

Manual No: **DL-603-5500-066**

Revision: F

Revision Date:

Authored by: S. White

03/30/2021 Approved by: D. Hushbeck

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.

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.

In the event the packer will not release in the normal manner, the J-pin ring is equipped with an emergency shear release.

B) RELATED TOOLS (sold separately)

- B-1) 2-3/8" DT-2 On/Off Tool-refer to technical manual DL-512-2375-360.
- B-2) 2-3/8" Stinger—actual P/N varies depending on customer requirements.

C) SPECIFICATION GUIDE

	CASING		TOOL			
SIZE (INCHES)	WEIGHT (LBS/FT)	RECOMMENDED HOLE SIZE (INCHES)	GAGE OD (INCHES)	NOMINAL ID (INCHES)	THREAD CONNECTIONS BOX UP / PIN DOWN	PART NUMBER
5.1/2	14.0 - 20.0	4.778 - 5.012	4.625	2.00	2-3/8 EUE	60355SR 60355SRH ¹ 60355SRV ² 60355SRC3 60355SRHC ⁴ 60355SRVC ⁵
5-1/2	20.0 - 23.0	4.670 – 4.778	4.500	2.00	2-3/8 EUE	60357SR 60357SRH ¹ 60357SRV ² 60357SRC ³ 60357SRHC ⁴ 60357SRVC ⁵

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

NOTE₁: Tools listed are right-hand set / right-hand release.

NOTE₂: 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.



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C) SPECIFICATION GUIDE (cont'd)

DIFFERENTIAL	TENSILE LOAD	HANGING WEIGHT ON	TORQUE
PRESSURE	THRU TOOL	SET TOOL	THRU TOOL
(MAX)	(MAX)	(MAX)	(MAX)
7,000 PSI	54,000 LBS	54,000 LBS*	2,000 FT-LBS

*Casing must be cemented for this load rating.

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

HAN

ICUS		GENERAL THREAD CONNECTION TORQUE RECOMMENDATIONS						
		STUB ACME /	INTERNAL TAPI	ERED TUBING THREADS	PREMIUM THREADS			
	ACME 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 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.

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 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.

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 (12,000 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 (12,000 lbs). After setting the packer, the work string can be left in compression, tension or neutral.



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ASI-X PACKER w/SHEAR RELEASE BOTTOM 5-1/2" X 2-3/8"

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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.

CAUTION₃: 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 4,300 lbs to 51,600 lbs (in 4,300 lbs/screw increments) 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	TUBING SIZE	PRESSURE AFFECTED AREA (SQ. INCHES)		
(INCHES)	(INCHES)	ABOVE	BELOW	
5 1/2	2.375	0.92 (DOWN)	-2.22 (UP)	
5-1/2	2.875	-1.15 (UP)	-0.67 (UP)	

Example: Consider a 5-1/2" X 2-3/8" ASI-X Packer set on 2.375" 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 5-1/2" X 2-3/8" ASI-X Packer run on 2.375" 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 0.92 in². Multiplying the differential pressure (3,000 psi) by the pressure affected area (0.92 in²) results in a force of 2,760 lbs. The piston effect on the packer mandrel is a downward force of 2,760 lbs.



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I) ELASTOMER TRIM TEMPERATURE GUIDE

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

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

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

- SCREWDRIVER SET, FLAT-TIPPED ٠
 - SOCKET SETS
 - 3/8-INCH DRIVE 1/2-INCH DRIVE
 - HAMMERS
 - SLEDGE
 - BALL PEEN
 - DEAD BLOW

ULS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	DRAG BLOCK ASSEMBLY TOOL	AT055110

K) DISASSEMBLY

- K-1) Clamp top sub (1) in vise.
 - K-1.1) Remove external ring (30) from J-pin bottom sub (23).
 - K-1.2) Unscrew and remove set screws (32) 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).

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

- K-1.3.1) Remove o-ring (35) from J-pin bottom sub (23).
- K-1.3.2) Unscrew and remove shear screws (31) 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) using drag block assembly tool (T1).
- K-1.5) Unscrew and remove set screws (33) from J-body (20).
- K-1.6) Unscrew and remove J-body (20) from drag block body (18) (NOTE4: Left-hand threads.).
- K-1.7) Remove drag block retainer (21) from drag block body (18).
- K-1.8) Release drag blocks. 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). NOTEs: For added leverage, insert a rod thru rubber retainer (15) and rubber mandrel (11) as needed.



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K) DISASSEMBLY (cont'd)

- 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).

NOTE₆: For added leverage, insert a rod thru upper cone (9) as needed.

- K-1.13) Remove rubber mandrel assembly and disassemble:
 - K-1.13.1) Remove gage ring (29), 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 (36) from center coupling (10).

K-1.14.1.1) Remove o-ring (34) 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.
 - CAUTION₇: Do <u>NOT</u> wrench or clamp on seal surface.
 - K-2.1) Unscrew and remove spring cage cap (27) from spring cage (5).

CAUTION1: 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) 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

- **NOTE7:** 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 <u>NOT</u> thread reliefs unless stated otherwise (Fig. 2).
- L-1) Clamp inner mandrel (2) in vise.

CAUTION₇: Do <u>NOT</u> wrench or clamp on seal surface.

- L-1.1) Assemble upper slip body assembly and install:
 - L-1.1.1) Install upper slips (8), releasing slip (7), and upper slip springs (26) into upper slip body (6).

NOTE₈: Uses two (2 ea) springs 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).
- 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).



Fig. 2





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L) ASSEMBLY (cont'd)

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

CAUTION₁: 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 upper cone (9) onto inner mandrel (2).
- L-2.2) Install o-ring (36) in o-ring groove in center coupling (10).
- L-2.3) Install o-ring (34) in o-ring groove in bonded seal (24).
- 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) onto upper cone (9).
- **NOTE**₆: For added leverage, insert a rod thru upper cone (9) as needed.
- L-2.6) Assemble rubber mandrel assembly and install:
 - L-2.6.1) Install rubber retainer (15), elements (13, 14), rubber spacers (12) and gage ring (29) onto rubber mandrel (11).
 - L-2.6.2) Install rubber mandrel assembly onto inner mandrel (2).
 - L-2.6.3) Screw rubber mandrel (11) into center coupling (10).

CAUTION₂: Do not rip or tear o-rings 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). Wedge slips outward. **NOTE8**: Uses two (2 ea) springs per slip (Fig. 4).

- L-2.8.2) Install drag block body assembly onto rubber mandrel (11).
- L-2.9) Screw rubber mandrel cap (19) onto rubber mandrel (11).

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

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

NOTE9: Uses four (4 ea) drag block springs per drag block (Fig. 5).

- L-2.11) Install drag block retainer (21) capturing ends of drag blocks (22).
- L-2.12) Screw J-body (20) onto drag block body (18) (**NOTE**₄: Left-hand threads). **NOTE**₃: Drag block body assembly must be free to rotate.
- L-2.13) Screw set screws (33) into J-body (20). Release drag blocks (22).
- L-2.14) Assemble J-pin assembly and install:
 - L-2.14.1) Install o-ring (35) in o-ring groove in J-pin bottom sub (23).
 - L-2.14.2) Install J-pin ring (28) onto J-pin bottom sub (23).
 - L-2.14.3) Align threaded holes in J-pin ring (28) with pocket holes in J-pin bottom sub (23). Screw shear screws (31) into J-pin ring (28). Tighten until shear screws (31) make contact with J-pin bottom sub (23). Back shear screws (31) out 1/4 turn.
 - L-2.14.4) Screw J-pin bottom sub (23) onto inner mandrel (2).

CAUTION₂: Do not rip or tear o-ring during installation.

- L-2.15) Screw set screws (32) into J-pin bottom sub (23). Move J-body (20) as needed.
- L-2.16) Install external ring (30) in groove in J-pin bottom sub (23).
- L-3) Unclamp top sub (1) from vise and remove assembled tool.











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M) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60355SR	P/N 60357SR	
1	1	TOP SUB	DLMS80	6015	5610	
2	1	INNER MANDREL	DLMS41X80	60355210	60357210	
3	16	DRAG BLOCK SPRING		910)900	
4	1	COMPRESSION SPRING	DLMCRSP	6035	5920	
5	1	SPRING CAGE	DLMS60	6015	5310	
6	1	UPPER SLIP BODY	DLMS60	6005	5320	
7	1	RELEASING SLIP	DLMS110	6005	5125	
8	2	UPPER SLIP	DLMS35	6005	5115	
9	1	UPPER CONE	DLMS60	6035	5410	
10	1	CENTER COUPLING	DLMS80	6035	5620	
11	1	RUBBER MANDREL	DLMS60	60055220	60057220	
12	2	RUBBER SPACER	DLMS60	60255840	60257840	
13	1	ELEMENT	70 DURO NITRILE	60255511	60257511	
14	2	ELEMENT	90 DURO NITRILE	60255513	60257513	
15	1	RUBBER RETAINER	DLMS80	60255850	60257850	
16	1	LOWER CONE	DLMS60	60055420		
17	4	LOWER SLIP	DLMS60	60055135		
18	1	DRAG BLOCK BODY	DLMS60 / DLMS35	60055335	60057335	
19	1	RUBBER MANDREL CAP	DLMS60	60155230		
20	1	J-BODY	DLMS80	60155340		
21	1	DRAG BLOCK RETAINER	DLMS60	60055910	60057910	
22	4	DRAG BLOCK	DLMSDB8	9055900	9045900	
23	1	BOTTOM SUB	DLMS80	6005	5655	
24	1	BONDED SEAL	DLMS60 / 90 DURO NITRILE	6005	5520	
25	8	LOWER SLIP SPRING		715	5901	
26	6	UPPER SLIP SPRING		715	5902	
27	1	SPRING CAGE CAP	DLMS60	60155810	60157810	
28	1	J-PIN RING	DLMS125	6005	5875	
29	1	GAGE RING	DLMS60	60255830	60257830	
30	1	SMALLEY HEAVY DUTY EXTERNAL RING	DLMSC	WSM-268		
31	12	SLOTTED SHEAR SCREW (5000# EA) 7/16-20 UNF X 3/8	DLM360BRS	BSSSLT043F037		
32	2	SOCKET SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS02	5C037	
33	4	SOCKET SET SCREW 5/16-18 UNC X 1/2	STEEL	SSS03	1C050	
34	1	149 O-RING	90 DURO NITRILE	90	90149	



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M) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60355SR P/N 603557R	
35	1	228 O-RING	90 DURO NITRILE	902	228
36	1	234 O-RING	90 DURO NITRILE	90234	

REDRESS KIT (RDK)	60355050SR	60357050SR
ASSEMBLED WEIGHT	196 LBS	192 LBS

M-1) ELASTOMER TRIM OPTIONS

NOTE₁₀: For temperature range, refer to Elastomer Trim Temperature Guide.

M-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60355SRH	P/N 60357SRH
13	1	ELEMENT	70 DURO HSN	60255511H	60257511H
14	2	ELEMENT	90 DURO HSN	60255513H	60257513H
24	1	BONDED SEAL	DLMS60 / 90 DURO HSN	60055520H	
34	1	149 O-RING	90 DURO HSN	90149H	
35	1	228 O-RING	90 DURO HSN	90228H	
36	1	234 O-RING	90 DURO HSN	90234H	

REDRESS KIT (RDK)	60355050SRH	60357050SRH

M-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60355SRV	P/N 60357SRV
13	1	ELEMENT	70 DURO VITON	60255511V	60257511V
14	2	ELEMENT	90 DURO VITON	60255513V	60257513V
24	1	BONDED SEAL	DLMS60 / 90 DURO VITON	60055520V	
34	1	149 O-RING	90 DURO VITON	90149V	
35	1	228 O-RING	90 DURO VITON	90228V	
36	1	234 O-RING	90 DURO VITON	90234V	

REDRESS KIT (RDK)	60355050SRV	60357050SRV
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M-2) CARBIDE OPTION

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60355SRC	P/N 60357SRC
8	2	CARBIDE UPPER SLIP	DLMS35	60055115C	
17	4	CARBIDE LOWER SLIP	DLMS60	60055135C	
22	4	CARBIDE DRAG BLOCK	DLMSDB8	9055900C	9045900C



N) TECHNICAL ILLUSTRATION



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	ASI-X PACKER	DL-603-5500-066
&	w/SHEAR RELEASE BOTTOM	Revision: F
OIL TOOLS	5-1/2" X 2-3/8"	Revision Date: 03/30/2021
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O) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
03/30/2021	F	Added P/N 60357SRC, carbide options; Revised trim temp. ratings	J.Anderson	E.Visaez
05/02/2016	Е	Added Related Tools, Pre-Installation Inspection Procedures, max. hanging weight, torque thru tool, Storage Recommendations; Revised Pressure Affected Area Guide, Elastomer Trim Temperature Guide	J.Anderson	K.Plunkett
06/20/13	D	Revised P/N 60155610 was 60055610, P/N 60155310 was 60355310, P/N 60155230 was 60055230, P/N 60155340 was 60355340, P/N 60155810 was 60055810, P/N SSS031C050 quantity was 1, assembled weight was 199 lbs; Added recommended hand tools, HSN and Viton options (P/Ns 60355SRH, 60355SRV);	J.Anderson	J.McArthur