

TM12093
CRT 750 TON
smART



Section 1 - Table of Contents

Section 1 - Table of Contents	2
Section 2 - Introduction	5
2.1 CRT Description	5
2.2 Terms and Definitions	10
Section 3 - McCoy Customer Service	12
Section 4 - Safety Requirements	13
4.1 Recommended Tools	13
4.2 Identification Numbers.....	13
4.3 Limited Warranty.....	13
Section 5 - CRT Training Outline	14
Section 6 - CRT General Information	15
6.1 General Information	15
6.2 Tension vs. Torque Capacities	15
Section 7 - Operational Procedures	17
7.1 CRT Operational Positions	17
7.2 Rig Up Procedure.....	18
7.3 Stump Test Procedure	19
7.4 Setting Procedure (Activating the Slips).....	19
7.5 Unsetting Procedure (Releasing the Slips)	20
7.6 Connection Make-up with Conventional Tongs	20
7.7 Running the CRT to Reciprocate, Rotate and Make-Up Casing.....	20
7.8 Using the CRT to Back Out a Joint of Casing.....	20
7.9 Running the CRT to Drill with Casing	21
7.10 Fill-Up Procedures with CRT	21
7.11 Circulating Procedures with CRT	21
7.12 Rig Down.....	22
7.13 Operating Specifications.....	22
7.13.1 CRT Load Rating	22
7.13.2 CRT Torque Rating.....	23
Section 8 - Packer Cups and Gage Rings	24
8.1 Packer Cups	24
8.2 Gage Rings	24
Section 9 - CRT Lubrication and Maintenance	25

9.1 CRT Spring Replacement Guide	26
9.2 Results of Inspections	26
9.3 Recommended Lubrication	27
9.3.1 Stocking Quantity	30
9.4 CRT Inspection Chart	31
9.4.1 Head Assembly	31
9.4.2 Internal Gripping Assembly	32
9.4.3 Slip Teeth Inspection Criteria	33
Section 10 - Assembly – BOMs	34
10.1 CRT Assembly	34
10.1.1 – 1006255-0001 – Head Assembly, 750 Ton.....	34
10.2 Internal Gripping Assembly	37
10.2.1 – 1006375-0001 - 7" 17-35# (6.538" – 6.004").....	37
10.3 Internal Die Kits	38
10.3.1 – 1006375-0002 – 9 5/8" 36-59.4#, 9 7/8" 62.8# (8.921" – 8.407")	38
10.4 Base Slip Kit	39
10.4.1 – 1006375-0005 – 13 3/8" – 30"	39
10.5 Internal Insert Kit.....	40
10.5.1 – 1006375-0003 – 13 3/8" 54.5-85# (12.615" – 12.159")	40
Section 11 - CRT Assembly Tools	41
Section 12 - Assembly - Head	42
Section 13 - Assembly – Installation of Inserts and Wear Guides	56
Section 14 - Assembly – Internal Circulator.....	59
Section 15 - SmartCRT Sub Removal	59
Section 16 - Troubleshooting.....	62
16.1 Rigging Up the CRT	62
16.2 Engaging the CRT	62
16.3 Disengaging the CRT	63
16.4 Backing Out Casing with the CRT.....	64
Section 17 - Customer Feedback Form	65
Section 18 - Additional Documentation	66

Appendices

Appendix 1.1: Size and Ratings	72
Appendix 1.4: Minimum Set Torque	73
Appendix 1.5: Bolt and Set Screw Torque	74
Appendix 1.6: Tool Joint Sizes and Make-up Torque	74
Appendix 1.7: Packer Cup, Gage Ring, Thimble Size Chart	75

Section 2 - Introduction

2.1 CRT Description

The McCoy Casing Running Tool (smartCRT) 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 can be outfitted with a sensor kit to communicate wirelessly to remote displays that provide loading conditions and tool state.

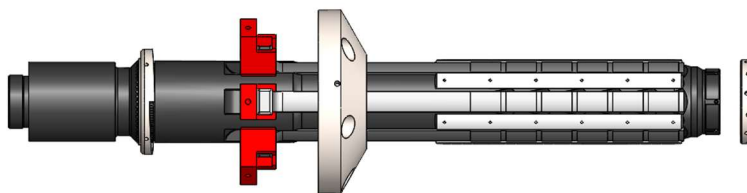
The tool's operating temperature range is between -40°F to 180°F. The main components of CRT are shown in the figure below:

Sensor Kit: A combination of sensors that can be mounted on the CRT to measure torque, tension, pressure, RPM and tool status. This information is transmitted to several offered displays.

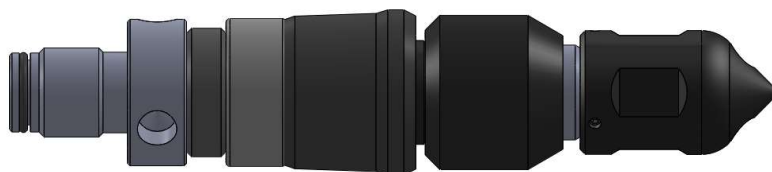
Head Assembly: Mechanical device that converts rotation from the Top Drive into axial movement of the Gripping Actuator or Mandrel. It can include an optional compensator (which allows unrestricted axial movement of the CRT to make up thread loss or gain when making-up or breaking-out connections) to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

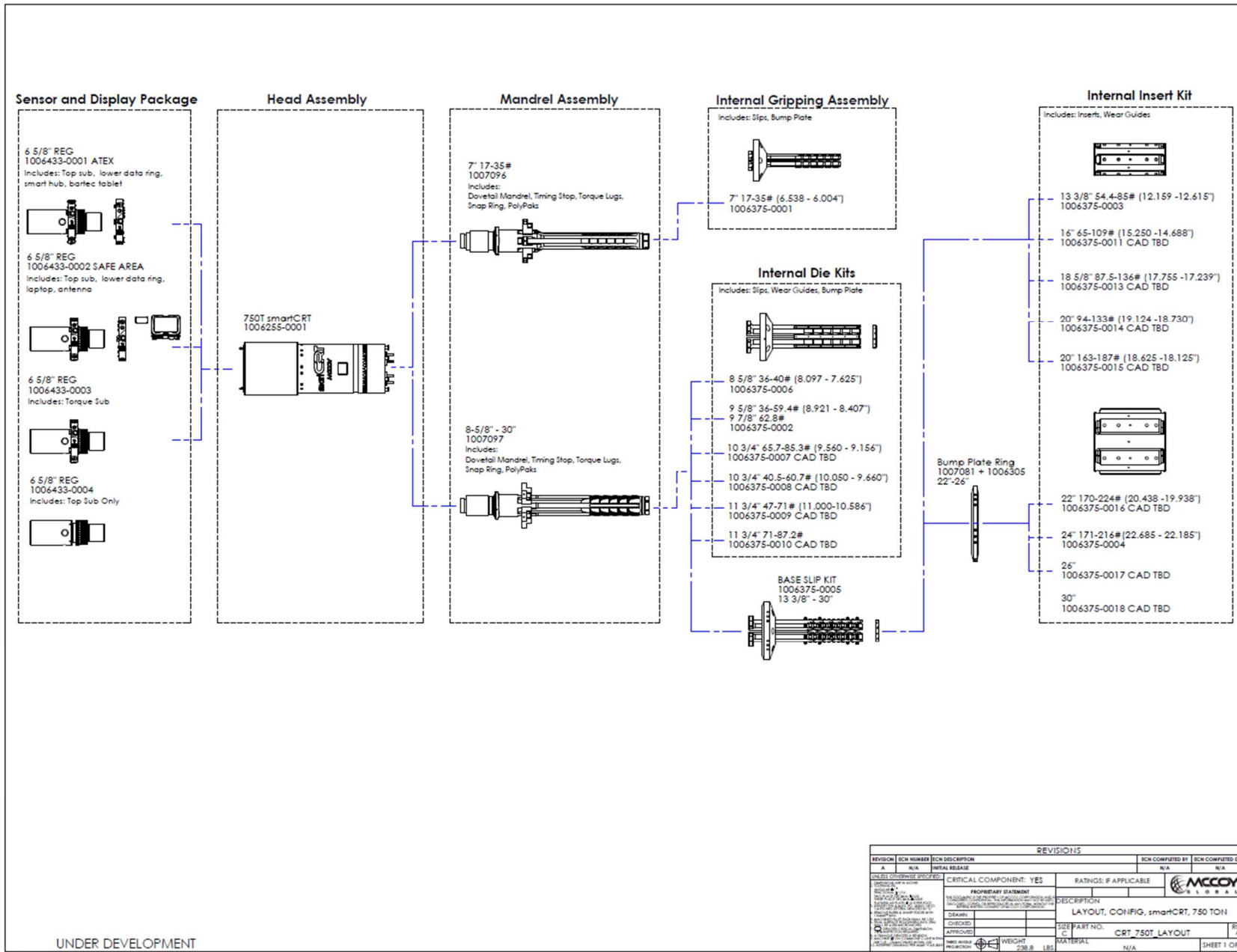


Circulator Assembly: Seal Guide Assembly. This keeps pressurized mud below the Gripping Assembly and contained in the ID of the Casing, allowing for operations where circulating is required. McCoy also offers an optional mud valve. Contact sales for details.

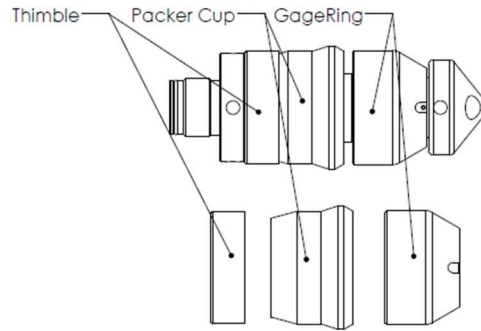
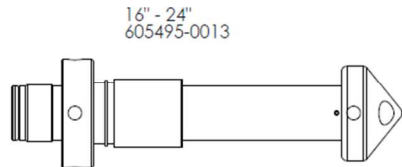
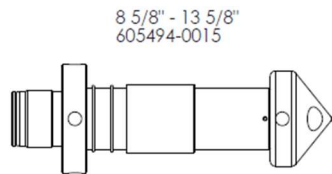
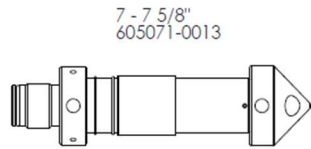


NOTE:

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



Internal Circulator Base Kit
 Include: Circulator Body, Cup Spacer, Nose



DWCRT Packer Cup Gage Ring Thimble Size Chart

Casing Size	Weight Range	Gage Ring	OD	Packer Cup	OD	Packer Cup Rated Pressure	Thimble	OD
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"
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"

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

DESCRIPTION			
CIRCULATOR LAYOUT			
SIZE	PART NO.	REV	
B	CRT_750T_LAYOUT	A	
MATERIAL			SHEET 2 OF 5

**ASSEMBLY TOOLS FOR CRT CAN BE COVERED USING PART NUMBER 1006379 CONFIGURATIONS.
IN ADDITION TO PICKING SPECIFIC LINE ITEMS BELOW.**

Assembly Tool List				
Part	Description	Supplier	Supplier PN	Qty
Locking Changeable-Tip Retaining Ring Plier	for Internal Rings That Fit 6.25"-10" ID, Plain Grip	McMaster Carr	5300A27	1
Steel Eyebolt with Shoulder - for Lifting	5/8"-11 Thread Size, 1-3/4" Thread Length	McMaster Carr	3014T52	2
4-Piece Straight Handle Pick Set	7" Lg. Hook, 90, 45, Straight Tip	McMaster Carr	3842A37	1
Rod Seal Installation Tool	for 2" to 3" Seal ID	McMaster Carr	45015K23	1
12-Piece Hex Bit Socket Set	1/4" and 3/8" Square Drive	McMaster Carr	54875A86	1
Mobil Grease	Mobilith SHC 220, High-Pressure, 13.4 oz. Cartridge	McMaster Carr	1394K4	1
Antiseize	lb. 771, Copper-Free, 8 oz. Brush-Top Can	McMaster Carr	1821A3	1
Adjustable Torque Wrench with Certificate	Ratchet, 1/2" Drive, 30-250 in.-lbs. and 47-332 NM	McMaster Carr	85555A319	1
Adjustable Torque Wrench with Certificate	Ratcheting, 1/4" Drive, 30-150 in.-lbs. and 3.06-15.3 NM	McMaster Carr	85555A115	1
Dead Blow Mallet	High-Visibility, Polyurethane Rubber Face, 3 lbs.	McMaster Carr	3209N13	2
Emery Sanding Roll	60 Feet Long, for Smooth Finish, 1" Wide, 150 Grit	McMaster Carr	8238A53	1
Twisted-Eye Web Sling	4400 lbs. Choker Capacity, 1" x 4 ft. Nylon	McMaster Carr	9077T6	2
Twisted-Eye Web Sling	8800 lbs. Choker Capacity, 2" x 6 ft. Nylon	McMaster Carr	9077T8	2
Twisted-Eye Web Sling	8800 lbs. Choker Capacity, 2" x 8 ft. Nylon	McMaster Carr	9077T8	2
Screwdriver-Style Pry Bar	25" Overall Length	McMaster Carr	60025A67	1
Secure-Grip Strap Wrench	for 2-3/8" to 12" OD, 24" Long Iron Handle	McMaster Carr	5349A14	1
10 Piece T-Handle Hex Key Set	3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", 5/16", 3/8"	McMaster Carr	5422A15	1
Hex Bit Socket	3/8" Square Drive, 2mm Size, 1 5/8" Long	McMaster Carr	8367A313	1
Heavy Duty Screwdriver	Chiseling and Demolition, 9/16" Slotted	McMaster Carr	7249A38	2
High-Tension Ratchet Strap	1 1/2" Wide, 6' Max Length	McMaster Carr	31025T893	3
Steel Eyebolt w/ Shoulder	Zinc-Plated, 1/2"-13 Thread, 1 1/2" Thread Length	McMaster Carr	3014T254	1
Internal Retaining Ring Pliers	0.38" Tip Dia.	McMaster Carr	57805A33	1
Crescent Wrench	12" Overall Length, 1 9/16" Max Jaw Capacity	McMaster Carr	5385A23	1
Kluber Grease	AG 11-462	McCoy Part Number	700053	1
Oil-Filled Cast Nylon Rod	2" DIA x 3'	McCoy Part Number	606560	1
Mandrel Install Tool	CRT 750T	McCoy Drawing	1006574	1
Threaded install Tool	9-4 Stub Acme	McCoy Drawing	1006376	1
Plate, Spring Press	CRT 750T	McCoy Drawing	1006384	1
Depth Measureing Microscope	Depth Measuring Microscope Peak 2008 (DMR) 25x - 100x	McCoy Drawing	1006801	1
6-Point Standard Socket	1 1/2" size, 1/2" Sqaure Drive	McCoy Drawing	1006591	1
Transport Case Stand	CRT 750T	McCoy Drawing	1006396	1
Puller Tool	9-4 Stub Acme	McCoy Drawing	1006376	1
Mandrel Hanger Assembly	7", CRT 750T	McCoy Drawing	1006422-0003	1
Hanging Strap Roller	CRT 750T	McCoy Drawing	1007114	1
Chain Wrench	6" Pipe, 23" Long - 5 1/2" Actual OD, 24" Handle Length	MSC	94195260	1
Chain Extention for Wrench	5" Actual OD	MSC	72549272	1

DESCRIPTION		
CRT 750 TON ASSEMBLY TOOLS		
SIZE PART NO.		REV
B	CRT_750T_LAYOUT	
MATERIAL		SHEET 4 OF 5

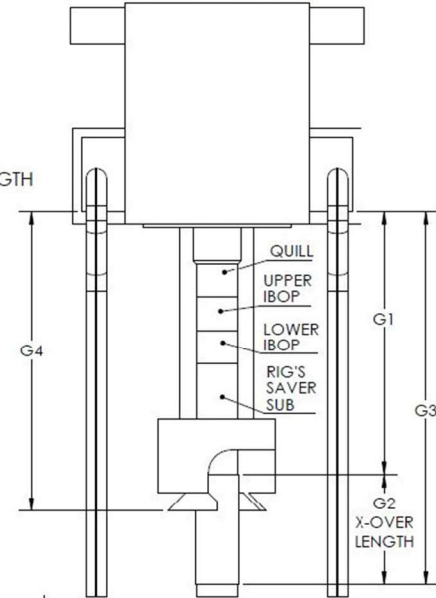
X-Over/DW Accessories	Length*	Actual	McCoy 750	Length*	Actual
X-Over	TBD		7" - 7-5/8"	139 in.	
DWSES	24-36 in.		8-5/8" - 13-5/8"	142 in.	
			16" - 20"	147 in.	

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

*Verify upon Rig Survey

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

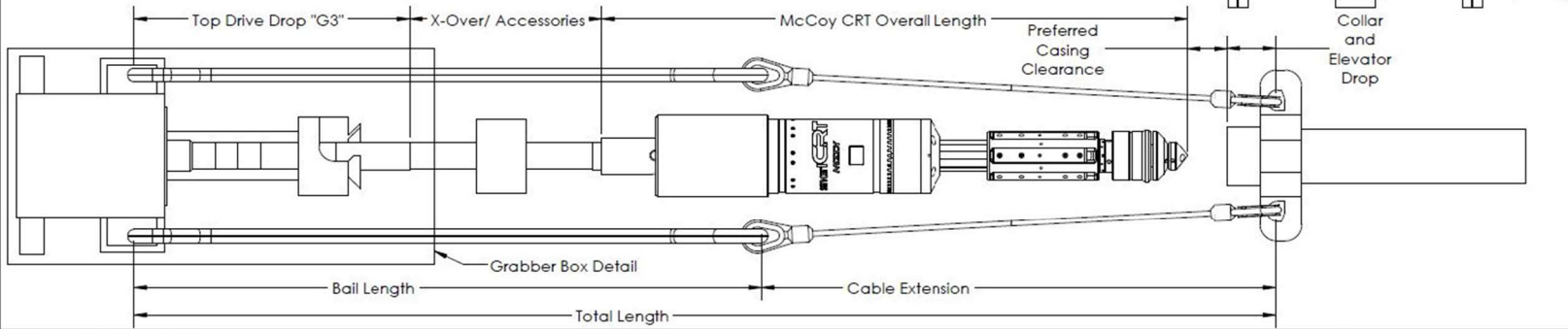
Grabber Box Drop Calculation
 $G1 + G2 - G4 = \text{Greater Than } 12''$
 (12" is the set minimum allowance for Manual Tong Gripping - when necessary)



$$\text{DROP "G3"} + \text{ACCESSORIES} + \text{DWCR} + \text{PREFERRED CLEARANCE} + \text{COLLAR \& ELEVATOR DROP} = \text{TOTAL BAIL/CABLE LENGTH}$$

$$\text{X-OVER} + \text{SUM OF DROP} = \text{BAIL LENGTH} + \text{SLINGS/CABLES}$$

"G2" (G1, ACCS., DWCR, PF. CLEARANCE, COLLAR/ELEVATOR)



SIZE PART NO.	CRT_750T_LAYOUT	REV
MATERIAL	CRT 750 SPACE OUT	SHEET 5 OF 5

SOLEWORKS DOCUMENT PRINTED ON: Friday, December 3, 2021

2.2 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 counterclockwise.
- 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.
- Driller Display – Device Showing Tool State, and Loads applied by the tool
- 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 Data Ring – Electronics Enclosure that is mounting to the head assembly. Visible wires connect this to the housing of the tool to read the internal tool state.
- 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).

- MTT – McCoy Torque Turn – Torque Turn Software for recording connection make-up.
- 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.
- Safety Swivel (safety cable attachment, safety ring, swivel ring) - Rotary ring on the Top Mandrel intended for a secondary retention point.
- 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
- Upper Data Ring – Electronics Enclosure closest to the top drive connection responsible for measure and transmitting torque, tension and pressure.
- Vertical Indicator Line – Line on the Housing and Indicator that identifies when the tool is completely unset.
- VTR – (Virtual Thread Rep)
- 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 3 - 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 4 - 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.

4.1 Recommended Tools

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

4.2 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.

4.3 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.mccoysglobal.com/download/terms-conditions-sales/>

Section 5 - CRT Training Outline

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

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

1. CRT 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. CRT 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. Driller Display
 - a. Pairing with Tool
 - b. Overview of Screen
 - c. Job Setup
 - d. Run Screen
4. CRT Procedures
 - a. Using with Casing Tongs
 - b. Using without Tongs
 - c. Fill-up only
5. CRT Capacity and Modular Parts
 - a. Ratings
 - b. Flowrates
 - c. Valve options
 - d. Space out
 - e. Wear Guides, Bump Plates, Slips and Inserts
6. CRT Maintenance Schedule
 - a. Category I
 - b. Category II
 - c. Category III
 - d. Category IV
7. CRT 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 6 - CRT General Information

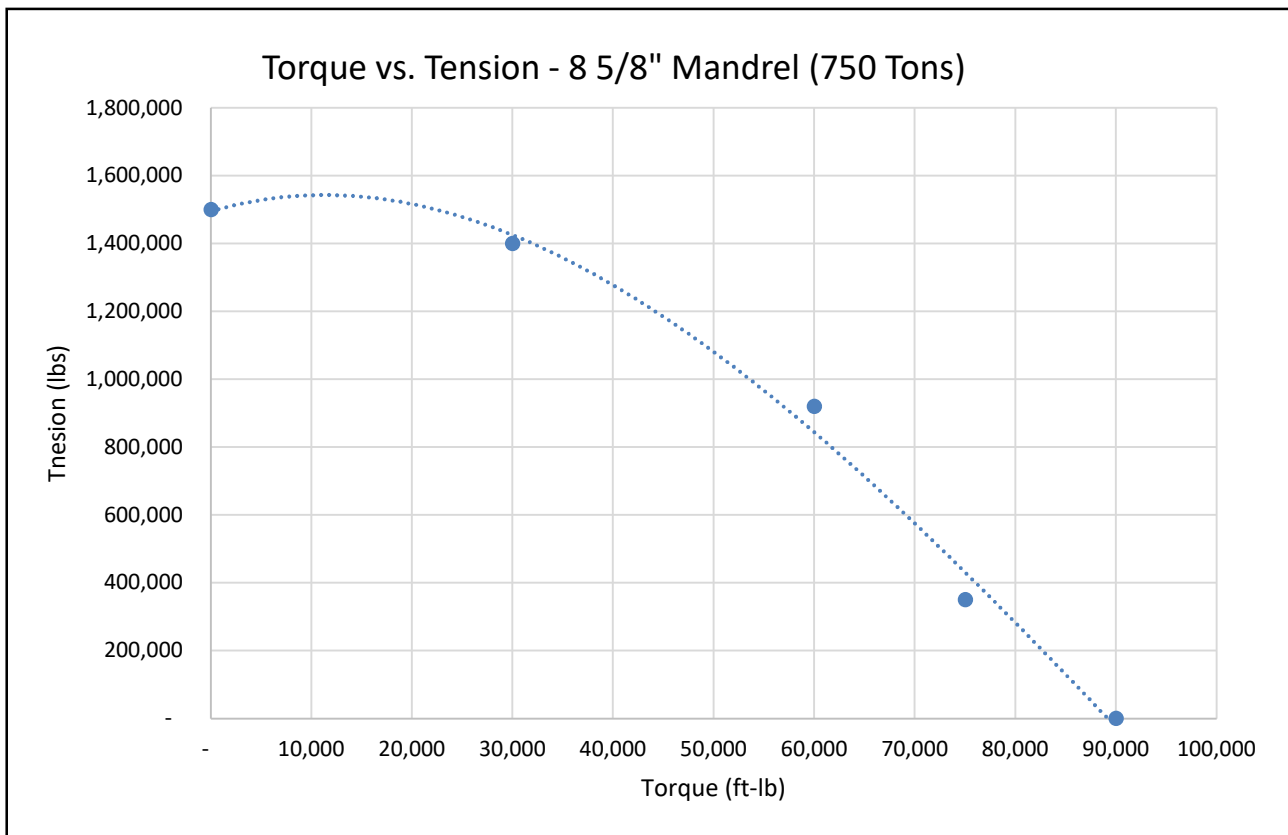
6.1 General Information

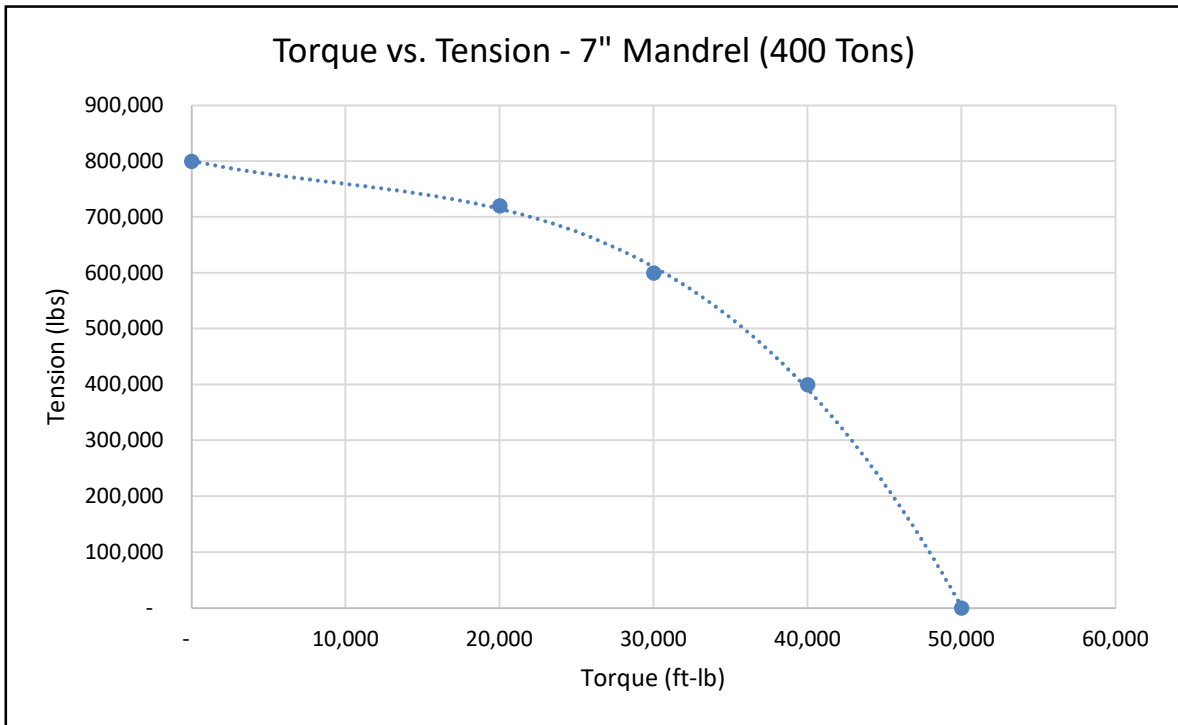
The smartCRT represents a new generation of Casing Running Tools. It is a mechanical tool with modular design which meets design requirements of the API 8C standard. The CRT is designed to make up Casing, run it in the well, and provide rotation, reciprocation, and circulation. Minimal Top Drive set 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. The tool is outfitted with a sensor kit to record and display loads applied to the tool and the tool state.

6.2 Tension vs. Torque Capacities

The graphs below provide rated Tension vs. Torque capacities for various sizes of CRT. Please use the correct load capacity limits for your application. If you have any questions, please contact McCoy. These Load Curves are preloaded into the Software and the actual load applied to the tool can be easily compared to the operational load limit when using the tool.

- Blue line - CRT Operation Load





CRT Hoist Reduction from Pressure		
Casing Size	ID (Inches)	Tool Hoist Reduction in pounds for every 1 PSI of pressure
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:

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

Example: 750-ton Mandrel in 9-5/8" casing at 4,000 psi = 65 sq. in x 4,000 psi = 260,200 lb = 130 tons

750 tons - 130 tons = 620 tons



Section 7 - Operational Procedures

7.1 CRT Operational Positions

7.7.1.1 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.

7.7.1.2 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.

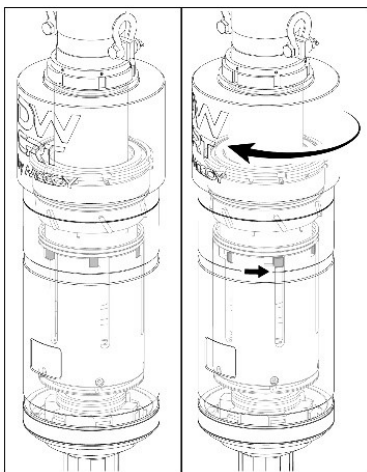
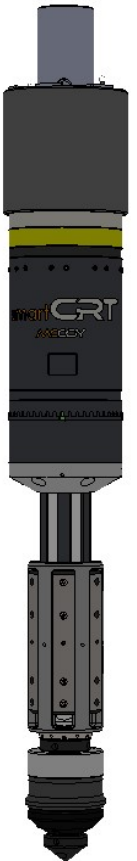
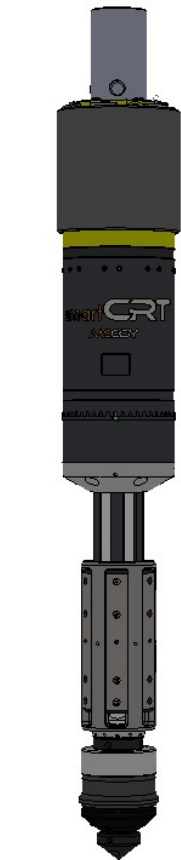
7.1.3 Push Position

In the Locked position, 15 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.



7.2 Rig Up Procedure

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

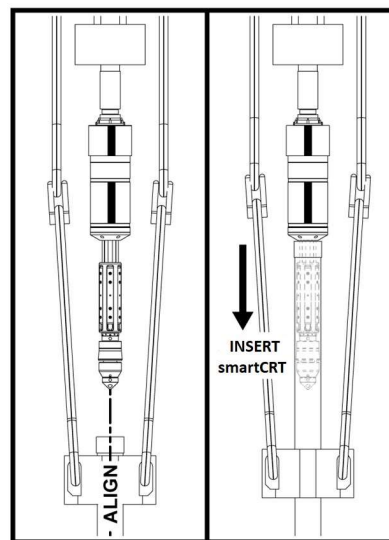
1. Lower the first joint of Casing into the rotary on the rig.
2. Set the Floor Slips to hold the Casing.
3. Insert a Packer Saver (a device inserted into the box of a section of casing to guide the packer cup past any sharp edges or ledges, intended to extend the life of a packer cup (similar to a "safety 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 CRT via the Lifting Cap. Tag line may be used to guide the tool in the joint of Casing.
6. Insert the CRT into the first joint of Casing. Lower the CRT until the tool lands on the Casing.
7. Remove the CRT Lifting Cap.

WARNING!

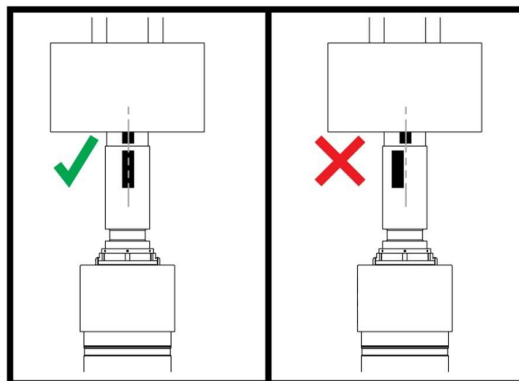
The CRT must be inserted into Casing before proceeding to step 8. If the CRT is not in a joint of Casing, there is a chance for potential damage to the Slips and Mandrel if the tool is activated.

WARNING!

The tool cannot tolerate large Top Drive to wellbore misalignment. Excessive misalignment may cause difficulty inserting the CRT. Misalignment must be less than $\frac{1}{2}$ the diameter of the casing being run or 6", whichever is less.



8. Using the Tool Joint Handler (Top Drive back-up or Tongs), make-up the CRT 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 periodically, as misalignment indicates that the tool joint is backing off. Refer to Table XX for recommend MUT.



7.3 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. With one joint of casing in the floor slips, insert the CRT into the casing. 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. Verify that the Display shows the tool is fully unset. If the tool is not unset, hoist it out for the casing so it is hanging freely in the top drive and tare the software. Once the software is reset, re-insert the tool into the casing.
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. Verify the display shows the tool is set.
3. Rotate the Top Drive counterclockwise. The same number of rotations are required to retract Slips completely. Check the software to show the tool is unset. 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 once removed from the casing

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

7.4 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 CRT.

1. Insert the CRT 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 CRT Indicator should be rotated until either the Casing make-up torque or the Safe unlocked torque for the specific casing is achieved. Do not exceed the torque value corresponding to the lesser of these two values. **Refer to Appendix 1.1: Size and Ratings 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 CRT 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.

NOTE: Tool can be placed in Push position by rotating the Indicator 15 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). The Display will also show the tool going into this state.

7.5 Unsetting Procedure (Releasing the Slips)

NOTE: If the tool was in the Push position, set the floor slips, rotate the Indicator 15-degree counter-clockwise (vertical lines aligned) with neutral weight or slight tension before going to the Unlocked position. Using the Display the correct axial and rotational position can be easily observed.

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.
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.
 - Software indicates the tool is unsetIf the Indicator lines are not lined up, apply set down weight and continue to retract the Slips by rotating counterclockwise.
4. Once the tool is fully unset, raise the tool out of the casing.

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.

7.6 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 CRT Setting procedure, lower the string, then perform Unsetting procedure.

7.7 Running the CRT 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 CRT Setting procedure, lower the string, then perform Unsetting procedure.

7.8 Using the CRT to Back Out a Joint of Casing

1. Insert the CRT 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 1.4: 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.

7.9 Running the CRT to Drill with Casing

1. Push position is required for drilling with Casing. After the tool is set, 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 CRT 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 $\frac{1}{4}$ inch, the CRT 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.

7.10 Fill-Up Procedures with CRT

Use this procedure to use the CRT 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. 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.

7.11 Circulating Procedures with CRT

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

1. Follow Setting procedure.
2. 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.

NOTE:

- **Slowly raise the Top Drive to remove the tool. 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 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.**

7.12 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 CRT from the Top Drive and verify the tool is unset
2. Thread a Lifting Cap into the CRT.
3. Hoist the CRT via the Lifting Cap from the Casing joint.
4. Pace the tool in the assembly stand. Remove Lifting Cap.

7.13 Operating Specifications

7.13.1 CRT Load Rating

Often the McCoy smartCRT 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 7" 23# J-55 Casing, the rated tensile load is 366,000 lb. This number should be multiplied by 0.80 to get the recommended max tensile load.

$$0.8 \times 366,000 = 292,800$$

Even though the 7" internal Dovetail Mandrel is rated for 400 Tons, the limit for this Casing is 292,800 lb. or 146.4 tons.

Example 2: When running 7" 38# P110 Casing, the rated tensile load is 1,206,000 lb. This number should be multiplied by 0.8 to get its recommended tension load.

$$0.8 \times 1,206,000 = 964,800$$

Even though the maximum load for the Casing is 964,800 lb. (or approximately 482 tons), the 7" internal Dovetail Mandrel is only rated at 400 tons. As such, 400 Tons is the maximum axial load that should be applied.

7.13.2 CRT Torque Rating

Often the McCoy' CRT 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.

$$0.8 \times 196,000 = 156,800 \text{ lb.}$$

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

$$156,800 \times 0.054 = 8,500 \text{ ft-lb}$$

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.

$$0.8 \times 1,370,000 = 1,096,000$$

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

$$1,096,000 \times 0.054 = 59,000 \text{ ft-lb}$$

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. 50,000 should be the maximum torque applied in the unlocked position.

Refer to Appendix 1.1: Size and Ratings for Locked and Unlocked Torque Limits.

Section 8 - Packer Cups and Gage Rings

8.1 Packer Cups

Packer Cups are an interference seal used to seal off the mud system of the CRT, enabling flowback, circulation, or pumping cement thru the CRT. 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.

8.2 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"

Pro Tip for internal flush Casing: A thread protector can be bored out and screwed into the internal flush Casing of all the joints where the Packer Cup will be inserted. The modified thread protector covers the sharp corners on the Casing thread that damages the Packer Cups and acts like a "lift nubbin".

Section 9 - CRT Lubrication and Maintenance

Only McCoy manufactured parts are to be used on the CRT. Welding should never be performed on any primary load carrying components of the CRT. The CRT utilizes modern heat-treated alloys and special processes which can be dangerously altered by heating or welding. Repairs of any CRT 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 are free of metal shavings after Magnetic Particle Inspection. McCoy recommends a performance pull test every 5 years followed by NDE. Inspection and 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 assemblies. 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. Check paint or chalk line on Top Drive-CRT connection 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. Do not Spray High Pressure water at the data rings or electrical components if equipped.
- 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. Re-tape the vertical line.
- g. Remove and disassemble Circulating Assembly, replace seals and reassemble.
- h. Remove Bump Plate, Slips and Inserts, and inspect Dovetail grooves on the Slips and Dovetail Mandrel for



wear, lubrication, chips or cracks.

- i. Wash Slips and Dovetail Mandrel before re-applying grease.
- j. Inspect components in the mud flow path for erosion.
- k. Inspect and repair as required, the White and Yellow indicator stripes on Housing.
- l. Check and Replace the Battery in both upper and lower sensor housings.

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
 - 3- Inserts

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. Sensor Sub

9.1 CRT Spring Replacement Guide

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

Part# 1006353 Bump Plate Springs (Qty. 6): 6.733"

Part# 1006281 Bevel Spring (Qty. 8): 0.618"

Part# 1006287 Clutch Spring (Qty. 4): 5.225"

9.2 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.

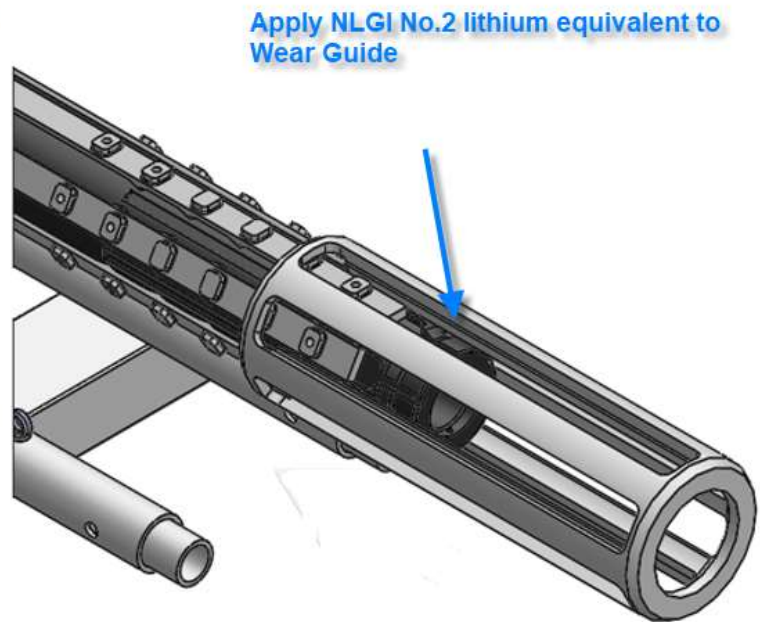
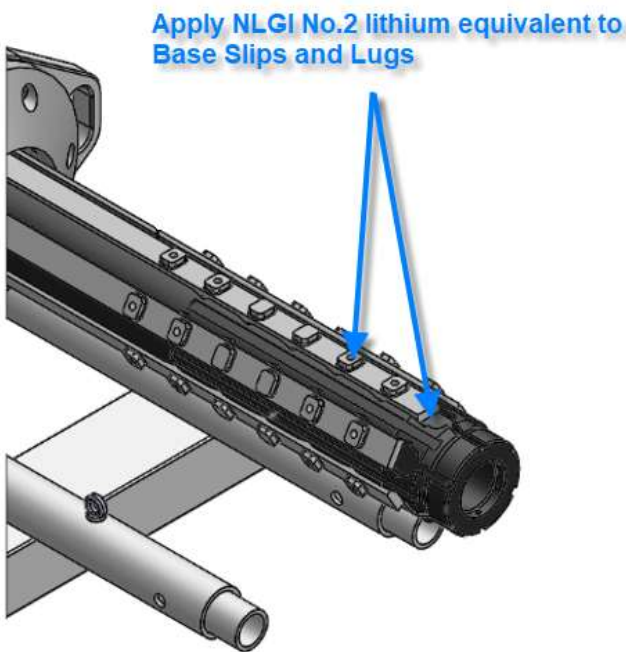
9.3 Recommended Lubrication

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.

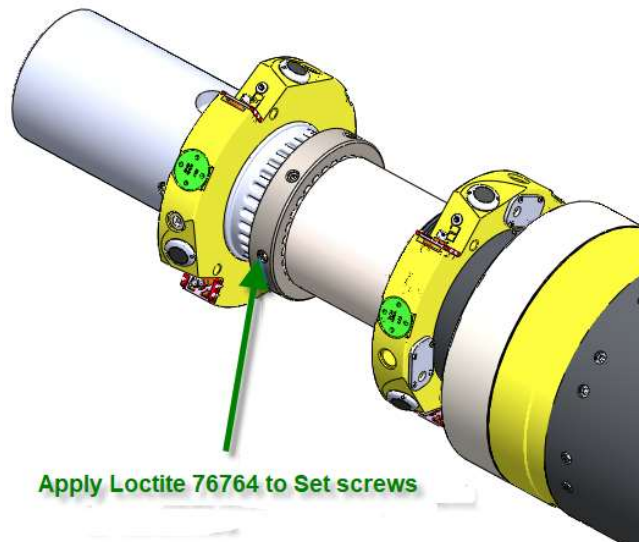
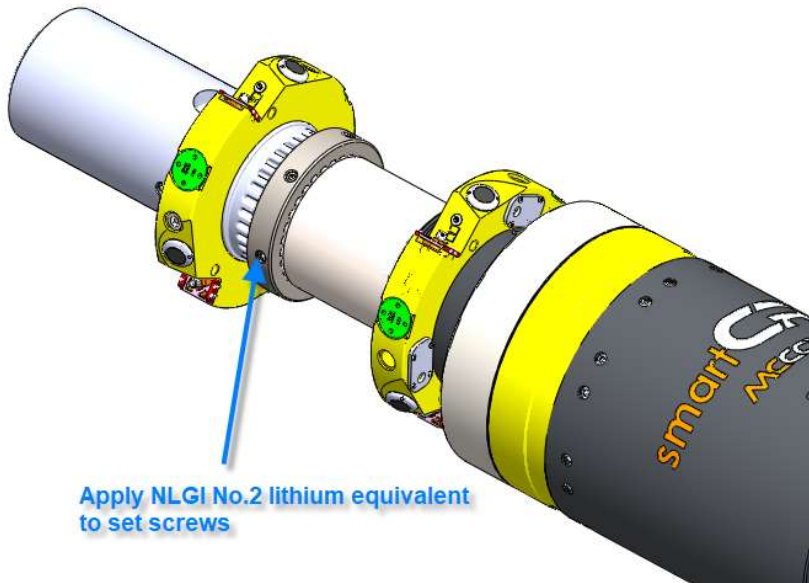
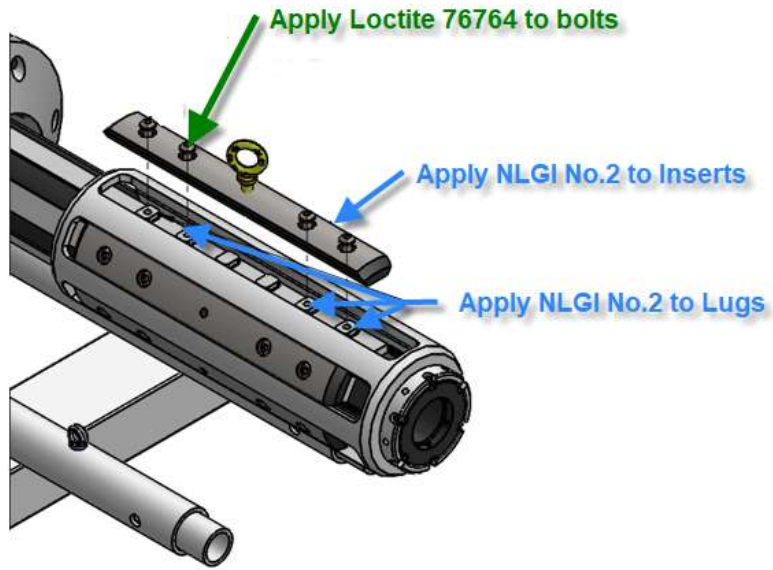
Area	Lubrication	Color Codes
Dovetail Threads and Slip/Die Taper Surfaces above 32°F (0°C)	Klüberplex AG 11-462 (McCoy P/N: 700053)	
Dovetail Threads and Slip/Die Taper Surfaces below 32°F (0°C)	Klüberplex ELM 44-80 ARTIC (McCoy P/N: 700095)	
Bolt and Set Screw Threads	Loctite 76764 (McCoy P/N: 700093)	
Square Threads, Seals, Splines and other	NLGI No. 2 Lithium equivalent	

Keep all parts lubricated to prevent corrosion.

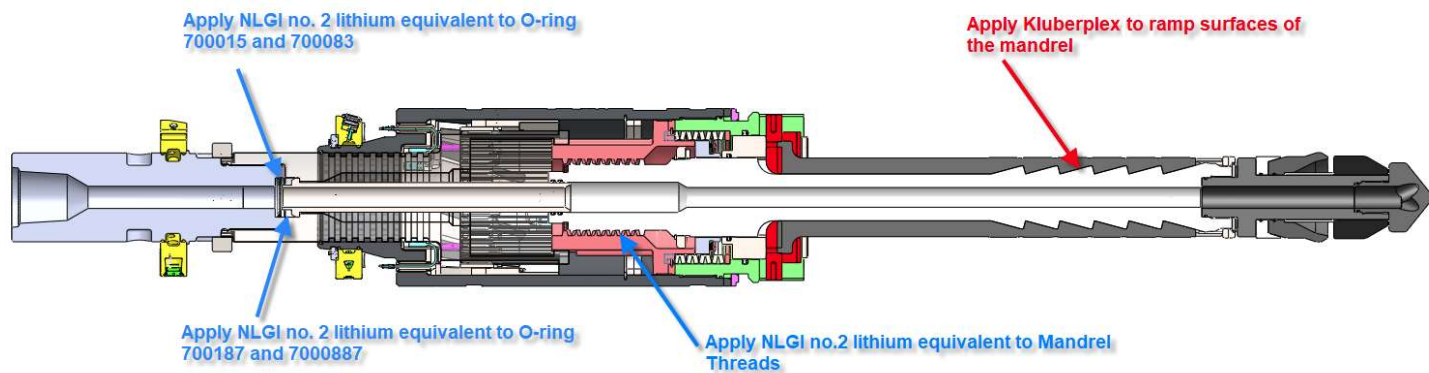
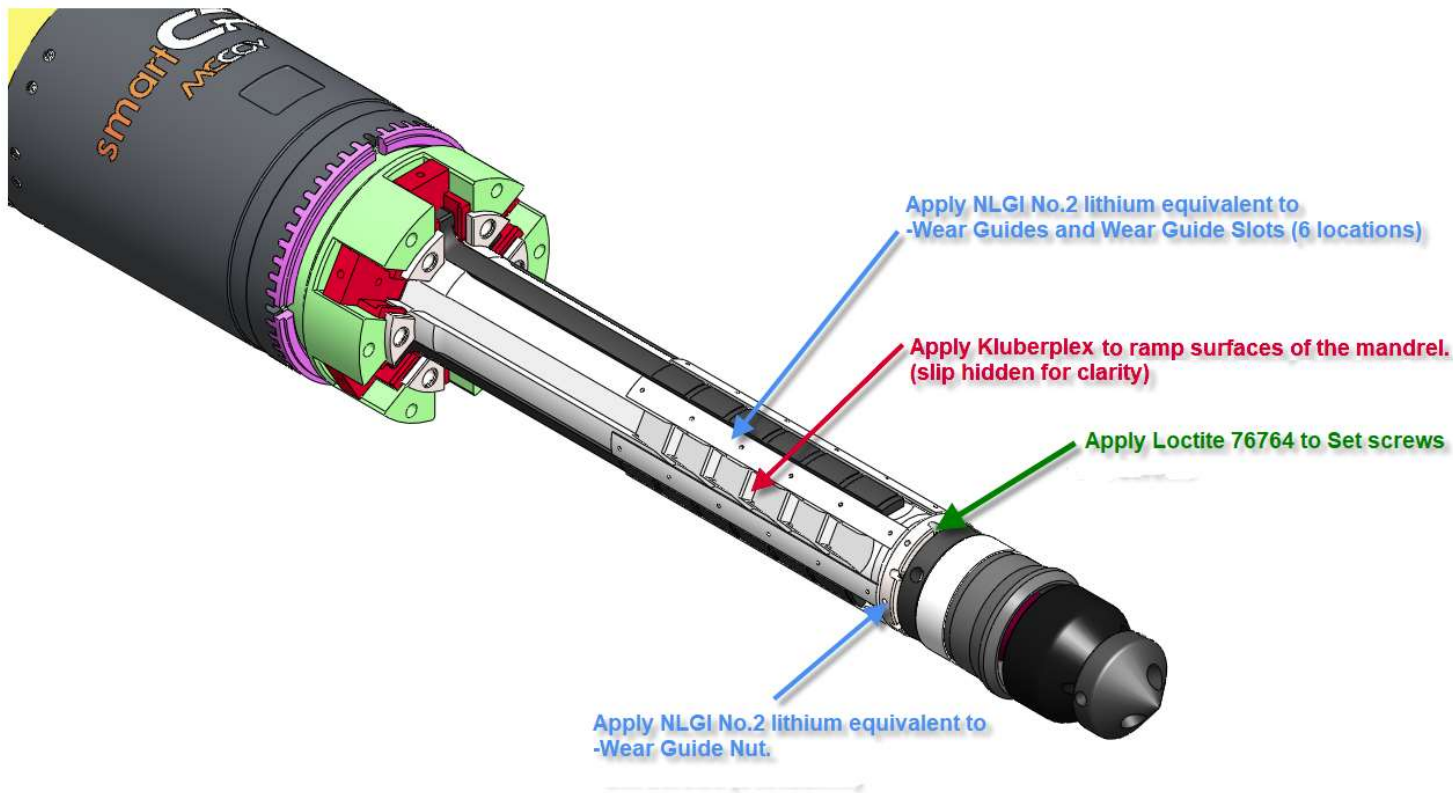
Lubrication Images



Lubrication Images (Continued)



Lubrication Images (Continued)



9.3.1 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 CRT 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.

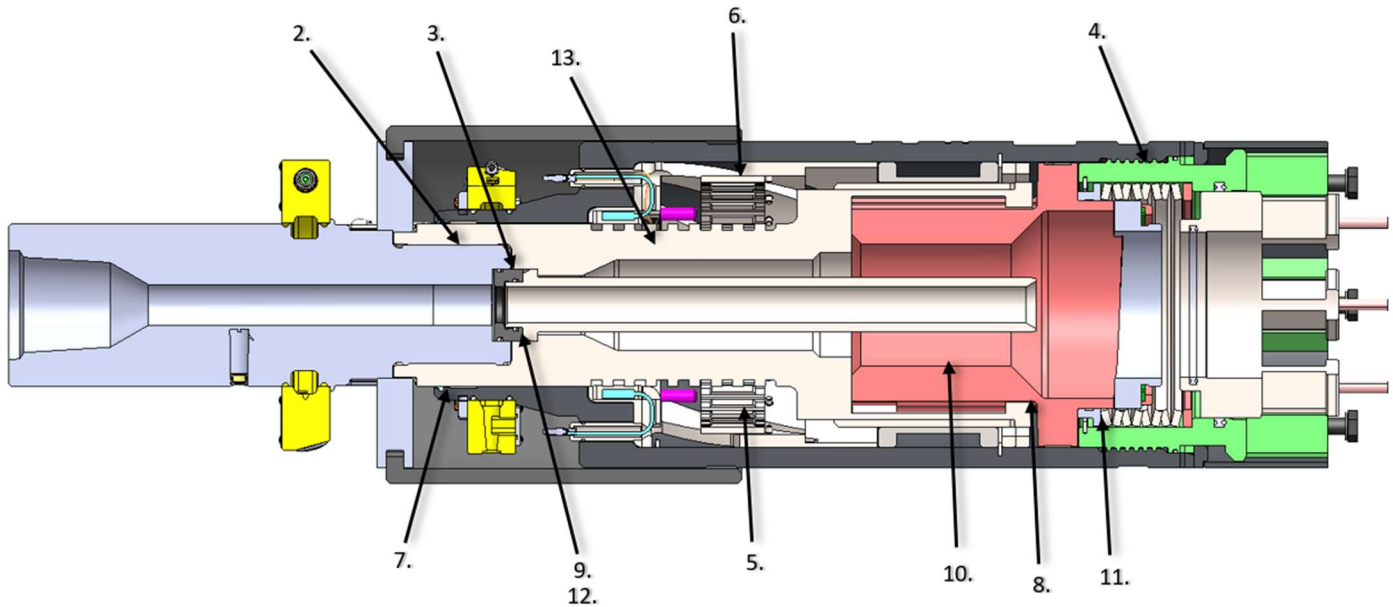
Common wear items for the circulator assembly such as packer cups and gage rings are listed on the table in Appendix 1.7. Select the appropriate part number for your CRT size and configuration. A complete tool requires a Head Assembly, Gripping Assembly, and Circulator Assembly.

Use the table below for generalized spare part recommendations.

PART NUMBER	DESCRIPTION	QTY PER MONTH	QTY PER YEAR
1006825	KIT, OVERHAUL, HEAD ASSEMBLY	-	1
1006826	KIT, REBUILD, HEAD ASSEMBLY	-	2
1006827	KIT, REDRESS, HEAD ASSEMBLY, INCLUDES POLYPAKS FOR DT MADREL	-	1
700877	POLYPAKS FOR DT MANDREL	3	10
605149	KIT, REDRESS, CIRCULATOR ASSEMBLY, 7"	3	12
605678	KIT, REDRESS, CIRCULATOR ASSEMBLY, 8 5/8"- 13 3/8"	3	12
605598	KIT, REDRESS, CIRCULATOR ASSEMBLY, 16"- 20"	3	12
605600	KIT, REDRESS, CURCULATOR ASSEMBLY, 22"- 30"	3	12
REF TABLE 17	PACKER CUP	-	10
REF TABLE 17	GAGE RING	-	2
1006248	SNORKEL	-	1

9.4 CRT Inspection Chart

9.4.1 Head Assembly

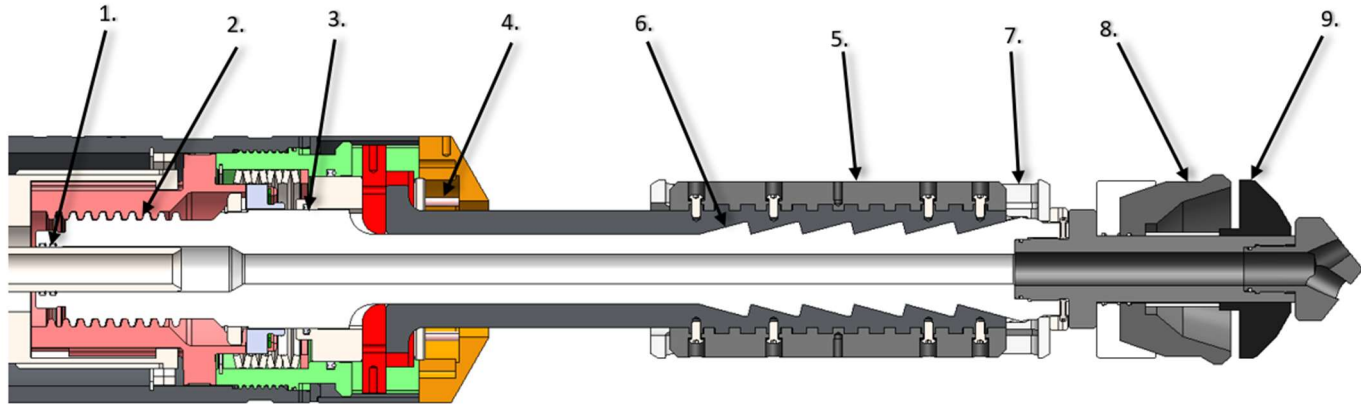


- 1. Inspect tool joint for thread and seal area damage. (Not Pictured)
- 2. Inspect internal threads that connect the upper data sub and the head assembly.
- 3. Inspect the seals and sealing surfaces for the Snorkel.
- 4. Inspect Housing Cap male and female threads and seal areas.
- 5. Inspect internal Clutch teeth for deformation (black coating worn away is acceptable).
- 6. Inspect external lugs on the Clutch. Make sure the Clutch moves and rotates freely in the Housing.
- 7. Inspect wiper seal surface for corrosion and cracks.
- 8. Inspect internal splines on Top Mandrel for deformation (black coating worn away is acceptable).
- 9. Inspect Snorkel wiper seal area for corrosion and cracks.
- 10. Inspect internal threads on Dovetail Mandrel Nut for scaring or galling.
- 11. Inspect Thrust Washers for scaring or galling.
- 12. Inspect seal area on Snorkel for rust or pits.
- 13. Inspect critical cross-section of Top Mandrel for cracks.

Checked By: _____

Date: _____

9.4.2 Internal Gripping 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 fully unset.
- 8. Inspect Packer Cup OD for tears, cracks, or excessive wear.
- 9. Inspect Gage Ring OD based on Casing being run.

Checked By: _____

Date: _____

9.4.3 Slip Teeth Inspection Criteria

WARNINGS

The CRT 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 CRT, the tool must be retorqued before a tensile load can be applied.

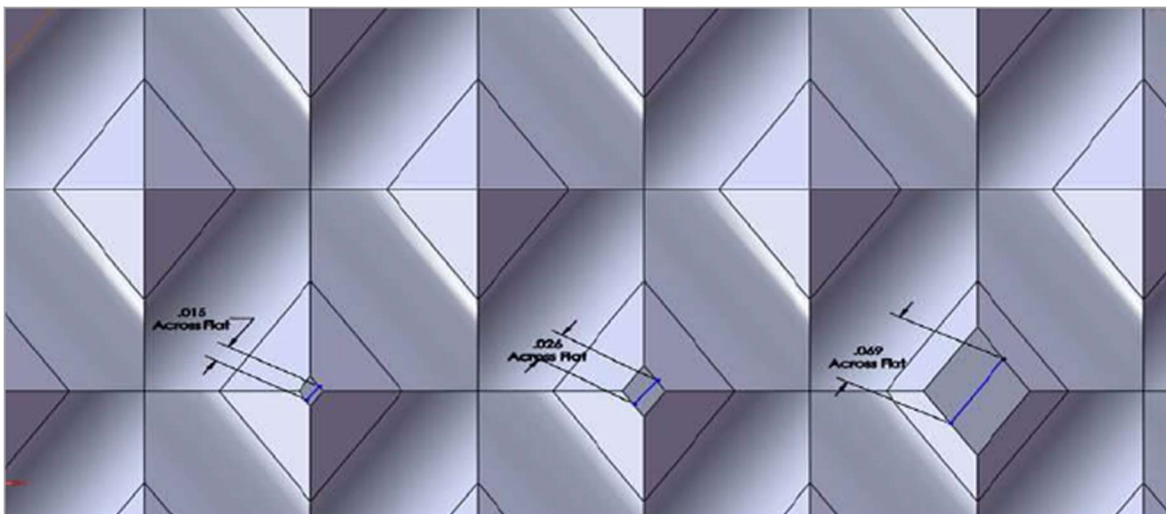
Up to 100,000 lbs. of set-down weight may be applied to the tool in the unlocked position as long as the tool is in the Push Position. Do not use the CRT compensator as a jar for hammering the casing into the well.

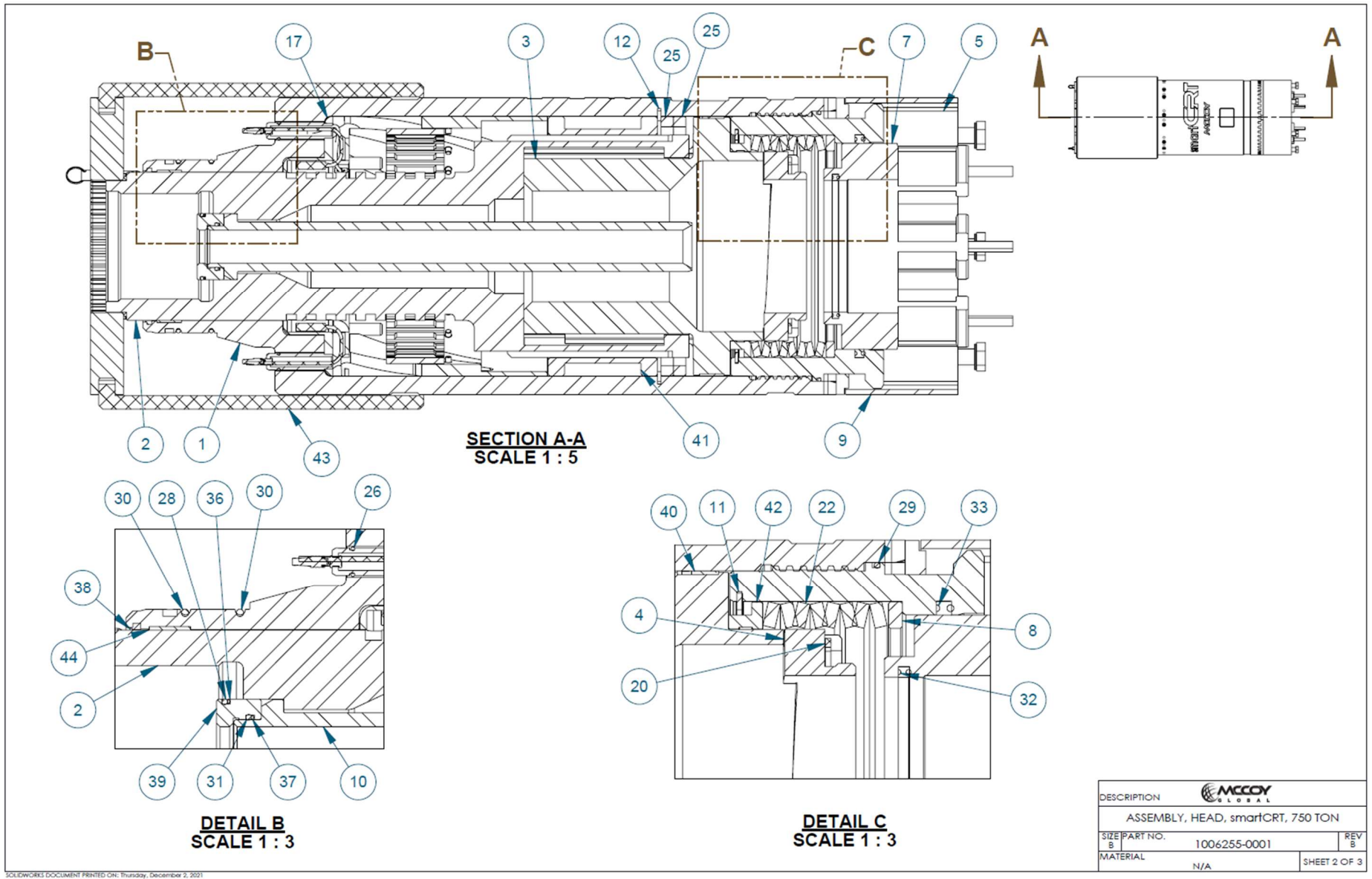
Occasionally the Indicator will continue to completely cover the yellow stripe on the Housing as the tool is raised out of the casing. This is indicative of an air bubble trapped below the Packer Cup which will lift the Housing and Mandrel until the Packer Cup releases its seal. Usually, the seal is released in the coupler.

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.

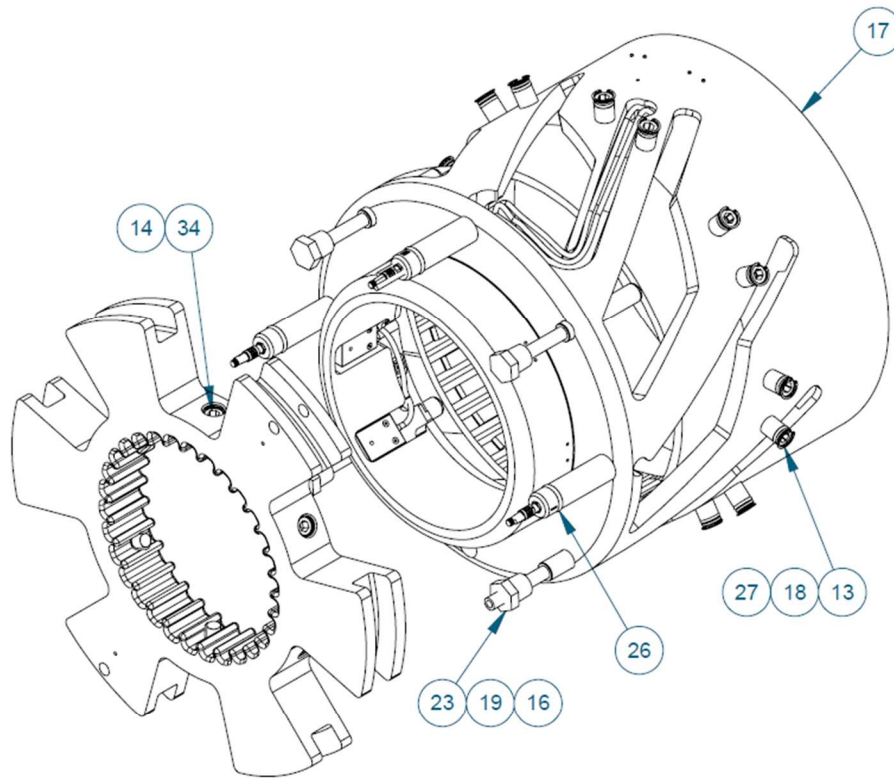
Dies whose teeth that have been worn flat or broken must be replaced. To measure the flatness of CRT dies, use an optical micrometer (1006801). Place the optical micrometer over the area to be examined. After proper focusing, you will align the .00 on one side of the die and will measure across to the other side. If it measures more than .025, that 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 25% of the total number of teeth in that square, the die should be replaced. The top and bottom inch of the die are exempt from the 25% damage criteria.

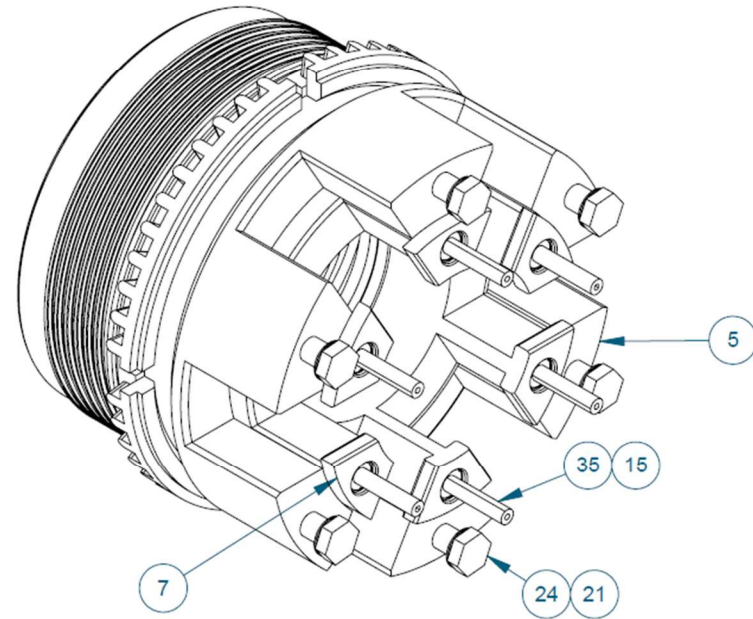




SOLIDWORKS DOCUMENT PRINTED ON: Thursday, December 2, 2021



TOP SIDE



BOTTOM SIDE

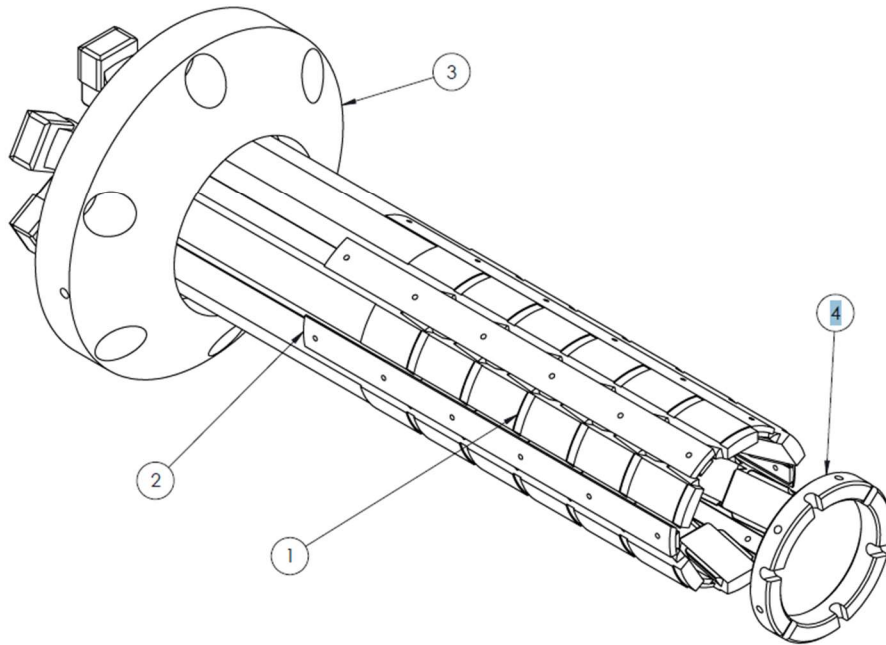
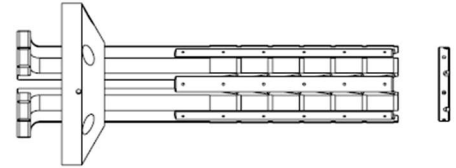
DESCRIPTION		
	ASSEMBLY, HEAD, smartCRT, 750 TON	
SIZE	PART NO.	REV
B	1006255-0001	B
MATERIAL	N/A	SHEET 3 OF 3

SOLEWORKS DOCUMENT PRINTED ON: Thursday, December 2, 2021

10.3 Internal Die Kits

10.3.1 – 1006375-0002 – 9 5/8” 36-59.4#, 9 7/8” 62.8# (8.921” – 8.407”)

ITEM	QTY	P/N	DESCRIPTION
1	6	1006293	SLIP, 9 5/8", 36-59.4#, CRT 750 TON
2	6	1006294	WEAR GUIDE, 9 5/8", 36-59.4#, CRT 750 TON
3	1	1006246	PLATE, BUMP, 9 5/8 - 16" CRT, 750 TON
4	1	1006304	NUT, WEARGUIDE, CRT 750 TON, 9 5/8"-30"



RELEASED FOR PROTOTYPE

REVISIONS					
REVISION	ECN NUMBER	ECN DESCRIPTION	ECN COMPLETED BY	ECN COMPLETED DATE	
A	N/A	INITIAL RELEASE	N/A	N/A	

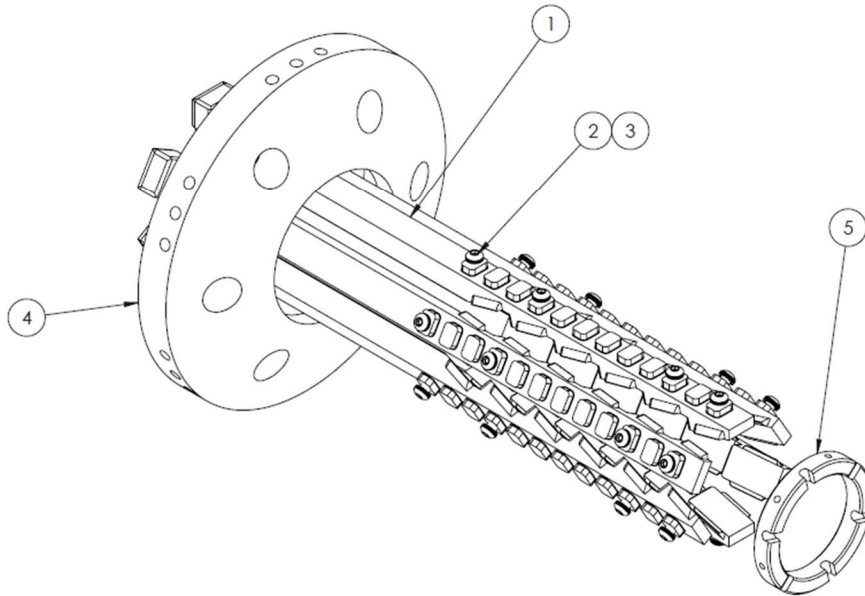
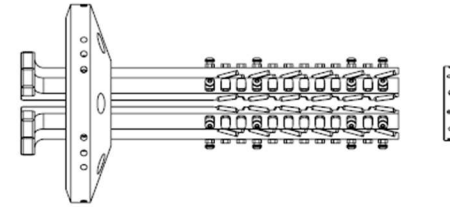
UNLESS OTHERWISE SPECIFIED: 1. DIMENSIONS ARE IN INCHES 2. TOLERANCES: FRACTIONS ± 1/16" DECIMALS ± 0.005" HOLDINGS AS PLACED ± 0.010" 3. CONVEYANCE: AS SHOWN, UNLESS OTHERWISE SPECIFIED WITHIN COMMENTS OF MCCOY CORPORATION. 4. FINISH: UNLESS OTHERWISE SPECIFIED, ALL SURFACES SHALL BE MACHINED TO A FINISH OF 32 RMS. 5. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE TO THE CENTERLINE OF THE PART. 6. DIMENSIONS TO SURFACE UNLESS OTHERWISE SPECIFIED. 7. DIMENSIONS TO CENTERLINE UNLESS OTHERWISE SPECIFIED. 8. A DIMENSION WITH A HOLE OR SLOT SHALL BE TO THE CENTERLINE OF THE HOLE OR SLOT UNLESS OTHERWISE SPECIFIED. 9. DIMENSIONS TO CENTERLINE UNLESS OTHERWISE SPECIFIED. 10. INTERFERE DRAWING PER ASME Y14.5-2009	PROPRIETARY STATEMENT THIS DOCUMENT IS THE PROPERTY OF MCCOY CORPORATION AND IS CONFIDENTIAL. THE INFORMATION CONTAINED HEREIN IS UNCLASSIFIED AND IS NOT TO BE RELEASED OR DISCLOSED TO ANY OTHER PARTY WITHOUT THE EXPRESS WRITTEN CONSENT OF MCCOY CORPORATION.	RATINGS: IF APPLICABLE 	DESCRIPTION KIT, INTERNAL, CRT, 750 TON, 9 5/8" 36-59.45#, SLIPS, WEAR GUIDE		
DRAWN	J.LASA	10/07/2020	SIZE PART NO.	REV	
CHECKED	M.HICKL	10/07/2020	B	A	
APPROVED	J.LASA	10/07/2020	MATERIAL	SHEET 1 OF 1	
THIRD ANGLE PROJECTION	WEIGHT	342.3 LBS.	MATERIAL N/A		



10.4 Base Slip Kit

10.4.1 – 1006375-0005 – 13 3/8” – 30”

ITEM	QTY	P/N	DESCRIPTION
1	6	1006249	SLIP, BASE, 13 3/8" - 24", CRT 750 TON
2	24	700878	BOLT, BUTTON, HEX DRIVE, 5/8"-11x1-1/4", ALLOY STEEL, McMaster-Carr 91255A796 OR EQUIVALENT
3	24	700735	WASHER, NORD-LOCK, 0.670 ID x 1.000" OD, STEEL
4	1	1006305	PLATE, BUMP, 16"-20", CRT, 750 TON
5	1	1006304	NUT, WEARGUIDE, CRT 750 TON, 9 5/8"-30"



RELEASED FOR PROTOTYPE

REVISIONS				ECN COMPLETED BY	ECN COMPLETED DATE
REVISION	ECN NUMBER	ECN DESCRIPTION		N/A	N/A
A	N/A	INITIAL RELEASE			

UNLESS OTHERWISE SPECIFIED: 1. DIMENSIONS ARE IN INCHES 2. DECIMALS 3. DIMENSIONS ARE IN INCHES 4. DIMENSIONS ARE IN INCHES 5. DIMENSIONS ARE IN INCHES 6. DIMENSIONS ARE IN INCHES 7. DIMENSIONS ARE IN INCHES 8. DIMENSIONS ARE IN INCHES 9. DIMENSIONS ARE IN INCHES 10. INTERPRET DRAWING PER ASME Y14.5-2009	CRITICAL COMPONENT: YES RATINGS: IF APPLICABLE PROPRIETARY STATEMENT THIS DOCUMENT IS THE PROPERTY OF MCCOY CORPORATION AND IS CONSIDERED CONFIDENTIAL. THE INFORMATION MAY NOT BE USED, REPRODUCED, COPIED, OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN CONSENT OF MCCOY CORPORATION. DRAWN: J LARA 10/07/2020 CHECKED: M NICKEL 10/07/2020 APPROVED: J LARA 10/07/2020 THIRD ANGLE PROJECTION	DESCRIPTION KIT, BASE SLIPS, CRT, 750 TON SIZE/PART NO. B 1006375-0005 MATERIAL N/A	MCCOY GLOBAL REV A SHEET 1 OF 1
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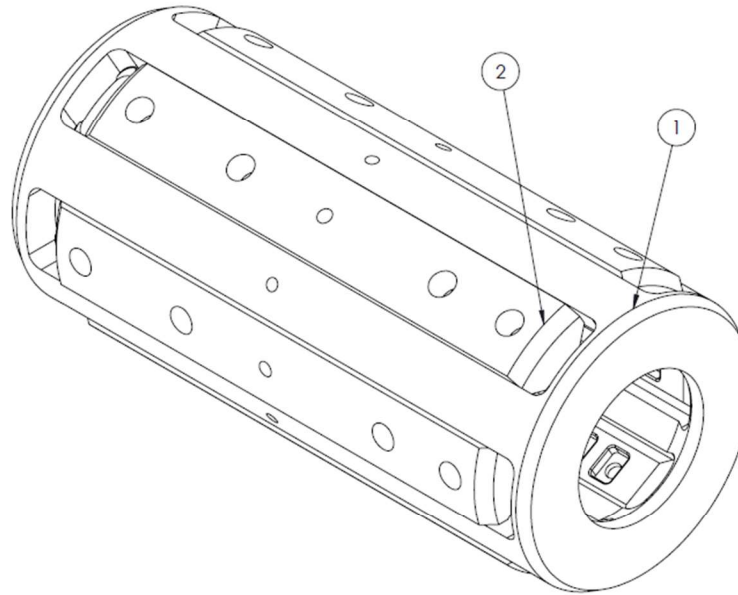
SOLIDWORKS DOCUMENT PRINTED ON: Tuesday, November 30, 2021



10.5 Internal Insert Kit

10.5.1 – 1006375-0003 – 13 3/8" 54.4-85# (12.615" – 12.159")

ITEM	QTY	P/N	DESCRIPTION
1	1	1006260	WEAR GUIDE, 13-3/8" 54.4-85#, CRT, 750 TON
2	6	1006259	INSERT, 13 3/8" 54.4-85#, CRT, 750 TON



RELEASED FOR PROTOTYPE

REVISIONS				ECN COMPLETED BY	ECN COMPLETED DATE
REVISION	ECN NUMBER	ECN DESCRIPTION		N/A	N/A
A	N/A	INITIAL RELEASE			
UNLESS OTHERWISE SPECIFIED:		CRITICAL COMPONENT: YES		RATINGS: IF APPLICABLE	
1. DIMENSIONS ARE IN INCHES		PROPRIETARY STATEMENT		MCCOY GLOBAL	
2. TO BE FINISHED		THIS DOCUMENT IS THE PROPERTY OF MCCOY CORPORATION AND IS		DESCRIPTION	
3. FINISHES ARE TO BE AS SPECIFIED		CONSIDERED CONFIDENTIAL. THE INFORMATION CONTAINED HEREIN IS		KIT, INTERNAL, CRT, 750 TON, 13 3/8" 54.4-85#,	
4. SURFACE FINISHES ARE TO BE AS SPECIFIED		UNLESS OTHERWISE SPECIFIED BY ANY OTHER METHOD		INSERTS, WEAR GUIDE	
5. DIMENSIONS ARE TO BE AS SPECIFIED		DURING THE COURSE OF THE PROJECT		SIZE/PART NO.	
6. DIMENSIONS ARE TO BE AS SPECIFIED		DRAWN J.LARA 10/07/2020		B 1006375-0003	
7. DIMENSIONS ARE TO BE AS SPECIFIED		CHECKED M.HICKL 10/07/2020		MATERIAL	
8. DIMENSIONS ARE TO BE AS SPECIFIED		APPROVED J.LARA 10/07/2020		N/A	
9. DIMENSIONS ARE TO BE AS SPECIFIED		THIRD ANGLE PROJECTION		REV A	
10. INTERFIT DRAWING PER ASME Y14.5-2009		WEIGHT 411.9 LBS.		SHEET 1 OF 1	



Section 11 - CRT Assembly Tools

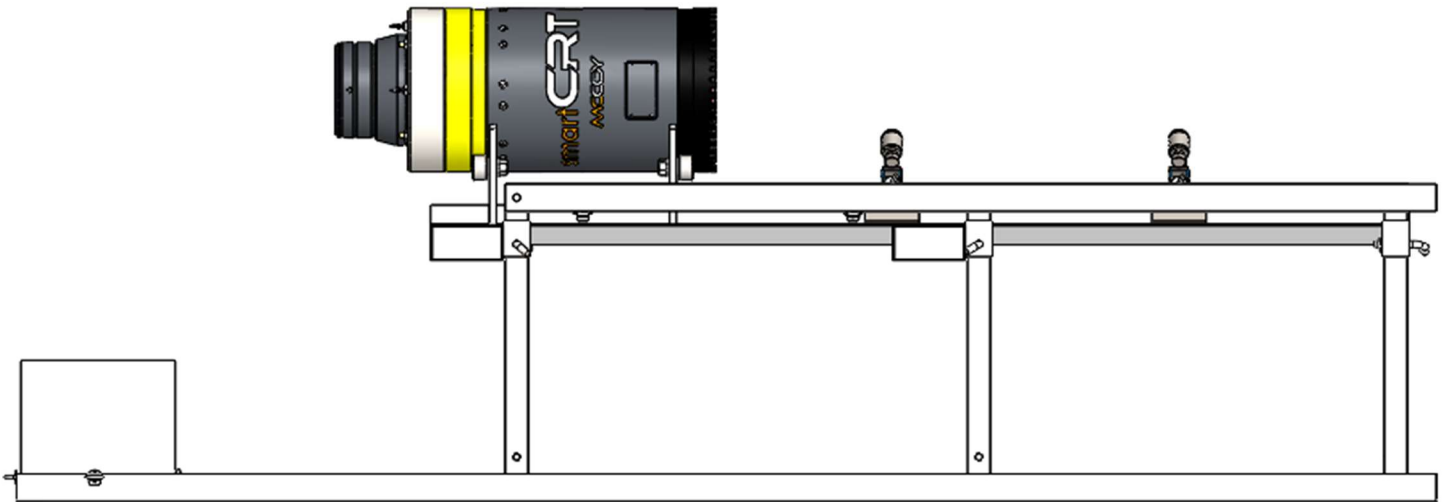
11.1 Internal Assembly Tools

Assembly Tool List				
Part	Description	Supplier	Supplier PN	Qty
Locking Changeable-Tip Retaining Ring Plier	for Internal Rings That Fit 6.25"-10" ID, Plain Grip	McMaster Carr	5300A27	1
Steel Eyebolt with Shoulder - for Lifting	5/8"-11 Thread Size, 1-3/4" Thread Length	McMaster Carr	3014T52	2
4-Piece Straight Handle Pick Set	7" Lg. Hook, 90, 45, Straight Tip	McMaster Carr	3842A37	1
Rod Seal Installation Tool	for 2" to 3" Seal ID	McMaster Carr	45015K23	1
12-Piece Hex Bit Socket Set	1/4" and 3/8" Square Drive	McMaster Carr	54875A86	1
Mobil Grease	Mobilith SHC 220, High-Pressure, 13.4 oz. Cartridge	McMaster Carr	1394K4	1
Antiseize	lb. 771, Copper-Free, 8 oz. Brush-Top Can	McMaster Carr	1821A3	1
Adjustable Torque Wrench with Certificate	Ratchet, 1/2" Drive, 30-250 in.-lbs. and 47-332 NM	McMaster Carr	85555A319	1
Adjustable Torque Wrench with Certificate	Ratcheting, 1/4" Drive, 30-150 in.-lbs. and 3.06-15.3 NM	McMaster Carr	85555A115	1
Dead Blow Mallet	High-Visibility, Polyurethane Rubber Face, 3 lbs.	McMaster Carr	3209N13	2
Emery Sanding Roll	60 Feet Long, for Smooth Finish, 1" Wide, 150 Grit	McMaster Carr	8238A53	1
Twisted-Eye Web Sling	4400 lbs. Choker Capacity, 1" x 4 ft. Nylon	McMaster Carr	9077T6	2
Twisted-Eye Web Sling	8800 lbs. Choker Capacity, 2" x 6 ft. Nylon	McMaster Carr	9077T8	2
Twisted-Eye Web Sling	8800 lbs. Choker Capacity, 2" x 8 ft. Nylon	McMaster Carr	9077T8	2
Screwdriver-Style Pry Bar	25" Overall Length	McMaster Carr	60025A67	1
Secure-Grip Strap Wrench	for 2-3/8" to 12" OD, 24" Long Iron Handle	McMaster Carr	5349A14	1
10 Piece T-Handle Hex Key Set	3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", 5/16", 3/8"	McMaster Carr	5422A15	1
Hex Bit Socket	3/8" Square Drive, 2mm Size, 1 5/8" Long	McMaster Carr	8367A313	1
Heavy Duty Screwdriver	Chiseling and Demolition, 9/16" Slotted	McMaster Carr	7249A38	2
High-Tension Ratchet Strap	1 1/2" Wide, 6' Max Length	McMaster Carr	31025T893	3
Steel Eyebolt w/ Shoulder	Zinc-Plated, 1/2"-13 Thread, 1 1/2" Thread Length	McMaster Carr	3014T254	1
Internal Retaining Ring Pliers	0.38" Tip Dia.	McMaster Carr	57805A33	1
Crescent Wrench	12" Overall Length, 1 9/16" Max Jaw Capacity	McMaster Carr	5385A23	1
Kluber Grease	AG 11-462	McCoy Part Number	700053	1
Oil-Filled Cast Nylon Rod	2" DIA x 3'	McCoy Part Number	606560	1
Mandrel Install Tool	CRT 750T	McCoy Drawing	1006574	1
Threaded Install Tool	9-4 Stub Acme	McCoy Drawing	1006376	1
Plate, Spring Press	CRT 750T	McCoy Drawing	1006384	1
Depth Measuring Microscope	Depth Measuring Microscope Peak 2008 (DMR) 25x - 100x	McCoy Drawing	1006801	1
6-Point Standard Socket	1 1/2" size, 1/2" Square Drive	McCoy Drawing	1006591	1
Transport Case Stand	CRT 750T	McCoy Drawing	1006396	1
Puller Tool	9-4 Stub Acme	McCoy Drawing	1006376	1
Mandrel Hanger Assembly	7", CRT 750T	McCoy Drawing	1006422-0003	1
Hanging Strap Roller	CRT 750T	McCoy Drawing	1007114	1
Chain Wrench	6" Pipe, 23" Long - 5 1/2" Actual OD, 24" Handle Length	MSC	94195260	1
Chain Extension for Wrench	5" Actual OD	MSC	72549272	1

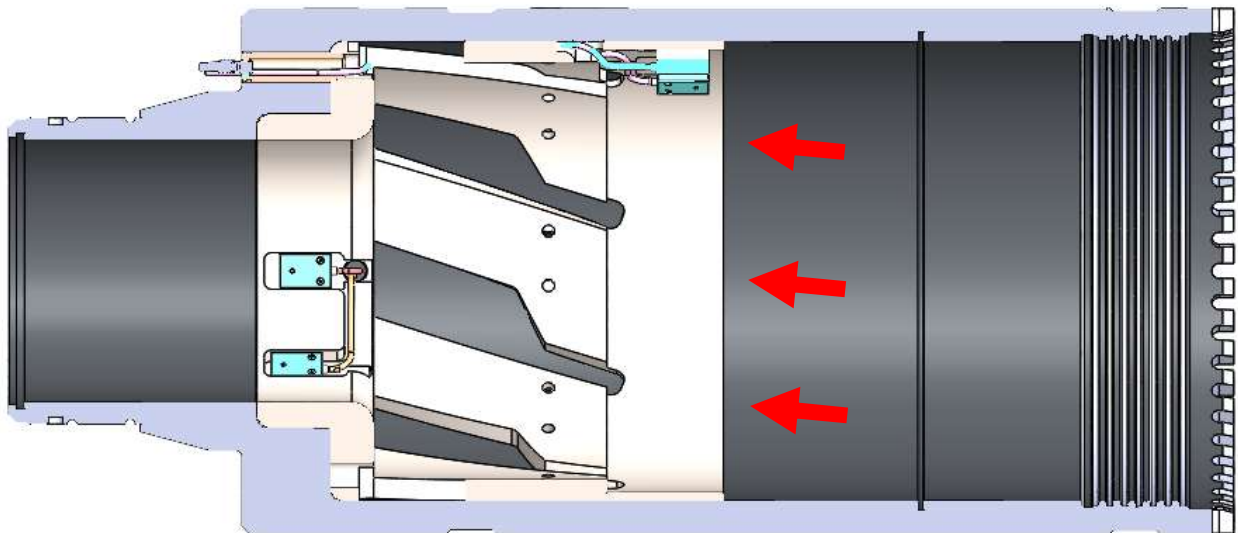
Section 12 - Assembly - Head

Note:

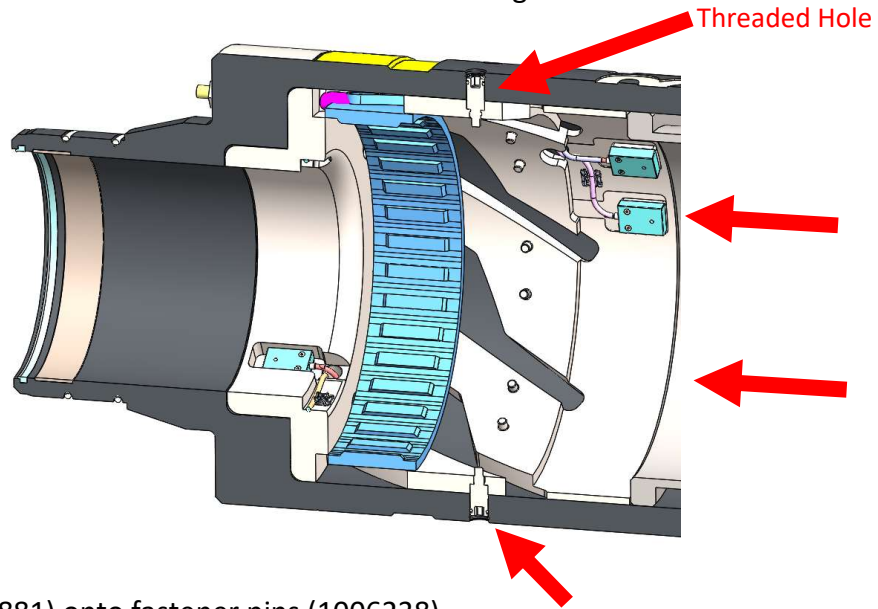
- The tool is Modular, be sure to use the correct mandrels slips, and/or inserts for the correct size casing.
 - Apply Grease to all metal surfaces, threads and sealing grooves lightly to prevent rust and corrosion:
 - Grease “A”: Napa general Multi-Purpose Grease or equivalent.
 - Grease “B”: Kluberplex AG 11-462 (PN 700053)
1. Place the Housing (1006230) on the Assembly/Transport Case Stand (1006396) for easier assembly as shown below. **Warning: Strap the Housing to the Assembly Stand.**



2. Apply grease “A” on the entire ID of the housing for rust prevention.
3. Install the clutch housing assembly (1006620) as shown.

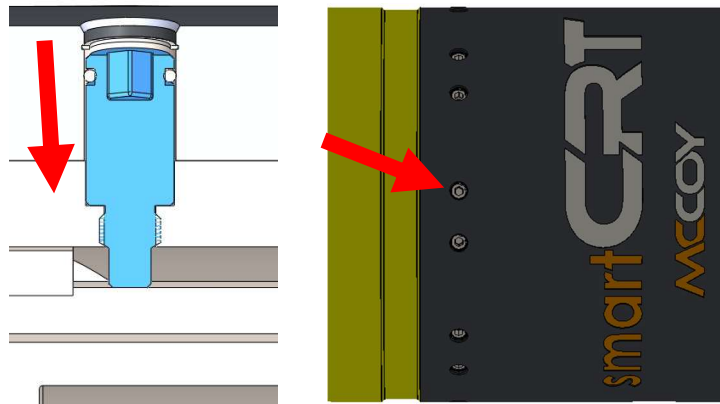


4. Push the clutch in past the threaded holes on the clutch housing.

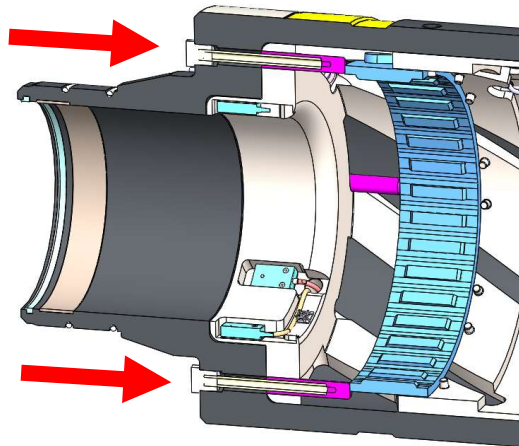


5. Install O-ring #113 (700881) onto fastener pins (1006238).

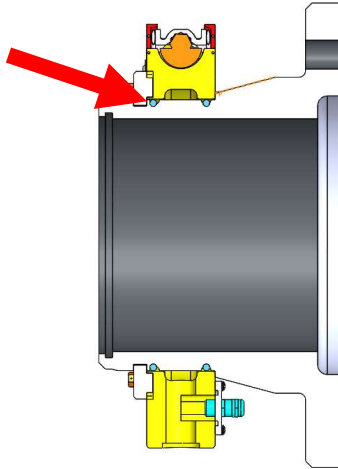
6. Install fastener pins (Qty. 16) into housing and retain with safety snap rings (700793).



7. Install Clutch Springs (1006287, Qty.4) & Spacers (1006569) and fasten with plugs (100

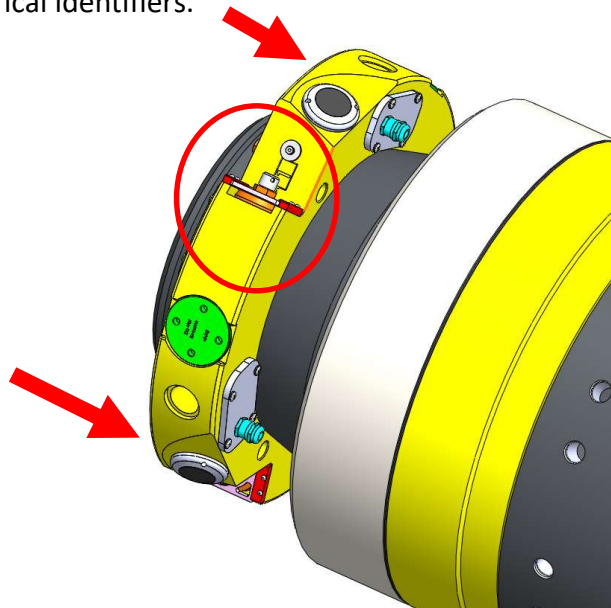


8. Install the O-Rings #449 (700880, Qty. 2) on the top of the housing. Apply grease "A" to the O-Ring.



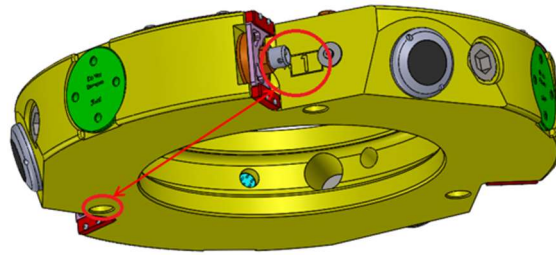
9. Secure the Clutch Housing Assembly with the radial bolts. *Refer to Appendix 1.5: Bolt and Set Screw Torque for recommended torque chart.*

10. Slide the Lower Data Ring over the housing and rotate so that the electrical connections line up to the correct wire. Important!! The ring will have numerical identifiers (1, 2, 3) the Pins on the Clutch Assembly will also have numerical identifiers.

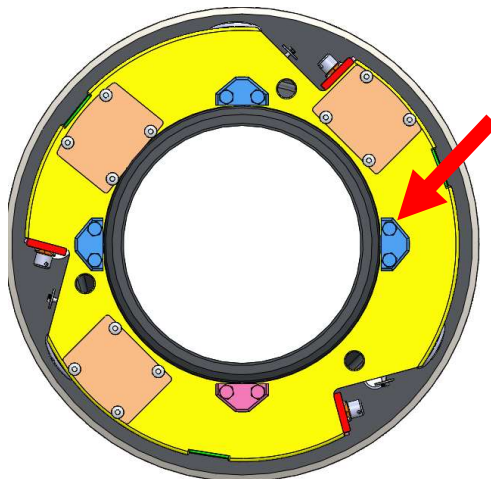


11. Apply WD40 30080 Specialist Electrical Contact Cleaner or equivalent to Electrical connection before connecting.

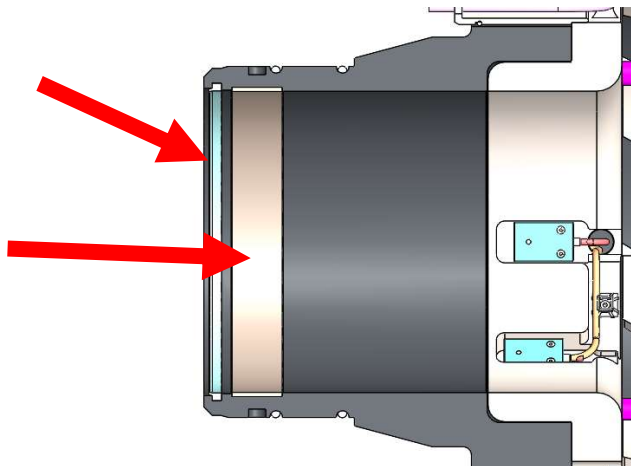
12. Connect Electrical wires by connecting the corresponding numbered wires to the numbered connector as shown below.



13. Secure the Data Ring (NGTTS-00003-15) with the 4 Bolts (7018-12HSS-01, Qty. 8, 5/16" -18) and Tabs. Tighten Bolts to 17 ft-lbs. and Install Safety wire. **Refer to Appendix 1.5: Bolt and Set Screw Torque for recommended torque chart.**

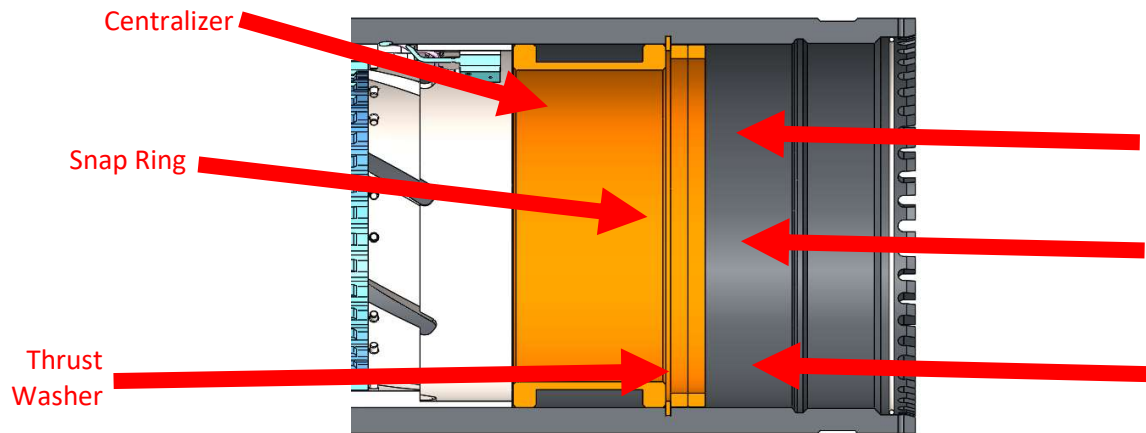


14. Apply grease "A" to Wiper Seal Groove in Housing. Install the Wiper Seal (1006588) and wear band (1006846).



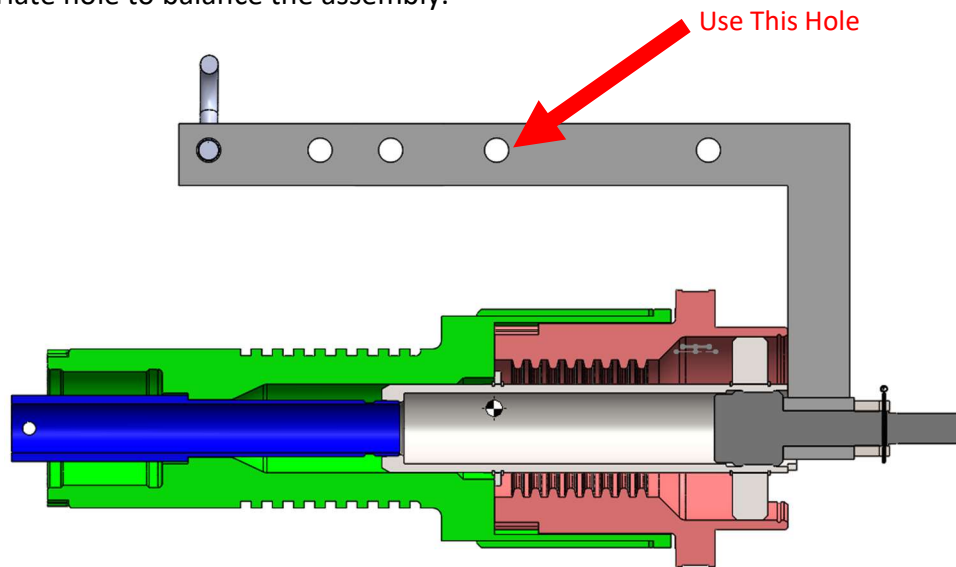
15. Insert Top Mandrel Centralizer (1006761) into housing.

16. Install the snap ring (700875) into the housing. Apply grease "A" to the two thrust washers (1006292) and install them below the snap ring.

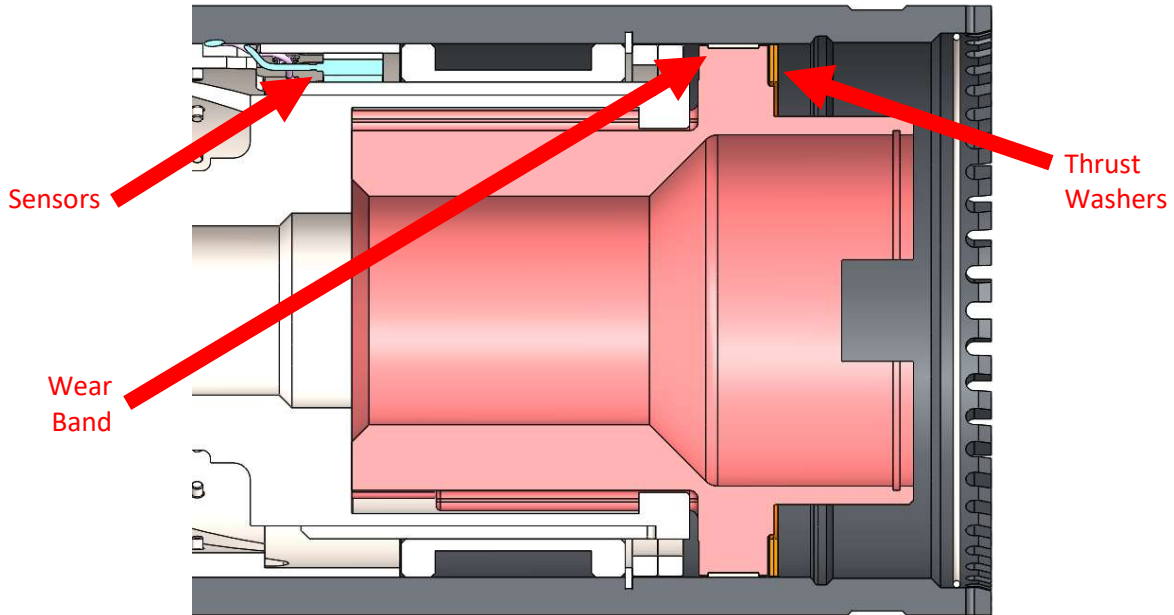


17. Using the Top Mandrel Installer Tool (1006574), pick up the Dovetail Nut, then insert the Dovetail Nut into the Top Mandrel. Make sure the splines are aligned and not in the push position (J-Slot). The L-Shaped Hanger (1006422-0003) can be used for easier assembly as seen below. Use appropriate hole to balance the assembly.

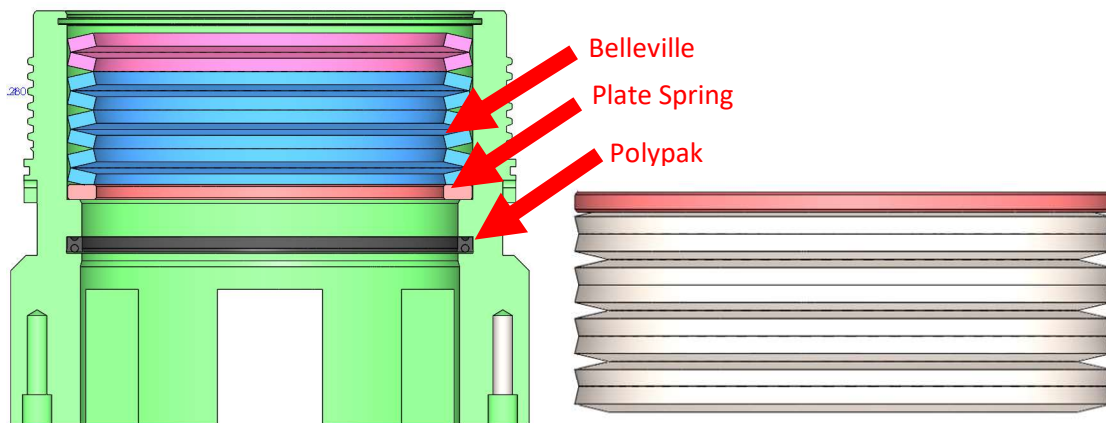
18. Install the Pin of the Top Mandrel Installer Tool to secure the Top Mandrel and Dovetail Nut assembly. Use appropriate hole to balance the assembly.



19. Install the top mandrel assembly with the small end towards the top of the housing using the Top Mandrel Installer Tool.
- Note: before installing top mandrel assembly, rotate the main housing so that the sensors are on the top side of the tool.
 - Place wear band (1006606) on Dovetail Nut as it goes into the Housing
 - Insert two thrust washers (1007404) on outer face of Dovetail Nut

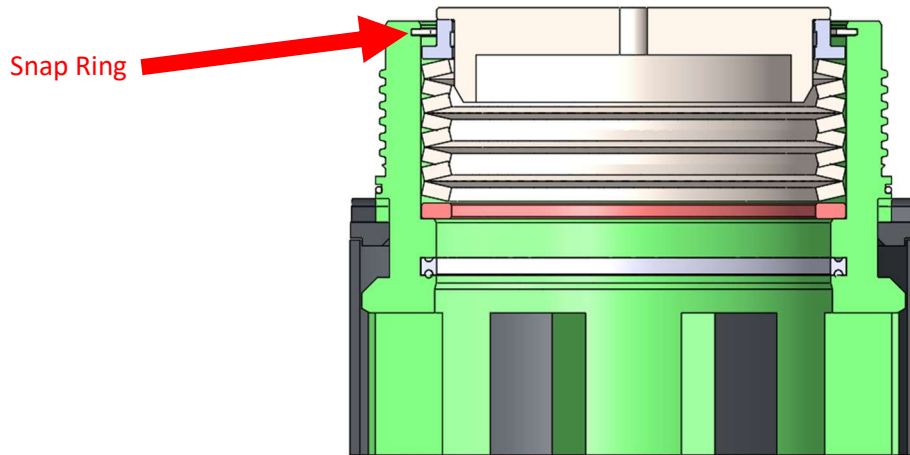


20. Install the polypak (700873) into the Housing Cap (1006239) followed by the Plate Spring (1006244) and then the 8 Belleville's (1006281) in series with the first one contacting on the ID

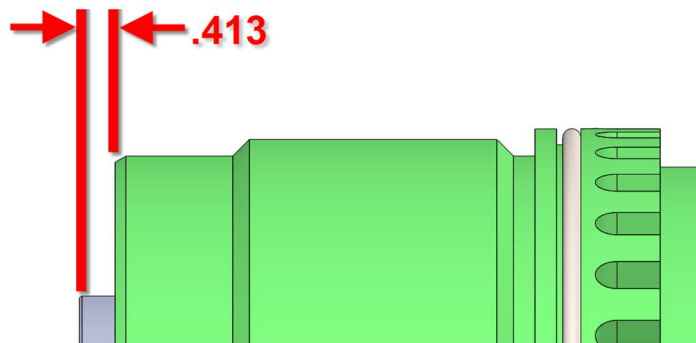


21. Place the Thrust bearing (1006823) on top of the Belleville's and use the spring pressing plate (1006384) and a press to collapse the springs. (Approximate compression load ~40,000lb)

22. With the springs compressed, install the snap ring (700884) into the groove.

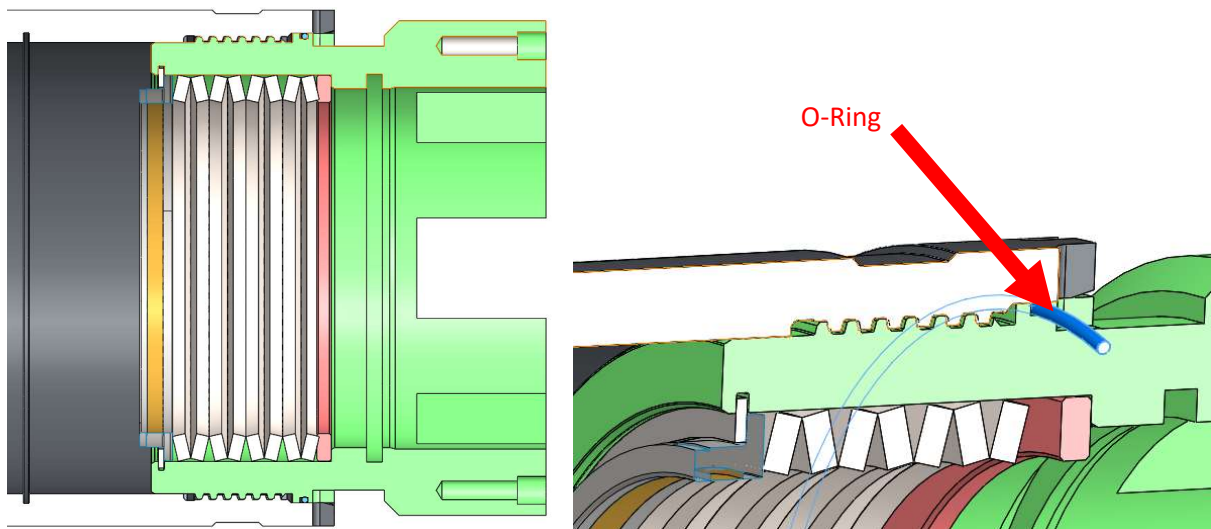


23. Once the snap ring is in place, slowly relieve the compression load, the Thrust bearing should be protruding the housing cap approximately $7/16''$.

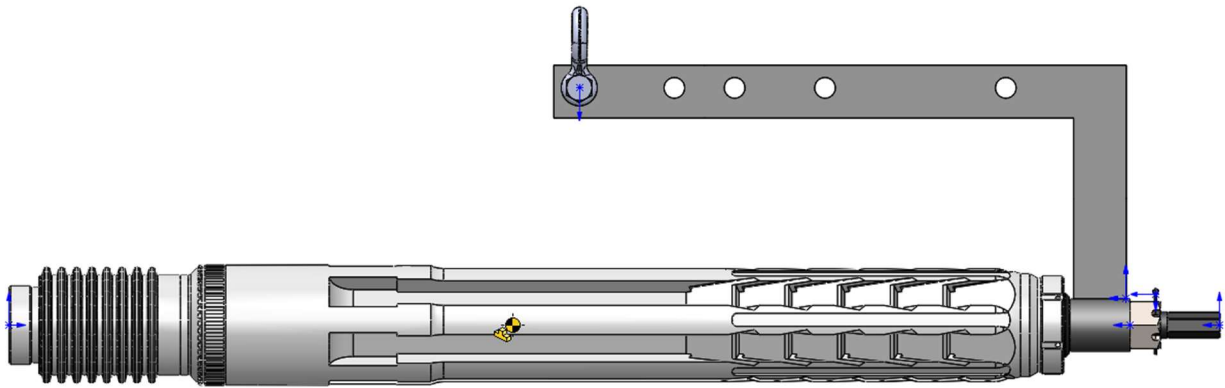


24. Install the O-Ring (700871) on the OD of the Housing Cap.

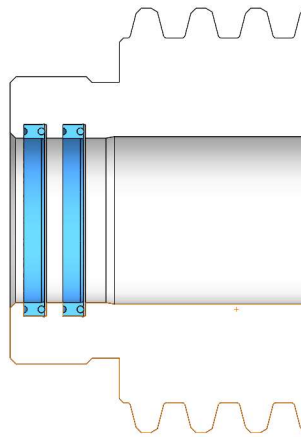
25. Fully thread the Housing Cap into the housing.



26. Hoist the CRT Dovetail mandrel assembly (1007097) with the lifting tool. Use the appropriate hole marked 750T on the lifting tool.

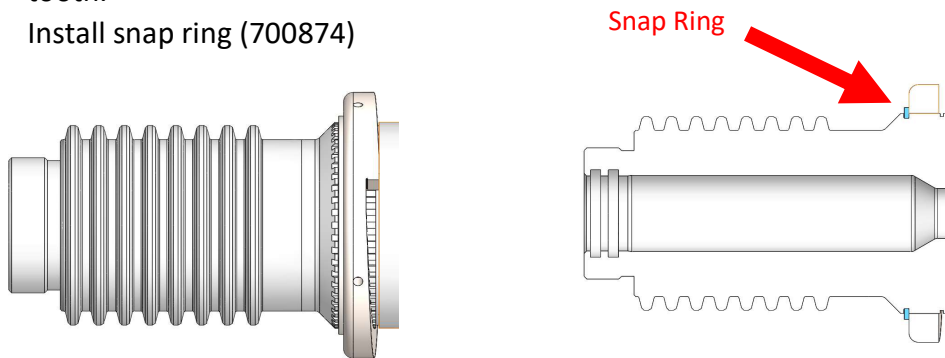


27. Install the polypaks (700877, Qty. 2) with the lip facing into the mandrel.

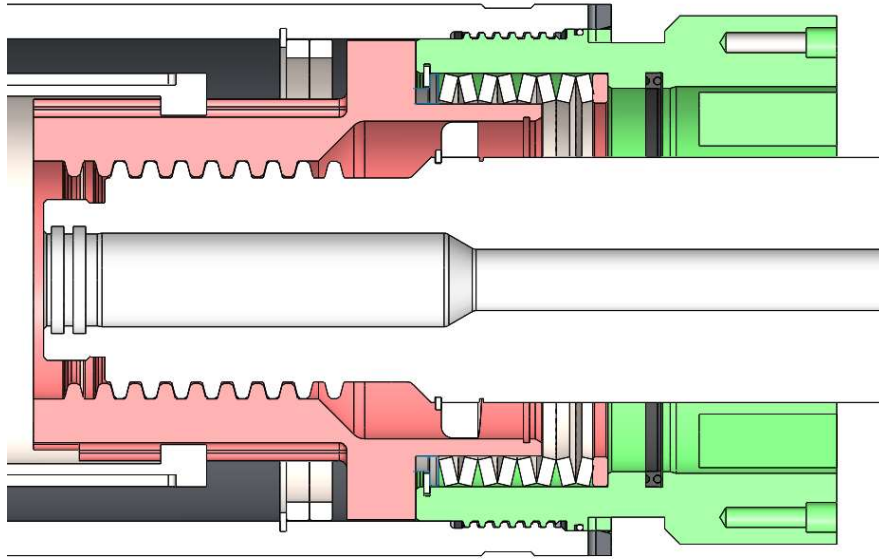


28. Timing ring installed in the factory. It will need to be removed and reinstalled after one year for NDT to be performed. For reinstallation, please follow the proceeding steps:

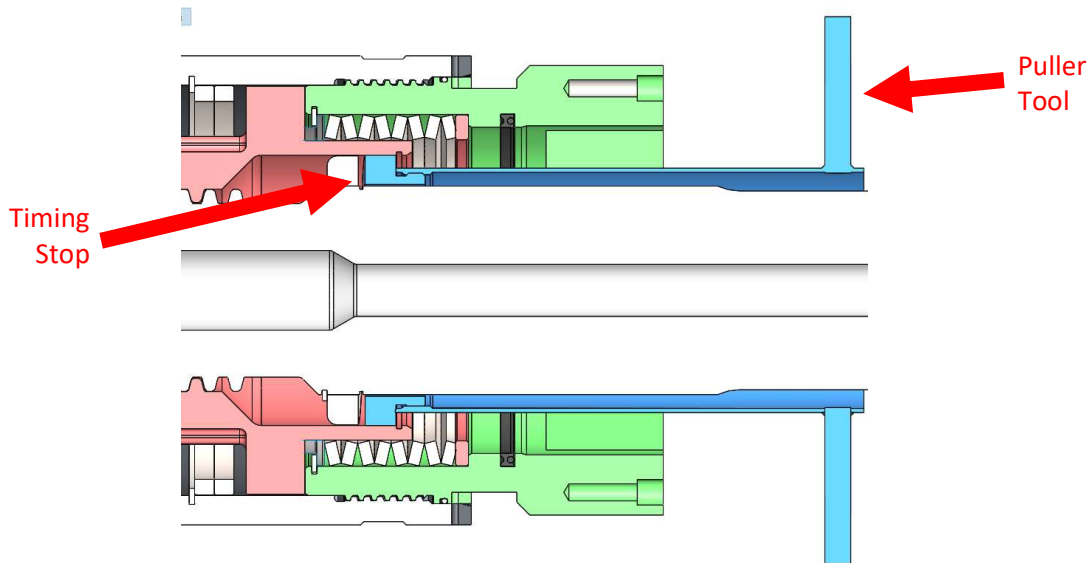
- a) Line the flat edge of the stop with the timing line on the mandrel. If the flat cannot exactly align with the line due to the spline teeth, then rotate the timing stop clockwise one spline tooth.
- b) Install snap ring (700874)



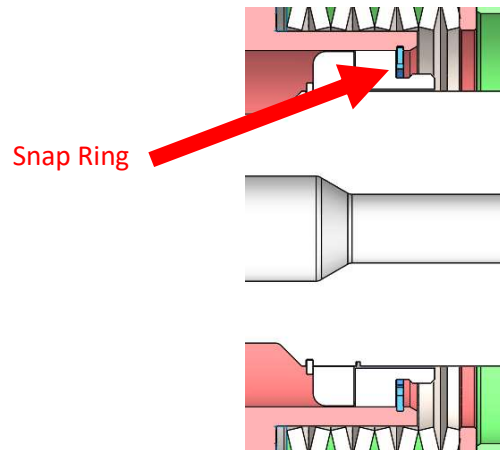
29. Insert the mandrel into the dovetail nut inside the housing by rotating the mandrel clockwise. Rotate the Mandrel approximately 8 rotations



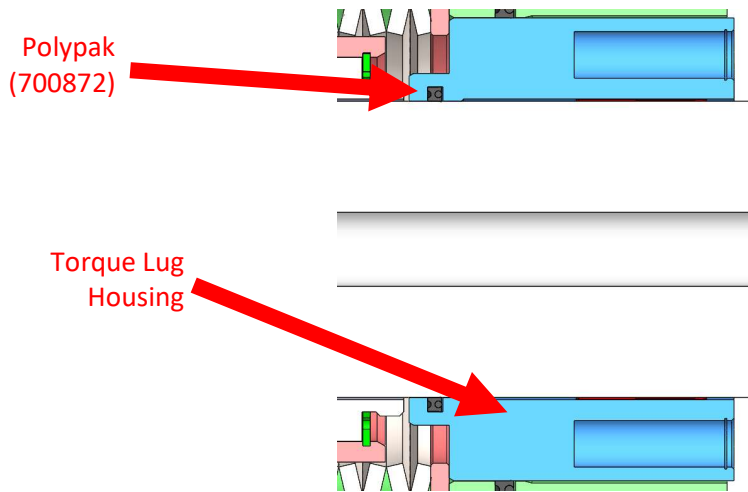
30. Insert the Timing Stop (1006235) into the dovetail nut using the Puller tool (1006376).



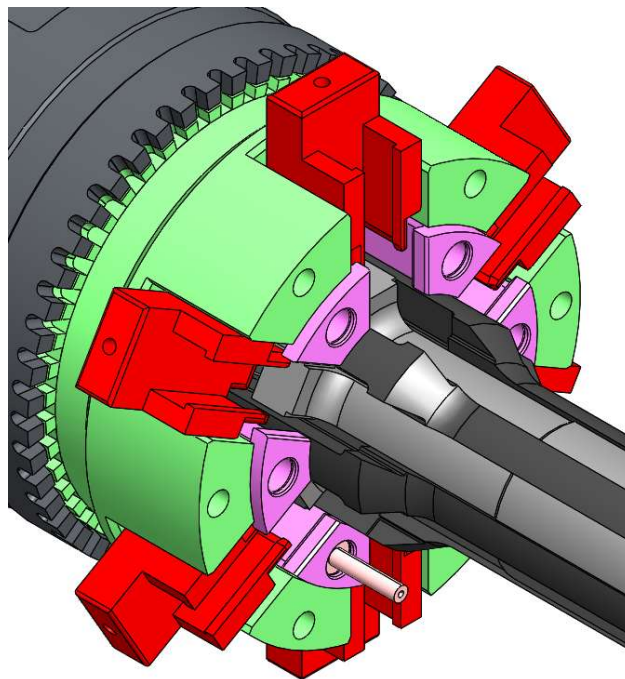
31. Insert the snap ring (1006290) into the ID groove of the dovetail nut (1006233).



32. Install the Poly Pak (700872) inside the Torque Lug Housing (1006243).
33. Slide the Torque Lug Housing over the mandrel with the polypak toward the housing and insert it into the housing cap.

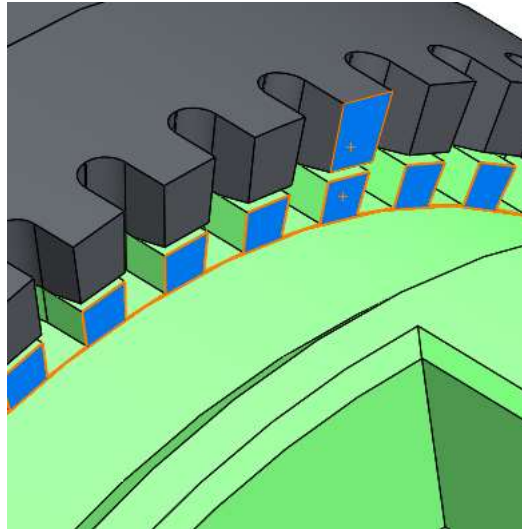


34. Align housing cap, torque lug housing and dovetail mandrel before installing slips and torque lugs.
35. Install the slips or base slips into the mandrel. Apply grease "B" to the ramp surfaces.
36. Insert the torque lugs into the torque lug housing capturing the slip heads.
 - a. Support lugs with Bump Plate Cap (1006247) to prevent lugs from falling. Cap will be installed in a later step.



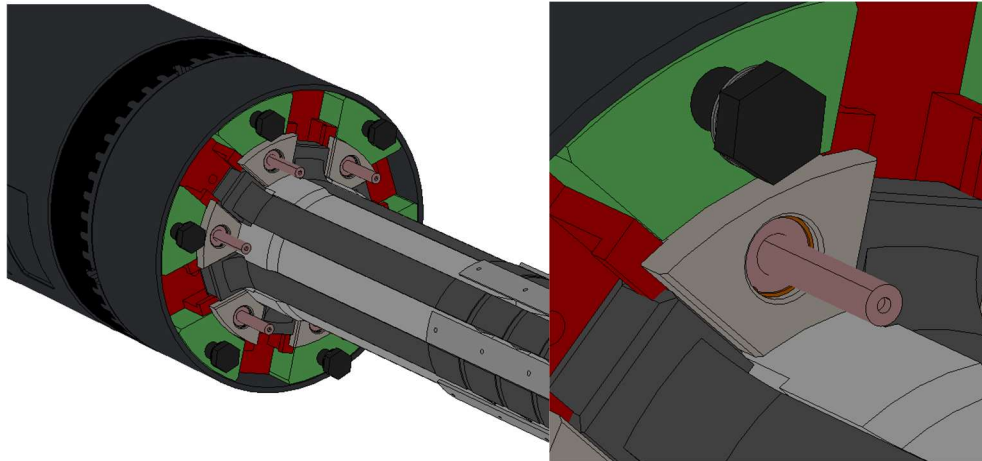
37. With the tool in the unlocked position, and holding back up on the dovetail mandrel, Rotate the top mandrel counterclockwise until the Timing Ring on the DT Mandrel contacts the Timing Stop inside DT Nut.
38. Verify the slips are partially exposed out of the mandrel or wear guide.

39. Rotate the housing cap into the housing until the timing teeth faces are flush.

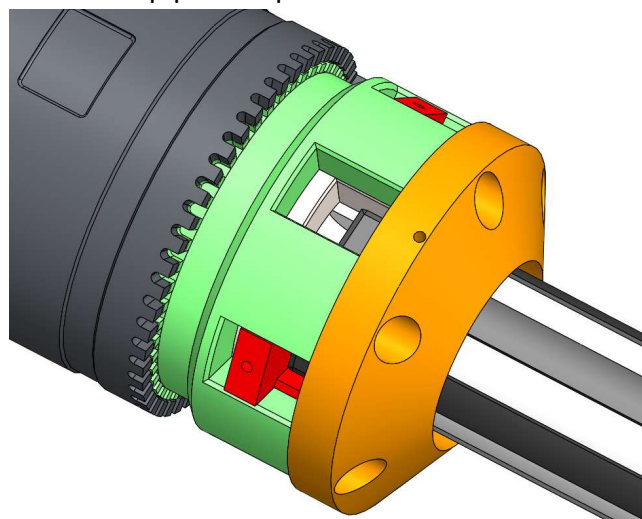


40. Remove one torque lug.

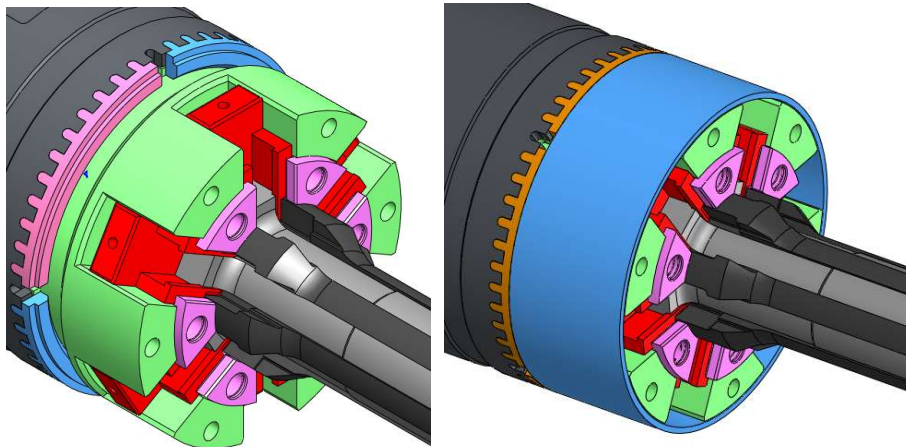
41. Install the gas springs (1006353, Qty. 6) and retaining rings (700879, Qty. 6).



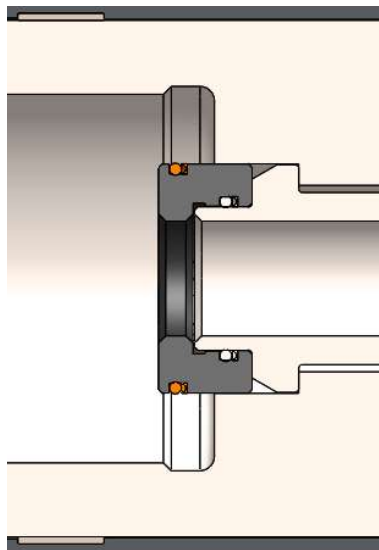
42. Install the bump plate and bolts until the bottom of the bump plate bottoms out on the housing plate mating face. Do not install the bump plate cap.



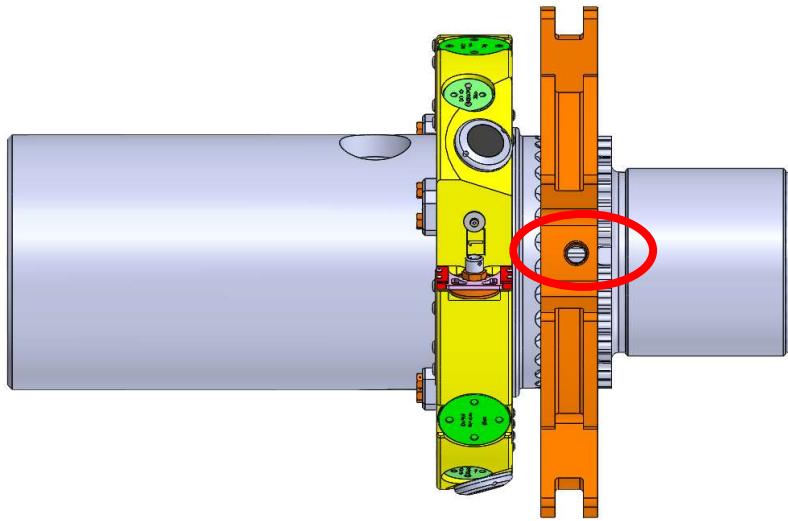
43. Push the slip that has the torque lug removed until it is fully retracted and contacts the end of the slip ramp. Hold the slip in that position and paint a line across the slip and the dovetail mandrel to locate the fully retracted position.
44. Replace the torque lug and measure the distance between the line on the slip and the mandrel. The distance should be between 0.000 – 0.030”.
45. Continue rotating the top mandrel counterclockwise while holding back up on the housing. Once the slips are retracted below the mandrel and wear guide, there should be a noticeable increase in torque requirement.
 - a. If distance is not met, then repeat last two steps until distance is accurate.
 - b. If distance is met, continue assembly.
46. Once the torque increase is seen, back off the housing cap until the next available spline between the housing and housing cap is aligned.
47. Remove bump plate, install the 4 timing locks (1006240), followed by the bump plate cap (1006247).



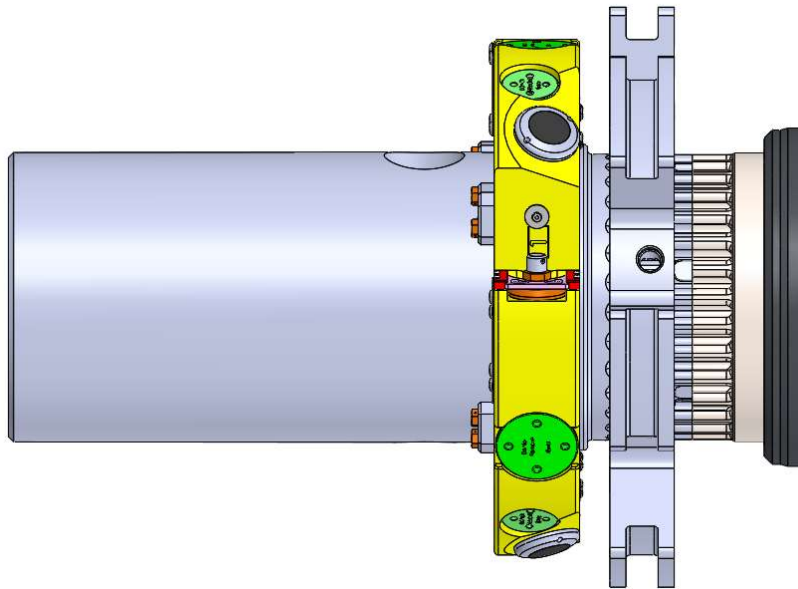
48. Install the bump plate and torque the bolts to 250 ft-lb.
49. Apply grease “A” and install the O-ring #342 (700015), back up ring (700883), O-ring #333 (700187) and back up ring (700887) on the Snorkel spacer (106605). Apply grease “A” the OD sealing surface of the Snorkel (1006248).



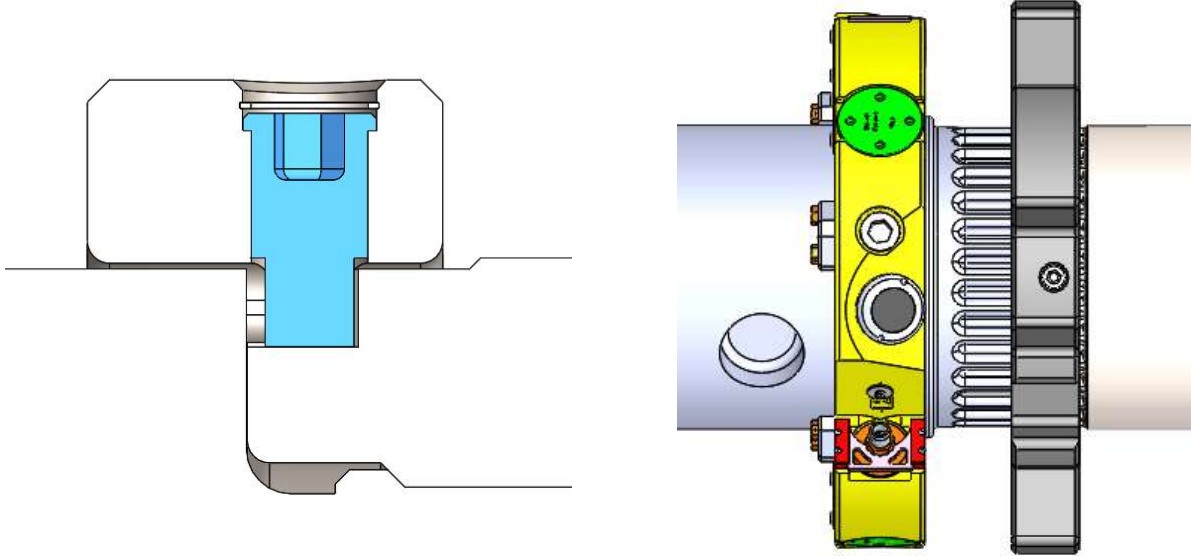
50. Insert the snorkel into the top mandrel push it all the way into the counterbore of the Top Mandrel ID.
51. Install the Lock Plate (1006632) with holes offset towards the threaded end onto the torque sub (NGTTS-33-06). Line up the holes on the ring with the notches in the splines.
- a. Lock plate will not be secure, handle with caution.



52. Install the torque sub assembly, shoulder the connection then back off the connection until the splines line up.



53. Slide the lock plate down and install the radial bolts (1006303) with anti-seize and torque to 30 ft-lb followed by the Snap Rings (700869).



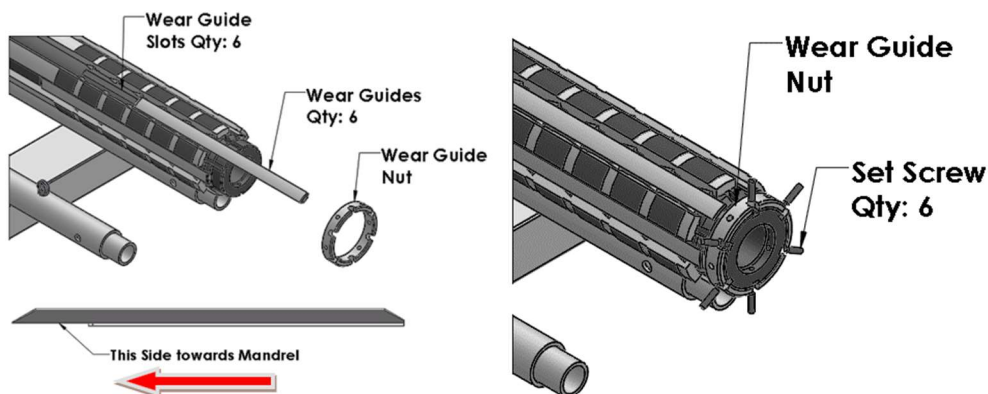
54. Install the indicator cover (1006630).

55. Install Wear Guides/ Insets/ Circulator as shown in Section 13.

Section 13 - Installation of inserts and wear guides

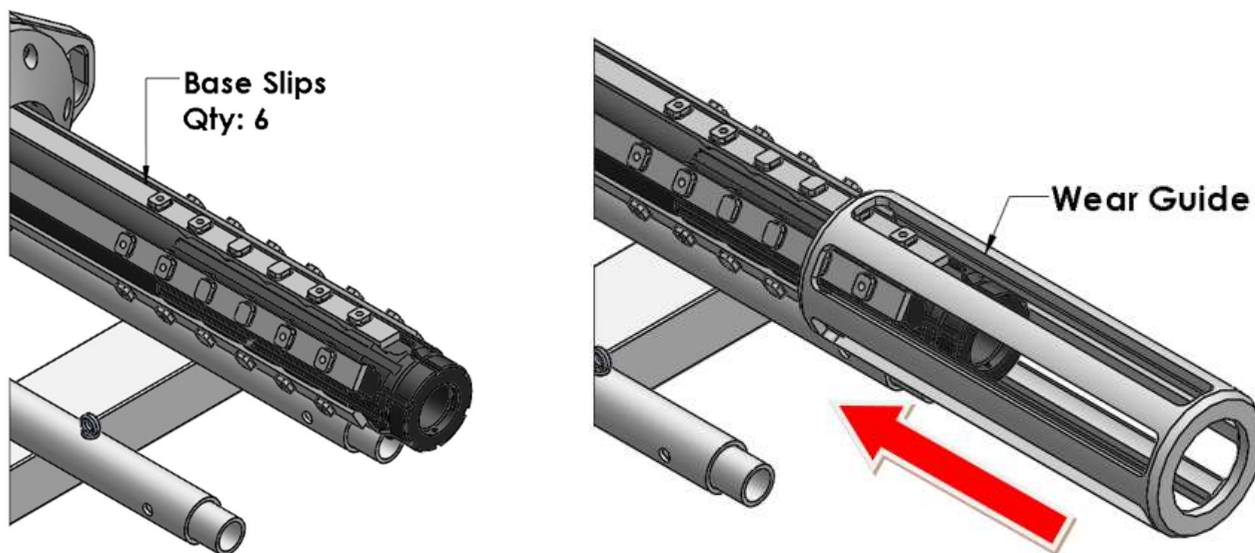
For pipe sizes smaller than 13 3/8”:

1. Grease slots and slide (Qty-6) Wear Guides in the slots as shown below.
2. 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.
3. Anti-seize Set Screws. Bolt (Qty-6) 3/8”-16 Set Screws into the Wear Guide Nut to secure the Wear Guide Nut.
Refer to Appendix 1.5: Bolt and Set Screw Torque for recommended torque chart.

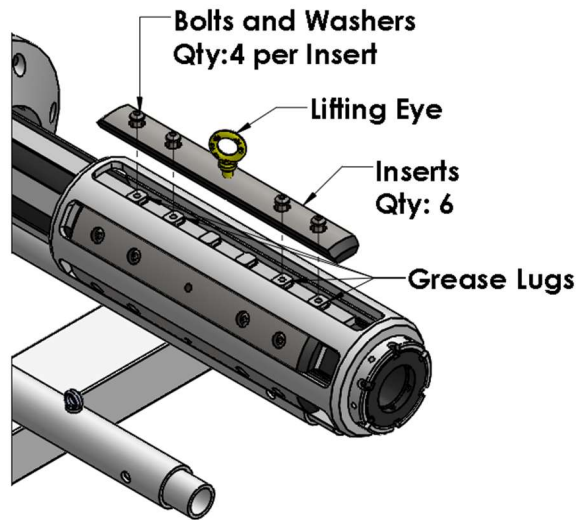


For pipe sizes 13 3/8” and larger:

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



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



When installing an insert kit 13 3/8" and larger, you must install the wear guide, then the circulator body. Lift up with the front jack under the circulator body, and then install the inserts. Failure to do so will throw the tool off balance towards the insert side. Since you must disengage the ratchet straps to rotate the tool to install the inserts on the bottom side, the tool will fall over.

6. Repeat step 2 and 3 to complete installing Wear Guide Nut and Set Screws.
7. To put the line 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).

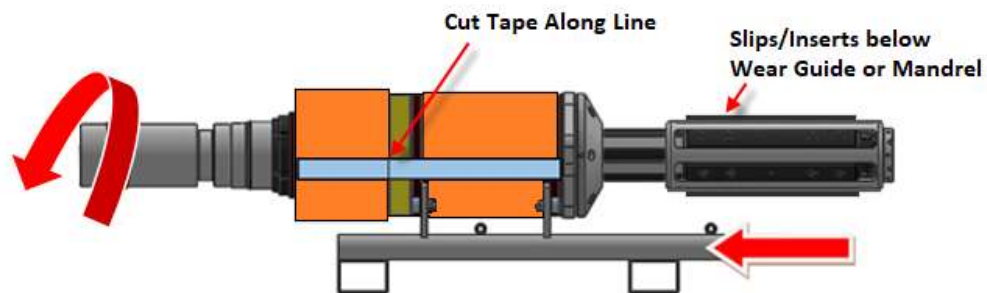
Warning: Loosen strap on the housing while rotating.

Warning: Never put hands on the lower half of the tool due to pinch points. Cam rollers present crushing hazard. When rolling a tool, roll from the 12:00 high position down to either 3:00 or 9:00 and no further.

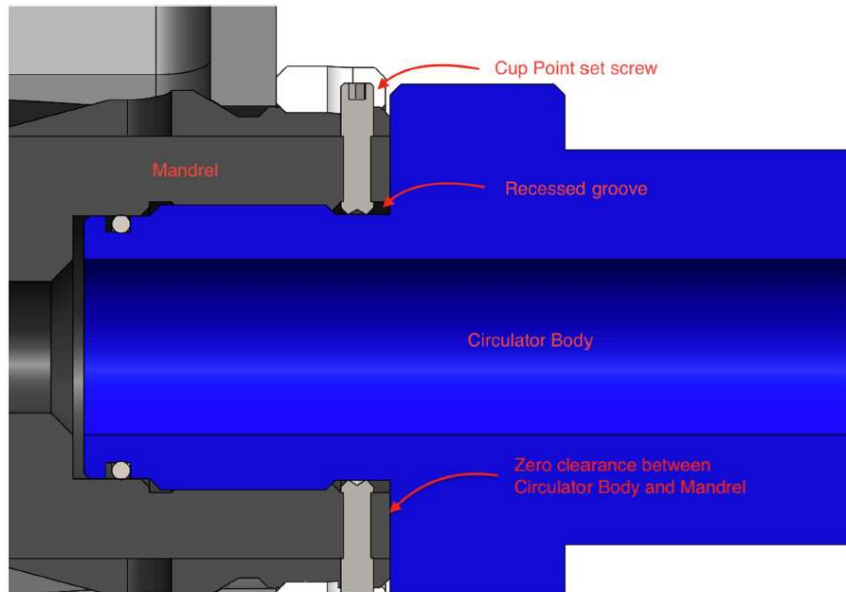
This should be the fully retracted position of the CRT. Two ways to verify that you are fully retracted are: 1) Slips/Inserts will be below the Dovetail Mandrel/Wear Guide. 2) Continued rotation will cause the Housing to rotate as well.

Note: 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.

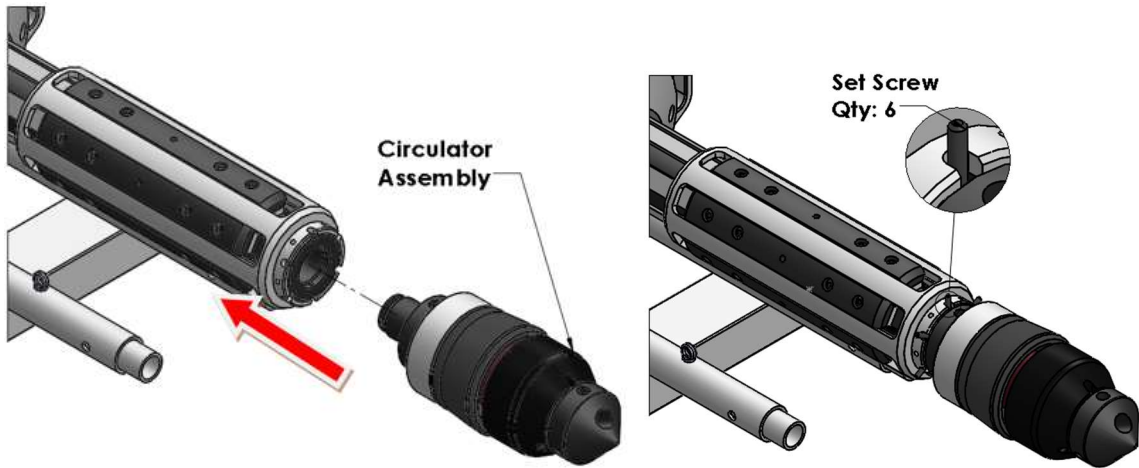
Remove existing tape/paint on the indicator. Use silver duct tape to make a line straight down the side of the Indicator and Housing. Cut tape at Indicator and housing.



8. Screw greased Circulator Assembly into the bottom of the Dovetail Mandrel, ensure that it is fully threaded into the CRT Mandrel and no gap is present between the Circulator Body and CRT Mandrel. See following page for information on constructing the Circulator Assembly.



9. Apply (Qty. 6) anti-seize 3/8"-16 set screws, install and apply proper torque. **Refer to Appendix 1.5: Bolt and Set Screw Torque for recommended torque chart.**



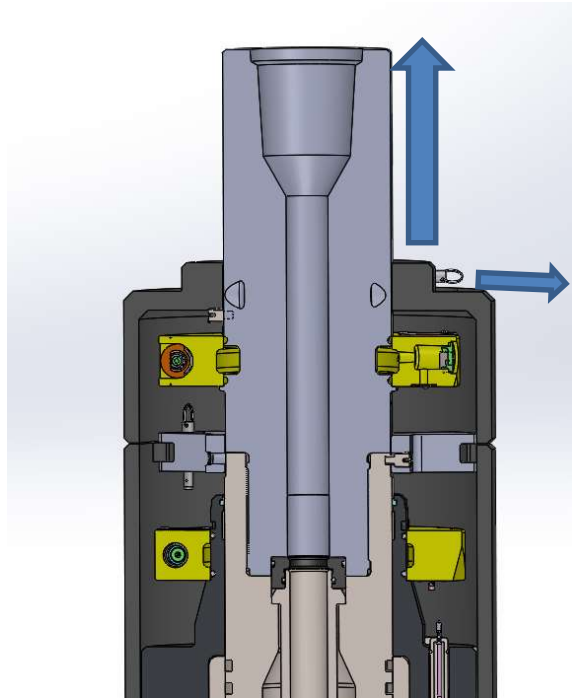
Section 14 - Assembly – Internal Circulator

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.
9. Install (Qty. 3) 3/8"-16 Set Screws in the Circulator Nose's set screw holes and apply proper torque.

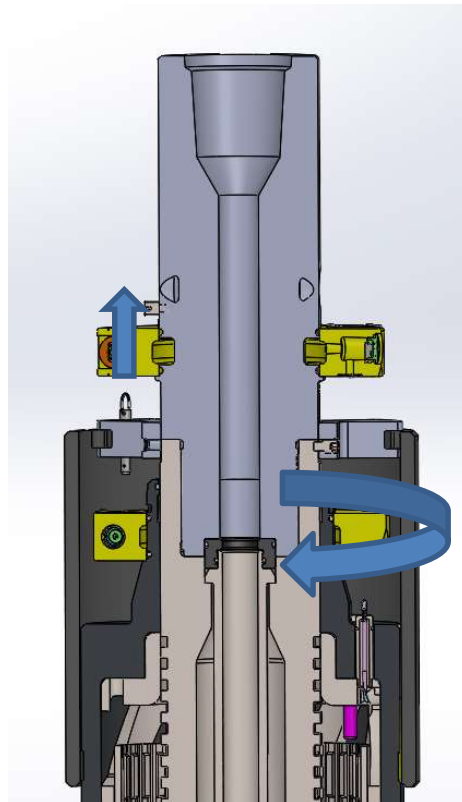
NOTE: Refer to drawing BOM for appropriate parts list

Section 15 - Assembly – SmartCRT Sub Removal

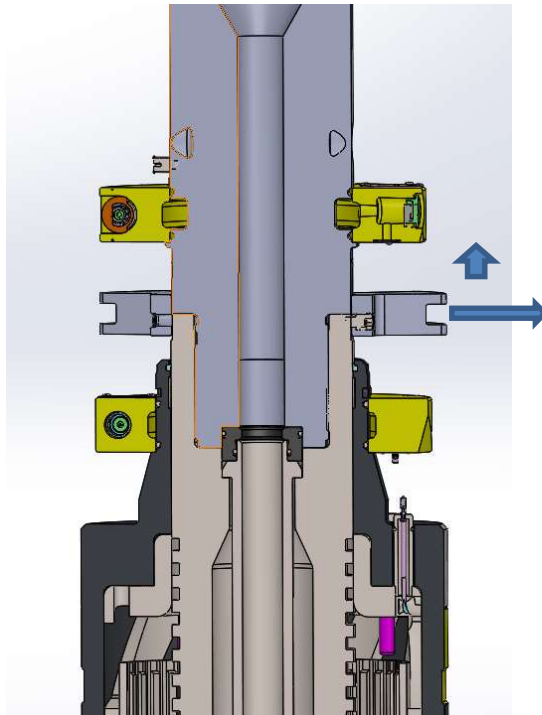
1.) Pull Pin, Remove Top Cover



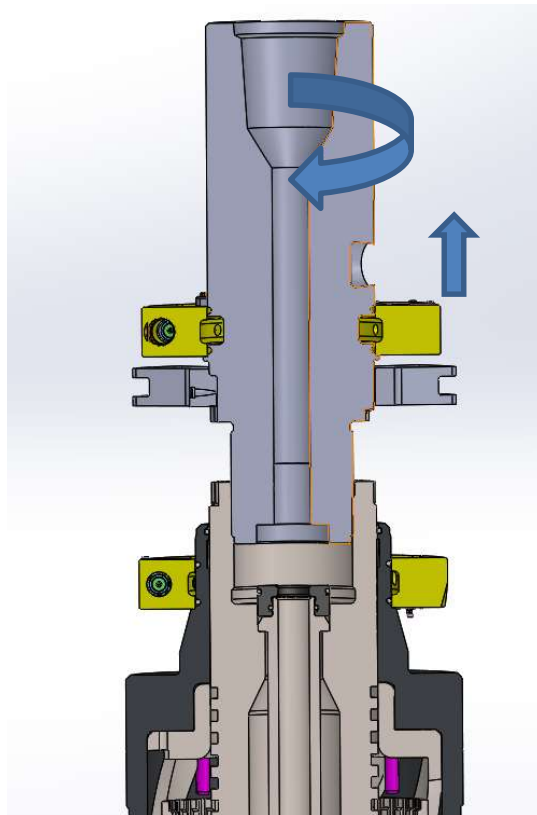
2.) Pull Retaining Pins QTY 2, Rotate Nylon Cover 60 deg and lift over top.



3.) Remove Snap Ring and shoulder bolts QTY 6, Raise Torque Ring



4.) Holding Up on Torque Ring, Rotate Top Sub to Unthread



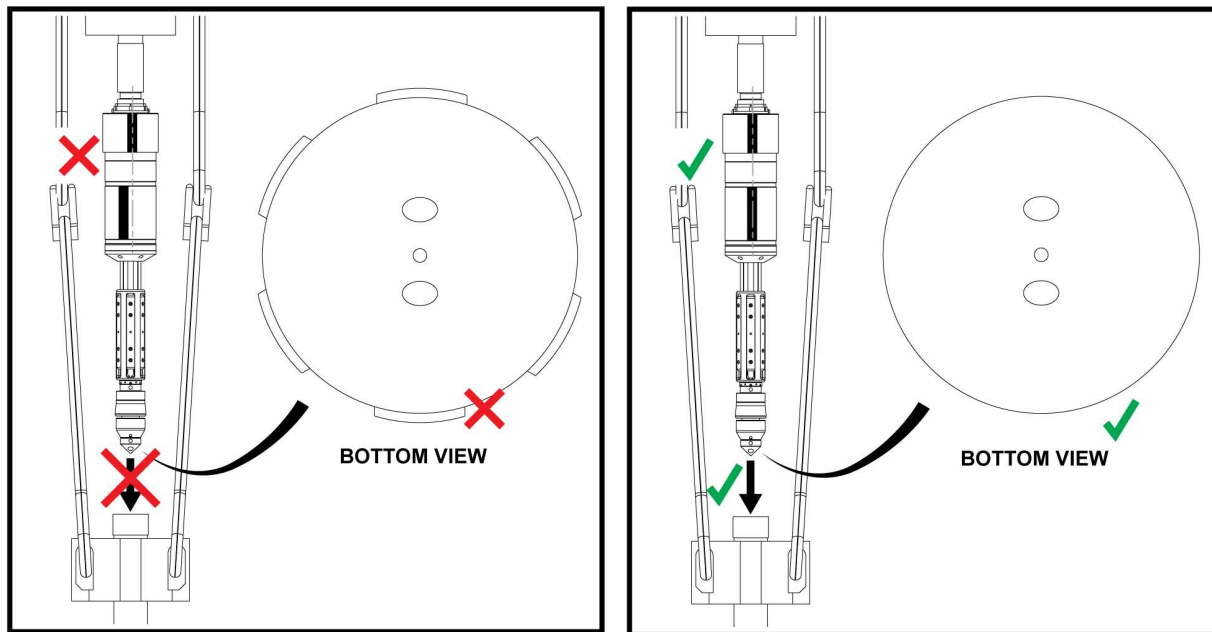
Section 16 - Troubleshooting

16.1 Rigging Up the CRT

1. CRT 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 CRT IF THE INDICATOR LINES ARE NOT ALIGNED. SLIPS MAY BE PARTIALLY ACTIVATED CAUSING CLEARANCE ISSUES FOR STABBING INTO CASING.



2. CRT 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 CRT.
- 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 CRT 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).

16.2 Engaging the CRT

1. THE CRT ROTATES ON TOP OF THE CASING AND WILL NOT ENGAGE.

- Verify the CRT 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.
 - 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 CRT AND PREVENT ACTIVATION OR CAUSE DAMAGE TO THREADED CONNECTIONS.

NOTE: REFER TO Appendix 1.4: Minimum Set Torque.

2. DURING TOOL ENGAGEMENT THE CRT ONLY ROTATES 1/2 TURN BEFORE TORQUE IS OBSERVED AND TOOL STOPS ROTATION.

- The CRT does not require a large amount weight to be applied when engaging the tool, reduce set down weight and continue rotation.
 - Verify tool has rotated the same number of rotations as observed during the “Stump Test” when the CRT was rigged up.
 - 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.

16.3 Disengaging the CRT

1. THE CRT 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).
- Lower top drive until the yellow window is completely covered. Apply 3000lbs of set down weight to create friction on the casing collar and rotate in reverse.

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

2. THE CRT 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).
- Fluid pressure against the packer cup can have enough force to lift the CRT 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 CRT.

3. CRT INDICATOR LINES HAVE MOVED AND ARE NO LONGER LINED UP – WHILE RIGGED INTO TOP DRIVE AND CRT 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 CRT 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 CRT WHILE RIGGED IN.

4. WHILE REMOVING THE CRT FROM THE CASING THE SLIPS SNAG OR LIFT THE CASING.

- **Immediately Stop Lifting!**

- If there are only 1-2 joints of casing in the hole the packer cup may have enough friction to hoist the string.
 - 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 CRT back into the pipe, confirm indicator lines are aligned by rotating in reverse with the tool in the Setting Position (yellow window).
 - Hoist slowly and monitor for casing movement.
 - 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 CRT INTO THE SETTING POSITION (YELLOW WINDOW).

- The internal seals on the Snorkel may be leaking, which could allow fluid to enter the Housing.
 - 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.

6. WHEN ATTEMPTING TO RELEASE THE TORQUE SET IN THE CRT, 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 CRT tool joint, follow the instructions below.
 - With the CRT 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.
 - Allow CRT to move into the Locked Position (white window) by slowly hoisting. Place back-ups on the casing and torque through the CRT until desired tool joint torque is achieved.
 - Place CRT in the Setting Position (yellow window) and release the initial setting torque of 3,500 ft-lb.

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

16.4 Backing Out Casing with the CRT

1. HIGH TORQUE CASING CONNECTION NEEDS TO BE “BROKEN-OUT” –

- With the Housing in the Locked Position (white window), apply sufficient reverse torque to break the casing connection. **REFER TO APPENDIX 1.1: SIZE AND RATINGS FOR RECOMMENDED TORQUES.**
 - Once the make-up torque has released from the casing connection (approximately 1 full rotation), stop rotation.
 - Apply manual tong on casing collar and release CRT from the casing and immediately re-torque to 3,500 ft-lb.
 - Place CRT into the Locked Position (white window) by slowly hoisting. Continue backing out threaded connection and follow procedure for “Backing Out Casing”.

Section 17 - Customer Feedback Form



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MCCOY GLOBAL INC.
Suite 201, 9910 39th Ave NW, Edmonton, AB T6E 5H8 Canada

INTELLIGENT PRODUCTIVITY SOLUTIONS.

Website: www.mccoysglobal.com

Email: sales@mccoysglobal.com

Thank you for choosing a CRT. 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 | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Product came with all required tools | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Product included user manual | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Customer support were responsive | <input type="checkbox"/> | <input type="checkbox"/> |

Suggestion and
Comment for
the Product:



Section 18 - Additional Documentation



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Customer:	Location:	Date:	New JSEA: <input type="radio"/> Yes <input type="radio"/> No	Revised JSEA: <input type="radio"/> Yes <input type="radio"/> No
Casing Running Tool (CRT)				
Basic Job Steps	Potential HS&E Concerns	Recommended Safe Procedures/Protection	Responsible Party	
Look over worksite	Employees not familiar with potential hazards of worksite and task.	All employees involved in the task shall be familiarized with all areas they will be working in.	Everyone involved in this task.	
Conduct safety meeting & review JSEA with rig crew.	Employees unfamiliar with task to be performed. SSE involved in task. Defective tools/equipment/PPE. Bad communication.	Review JSEA with rig crew so crew understands what they will be doing. Identify communication process to be used and identify PPE needed/safe handling procedure. Repair or replace defective tools/equipment/PPE.	Everyone involved in this task	
Pick up or lay down DWCRT from rig floor to catwalk or viseversa.	Overexertion or strain due to over extension. Tool damage, pinch points, overhead suspended/swinging loads.	Use tag lines to tag all equipment out the V-door. Watch hand/finger placement. Do no get under suspended loads. Establish good communication with winch operator. Use the fast line if a lay-down machine is available.	Everyone involved in this task	
Lowering the DWCRT to casing or rotary table.	Overexertion or strain due to over extension. Tool damage, pinch points, overhead suspended/swinging loads. Damage to Inserts or Packer Cup.	Use tag lines to tag all equipment out the V-door. Watch hand, finger placement. Do no get under suspended loads. Establish good communication with winch operator. Lock the rotary table. Never clamp slips on DWCRT Inserts. Grease Packer Cup before inserting in casing.	Driller, rig crew, CRT specialist	
Making up DWCRT to top drive.	Over torquing and seting insert into casing. Alignment issues may be present, which could affect how smoothly the CRT slinger enters casing.	Only apply recommended torque for tool joint. Once torque is set on tool joint with back ups, release back ups and rotate counter clockwise until DWCRT is in the retracted position.	Driller/CRT specialist	
Making up DWCRT to casing.	Off-center hole causes casing stabbing difficulties. Inserts or Bump Plate slip.	Level top drive/derrick as needed. Use link tilts if available to straighten pipe to receive the stinger of CRT smoothly. Replace worn Slips/Inserts. Set down more weight to stop Bump Plate from slipping.	Driller/CRT specialist	
Lowering casing with DWCRT.	Dies slipping. Overhead hazard.	Use more set torque on Slips/Inserts. Replace dies if needed. Be aware of overhead work and stand clear of lifted loads.	Driller, rig crew	
Fill-Up & Circulating	Potential of washing out a valve.	Wait for pressure to drop under the value agreed upon between driller and CRT specialist.	Driller, CRT specialist	



INTELLIGENT PRODUCTIVITY SOLUTIONS.

Removing DWCRT from casing after circulating.	Damage packer cup. Spray drilling fluids over the rig and employees.	Ensure all pressure is bled off and IBOP and 2" is open.	Driller
Releasing DWCRT from casing.	High torque release. Not being able to release.	Verify the set torque and adjust to same or slightly higher. Release set torque before setting weight on the tool. Communicate with winch operator.	Driller/CRT Specialist
Releasing DWCRT from casing after circulating.	Tool getting over torqued from long periods of circulating while rotating.	Take necessary precautions such as releasing and reengaging the tool every few hours.	Driller/CRT Specialist
Rig down DWCRT	Tool damage, pinch points, overhead suspended/swinging loads.	Use rig tongs or grabber box to break crossover sub. Watch hand. Finger placement using rig tongs. Do not get under suspended loads. Establish good communication with winch operator.	Everyone involved in this task
	Pinch points between waiting	Watch hand/foot placement. Use tag lines.	Everyone involved in this task
	Lose/damage equipment or vehicle because of improper securing or traffic accidents.	Make sure tools are secured properly. Drive safely, stop and rest when too tired to drive.	DrawWorks personnel
	Include HSE concerns	Include recommended safe procedure/protection.	



Real Time Data Direct to Drillers

FINGER-TIP MONITORING FROM THE DRILLER'S CABIN

smart

Increase your productivity by reducing your reliance on CRT technicians and reducing extensive Driller training time with the McCoy smartCRT

Mechanical CRT with Integrated electronics provides:

- » Torque, Tension, Pressure
- » RPM (Speed)
- » Make-up reports (Torque and Turns)
- » Post Job Report on Loads applied to the tool and casing

Display features:

- » One or many remote Displays
- » Real-time tool status and movements
- » Warning when safe limits are approached
- » ExpertDriller™ instructions – removes the requirement for extensive Driller training and removes the failure modes of sequence (Expertise not required)



The smartCRT Advantage



vs Conventional CRT



DRILLER USES DIGITAL REPRESENTATION ON THE REAL TIME DISPLAY (RTD) TO OPERATE THE TOOL

1. Displays the Load in real-time and warns when safe load limits are approached.
2. Digital representation of the actual movements of the tool eliminates the need for line of sight to operate.
3. Instructions on the Display help guide the Driller through the steps necessary to operate the tool.
4. Post Job Reports are auto-generated using recorded data. A large variety of reports are available.
5. Remote training and Tech Support with ability to view CRT status for rig operations and provide support remotely.

CRT TECHNICIAN IS REQUIRED TO PROVIDE INSTRUCTIONS TO THE DRILLER

1. Use of Top Drive loads Output with common calibration issues (expired calibration or calibrated at RPM).
2. Need line of sight path to tool, often high up in the derrick. Relies on using sight from floor hand/CRT Technician.
3. CRT Technician is required to provide instructions to the Driller.
4. Limited number of reports can be provided and all of them are manually prepared, hence subject to human error.
5. N/A CRT Technician is required to be on the rig at all times.

Contact a McCoy sales representative today for a full presentation

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smart

Easy-to-Navigate Display System

Settings Menu

Loading Details

Real-time Graphical Representation

Alerts/Warnings/Notifications

Connection and Battery Status

Chat Window

- » 24/7 access to a CRT Technician that can remote in to provide support

Internal CRT Display

Dynamic Window

- » Torque Tension Graph
- » Driller Instruction Screen
- » Tool Manual
- » MTT Screen/Connection Status
- » Procedures

Dynamic Window allows the Driller to access a variety of data for the job at hand

Driller Display

Graphic Display

- » Digital representation of the actual movements of the tool
- » No longer does a driller need to have line of sight and rely on assistance from a person on the rig floor to understand the state of the tool and ensure proper set, release etc.

Display

- » Load display and warning when safe load limits are approached
- » Prevents damage to the tool and casing

Specifications of 750 Ton smartCRT

Tubular Size	Weight Range	Casing ID (in)	API BC Host Capacity (tons)	Torque Capacity (ft*lbs)	Set Down Weight (Tons)	Min ID (in)	Flow Rate (bbbl/min)	OAL (in)	OAL w/ Circulator (in)	OD (in)	Approx. Weight (lbs)
7"	17 - 35#	6.538 - 6.004	400	50,000	100	1.5	12	124	142	19.75	3600
7-5/8"	24 - 42.8#	7.025 - 6.501	400	50,000	100	1.5	12	124	142	19.75	3600
8-5/8"	24 - 44.8#	8.097 - 7.825	750	90,000	100	2.0	20	124	144	19.75	3800
9-5/8"	36 - 59.4#	8.921 - 8.407	750	90,000	100	2.0	20	124	144	19.75	3900
9-7/8"	62.8#	8.625	750	90,000	100	2.0	20	124	144	19.75	3900
10-3/4"	40.5 - 60.7#	10.050 - 9.650	750	90,000	100	2.0	20	124	144	19.75	4000
10-3/4"	65.7 - 85.3#	9.500 - 9.150	750	90,000	100	2.0	20	124	144	19.75	4000
11-3/4"	47 - 71#	11.000 - 10.588	750	90,000	100	2.0	20	124	144	19.75	4100
11-3/4"	71 - 87.2#	10.588 - 10.282	750	90,000	100	2.0	20	124	144	19.75	4100
12-3/4"	44 - 77#	12.080 - 11.584	750	90,000	100	2.0	20	124	144	19.75	4100
13-3/8"	54.4 - 85#	12.615 - 12.159	750	90,000	100	2.0	20	124	144	19.75	4300
13-5/8"	88.2#	12.375	750	90,000	100	2.0	20	124	144	19.75	4300
16"	85 - 109#	15.250 - 14.688	750	90,000	100	2.0	20	124	149	19.75	4700
16-3/4"	85 - 109#	16.250 - 15.750	750	90,000	100	2.0	20	124	149	19.75	4700
18-5/8"	87.5 - 136#	17.755 - 17.239	750	90,000	100	2.0	20	124	149	19.75	5100
20"	94 - 139#	18.124 - 18.730	750	90,000	100	2.0	20	124	149	19.75	5400
20"	163 - 187#	18.625 - 18.125	750	90,000	100	2.0	20	124	149	19.75	5400
22"	170 - 224#	20.438 - 19.938	750	60,000	100	2.0	20	124	149	19.75	5800
24"	171 - 216#	22.685 - 22.185	750	60,000	100	2.0	20	124	149	22	6300
26"	202 - 275#	24.550 - 24.050	750	60,000	100	2.0	20	124	149	24	7000
30"	TBD	TBD	750	60,000	100	2.0	20	124	149	28	7000

Contact a McCoy sales representative today for a full presentation

mccoysglobal.com/MTT | sales@mccoysglobal.com



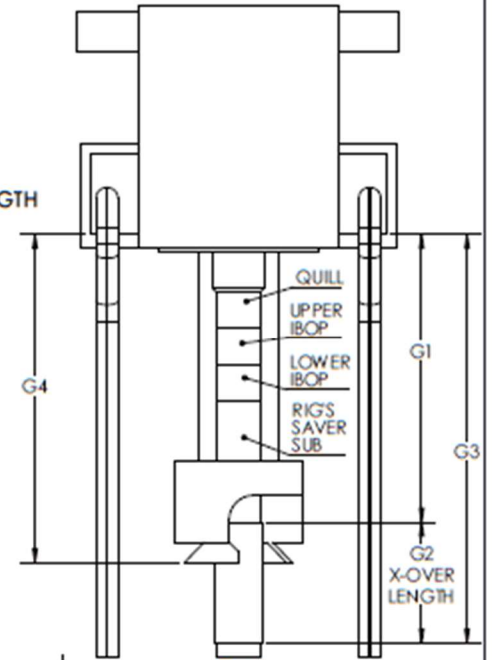
X-Over/DW Accessories	Length*	Actual	McCoy 750	Length*	Actual
X-Over	TBD		7" - 7-5/8"	139 in.	
DWSES	24-36 in.		8-5/8" - 13-5/8"	142 in.	
			16" - 20"	147 in.	

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

*Verify upon Rig Survey

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

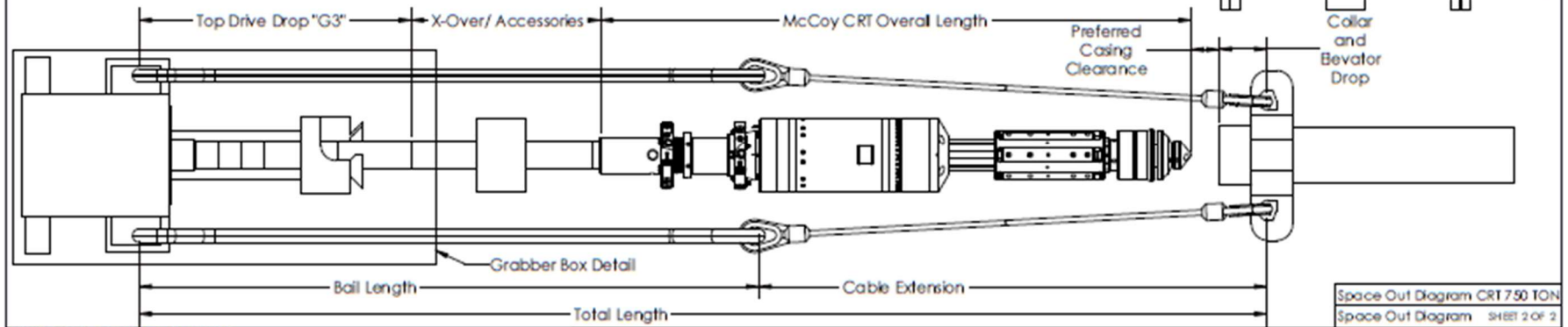
Grabber Box Drop Calculation
 $G1 + G2 - G4 = \text{Greater Than } 12"$
 (12" is the set minimum allowance for Manual Tong Gripping - when necessary)



$$\text{DROP "G3" + ACCESSORIES + DWCRT + PREFERRED CLEARANCE + COLLAR \& ELEVATOR DROP = TOTAL BAIL/CABLE LENGTH}$$

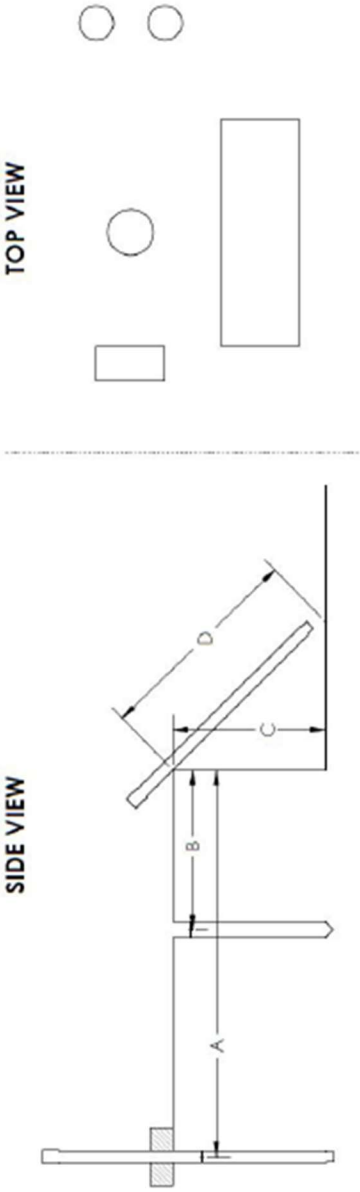



$$\text{X-OVER + SUM OF DROP = BAIL LENGTH + SLINGS/CABLES}$$

"G2" (G1, ACCS., DWCRT, PF. CLEARANCE, COLLAR/ELEVATOR)



Space Out Diagram CRT 750 TON
 Space Out Diagram SHEET 2 OF 2

Surveyor:		Date:	
Location:		Rig Manager:	
Drilling Contractor:		Rig Name:	
Operator:		Rep:	
Casing/Connection Data			
Diameter:	String Length:	Drift Measured:	
Weight:	Est. String Weight:	Torque (ft. lbs)	
Grade:	Pipe Body Yid (lbs):	Min:	Opt:
Connection:	CRT Hoist (ton):	Max:	
Pipe Range:	Casing Yld Strength (psi):		
Casing/Connection Data			
Diameter:	String Length:	Drift Measured:	
Weight:	Est. String Weight:	Torque (ft. lbs)	
Grade:	Pipe Body Yid (lbs):	Min:	Opt:
Connection:	CRT Hoist (ton):	Max:	
Pipe Range:	Casing Yld Strength (psi):		
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: <input type="checkbox"/> No: <input type="checkbox"/>		
Quill Connection			
Connection	ID	OD	Max. Trq
Bail / Saver Sub Requirements			
Bail Length Required:	Bail Extension/Cable 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: Rotary Table Size/Type	
Rig Floor and V-door Measurements	
A:	B: C: D:
	
Electronics/RF Connectivity	
Electronics Certification Required: yes / no	Rig WiFi/Signal Strength:
Location of 120/240 V Power Source Place X on map.	Location for Safe area Toughbook/Smart Hub:
Plug Type:   	
Plug Voltage: 120 240	Display mounting area:
Report sent to email:	

Appendix 1.1: Size and Ratings

750T CRT Internal Specifications											
Tubular Size	Weight Range	Casing ID (in)	API 8C Hoist Capacity (tons)	Torque Capacity (ft*lbs)	Set Down Weight (Tons)	Min ID (in)	Flow Rate (bbl/min)	OAL (in)	OAL w/ Circulator (in)	OD (in)	Approx. Weight (lbs)
7"	17 - 35#	6.538 - 6.004	400	50,000	100	1.5	12	124	142	19.75	3600
7-5/8"	24 - 42.8#	7.025 - 6.501	400	50,000	100	1.5	12	124	142	19.75	3600
8-5/8"	24 - 44 #	8.097 - 7.625	750	90,000	100	2.0	20	124	144	19.75	3800
9-5/8"	36 - 59.4 #	8.921 - 8.407	750	90,000	100	2.0	20	124	144	19.75	3900
9-7/8"	62.8#	8.625	750	90,000	100	2.0	20	124	144	19.75	3900
10-3/4"	40.5 - 60.7#	10.050 - 9.660	750	90,000	100	2.0	20	124	144	19.75	4000
10-3/4"	65.7 - 85.3#	9.560 - 9.156	750	90,000	100	2.0	20	124	144	19.75	4000
11-3/4"	47 - 71#	11.000 - 10.586	750	90,000	100	2.0	20	124	144	19.75	4100
11-3/4"	71 - 87.2#	10.586 - 10.282	750	90,000	100	2.0	20	124	144	19.75	4100
12-3/4"	44 - 77#	12.080 - 11.584	750	90,000	100	2.0	20	124	144	19.75	4100
13-3/8"	54.4 - 85#	12.615 - 12.159	750	90,000	100	2.0	20	124	144	19.75	4300
13-5/8"	88.2#	12.375	750	90,000	100	2.0	20	124	144	19.75	4300
16"	65 - 109#	15.250 - 14.688	750	90,000	100	2.0	20	124	149	19.75	4700
16-3/4"	65 - 109#	16.250 - 15.750	750	90,000	100	2.0	20	124	149	19.75	4700
18-5/8"	87.5 - 136#	17.755 - 17.239	750	90,000	100	2.0	20	124	149	19.75	5100
20"	94 - 133#	19.124 - 18.730	750	90,000	100	2.0	20	124	149	19.75	5400
20"	163 - 187#	18.625 - 18.125	750	90,000	100	2.0	20	124	149	19.75	5400
22"	170 - 224#	20.438 - 19.938	750	60,000	100	2.0	20	124	149	19.75	5800
24"	171 - 216#	22.685 - 22.185	750	60,000	100	2.0	20	124	149	22	6300
26"	202 - 275#	24.550 - 24.050	750	60,000	100	2.0	20	124	149	24	7000
30"	TBD	TBD	750	60,000	100	2.0	20	124	149	28	7000

Appendix 1.4: Minimum Set Torque

SmartCRT Internal (400 Ton) and (750 Ton)

Minimum Set Torque before Applying Torque in Locked Position		
CRT Mandrel	Minimum Set Torque	Make-Up Torque
400T 750T	3,500 ft-lb	0 – 9K ft-lb
400T 750T	5,000 ft-lb	10K – 19K ft-lb
400T 750T	10,000 ft-lb	20K – 39K ft-lb
400T 750T	15,000 ft-lb	40K – 50K ft-lb
750T	25,000 ft-lb	50-90k ft-lb

Appendix 1.5: Bolt and Set Screw Torque

Cup Point Set Screw	Tightening Torque In-lb.(N-m)
1/4"	94 (127.4)
5/16"	183 (248.1)
3/8"	317 (429.8)
7/16"	502 (680.6)
1/2"	750 (1016.9)

Appendix 1.6: Tool Joint Sizes and Make-up Torque

Tool Joint Sizes & Makeup Torque		
Tool Joint Size	Hoist Capacity (Tons)	API Make-up Torque (ft-lb)
6-5/8" REG Box	750	62,000

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 CRT and Top Drive). Contact McCoy for alternate connection options.

Appendix 1.7: Packer Cup, Gage Ring, Thimble Size Chart

Please see the CRT Table 17 for complete list of Packer Cup, Gage Ring and Thimble sizes. The CRT family is 10,000 PSI capable but limited to the maximum working pressure of the Packer Cup.

*An updated CRT Table 17 can be found on the McCoy Global website

<https://www.mccoysglobal.com/products-and-services/dw-casing-running-tool-dwcrt/>

Casing Size	Weight Range ¹	Nominal Casing ID Range (inches)	DWCRT Internal Gripping Assembly PN	DWCRT External Gripping Assembly PN	smartCRT Gripping PN	Gage Ring	Gage Ring OD	Packer Cup	Packer Cup OD ¹	Packer Cup Rated Pressure	Thimble	Thimble OD
7"	17/23#	6.538 - 6.366	605730-0006	606280-0021	1006375-0001	605074	6.241"	605001	6.740"	5,000 psi	605000	5.91"
	23/26#	6.366 - 6.276	605730-0006	606280-0021	1006375-0001	605075	6.151"	605002	6.460"	5,000 psi	605000	5.91"
	26-29#	6.276 - 6.184	605730-0006	606280-0021	1006375-0001	1005925	6.029"	1005924	6.38"	5,000 psi	605000	5.91"
	29/32#	6.184 - 6.094	605730-0006	606280-0021	1006375-0001	605076	5.969"	605003	6.469"	5,000 psi	605000	5.91"
	35#	6.004	605730-0006	606280-0021	1006375-0001	605077	5.875"	605012	6.200"	5,000 psi		
7-5/8"	24/26.4#	7.025 - 6.969	605730-0039	606280-0022		605078	6.750"	605438	7.150"	5,000 psi	605009	6.24"
	24/29.7#	7.025 - 6.875	605730-0039	606280-0022		605078	6.750"	605010	7.150"	5,000 psi	605009	6.24"
	29.7-33.7#	6.875 - 6.765	605730-0039	606280-0022		605676	6.640"	605437	7.050"	5,000 psi	605009	6.24"
	33.7/42.8#	6.765 - 6.501	605730-0039	606280-0022		605079	6.376"	605011	6.876"	5,000 psi	605009	6.24"
8-5/8"	24 #	8.097	605730-0045	N/A	1006375-0006	605973	7.972"	602721	8.250 "	5,000 psi	605975	7.50"
	28/36#	8.017 - 7.825	605730-0045	N/A	1006375-0006	605092	7.700"	600288	8.150"	4,250 psi	600304	7.50"
	40-44#	7.725 - 7.625	605730-0045	N/A	1006375-0006	605974	7.500"	605977	-	4,250 psi	605976	7.38"
9-5/8"	36#	8.921	605730-0047	N/A	1006375-0002	605780	8.765"	601925	9.210"	4,250psi	602205	8.77"
	36/47#	8.921 - 8.681	605730-0047	N/A	1006375-0002	605093	8.379"	601207	9.061"	4,250psi	600305	8.26"
	47/53.5#	8.681 - 8.535	605730-0047	N/A	1006375-0002	605093	8.379"	600290	8.850"	4,250psi	600305	8.26"
	53.5/59.4#	8.535 - 8.407	605730-0047	N/A	1006375-0002	605094	8.250"	605781	8.700"	4,250psi	600305	8.26"
9-7/8"	62.8#	8.625	605730-0047	N/A	1006375-0002	605093	8.379"	601207	9.061"	4,250psi	600305	8.26"
10-3/4"	40.5/60.7#	10.050 - 9.660	605730-0048	N/A	1006375-0008	605095	9.504"	601217	10.200"	3,750 psi	600306	9.51"
10-3/4"	40.5-55.5	10.050 - 9.760	605730-0048	N/A	1006375-0008	605095	9.504"	603363	10.010"	3,750 psi	600306	9.51"
10-3/4"	65.7-73.2#	9.560 - 9.406		N/A	1006375-0007	606503	9.250"	600771	9.800"	3,750 psi	606504	9.17"
10-3/4"	96.8-108.7##	8.906 - 8.656	605730-0047	N/A	1006375-0002	605093	8.379"	600290	8.850"	4,250psi	600305	8.26"
11-3/4"	47/71#	11.000 - 10.586	605730-0043	N/A	1006375-0009	605096	10.430"	601208	11.000"	2,000 psi	600307	9.96"
	71-87.2#	10.586 - 10.282		N/A	1006375-0010			604092	10.610"	2,000 psi	600307	9.96"
11-7/8"	71.8#	10.711	605730-0043	N/A	1006375-0009	605096	10.430"	601208	11.000"	2,000 psi	600307	9.96"
12-3/4"	44-58#			N/A								
12-3/4"	65-77#			N/A								
13-3/8"	54.5/72#	12.615 - 12.347	6057030-0029	N/A	1006375-0003	605097	12.003"	601212	12.800"	2,000 psi	600308	12.00"
13-3/8"	72-85#	12.347 - 12.159	6057030-0029	N/A	1006375-0003	605097	12.003"	602946	12.450"	2,000 psi	600308	12.00"

Casing Running Tool Size Chart

Casing Size	Weight Range ¹	Nominal Casing ID Range (inches)	DWCRT Internal Gripping Assembly PN	DWCRT External Gripping Assembly PN	smartCRT Gripping PN	Gage Ring	Gage Ring OD	Packer Cup	Packer Cup OD ¹	Packer Cup Rated Pressure	Thimble	Thimble OD
8-5/8"	28/36#	8.017 - 7.825	605730-0045	N/A	1006375-0006	605092	7.700"	600288	8.150"	4,250 psi	600304	7.50"
	40-44#	7.725 - 7.625	605730-0045	N/A	1006375-0006	605974	7.500"	605977	-	4,250 psi	605976	7.38"
9-5/8"	36#	8.921	605730-0047	N/A	1006375-0002	605780	8.765"	601925	9.210"	4,250psi	602205	8.77"
	36/47#	8.921 - 8.681	605730-0047	N/A	1006375-0002	605093	8.379"	601207	9.061"	4,250psi	600305	8.26"
	47/53.5#	8.681 - 8.535	605730-0047	N/A	1006375-0002	605093	8.379"	600290	8.850"	4,250psi	600305	8.26"
	53.5/59.4#	8.535 - 8.407	605730-0047	N/A	1006375-0002	605094	8.250"	605781	8.700"	4,250psi	600305	8.26"
9-7/8"	62.8#	8.625	605730-0047	N/A	1006375-0002	605093	8.379"	601207	9.061"	4,250psi	600305	8.26"
10-3/4"	40.5/60.7#	10.050 - 9.660	605730-0048	N/A	1006375-0008	605095	9.504"	601217	10.200"	3,750 psi	600306	9.51"
10-3/4"	40.5-55.5	10.050 - 9.760	605730-0048	N/A	1006375-0008	605095	9.504"	603363	10.010"	3,750 psi	600306	9.51"
10-3/4"	65.7-73.2#	9.560 - 9.406		N/A	1006375-0007	606503	9.250"	600771	9.800"	3,750 psi	606504	9.17"
10-3/4"	96.8-108.7##	8.906 - 8.656	605730-0047	N/A	1006375-0002	605093	8.379"	600290	8.850"	4,250psi	600305	8.26"

Casing Running Tool Size Chart

Casing Size	Weight Range ¹	Nominal Casing ID Range (inches)	DWCRT Internal Gripping Assembly PN	DWCRT External Gripping Assembly PN	smartCRT Gripping PN	Gage Ring	Gage Ring OD	Packer Cup	Packer Cup OD ¹	Packer Cup Rated Pressure	Thimble	Thimble OD
13-3/8"	68# Premium	12.415	6057030-0029	N/A	1006375-0003	1007422	12.259"	1007421	12.600"	2,000 psi	600308	12.00"
13-3/8"	72# Premium	12.347	6057030-0029	N/A	1006375-0003	1007420	12.191"	1007419	12.480"	2,000 psi	600308	12.00"
13-3/8"	86/92#	12.125-12.031	6057030-0051	N/A	1006375-0003	1006560	11.750"	1006559	12.350"	2,000 psi	1007324	11.75"
13-5/8"	88.2#	12.375	6057030-0029	N/A	1006375-0003	605097	12.003"	602946	12.450"	2,000 psi	600308	12.00"
16"	65/75#	15.250 - 15.124	605730-0049	N/A	1006375-0011	602439	14.936"	601209	15.438"	2,000 psi	N/A	-
	75#	15.124	605730-0049	N/A	1006375-0011			601895				
	84#	15.01	605730-0049	N/A	1006375-0011	604611	14.800"	600297	15.25"	2,000 psi	N/A	-
	95-99#	14.868 - 14.810	605730-0049	N/A	1006375-0011	600257	14.500"	603671	15.10"	2,000 psi	N/A	-
	109#	14.688	605730-0049	N/A	1006375-0011	600257	14.500"	602283	14.88"	2,000 psi	N/A	-
18-5/8"	87.5-94.5#	17.755 - 17.689	605730-0031	N/A	1006375-0013	600634	17.400"	601210	18.000"	1,750 psi	N/A	-
	106/117.5#	17.552 - 17.425	605730-0031	N/A	1006375-0013	603649	17.250"	600299	17.800"	1,750 psi	N/A	-
	123.4 - 136 #	17.375 - 17.239		N/A	1006375-0013	603849	16.982"	603958	17.430"	1,750 psi	N/A	-
20"	94/106.5#	19.124 - 19.000	605730-0032	N/A	1006375-0014	600259	18.800"	601211	19.370"	1,500 psi	N/A	-
	94-106.5#	19.124 - 19.000	605730-0032	N/A	1006375-0014	604000	18.740"	603781	19.250"	1,500 psi	N/A	-
	118.5#	18.874	605730-0032	N/A	1006375-0014	605597	18.600"	603782	19.100"	1,500 psi	N/A	-
20"	129-133#	18.710 - 18.730	605730-0032	N/A	1006375-0014	602641	18.500"	600301	18.980"	1,500 psi	N/A	-
20"	163/187#	18.625 - 18.125			1006375-0015							
20"	203#	18		N/A		1006547	17.630"	1006546	18.250"	1,500 psi	N/A	-
Sizes Past 20" Are not based on any particular standard or manufacture for determining weight range. Please Verify Casing ID and Tool Component OD before use												
22	170-224#	20.438 - 19.938	605730-0053		1006375-0016	605542	19.810"	605502	20.200"	1,000 psi	N/A	-
24	171-216#	22.685 - 22.185	605730-0052		1006375-0004	605543	22.060"	605503	22.875"	800 psi	N/A	-
26	202-275#					605544	23.900"	605504	24.750"	800 psi	N/A	-

1. These are recommended weight ranges. Casing Coupling types and Tolerances should be review prior to use. For packer cups we recommend .25" interference for standard casing connections and .125-.175" for premium connections.

2. Alternate sizes for 5-1/2" are available. Review the Layout Drawings