

# FOREDOM<sup>®</sup> PowerGraver<sup>™</sup>

**Owner's Manual: Assembly, Operation and Service for the PowerGraver Kit**  
**Including "Using the Foredom PowerGraver for Stone Setting and Engraving"**  
**by George Bennett**



**WARNING – Personal Injury Hazard**



**Read this manual before operating any Foredom Tool.**



**Always wear eye protection when using Foredom Tools.**

**Failure to follow safety instructions may result in serious injury.**



**FOREDOM<sup>®</sup>**  
Foredom Electric Company

## PRODUCT-SPECIFIC SAFETY WARNINGS — FOREDOM POWERGRAVER



### WARNING — TRAINED OPERATOR REQUIREMENT

This device is intended for use by trained operators familiar with engraving tools and flexible shaft equipment. Improper use may result in injury or equipment damage.



### WARNING — EYE AND RESPIRATORY PROTECTION

Always wear eye protection when operating this tool. Use dust collection or respiratory protection when working with materials that produce airborne dust or debris.



### WARNING — ENTANGLEMENT AND MOVING PARTS HAZARD

Keep hands, fingers, hair, clothing, and jewelry away from moving parts. Do not wear loose clothing or unsecured jewelry. Tie back long hair.



### WARNING — ACCESSORY SECURITY AND CONDITION

Use only properly installed, undamaged gravers and accessories. Insert accessories fully into the collet and tighten securely. Loose or damaged accessories may be ejected and cause injury.



### WARNING — FLEXIBLE SHAFT HAZARD

Never operate the tool with a damaged, improperly installed, or uncovered flexible shaft. Improper installation may result in injury or equipment damage.



### WARNING — ELECTRICAL SAFETY

Disconnect the power tool from its power source before installing accessories, servicing, or performing maintenance. Use only with a properly grounded power outlet matching the motor nameplate.



### WARNING — WORKPIECE SECURING

Always secure the workpiece using an engraver's block, vise, or other holding device. Unsecured workpieces may move unexpectedly and cause injury.



### WARNING — PROPER OPERATION

Maintain control of the tool during operation. Do not force the tool or apply excessive pressure. Allow the tool and accessory to operate at their intended speed.

# Why Professional Jewelers and Engravers use the PowerGraver

- engraving
- bead setting and bright cutting
- channel and hammer setting
- texture and florentine finishing
- carving figures and initials on jewelry

and many other applications where hand tools such as gravers and beading tools might normally be used. The PowerGraver can help the professional jeweler in these applications by providing a controlled hammering action through the handpiece which can accept a wide variety of tools. The user controls the hammering action by adjusting the strokes per minute (SPM) with the speed control and by adjusting the impact intensity from a very light to a heavy impact with the adjusting ring on the handpiece.

The PowerGraver can also be used with Foredom rotary handpieces for low speed, high torque applications such as drilling holes, cutting bearings with a setting bur, wax carving or other applications where high speed is not required or desirable.

The PowerGraver (M.PGX) is a low speed (500–2,800 rpm) high torque DC motor. It provides smooth acceleration and holds the preset speed under load.

The permanently lubricated ball bearings and heavy duty construction can provide almost infinite life even in continuous duty operation. The flexible shaft and sheath are more flexible than those on the standard Foredom flexible shaft power tools because the sheath is made from a special and more pliable neoprene material. This provides greater control and less “drag” on the handpiece.

The H.9D handpiece (shown below) converts the rotary motion of the flexible shaft into a hammering action on the tool holder. The chuck nut tightens the collet around the shank (or tang) of the accessory.

\*Note: This handpiece is not intended for use on standard Foredom flexible shaft power tools, as it has a maximum speed of 3,000 RPM.

Four different size collets are provided so that different size tools can be held securely:



|       |       |                 |
|-------|-------|-----------------|
| HP603 | 3/32" | (.0937"/2.35mm) |
| HP604 | 1/8"  | (.125"/3.17mm)  |
| HP605 | 3mm   |                 |

To change collets unscrew the chuck nut using the two wrenches provided - use one to hold shaft behind chuck nut and one to loosen chuck nut. Remove collet in handpiece, insert new collet, and screw on chuck nut.

Always use both wrenches when loosening or tightening chuck nut to avoid damaging handpiece.

The HP604 1/8" collet is generally used with engraving tools with 1/8" shanks.

The HP603 3/32" collet is used with the hammer or anvil point (A-10177P) and carbide stylus (A-10215) that have 3/32" shanks. These come in the kit. Beading tools also work with HP603 3/32" collet.

The palm rest can be rotated around the handpiece barrel to the most comfortable position or removed completely when you wish to use the handpiece in a “pencil grip” manner. Just loosen the set screw in the palm rest and tighten it at the desired position. The palm rest can also be moved part way down the handpiece barrel if required to align your thumb and index finger with the chuck tool more comfortably.

The handpiece is designed to be used like a traditional graver handle or push tool. Generally, the flat surface of the palm rest should be positioned at the bottom of the handpiece in relationship to the cutting edge of the graving tool. This provides a flat surface for the fingers and better clearance over the work area.

Select a collet that has the closest fit with the tool's shank. (If too large a collet is used on a thin tool, the collet jaws or fingers can be distorted or broken when tightened.) The shank of the tools should be at least 1" (25mm) long so that it will make contact with the bottom of the collet holder. This is important because it maximizes the hammering action efficiency and the tool will not “slip back” in the collet.

Insert the tool or graver into the collet until it touches the bottom of collet holder, then tighten the chuck nut securely with one wrench while holding the collet holder shaft with the other. Do not tighten chuck nut without using a wrench on the flats in collet holder shaft. Failure to use both wrenches can damage the handpiece.

Retighten the chuck nut periodically as you work since extended use may loosen the chuck nut.

**When grinding or modifying gravers, they must be kept cool with water so you do not change the temper.**

Modifying tools to fit securely in the handpiece is not difficult. The shank or tang end of the tool must be ground or cut so that it is at least 1" (25mm) long and 1/8" (3mm) or less in diameter.

The tapered tang on the traditional style gravers needs to be ground as shown in Illustration 3. A new graver's tapered tang (Fig. A) can be ground with a bench grinder or grinding wheel in a flexible shaft handpiece until it is straight (see Fig. B) and 1" (25mm) long and 1/8" (3mm) wide. Then grind the corners off (see Fig. C) making it as round as possible.

If the taper is less than 1/8" (3mm) at the

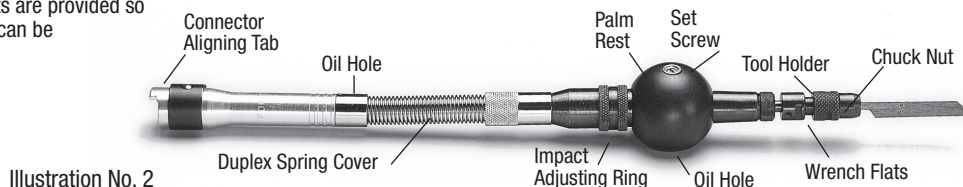


Illustration No. 2

end of the tang, grind a 1/2" (12.5mm) long section (see Fig. D) behind the heel into a 1/8" (3mm) diameter. This is the section held by the handpiece collet jaws.

For smaller gravers and tools, grind the tang or shank end to a 1" (25mm) long by 3/32" (2.35mm) diameter for use in the smaller collet. Try to keep the 1" long section in line with the top, bottom and sides of the graver as much as possible for better control of the cutting edge. Remove all burrs or sharp edges on the tang or shank end to prevent damage to the collet or inside of the collet holder.

Because the PowerGraver is designed to help the jeweler or engraver with bead setting, bright cutting and engraving, the handpiece should be held like a conventional graver. Hold the handpiece by placing your hand, palm down, over the top of the handpiece. Locating the adjustable palm rest in the center of your palm, extend your thumb to the left side of the chuck nut, put your index finger to the right side or on top of the chuck nut. Your other fingers can go around the

Illustration No. 3

Fig. A



Fig. B

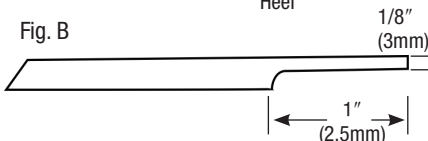


Fig. C

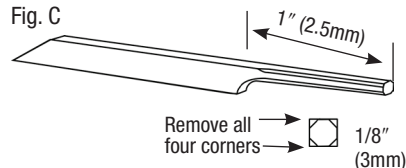
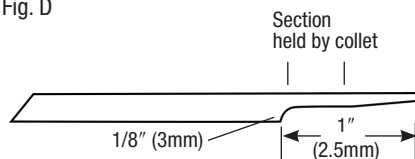


Fig. D



## Holding the Power Graver Handpiece and Determining the Best Graver Length

palm rest until they rest on the flat underside of the palm rest. This is a very natural and comfortable position to hold the handpiece, similar to holding a regular graver. The only time the handpiece would be held like a pencil would be when using it for applying a texture finish or doing channel setting.

Having the graver or tool at a comfortable length from the chuck is very important. A graver that is too long feels awkward and is difficult to control. To determine a workable graver length first insert a graver with the tang end modified into the collet. Then, place the handpiece in your hand as suggested above. Extend your thumb along the length of the graver blade while still holding the handpiece comfortably in your hand. Mark the graver at about 3/4" (19mm) past the end of your thumb. This is the length where the graver should be to provide an efficient working length.

The palm rest can also be adjusted forward about 1/4" (6mm) to accommodate a longer graver and moved back up the grip as the graver becomes shorter from repeated sharpening.

To shorten a graver use the corner of a bench grinding wheel to first grind half way through one side of the graver where marked. Then grind most of the way through the other side of the graver until it is thin enough to snap off after placing it in a bench vice.

## Adjusting the Impact

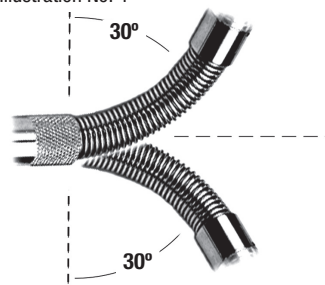
Turning the impact adjustment ring (Illustration No. 2) to the right (clockwise) will reduce or soften the impact. Turning it to the left (counterclockwise) will increase the impact force. The ring can be rotated while the motor and handpiece are running so that you can "feel" and "hear" the change in impact

**Helpful Hint** For even lighter impact when doing very delicate work or to avoid damaging small stones when doing setting work, grab the chuck nut with your thumb and index finger and pull back slightly while handpiece is running. This will reduce or "cushion" the impact even more.

## Proper Use of Duplex Spring Connection –

The duplex connection consists of a double wound flat wire spring which acts as the drive shaft or spindle inside the duplex cover which is made with a round wire spring. The purpose of the duplex spring connection is to give you very free, unrestricted control over the handpiece. The duplex spring connection is designed for use at angles of 30° or less from center (see Illustration No. 4). If it is used in a tighter radius the drive spring can be damaged or the connection can get hot. You can replace the drive spring (P/N HP76) if it breaks from being used at too tight a radius. Directions are included with replacement springs.

Illustration No. 4



## Handpiece Lubrication –

The sleeve bearing in the back end of the duplex connection should be oiled every 40 hours of use by putting one or two drops of Foredom handpiece oil in the oil hole. Use the Hypodermic Dispenser (P/N MS10005) which is included in Kit K.2293.

Another oil hole is located in the handpiece barrel under the palm rest. Put one or two drops of oil in it every 40 hours of use.

## Dial Speed Control

The bench mounted dial variable speed control (C.EMGX) is calibrated to correspond to the motor RPM's. You can set and maintain the desired speed for each application using the dial control. If you use the optional On/Off foot switch (C.FCGX), it will then start and stop the motor at whatever speed is set on the dial.

## Preparation

# Bead Setting with the PowerGraver Handpiece

The most commonly used graver is a round graver. (A #52 graver is provided in Kit K.2293. See Illustration 6.) First, prepare the graver tang as previously instructed to fit the 1/8" collet (see page 3). Next, secure the graver by its tang in an adjustable handle like a millgraining handle or a file handle to provide a safe way to hold the graver while grinding its cutting edge (see Illustration 5, Fig. A).

Place a container of water next to your bench grinder wheel to use as a coolant to keep the graver cool while grinding. This will prevent the loss of the temper (hardness) of the steel due to overheating. While grinding the graver, repeatedly dip the graver into the water. It is a good idea to dip the graver in the water after each grinding pass.

**Always wear eye protection when using any grinding tool.**

Illustration No. 5



Fig. B

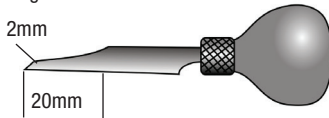
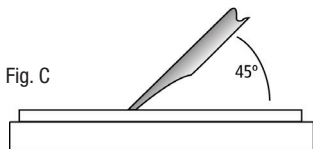


Fig. C

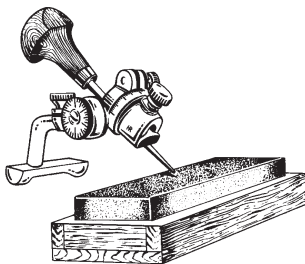


Grind away the top of the graver, always grinding from the front to the back (tip to the handle). Grind in a smooth, continuous motion. Grind away a small amount with each pass. (Remember to dip the graver in the coolant after each pass.) Grind a taper into the graver approximately .08" (2mm) high at the tip, then back approximately 3/4" (20mm) to the top of the graver. (See Illustration 5 Fig. B.) Remove any burrs on the sides of the graver left by the grinding.

The face of the graver should be sharpened at the bench with an oil stone (an Arkansas

hard stone is recommended). The graver can be held by hand for this operation, or in a graver sharpening fixture (See Illustration 7) available through most jewelry supply tool stores and catalogs.

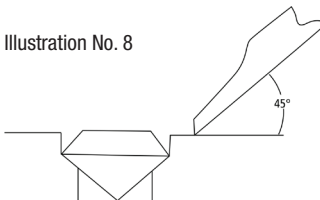
The angle on the face of the #52 round



graver can vary depending on the application and what you are accustomed to using. The most common angle used is 45°. Move the graver back and forth slowly along the length of an oil stone while holding the graver at a 45° angle. Do this until the face is established across the width and height of the graver tip. (See Illustration No. 5, Fig. C.) Remove graver from handle and secure in handpiece collet.

Set the impact adjusting ring to a medium to hard impact. To create a bead, place the graver about 1/32" (.75–1mm) away from the inside wall of the bearing. Raise the graver so the bottom edge is at a 45° angle from the surface. (See Illustration No. 8.) Do not push, apply just enough pressure to keep the graver tip in the metal. This will take some practice, and may require breaking old habits. With the graver in this position, set the speed control at 2,200–2,400 S.P.M. For even better results use an optional on/off foot switch. Let the hammering action of the handpiece do the work.

Illustration No. 8



**Helpful Hint** By guiding the tool instead of pushing it as you must do with a beading tool in a handle, you have much more control of the operation. You will not get tired and thus, lose your "feel" for the work. And, there is far less chance of slipping and damaging the metal or a stone.

It will be necessary to adjust the SPM and the degree of impact depending on the size of bead to be created and the hardness of the metal you are working with. Try different settings to find which works best for you on a particular jewelry piece.

For removing the metal around the beads and for general excavating work, a #3 onglette graver (see Illustration No. 6) is most commonly used. This graver is prepared the same way as the #52 round with a 2mm high tip and a 20mm long taper. A 45° face angle is used, but with the addition of a slight angle (8°–10°) to the right or left side depending on the application of the graver. The forward edge of this angle will work like a chisel, allowing the metal to peel off to the opposite side for ease of removal. (See Illustration No. 9.)

A higher speed (2,400–2,800 SPM) is recommended for this procedure. A lighter impact setting will also give you more control around the beads and stones. The point of the graver needs to be set in the metal before activating the on/off switch.

**Don't push, let the handpiece do the work for you.**

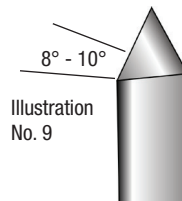


Illustration No. 9

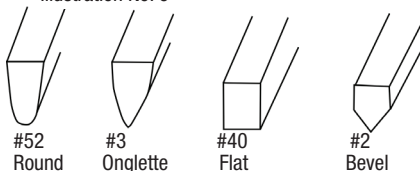
**Helpful Hint** The secret to successful bright cutting is polishing all cutting surfaces of the graver. A polished cutting surface will create a "Bright Cut". An unpolished cutting surface will create a dull cut.

## Bright Cutting with the PowerGraver Handpiece

For bright cutting or the final finishing of a setting use a flat graver like the #40 included in Kit K.2293 (see Illustration No. 6).

Preparing the #40 flat graver is a little different from the other gravers. After preparing the tang end and cutting it to length, grind the same 2mm high by 20mm long taper to the graver (see Illustration 5, Fig. B). Then use the bench oil stone to establish the following surfaces. First, a "foot" needs to be created on the bottom of the graver. This foot raises the bottom of the graver off the working surface and provides necessary clearance around the beads and adjoining surfaces. Place the graver in a handle or a graver sharpening fixture. Place the graver bottom flat on the

Illustration No. 6



#52 Round

#3 Onglette

#40 Flat

#2 Bevel

## Bright Cutting with the PowerGraver Handpiece *continued*

oil stone, raise the handle/fixtures 10°–15° to create a foot approximately 1mm long. (See Illustration 10, Fig. A). The face of the graver is then sharpened at a 45° angle to the foot of the graver. (See Illustration 10, Fig. B.)

Additional clearance for working around the beads and stone can be gained by grinding the top of the graver tip to a peak (see Illustration 10, Fig. C), back approximately 1/4" (6mm) from the face. Use a small hand held grinding wheel in your flexible shaft power tool for this procedure.

The advantage of bright cutting the surfaces around the beads and stones is to eliminate the need to polish these surfaces and thus wearing away (polishing off) the beads holding the stones.

### Polishing the Cutting Surface –

To create a polished cutting surface you use a small piece of polishing or emery paper (#4/0 or #6/0) approximately 2" x 2" (50mm x 50mm); a small piece of smooth, hard paper (such as a business card) and jeweler's rouge (such as a yellow rouge). After establishing the graver angles described above and with the graver still mounted in the adjustable handle, place the face of the graver on the polishing paper at the same angles and pull (draw) the graver across the paper.

The polishing paper and the hard paper need to be placed on a very hard, flat surface (glass or polished stone) to support them. This procedure will remove (polish) the oil stone marks from the surface. A couple of drops of light oil on the polishing paper will create an even smoother surface. Prepare the piece of hard paper by rubbing a light coat of the yellow rouge on a small area.

Repeat the same procedure of pulling (drawing) the graver across the prepared paper to remove the polishing paper marks. This will produce a smooth, polished surface on the graver cutting surface.

After preparing the #40 flat graver, and inserting it in the handpiece collet, set the dial control to a 2600–2800 SPM setting. This speed and a light impact setting will create the smoothest cuts.

Remember, the "Bright Cutting" tool is used for the final finished cut and is not meant for heavy removal or excavating work.

Illustration No. 10

Fig. A



Fig. B

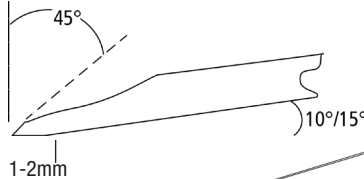


Fig. C



**Helpful Hint** Lubricating the graver tip is recommended for all graver work and especially bright cutting. Polished (bright cutting) gravers require liberal lubrication to keep the metal being cut from sticking to the graver and keep the graver sharper longer. Lubricate your gravers with oil of wintergreen. Place a piece of cotton in a small glass or metal dish and saturate it with oil of wintergreen. Touch the cutting edge of the graver frequently to the oil while using it.

### Doing Channel and Hammer (Gypsy) Work with the PowerGraver

For channel setting the professional jeweler will find the PowerGraver an invaluable tool. By selecting the appropriate graver, the PowerGraver can be used to cut a bearing or clean up an existing one. The anvil or hammer tip in the PowerGraver handpiece can be used to fold (hammer) the metal down around the sides of the stone. (Prongs and bezels can also be turned over a stone with the anvil point.) By using the controlled power of the PowerGraver, the setter will find that the work becomes less fatiguing while quality and production go up.

For maximum striking power it is recommended that the SPM be set at 2200–2400 with the impact adjustment ring set at hard. Be sure that the workpiece is held very securely on a solid base to achieve maximum movement or "flow" of the metal. Experiment with a similar piece of metal to determine the best speed and impact.

### Surface Texturing with the PowerGraver Florentine (Italian) Finish –

The PowerGraver works very well for doing Florentine finishes by providing controlled power that can be started and stopped instantly with the on/off switch. The elimination of the need to "push" through the first set of lines gives the operator the control that produces quality work. The lining gravers used for this finish are modified and sharpened in the same manner as

regular gravers.

### Pavé and other Decorative Work –

The PowerGraver will accept a variety of texturing points including the carbide point provided in Kit K.2293. This is an application where the handpiece should be held like a dart or a pencil. Remember to check the angle of the duplex spring when texturing to avoid using it with a sharp bend.

### Engraving and Carving Preparation and Maintenance of Gravers

Many gravers are used for engraving and carving but the most common are the bevel and square gravers. A #2 bevel graver is included in kit K.2293. Preparing the graver is similar to preparing them for bead setting and bright cutting. After grinding in the 2mm high by 20mm long taper on the front (cutting) end of the graver, a "foot" needs to be put on the bottom (or belly) of the graver with a 10°–15° angle (see Illustration No. 10, Fig. A) from the working surface to provide clearance so the graver bottom doesn't drag across the surrounding surface. This foot should be about 1/16" (1–1.5mm) long. By hand or by using a graver sharpening fixture, re-sharpen the face at a 45° angle to the foot of the graver, (see Illustration No. 10, Fig. B). The 45° face, as viewed from the side of the graver should also have a slight angle (See Illustration 9) to the right or left depending on application. A face angled to the left, with the forward edge being on the right will allow for straight line engraving and also for making clean curves to the left. A graver set up with a face angled to the right with the forward edge to the left will allow for straight line engraving and curves to the right. A bevel graver can also be set up with no face angle (or at 90° to the gravers' sides), but this is not advisable since it has the tendency to push the metal being removed directly in front of the graver. This creates an unnecessary load that makes the graver difficult to move and control.

The bevel graver's cutting surfaces should now be polished smooth as described in "Polishing the Cutting Surface". The polishing not only provides a nice bright cut, but also the smooth surface of the graver will move through the metal with less resistance than an unpolished graver.

Remember to use a lubricant (oil of wintergreen) on the graver tip. The graver tip should be lubricated after every cut while engraving. The lubricant will help the graver cut and also keeps the metal being engraved from sticking to the graver's cutting surfaces. Even while using a lubricant some residue from the metal being cut may adhere to the graver. If allowed to build up this residue will take the "edge" off the graver

by rounding off the cutting edge. To remove this residue draw (pull) the graver across the rouged hard paper at the established angles. For thicker deposits it may be necessary to go back to the polishing paper and then the rouge paper. Maintaining the polished surfaces of the graver is essential for creating quality engraving.

### Good Engraving Techniques –

For most metals and most engraving procedures a high 2600-2800 SPM is recommended with a light to medium impact setting. These settings will provide a smooth continuous cut without choppy or hammering marks. The faster the SPM the smoother the cut. To start a cut, place the tip (point) of the graver into the metal. This can be accomplished by holding the graver at a 30°–45° angle to the working surface, then exerting a little downward pressure on the graver tip while making a slight twisting motion with your hand. Lower your hand and the graver with the point still in the metal until the foot of the graver is almost parallel to the surface. Make sure the point of the bevel graver is at the absolute bottom.

**Don't push. Apply only enough pressure to maintain the graver in the metal.**

Now start the PowerGraver using the on/off foot switch. Immediately (as soon as the graver starts to move) lower the graver angle until the bottom surface of the foot (at the 10°–15° angle) is parallel with the surface. The graver will maintain the depth throughout the cut. If you want to make a deeper cut, raise your hand (graver angle) until the desired depth is reached, then level off the graver again as it moves forward. To make a shallower cut, lower your hand (graver angle) until the desired depth is reached, then level off the graver.

For deeper cutting or for working with harder metals, it may be necessary to increase the impact adjustment to a harder impact. Experiment to find the setting that works best.

So far we've described how to cut a straight, fine line (thread line). Other cuts can be made with the bevel graver.

To cut a wider line, immediately after starting and determining the desired depth, rotate your hand (graver) slightly to introduce the side of the graver face into the metal, not just the point. This will create a wider line (shade line). (See Illustration No. 11.) The further the graver is rotated the wider the line. Never use the entire side of the bevel graver, a flat graver is used to make this type of cut.

Illustration  
No. 11



**Helpful Hint** The PowerGraver can help the beginning or experienced engraver by providing controlled power and eliminating the need to push a graver. When learning, pushing too hard is a main cause of slipping and the frustration that comes with it.

### Using an Engravers Block –

To engrave curves, scrolls, lines, etc. the piece to be engraved should be secured in an engravers block. The engravers block and its accessories are designed for this purpose and should be considered an absolute necessity for doing fine engraving work. It is also a very helpful device for the stone setter as well for holding and positioning rings, bracelets, etc.

With the piece secured in the engravers block, start the cut. To cut a curve, rotate the block, while keeping your hand and graver in the same position. Curved thread line and shade lines can be cut in this way.

### Helpful Bench Accessories for Engraving Work are Available from Jewelry Supply Distributors

**1. Chinese White** can be applied to the surface of the metal to be engraved so that you can draw the letters, figures, or design with a pencil on the surface. It is applied with a wet, soft hair brush or your finger.

**2. Eye Loupe, Spectacle Loupes or Clip-on Magnifiers** are available in 2x up to 10x magnification power.

**3. Flex Arm Lamps** Good lighting is essential for engraving and stone setting.

**4. Crocker Graver Sharpener** A sharpening jig used with sharpening stones.

**5. Arkansas Oil Stone** Used with a light oil to sharpen gravers.

**6. Polishing Paper** (Emery Paper) #4/0 (or 6/0) and hard, flat surface (glass or polished stone) for polishing cutting surface of graver.

**7. Rouge and Hard Paper Yellow Rouge** on hard paper for final polishing operation on cutting surface.

**8. Millgrain Handle** or File Handle with Chuck Used to hold gravers while sharpening.

**9. Templates** Used to draw scroll designs and patterns on surfaces to be engraved.

**10. Engraving Block with Work Holding Pins and Fixtures** This is a good investment for any jeweler and essential for engraving work.

**11. Freedom Texturing Points Available for the H.9D Handpiece –**

Carbide Stylus with 3/32" A-10215 (2.35mm) shank. This stylus is used to shade and texture surfaces around or between engraved lines.

## Getting the Best Results and Performance from your Freedom PowerGraver —

### Don't Push –

Traditionally it has been necessary to push and then push harder to get a graver to move. With the PowerGraver pushing actually reduces the effectiveness of the handpiece. The harder you push the less effective it becomes. The tool requires the freedom to work. This freedom to work is achieved by applying just enough force to keep the graver in contact with the metal while you guide it where you want the tip of the tool to cut or hammer. A light touch provides control which will result in better quality work.

### Use a Light Touch –

Try to develop a light touch. Unless required, a huge bead over a stone is unnecessary. Large beads over the stone have a tendency to cover it up and detract from the size and character of the stone. When bright cutting, remember the cut should never expose the girdle of the stone. This necessitates a shallow, smooth cut to enhance the size and beauty of the stone.

Fine quality engraving does not require deep cuts. Deep engraving, because of its inherent size, takes away from the fine detail that can be gained by cutting a lighter line. Try a lighter touch.

### Secure Work Pieces on a Solid Base –

Whenever possible secure the piece to be worked in a rigid, solid holding device.

For engraving and most setting, texturing, Florentine and carving, an engraver's block is a valuable asset. Other jobs can be done in a bench mounted fixture such as a ring clamp or work holding vise if it is mounted on a solid surface or bench top. The objective is to eliminate the "shock absorbing" effect of a hand held project. The more solidly mounted the work the less impact is needed to accomplish the work.

### Maintain and Sharpen Your Gravers

Whether bead setting, bright cutting, carving, or any work using a graver, the maximum efficiency and highest quality are achieved by a sharp, clean graver. Once the graver has dulled or become coated with residue from the metal being cut, the chance of slipping increases and the cuts become crude. Keep the gravers maintained and the work will go faster and look better.

### Experiment –

The PowerGraver is a very versatile tool capable of producing quality work in many different application. Experiment with different speed settings (strokes per minute) and impact adjustments as you are using the PowerGraver. Find the settings that work best for each job. You may want to mark certain speed settings on the dial control face or make a card showing different settings for different tools or jobs.

## Use Your Other Foredom Handpieces with the PowerGraver –

Because the PowerGraver motor has much more torque at low speed (under 2,800 RPM) than a standard Series SR, TX or LX Foredom flexible shaft power tool, you will find it excellent for doing certain work with rotary handpieces such as the H.30® or H.8. You can set the speed on the dial and start/stop the handpiece with an optional on/off foot switch. Wax carving is a good example of work done better at a lower speed. Polishing, cleaning and drilling are also done better at low speed in many applications.

## PowerGraver- Info, Setup and Maintenance

### M.PGX Motor

Permanently lubricated ball bearing motor for quiet, trouble free performance. This smooth running, high torque motor is designed specifically for use with the H.9D handpiece for power assisted engraving and stone setting. The M.PGX Motor can be used with other Foredom handpieces for low speed, high torque operations such as drilling. Motor also comes equipped with a special, extra flexible neoprene sheath and a six foot long power cord. The M.PGX Motor has a Two Year Warranty.



### C.EMGX Dial Speed Control

Solid state dial control in plastic housing. Motor speed can be varied from 500 to 2,800 strokes per minute and set at the optimum speed for the job. Both the 230 Volt or 115 Volt version of this speed control have a 1.5 Amp fuse which can be replaced: Part No. CP10543.

### PowerGraver Kit K.2293 Contains:



**K.2293 –  
for 115V AC**

**K.2293-2 –  
for 230V AC**



### H.9D Handpiece

Chuck type handpiece comes with 3 interchangeable collets (3/32", 1/8", and 3mm) for holding different sizes and shapes of popular gravers, as well as beading and setting tools. Adjusting ring changes impact force. The palm rest provides the comfort and "feel" of a hand engraving tool. This handpiece has a special quick disconnect which fits only the PGX Motor sheath.

### K.2293 Accessories

#### Collets

HP603 – 3/32" (2.35mm)

HP604 – 1/8"

HP605 – 3mm

**4 Graver Set** – Square, Onglette, Round, Oval Points with 3/32" (2.35mm) shanks

A-10215 Carbide Stylus

A-10177P Anvil Point

### Maintenance Supplies

MS10005 – Handpiece Oil in Dispenser

MS10006 – Flexible Shaft Grease in Tube

MP319P – Replacement Motor Brush pair

CP10543 – Replacement Fuse for the C.EMGX Dial Speed Control for 115V AC or 230V AC

### Optional PowerGraver Equipment and Accessories

#### C.FCGX Foot Switch

Optional On/Off foot switch turns motor on at the speed set on the EMGX dial speed control with six foot long power cord.





### Accessories

Collets:  
HP603 (3/32"),  
HP604 (1/8")  
HP605 (3mm)

Gravers:  
A-G91 #52 Round  
A-G92 #3 Onlettle  
A-G93 #2 Bevel  
A-G94 #40 Flat  
10215 Carbide Stylus  
10177P Anvil Point

Variable Speed  
Dial Control

## The PowerGraver Kit

The Foredom® PowerGraver is a complete power tool used to perform a wide variety of tasks such as engraving, stone setting, bright cutting, bead raising, and other applications requiring the use of a graver or a hammering effect. Foredom power tools are manufactured to high standards of precision and with proper use and regular maintenance will give you years of trouble-free performance.

The Foredom PowerGraver Kit K.2293 consists of a permanent magnet DC motor, flexible shaft with neoprene sheath, dedicated handpiece with palm rest, variable speed dial control, and accessories listed at left. Kit K.2293 also includes collet changing

wrenches, handpiece oil, flexible shaft grease.

Locate and identify all components before discarding the packing list and materials that came with your PowerGraver.

On/Off Foot Switch is available.

### Specifications

**M.PGX Motor:** 125 Volt DC; Ball Bearing Permanent Magnet Motor, Operable Speed Range: 500 – 2,800 RPM.

PGX-1 is for use with 115Volt AC.

PGX-2 is for use with 230Volt AC.

**C.EMGX Dial Control:** Variable speed manually operated electronic control.

EMGX-1 is for use with 115Volt AC.

EMGX-2 is for use with 230Volt AC.

**Shaft/Sheath:** Shaft S-93 is 39" long, and .150" in diameter. Flexible Neoprene Sheath S-76N is 36-1/4" long.

**FCGX Foot Switch:** On/Off foot-operated switching. 115V or 230V AC.

## Assembly Instructions

**Always make sure your power tool is unplugged during assembly.**

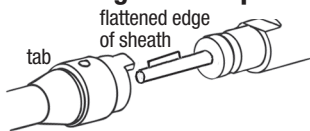
The PowerGraver ships with the shaft and sheath assembled, however, **please check to be sure that the tip of the shaft extends 3/4" beyond the end of the sheath.** If it needs to be adjusted, place the entire unit on a flat surface with shaft and sheath extended straight.



Adjust the exposed tip of the flexible shaft so that it extends 3/4" beyond the sheath, as shown. This is done by

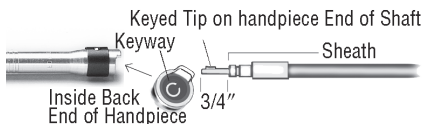
loosening the set screw in the motor connector and moving the sheath in or out of the motor connector. When the correct adjustment is made, tighten the set screw in the connector. See photo on bottom of page.

### Connecting the Handpiece:



Unlike other Foredom Handpieces, the H.9D handpiece has a tab on the end where it connects to the shaft and sheath (shown above). The tab slides over the flattened edge on the sheath. The H.9D will not fit other Foredom sheaths. However, other handpieces can be attached to the PowerGraver shaft for slow speed jobs.

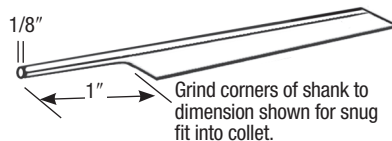
**1. In addition to aligning the outer tab,** the key tip at the end of the flexible shaft must be lined up with the keyway slot inside the end of the



handpiece. Do this by looking into the rear of the handpiece before pushing it on. If it is not in line, turn the key tip or the handpiece to the correct position while being sure to also align the outer tab with the flat outer edge of the shaft. Both connections must be properly aligned and they move or turn independently of each other. The handpiece is easy to remove from the flexible shaft by simply pulling it off the shaft and sheath with a firm grip.



**2. Install the Palm Rest.** Slide the larger opening over the front of the handpiece and place it as close to the impact adjustment ring as possible. Rotate the palm rest to the most comfortable position and tighten set screw with a small flat-head screwdriver. Use of the palm rest

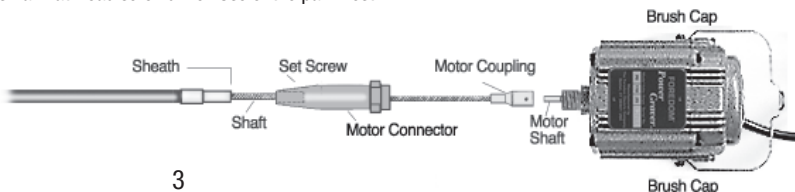


is a matter of personal preference.

### Installing Accessories

The PowerGraver can take standard gravers and other accessories with 3/32" (2.35mm), 1/8" (3.18mm) and 3mm diameter shanks. Choose the correct accessory and collet for your particular application. We recommend that you grind and trim standard graver shanks to the dimension illustrated above.

To install an accessory, insert one wrench into the wrench flats of handpiece. Insert other wrench into wrench flats of chuck nut. Loosen chuck nut. Insert accessory as far as possible into the collet. Tighten chuck nut. Test for a secure hold by pulling on accessory. Remove wrenches. To release an accessory, follow the same steps.



## Changing Collets

The H.9D handpiece has collets to fit three different shank sizes: 3/32", 1/8" and 3mm. Collets are shank size specific and you will need to change a collet to match the size of the accessory you are using. Collets are easy to change: Unscrew the chuck nut and slip out collet. Slip in new collet and screw the chuck nut back into place.



## Adjusting Impact of Hammer

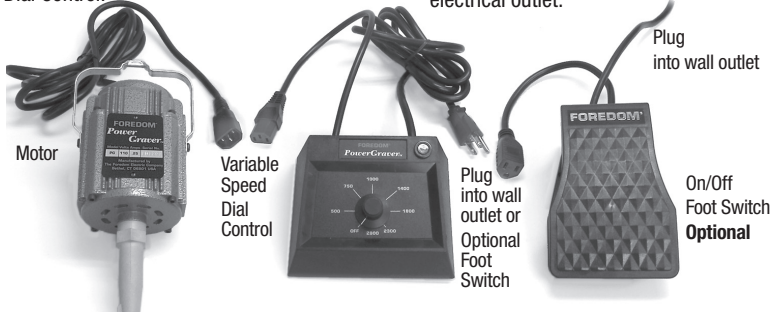
The impact of the stroke is adjusted by rotating the knurled ring on the handpiece clockwise towards the chuck nut for a lighter impact – and counterclockwise towards the back for a heavier impact.

## Connecting Motor and Control

1. Connect motor cord to short cord of Dial Control.

2. Connect long cord of Dial Control into wall outlet or into short cord of On/Off Foot Switch.

3. Plug the On/Off Foot Switch into an electrical outlet.



## Maintenance Procedures

**Always make sure your power tool is unplugged during maintenance!**

It is very important to routinely clean your Foredom Power Tool and lubricate the shaft (NOT the motor), especially in areas that generate a lot of dust.

**Dirt and improper lubrication are the most common causes of poor operation and excessive wear.**

**Always disconnect power tool before cleaning or servicing.**

**Note: The M.PGX has permanently lubricated ball bearings and does not require additional lubrication.**

## Routine Cleaning of Motors

Foredom Motors need air circulation through the motor housing to remove waste heat and cool the windings. Inlet and outlet slots provide the means for air flow. However, saw dust and conductive debris (like metal filings or gold dust) can enter in through these slots. If not cleaned regularly, dust can collect, making a bridge between parts, causing an electrical short.

**In high dust environments, Foredom recommends cleaning the motor every 40 hours of use.**

To remove dirt and dust buildup, motor brushes should be removed, and air should be blown through the motor. Then replace motor brushes.

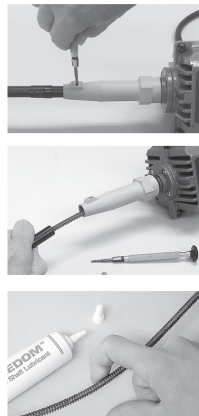
## Routine Cleaning and Lubrication of Flexible Inner Shaft

The shaft should be checked, wiped clean, and re-lubricated with grease every 50 hours of use. With every 200 hours of use, the shaft should be thoroughly cleaned with solvent and lubricated. Use Foredom flex shaft grease (p/n MS10006) or high quality white lubricating grease.

## Exposing the Inner Shaft

1. Remove handpiece (see previous page).
2. Loosen set screw on motor connector.
3. Slide outer sheath out of motor connector and wipe shaft clean.

4. Apply a **very light** coating of lubrication to shaft starting at the top and working down-



## Operation

Read all safety instructions on page 2 before using your Foredom PowerGraver. **Wear proper eye and face protection to protect yourself** from injuries caused by flying debris or chips from the work being done.

Your Foredom® motor may be operated in a vertical or horizontal position. If the motor is hung up above a workbench, be sure to fasten it securely.

**Do Not Bend the Flexible Shaft at a Tight Angle.** Shafts and sheaths last longer when they are used without sharp bends. If used at angles or loops, wear will occur at the points of greatest friction.

**Do Not Force the Tool.** Let the speed of the tool do the work. Avoid using too much pressure.

## Stroke/Speed Adjustment

The strokes per minute are determined by motor speed, which can be varied from 500 to 2,800 strokes. Set the speed desired with the knob on the Variable Speed Dial Control. Both speed and impact can be adjusted while the motor is running. The Optional On/Off Foot Switch will turn the motor on or off at the speed set on the speed control.

ward to about five inches from the handpiece end. Apply grease with your finger tip or small brush. Don't overdo, apply a light film of grease. Once the machine is running, the shaft itself will spread the grease. If too much grease is applied, the excess will work its way into the handpiece and will make the handpiece run hot. For this reason, apply a bit less near the handpiece end of the shaft.

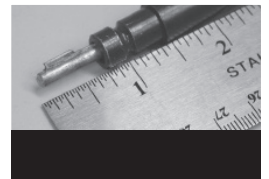
**Never operate the motor with the outer sheath removed from the flexible shaft.**

5. Replace and adjust sheath so that shaft key tip extends 3/4" (19mm) from sheath. Retighten the set screw in motor connector.

6. Clean outside of sheath by wiping with a cloth.

7. **Before attaching the handpiece**, hang and run the motor for about 10 minutes to allow enough time for the grease to warm up, spread and drain off. Wipe off any excess grease at tip end of sheath.

8. Re-attach handpiece.



**Always make sure your power tool is unplugged during maintenance procedures!**

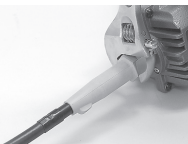
### Replacing Worn Shafts and Sheaths

Shafts and sheaths last longer when they are not used at sharp angles or loops, since wear occurs at the points of greatest friction. There is no way to avoid ultimate wear, and under normal conditions a flexible shaft machine may require several replacement shafts and sheaths during its lifetime.

To expose the inner shaft follow steps 1, 2, and 3 on the previous page.

Next, remove motor connector with 1" open end or adjustable wrench. **Motor connector has a left hand thread and must be turned clockwise (right)** for removal.

Loosen set screw on the flexible shaft motor coupling and slide shaft off the motor shaft.



### Installation of New Shaft

1. After removing old shaft, loosen set screw on the new flexible shaft motor coupling and slide coupling onto motor shaft.

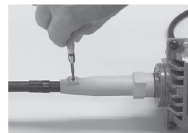
2. Tighten set screw securely onto the flat of the motor shaft.

3. Grease shaft prior to putting on the sheath. (See lubrication instructions on page 4.)

4. Slide motor connector back up over the shaft and tighten to the left (counterclockwise).

5. Slide sheath over flexible shaft with plain fitting directed toward the motor and into the motor connector. (Each end of the sheath has a metal fitting. One is plain, the other fits the handpiece.)

6. Adjust the shaft as shown below and tighten sheath set screw in motor connector.

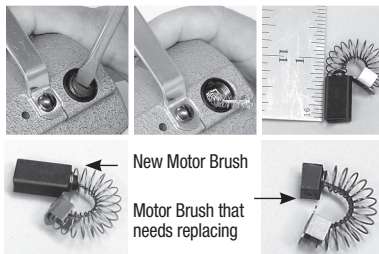


### Shaft and Sheath Adjustment:

Place the entire unit on a flat surface with shaft and sheath extended straight. Adjust the exposed tip of the flexible shaft at the handpiece end so that it extends 3/4" (19mm) beyond the sheath, as shown at right above. This is done by moving the sheath in or out of the motor connector. When the correct adjustment is made, tighten the screw in the motor connector.



### Replacement of Motor Brushes



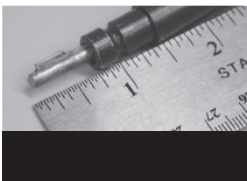
MP319P motor brushes should be checked for wear periodically. When new, they are approximately 3/4" long. They should be replaced when they have worn to 1/4". To remove brushes, disconnect motor power cord and unscrew the brush caps. Be sure that the contour of the brushes match the contour of the armature when replacing them. Be sure to replace both motor brushes even if one of them is less worn than the other. To remove dirt and dust buildup, when motor brushes are checked or replaced, compressed air should be blown through the motor.

### Handpiece Lubrication

The H.9D Handpiece requires lubrication approximately every 40 hours of use. Use oiler MS10005 to apply two drops of oil into the oiling hole located on the barrel of the handpiece under the palm rest and into the hole on the rear of the duplex spring connection. To remove palm rest, loosen set screw. **Do not apply more than two drops of oil.**

### Replacement Fuse

The C.EMGX Dial Speed Control may require CP10543 Replacement Fuse for either 115V AC or 230V AC.



### Repair Service

Authorized repair service is available at the Foredom factory in Danbury, Connecticut, USA.

If you believe your item is under warranty, please contact our customer service team for assistance.

To learn more about our flat-rate repair service and how to arrange for a repair.

Call 1-800-272-2885, email [customerservice@blackstoneind.com](mailto:customerservice@blackstoneind.com), or visit [www.foredom.net/warranty-repairs](http://www.foredom.net/warranty-repairs)

Please retain your proof of purchase for warranty repairs.

### Storage

Store your Foredom power tools in a dry, clean, dust-free area and out of the reach of children.

**Please retain your proof of purchase for warranty repairs.**

### Contact Information

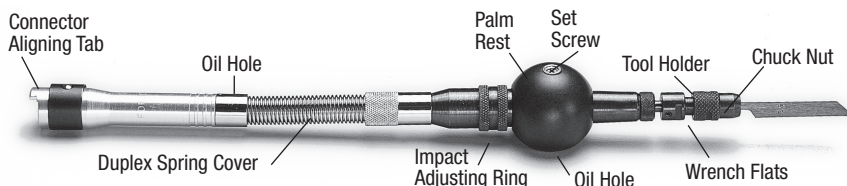
For more information on Foredom machines, handpieces or accessories, contact your local dealer. When no local dealer is available, write, call, fax or visit on-line:

**Foredom Electric Company**

Tel.: (203) 792-8622

Email: [customerservice@blackstoneind.com](mailto:customerservice@blackstoneind.com)

Website: [www.foredom.net](http://www.foredom.net)



### **LIMITED WARRANTY**

Warranty period is 2 years for motors, speed controls, filter hoods, lathes and arch trimmer, 90 days for handpieces, and 1 year for drill presses and switches.

Blackstone Industries, Inc. d/b/a The Foredom Electric Company warrants, to the original purchaser only, that its products will be free from defects in material or workmanship for the applicable period of time indicated above following the purchase date. During the warranty period, the defective product will be repaired or replaced without charge or, at our sole option, the purchase price will be refunded. This warranty does not cover damage caused in transit or by accident, misuse or ordinary wear.

ALL IMPLIED WARRANTIES INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, ARE LIMITED IN DURATION TO THE APPLICABLE WARRANTY PERIOD. IN NO EVENT WILL WE BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusion may not apply to you.

At our sole option, repair, replacement or refund will be made. **Please call 1-800-272-2885, or email [customerservice@blackstoneind.com](mailto:customerservice@blackstoneind.com) for further instructions.**

All warranty repairs must be done at our factory at the above address. We will not pay any shipping or transportation charges. Shafts, sheaths and duplex springs are not covered by this warranty.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.