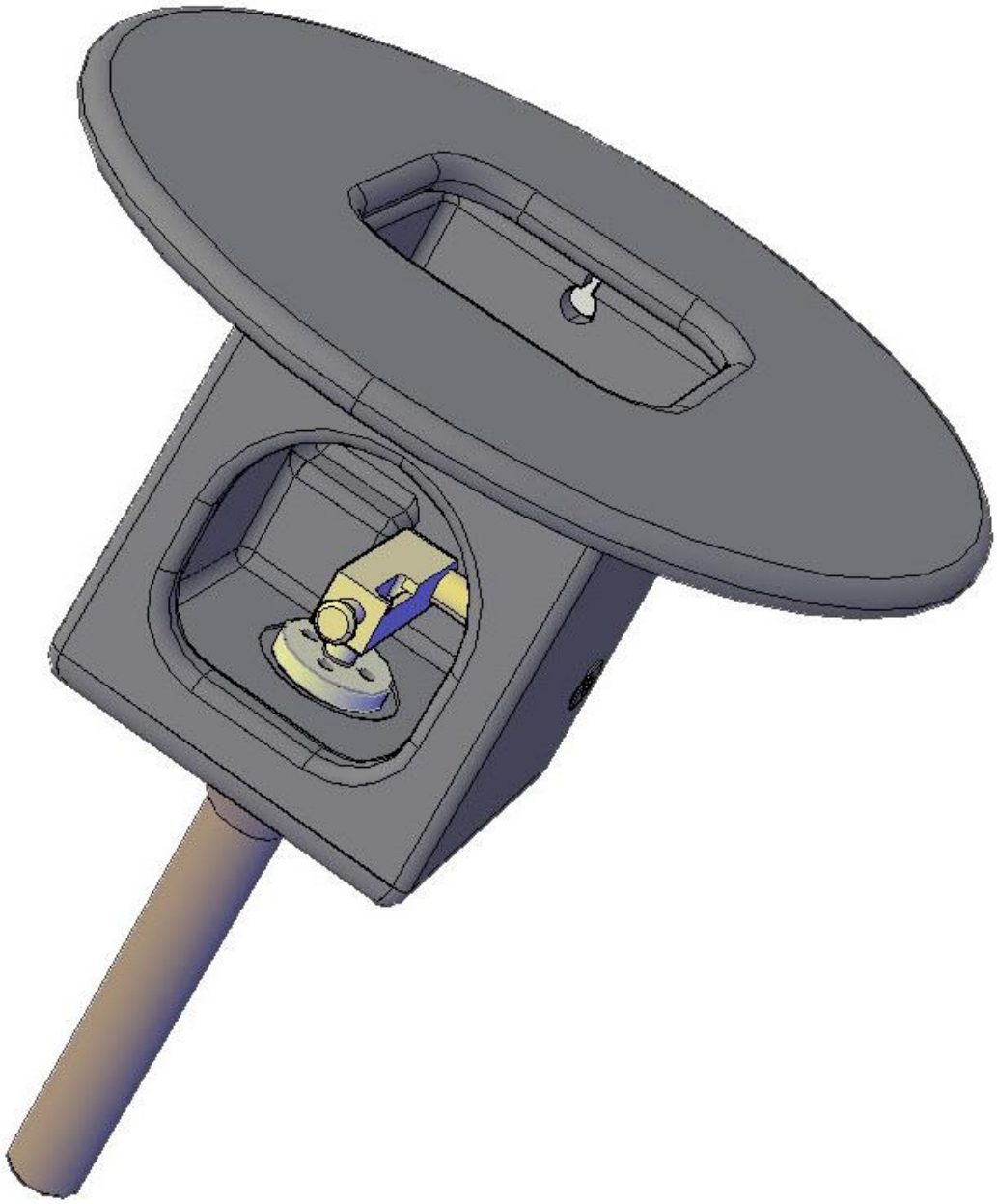
BOULDER BUSTER
USER MANUAL



FOREWORD

INTRODUCTION

Congratulations on purchasing your BOULDER BUSTER. To get the best and safest results out of your BOULDER BUSTER please read this User Manual carefully.

IMPORTANT NOTICE

No operator should be allowed to work with the Magnum Buster without first reading the official Magnum Buster User Manual and comprehending the important procedures, notices and warnings.

ADVANTAGES

The BOULDER BUSTER has a number of advantages over other methods of secondary rock breaking. Its advantages are:

- **Non-detonating (for use in confined spaces and close to other operations)**
- **Convenient**
- **Fast**
- **Cost effective**
- **Rugged**
- **Simple to use, maintain and repair**

CRITICAL WARNING

When using the Magnum Buster in the field, **NEVER** drill (or place any tool such as breakers, pry bars, loose drill steel etc) into pre-drilled holes - **EVER**. This action can initiate an unfired Magnum Buster Cartridge and may result in injury.

This is the **NUMBER ONE** safety declaration when working with the Magnum Buster, and has been an industry standard safety practice when working with explosives and power cartridges for decades.

This procedure relieves the operator from remembering whether an unfired cartridge, for any reason, remains in a pre-existing drill hole as the work progresses.

If there is any question regarding a live cartridge in a pre-existing drill hole it is always acceptable to utilize the Magnum Buster retrieval Tool to remove any know cartridges from the drill hole.

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IMPORTANT OPERATIONAL NOTICE

WHEN OPERATING *BOULDER BUSTER* ALWAYS INSERT THE END OF BARREL ENTIRELY INSIDE DRILL HOLE.

FOR ROCK CONDITIONS THAT TEND TO ABSORB SHOCK WAVES KEEP THE TOP CARTRIDGE IN THE DRILL HOLE WITHIN 6 TO 12 INCHES OF THE BOTTOM END OF THE BARREL.

WARNING

NEVER PUSH/TAMP A CARTRIDGE INTO THE HOLE. FORCEFULLY COMPRESSING THE TOP CAP COULD CAUSE THE CARTRIDGE TO FIRE AND RESULT IN INJURY.

WARNING

IN THE EVENT OF A MISSFIRE WAIT 5 MINUTES BEFORE APPROACHING THE DRILL HOLE.

NOTE

CAST ITEMS ARE MADE OF A SPHERICAL GRAPHITE (MALLIABLE) CAST IRON WHICH HAS THE SAME MECHANICAL PROPERTIES OF MILD STEEL

SAFETY PRECAUTIONS AND PROCEDURES

WARNING

NEVER CARRY OR TRANSPORT THE BOULDER BUSTER WITH AN INITIATION CARTRIDGE SEATED IN THE BREECH PLUG. SHARP SHOCKS MAY ACTIVATE THE CARTRIDGE. ACTIVATION DURING TRANSPORTATION MAY CAUSE INJURY OR DAMAGE.

WARNING

ONLY PROPERLY TRAINED PERSONNEL SHOULD BE ALLOWED TO OPERATE THE BOULDER BUSTER.

WARNING

EAR PROTECTION, SAFETY GLASSES, FACE PROTECTION, SAFETY SHOES AND HARD HATS, WHICH MEET OR EXCEED THE STANDARDS OF NATIONAL AUTHORITIES, MUST BE WORN BY ALL PERSONS IN THE AREA IMMEDIATELY SURROUNDING THE OPERATING LOCATION.

WARNING

DO NOT OPERATE THE BOULDER BUSTER WITHOUT THE SAFETY MAT OVER THE TOOL UNLESS THE OPERATOR CAN BE ASSURED THAT SOME OTHER NATURAL OBSTRUCTION IS BETWEEN THE OPERATOR AND THE BOULDER BUSTER THAT WILL CREATE AN EQUAL OR SUPERIOR SAFETY ZONE.

WARNING

DO NOT INSERT THE INITIATION CARTRIDGE INTO THE BREECH BEFORE THE BOULDER BUSTER HAS BEEN PLACED IN THE HOLE TO BE FIRED.

WARNING

DO NOT DRILL INTO A HOLE WHICH HAS PREVIOUSLY BEEN FIRED. BOOSTER CARTRIDGES MAY HAVE BEEN PLACED IN THE BOTTOM (BACK) OF THE HOLE AND NOT INITIATED. THESE CARTRIDGES WILL BE INITIATED BY THE DRILL AND SUCH INITIATION COULD CAUSE SERIOUS INJURY.

WARNING

NEVER FIRE THE BOULDER BUSTER WITH AN OBSTRUCTION IN THE IMPULSE STEM. CHECK THE IMPULSE STEM IF YOU EXPERIENCED AN “0FF SOUND” OR UNUSUAL OCCURRENCE DURING FIRING.

WARNING

WHILE FIRING IS IN PROGRESS DO NOT ALLOW ANYBODY EXCEPT THE OPERATOR WITHIN 50 FEET (15 METER) OF THE BOULDER BUSTER.

WARNING

NO UNAUTHORIZED MODIFICATION OR MACHINING OF COMPONENTS MAY BE MADE. USE ONLY COMPONENTS SUPPLIED BY THE MANUFACTURER WHEN PARTS ARE REPLACED. UNAUTHORIZED MODIFICATIONS OR PIRATE PARTS MAY RESULT IN SERIOUS INJURY FOR WHICH THE MANUFACTURER CANNOT BE HELD RESPONSIBLE.

WARNING

NEVER REPAIR A FIRING MECHANISM ASSEMBLY. ALWAYS REPLACE BROKEN FIRING HAMMER ASSEMBLY OR BREECH PLUG WITH NEW "ORIGINAL MANUFACTURER" PARTS SUPPLIED THROUGH AUTHORIZED DEALER.

WARNING

USE ONLY BOULDER BUSTER "OEM" CERTIFIED CARTRIDGES SUPPLIED THROUGH AN AUTHORIZED DEALER.

WARNING

REPLACE THE MAT IF IT IS WORN.

WARNING

IT IS VERY IMPORTANT FOR THE OPERATOR TO ADHER TO THE DRILL HOLE DIAMETER SPECIFICATIONS PROVIDED IN THE TABLE ABOVE. USING THE MAGNUM BUSTER™ IN DRILL HOLES LARGER THAN SPECIFIED WILL LIKELY REDUCE BREAKAGE PERFORMANCE AND ALSO POTENTIALLY RESULT IN AN INCREASE IN MISFIRES.

OPERATORS NOTE

IT IS VERY IMPORTANT TO ASSURE THAT THE TOOL BARREL IS PLACED IN THE HOLE SUCH THAT A PORTION OF THE BARREL IS SEATED INTO THE WATER PHASE, THUS ALLOWING A NATURAL PUSH OF A PORTION OF THE WATER INTO THE GAS INJECTION TUBE. IF THERE IS ANY QUESTION THAT SOME WATER WAS PUSHED FROM THE HOLE DURING TOOL INSERTION, POTENTIALLY INTRODUCING AN AIR POCKET, THEN THE OPERATOR SHOULD ADD SUFFICIENT ADDITIONAL WATER TO ASSURE THE BARREL SEATS WITHIN THE WATER PHASE. THIS ASSURES THAT AN OPTIMUM AMOUNT OF SHOCK ENERGY FROM THE INITIATION CARTRIDGE IS TRANSMITTED INTO THE WATER PHASE AND NOT ABSORBED IN COMPRESSING AN AIR POCKET. ALONG WITH WEIGHT SEALING THE DRILL HOLE THIS WILL BETTER ASSURE CONSISTENT CARTRIDGE IGNITION SUCCESS. OTHERWISE THERE IS A CHANCE THAT AN AIR POCKET WILL ABSORB TOO MUCH OF THE SHOCK ENERGY BEFORE IT REACHES THE CARTRIDGES IN THE DRILL HOLE.

DEFECTIVE PARTS GUARANTEE

McCarthy Industries or its' Authorized Distributors guarantees the BOULDER BUSTER and any of its components against defective material or workmanship for a period of 3 months from the date of purchase. The manufacturer undertakes, free of charge, at its discretion to repair or replace the defective item, provided that the item is delivered to, and collected from, a duly authorized distributor. This guarantee shall not cover items subject to normal wear and tear or to items damaged in application of the BOULDER BUSTER outside of the guideline/specifications stipulated in this Users Manual.

While McCarthy Industries has exercised great care in the manufacture of the BOULDER BUSTER so as to ensure that the product conforms to the highest standard of quality and safety, the BOULDER BUSTER is sold only subject to this guarantee and on condition that the manufacturer or it's Authorized Distributor shall not be responsible and disclaims liability for any loss of, or injury to, person or property resulting or arising from the use or operation of the BOULDER BUSTER or any cause whatsoever.

PRODUCT USE RECOMMENDATION AND DISCLAIMER

The product line consists of the BOULDER BUSTER with various sizes of Gas Ignition Barrels to be used in the following drill hole sizes:

Small Hole Diameter	***1 to 1 1/16 inch hole (25 to 27 mm hole)***
Large Hole Diameter	***1 7/16 to 1 ½ inch hole (36 to 38 mm hole)***

The BOULDER BUSTER is a tool that imparts tremendous energy and as such become subject to fatigue forces no metal components can withstand indefinitely. As such, the following use profile is recommended:

The BOULDER BUSTER was designed to be used in boulders and rock formations of any size requiring only a single or multiple cartridges in a single drill hole. Although the tool was designed to be extremely robust and provide a failsafe service life for many years. Continuous use of the tool with multiple booster cartridges will place additional pressure related stress on the principle barrel and firing mechanism components. This could limit the service life of these components, thus requiring their replacement in order to bring the tool back to its design capabilities.

BOULDER BUSTER ASSEMBLY

CHAPTER 1 GENERAL INFORMATION AND TECHNICAL DATA

INTRODUCTION Refer to Figure 1-1.

The BOULDER BUSTER is a compact and portable piece of equipment which is extremely useful in the splitting and breaking of rocks, boulders and concrete into smaller bits for easier removal or further processing.

BOULDER BUSTER APPLICATIONS

The BOULDER BUSTER can be effectively and efficiently used in the following applications:

- **Rock/Boulder cleaning operations on construction sites.**
- **Secondary blasting in mining and quarrying operations.**
- **Road building.**
- **Trenches for the laying of cables and pipes.**
- **Removal of blockages in jaw crushers and tube mills.**
- **Breaking of large rocks on grizzlies in mine ore passes.**
- **Loose boulders in tunnels or stopes.**
- **Swimming pool excavation.**
- **Farming operations.**

PHYSICAL DESCRIPTION

Refer to Figure 1-1 and Parts Photo Gallery Below

The BOULDER BUSTER is a robust, safe, easy to operate rock breaking tool. It consists of the following major components:

- **BOULDER BUSTER**
- **Weight Disk**
- **Lanyard Assembly**
- **Safety Mat**
- **Cartridge Injection Tool**

If, on receipt, your new BOULDER BUSTER is damaged or unserviceable in any way please retain the packaging and all delivery information and return the BOULDER BUSTER.

Lanyard Assembly

The Lanyard Assembly is a 25 ft (7.7 m) rope with an attached Chain and Chain Ring.

The Chain Ring fits into the Head Mechanism and overlaps onto the front knob of the Firing Hammer and fires the Firing Primer when pulled sharply out.

The Lanyard Line is looped or fitted to the BOULDER BUSTER in any way that prevents the released Lanyard from recoiling and hitting the Operator but still permits unencumbered initiation of the Firing Primer.

Safety Mat and Weight Disc

The Mat is a heavy Kevlar ballistic mat which is place over BOULDER BUSTER. It prevents (catches) chips of debris flying off the rock. The Weight Disc is provided to give the BOULDER BUSTER additional hold down force onto the rock or material to be broken. The Weight Disk also provides a level platform to add additional weight as desired.

Carrying Case

The fiberglass box is specially designed to house the BOULDER BUSTER and its support equipment.

Debris Removal Tool

The debris and initiation cartridge removal tool is used to dislodge debris that may become lodged in the gas channel of the Ignition Barrel and also to remove the Initiation Cartridge should it become stuck in the breach plug.

Cartridge Removal Tool

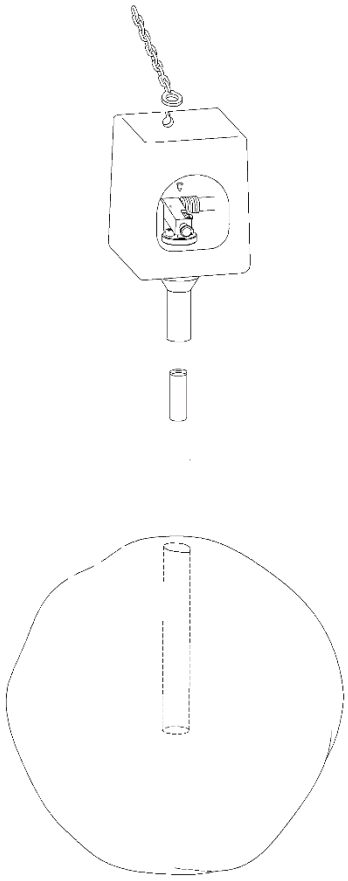
The main power cartridge removal tool is used to reach into the drill hole and grab onto a cartridge body (either intact, fired or misfired). This tool is made available as an accessory in order to assure the operator has a physical ability to remove unwanted cartridge from the drill hole at any time for any reason.

BOULDER BUSTER Operating Assembly

The BOULDER BUSTER is made from high quality special steels and consists of the following parts:

- **Head Assembly.**
- **Firing Mechanism Assembly.**
- **Gas Ignition Barrel.**

The Head Assembly provides a chamber for the discharge of the Firing Primer and the Gas Ignition Barrel channels the discharge from the Firing Primer down into the BOULDER BUSTER cartridge in the drill hole. The BOULDER BUSTER cartridge fires and discharges its energy into the hole in the rock.



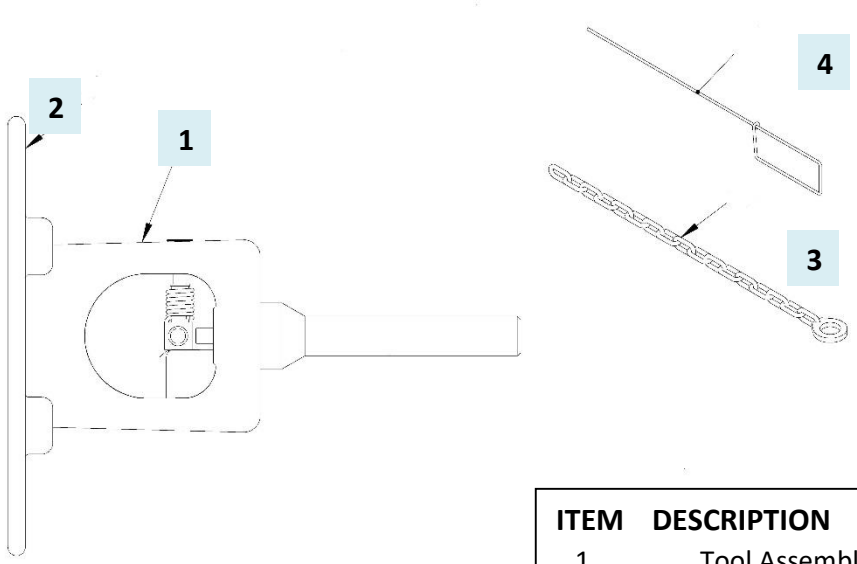
PHYSICAL CHARACTERISTICS

Mass

BOULDER BUSTER in box	67 lbs	(30.4 kg)
Tool without Weight Disk	62 lbs	(28.1 kg)
Weight Disc	33 lbs	(15.0 kg)
Mat	3 lbs	(1.4 kg)
Cartridges No 10 (Box of 25)		
Total	27.3 oz	(775 gm)
Net explosives	8.8 oz	(250 gm)
Cartridges No 20 (Box of 25)		
Total	34.4 oz	(975 gm)
Net explosives	13.2 oz	(375 gm)
Cartridges No 30 (Box of 25)		
Total	51.1 oz	(1450 gm)
Net explosives	26.5 oz	(750 gm)

Dimensions

BOULDER BUSTER box	11 in x 12 in x 26 in 280 mm x 305 mm x 660 mm



ITEM	DESCRIPTION
1	Tool Assembly
2	Auxiliary Weight Disk
3	Chain Assembly
4	Cartridge Ejection

Figure 1-1 BOULDER BUSTER Assembly and Contents

Chapter 2 Operating Instructions

INTRODUCTION

The BOULDER BUSTER requires very little preparation for use. A BOULDER BUSTER can be operational in less than five minutes. Follow these instructions for rapid setting up and efficient and safe use of your BOULDER BUSTER. You will need one person to setup the BOULDER BUSTER.

OPERATING PROCEDURES FOR THE BOULDER BUSTER

The following operating procedures for the BOULDER BUSTER have been designed to make the operation of your BOULDER BUSTER safe, efficient and economical. Only properly trained and certified persons should be permitted to operate the BOULDER BUSTER in any application.

WARNING

USE ONLY OEM BOULDER BUSTER CARTRIDGES.

WARNING

EAR PROTECTION, SAFETY GLASSES, FACE PROTECTION, SAFETY SHOES AND HARD HATS, WHICH MEET OR EXCEED THE STANDARDS OF NATIONAL AUTHORITIES, MUST BE WORN BY ALL PERSONS IN THE AREA IMMEDIATELY SURROUNDING THE OPERATING LOCATION.

WARNING

DO NOT INSERT INITIATION CARTRIDGE INTO THE BREECH BEFORE THE BOULDER BUSTER HAS BEEN PLACED IN THE HOLE TO BE FIRED.

WARNING

DO NOT DRILL INTO A HOLE WHICH HAS PREVIOUSLY BEEN FIRED. BOOSTER CARTRIDGES MAY HAVE BEEN PLACED IN THE BOTTOM (BACK) OF THE HOLE AND NOT DETONATED. THESE CARTRIDGES WILL BE DETONATED BY THE DRILL AND SUCH DETONATION COULD CAUSE SERIOUS INJURY.

WARNING

NEVER FIRE THE BOULDER BUSTER WITH AN OBSTRUCTION IN THE IGNITION STEM. CHECK THE IMPULSE STEM IF YOU EXPERIENCED AN “OFF SOUND” OR UNUSUAL OCCURRENCE DURING FIRING.

WARNING

WHILE FIRING IS IN PROGRESS DO NOT ALLOW ANYBODY EXCEPT THE OPERATOR WITHIN 50 FEET (15 METER) OF THE BOULDER BUSTER.

Evaluation of the Worksite

Careful evaluation of the site is important for the successful operation of the BOULDER BUSTER.

For optimum results with exposed boulders that are approximately 10 CY or Less:

- Determine overall shape of boulder by viewing it from several directions.
- Direct the drill hole from the top down toward center of the mass. .
- Drill hole to a depth (level) of desired rock removal. This would typically be ½ to ¾ of the total dimension of boulder.

For best results with rock outcroppings or partially buried larger boulders:

- Drill down hole a nominal 3 feet back from and parallel to an exposed vertical face.
- Drill hole to a depth elevation that will produce desired rock removal.
- Never position operator in front of face to be loosened. Stand to side or behind.

When working in confined spaces such as trenching applications:

- More energy will be needed to loosen material when only one free face is available.
- Drill hole location should ***INITIALLY*** be in the order 1.5 ft behind open face.
- Always remove broken material to provide relief prior to drilling next hole.

These guidelines are for the most effective use of the BOULDER BUSTER. The BOULDER BUSTER can be used with success on a variety of projects and under a variety of working condition.

Setup Checks

The following checks must be carried out before operating the BOULDER BUSTER:

- Check that the bolts securing the Breach Plug to the Ignition Barrel are tight. If the bolts are loosening after every shot then secure them with a high strength lock tight paste.
- Check that the Lanyard is complete and undamaged.
- Check that the Chain Ring connector on the Lanyard is undamaged.
- Check that the BOULDER BUSTER is complete and clean. Check especially for:

  Dirt or obstructions in the Firing Mechanism.

  Check that the Gas Ignition Barrel is free of debris particles.

  Free movement of the Hammer Assembly against the spring tension when lifted upwards.

Operating the BOULDER BUSTER

Refer to Figures 2-2 thru 2 -5

Operate the BOULDER BUSTER as follows:

1. Cordon off the work area. Prevent all members of the public from approaching within 15 meters of the BOULDER BUSTER site.

2. Drill a hole into the center of the rock to a depth of ½ to ¾ of the rock. The hole must be at least 16 in (400 mm) deep. Drill steel diameters depend on the Impulse Barrel fitted on your BOULDER BUSTER Sleeve /Stem Assembly and drill steel diameters are as follows:

IGNITION BARREL DIAMETER in (mm)	DRILL HOLE DIAMETER in (mm)
1 in (25mm)	1 to 1 1/16 in (25 to 27 mm)
1 ½ in (38 mm)	1 7/16 to 1 ½ in (36 to 38 mm)

3. Fill the hole with water or (Gel if the rock will not hold water alone).

4. Check that the Gas Ignition Barrel is clear.

5. Place BOULDER BUSTER Cartridges in the drill hole as necessary. Wings are available for field fitment to the cartridges in order to allow optimal placement of the cartridges within the drill hole. Cartridges will float so if it is desired to have the first cartridge close to the barrel no wing is necessary. The wings will be necessary to place and the cartridges deeper in the drill hole.

6. Insert BOULDER BUSTER slowly into the drilled hole and making sure the barrel is within the hole/water interface***. ALWAYS PLACE IGNITION BARREL SO IT IS COMPLETELY EMERSED IN WATER INSIDE DRILL HOLE. THUS ASSURING SUFFICIENT WATER PUSHES UP INTO THE SHOCK TUBE OF THE BARREL***.

7. Attach a Chain and Shackle (customer supplied - if required) to BOULDER BUSTER and the other end to a strong support if there is any concern that the tool may require retrieval from a difficult spot.

8. **MAKE SURE THE HAMMER ASSEMBLY IS MOVED FROM POSITION 1 TO THE SAFE HAMMER POSITION 2 (Figure 2-2) ALONG SIDE THE BREECH PLUG – THIS IS THE PRE-FIRING POSITION.**

9. **INSERT THE FIRING PRIMER INTO THE FIRING PRIMER BREECH.**

10. Insert the Chain Ring Connector ***THROUGH*** the slot **(Figure 2-3)** in the Head Assembly and place the Connector Ring onto the top knob of the Hammer Assembly **(Figure 2-4).** See **(Figure 2-5)** for correct insertion of Chain Ring into Head Assembly slot. Chain insertion must be from side position. Insertion from top position will not allow chain to enter slot.

11. Place Weight Disc on top of Head to provide necessary hold down weight and (tool to drill hole) interface sealing. Add additional weight on top of Disc as necessary to optimize breakage results.

12. Drape the Safety Mat over the Entire assembly.

13. Move to a firing position at least 21 feet (7 meters) from the BOULDER BUSTER.

14. Pull the Lanyard with a sharp, jerking action. **HAMMER ASSEMBLY PULLS UP FROM POSITION 2 AND RELEASES FROM THE CONNECTOR RING - SPRINGING FORWARD TO POSITION 1 IMPACTING THE INITIATION CARTRIDGE IN ITS BREECH PLUG AND FIRING.**

15. The shock wave generated by the Initiation Cartridge **FIRES** the BOULDER BUSTER Cartridges.

NOTE ON CARTRIDGE USAGE:

It is not a problem to use multiple cartridges in a hole. A special wing is available to be used to place and hold the cartridges within the drill hole at any position. The cartridges float so if the first cartridge is desired close to the tool barrel than no wing is necessary. The number of cartridges should, however, be additive according to the relative rock size, nature of insitu containment and/or strength of the rock. There is no hard rule, but as a guide we generally recommend a **maximum of 3 cartridges** on the typical large and difficult rock. In special situations it is also acceptable to use more cartridges if the uniqueness of the project warrants. Should the user encounter unique work site circumstances the manufacturer is available for consultation.

NOTE ON WEIGHT DISK:

The use of the auxiliary weight disk is intended to provide additional hold down force in order to better seal the hole and in so doing enhance the breakage efficiency. It is also acceptable to place additional weight (broken rocks etc.) on the disk to provide even more sealing effect and enhanced productivity (as a judgment call by the operator). However, we recognize that users will also encounter rock geometries (limited spaceial orientation) that will not allow the tool to be placed on or around the rock such that the disk will actually stay on the tool. In these conditions it is acceptable to leave the disk off but the operator my find somewhat less overall productivity and/or with a greater tendency for energy to be spent launching the tool from the hole. If this develops it is acceptable for the operator to improvise hold down force by utilizing a variety of field determined methods that will place weight on the tool in order to enhance productivity.

NOTE ON SAFETY MAT:

Do not operate the BOULDER BUSTER without the safety mat over the tool unless the operator can be assured that some other natural obstruction is between the operator and the BOULDER BUSTER that will create and equal or superior safety zone. The purpose of the safety mat is to catch any arrant rock pieces that might spall off of the rock while the operator is in direct line of sight of the BOULDER BUSTER. However, the operator has the option to use any method that will provide an equal or safer work environment beyond the safety mat provided with the tool.

NOTE ON DRILLING:

Drilling is a special case with regard to misfires. It has always been standard practice in the industry to ***never*** drill in to an existing drill hole under any conditions. This basic safety rule is stated in this user manual in a number of places and in any regulatory document that deals with this issue. BOULDER BUSTER cartridges, like ammunition, do not self-ignite but if drilled onto there is a probability that they will fire before the case breaks up and wets the propellant. If there is any question regarding any live cartridge remaining in an open drill hole, and for specific reasons the hole has been otherwise rendered useless (typically by not holding water) it is standard practice to drill another hole (a safe distance) to the side of the first drill hole and then break the rock from this new drill hole. The unfired cartridge can then be retrieved for inspection once the mass is broken. One fail safe action that operators can employ when drilling a new hole nearby is to put a fabricated metal plug with a plate and handle that fits several inches into the drill hole so there would never be any chance of the drill stem and bit dancing its way into the previous hole by accident. Of course the operator would still need to drill at a slight angle away from the bottom of the existing hole to assure that the old hole is not intersected.

In all cases, retrieval of the cartridge (with the Boulder Buster Retrieval Tool) from the hole would be the best and safest practice.

OPERATORS NOTE

IT IS VERY IMPORTANT FOR THE OPERATOR TO ADHER TO THE DRILL HOLE DIAMETER SPECIFICATIONS PROVIDED IN THE TABLE ABOVE. USING THE BOULDER BUSTER IN DRILL HOLES LARGER THAN SPECIFIED WILL LIKELY REDUCE BREAKAGE PERFORMANCE AND ALSO POTENTIALLY RESULT IN AN INCREASE IN MISFIRES.

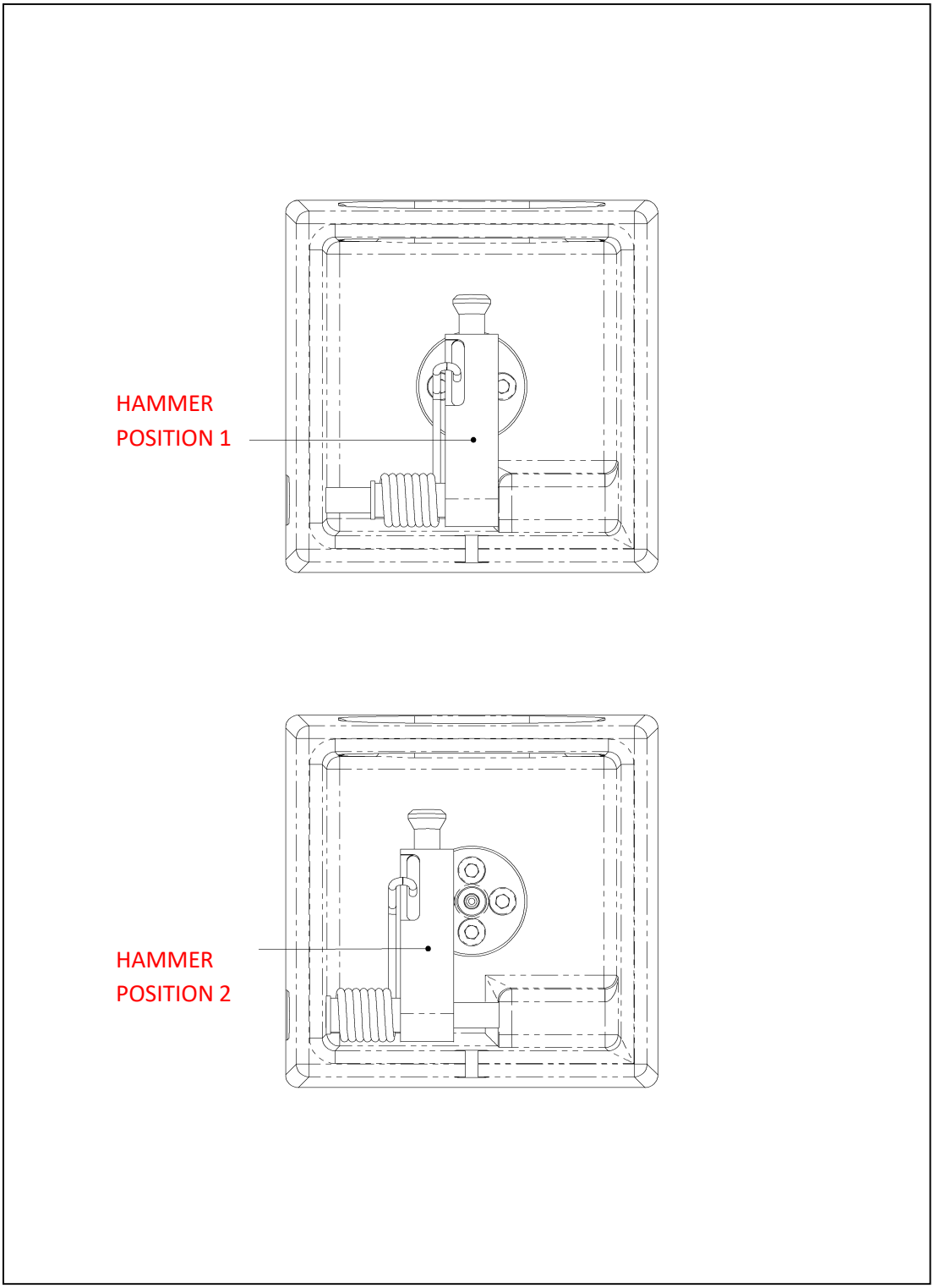


Figure 2-2 Hammer Assembly Operating Positions

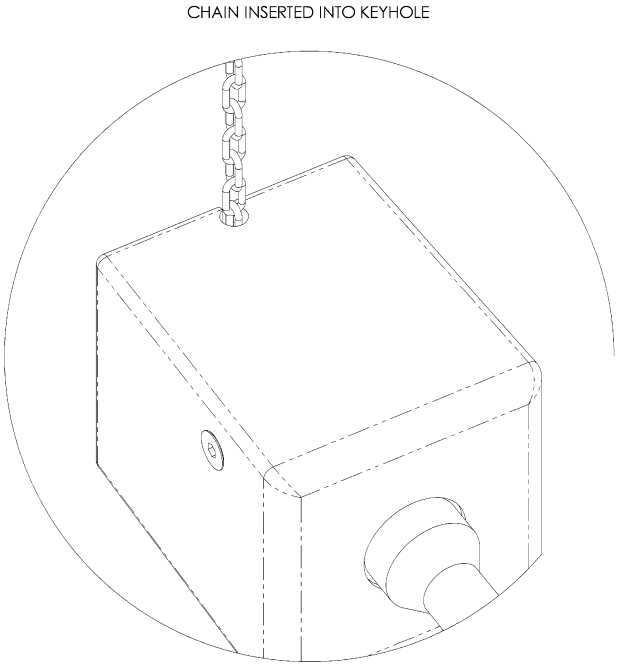


Figure 2-3 Chain Ring Inserted Through Head

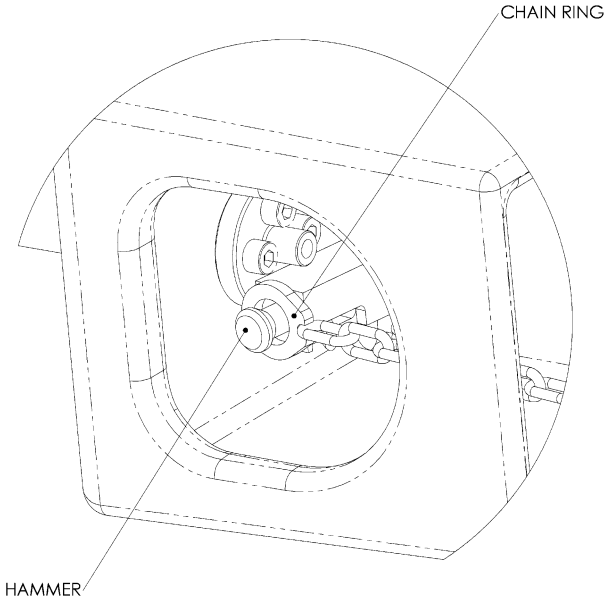


Figure 2-4 Chain Ring Connected to Hammer Assembly

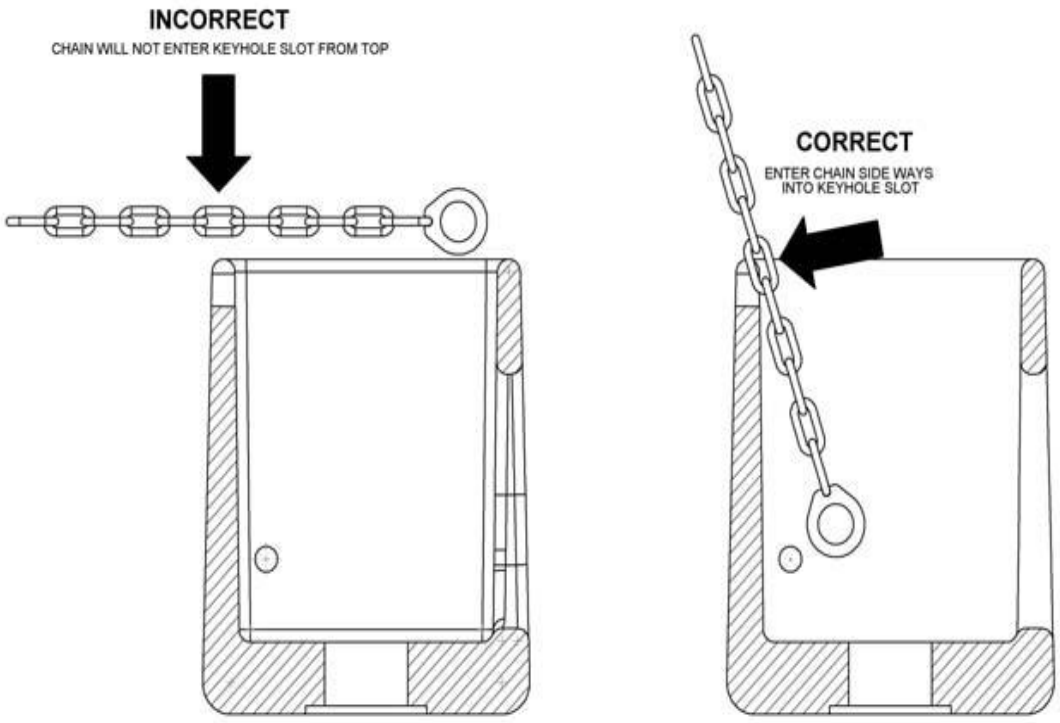


Figure 2-5 Correct Chain Ring Placement

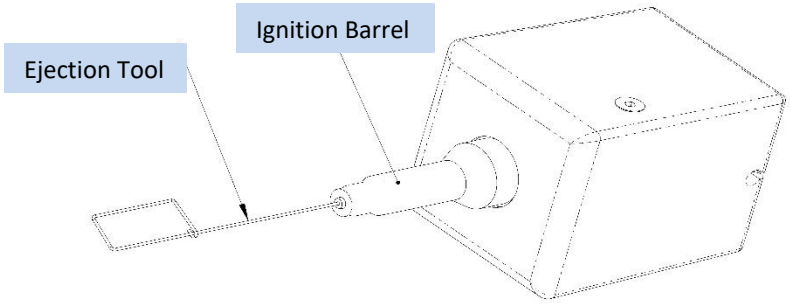


Figure 2-6 Use of Cartridge Ejection Tool

NOTE ON MISFIRES:

It is important to note that the BOULDER BUSTER cartridges will not self-ignite and are not unstable when sitting in the hole until a shock wave is transmitted thus causing them to fire. Therefore, a misfire does not transform a cartridge into becoming uniquely more dangerous than one right out of the box. So initiating additional cartridges in the same hole is an acceptable procedure – it becomes an operational call.

SEE CHAPTER 4 FOR A MORE COMPLETE GUIDE TO TROUBLESHOOTING THE BOULDER BUSTER.

IN THE EVENT OF A MISFIRE:

1. Remove the Auxiliary Weight Disc from the BOULDER BUSTER.
2. Move the Hammer to the side of the Breech Plug and inspect the Initiation Cartridge condition. Do not pull the hammer up into a position that it could slip and inadvertently initiate the Initiation Cartridge.
3. If the Initiation Cartridge did not fire replace it with another and repeat the firing process.
4. If the Initiation Cartridge did fire but not the BOULDER BUSTER Cartridge, inspect the Gas injection Stem for obstructions. If the Gas Injection Stem contains obstructions remove with the poker as necessary **(Figure 2-6)**.
5. If there is a spent Initiation Cartridge still stuck in the Breach Plug and the Poker will not remove it then use the Cartridge Extraction Tool for removal.
6. Remove the Cartridge from the drill hole and Inspect the Cartridge for damage. If the Cartridge is damaged, or altered in any way, destroy the old Cartridge and replace it in the drill hole with a new Cartridge.
7. Clean the BOULDER BUSTER by wiping off excess sand or dipping it in a bucket of water and cleaning with brush.
8. The BOULDER BUSTER is now ready for the next firing.
9. Never re-drill in an existing drill hole and always remove any suspected unfired cartridges in existing drill holes before leaving the worksite

OPERATORS NOTE

IT IS VERY IMPORTANT TO ASSURE THAT THE TOOL BARREL IS PLACED IN THE HOLE SUCH THAT A PORTION OF THE BARREL IS SEATED INTO THE WATER PHASE, THUS ALLOWING A NATURAL PUSH OF A PORTION OF THE WATER INTO THE GAS INJECTION TUBE. IF THERE IS ANY QUESTION THAT SOME WATER WAS PUSHED FROM THE HOLE DURING TOOL INSERTION, POTENTIALLY INTRODUCING AN AIR POCKET, THEN THE OPERATOR SHOULD ADD SUFFICIENT ADDITIONAL WATER TO ASSURE THE BARREL SEATS WITHIN THE WATER PHASE. THIS ASSURES THAT AN OPTIMUM AMOUNT OF SHOCK ENERGY FROM THE INITIATION CARTRIDGE IS TRANSMITTED INTO THE WATER PHASE AND NOT ABSORBED IN COMPRESSING AN AIR POCKET. ALONG WITH WEIGHT SEALING THE DRILL HOLE THIS WILL BETTER ASSURE CONSISTENT CARTRIDGE IGNITION SUCCESS. OTHERWISE THERE IS A CHANCE THAT AN AIR POCKET WILL ABSORB TOO MUCH OF THE SHOCK ENERGY BEFORE IT REACHES THE CARTRIDGES IN THE DRILL HOLE.

Transporting the BOULDER BUSTER

- *Check that the Firing Primer breech is clear of a Firing Primer. If necessary clear by inserting the poker through the Gas Injection Stem from the cartridge end of the tube.*
- *Transport the* BOULDER BUSTER *only in its Carrying Case.*

WARNING

NEVER CARRY OR TRANSPORT THE MAGNUM BUSTER™ WITH AN INITIATION CARTRIDGE SEATED IN THE BREECH PLUG. SHARP SHOCKS MAY ACTIVATE THE CARTRIDGE.

ACTIVATION DURING TRANSPORTATION MAY CAUSE INJURY OR DAMAGE.

Support Equipment And Supplies For The BOULDER BUSTER

WARNING

USE ONLY CERTIFIED OEM MAGNUM BUSTER™ CARTRIDGES

The following support equipment and supplies are required for safe and efficient use of the BOULDER BUSTER.

- Correct Cartridges. Use only Cartridges supplied by BOULDER BUSTER OEM Authorized Distributors.
- The BOULDER BUSTER Cartridge is a self-contained unit with an integrated firing pin. It can only be used with the BOULDER BUSTER system.
- Multiple BOULDER BUSTER Cartridges are added for intensifying the effect of the BOULDER BUSTER typically used for splitting excessively hard or very large rocks.
- Cartridges are placed in the bottom as well as strategically located along the length of the drilled hole before the BOULDER BUSTER is placed in the hole.
- The Cartridges are available in two strengths for maximum project flexibility:

BOULDER BUSTER Cartridges:

Initiation Cartridge	**Placed in the breech plug that initiates the booster cartridges listed below.**
No 10	**For average sizes and lighter breakage.**
No 20	**For average sizes and lighter breakage.**
No 30	**For large sizes and heavy breakage requirements.**

- The BOULDER BUSTER cartridge are too large for use in shotguns.
- Safety Clothing. Ear protection, safety glasses, face protection, safety shoes and hard hats, which meet or exceed the standards of national authorities for all persons to be involved in blasting operations.
- Water. Sufficient water for the number and depth of holes to be drilled during the day is necessary.
- Gel. Specially manufactured Gel or absorbent powder for use with porous rocks where water will drain away before the BOULDER BUSTER can be fired. Refer to Chapter 5 for more details on Gel and gel substitutes.
- Support Equipment. Suitable drill and support equipment for drilling the holes required.
- Drill Holes. Drill holes of suitable length and diameter. Length is determined by the size of the boulders to be broken. Diameter is determined by the diameter of your BOULDER BUSTER Ignition Barrel. Sizes of Gas Ignition Barrel and drill hole diameter are as follows:

For Ignition Barrel – 1 inch: ***1 to 11/16 in (25 to 27 mm)*** **drill bit (hole)**

For Ignition Barrel – 1 ½ inch: ***17/16 to 1½ in (36 to 38 mm)*** **drill bit (hole)**

WARNING

IT IS VERY IMPORTANT FOR THE OPERATOR TO ADHER TO THE DRILL HOLE DIAMETER SPECIFICATIONS PROVIDED IN THE TABLE ABOVE. USING THE MAGNUM BUSTER™ IN DRILL HOLES LARGER THAN SPECIFIED WILL LIKELY REDUCE BREAKAGE PERFORMANCE AND ALSO POTENTIALLY RESULT IN AN INCREASE IN MISFIRES.

CHAPTER 3 MAINTENANCE INSTRUCTIONS

PREVENTIVE MAINTENANCE

The procedures detailed in this chapter will ensure that your BOULDER BUSTER lasts for a long time.

Daily Maintenance

Clean the Gas Injection Stem Assembly and Firing Mechanism regularly with water or a piece of cloth to prevent sand and dirt from interfering with the firing action.

Clean all parts after use. Dry off and lightly lubricate the moving components and the special cast components (Head and Weight Disc) with a light oil. Remove excess oil, reassemble the BOULDER BUSTER and pack into the box provided

The BOULDER BUSTER Cartridges must be stored in a dry place under lock and key.

Weekly Maintenance

1. Inspect Firing Mechanism as detailed in Chapter 3, Paragraph Firing Mechanism.

2. Check that the Hammer Assembly is functioning properly and the spring is still has sufficient life.

3. Check that there is no wear or damage to the firing mechanism.

4. Check the gas ignition stem tube for signs of damage. Replace as necessary.

5. Check Chain Ring Connector for damage. Replace as necessary.

6. Clean and lubricate all the parts of the BOULDER BUSTER .

7. Refer to Chapter 1, Paragraph Physical Description to ensure that BOULDER BUSTER is complete.

Corrective Maintenance

The following provides step-by-step procedures for the most common maintenance issues.

Common Tools

The following common tools are required for the procedures detailed in this chapter:

- **Vice.**
- **Wrench and Socket for M12 and M8 Screws.**

Firing Mechanism

Refer to Figure 3-1.

1. Inspect the Hammer Assembly and clean as necessary. Make sure the Hammer Spring is fully effective. Replace as necessary

2. Insert the debris removal tool into the Ignition Barrel and dislodge any particle or obstructions from the tube bore.

Disassemble the Hammer Assembly as follows:

1. Unscrew and remove the M12 Screw from the Head.

2. Remove the Spring from the Hammer bushing.

Assemble the Hammer Assembly as follows:

1. Slide the Spring over the Hammer bushing.

2. Hold the hammer in position inside the Head and slide the M12 Screw through the Hammer until it enters the threaded hole.

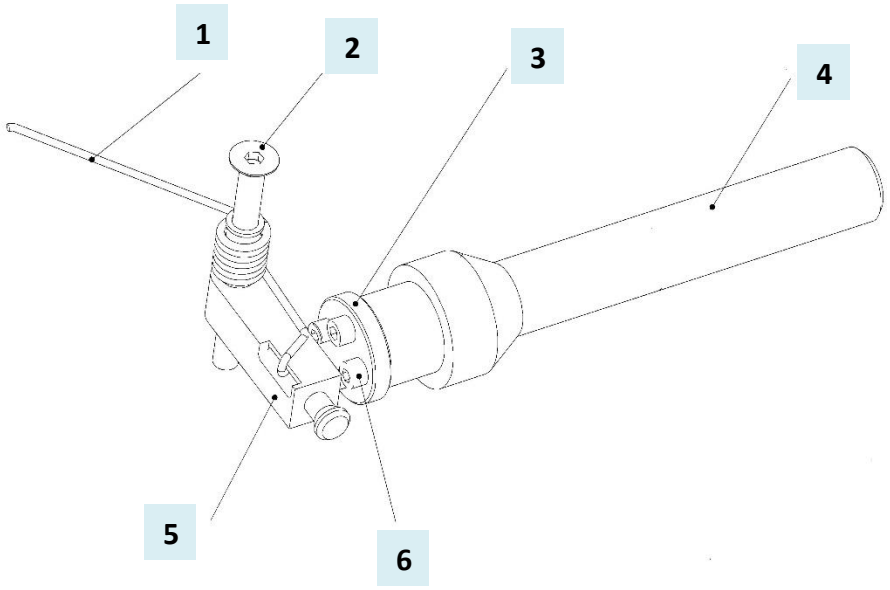
3. Screw the M12 Screw home.

Assemble/Dissemble the Head and Gas Injection Stem as follows:

The M8 Screws securing the Plug onto the Stem are fixed with thread locking compound and should not be removed unless the Plug, Stem or Head needs to be replaced. If they are ever removed they should be re-applied with thread locking compound when re-assembled.

WARNING

NEVER REPAIR A HAMMER ASSEMBLY. ALWAYS REPLACE A BROKEN HAMMER ASSEMBLY WITH A NEW ASSEMBLY PURCHASED FROM AN AUTHORIZED DISTRIBUTOR



ITEM	DESCRIPTION
1	Spring
2	M12 Cap Screw
3	Breech Plug
4	Ignition Barrel
5	Hammer
6	M8 Cap Screw

Figure 3-1 Firing Mechanism

CHAPTER 4 TROUBLESHOOTING

INTRODUCTION

This chapter supplies Troubleshooting Procedures for the BOULDER BUSTER.

TROUBLESHOOTING PROCEDURES

The following troubleshooting procedures are recommended for the safe and efficient operational reestablishment of the BOULDER BUSTER.

Lanyard and Chain Ring Connector Damaged:

Replace Lanyard Connector.

Cartridge Does Not Fit Into Breech:

Old Initiation Cartridge rim may still be jammed in the Breech Plug. Use Cartridge Extraction Tool to remove. ***Additional Cartridge Extraction Tool may be required to completely remove spent cartridge parts.*** Reinsert the new Initiation Cartridge.

Troubleshooting Misfires:

Misfires are a condition where it becomes necessary to exercise extra vigilance. Although the probability of a cartridge not firing is low when the proper setup and operational procedures are followed, a misfire is still possible. Again the approach to a safe solution may have a variety of options. If the operator is simply dealing with a known misfire and the hole will still hold water it is acceptable to initiate the firing sequence again (with a new initiation cartridge), or even several times, or adding another cartridge in the hole placed within 6 to 12 inches of the barrel. It might be that a better seal can be affected by placing some weight against the tool (using the weight disk provided or a field determined alternative). This might lower the chances of a misfire. On occasion, a misfire might occur that would rupture the cartridge case but not fire adequately. This would render its propellant harmless by water dilution. The operator may want to better analyze what actually happened with a particular cartridge and to try and determine, with our help, what might be the cause. In that case removing the cartridge from the hole is the best option.

Of course removal is possible with the Cartridge Retrieval Tool ONLY. The cartridge retrieval tool must be fit to a ½ inch PVC water pipe. It is designed to press fit into one end of that size water pipe. Never devise an alternative home-made fitment method. The cartridge retrieval tool, fit to a water pipe, offers the safest cartridge retrieval method.

If misfires persist than the shock energy transmitted through the shock tube in the Ignition Barrel is insufficient to initiate the cartridge. The following are the range of likely causes and should be evaluated for cause and effect:

1. The tool may not have sufficient weight to hold and seal it securely to the drill hole. In that case use the supplied weight disk and additional weight on top of the disk might be necessary to seal the drill hole and better contain the shock wave.
2. Check that the bolts securing the Breach Plug and Ignition Barrel are tight in order to containing the gas pressure from the initiation Cartridge. If these bolts become progressively looser during operation pressure can escape through the Breach Plug/Ignition Barrel interface and sufficiently dilute the shock wave effectiveness.
3. Assure that the Ignition Barrel is inside the water phase of the drill hole. Be careful not to drop the barrel in the hole at a rate that pushes the water from the hole leaving an air pocket between the shock tube and cartridge. This will require too much energy from the Initiation Cartridge to first compress the air before it is able transmit sufficient shock energy through the water phase.
4. Only use drill hole sizes recommended according to the Ignition Barrel size in use. Drill hole sizes that are oversized can allow shock energy to transfer back up the annulus between Barrel and hole and dilute the effective shock wave away from the cartridge.
5. Evaluate the internal parts (Spring and Hammer and Breach Plug) for excessive wear and loss of spring tension. It is important to have these parts in good working order so that the hammer not only properly impacts the Ignition Cartridge but also holds its force long enough to contain the initial ignition pressure.

In The Event of a Misfire:

1. Remove the Auxiliary Weight Disc from the BOULDER BUSTER.
2. Move the Hammer to the side of the Breech Plug and inspect the Initiation Cartridge condition. Do not pull the hammer up into a position that it could slip and inadvertently initiate the Initiation Cartridge.
3. If the Initiation Cartridge did not fire replace it with another and repeat the firing process.
4. If the Initiation Cartridge did fire but not the BOULDER BUSTER Cartridge, inspect the Gas injection Stem for obstructions. If the Gas Injection Stem contains obstructions remove with the poker as necessary **(Figure 2-6)**.
5. If there is a spent Initiation Cartridge still stuck in the Breach Plug and the Poker will not remove it then use the Cartridge Extraction Tool for removal.
6. Remove the Cartridge from the drill hole (with the prescribed cartridge retrieval toll setup only) and Inspect the Cartridge for damage. If the Cartridge is damaged, or altered in any way, destroy the old Cartridge and replace it in the drill hole with a new Cartridge.
7. Clean the BOULDER BUSTER by wiping off excess sand or dipping it in a bucket of water and cleaning with brush.
8. The BOULDER BUSTER is now ready for the next firing.
9. Never re-drill in an existing drill hole and always remove any suspected unfired cartridges in existing drill holes before leaving the worksite.

CHAPTER 5 METHODS AND APPLICATIONS

INTRODUCTION

This chapter details Methods and Applications for your BOULDER BUSTER.

Gel Agent

When rocks or boulders to be broken are porous or cracked and do not hold water a thickening agent or Gel can be used. These granules are a polymer that absorbs water and forms a non-sticky lumpy gel. It can be used to slow or stop leakage from a porous hole, to space booster cartridges in a deep hole and generally enhance the performance of the Magnum Buster.

NOTE: The thickening agent can be any absorbent, non-explosive powder. The following notes are applicable to ANY gel used:

- When pouring the mixture down the hole, be careful that no “airlocks” are formed.
- Do not fill the hole completely with the mixture: leave at least 6 in (150 mm) clear from the rim of the hole.
- Then top remaining hole length off with water to avoid pushing the Initiation Cartridge out of the Breech Plug

The directions below are for a commercial Gel. If any other type of powder is used, it is sufficient to ensure that the consistency of the gel is approximately that of thick cream.

Mix commercial Gel as follows:

- Fill a container with 1 gal (4 liters) of water.
- Follow product instructions for proper ratio of water to gel powder.
- Allow sufficient time for Gel to absorb water (approximately ½ hour). The granules will swell as they absorb water and will last indefinitely.

Use of Booster Cartridges

Bigger boulders can be broken by using the power of an extra cartridge which is dropped into the water filled hole. The Booster Cartridge should be placed into the water filled hole with the cap towards the top. The standard BOULDER BUSTER Cartridges are used for this purpose. Cartridges are available from your Authorized Distributor for this purpose and in a No 20 and No 30 size.

Table 1 details the number of cartridges that can be inserted in a hole.

CAUTION

DO NOT EXCEED THE LIMITS DETAILED IN TABLE 1, AS THIS COULD REDUCE THE LIFE OF MAGNUM BUSTER™ COMPONENTS UNLESS WORK PRODUCTIVITY OUTWEIGHS THE COST OF PARTS REPLACEMENT.

Table 1. Use of Booster Cartridges in Large Rocks

DEPTH OF HOLE IN (mm)	NUMBER OF MAGNUM CARTRIDGES
BOULDER BUSTER	**No 20 or No 30**
15-40 (400-1000)	1
40-60 (1000-1500)	2
Greater Than 60 (1500)	3 maximum

NOTE
The following procedure is one of a number of ways that extra Cartridges can be used. Experimentation will show you the best method for your particular application.

WARNING

DO NOT PUSH/TAMP A CARTRIDGE INTO THE HOLE. COMPRESSING THE TOP CAP COULD CAUSE THE CARTRIDGE TO FIRE AND RESULT IN INJURY

1. Place the Cartridges down the hole (top cap face upwards). The Cartridges may be spaced strategically along the drilled hole length for long holes in order to achieve optimum performance.

2. Fill the hole, as described earlier, with water or Gel taking care to avoid airlocks.

3. **Depending on the extent to which the barrel is fit securely into the hole (thus creating an effective seal), the single or top cartridge may be required to be placed within 6 to 12 inches (140 to 380 mm) of the bottom of the Ignition Barrel. This procedure will better assure cartridge initiation and minimize misfires in certain difficult rock conditions.**

4. Proceed as normal for firing the BOULDER BUSTER.

CHAPTER 6 ILLUSTRATED PARTS BREAKDOWN

INTRODUCTION

This chapter details the recommended spares and ordering information for the BOULDER BUSTER.

HOW TO USE THIS CHAPTER

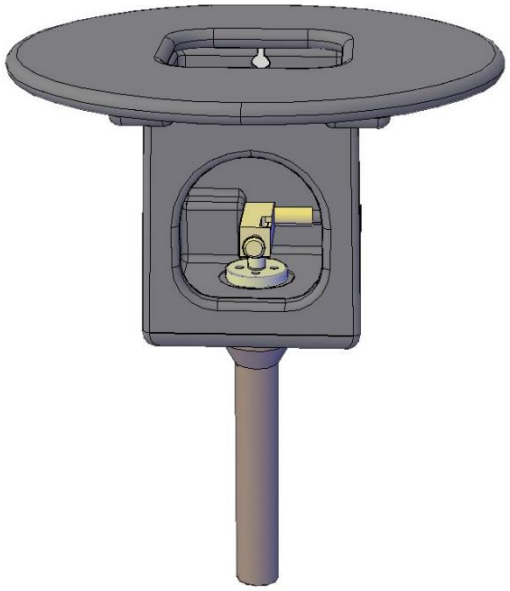
Identify the part that requires replacement. Then locate it in the relevant figure. Note the Item reference and the description.

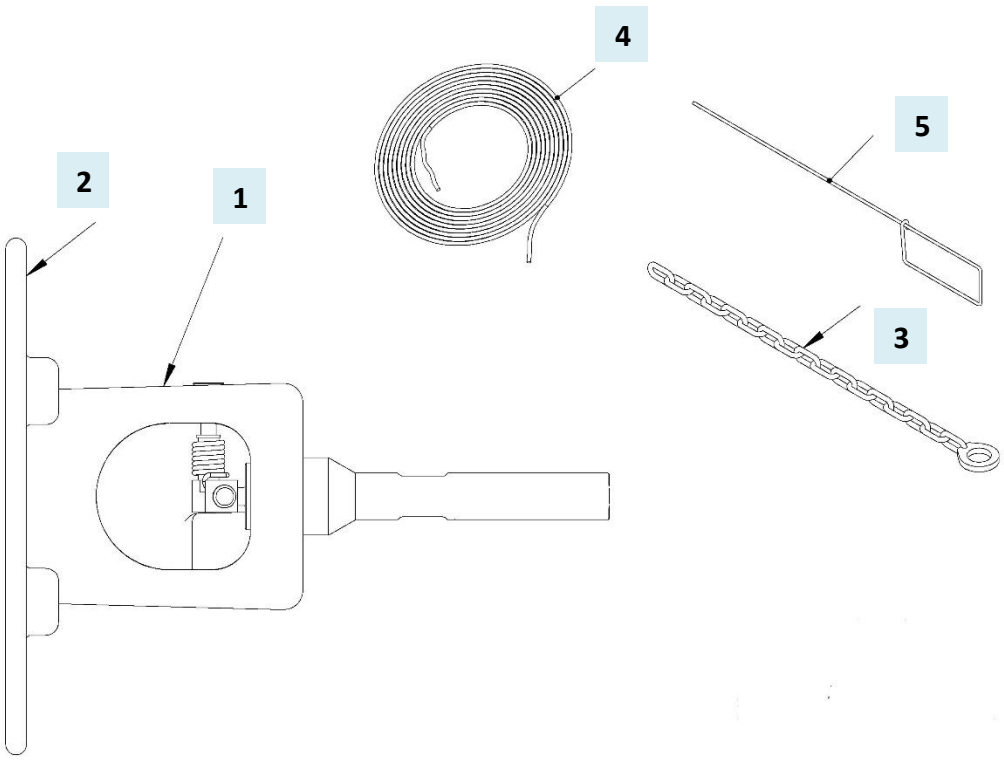
WARNING

NO UNAUTHORIZED MODIFICATION OR MACHINING OF COMPONENTS MAY BE MADE. USE ONLY CERTIFIED OEM COMPONENTS SUPPLIED BY THE MANUFACTURER WHEN PARTS ARE REPLACED. UNAUTHORIZED MODIFICATIONS OR PIRATE PARTS MAY RESULT IN SERIOUS INJURY FOR WHICH THE MANUFACTURER CANNOT BE HELD RESPONSIBLE.

BOULDER BUSTER General Arrangement and Parts List

ITEM		DESCRIPTION	QUANTITY
1	**MT100T/150T**	Tool Assembly	1
2	**T032**	Auxiliary Weight Disc	1
3	**T034**	Lanyard Assembly	1
4	**T043**	Cartridge Ejection Tool	1





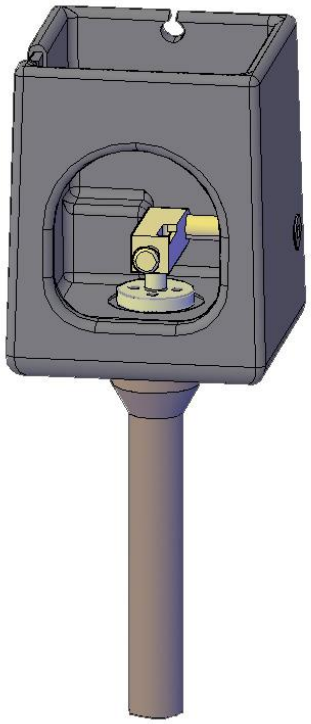
ITEM	DESCRIPTION	PART NO
1	Tool Assembly	**TMT100T/MT150T**
2	Auxiliary Weight Disk	**T032**
3,4	Chain Assembly	**T034**
5	Cartridge Ejection Tool	**T043**

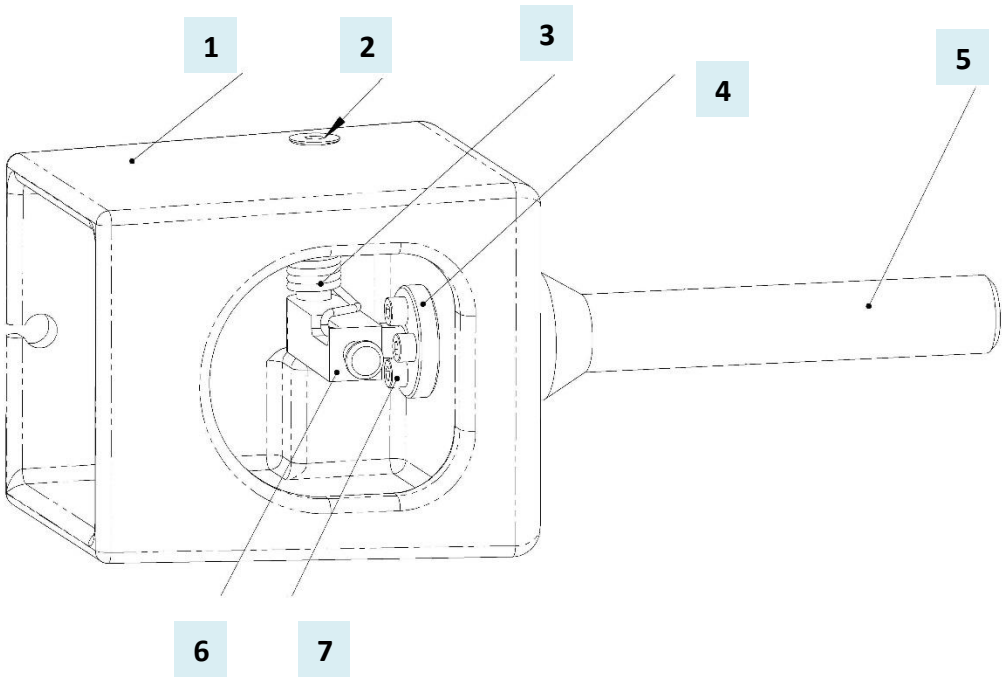
Figure 6-1 General Arrangement Illustrated

BOULDER BUSTER Tool Assembly Parts List

MT100T/150T Tool Assembly

ITEM		DESCRIPTION	QUANTITY
1	**T030**	Tool Head	1
2	**T026**	M12 Cap Screw	1
3	**T024**	Spring	1
4	**T022**	Breech Plug	1
5	**T010/T015**	Ignition Barrel	1
6	**T020**	Hammer	1
7	**T028**	M8 Cap Screw	4





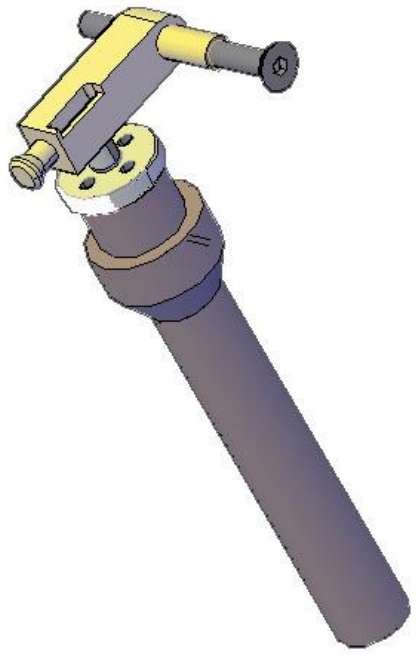
ITEM	DESCRIPTION	PART NO
1	Tool Head	**T030**
2	M12 Cap Screw	**T026**
3	Spring	**T024**
4	Breech Plug	**T022**
5	Ignition Barrel	**T010/T015**
6	Hammer	**T020**
7	M8 Cap Screw	**T028**

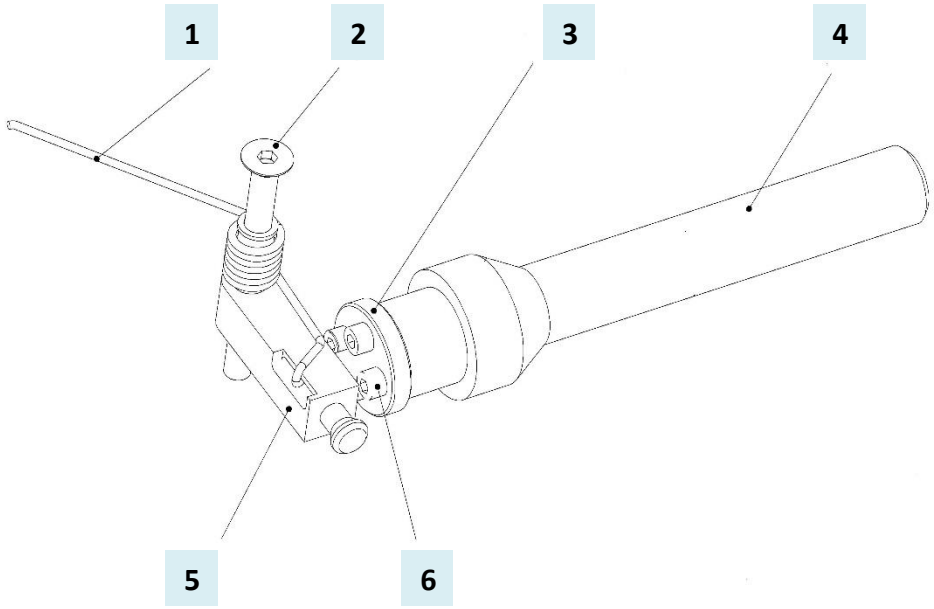
Figure 6-2 Tool Assembly Illustration

BOULDER BUSTER Firing Mechanism Parts List

MT100T/150T Firing Mechanism Assembly

ITEM		DESCRIPTION	QUANTITY
1	**T024**	Spring	1
2	**T026**	M12 Screw	1
3	**T022**	Breech Plug	1
4	**T010/T015**	Gas Ignition Barrel	1
7	**T020**	Hammer	1
8	**T028**	M8 Screw	4





ITEM	DESCRIPTION	PART NO
1	Spring	T024
2	M12 Cap Screw	T026
3	Breech Plug	T022
4	Ignition Barrel	T010/T015
5	Hammer	T020
6	M8 Cap Screw	T028

Figure 6-3 Firing Mechanism Illustration