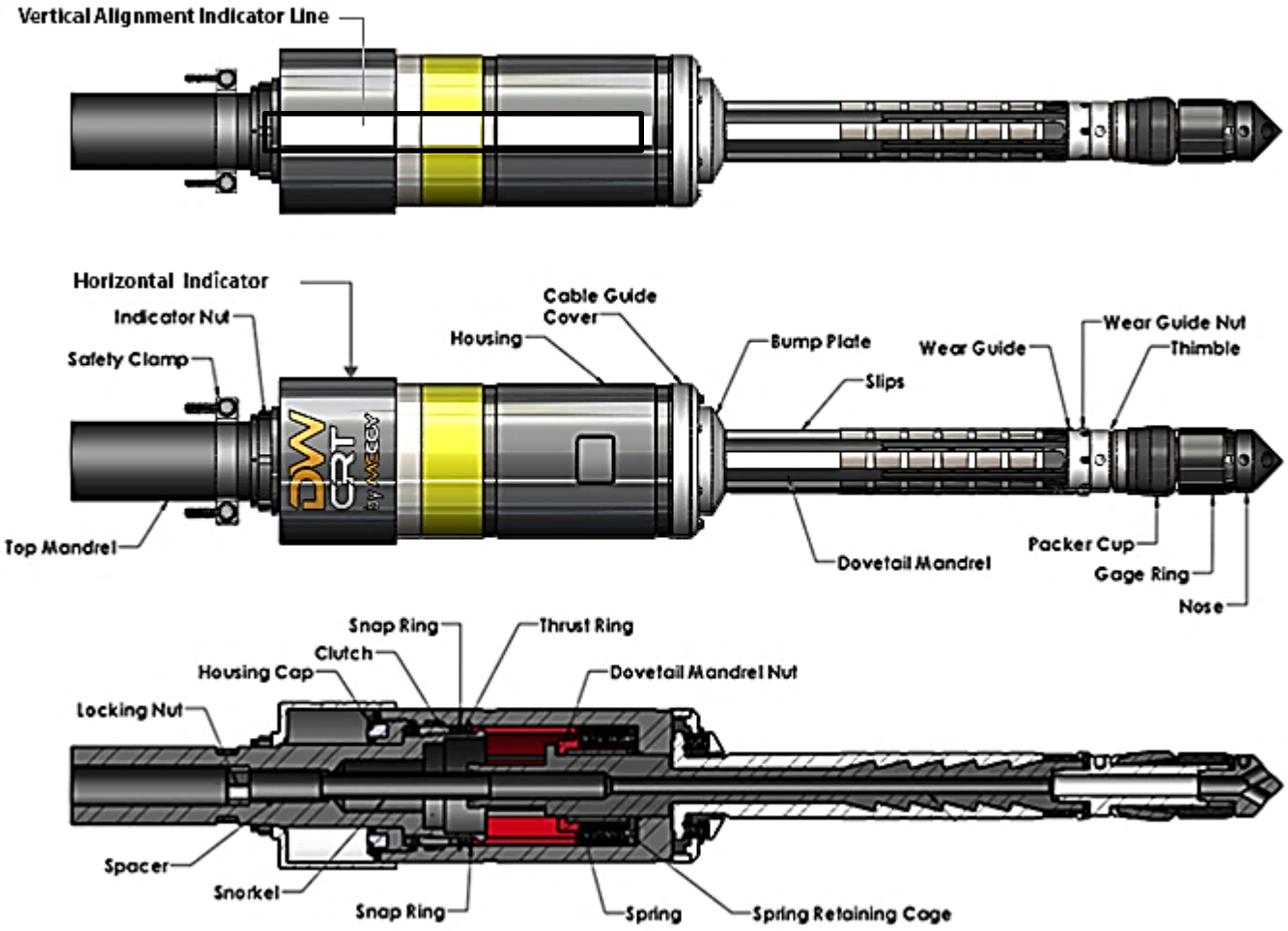


Circulator Assembly: Seal Guide Assembly. This keeps pressurized mud below the Gripping Assembly and contained in the ID of the Casing, allowing for operations were circulating is required. McCoy also offers an optional mud valve. Contact sales for details.



DWCRT Assembly: CRT Assembly is made up of Head, Gripping and Circulator Assembles. Figure below provides more detail of parts that go into making DWCRT. Refer to Assembly – BOMs section for more details.

NOTE: All illustrations and figures in this manual are for illustrative purposes. Details shown may not represent all surface features of the actual tool.



1.2 Terms and Definitions

- Bail Extensions (Extend-a-Bails, Buddy Bails, Add-a-Links) – Second set of bails places in series with the drilling bails to extend the overall length of the bail assembly. Necessary to avoid interference between the CRT and elevators.
- Base Slips – Intermediate tapered segment in the gripping assembly that retains the Inserts (Dies).
- Bell Guide - External pipe guide on the External Gripping Assembly used to guide the pipe into the tool. Creates friction to resist rotation on the tubular when setting and unsetting the tool.
- Break Out – The process of unthreading the casing connection typically counter clock-wise ("CCW").
- Bridge - Downhole obstruction that resists casing being advanced into the well.
- Bump Plate - Sacrificial component mounted to the bottom of the housing to create friction between the CRT and the tubular for connection make-up
- Circulate - Pumping mud under pressure inside the casing while taking returns from the well.
- Circulating Assembly - Sub assembly of the CRT that provides a means for sealing internally of the tubular to allow fluid to be pumped into the casing or to receive pressurized mud returns.
- Clutch - Component of Head Assembly used to prevent incremental torque make-up during rotation.
- Dovetail Mandrel – Primary component of the Internal Gripping Assembly that moves axially to set and unset the Slips (Dies).
- Fill Up - Pumping mud inside the casing while it is not pressurized.
- Floor Slips - Device used to hold the tubular at the rig floor, flush mount spider, hand slips,
- Gage Ring -Sacrificial component of the Circulator Assembly that centralizes the tool prior to the packer cup entering the ID of the casing.
- Grabber Box (tool handler, tool joint handler)– External tool joint clamp below the top drive quill used to react top drive torque for make-up or break-out of tool joints.
- Gripping Assembly – Sub assembly of the CRT that uses axial movement of relative members to grip and release the tubular, can be configured to grip the internal or external of the tubular.
- Head Assembly – Common sub assembly of the CRT assembly used to selectable transmit top-drive rotation into axial movement of the Gripping Assembly for selective grip or release of a tubular
- Housing – Main body of the Head Assembly that contains the drive components necessary for setting and unsetting of the CRT.
- Housing Cap -Component of the Head Assembly that retains the components inside the head.
- Indicator - External cover that exposes yellow and white bands on the housing to indicate if the tool is in the lock or unlocked position.
- Inserts - Interchangeable components mounted to the base slips that have teeth to engage the casing.
- Lift Nubbin – Upset installed into a threaded connection of a flush joint tubular, designed to lift the tubular with an elevator.
- Locked Position – Position of the Head Assembly to prevent axial movement of the gripping assembly from the Set to Unset position, identified with white exposed under the Indicator.
- Lower Housing – Component of the External Bell Assembly that houses the Ramp Segments
- Make Up - The act of threading together the casing connection (typically clockwise("CW")).
- MUT – Make up Torque
- Packer Cup - Elastomer component of the Circulating Assembly that utilizes an interference fit to create a seal.
- Packer Saver (seal guide, packer cup guide)- Beveled entry guide installed into the tubular threaded connection to guide the CRT into the tubular ID. Designed to prevent rips and tear in the packer cup from sharp edges or rig misalignment.
- Reciprocate - The process of lifting and lowering the casing string to work it through a bridge or into a long lateral

- Rig down - Removing the CRT from the top drive.
- Rig up – Installing the CRT onto the top drive.
- Rotary Table – Mechanical device on a drilling rig that provides rotation or resist rotation and supports the drill string when the top drive does not.
- Set – a state when the CRT is gripping the casing
- Slips (dies) – Component of the Gripping Assembly that moves radially to grip the tubular, could have teeth or lugs, identified by a tapered surface.
- Snorkel – Internal mud tube passage between the Top Mandrel and the Dovetail Mandrel, preventing mud from contaminating the internal components of the Head Assembly.
- Stabbing Guide (False Stabbing Guide) -Beveled entry used to assist placing the threaded connection into the mating connection, installed prior to stabbing and removed before casing make-up.
- Stump Guide – Aluminum plate placed between the pin and box when activating the CRT to prevent casing thread damage. Commonly used when a high amount of set down weight is required to activate the CRT.
- Thimble – Metal Back Up plate to support the packer cup allowing for higher fluid pressures to be pumped through the CRT. In larger diameters the Thimble may be integrated into the Packer Cup.
- Top Mandrel – Component of the Head Assembly that connects to the Top Drive using a tool joint connection.
- Unlocked Position – Position of the Head Assembly that allows the Gripping Assembly to be moved axially to set or unset the tool, indicated by some or no yellow exposed under the indicator.
- Unset – a state when the CRT is completely released from the casing
- Upper Housing – Component of the External Bell Assembly
- Vertical Indicator Line – Line on the Housing and Indicator that identifies when the tool is completely unset.
- Wear Guide - Sacrificial surface that allows the Slips or Inserts to be retracted behind the Wear Guide preventing the teeth from contacting the tubular during insertion or removal.

Section 2 - **McCoy Customer Service**

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 service and reliability. The installation and commissioning, operating, and maintenance instructions in this manual will assist you in giving your equipment the care it requires. Please read the manual before installing and using your equipment. Replacement parts are readily available from McCoy Global. Should you need replacement parts, or should you experience any difficulty not covered in this manual, please contact:

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

https://www.mccoyglobal.com/download/terms-conditions-sales/

Section 3 - **Safety Requirements**

McCoy equipment is typically installed and operated in a controlled drilling rig environment involving hazardous situations. Only authorized, trained, and competent personnel shall operate, maintain, and repair this equipment. Appropriate procedures and protocols should be established to address hazards and situations that may arise.

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

3.1 Recommended Tools

Assembly and Maintenance operation may require the use of tools designed specifically for the purposes, refer to DWCRT Assembly Tools section for tool details. McCoy recommends that only the specified tools be used, and used as intended, to ensure personal safety.

3.2 Identification Numbers

All McCoy primary load carrying parts are engraved with part and serial numbers. Since McCoy parts are modular, no identification number exists for the complete assembly. When documenting maintenance, be sure to include all applicable serial numbers of individual parts.

3.3 Limited Warranty

The limitations outlined by this manual are for ideal operating conditions. The limits of the tool may be further reduced by less than ideal conditions, and it is up to the equipment operator or technician to determine a safe operating limit for each scenario.

For claims against warranty, documentation, digital documentation of rig operating parameters, and load applied to the tool should be provided (such as a Pason report).

Standard Terms and Conditions of Sale (including general warranty information) may be viewed here:

https://www.mccoyglobal.com/download/terms-conditions-sales/

Section 4 - **DWCRT Training Outline**

McCoy requires that users receive a training course before the use or maintenance of the DWCRT.

McCoy recommends periodic training afterwards to keep maintenance and procedural alterations up to date with any lessons learned or changes.

The following is an example course outline of the topics covered.

1. DWCRT Introduction
    a. Overall Explanation of the tool (mechanical, modular)
        i. Handout manual
    b. Show parts of the tool (Head, Dovetail Mandrel, Wear Guides)
    c. Basic operation (set and release)
2. DWCRT Assembly and Disassembly
    a. Assembly Tools
    b. Assembly Video – hands-on disassembly
        i. Show inspection points and key components (seals, wear items, seal areas)
        ii. Lubrication
    c. Circulator Assembly
        i. Show parts and how to select Packer Cups and Gage Rings
        ii. Check for wear on Packer Cup
    d. Pre-job checklist for assembling tool
3. DWCRT Procedures
    a. Using with Casing Tongs
    b. Using without Tongs
    c. Fill-up only
4. DWCRT Capacity and Modular Parts
    a. Ratings
    b. Flowrates
    c. Valve options
    d. Space out
    e. Wear Guides, Bump Plates, Slips and Inserts
5. DWCRT Maintenance Schedule
    a. Category I
    b. Category II
    c. Category III
    d. Category IV
6. DWCRT Calculations
    a. Reduced reciprocate ratings
    b. Unlocked torque limits
    c. Max tension and torque to keep from damaging Casing
    d. Recommended set torque
    e. Test

Section 5 - **DWCRT General Information**

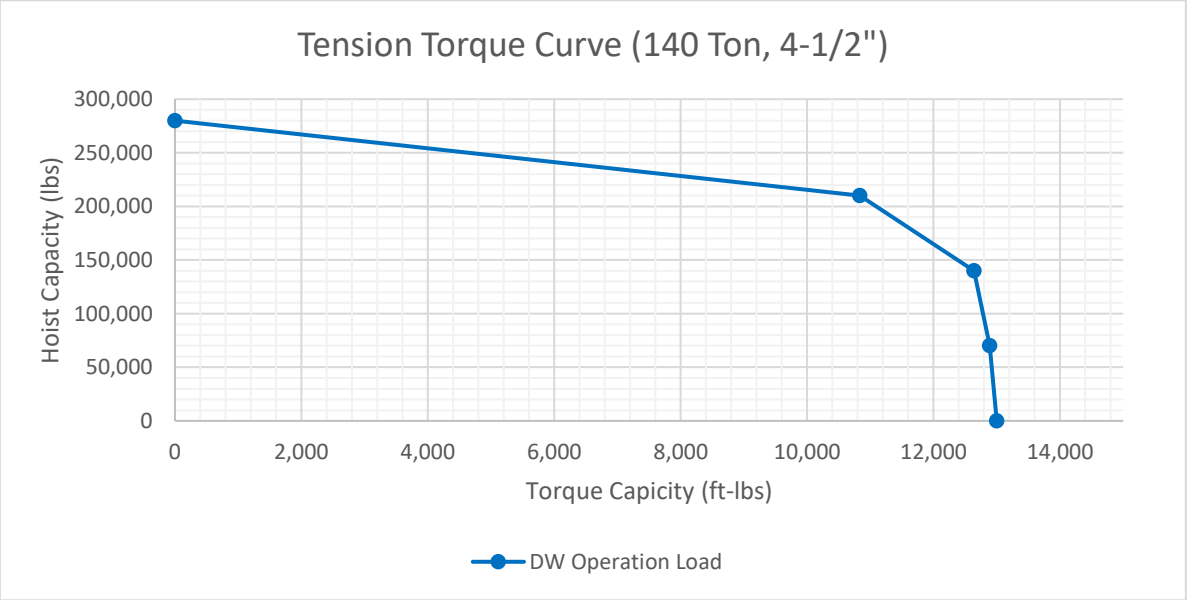
5.1 General Information

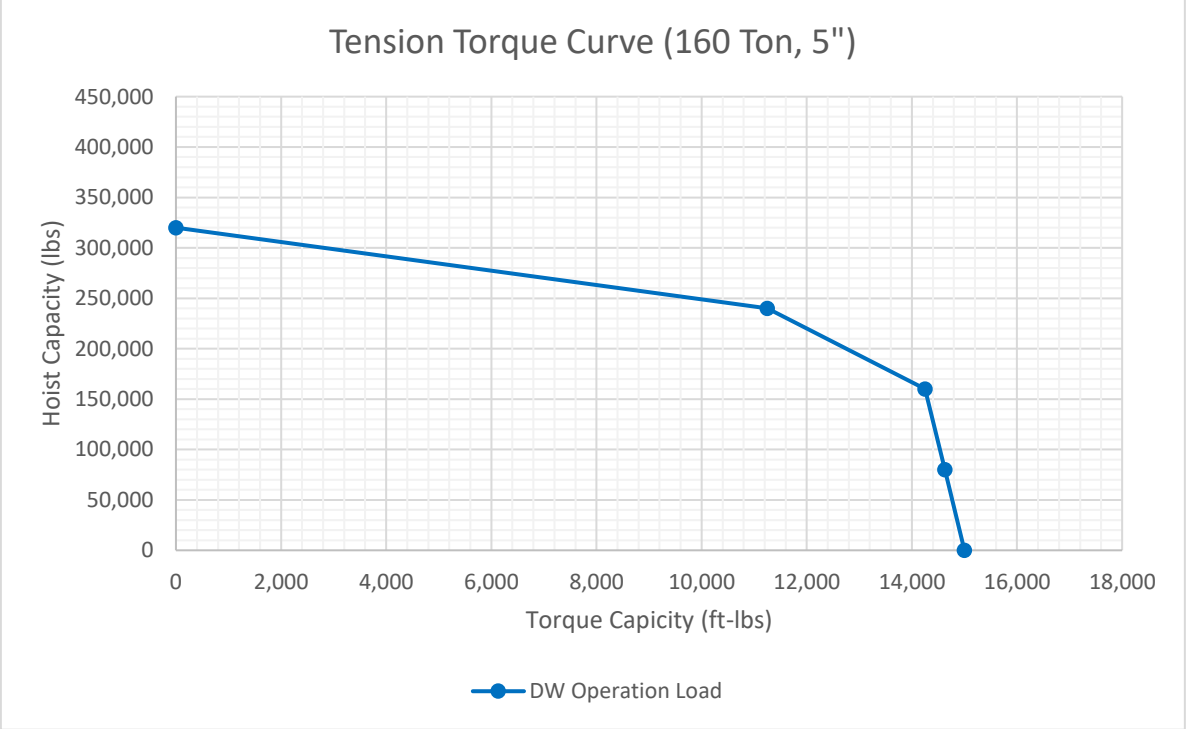
DWCRT represents a new generation of Casing Running Tools. It is a mechanical tool with modular design which meets design requirements of the API 8C standard. The DWCRT is designed to make up Casing, run it in the well, and provide rotation, reciprocation, and circulation. Minimal Top Drive set down weight is required to activate the tool. The compensating locking mechanism allows Slips to be set with low torque with easy release and the ability to achieve high torque for making Casing joints.

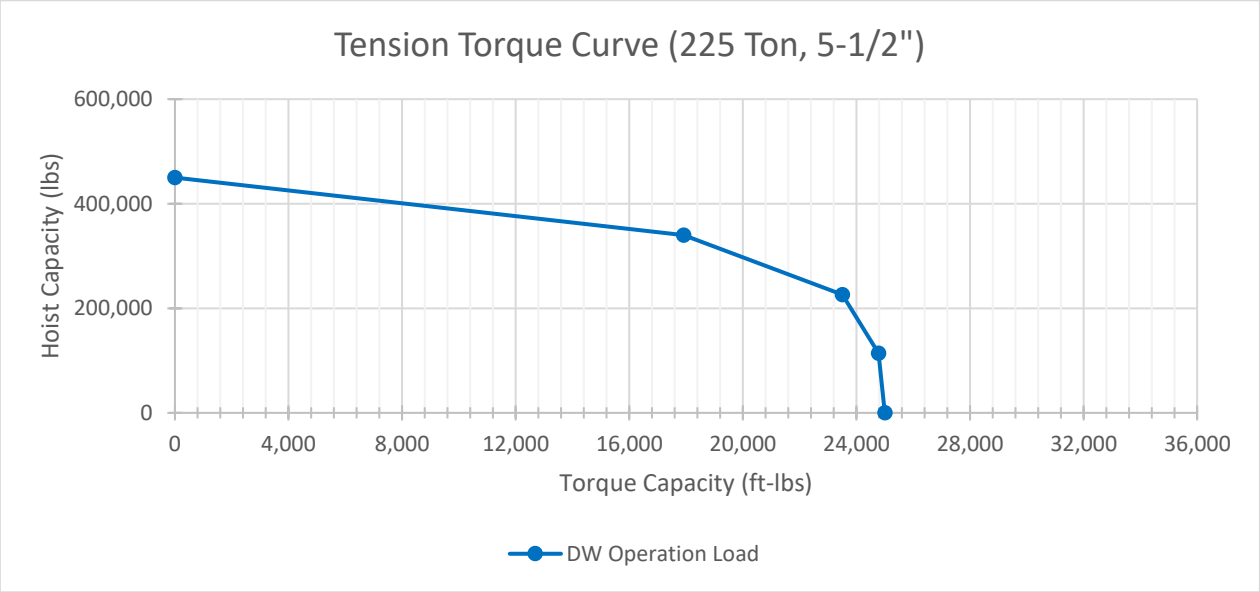
5.2 Tension vs. Torque Capacities

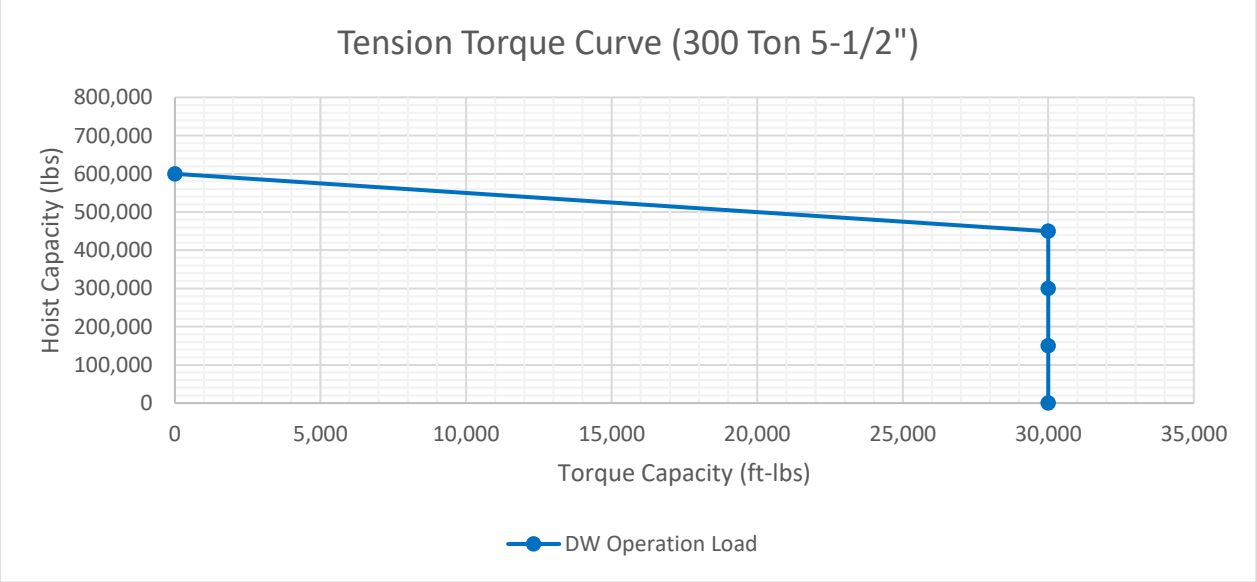
The graphs below provide rated Tension vs. Torque capacities for various sizes of DWCRT. Please use the correct load capacity limits for your application. If you have any questions, please contact McCoy. For additional information refer to Section 5.2.1 Hoisting Capacity Reduction with Pressure.

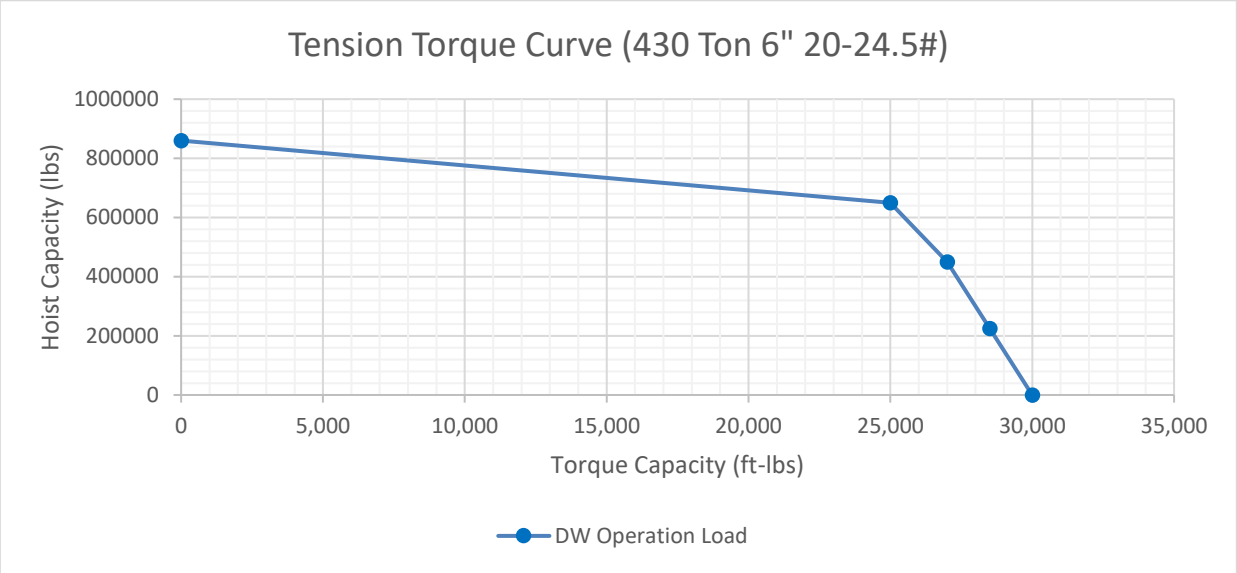
- Blue line - DW Operation Load

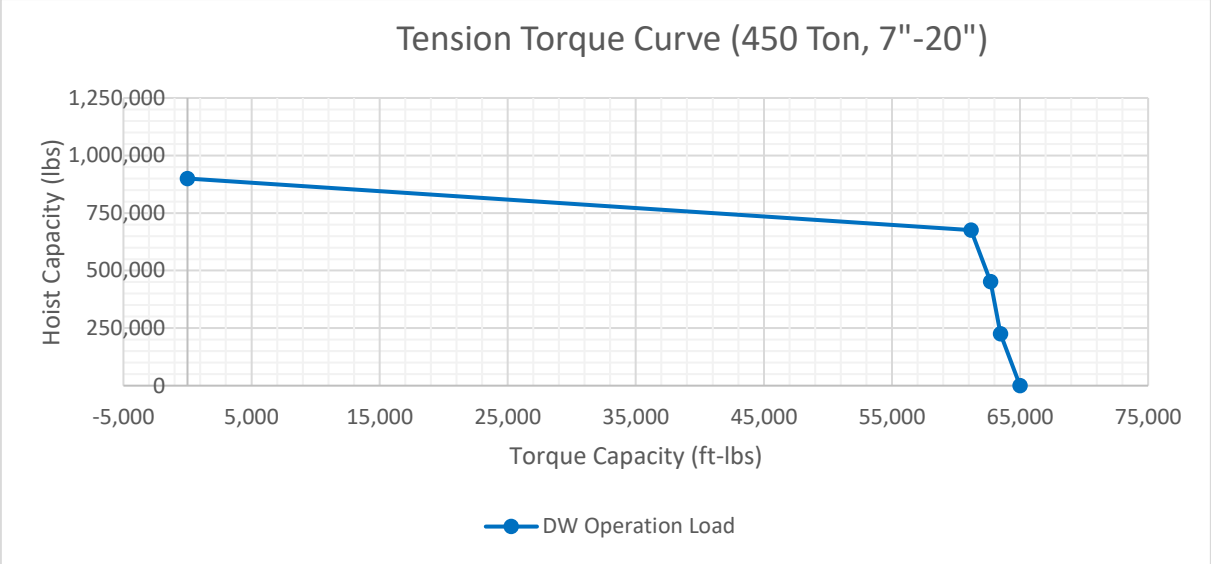


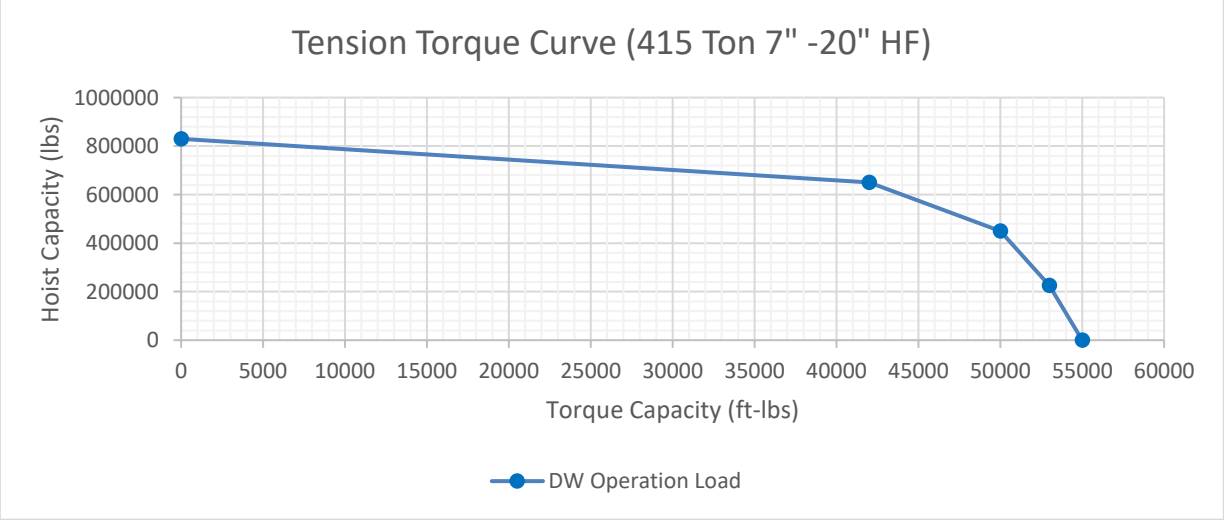



Tension Torque Curve (225 Ton, 5-1/2")
600,000
400,000
200,000
0
Hoist Capacity (lbs)
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
32,000
36,000
Torque Capacity (ft-lbs)
DW Operation Load


Tension Torque Curve (300 Ton 5-1/2")
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Hoist Capacity (lbs)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
Torque Capacity (ft-lbs)
DW Operation Load


Tension Torque Curve (430 Ton 6" 20-24.5#)
Hoist Capacity (lbs)
1000000
800000
600000
400000
200000
0
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
Torque Capacity (ft-lbs)
DW Operation Load


Tension Torque Curve (450 Ton, 7"-20")
Hoist Capacity (lbs)
1,250,000
1,000,000
750,000
500,000
250,000
0
-5,000
5,000
15,000
25,000
35,000
45,000
55,000
65,000
75,000
Torque Capacity (ft-lbs)
DW Operation Load


Tension Torque Curve (415 Ton 7" -20" HF)
Hoist Capacity (lbs)
1000000
800000
600000
400000
200000
0
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
60000
Torque Capacity (ft-lbs)
DW Operation Load

5.2.1 Hoisting Capacity Reduction with Pressure

DWCRT Hoist Reduction with Pressure		
Casing Size	**ID (Inches)**	**Tool Hoist Reduction in pounds for every 1 PSI of pressure**
4½"	4.1	13
5"	4.6	17
5½"	5.1	20
6”	5.3	24
7"	6.6	34
7-5/8"	7.1	40
8-5/8"	8.1	52
9-5/8"	9.1	65
10-3/4"	10.2	82
11-3/4"	11.1	97
13-3/8"	12.8	129
13-5/8"	12.4	121
16"	15.3	184
18-5/8"	17.8	249
20”	19.2	290
22"	21.5	363
24"	23.5	433
26"	25.5	510

Effects of Circulation Pressure:

DWCRT hoist capacity is reduced when circulating. The amount of reduction depends on the circulation pressure and the Casing size.

Example: 225-ton Mandrel in 5-1/2” Casing at 4,000 psi = 20 x 4,000 = 80,000 lbs. = 40 tons

225 tons - 40 tons = 185 tons

Section 6 - **Operational Procedures**

6.1 DWCRT Operational Positions

6.1.1 Locked Position

(Note the white showing below the Horizontal Indicator)

Once the slips are set at the appropriate minimum setting torque, the tool can rotate the string while in the locked position.

While in the locked position, the slips will not extend or retract.

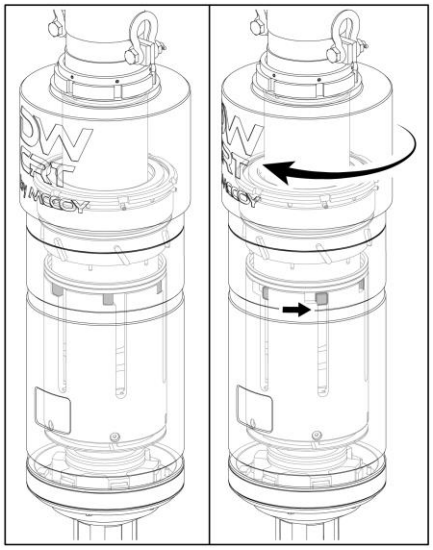
6.1.2 Unlocked Position

(There is no white visible below the Horizontal Indicator and the Indicator is in the yellow area to extend or retract Slips)

Clockwise rotation of the tool in the unlocked position extends the slips toward the pipe while counterclockwise rotation retracts the slips.

NOTE: Count number of rotations required to completely extend the Slips during Casing make up. The exact same number of rotations is required to retract the Slips completely. The number of rotations change with internal diameter of the Casing.

During pre-job function test in Unlocked position, rotate Top Mandrel by hand clockwise to extend the Slips. Note required torque to activate the tool. Verify torque does not change at Rig site.



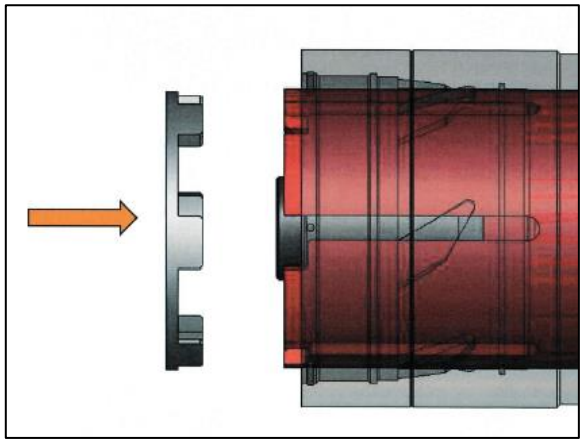
6.1.3 Push Position (Gen 2 Only)

In the Locked position, 12 degrees clockwise rotation of the tool rotates the Top Mandrel. Any further rotation applies torque to the casing. At this position:

1. The tool is ready to reach maximum torque capacity.
2. Top Drive weight can be applied to the tool while rotating clockwise without the tool going into the unlocked position.

WARNING!

Do not exceed 10 RPM when activating (setting or unsetting) the tool. Impact of setting or release at high RPM are a safety hazard and may cause internal damage to the Timing Lug on the Dovetail Mandrel Nut.



6.1.4 Push Position Disabled (Gen 2 Only)

1. Disables the push position by adding the spacer push down ring when not required for CD or reaming applications.
2. Decision to disable is based on operators use case and hole conditions.
3. If disabled, reciprocating and rotating can only occur in the locked position.
4. Do not attempt to rotate CW or CCW in the unlocked position with the push position disabled.
5. See Appendix 1.7 for instructions to disable the push position.

WARNING!

Do not exceed 10 RPM when activating (setting or unsetting) the tool. Impact of setting or release at high RPM are a safety hazard and may cause internal damage to the Timing Lug on the Dovetail Mandrel Nut.

6.2 Rig Up Procedure

Use the following procedure to install the DWCRT on the rig's Top Drive.

1. Lower the first joint of Casing into the rotary on the rig.
2. Set the Floor Slips to hold the Casing.
3. Insert a Packer Saver (a device inserted into the box of a section of casing to guide the packer cup past any sharp edges or ledges, intended to extend the life of a packer cup (similar to a "safety nubbin")) into the coupling. The use of a Packer Saver is not required but will extend the life of the Packer Cup. Only Steel Packer Savers are to be used. Lubricate the Packer Cup Lip to prevent rips and tears when inserting into the casing.
4. Thread a Lifting Cap into the CRT. Verify the lifting cap is approved for the intended weight and angle of the lift.
5. Hoist the DWCRT via the Lifting Cap. Tag line may be used to guide the tool in the joint of Casing.
6. Insert the DWCRT into the first joint of Casing. Lower the DWCRT until the tool lands on the Casing.
7. Remove the DWCRT Lifting Cap.
    - Crossover Make-up Procedure
        a. Ensure the crossover and TDS Saver Sub connections are the same and will mate correctly.
        b. Review and confirm the data sheet for the crossover connection is not outdated and the most up-to-date version for the application.
        c. Review the data sheet and ensure the correct thread compound is applied as per OEM specifications. Observe the thread compound Friction Factor ("FF") and adjust torque accordingly.
        d. Recommend 10% less than OEM maximum torque for the crossover connection MUT.
        e. Make up the connection, observing alignment, correct thread, and seal engagement on the rig floor.
        f. Confirmation torque required while in the doghouse, observing the Top Drive torque.
        g. Paint lines or chalk lines on all Rotary Shoulder Connections
        h. Recommend set TDS break out stall torque to 60% of applied crossover torque to the lowest torque crossover connection above the DWCRT.
            i. **WARNING – If tool disengagement exceeds 60% of MUT applied to the crossover, check the painted lines on all Rotary Shoulder Connections. Recommend a confirmation torque be applied to the crossover connections.**
            ii. **WARNING – It's important to observe the painted lines on all Rotary Shoulder Connections every time the tool is disengaged. See Category I inspections during the job.**
            iii. **WARNING – If recommended OEM connection torque cannot be achieved with the TDS use your stop work authority and stop the job. DO NOT PROCEED WITH AN INCORRECTLY MADE-UP CROSSOVER.**
                1. **HINT:** Rig Tongs can be used if additional make-up torque is required on the crossover.
                2. **HINT:** It's recommended that every time a new driller comes on shift to recommend a crossover confirmation torque to ensure all connections are tight prior to proceeding.

WARNING!

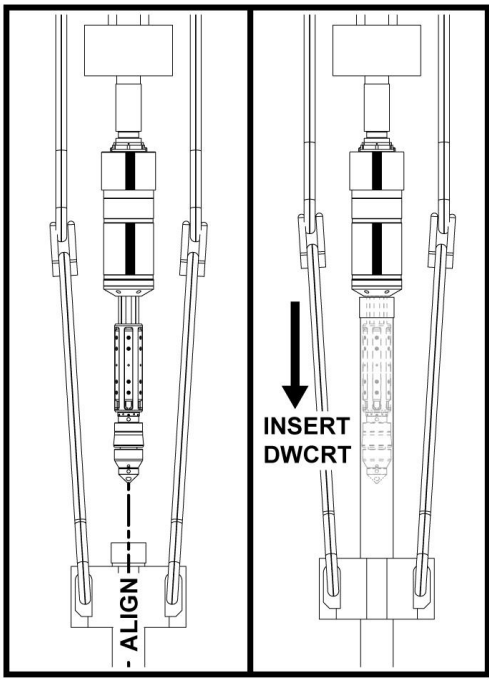
The DWCRT must be inserted into Casing before proceeding to step 8. If the DWCRT is not in a joint of Casing, there is a chance for potential damage to the Slips and Mandrel if the tool is activated.

WARNING!

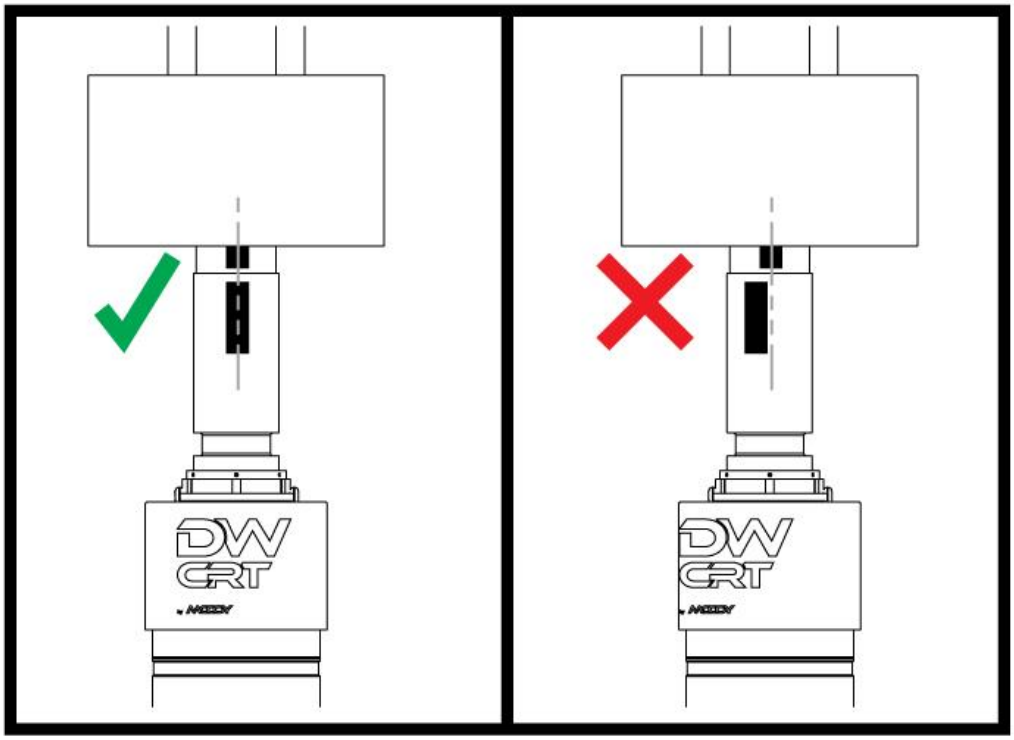
The tool cannot tolerate large Top Drive to wellbore misalignment. Excessive misalignment may cause difficulty inserting the CRT. Misalignment must be less than ½ the diameter of the casing being run or 6", whichever is less.

WARNING!

Ensure that the rig is aligned when threading the Top Drive into the DWCRT. Excessive misalignment may cause thread damage.



1. Using the Tool Joint Handler (Top Drive back-up or Tongs), make-up the DWCRT to the Top Drive. Mark the tool joint connection with chalk or paint to represent where the tool joint backed off. This mark should be monitored every time the DWCRT tool is disengaged, as misalignment indicates that the tool joint is backing off.



6.3 Stump Test Procedure

Use this procedure to ensure the CRT is properly installed and that tool is suitable for the casing to be run.

1. During Rig Up Procedure, the tool may have been partially activated. Rotate the Top Drive counterclockwise. The Indicator should rotate as the Housing is held stationary. This indicates the Slips are being retracted. When the housing starts spinning on the Casing and the lines are lined up, this indicates the Slips are fully retracted.
2. Rotate the tool clockwise and make-up to set torque of 3500 ft-lb. The Indicator should rotate while the Housing stays stationary, this indicates that the Slips are being extended. Count number of rotations to set tool and document the Procedure for later use.
3. Rotate the Top Drive counterclockwise. The same number of rotations are required to retract Slips completely. Verify that the Line on the Housing lines up with the Line on the Indicator and remove tool from the casing. Also verify Slips are retracted below Mandrel or Wear Guide.

NOTE: Perform Rig Up and Stump Test procedure before starting Setting Procedure

6.4 Setting Procedure (Activating the Slips)

Use this procedure to extend the slips using top drive rotation to apply torque or tension to the casing via the DWCRT.

1. Insert the DWCRT into the Casing by lowering the Top Drive. Lower the tool until the Indicator is near the bottom of the unlocked (yellow) stripe.
2. Rotate the tool clockwise. The Vertical Indicator should rotate while the Housing stays stationary, this indicates that the Slips are being extended. Certain situations (rig misalignment, inadequate tool maintenance) may require minor set down weight to activate the Slips and to keep the housing from rotating on the top of the casing.
3. The DWCRT Indicator should be rotated until either the Casing make-up torque or the Dovetail Mandrel's maximum unlock torque is reached. Do not exceed the torque value corresponding to the lesser of these two values. ***Refer to 6.13.2 to understand safe setting torque based on Casing used. Refer to Appendix 1.3 Recommended Minimum Set Torque for unlock torque ratings to ensure a firm grip on the Casing.***
4. After setting the Slips, raise the Top Drive. The tool is placed in the locked position once approximately 2" of white band is showing under the Indicator. The DWCRT can now hold the Casing string weight and the Slips at the rig floor may be released. The Casing can now be rotated, reciprocated, and circulated. ***Refer to Appendix 1.3 Recommended Minimum Set Torque in the unlocked position.***

NOTE for Gen 2: Tool can be placed in Push position by rotating the Indicator 12 degree clockwise relative to the Housing. The tool will lug out indicated by a torque increase. To verify- when the tool is engaged in the Push position, setting down weight will not allow the tool to go into the Unlocked position (see page 17 for visual reference).

6.5 Unsetting Procedure (Releasing the Slips)

NOTE for Gen 2: If the tool was in the Push position, set the floor slips, rotate the Indicator 12-degree counter- clockwise (vertical lines aligned) with neutral weight before going to the Unlocked position.

1. In the locked position, lower the Casing to the floor and set the floor Slips. Slack off the Top Drive until the Indicator partially covers the yellow band. The tool is now in the unlocked position.
2. Verify Mud Pump is turned off and pressure is bled off to Stand Pipe. IBOP must be open to fully release all the pressure.
3. Count rotations of the Top Drive while rotating counter-clockwise at a maximum of 10 RPM. The Indicator should start to rotate as the Housing is held stationary. This indicates the Slips are being retracted. When the housing starts spinning on the Casing verify:
   - Number of rotations are completed as per Stump Test.
   - Lines are lined up; this indicates the Slips are fully retracted.

   If the Indicator lines are not lined up, apply set down weight and continue to retract the Slips by rotating counterclockwise.
4. Once the Lines are lined up, raise the tool out of the Casing.
5. **NOTE: Do not attempt to raise the tool out of the casing if the tool is not fully disengaged.**
6. **NOTE: Inspect the Slip's teeth and Packer Cup for wear after every ten joints. The teeth should be sharp and have no visible flat spots. Also, make sure the teeth are fully retracted when removing the tool from the Casing to ensure that the teeth will not contact the Casing upon the next insertion.**
7. **NOTE: If high break out torque is required, refer to the troubleshooting section of the manual.**

WARNING: If unsetting torque exceeds 60% of crossover makeup torque, check the painted lines on all Rotary Shoulder Connections and conduct a confirmation torque to the crossovers to ensure they are correctly made up to OEM specifications.

6.6 Connection Make-up with Conventional Tongs

1. Using appropriate Casing elevator, hoist next joint of the Casing. Insert the hoisted joint into the Casing string and make-up to the specified torque with Tongs.
2. Follow DWCRT Setting procedure, lower the string, then perform Unsetting procedure.

6.7 Running the DWCRT to Reciprocate, Rotate and Make-Up Casing

1. Install Steel Packer Saver in the coupling of the next joint and then hoist with an elevator. Insert the hoisted joint into the string.
2. Follow DWCRT Setting procedure, lower the string, then perform Unsetting procedure.

6.8 Using the DWCRT to Back Out a Joint of Casing

1. Insert the DWCRT by lowering the Top Drive. Slack off until the tool lands on the casing and continue to lower until the indicator is in the unlocked position.
2. Rotate the tool clockwise and set with the recommended torque. ***Refer to Appendix 1.3: Minimum Set Torque.***
3. Raise the tool in the locked position.
4. Rotate the tool counterclockwise to apply torque to break out the connection.

NOTE: If high break out torque is required refer to the troubleshooting section of the manual.

5. Back out the connection.
6. Lower the tool until the indicator is in the unlocked position.
7. Rotate counterclockwise to release the tool.

NOTE: If the casing begins to rotate a backup tong may be required.

8. Once the slips are fully retracted, lift the CRT out of the casing and lay down the joint of Casing.

WARNING: If break out torque exceeds 60% of crossover makeup torque, use power tongs or rig tongs for the initial torque break. Watch the painted lines on all Rotary Shoulder Connections to ensure crossover integrity is maintained.

6.9 Running the DWCRT to Drill with Casing (Gen 2 Modification Recommended)

1. Push position is required for drilling with Casing. Begin pumping mud through the tool once drilling operations resume. The internal valve (if optionally used) may need to be removed if a higher flow rate is required.
2. Begin rotating the DWCRT at the desired RPM.
3. Maintain positive clockwise rotation.
4. Monitor the gap between the Casing and the bump plate. If this gap is more than ¼ inch, the DWCRT may need to be released and reset to better grip the Casing.
5. Set the floor Slip once the Casing has been drilled to the floor.
6. Follow Unsetting procedure.

6.10 Fill-Up Procedures with DWCRT

Use this procedure to use the DWCRT to fill the casing up with mud, but not to apply any pressure or circulation. Volume of mud will need to be monitored so that it does not over fill.

1. Lower the Casing and set the floor Slips. Be mindful of the bails and how low the Top Drive can get to the floor.
2. Insert the Nose into the Casing. Use link tilts to center the Casing if the Casing is off-center.
3. Ensure the IBOP is open, turn the pumps on, and fill to the desired amount.
4. Turn the pumps off. Open the drain on the standpipe and bleed pressure to zero.
5. Allow the mud to drain out of the tool.

6.11 Circulating Procedures with DWCRT

Procedure for taking returns from the casing, pumping pressurized mud or cement.

1. Follow Setting procedure.
2. Ensure the IBOP is open and turn the pumps on. Fill and circulate to the desired amount.
3. When complete, turn the pumps off. Open the drain on the standpipe and bleed pressure to zero.
4. Follow Unsetting procedure.

NOTES:

- **Slowly raise the Top Drive to remove the tool. An air pressure may have formed under the Packer Cup which can be released once the Packer Cup slides out of the internal diameter. Use caution when hoisting the tool out of the Casing. Ensure the tool does not snag on the Casing.**
- **Allow the mud to drain out after the Packer Cup exits the Casing before continuing to hoist the tool.**
- **Occasionally the Indicator will continue to completely cover the yellow stripe on the Housing as the tool is raised out of the Casing. This is indicative of an air pressure trapped below the Packer Cup which will lift the Housing and Mandrel until the Packer Cup releases its seal. Usually, the seal is released in the coupler. Verify Stand Pipe is open to bleed of pressure.**
- **McCoy recommends resetting the DWCRT every 3 to 4 hours to make sure there is good contact between the bumper and coupling.**

6.12 Rig Down

Procedure to remove the CRT from the Top Drive.

1. With the tool in a joint of Casing, use the Tool Joint Handler (Top Drive back-up or Tongs) to break-out the DWCRT from the Top Drive.
2. Thread a Lifting Cap into the CRT.
3. Hoist the DWCRT via the Lifting Cap from the Casing joint.
4. Place the tool in the assembly stand. Remove Lifting Cap.

6.13 Operating Specifications

6.13.1 DWCRT Load Rating

Often the McCoy DWCRT is stronger than the Casing it is gripping on. To keep from damaging the Casing, we recommend not exceeding 80% of the pipe body tensile yield strength for the Casing used. The manufacturer should provide a tensile rating for the Casing or it can be looked up in a reference such as the manufacturer's spec sheet or API 5CT.

Example 1: When running 5-1/2" 17# J-55 Casing, the rated tensile load is 273,000 lb. This number should be multiplied by 0.80 to get the recommended max tensile load.

0.8 x 273,000 = 218,400.

Even though the 5-1/2" internal Dovetail Mandrel is rated for 225 Tons, the limit for this Casing is 218,400 lb. or 109.2 tons.

Example 2: When running 5-1/2" 23# P110 Casing, the rated tensile load is 729,000 lb. This number should be multiplied by 0.8 to get its recommended tension load.

0.8 x 729,000 = 583,200.

Even though the maximum load for the Casing is 583,200 lb. (or approximately 290 tons), the 5-1/2" internal Dovetail Mandrel is only rated at 225 tons. As such, 225 Tons is the maximum axial load that should be applied.

6.13.2 DWCRT Torque Rating

Often the McCoy' DWCRT is stronger than the Casing it is gripping. To keep from damaging the Casing, we recommend a Safe Setting Torque based on the Casing used. The manufacturer should have a tensile rating for the Casing, or it can be looked up in a reference such as Baker Hughes Tech Facts Engineering Handbook or API 5CT.

Example 1: When running 7" 17# H-40 Casing, the rated tensile load is 196,000 lb. This number should be multiplied by 0.8 to get the recommended maximum tension load.

0.8 x 196,000 = 156,800 lb.

The recommended tension load should then be multiplied by 0.054 to get maximum setting torque.

156,800 x 0.054 = 8,500 ft-lb

Even though the internal Dovetail Mandrel is rated for 50,000 ft-lb in the unlocked position, the limit for this size Casing is 8,500 ft-lb. 8,500 ft-lb is the maximum torque that should be applied.

Example 2: When running 7" 35# Q-125 Casing, the rated tensile load is 1,370,000 lb. This number should be multiplied by 0.8 to get its recommended tension load.

0.8 x 1,370,000 = 1,096,000

The recommended tension load should then be multiplied by 0.054 to get maximum setting torque.

1,096,000 x 0.054 = 59,000 ft-lb

While the maximum setting torque for this Casing is 59,000 ft-lb, the 7" internal Dovetail Mandrel is only rated at 50,000 ft-lb in the unlocked position. 50,000 should be the maximum torque applied in the unlocked position.

Refer to Appendix 1.3 for Minimum Set Torque limits.

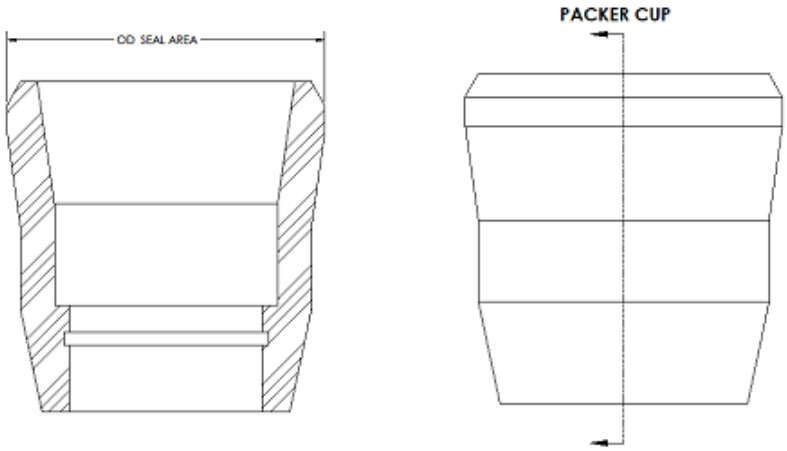
Section 7 - **Packer Cups and Gage Rings**

7.1 Packer Cups

Packer Cups are an interference seal used to seal off the mud system of the DWCRT, enabling flowback, circulation, or pumping cement thru the DWCRT. Use this rule for determining the best Packer Cup size for a given Casing size and weight.

a. The OD sealing area on the cup should be .100”-.250” over the Casing ID for 4-1/2” to 6-5/8” Casing sizes.
b. The OD sealing area on the cup should be .250”-.350” over the Casing ID for 7” to 20” Casing sizes.
c. Packer Cups used in Premium Connections may require less interference and the use of specialty GageRings and Packer Cups.

Before storage, it is good practice to measure and label the OD of the Packer Cups after returning from a job. Packer Cups are made of rubber which will wear after several jobs. Packer Cups should not be stored in environments exceeding 60% humidity.



7.2 Gage Rings

Gage Rings are used to both center the Packer Cups and prevent wear and tear on the Packer Cups, thereby extending their use life. Drifts for Gage Rings are normally smaller than the ID of the Casing by:

0.125" for 4-1/2" to 8-5/8"
0.156" for 9-5/8"-14"
0.188" for 16"-20"

HINT: For internal flush Casing: Fabricate a metal nubbin to thread into the internal flush casing box to protect the Packer Cup when inserting the tool into the casing. Never use a bored-out plastic protector.

Section 8 - **DWCRT Lubrication and Maintenance**

Only McCoy manufactured parts are to be used on the DWCRT. Welding should never be performed on any primary load carrying components of the DWCRT. The DWCRT utilizes modern heat-treated alloys and special processes which can be dangerously altered by heating or welding. Repairs of any DWCRT part should only be undertaken by McCoy or a McCoy authorized shop with the proper knowledge and procedures to ensure the safety and performance of the tool are not compromised. McCoy recommends maintenance and inspection in accordance with API RP8B guidelines.

Customers should work with McCoy to jointly develop and update inspection, maintenance, and repair procedures consistent with equipment application, loading, work environment, and storage conditions. These factors may change from time-to-time as a result of equipment history, product improvements, new maintenance techniques, and service conditions. NDE should be performed per ASTM E165 and ASTM E709. Ensure the parts a free of metal shavings after Magnetic Particle Inspection. McCoy recommends a performance pull test every 5 years followed by NDE. Inspection of gauging rotary connection should be performed to API 7-2.

Tool documentation should be kept by the user and updated as the tool components are changed out on the tools. It is recommended to establish a serial or asset number to tie all documentation to. The serial or asset number will contain all the individual parts and serial numbers. The documentation is the responsibility of the user and should be checked prior to the job in the event documentation needs to be provided prior to rig up.

Schedule frequency listed below is based on 1 to 4 jobs per month under normal operating conditions.

Category I

During the job

Observation of equipment during operation for indications of inadequate performance.

a. Check for tears and rips in the Packer Cup.
b. Verify after every joint that the Indicator line is lined up before removing from Casing.
c. Check that Slips are recessed below Dovetail Mandrel or Wear Guide before inserting Casing.
d. Make sure the teeth are sharp and free of debris.
e. Visual inspection of paint or chalk line on all Rotary Shoulder Connections. This must occur every time the tool is disengaged to verify the connection is properly torqued.

Category II

After every job

Category I inspection plus further inspection for corrosion or missing components, deterioration, proper lubrication, visible external cracks, and adjustment.

a. Wash OD and ID of the tool.
b. Visually Inspect tool joint threads.
c. If used, remove the internal valve, clean and redress.
d. Replace internal wiper seal in Dovetail Mandrel.
e. Lubricate Dovetail Mandrel threads.
f. Clean, lubricate, and check for wear on the Clutch and mating teeth and slots.
g. Re-tape the vertical line.
h. Remove and disassemble Circulating Assembly, replace seals and reassemble.
i. Remove Bump Plate, Slips and Inserts, and inspect Dovetail grooves on the Slips and Dovetail Mandrel for

wear, lubrication, chips or cracks.

j. Wash Slips and Dovetail Mandrel before re-applying grease.
k. Inspect components in the mud flow path for erosion.
l. Inspect and repair as required, the White and Yellow indicator stripes on Housing.

Category III

Every 6 months.

Category II inspection plus further inspection which should include NDE of exposed critical areas and may involve some disassembly to access specific components and identify wear that exceeds allowable tolerances.

a. Replace all seals in the Housing.
b. Carry out NDE on critical load-bearing components which include:
    1- Dovetail Mandrel
    2- Slips (when applicable)
    3- Inserts

(Contact McCoy for more details)

Category IV

Every 12 months.

Category III inspection plus further inspection which should include NDE of all primary load carrying components and critical dimension measurement.

Carry out NDE on all primary load carrying components which include:

a. Dovetail Mandrel
b. Slips
c. Inserts
d. Housing
e. Housing Cap
f. Dovetail Mandrel Nut
g. Top Mandrel
h. Upper Housing- External tool only
i. Lower Housing- External tool only
j. Ramp Segments- External tool only

8.1 DWCRT Spring Replacement Guide

Replace the family of springs when damaged or when the uncompressed length of any individual spring is less than:

Part# 701254 Bump Plate Springs (Qty-6): 2.43”.
Part# 701250 Mandrel Nut Springs (Qty-10): 5.38”.
Part# 605721 Bevel Spring (Qty-4): 1.57”.
Part# 700110 Clutch Spring (QTY-6): 4.12”.
Part# 1007309 Bumper Plate Spring (QTY-6): 2.43”.

8.2 Results of Inspections

Parts with indications less than 3/16” located in non-critical areas are permitted. A follow-up examination is recommended to check for indication growth. External tool dogs have a max wear limit of 3/16” to provide proper friction on the Casing.

NOTE: Please refer to the CRT Inspection and Maintenance Guidance document for specific information on the pass/fail criteria.

NOTE: McCoy requires replacement of dies whose teeth have been worn flat or broken. To measure the flatness of DWCRT Dies, use optical micrometer to measure the width of the flat on the tip of the tooth. If the flat is more than 0.025” wide, the tooth is considered damaged. If more than 10% of the teeth within any 2” x 2” square is damaged, the Die needs to be replaced.

8.3 Recommended Lubrication

McCoy recommends using the following lubrication. The use of other lubricants may affect the performance and accelerate wear on critical components, reducing the life expectancy of the parts and/or effectiveness of the tool.

Area	Lubrication
Dovetail Threads and Slip/Die Taper Surfaces above 32°F (0°C)	Klüberplex AG 11-462 (McCoy P/N: 700053)
Dovetail Threads and Slip/Die Taper Surfaces below 32°F (0°C)	Klüberplex ELM 44-80 ARTIC (McCoy P/N: 700095)
Bolt and Set Screw Threads	Loctite 76764 (McCoy P/N: 700093)
Housing, Thrust Washers, Thrust Rings, OD of Mandrel Nut, Clutch ID & OD, Square Threads, Seals, Splines and other	NLGI No. 2 Lithium equivalent

Keep all parts lubricated to prevent corrosion.

8.3.1 Stocking Quantity

McCoy suggests enough spare parts of seal kits, Packer Cups, Slips, Inserts and springs be stocked to properly operate and maintain the tool for 3 months using DWCRT Lubrication and Maintenance schedule. McCoy also recommends additional set of Slips be purchased. For additional details, please contact customer service as detailed on page 9 of this manual.

Common wear items for the circulator assembly such as packer cups and gage rings are listed on the table in Appendix 1.6. Select the appropriate part number for your DWCRT size and configuration. A complete tool requires a Head Assembly, Gripping Assembly, and Circulator Assembly.

Use the table below for generalized spare part recommendations:

Part Number	Description (DWCRT 450)	QTY Per 3 Month	Qty per Year
606476	Head Assembly Redress Kit	3	10
606475	Head Assembly Rebuild Kit	-	2
606201	Internal Gripping Assembly Redress Kit 4-1/2”- 6-5/8”	3	10
606202	Internal Gripping Assembly Redress Kit 7”- 8-5/8”	3	10
606203	Internal Gripping Assembly Redress Kit 9-5/8”- 20”	3	10
606205	Internal Gripping Assembly Overhaul Kit 4-1/2”- 6-5/8”	-	1
606206	Internal Gripping Assembly Overhaul Kit 7”- 8-5/8”	-	1
606207	Internal Gripping Assembly Overhaul Kit 9-5/8”- 20”	-	1
606213	External Gripping Assembly Redress Kit 4-1/2” -7-5/8”	3	10
606212	External Gripping Assembly Rebuild Kit 4-1/2” – 7-5/8”	-	1
605105	Internal Circulator Assembly Redress Kit 4-1/2” – 6-5/8”	3	12
605149	Internal Circulator Assembly Redress Kit 7”-7-5/8”	3	12
605098	Internal Circulator Assembly Redress Kit 8-5/8” – 20”	3	12
606522	External Circulator Assembly Rebuild Kit 4-1/2” – 7-5/8”	3	12
Ref Table	Packer cup	2	10
Ref Table	Gage Ring	-	2
605739	Snorkel	1	3
1006846	Wear Band	-	2

8.4 DWCRT Inspection Chart

8.4.1 Head Assembly

- ☐ 1. Inspect tool joint for thread and seal area damage.
- ☐ 2. Inspect internal threads and the threaded nut that holds the Snorkel.
- ☐ 3. Inspect Housing Cap male and female threads and seal areas.
- ☐ 4. Inspect internal Clutch teeth for deformation (black coating worn away is acceptable).
- ☐ 5. Inspect external lugs on the Clutch. Make sure the Clutch moves and rotates freely in the Housing.
- ☐ 6. Inspect wiper seal surface for corrosion and cracks.
- ☐ 7. Inspect external splines on Top Mandrel for deformation (black coating worn away is acceptable).
- ☐ 8. Inspect Snorkel wiper seal area for corrosion and cracks.
- ☐ 9. Inspect internal threads on Dovetail Mandrel Nut for scaring or galling.
- ☐ 10. Inspect Thrust Washers for scaring or galling.
- ☐ 11. Inspect seal area on Snorkel for rust or pits.
- ☐ 12. Inspect critical cross-section of Top Mandrel for cracks.
- ☐ 13. Inspect the thrust bearing for smooth operation.
- ☐ 14. Inspect the mandrel nut timing lug for damage.
- ☐ 15. Inspect the dovetail mandrel timing nut for damage.
- ☐ 16. Inspect the springs for damage & measure.
- ☐ 17. Inspect Wear Band in Housing Cap.

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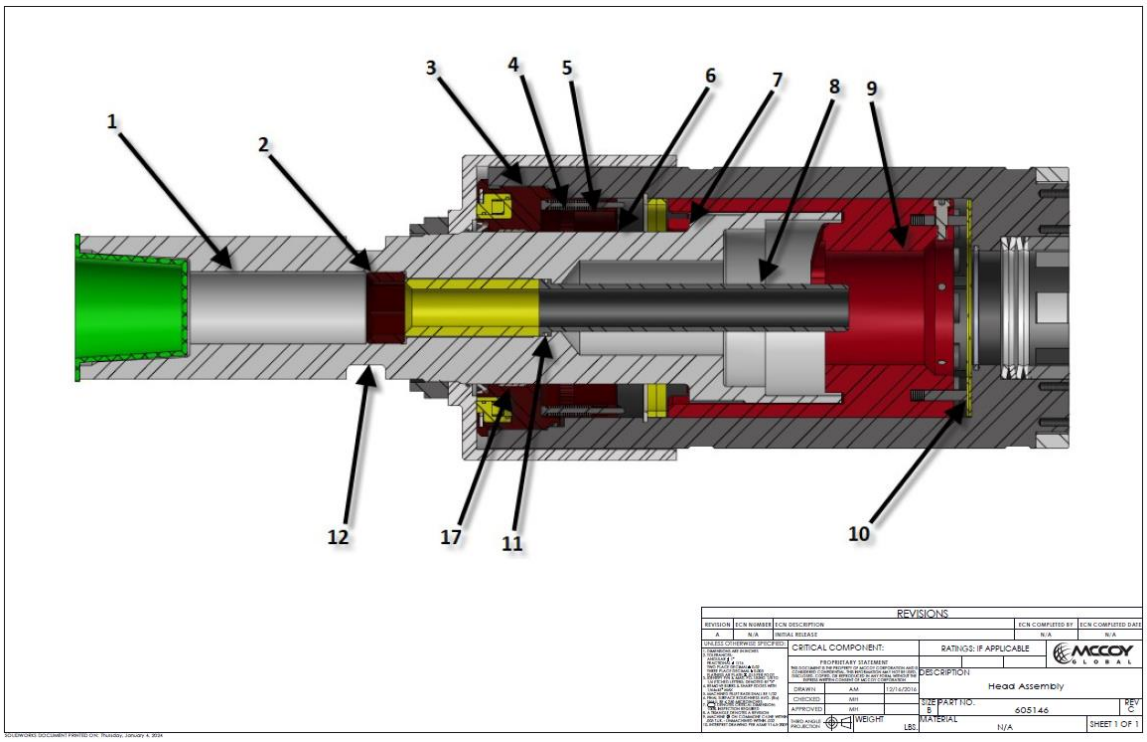
Date: _____



8.4.2 Internal Assembly

- ☐ 1. Inspect seal groove for corrosion.
- ☐ 2. Inspect thread for wear.
- ☐ 3. Inspect seal area for corrosion or pitting.
- ☐ 4. Check for broken springs or short springs.
- ☐ 5. Inspect Insert teeth per acceptance criteria.
- ☐ 6. Inspect Slip contact areas for wear or corrosion.
- ☐ 7. Inspect Wear Guide OD, verify Slips are recessed when tool is released.
- ☐ 8. Inspect internal seal diameter.
- ☐ 9. Inspect Packer Cup OD for tears, cracks, or excessive wear.
- ☐ 10. Inspect Gage Ring OD based on Casing being run.

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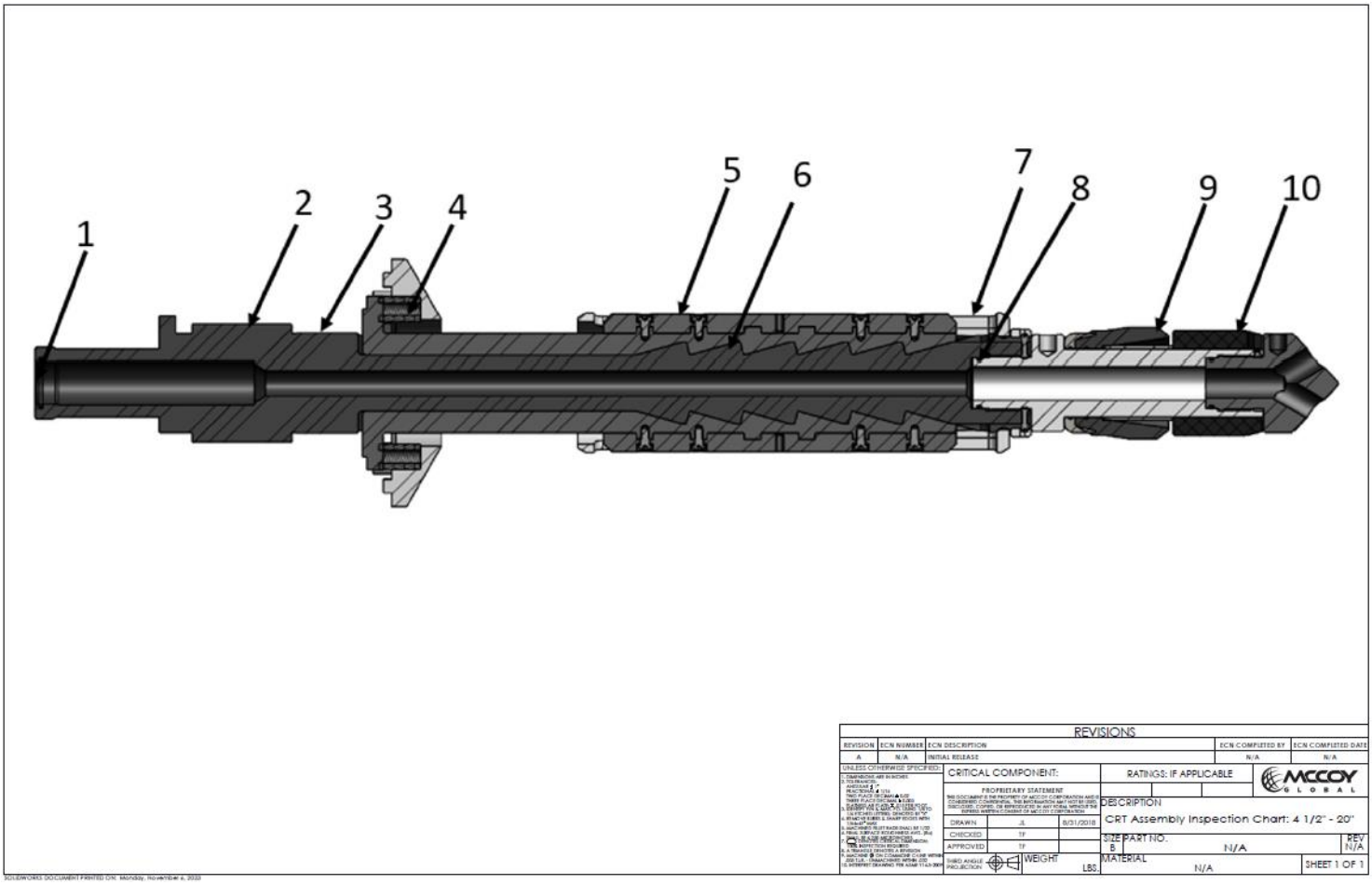


8.4.3 Slip Teeth Inspection Criteria

WARNING

The DWCRT cannot tolerate wellbore misalignment in excess of 1" less than half of the pipe diameter. For example, a 20" casing can tolerate 9" of wellbore misalignment (20"/2 - 1" = 9").
Once top drive weight has been set down on the DWCRT, the tool must be retorqued before a tensile load can be applied.

The DWCRT compensator will unlock the tool if the top drive continues to lower after the casing gets stuck. Any rotation of the tool while in the unlocked position, even clockwise rotation, has the potential to retract the Slips and release the casing string.

Up to 100,000 lbs. of set-down weight may be applied to the tool in the unlocked position if the tool isn't rotated. Gen 2 tool will allow set down weight combined with rotation while in the push position. ***Do not use the DWCRT compensator as a jar for hammering the casing into the well.***

Occasionally the Indicator will continue to completely cover the yellow stripe on the Housing as the tool is raised out of the casing. This is indicative of an air bubble trapped below the Packer Cup which will lift the Housing and Mandrel until the Packer Cup releases its seal. Usually, the seal is released in the coupling. It's important to open the 2" standpipe valve and ensure the IBOP is open to completely release all pressure. Often, the pump pressure gauge will read zero but the only way to fully release all pressure is to completely bleed off the standpipe.

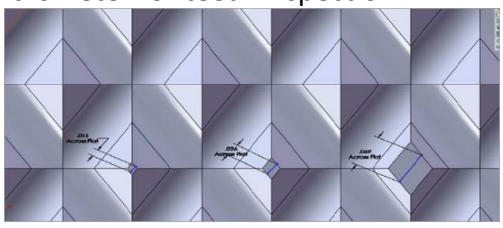
Slips that are not fully retracted can drag along the casing ID and threads which may result in damage to the casing or damage to the tool. The Housing will spin with the Top Mandrel and Indicator once the Slips are fully retracted. Verify that the Retract Line on the Housing lines up with the Retract Line on the Indicator. If the two are not lined up, apply set down weight and continue to retract the Slips.

Dies whose teeth that have been worn flat or broken must be replaced. To measure the flatness of DWCRT dies, use a caliper to measure the width of the flat on the tip of the tooth. If the flat is more than 0.025" wide, the tooth is considered damaged.

Count both the total number of teeth and the number of damaged teeth in a 2" x 2" square. If the number of damaged teeth is more than 10% of the total number of teeth in that square, the die should be replaced.

When inspecting for broken teeth, up to 25% of teeth in and 1.5" square may be broken or missing and the bottom and top 1" of the die face surface are exempt from inspection.

Use part number 1007120: Optical Micrometer for teeth inspection.



8.4.4 DWCRT Thrust Bearing Inspection Guidelines

Disassembly guidelines:

1. Separate the Shaft and Housing Washers from the Cage and Roller Assembly
2. A hydraulic press with suitable fixturing / rings may be required to overcome the seal friction (depending on operating conditions / state of the seal)

Inspection guidelines:

Prior to inspection, the washers will need to be removed from the cage and roller assemblies (using caution not to bend / deflect the cages or gouge the washers during the separation process). Once the bearing has been disassembled, all parts will need to be thoroughly cleaned (preferably with a non-abrasive cleaner and lint free cloths). During the cleaning process, the cage and roller assemblies will need to be flushed with clean oil (to ensure that there is no particulate / debris caught in the cage), and each roller will need to be rotated by hand through a minimum of 360°. This ensures that the entire surface of the roller is evaluated (for debris and/ or damage) and ensures that all rolling elements still rotate freely. If either of the cage and roller assemblies cannot be fully cleaned / decontaminated, both cage and roller assemblies should be scrapped out and replaced. At this stage, any components that show signs of rust, should be set aside, and be deemed to require replacement.

The cage and roller assemblies will need to be replaced if any of the following are observed:

1. Any rusting of the cage
2. Any wear (pitting, galling, etc.) on even one roller
3. Any signs of cage separation
4. Any signs of cage bar (the material between the cylindrical rollers) damage
5. If even one of the rollers seems to be sticky / more difficult to rotate

The housing and shaft washers will need to be replaced if any of the following are observed:

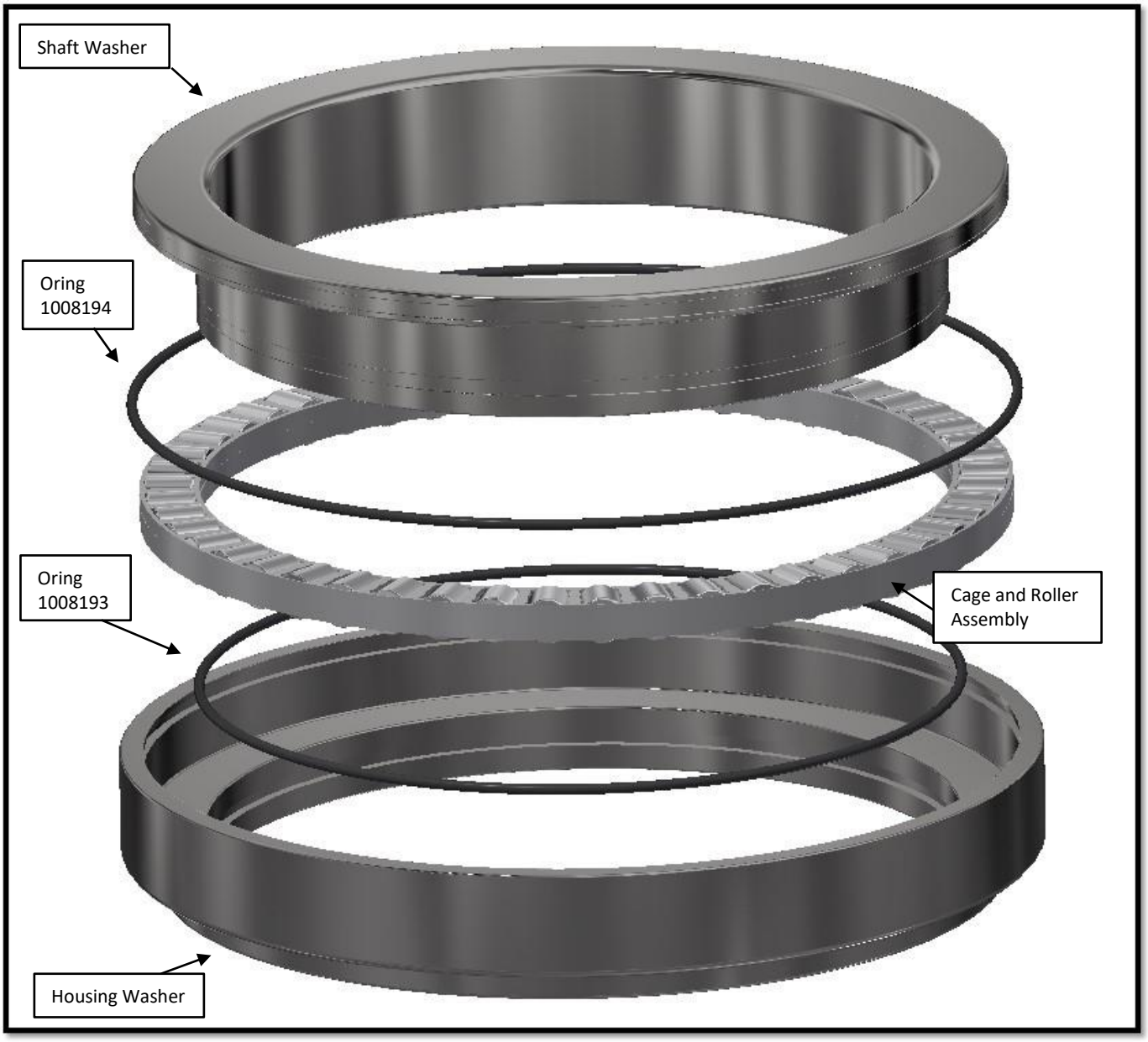
1. Any rust forming on the washers
2. Any pitting
3. Any initiation of spalling
4. Any other signs of wear / damage on the running surface of the bearing
    a. **NOTE**: The running surface of the washer / bearing is defined as the face of the washer that the cylindrical rollers run / rotate on

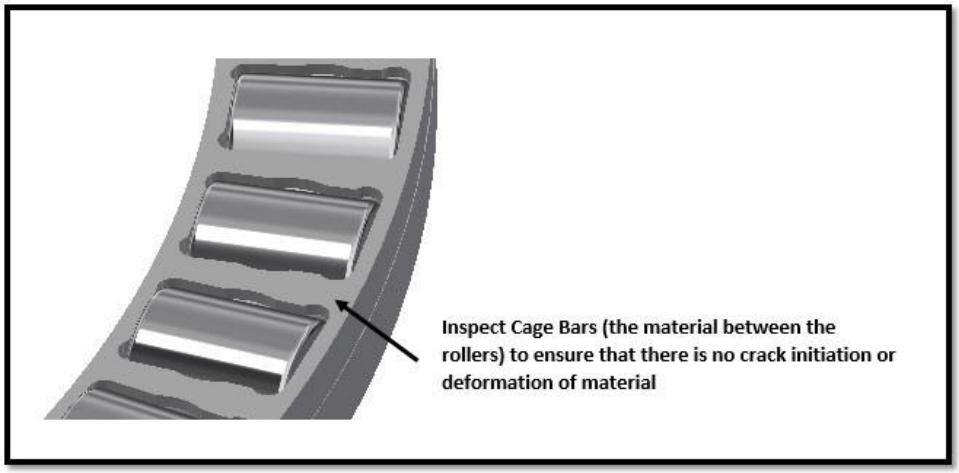
Additional inspection steps:

1. Inspect the seals and replace if there are any signs of seal wear / damage

Re-Assembly Guidelines:

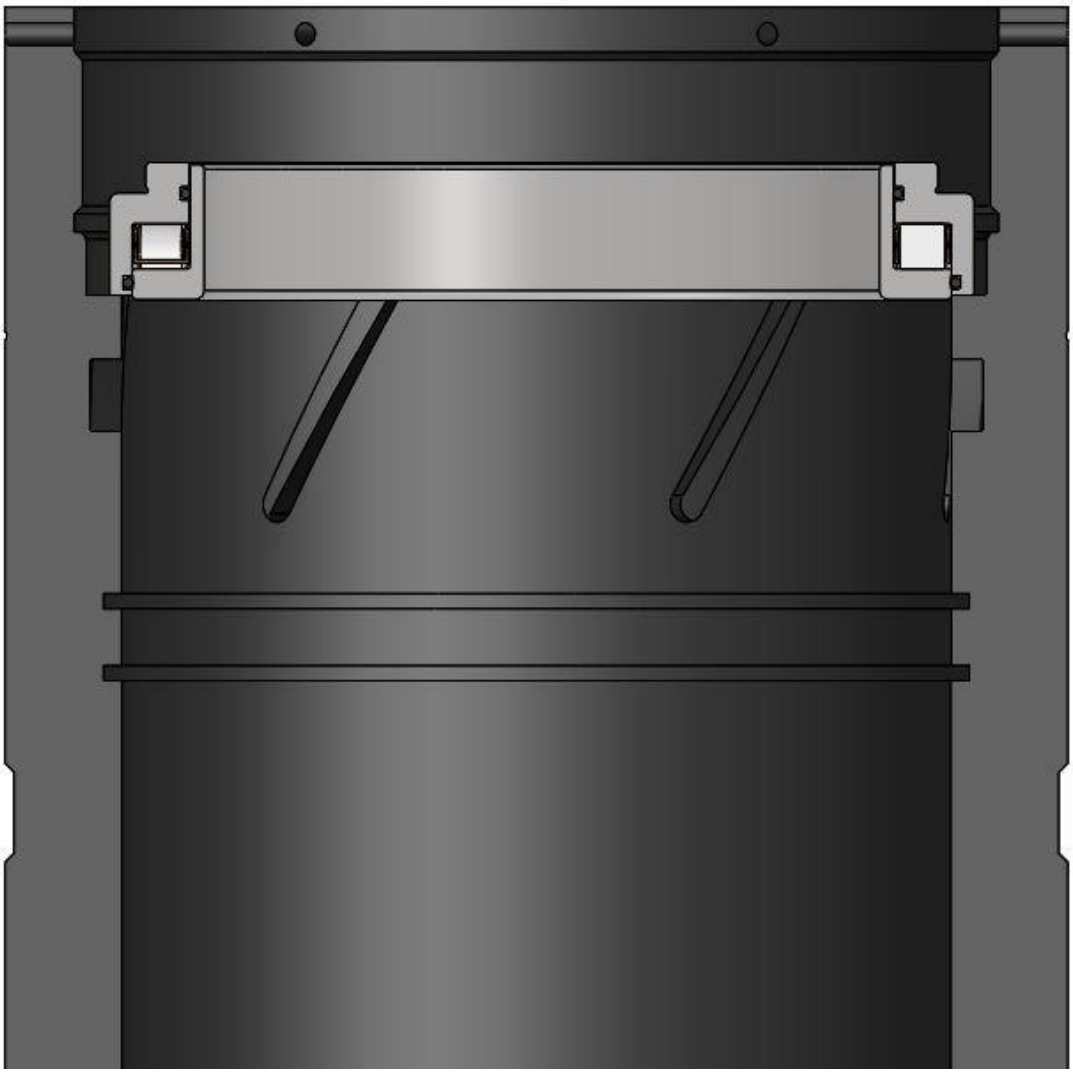
1. Thoroughly clean all surfaces (including the seal grooves, and cage and roller assembly)
2. Grease the running surface in the housing washer
3. Place the cage and roller assembly in the housing washer
4. Grease the cage and roller assembly
5. Support the housing washer while installing the shaft washer (again, a hydraulic press with suitable fixturing / rings may be required to overcome seal friction)


Shaft Washer
Oring
1008194
Oring
1008193
Cage and Roller
Assembly
Housing Washer


Inspect Cage Bars (the material between the rollers) to ensure that there is no crack initiation or deformation of material

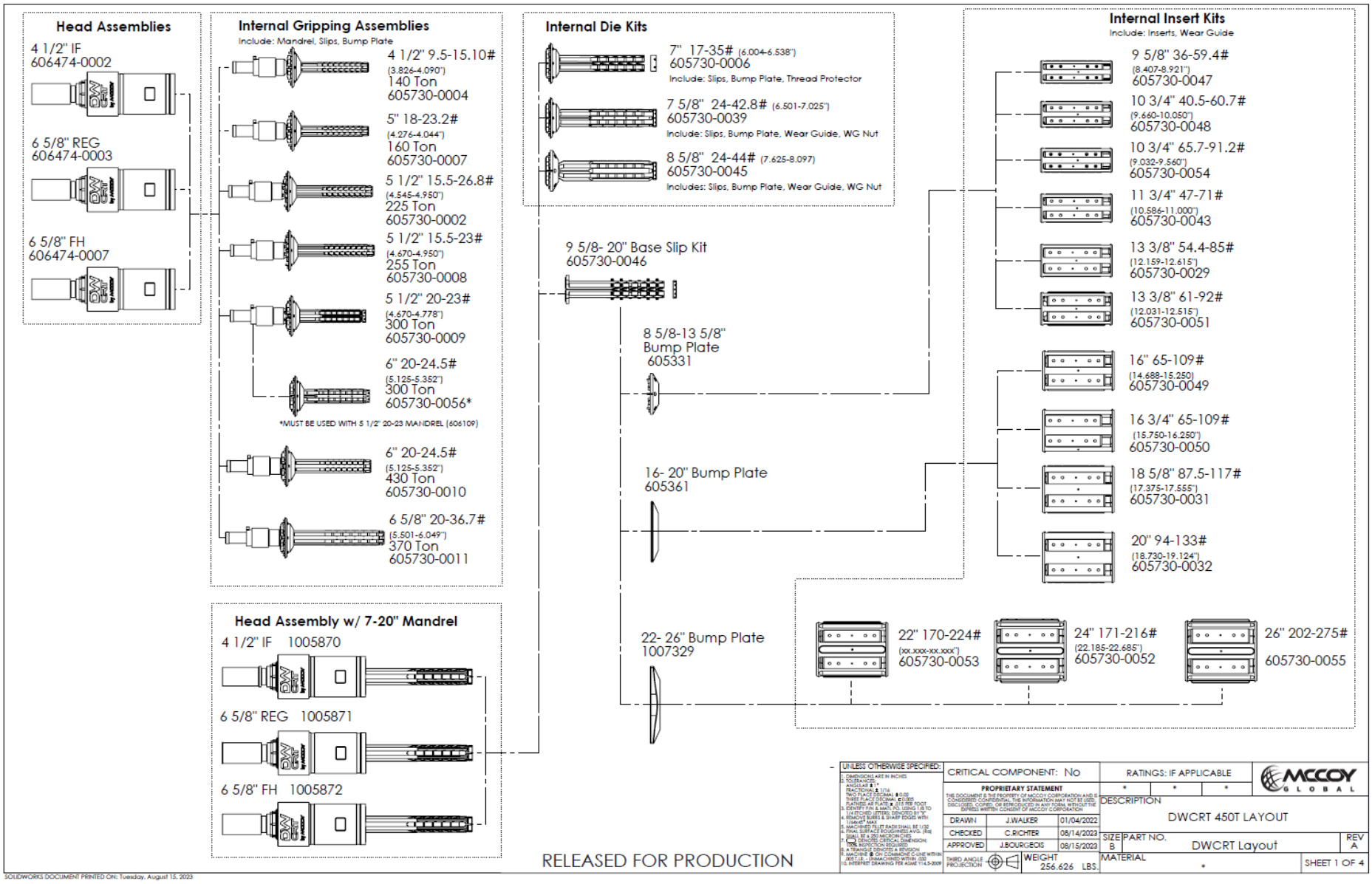
The DWCRT housing can be used as a fixture to aid in disassembly.

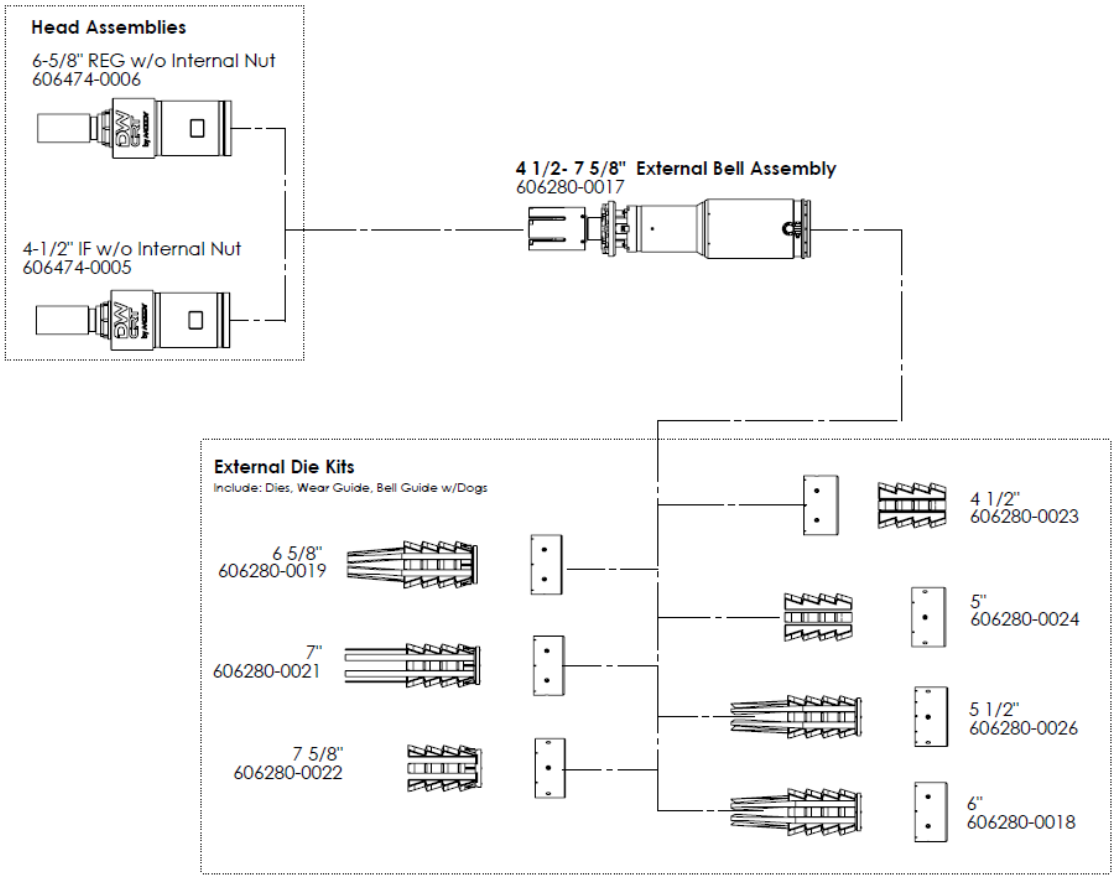
1. Place the thrust bearing in the housing as shown below
2. Using a plastic or rubber mallet, tap the shaft washer in a star pattern to evenly push the shaft washer down
3. Be sure to hold the shaft washer and roller assembly to keep it from falling once it is free



Section 9 - **Assembly – BOMs**

9.1 DWCRT 450T Layout





DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		
SIZE B	PART NO. DWCRT Layout	REV A
MATERIAL *		SHEET 2 OF 4

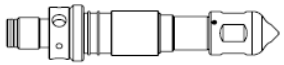
SOLIDWORKS DOCUMENT PRINTED ON: Tuesday, August 15, 2023

Internal Circulator Base Kit

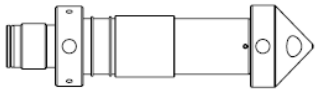
Includes: Circulator Body, Cup Spacer, Nose

4 1/2- 5"
605101-0023

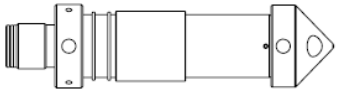
5 1/2- 6 5/8"
605101-0024



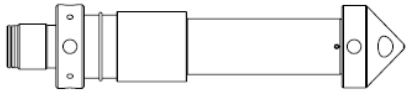
7- 7 5/8"
605071-0013



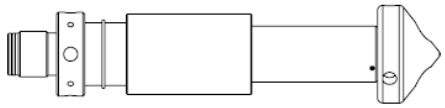
8 5/8- 13 3/8"
605090-0024



16- 20"
605351-0014



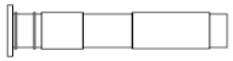
22- 26"
1007325



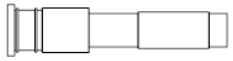
External Circulator Cartridge Base Kit

Includes: Cartridge Body, Cup Spacer

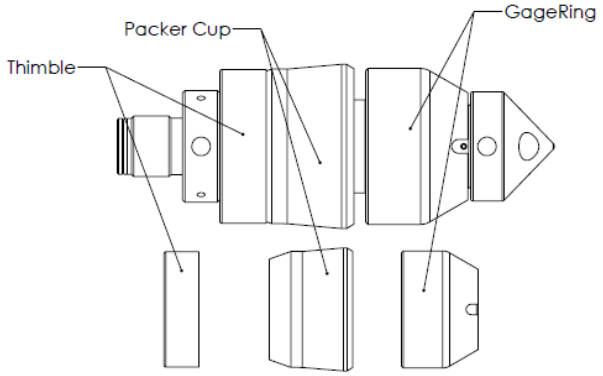
4 1/2- 5"
606067-0007



5 1/2- 6 5/8"
606069-0011



7- 7 5/8"
606071-0005

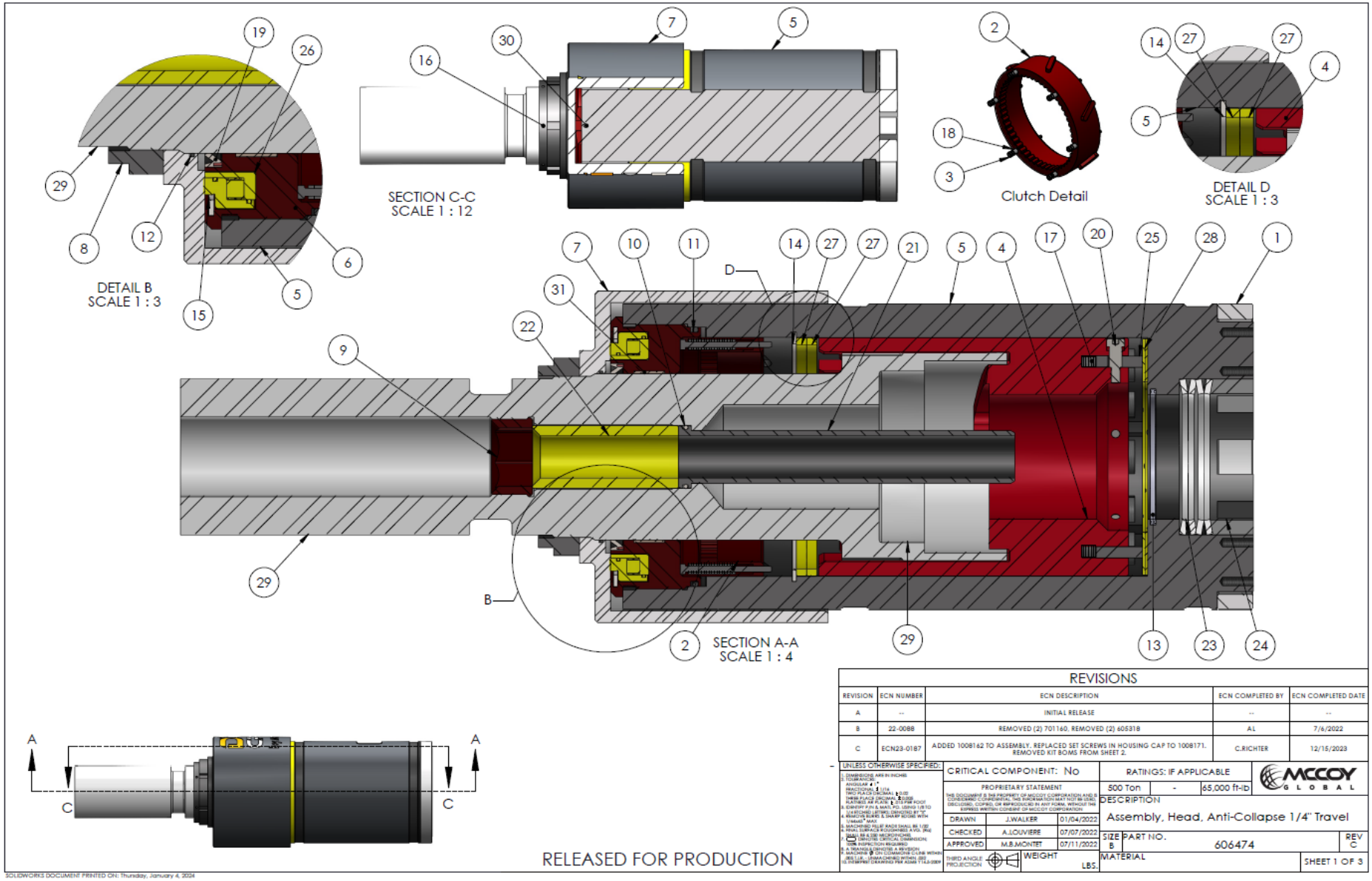


Refer to TABLE 17 on the Iportal or in the manual for Packer Cups,Gage Rings and Thimbles. Table is updated as request come in.

DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		
SIZE B	PART NO. DWCRT Layout	REV A
MATERIAL *		SHEET 3 OF 4

SOLIDWORKS DOCUMENT PRINTED ON: Tuesday, August 15, 2023

9.1.1 Head Assembly, 500 Ton



REVISIONS				
REVISION	ECN NUMBER	ECN DESCRIPTION	ECN COMPLETED BY	ECN COMPLETED DATE
A	--	INITIAL RELEASE	--	--
B	22-0088	REMOVED (2) 701160, REMOVED (2) 605318	AL	7/6/2022
C	ECN23-0187	ADDED 1008162 TO ASSEMBLY, REPLACED SET SCREWS IN HOUSING CAP TO 1008171, REMOVED KIT BOMS FROM SHEET 2.	C.RICHTER	12/15/2023

UNLESS OTHERWISE SPECIFIED:

CRITICAL COMPONENT: No

RATINGS: IF APPLICABLE

500 Ton - 65,000 ft-lb

MCCOY GLOBAL

PROPRIETARY STATEMENT

DESCRIPTION: Assembly, Head, Anti-Collapse 1/4" Travel

DRAWN	J.WALKER	01/04/2022
CHECKED	A.LOUVIERE	07/07/2022
APPROVED	M.B.MONTET	07/11/2022

SIZE B | PART NO. 606474 | REV C

THIRD ANGLE PROJECTION | WEIGHT LBS. | MATERIAL | SHEET 1 OF 3

SOLIDWORKS DOCUMENT PRINTED ON: Thursday, January 4, 2024

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	605398	Cable Guide Cover	1
2	605620	CLUTCH, DWCRT 500 TON	1
3	605749	PIN, CLUTCH ALIGNMENT SPRING, DWCRT	6
4	606041	DOVETAIL MANDREL, NUT, DWCRT 500 TON	1
5	606473	HOUSING, 500 TON, 1/4" TRAVEL, DWCRT	1
6	605016	Housing Cap	1
7	605390	INDICATOR, DWCRT 450 TON	1
8	605018	Indicator Nut	1
9	604079	LOCKING NUT, 2 3/4"	1
10	700601	O-Ring, 3.020" OD X 2.600" ID X 0.210" CS	1
11	700600	O-Ring	1
12	700602	O-Ring	1
13	700800	PolyPak, 6.5" OD x 6.0" ID x 0.25" CS	1
14	701200	RING, SNAP, 12.102" OD x 10.98" ID x 0.56" W x 0.19" T, SMALLEY WHM-1150	1
15	701201	RING, SNAP, 12.628" OD x 11.504" ID x 0.56" W x 0.19" T, SMALLEY WHM-1200	1
16	700002	Set Screw	6
17	701250	COMPRESSION SPRING	10
18	700110	SPRING, 1/2, 3 3/8 L, 103-218-00	6
19	700801	Seal, Wiper, 9 OD x 8 ID x 0.625" CS	1
20	700000	BOLT, SHOULDER, 5/8" x 1" x 1/2"-13, GR. 8	5
21	605739	SNORKEL, 450 TON, DWCRT	1
22	1006174	SPACER, DWCRT, 7" LG, 1" ID	1
23	605721	SPRING. 7.50" OD x 6.00 ID x 0.298" THK	4
24	605720	Spring Plate	1
25	605020	SPRING RETAINING CAGE	1
26	605222	THRUST BEARING	1
27	605686	THRUST RING, 11.469" OD x .500 THK, DWCRT	2
28	605022	THRUST WASHER, 11.38 OD x .13" THK, DWCRT	2
29	605900	Top Mandrel Blank	1
30	1008171	SCREW, SET, EXTENDED TIP, 3/8-16 X 5/8, STEEL	6
31	1008162	WEAR STRIP, BRONZE, 1/8" x 1 1/2" W, 25.525" CHORD LENGTH, 612T-150B	1

△C

ITEM NO.	PART NUMBER	DESCRIPTION	Options/QTY.
50	605118	Safety Ring	1

Notes:
1. Refer to 60590X for available connections.
2. Safety ring available in place of cable guide cover.

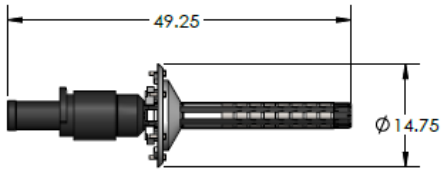
Internal Spring Valve
Part Number 602870
Can Replace Item # 605113

△C

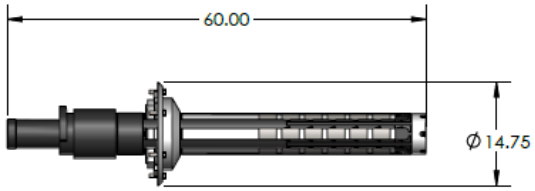
DESCRIPTION	MCCOY GLOBAL	
Assembly, Head, Anti-Collapse 1/4" Travel		
SIZE B	PART NO. 606474	REV C
MATERIAL		SHEET 2 OF 3

SOLIDWORKS DOCUMENT PRINTED ON: Friday, January 12, 2024

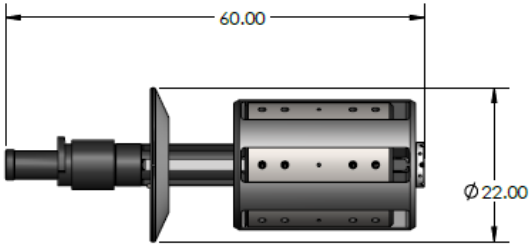
9.2 Internal Gripping Assembly, 4-1/2” – 20”



140 Ton 4-1/2" 9.5-15.10# Display



450 Ton 7" 17-35# Display



450 Ton 20" 94-133# Display

Casing Range	Tension (Tons)	Torque (ft-lb.)	OAL w/circulator and Standard Head(ft)
4-1/2" 9.5-15.10#	140	13,000	8.6
5" 18-23.2#	160	15,000	8.6
5-1/2" 15.5-26.8#	225	25,000	8.9
5-1/2" 15.5-23#	255	25,000	8.9
5-1/2" 20-23#	300	30,000	8.9
6" 20-24.5#	430	30,000	9
6-5/8" 20-36.7#	370	50,000	9.6
7" 17-35# 7-5/8" 24-42.8#	450	65,000	9.6
8-5/8" 24-44# 9-5/8" 36-59.4# 10-3/4" 40.5- 60.7# 11-3/4" 47-71# 13-3/8" 54.4-85#	450	65,000	9.7
16" 65-109# 16-3/4" 65-109# 18-5/8" 87.5-117# 20" 94-133#	450	65,000	10

All Configurations will need CRT Head and a Circulator Assembly

REVISIONS

REV	ECN	ECN DESCRIPTION	COMPLETED BY	COMPLETED DATE
B	ECN19-0307	Changed slip part number on 5-1/2" 20-23# 300Ton	J.LARA	2019

UNLESS OTHERWISE SPECIFIED:

CRITICAL COMPONENT: No

RATINGS: IF APPLICABLE

PROPRIETARY STATEMENT

DRAWN	JL	8/31/2018
CHECKED	TF	
APPROVED	RU	

THIRD ANGLE PROJECTION

WEIGHT 807.378 LBS.

DESCRIPTION: DWCRT 450T LAYOUT

SIZE B | PART NO. 605730 | REV B

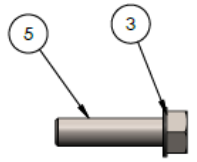
MATERIAL *

SHEET 1 OF 14

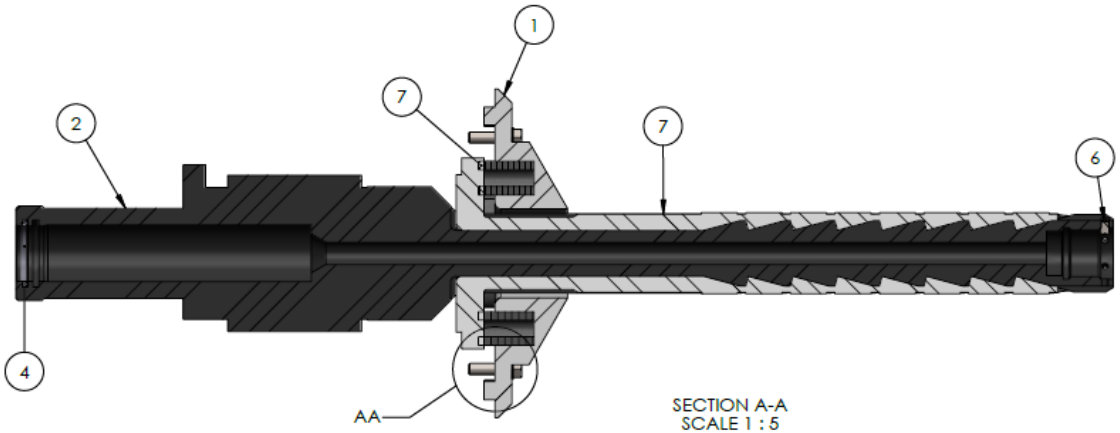
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	4.5" 9.5-15.10/QTY.
1	605328	BUMP PLATE, 4 1/2-5", DWCRT	4-1/2"-5"		1
2	606105	DOVETAIL MANDREL, 140 TON, 4 1/2" 9.5-15.1#, DWCRT			1
3	700500	Washer Nord-Lock 1/2" 0184807			6
4	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
5	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
6	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
7	606667	SLIP, 140 TON, 4 1/2" 9.5-15.1#, DWCRT			6
8	701254	SPRING, DIE, 104-710 (RAYMOND)			6

Redress Kit
Part # 606201
Contains
QTY Part #
1) 700802
6) 700500

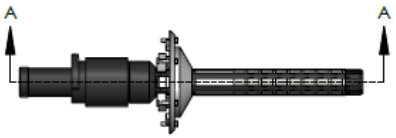
Overhaul Kit
Part # 606205
Contains
QTY Part #
1) 606201
6) 701254
6) 700008
6) 701352



DETAIL AA
SCALE 1 : 2



SECTION A-A
SCALE 1 : 5



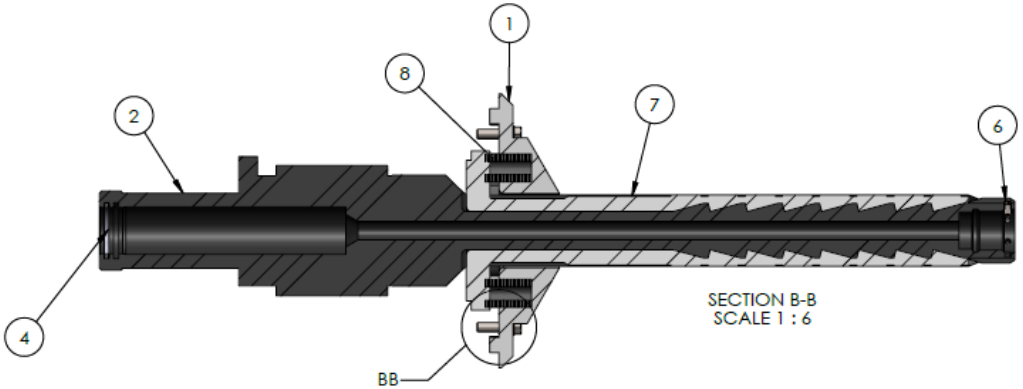
DESCRIPTION		
DWCRT 450T LAYOUT		140 Ton 4-1/2"
SIZE B	PART NO. 605730	REV B
MATERIAL		SHEET 2 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

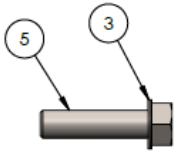
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	5" 18-23.2/QTY.
1	605328	BUMP PLATE, 4 1/2-5", DWCRT	4-1/2"-5"		1
2	606106	Dovetail Mandrel			1
3	700500	Washer Nord-Lock 1/2" 0184807			6
4	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
5	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
6	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
7	606668	Slip	5" 18-23.2#		6
8	701254	SPRING, DIE, 104-710 (RAYMOND)			6

Redress Kit
Part # 606209
Contains
QTY Part #
1) 700802
6) 700500

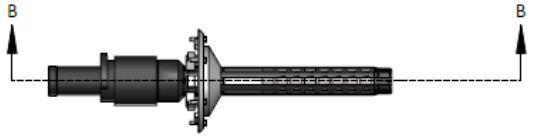
Overhaul Kit
Part # 606210
Contains
QTY Part #
1) 606209
6) 701254
6) 700008
6) 701352



SECTION B-B
SCALE 1 : 6



DETAIL BB
SCALE 1 : 2



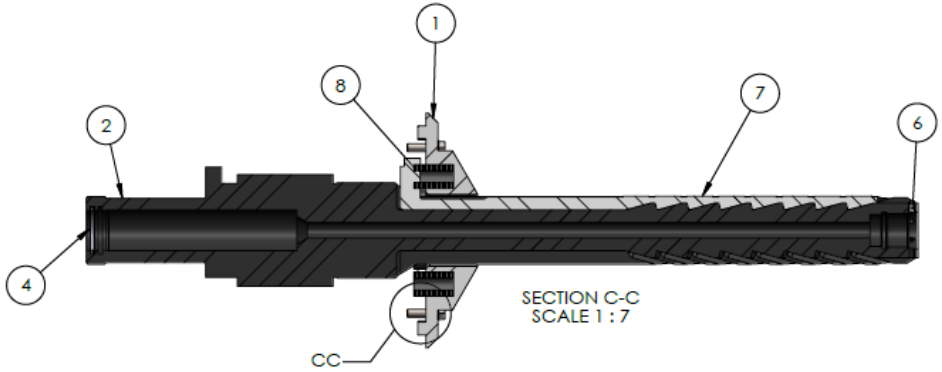
DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		160 Ton 5"
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 3 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

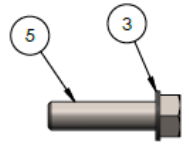
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	5.5" 15.5-26.8#/5.5" 15.5-26#/QTY.
1	605329	BUMP PLATE, 5 1/2", 15.5-26#, DWCRT	5-1/2" 15.5-26#		1
2	606107	DOVETAIL MANDREL, 225 TON, 5 1/2" 15.5-26.8#, DWCRT			1
3	700500	Washer Nord-Lock 1/2" 0184807			6
4	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
5	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
6	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
7	606666	SLIP, 5 1/2", 15.5-26.8#, 225-255 TON, DWCRT	5-1/2" 15.5-26.8#		6
8	701254	SPRING, DIE, 104-710 (RAYMOND)			6

Redress Kit
Part # 606201
Contains
QTY Part #
1) 700802
6) 700500

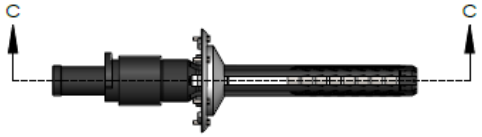
Overhaul Kit
Part # 606205
Contains
QTY Part #
1) 606201
6) 701254
6) 700008
6) 701352



SECTION C-C
SCALE 1 : 7



DETAIL CC
SCALE 1 : 2



DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT	225 Ton 5-1/2" 15.5-26.8 #	
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 4 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

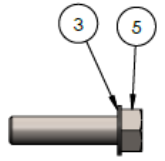
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	5.5" 15.5-23#/QTY.
1	605573	BUMP PLATE, 5 1/2" 15.5-23#, DWCRT	5-1/2" 15.5-23#		1
2	606108	DOVETAIL, MANDREL, 255 TON, 5 1/2" 15.5-23#, DWCRT			1
3	700500	Washer Nord-Lock 1/2" 0184807			6
4	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
5	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
6	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
7	606666	SLIP, 5 1/2", 15.5-26.8#, 225-255 TON, DWCRT	5-1/2" 15.5-26.8#		6
8	701254	SPRING, DIE, 104-710 (RAYMOND)			6

Redress Kit
Part # 606201
Contains

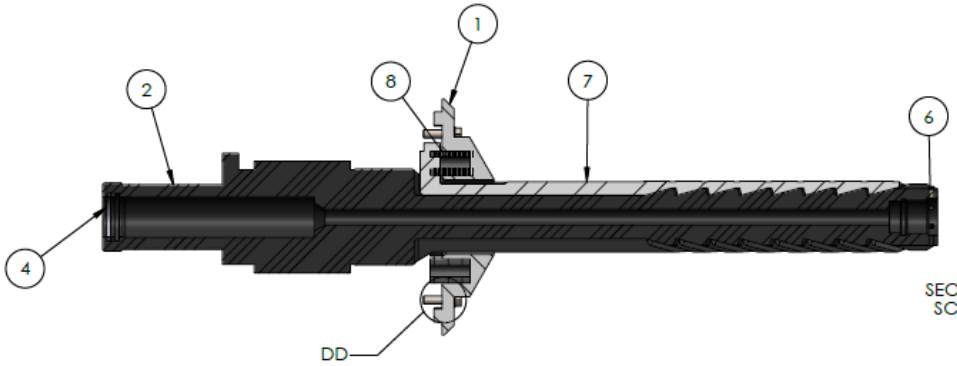
QTY	Part #
1)	700802
6)	700500

Overhaul Kit
Part # 606205
Contains

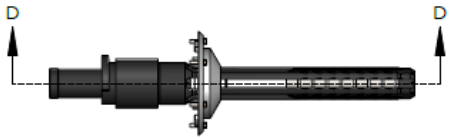
QTY	Part #
1)	606201
6)	701254
6)	700008
6)	701352



DETAIL DD
SCALE 1 : 2



SECTION D-D
SCALE 1 : 7



DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		255 Ton 5-1/2" 15.5-23#
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 5 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

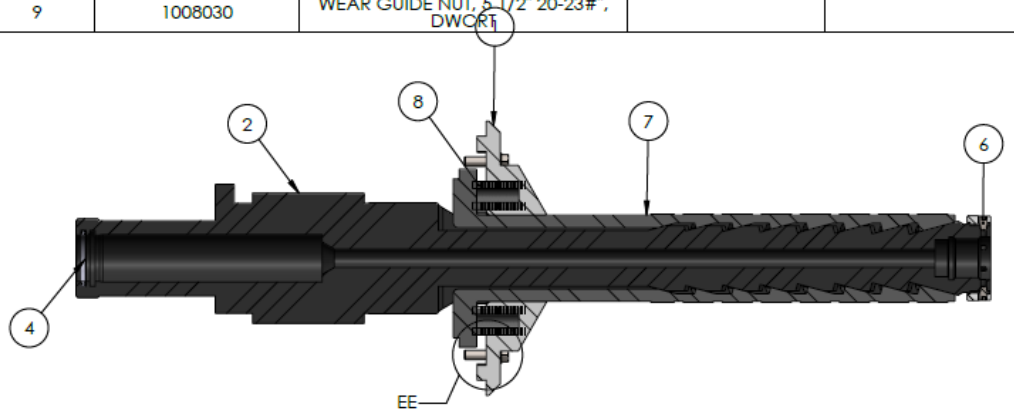
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	5.5" 20-23#/QTY.
1	605573	BUMP PLATE, 5 1/2" 15.5-23#, DWCRT	5-1/2" 15.5-23#		1
2	1008238	DOVETAIL MANDREL, 300 TON, 5 1/2" 20-23# - 6" 20-24.5#, DWCRT			1
3	700500	Washer Nord-Lock 1/2" 0184807			6
4	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
5	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
6	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
7	1005843	SLIP, 5 1/2" 20-23#, DWCRT	5-1/2" 20-23#		6
8	701254	SPRING, DIE, 104-710 (RAYMOND)			6
9	1008030	WEAR GUIDE NUT, 5 1/2" 20-23#", DWCRT			1

Redress Kit
Part # 606201
Contains

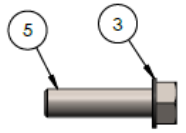
QTY	Part #
1)	700802
6)	700500

Overhaul Kit
Part # 606205
Contains

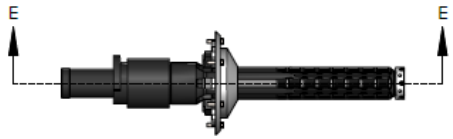
QTY	Part #
1)	606201
6)	701254
6)	700008
6)	701352



SECTION E-E
SCALE 1 : 6



DETAIL EE
SCALE 1 : 2



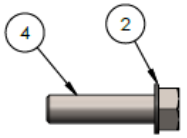
SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		300 Ton 5-1/2" 20-23#
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 6 OF 14

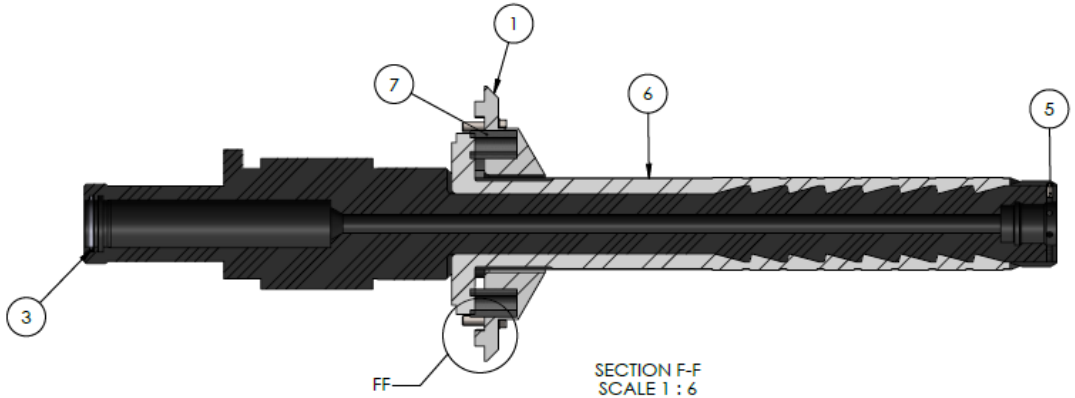
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	6" 20-24.5#/QTY.
1	605533	Bump Plate	6" 20-24.5#		1
2	700500	Washer Nord-Lock 1/2" 0184807			6
3	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
4	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
5	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
6	606675	Slip, 6" 20-24.5#			6
7	701254	SPRING, DIE, 104-710 (RAYMOND)			6
8	606110	Dovetail Mandrel, 6" 20-24.5#, 430 Ton			1

Redress Kit
Part # 606201
Contains
QTY Part #
1) 700802
6) 700500

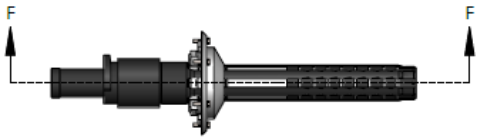
Overhaul Kit
Part # 606205
Contains
QTY Part #
1) 606201
6) 701254
6) 700008
6) 701352



DETAIL FF
SCALE 1 : 2



SECTION F-F
SCALE 1 : 6



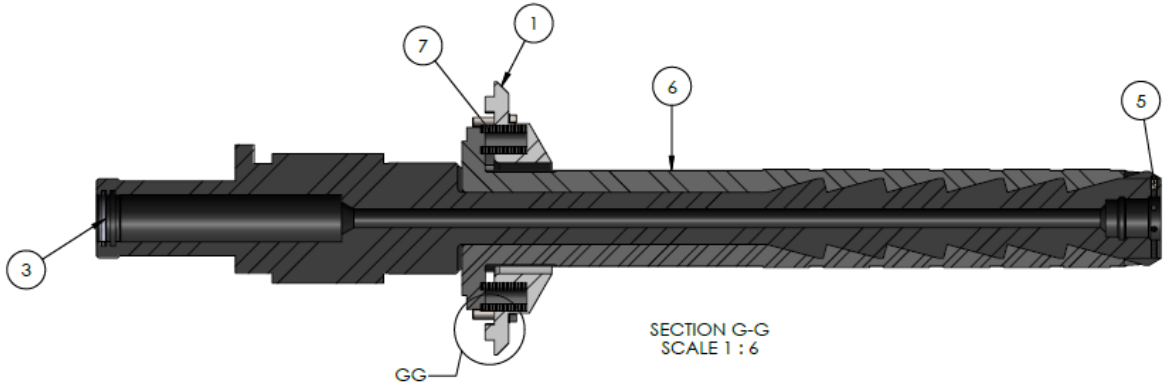
DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		430 Ton 6" 20-24.5 #
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 7 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

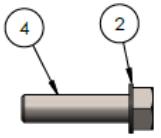
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	6.625" 20-36.7#/QTY.
1	605499	BUMP PLATE, 6-5/8" 20-36.7#, DWCRT			1
2	700500	Washer Nord-Lock 1/2" 0184807			6
3	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
4	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
5	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
6	606672	SLIP, 6-5/8" 20-36.7#, DWCRT	6-5/8" 20-36.7#		6
7	701254	SPRING, DIE, 104-710 (RAYMOND)			6
8	606111	DOVETAIL, MANDREL, 6-5/8" 20-36.7# , DWCRT			1

Redress Kit
Part # 606201
Contains
QTY Part #
1) 700802
6) 700500

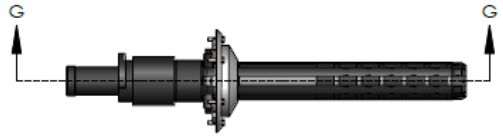
Overhaul Kit
Part # 606205
Contains
QTY Part #
1) 606201
6) 701254
6) 700008
6) 701352



SECTION G-G
SCALE 1 : 6



DETAIL GG
SCALE 1 : 2



DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		370 Ton 6-5/8" 20-36.7#
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 8 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

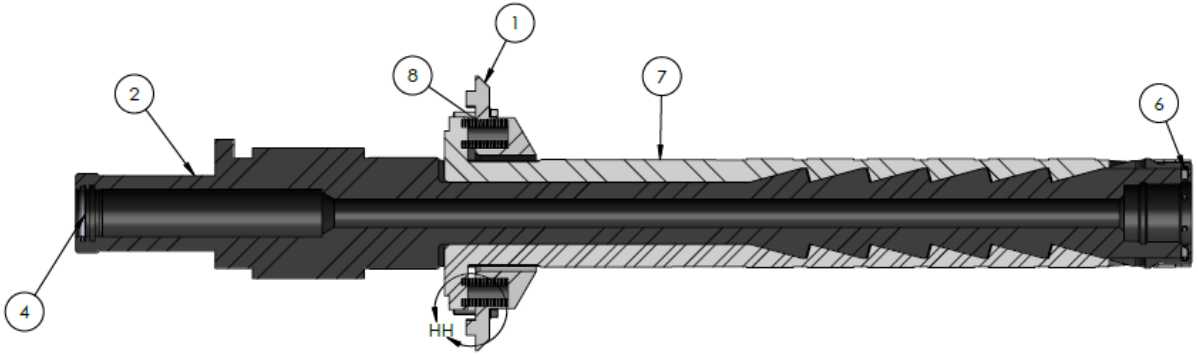
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	7" 17-35#/QTY.
1	605330	Bump Plate, 7"			1
2	606112	DOVETAIL MANDREL, 7"-20" 450 TON, DWCRT			1
3	700500	Washer Nord-Lock 1/2" 0184807			6
4	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
5	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
6	701352	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL		3/8-16 x 3/4	6
7	606664	Slip, 7" 17-35#, DWCRT			6
8	701254	SPRING, DIE, 104-710 (RAYMOND)			6
9	605287	Thread Protector, 7" 17-35#			1

Redress Kit
Part # 606202
Contains

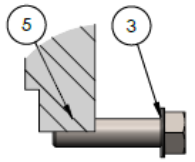
QTY	Part #
1)	700802
6)	700500

Overhaul Kit
Part # 606206
Contains

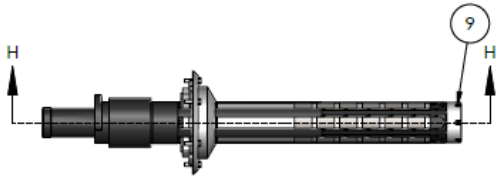
QTY	Part #
1)	606202
6)	701254
6)	700008
6)	701352



SECTION H-H
SCALE 1 : 6



DETAIL HH
SCALE 1 : 2



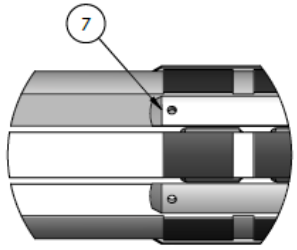
DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		450 Ton 7" 17-35#
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 9 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

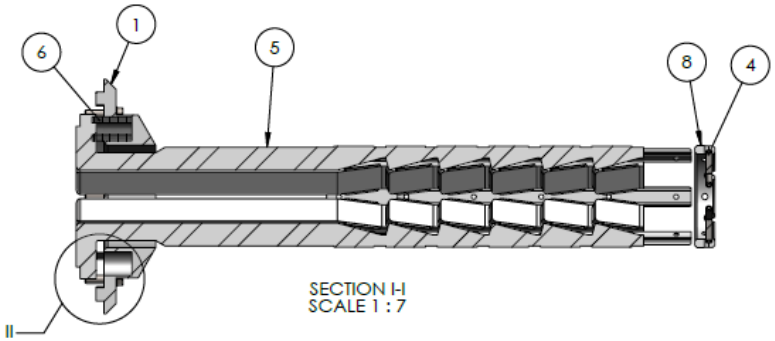
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	7.625" 24-42.8#/QTY.
1	605374	BUMP PLATE, 7-5/8", DWCRT	7-5/8"		1
2	700500	Washer Nord-Lock 1/2" 0184807			6
3	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
4	701357	SCREW, SET, 3/8-16, 1 1/2, GR 8		3/8-16 x 1 1/2	6
5	606665	SLIP, 7 5/8" 24-42.8#, DWCRT	7-5/8" 24-42.8#		6
6	701254	SPRING, DIE, 104-710 (RAYMOND)			1
7	605160	WEAR GUIDE, DWCRT, 7-5/8" 24-42.8#	7-5/8" 24-42.8#		6
8	605167	WEAR GUIDE NUT, 7-5/8" - 20", DWCRT	7-5/8" - 20"		1

Redress Kit
Part # 606202
Contains
QTY Part #
1) 700802
6) 700500

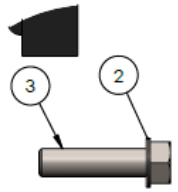
Overhaul Kit
Part # 606206
Contains
QTY Part #
1) 606202
6) 701254
6) 700008
6) 701357



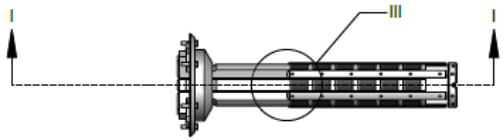
DETAIL III
SCALE 1 : 4



SECTION I-I
SCALE 1 : 7



DETAIL II
SCALE 1 : 2



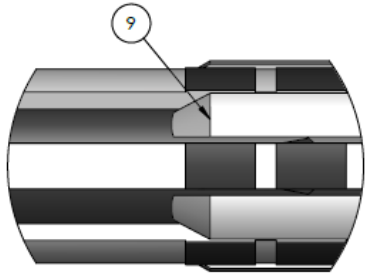
DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT	450 Ton 7-5/8"	
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 10 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

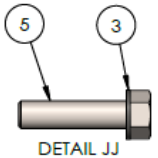
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	8.625" 24-44#/QTY.
1	605331	BUMP PLATE. 8-5/8" 13-5/8", DWCRT	8-5/8" 13-5/8"		1
2	606112	DOVETAIL MANDREL, 7"-20" 450 TON, DWCRT			1
3	700500	Washer Nord-Lock 1/2" 0184807			6
4	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
5	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
6	701357	SCREW, SET, 3/8-16, 1 1/2, GR 8		3/8-16 x 1 1/2	6
7	606669	SLIP, 8-5/8" 24-44#	8-5/8" 24-44#		6
8	701254	SPRING, DIE, 104-710 (RAYMOND)			6
9	605161	WEAR GUIDE, DWCRT, 8-5/8" 24-44#	8-5/8" 24-44#		6
10	605167	WEAR GUIDE NUT, 7-5/8" - 20", DWCRT	7-5/8" - 20"		1

Redress Kit
Part # 606202
Contains
QTY Part #
1) 700802
6) 700500

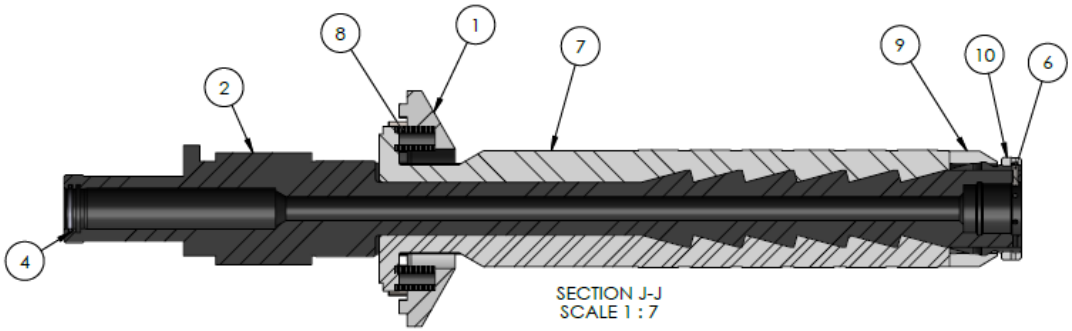
Overhaul Kit
Part # 606206
Contains
QTY Part #
1) 606202
6) 701254
6) 700008
6) 701357



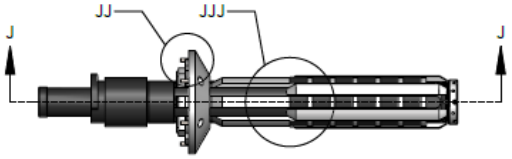
DETAIL JJJ
SCALE 1 : 4



DETAIL JJ
SCALE 1 : 2



SECTION J-J
SCALE 1 : 7



DESCRIPTION	MCCOY GLOBAL	
DWCRT 450T LAYOUT		450 Ton 8-5/8"
SIZE B	PART NO. 605730	REV B
MATERIAL *		SHEET 11 OF 4

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	9.625" 36-59.4#/QTY.
1	606764	BASE SLIP, 9-5/8" -20" 450 TON	9-5/8"-20"		6
2	605331	BUMP PLATE. 8-5/8" 13-5/8", DWCRT	8-5/8" 13-5/8"		1
3	606112	DOVETAIL MANDREL, 7"-20" 450 TON, DWCRT			1
4	605067	INSERT, 9-5/8" 36-59.4#, DWCRT			6
5	700500	Washer Nord-Lock 1/2" 0184807			30
6	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
7	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
8	701357	SCREW, SET, 3/8-16, 1 1/2, GR 8		3/8-16 x 1 1/2	6
9	701254	SPRING, DIE, 104-710 (RAYMOND)			6
10	SBHCSCREW 0.06-80x0.125-HX-N	BOLT, BUTTON HEAD, SOCKET, 1/2"-13, 7/8", PLAIN, ALLOY, McMASTER-CARR 91255A708	-		24
11	605162	WEAR GUIDE, 9-5/8" 36-59.4#, DWCRT			1
12	605167	WEAR GUIDE NUT, 7-5/8" - 20", DWCRT	7-5/8" - 20"		1

Other Size Configurations

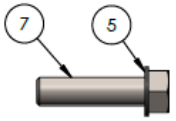
ITEM NO.	PART NUMBER	DESCRIPTION	Size	10.75" 40.5-60.7#/QTY.
4	605068	INSERT 10-3/4" 40.5-60.7#, DWCRT		6
11	605163	WEAR GUIDE, 10-3/4" 40.5-60.7#, DWCRT	10-3/4" 40.5-60.7#	1

ITEM NO.	PART NUMBER	DESCRIPTION	Size	11.75" 47-71#/QTY.
4	605069	INSERT, 11 3/4, 47-71#. DWCRT		6
11	605164	WEAR GUIDE, 11 3/4" 47-71#, DWCRT	11-3/4" 47-71#	1

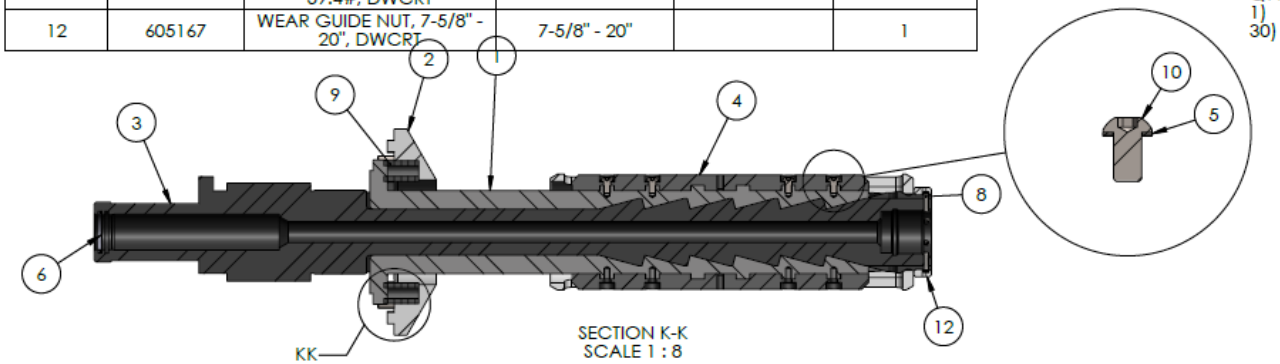
ITEM NO.	PART NUMBER	DESCRIPTION	Size	13.375 54.4-85# 13.625 88.2#/QTY.
4	605070	INSERT, 13 3/8" 54.4-85#, DWCRT		6
11	605165	WEAR GUIDE, 13-3/8" 54.4-85#, DWCRT		1

Redress Kit
Part # 606203
contains
QTY Part #
1) 700802
30) 700500

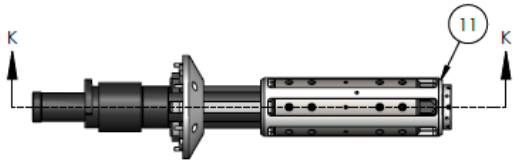
Overhaul kit
Part # 606207
Contains
QTY Part #
1) 606203
6) 701254
6) 700008
24) 700009
6) 701357



DETAIL KK
SCALE 1 : 2



SECTION K-K
SCALE 1 : 8



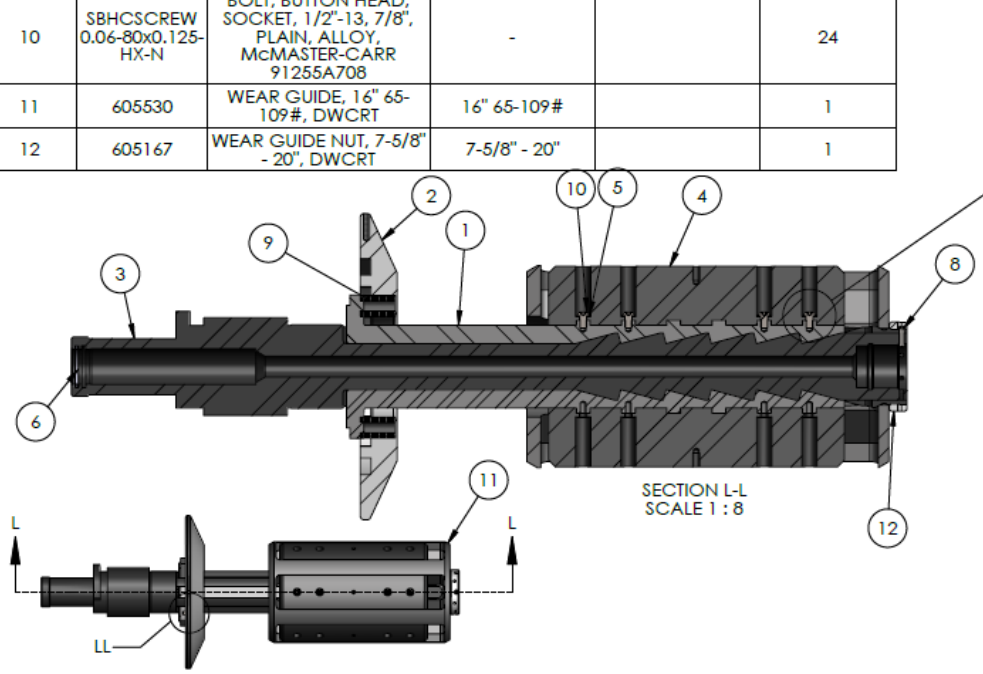
DESCRIPTION: DWCRT 450T LAYOUT — 450 Ton 9-5/8 - 13-3/8
SIZE B | PART NO. 605730 | REV B
MATERIAL: * | SHEET 12 OF 14

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

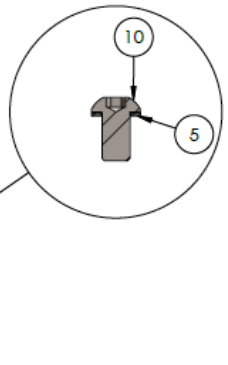
ITEM NO.	PART NUMBER	DESCRIPTION	Size	Toolbox Size	16" 65-109#/QTY.
1	606764	BASE SLIP, 9-5/8" -20" 450 TON	9-5/8"-20"		6
2	605361	Bump Plate	16"-20"		1
3	606112	DOVETAIL MANDREL, 7"-20" 450 TON, DWCRT			1
4	605529	INSERT, 16" 65-109#, DWCRT			6
5	700500	Washer Nord-Lock 1/2" 0184807			30
6	700802	PolyPak, 3" OD x 2.50" ID x 0.25" CS (Replaces Part #505121)	-		1
7	09-1174	BOLT, HEX, 1/2"-13, 2", GR 8, ZINC. FULL THREAD			6
8	701357	SCREW, SET, 3/8-16, 1 1/2, GR 8		3/8-16 x 1 1/2	6
9	701254	SPRING, DIE, 104-710 (RAYMOND)			6
10	SBHCSCREW 0.06-80x0.125-HX-N	BOLT, BUTTON HEAD, SOCKET, 1/2"-13, 7/8", PLAIN, ALLOY, McMASTER-CARR 91255A708	-		24
11	605530	WEAR GUIDE, 16" 65-109#, DWCRT	16" 65-109#		1
12	605167	WEAR GUIDE NUT, 7-5/8" - 20", DWCRT	7-5/8" - 20"		1

Other Size Configurations

ITEM NO.	PART NUMBER	DESCRIPTION	Size	16.75" 65-109#/QTY.
4	605422	INSERT, 16 3/4" 78#, DWCRT		6
11	605421	Wear Guide	16-3/4" 78#	1
13	internal tooth-lock washers_ai			24
ITEM NO.	PART NUMBER	DESCRIPTION	Size	18.625 87.5-117#/QTY.
4	605527	INSERT, 18-5/8" 87.5-117#, DWCRT		6
11	605528	Wear Guide, 18-5/8" 87.5-117#		1
ITEM NO.	PART NUMBER	DESCRIPTION	Size	20" 94-133#/QTY.
4	605373	INSERT, 20" 94-133#, DWCRT		6
11	605370	WEAR GUIDE, 20" 94-133#, DWCRT	20" 94-133#	1

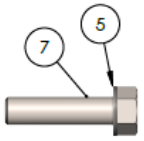


SECTION L-L
SCALE 1 : 8



Redress Kit
Part # 606203
contains
QTY Part #
1) 700802
30) 700500

Overhaul Kit
Part # 606207
Contains
1) 606203
6) 701254
6) 700008
24) 700009
6) 701357



DETAIL LL
SCALE 1 : 2

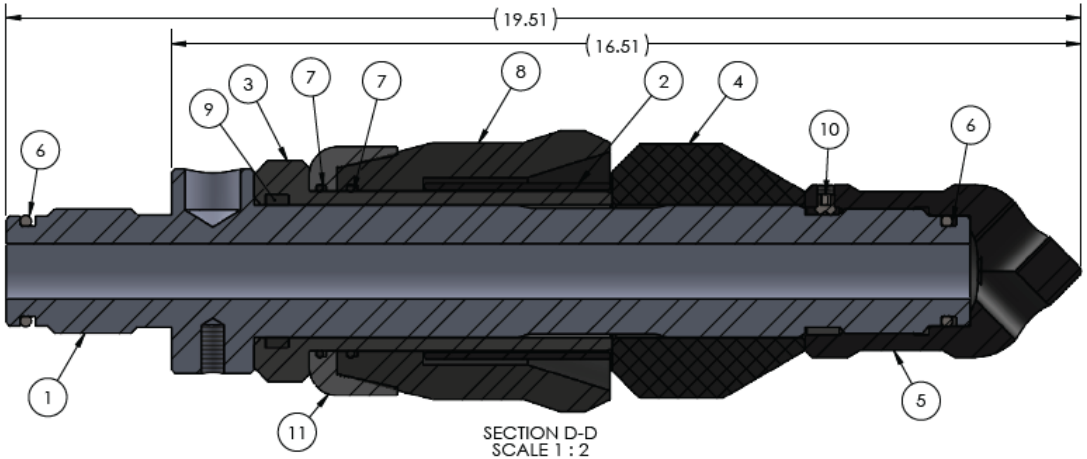
DESCRIPTION: MCCOY GLOBAL
DWCRT 450T LAYOUT — 450 Ton 16"-20"
SIZE B | PART NO. 605730 | REV B
MATERIAL | SHEET 13 OF 4

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 20, 2023

9.3 Internal Circulator Assemblies

9.3.1 Internal Circulators, 4-1/2” – 5”

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	605102	CIRCULATOR BODY, 4-1/2"-6-5/8", DWCRT
2	1	601095	CUP LOCK SPACER, 5-1/2" - 6-5/8"
3	1	601093	CUP SLEEVE, 5-1/2"-6-5/8", AUTOFILL
4	1	601101	GageRing, 5 1/2" 17-20#
5	1	605837	NOSE, CIRCULATOR, 4-1/2"-6-5/8"
6	2	700605	O-RING, 2.020" OD x 1.600" ID x 0.210" CS (Replaces Part #232601)
7	2	700606	O-RING, 3.137" OD X 2.859" ID X 0.139" CS (Replaces Part #223301)
8	1	601112	Packer Cup, 51/2" 17-20#
9	1	700803	SEAL, ROTARY, 2.770" OD X 2.400" ID X 0.412" CS (Replaces Part 501908)
10	3	09-2011	SCREW, SOCKET SET, 3/8-16, 3/8
11	1	601116	Thimble, 51/2" 14-23#



SECTION D-D
SCALE 1 : 2

NOTE: PRESSURE CONTAINING COMPONENT

Seal Kit
Part # 605105 Includes
2) 700605
2) 700606
3) 701351
1) 700803

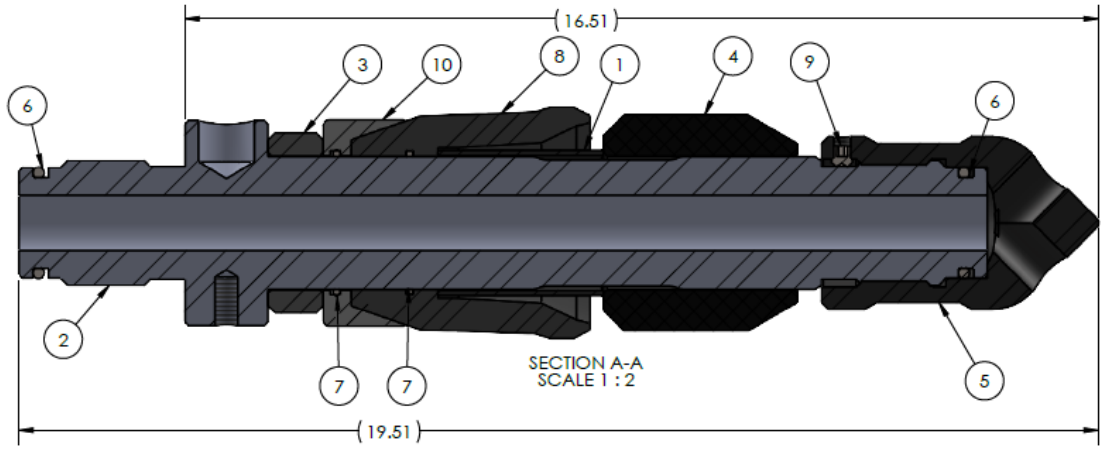
DESCRIPTION		
Circulator Assembly		5 1/2"
SIZE B	PART NO. 605101	REV A
MATERIAL *		SHEET 3 OF 5

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 6, 2023

9.3.2 Internal Circulators, 5-1/2”

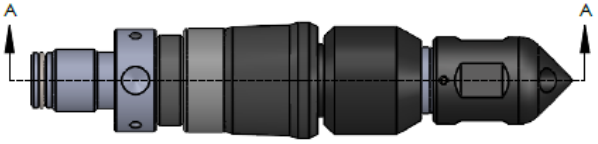
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	601094	CUP LOCK SLEEVE, 4 1/2"-5", AUTOFILL
2	1	605102	CIRCULATOR BODY, 4-1/2"-6-5/8", DWCRT
3	1	601092	CUP SPACER, 4 1/2" & 5", AUTOFULL
4	1	601096	GAGERING 4-1/2" 9.5-11.6#
5	1	605837	NOSE, CIRCULATOR, 4-1/2"-6-5/8"
6	2	700605	O-RING, 2.020" OD x 1.600" ID x 0.210" CS (Replaces Part #232601)
7	2	700611	O-RING, 2.637" OD X 2.359" ID X 0.139" CS (Replaces Part #222901)
8	1	601107	PACKER CUP, 4 1/2" 9.5-11.6#
9	3	09-2011	SCREW, SOCKET SET, 3/8-16, 3/8
10	1	601114	THIMBLE, 4 1/2" 9.5-13.5#

Sea Kit
Part # 605104 Includes
2) 700605
2) 700611
3) 701351



SECTION A-A
SCALE 1 : 2

NOTE: PRESSURE CONTAINING COMPONENT



REVISIONS				
REV	ECN	ECN DESCRIPTION	COMPLETED BY	COMPLETED DATE
A	--	INITIAL RELEASE	--	--

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CRITICAL COMPONENT: NO

RATINGS: IF APPLICABLE
- | 10,000 PSI | -

MCCOY GLOBAL

DRAWN	JL	1/13/2017
CHECKED	MH	
APPROVED	MH	

THIRD ANGLE PROJECTION

WEIGHT 28.653 LBS.

DESCRIPTION: Circulator Assembly 4 1/2" - 5"

SIZE B | PART NO. 605101 | REV A

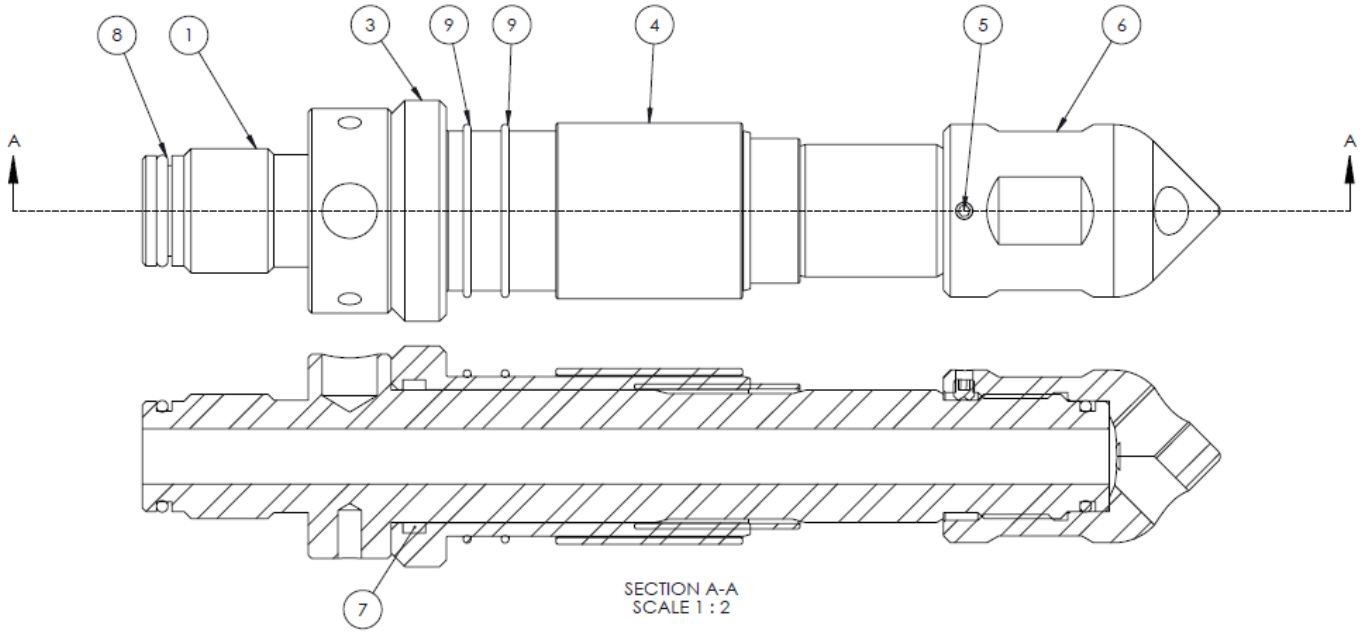
MATERIAL *

SHEET 1 OF 5

SOLIDWORKS DOCUMENT PRINTED ON: Monday, November 6, 2023

9.3.3 Internal Circulators, 5-1/2” – 6-5/8”

ITEM	QTY	P/N	DESCRIPTION	MATERIAL
1	1	605102	CIRCULATOR BODY, 4-1/2"-6-5/8", DWCRT	500938
2	1	601094	CUP LOCK SLEEVE, 4 1/2"-5", AUTOFILL	500936
3	1	601093	CUP SLEEVE, 5-1/2"-6-5/8", AUTOFILL	502365
4	1	601095	CUP LOCK SPACER, 5-1/2" - 6-5/8"	500936
5	3	09-2011	SCREW, SOCKET SET, 3/8-16, 3/8	GR8
6	1	605837	NOSE, CIRCULATOR, 4-1/2"-6-5/8"	500938
7	1	700803	SEAL, ROTARY, 2.770" OD X 2.400" ID X 0.412" CS (Replaces Part 501908)	90 Duro Nitrile
8	2	700605	O-RING, 2.020" OD x 1.600" ID x 0.210" CS (Replaces Part #232601)	70 Duro
9	2	700606	O-RING, 3.137" OD X 2.859" ID X 0.139" CS (Replaces Part #223301)	90 Duro



SECTION A-A
SCALE 1 : 2

REVISIONS

REVISION	ECN NUMBER	ECN DESCRIPTION	ECN COMPLETED BY	ECN COMPLETED DATE
A	-	BROUGHT IN FROM DW VAULT	JLARA	12/15/2020

UNLESS OTHERWISE SPECIFIED:

CRITICAL COMPONENT: No

RATINGS: IF APPLICABLE

-	10,000 PSI	-

PROPRIETARY STATEMENT

DRAWN	J.LARA	12/17/2020
CHECKED	M.HICKL	12/17/2020
APPROVED	M.HICKL	12/17/2020

THIRD ANGLE PROJECTION

WEIGHT 30.210 LBS.

DESCRIPTION: Circulator Assembly 5 1/2- 6 5/8", Body, Spacer, Nose (BBAABA)

SIZE B | PART NO. 605101-0024 | REV A

MATERIAL N/A

SHEET 1 OF 1

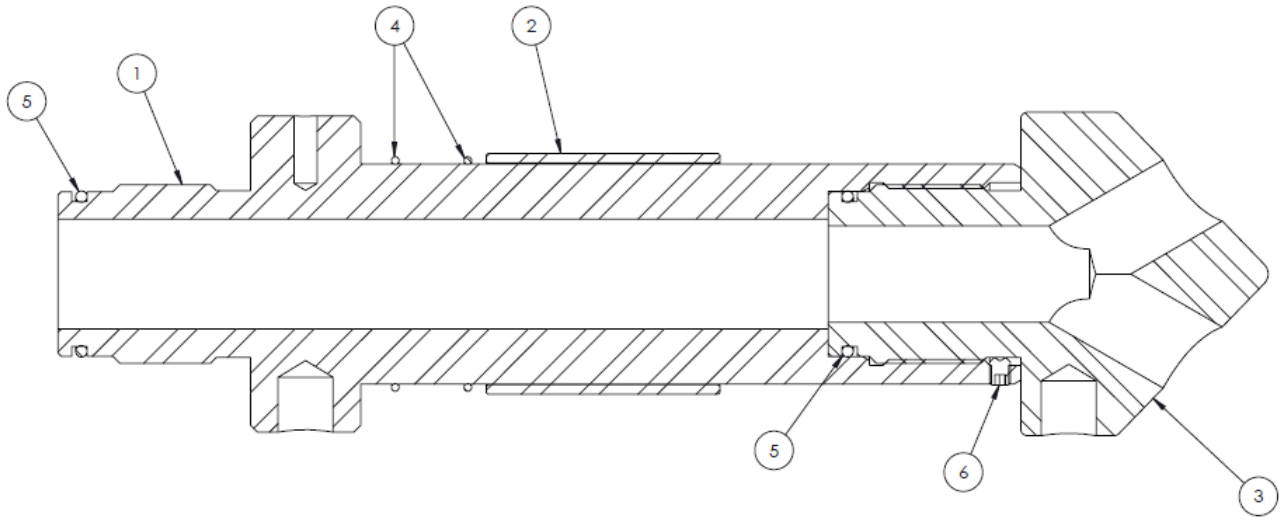
RELEASED FOR PRODUCTION

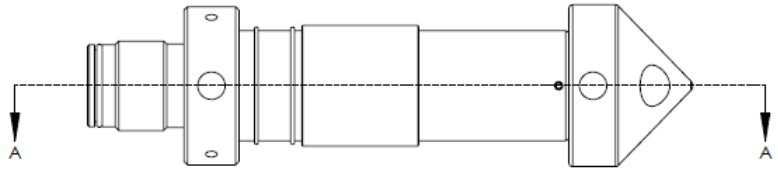
SOLIDWORKS DOCUMENT PRINTED ON: Monday, August 14, 2023

9.3.4 Internal Circulators, 7” – 7-5/8”

Seal Kit Part Number 605149
Includes:
2) 700612
2) 700601
3) 701350

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	605072	CIRCULATOR BODY, 7- 7-5/8", DWCRT
2	1	605080	Cup Spacer
3	1	605441	NOSE, CIRCULATOR, 7"-20"
4	2	700612	O-RING, 4.226" OD x 3.948" ID x 0.139" CS (Replaces Part #224201)
5	2	700601	O-Ring, 3.020" OD X 2.600" ID X 0.210" CS
6	3	701350	SCREW, SET, 3/8"-16, 1/2 STEEL, GR8





RELEASED FOR PRODUCTION

REVISIONS

REVISION	ECN NUMBER	ECN DESCRIPTION	ECN COMPLETED BY	ECN COMPLETED DATE
A	-	Initial Release	JLARA	1/10/2020

UNLESS OTHERWISE SPECIFIED:

CRITICAL COMPONENT: NO

PROPRIETARY STATEMENT

RATINGS: IF APPLICABLE

MCCOY GLOBAL

DRAWN		01/10/2020
CHECKED	B.PEARCE	
APPROVED	B.PEARCE	

DESCRIPTION: KIT, INTERNAL CIRCULATOR BASE, 7"- 7 5/8"

THIRD ANGLE PROJECTION | WEIGHT 68.866 LBS

SIZE B | PART NO. 605071-0013 | REV A

MATERIAL N/A | SHEET 1 OF 1

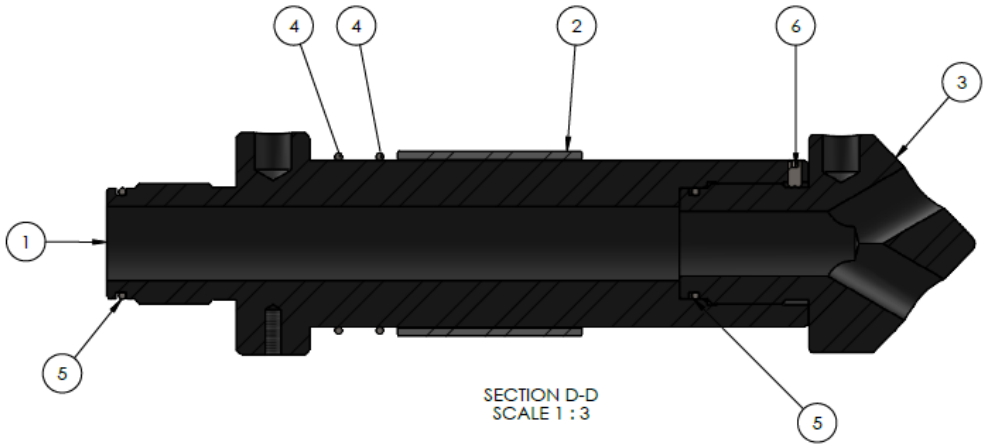
SOLIDWORKS DOCUMENT PRINTED ON: Friday, November 3, 2023

9.3.5 Internal Circulators, 8-5/8” – 13-3/8”

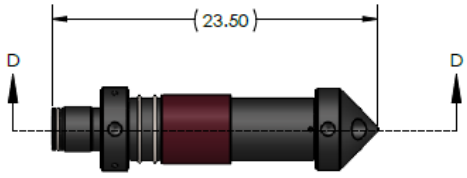
ITEM NO.	PART NUMBER	605090-0024 BBAAA/QTY.	DESCRIPTION
1	605091	1	CIRCULATOR BODY, 8 5/8" - 13 3/8", DWCRT
2	600070	1	Cup Spacer
3	605441	1	NOSE, CIRCULATOR, 7"-20"
4	700005	2	O-RING, 2-349, 4.895" OD x 4.475" ID x 0.210 CS, 70 DURO
5	700601	2	O-Ring, 3.020" OD X 2.600" ID X 0.210" CS
6	701352	3	SET SCREW, HEX DRIVE, CUP POINT, 3/8"-16 x 3/4", ALLOY STEEL

Seal Kit
Part # 605098
Includes:
2) 700005
2) 700601
3) 701352

See Packer Cup and GageRing list for complete list of available components 8-5/8 - 13-5/8"



SECTION D-D
SCALE 1 : 3



RELEASED FOR PRODUCTION

SOLIDWORKS DOCUMENT PRINTED ON: Friday, November 3, 2023

REVISIONS

REVISION	ECN NUMBER	ECN DESCRIPTION	ECN COMPLETED BY	ECN COMPLETED DATE
B	21-0100	REMOVE (1) 600305 FROM ERP TO SYNC WITH DRAWING BOM	B.PEARCE	7/27/2021

UNLESS OTHERWISE SPECIFIED:

CRITICAL COMPONENT: YES

PROPRIETARY STATEMENT

DRAWN	JL	4/17/2017
CHECKED	-	
APPROVED	MH	

THIRD ANGLE PROJECTION

WEIGHT 89.336 LBS.

RATINGS: IF APPLICABLE

-	10,000 PSI	-

MCCOY GLOBAL

DESCRIPTION
INTERNAL CIRCULATOR BASE KIT, BBAAAAB, 8-5/8"-13-3/8", INCLUDES: CIRCULATOR BODY, CUP SPACER, NOSE

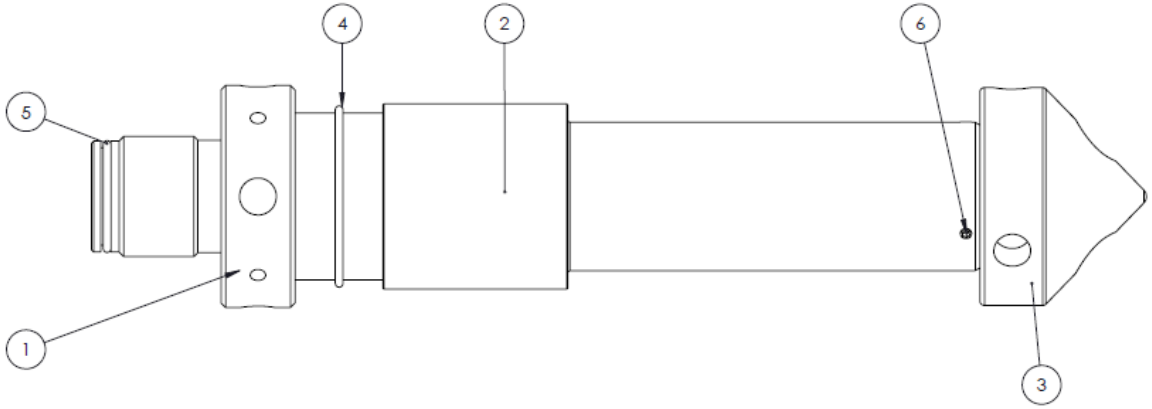
SIZE	PART NO.	REV
B	605090-0024	B

MATERIAL N/A

SHEET 1 OF 1

9.3.6 Internal Circulators, 16” – 20”

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION	Size
1	1	605475	CIRCULATOR BODY, 16-20", DWCRT	-
2	1	600070	Cup Spacer	8-5/8" 20"
3	1	605441	NOSE, CIRCULATOR, 7"-20"	7"-20"
4	1	700005	O-RING, 2-349, 4.895" OD x 4.475" ID x 0.210 CS, 70 DURO	-
5	2	700601	O-Ring, 3.020" OD X 2.600" ID X 0.210" CS	-
6	3	701350	SCREW, SET, 3/8"-16, 1/2 STEEL, GR8	



REVISIONS

REVISION	ECN NUMBER	ECN DESCRIPTION	ECN COMPLETED BY	ECN COMPLETED DATE
A	-	Initial Release	--	--

UNLESS OTHERWISE SPECIFIED:

CRITICAL COMPONENT: YES

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DRAWN	AM	5/9/2017
CHECKED	MH	
APPROVED	MH	

THIRD ANGLE PROJECTION

WEIGHT 96.427 LBS.

RATINGS: IF APPLICABLE

-	10,000 PSI	-

MCCOY GLOBAL

DESCRIPTION
INTERNAL CIRCULATOR BASE KIT, BBAAAAB, 16-20", INCLUDES: CIRCULATOR BODY, CUP SPACER, NOSE

SIZE B | PART NO. 605351-0014 | REV A

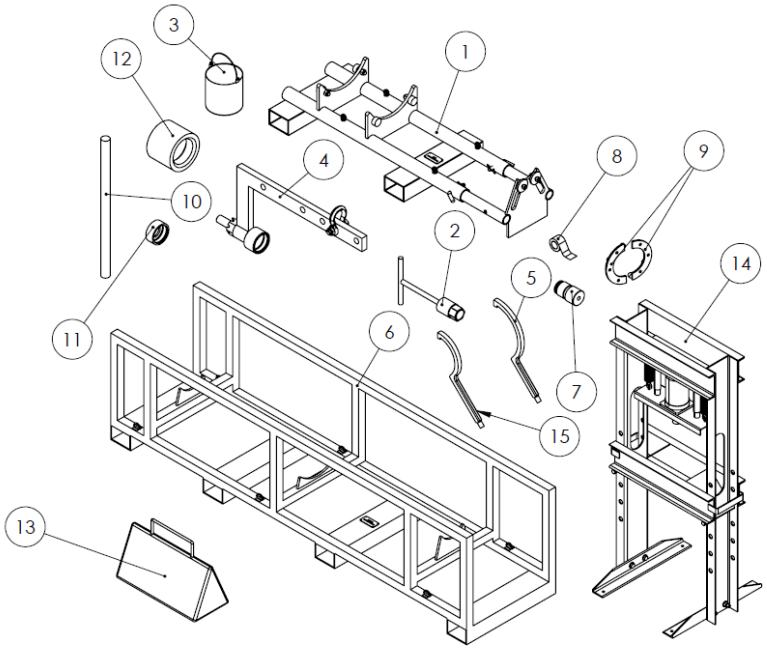
MATERIAL N/A | SHEET 1 OF 1

SOLIDWORKS DOCUMENT PRINTED ON: Friday, November 3, 2023

Section 10 - **DWCRT Assembly Tools**

10.1 Internal Assembly Tools

ITEM NO.	PART NUMBER	DESCRIPTION	606381-0001/Required/QTY.	606381-0002/Optional/QTY.	606381-0003/QTY.
1	605242	ASSMEBLY, STAND, DWCRT	-	1	1
2	604080	C-Series Lock Nut Tool	1	1	1
3	700053	LUBRICANT, WHITE OPERATING, 14 deg F, 5 KG BUCKET	1	1	1
4	605244	ASSY MANDREL HANGING TOOL, 450 TON	1	1	1
5	605235	Spanner Wrench	1	1	1
6	605319	TRANSPORT CASE, DWCRT, 500 TON	-	1	1
7	605571	PLUG, TEST PRESSURE, CIRCULATOR, 3.25-4 STUB ACME	-	-	1
8	700778	Tape	-	-	1
9	606421	WELDMENT, PLATE, COMPRESSOR, SPRING, DWCRT 500 TON	-	-	2
10	606560	Installation Rod	-	-	1
11	605605	Thread Protector, Dovetail Mandrel, 4.25"-4	-	-	1
12	605290	Thread Protector	-	-	1
13	800020	TOOL BAG, DWCRT 450 TON	-	-	1
14	800062	SHOP PRESS, 20 TON, H-FRAME	-	-	1
15	1008339	INDICATOR NUT SPANNER WRENCH	1	1	1



RELEASED FOR PRODUCTION

REVISIONS				
REV	ECN	ECN DESCRIPTION	COMPLETED BY	COMPLETED DATE
A	--	INITIAL RELEASE	--	--
H	24-0005	ADDED 1008339	AL	1/17/2024

UNLESS OTHERWISE SPECIFIED:
1. DIMENSIONS ARE IN INCHES
2. TOLERANCES:
ANGULAR: ± 1°
FRACTIONAL ± 1/16
TWO PLACE DECIMAL ± 0.02
THREE PLACE DECIMAL ± 0.005
FLATNESS AIR PLATE: ± .015 PER FOOT
3. IDENTIFY P/N & MATL PO, USING 1/8 TO 1/4 ETCHED LETTERS, DENOTED BY "S"
4. REMOVE BURRS & SHARP EDGES WITH 150 GRIT
5. UNMACHINED FILLET RADII SHALL BE 1/32
6. FINAL SURFACE ROUGHNESS AVG. (RMS) SHALL BE ≤ 250 MICROINCHES
7. DENOTES CRITICAL DIMENSIONS; 100% INSPECTION REQUIRED
8. A TRIANGLE DENOTES A REVERSION
9. MACHINE Ø ON COMMONE C-LINE WITHIN .005 T.I.R. - UNMACHINED WITHIN .020
10. INTERPRET DRAWING PER ASME Y14.5-2009

CRITICAL COMPONENT: NO

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RATINGS: IF APPLICABLE

MCCOY GLOBAL

DRAWN	C.RICHTER	01/09/2024
CHECKED	J.BOURGEOIS	01/09/2024
APPROVED	J.BOURGEOIS	01/09/2024

DESCRIPTION: Assembly Tools, DWCRT

SIZE B | PART NO. 606381 | REV H

THIRD ANGLE PROJECTION | WEIGHT 1006.65 LBS. | MATERIAL N/A | SHEET 1 OF 1

SOLIDWORKS DOCUMENT PRINTED ON: Wednesday, January 17, 2024

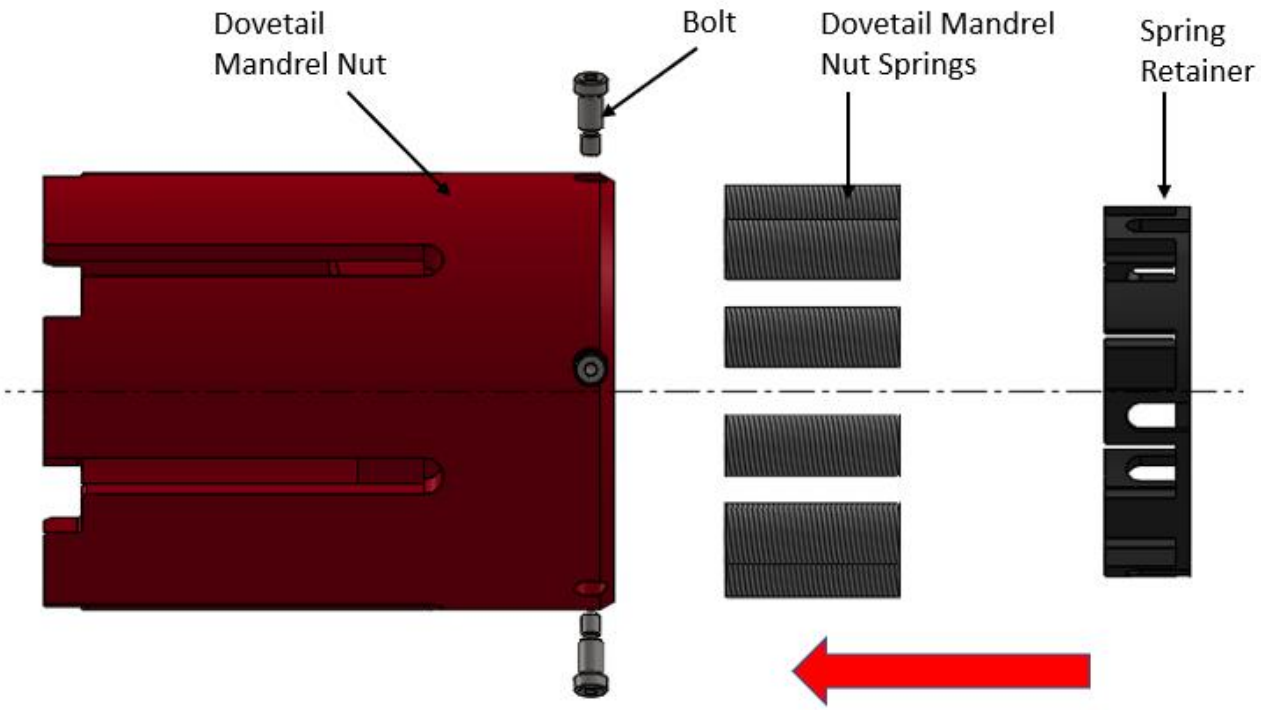
Section 11 - **Assembly - Head**

NOTE:

- **The DWCRT is modular. Use the correct Mandrel and Mandrel Nut for the tool you are building.**
- **Refer to Assembly-BOM's for part number, description, and quantity.**
- **Tool Assembly has pinch points. Keep your fingers and hands clear.**

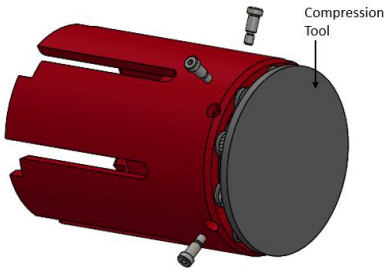
1. Load the Dovetail Mandrel Nut (606041) with the Dovetail Mandrel Nut Springs (701250). Insert (Qty-10) Dovetail Mandrel Nut Springs into the counterbore holes on the bottom of the Dovetail Mandrel Nut. Refer to Section 8.1 DWCRT Spring Replacement to ensure springs are within allowable tolerance.

2. Lay the Spring Retainer (605020) in the groove on the Dovetail Mandrel Nut and of the Dovetail Mandrel Nut Springs. The Spring Retainer should fall over the springs and fit into the groove, as seen below. Be sure the bolts line up with the horseshoe slots.

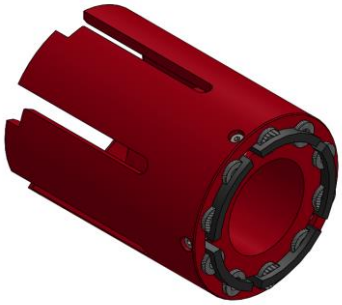


3. Compress the Dovetail Mandrel Nut Springs and Spring Retainer with a press (~10Ton) or Compression Assembly Tool (605243). Use a flat plate to press all the Dovetail Mandrel Nut Springs and the Spring Retainer down at the same time.

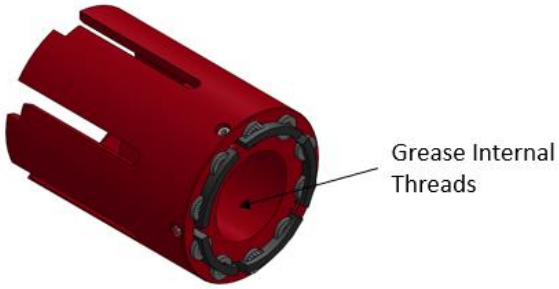
4. Coat the Dovetail Mandrel Nut Shoulder Bolts 5/8"- 11 x 1" (700000) with anti-seize. ***Refer to DWCRT lubrication and maintenance requirement for more details.*** While the Dovetail Mandrel Nut Springs are compressed, insert the Dovetail Mandrel Nut Bolts into the side holes on the Dovetail Mandrel Nut. Tighten the Dovetail Mandrel Nut Shoulder Bolts to 93 ft-lbs.



5. After locking the Spring Retainer with the Dovetail Mandrel Nut Bolts, the assembly should look as follows.



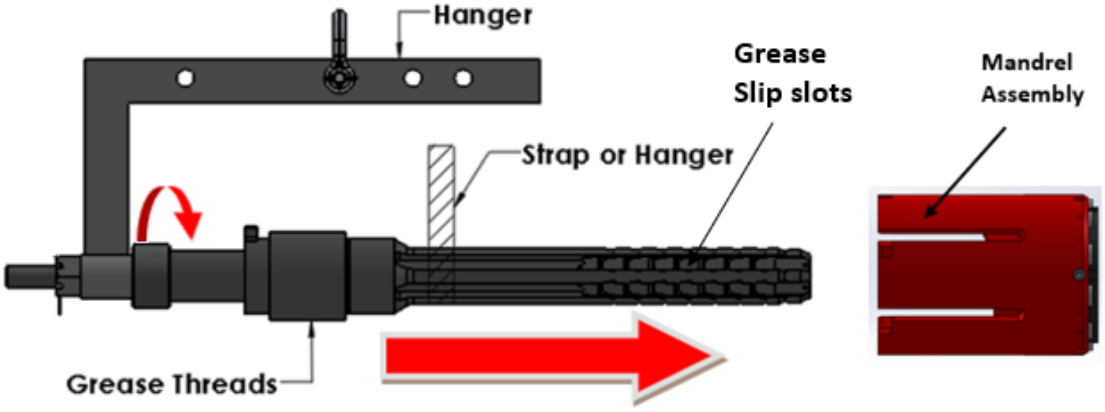
6. Lay the Dovetail Mandrel Nut on the floor or a pallet. Grease (Klüberplex Grease, 700053) ID Threads. ***Use recommended grease, see DWCRT Lubrication and Maintenance for recommended grease.***



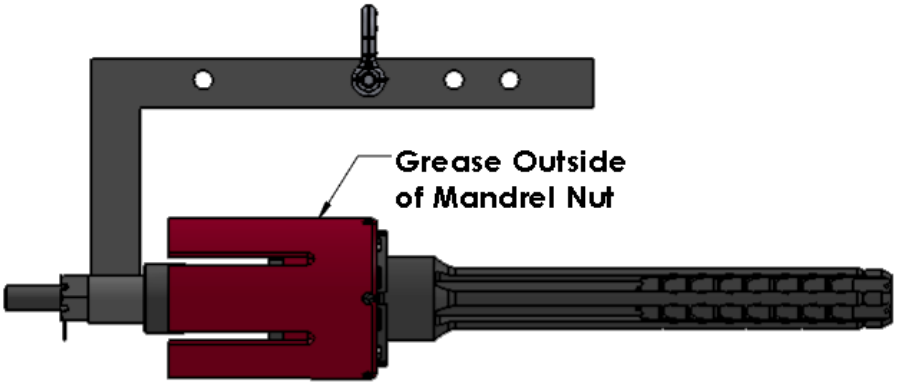
7. Select the Dovetail Mandrel size to be installed in the tool. We will use the 225 Ton 5½" Dovetail Mandrel for the illustration purposes of this assembly example. Refer to the list of different Dovetail Mandrels for size and tonnage ranges. ***Refer to Appendix 1.1: Size and Ratings for other Mandrel Sizes.*** Insert Polypak Seal (700802) into the mandrel (606108) with the O-ring facing away from the indicator.

HINT: Clean the seal groove and remove any debris or contaminants. Be sure to install the Polypak Seal with the correct orientation to prevent well bore fluids from entering the housing.

8. Pick up the Dovetail Mandrel with a strap at the pickup point as shown below. Alternatively, use the McCoy L-Shaped Hanger (605244) for easier assembly. To use the L-Shaped Hanger, simply attach a crane to the shackle in the correct hole based on tonnage, screw the Hanger's cap onto the Dovetail Mandrel (using clockwise rotation) and pick up the Dovetail Mandrel. Shackle needs to be attached to the appropriate L-Shaped Hanger hole depending on the tool Hoist capacity. Raise the Dovetail Mandrel approximately 12" off the floor and grease (Klüberplex Grease, 700053) the threads / Slip slots. ***Refer to DWCRT Lubrication and Maintenance requirement for more details.***

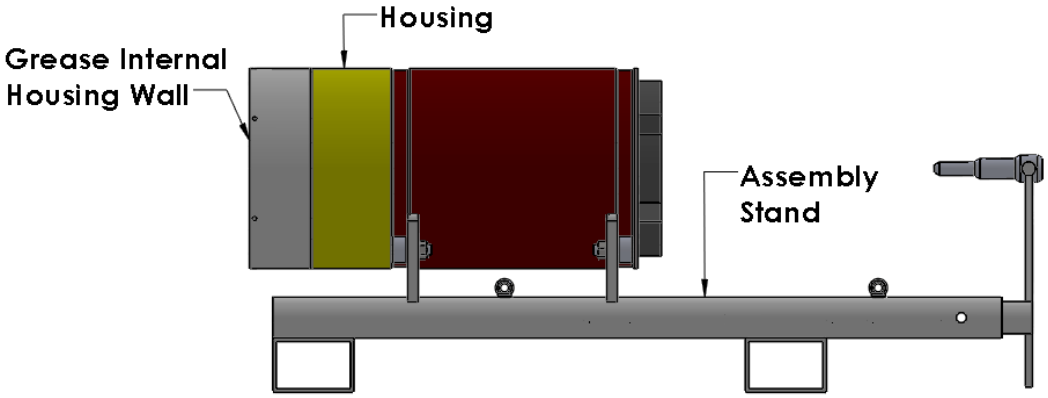


9. Slide the Dovetail Mandrel into and screw together with the Dovetail Mandrel Nut until completely made up. Use multi-purpose grease on the outside of the Mandrel nut.



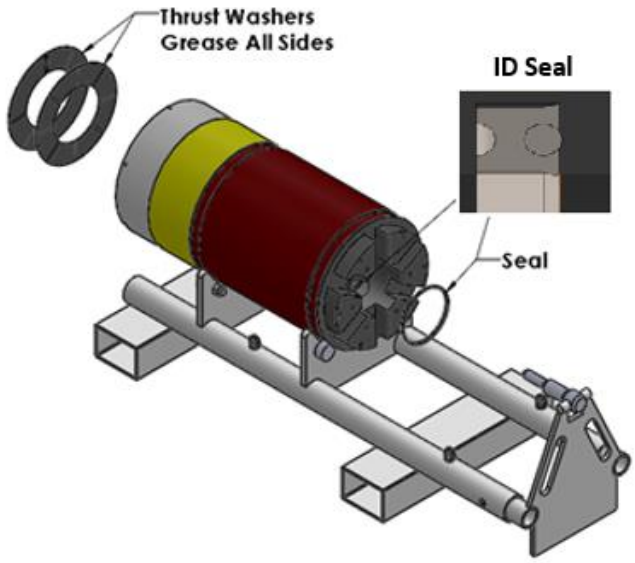
10. Now, lay the Housing (606473) on its side. While the tool may be assembled on the floor or on a pallet, utilize the McCoy CRT Assembly Stand (605242) for easier assembly. To do this, lay the Housing on the McCoy CRT Assembly Stand with the Indicator end facing away from the sliding triangle on the stand, as shown below. Use multi-purpose grease on the internal housing wall.

WARNING: Strap the Housing and secure it to the Assembly Stand.



11. Use multi-purpose grease and insert the Housing ID Seal into the ID groove on the Housing. Orient the Housing ID Seal as shown in figure away from white painted end. Be sure to install the Housing ID Seal in the correct orientation.

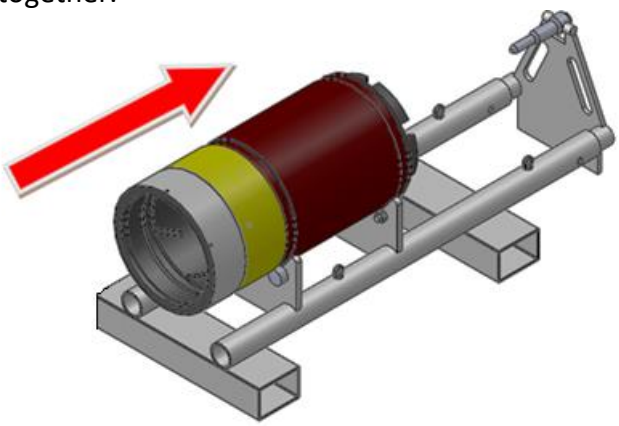
12. Thinly grease all sides of both Thrust Washers (605022) using **NLGI No.2 Lithium equivalent**. **Do NOT** use any grease other than **NLGI No.2 Lithium equivalent**.

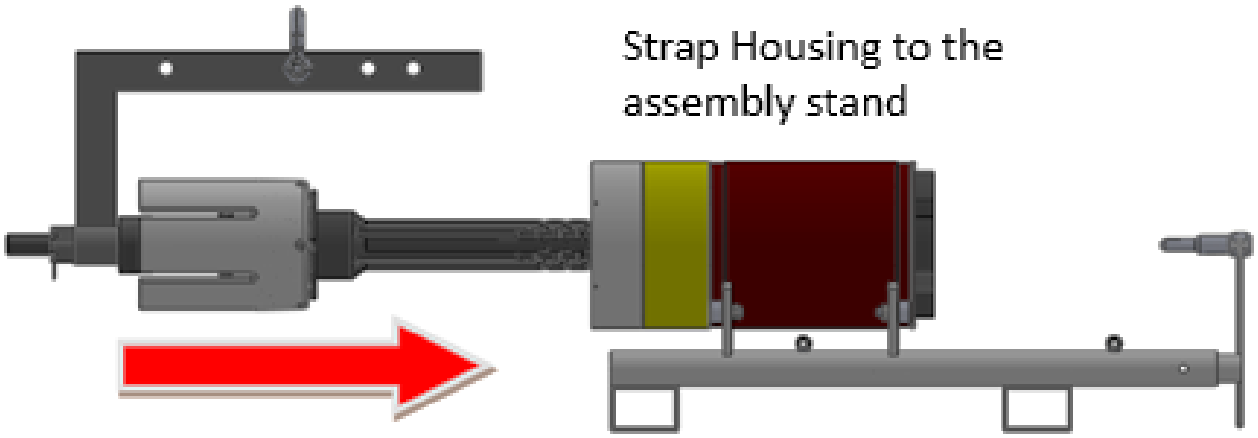


HINT: Inspect the thrust washers and mate the smoothest surfaces together.

WARNING: Using the incorrect grease could result in a higher-than-normal breakout torque.

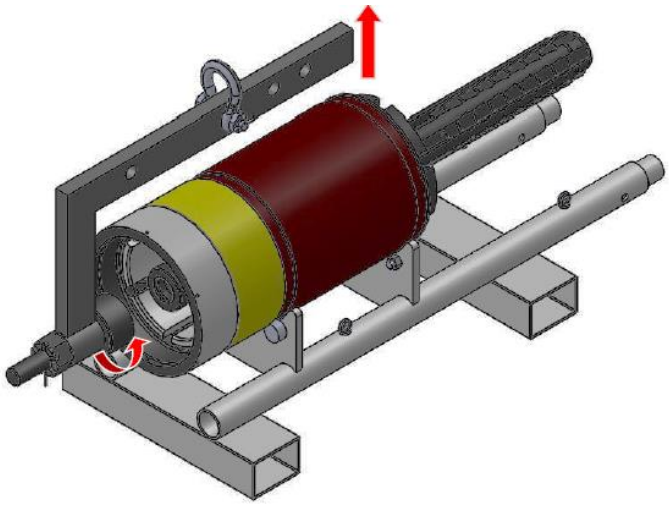
13. Insert both Thrust Washers into the Housing from the Indicator side. Make sure the internal housing wall has been thoroughly greased with **NLGI No.2 Lithium equivalent** before insertion of the Thrust Washers. It's important the Thrust Washers are free and clean of all debris, rust, burrs and the smoothest surfaces of the Thrust Washers are mated together.





14. Once the Dovetail Mandrel subassembly is inserted into the Housing, the L-Shaped Hanger (605244) may be removed using counter-clockwise rotation.

    HINT: Lifting on the end of the hanger tends to help in the Hanger removal process. Continue seating the mandrel against the thrust washers.

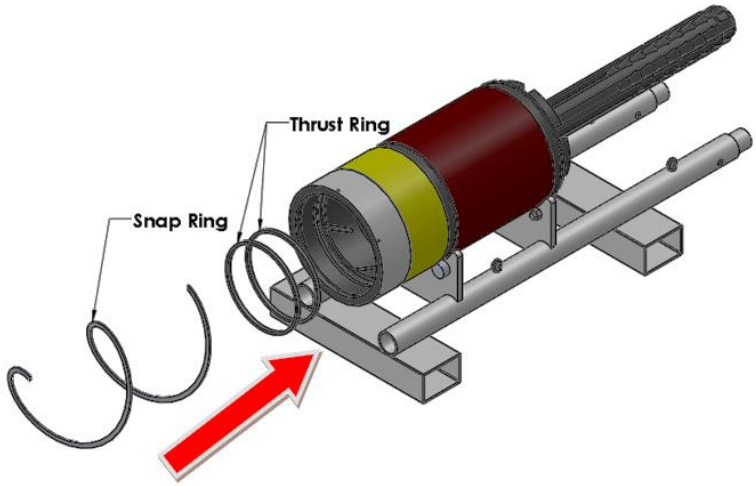


15. Use multi-purpose grease on the (Qty-2) Thrust Rings (605686). Lock the Dovetail Mandrel subassembly into the Housing with (Qty-2) Thrust Rings followed by (Qty-1) Snap Ring (701200).

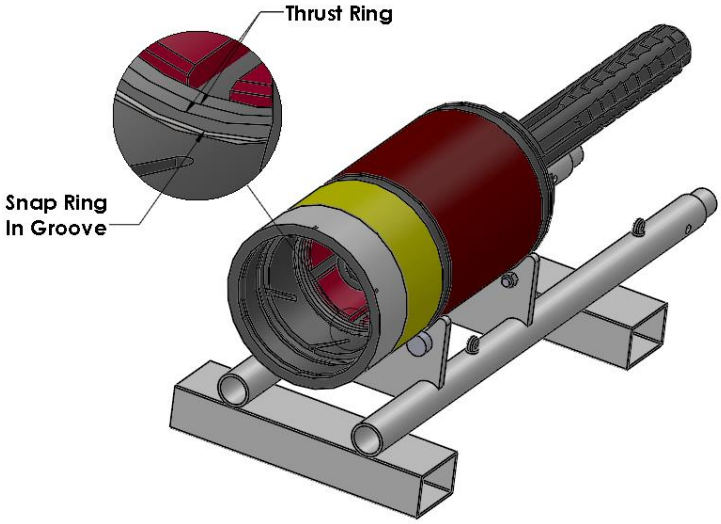
    HINT: The Snap Ring is a spiral ring and can be installed easily by starting one end of the ring in the groove and rotating the ring until it seats completely, as illustrated below.

    NOTE: If the Dovetail Mandrel is not coaxial with the housing, the Dovetail Mandrel Nut can move into the snap ring groove and prevent installation of the snap ring. Supporting the end of the Dovetail Mandrel can correct axial misalignment.

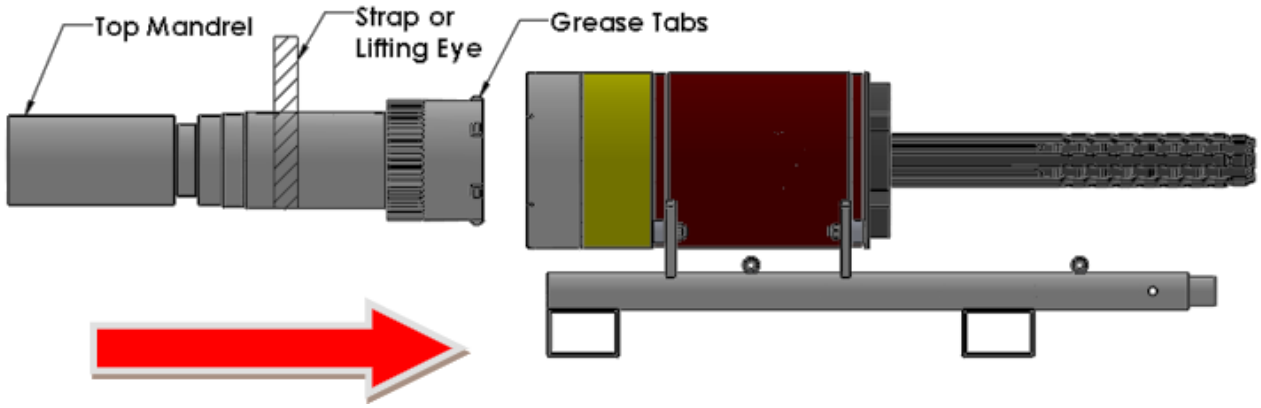
    NOTE: Lightly tap the snap ring to make sure it's uniformly seated in its groove.



16. Once the (Qty-2) Thrust Rings (*If the spacer push down ring is not installed*) and the Snap Ring are installed, verify that the Snap Ring is directly on top of the Thrust Rings as shown below (*If the spacer push down ring is installed, refer to Section 1.7 for installation instructions*).

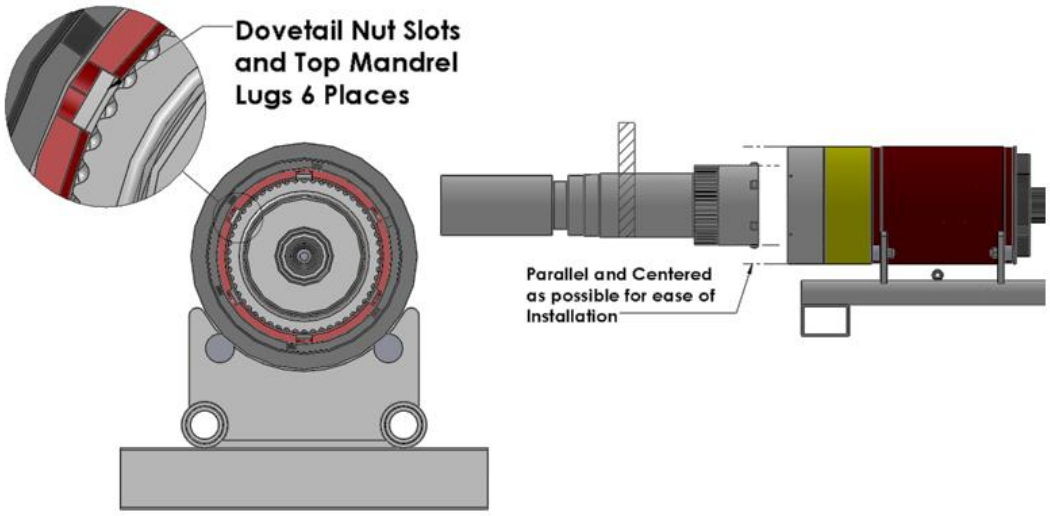


17. Apply multi-purpose grease on Top Mandrel lugs and splines. Pick up with a strap or a lifting eye and insert the Top Mandrel into the Housing. The Top Mandrel is offered in various tool joints. Rotate Top Mandrel to align with Dove Tail Mandrel Nut slot.

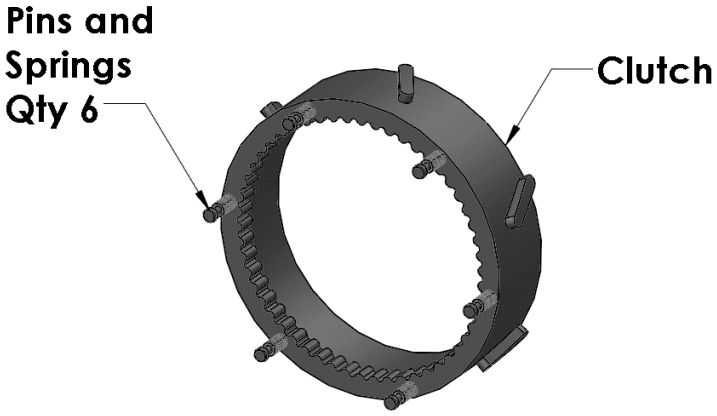


18. When inserting the Top Mandrel, line up the 6 tabs on the Top Mandrel's OD with the 6 slots of the Dovetail Mandrel Nut. Once lined up, the Top Mandrel may slide into the Housing.

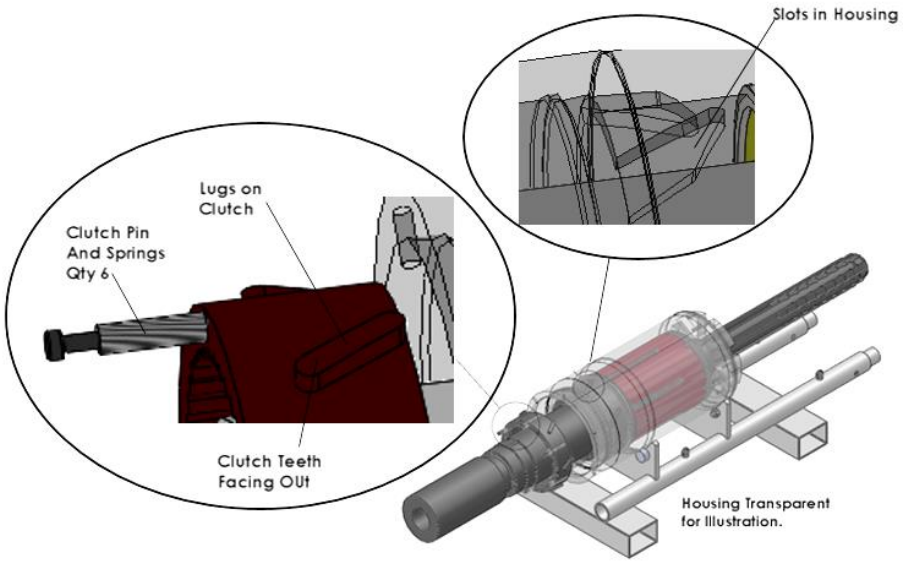
    HINT: The Spiral Ring covers some of the Housing ID. This causes tight clearances while inserting the Top Mandrel. It is crucial that you have the Top Mandrel and the Housing as coaxial as possible.



19. Apply multi-purpose grease on Clutch (605620), Clutch Pins (605749) and Clutch Spring (700110). Insert (Qty-6) Clutch Springs and (Qty-6) Clutch Pins into the Clutch. Refer to section 8.1 Spring Replacement Guide to ensure springs are within allowable tolerance.

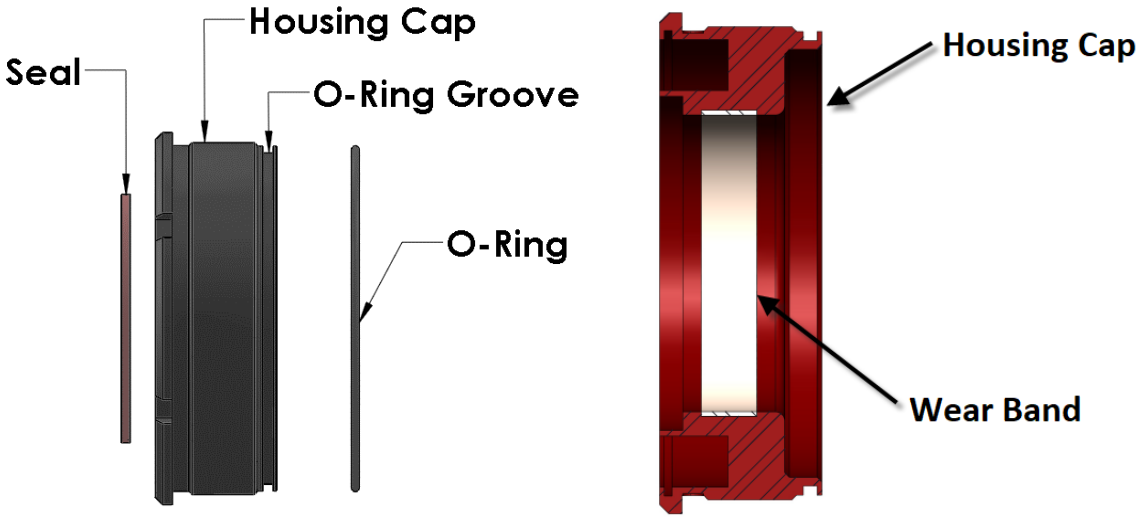


20. Orient the Clutch such that the Clutch Springs face towards the tool joint (If applicable). Orient the Clutch so that the engravement “This Side Up” faces towards the tool joint. Slide the Clutch over the Top Mandrel all the way into the ID of the Housing. The OD lugs on the Clutch will fit into and engage the angled slots on the ID of the Housing.



21. Install the Housing Cap O-Ring (700600) in the O-ring groove on the OD of the Housing Cap (605016). Make sure to apply multi-purpose grease on the O-ring and the O-ring groove.

22. Install Wear Band (1008162) into Housing Cap ID (605016).

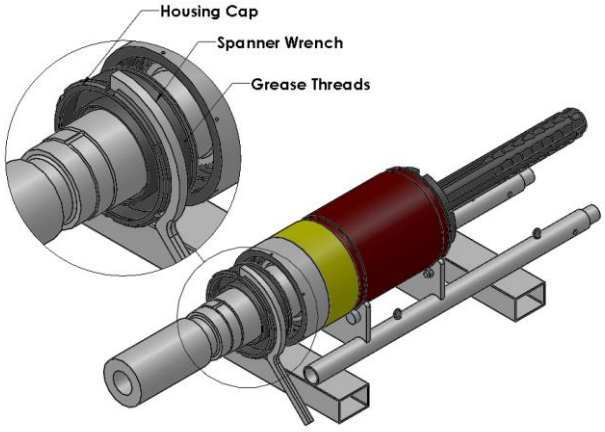


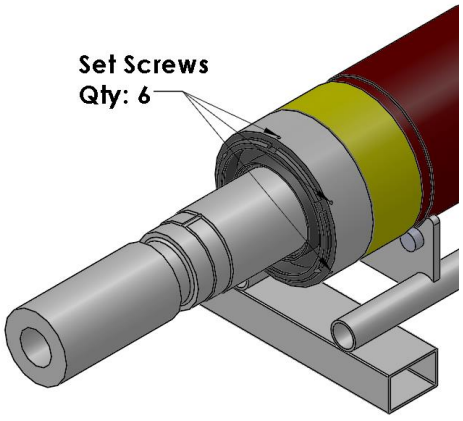
23. Place the Wiper Seal (700801) in the ID of the Housing Cap. Make sure Wiper Seal is completely in by applying pressure during installation.

24. Use multi-purpose grease on the threads on the Housing Cap and place the Housing Cap over the Top Mandrel. Slide the Housing Cap over the Top Mandrel and screw the Housing Cap into the Housing.

    HINT: The seal may contact the Top Mandrel OD threads. You may need to use a rubber mallet to help get passed the OD threads. Also make sure Housing Cap is centered with the Top Mandrel while passing through the thread.

25. Use the McCoy Spanner Wrench (605235) to screw the Housing Cap into the Housing until cap shoulders. The Housing Cap is required to be rotated few degrees counterclockwise to align the set screw holes in the Housing. Grease Set Screws 3/8" - 16 x 5/8" Full Dog Point (700002) with anti-seize compound. Install and tighten to 20 ft-lbs for this application only. (Qty-6) Set Screws into the screw holes on the OD of the Housing to lock the Housing Cap to the Housing. ***Refer to Appendix 1.4: Bolt and Set Screw Torque for recommended torque chart.***



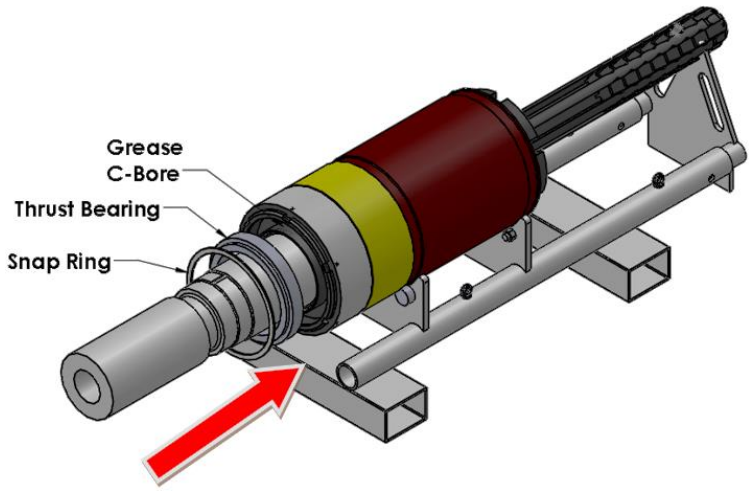


26. Grease the counterbore groove on top of the Housing Cap. Apply multi-purpose grease to OD of the Thrust Bearing (605222) for corrosion resistance, ensure the Thrust Bearing can be rotated prior to installation, and slide over the Top Mandrel into the Housing Cap counterbore groove.

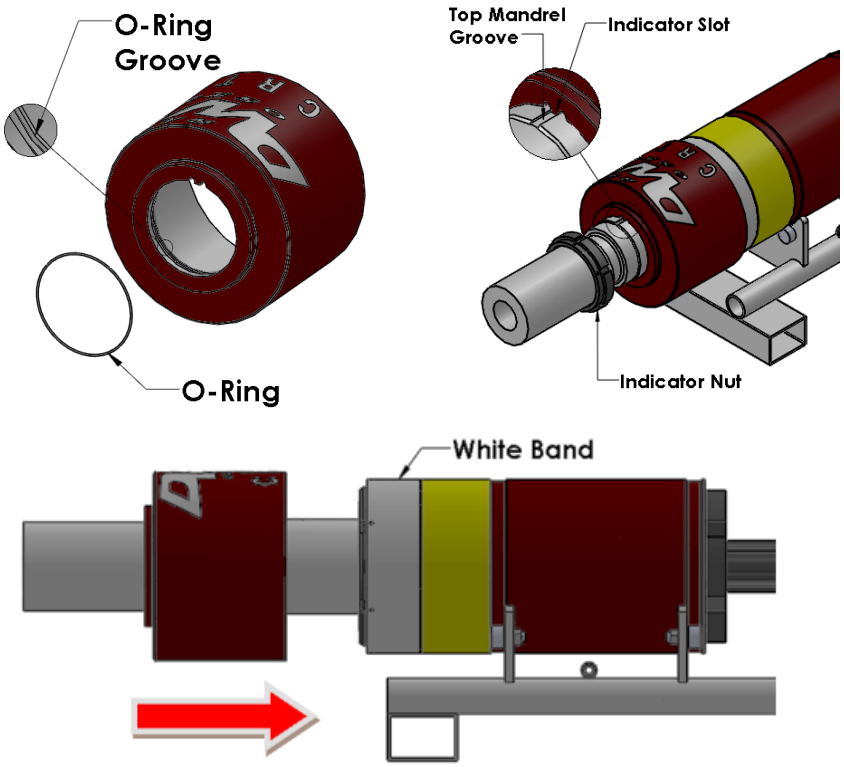
27. Retain the Thrust Bearing by installing a Snap Ring (701201) in the Housing Cap groove just above the Thrust Bearing.

    HINT: The Snap Ring is a spiral ring and can be installed easily by starting one end of the ring in the groove and rotating the ring until it seats completely, as illustrated.

HINT: After initial installation of the thrust bearing, the whole unit (Thrust Bearing and Housing Cap) can be removed and installed together as a single unit. Always check to ensure you can rotate the thrust bearing in the housing cap prior to field deployment.



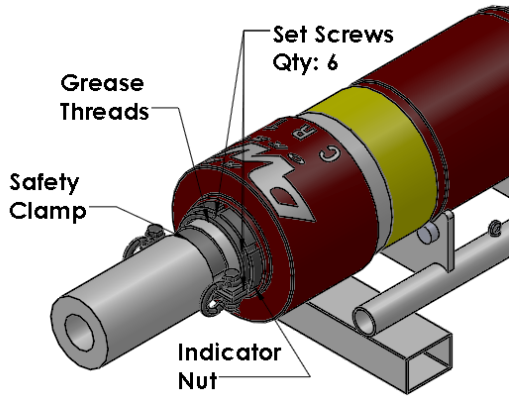
28. Prior to installing the Indicator (605390), clean the white band. Install the O-Ring (700602), in the O-Ring groove on the Indicator. Slide the Indicator over the Top Mandrel, Thrust Bearing, and Housing Cap. Orient the Indicator's tab to the slot in the Top Mandrel. If the Line is already on the Housing and the Indicator, make sure they are lined up during assembly.



29. Apply multi-purpose grease on the OD threads of the Top Mandrel and screw on the Indicator Nut (605018) with the Indicator Nut Spanner Wrench (1008339). This locks the Indicator to the Top Mandrel.

HINT: The Indicator Nut should be tightened when the tool is in the locked position as illustrated above (White Band showing). If the tool is in the unlocked position (fully compressed) when the Indicator Nut is tightened, open the tool and retighten the Indicator Nut prior to tightening the set screws.

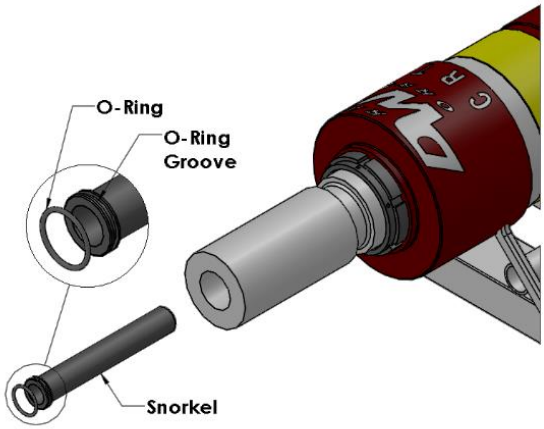
30. Anti-seize Set Screws 3/8” x 16 x 5/8” (700002) and Insert (Qty-6) into the screw holes on the Indicator Nut and tighten to 26.4 ft-lbs. ***Refer to Appendix 1.4: Bolt and Set Screw Torque for recommended torque chart.***



31. Apply multi-purpose grease on the Snorkel’s (605739) O-ring groove and install the O-ring (700601). Push the Snorkel into the ID of the Top Mandrel through the tool joint.

HINT: To prevent pitting on the snorkel, always ensure the snorkel is greased. If possible, post job, remove the snorkel and grease.

WARNING: Do NOT leave the snorkel ungreased for extended periods of time after the job is complete. It is important to remove wellbore contaminants after the job and replace with grease. This will preserve the snorkel from premature wear.



OPTIONAL - Valve Requirements:

Operators running casing sizes 4½” to 5½” who require a valve should install a C-Series Valve (part# 602870) which provides a flow rate of 6 bbl/min.

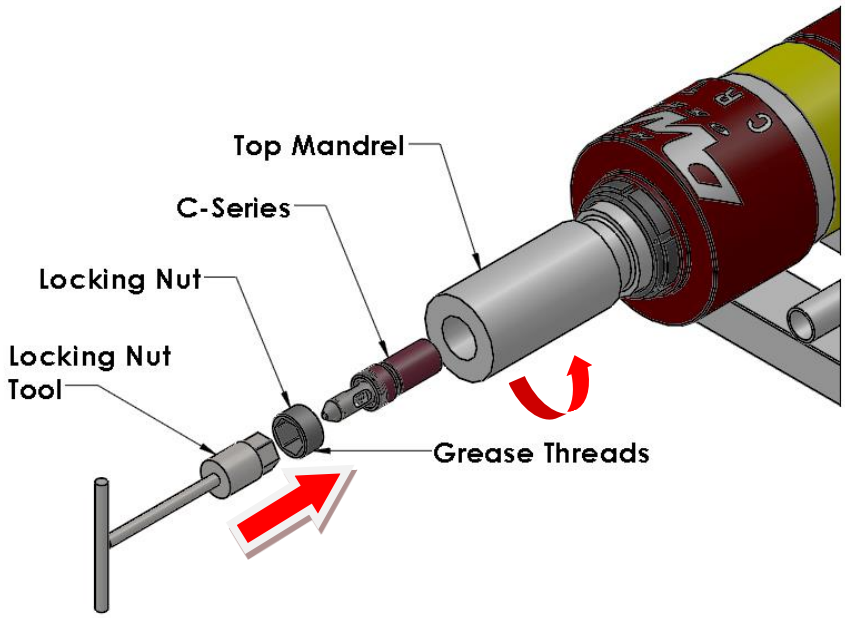
Operators needing higher flow rates to run casing sizes 7” to 20”, skip down to step 34 to install a Spacer Sleeve (part# 605113) instead of the C-Series Valve (part# 602870).

WARNING: Higher flow rates can be achieved but are not recommended as accelerated wear may occur on the ID of the tool.

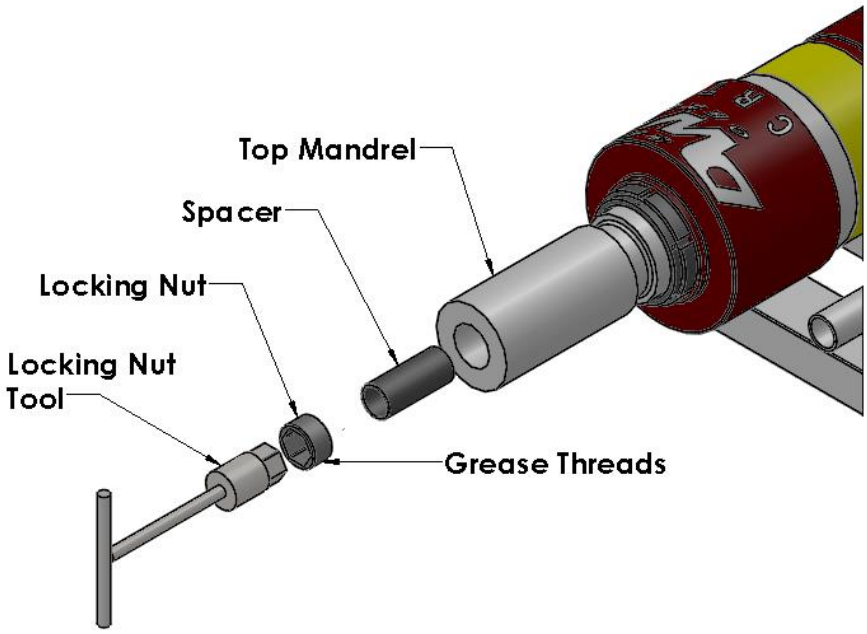
32. Grease the OD of the optional C-Series Valve (602870) and orient as shown below. Insert the C-Series Valve into the Top Mandrel until the valve flush mounts the Snorkel.

33. Grease the OD of the Locking Nut (604079). Secure the C-Series Valve and Snorkel in place with the Locking Nut. The Locking Nut is left-hand threaded; rotate counterclockwise to set the nut. The McCoy C-Series Locking Nut Tool (604080) is required to install the Locking Nut.

NOTE: Make sure the Locking Nut is tightened to atleast 250 ft-lb. The tool may fill with mud if the Locking Nut is not tight, which may prevent the tool from releasing the casing.



34. Higher flow rate operation: If you are running Casing sizes 7” to 20”, insert the Spacer Sleeve (1006174) instead of the C-Series Valve to protect the sealing area where the C-Series Valve sits. If you would like to install a valve, attach the Shorty AutoValve™ below the Circulator for higher flow rates.

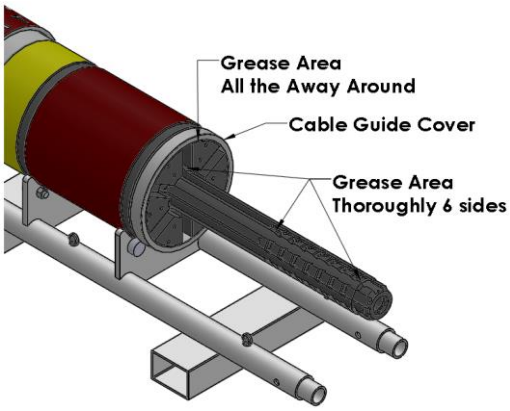


Section 12 - **Assembly – Internal Grip**

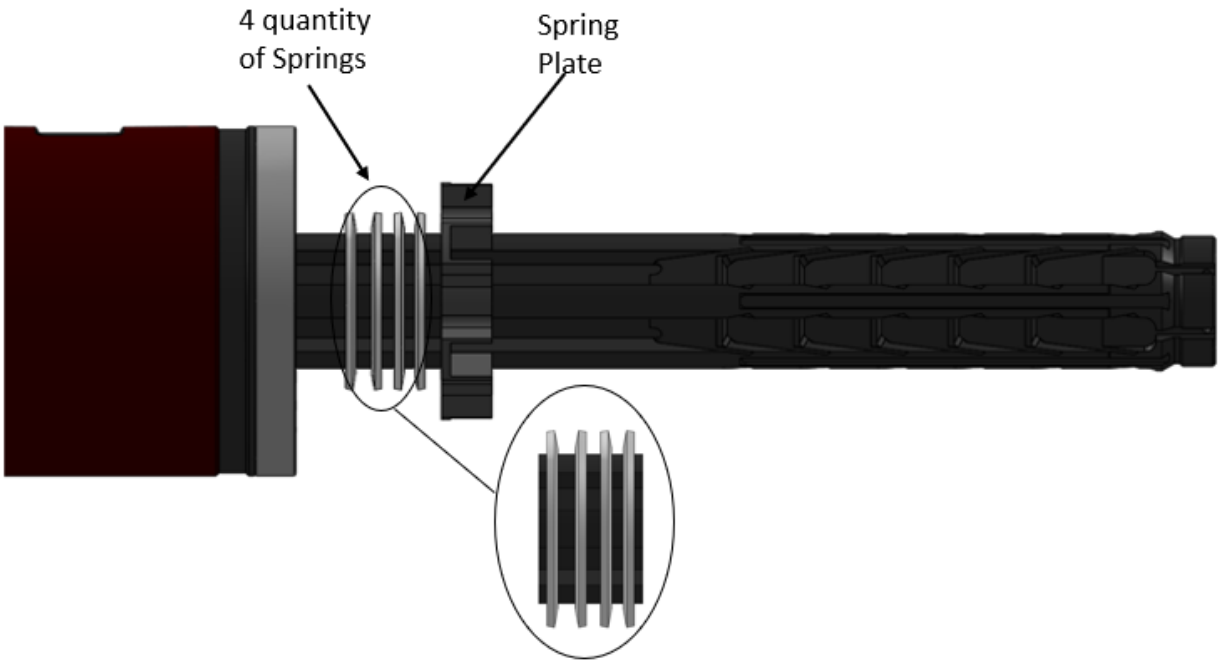
NOTE: The DWCRT is modular. Use the correct Dovetail Mandrel and Mandrel Nut for the tool you are building. For illustration purposes, multiple internal DWCRT Dovetail Mandrels are depicted below)

1. Apply multi-purpose grease on the ID of the Cable Guide Cover (605398) completely, Safety Ring or Attachment Ring such that it can rotate freely on the Housing. Install the Cable Guide Cover, Safety Ring or Attachment Ring over the OD groove of the Housing as shown below.

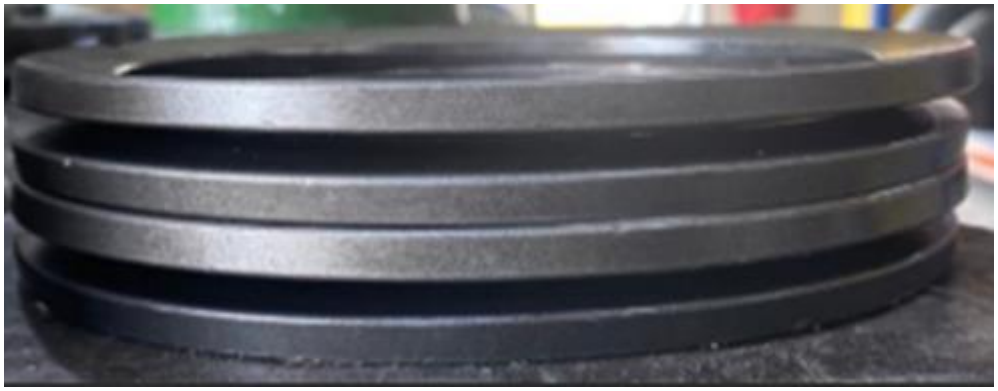
2. Grease (Klüberplex Grease, 700053) all the Dovetail Mandrel's dovetail ramps and grooves with light even grease. Refer to DWCRT Lubrication and Maintenance section for more details. The dovetail grooves are very critical areas and McCoy recommends to re-grease these areas after every job.



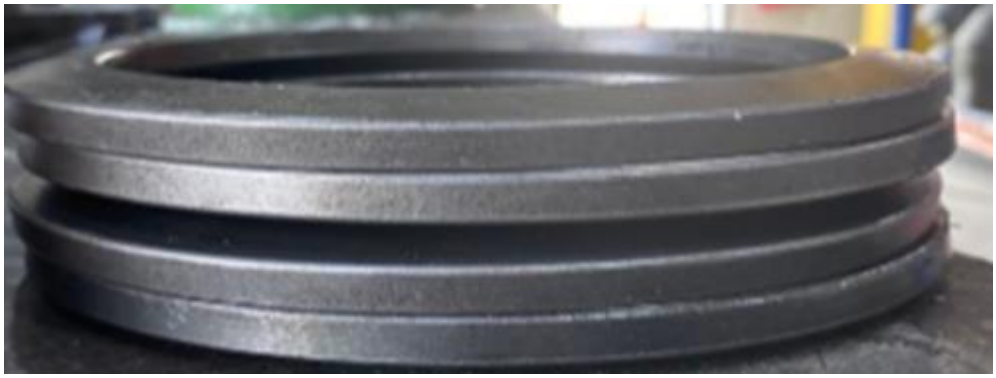
3. This step is only applicable for Gen 2. Apply multi-purpose grease on the spring plate (605720). Insert Belville Springs (605721, Qty. 4) into the housing assembly along with Spring Plate. Note the orientation of springs, the smaller diameter must face the indicator on the 1st spring, with alternating directions for the next 3.



Correct Orientation of Springs:

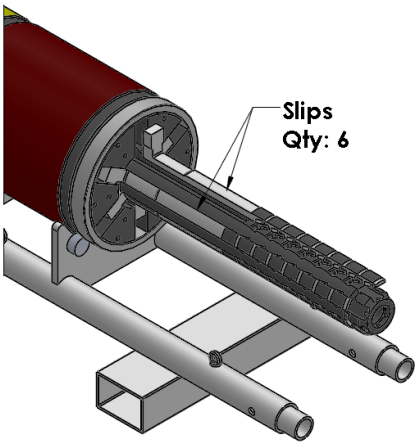


Incorrect Orientation of Springs:



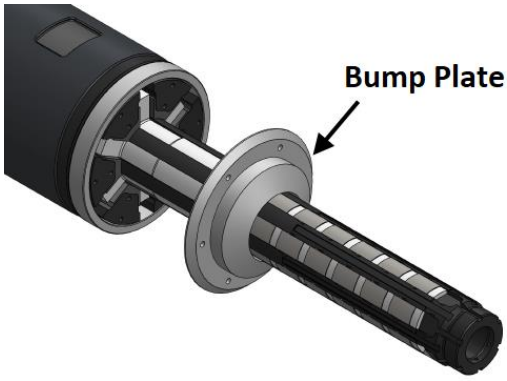
4. Line up the dovetails of a Slip with the dovetail grooves of the Dovetail Mandrel. Insert a Slip by sliding the Slip towards the Head of the CRT. Repeat this for all (Qty-6) Slips. ***Refer to Appendix 1.1: Size and Ratings for slip sizes and the Dovetail Mandrels they can be used in.*** Each casing size has its own set of slips.

NOTE: On DWCRT All casing sizes from 9-5/8" to 26" use the Base Slip



WARNING: When installing the slips be sure that they do not fall out of the track. The bump plate holds the slips to the housing but may need to be held by hand until the bump plate is installed.

5. Place the Bump Plate on the Dovetail Mandrel and partially slide towards the Housing.



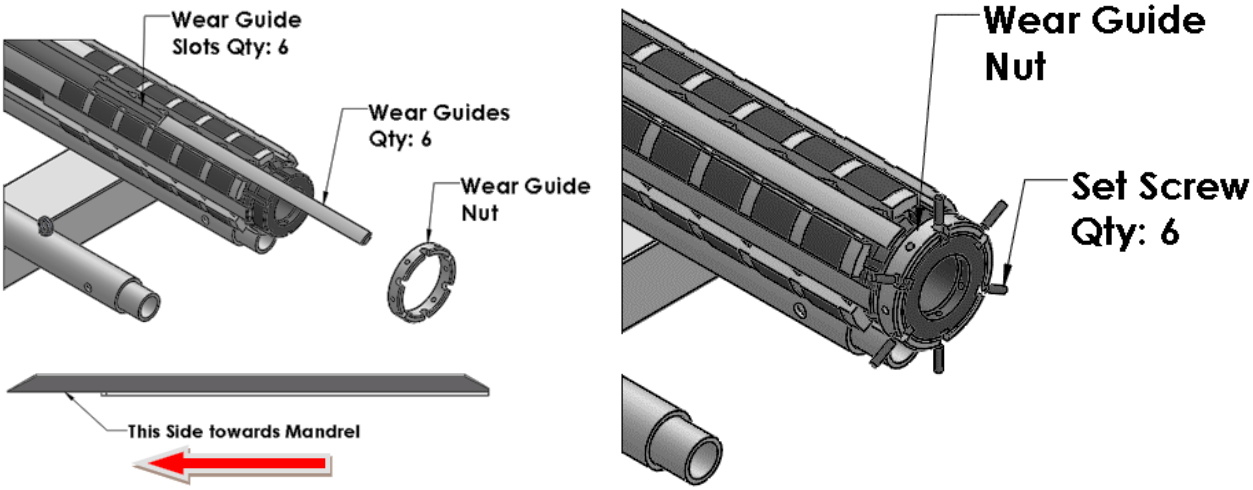
6. Insert the (Qty-6) Bump Plate Springs (701254) in the countersunk holes of the Bump Plate before seating the Bump Plate against the Housing. Apply anti-seize lubricant and bolt with 1/2”-13 x 2” full thread bolt (700008) to the Bump Plate to the housing.

   NOTE: Only use a fully threaded bolt to secure the bump plate to the housing. Recheck bolt torque to 93 ft-lbs. as per ***Appendix 1.4: Bolt and Set Screw Torque*** after all bolts are tightened and shouldered. Bolts should be torqued in an alternating pattern to ensure even force is applied on the Bump Plate.

7. <u>7-5/8” & 8-5/8”</u> Dovetail Mandrels require Wear Guides. Grease slots and slide (Qty-6) Wear Guides in the slots as shown below.

8. Grease the threads of the Wear Guide Nut and screw onto the threads at the lower end of the Dovetail Mandrel to lock the Wear Guides in place.

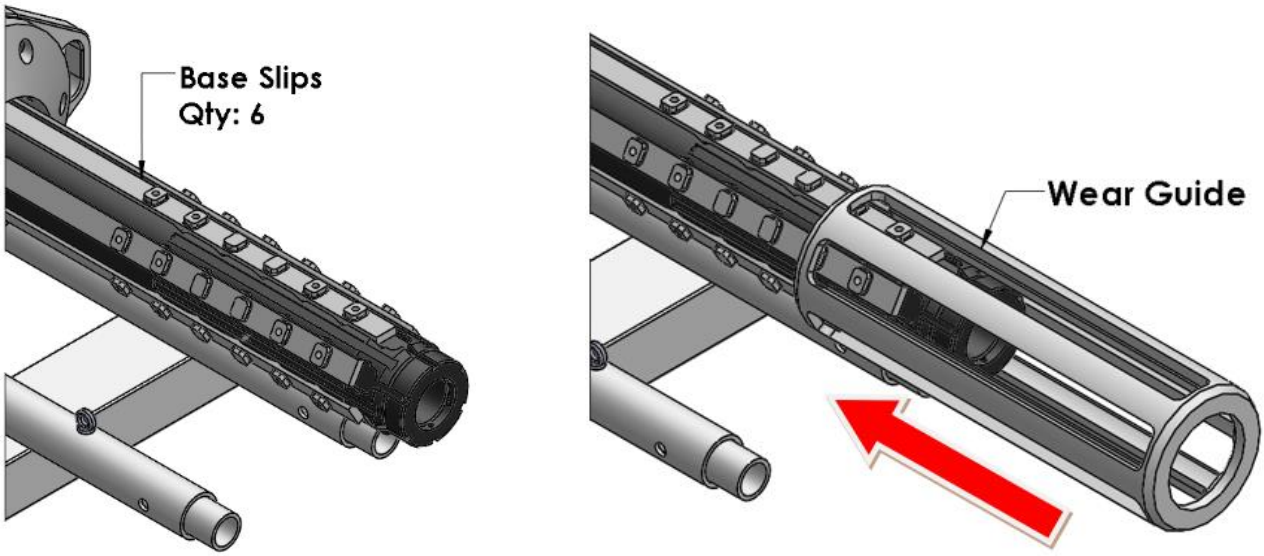
9. Anti-seize Set Screws. Bolt 3/8”-16 x 3/4" Set Screws (701352, Qty-6) to 26.4 ft-lbs into the Wear Guide Nut to secure the Wear Guide Nut and Circulator Body. ***Refer to Appendix 1.4: Bolt and Set Screw Torque for recommended torque chart.***



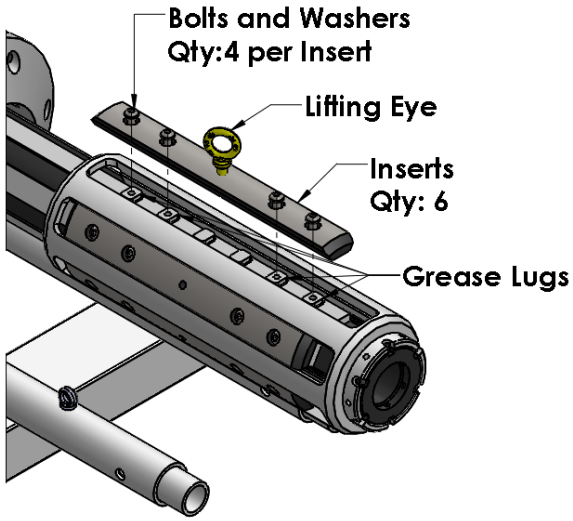
NOTE: For 450 T Tool sizes from 9-5/8” to 26” Base Slips and Wear Guides are used. 1/2"-13 UNC x 7/8” Hex Head bolts are required to secure the inserts onto the Base Slips. The counter bore OD on the inserts is 1.000”, a reduced OD socket is required. Be sure to use a Nord-Lock washer. Torque the bolts to 100 ft-lbs with a calibrated torque wrench. Below are the steps for using Base Slip with Inserts.

NOTE: Section 9.2 Internal Gripping Assembly details the BOM and components required for each casing size and weight.

10. Apply multi-purpose grease on the Wear Guide slots and slide on the Wear Guide.



11. Apply multi-purpose grease to the lugs of the Base Slips. Bolt on the Insert needed for the size of the Casing being run.



NOTE: McCoy Recommends changing the Nord-Lock washers periodically.

12. Repeat step 8 and 9 to complete installing Wear Guide Nut (606167) and Set Screws 3/8”-16 x 1-1/2” (701357).

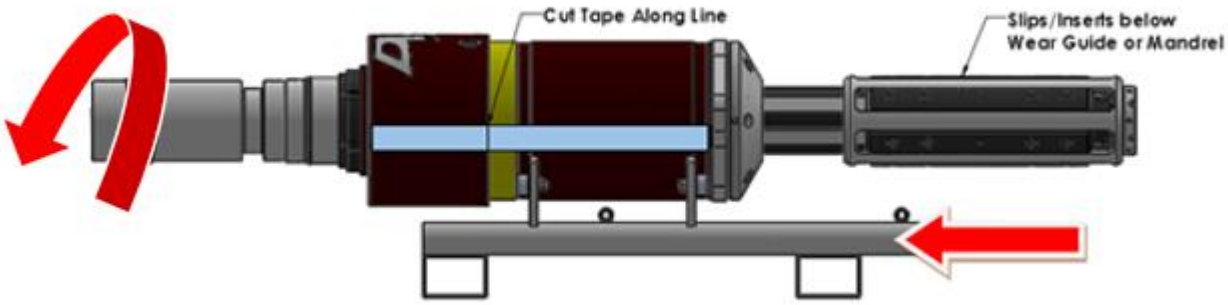
13. Now put the Lines on the Indicator and the Housing. First, push the Top Sub and Indicator all the way down. Next, rotate both the Top Sub and the Indicator counterclockwise (when viewed from Mandrel side) until you hear a mechanical stop (audible click).

WARNING: Loosen strap on the housing while rotating.

This should be the fully retracted position of the DWCRT. Two ways to verify that you are fully retracted are: 1) Slips/Inserts will be below the Dovetail Mandrel/Wear Guide. 2) Continued rotation will cause the Housing to rotate as well.

Note: McCoy recommends a horizontal function test If there is any increased resistance when releasing the tool before the internal stop is met, contact technical support. The hand operated break out activation needs to be smooth, uniform, and continuous. Any additional torque during break out process may result in issues fully releasing the tool at the Rig.

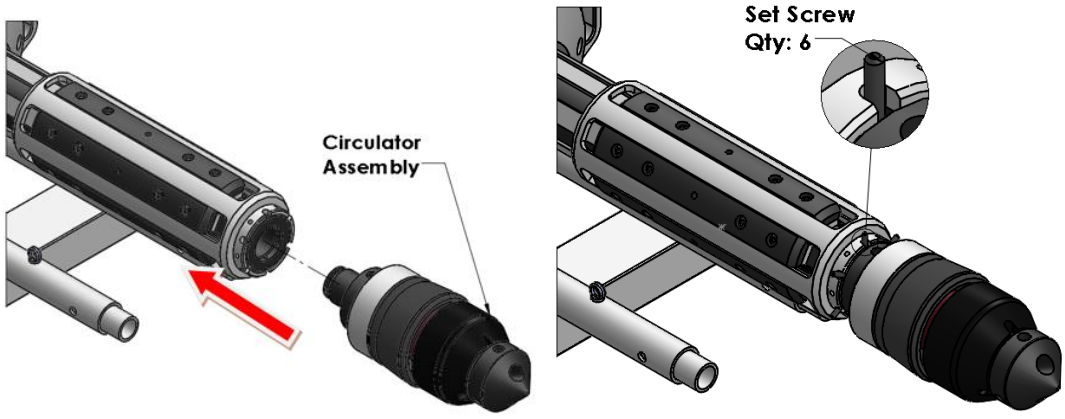
14. Remove existing tape/paint on the indicator. McCoy recommends putting two vertical lines on the indicator 180 degrees apart. The lines must be different colors to ensure the driller has the visual required to fully disengage the tool. Use the appropriate tape or paint to make a line straight down the side of the Indicator and Housing. Repeat for the other side.



15. Screw greased Circulator Assembly into the bottom of the Dovetail Mandrel to 150 ft-lb torque (see following page for information on constructing the Circulator Assembly).

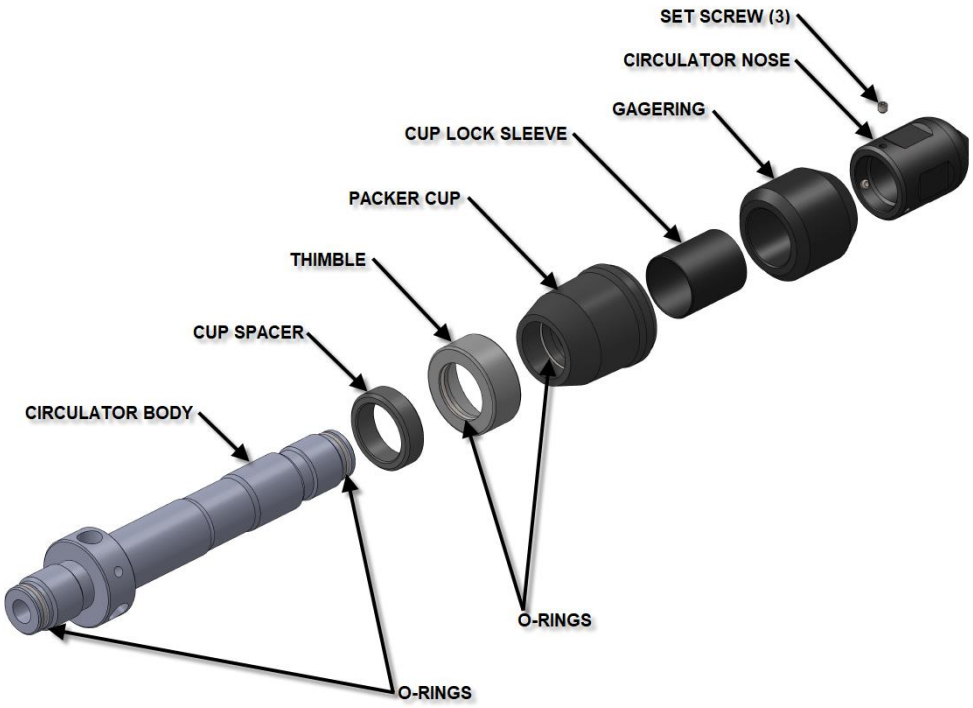
    HINT: It's recommended to thread the circulator body into the dovetail mandrel and add the circulator components (Cup Spacer, Thimble, Packer Cup, Cup Lock Sleeve, Gage Ring, and Circulator Nose) after the circulator body has been installed. See Section 13.

16. Anti-seize Set Screws. Insert the Set Screws corresponding to the selected Circulator Assembly and torque to 26.4 ft-lbs. **Fully assembled Circulator is for illustrations purposes only.** ***Refer to Appendix 1.4: Bolt and Set Screw Torque for recommended torque chart.***



The circulator must be threaded completely in until it bottoms out on the Dovetail Mandrel. Do NOT back off the circulator. Adjust the wear guide nut until the bolt holes align with the grooves in the Wear Nut / Mandrel. The bolts can then be installed, and the head prevents the circulator assembly from threading out.

Section 13 - **Assembly – Internal Circulator**

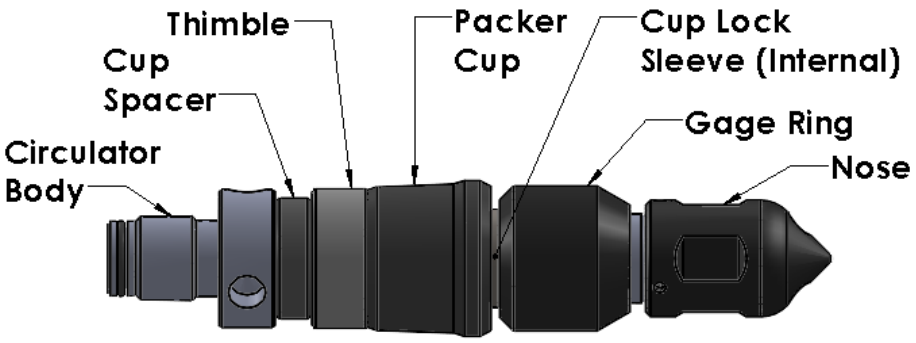


NOTE: The Circulator assembly needs to be assembled onto the mandrel piece by piece.

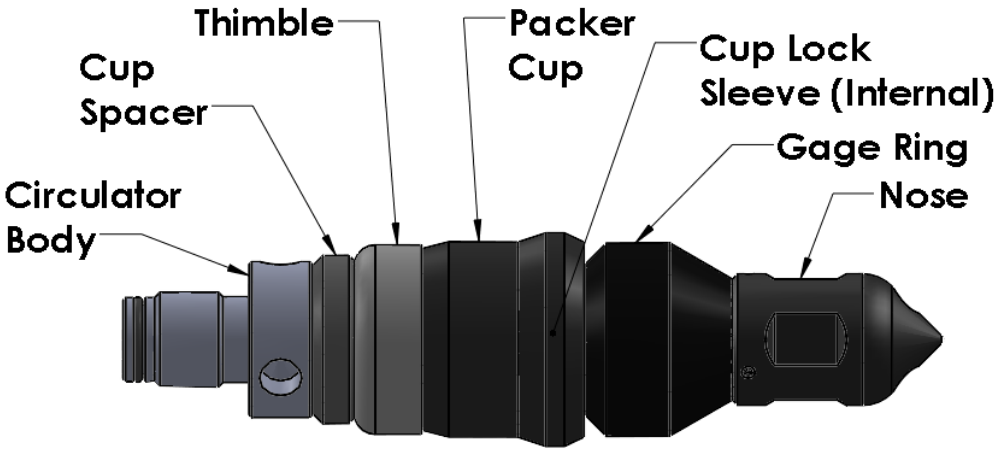
1. Grease and install an O-Ring in the groove on either end (Qty-2) of the Circulator Body.
2. Slide the Cup Spacer onto the Circulator Body until it shoulders.
3. Grease and insert an O-Ring (if required) into the ID groove on the Thimble.
4. Slide the Thimble (if applicable) onto the Circulator Body so it sits just on top of the Cup Spacer.
5. Insert a greased O-Ring into the ID groove on the Packer Cup and slide the Packer Cup onto the Circulator Body.
6. Slide the Cup Lock Sleeve onto the Circulator Body so it seats into the Packer Cup.
7. Slide the Gage Ring onto the Circulator Body.
8. Grease and thread on the Circulator Nose (the Circulator Nose are left-hand threaded). Tighten with a pipe wrench / spanner wrench to 250 ft-lb.
9. The Circulator Body must be fully installed to allow the Set Screws 3/8”16 x 3/4” (701352, Qty-3) to fit into the groove of the Circulator Nose’s set screw holes. Torque to 26.4 ft-lbs. *Do not install the set screws on the ACME threads.*

NOTE: Refer to drawing BOM for appropriate parts list

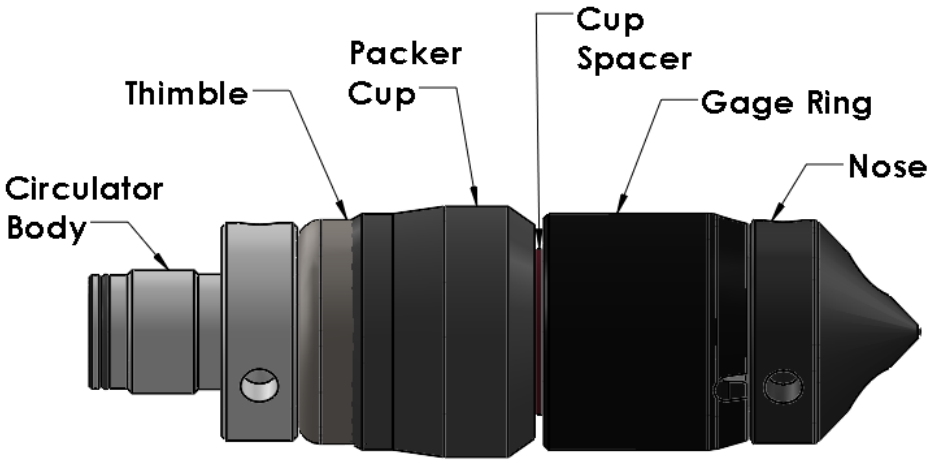
13.1 4-1/2” to 5” Circulator Assembly



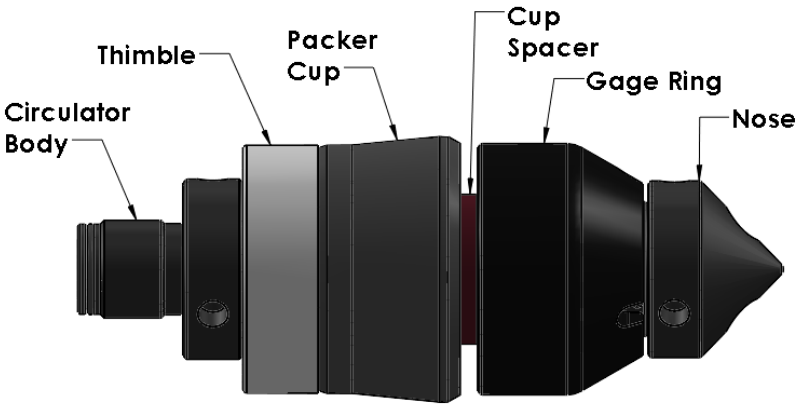
13.2 5-1/2” Circulator Assembly



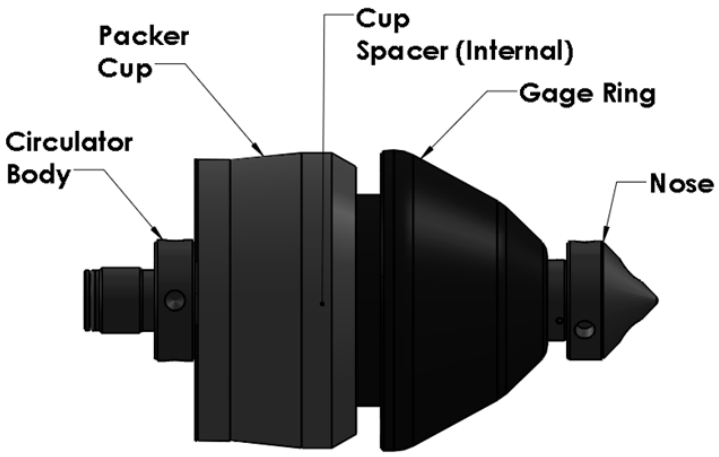
13.3 7” & 7-5/8” Circulator Assembly



13.4 8-5/8” to 13-3/8” Circulator Assembly



13.5 16”-20” Circulator Assembly



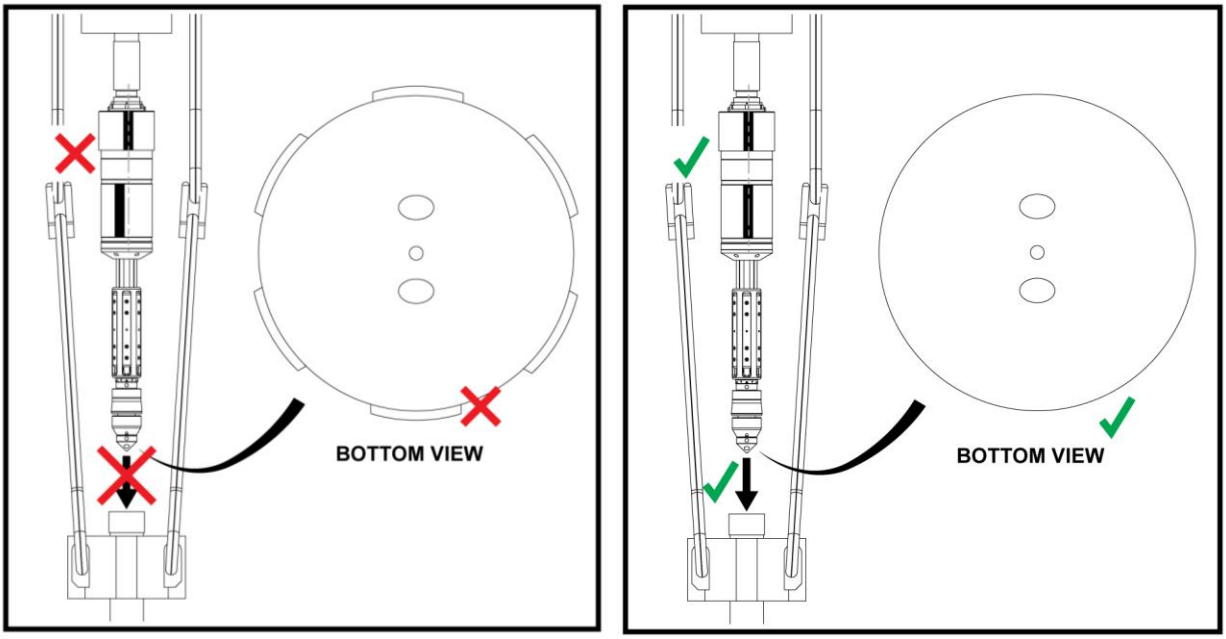
Section 14 - **Troubleshooting**

14.1 Rigging Up the DWCRT

1. **DWCRT INDICATOR LINES HAVE MOVED PRIOR TO RIG UP AND ARE NO LONGER ALIGNED.**
   - Refer to Section 7 for information related to indicator lines. Compress the Head Assembly into the setting position (yellow window) and rotate by hand in the reverse direction until a hard stop is felt and indicator lines are aligned, verify Slip teeth are sitting below the Wear Guide before proceeding.

NOTE: DO NOT ATTEMPT TO RIG UP THE DWCRT IF THE INDICATOR LINES ARE NOT ALIGNED. SLIPS MAY BE PARTIALLY ACTIVATED CAUSING CLEARANCE ISSUES FOR STABBING INTO CASING.

NOTE: ENSURE THE DWCRT WILL FIT INSIDE THE PIPE BEFORE RUNNING TO THE TOOL TO PREVENT PIPE DRIFTING.



2. **DWCRT WILL NOT FIT INSIDE THE CASING.**
   - Confirm packer cup O.D. compared to casing I.D., verify correct packer cup has been installed.
   - Confirm correct Slips have been installed on the DWCRT.
   - Confirm correct Thimble and Gage Ring have been installed on the Circulator. Verify dimensions with casing I.D.
   - If the Packer Cup is oversized and preventing insertion into casing you may opt to remove the Circulator Assembly, continue rigging up and install Circulator once the DWCRT has been connected to the top drive.
   - Verify the casing weight is in the operation range of the mandrel and wear guides being used (internal).

14.2 Engaging the DWCRT

1. **THE DWCRT ROTATES ON TOP OF THE CASING AND WILL NOT ENGAGE.**
   - Verify the DWCRT is in the Setting Position (yellow window). Apply enough set down weight to create friction between the Bump Plate and the Collar.
   - If casing is not aligned with the CRT, moving the bails to adjust the casing position may assist with tool engagement.
     1. Set make-up torque to a minimum of 3,500 ft-lb prior to hoisting the string.

NOTE: SETTING DOWN WEIGHT IS ONLY NECESSARY TO CREATE FRICTION ON THE PIPE COLLAR, EXCESSIVE SET DOWN WEIGHT COULD INCREASE FRICTION INSIDE THE DWCRT AND PREVENT ACTIVATION.

NOTE: ***REFER TO Appendix 1.3: Minimum Set Torque.***

2. **DURING TOOL ENGAGEMENT THE DWCRT ONLY ROTATES 1/2 TURN BEFORE TORQUE IS OBSERVED AND TOOL STOPS ROTATION.**
   - The DWCRT does not require a large amount weight to be applied when engaging the tool, reduce set down weight and continue rotation.
     1. Verify tool has rotated the same number of rotations as observed during the "Stump Test" when the DWCRT was rigged up.
     2. If the number of rotations cannot be confirmed, increase torque and observe for additional rotation.

NOTE: TOOL ENGAGEMENT VERIFICATION REQUIRES OBSERVING BOTH ROTATION AND TORQUE PRIOR TO HOISTING THE STRING.

14.3 Disengaging the DWCRT

1. **THE DWCRT DOES NOT FULLY DISENGAGE - INDICATOR LINES ARE NOT ALIGNED.**
   - Verify mud pumps are turned off and pressure reads 0. (It is good practice to open the Stand Pipe to bleed pressure. If the IBOP was closed, ensure it is open).
   - Lower top drive until the yellow window is completely covered. The max set down weight for setting the tool is 20,000 lbs.

   NOTE: SETTING DOWN WEIGHT IS ONLY NECESSARY TO CREATE FRICTION ON THE PIPE COLLAR, EXCESSIVE SET DOWN WEIGHT COULD INCREASE FRICTION INSIDE THE DWCRT AND PREVENT ROTATION.

2. **THE DWCRT IS FULLY DISENGAGED AND STARTS TO COME OUT OF THE CASING WITHOUT HOISTING.**
   - Verify mud pumps are turned off and pressure reads 0. (It is good practice to open the Stand Pipe to bleed pressure, if the IBOP was closed, make sure it is open).
   - Fluid pressure against the packer cup can have enough force to lift the DWCRT if the Slips are not engaged and fluid pressure is present.

NOTE: BLEED OFF THE STAND PIPE PRESSURE AND CONFIRM A ZERO READING ON THE GAUGES PRIOR TO DISENGAGING THE DWCRT.

3. **DWCRT INDICATOR LINES HAVE MOVED AND ARE NO LONGER LINED UP – WHILE RIGGED INTO TOP DRIVE AND DWCRT IS OUTSIDE OF CASING.**
   - The Housing needs to be held and the tool put in the Setting Position (yellow window).

- Place a soft sling under the Bump Plate and lift with air hoist until the DWCRT is in the Setting Position (yellow window). Grip the Housing above the Bump Plate with a chain tong and rotate by hand in the clockwise direction until the indicator lines are aligned.

NOTE: ENSURE THE DRILLER HAS LOCKED OUT THE TOP DRIVE PRIOR TO PERFORMING ANY WORK ON THE DWCRT WHILE RIGGED IN.

4. **WHILE REMOVING THE DWCRT FROM THE CASING THE SLIPS SNAG OR LIFT THE CASING.**
   - **Immediately Stop Lifting!**
   - If slips are not fully retracted the slip heads and/or attaching bolts could break.
   - If there are only 1-2 joints of casing in the hole the packer cup may have enough friction to hoist the string.
     1. Hoist slowly and monitor for casing movement. Lubricate the packer cup seal prior to inserting into the next joint of casing.
   - If string weight is sufficient and Slips snag on the casing, lower DWCRT back into the pipe, confirm indicator lines are aligned by rotating in reverse with the tool in the Setting Position (yellow window).
     1. Hoist slowly and monitor for casing movement.
     2. Inspect the Slip Head for damage once removed from the casing.

NOTE: CONTACT THE MCCOY TEAM IF YOU ARE UNSURE OF HOW TO INSPECT FOR DAMAGE.

5. **EXCESSIVE SET DOWN (TOP DRIVE) WEIGHT NECESSARY TO PLACE THE DWCRT INTO THE SETTING POSITION (YELLOW WINDOW).**
   - The internal seals on the Snorkel may be leaking, which could allow fluid to enter the Housing.
     1. Fluid needs to be displaced by slowly applying down force with the top drive and letting the fluid bleed off between the Head and the Housing. Once the tool can be placed in the Setting Position (yellow window), rotate in reverse until Indicator lines are aligned.

NOTE: CONTACT THE MCCOY TEAM IF YOU ARE UNSURE OF HOW TO INSPECT FOR DAMAGE.

NOTE: SNORKELS NEED TO BE REMOVED AFTER EACH JOB SO THAT IT DOES NOT RUST IN THE TOOL.

6. **WHEN ATTEMPTING TO RELEASE THE TORQUE SET IN THE DWCRT, THE TOOL JOINT CONNECTION BREAKS**
   - If available, lower the grabber box over the tool joint connection and torque to a minimum of 1.25 times the make-up torque.
   - If a grabber box is not available and manual tongs cannot be used as back-up on the DWCRT tool joint, follow the instructions below.
     1. With the DWCRT placed in the Setting Position (yellow window), rotate in the forward direction until the tool joint shoulders, apply a minimum of 3,500 ft-lb of torque.
     2. Allow DWCRT to move into the Locked Position (white window) by slowly hoisting. Place back-ups on the casing and torque through the DWCRT until desired tool joint torque is achieved.
     3. Place DWCRT in the Setting Position (yellow window) and release the initial setting torque of 3,500 ft-lb.

NOTE: ADDITIONAL TORQUING OF THE TOP DRIVE TOOL JOINT MUST BE DONE IN THE LOCKED POSITION (WHITE WINDOW) TO AVOID OVER TORQUING THE DWCRT.

14.4 Backing Out Casing with the DWCRT

1. **HIGH TORQUE CASING CONNECTION NEEDS TO BE "BROKEN-OUT" – DWCRT DRESSED WITH 140 - 450T MANDREL**
   - With the Housing in the Unlocked Position, apply clockwise torque to set the inserts. Sufficient torque must be applied in the unlocked position before hoisting to the locked position. ***REFER TO APPENDIX 1.3 MINIMUM SET TORQUE FOR RECOMMENDED TORQUES.***
     1. Once the make-up torque has released from the casing connection (approximately 1 full rotation), stop rotation.
     2. Apply manual tong on casing body and release DWCRT in the Unlocked Position from the casing and immediately re-torque to 3,500 ft-lb.
     3. Place DWCRT into the Locked Position (white window) by slowly hoisting. Continue backing out threaded connection and follow procedure for "Backing Out Casing".

IMPORTANT: It's recommended to use a Power Tong or Rig Tong to initially break the high torque connection. If the DWCRT is used, do not exceed 60% of the lowest crossover makeup torque. Watch all Rotary Shoulder Connections and painted lines. Notify the driller if you see a crossover break loose.

14.5 Resetting the Nut if the tool will not come out of the push position

- **If top Drive weight is applied when removing the tool from the push position, the tool can become stuck.**
  1. While stuck in the push position, slightly hoist until the indicator rises approx. 3/8", then apply minimal left-hand torque.
  2. With minimal left-hand torque applied, apply between 4,000 and 10,000 lbs. of top drive weight.
  3. With top drive weight applied, rotate to the right at the maximum previously applied right hand torque.
  4. With Torque still applied. Remove top drive weight and hoist until vertical travel is detected, approx. 3/8".
  5. Release right hand torque and apply left hand torque at minimal RPM up to the applied make-up torque. Observe for 12 degree of rotation out of the push position.
  6. Set down top drive weight once left-hand rotation has been achieved.
  7. If left hand rotation of 12 degree was not observed to allow removal from the push position, repeat steps be increasing the right-hand torque by 30% until the MUT (Make up Torque) for the Tubular is achieved.
  8. Set down top drive weight and continue unset procedure to unset slips.

- **If tool has become stuck after right hand torque has followed a heavy hoist load the following steps should be followed.**
    1. Apply between 10,000 and 15,000 lbs. of tension to the tool.
    2. With top drive holding tension on the tool, rotate to the right at the maximum previously applied right hand torque.
    3. With torque still applied. Remove the tension and place in a neutral or slight compression on the top. Vertical travel of approx. 3/8" of the indicator should be seen when moving from tension to compression.
    4. Place the tool in a neutral or slight tension state and release right hand torque
    5. Apply left hand torque at minimal RPM up to the applied make-up torque. Observe for 12 degrees of rotation out of the push position.
    6. Set down top drive weight once left-hand rotation has been achieved.
    7. If left hand rotation of 12 degree was not observed to allow removal from the push position, repeat steps but increase the right-hand torque by 30% until the MUT (Make up Torque) for the Tubular is achieved.
    8. Set down top drive weight and continue unset procedure to unset slips.

14.6 Applying low torque to hoist or lower casing

1. Top casing connection of the hanger assembly should be compatible with the corresponding configuration of the CRT. Casing size and weight to be confirmed with TRS company.
2. Hanger representative to confirm proper make-up position of the acme thread and place vertical alignment marks across the mating pieces with a mark visible to the driller.
3. Pick-up hanger with appropriate handling equipment and place lower side pin into the mating box connection.
4. Slowly lower the top drive until the CRT nose cone enters the top box connection, placing the gage ring inside the box but still visible to the driller. (Note. Gage ring material is designed to protect the casing threads from damage when centering the CRT).
5. Place power tong on lower connection and make up thread to appropriate connection torque
6. Once connection torque and graph have been verified, remove power tong and continue insertion of CRT until Bump Plate reaches the collar.
7. Continue lowering the top drive until the CRT Indicator reaches the bottom of the Yellow band.
8. Torque/turn computer to be setup and ready to record torques placed through the CRT. Minimum of 1000 ft/lbs. to be recorded before hoisting string.
9. Place 10k set down weight through top drive. Set TD make-up torque to 2000 ft/lbs. and TD RPM to 5 RPM or less.
10. Driller to have clear line of communication with CRT technician and Hanger representative during CRT engagement. (Note. If any amount of rotation of the hanger is noted driller to stop TD rotation immediately).
11. Press Record on torque/turn graph.
12. Driller to start TD rotation at the direction of the CRT technician. CRT Indicator will rotate approximately 2 rotations +/- before any torque is recorded.
13. Once CRT technician confirms full rotation and a minimum of 2000 ft/lbs. torque, driller to confirm all torque has been released before proceeding to next step. Once confirmed, driller can begin steps for hoisting string. (Note. Torque verification to be confirmed on torque/turns computer).
14. Driller to pull weight through slips until full string weight is achieved before giving command to open FMS or remove hand slips.
15. Lower string until hanger assembly is past the floor, set slips at appropriate stump height. (Note. No rotation of the top drive to occur while lowering string through the table. Table to remain in

the unlocked position for the duration of this procedure).

16. Set slips and lower CRT Indicator into the yellow band, release torque by rotating in the reverse direction.

14.7 DWCRT is Fully Disengaged but cannot remove Tool from the casing.

1. Compress the compensator (yellow band) and rotate in reverse until the indicator lines are aligned.
2. Slowly hoist the tool from the casing, if the tool cannot be removed, look for a small gap (1-2”) between the cable guide and the bump plate.
3. If a gap is observed, it’s likely that the bump plate bolts broke. This can occur if the tool is NOT fully disengaged, and the inserts snag the ID of the casing while hoisting the tool.
4. Set weight and compress the tool until the gap is closed.
5. Attach slings on both sides of the bump plate and secure the bump plate in place.
6. Hold the bump plate in place, ensure the gap between the bump plate and housing remains closed.
7. Hoist the DWCRT with the top drive while holding the bump plate in position.
8. Once the tool has been removed, cover the casing hole and lower the bump plate.
9. Remove the broken bolts.
10. Lift the bump plate back into position and insert new bolts. Torque to 62 ft-lbs.
11. Continue running casing.
12. Observe and apply OEM Unsetting Procedures, see Section 6.5 to avoid reoccurrences.

Section 15 - **Customer Feedback Form**

www.mccoyglobal.com
Email: sales@mccoyglobal.com

Thank you for choosing a DWCRT. Your honest feedback will help us to serve you better and enable us to work on improving our product standards. Thank you.

Name		
Organization		
Address		
Email		
Phone		
Product		
Date:		location:

	Yes	No
1. Product was easy to assemble	☐	☐
2. Product came with all required tools	☐	☐
3. Product included user manual	☐	☐
4. Customer support were responsive	☐	☐

Suggestion and Comment for the Product

Section 16 - **Additional Documentation**

Risk Assessment

Assessed by: _____ Date: _____

Reason/Opportunity for Risk Assessment: _____

ITEM	Risk Description	Initial Risk			Controls	Residual Risk		
	Description	Severity	Likelihood of Occurrence	Risk Rating		Severity	Likelihood of Occurrence	Risk Rating
	Section 1							
1	Inspect equipment being used. Equipment failure Manual handling, Pinch points	Moderate	Low	Tolerable Risk	Inspect equipment prior to use. Ensure equipment has relevant Documentation and SWL has been checked. Good Body positioning. Good and correct PPE at all times	Low	Low	Low Risk
2	Lift CRT to Rig Floor. Heavy overhead lift, Uncontrolled Load, Dropped objects, Pinch points Trapped against or in between	High	Moderate	Substantial Risk	Ensure all parties fully understand Tool Box Talk and instructions for lifting CRT. Ensure all securing devices in good condition and utilized.Correct Tools and Slings for Job using a communicated lift Plan, LOLER regulations. Competent Banksman and Deck CrewTag Lines and Stiffy Hand Tools when available.PA announcement and/or barriers as required to inform others not involved with Operation	High	Low	Moderate Risk
3	Positioning of CRT to Rotary Table.Heavy overhead lift, Uncontrolled Load, Dropped objects, Pinch points Trapped against or in between	High	Moderate	Substantial Risk	Ensure all securing devices in good condition and utilized. Correct Tools and Slings for Job using a communicated lift Plan, LOLER regulations. Competent Air Hoist Operaton's Competent person on TDS Brake. Tag Lines and Stiffy Hand Tools as required. Controlled slow movement of CRT Good Communication, Signals and awareness by all Parties	High	Low	Moderate Risk
4	Rig up CRT. Manual handling. Stored energy Pinch points. Dropped object. Trapped against or in between	High	Moderate	Substantial Risk	Use correct manual handling and lifting techniques. Correct hand tools for job Wear fall protection if working at height Awareness of surroundings (ABBI) Above, Below, Behind and Inside. Witness proper torque applied by driller on tool. Verify proper torque application.	Moderate	Low	Tolerable Risk
5	Cross Over Make Up. Make-up Torqe to top drive saver sub, paint connection make-up. Dropping Objects.	High	Moderate	Substantial Risk	Ensure Connection Top drive match with Crossover. Verify connection data sheet is current and the OEM recommended torque has been applied. Make up the connection, observing alighnment, correct thread engagement and seal contact on the rig floor. Action a confirmation torque to the crossover connection while standing in the Doghouse observing the torque applied on the drillers display. If additional rotation is observed, apply a second confirmation to ensure applied torque has been achieved. Paint or Chalk line to be placed vertically accross all Rotary Shoulder Connections. Every Joint, observe the pained chalk lines to ensure connection integrity is maintained. Set break out stall mode to 60% of applied torque (applied to the lowest torque crossover) in the connections above the CRT. If tool disengagement exceeds 60% of MUT applied to the crossover connection, a torque confirmation is required on the crossover connection and Chalk/Paint lines cinfirmed for alighnment. Maintain good visibility. (clean throughout job to keep continuously visible.)	Moderate	Low	Tolerable Risk
6	Rotating Counter Clockwise, Locked Position, Back out saver sub, Back out cross over, Dropped Objects/Tool.	High	Moderate	Substantial Risk	Follow recommended running procedures, Section 7,5 Unsetting Procedure (Releasing Slips) Counter Clockwise torque should only be applied in the unlocked position when disengaging the inserts from the casing. Category I inspection per manual on every connection. Set Top Drive stall torque in break out mode (If applicable) 60% below cross over make-up torque. (per application use and using the lowest torque in the crossover configuration) Use locked position for final make-up torque for lower break-out torque. (If required) Ensure minimum set torque is applied as per manual Appendix 1.4: Minimum Set Torque.	Moderate	Low	Tolerable Risk
7	Operate and Run CRT. Counter Clockwise Torque in locked and unlocked position, Setting Slips on Coupling with External tool, damage coupling Internal tool. Back off Saver sub connection. Back out a casing connection. Dropped String. Dropped Objects Slips and Trips	Moderate	Moderate	Moderate Risk	Competent Operators only, follow recommended running procedures, Good TBT, JRA and step back and take 5 minutes to review imperative tasks prior to the Job. Observe cross over connections when backing out a casing connection in the locked position, use power tongs if casing connection break-out torque exceeds 60% of cross over make-up torque. Category I Inspection as per manual on every connection. Continuous checks on securing devices/connections. Good housekeeping, Good communication by all parties. Driller must be issued with instructions and information. Counter clockwise torque should only be applied in the unlocked position when disengaging the inserts from the casing.	Moderate	Low	Tolerable Risk
8	Rig Down CRT. Manual handling. Stored energy. Trip hazard. Possible working at heights.Pinch points. Dropped object Trapped against or in between	Moderate	Moderate	Moderate Risk	Use correct manual handling and lifting techniques. Correct hand tools for job Wear fall protection if working at height Awareness of surroundings (ABBI) Above, Below, Behind and Inside. .	Moderate	Low	Tolerable Risk
9	Remove CRT from Drill floor. Heavy overhead lift, Uncontrolled Load, Dropped objects, Pinch points Trapped against or in between	High	Moderate	Substantial Risk	Ensure all securing devices in good condition and utilized.Correct Tools and Slings for Job using a communicated lift Plan, LOLER regulations. Competent Banksman and Deck CrewTag Lines and Stiffy Hand Tools when available.PA announcement and/or barriers as required to inform others not involved with Operation Ensure all Lifting devices are in good condition and secure prior to moving the CRT	High	Low	Moderate Risk

Form: F-GL-OPS-003, Revision: 03
File Name: Risk Assessment Form

Approved by: K. LeJeune
Date: August 18th 2023

Page 1 of 1

Accesories	Length*	Actual
X-Over	TBD	
DWSES	24-36 IN	
McCoy TTS Sub	15-36 IN	

*Lengths may vary due to re-cuts of threaded connection. Please verify length of actual accessory being used.
*Verify upon Rig Survey

CRT Internal	Length*	Actual
140-300	106.8 IN	
450 (7"-13-3/8")	116.4 IN	
450 (16'-20")	120 IN	
1000 Ton (9 5/8"-13 5/8")	130 IN	
1000 Ton (16"-20")	135 IN	
1000 Ton (22"-26")	138 IN	

CRT External	Length	Actual
4-1/2"-7-5/8"	123.6 IN	

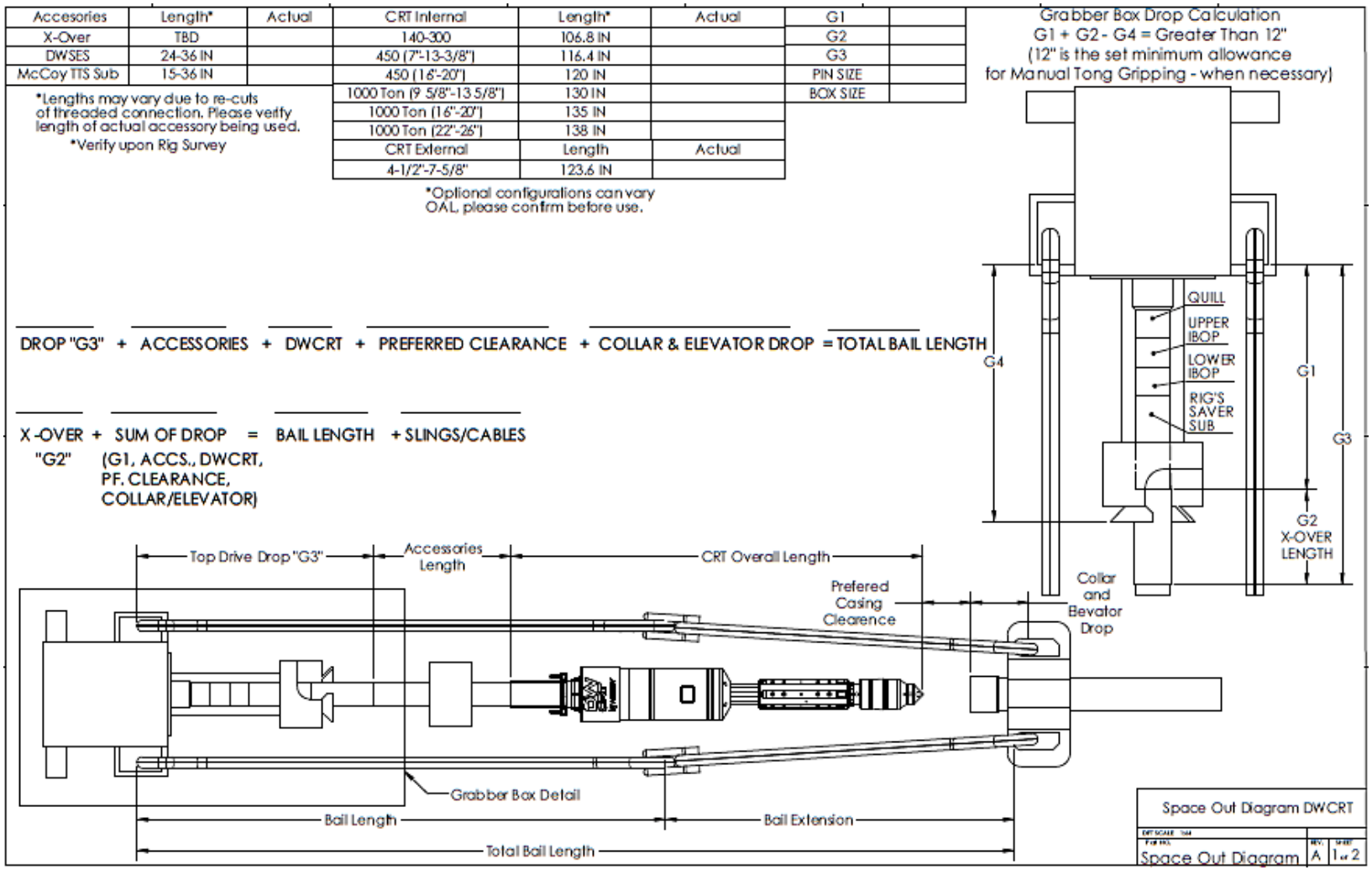
*Optional configurations can vary OAL, please confirm before use.

G1	
G2	
G3	
PIN SIZE	
BOX SIZE	

Grabber Box Drop Calculation
G1 + G2 - G4 = Greater Than 12"
(12" is the set minimum allowance for Manual Tong Gripping - when necessary)

DROP "G3" + ACCESSORIES + DWCRT + PREFERRED CLEARANCE + COLLAR & ELEVATOR DROP = TOTAL BAIL LENGTH

X-OVER "G2" + SUM OF DROP (G1, ACCS., DWCRT, PF. CLEARANCE, COLLAR/ELEVATOR) = BAIL LENGTH + SLINGS/CABLES



Space Out Diagram DWCRT
Space Out Diagram
REV. A
SHEET 1 of 2

RIG SURVEY

Surveyor:	Date:
Location:	Rig Manager:
Drilling Contractor:	Rig Name:
Operator:	Rep:

Casing/Connection Data

Diameter:	String Length:		
Weight:	Est. String Weight:	Drift Measured:	
Grade:	Pipe Body Yld (lbs):	Torque (ft. lbs)	Min:
Connection:	CRT Hoist (ton):		Opt:
Pipe Range:	Casing Yld Strength (psi):		Max:

Casing/Connection Data

Diameter:	String Length:		
Weight:	Est. String Weight:	Drift Measured:	
Grade:	Pipe Body Yld (lbs):	Torque (ft. lbs)	Min:
Connection:	CRT Hoist (ton):		Opt:
Pipe Range:	Casing Yld Strength (psi):		Max:

Rig Information

Rig type:		Rig bail Length:	
Top Drive Type:		Bail Extensions:	
Top drive Connection:		Casing Bail Length:	
Top Drive Drop:		Grabber Box Max OD:	
Joystick or Brake Handle:		Iron Roughneck : Yes: ☐	No: ☐

Quill Connection

Connection	ID	OD	Max. Trq

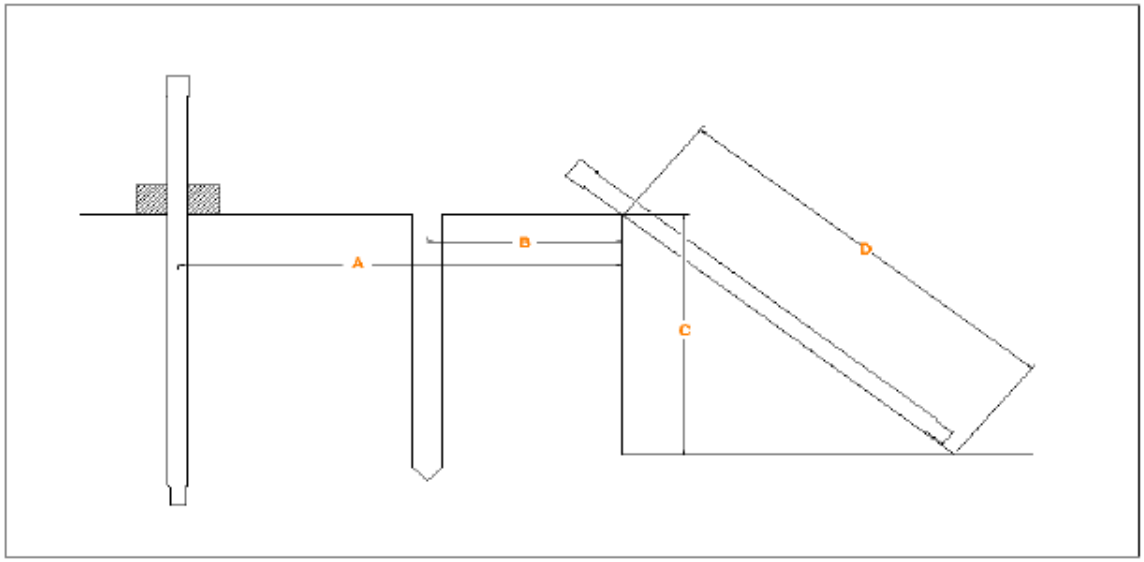
Bail / Saver Sub Requirements

Bail Length Required:		Bail Extension Length Required:
Saver Sub OD / Grabber Box ID Confirmed:	Saver Sub Length Required:	Elevator Capacity Required:

Type of Elevator	
Type of Elevator:	Rating:
Comment:	

Pipe Handling	
V-Door equipped Rigs	Non V-Door Rigs
Pipe Wrangler w/ pipe skate:	Pipe Cart (Handles Multiple Tubulars):
Standard Catwalk w/skate:	Catwalk Shuttle (Single Tubular):
Crane-In Operation only (pipe deck):	Crane-In Operation only (pipe deck):
Pick-up / Lay-down Machine:	Eagle Pipe Handler Set Down Capacity:
Other:	

Rig Floor and V-door Measurements			
A:	B:	C:	D:



Appendix 1.1: Size and Ratings

DWCRT Internal Specifications

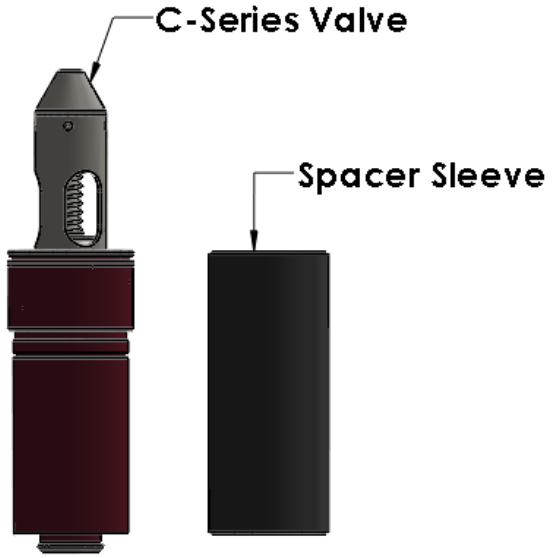
Tubular Size	Weight Range	Casing ID (in.)	API 8C Hoist Capacity (Tons)	Torque Capacity (Locked ft-lb)	Torque Capacity (Unlocked ft-lb) Gen 1 Only	Set Down Weight (Tons)	Min ID (in.)	Flow Rate (bbl/min)	OAL (in.)	Shorty OAL (in.)	OAL w/ AutoValve (in.)	Shorty OAL w/ AutoValve (in.)	Approx. Weight (lbs.)
4-1/2"	9.5 - 15.1 #	4.090 - 3.826	140	13,000	5,000	50	1	6	103	87	114	98	1300
5"	15 -23.2#	4.408 - 4.044	160	15,000	5,000	50	1	6	103	87	114	98	1300
5-1/2"	15.5 - 26.8#	4.950 - 4.545	225	25,000	10,000	50	1	6	106	90	117	101	1300
5-1/2"	18 - 23 #	4.950 - 4.670	255	25,000	10,000	50	1	6	106	90	117	101	1300
5-1/2"	20 - 23#	4.778 - 4.670	300	30,000	10,000	50	1	6	106	90	117	101	1300
6"	20 -24.5 #	5.352 - 5.125	430	30,000	10,000	50	1	6	108	92	120	104	1500
6-5/8"	20 - 36.7 #	6.049 - 5.501	370	50,000	15,000	50	1	6	115	99	120	104	1500
7"	17 - 35#	6.538 - 6.004	450	65,000	50,000	50	1.5	12	115	99	120	104	1500
7-5/8"	24-42.8#	7.025 - 6.501	450	65,000	50,000	50	1.5	12	115	99	120	104	1500
8-5/8"	24 - 44 #	8.097 - 7.625	450	65,000	50,000	50	1.5	12	115	99	142	126	1500
9-5/8"	36 -59.4 #	8.921 - 8.407	450	65,000	50,000	50	1.5	12	115	99	142	126	1650
9-7/8"	62.8#	8.625	450	65,000	50,000	50	1.5	12	115	99	142	126	1650
10-3/4"	40.5 - 60.7#	10.050 - 9.660	450	65,000	50,000	50	1.5	12	115	99	142	126	1750
10-3/4"	65.7 - 85.3#	9.560 - 9.156	450	65,000	50,000	50	1.5	12	115	99	142	126	1800
11-3/4"	47 - 71#	11.000 - 10.586	450	65,000	50,000	50	1.5	12	115	99	142	126	1875
12-3/4"	44-77#	12.080-11.584	450	65,000	50,000	50	1.5	12	115	99	142	126	2000
13-3/8"	54.4 - 85#	12.615 - 12.159	450	65,000	50,000	50	1.5	12	115	99	142	126	2100
13-5/8"	88.2#	12.375	450	65,000	50,000	50	1.5	12	115	99	142	126	2100
16"	65 -109#	15.250 - 14.688	450	65,000	50,000	50	1.5	12	120	104	147	131	2400
16-3/4"	65 - 109#	16.250 - 15.750	450	65,000	50,000	50	1.5	12	120	104	147	131	2400
18-5/8"	87.5 - 117#	17.755 - 17.375	450	65,000	50,000	50	1.5	12	120	104	147	131	2900
20"	94 - 133#	19.124 - 18.730	450	65,000	50,000	50	1.5	12	120	104	147	131	3100
24"	171-216#	22.685 - 22.185	450	50,000	50,000	50	1.5	12	126	110	N/A	N/A	4500
26"	202-275#	24.550 - 24.050	450	50,000	50,000	50	1.5	12	126	110	N/A	N/A	5000
7-20"	High Flow Mandrel Option for the same Size and Weights		415	55,000	50,000	50	1.75	18	126	104	147	126	N/A

Appendix 1.2: DWCRT Valve Options

Internal (450 Ton)

DWCRT Valve Options			
Tool Size	**Valve**	**Flow Rate**	**OAL Added**
4½" to 20"	C-Series	6 bbl/min	0"
4½" to 5½ "	4-1/2" to 5-1/2" Shorty AutoValve	6 bbl/min	15-1/4"
7" & 7-5/8"	7" & 7-5/8" Shorty AutoValve	12 bbl/min	17"
8-5/8" to 20"	8-5/8" to 20" Shorty AutoValve	12 bbl/min	22"

For the 450 Ton DWCRT we offer a C-SERIES Valve inside of a Crossover Sub which positions the valve for easy removal from job-to-job. In this configuration, a Spacer Sleeve is installed in the Top Mandrel as depicted in step



Spacer Sleeve (part# 605113) and C-Series Valve (part# 602870)

Appendix 1.3: Recommended Minimum Set Torque

Recommended Min Set Torque (Yellow Position)					
Casing Size	Connection Make up Torque				
	10,000	15,000	30,000	45,000	65,000
4-1/2”	3,500	5,500	N/A	N/A	N/A
5-1/2”	3,500	4,500	9,000	N/A	N/A
7”	3,500	3,500	6,000	8,500	13,000
8-5/8”	3,500	3,500	5,000	7,500	12,000
9-5/8”	3,500	3,500	4,500	6,500	9,000
10-3/4”	3,500	3,500	4,000	5,500	8,000
11-3/4”	3,500	3,500	3,500	5,000	7,500
13-3/8”	3,500	3,500	3,500	4,500	6,500
16”	3,500	3,500	3,500	4,000	5,500
20”	3,500	3,500	3,500	3,500	4,500

IMPORTANT NOTE – Several factors can impact the Minimum Set Torque Requirement. These factors include Alignment, Grade of Steel, Insert Die Condition, Debris or Contamination on insert teeth and Top Drive Calibration Variances. A 30% minimum set torque variance can be applied, plus or minus, based on conditions and use case.

Example – While making up 9-5/8” Casing and Optimal Casing MUT is 30,000 ft-lbs.

- Option # 1 - Make up the casing connection in the Yellow Position to final torque - 30,000 ft-lbs. Break Out Torque will be 50-60% of casing make up torque or approximately 15,000 ft-lbs to release the tool.
- Option # 2 – Low Break Out Mode - Make up the casing to 4,500 ft-lbs in the Yellow Position, shift or hoist the tool to the White Position (2” of white band showing) continue make up in the White Position to 30,000 ft-lbs. Break Out Torque will be 50-60% of casing make up torque in the Yellow Position or approximately 2,250 ft-lbs to release the tool.

HINT: If you see slipping on the torque turn graph, increase the Minimal Set Torque by 30%, repeat if necessary.

Low Break Out Mode - Option # 2

Yellow Position
* Make up the casing in the yellow positon until the minimum set torque is achieved (Blue numbers on chart)
* Shift to the white position for final make up torque.

White Position
* Achieve the minimal set torque in the yellow position.
* Shift the tool to the white position
* Complete final make up torque in the white position.

Appendix 1.4: Bolt and Set Screw Torque

Coarse Thread Gr. 8 HHCS 	Dry Torque (ft-lbs) K=0.22 @ 75% Proof Load	Lubricated Torque (ft-lbs) K=0.17 @ 75 Proof Load
1/4”	14	10
5/16”	28	21
3/8”	50	38
7/16”	81	61
1/2”	124	93
5/8”	238	178
3/4”	423	317
7/8”	682	512
1”	1022	767
Coarse Thread Gr. 8 SHCS 	**Dry Torque (ft-lbs) K=0.22 @ 75% Proof Load**	**Lubricated Torque (ft-lbs) K=0.17 @ 75 Proof Load**
1/4”	13	11
5/16”	28	23
3/8”	46	37
7/16”	75	60
1/2”	115	92
5/8”	225	180
3/4”	370	296
7/8”	590	473
1”	893	715

Cup Point Set Screw 	Tightening Torque (In-lb.)	Tightening Torque (ft-lbs.)	Lubricant
1/4"	94	7.8	Metal bases Anti-seize
5/16"	183	15.3	Metal bases Anti-seize
3/8"	317	26.4	Metal bases Anti-seize
7/16"	502	41.8	Metal bases Anti-seize
1/2"	750	62.5	Metal bases Anti-seize

The type of lubrication used can change the recommended tightening torque. Reference current McCoy manual for proper lubricant.

Appendix 1.5: Tool Joint Sizes and Make-up Torque

Internal (450 Ton) and External (500 Ton)

Tool Joint Sizes & Makeup Torque		
Tool Joint Size	**Hoist Capacity (Tons)**	**API Make-up Torque (ft-lb)**
4-1/2 IF Box	500	49,000
6-5/8" REG Box	500	62,000
6-5/8" FH Box	425	35,000

McCoy Box Connection is often stronger than the pin connection. The make-up torque and tension rating were calculated using small inner diameters for the pin. The load rating of the connection should be first based on the McCoy rating, then reduced if necessary, depending on the pin that will be connected to the McCoy Tool (and other connections between the DWCRT and Top Drive). Contact McCoy for higher torque requirement options.

Appendix 1.6: Packer Cup, Gage Ring, Thimble Size Chart

The DWCRT family is 10,000 PSI capable but limited to the maximum working pressure of the Packer Cup.
The Below Sizes and rating are general guidelines and the compatibility in Special, or premium connections may require the use of a specialty cup or gage ring combination. High Pressure Cups are available upon special request up to 10,000 psi.

For the latest version, please visit our website or contact sales: sales@mccoyglobal.com

DWCRT Packer Cup Gage Ring Thimble Size Chart								
Casing Size	Weight Range	Gage Ring	OD	Packer Cup	OD	Packer Cup Rated Pressure	Thimble	OD
4-1/2"	9.5/11.6#	601096	4.150"	60110	4.150	5,000 p	60111	3.7
	12.6/13.5#	601097	3.800"	601108	4.070"	5,000 psi	601114	3.73"
	15.10#	601988	3.701"	601927	3.95	5,000 psi	605276	3.63"
5"	15/18#	601098	4.150"	601109	4.620"	5,000 psi	601115	3.99"
	18/21.4#	601099	3.955"	601110	4.340"	5,000 psi	601115	3.99"
	23.2#	602061	3.785"	602604	4.230"	5,000 psi	601115	3.99"
5-1/2"	13/15.5#	601100	4.820"	601111	5.300"	5,000 psi	601116	4.50"
	17/20#	601101	4.600"	601112	5.090"	5,000 psi	601116	4.50"
	20/23#	601101/601102	4.600"/4.420"	601113	4.980"	5,000 psi	601116	4.50"
	23#	603635	4.545"	603531	4.800"	5,000 psi	605277	4.38"
	23/26#	601102	4.420"	605779	4.800"	5,000 psi	605277	4.38"
	26#	601102	4.420"	602593	4.700"	5,000 psi	605277	4.38"
	26.8#	601098	4.150"	601109	4.620"	5,000 psi	601115	3.99"
6"	20#	603935	5.200"	605047	5.590"	5,000 psi	605048	5.20"
	23#	1006135	5.061	1006133	5.350"	5,000 psi	1006134	4.840"
6-5/8"	20/23.2#	605672	5.845"	605674		5,000 psi	605556	5.50"
	24/28#	605673	5.666"	603960	6.020"	5,000 psi	605556	5.50"
	32-35#	603940	5.450"	603941	5.850"	5,000 psi	605556	5.50"
7"	17/23#	605074	6.241"	605001	6.740"	5,000 psi	605000	5.91"
	23/26#	605075	6.151"	605002	6.460"	5,000 psi	605000	5.91"
	26-30#	1005925	6.029"	1005924	6.38"	5,000 psi	605000	5.91"
	29/32#	605076	5.969"	605003	6.469"	5,000 psi	605000	5.91"
	35#	605077	5.875"	605012	6.200"	5,000 psi		
7-5/8"	24/26.4#	605078	6.750"	605438	7.150"	5,000 psi	605009	5.91"
	24/29.7#	605078	6.750"	605010	7.150"	5,000 psi	605009	5.91"
	29-33#	605676	6.640"	605437	7.050"	5,000 psi	605009	5.91"
	33.7/42.8#	605079	6.376"	605011	6.876"	5,000 psi	605009	5.91"
8-5/8"	20-24 #	605973	7.972"	602721	8.250 "	5,000 psi	605975	7.50"
	28/36#	605092	7.700"	600288	8.150"	4,250 psi	600304	7.50"
	40-44#	605974	7.500"	605977	-	4,250 psi	605976	7.38"

Casing Size	Weight Range	Gage Ring	OD	Packer Cup	OD	Packer Cup Rated Pressure	Thimble	OD
9-5/8"	29/36#	605780	8.765"	601925	9.210"	4,250psi	602205	8.77"
	36/47#	605093	8.379"	601207	9.061"	4,250psi	600305	8.26"
	47/53.5#	605093	8.379"	600290	8.850"	4,250psi	600305	8.26"
	53.5/59.4#	605094	8.250"	605781	8.700"	4,250psi	600305	8.26"
	58.4/71.8#	605782	7.969"	601184	8.700"	4,250psi	605783	Special
9-7/8"	62.8#	605093	8.379"	601207	9.061"	4,250psi	600305	8.26"
10-3/4"	40.5/60.7#	605095	9.504"	601217	10.200"	3,750 psi	600306	9.51"
10-3/4"	40.5-55.5			603363	10.010"			
10-3/4"	65.7-73.2#	606503	9.250"	600771	9.800"	3,750 psi	606504	9.17"
11-3/4"	38/54#				11.25	2,000 psi	600307	9.96"
11-3/4"	60/65#				10.96	2,000 psi	600307	9.96"
11-3/4"	65/71#				10.87	2,000 psi	600307	9.96"
11-3/4"	73/79#				10.7	2,000 psi		
11-3/4"	82#				10.61	2,000 psi		
11-3/4"	47/71#	605096	10.430"	601208	11.000"	2,000 psi	600307	9.96"
11-7/8"	71.8#	605096	10.430"	601208	11.000"	2,000 psi	600307	9.96
12-3/4"	44-58#							
12-3/4"	65-77#							
13-3/8"	54.5/85#	605097	12.003"	601212	12.800"	2,000 psi	600308	12.00"
13-5/8"	88.2#	605097	12.003"	601212	12.800"	2,000 psi	600308	12.00"
16"	65/75#	602439	14.936"	601209	15.438"	2,000 psi	N/A	-
	84#	604611	14.800"	601895	15.270"	2,000 psi	N/A	-
	109#	600257	14.500"	600297	15.070"	2,000 psi	N/A	-
18-5/8"	87.5/106#	600634	17.400"	601210	18.020"	1,750 psi	N/A	-
	106/117.5#	603649	17.250"	600299	17.880"	1,750 psi	N/A	-
	123.4 -136 #	603849	16.982"	603958	17.430"	1,750 psi	N/A	-
20"	94/106.5#	600259	18.800"	601211	19.370"	1,500 psi	N/A	-
20"	106-118#	604000	18.740"	603781	19.250"	1,500 psi	N/A	-
20"	118-133#	605597	18.600"	603782	19.100"	1,500 psi	N/A	-
20" SPECIAL	129-133#	602641	18.500"	600301	18.980"	1,500 psi	N/A	-
' Are not based on any particular standard or manufacture for determining weight range. Please Verify ID and C								
22	170-224#	605542	19.810"	605502	20.200"	1,000 psi	N/A	-
24	171-216#	605543	22.060"	605503	22.875"	800 psi	N/A	-
26	202-275#	605544	23.900"	605504	24.750"	800 psi	N/A	

Appendix 1.7: Spacer Ring Installation Instructions

CASING RUNNING TOOL

by MCCOY

MAN-DW-706 Addendum 21-0001

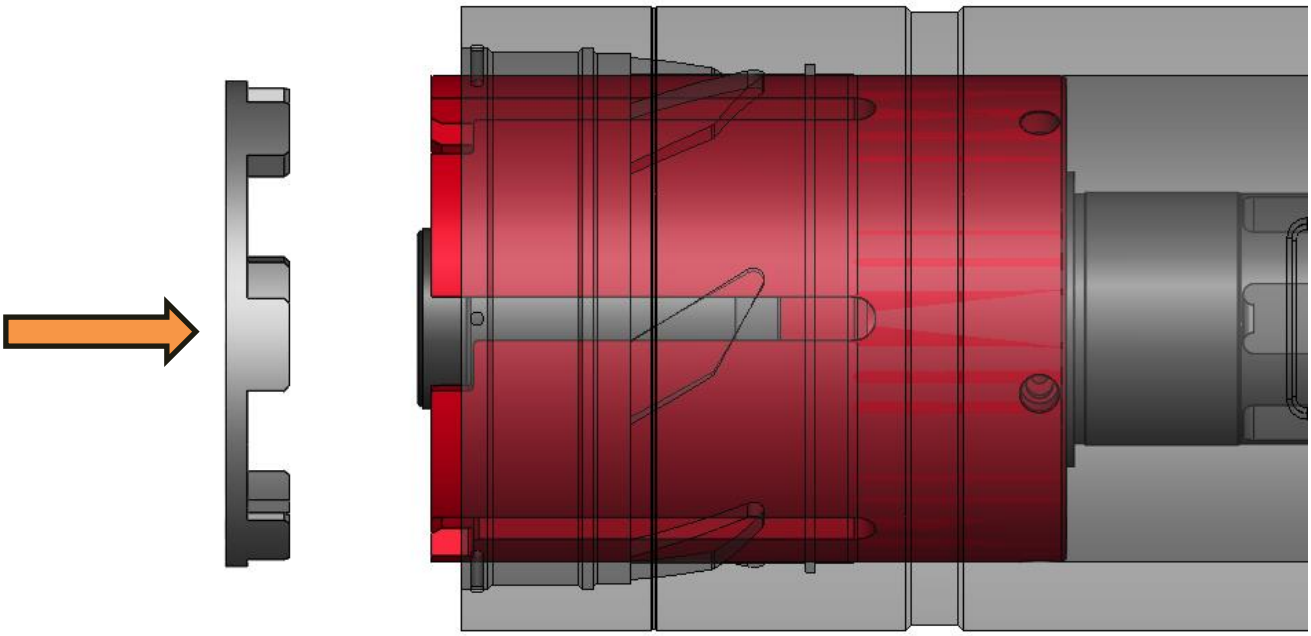
Spacer Ring Installation Instructions

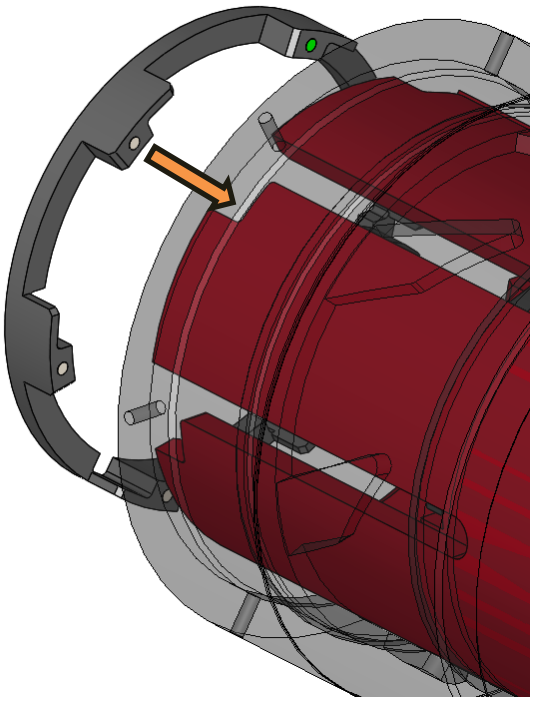
Spacer Ring P/N 1006464

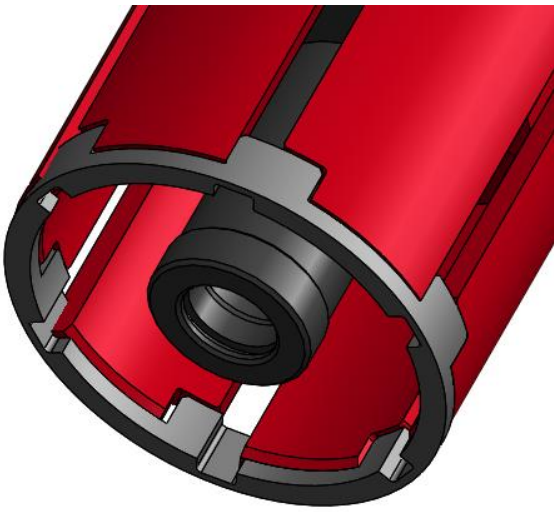
Installing the Spacer Ring will remove the ability for the DWCRT to be placed into the push position.

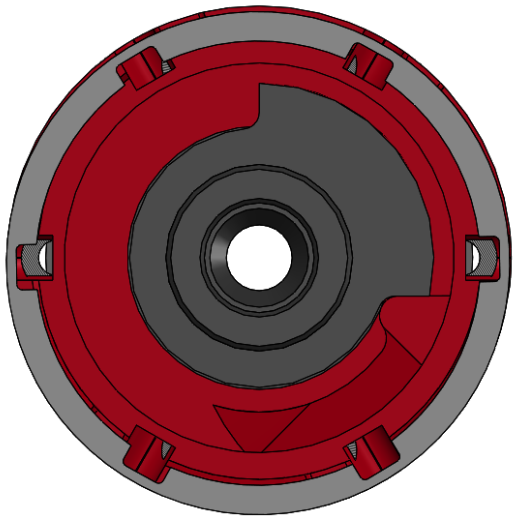
The following steps will guide you through the installation of the 1006464 Spacer Ring. Please follow steps 1 through 15 in the DWCRT II MAN-DW-706 manual. At that point refer to the following steps.

1. With the Dovetail Mandrel subassembly inserted in the Housing. Install the Spacer Ring with the magnets facing towards the Dovetail Nut.



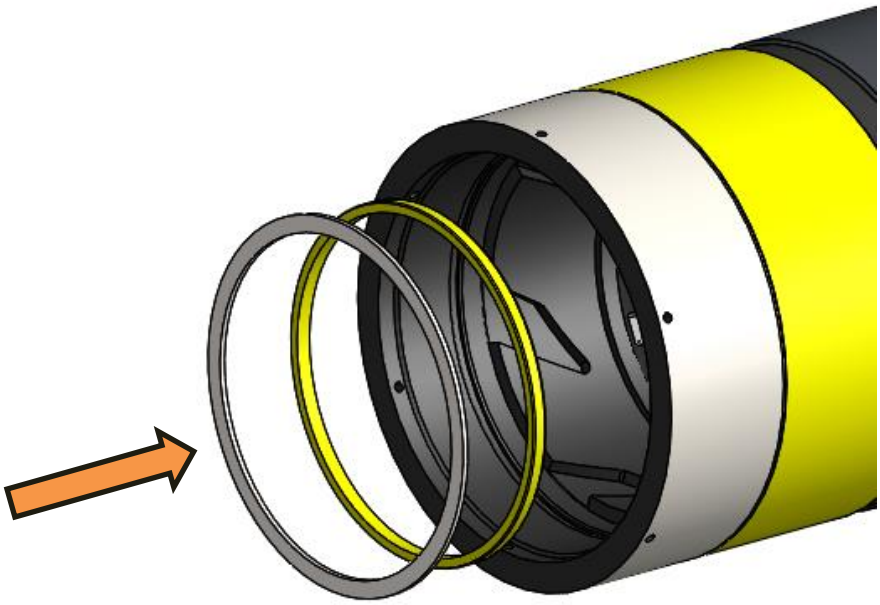






2. Once Spacer Ring has been installed, continue seating the Dovetail Mandrel subassembly against the Thrust Washers.

3. Use multi-purpose grease on the (Qty-1) Thrust Ring. Lock the Dovetail Mandrel subassembly into the Housing with (Qty-1) Thrust Ring followed by (Qty-1) Snap Ring. **Hint:** The Snap Ring is a spiral ring and can be installed easily by starting one end of the ring in the groove and rotating the ring until it seats completely.
   NOTE: If the Dovetail Mandrel is not coaxial with the housing, the Dovetail Mandrel Nut can move into the snap ring groove and prevent installation of the snap ring. Supporting the end of the Dovetail Mandrel can correct axial misalignment.



4. This completes the steps required to install the Spacer Ring. Please continue to assemble the tool using the DWCRT II MAN-DW-706 manual, picking up at step 18.

5. After the tool is assembled paint a green ban in the upper groove on the Housing to denote the DWCRT is equipped with a Spacer Ring.

***Please note that any references to the Push Position in the DWCRTII manual are not applicable once the Spacer Ring is installed.**