Logan Bi-Directional Coiled Tubing Jar
Overview................................................................. 2
Rig Up........................................................................... 2
Jarring.......................................................................... 2
Troubleshooting.......................................................... 3
Rig Down............................................................... 3
Dressing Area Maintenance......................................... 3
Disassembly ............................................................... 4
Inspection of Parts....................................................... 4
Inspection of Critical Parts............................................ 4
Assembly ................................................................... 5
Testing the Jar............................................................. 6
  Pull/Up Test................................................................. 7
  Push/Down Test.......................................................... 7
Figure 1: Jar Tong and Vise Locations ...................... 8
Figure 2: Jar Components........................................... 9
Figure 3: Jar Seal Components.................................... 10
Table 1: Recommended Tightening Torque ................. 11
Table 2: Jar Pull Data................................................... 11
Table 3: Jar Push Data.................................................. 11
Table 4: Pump Open Area.......................................... 11
Table 5: Acceptable Pull Times................................. 12
Table 6: Oil Fill Volumes.......................................... 13
Table 7: Maximum Torque........................................ 11
Component Parts List.............................................. 14 – 15
Jar Test Form............................................................. 16
OVERVIEW

The Logan Bi-Directional Coiled Tubing Jar is designed to hit upward and downward blows. The Coiled Tubing Jar is capable of applying up only, down only, or up and down blows in succession with splines that are engaged at all times. It can also be dressed to only hit up or down. The short length of the Jar makes it ideal for coiled tubing operations.

Logan Bi-Directional Coiled Tubing Jars are hydrostatically pressure balanced and can operate at any depth. They can be dressed with special packing to withstand temperatures above 350° F. They are constructed of stainless steel for added strength and corrosion resistance.

It is designed to be operated in conjunction with the Logan Bi-Directional Coiled Tubing Energizer. This Jar is simple to assemble and its unique design allows for easy, dependable operation. No setting or adjustment is required before going in the hole or after the fish is engaged. The Coiled Tubing Jar allows the operator to easily and simply control the intensity of jarring blows by varying the applied load. The Jar can deliver a wide range of blows with low to high impact and impulse forces.

The variable impact control of the Coiled Tubing Jar is made possible by the metering action of the Pistons. Fluid flows from one side of the Piston to the other through a metering port when load is applied to the Jar. This gives the operator ample time to take the necessary stretch in the running string (and Logan Bi-Directional Coiled Tubing Energizer) or apply slack off weight to strike a blow.

During cocking of the tool, large ports open in the Piston assembly allowing unimpeded fluid flow. Since the metering action does not occur during cocking, only sufficient load to overcome friction is required.

Since the Jar’s internal chamber is sealed at both ends, the operating oil cannot escape and well fluids cannot enter the chamber. The operating oil constantly lubricates the internal working parts promoting long wear life of the Jar.

The comparatively large ID (Inside Diameter) of the Coiled Tubing Jar permits the use of drop balls for unlatching devices and accessories.

Prior to running any operation using the Coiled Tubing Jar, it is necessary to configure the appropriate weight above the Coiled Tubing Jar to achieve the best impact/impulse. When run with an Energizer, the weight must be between the Jar and Energizer (no weight above the Energizer).

In general, the Coiled Tubing Jar, weight and Coiled Tubing Energizer should be run as close to the fish as possible.

The lubricator must be of sufficient length to contain both the downhole fishing assembly and the fish.

**NOTE:** If the Energizer and/or weight are not run with the Jar due to a desire to keep the bottomhole assembly short, the effectiveness of the Jar will not be fully utilized.

RIG UP

All internal and external threaded connections are tightened to the recommended torque at the dressing facility prior to shipment.

Drift all the elements of the downhole fishing assembly with any drop balls which will be used.

Tong the Bi-Directional Coiled Tubing Jar only on tool joint OD (Outside Diameter). Do not tong on the body joints. Doing so will damage the tool.

**WARNING:** The Logan Bi-Directional Coiled Tubing Jar is shipped in the closed (cocked) position. When closed, the Jar should not be left suspended in the string, especially with any amount of weight below it. When it is in this position, the Jar can trip and cause bodily harm or damage to the equipment.

JARRING

The cycle life of the coiled tubing string should be considered when planning the jarring operation.

**WARNING:** At no time during the jarring cycle of the Jar should the maximum recommended push or pull load be exceeded. See Table 2: Jar Pull Data and Table 3: Jar Push Data on page 11.

Up Jarring Procedure

Slowly lower the tubing. It requires only minimal force to cock the Jar. When the Jar starts to take weight, the pull load is ready to be applied. Pull the desired load. After the Jar trips, pick up the string to see if the fish is free or can be freed with tension. Repeat the Up Jar sequence as described above until the fish is freed.

**NOTE:** The cycle times will decrease somewhat after the first few cycles. This is due to the Jar warming up and decreasing the viscosity of the Jar oil.

Down Jarring Procedure

Slowly raise the tubing. It requires only minimal force to cock the Jar. When the Jar starts to take load, the push load is ready to be applied. Apply the desired load until the Jar trips.

Repeat the down Jar sequence as many times as required to free the stuck fish.
TROUBLESHOOTING

Operating difficulties are sometimes encountered by operators, some of which are listed below along with corrective procedures.

If unable to strike the initial up blow:
1. Make sure the Jar is cocked.
   a. Lower the string further to apply more closing force before applying pull load.
   b. If the pumps are running, the pump pressure will be exerting an opening force on the Jar. To calculate the additional force (lbs) required to trip the Jar, multiply the pump pressure (psi) by the pump open area (in\(^2\)) and apply the additional force (lbs) down on the Jar. See Table 4: Pump Open Area on page 11.
   c. If the additional weight does not cock the Jar, it may be necessary to temporarily reduce the pump pressure to get the Jar to cock.
   d. Pull up to the desired load in the string and hold this position until the Jar strikes its blow.

   CAUTION: Do not exceed the maximum overpull for the Jar. See Table 2: Jar Pull Data on page 11.

If unable to hit subsequent up blows:
1. The corrective procedure is the same as listed above under “If unable to strike the initial up blow.”

2. If the pumps are running.
   a. The pump pressure will be exerting an opening force on the Jar. To calculate the additional force (lbs) required to trip the Jar, multiply the pump pressure (psi) by the pump open area (in\(^2\)) and apply the additional force (lbs) down on the Jar. See Table 4: Pump Open Area on page 11.
   b. If the additional weight does not trip the Jar, it may be necessary to temporarily reduce the pump pressure to get the Jar to trip.

3. Push down to the desired load in the string and hold this position until the Jar strikes its blow.

If unable to hit subsequent down blows:
1. The corrective procedure is the same as listed above under “If unable to strike the initial down blow.”

RIG DOWN

The Logan Bi-Directional Coiled Tubing Jar requires no special action for rig down. The Jar will usually come out of the hole in the fully open position.

WARNING: If the Jar comes out of the hole in the partially closed or cocked position, it should not be left suspended in the string, especially with any amount of weight hanging below the tool. When in this position, the Jar can trip causing bodily harm or damage to equipment.

Remove the tool from the string and inspect for damage and oil leaks. Prior to storage, the tool should be flushed out. Wash the tool joints and replace thread protectors before racking the tool.

DRESSING AREA

MAINTENANCE

Overview
After field service, the Logan Bi-Directional Coiled Tubing Jar should be tested, disassembled, cleaned, inspected, and redressed.

Equipment Required
The following is a list of equipment that will be required to dress the Jar:

1. A vise or equivalent device of a suitable size that is capable of clamping the tool horizontally and vertically
2. Overhead crane with adequate capacity
3. Non-marking friction tongs for outside diameters of body parts
4. Lift straps suitable for lifting heavy parts during assembly and disassembly
5. An inclined Coiled Tubing Jar Tester
6. Packing set for the size tool being dressed
7. T-Bar wrench, extensions, and sockets for the size tool being dressed
8. Floater ID Setting Tool for the size tool being dressed
9. Floater Removal Tool for the size tool being dressed
10. Polypak Stretcher and Installation Tool (to install the OD O-rings on the Nut and Floater) for the size of tool being dressed
11. 100 ml and 1000 ml graduated cylinder
12. Filtering funnel with extension
13. Infrared thermometer
14. Black spray paint
15. Stainless steel anti-seize grease
16. Combination wrenches in suitable sizes for hex on Mandrel Extension
17. Jar Oil – Mobile DTE 21 ISO 10 Hydrocarbon Oil or equivalent
18. Clean sheet or rolled paper

DISASSEMBLY

NOTE: Correct placement of the vise and tong is required when breaking connections to prevent damage to the tool. For correct placement see Figure 1: Tong and Vise Locations on page 8.

WARNING: The Jar could contain residual well pressure. Care should be taken when unscrewing connections to avoid bodily harm.

NOTE: If the tool has been field run, the tool should be tested before disassembly per instructions under Testing the Jar on page 6.

The Jar should always be in the closed position prior to disassembly.

1. In a vise, break all external joints supporting the end of the Jar to prevent bending. DO NOT fully unscrew parts.

CAUTION: Do not clamp or tong over the thread area at any time to prevent galling of the connection.

2. Place Pressure Body in the vise.

Loosen and remove the Top Sub and lay the part aside.

3. Reposition the Jar in the vise clamping the piston body. Place an oil catch bucket under the Pressure Body, Top Sub end, and under the Piston Body.

4. Loosen the Pressure Body just enough to allow the oil to leak out of tool.

WARNING: The Jar may contain trapped high pressure that will be released as the Pressure Body is unscrewed. Allow the pressure to be fully released before completely unscrewing the connection.

5. Reposition the Jar in the vise clamping the Mandrel.

6. Insert the appropriate socket and extension with T-bar wrench into the Pressure Body and completely unscrew the Nut leaving it in the Pressure Body. Allow the oil to drain out of tool.

7. Remove the Pressure Body.

8. Insert the Floater Removal Tool through the pin end of the Pressure Body and carefully remove the Nut. Lay the parts aside.

9. With two (2) appropriately sized combination wrenches installed at 180 degrees on the hex of the Mandrel Extension, loosen and remove it. Lay the part aside.

CAUTION: The Down Piston may come out with the Mandrel Extension, do not drop it.

10. If the Down Piston did not already come out, remove it from inside the Piston Body. Lay it aside.

11. Remove the Piston Body taking care not to drop the Up Piston. Remove the Up Piston. Set the parts aside.

12. Remove the Floater Body.

13. Insert the “Floater Removal Tool” through the pin end of the Floater Body and carefully remove the Floater. Lay the parts aside.


The disassembly is now complete.

INSPECTION OF PARTS

Non-Extrusion Rings are normally reused and should not be removed unless they are damaged.

Inspect all seals as they are removed for unusual wear patterns. Noting seal wear can help pinpoint other areas of wear that could cause premature seal failure.

All parts should be cleaned prior to inspection. High-pressure wash all parts with soap and hot water inside and out. Rinse the soap off with hot or cold wa-ter, spraying from both ends. Blow dry (with air) the ID, OD, and threads. Place the dry clean parts on a clean sheet of paper.

NOTE: Seals are to be replaced at re-dress when the tool is at a repair facility.

CAUTION: Magnetic particle inspection is strongly recommended for locating fatigue cracks that could lead to failure downhole. Parts with cracks must be replaced.

Inspect all parts for signs of damage on seal surfaces, splines, bores, bearing faces at each connection, and impact surfaces. Inspect all outside body parts for OD wear.

INSPECTION OF CRITICAL PARTS

Pistons

Inspect the ID of the Piston for abrasion or galling.

All pistons will show some signs of wear due to the interference fit between it and the Mandrel Extension so some light marking is acceptable. If the marking is so pronounced that it can be felt with your finger, the Piston should be replaced. Inspect the back of the piston for wear or pitting. This is a sealing surface. It must be flat to be acceptable. Ensure that the oil passage groove is clean and clear of obstructions.

Pressure Body and Floater Body

Inspect the Pressure Body and Floater Body pin ends on the sealing face. This is a sealing surface. It must be flat to be acceptable.
Mandrel Extension  
Examine the chrome sealing surface of the Mandrel Extension for galling or pitting. If severe damage is noted, the parts will have to be replaced or reworked by returning it to the manufacturing facility for repair.

Splines  
Damaged Splines should be replaced.

Mandrel and Spline Body  
Inspect spline grooves for damage. Buff spline grooves to remove damage.  

WARNING: Care should be taken when using power tools. Always wear protective eyewear and gloves to prevent metal particles from injuring eyes and hands.

ASSEMBLY  

Preparation  
All parts must be cleaned after Magnetic Particle Inspection. High-pressure wash all parts with soap and hot water inside and out. Rinse the soap off with hot or cold water, spray from both ends. Blow dry (with air) the ID, OD and threads. Place the dry clean parts on a clean sheet of paper.

Prior to assembly, install all seals in their proper location by observing their location and direction as shown in Figure 3: Jar Seal Components on page 10. Some seals have special non-extrusion devices and care should be taken to assure their proper orientation. Groove depths of the Up and Down Pistons and length of the OD of the Mandrel Extension bump should be measured and documented on the test sheet.

CAUTION: Only lint-free cloths should be used while handling the parts.

Assembling the Jar  
1. Coat the pin threads and the shoulder of the Float Body with stainless steel anti-seize grease. Do not grease over the seals. Coat the seals with jar oil. Place the Float Body vertically in the vise with the pin end up.

2. Place the Up Piston on top of the Float Body with the groove end facing down. The Up Piston is the one with the narrower oil groove. Gently slide the Piston around on the face of the Float Body to ensure there are not any burrs. When no burrs are present and with the Up Piston in place, install the Piston Body over the Piston and screw it hand-tight onto the Float Body.

NOTE: If the Float Body is damaged, remove it from the vise and polish it with 320 or finer grit sandpaper on a flat surface. Stand the body straight up with the face on the sandpaper and hold the body close to the bottom. Keeping the part square with the flat surface, polish the face by sliding and rotating the part. Rotate the position of your hands on the part and continue polishing. Check the face often to see if burrs are removed.

3. Vertically flip over the assembled parts in the vise with the Float Body box end up. Do not clamp any closer than 2″ from the box end. Apply stainless steel anti-seize grease on the ID and the OD of the Float, from the Optiseal end up to the rubber seals. Do not grease on or past the Non-Extrusion Ring. Remove any accidentally applied grease on the Non-Extrusion Ring and O-ring area with a lint-free cloth. Apply jar oil to the OD and ID O-ring seal. Install the Floater, with the Optiseal facing up, into the Float Body. Push the Floater with the Mandrel into the seal bore past the threads of the Float Body.

4. Apply stainless steel anti-seize grease on the entire box ID and internal shoulder at the small end of the Mandrel.

5. Ensure that the Splines do not have any sharp corners. Separate the Spline Body into two halves.

CAUTION: Parts are stenciled with set numbers. Ensure that you have a matched set.

Place the Splines into the spline grooves of the Spline Body and freely apply stainless steel anti-seize grease on the entire ID of both halves of the Spline Body. Place one half on a bench. Orient the Mandrel and Spline Body as shown in Figure 2: Jar Components on page 9. Lay the Mandrel on the Spline Body half where the spline grooves of Mandrel line up with the Splines. Place the other half on the Mandrel aligning the Spline Body halves and press them together. Grease the entire Spline Body pin end, including the threads and shoulder. Install the Mandrel and the Spline Body into the Float Body. Screw the Spline Body hand-tight into the Floater Body.

6. Move tool into pipe vise clamping onto Spline Body with the split horizontal. Tighten the Float Body to the Spline Body to specified torque. See Table 1: Recommended Tightening Torque on page 11.

7. Loosen vise and move tool so the vise is gripped onto tool joint OD of Mandrel. Ensure that it is possible to stroke the Float Body and Spline Body by hand. (It may be difficult at first to stroke, but it should get easier after a few strokes.) If the tool will not stroke, disassemble the Spline Body and Mandrel from the Floater Body.
Clean, inspect the sliding surfaces, remove any galls or burrs, and reassemble the parts. Retest the sliding of the Mandrel.

8. Close the Mandrel against the Spline Body. Put the tool vertically into the bench vise with the Mandrel end down. Place a block of wood under the Mandrel pin to keep the tool closed. With the Piston Body facing up, drop in the Down Piston with the oil groove facing up. Reach into the Piston Body and wiggle the Piston to ensure it is seated.

9. Wipe the Mandrel Extension with a lint-free cloth to ensure it is clean. Spray jar oil on about 2" of the Mandrel Extension on the end opposite the hex. Insert the Mandrel Extension with the hex end at the top into the tool. Push down and rotate until it hits the Mandrel. If unable to push down all the way, wrap a lint-free cloth around the Mandrel Extension covering the Piston Body to prevent dirt from entering the tool. Hit the top of the Mandrel Extension with a plastic or rubber mallet. If unable to rotate by hand, use the combination wrench on the hex and rotate until seated.

10. Keeping the Mandrel closed and gripping the tool on the tool joint OD of the Mandrel, remove the tool from the pipe vise and place it vertically in the bench vise. Push down and rotate until it hits the Mandrel. If unable to push down all the way, wrap a lint-free cloth around the Mandrel Extension on the end opposite the hex. Insert the Mandrel Extension with the hex end at the top into the tool. Push down and rotate until it hits the Mandrel. If unable to push down all the way, wrap a lint-free cloth around the Mandrel Extension covering the Piston Body to prevent dirt from entering the tool. Hit the top of the Mandrel Extension with a plastic or rubber mallet. If unable to rotate by hand, use the combination wrench on the hex and rotate until seated.

11. Keeping the tool closed, remove the tool from the pipe vise and place it vertically in the bench vise. Check the face of the Pressure Body to ensure there are not any burrs. If no burrs are present, coat the pin threads and shoulder of the Pressure Body with stainless steel anti-seize grease. Do not apply grease over the seals. Coat the seals with jar oil. Install the Pressure Body hand-tight.

NOTE: If the Pressure Body is damaged, remove it from the vise and polish it with 320 or finer grit sandpaper on a flat surface. Stand the body straight up with the face on the sandpaper and hold the body close to the bottom. Keeping the part square with the flat surface, polish the face by sliding and rotating the part. Rotate the position of your hands on the part and continue polishing. Check the face often to see if burrs are removed.

12. Pour the needed amount of oil into the graduated cylinder. See Table 6: Oil Fill Volumes on page 13.

13. With the Jar fully closed, place the filtered funnel extension inside the tool between the outside of the Mandrel Extension and inside the Pressure Body. Pour the oil from the graduated cylinder into the tool thru the filtered funnel.

CAUTION: Care should be taken not to allow the oil to overflow from the funnel into the ID of the Mandrel Extension. Overflow will cause the amount of oil to be incorrect and the tool will have to be disassembled, washed, and reassembled.

14. Coat the ID threads, internal shoulder, and OD Optiseal on the Nut with stainless steel anti-seize grease. Do not grease over the rubber seals. Coat the rubber seals with jar oil. Install the Nut into the Pressure Body with the hex end up.

Using the Nut Installation Tool (T-bar wrench, extension, and socket), press down while turning in order to force the Nut into the seal bore of the Pressure Body. Tighten until the Nut shoulders on the Mandrel Extension.

15. Move the Jar to the pipe vise and clamp on the Mandrel tool joint OD. Tighten the Nut to the specified torque. See Table 1: Recommended Tightening Torque on page 11.

16. Apply stainless steel anti-seize grease to the entire pin end and shoulder of the Top Sub. Install the Top Sub hand-tight.

17. Test the Jar per the procedure outlined under "Testing the Jar" on page 6.

NOTE: Correct placement of the vise and tong is required when making up connections to prevent damage to the tool. For correct placement see Figure 1: Tong and Vise Locations on page 8.

18. Tighten all exterior joints to the specified torque. See Table 1: Recommended Tightening Torque on page 11.

TESTING THE JAR

NOTE: The Logan Coiled Tubing Jar Tester is at a 15° incline so the Jar will test properly.

CAUTION: Do not exceed the "Standard Push (firing) Load (lb) in Jar Tester" as shown in Table 3: Jar Push Data on page 11. Do not exceed the “Maximum Pull (firing) Load (lb) Downhole with Weight Directly Above Jar” shown in Table 2: Jar Pull Data on page 11.

NOTE: The oil will gradually warm as the Jar is stroked causing the oil to thin and trip times will shorten.
Pull/Up Test
1. Install the proper Jar tester subs onto the Jar and lift it into the Coiled Tubing Jar Tester using an appropriate hoist with the Mandrel end up.

2. Paint one side of the Piston Body lengthwise with black spray paint. (This allows accurate temperature readings to be taken with the infrared thermometer.)

3. Set the Jar Tester to the proper standard pull (firing) load (lb) in the Jar Tester for the tool being tested. See Table 2: Jar Pull Data on page 11.

WARNING: When cocking the tool (pushing the tool closed), do not fully close the Jar. While closing, watch the tool closely and as soon as it starts to bow, stop pushing. When the Jar starts to bow, this indicates the tool is starting the down jarring cycle and excessive push load applied to the tool in the Jar Tester may cause sudden (destructive) buckling.

4. Conduct the pull test. Typically the Jar is tested two (2) times at test load (Standard Pull (firing) Load (lb) in the Jar Tester).
   a. Record the actual applied test pull load.
   b. Record the actual time in seconds that it takes to stroke one (1) inch at the applied test pull load.
   c. Immediately after the Jar trips, determine the highest temperature along the black painted area on the Piston Body using the infrared thermometer and record the temperature.
   d. Determine if the tool is acceptable. See Table 5: Acceptable Pull Times on page 12.
   e. If pull times are acceptable, pull one (1) time at maximum load for tool being tested per Table 2: Jar Pull Data, Maximum Pull (firing) Load (lb) Downhole with Weight Directly Above Jar. Record the pull load, time, and temperature on the test sheet on page 16.

NOTE: If the tool trips too fast and one (1) inch of travel cannot be timed, time it for one-half (½) inch of travel and note it on the test sheet.

Push/Down Test
1. With an appropriate hoist, remove the tool from the Jar Tester. With the Mandrel end down, stand the Jar vertically. Using a rubber or plastic head hammer, hit the Jar in the area of the Piston Body. (This is done to allow the air pocket to rise to the Top Sub end of the tool.) Place the Jar into the Jar Tester with the Mandrel end down.

2. Set the Jar Tester to the proper push test load for the tool being tested. See Table 3: Jar Push Data, Standard Push (firing) Load (lb) in Jar Tester on page 11.

3. Conduct the push test and record the time and actual push load for each push. The time recorded is for the amount of time it takes to stroke one (1) inch at the applied test push load. Typically the Jar is tested three (3) times at Jar Tester load. One (1) inch push times should take 30 to 60 seconds.

NOTE: If the tool trips too fast and one (1) inch of travel cannot be timed, time it for one-half (½) inch of travel and note it on the test sheet. Push times should take 15 to 30 seconds for one half (½) inch travel.

4. Immediately after the Jar trips, determine the highest temperature along the black painted area on the Piston Body using the infrared thermometer and record the temperature.

NOTE: Watch the pull gauge while cocking the Jar and as soon as it starts to build pressure, stop pulling.
Figure 1:
Jar Tong and Vise Locations for Applying Make-up and Break-out Torque
Figure 2: Jar Components

Logan Oil Tools reserves the right to change or discontinue designs without notice.
Figure 3:
Jar Seal Components

- Top Sub Seal: 1 required
- Nut OptiSeal: 1 required
- Nut Seal Non-Extrusion Ring: 2 required
- Nut Seal Protector Ring: 2 required
- Nut Seal: 1 required
- Nut ID Seal Protector Ring: 1 required
- Nut ID Seal: 1 required
- Pressure Body Seal: 1 required
- Pressure Body Seal Non-Extrusion Ring: 1 required
- Pressure Body Seal Protector Ring: 1 required
- Floater Body Seal: 1 required
- Floater Body Seal Protector Ring: 1 required
- Floater Body Seal Non-Extrusion Ring: 1 required
- Floater ID Seal: 1 required
- Floater ID Seal Protector Ring: 1 required
- Floater ID Seal Non-Extrusion Ring: 1 required
- Floater ID OptiSeal: 1 required
- Floater OD Seal: 1 required
- Floater OD Seal Protector Ring: 1 required
- Floater OD Seal Non-Extrusion Ring: 1 required
- Floater OD OptiSeal: 1 required
- Mandrel Seal: 1 required
Table 1: Recommended Tightening Torque

<table>
<thead>
<tr>
<th>Tool OD Size (in)</th>
<th>1-11/16</th>
<th>2-1/8</th>
<th>2-7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer Body Torque (ft-lb)</td>
<td>250</td>
<td>750</td>
<td>1,500</td>
</tr>
<tr>
<td>Mandrel Extension (ft-lb)</td>
<td>75</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>Nut Torque (ft-lb)</td>
<td>50</td>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2: Jar Pull Data

<table>
<thead>
<tr>
<th>Tool Size OD (in)</th>
<th>1-11/16</th>
<th>2-1/8</th>
<th>2-7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Pull (firing) Load (lb) in Jar Tester</td>
<td>12,000</td>
<td>24,000</td>
<td>35,000</td>
</tr>
<tr>
<td>Max. Pull (firing) Load (lb) Downhole with No Weight Above Jar</td>
<td>12,000</td>
<td>24,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Max. Pull (firing) Load (lb) Downhole with Weight Directly Above Jar</td>
<td>15,500</td>
<td>30,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Max. Lift Load (lb) Downhole</td>
<td>69,000</td>
<td>125,000</td>
<td>225,000</td>
</tr>
</tbody>
</table>

Note: Do not exceed maximum pull loads shown above when using the tool.

Table 3: Jar Push Data

<table>
<thead>
<tr>
<th>Tool Size OD (in)</th>
<th>1-11/16</th>
<th>2-1/8</th>
<th>2-7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Push (firing) Load (lb) in Jar Tester</td>
<td>1,500</td>
<td>2,500</td>
<td>4,000</td>
</tr>
<tr>
<td>Max. Push (firing) Load (lb) Downhole with No Weight Above Jar</td>
<td>12,000</td>
<td>24,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Max. Push (firing) Load (lb) Downhole with Weight Directly Above Jar</td>
<td>15,500</td>
<td>30,000</td>
<td>50,000</td>
</tr>
</tbody>
</table>

Notes:
1. Do not exceed maximum push loads shown above when using the tool downhole.
2. An excessive push load applied to the tool in the Jar Tester may cause sudden (destructive) buckling.

Table 4: Pump Open Area

<table>
<thead>
<tr>
<th>Tool Size OD (in)</th>
<th>1-11/16</th>
<th>2-1/8</th>
<th>2-7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Open Area (sq in)</td>
<td>1.28</td>
<td>2.23</td>
<td>3.98</td>
</tr>
</tbody>
</table>

Table 7: Maximum Torque

<table>
<thead>
<tr>
<th>Tool Size OD (in)</th>
<th>1-11/16</th>
<th>2-1/8</th>
<th>2-7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque @ Yield (ft-lb)</td>
<td>800</td>
<td>1,700</td>
<td>4,000</td>
</tr>
</tbody>
</table>
Table 5: Acceptable Pull Times

<table>
<thead>
<tr>
<th>Jar Temperature (°F)</th>
<th>Travel Time for 1&quot; Travel (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>110</td>
<td>60</td>
</tr>
<tr>
<td>120</td>
<td>50</td>
</tr>
</tbody>
</table>

Notes:
1. If time for ½" travel was recorded, double the time for use in the chart above.
2. For optimum results, the test should fall between the lines.
3. A test that falls below the bottom line is unacceptable.
   a. Most often cause is dirty oil. The Jar must be disassembled, washed, and reassembled.
   b. If a new Up Piston was used, the metering slot is too deep and the face must be lapped.
      Repeat until results fall between the lines.
4. A test that falls above the top line is unacceptable.
   a. Most often cause is a dirty or damaged Up Piston metering slot.
      The Jar must be disassembled, the Up Piston repaired, tool washed and reassembled.
   b. The metering slot is too shallow. Replace the Up Piston.
      Repeat until results fall between the lines.
Table 6: Oil Fill Volumes
Charts are based on oil fill temperature of 60° to 90° F.

<table>
<thead>
<tr>
<th>1-11/16&quot; OD Jar – 2 Pistons in Jar</th>
<th>1-11/16&quot; OD Jar – 1 Piston in Jar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Downhole Temperature (°F)</strong></td>
<td><strong>Fill Volume in Shop (ml)</strong></td>
</tr>
<tr>
<td>100</td>
<td>173</td>
</tr>
<tr>
<td>150</td>
<td>170</td>
</tr>
<tr>
<td>200</td>
<td>166</td>
</tr>
<tr>
<td>250</td>
<td>163</td>
</tr>
<tr>
<td>300</td>
<td>160</td>
</tr>
<tr>
<td>350</td>
<td>156</td>
</tr>
<tr>
<td>400</td>
<td>151</td>
</tr>
<tr>
<td>450</td>
<td>147</td>
</tr>
<tr>
<td>500</td>
<td>143</td>
</tr>
<tr>
<td>550</td>
<td>140</td>
</tr>
<tr>
<td>600</td>
<td>136</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2-1/8&quot; OD Jar – 2 Pistons in Jar</th>
<th>2-1/8&quot; OD Jar – 1 Piston in Jar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Downhole Temperature (°F)</strong></td>
<td><strong>Fill Volume in Shop (ml)</strong></td>
</tr>
<tr>
<td>100</td>
<td>391</td>
</tr>
<tr>
<td>150</td>
<td>383</td>
</tr>
<tr>
<td>200</td>
<td>375</td>
</tr>
<tr>
<td>250</td>
<td>368</td>
</tr>
<tr>
<td>300</td>
<td>361</td>
</tr>
<tr>
<td>350</td>
<td>354</td>
</tr>
<tr>
<td>400</td>
<td>347</td>
</tr>
<tr>
<td>450</td>
<td>341</td>
</tr>
<tr>
<td>500</td>
<td>335</td>
</tr>
<tr>
<td>550</td>
<td>329</td>
</tr>
<tr>
<td>600</td>
<td>323</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2-7/8&quot; OD Jar – 2 Pistons in Jar</th>
<th>2-7/8&quot; OD Jar – 1 Piston in Jar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Downhole Temperature (°F)</strong></td>
<td><strong>Fill Volume in Shop (ml)</strong></td>
</tr>
<tr>
<td>100</td>
<td>682</td>
</tr>
<tr>
<td>150</td>
<td>688</td>
</tr>
<tr>
<td>200</td>
<td>654</td>
</tr>
<tr>
<td>250</td>
<td>642</td>
</tr>
<tr>
<td>300</td>
<td>629</td>
</tr>
<tr>
<td>350</td>
<td>618</td>
</tr>
<tr>
<td>400</td>
<td>606</td>
</tr>
<tr>
<td>450</td>
<td>595</td>
</tr>
<tr>
<td>500</td>
<td>584</td>
</tr>
<tr>
<td>550</td>
<td>574</td>
</tr>
<tr>
<td>600</td>
<td>564</td>
</tr>
<tr>
<td>OUTSIDE DIAMETER - INCHES</td>
<td>1-11/16 (1.708)</td>
</tr>
<tr>
<td>INSIDE DIAMETER - INCHES</td>
<td>17/32 (.530)</td>
</tr>
<tr>
<td>CONNECTION SIZE (BOX UP)</td>
<td>1&quot; AMMT</td>
</tr>
<tr>
<td>CONNECTION SIZE (PIN DOWN)</td>
<td>1&quot; AMMT</td>
</tr>
</tbody>
</table>

| COMPLETE ASSEMBLY | Logan Part No. | 616-169 | 616-213 | 616-288 |

**COMPONENT PARTS**

| TOP SUB | Logan Part No. | CC1000 | CC1002 | CC1004 |
| TOP SUB SEAL | Logan Part No. | 568122 | 568128 | 568226 |
| PRESSURE BODY | Logan Part No. | CC2000 | CC2002 | CC2004 |
| PRESSURE BODY NON-EXTRUSION RING | Logan Part No. | CC14000 | CC14002 | CC14004 |
| PRESSURE BODY SEAL PROTECTOR RING | Logan Part No. | 8-025 | 8-128 | 8-226 |
| PRESSURE BODY SEAL | Logan Part No. | 568025 | 568128 | 568226 |
| PISTON BODY | Logan Part No. | CC3000 | CC3002 | CC3004 |
| FLOATER BODY | Logan Part No. | CC4000 | CC4002 | CC4004 |
| FLOATER BODY NON-EXTRUSION RING | Logan Part No. | CC14000 | CC14002 | CC14004 |
| FLOATER BODY SEAL PROTECTOR RING | Logan Part No. | 8-025 | 8-128 | 8-226 |
| FLOATER BODY SEAL | Logan Part No. | 568025 | 568128 | 568226 |
| SPLINE BODY | Logan Part No. | CC5000 | CC5002 | CC5004 |
| MANDREL | Logan Part No. | CC6000 | CC6002 | CC6004 |
| MANDREL ID SEAL | Logan Part No. | 568118 | 568120 | 568220 |
| MANDREL EXTENSION | Logan Part No. | CC7000 | CC7002 | CC7004 |
| NUT | Logan Part No. | CC8000 | CC8002 | CC8004 |
| NUT ID SEAL PROTECTOR RING | Logan Part No. | 8-117 | 8-120 | 8-220 |
| NUT ID SEAL | Logan Part No. | 568118 | 568120 | 568220 |
| NUT OD NON-EXTRUSION RING | Logan Part No. | CC15000 | CC15002 | CC15004 |
| NUT OD SEAL PROTECTOR RING | Logan Part No. | 8-121 | 8-221 | 8-327 |
| NUT OD SEAL | Logan Part No. | 568914 | 568221 | 568327 |
| NUT OD OPTISEAL | Logan Part No. | CC19000-001 | CC19002-001 | CC19004-001 |
| UP PISTON | Logan Part No. | CC9000 | CC9002 | CC9004 |
| DOWN PISTON | Logan Part No. | CC10000 | CC10002 | CC10004 |
| FLOATER | Logan Part No. | CC11000 | CC11002 | CC11004 |
| FLOATER ID NON-EXTRUSION RING | Logan Part No. | CC13000 | CC13002 | CC13004 |
| FLOATER ID SEAL PROTECTOR RING | Logan Part No. | 8-117 | 8-120 | 8-220 |
| FLOATER ID SEAL | Logan Part No. | 568911 | 568120 | 568220 |
| FLOATER ID OPTISEAL | Logan Part No. | CC19000-002 | CC22002 | CC22004 |
| FLOATER OD NON-EXTRUSION RING | Logan Part No. | CC15000 | CC15002 | CC15004 |
| FLOATER OD SEAL PROTECTOR RING | Logan Part No. | 8-121 | 8-221 | 8-327 |
| FLOATER OD SEAL | Logan Part No. | 568914 | 568221 | 568327 |
| FLOATER OD OPTISEAL | Logan Part No. | CC19000-001 | CC19002-001 | CC19004-001 |
| SPLINE | Logan Part No. | CC12000 | CC12002 | CC12004 |

**No. Req'd**

| 2 | 2 | 2 | 4 |
## REDRESS KITS

### REDRESS KIT

<table>
<thead>
<tr>
<th>Consists of:</th>
<th>Logan Part No.</th>
<th>CC21000</th>
<th>CC21002</th>
<th>CC21004</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOATER ID NON-EXTRUSION RING</td>
<td></td>
<td>CC13000</td>
<td>CC13002</td>
<td>CC13004</td>
</tr>
<tr>
<td>No. Req'd</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PRESSURE &amp; FLOATER BODY OD NON-EXTRUSION RING</td>
<td></td>
<td>CC14000</td>
<td>CC14002</td>
<td>CC14004</td>
</tr>
<tr>
<td>No. Req'd</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>FLOATER &amp; NUT OD NON-EXTRUSION RING</td>
<td></td>
<td>CC15000</td>
<td>CC15002</td>
<td>CC15004</td>
</tr>
<tr>
<td>No. Req'd</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>SEAL KIT *</td>
<td></td>
<td>CC20000</td>
<td>CC20002</td>
<td>CC20004</td>
</tr>
<tr>
<td>No. Req'd</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SPLINE</td>
<td></td>
<td>CC12000</td>
<td>CC12002</td>
<td>CC12004</td>
</tr>
<tr>
<td>No. Req'd</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

* Includes O-Rings, Seal Protector Rings, and Opti-Seals

### REQUIRED ACCESSORIES

#### COMBINATION WRENCH SIZE FOR MANDREL EXTENSION - INCHES

<table>
<thead>
<tr>
<th>Combination Wrench</th>
<th>No. Req'd</th>
<th>13/16</th>
<th>1</th>
<th>1-3/8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

#### SIX-POINT SOCKET SIZE FOR NUT - INCHES

<table>
<thead>
<tr>
<th>Socket Size</th>
<th>No. Req'd</th>
<th>7/8</th>
<th>1-1/8</th>
<th>1-1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>1-1/2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** FLOATER ID SETTING TOOL  
Logan Part No. CC17000 CC17002 CC17004

** FLOATER REMOVAL TOOL  
Logan Part No. CC18000 CC18002 CC18004

** POLYPAK STRETCHER **  
Logan Part No. CD11000 CD11002 CD11004

** POLYPAK INSTALLATION TOOL **  
Logan Part No. CD12000 CD12002 CD12004

** Used for installing seals onto OD of Nut and Floater
Logan Bi-Directional Coiled Tubing Jar Test Form

Date of Test ____________________________

Person Who Dressed/Tested Jar ______________________________________________________

Jar Assembly Number ___________________ Serial Number ________________________________

Jar OD ___________________ Connection ________________________________________________

Up Piston Gap Depth ________________ Down Piston Gap Depth __________________________

Length of OD of Mandrel Extension Bump ______________ Type of Oil Put Into Jar ___________

Temperature of Oil Put Into Jar (°F) ___________________ Volume of Oil Put Into Jar (ml) _______

<table>
<thead>
<tr>
<th>Push/Pull Load (lbs)</th>
<th>Time for 1&quot; Travel (sec)</th>
<th>Temperature (°F)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dirty Tool Test Data

Date of Test ________________________________

Person Who Tested Tool _______________________

<table>
<thead>
<tr>
<th>Push/Pull Load (lbs)</th>
<th>Time for 1&quot; Travel (sec)</th>
<th>Temperature (°F)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
U.S. SALES OFFICES

▲ California
3155 Pegasus Drive
Bakersfield, CA 93308-6800
661.387.1449 | Fax 661.387.1624

▲ Louisiana
103 Bluffwood Drive
Broussard, LA 70518-3310
337.839.2331 | Fax 337.839.2334
118 Common Court
Houma, LA 70360-7982
985.868.7333 | Fax 985.868.7007

▲ North Dakota
4925 Highway 85 South
Williston, ND 58801
701.572.0565 | Fax 701.572.0644

▲ Oklahoma
424 South Eagle Lane
Oklahoma City, OK 73128-4225
405.782.0625 | Fax 405.782.0760

▲ Pennsylvania
244 Grey Fox Drive, Suite 1
Montoursville, PA 17754-9572
570.546.1066 | Fax 570.546.0388

▲ Texas
1519 South Flournoy
Alice, TX 78332
361.396.0139 | Fax 361.396.0112
11610 Cutten Road
Houston, TX 77066-3008
832.602.2134 | Fax 832.286.4117
11006 Lucerne Street
Houston, Texas 77016-1920
281.219.6613 | Fax 281.219.6638
1305 Energy Drive
Kilgore, TX 75662-5539
903.984.6700 | Fax 903.984.6755
601 McDonald
Odessa, TX 79761-6106
432.580.7414 | Fax 432.580.7656

▲ Utah
1369 South 1100 East
Vernal, UT 84088-6800
435.781.2856 | Fax 435.781.2858

INTERNATIONAL STOCKING DISTRIBUTORS

▲ Canada
Logan Oil Tools
9755 45th Avenue NW
Edmonton, Alberta T6E 5V8
780.433.9957 | Fax 780.468.1979

▲ Colombia
Logan Oil Tools Sucursal Colombia
Calle 113 No. 7-21
Edificio Teleport Business Park
Torre A, Oficina 915
Bogota, Colombia
(57.1).629.1995 | Fax (57.1).612.8357

▲ Singapore
Logan Oil Tools Pte Ltd
54 Loyang Way
Singapore 508747
65.65428422 | Fax 65.65420477

▲ United Arab Emirates
Logan Oil Tools
Jebel Ali Free Zone (South)
P.O. Box 23724
Dubai, UAE
971.4.813.8000 | Fax 971.4.813.8001

▲ Woodhouse International
P.O. Box 23724
Dubai, UAE
971.4.347.2300 | Fax 971.4.347.4642

▲ United Kingdom
Logan Oil Tools, U.K. Ltd.
Unit C1 Kintore Business Park
Kintore, Inverurie
Aberdeen-shire AB51 OYQ
Scotland
+44.1467.631190