

6"

Manual No: **DL-735-6000-1667**

Revision: A

Revision Date: **06/30/2023**

Approved by: E.Visaez

A) DESCRIPTION

The WR Bridge Plug is wireline set, wireline retrieve, packer-type bridge plug capable of holding differential pressure from above or below. The WR Bridge Plug is used for a temporary bridge plug for acidizing, fracturing, cementing, casing pressure tests, well head replacement, and zone isolation. The WR Bridge Plug utilizes standard wireline or hydraulic setting tools.

B) RELATED TOOLS (sold separately)

- B-1) 5-1/2" 6" Wireline Adapter Kit (WLAK) (P/N 73557-20)—refer to technical manual DL-735-5500-834.
- B-2) 6" Retrieving Tool (PN 73560RT)—refer to technical manual DL-735-6000-1668.

C) SPECIFICATION GUIDE

	I HOLESIZE				
SIZE (INCHES)			TOOL GAGE OD (INCHES)	THREAD CONNECTION PIN UP	PART NUMBER
6	24.5	5.200	5.000	0.875-14 UNF	73562X

DIFFERENTIAL PRESSURE (MAX) FROM ABOVE FROM BELOW		TENSILE LOAD SHEAR STUD RATING	TENSILE LOAD RATING DURING RETRIEVAL
		(MAX)	(MAX)
10,000 PSI	10,000 PSI	48,000 LBS	63,000 LBS

D) PRE-INSTALLATION INSPECTION PROCEDURES

CAUTION₁: D&L ships tool connections made-up **HAND TIGHT**—labeled with hand-tight tape on the tool (Fig. 1)—unless stated otherwise. Tighten/torque all connections properly before operating tool.



G	GENERAL THREAD CONNECTION TORQUE RECOMMENDATIONS					
STUB ACME /	INTERNAL TAPEI	RED TUBING THREADS	PREMIUM THREADS			
ACME THREADS	UP TO 2-3/8"	GREATER THAN 2-3/8"	TREMIENT TIMES			
600 – 800 FT-LBS	600 – 800 FT-LBS	800 – 1,200 FT-LBS	Consult thread manufacturer's recommendations.			

GENERAL SCREW TORQUE RECOMMENDATIONS									
SCREW SIZE (INCHES)	#6	#8	#10	1/4	5/16	3/8	7/16	1/2	5/8 and larger
TORQUE RANGE (INCH-POUNDS)	5 – 8	10 – 15	18 – 25	25 – 40	50 – 80	90 – 135	160 – 210	250 – 330	450 - 650

D & L OIL TOOLS

P.O. BOX 52220 TULSA, OK 74152

PHONE: (800) 441-3504 www.dloiltools.com



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D) PRE-INSTALLATION INSPECTION PROCEDURES (cont'd)

Before first use, D&L recommends disassembly and inspection of the tool unless stated otherwise. Ensure parts have not been damaged during shipping. Replace damaged parts with D&L replacement parts. Contact D&L sales for replacement part information.

Re-assemble the tool after inspection. Install parts in the correct order and orientation. Properly tighten connections.

Before re-using the tool, D&L recommends disassembly and inspection of the tool. Clean parts and ensure parts are in good working condition. Replace worn or damaged parts with D&L replacement parts.

When redressing the tool, D&L recommends replacement of all seals, elements, o-rings, shear screws, etc. Contact D&L sales for redress kit and/or other replacement part information.

E) SETTING PROCEDURES

CAUTION₂: Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

The WR Bridge Plug is set on a #20 Baker E-4 wireline pressure setting assembly and wireline adapter kit.

The recommended running speed for the WR Bridge Plug is 100 ft/min. Well conditions may require much slower speeds to avoid damaging the tool.

During setting, a calculated force of 48,000 lbs may be pulled on the 6" Wireline Set Bridge Plug.

F) RETRIEVING PROCEDURES

The WR Bridge Plug is retrieved using the WR Bridge Plug Retrieving Tool.

F-1.1) TUBING RETRIEVAL

Make up the retrieving tool on the work string and run it to the setting depth. In the event sand or other debris is present on top of the WR Bridge Plug, standard washing may be continued to equalize any differential pressure across the plug - set down approximately 1,200 - 4,800 lbs (1,200 lbs/screw). This shifts the equalizing sleeve downward opening the equalizing ports, and latches the retrieving collet into the latch of the WR Bridge Plug.

After the differential is equalized, the head is latched onto the plug. The tool is released by the application of a minimum of 3,600 lbs tension. Continue to move the tool up the hole to completely stretch out the slip system and retrieve the tool from the hole. Slowly retrieve the plug for 100 ft to allow the packing element system to relax and pass through the casing without hanging up. After the elements have relaxed, the recommended retrieving speed is 100 ft/min. Well conditions may require much slower speeds to avoid damaging the tool.

F-1.2) SANDLINE RETRIEVAL

Make up the retrieving tool with the stem and the jars. Position the jars immediately above the retrieving tool. Flag the line and run the tools to setting depth. Jar down to open the equalizing sleeve. Allow sufficient time for any pressure differential to equalize. Pull a minimum of 3,600 lbs or jar upward to release the plug. Continue to move the tool up the hole to completely stretch out the slip system and retrieve the tool from the hole. Slowly retrieve the plug for 100 ft to allow the packing element system to relax and pass through the casing without hanging up. After the elements have relaxed, the recommended retrieving speed is 100 ft/min. Well conditions may require much slower speeds to avoid damaging the tool.



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G) STORAGE RECOMMENDATIONS

When preparing the tool for storage, follow the Pre-Installation Inspection Procedures. Re-assemble the tool with connections hand-tight only and in running position if applicable. Elements should be in a relaxed state—free from tension, compression, and other stresses that could cause deformation.

Store the tool, if possible, in an enclosed, temperature and humidity controlled environment. Avoid excessively high temperatures over long periods of time. Shield elastomeric parts from ultraviolet light sources. Keep tool dry and protected from condensation. Do not store in contact with or near volatile or corrosive chemicals. Do not store near ozone generating equipment or operations such as welding.

H) ELASTOMER TRIM TEMPERATURE GUIDE

N	ITRILE (STD)		
TEMPERATURE	DUROMETER			
RANGE (F°)	END	MIDDLE	END	
40° - 125°	80	70	80	
125° - 250°	90	70	90	

RUBBER	TEMPERATURE		
TYPE	RANGE		
NITRILE	40° - 250°F		

I) RECOMMENDED TOOLS

I-1) HAND TOOLS

- VISE
- GLOVES
- ALLEN WRENCHES
- TAPE MEASURE
- O-RING PICK
- BAR
 - 1/2-INCH
 - 3/4-INCH

- PAINT BRUSH, 2-INCH
- PIPE WRENCH, 3-FT (2 EA)
- "CHEATER" PIPE, 4-FT LONG
- ADJUSTABLE WRENCH, 12-INCH
- CORDLESS DRILL, 18V
- SNAP RING SPREADER PLIERS
- ALIGNING PUNCH

- SCREWDRIVER SET, FLAT-TIPPED
- SOCKET SETS
- 3/8-INCH DRIVE
- 1/2-INCH DRIVE
- HAMMERS
 - SLEDGE
 - BALL PEEN
 - DEAD BLOW

I-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	6" ASSEMBLY TOOL	AT73560-1
T2	1	6" DISASSEMBLY TOOL	AT73560-2

J) DISASSEMBLY

- J-1) Clamp upper gage ring (23) in vise.
 - J-1.1) From upper end of tool, unscrew and remove shear stud (8) from inner plug (22).
 - J-1.2) Unscrew and remove clutch ring (10) from inner plug (22).
 - J-1.3) Unscrew and remove shear screws (24) from latch (4).
 - J-1.4) Remove latch (4) from inner plug (22).
 - J-1.5) Unscrew and remove shear screw (24) from equalizing sleeve (15).
 - J-1.6) Remove equalizing sleeve (15) from ratchet mandrel top (20).
 - J-1.6.1) Remove o-rings (32) from equalizing sleeve (15).



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J) DISASSEMBLY (cont'd)

- J-1.7) Move to lower end of tool. Unscrew and remove inner mandrel cap (19) from inner mandrel (2).
- J-1.8) Move to upper end of tool. Pull on inner plug (22) to remove inner mandrel assembly from ratchet mandrel (2).

NOTE₁: Additional pulling force may be required to overcome spring resistance of collet fingers on ratchet mandrel top (20).

- J-1.9) Disassemble inner mandrel assembly:
 - J-1.9.1) Unscrew and remove inner plug (22) from inner equalizing body (21).
 - J-1.9.1.1) Remove o-ring (29) from inner plug (22).
 - J-1.9.2) Unscrew and remove inner equalizing body (21) from inner mandrel (2).
 - J-1.9.2.1) Remove o-ring (30) from inner equalizing body (21).
- J-1.10) Unscrew upper cone (9) from lower gage ring (5).
- J-1.11) Unscrew ratchet mandrel (6) from ratchet mandrel top (20) and from ratchet ring (3).

NOTE₂: For added leverage, insert rod or assembly punch (T1-6) into ratchet mandrel (6) through holes in slip body (18) and lower cone (16) as needed.

- J-1.12) Remove slip body assembly from rubber mandrel (11). Set assembly aside temporarily to be disassembled in later steps.
- J-1.13) Unscrew and remove shear screws (25) from upper gage ring (23).
- J-1.14) Remove ratchet mandrel top (20) from upper gage ring (23).
 - J-1.14.1) Remove o-ring (31) from groove in ratchet mandrel top (20).
- J-1.15) Unscrew and remove shear screw (1) from rubber mandrel (11).
- J-1.16) Unscrew and remove ratchet ring (3) from rubber mandrel (11).
- J-1.17) Unscrew rubber mandrel (11) from upper gage ring (23).
- J-1.18) Remove rubber mandrel assembly and disassemble:
 - J-1.18.1) Unscrew shear screws (25) from lower gage ring (5).
 - J-1.18.2) Remove elements (13,14), rubber spacers (12), and lower gage ring (5) from rubber mandrel (11).
 - J-1.18.3) Remove o-ring (31) from rubber mandrel (11).
- J-2) Unclamp and remove upper gage ring (23) from vise.
- J-3) Remove slip assemblies from slip body (18) before using disassembly tool (T2):
 - J-3.1) Unscrew and remove set screws (27) from slip body (18).
 - J-3.2) Unscrew slip body cap (28) from slip body (18) and remove from lower cone (16).
 - J-3.3) Wedge slips (7) outwards if needed. Remove slip body (18) from lower cone (16).
 - J-3.4) Remove slips assemblies and disassemble. Remove wedges (if needed):
 - J-3.4.1) Unscrew and remove button head cap screws (26) from slips (7).
 - J-3.4.2) Remove slip springs (17) from slips (7).
 - J-3.5) Reinstall slip body (18) onto lower cone (16).
 - J-3.6) Screw slip body cap (28) onto slip body (18).
- J-4) Clamp slip body assembly in vise and disassemble using disassembly tool (T2):
 - J-4.1) Clamp slip body (18) in vise.
 - J-4.2) Screw top plate (T2-2) onto upper end of ratchet mandrel (6).
 - J-4.3) Install internal collet lug (T2-3), flat washers (T2-5), and hex nuts (T2-7) onto lower end of threaded rod (T2-1). Screw hex nuts (T2-7) onto threaded rod (T2-1) until fully threaded.
 - J-4.4) Install threaded rod (T2-1) from lower end of slip body assembly and through top plate (T2-2).



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J) DISASSEMBLY (cont'd)

- J-4.5) Install welded housing assembly (T2-6) over threaded rod (T2-1). Align threaded holes in housing assembly (T2-6) with slip windows in slip body (18).
- J-4.6) Screw cap screws (T2-8) into housing assembly (T2-6).
- J-4.7) Install flat washers (T2-5) onto threaded rod (T2-1).
- J-4.8) Screw threaded lug (T2-4) onto threaded rod (T2-1) and against flat washer (T2-5).
- J-4.9) Tighten threaded lug (T2-4) to pull collet fingers on ratchet mandrel (6) through lower and upper cones (16, 9)
- J-4.10) Remove disassembly tool (T2) and ratchet mandrel (6) from slip body assembly.
- J-4.11) Separate disassembly tool (T2) from ratchet mandrel (6).
- J-4.12) Disassemble slip body assembly:
 - J-4.12.1) Remove lower cone (16) from slip body (18).
 - J-4.12.2) Remove upper cone (9) from slip body (18).
- J-5) Unclamp and remove slip body (18) from vise.

K) ASSEMBLY

- **NOTE₃:** Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.
- **CAUTION**₃: To ensure tool operates properly, install o-rings in o-ring grooves <u>NOT</u> in thread reliefs (unless stated otherwise) (Fig. 2).
- K-1) Assemble slip body assembly:
 - K-1.1) Clamp slip body (18) in vise.
 - K-1.2) Install upper cone (9) into slip body (18).
 - K-1.3) Assemble slips and install into slip body (18):
 - K-1.3.1) Set slip springs (17) in place on slips (7).
 - **NOTEs:** Install two (2 ea) springs per slip (Fig. 3).
 - K-1.3.2) Screw button head cap screws (26) into slips to secure lower slip springs (17).
 - K-1.3.3) Install slips (7) into slip body (18). Wedge slips outward.
 - K-1.4) Install lower cone (16) into slip body (18).
 - K-1.5) Screw slip body cap (28) into slip body (18).
 - K-1.6) Screw set screws (27) into slip body (18).
 - K-1.7) Use assembly tool (T1) to install ratchet mandrel (6) into upper cone (9) and lower cone (16):
 - K-1.7.1) Screw top plate (T1-2) onto upper end of ratchet mandrel (6).
 - K-1.7.2) Install flat washers (T1-5) onto threaded rod (T1-1).
 - K-1.7.3) Screw threaded lug (T1-4) partially onto threaded rod (T1-1).
 - K-1.7.4) Install threaded rod (T1-1) through top plate (T1-2) and ratchet mandrel (6).
 - K-1.7.5) Install ratchet mandrel (6) and threaded rod assembly into upper cone (9).
 - K-1.7.6) From lower end of assembly, install bottom cap (T1-3) and flat washers (T1-5) onto threaded rod (T1-1).
 - K-1.7.7) Screw threaded lug (T1-4) onto threaded rod (T1-3).
 - K-1.7.8) Tighten threaded lug (T1-4) to pull collet fingers on ratchet mandrel (6) through upper and lower cones (9, 16).

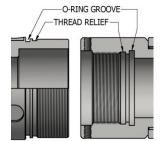


Fig. 2



Fig. 3



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K) ASSEMBLY (cont'd)

- K-1.7.9) Remove assembly tool (T1) from slip body assembly.
- K-1.7.10) Unclamp slip body (18) and remove slip body assembly from vise. Set assembly aside to be installed in later steps.
- K-2) Clamp upper gage ring (23) in vise.
 - K-2.1) Assemble rubber mandrel assembly and install:
 - K-2.1.1) Install o-ring (31) in o-ring groove in rubber mandrel (11).
 - K-2.1.2) Install lower gage ring (5), elements (13, 14), and rubber spacers (12) onto rubber mandrel (11).
 - K-2.1.3) Screw rubber mandrel (11) into upper gage ring (23). Align threaded holes in lower gage ring (5) with groove in rubber mandrel (11).
 - K-2.1.4) Screw shear screws (25) into lower gage ring (5). Tighten until shear screws (25) contact rubber mandrel (11). Back shear screws (25) out 1/4 turn.
 - K-2.2) Thread ratchet ring (3) into rubber mandrel (11) until flush with bottom edge of rubber mandrel (11) thread (Fig. 4).

NOTE4: Threads on ratchet ring (3) must be in installed in correct direction for tool to work properly.

K-2.3) Align gap in ratchet ring (3) with threaded hole in rubber mandrel (11).

CAUTION₅: Should not require more than one revolution past flush to align ring with threaded hole. Back out ratchet ring as necessary.

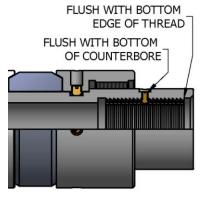


Fig. 4

- K-2.4) Screw shear screw (1) into rubber mandrel (11). Tighten until shear screw is flush with bottom of counter bore of threaded hole in rubber mandrel (11) (Fig. 4).
- K-2.5) Install o-ring (31) in o-ring groove in ratchet mandrel top (20).
- K-2.6) Install ratchet mandrel top (20) into upper gage ring (23). Align groove in ratchet mandrel top (20) with threaded holes in upper gage ring (23).
- K-2.7) Screw shear screws (25) into upper gage ring (23). Tighten until shear screws (25) contact ratchet mandrel top (20). Back out 1/4 turn.
- K-2.8) Install slip body assembly into rubber mandrel (11).
- K-2.9) Screw ratchet mandrel (6) into ratchet mandrel top (20) and into ratchet ring (3).

CAUTION₄: Do not rip or tear o-rings during installation.

NOTE₂: For added leverage, insert rod or assembly punch (T1-6) into ratchet mandrel (6) through holes in slip body (18) and lower cone (16) as needed.

- K-2.10) Screw upper cone (9) into lower gage ring (5).
- K-2.11) Assemble inner mandrel assembly and install:
 - K-2.11.1) Install o-ring (30) in o-ring groove in inner equalizing body (21).
 - K-2.11.2) Screw inner equalizing body (21) onto inner mandrel (2).
 - K-2.11.3) Install inner mandrel into ratchet mandrel (6).

NOTE₆: Additional force may be required to get inner equalizing body (21) into collet fingers on ratchet mandrel top (20).

CAUTION₄: Do not rip or tear o-ring during installation.

- K-2.12) Move to lower end of tool. Screw inner mandrel cap (19) onto inner mandrel (2).
- K-2.13) Move back to upper end of tool. Install o-ring (29) in o-ring groove in inner plug (22).



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K) ASSEMBLY (cont'd)

- K-2.14) Screw inner plug (22) into inner equalizing body (21).
 - CAUTION₄: Do not rip or tear o-ring during installation.
- K-2.15) Install o-rings (32) in o-ring groove in equalizing sleeve (15).
- K-2.16) Install equalizing sleeve (15) onto ratchet mandrel top (20). Align threaded hole in equalizing sleeve (15) with groove in ratchet mandrel top (20).
 - **CAUTION**₄: Do not rip or tear o-ring during installation.
- K-2.17) Screw shear screws (24) into equalizing sleeve (15). Tighten until shear screws (24) contact ratchet mandrel top (20). Back out 1/4 turn.
- K-2.18) Install latch (4) onto inner plug (22). Align threaded holes in latch (4) with groove in inner plug (22).
- K-2.19) Screw shear screws (24) into latch (4). Tighten until shear screws (24) contact inner plug (22). Back out 1/4 turn.
- K-2.20) Screw clutch ring (10) onto inner plug (22).
- K-2.21) Screw shear stud (1) into inner plug (22).
- K-2.22) Back up on shear stud (1) and apply 150 ft-lbs of torque between shear stud (1) and inner mandrel cap (19).
- K-3) Unclamp upper gage ring (23) from vise and remove assembled tool.



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L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER
1	1	#10-32 UNF X 3/8 SLOTTED SHEAR SCREW (750#)	DLM360BRS	BSSSLT1032F037
2	1	INNER MANDREL	DLMS110	73562205
3	1	RATCHET RING	DLMS110	73562011
4	1	LATCH	DLMS110	73562660
5	1	LOWER GAGE RING	DLMS110	73562X850
6	1	RATCHET MANDREL	DLMS125	73562210
7	4	CARBIDE SLIP	DLMS110	73562X110C
8	1	SHEAR STUD	DLMS110	73557901
9	1	UPPER CONE	DLMS110	73562410
10	1	CLUTCH RING	DLMS110	73562920
11	1	RUBBER MANDREL	DLMS110	73562220
12	2	RUBBER SPACER	DLMS35	60262X840
13	1	ELEMENT	80 DURO NITRILE	60262X512
14	2	ELEMENT	90 DURO NITRILE	60262X513
15	1	EQUALIZING SLEEVE	DLMS110	73562620
16	1	LOWER CONE	DLMS110	73562420
17	8	SLIP SPRING		32045950
18	1	SLIP BODY	DLMS110	73562X335
19	1	INNER MANDREL CAP	DLMS110	73562235
20	1	RATCHET MANDREL TOP	DLMS110	73562610
21	1	INNER EQUALIZING BODY	DLMS110	73562260
22	1	INNER PLUG	DLMS110	73562250
23	1	UPPER GAGE RING	DLMS110	73562X830
24	7	1/4-20 UNC X 3/8 SLOTTED SHEAR SCREW (1200#)	DLM360BRS	BSSSLT025C037
25	7	5/16-24 UNF X 5/16 SLOTTED SHEAR SCREW (2200#)	DLM360BRS	BSSSLT031F031
26	4	#8-32 UNC X 3/8 BUTTON HEAD SOCKET CAP SCREW	STEEL	BHSC832C037
27	3	3/8-16 UNC X 1/4 SOCKET SET SCREW	STEEL	SSS037C025
28	1	SLIP BODY CAP	DLMS110	73562X336
29	1	217 O-RING	90 DURO NITRILE	90217
30	1	222 O-RING	90 DURO NITRILE	90222
31	2	227 O-RING	90 DURO NITRILE	90227
32	2	233 O-RING	90 DURO NITRILE	90233

REDRESS KIT (RDK)	73562X050
ASSEMBLED WEIGHT	158 LBS



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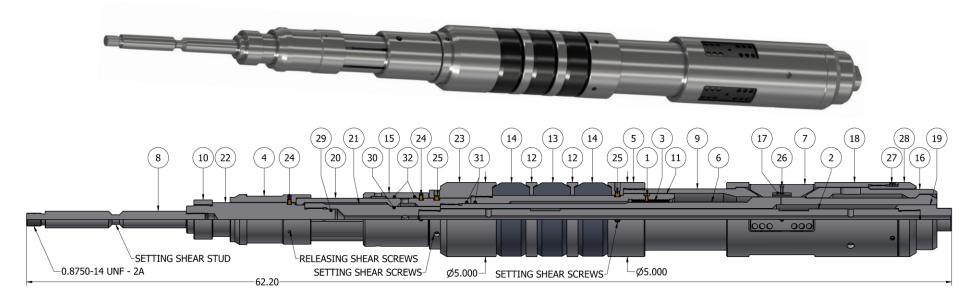
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M) TECHNICAL ILLUSTRATION



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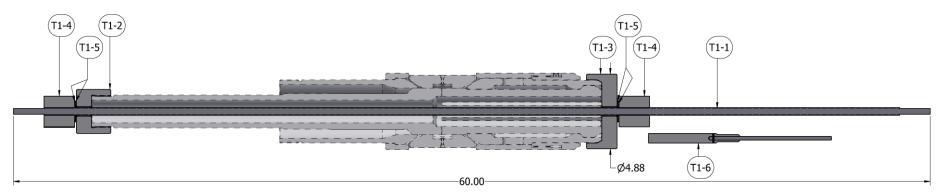
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N) ASSEMBLY TOOL

N-1) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N AT73560-1
T1-1	1	THREADED ROD	STEEL	AT73557-004
T1-2	1	TOP PLATE	DLMS110	AT73560-001
T1-3	1	BOTTOM CAP	DLMS110	AT73560-002
T1-4	2	THREADED LUG	DLMS110	AT73557-003
T1-5	4	1/2 LARGE FLAT WASHER	DLM360BRS	FW050B-1
T1-6	1	ASSEMBLY PUNCH	-	AT735-PUNCH

N-2) TECHNICAL ILLUSTRATION



NOTE: THIS ASSEMBLY TOOL IS USED DURING THE INSTALLATION OF RATCHET MANDREL 73562210 TO SAFELY DEFLECT THE COLLET FINGERS.

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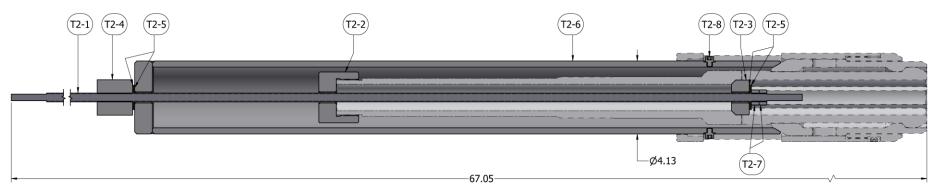
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O) DISASSEMBLY TOOL

O-1) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N AT73560-2
T2-1	1	THREADED ROD	STEEL	AT73557-004
T2-2	1	TOP PLATE	DLMS110	AT73560-001
T2-3	1	INTERNAL COLLET LUG	DLMS110	AT73560-005
T2-4	1	THREADED LUG	DLMS110	AT73557-003
T2-5	4	1/2 LARGE FLAT WASHER	BRASS	FW050B-1
T2-6	1	WELDED HOUSING ASSEMBLY	DLMS110	AT73560-008
T2-7	2	STEEL HEX NUT .500-13 UNC	STEEL	SHN050C
T2-8	2	5/16-18 UNC X 1/4 SOCKET CAP SCREW	STEEL	SCS031C025

O-2) TECHNICAL ILLUSTRATION



NOTE: THIS DISASSEMBLY TOOL IS USED WHEN REMOVING RATCHET MANDREL 73557210 TO SAFELY DEFLECT THE COLLET FINGERS.

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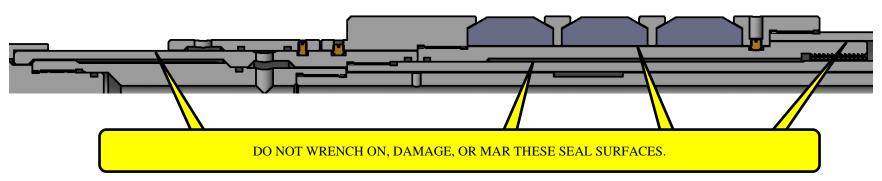
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P) SEAL SURFACES



Q) REVISION HISTORY

	DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
Ī	06/30/2023	A	Created manual	-	-