



# IE THERMAL PACKER W/ 15 FT EXPANSION JOINT 9-5/8" X 4-1/2"

Manual No:  
**DL-741-9625-391**

Revision: **E**

Revision Date:  
**02/22/2019**

Authored by: B.Mathis

Approved by: B.Oligschlaeger

## A) DESCRIPTION

The IE Thermal Packer is a DLT Thermal Packer with an internal expansion (IE) joint used in steam injection/production applications. This packer maintains the design features of our reliable ASI-X Packer and includes a packing element that can be packed-off with tension to allow the packer to be set at shallow depth. This packer is capable of setting in shallow wells, and will hold pressure from above and below. Its design also features an adjustable safety shear release. This packer needs 1/4 right-hand rotation to set it, and 1/4 right-hand rotation to release it (other J-slot designs are available). The thermal elements are available in 450° F to 650° F versions.

## B) SPECIFICATION GUIDE

CASING		RECOMMENDED HOLE SIZE (INCHES)	GAGE OD (INCHES)	TOOL ID (INCHES)	THREAD CONNECTION BOX UP / PIN DOWN	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)					
9-5/8	32.3 – 43.5	8.755 – 9.110	8.500	4.00	4-1/2 EUE	74196
	43.5 – 53.5	8.535 – 8.755	8.250	4.00	4-1/2 EUE	74195

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)	TORQUE THRU TOOL (MAX)	TEMPERATURE RATING (MAX)
3,000 PSI	110,000LBS	1,500 FT-LBS	625°F

## C) PRE-INSTALLATION INSPECTION PROCEDURES

**CAUTION<sub>1</sub>:** 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.



Fig. 1

GENERAL THREAD CONNECTION TORQUE RECOMMENDATIONS			
STUB ACME / ACME THREADS	INTERNAL TAPERED TUBING THREADS		PREMIUM THREADS
	UP TO 2-3/8"	GREATER THAN 2-3/8"	
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

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.

D & L OIL TOOLS  
P.O. BOX 52220 TULSA, OK 74152  
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## C) PRE-INSTALLATION INSPECTION PROCEDURES (cont'd)

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, shear screws, etc. Contact D&L sales for redress kit and/or other replacement part information.

## D) SETTING PROCEDURES

**CAUTION<sub>2</sub>:** Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

Run the packer to setting depth, pick up on work string approximately one foot (1'), and rotate 1/4 turn to the right at the packer. Set down on work string while releasing torque until it takes weight. Set down weight (20,000 to 30,000 lbs) on the packer. Pick up on work string (20,000 to 30,000 lbs tension) and hold for 10 minutes to set the packer.

Since the thermal packing elements are more resistant to flowing than standard elastomeric elements, it is recommended to apply tension and slack off weight two or three (2-3) cycles to ensure the elements are fully packed off.

To release the expansion joint, set down on work string then rotate and hold left-hand torque while picking up. Stroke the expansion joint to the desired position.

## E) RELEASING PROCEDURES

The releasing procedures are the same whether the packer has been tension or compression set. Set down weight on the packer to unseat the J-pin from the tension shoulder of the J-slot. Refer to the Pressure Affected Area Guide to determine necessary set down weight on the packer. Rotate the tubing 1/4 right-hand turn at the packer and pick up while holding right-hand torque. Weight in addition to pipe weight may be required to pick up on the packer – refer to Pressure Affected Area Guide. Continue to pick up to release the upper slips, relax the elements and release the lower slips so the packer can be re-set or removed from the well.

**CAUTION<sub>3</sub>:** High differential pressure below the anchor may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

### E-1) EMERGENCY RELEASE

In the event the packer will not release in the normal manner, the J-pin ring is equipped with an emergency shear release. The shear screws can be sheared with straight pickup above tubing weight. The shear release value is adjustable from 22,000 lbs to 66,000 lbs (5,500 lbs/screw) by adding or removing shear screws from the J-pin ring. When released in this manner, the anchor will reset when moved down the hole.

## F) PRESSURE AFFECTED AREA GUIDE

When set downhole, the packer mandrel is subjected to a force created by differential pressure above or below the packer that acts on the pressure affected area (i.e., the piston effect). Depending on the tubing size and weight and the seal area of the packer the force created by differential pressure acts upwards or downwards on the packer mandrel. An upward force, designated as a negative (-) value, acts to push the packer mandrel up hole and must be accounted for when releasing the packer. A downward force, designated as a positive value, acts to push the packer mandrel down hole and must be accounted for when releasing the packer. Other factors (e.g., tubing movement due to temperature change) must be considered separately to determine all the forces acting on the packer.



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## F) PRESSURE AFFECTED AREA GUIDE (cont'd)

PACKER SIZE (INCHES)	TUBING SIZE (INCHES)	PRESSURE AFFECTED AREA (SQ. INCHES)	
		ABOVE	BELOW
9-5/8	2.375	17.22 (DOWN)	-18.52 (UP)
	2.875	15.16 (DOWN)	-16.97 (UP)
	3.500	12.03 (DOWN)	-14.62 (UP)
	4.500	5.74 (DOWN)	-9.344 (UP)

**Example:** Consider a 9-5/8" X 4-1/2" IE Thermal Packer set on 4.500" tubing with a differential pressure of 3,000 psi in the annulus around the tubing above the packer. What is the force acting on the seal area of the mandrel?

To calculate the force (lbs) acting on the seal area of the mandrel, refer to the Pressure Affected Area Guide for a 9-5/8" X 4-1/2" IE Thermal Packer run on 4.500" tubing. In this example, the differential pressure from above the packer acts on the seal area of the packer mandrel across a pressure affected area of 5.74 in<sup>2</sup>. Multiplying the differential pressure (3,000 psi) by the pressure affected area (5.74 in<sup>2</sup>) results in a force of 17,220 lbs. The piston effect on the packer mandrel is a downward force of 17,220 lbs.

## 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) RECOMMENDED TOOLS

### H-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

### H-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	DRAW BLOCK ASSEMBLY TOOL	AT095110



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## I) DISASSEMBLY

I-1) Clamp upper J-body (32) in vise.

I-1.1) Unscrew and remove set screws (36) from wireline guide bottom (28).

I-1.2) Unscrew and remove wireline guide bottom (28) from expansion joint mandrel (31) (**NOTE<sub>1</sub>**: Left-hand threads).

I-1.3) Unscrew and remove set screws (35) from J-pin sub (23). Move lower J-body (20) as needed to access screws.  
**NOTE<sub>2</sub>**: Drag block body assembly must be free to rotate.

I-1.4) Wrench on lower J-body (20), rotating to the right, to unscrew and remove J-pin sub assembly from inner mandrel (2) (**NOTE<sub>1</sub>**: Left-hand threads).

I-1.4.1) Unscrew and remove shear screws (33) from J-pin ring (12).

I-1.4.2) Remove J-pin ring (12) from J-pin sub (23).

I-1.5) Compress drag blocks (22) with drag block assembly tool (T1).

I-1.6) Unscrew and remove set screws (34) from drag block body (18). Rotate drag block retainer (21) as need to access screws.

I-1.7) Unscrew and remove lower J-body (20) from drag block body (18) (**NOTE<sub>1</sub>**: Left-hand threads).

I-1.8) Remove drag block retainer (21) from drag block body (18).

I-1.9) Release drag blocks (22). Remove drag blocks (22) and drag block springs (3) from drag block body (18).

I-1.10) Unscrew and remove rubber mandrel cap (19) from inner mandrel (2).

I-1.11) Wedge lower slips (17) outwards (if needed). Remove drag block body assembly and disassemble:

I-1.11.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

I-1.12) Unscrew and remove lower cone (16) from rubber retainer (15).

I-1.13) Unscrew and remove lower rubber mandrel (14) from rubber mandrel (11).

I-1.14) Remove rubber retainer (15) and element (13) from rubber mandrel (11).

I-1.15) Unscrew and remove gage ring (29) from rubber mandrel (11).

I-1.16) Unscrew and remove rubber mandrel (11) from upper cone (9).

**CAUTION<sub>3</sub>**: Do NOT wrench or clamp on seal surface.

I-1.16.1) Remove seal (30) from rubber mandrel (11).

I-1.17) Remove upper cone (9) from inner mandrel (2).

I-2) Remove upper J-body (32) from vise. Clamp inner mandrel (2) in vise.

**CAUTION<sub>3</sub>**: Do NOT wrench or clamp on seal surface.

I-2.1) Unscrew and remove top sub (1) from expansion joint mandrel (31).

**NOTE<sub>3</sub>**: Upper slip body assembly must be free to rotate.

I-2.2) Unscrew and remove upper J-body (32) from spring cage keeper (10).

I-2.3) Remove expansion joint mandrel (31) from upper end of assembly.

I-2.4) Unscrew spring cage (5) from upper slip body (27) and remove from spring cage keeper (10).

**CAUTION<sub>4</sub>**: Compression spring (4) is compressed with spring tension against upper slip body assembly.

I-2.5) Unscrew and remove spring cage keeper (10) from inner mandrel (2).

I-2.5.1) Remove seal (24) from spring cage keeper (10).

I-2.6) Remove compression spring (4) from inner mandrel (2).



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## I) DISASSEMBLY (cont'd)

I-2.7) Remove upper slip body assembly and disassemble:

I-2.7.1) Unscrew and remove spring retainer (27) from upper slip body (6).

I-2.7.2) Remove wedges (if needed). Remove upper slips (8), releasing slip (7) and upper slip springs (26) from upper slip body (6).

I-3) Unclamp and remove inner mandrel (2) from vise.

## J) ASSEMBLY

**NOTE4:** Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

J-1) Clamp inner mandrel (2) in vise.

**CAUTION3:** Do NOT wrench or clamp on seal surface.

J-1.1) Assemble upper slip body assembly and install:

J-1.1.1) Install upper slips (8), releasing slip (7) and upper slip springs (26) into upper slip body (6). Wedge releasing slip (7) and upper slips (8) outwards.

**NOTE5:** Install two (2ea) springs per slip (Fig. 2).

J-1.1.2) Screw spring retainer (27) into upper slip body (6).

J-1.1.3) Install upper slip body assembly onto inner mandrel (2).

J-1.2) Install compression spring (4) onto mandrel (2).

J-1.3) Install seal (24) into spring cage keeper (10).

J-1.4) Screw spring cage keeper (10) onto inner mandrel (2).

J-1.5) Install spring cage (5) onto spring cage keeper (10) and screw onto spring retainer (27).

**CAUTION4:** Compression spring (4) is compressed with spring tension against upper slip body assembly.

J-1.6) Screw upper J-body (32) into spring cage keeper (10)

J-1.7) Install expansion joint mandrel (31) into upper end of assembly.

**CAUTION5:** Do not rip or tear seal during installation

J-1.8) Screw top sub (1) onto expansion joint mandrel (31). Remove wedges.

J-2) Unclamp and remove inner mandrel (2) from vise. Clamp upper J-body (32) in vise.

J-2.1) Install upper cone (9) onto inner mandrel (2).

J-2.2) Install seal (30) into rubber mandrel (11).

J-2.3) Screw rubber mandrel (11) into upper cone (9).

**CAUTION5:** Do not rip or tear seal during installation

J-2.4) Screw gage ring (29) onto rubber mandrel (11).

J-2.5) Install element (13) and rubber retainer (15) onto rubber mandrel (11).

J-2.6) Screw lower rubber mandrel (14) onto rubber mandrel (11).

J-2.7) Screw lower cone (16) into rubber retainer (15).

J-2.8) Assemble drag block body assembly and install:

J-2.8.1) Install lower slips (17) and lower slip springs (25) into drag block body (18). Wedge slips outwards.

**NOTE5:** Install two (2ea) springs per slip (Fig. 3).

J-2.8.2) Install drag block body assembly onto inner mandrel (2). Remove wedges.

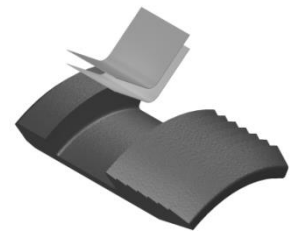


Fig. 2

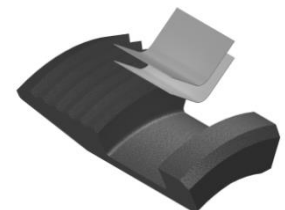


Fig. 3



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## J) ASSEMBLY (cont'd)

J-2.9) Screw rubber mandrel cap (19) onto lower rubber mandrel (14).

J-2.10) Install drag blocks (22) and drag block springs (3) in drag block body (18). Compress drag blocks (22) with drag block assembly tool (T1).

**NOTE<sub>6</sub>:** Install six (6ea) springs per block (Fig. 4).

J-2.11) Install drag block retainer (21) onto drag block body (18) capturing ends of drag blocks (22).

**NOTE<sub>7</sub>:** Align holes in drag block retainer (21) to access threaded holes in drag block body (18).

J-2.12) Screw lower J-body (20) into drag block body (18) (**NOTE<sub>1</sub>:** Left-hand threads).

J-2.13) Screw set screws (34) into lower J-body (20). Release drag blocks (22).

J-2.14) Assemble wireline guide bottom assembly and install:

J-2.14.1) Install J-pin ring (12) onto J-pin sub (23).

J-2.14.2) Align threaded holes in J-pin ring (12) with pocket holes in J-pin sub (23). Screw shear screws (33) into J-pin ring (12). Tighten until shear screws (33) make contact with J-pin sub (23). Back shear screws (33) out 1/4 turn.

J-2.15) Wrench on lower J-body (20) to screw J-pin sub (23) onto inner mandrel (2) (**NOTE<sub>1</sub>:** Left-hand threads).

**NOTE<sub>2</sub>:** Drag block body assembly must be free to rotate.

J-2.16) Screw set screws (35) into J-pin sub (23). Move lower J-body (20) as needed to access threaded holes in J-pin sub (23).

J-2.17) Screw wireline guide bottom (28) onto expansion joint mandrel (31) (**NOTE<sub>1</sub>:** Left-hand threads).

J-2.18) Screw set screws (36) into wireline guide bottom (28).

J-3) Unclamp upper J-body (32) from vise and remove assembled tool

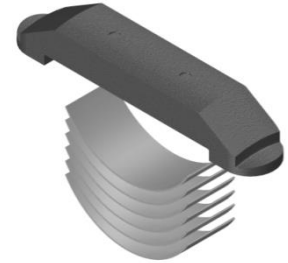


Fig. 4

## K) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	43.5 – 53.5# P/N 74195	32.3 – 43.5# P/N 74196
1	1	TOP SUB	DLMS60	74195610	
2	1	INNER MANDREL	1026	74195210	
3	36	DRAG BLOCK SPRING	-	9101900	
4	1	COMPRESSION SPRING	DLMCRSP	74195920	
5	1	SPRING CAGE	1026	74195310	
6	1	UPPER SLIP BODY	DLMS110	60395320	
7	1	RELEASING SLIP	DLMS110	60095125	
8	2	UPPER SLIP	DLMS35	60095115	
9	1	UPPER CONE	DLMS35	74195410	
10	1	SPRING CAGE KEEPER	DLMS80	74195811	
11	1	RUBBER MANDREL	1026	74195220	



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## K) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	43.5 – 53.5# P/N 74195	32.3 – 43.5# P/N 74196
12	1	J-PIN RING	P-110	74195875	
13	1	ELEMENT	90 DURO AFLAS	OEM-3346-00	S7383
14	1	LOWER RUBBER MANDREL	1026	74195250	
15	1	RUBBER RETAINER	DLMS35	74195850	74196850
16	1	LOWER CONE	1026	74195420	
17	4	LOWER SLIP	DLMS35	60095135	
18	1	DRAG BLOCK BODY	1026	74195335	
19	1	RUBBER MANDREL CAP	DLMS35	74195230	
20	1	LOWER J-BODY	1026	74195340A	
21	1	DRAG BLOCK RETAINER	1026	74195910	
22	6	DRAG BLOCK	DLMsDB8	9080900	
23	1	J-PIN SUB	L-80	74195640	
24	1	SEAL	-	S7387	
25	8	LOWER SLIP SPRING	-	7170901	
26	6	UPPER SLIP SPRING	-	7170902	
27	1	SPRING RETAINER	1026	74195820	
28	1	WIRELINE GUIDE BOTTOM	P-110	74195633WL	
29	1	GAGE RING	1026	74195830	74196830
30	1	SEAL	-	S7384	
31	1	EXPANSION JOINT MANDREL	1026	74195260	
32	1	UPPER J-BODY	1026	74195345	
33	12	SHEAR SCREW (5500#) 1/2-13 UNC X 7/16	DLM360BRS	BSSSLT050C043	
34	3	SET SCREW 1/4-20 UNC X 1/4	STEEL	SSS025C025	
35	2	SET SCREW 1/4-20 UNC X 1/2	STEEL	SSS025C050	
36	2	SET SCREW 5/16-18 UNC X 1/2	STEEL	SSS031C050	

REDRESS KIT (RDK)		74195050	74196050
ASSEMBLED WEIGHT		933 LBS	928 LBS





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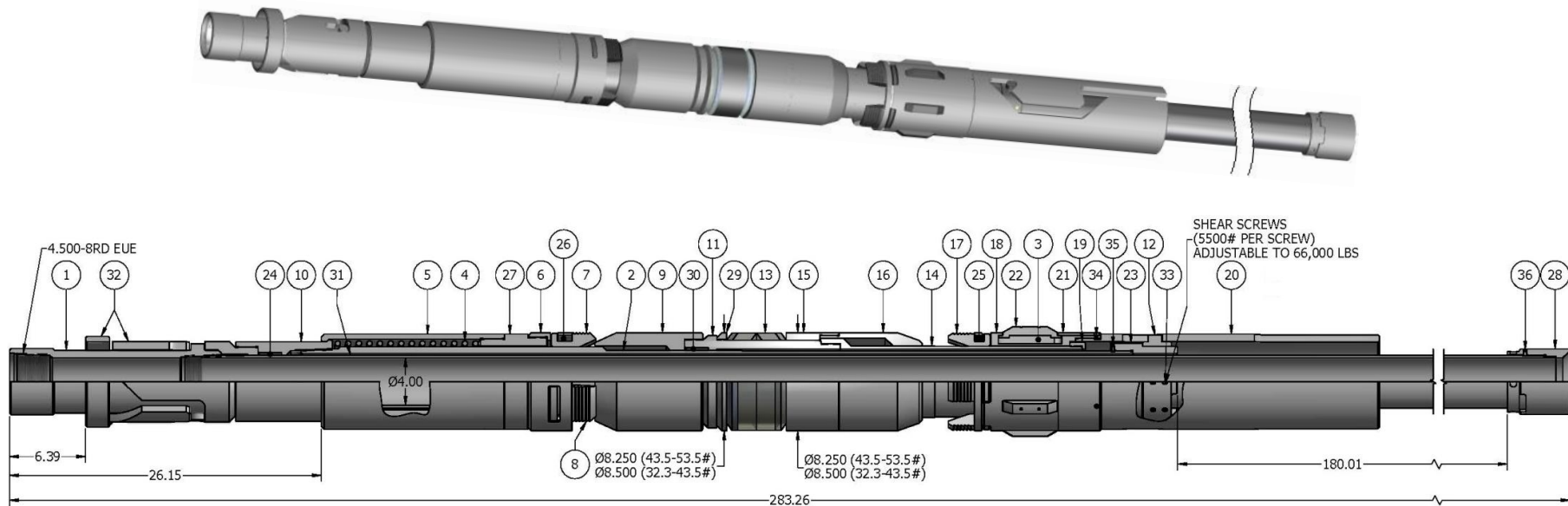
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## L) TECHNICAL ILLUSTRATION



## M) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
02/22/2019	E	Revised max. differential pressure and max. temp rating	J.Anderson	N.Banker
10/04/2018	D	Revised temp rating was 625 F; Added torque thru tool, General Screw Torque Recommendations, Pressure Affected Area Guide	J.Anderson	N.Banker
03/11/15	C	Revised recommended special tool P/N AT095110 was AT010110, P/N 60395320 was 60395320A, tools' assembly weights; Added max. tensile load thru tool, Pre-Installation Inspection and Storage Procedures, Recommended Hand Tools, redress kit P/Ns, Revision History	J.Anderson	J.McArthur