

Document #	TU-FH-5312
Revision	3
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Author	Omar Perdomo
Approved By:	Joshua Johnson

FH™ 5312 HYDRAULIC SETTING TOOL

The Alpha 5312 FH™ Hydraulic Setting Tool is designed to run and set the Alpha FH™ One-Trip Cement Retainer then squeeze or spot cement in one trip. It is recommended for deviated wells. No rotation is required; simply run tool to the predetermined setting depth, drop ball, then pressure up either the drill pipe, tubing or coil tubing to shear release. The 5312 FH™ Hydraulic Setting Tool sets the FH™ Cement Retainer, unlocks the ball seat, closes the circulation ports, opens the bypass and compensates setting travel automatically.

Applications:

Designed to run and set the Alpha FH™ One-Trip Cement Retainer then squeeze or spot cement in one-trip. It is recommended for deviated wells where conditions are not suitable for rotating or wireline set cement retainers.

Features:

- One-trip system
- Simple operation and easy clean up makes it ideal for applications on drill pipe, tubing or coil tubing
- No rotation required

CEMENT RETAINERS

Utilizing the Alpha FH™ Cement Retainer with the 5312 FH™ Setting Tool, the Retainer can be run, set and squeezed through in one-trip using the Alpha FH™ Hydraulic Setting Tool. No rotation is required. The sliding sleeve valve located inside the cement retainer is controlled by picking up 2 inches to close and setting down weight to open then squeeze. Cement can also be placed on top of the cement retainer. The 5312 FH™ Setting Tool is compatible with the following Alpha FH™ Cement Retainers:

Part Number	Setting Sleeve/ Conversion Kit Part Number
005-5687-500	019-5687-210
005-6312-500	019-6312-210
005-8125-500	019-8125-210
005-9437-500	019-9437-210
005-9500-500	019-9500-210
005-1200-500	019-1200-210
005-1425-500	019-1425-210

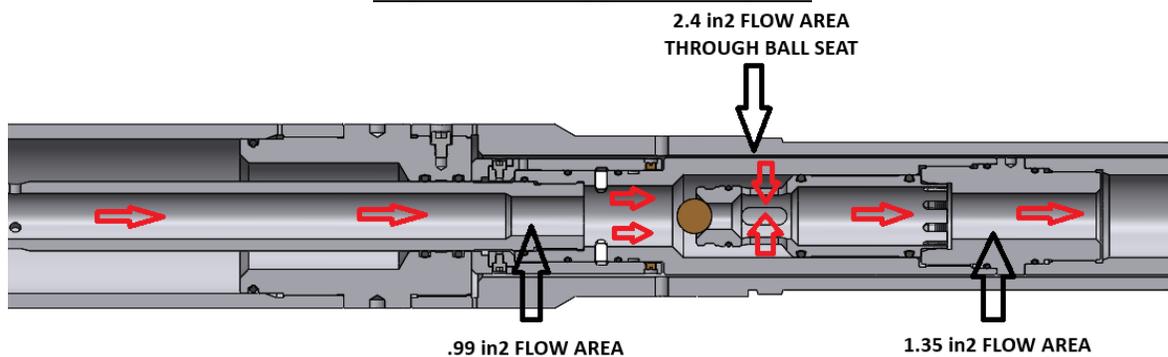


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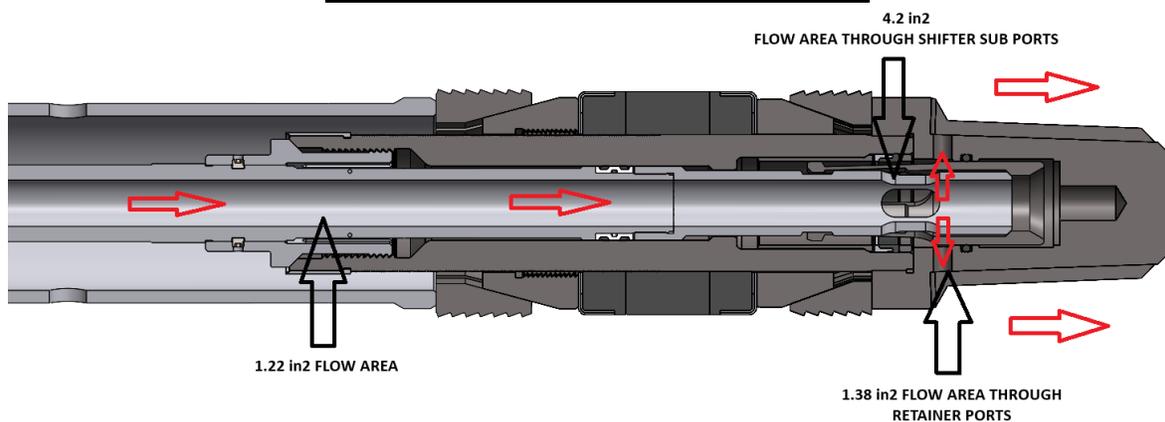
HOW THE 5312 FH™ SETTING TOOL WORKS

The ball lands on the ball seat which diverts the well fluid into the hydraulic setting chamber (12.34 in^2 total piston area). The workstring is pressurized to establish differential pressure at the tool. That pressure is held for 5 minutes to allow the cement retainer packing system to conform to the casing ID. The 5312 FH™ Hydraulic Setting Tool continues to stroke and at the end of its 11.13 inches stroke it unlocks the ball seat by shearing the shear screws which positions an undercut over the ball seat locks. These locks are tapered so they cannot enter the cement flow path. The ball seat is now free to move downward, close circulation ports and latch into the tandem sub. The ball seat latch keeps the ball seat from moving upward during the reverse circulation process which keeps the flow path the same as the ID of the Hydraulic Setting Tool.

FLOW PATH AROUND BALL SEAT



FLOW PATH AROUND CEMENT RETAINER



Min. Flow Area	Max. Recommended Flow Rate
.99 in^2	3.5 BPM

The stinger remains pinned to in the cement retainer body (8,000 lbs), unaffected by the setting force because the stroke compensation sleeve moves independently from the stinger. The squeeze operation should be performed then apply overpull to remove stinger from cement retainer. See the operational procedure on page 4.

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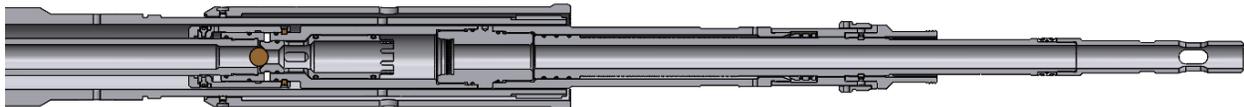
GENERAL INFORMATION

1. Use a casing scraper before running any equipment in the well to remove scale and other materials from the casing wall. Any tool that is expected to grip the casing wall has to first reach the casing wall.
2. Circulate the well to clean the well of debris and junk.
3. Drift the casing ID 80-100 feet below setting depth with a full OD gage ring and junk basket to ensure no restrictions or debris exist.
4. Use the correct FH™ Sleeve Valve Cement Retainer for the temperature, pressure, casing size, casing weight and environment.
5. Casing should have 100% cement bond before running the cement retainer in the well.
6. Never set the retainer in a casing collar or a location where milling has occurred.
7. Always set the retainer in static well conditions (no fluid or gas movement).
8. When perforating, the cement retainer should be protected with a minimum of ten feet of cement dumped directly on top of the retainer. Cement should be given sufficient time to harden before perforating.
9. Perforating should not be done closer than fifty feet of cement retainer without putting a minimum of 10 ft. of hard cement on top of retainer.

FIELD ASSEMBLY PROCEDURE

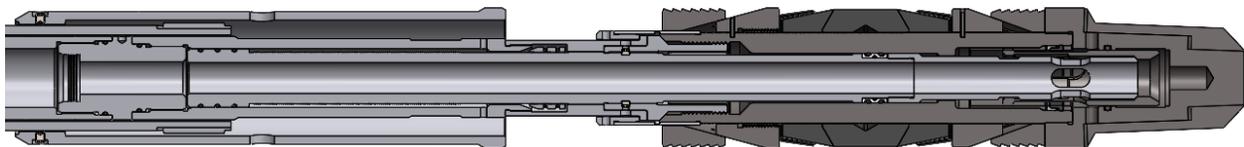
STEP 1: Attach the setting tool to the end of two joints of tubing then hoist up. Apply grease to all parts from the latch down to stinger.

STEP 2: Install Setting Sleeve and thread onto Push Sleeve (item 7).



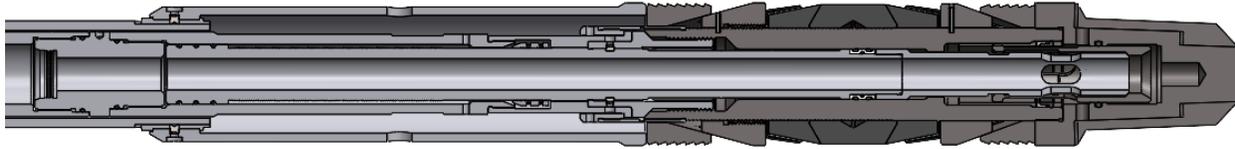
STEP 3: Stand the cement retainer upright on rig floor. Lower the setting tool into seal bore and allow the tubing weight to bottom the latch onto the locating shoulder. If the snap latch does not shoulder then pick up slightly on the tubing, hold wrench back-up on extension housing then screw the cement retainer to the **LEFT** until it bottoms out.

STEP 3: Thread the Setting Nut into the into the shear ring on the cement retainer wrench tight.



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STEP 4: Thread the Setting Sleeve/Conversion kit down until it touches Top Slip of the Retainer. Back the Setting Sleeve off slightly to align the closest slot in push sleeve with the tapped holes in the Setting Sleeve and install two 3/8-16 x 3/8 long socket head set screws hand tight. **NOTE: THE TOP SLIP MUST BE FREE TO ROTATE.**



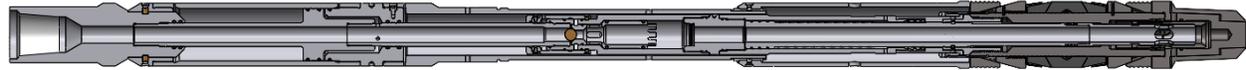
OPERATION PROCEDURE

1. Run the Alpha 5312 FH™ Hydraulic Setting Tool and Cement Retainer several feet below the setting depth.

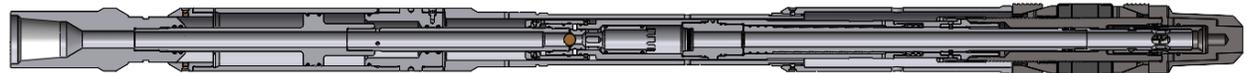
NOTE: The stinger holds the cement retainer valve in the open position allowing the tubing to fill going in the hole.

2. Pick up slowly to setting depth to remove slack from tubing string.

3. Drop the 1.00" diameter Brass Ball and slowly pump down until it has seated (pressure increase).



4. Slowly increase the pressure workstring to establish a 2,500 psi differential pressure inside the tubing "at the tool" to begin the setting sequence. Hold this differential pressure for 1-2 minutes.



5. Continue increasing the pressure in the workstring to establish a 3,750 psi differential pressure inside the tubing "at the tool" to anchor the cement retainer against the casing wall. Hold pressure for 5 minutes.

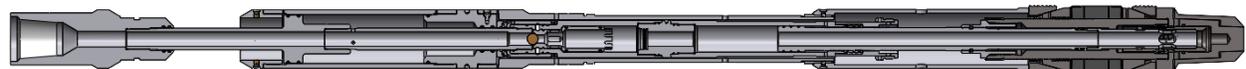
NOTE: If pressure bleeds off on its own, then go to Step 8 (tool has been released from the retainer).

6. Pick up 5,000 lbs over the tubing weight.



7. Pressure workstring to establish 4,600 psi differential pressure inside the tubing at the tool to release from the cement retainer (pressure should bleed off on its own).

NOTE: If tool does not release from cement retainer, continue pressuring up to a maximum of 5,000-6,000 psi "at the tool" to release from the cement retainer.



If unsuccessful, then bleed off pressure, return tubing to the neutral point and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate the ball back to the ball seat and attempt pressuring tubing again to 5,000-6,000 psi to release from the Cement Retainer.

If still unsuccessful, refer to the "Troubleshooting" section below:

8. Sting out of the cement retainer and circulate through the workstring.

NOTE: If circulation cannot be obtained, then pressure workstring to establish 1,500 psi differential pressure inside the tubing "at the tool" to close circulating ports located below ball seat and open the by-pass.



9. Sting into cement retainer and apply 20,000 lbs weight to determine if tool is securely set and begin squeeze operation.

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NOTE: The Ball Seat cannot be pumped out until the setting sequence has been completed. The Extension Housing will automatically adjust and lock, according to the setting travel, which enables the stinger to stay in the Cement Retainer. A maximum flow rate of 7-8 BPM can now be established through the tool. Raise the workstring 2" to close the sliding sleeve and test the tubing then lower 2" to open and squeeze. Snap Latch is designed to snap out at 5,000/lbs and snap in at 2,000/lbs. In highly deviated applications the use of an 18-inch fully balanced bumper sub is recommended to absorb the setting stroke.



TROUBLESHOOTING

Only if setting tool does not release from cement retainer by hydraulic pressure as in Step 7:

- a) Bleed off pressure
- b) Pull 55,000/lbs over workstring weight to release from Cement Retainer.
- c) Slowly pressure workstring to establish 1,550psi differential inside the tubing "at the tool" to close circulating ports and open the by-pass. A maximum flow rate of 7-8 BPM can now be established through the tool.
- d) If a flow rate cannot be established then reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing or tool. Circulate ball back to seat and attempt pressuring tubing to 1,550psi again to close circulating ports and open the by-pass. Proceed to Step 9.

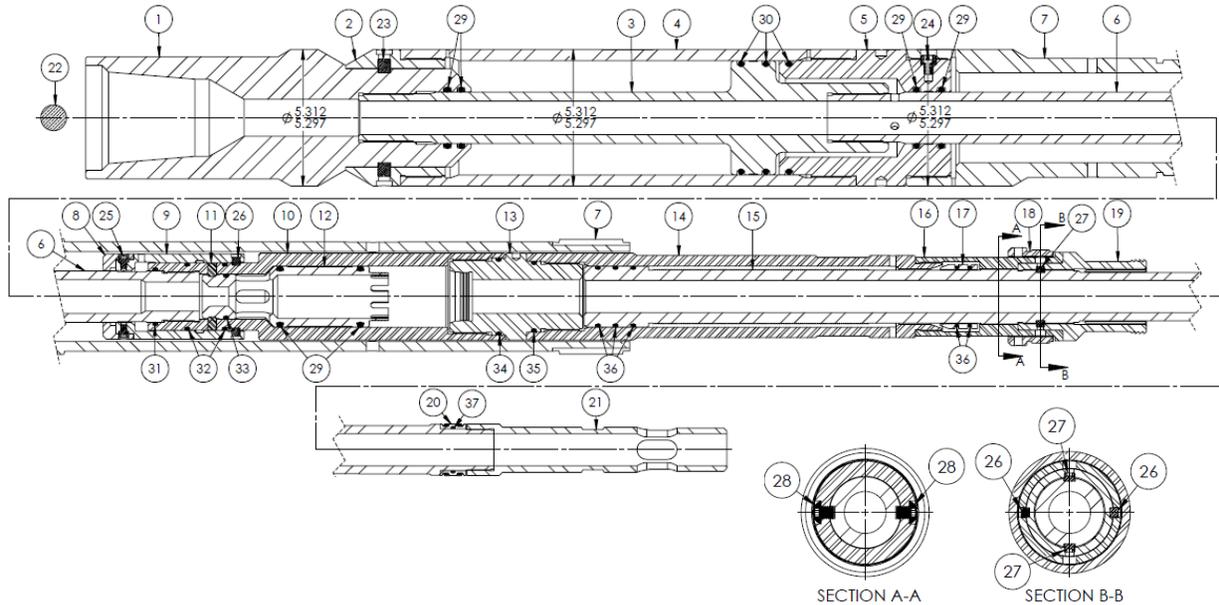
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ASSEMBLY INSTRUCTIONS FOR 5312 FH™ SETTING TOOL

Anti-galling compound should be used on all threads. Downhole grease should be used on all O-rings. To avoid damage to parts, use a soft jaw vise and strap wrenches when tightening connections. Wrench on knurled areas or utilize spanner holes. File away wrench marks.

NOTE: Wrench tight means putting your weight on the end of a 24" pipe wrench. Screwdriver tight means hand tight with a medium blade 6" long screwdriver.

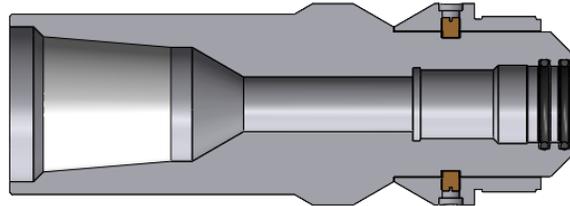
5312 FH™ SETTING TOOL ASSEMBLY ILLUSTRATION



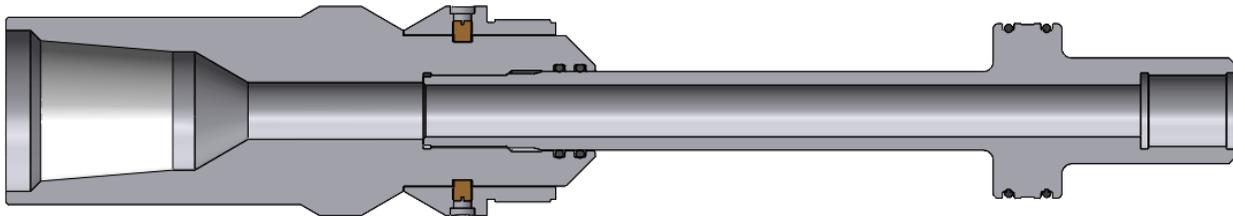
ITEM NO.	PART NUMBER	ALPHAPARTNAME	QTY.	ITEM NO.	PART NUMBER	ALPHAPARTNAME	QTY.	ITEM NO.	PART NUMBER	ALPHAPARTNAME	QTY.
1	019-5312-220	TOP SUB	1	13	019-5312-242	CONNECTOR SUB	1	25	250C20X250	1/4-20 X .25 LG SHCS	2
2	019-5312-221	CYLINDER CAP	1	14	019-5312-243	COMPENSATION HOUSING	1	26	062-4500-127	SHEAR SCREW	4
3	019-5312-223	PISTON	1	15	019-5312-244	COMPENSATION PISTON	1	27	313S18X250	5/16-18 X .25 SET SCREW	2
4	019-5312-222	CYLINDER	1	16	019-5312-240	LOCK RING RETAINER	1	28	375B16X375	3/8-16 X .375 LG BHCS	2
5	019-5312-225	CYLINDER CONNECTOR	1	17	019-5312-241	LOCK RING	1	29	000-329N-070	329 O-RING NITRILE DURO 70	6
6	019-5312-227	UPPER BALL SEAT HOUSING	1	18	019-5312-249	SETTING NUT	1	30	000-345N-070	345 O-RING 70 NITRILE	3
7	019-5312-226	PUSH SLEEVE	1	19	019-5312-250	SNAP LATCH	1	31	000-226N-070	226 O-RING 70 NITRILE	1
8	019-5312-231	LOCK RETAINER NUT	1	20	016-5610-033	MOLDED SEAL	1	32	000-229N-070	229 O-RING 70 NITRILE	2
9	019-5312-230	LOCK RETAINER	1	21	017-5687-034	SHIFTER SUB	1	33	000-222N-090	222 O-RING	1
10	019-5312-257	LOWER BALL SEAT HOUSING	1	22	019-5312-236	1.00 BRASS BALL	1	34	000-232N-090	232 O-RING	1
11	019-5312-229	BALL SEAT LOCK	3	23	062-4500-128	SHEAR SCREW	4	35	000-230N-090	230 O-RING	1
12	019-5312-228	BALLSEAT	1	24	375C16X375	3/8-16 X .375 LG SHCS	1	36	000-227N-090	227 O-RING	5
								37	000-130N-090	130 O-RING	1

5312 FH™ SETTING TOOL ASSEMBLY STEPS

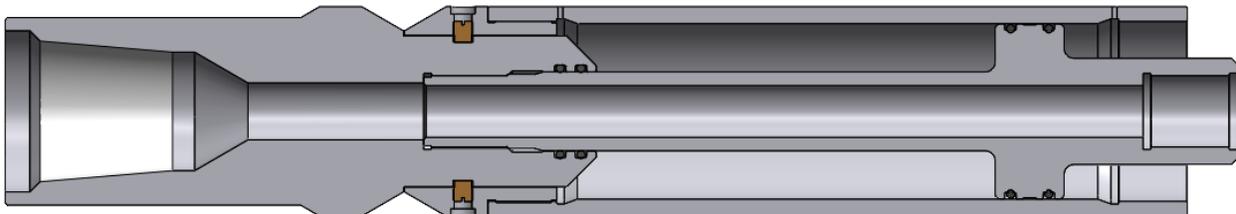
1. Place the Top Sub (item 1) into a vise.
2. Install two 329 O-Rings (item 29) into the Top Sub (item 1) and grease liberally.
3. Slide the Cylinder Cap (item 2) over the Top Sub (item 1).
4. Install four Brass Shear Screws (item 23) into the Cylinder Cap (item 2) until the screws fully bottom out on the Top Sub (item 1) and then back off ¼ turn.



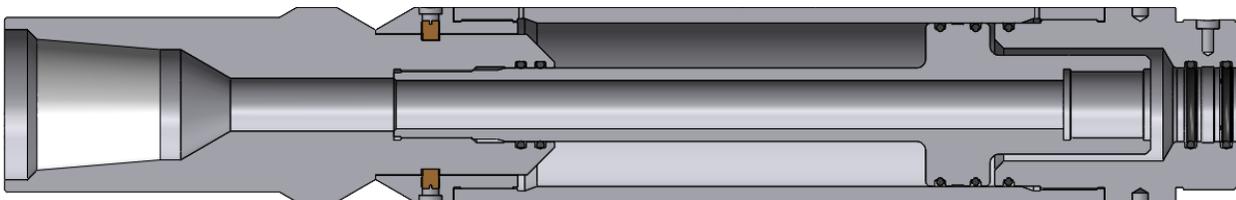
5. Install two 345 O-Rings (item 30) into the corresponding grooves of the Piston (item 3) and grease liberally.
6. Thread the Piston (item 3) into the Top Sub (item 1) and tighten wrench tight with a 24" pipe wrench.



7. Install the Cylinder (item 4) over the Piston (item 3) and thread the Cylinder onto the Cylinder Cap (item 2) until the two parts fully bottom out.

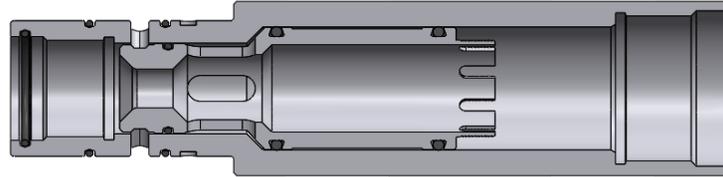


8. Install one 345 O-Ring (item 30) and two 329 O-Rings (item 29) into the corresponding grooves of the Cylinder Connector (item 5) and grease liberally.
9. Thread the Cylinder Connector (item 8) into the Cylinder (item 4) and tighten wrench tight with a 24" pipe wrench. Set this sub-assembly aside.

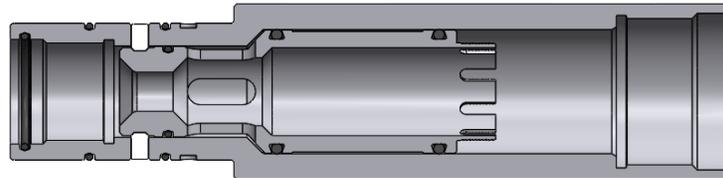


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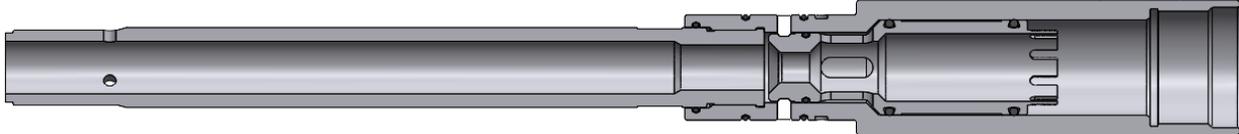
10. Starting a new sub-assembly. Install one 226 O-Ring (item 31) and two 229 O-Rings (item 32) into the Lower Ball Seat Housing (item 10) and grease liberally.
11. Install one 222 O-Ring (item 33) and two 329 O-Rings (item 29) into the Ball Seat (item 12) and grease liberally.
12. Install the Ball Seat (item 12) into the Lower Ball Seat Housing (item 10) and slide in place until the Ball Seat (item 12) fully bottoms out on the Lower Ball Seat Housing (item 10).



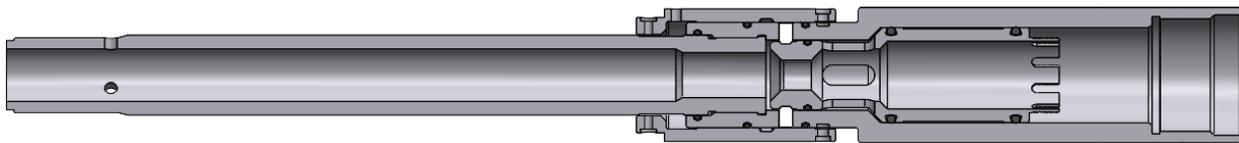
13. Pack the windows of the Lower Ball Seat Housing (item 10) with grease.
14. Install two Ball Seat Locks (item 11) into the windows of the Lower Ball Seat Housing (item 10).



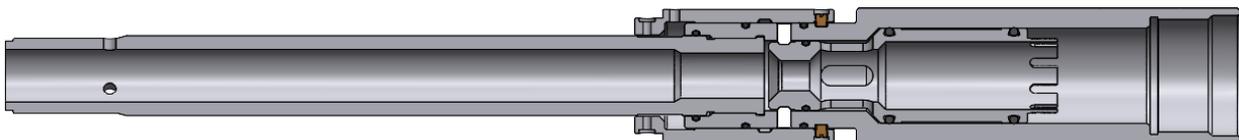
15. Thread the Upper Ball Seat Housing (item 6) into the Lower Ball Seat Housing (item 10) and tighten wrench tight with a 24" pipe wrench.



16. Slide the Lock Retainer (item 9) over the Upper Ball Seat Housing (item 6) until the holes in the Lock Retainer align with the spot faces in the Lower Ball Seat Housing (item 10).

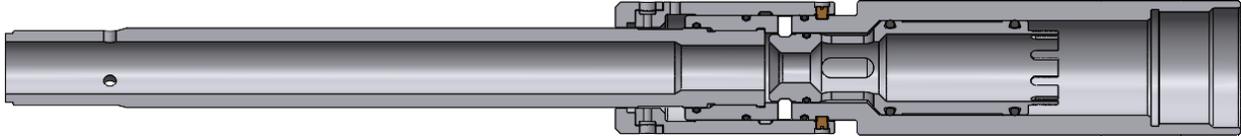


17. Install two Brass Shear Screws (item 26) into the Lock Retainer (item 9) until the screws fully bottom out on the Lower Ball Seat Housing (item 10) and then back off ¼ turn.

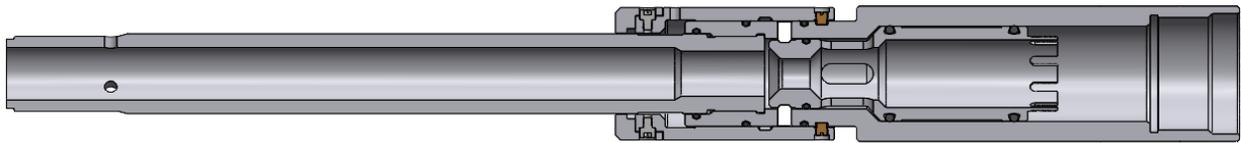


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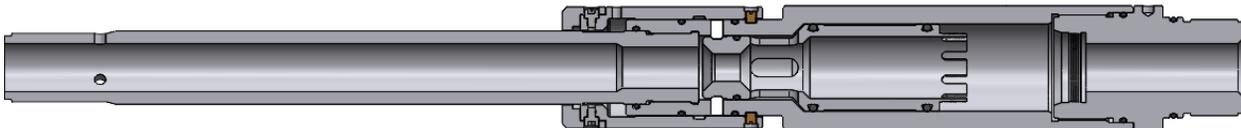
18. Slide the Lock Retainer Nut (item 8) over the Upper Ball Seat Housing (item 6) until the Lock Retainer Nut (item 8) fully bottoms out on the Lock Retainer (item 9) and align the holes in the Lock Retainer Nut (item 8) with the counterbore/tapped holes in the Lock Retainer (item 9).



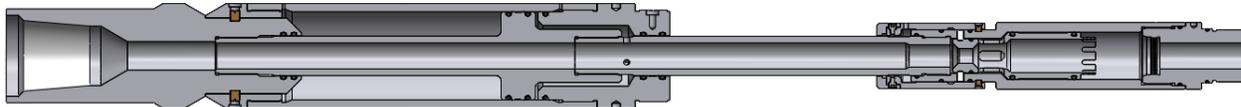
19. Install two ¼ -20 X ¼" long Socket Head Cap Screws (item 25) into the two tapped holes in the Lock Retainer (item 8) until the Socket Head Cap Screws (item 25) fully bottom out to retain the Lock Retainer Nut (item 8).



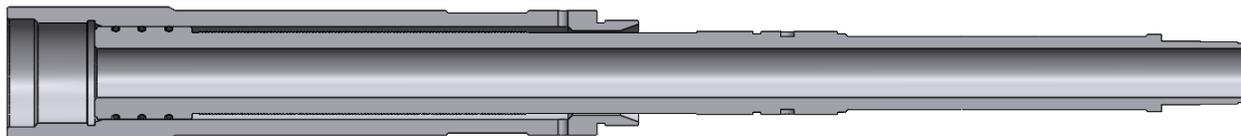
20. Install one 232 O-Ring (item 34) and one 230 O-Ring (item 35) onto the corresponding grooves of the Connector Sub (item 13) and grease liberally.
21. Thread the Connector Sub (item 13) into the Lower Ball Seat Housing (item 10) and tighten wrench tight with a 24" pipe wrench.



22. Assemble the two sub-assemblies by threading the Upper Ball Seat Housing (item 6) into the Piston (item 3) and tighten wrench tight with a 24" pipe wrench.

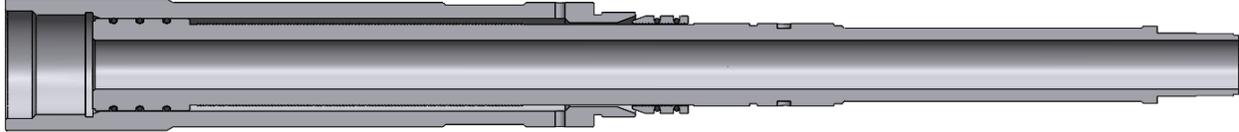


23. Install three 227 O-Rings (item 36) into the corresponding grooves on the Compensation Piston (item 15) and grease liberally.
24. Starting a new sub-assembly. Install the Compensation Piston (item 15) into the Compensation Housing (item 14) so all three 227 O-Rings (item 36) seal in the Bore.

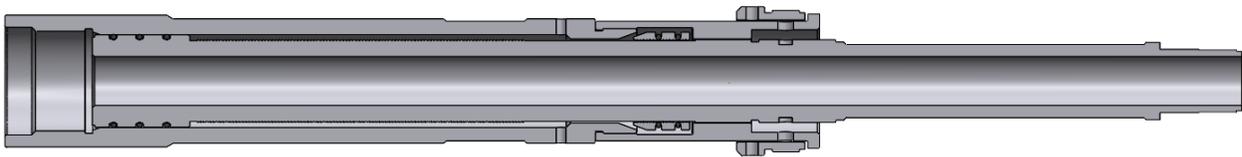


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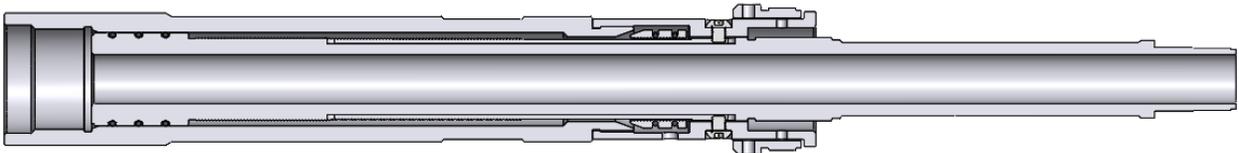
25. Place the three segments of the Lock Ring (item 17) over the Compensation Housing (item 14) and utilize two 227 O-Rings (item 36) to hold them in place. Ensure the segments are a matched set and sequenced correctly.



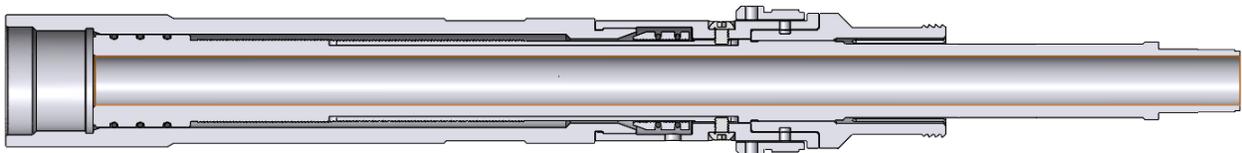
26. Slide the Setting Nut (item 18) over the Lock Ring Retainer (item 16) then thread the Lock Ring Retainer onto the Compensation Housing (item 14) and tighten wrench tight with a 24" pipe wrench.



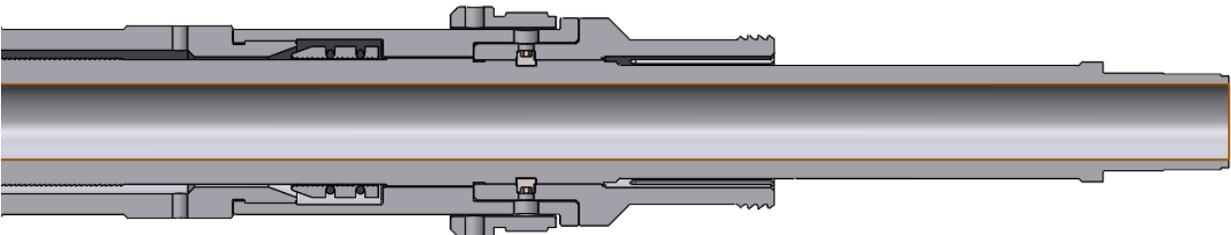
27. Rotate the Compensation Piston (item 15) as needed to align the slots with the threaded holes in the Lock Ring Retainer (item 16) then install two 3/8 -16 X 3/8 long Button Head Cap Screws (item 28) into the tapped holes in the Lock Ring Retainer (item 16) hand tight.



28. Thread the Snap Latch (item 19) onto the Compensation Piston (item 15) until the Snap Latch bottoms out and then back off slightly as needed to align the holes in the Lock Ring Retainer (item 16) align with the spot faces in the Snap Latch.

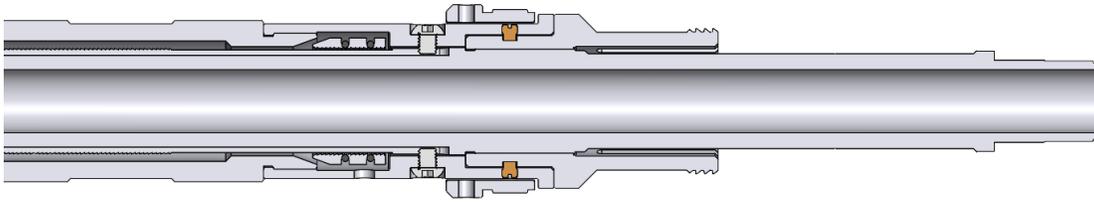


29. Install two 5/16 - 18 X 1/4 long Set Screws (item 27) into the two tapped holes in the Snap Latch (item 19) hand tight.

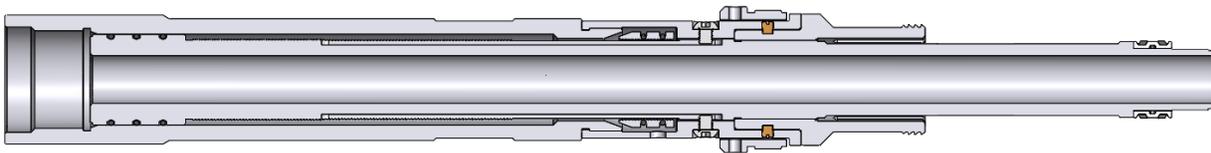


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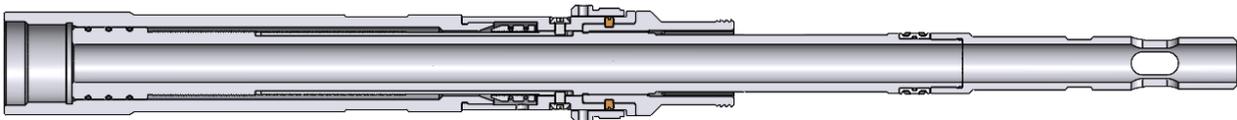
30. Install two Brass Shear Screws (item 26) into the two tapped holes in the Lock Ring Retainer (item 16) until the screws fully bottom out on the Snap Latch (item 19) and then back off ¼ turn.



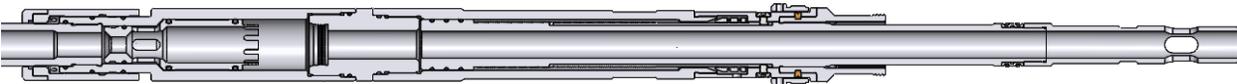
31. Grease the Molded Seal (item 20) and install onto the Compensation Piston (item 15) with 130 O-ring (item 37) until the Molded Seal bottoms out on the Compensation Piston.



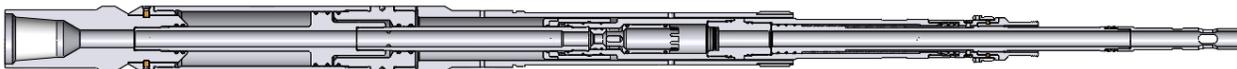
32. Thread the Shifter Sub (item 21) onto the Compensation Piston (item 15) and tighten wrench tight with a 24" pipe wrench.



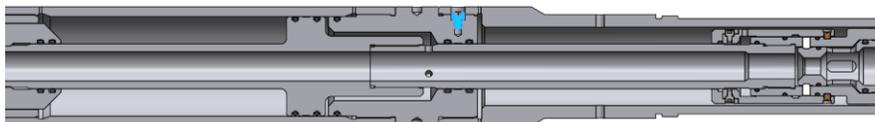
33. Assemble the Compensation Piston sub-assembly onto rest of the Setting Tool by threading the Compensation Housing (item 14) onto the Connector Sub (item 13) and tighten wrench tight with a 24" pipe wrench.



34. Slide the Push Sleeve (item 7) over the Shifter Sub (item 21) then thread the Push sleeve onto the Cylinder Connector (item 5) and tighten wrench tight with a 24" pipe wrench.



35. Install one 3/8-16 x 3/8" Long Cap Screw (item 24) through the hole in the Push Sleeve (item 7) and thread the 3/8-16 x 3/8" Long Cap Screw into the Cylinder Connector (item 5) hand tight until it fully bottoms out.



36. Package 1" Brass Ball separate and affix to the Setting Tool.

DO NOT PLACE THE BALL IN THE TOOL

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Approved By:	Joshua Johnson

DISASSEMBLY OF THE 5312 FH™ SETTING TOOL

1. Drain all well fluids from Hydraulic Setting Tool and dispose of properly.
2. Place the Setting Tool in a pipe vise and vise onto the Top Sub (item 1).
3. Push the Outer components of the tool as far back as possible by hammering the Setting Sleeve towards the Top Sub (item 1) with a dead blow hammer or mallet. Use caution as to ensure not to damage the Setting Sleeve.
4. Fully remove the 3/8-16 x 3/8 long socket head set screws in the Setting Sleeve/Conversion Kit.
5. Unthread the Setting Sleeve/Conversion Kit from the Push Sleeve (item 7) and fully remove.
6. While holding back-up on the Compensation Piston (item 15), unthread the Shifter Sub (item 21) from the Compensation Piston (item 15) and fully remove.
7. Remove the Molded Seal (item 20) from the Compensation Piston (item 15) and discard.
8. Fully remove the two 5/16 – 18 X ¼” long Set Screws (item 27) from the two tapped holes in the Latch (item 19).
9. While holding back-up on the Compensation Piston (item 15), unthread the Latch (item 19) from the Compensation Piston (item 15) and fully remove.
10. Unthread the remaining half of the Shear Ring of the Retainer from the Setting Nut (item 18) and discard the Shear Ring.
11. Remove the two Brass Shear Screws (item 26) from the two tapped holes in the Lock Ring Retainer (item 16) and discard them.
12. Remove the two 3/8 -16 X 3/8 long Button Head Cap Screws (item 28) from the two tapped holes in the Lock Ring Retainer (item 16).
13. While holding back-up on the Compensation Housing (item 14), unthread the Lock Ring Retainer (item 16) and fully remove from over the Compensation Piston (item 15).
14. Remove the Setting Nut (item 18) from over the Lock Ring Retainer (item 16).
15. Fully remove the three segments of the Lock Ring (item 17) from the Compensation Piston (item 15) and discard the two O-Rings.

NOTE: ENSURE TO KEEP ALL THREE SEGMENTS TOGETHER.

16. Fully remove the 3/8-16 x 3/8” Long Cap Screw (item 24) from the Cylinder Connector (item 5)/Push Sleeve (item 7).
17. While holding Back-Up on the Cylinder Connector (item 5), unthread the Push Sleeve (item 7) from the Cylinder Connector (item 5) and fully remove from over the Compensation Housing (item 14).
18. While holding back-up on the Connector Sub (item 13), unthread the Compensation Housing (item 14) and fully remove.
19. Remove the Compensation Piston (item 15) from the Compensation Housing (item 14).
20. Remove the three 227 O-Rings (item 36) from the Compensation Piston (item 15) and discard them.
21. While holding back-up on the Upper Ball Seat Housing (item 6), unthread the Lower Ball Seat Housing (item 10) from the Upper Ball Seat Housing. This will remove the Ball Seat section as a more manageable sub assembly. Set this sub-assembly aside.
22. While holding Back-Up on the Cylinder (item 4), unthread the Cylinder Connector (item 5) from the Cylinder and remove the Cylinder Connector from over the Upper Ball Seat Housing (item 6).
23. Remove the one 345 O-Ring (item 30) and two 329 O-Rings (item 29) from the Cylinder Connector (item 5) and discard them.
24. Unthread the Cylinder (item 4) from the Cylinder Cap (item 2) and remove the Cylinder (item 4) from over the Piston.
25. Unthread the Upper Ball Seat Housing (item 6) from the Piston (item 3).
26. Unthread the Piston (item 3) from the Top Sub (item 1).
27. Remove the two 345 O-Rings (item 30) from the Piston (item 4) and discard them.
28. Remove the Cylinder Cap (item 2) from the Top Sub (item 1).
29. Remove the four Brass Shear Screws (item 23) into the Cylinder Cap (item 2) and discard them.

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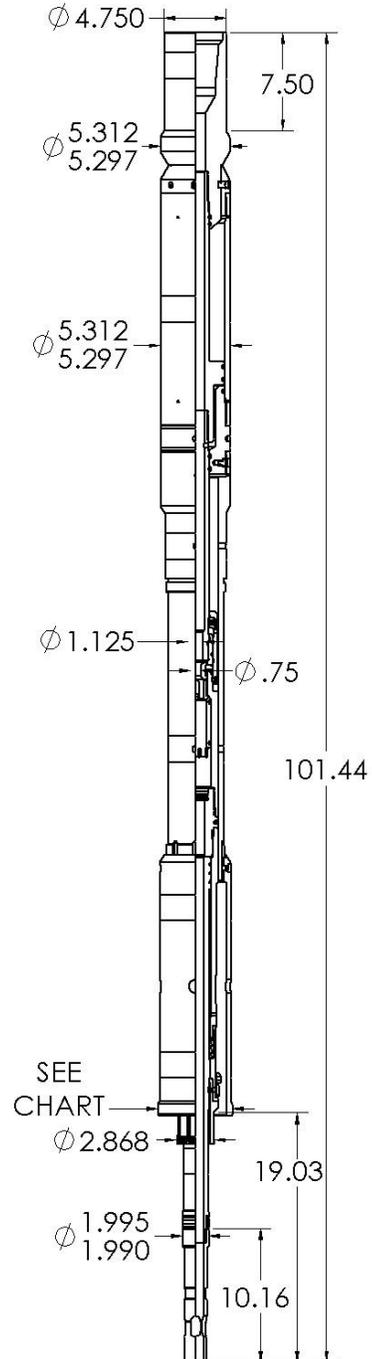
30. Remove the two 329 O-Rings (item 29) from the Top Sub (item 1) and discard them.
31. Place the Ball Seat sub-assembly into a vise and vise down on the Lower Ball Seat Housing (item 10) at the knurl.
32. Fully remove the two ¼ -20 X ¼” long Socket Head Cap Screws (item 25) from the Lock Retainer (item 9)/Lock Retainer Nut (item 8).
33. Remove the Lock Retainer Nut (item 8) from the Lock Retainer (item 9).
34. Remove the two Brass Shear Screws (item 26) from the two tapped holes in the Lock Retainer (item 9) and discard them.
35. Fully remove two Ball Seat Locks (item 11) from the windows of the Lower Ball Seat Housing (item 10).
36. Fully unthread the Connector Sub (item 13) from the Lower Ball Seat Housing (item 10).
37. Remove the one 226 O-Ring (item 31) and two 229 O-Rings (item 32) from the Lower Ball Seat Housing (item 10) and discard them.
38. Place the Connector Sub (item 13) in a vise.
39. Fully unthread the Ball Seat (item 12) from the Connector Sub (item 13)
40. Remove the one 222 O-Ring (item 31) and two 329 O-Rings (item 29) from the Ball Seat (item 12) and discard them.
41. Remove the one 232 O-Ring (item 34) and one 230 O-Ring (item 35) from the Connector Sub (item 13) and discard them.

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**5312 FH™ HYDRAULIC SETTING TOOL
DIMENSIONAL DATA**

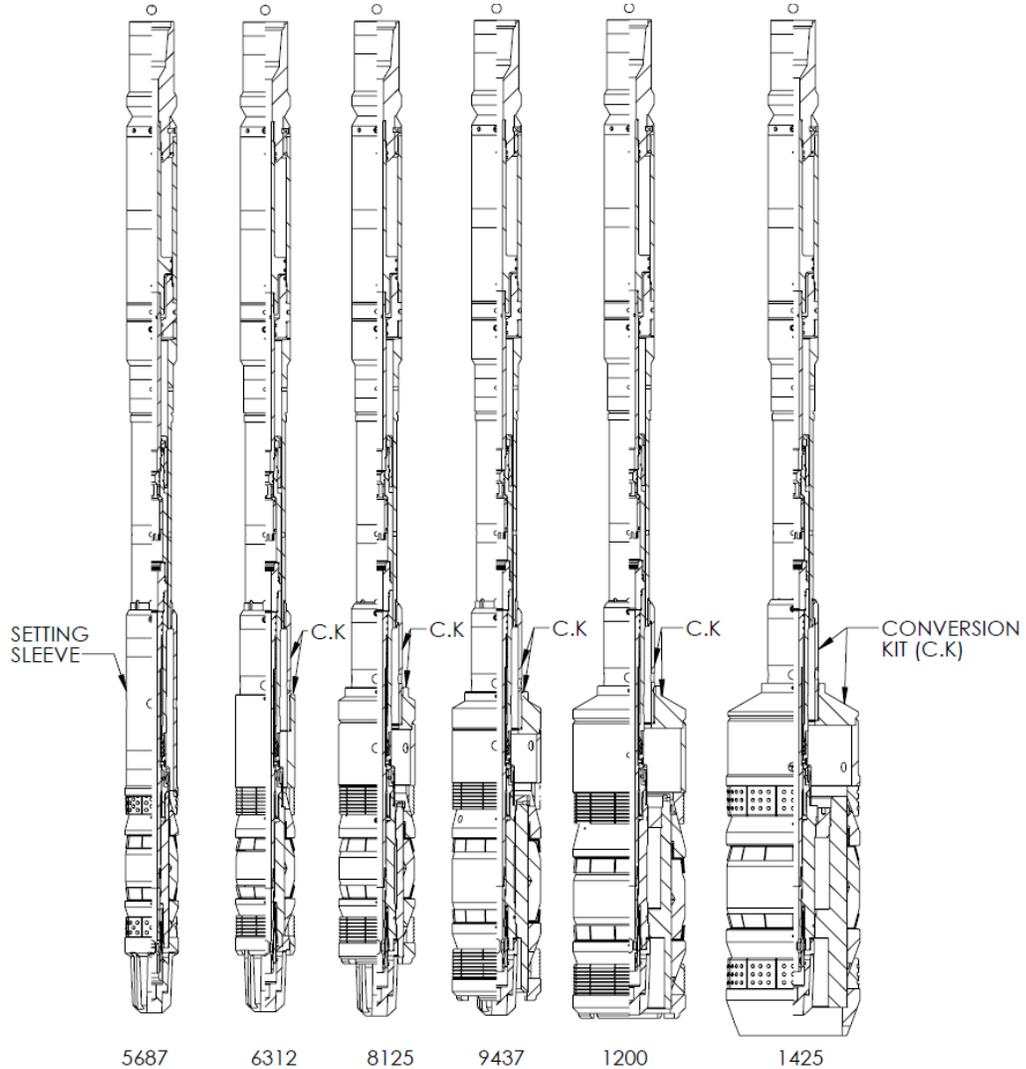
RETAINER SIZE	O.D. MAX (in.)
5687	5.687
6312	6.312
8125	8.125
9437	9.437
9500	9.500
1200	12.00
1425	14.25

For sizes 6312-1425 Conversion Kit needs to be installed on part 7 (Push Sleeve) and adjusted to touch Top Slip on the Cement Retainer. Top Slip must be free to rotate.



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**5312 FH™ HYDRAULIC SETTING TOOL
Conversion Kit**





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**REDRESS KIT
(AFTER DISASSEMBLY OF THE TOOL)**

Required Parts for Redress Kit (019-5312-215)		
PART NAME	PART NUMBER	QTY.
Bronze Ball 1.00	019-5312-236	1
Shear Screw	062-4500-128	4
Shear Screw	062-4500-127	4
329 O-ring	000-329N-090	6
345 O-ring	000-345N-090	3
226 O-ring	000-226N-090	1
229 O-ring	000-229N-090	2
222 O-ring	000-222N-090	1
232 O-ring	000-232N-090	1
230 O-ring	000-230N-090	1
227 O-ring	000-227N-090	5
130 O-ring	000-130N-090	1