A) DESCRIPTION

The D&L Hydroset II Packer is a hydraulic set, mechanically held dual string production packer, normally run above a single string hydraulic set or wireline set seal bore packer. The short length of the Hydroset II makes it ideally suited for deviated wells or doglegs. Since there is no tubing manipulation required to set the packer, the well head can be installed and flanged up before setting the packer.

The Hydroset II Packer is available with short or long string setting capabilities and a variety of tubing connections. The packer is also adaptable for submersible pump applications. The Hydroset II Packer has a sequential upper slip releasing system that is designed so that each slip is released individually to reduce the pull required to release the packer. The angles on the upper slips and upper slip body result in the slips releasing smoothly from the casing.

B) SPECIFICATION GUIDE

CASING		**RECOMMENDED HOLE SIZE** (INCHES)	**TOOL OD** (INCHES)	**THREAD CONNECTION** BOX UP / PIN DOWN		**PART NUMBER**
SIZE (INCHES)	**WEIGHT** (LBS/FT)			**LONG STRING**	**SHORT STRING**	
7-5/8"	24.0 – 29.7#	6.875 – 7.025	6.672	2-7/8 EUE MIN ID = 2.39"	2-3/8 NUE / 2-3/8 EUE MIN ID = 1.94"	90575-BAC-BAB

DIFFERENTIAL PRESSURE (MAX)	**TENSILE LOAD THRU TOOL** (MAX)
7,000 PSI	79,000 LBS*

* Using all eight (8EA) releasing shear screws (see Part List and Technical Illustration).

C) OPERATION

When tubing pressure is applied to the packer, the inlet port allows pressure differential to be present in the setting chamber. This differential forces the setting mandrel to separate from the setting cylinder, shearing the setting shear screws. The setting cylinder is forced down, which shears the lower slip body shear screws and sets the lower slips. The setting mandrel is forced up, which shears the upper slip body shear screws, and sets the upper slips and packs off the elements.

Any relative motion between the setting cylinder and the setting mandrel is held in place by the locking nut, which will ratchet in only one direction. With a pressure differential from above, the force is transferred through the outer components of the packer and is supported by the lower slips. With the pressure differential from below, the force transfers through the outer components of the packer and is supported by the upper slips.

C) OPERATION (cont'd)

C-1) SETTING PROCEDURES

Running speed is critical, especially in heavy or viscous fluid where excess speed can result in swabbing off the packing element or in creating pressure waves which could lead to creating a preset condition. As a guide it is recommended that running speed should not be more than 30 seconds per joint (range II or 30 feet). **Do not exceed this speed**, particularly when running the packer in the heaviest weight casing for the range for which the packer is dressed.

A run in the well with a junk basket and suitable sized gauge ring or a bit and scraper is strongly recommended prior to running. The location of any tight spots should be noted and the running speed for the packer through these spots should be reduced.

Being a hydraulically set packer, it can be subject to preset conditions by pressure waves through the fluid. A slow steady running speed should be used and sudden stops and starts, such as when setting or pulling slips, should be avoided. Make up the packer to the tubing string in the desired position and to the required torque.

If both strings are run simultaneously, allow at least 30 minutes for the packer to equalize thermally before setting. Run the secondary string, if it was not run with the primary string, and latch into the packer seal bore. Temporarily plug the long string below the packer and apply a minimum of 1,200 PSI differential in the tubing at the packer and hold it for 30 minutes. (**CAUTION$_1$**: *Do NOT exceed 5,000 PSI*). The packer should now be fully set and can be pressure tested if desired.

C-2) RELEASING PROCEDURES

The Hydroset II packer is released by a straight pick up on the long string. The shear release value is adjustable from 15,000 lbs to 40,000 lbs (in 5,000 lbs. increments - see technical illustration).

NOTE$_1$: A minimum of three (3) shear screws must be used or the packer may release prematurely.

D) RECOMMENDED 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

E) DISASSEMBLY

E-1) Clamp flat top (1) in vise.

E-1.1) Unscrew and remove coupling (17) from handling pup (16).

E-1.2) Unscrew and remove handling pup (16) from flat top (1).

E-1.3) Unscrew and remove crossover (18) from pup joint (15).

E-1.4) Unscrew and remove pup joint (15) from lower slip body cap (10).

E-1.5) Unscrew and remove changeover (19) from long string mandrel (13).

E-1.6) Unscrew and remove shear screws (20) from shear pin retainer (12).

E-1.7) Unscrew and remove shear pin retainer (12) from lower slip body cap (10).

E-1.8) Unscrew and remove socket cap screws (21) from lower cone (9).

E-1.9) Unscrew and remove shear screws (22) from lower slip body (11).

E-1.10) Wedge lower slips (24) outwards (if needed). Remove lower slip body assembly and disassemble:

E-1.10.1) Remove lower slip assemblies and disassemble:

E-1.10.1.1) Unscrew and remove button head screws (30) from lower slips (24).

E-1.10.1.2) Remove slip springs (29) from lower slips (24).

E-1.10.2) Unscrew and remove lower slip body (11) from lower slip body cap (10).

E-1.10.2.1) Unscrew and remove alignment mandrel (33) from lower slip body cap (10).

E-1.10.2.2) Remove o-ring (26) from lower slip body cap (10).

E-1.11) Remove pick up ring (31) from groove in long string mandrel (13).

E-1.12) Remove setting mandrel assembly and disassemble:

E-1.12.1) Unscrew and remove lower cone (9) from setting cylinder (8).

E-1.12.1.1) Remove o-rings (26, 27, 28) from lower cone (9).

E-1.12.2) Remove locking ring (32) from lower end of setting cylinder (8).

E-1.12.3) Unscrew and remove shear screws (22) from setting cylinder (8).

E-1.12.4) Remove setting mandrel (7) from setting cylinder (8).

E-1.12.4.1) Remove o-rings (26, 27) from setting mandrel (7).

E-1.12.4.2) Remove o-ring (25) from setting cylinder (8).

E-1.13) Remove elements (4, 5) and rubber spacers (6) from short string mandrel (14) and long string mandrel (13).

E-1.14) Unscrew and remove short string mandrel (14) and long string mandrel (13) from flat top (1).

NOTE$_2$: Do NOT wrench or clamp on seal surfaces.

E-1.15) Unscrew and remove socket cap screws (21) from upper cone (3).

E-1.16) Unscrew and remove shear screws (22) from upper slip body (2).

E-1.17) Wedge upper slips (23) outwards (if needed). Remove upper cone (3) from upper slip body (2).

E-1.17.1) Remove o-rings (26, 27) from upper cone (3).

E-1.17.2) Remove upper slip assemblies and disassemble:

E-1.17.2.1) Unscrew and remove button head screws (30) from upper slips (23).

E-1.17.2.2) Remove slip springs (29) from upper slips (23).

E-1.18) Unscrew and remove upper slip body (2) from flat top (1)

E-2) Unclamp and remove flat top (1) from vise.

F) ASSEMBLY

NOTE$_3$: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order and orientation.

F-1) Clamp flat top (1) in vise

F-1.1) Screw upper slip body (2) onto flat top (1).

F-1.2) Install o-rings (26, 27) in grooves in upper cone (3).

F-1.3) Assemble upper slip assemblies and install:

F-1.3.1) Set slip springs (29) in place on upper slips (23).

NOTE$_4$: Install two (2EA) springs per slip (Fig. 1).

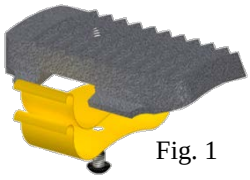


Fig. 1

F-1.3.2) Screw button head screws (30) into upper slips (23).

F-1.3.3) Install slip assemblies into upper slip body (2). Wedge upper slips (23) outwards.

F-1.4) Install upper cone (3) into upper slip body (2).

F-1.5) Align threaded holes in upper cone (3) with slots in upper slip body (2). Screw socket cap screws (21) into upper cone (3).

F-1.6) Screw shear screws (22) into upper slip body (2). Tighten until shear screws (22) make contact with upper cone (3). Back shear screws (22) out 1/4 turn.

F-1.7) Screw long string mandrel (13) and short string mandrel (14) into flat top (1). Remove wedges.

NOTE$_2$: Do NOT wrench or clamp on seal surfaces.

CAUTION$_2$: Do NOT rip or tear o-rings while installing.

F-1.8) Install elements (4, 5) and rubber spacers (6) onto long string mandrel (13) and short string mandrel (14).

F-1.9) Assemble setting mandrel assembly and install:

F-1.9.1) Install o-rings (26, 27) in grooves in setting mandrel (7).

F-1.9.2) Install o-ring (25) in groove in setting cylinder (8).

F-1.9.3) Gently tap setting mandrel (7) into setting cylinder (8).

CAUTION$_2$: Do NOT rip or tear o-ring while installing.

F-1.9.4) Align threaded holes in setting cylinder (8) with pocket holes in setting mandrel (7). Screw one shear screw (22) into setting cylinder (8) to hold parts together temporarily.

F-1.9.5) Insert locking ring (32) into bottom end of setting cylinder (8) – keep it in smooth part of setting cylinder (8).

F-1.9.6) Install o-rings (26, 27, 28) in grooves in lower cone (9).

F-1.9.7) CAREFULLY screw lower cone (9) into setting cylinder (8) until they shoulder.

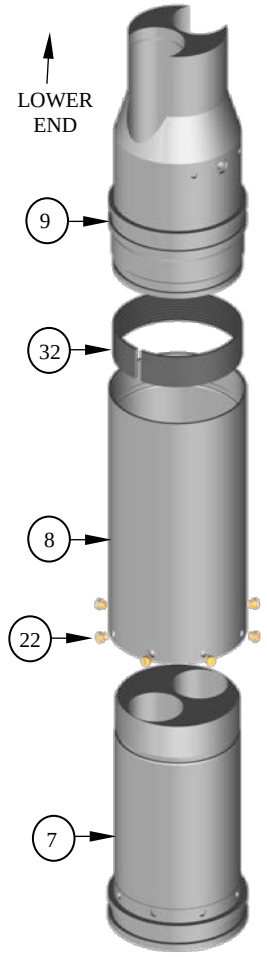
CAUTION$_2$: Do NOT rip or tear o-ring while installing.

F-1.9.8) Remove shear screw (22) from setting cylinder (8). Rotate setting cylinder (8) and lower cone (9) in right-hand motion to align holes for long string mandrel (13) and short string mandrel (14).

F-1.9.9) Continue rotating setting cylinder and lower cone in unison to align threaded holes in setting cylinder (8) with pocket holes in setting mandrel (7).

NOTE$_5$: This should NOT take more than 1/8 rotation (45°).

F-1.9.10) Screw shear screws (22) into setting cylinder (8). Tighten until shear screws (22) make contact with setting mandrel (7). Back shear screws (22) out 1/4 turn.



NOTE: O-rings not shown.

NOTE: Holes MUST be aligned before installing shear screws (22).

F) ASSEMBLY (cont'd)

F-1.9.11) Back up on setting cylinder (8) with a wrench. Back off lower cone (9) enough to align holes for long string mandrel (13) and short string mandrel (14).

F-1.9.12) Install setting mandrel assembly onto long string mandrel (13) and short string mandrel (14).

CAUTION$_2$: Do NOT rip or tear o-rings while installing.

F-1.10) Install pick up ring (31) in groove in long string mandrel (13).

F-1.11) Assemble lower slip body assembly and install:

F-1.11.1) Install o-ring (26) in groove in lower slip body cap (10).

F-1.11.2) Screw alignment mandrel (33) into lower slip body cap (10).

CAUTION$_2$: Do NOT rip or tear o-ring while installing.

F-1.11.3) Screw lower slip body (11) onto lower slip body cap (10).

F-1.11.4) Assemble lower slip assemblies and install:

F-1.11.4.1) Set slip springs (29) in place on lower slips (24).

NOTE$_4$: Install two (2EA) springs per slip (Fig. 2).

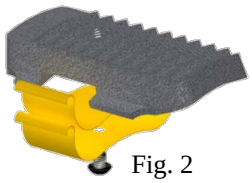


Fig. 2

F-1.11.4.2) Screw button head screws (30) into lower slips (24).

F-1.11.4.3) Install slip assemblies into upper slip body (2). Wedge lower slips (24) outwards.

F-1.11.5) Install lower slip body assembly onto long string mandrel (13), short string mandrel (14), and over lower cone (9).

NOTE$_6$: Back off lower slip body cap (10) as needed to align long string mandrel (13) and short string mandrel (14).

CAUTION$_2$: Do NOT rip or tear o-ring while installing.

F-1.12) Align threaded holes in lower cone (9) with slots in lower slip body (11). Screw socket cap screws (21) into lower cone (9).

Fig. 3

F-1.13) Screw shear screws (22) into lower slip body (11) (Fig. 3). Tighten until shear screws (22) make contact with lower cone (9). Back shear screws (22) out 1/4 turn.

F-1.14) Screw shear pin retainer (12) into lower slip body cap (10) until shouldered. Back off shear pin retainer (12) as needed to align threaded holes in shear pin retainer (12) with pocket holes in long string mandrel (13).

F-1.15) Screw shear screws (20) into shear pin retainer (12). Tighten until shear screws (20) make contact with long string mandrel (13). Back shear screws (20) out 1/4 turn.

NOTE$_7$: Install a minimum of three (3EA) shear screws (20). Install additional shear screws (20) as needed to achieve desired shear value.

F-1.16) Remove wedges.

F-1.17) Screw changeover (19) onto long string mandrel (13).

F-1.18) Screw pup joint (15) into lower slip body cap (10).

F-1.18.1) Screw crossover (18) onto pup joint (15).

F-1.19) Screw handling pup (16) into flat top (1).

F-1.20) Screw coupling (17) onto handling pup (16).

F-2) Unclamp flat top (1) from vise and remove assembled tool.

G) PRESSURE TEST

G-1) ASSEMBLY

NOTE$_8$: Prior to testing, all o-rings must be properly installed and in good condition (no rips, tears, cuts, etc.).

G-1.1) Unscrew and remove all but one of setting shear screws (22) from setting cylinder (8).

G-1.2) Install sleeve cap (P1) onto lower end of packer up onto lower element (4) with threads facing toward lower end of packer.

G-1.3) Install upper split ring (P2) into pressure test groove on setting mandrel (7).

G-1.4) Move sleeve cap (P1) onto upper split ring (P2).

G-1.5) Install lower split ring (P2) into pressure test groove on lower cone (9).

G-1.6) Install test sleeve (P3) onto lower end of packer (with threads facing upper end) over lower split ring (P2) in setting mandrel (7).

G-1.7) Screw sleeve cap (P1) onto test sleeve (P3). Tighten sleeve cap (P1).

NOTE$_9$: Sleeve cap (P1) may not shoulder up to test sleeve (P3) when tight.

G-1.8) Plug off top and bottom of long string mandrel (13).

G-1.9) Fill long string mandrel (13) with hydraulic oil or inhibited water.

G-1.10) Apply pressure. Hold for a minimum of one (1) minute and observe for leaks.

WARNING$_1$: Do NOT exceed 500 PSI.

G-1.11) Release pressure.

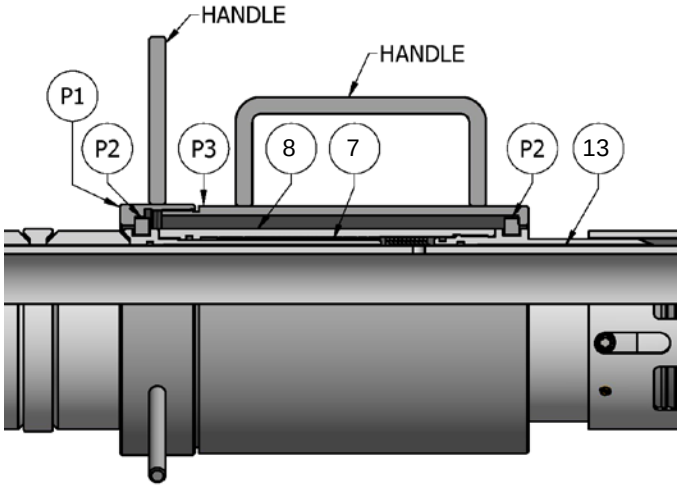
G-1.12) Remove test fixtures and plugs.

G-1.13) Re-install setting shear screws (22) in setting cylinder (8).

G-2) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 90575PTF
P1	1	SLEEVE CAP	WELDED STEEL MILD	90575PTF006
P2	2	SPLIT RING (2 PIECES EA)	P-110	90575PTF008
P3	1	TEST SLEEVE	WELDED STEEL MILD	90575PTF007

G-3) TECHNICAL ILLUSTRATION



H) PARTS LIST

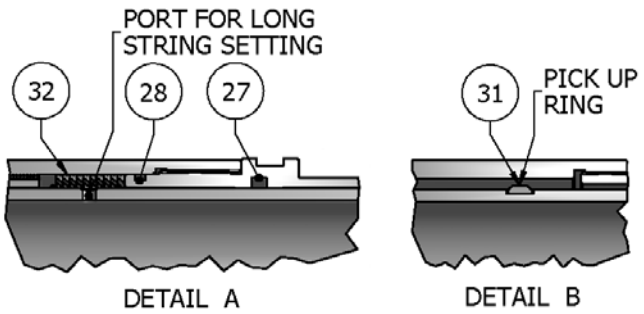
ITEM	QTY	DESCRIPTION	MATERIAL	P/N 90575-BAC-BAB (24.0 – 29.7#)
1	1	FLAT TOP	L-80	90575610
2	1	UPPER SLIP BODY	L-80	90575320
3	1	UPPER CONE	L-80	90575410
4	2	ELEMENT	80 DURO NITRILE	90575512
5	1	ELEMENT	70 DURO NITRILE	90575511
6	2	RUBBER SPACER	1026	90575840
7	1	SETTING MANDREL	L-80	90575750
8	1	SETTING CYLINDER	P-110	90575755
9	1	LOWER CONE	L-80	90575420
10	1	LOWER SLIP BODY CAP	L-80	90575335
11	1	LOWER SLIP BODY	L-80	90575316
12	1	SHEAR PIN RETAINER	P-110	90570741
13	1	LONG STRING MANDREL	L-80	90575210
14	1	SHORT STRING MANDREL	L-80	90575212
15	1	PUP JOINT	L-80	PJ-BBB-24-B
16	1	HANDLING PUP	L-80	PJ-BBC-48-B
17	1	COUPLING - SPECIAL CLEARANCE	1026	CP2875E2875N-SC
18	1	CROSSOVER	L-80	CH2375N2375ESC
19	1	CHANGEOVER	L-80	CH2875N2875E-SC
20	8	SHEAR SCREW (5000#) 1/2-13 W/ .418 DOG POINT	BRASS	65050902
21	4	SOCKET CAP SCREW 3/8-16 UNC X 5/8	STEEL	SCS037C062
22	16	SHEAR SCREW (2375#)	BRASS	60100990
23	4	UPPER SLIP	1026	90575111
24	4	LOWER SLIP	1026	90575131
25	1	360-90 O-RING	NITRILE	90360
26	4	332-90 O-RING	NITRILE	90332
27	3	336-90 O-RING	NITRILE	90336
28	1	257-90 O-RING	NITRILE	90257
29	16	SLIP SPRING	-	72470950
30	8	BUTTON HEAD SCREW #10-24 X 1/4	-	BHSC1024C025

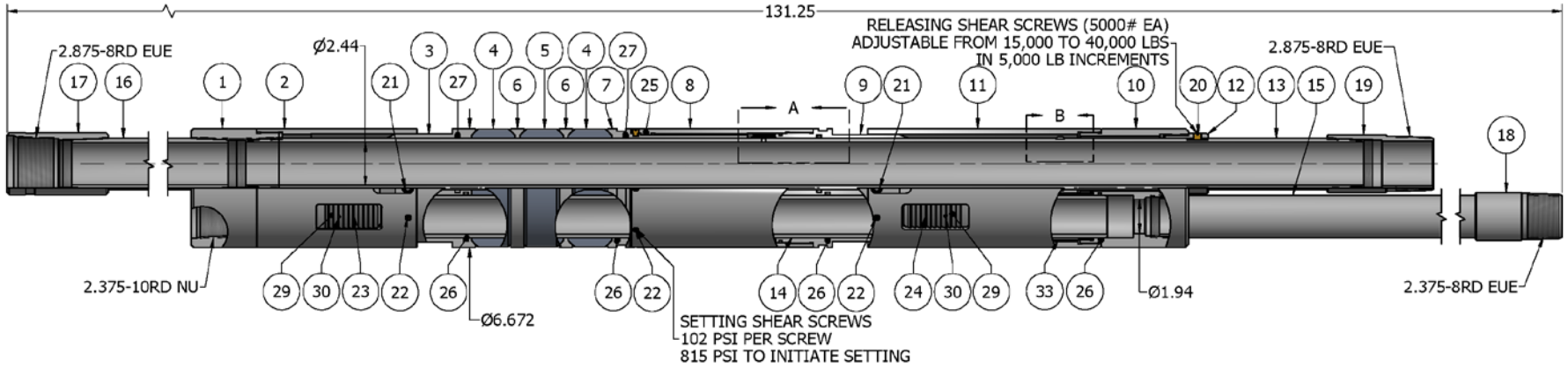
H) PARTS LIST (cont’d)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 90575-BAC-BAB (24.0 – 29.7#)
31	1	PICK UP RING	1026	90570761
32	1	LOCKING RING	L-80	90575720
33	1	ALIGNMENT MANDREL	1026	90570215

REDRESS KIT (RDK)		90575-C-B
ASSEMBLED WEIGHT		368 LBS

I) TECHNICAL ILLUSTRATION





J) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
07/02/13	A	Created new tech manual;	-	-