



CHALLENGER® 6

CARE & MAINTENANCE INSTRUCTIONS

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WARRANTIES AND REMEDIES

LIMITED WARRANTY

Numa warrants that the Product will be new and free from defects in material and workmanship under normal use as contemplated by this Contract for a period of six (6) months from the date of shipment.

Except for the foregoing warranty, Numa disclaims all warranties and representations wherever made, including warranties of merchantability, durability, length of service, or fitness for a particular purpose.

Any alteration or modification of the original product without the express written consent of Numa will void this warranty.

REMEDY

If, during such warranty period, Buyer promptly notifies Numa in writing of any defect and establishes that the above warranty is not met, Numa shall either repair or replace the Product or credit the customer, as it deems necessary to meet the warranty.

Such repair, replacement, or credit of Product shall constitute complete fulfillment of Numa's obligation under this warranty, and upon the expiration of the original warranty period, all of Numa's obligations hereunder shall terminate.

LIMITATION OF LIABILITY

Numa shall not be liable to Buyer whether in contract, in tort (including negligence and strict liability), under any warranty or otherwise, for any special, indirect, incidental or consequential loss or damage whatsoever, including (without limitation) loss arising from delay, cost or capital and loss of profits or revenues. The remedies set forth in this Contract are exclusive, and the total cumulative liability of Numa under this Contract or for any act or omission in connection therewith or related thereto, whether in contract, in tort (including negligence and strict liability), under any warranty or otherwise, is limited to the price paid by Buyer for the Product.

The *WARNINGS*, *CAUTIONS* and *NOTES* used throughout the text of this instruction book are defined as follows:

WARNING A specific procedure or practice that must be strictly followed, or a specific condition that must be met, to prevent possible bodily harm.

CAUTION A specific procedure or practice that must be strictly followed, or a specific condition that must be met, to prevent damage to the equipment.

NOTE Important supplemental information.

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SECTION I DESCRIPTION

GENERAL DESCRIPTION

The Challenger 6 is a valveless, pneumatically operated tool designed to utilize Numa 6" to 8-1/2" (152 mm to 216 mm) diameter bits in rock formations under a wide range of operating conditions.

The Challenger 6 hammer design incorporates a hardened, reversible case. The simple design of the Challenger 6 provides performance and dependability without sacrificing tool life.

The Challenger 6 is designed for universal applications using air pressure from 150 PSI to 500 PSI (10.2 Bar to 34.5 Bar) with compressors ranging in size from 425 CFM (201 Litres/Second) or more. When drilling conditions require supplementary hole cleaning, additional hole cleaning air can be passed through the hammer by utilizing an interchangeable choke. All standard hammers shipped from Numa have a blank choke installed. Refer to page 14 for correct choke selection and pages 7 & 11 to facilitate the removal and the installation of the choke.

<i>Challenger 6</i>		
Weight w/o Bit	258 lbs.	(117 kg)
Outside Diameter	5-3/8"	(137 mm)
Hammer Length:		
Shoulder to Shoulder	52"	(132 cm)
Shoulder to Bit Face	55"	(140 cm)
Backhead API Thread	3-1/2 API REG	

Table 1-1 General Hammer Specifications

6"	(152 mm)	52 lbs.	(24 kg)	6-3/4"	(172 mm)	55 lbs.	(25 kg)
6-1/8"	(156 mm)	52 lbs.	(24 kg)	7"	(178 mm)	63 lbs.	(29 kg)
6-1/4"	(159 mm)	53 lbs.	(24 kg)	* 8"	(203 mm)	69 lbs.	(31 kg)
6-1/2"	(165 mm)	53 lbs.	(24 kg)	* 8-1/2"	(216 mm)	72 lbs.	(33 kg)

* Not for use in production drilling

Table 1-2 General Bit Specifications

NOTE

NUMA 6" TO 8-1/2" (152 MM TO 216 MM) BITS ARE AVAILABLE IN CONCAVE, CONVEX OR FLAT FACE DESIGNS WITH LARGE AIR FLUSHING HOLES AND CHIP WAYS. OTHER SIZES MAY BE AVAILABLE UPON REQUEST.

FUNCTIONAL DESCRIPTION

1. BACKHEAD



The backhead connects the hammer to the drill rod. It is threaded into the top end of the case with a large cross section thread form and into the drill rod with a standard 3-1/2 REG API thread. Other threads are available upon request. Wrench flats are provided for disassembling.

2. CHECK VALVE



The check valve maintains pressure in the hammer when the air supply has been shut off. The pressure in the hammer balances the hydrostatic pressure in the hole thereby preventing contaminants from entering the hammer.

3. CHECK VALVE SPRING



The check valve spring provides tension under the check valve to keep it closed. It is compressed as the air is turned on.

4. CHECK VALVE HOUSING



The check valve housing guides the check valve and the check valve spring. The main air supply is directed to the feed tube through ports located in the check valve housing.

5. COMPRESSION RINGS



Two compression rings, one between the check valve housing and the feed tube housing and one between the feed tube and the feed tube housing, keep the internal hammer parts tight.

6. FEED TUBE RETAINER



The feed tube retainer keeps the feed tube seated in the proper location. The feed tube retainer also allows air to flow to the piston and feed tube.

7. FEED TUBE HOUSING



The feed tube housing is aligned in the main bore of the hammer. It is located by a matching 45° angle in the case bore and is held in position by the backhead, check valve housing and compression ring combination. The feed tube housing locates and aligns the feed tube.

8. FEED TUBE



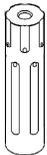
The feed tube supplies the main air into the chambers located in the piston. The feed tube collar seats against the feed tube compression ring which locates against a shoulder in the feed tube housing. The feed tube is held in place by a feed tube snap ring located above the feed tube collar. The long bearing surface design insures alignment in the feed tube housing.

9. CHOKE



The interchangeable choke is located in the tip of the feed tube and is held in place with a press fit. A set of four chokes is supplied with each hammer. By installing the correct choke, the hammer can be fine tuned to the compressor package.

10. PISTON



The piston functions as the only moving part in the hammer, controlling the operational air cycle. The percussive action of the piston striking the bit transfers the energy through the bit in order to fracture rock formations.

11. CASE



The case is designed to contain the internal parts which make up the hammer assembly. The case is reversible and is hardened to resist wear and to extend life in abrasive conditions.

12. BIT BEARING



The bit bearing guides the bit to insure proper alignment between the piston and the bit. The bit bearing is pressed into the chuck end of the case and locates against a matching 45° angle in the case bore. The bit bearing provides a seal for the main air supply.

13. WEAR SPACER



The wear spacer is not installed in a new hammer. It is located in the chuck end of the case between the bit bearing and the disc springs. The wear spacer is used to take up any space that can no longer be compensated for by the disc springs due to disc spring compression fatigue in the bottom end of the hammer.

14. DISC SPRINGS



The four disc springs are located in the chuck end of the case. They are held in place between the bit bearing and the washer. The disk springs are compressed as the chuck is screwed into the case. They are designed to expand and maintain a tight assembly as the internal hammer parts wear.

15. WASHER



The washer is located between the disc springs and the retainer. The washer is used to provide an area to seat the disc springs.

16. RETAINER



The retainer is a hardened steel ring with a 3/4" (19mm) space to allow it to be compressed when installing it in the case. The retainer is installed in the chuck end of the case and prevents the disc springs and washer from falling out when the chuck, the bit retaining rings and the bit are removed.

17. BIT RETAINING RINGS



The bit retaining rings are designed to allow the bit to move between the drilling and cleaning positions and prevent the bit from coming completely out of the hammer. The bit retaining rings consist of two matched halves and are held together with an o-ring.

18. CHUCK



The chuck threads into the bottom of the case with a large cross section thread form. It has internal splines that mesh with the splines on the bit body to transmit rotation.

19. THRUST WASHERS



Two brass thrust washers, one located between the backhead and the case, and one between the chuck and the case, provide for easy disassembly.

SECTION II MAINTENANCE

DISASSEMBLY

- If at all possible, the backhead and chuck should be broken loose on the drill rig; this is much easier than trying to do so after the drill has been removed from the drill rig.

CAUTION

USE CAUTION WHEN HANDLING DOWN HOLE HAMMER PARTS. NUMA HAMMER PARTS ARE MANUFACTURED FROM HARDENED, HEAT TREATED MATERIALS. DROPPING OR STRIKING THESE PARTS MAY CAUSE SEVERE DAMAGE. STRIKING THE HAMMER PARTS WITH HAMMERS, CROWBARS OR LIKE INSTRUMENTS WILL VOID THE WARRANTY

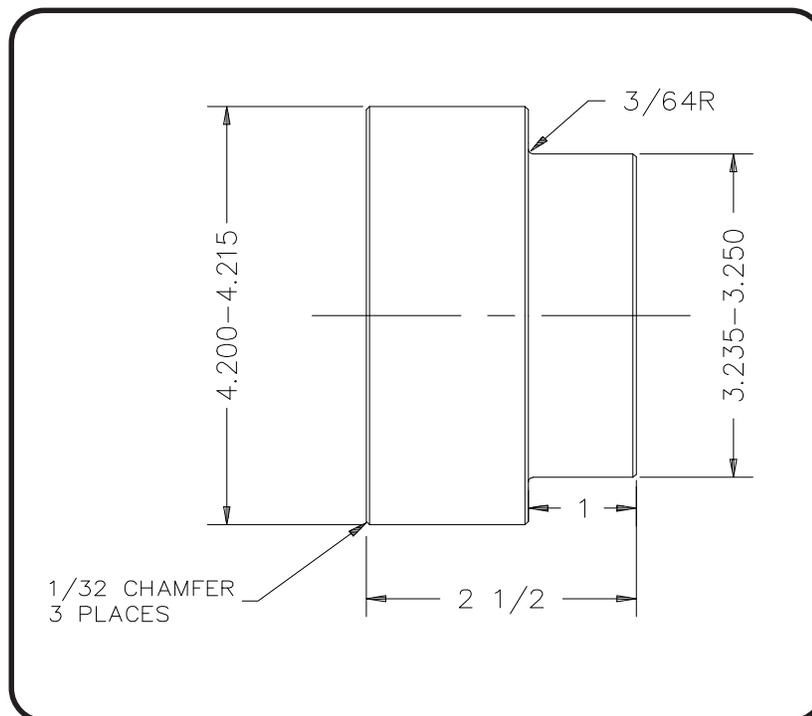
- Maintenance should be performed in a clean environment.
- Tools needed: hammer stand, chain vise, 2" (51mm) diameter brass rod, snap ring pliers, press, a drift pin and a small screwdriver.
- Clean the outside of the hammer. This will insure a good surface to clamp on.
- Place the hammer horizontally on a hammer stand and secure the hammer with a chain vise. Place the chain vise on the area of the case where the bit bearing is housed when working on the chuck end of the hammer. When working on the backhead end of the hammer, place the chain vise on the area of the case where the check valve housing is housed.

CAUTION

THE ACCEPTABLE CLAMPING AREAS START 5" (127MM) FROM EITHER CASE END, TO AN ADDITIONAL 3" (76MM) BEYOND THIS POINT. PLACING THE CHAIN VISE ON THE AREA OF THE CASE WHERE THE PISTON CYCLES CAN DISTORT THE CASE, RESTRICT PISTON MOVEMENT AND VOID THE WARRANTY.

- Unscrew and remove the backhead from the case. Remove the backhead o-ring from the backhead and thrust washer.
- Remove the check valve, the check valve spring and the check valve housing from the backhead end of the case.
- Remove the compression ring from the base of the check valve housing.
- Remove the feed tube retainer.

- Unscrew and remove the chuck, bit and the bit retaining rings from the case.
- Remove the thrust washer from the chuck.
- Remove the bit retaining rings o-ring from the bit retaining rings.
- Use the snap ring pliers to remove the retainer, then remove the washer and the four disc springs.
- Using a 2" (51mm) diameter brass rod, slide the piston against the feed tube assembly and push the feed tube assembly out the backhead end of the case.
- Slide the piston out the backhead end of the case.
- Removal of the bit bearing is not necessary for routine maintenance. If necessary, insert the bit bearing press plate into the backhead end of the case, with the small diameter toward the case bore. Using a 2" (51mm) diameter brass rod, slide the bit bearing press plate to the chuck end of the case until it rests against the bit bearing. Using a press, apply pressure to the 2" (51mm) diameter brass rod and force the bit bearing press plate and the bit bearing out of the chuck end of the case. Refer to figure 2-1 for bearing spacer dimensions.



*N6 Bearing Spacer/Press Plate
Figure 2-1*

- Disassembly of the feed tube assembly is not necessary for routine maintenance. If necessary, with the choke end of the feed tube against the work bench, apply downward pressure toward the work bench. This will cause the feed tube to protrude from the backhead end of the feed tube housing. Grasp the feed tube and slide it out of the feed tube housing. Slide the feed tube compression ring off the choke end of the feed tube. Place the feed tube collar toward the work bench. Using a drift pin, tap the choke from the feed tube press diameter. The choke will fall out of the collar end of the feed tube. Using a small screwdriver, pick the two feed tube o-rings from the feed tube housing.

INSPECTION

- All parts should be washed in a clean solvent before they are inspected and reassembled.

WARNING

USE CLEANING FLUIDS THAT ARE NONFLAMMABLE AND AVOID BREATHING THE FLUID VAPORS.

- Handle all parts carefully, hardened parts may chip if dropped on a hard surface.

BACKHEAD

- Inspect the threads for cracks and burrs.
- Remove all burrs on the thread with a fine file.
- Replace if necessary.

CHECK VALVE

- The check valve should be smooth and free from abrasions.
- Replace if necessary.
- Replace the check valve spring if it is worn or broken.

FEED TUBE ASSEMBLY

- Inspect the outside diameter for nicks, burrs and scoring.
- Inspect all makeup surfaces for indentations or nicks caused by wear.
- Remove all minor irregularities with emery cloth.
- Replace if necessary.

PISTON

- Inspect the striking face, inside and outside diameters for nicks, scoring and cracks.
- Polish the piston with emery cloth to remove all minor irregularities, cracked pistons should be replaced.
- Wash the piston thoroughly, inside and out, to remove all emery dust.

CASE

- Inspect the outside diameter for excessive wear or cracks. Inspect the internal case bore for scoring.
- Remove all minor irregularities with fine honing stones.
- Clearance between the piston and the case should not exceed 0.015" (0.38 mm).
- Select the larger end of the case to be the chuck end. Replace if the outside diameter is worn to 5" (127 mm) or less near the chuck end.

BIT BEARING

- Inspect the inside and outside for nicks and burrs.
- Remove all internal irregularities with a fine honing stone.
- Remove all external irregularities with an emery cloth.
- Clearance between the bit shank and bit bearing should not exceed 0.010" (0.25 mm).
- Replace if necessary.

BIT RETAINING RINGS

- Inspect for cracks or deformations.
- Remove all irregularities with a file or emery cloth.
- Replace if necessary.

CHUCK

- Inspect for cracks and burrs.
- For continued use, the outside diameter should be larger than the outside of the case or the same. Collar length should not be less than 2.125" (54 mm).

CAUTION

IF THE COLLAR LENGTH IS LESS THAN 2.125" (54 MM) AND THE BIT IS UNDER LOAD CONDITIONS, CONTACT BETWEEN THE SHOULDER OF THE BIT RETAINING RINGS AND THE BOTTOM OF THE BIT RETAINING RING AREA ON THE BIT, COULD CAUSE THE BIT TO FAIL IN THIS AREA.

- Torsional play in the splines should not exceed 0.125" (3.2 mm).
- Replace if necessary.

O-RINGS

- Inspect for damage such as cracks and deformations.
- Replace if necessary.

THRUST WASHERS

- Inspect for damage such as cracks.
- Replace if necessary.

GENERAL ASSEMBLY INSTRUCTIONS

- Assembly should be performed in a clean environment.
- All parts should be cleaned thoroughly and wiped dry before assembly.
- Oil all parts by hand using Rock Drill Oil to insure easy assembly.
- Coat all thread connections with a thread compound to allow joints to thread easily.

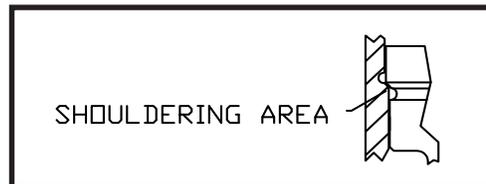
FEED TUBE ASSEMBLY

- Install the two feed tube o-rings in the two grooves located in the smallest inside diameter of the feed tube housing.
- Place the feed tube compression ring over the choke end of the feed tube, then slide it along the feed tube until it seats against the feed tube collar.
- Position the piston vertically on the work bench. Place the smallest outside diameter of the feed tube housing on the piston so that the bores will align. Insert the choke end of the feed tube into the feed tube housing. Slide the feed tube into the feed tube housing until the feed tube compression ring is seated against the feed tube housing shoulder. With the smaller diameter of the choke toward the collar end of the feed tube bore, slide the choke all the way to the pressing diameter. Using a long drift pin, tap the choke into the pressing diameter.

HAMMER ASSEMBLY

- Select the larger, outside diameter end of case to be the chuck end.
- Using the bit bearing press plate and a press, press the bit bearing into the chuck end of the case. The larger inside diameter of the bit bearing should be facing toward the chuck end of the case. Make sure the bit bearing is in contact with the shoulder of the case.
- Place the four disc springs into the chuck end, being sure they are stacked correctly. (See diagram page 13)
- Place the washer into the chuck end of the case.
- Using snap ring pliers, install the retainer into the chuck end of the case.
- Place the bit retaining rings o-ring around the bit retaining rings and place in the chuck end of the case.

- Install the thrust washer installed against the shoulder of the chuck threads. Thread the chuck into the case and hand tighten. Clearance between the case and chuck should be a minimum of 0.050" (1.3mm) gap. If the gap is less than 0.050" (1.3mm), a wear spacer must be installed between the bit bearing and the disc springs.
- Slide the piston in the backhead end of the case. Push the piston all the way to the chuck end. The piston should ride in the case very smoothly. Stand the case up in a vertical position, with the chuck end on the ground.
- Install the feed tube assembly into the backhead end of the case, be certain the feed tube shoulders properly in the case. Due to close tolerances, caution is advised when inserting the feed tube, it should not be forced into the case. Place the feed tube retainer into the feed tube housing, resting it onto the feed tube collar.



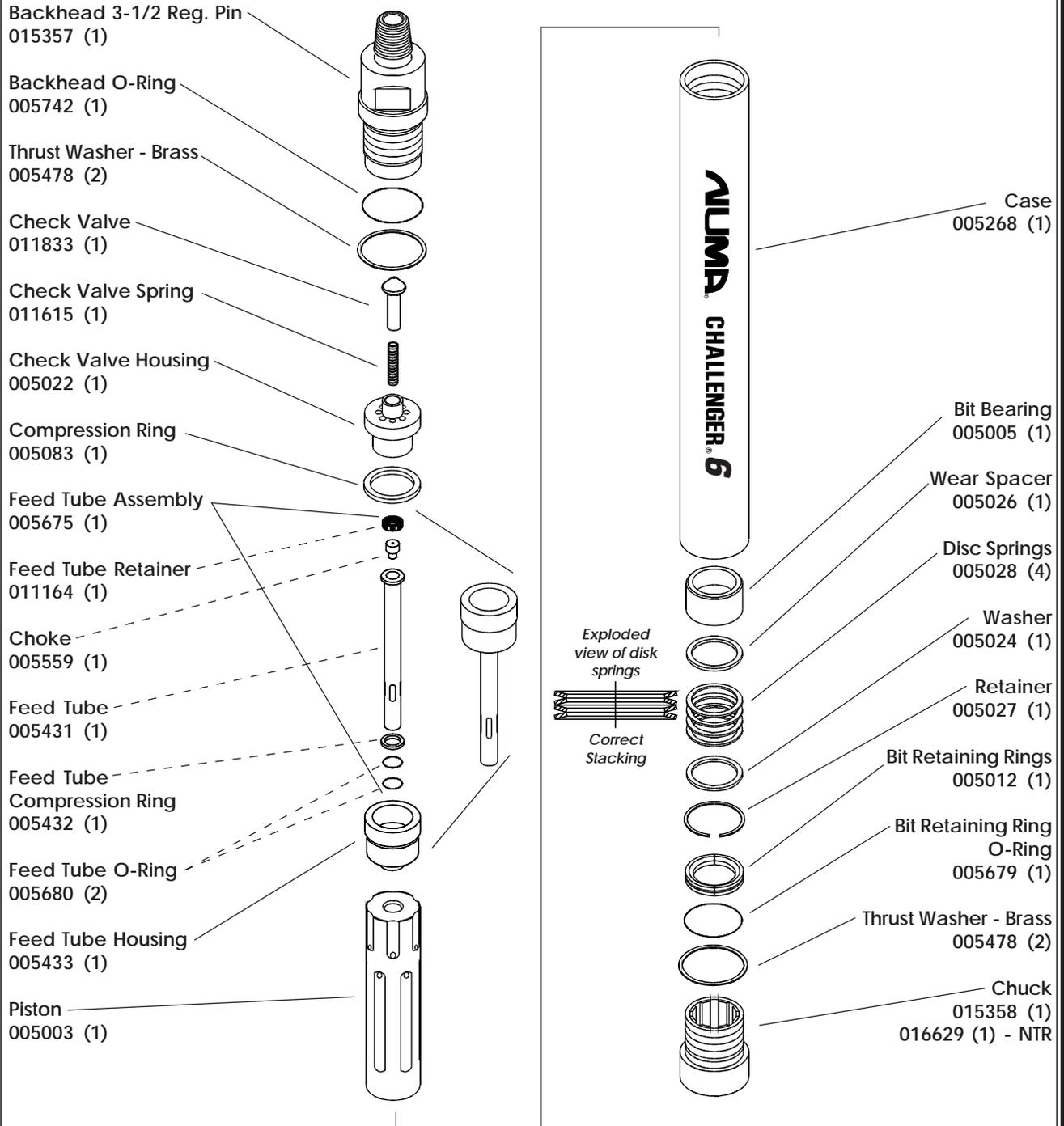
*Figure 2-2
Proper Feed Tube Shouldering in Wear Sleeve*

- Install the compression ring.
- Install the check valve housing into the case, pushing it all the way to the compression ring.
- Place the check valve spring into the check valve housing then insert the check valve into the check valve housing.
- Place the thrust washer against the backhead thread shoulder. Install the backhead o-ring into the groove on the backhead. Screw the backhead into the case and hand tighten.

CAUTION

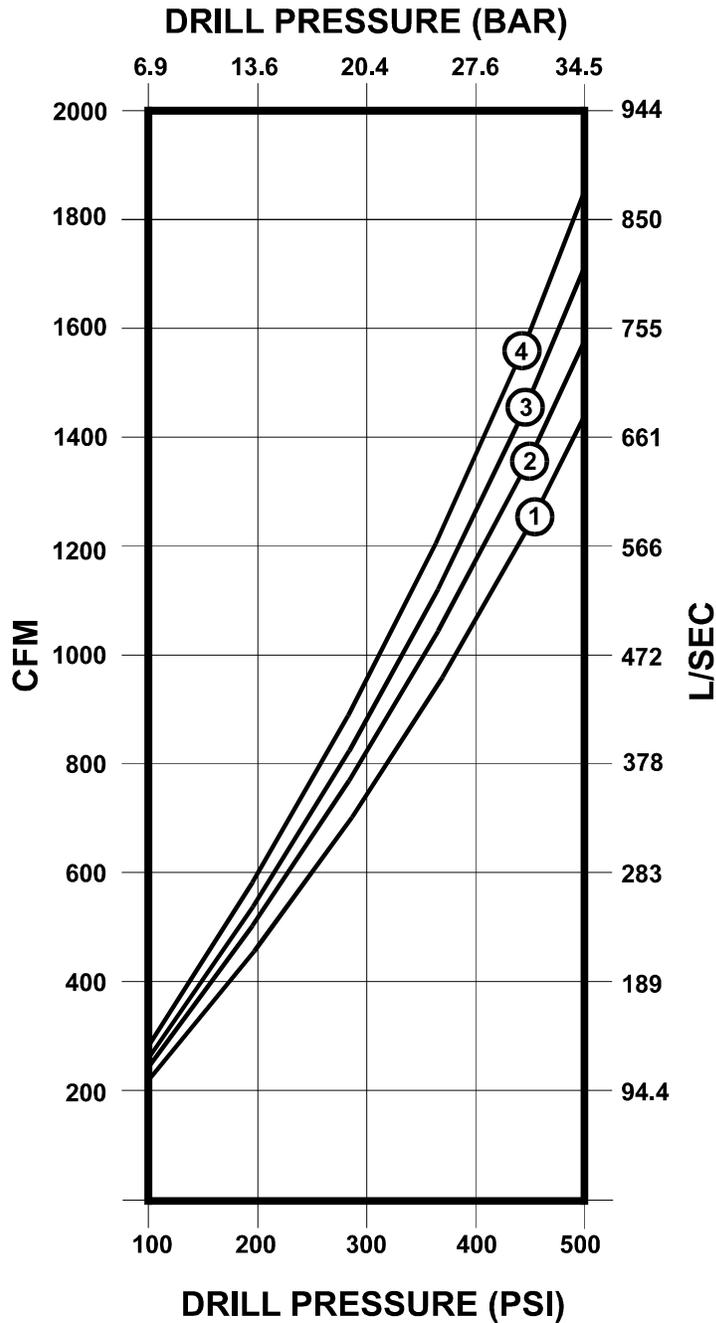
DUE TO THE CLOSE TOLERANCES BETWEEN THE CHALLENGER 6 INTERNAL PARTS AND THE CASE, NUMA CAN NOT ACCEPT RESPONSIBILITY FOR DAMAGE CAUSED BY WELDING ON THE CASE OD. WELDING ON THE CASE CAN CREATE DISTORTION, CAUSE PREMATURE FAILURE AND VOID THE WARRANTY. CONTACT NUMA FOR SPECIAL INSTRUCTIONS IF WELDING THE CASE BECOMES UNAVOIDABLE.

SECTION III PARTS IDENTIFICATION EXPLODED VIEW



HAMMER ASSEMBLY #015356 / NTR #016628
 Figure 3-1

SECTION IV AIR CONSUMPTION CHART CHALLENGER 6



- ① SOLID CHOKE ③ 3/16 (4.8mm) CHOKE
- ② 1/8 (3.2mm) CHOKE ④ 1/4 (6.4mm) CHOKE

SECTION V LUBRICATION

The Challenger 6 hammer requires a continuous supply of the correct type Rock Drill Oil or an adequate application of Numa Enviro Lube. The Challenger 6 hammer consumes at least two quarts (2 litres) of Rock Drill Oil per hour in order to maintain adequate lubrication. See table 5-1 for recommended Rock Drill Oil.

As an alternative to Rock Drill Oil, Numa Enviro Lube provides continuous protection for the Challenger 6 when 3 oz. (.09 litres) are used every 300' (92 m) or four hours of drilling, whichever occurs first. Numa Enviro Lube is utilized in 3-1/2" to 6" hammers only.

	Medium SAE 30	Heavy SAE 50
Shell	Air Tool Oil S2 A 150	Air Tool Oil S2 A 320
Texaco / Caltex	Rock Drill Lube 100	Rock Drill Lube 320
Chevron	Vistac 150	Vistac 320
Conoco	Conoco 150	Conoco 320
Numa Bio Blend	RDP 150	RDP 320

Table 5-1
Recommended Rock Drill Oil

CAUTION

ROCK DRILL OILS AND NUMA ENVIRO LUBE ARE THE ONLY ACCEPTABLE LUBRICANTS. SAE 50 ROCK DRILL OIL SHOULD BE USED IN AMBIENT TEMPERATURES OF 80° FAHRENHEIT (27° CELSIUS) OR HIGHER. CONTACT NUMA FOR ACCEPTANCE OF ALTERNATIVE ROCK DRILL LUBRICANTS.

CAUTION

THE CHALLENGER 6 HAMMER, AS WITH ANY MACHINE, REQUIRES CONTINUOUS LUBRICATION. THE FAILURE TO SUPPLY ADEQUATE LUBRICATION TO THE HAMMER CAN CAUSE PREMATURE FAILURE AND MAY VOID THE WARRANTY.

SECTION VI STORAGE

When storing a Challenger hammer, it is important to take the necessary steps in order to insure a smooth operation after restarting.

When the hole is completed and the hammer is to be inactive for several weeks or longer the following steps should be followed:

Each drill rod should be blown clear of all water. During this process, turn on the in line lubricator and blow until the rock drill oil can be seen from the bottom end of each drill rod. In addition, each rod (pin and box end) should be wiped clean and capped to prevent foreign contaminants from sticking to the connector ends.

SHORT TERM STORAGE

When the Challenger hammer will be stored for only a short period of time the following steps should be taken:

- Blow the hammer clear of all water.
- Pour 1 quart (1 liter) of Rock Drill Oil into the backhead.
- Turn the air on and cycle for 10 seconds. This will lubricate the internal parts.
- Cap the backhead and chuck end.
- Store the hammer horizontally in a dry environment.

LONG TERM STORAGE

When the Challenger hammer will be stored for only a long period of time the following steps should be taken:

- Blow the hammer clear of all water.
- If at all possible, the backhead and chuck should be broken loose on the drill rig, this is much easier than trying to do so in the shop.
- Disassemble the hammer.
- Inspect and wipe all the parts clean.

- Lubricate all the internal parts with Rock Drill Oil. See table 5-1 on page 15 for suitable Rock Drill Oils.
- Cap the backhead and chuck ends.
- Store the hammer horizontally in a dry environment.

RESTARTING

Before restarting the hammer after prolonged periods of inactivity, disassemble and inspect all internal hammer parts.

If any internal hammer parts have oxidized, use an emery cloth to polish each part. Wash each hammer part, wipe dry, relubricate with rock drill oil and reassemble the hammer.

CAUTION

FAILURE TO CHECK INTERNAL PARTS BEFORE RESTARTING THE HAMMER MAY CAUSE SERIOUS DAMAGE TO THE HAMMER.

SECTION VII BUTTON BIT MAINTENANCE

GENERAL

Numa button bits are designed for fast penetration and long life. Keeping the carbide buttons sharp has a direct effect on both the penetration and the tool life.

As the bit wears flat, spots develop on the carbide buttons. These flat spots increase stress on the buttons causing the bit to work harder, which may cause button failure. Bit sharpening can minimize these problems.

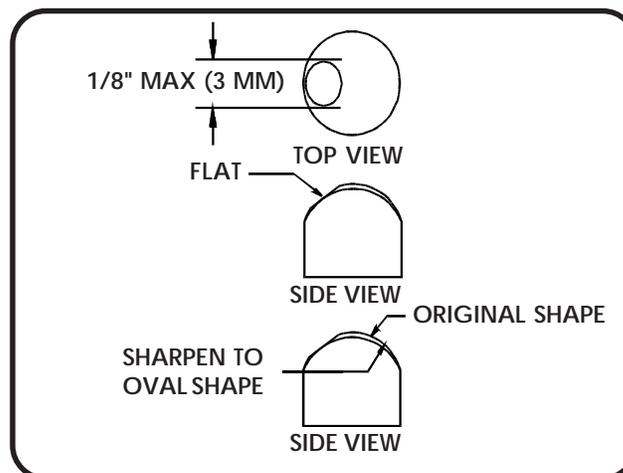
Gauge buttons will usually show the most wear and should be used to determine the frequency of bit sharpening. When the flats on the gauge buttons become a maximum of 1/8" (3 mm) wide it is time to resharpen. Refer to figure 7-1.

SHARPENING

The following tools are required to resharpen the bit:

- Hand grinder (20,000 r.p.m.)
- Silicon carbide wheel 1" (25 mm) diameter, 60 - 80 grit
- Bit stand
- Pencil

Place a mark on the center of the button flat. Grind the button to its original shape leaving the mark untouched. Refer to figure 7-1. It is important to leave the center of the flat untouched to insure concentricity.



Button Resharpening
Figure 7-1

SECTION VIII RECOMMENDED SPARES CHALLENGER 6

Product Description	Part Number	Class 1	Class 2
Backhead 3-1/2 Reg. Pin	015357	0	1
Backhead O-Ring	005742	2	4
Thrust Washer - Brass	005478	2	4
Check Valve	011833	1	2
Check Valve Spring	011615	1	2
Check Valve Housing	005022	0	1
Compression Ring	005083	1	2
Feed Tube Assembly	005675	1	2
Feed Tube Retainer	011164	1	2
Choke Blank	005559	1	2
Feed Tube	005431	1	2
Feed Tube Compression Ring	005432	1	2
Feed Tube O-Ring	005680	2	4
Feed Tube Housing	005433	0	1
Piston	005003	0	2
Case	005268	0	1
Bit Bearing	005005	0	1
Wear Spacer	005026	1	2
Disc Springs	005028	4	8
Washer	005024	1	2
Retainer	005027	1	2
Bit Retaining Rings	005012	1	2
Bit Retaining Ring O-Ring	005679	1	2
Chuck	015358	1	2
Choke Set	007113	1	2
Choke Blank - installed in hammer	005559	1	2
Choke 1/8"	007114	1	2
Choke 3/16"	007115	1	2
Choke 1/4"	007116	1	2
Alternate Parts			
Chuck NTR	016629	1	2

For Complete Hammer Assembly #015356 / NTR #016628

Table 8-1

NOTE

Class 1 Represents a user of a Challenger 6 hammer that has readily available spare parts.

Class 2 Represents a user of a Challenger 6 hammer that does not have readily available spare parts.

NOTES