FH™ 1750 HYDRAULIC SETTING TOOL

The Alpha 1750 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. 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 1750 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

TOOL SIZE	PART NUMBER	TOP CONNECTION	MAX. STROKE LENGTH	MAX. APPLIED PRESSURE
1.750	019-1750-200	1" MT Box	4-½"	5,000 psi

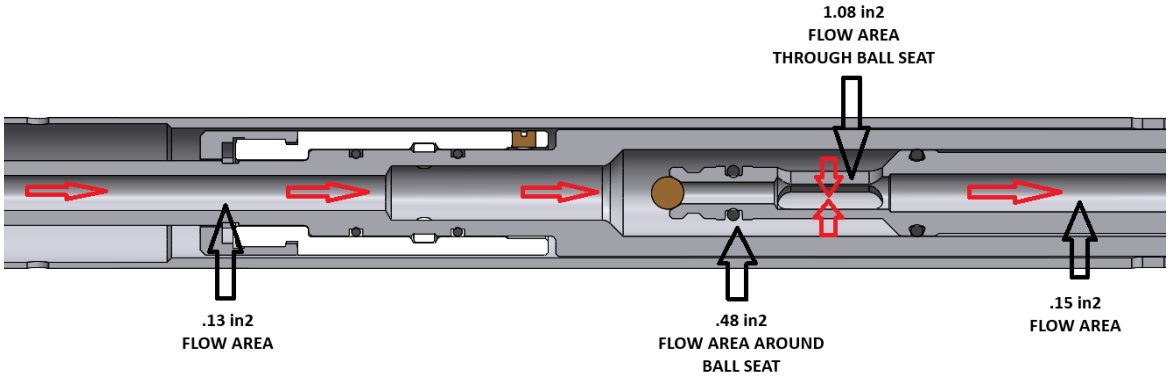
CEMENT RETAINERS
Utilizing the Alpha FH™ Cement Retainer with the 1750 FH Setting Tool, the Retainer can be run, set and squeezed through in one-trip using the Alpha FH™ Hydraulic Setting Tool. No rotation is required. The sliding sleeve valve located inside the cement retainer is controlled by picking 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 1750 FH™ Setting Tool is compatible with the following Alpha FH™ Cement Retainers:

Part Number	Setting Sleeve Part Number
005-1750-500	019-1750-247
005-1750-500A	019-1750-247

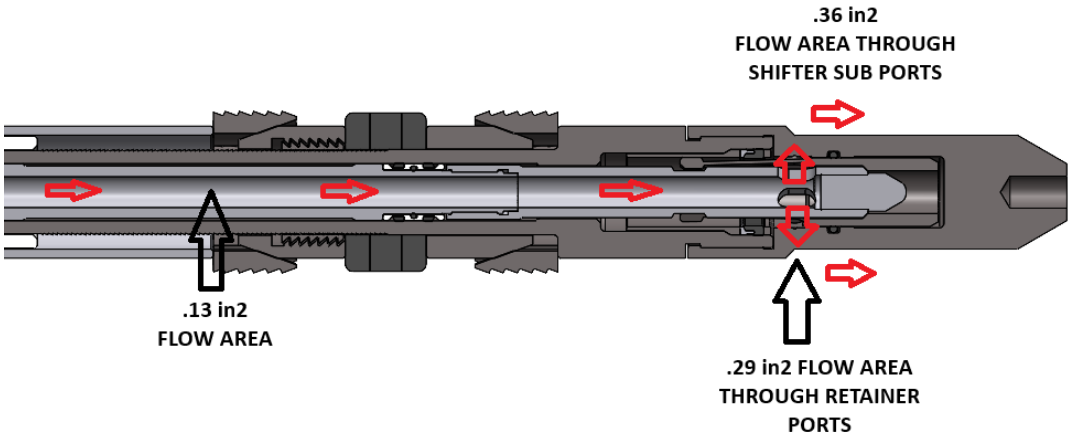
HOW THE 1750 FH™ SETTING TOOL WORKS

The ball lands on the ball seat which diverts the well fluid into the three hydraulic setting chambers (3.91 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 tubing ID. The pressure in the workstring is then increased in order to shear the Shear Screws that connect to the cement retainer (this fully sets the cement retainer and disconnects the Setting Tool from the Cement Retainer). The FH™ Setting Tool continues to stroke and at the end of its 6" 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

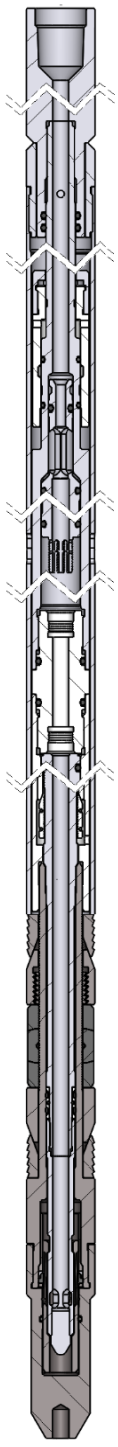


FLOW PATH THROUGH RETAINER

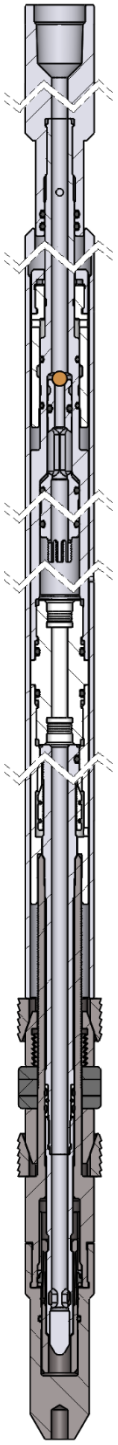


Min. Flow Area	Max. Recommended Flow Rate
.13 in^2	.45 BPM

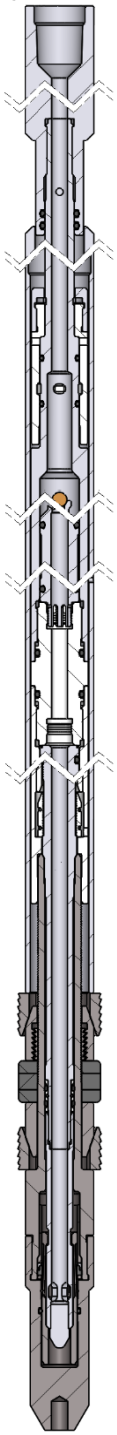
The stinger remains pinned to in the cement retainer body, unaffected by the setting force because the stroke compensation sleeve moves independently from the stinger. The squeeze operation should be performed then apply overpull to remove stinger from cement retainer. See operational illustration next page.



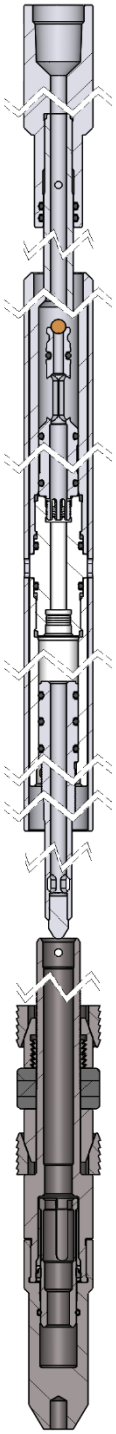
Run in Position



Drop Ball & Pressure Workstring to anchor Retainer



Increase Pressure



Pull Out Retainer @ 2000lbs

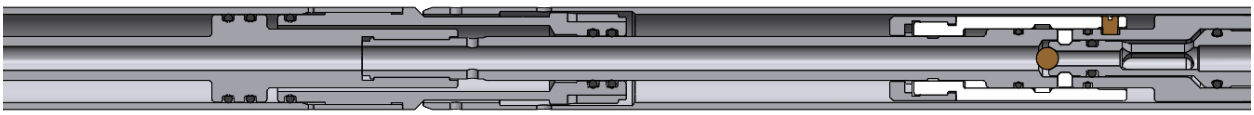
GENERAL INFORMATION

1. Use a casing scraper before running any equipment in the well to remove scale and other materials from 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 feet of hard cement on top of retainer.

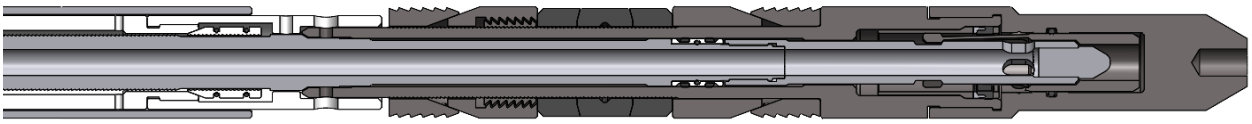
FIELD ASSEMBLY PROCEDURE

Reference Field Assembly Illustrations on Page 3. Since the Retainer is a compact size, it is recommended that the Retainer is assembled to the Setting Tool off the rig floor in a vice or on stands.

STEP 1: Thread the Setting Sleeve back and grease all parts from the to the stinger on the seal down.

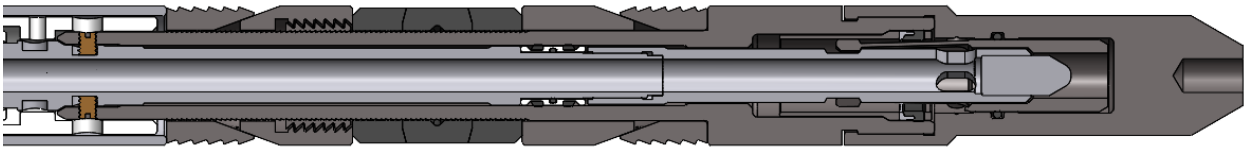


STEP 2: Install the setting tool into the seal bore of the Retainer until the Retainer shoulders onto the Setting Tool. (A mallet may be required to cycle the Sliding Valve of the Retainer inward)



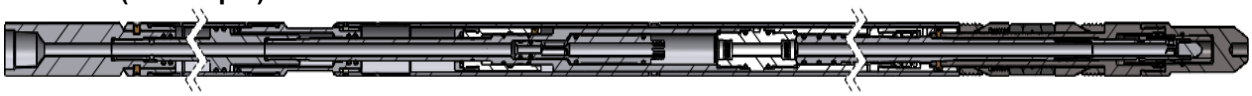
STEP 3: Rotate as needed to align the holes in the Latch Housing of Setting Tool with holes in the Body of the Retainer. Install the two ¼ -20 X .28 Long Brass Shear Screws (005-2187-519) into the tapped holes of the Body of the Retainer until they bottom out on the Stinger/Stroke Piston then back off ¼ turn. Install the four Brass Shear Screws (062-4500-127) into the tapped holes of the Latch Housing until they bottom out on the Body of the Retainer then back off ¼ turn.

STEP 4: Thread the Setting Sleeve 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 ⅜-16 x ¼ long socket head set screws hand tight. ***NOTE: THE TOP SLIP MUST BE FREE TO ROTATE***.

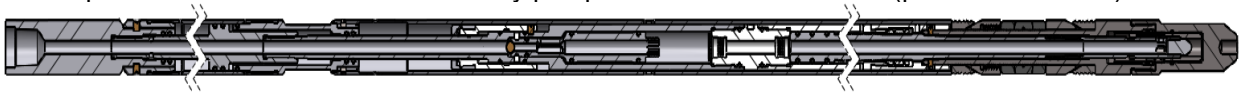


OPERATION PROCEDURE

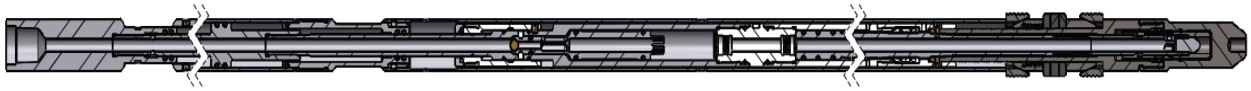
1. Run the Alpha Model FH™ Hydraulic Setting Tool and Cement Retainer several feet below the setting depth. The HST circulation ports located below the ball seat and in the CR valve shoe for circulating a maximum rate of ¼ BPM while going in the hole. Well fluid must clean and free of debris (sand) for the HST to work properly.
   Warning: The setting sequence will begin at 1,000 *psi* differential pressure in the tubing "at the tool" (see step 4).



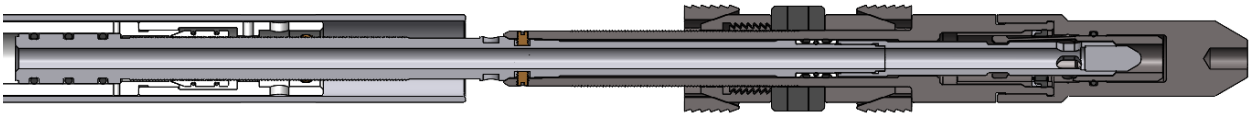
2. Pick up slowly to setting depth to remove slack from tubing string.
3. Drop a ⅜" diameter brass ball and slowly pump down until it has seated (pressure increase)



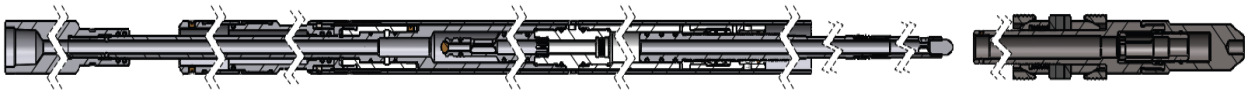
4. Slowly increase the pressure in the workstring to establish a 1,000 *psi* differential pressure inside the tubing "at the tool" to begin the setting sequence.
5. Continue pressuring workstring to establish a 1,500 psi differential pressure inside the tubing "at the tool" to anchor the cement retainer against the casing wall. Pick up coil to the neutral position. Hold pressure for 5 minutes.



6. Continue pressuring workstring to establish a 2,000 *psi* (3,500 *psi* max) differential pressure inside the tubing "at the tool" to complete the set (weight indicator will drop off). Pick up 1,000# on coil to confirm CR is set.



7. Set down 2,000# on cement retainer and squeeze 3,500 *psi* maximum (stinger pinned 2K).
8. Straight Pull 2,000# to release stinger from Cement Retainer (valve closed).

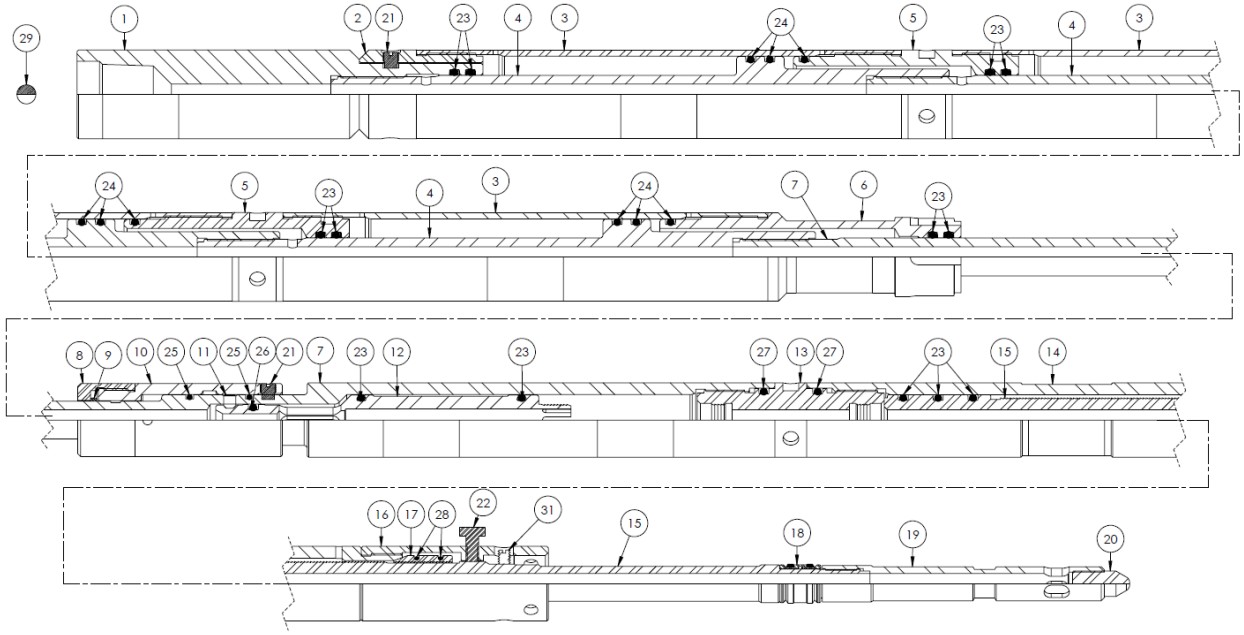


TROUBLESHOOTING

If the Setting Tool does not set the Cement Retainer:
Pressure workstring to establish a 2,000 *psi* (3,000 *psi* max) differential pressure inside the tubing "at the tool" to release from cement retainer. If unsuccessful, then bleed off pressure and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate Ball back to the Ball Seat and attempt pressuring tubing again to 3,000 *psi* maximum.
NOTE: The Ball Seat cannot be pumped out until the setting sequence has been completed.
Carefully remove workstring from well.

If the Setting Tool does not disconnect from the Cement Retainer:
Pull 1,000 pounds over tubing weight and pressure workstring to establish a 2,000 *psi* (3,000 *psi* max) differential pressure inside the tubing "at the tool" to release from 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 Ball back to the Ball Seat and attempt pressuring tubing again to 3,000 *psi* max.
NOTE: The Ball Seat cannot be pumped out until the setting sequence has been completed.
Pull 8,000 pounds (CR disconnect valve) over tubing weight.

1750 FH™ SETTING TOOL PARTS LIST



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	019-1750-220	TOP SUB	1
2	019-1750-221	CYLINDER CAP	1
3	019-1750-222	CYLINDER	3
4	019-1750-223	PISTON	3
5	060-1750-225	LOWER CONNECTOR	2
6	019-1750-225	LOWER CONNECTOR	1
7	019-1750-227	BALL SEAT HOUSING	1
8	019-1750-231	LOCK RETAINER NUT	1
9	019-1750-232	SNAP RING	1
10	019-1750-230	LOCK RETAINER	1
11	019-1750-229	BALL SEAT LOCK	2
12	019-1750-228	BALL SEAT	1
13	019-1750-242	TANDEM SUB	1
14	019-1750-243	STROKE COMP HOUSING	1
15	019-1750-244	STINGER/ STROKE PISTON	1
16	019-1750-240	LATCH HOUSING	1
17	019-1750-241	STINGER LATCH	1
18	019-1750-233	STINGER MOLDED SEAL	1
19	019-1750-234	SHIFTER SUB	1
20	019-1750-235	SHIFTER SUB GUIDE	1
21	062-4500-127	SHEAR SCREW	3
22	SHIPPING BOLT	1/4-20 X 1-1/2" BOLT	1
23	000-210N-070	210 O-RING	13
24	000-218N-070	218 O-RING	9
25	000-117N-070	117 O-RING	2
26	000-204N-070	204 O-RING	1
27	000-214N-090	214 O-RING	2
28	000-021N-090	021 O-RING	2
29	019-1750-236	.375 BRASS BALL	1
30	000-015N-070	015 O-RING	1
31	005-2187-519	BRASS SHEAR SCREW	1

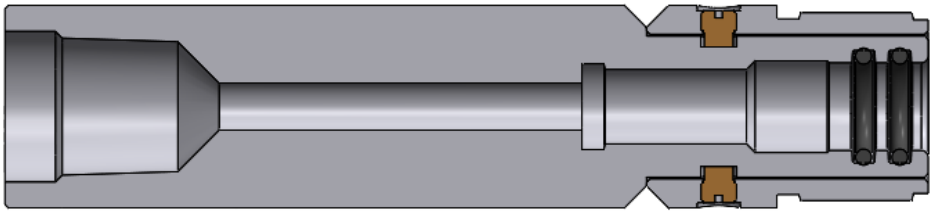
ASSEMBLY INSTRUCTIONS FOR 1750 FH™ SETTING TOOL

Anti-galling compound should be used on all threads. Lithium Grease or equivalent should be used on all O-rings and sealing surfaces. 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.

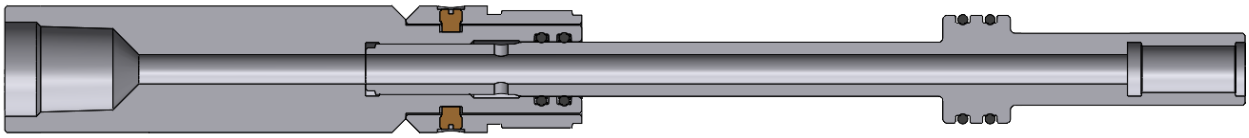
NOTE: Wrench tight means putting your weight on the end of a 24" pipe wrench. Screwdriver tight means hand tight with a medium blade 6" long screwdriver.

1750 FH™ SETTING TOOL ASSEMBLY STEPS

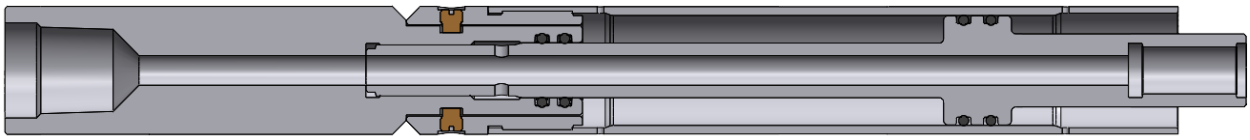
1. Place the Top Sub (item 1) into a vise.
2. Install two 210 O-Rings (item 23) into the Top Sub (item 1) and grease liberally.
3. Slide the Cylinder Cap (item 2) over the Top Sub (item 1).
4. Install two Brass Shear Screws (item 21) into the Cylinder Cap (item 2) until the screws fully bottom out on the Top Sub (item 1) and then back off ¼ turn.



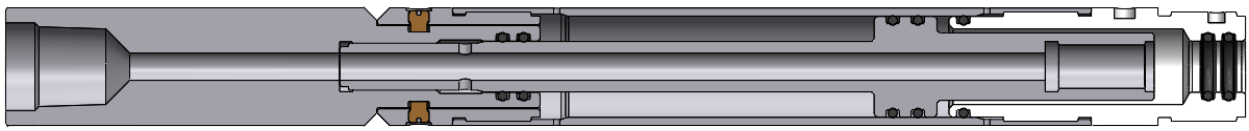
5. Install two 218 O-Rings (item 24) into the corresponding grooves of a Piston (item 4) and grease liberally.
6. Thread the Piston (item 4) into the Top Sub (item 1) and tighten wrench tight with a 24" pipe wrench.



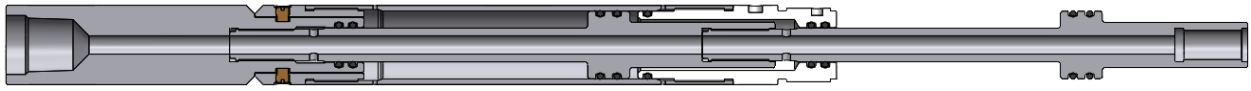
7. Install the Cylinder (item 3) over the Piston (item 4) and thread the Cylinder (item 3) onto the Cylinder Cap (item 2) until the two parts fully bottom out.



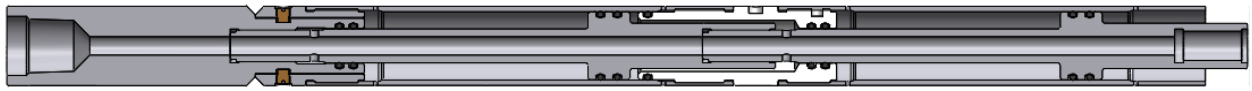
8. Install one 218 O-Ring (item 24) and two 210 O-Rings (item 23) into the corresponding grooves of the Cylinder Connector (item 5) and grease liberally.
9. Thread the Cylinder Connector (item 5) into the Cylinder (item 3) and tighten wrench tight with a 24" pipe wrench. Set this sub-assembly aside.



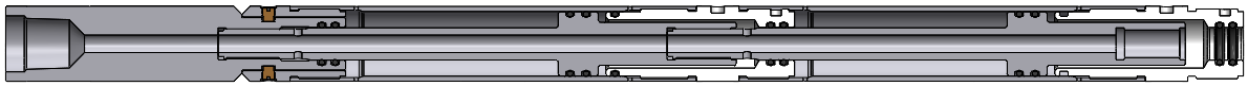
10. Install two 218 O-Rings (item 24) into the corresponding grooves of a Piston (item 4) and grease liberally.
11. Thread the Piston (item 4) into the Cylinder Connector (item 5) and tighten wrench tight with a 24" pipe wrench.



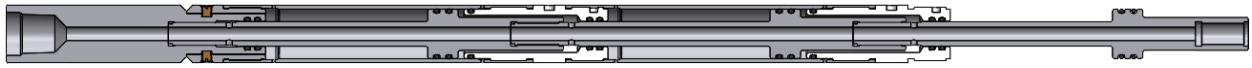
12. Install the Cylinder (item 3) over the Piston (item 4) and thread the Cylinder (item 3) onto the Cylinder Connector (item 5) until the two parts fully bottom out.



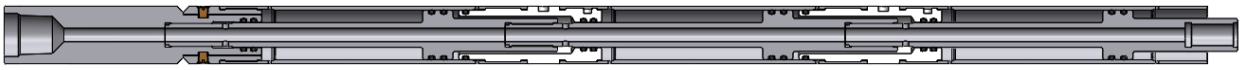
13. Install one 218 O-Ring (item 24) and two 210 O-Rings (item 23) into the corresponding grooves of the Cylinder Connector (item 5) and grease liberally.
14. Thread the Cylinder Connector (item 5) into the Cylinder (item 3) and tighten wrench tight with a 24" pipe wrench. Set this sub-assembly aside.



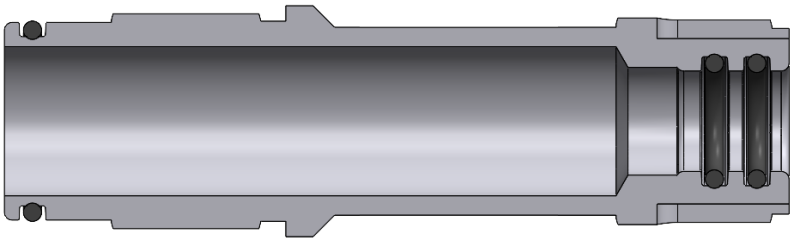
15. Install two 218 O-Rings (item 24) into the corresponding grooves of a Piston (item 4) and grease liberally.
16. Thread the Piston (item 4) into the Cylinder Connector (item 5) and tighten wrench tight with a 24" pipe wrench.



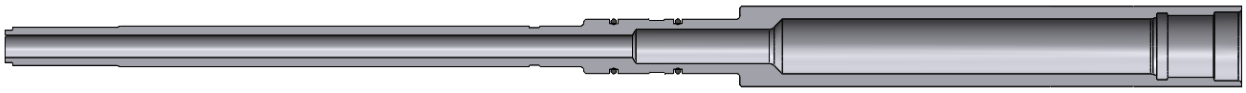
17. Install the Cylinder (item 3) over the Piston (item 4) and thread the Cylinder (item 3) onto the Cylinder Connector (item 5) until the two parts fully bottom out.



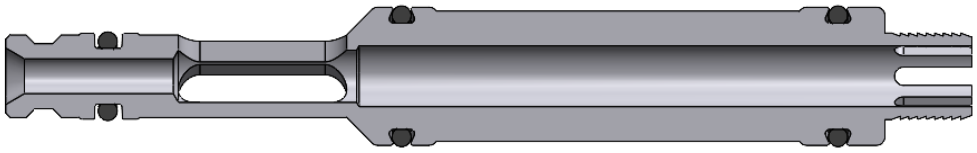
18. Install one 218 O-Ring (item 24) and two 210 O-Rings (item 23) into the corresponding grooves of the Lower Connector (item 6) and grease liberally. Set Sub-Assembly aside.



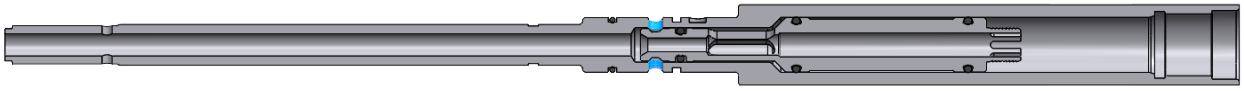
19. Starting a new sub-assembly. Install two 117 O-Rings (item 25) into the Ball Seat Housing (item 7) and grease liberally.



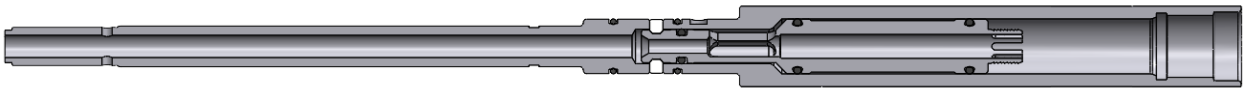
20. Install one 204 O-Ring (item 26) and two 210 O-Rings (item 23) into the Ball Seat (item 12) and grease liberally.



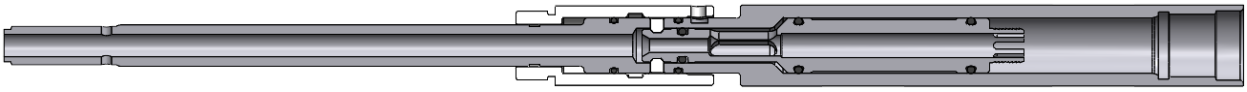
21. Install the Ball Seat (item 12) into the Ball Seat Housing (item 7) and slide in place until the groove on the Ball Seat aligns with the milled windows in the Ball Seat Housing.



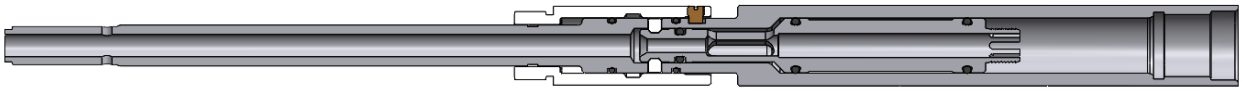
22. Pack the windows of the Ball Seat Housing (item 7) with grease.
23. Install two Ball Seat Locks (item 11) into the windows of the Ball Seat Housing (item 7).



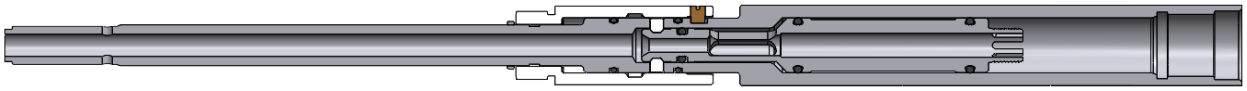
24. Slide the Lock Retainer (item 10) over the Ball Seat Housing (item 7) until the holes in the Lock Retainer align with the spot faces in the Ball Seat Housing.



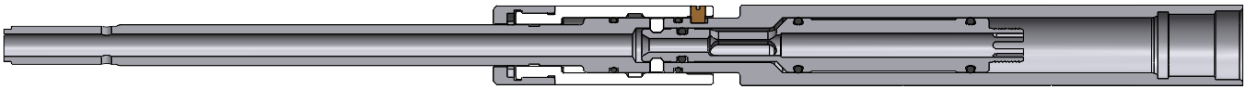
25. Install one Brass Shear Screw (item 21) into the Lock Retainer (item 10) until the screws fully bottom out on the Ball Seat Housing (item 7) and then back off ¼ turn.



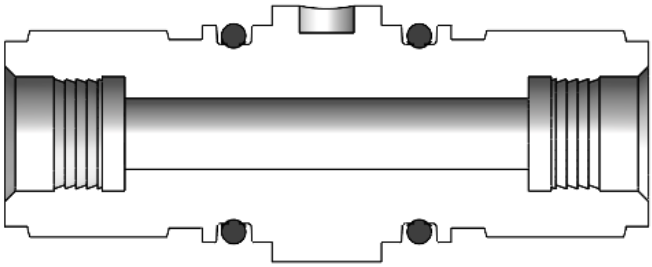
26. Using Spreader Pliers, slide the Snap Ring (item 9) over the Ball Seat Housing (item 7).



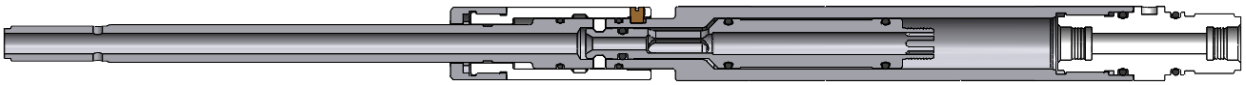
27. Slide the Lock Retainer Nut (item 8) over the Ball Seat Housing (item 7) and thread the Lock Retainer Nut onto the Lock Retainer (item 10) until the Lock Retainer Nut fully bottoms out on the Lock Retainer.



28. Install two 214 O-Rings (item 27) onto the corresponding grooves of the Tandem Sub (item 13) and grease liberally.

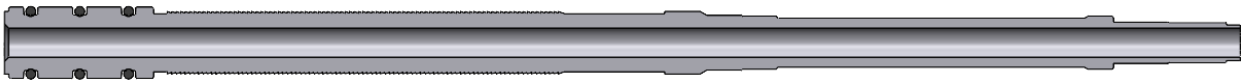


29. Thread the Tandem Sub (item 13) into the Ball Seat Housing (item 7) and tighten wrench tight with a 24” pipe wrench.

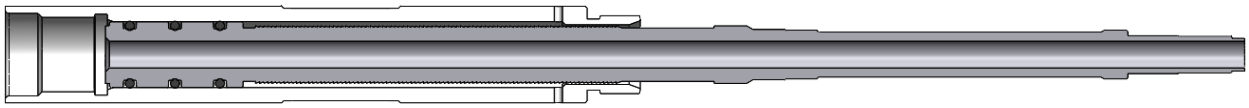


30. Assemble the two sub-assemblies by threading the Ball Seat Housing (item 7) into the Lower Connector (item 6) and tighten wrench tight with a 24” pipe wrench.

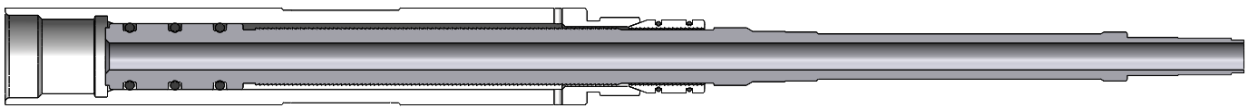
31. Starting a new sub-assembly. Install three 210 O-Rings (item 23) into the corresponding grooves on the Stinger/Stroke Piston (item 15) and grease liberally.



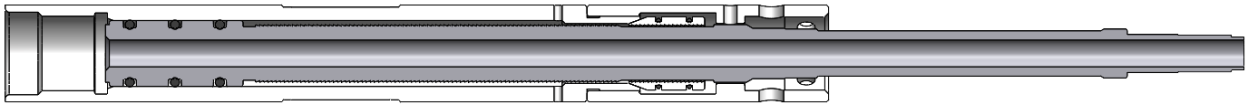
32. Install the Stinger/Stroke Piston (item 15) into the Stroke Compensation Housing (item 14) so all three 210 O-Rings (item 21) seal in the Bore.



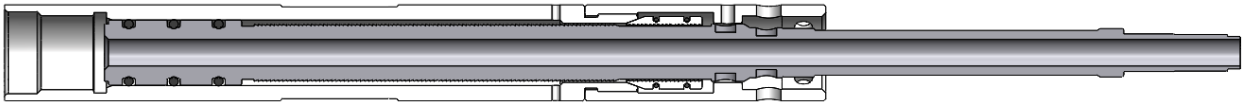
33. Place the three segments of the Stinger Latch (item 17) over the Stinger/Stroke Piston (item 15) and utilize two 021 O-Rings (item 28) to hold them in place. Ensure the segments are a matched set and sequenced correctly.



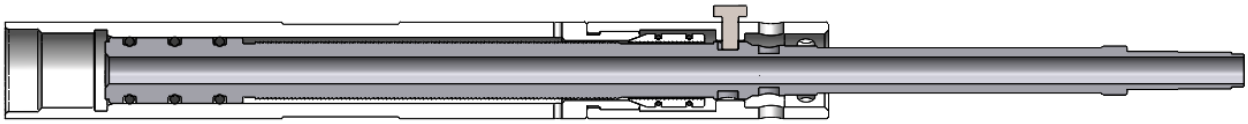
34. Slide the Latch Housing (item 16) over the Stinger/Stroke Piston (item 15) then thread the Latch Housing (item 16) onto the Stroke Compensation Housing (item 14) and tighten wrench tight with a 24” pipe wrench.



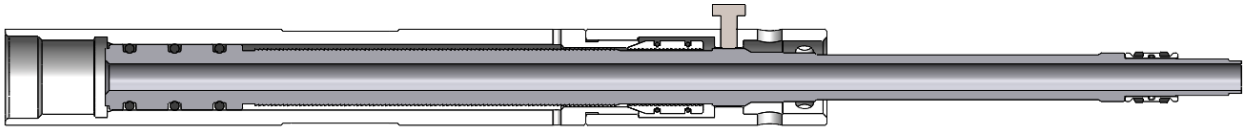
35. Rotate & Adjust the Stinger/Stroke Piston (item 15) as needed to align the ¼-20 tapped hole in the Latch Housing (item 16) with the upper most 5/16 spot face in the Stinger/Stroke Piston (item 15).
NOTE: The four ⅜ holes in the Latch Housing (item 16) also must align with the four 5/16 spot faces on the Stinger/Stroke Piston (item 15).



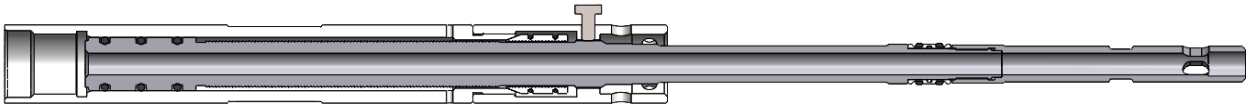
36. Install the ¼ – 20 X ½ long Bolt (item 22) into the tapped hole in the Latch Housing (item 16) hand tight.



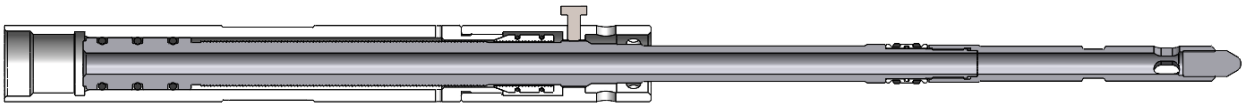
37. Grease the Molded Seal (item 18) and install onto the Stinger/Stroke Piston (item 15) until the Molded Seal bottoms out on the Stinger/Stroke Piston (item 15).



38. Thread the Shifter Sub (item 19) onto the Stinger/Stroke Piston (item 15) and tighten wrench tight with a 24” pipe wrench.



39. Thread the Shifter Sub Guide (item 20) into the Shifter Sub (item 19) and tighten wrench tight with a 12” pipe wrench.



40. Thread the Stroke Piston sub-assembly and affix to the main assembly by thread the Stroke Compensation Housing (item 14) onto the Tandem Sub (item 13) and tighten wrench tight with a 24” pipe wrench.

41. Package 1” Brass Ball separate and affix to the Setting Tool.

NOTE: DO NOT PLACE THE BALL IN THE TOOL

DISASSEMBLY OF THE 1750 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 ¼-20 x ¼ long socket head set screws in the Setting Sleeve.
5. Unthread the Setting Sleeve from the Lower Connector (item 6) and fully remove.
6. While holding back-up on the Stinger/Stroke Piston (item 15), unthread the Shifter Sub (item 19) from the Stinger/Stroke Piston (item 15) and fully remove.
7. Remove the Molded Seal (item 18) from the Stinger/Stroke Piston (item 15) and discard.
8. While holding back-up on the Stroke Compensation Housing (item 14), unthread the Latch Housing (item 16) from the Stroke Compensation Housing (item 14) and fully remove. Remove and discard all Shear Screw remnants.
9. Fully remove the three segments of the Stinger Latch (item 17) from the Stinger/Stroke Piston (item 15). Remove and discard the two O-Rings.
   NOTE: ENSURE TO KEEP ALL THREE SEGMENTS TOGETHER.
10. While holding back-up on the Tandem Sub (item 13), unthread the Stroke Compensation Housing (item 14) from the Tandem Sub (item 13). Remove and discard all O-Rings.
11. Using a dead blow hammer or mallet, hammer the Stinger/Stroke Piston (item 15) out of the Stroke Compensation Housing (item 14). Remove and discard all O-Rings.
12. While holding back-up on the Ball Seat Housing (item 7), unthread the Tandem Sub (item 13) from the Ball Seat Housing (item 7). The Ball Seat (item 12) will come up with the Tandem Sub (item 13).
13. Remove the Ball Seat (item 12) from the Tandem Sub (item 13). Remove and discard all O-Rings.
14. While holding back-up on the Cylinder (item 3), unthread the Lower Connector (item 6) from the Cylinder (item 3). Shift the Tandem Sub (item 13) as far downward towards the Lock Retainer Nut (item 8) as it will go.
15. While holding back-up on the knurled section of the Piston (item 4), unthread the Ball Seat Housing (item 7) from the Piston (item 4). Set the Ball Seat Housing sub-assembly aside.
16. While holding back-up on the knurled section of the lower Cylinder Connector (item 5), unthread the lower Cylinder (item 3) from the lower Cylinder Connector (item 5).
17. While holding back-up on the knurled section of the middle Cylinder (item 3), unthread the lower Cylinder Connector (item 5) from the middle Cylinder (item 3). Shift the lower Cylinder Connector (item 5) as far downward towards the large OD section of the lower Piston (item 4) as it will go.
18. While holding back-up on the knurled section of the middle Piston (item 4), unthread the lower Piston (item 4) from the middle Piston (item 4).
19. Remove the lower Cylinder Connector (item 5) from the lower Piston (item 4). Remove and discard all O-Rings.
20. While holding back-up on the knurled section of the upper Cylinder Connector (item 5), unthread the middle Cylinder (item 3) from the upper Cylinder Connector (item 5).
21. While holding back-up on the knurled section of the upper Cylinder (item 3), unthread the upper Cylinder Connector (item 5) from the upper Cylinder (item 3). Shift the upper Cylinder Connector (item 5) as far downward towards the large OD section of the middle Piston (item 4) as it will go.
22. While holding back-up on the knurled section of the upper Piston (item 4), unthread the middle Piston (item 4) from the upper Piston (item 4).
23. Remove the upper Cylinder Connector (item 5) from the middle Piston (item 4). Remove and discard all O-Rings.

DISASSEMBLY OF THE 1750 FH™ SETTING TOOL CONT'D

24. While holding back-up on the Cylinder Cap (item 2), unthread the upper Cylinder (item 3) from the Cylinder Cap (item 2).
25. Unthread the upper Piston (item 4) from the Top Sub (item 1). Remove and discard all O-Rings.
26. Remove the Cylinder Cap (item 2) from the Top Sub (item 1). Remove and discard all Shear Screw remnants.
27. Remove and discard the O-Rings in the Top Sub (item 1).
28. Place the Ball Seat Housing sub-assembly in the vice and vice down on the knurled section of the Ball Seat Housing (item 7).
29. While holding back-up on the Lock Retainer (item 10), unthread the Lock Retainer Nut (item 8) from the Lock Retainer (item 10).
30. Remove the Snap Ring (item 9) from the Ball Seat Housing (item 7).
31. Remove the Lock Retainer (item 10) from the Ball Seat Housing (item 7). Remove and discard all Shear Screw remnants.
32. Remove the two Ball Seat Locks (item 11) from the Ball Seat Housing (item 7).
33. Remove and discard the O-Rings on the Ball Seat Housing (item 7).

1750 FH™ HYDRAULIC SETTING TOOL
DIMENSIONAL DATA

MAX. O.D.	1.750 *in*
OVERALL LENGTH	84.10 *in*
MIN. I.D.	.406 *in*
SEAL O.D.	750 *in*