



HAMMER MAINTENANCE

Service Kit (O-Ring Kit)

- All new SH&B RC hammers are ready to operate upon delivery
- It is recommended to have a rubber service kit on hand whenever dismantling hammers.
- Deterioration of rubber parts will occur if the hammer is overheated. This may be due to poor lubrication or when the hammer has been bogged. If this occurs, the hammer should be stripped down for inspection. If the rubber components show any deterioration they should be replaced. Under normal working conditions the rubber components of a hammer should last 4000 m. It is recommended to service all hammers after 4000 m. All internal parts should be checked and all rubber parts replaced.

Certain operating conditions will require more frequent servicing:

- Operating above 500 psi
- Extremely hard ground conditions
- Corrosive ground water conditions

Hammer Disassemble

500 Series

If possible, break the thread joints on the Drill Rig, otherwise use a hydraulic breakout bench. Disassemble the hammer with the hammer lying horizontal if possible

1. Remove the Circlip that holds the Adaptor Nozzle.
2. Remove the Adaptor Nozzle and the Inner Tube Together.
3. Remove the Drive Sub, Percussion Bit and Bit Retainer Rings.
4. Push the Piston Bearing Bush up the hammer to clear the Piston Retainer Ring.
5. Remove the Piston Retaining Ring. A small tool with a pointed end can be used to pry the retaining ring from the groove. Slide the tool into the relief groove and flick the retainer ring into the piston case. Care should be taken not to scratch the piston Case.
6. Slide the Piston Bearing Bush out of the hammer.
7. Slide the Piston out of the bottom end of the hammer.
8. Unscrew the Top Cylinder from the Piston case.
9. By turning the Top Cylinder upside down the Check Valve and spring should fall out.



Wash all of the components with a cleaning solvent and immediately dry with high pressure air. Immediately coat all components with lubricant to prevent oxidization as surface damage may have occurred during drilling allowing oxidization to occur quickly.

600 Series

If possible:

- Breakout all thread joints using the breakout equipment on the drill rig, or alternatively use a hydraulic breakout bench
- Disassemble the Hammer with the Hammer lying in a horizontal position

- Unscrew the top adaptor & or dig out sub from the top cylinder
- Remove the Circlip from within the top cylinder that retains the Adaptor nozzle
- Remove the Adaptor Nozzle and the Inner Tube Together.
- Remove the Check Valve and Spring
- Unscrew the Top Cylinder from the Piston Case
- Slide the Piston out of the cylinder
- Unscrew Drive Sub/Bit assembly and Bit Retaining Rings from the Piston Case
- To remove the drive sub bush, face the piston case with the drive sub end down and force onto a block of wood. This should dislodge the bush and you now should be able to pull it out by hand.
- Wash all of the components with a cleaning solvent and immediately dry with high pressure air. Immediately coat all components with lubricant to prevent oxidization as surface damage may have occurred during drilling allowing oxidization to occur quickly.

Note:

- Hammers or parts that have not been adequately sealed and relubricated will deteriorate quickly due to corrosive damage. Lack of basic protection from moisture, dust or air can quite often cause damage to hammer components in a short period of time.
- Do not use breakout tools over the threaded area of the piston case, as this may initiate cracking and will compress the threads making them impossible to loosen.
- Do not use a steel hammer against the cylinder as this will also initiate cracks.
- Do not use drifts or foreign objects inside of the cylinder as it may damage the internal ground surfaces resulting in premature failure of the hammer

Hammer Reassemble

500 Series

- To ensure optimum performance of your Reverse Circulation DTH Hammer it is essential to service the hammer regularly.



- Routinely replacing 'O'Rings, check valve seals and springs and bearing bush seals is good practice and will ensure your hammer does not lose air unnecessarily.
- When re-assembling your hammer ensure all of the components are coated with Rock Drill Oil. Take particular care to adequately lubricate the internal diameter of the piston case and the piston.
- For safety and ease of installation the piston case should be horizontal when installing the piston. Once the Piston, piston retainer ring bearing bush and drive sub are correctly installed the hammer can be stood vertically for the installation of the remaining components.

Piston Case

Ensure the internal diameter of the piston case is kept well lubricated. Remove any pick up marks or burrs with light hand sanding. These imperfections mainly occur due to the introduction of foreign material during the drilling process.

The piston case is heat treated and as such never apply heat as this may cause cracking or distortion. When tightening the piston case do not put the chain wrench over the threaded area as this may cause distortion or cracking.

Piston

Install the piston into the hammer with the smaller diameter facing the drive sub end of the piston case. Before installation lubricate the piston internally and externally with Rock Drill Oil. Once installed ensure the piston slides freely in the bore of the piston case.

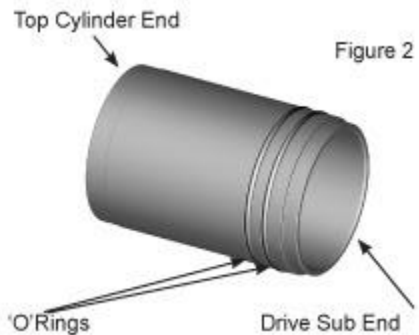
Top Cylinder End



Bearing Bush

Prior to installation locate the 'O'Rings onto the bearing bush ensuring that rock drill oil is adequately coated externally and internally.

Install the bearing bush with the larger diameter facing the drive sub end of the piston case. Push the bearing bush up to the piston retainer ring.



Please note the bearing bush can only be installed in one direction for the hammer to operate. The Top Cylinder must be towards the Top Cylinder.

Piston Retainer Ring

Slide the piston past the retainer groove and install the piston retainer Ring. It is easiest to insert the retainer ring with the split facing towards the bottom of the piston case. A thin steel rod with a 90° hook at one end will assist in the locating of the retainer into the groove

Bit Retainer Rings

If the hammer is to be stored locate the 'O'Ring onto the 2 piece Bit retainer rings and slide them into the piston case until bedded up against the bottom of the bearing bush. If the hammer is going into service then slide the drive sub onto the Percussion bit with the bit retainer rings fitted on top of the drive sub. (See Figure 4)



Drive Sub

Coat the Drive Sub threads with no-gall tool joint lubricant, zinc based or equivalent. If hammer is going into service then install drive sub with percussion bit. If the hammer is to be stored, seal the drive sub on the bottom end and thread into piston case.

Assembled Reverse Circulation Percussion Bit with Bit Retainer Rings and Drive Sub.

1. Percussion Bit
2. Bit Retainer Rings
3. Drive Sub

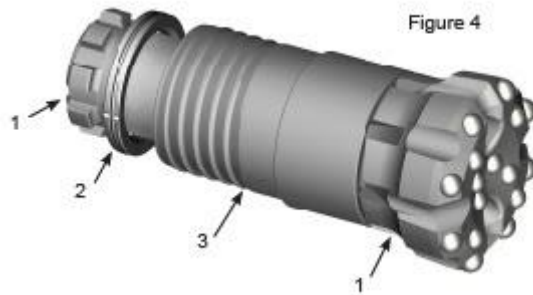


Figure 4

Top Sub

Coat the Top sub threads with no-gall tool joint lubricant, zinc based or equivalent. Avoid excess grease as this can be introduced into the hammer and block airways or internal air ports.

Prior to installation lightly coat the internal diameter and ported section of the Top Cylinder with Rock Drill Oil.

Slowly slide the Top cylinder into the piston case being careful not to damage the piston or piston case during installation. Hand Tighten the thread.

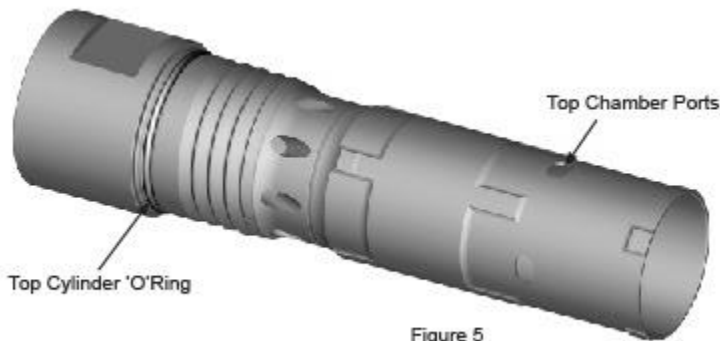


Figure 5

Check Valve

Lubricate the check valve and the spring with rock drill oil. Ensure the Check Valve seal is installed on the internal diameter of the check valve. Drop the check valve spring into the Top cylinder ensuring it is sitting squarely. Drop the Check valve down onto the spring ensuring it also sits squarely.



Figure 6



Figure 7

Adapter Nozzle

Apply a light coating of Rock drill oil to the Adapter Nozzle.

Add the 'O' Ring to the external diameter of the adapter Nozzle. Push the adapter nozzle down onto the check valve pushing the check valve down. Continue to push until the Circlip groove in the Top cylinder is exposed. While holding down the adapter nozzle install the circlip with circlip pliers.



Order of Assembly of Check Valve Assembly.

1. Check Valve Spring
2. Check Valve
3. Check Valve Seal (Install into check valve first)
4. Adaptor Nozzle
5. Adaptor Nozzle 'O'Ring (Installed prior to Assembly)
6. Air Screen
7. Circlip

Inner Tube

Apply a light coating of Rock Drill oil to the entire length of the external diameter of the inner tube. The internal diameter does not require any lubrication. Install the 'O'Rings on the Inner Tube. Push the Inner tube down into the Hammer through the Adaptor nozzle. Continue to push the inner tube until the inner tube sits flush with the adaptor Nozzle.

During Drilling the Inner tube should be checked regularly for wear to prevent internal contamination of the hammer with Rock Sample. The wear indicator is the shortest length the inner tube should wear to.

600 Series

It is good practice to replace all 'O' Rings and check valve seal during each maintenance routine.

Ensure all internal parts are coated with rock drill oil. Take particular care to liberally coat the internal bores of the piston and piston case.

For safety and ease of installation, assembly of the piston into the cylinder is best carried out with the cylinder in the horizontal position. Once the piston, piston retaining ring, drive sub bush, bit ring and drive sub is installed, the hammer should be stood vertical for installation of the remaining components from the top end.



- Lubricate the internal bore of the cylinder with rock drill oil.
- Where applicable, insert the piston retainer ring into the cylinder from the bottom end, if not already in place



- Insert the lubricated drive sub bush until it stops on the piston retainer ring/shoulder.
- Insert the bit retainer ring until it rests on the drive sub bush.
- Coat the thread on the drive sub with no-gall tool joint lubricant and screw into the cylinder with the shroud placed over the top.
- Note that there will be a gap between the drive sub and cylinder unless there is a shroud assembled to the drive sub.
- Lubricate all the piston's surfaces (external & internal) with rock drill oil.
- Stand the cylinder on a slight incline and carefully lower the piston into the cylinder from the top end until it rests on the drive sub bush.
- Coat the top cylinder thread with a tool joint grease and lubricate all other surfaces.
- Screw the top cylinder into the cylinder.
- Insert the check valve spring, check valve and adaptor nozzle/distributor into the top sub and then lock in place with the circlip.

Piston Case

Ensure the internal diameter of the piston case is kept well lubricated. Remove any pick up marks or burrs with light hand sanding. These imperfections mainly occur due to the introduction of foreign material during the drilling process.

The piston case is heat treated and as such never apply heat as this may cause cracking or distortion. When tightening the piston case do not put the chain wrench over the threaded area as this may cause distortion or cracking

Piston Bush

Prior to installation locate the O-Ring's onto the Piston bush ensuring that rock drill oil is adequately coated externally and internally.

Install the bearing bush with the larger internal diameter facing the drive sub end of the piston case. Locate the bearing bush up to the piston retainer ring, O-Ring end first.

To secure the Piston bush in place force the Piston case (top cylinder end first) onto a block of wood and hear it drop into position.



Please note the bearing bush must only be installed in one direction for the hammer to operate.

Bit Retainer Rings

If the hammer is to be stored fit the Bit retainer rings into the piston case until resting up against the bottom of the bearing bush. If the hammer is going into service then fit the drive sub onto the Percussion bit with the bit retainer rings fitted on top of the drive sub.



Drive Sub

Coat the Drive Sub threads with no-gall tool joint lubricant, zinc based or equivalent. If hammer is going into service then install drive sub with percussion bit. If the hammer is to be stored, seal the drive sub on the bottom end and thread into piston case.



Assembled Reverse Circulation Bit with Bit Retainer Rings and Drive Sub.

1. Percussion Bit



- 2. Bit Retainer Rings
- 3. Drive Sub

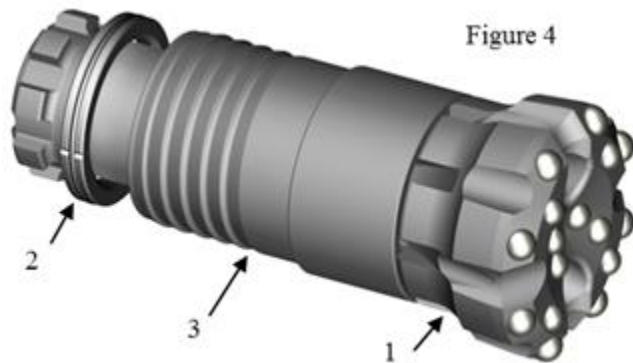


Figure 4

Piston

Install the piston into the hammer with the smaller diameter facing the drive sub end of the piston case. Before installation lubricate the piston internally and externally with Rock Drill Oil. Once installed ensure the piston slides freely in the bore of the piston case.



Top Cylinder

Coat the Top cylinder threads with no-gall tool joint lubricant, zinc based or equivalent. Avoid excess grease as this can be introduced into the hammer and block airways or internal air ports..

Prior to installation lightly coat the internal diameter and ported section of the Top Cylinder with Rock Drill Oil.

Slowly slide the Top cylinder into the piston case being careful not to damage the piston or piston case during installation. Hand Tighten the thread.



Check Valve

Lubricate the check valve and the spring with rock drill oil. Ensure the Check Valve seal is installed on the internal diameter of the check valve. Drop the check valve spring into the Top cylinder ensuring it is sitting squarely. Place the Check valve down onto the spring ensuring it also sits squarely.



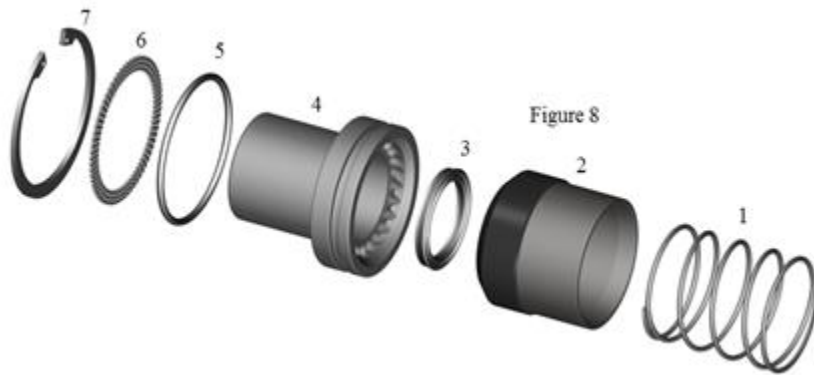
Adaptor Nozzle

Apply a light coating of Rock drill oil to the Adaptor Nozzle. Add the 'O' Ring to the external diameter of the adaptor Nozzle. Install the airscreen over the adaptor nozzle then continue to push the adaptor nozzle down onto the check valve pushing the check valve down. Continue to push until the Circlip groove in the Top cylinder is exposed. While holding down the adaptor nozzle install the circlip with circlip pliers.



Order of Assembly of Check Valve Assembly

1. Check Valve Spring
2. Check Valve
3. Check Valve Seal (Install into check valve first)
4. Adaptor Nozzle
5. Adaptor Nozzle 'O'Ring (Installed prior to Assembly)
6. Air Screen
7. Circlip



Inner tube

Apply a light coating of Rock Drill oil to the entire length of the external diameter of the inner tube. The internal diameter does not require any lubrication. Install the 'O'Rings on the Inner Tube. Push the Inner tube down into the Hammer through the Adaptor nozzle. Continue to push the inner tube until the inner tube sits flush with the adaptor Nozzle.

During Drilling the Inner tube should be checked regularly for wear to prevent internal contamination of the hammer with Rock Sample. The wear indicator is the shortest length the inner tube should wear to.



Hammer Storage

Short term Storage (1 or 2 weeks)

1. Blow the hammer clear of all water while still on the Drill Rig
2. Pour 1 litre of Rock Drill Oil into the Hammer
3. Turn the Air on and cycle the hammer against a block of wood for 10 seconds. This will lubricate the internal components.
4. Remove the hammer from the Drill Rig and cap the Top Sub end of the Hammer



Long term Storage (more than 3 weeks)

Completely dismantle the hammer and follow the hammer reassembly direction of this manual. Store the hammer with both ends capped in a dry place, with the hammer in a horizontal position.

Before re-starting after long periods of inactivity, disassemble the hammer and inspect all internal components for rust. Use a light emery to remove any oxidization, completely wash and dry the hammer and re-assemble following the directions in this manual.

Recommendations

Hammers and bits that are used in drilling wet holes or have water or foam injected should be stripped, inspected for corrosion then suitably service every 60 – 80 hours of operation. In particular, both male and female threads should be liberally coated with grease to provide a barrier against corrosion attack, especially non-contact surfaces where water can accumulate. SH&B recommend the use of molybdenum-disulphide additive to hammer oil, primarily to minimise 'heat checking' on pistons. Molybdenum-disulphide's affinity (attraction) to steel provides excellent protection against corrosion to both the cylinder bore and piston. Hammers **SHOULD NEVER** be left, between shifts, **PARKED** in the hole under water. A 12 hour exposure of a steel surface to an 'electrolyte' is sufficient time to establish significant corrosion pitting.

The correct procedure is to pull the hammer back above the water level, blow dry with air, and pour a quantity of oil down the drill pipe then blow air through the hammer to hopefully cover its components with a protective film of oil. Some drilling personnel may argue that "pull back" costs time and money. This consideration must be weighed up against the cost of a replacement piston (usually \$2-3K) and possible consequential damage and replacement of the cylinder and as well the down time when failure occurs.

Storage of a hammer for any period of time requires that it be stripped to its component pieces, thoroughly cleaned and dried and the internal pieces liberally coated with oil and the cylinder thread joints liberally covered with grease.