



VSI-X PACKER WITH YO-YO

3-1/2" X 1.900"

Manual No:
DL-601-3500-498

Revision: **C**

Revision Date:
03/04/2022

Authored by: J.Anderson

Approved by: K.Riggs

A) DESCRIPTION

The VSI-X Single String Double-Grip Production Packer is one of the most versatile packers on the market. This packer is a modification of the ASI-X Packer with the advantage of being able to set on electric line or hydraulically.

An On-Off Tool Stinger with a Wireline Plug installed can be attached to the top of this packer. This packer can then be lubricated in the hole and set under pressure. Once set, casing pressure can be bled off, and the tubing with an On-Off Tool Overshot can be run and latched onto the packer. The Wireline Plug can then be removed.

The VSI-X Packer with Yo-Yo design allows the packer to be set and unset without rotation of the tubing.

NOTE₁: Stinger and setting equipment sold separately.

NOTE₂: This packer requires at least a 30 second burn on the wireline setting tool to ensure a proper set. A burn time less than 30 seconds may shear the setting tool from the packer before fully setting the packer.

B) RELATED TOOLS (sold separately)

B-1) 3-1/2" Wireline Adapter Kit (WLAK) (PN 97130)—refer to technical manual *DL-971-3500-550*.

B-2) 1.900" DT-2 On/Off Tool (P/N varies)—refer to technical manual *DL-512-1900-386*.

B-3) 1.900" 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)		
3-1/2	7.7 – 10.2	2.922 – 3.068	2.781	1.25	1.900 NUE	60135YY 60135YYH ¹ 60135YYV ² 60135YYC ³ 60135YYHC ⁴ 60135YYVC ⁵

Tool Options: ¹HSN, ²Viton, ³Nitrile, Carbide, ⁴HSN, Carbide, ⁵Viton, Carbide

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)
10,000 PSI	30,000 LBS

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

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.



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.

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

Follow the wireline setting tool manufacturer's setting instructions.

CAUTION₂: Packer must be pinned with **two (2 qty)** shear screws in spring cage (5) and **two (2 qty)** in J-pin body (20).

F) RELEASING PROCEDURES

Set down weight on the packer and pick up. 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.

CAUTION₃: High differential pressure below the VSI-X may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

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.



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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, represented 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.

PACKER SIZE (INCHES)	TUBING SIZE (INCHES)	PRESSURE AFFECTED AREA (IN ²)	
		ABOVE	BELOW
3-1/2	1.050	1.27 (DOWN)	-1.60 (UP)
	1.315	0.78 (DOWN)	-1.27 (UP)
	1.660	-0.03 (UP)	-0.64 (UP)
	1.900	-0.70 (UP)	-0.10 (UP)
	2.375	-2.29 (UP)	0.99 (DOWN)

Example: Consider a 3-1/2" X 1.900" VSI-X Packer set on 1.315" 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 3-1/2" X 1.900" VSI-X Packer run on 1.315" 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 0.78 in². Multiplying the differential pressure (3,000 PSI) by the pressure affected area (0.78 in²) results in a force of 2,340 lbs. The piston effect on the packer mandrel is a downward force of 2,340 lbs.

I) ELASTOMER TRIM TEMPERATURE GUIDE

NITRILE (STD)			
TEMPERATURE RANGE (F°)	DUROMETER		
	END	MIDDLE	END
40° - 125°	80	70	80
125° - 250°	90	70	90
150° - 250°	90	80	90
250° +	Contact D&L Sales		

RUBBER TYPE	TEMPERATURE RANGE
NITRILE	40° - 250°F
HSN (HNBR)	70° - 300°F
VITON	100° - 350°F



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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
T2	1	DRAG BLOCK ASSEMBLY TOOL	AT045110

K) DISASSEMBLY

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

K-1.1) From lower end of tool, unscrew and remove set screws (22) from J-pin body (20).

K-1.2) Unscrew J-pin body (20) from J-pin sub (31). Move J-pin body (20) and drag block body assembly upwards.

NOTE₃: Drag block body assembly must be free to rotate.

K-1.3) Move J-pin retainer (32) upwards and remove J-pin (27) from J-pin sub (31).

K-1.4) Remove J-pin sub (31) and J-pin retainer (32) from J-slot mandrel (23).

K-1.5) Unscrew and remove shear screws (3) from J-pin body (20).

K-1.6) Unscrew and remove J-slot mandrel (23) from inner mandrel (2).

K-1.6.1) Remove o-ring (29) from J-slot mandrel (23).

K-1.7) Unscrew and remove set screws (22) from J-pin body (20).

K-1.8) Unscrew and remove J-pin body (20) from drag block body (18) (**NOTE₄:** Left-hand threads).

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

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

K-1.10.1) Remove drag block retainer (21) from drag block body (18).

K-1.10.2) 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), and rubber retainer (15) from rubber mandrel (11).

K-1.14) Unscrew and remove center coupling (10) from upper cone (9).

K-1.14.1) Remove bonded seal (24) and o-ring (30) from center coupling (10).

K-1.14.1.1) Remove o-ring (28) from bonded seal (24).

K-1.15) Remove upper cone (9) from inner mandrel (2).

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

CAUTION: Do NOT wrench or clamp on seal surface.



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K) DISASSEMBLY (cont'd)

K-2.1) Unscrew and remove shear screws (3) from spring cage (5).

CAUTION4: Compression spring is compressed with spring tension against upper slip body assembly.

K-2.2) Unscrew and remove spring cage (5) from upper slip body (6).

K-2.3) Unscrew and remove top sub (1) from inner mandrel (2).

K-2.4) Remove compression spring (4) from inner mandrel (2).

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

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

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

L) 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.

CAUTION6: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs (Fig. 2).

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

CAUTION5: Do **NOT** wrench or clamp on seal surface.

L-1.1) Assemble upper slip body assembly:

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

NOTE5: Install one (1ea) spring per slip (Fig. 3).

L-1.1.2) Wedge releasing slip (7) and upper slips (8) outwards. Install upper slip body assembly onto inner mandrel (2) and remove wedges.

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

L-1.3) Screw top sub (1) onto inner mandrel (2).

L-1.4) Screw spring cage (5) onto upper slip body (6).

L-1.5) Align threaded holes in spring cage (5) with recessed holes in top sub (1). Screw two (2 qty) shear screws (3) into spring cage (5). Tighten until shear screws (3) make contact with top sub (1). Back shear screws (3) out 1/4 turn.

CAUTION4: Compression spring is compressed with spring tension against upper slip body assembly.

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

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

L-2.2) Install o-ring (28) in groove in bonded seal (24).

L-2.3) Install bonded seal (24) into center coupling (10).

CAUTION7: Do not rip or tear o-ring during installation.

L-2.4) Install o-ring (30) in groove in center coupling (10).

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

L-2.6) Assemble and install rubber mandrel assembly:

L-2.6.1) Install rubber retainer (15), elements (13, 14) and rubber spacers (12) onto rubber mandrel (11).

L-2.6.2) Install rubber mandrel assembly onto inner mandrel (2).

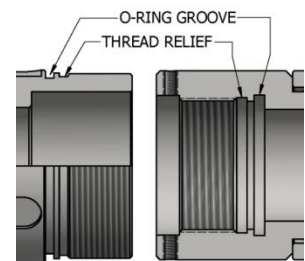


Fig. 2

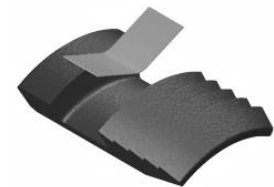


Fig. 3



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L) ASSEMBLY (cont'd)

L-2.6.3) Screw rubber mandrel (11) into center coupling (10).

CAUTION7: Do not rip or tear o-ring during installation.

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

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

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

NOTE5: Install three (3 ea) springs per slip (Fig. 4).

L-2.8.2) Install drag block retainer (21) onto drag block body (18).

L-2.8.3) Wedge lower slips (17) outwards. Install drag block body assembly onto rubber mandrel (11). Remove wedges.

L-2.9) Install rubber mandrel cap (19) onto rubber mandrel (11).

L-2.10) Screw J-pin body (20) onto drag block body (18) (**NOTE4:** Left-hand threads).

L-2.11) Screw set screws (22) into J-pin body (20).

L-2.12) Install o-ring (29) into groove in J-slot mandrel (23).

L-2.13) Screw J-slot mandrel (23) onto inner mandrel (2).

CAUTION7: Do not rip or tear o-ring during installation.

L-2.14) Loosely install J-pin retainer (32) onto J-slot mandrel (23).

L-2.15) Install J-pin sub (31) on J-slot mandrel (23). Align hole in J-pin sub (31) with assembled position of J-slot mandrel (23) (Refer to Technical Illustration, Fig. 5 for positioning)

L-2.16) Install J-pin (27) into J-pin sub (31).

L-2.17) Install J-pin retainer (32) onto J-pin sub (31).

L-2.18) Move J-pin body (20) and drag block body assembly downwards and screw J-pin body (20) onto J-pin sub (31).

NOTE3: Drag block body assembly must be free to rotate.

L-2.19) Screw set screws (22) into J-pin body (20).

L-2.20) Move drag block body assembly as required to align threaded holes in J-pin body with recessed holes in rubber mandrel cap (19). Screw two (2 qty) shear screws (3) into J-pin body (20). Tighten until shear screws (3) make contact with rubber mandrel cap (19). Back shear screws (3) out 1/4 turn.

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

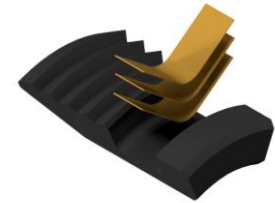


Fig. 4

M) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135YY
1	1	TOP SUB	DLMS60	60130610
2	1	INNER MANDREL	DLMS80	60330210
3	4	SHEAR SCREW (2375#)	DLM360BRS	60100990
4	1	COMPRESSION SPRING	DLMCRSP	60335920
5	1	SPRING CAGE	DLMS60	60130310
6	1	UPPER SLIP BODY	DLMS60	60030320
7	1	RELEASING SLIP	DLMS110	60030125
8	2	UPPER SLIP	DLMS60	60030115



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M) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135YY
9	1	UPPER CONE	DLMS60	60030410
10	1	CENTER COUPLING	DLMS60	60230620
11	1	RUBBER MANDREL	DLMS60	60330220
12	2	RUBBER SPACER	DLMS60	60230840
13	1	ELEMENT	70 DURO NITRILE	60230511
14	2	ELEMENT	90 DURO NITRILE	60230513
15	1	RUBBER RETAINER	DLMS60	60230850
16	1	LOWER CONE	DLMS60	60130420
17	4	LOWER SLIP	DLMS60	60030135
18	1	DRAG BLOCK BODY	DLMS60	60330335
19	1	RUBBER MANDREL CAP	DLMS60	60130230
20	1	J-PIN BODY	DLMS110	60135341Y
21	1	DRAG BLOCK RETAINER	DLMS60	60330910
22	6	SET SCREW #10-24 UNC X 3/16	STEEL	SSS1024C018
23	1	J-SLOT MANDREL	DLMS110	60035630Y
24	1	BONDED SEAL	DLMS60 / 90 DURO NITRILE	60030520
25	12	LOWER SLIP SPRING	ELGILOY	7125900
26	3	UPPER SLIP SPRING	ELGILOY	61345975
27	1	J-PIN	ELGILOY	60035636Y
28	1	031 O-RING	DLMS110	90031
29	1	127 O-RING	90 DURO NITRILE	90127
30	1	134 O-RING	90 DURO NITRILE	90134
31	1	J-PIN SUB	90 DURO NITRILE	60135875Y
32	1	J-PIN RETAINER	DLMS110	60135910Y
33	8	SHEAR SCREW (1200#) 1/4-20 UNC X 3/8	DLMS110	BSSSLT025C037*

*Refer to WLAK technical manual for placement.

REDRESS KIT (RDK)	60135050
ASSEMBLED WEIGHT	49 LBS



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M) PARTS LIST (cont'd)

M-1) ELASTOMER TRIM OPTIONS

NOTE: For temperature range, refer to Elastomer Trim Temperature Guide.

M-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135YYH
13	1	ELEMENT	70 DURO HSN	60230511H
14	2	ELEMENT	90 DURO HSN	60230513H
24	1	BONDED SEAL	90 DURO HSN	60030520H
28	1	031 O-RING	90 DURO HSN	90031H
29	1	127 O-RING	90 DURO HSN	90127H
30	1	134 O-RING	90 DURO HSN	90134H

REDRESS KIT (RDK)		60135050H
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M-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135YYV
13	1	ELEMENT	70 DURO VITON	60230511V
14	2	ELEMENT	90 DURO VITON	60230513V
24	1	BONDED SEAL	90 DURO VITON	60030520V
28	1	031 O-RING	90 DURO VITON	90031V
29	1	127 O-RING	90 DURO VITON	90127V
30	1	134 O-RING	90 DURO VITON	90134V

REDRESS KIT (RDK)		60135050V
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M-2) CARBIDE OPTION

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135YYC
8	2	CARBIDE UPPER SLIP	DLMS110	60030115C
17	4	CARBIDE LOWER SLIP	DLMS110	60030135C



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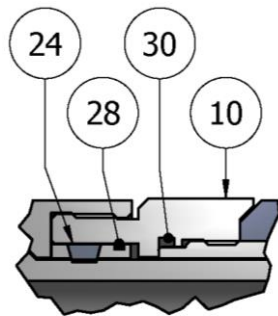
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A) TECHNICAL ILLUSTRATION



DETAIL A

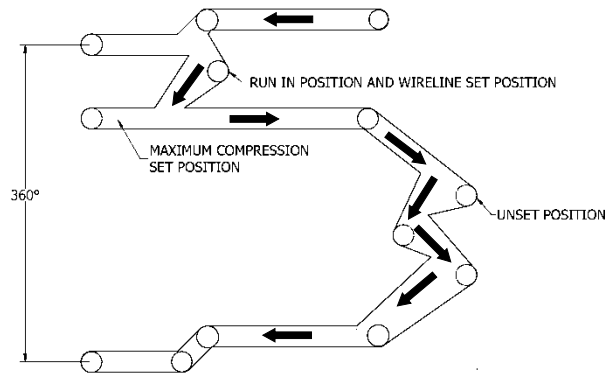
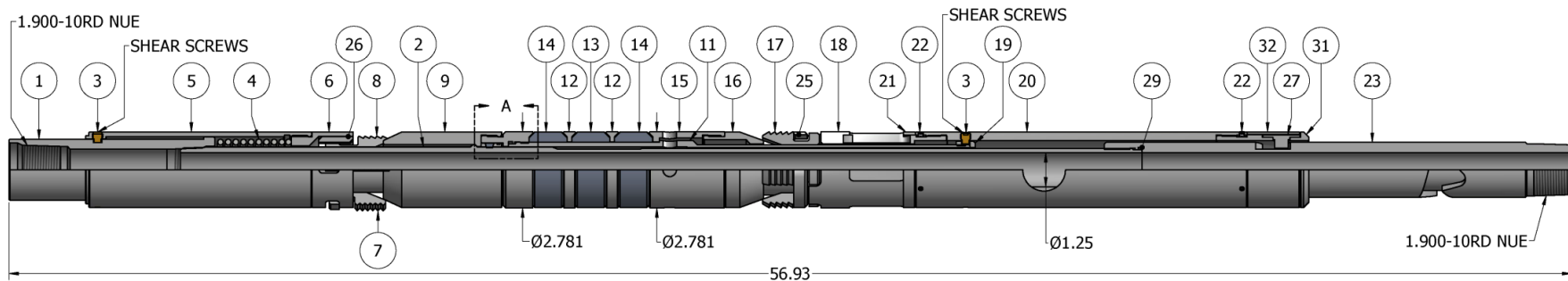



Fig. 5



	VSI-X PACKER WITH YO-YO 3-1/2” X 1.900”		Manual No:
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B) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
03/04/2022	C	Added carbide options, revised 7125900 qty 12 was 4	J.Anderson	E.Visaez
10/17/2017	B	Revised Elastomer Trim Temperature Guide, P/N 60135341Y was 60135340Y, 60035636Y was 60035635Y, P/N SSS1024C018 qty 6 was 3; Added P/N 60135875Y, 60135910Y; Removed re-setting procedures	J.Anderson	K.Riggs
10/03/14	A	Created new manual	-	-