A) DESCRIPTION

The ASI-X Single String Double-Grip Production Packer is the most versatile of the mechanically set retrievable packers and may be used in any production application. This packer is suited for treating, testing, or injection applications, in pumping or flowing wells, either deep or shallow. This packer can be left in tension or compression depending on well conditions and the required application. The ASI-X Packer with Shear Release Bottom features a J-pin ring equipped with an emergency shear release in the event the packer will not release in the normal manner.

A large internal by-pass reduces swabbing when running and retrieving. The by-pass closes when the packer is set and opens prior to releasing the upper slips when retrieving to allow pressure equalization. The J-slot design allows easy setting and releasing; 1/4 turn right-hand set, 1/4 turn right-hand release.

The standard ASI-X Packer is designed for differential pressures up to 7,000 psi (unless noted otherwise). This packer is also available in an HT version which is designed for differential pressures up to 10,000 psi (unless noted otherwise). The HT version allows this packer to be utilized in completions where high pressure treating operations are performed and it is desirable to leave the tool in the well for production.

B) RELATED TOOLS (sold separately)

B-1) 3-1/2” DT-2 On/Off Tool—refer to technical manual *DL-512-3500-131*.

B-2) 3-1/2” Stinger—actual P/N varies depending on customer requirements.

C) SPECIFICATION GUIDE

CASING			TOOL			THREAD CONNECTION BOX UP / PIN DOWN	PART NUMBER
SIZE (INCHES)	**WEIGHT** (LBS/FT)	**RECOMMENDED HOLE SIZE** (INCHES)	**GAGE OD** (INCHES)	**NOMINAL ID** (INCHES)	**DRIFT ID** (INCHES)		
7	17.0 – 26.0	6.276 – 6.538	6.000 6.125*	3.00	2.867	3-1/2 EUE	60374SR 60374SRH[1] 60374SRV[2]
	26.0 – 32.0	6.094 – 6.276	5.875	3.00	2.867	3-1/2 EUE	60373SR 60373SRH[1] 60373SRV[2]

Elastomer Trim Options: [1]HSN, [2]Viton

*Maximum OD is over compressed drag blocks

NOTE$_1$: Tools listed are right-hand set / right-hand release.

NOTE$_2$: Use of a Double Hook J-slot Packer is recommended when running with a pumpjack to help prevent the packer from unsetting during well production.

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)
7,000 PSI	105,000 LBS

D) PRE-INSTALLATION INSPECTION PROCEDURES

CAUTION$_1$: 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.

Before first use, D&L recommends disassembly and inspection of the tools 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.

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 part information.

E) SETTING PROCEDURES

CAUTION$_2$: Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

E-1) COMPRESSION SET

Run the packer to setting depth. Pick up the work string to allow for setting stroke (12-13”) plus desired work string load. Rotate the work string 1/4 right-hand turn at the packer, and then lower the work string while releasing torque. Slack off on the work string sufficient weight to set the packer (14,000 lbs). Pull tension to assure that the upper slips are set. The work string can then be left in tension, compression or neutral. If insufficient weight is available to set the packer with compression, tension can be applied after slack-off to pack off the elements.

E-2) TENSION SET

Run to setting depth, pick up on the work string and rotate 1/4 turn to the right at the packer then lower the work string slacking off available weight to set the packer lower slips. Pull tension to set upper slips and pack off elements (14,000 lbs). After setting the packer, the work string can be left in compression, tension or neutral.

F) 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 work string 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 packer - refer to Pressure Affected Area Guide. The internal by-pass will open, allowing pressure to equalize. After pressure is equalized, continue to pick up to release the upper slips, relax the elements and release the lower slips thus allowing the packer to be re-set or removed from the well.

CAUTION$_3$: High differential pressure below the ASI-X Packer may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

F-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 pipe weight. The shear release value is adjustable from 5,500 lbs to 66,000 lbs (in 5,500 lb/screw increments - See illustration) by adding or removing screws from the J-pin ring. When released in this manner, the packer will reset when moved down the hole.

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) 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 to ensure that the packer remains set. 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.

PACKER SIZE (INCHES)	**TUBING SIZE** (INCHES)	**PRESSURE** (SQ. INCHES)	
		ABOVE	**BELOW**
7” X 3-1/2”	2.375	6.43 (DOWN)	-7.74 (UP)
	2.875	4.37 (DOWN)	-6.19 (UP)
	3.500	1.24 (DOWN)	-3.83 (UP)

Example: Consider a 7” X 3-1/2” ASI-X Packer set on 2.875” 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 7” X 3-1/2” ASI-X Packer run on 2.875” 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 4.37 in^2. Multiplying the differential pressure (3,000 PSI) by the pressure affected area (4.37 in^2) results in a force of 13,110 lbs. The piston effect on the packer mandrel is a downward force of 13,110 lbs.

I) ELASTOMER TRIM TEMPERATURE GUIDE

NITRILE (STD)			
TEMPERATURE RANGE (F°)	**DUROMETER**		
	END	**MIDDLE**	**END**
70° - 125°	80	70	80
125° - 250°	90	70	90
250° - 300°	90	80	90
300° +	Contact D&L Sales		

RUBBER TYPE	**TEMPERATURE RANGE**
NITRILE	70° - 300°F
HSN (HNBR)	70° - 325°F
VITON	100° - 350°F

J) RECOMMENDED TOOLS

J-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

J-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	DRAG BLOCK ASSEMBLY TOOL	AT070110

K) DISASSEMBLY

K-1) Clamp top sub (1) in vise.

K-1.1) Remove external ring (32) from J-pin bottom sub (23).

K-1.2) Unscrew and remove set screws (34) from J-pin bottom sub (23). Move J-body (20) as needed.

K-1.3) Unscrew and remove J-pin bottom sub (23) from inner mandrel (2).

NOTE$_3$: Drag block body assembly must be free to rotate.

K-1.3.1) Remove o-ring (37) from J-pin bottom sub (23).

K-1.3.2) Unscrew and remove shear screws (33) from J-pin ring (28).

K-1.3.3) Remove J-pin ring (28) from J-pin bottom sub (23).

K-1.4) Compress drag blocks (22) with drag block assembly tool (T1).

K-1.5) Unscrew and remove and remove set screws (35) from J-body (20).

K-1.6) Unscrew and remove J-body (20) from drag block body (18) (**NOTE$_4$**: Left-hand threads.).

K-1.7) Remove drag block retainer (21) from drag block body (18).

K-1.8) Release drag blocks (22). Remove drag blocks (22) and drag block springs (3) from drag block body (18).

K-1.9) Unscrew and remove rubber mandrel cap (19) from rubber mandrel (11).

NOTE$_5$: For added leverage, insert a rod thru rubber retainer (15) and rubber mandrel (11) as needed.

K-1.10) Wedge lower slips (17) outwards (if needed). Remove drag block body assembly and disassemble:

K-1.10.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

K-1.11) Unscrew and remove lower cone (16) from rubber retainer (15).

K-1.12) Unscrew rubber mandrel (11) from center coupling (10).

K-1.13) Remove rubber mandrel assembly and disassemble:

K-1.13.1) Remove elements (13, 14), rubber spacers (12), rubber retainer (15) from rubber mandrel (11).

K-1.13.1.1) Unscrew and remove gage ring (29) from rubber retainer (15).

K-1.14) Unscrew and remove gage ring (29) from center coupling (10).

K) DISASSEMBLY (cont’d)

K-1.15) Unscrew and remove center coupling (10) from upper cone (9).

K-1.15.1) Remove bonded seal (24) and o-ring (38) from center coupling (10).

K-1.15.1.1) Remove o-ring (36) from bonded seal (24).

K-1.16) Remove bearing bushing (30) and upper cone (9) from inner mandrel (2).

K-2) Unclamp and remove top sub (1) from vise. Clamp inner mandrel (2) in vise.

NOTE$_7$: Do NOT wrench or clamp on seal surface.

K-2.1) Unscrew and remove spring cage cap (27) from spring cage (5).

CAUTION$_1$: Compression spring (4) is compressed with spring tension against upper slip body assembly.

K-2.2) Unscrew and remove top sub (1) from inner mandrel (2).

K-2.3) Remove compression spring (4) from spring cage (5).

K-2.4) Unscrew and remove spring cage (5) from upper slip body (6).

K-2.5) Wedge releasing slip (7) and upper slips (8) outwards (if needed). Remove upper slip body assembly and disassemble:

K-2.5.1) Removed wedges (if needed). Remove releasing slip (7), upper slips (8), and upper slip springs (26) from upper slip body (6).

K-2.5.2) Remove spring retainer ring (31) from upper slip body (6).

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

L) ASSEMBLY

NOTE$_3$: 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$_1$: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs unless stated otherwise (Fig. 2).

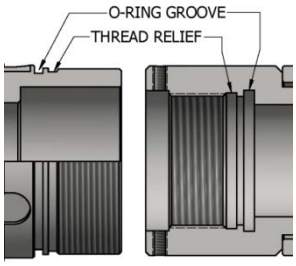

Fig. 2

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

NOTE$_7$: Do NOT wrench or clamp on seal surface.

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

L-1.1.1) Install spring retainer ring (31) into upper slip body (6).

L-1.1.2) Install upper slips (8), releasing slip (7), and upper slip springs (26) into upper slip body (6).

NOTE$_9$: Uses two (2ea) springs per slip (Fig. 3).

L-1.1.3) Wedge releasing slip (7) and upper slips (8) outwards. Install upper slip body assembly onto inner mandrel (2).

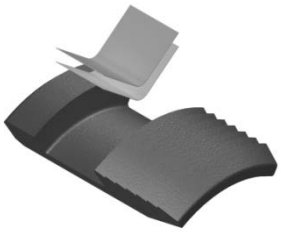

Fig. 3

L-1.2) Screw spring cage (5) into upper slip body (6).

L-1.3) Install compression spring (4) into spring cage (5).

L-1.4) Screw top sub (1) onto inner mandrel (2).

L-1.5) Screw spring cage cap (27) onto spring cage (5).

CAUTION$_1$: Compression spring (4) is compressed with spring tension against upper slip body.

L-2) Unclamp and remove inner mandrel (2) from vise. Clamp top sub (1) in vise.

L-2.1) Install bearing bushing (30) and upper cone (9) onto inner mandrel (2).

L-2.2) Install o-ring (38) in o-ring groove in center coupling (10).

L-2.3) Install o-ring (36) in o-ring groove in bonded seal (24).

L) ASSEMBLY (cont’d)

L-2.4) Install bonded seal (24) into center coupling (10).

CAUTION$_2$: Do not rip or tear o-ring during installation.

L-2.5) Screw center coupling (10) into upper cone (9).

L-2.6) Screw gage ring (29) onto center coupling (10).

L-2.7) Assemble rubber mandrel assembly and install:

L-2.7.1) Screw gage ring (29) onto rubber retainer (15).

L-2.7.2) Install rubber retainer (15), elements (13, 14) and rubber spacers (12) onto rubber mandrel (11).

L-2.7.3) Install rubber mandrel assembly onto inner mandrel (2).

L-2.7.4) Screw rubber mandrel (11) into center coupling (10).

CAUTION$_2$: Do not rip or tear o-ring during installation.

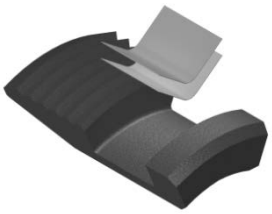

Fig. 4

L-2.8) Screw lower cone (16) into rubber retainer (15).

L-2.9) Assemble drag block body assembly and install:

L-2.9.1) Install lower slips (17) and lower slip springs (25) into drag block body (18). Wedge slips outward.

NOTE$_9$: Uses two (2ea) springs per slip (Fig. 4).

L-2.9.2) Install drag block body assembly onto rubber mandrel (11).

L-2.10) Screw rubber mandrel cap (19) onto rubber mandrel (11).

NOTE$_5$: For added leverage, insert a rod thru rubber retainer (15) and rubber mandrel (11) as needed.

L-2.11) 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$_{10}$: Uses six (6ea) drag block springs per drag block (Fig. 5).

Fig. 5

L-2.12) Install drag block retainer (21) capturing ends of drag blocks (22).

L-2.13) Screw J-body (20) onto drag block body (18) (**NOTE$_4$**: Left-hand threads.).

L-2.14) Screw set screws (35) into J-body (20). Release drag blocks (22).

L-2.15) Assemble J-pin assembly and install:

L-2.15.1) Install o-ring (37) in o-ring groove in J-pin bottom sub (23).

L-2.15.2) Install J-pin ring (28) onto J-pin bottom sub (23). Align threaded holes in J-pin ring (28) with pocket holes in J-pin bottom sub (23).

L-2.15.3) Screw shear screws (33) into J-pin ring (28). Tighten until shear screws (33) make contact with J-pin bottom sub (23). Back shear screws (33) out 1/4 turn.

L-2.15.4) Screw J-pin bottom sub (23) onto inner mandrel (2).

NOTE$_3$: Drag block body assembly must be free to rotate.

CAUTION$_7$: Do not rip or tear o-ring during installation.

L) ASSEMBLY (cont’d)

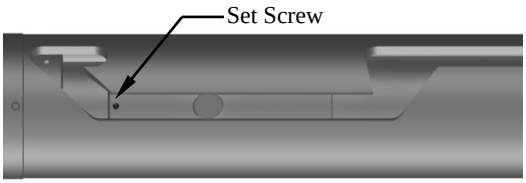

Fig. 6

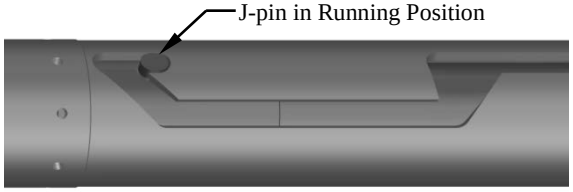

Fig. 7

L-2.16) Screw set screws (34) into J-pin bottom sub (23). Move J-body (20) as needed (Fig. 6).

L-2.17) Position J-pin in running position in J-slot of J-body (20) (Fig. 7).

L-2.18) Install external ring (32) in groove in J-pin bottom sub (23).

L-3) Unclamp top sub (1) from vise and remove assembled tool.

M) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	26.0 - 32.0# P/N 60373SR	17.0 - 26.0# P/N 60374SR
1	1	TOP SUB	1026	60173610 (60073610*)	
2	1	INNER MANDREL	DLMS80	60373210	
3	24	DRAG BLOCK SPRING	INCONEL	9101900	
4	1	COMPRESSION SPRING	CHROME VANADIUM	60373920	
5	1	SPRING CAGE	1026	60174310 (60373310 *)	
6	1	UPPER SLIP BODY	1026	60073320	
7	1	RELEASING SLIP	P-110	60073125	
8	2	UPPER SLIP	1026	60073115	
9	1	UPPER CONE	1026	60373410	
10	1	CENTER COUPLING	1026	60273620	
11	1	RUBBER MANDREL	1026	60073220	
12	2	RUBBER SPACER	1026	60273840	60274840
13	1	ELEMENT	70 DURO NITRILE	60273511	60274511
14	2	ELEMENT	90 DURO NITRILE	60273513	60274513
15	1	RUBBER RETAINER	1026	60273850	
16	1	LOWER CONE	1026	60073420	
17	4	LOWER SLIP	1026	60073135	
18	1	DRAG BLOCK BODY	1026	60073335	
19	1	RUBBER MANDREL CAP	1026	60173230 (60073230*)	
20	1	J-BODY	1026	60173340 (60373340*)	
21	1	DRAG BLOCK RETAINER	1026	60073910	
22	4	DRAG BLOCK	8620	9070900	9080900

M) PARTS LIST (cont’d)

ITEM	QTY	DESCRIPTION	MATERIAL	26.0 - 32.0# P/N 60373SR	17.0 - 26.0# P/N 60374SR
23	1	J-PIN BOTTOM SUB	L-80	60373655	
24	1	BONDED SEAL	90 DURO NITRILE	60073520	
25	8	LOWER SLIP SPRING	ELGILOY	7170901	
26	6	UPPER SLIP SPRING	ELGILOY	7170902	
27	1	SPRING CAGE CAP	1026	60174810 (60073810*)	
28	1	J-PIN RING	P-110	60373875	
29	2	GAGE RING	1026	60273830	60274830
30	1	BEARING BUSHING	1026	60373224	
31	1	SPRING RETAINER RING	1026	60073820	
32	1	SMALLEY EXTERNAL RING	-	WST-375	
33	12	SHEAR SCREW (5500#) 1/2-13 UNC X 1/2	BRASS	BSSSLT050C050	
34	2	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037	
35	3	SET SCREW 3/8-16 UNC X 3/8	STEEL	SSS037C037	
36	1	155 O-RING	90 DURO NITRILE	90155	
37	1	237 O-RING	90 DURO NITRILE	90237	
38	1	243 O-RING	90 DURO NITRILE	90243	

REDRESS KIT (RDK)		60373050SR	60374050SR
ASSEMBLED WEIGHT		315 LBS	315 LBS

*P/N may be substituted.

M-1) OPTIONS PARTS LIST

NOTE$_{11}$: For temperature range, refer to Elastomer Trim Temperature Guide.

M-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	26.0 - 32.0# P/N 60373SRH	17.0 - 26.0# P/N 60374SRH
13	1	ELEMENT	70 DURO HSN	60273511H	60274511H
14	2	ELEMENT	90 DURO HSN	60273513H	60274513H
24	1	BONDED SEAL	90 DURO HSN	60073520H	
36	1	155 O-RING	90 DURO HSN	90155H	
37	1	237 O-RING	90 DURO HSN	90237H	
38	1	243 O-RING	90 DURO HSN	90243H	

REDRESS KIT (RDK)		60373050SRH	60374050SRH

M) PARTS LIST (cont’d)

M-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	26.0 - 32.0# P/N 60373SRV	17.0 - 26.0# P/N 60374SRV
13	1	ELEMENT	70 DURO VITON	60273511V	60274511V
14	2	ELEMENT	90 DURO VITON	60273513V	60274513V
24	1	BONDED SEAL	90 DURO VITON	60073520V	
36	1	155 O-RING	90 DURO VITON	90155V	
37	1	237 O-RING	90 DURO VITON	90237V	
38	1	243 O-RING	90 DURO VITON	90243V	

REDRESS KIT (RDK)		60373050SRV	60374050SRV

N) TECHNICAL ILLUSTRATION

O) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
06/12/15	F	Added Related Tools, tool OD across retracted drag block for P/N 60374SR, tool drift ID, Pre-Installation Inspection Procedures, Storage Recommendations, P/N 60073610, 60373310, 60073230, 60373340, 60073810; Revised Pressure Affected Area Guide, P/N WST-375 was WST-325	J.Anderson	J.McArthur
06/27/13	E	Revised P/N 60173610 was 60073610, P/N 60174310 was 60373310, P/N 60173230 was 60073230, P/N 60173340 was 60373340, P/N 60174810 was 60073810. P/N 60374SR assembled weight was 317; Added recommended hand tools, HSN and Viton options (P/Ns); Removed AFLAS from element selection guide.	J.Anderson	