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GemMaster II

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OPERATIONS MANUAL

FAC-ETTE MANUFACTURING, INC.

GEM MASTER II

OPERATION MANUAL

THIS MANUAL SHOULD BE READ BEFORE ANY UNPACKING OR ASSEMBLY IS DONE.

FIGURE 1

FIGURE 1 INDEX

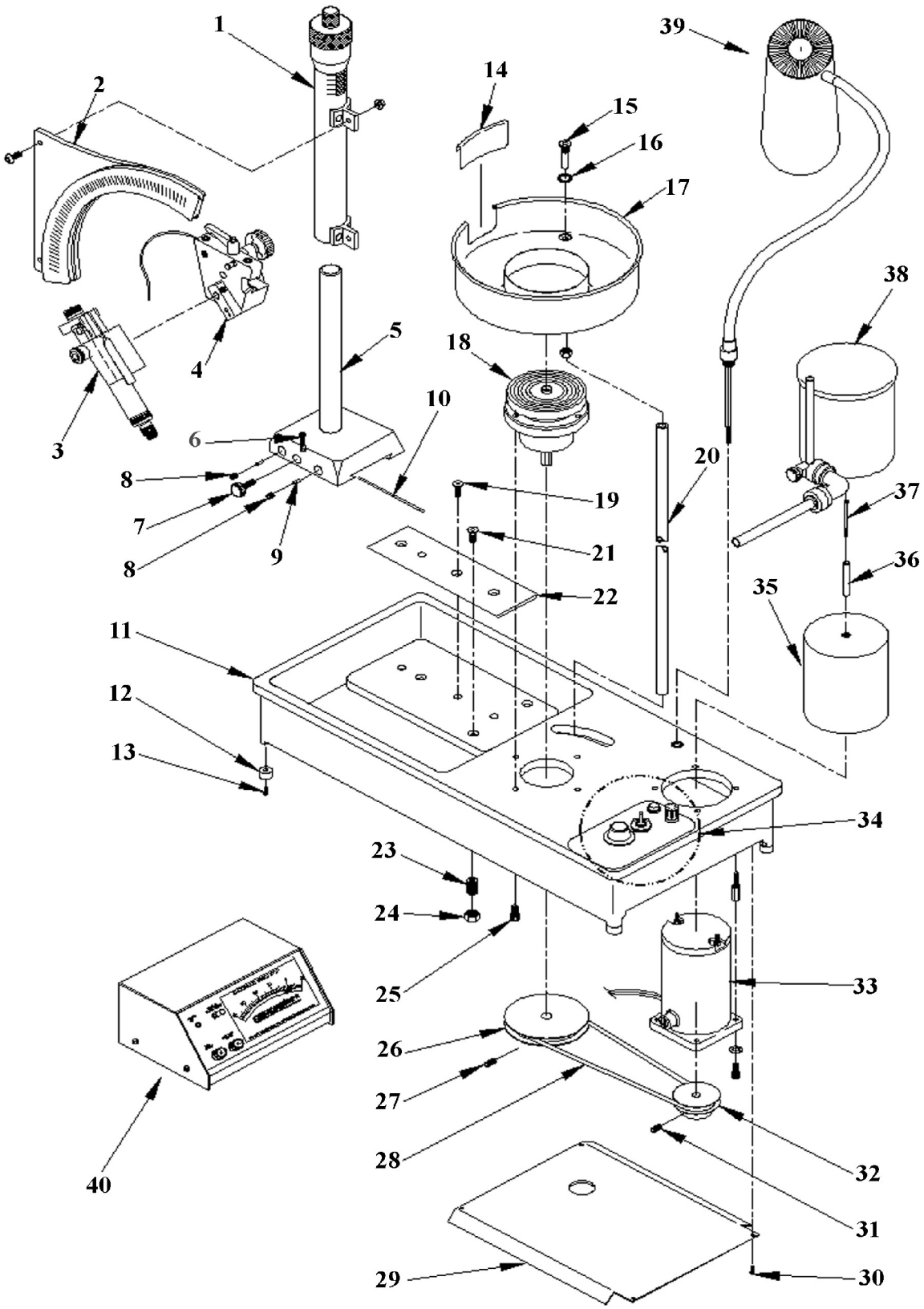
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Figure 1

FIGURE 1 INDEX

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I. INTRODUCTION

CONGRATULATIONS! You have purchased a Fac-Ette Manufacturing, Inc., **GEM MASTER II**.

FAC-ETTE, the most respected name in faceting equipment, brings world-class technology to the art of faceting. With its research and development facilities, the company has long set the standards throughout the world for faceting accuracy. The machine you have purchased takes accuracy one step further. We know of no other faceting machine on the market today that has reached the same degree of precision or accuracy.

This instrument was made with precision and care, and with the following aims in mind: to make your faceting easier, more accurate, faster, and therefore more enjoyable. Your **GEM MASTER II** was created from the best materials, including brass, stainless steel, chrome-plated tool steel, and anodized aluminum. All parts were machined on Computer Numeric Controlled automatic machinery to extremely close tolerances for superior accuracy when cutting facets. The graduations on the protractor, mast barrel, and thimble were etched with a laser beam to insure accuracy.

Whether you facet as a hobby or as a profession (or maybe a little of both), the **GEM MASTER II** will provide you with many long years of accurate service.

ABOUT THIS MANUAL

This manual should be read and the instrument parts learned before assembly is attempted. The manual is divided into five sections:

I. INTRODUCTION

II. UNPACKING, SETTING UP, AND CHECKING OUT THE GEM MASTER II Unpacking the box, making sure everything is there, and setting up the instrument for use.

III. USING THE GEM MASTER II

A tour of the entire instrument. We will describe each of the parts, controls and adjustments and explain their use.

IV. FACETING THE ROUND BRILLIANT CUT ON THE GEM MASTER II

A step-by-step guide to cutting a standard round brilliant stone with specific instructions as they relate to the GEM MASTER II.

V. MAINTENANCE

Preventive maintenance procedures to insure a long and trouble free life for your GEM MASTER II.

II. UNPACKING, SETTING UP, AND CHECKING OUT OF THE GEM MASTER II

A. UNPACKING AND SETTING UP THE GEM MASTER II

ALL ORIGINAL PACKAGING MATERIAL SHOULD BE RETAINED. SHIPPING THE MACHINE IN PACKAGING OTHER THAN WHAT IS PROVIDED BY THE MANUFACTURER COULD RESULT IN DAMAGE TO THE MACHINE AND VOID THE WARRANTY.

If you are reading this manual, then you have already opened the box, so there is not point in telling you to do that. If you are like most people, you have probably pulled most everything out of the box and have it spread out on the floor. It's okay, but now let's check and make sure you received everything you were supposed to receive.

If you have only opened the main box, the following information will make it easier for you to unpack the machine.

A checklist that came in the box was used by the packer at the factory. Try to locate all items listed. If you are missing anything, contact the factory as soon as possible and report the shortage.

The instrument should be situated so that the mast is on the left and the control section is on the right, assuming a mast on left instrument.

Remove all paper packing. You will then see a number of labeled packages. Packed inside the packages are the Protractor/Head Assembly, the Splash Pan assembly, the Electronic Micro Stop Assembly, and the Drip Can Assembly. Remove these items. There is a cardboard liner which extends from the top of the instrument base to the top of the box on all four sides. This liner keeps the instrument base in place during shipping. Remove this liner by pulling it straight up and out of the box. Now remove any other items which may be packed in the base. Lay the shipping carton on a long side, with mast and motor closest to the surface on which the box is resting.

Grasp the mast with a clean cloth and the motor cover and gently pull the instrument base from the shipping carton. Put the instrument base on your working area with the mast in a vertical position. Packed inside the accessories package are four rubber feet and four stainless steel (10 X 1/2) round-head screws. The rubber feet should be attached to each corner of the bottom edge of the base, in the threaded holes, using the stainless steel screws. Laying the instrument base on its side will give you clear access to the bottom. **Use care not to strike the mast or lamp against anything while performing this task.** The mast was aligned at the factory to be perpendicular with the lap. If the mast is struck there is a possibility it will not be aligned any longer. While you have the instrument lying on its side, you may want to check the serial number, marked on the underside of the instrument base. A serial number is also marked on the front side of the protractor arm assembly. Once you have installed the rubber feet and checked the serial number, stand the instrument upright with the instrument base resting on the rubber feet.

Note: To identify the instrument as mast on left or mast on right, do the following: face the instrument so that the power cord is in the back and the printing on the controls reads properly from left to right. In this position, if the mast is

on the left it is referred to as mast on left instrument, and if the mast is on the right it is referred to as mast on right instrument.

Note: The instructions assume a mast on left instrument. If you ordered a mast on right instrument, you need to reverse the references to right and left in this section.

Now open the box marked Protractor/Head Assembly. Inside are two items packed in a foam cushion. One is the protractor/arm assembly and the other is the saddle block and dop spindle. Those parts assembled are called the head assembly. **These items should be handled with extreme care. DO NOT DROP**. Remove these assemblies and lay them gently on a clean, uncluttered work area.

Wipe the mast with a facial tissue. The mast should be lightly oiled with the lubricant supplied. **DO NOT PUT ANY GREASE ON THE MAST**. Grease on the mast may cause the column to stick. Put a few drops of lubricant on the mast and spread it evenly with a soft clean cloth. **DO NOT USE YOUR FINGERS**, as they may leave acid on the metal.

Note: There is an oil seal just inside the open end of the mast barrel. Put a few drops of oil on the seal. Use care not to cut or damage this seal while installing the protractor/arm assembly onto the mast.

Take the protractor/arm assembly and place the open end of the mast barrel over the mast. With a slightly wobbling rotating motion, slide the mast barrel down onto the mast. It should slide on easily. The assembly should pivot back and forth freely, and if the instrument is level, it should stay where you put it. If it has a tendency to swing forward or backward, the instrument is not quite level. Shim the worktable legs until the protractor/arm assembly no longer moves when you let it go.

Next, slide the saddle block onto the protractor. While handling the saddle block and dop spindle assembly, **be careful that the stop key on the dop spindle assembly does not strike the strain gauge**. This unit is very sensitive and the gauge can be damaged by a sudden strike or mechanical shock.

Open the box with the slash pan, the 60” drain tubing and the splash pan gate. The drain tubing should be inserted up through the hole in the cover plate on the bottom of the instrument and through the curved slot on top of the instrument base above it. The drain tubing should be pushed over the metal drain tube on the splash pan before the splash pan is installed in its final position. Place the splash pan over the lap platen with the drain tube protruding through the curved slot on top of the instrument base previously mentioned. The splash pan should be placed so that the cutout opening in the side of the pan is facing the mast.

A 60-inch plastic tube is provided to allow the splash pan to drain continually into a bucket placed under the work area. Since the instrument may be set into a cutout in a desk top or work bench, the plastic drain tube will come out from the bottom of the instrument. Make sure you position the bucket so that you will not kick it over with your feet. It is best to mount the drain bucket on a shelf about 6 to 12 inches off the floor. You may want to cut the drain tube to a more useful length, but the 60” supplied is for maximum reasonable reach.

The splash pan also comes with a movable plastic piece, called the gate. The gate is used to cover the cutout in the splash pan when you are not grinding or polishing the girdle of your stone.

Now unpack the Electronic Micro Stop (EMS). Route the cable and connector from the protractor/head assembly to the location you have chosen for the EMS. Attach the matching connector to the receptacle provided on the rear of the EMS unit.

A number of accessories have been supplied with your new GEM MASTER II. There are three allen wrenches, sizes 1/8" (Part #6528), 5/32" (Part #6530), and 3/16" (Part #6531). The 1/8" wrench is used to adjust the mast base gib, the 5/32" wrench is used to remove the screws from the mast dovetail plate so that it can be removed for cleaning.

An assortment of keyed dops are also supplied with the instrument to get you started.

A set of calipers has been included which are graduated both in millimeters and inches.

A spare 6-A fuse is provided for use with the motor drive system. The fuse holder is located on top of the instrument base near the motor speed control knob.

B. CHECK OUT OF THE GEM MASTER II

Your GEM MASTER II was tested and aligned at the factory with all parts in place.

The head assembly from one instrument should not be interchanged with the head assembly from another instrument without checking the alignment because the head assembly is aligned at the factory on the machine with which it is to be use.

We are now ready for a preliminary check of the instruments. Make sure all switches and controls (there are three) are OFF. The FWD/OFF/REV should be in the center, or OFF, position. The switch on the back of the EMS is marked 1 and 0. The O, which if OFF, should be depressed. The motor speed control knob should be turned fully counterclockwise with the marker on the motor speed control pointing to the zero reference mark on the dial.

Attach the power cord supplied with the instrument to the inlet receptacle provided on the back side of the instrument base. Likewise, attach the power cord that is supplied with the ELECTRONIC MICRO STOP (EMS) to the inlet receptacle provided on the back of the EMS. Plug the other ends of these cords into a 120 volt AC 60 cycle outlet. For use in countries where 240 volt power is used, 240 volt equipment and cords are available from Fac-Ette.

Try turning on the lamp; it should light. Now put the FWD/OFF/REV switch into the FWD position. The pilot lamp should light and the lap spindle should begin to rotate slowly counterclockwise. (The 240 volt units do not have a pilot lamp.) Now turn the speed control slightly in a clockwise direction. The lap spindle should increase in speed. You may now turn the speed control knob to the full clockwise position and then back to zero. The lap spindle will go to maximum speed, and then as the speed control knob approaches zero, the lap spindle will stop momentarily then begin to rotate slowly. This condition is normal. When the lap spindle stops decelerating, pull the FWD/OFF/REV switch to the OFF position. The lap spindle should begin to rotate slowly in a clockwise direction. There is no mechanism built into the FWD/OFF/REV switch to prevent direct reversal of the lap motor. Damage to the motor controller or motor could occur if the direction of the motor were reversed while run-

ning at high speeds. We recommend that the motor be allowed to come to a complete stop before reversing direction. The motor should always be started at lowest speed possible.

Turn the FWD/OFF/REV switch to the OFF position and the lap spindle should stop rotating.

We are now ready for a preliminary checkout of the EMS.

Once again, we want to remind you that it is extremely important that you do not allow the dop spindle to hit or in any way mechanically shock the strain gauge. A sudden shock could permanently damage the strain gauge.

Lower the collet end of the dop spindle assembly toward the lap spindle assembly until the stop key rests against the strain gauge. You may have to raise the head assembly to accomplish this. You can raise the head assembly by turning the "THIMBLE" clockwise.

Turn the OFF/ON switch on the back of the Electronic Micro Stop (EMS) to the ON position by pressing in the side of the rocker switch marked I; the pilot light on the Electronic Micro Stop should light. At this point, the meter needle may go all the way either to the left or right, or stay somewhere in the mid-range. Turn the METER ADJUST (zero adjust) knob, located to the left of the meter face, counterclockwise to move the meter needle to the left, or clockwise to move the meter needle to the right. If the alarm sounds, just turn the ALARM SET control clockwise until it stops, or ignore it. We will cover this feature later. Adjust the METER ADJUST knob until the meter needle is over the number 40 on the left side of the meter face. With the needle at 40, apply a slight downward pressure on the collet end of the dop spindle assembly. The needle should move to the right. As you increase or decrease pressure on the dop spindle, the meter reading should vary accordingly. If you get no response from the meter, you may have forgotten to connect the cable coming from the strain gauge located on the saddle block assembly to the EMS. If after making sure all your connections are correct you still get no response from the EMS, contact your FAC-ETTE dealer or the factory.

III. USING THE GEM MASTER II

In this chapter we are going to take a complete tour of the GEM MASTER II describing all of its components, controls, and adjustments, what they are used for and how to use them. If you are an experienced faceter, some of the descriptions will seem "old-hat" to you. We suggest you read them anyway.

A. THE MAST

The mast is located on either the left or right side of the instrument, depending on which model you own, and supports the head assembly. The mast moves horizontally on its base (left or right) to adjust the stone position on the lap. It can be locked into place using the knurled locking screw at the mast base. When the knurled locking screw is loosened, the mast is unlocked and can be moved. When the knurled locking screw is tightened, the mast is securely locked into place. A little torque on the screw should be sufficient to lock the mast firmly. **DO NOT OVER TIGHTEN.**

Unlock the mast (if it isn't already unlocked) and move it all the way to the left. It should move freely, requiring little effort.

B. VERTICAL ADJUSTMENT

The design of the GEM MASTER II places the stone being cut at or very near the center of the protractor radius. Therefore, horizontal adjustments of the mast position only need to be made when cutting or polishing the girdle, and vertical adjustments are kept to a minimum.

It is necessary to move the stone up and down only a small amount as the angle setting and lap thickness changes, and to adjust the amount of material that is removed from the stone before reaching the desired stone size. The part of the head assembly that moves up and down is called the mast barrel. The mast barrel height is adjusted by means of a large, easy to read micrometer, calibrated in millimeters.

The barrel is adjusted up and down by turning the micrometer thimble located at the top of the mast barrel. You can turn the small knurled knob on the top, or the large knurled one just beneath it. It makes no difference; use the one that feels best for you. There is a split nut built into the top of the mast barrel that can be adjusted as necessary to compensate for wear and maintain a “like new” feel to the micrometer. However, it will be a long time before any adjustment is necessary.

Notice that there are numbers and lines inscribed on the mast barrel. These markings, inscribed by a laser process, represent the mast barrel height marked in millimeters. Each line on the **barrel** represents one millimeter. The micrometer thimble is also inscribed with lines and numbers. Each line on the thimble represents 1/100 of a millimeter. One full turn of the thimble equals one millimeter of vertical travel of the mast barrel and one line on the vertical scale.

Zero on the vertical scale represents the highest mast setting, while higher numbers represent lower mast settings. Turning the thimble clockwise increases the mast barrel height, and consequently turning the thimble counterclockwise decreases the mast barrel height. The arrows on the micrometer thimble indicate the up direction.

After reading the above paragraph, you may feel that the numbers are backwards (high numbers for lower height?). They are backwards if you think of them in terms of mast barrel height. But when faceting, knowing the mast barrel height is of little value. What is of value is predicting how much material will be removed for a particular mast barrel height adjustment. The numbers represent exactly how much material will be removed: the higher the number, the more material. This is best illustrated by an example: you have cut to the zero setting on the EMS and still have not removed enough material. The thimble is at the 16 line on the mast barrel vertical scale and at .2 on the micrometer thimble. It looks like you need to remove a full millimeter more of material. Simply turn the thimble one turn counterclockwise back to .2 again. The vertical scale now reads 17. Cut o the zero setting on the EMS and one millimeter of material has been removed from each side of the stone. It looks like another 1/2 millimeter will just about finish the facet. Turn the thimble 1/2 turn counterclockwise (from .2 to .7) and cut to the zero setting on the EMS again. Exactly 1/2 millimeter of additional material has been removed from each side of the stone.

The mast barrel height adjustments are absolutely repeatable settings, for the same stone and lap height. Assuming your facet rough is all shaped about the same and is dopped very near the center, when the dop is placed into the dop spindle against the key and you use the same laps, you should be able to exactly duplicate a previously cut stone if you have

recorded that stone's settings. This is good for making a matched pair of stones for earrings, for example.

One of the uses for the vertical adjustment is in rounding the stone at the 90 degree setting. Here you can cut or preform the stone exactly to any predetermined size.

C. ANGLE ADJUSTMENT

The protractor is the large curved metal support for the dop spindle assembly. It is inscribed from 0 to 100 degrees for the angle adjustment of your stone. Riding on the protractor is the saddle block. The saddle block assembly contains a geared knob to adjust its position on the protractor; this sets the angle of the facet you are cutting.

The angle adjustment knob is located on the rear of the saddle block. This knob actually turns a small pinion gear riding along the teeth of the gear segment that you can see extending the length of the back of the protractor. The small size of this gear means that very fine adjustments in the angle setting may be made. By loosening the saddle block clamp lever, you can change the angle setting of the saddle block; carefully resetting the saddle block clamp locks the angle.

On the front of the saddle block is a window where the angle markings on the protractor may be read. A line is inscribed on the lower lip of the window to indicate the angle setting called the angle marker. The protractor is marked in 2/10 degree increments. To set the angle on any even 1/10 degree (like 35.2, 44.6, 23.8), set the angle marker to coincide exactly with the appropriate mark on the protractor. To set the angle to any odd 1/10 degree (like 37.7, 26.5), set the angle marker exactly between two lines on the protractor. Note that the higher numbers are toward the left, and the lower numbers are toward the right. Keep this in mind when setting the protractor between the lines to make sure you are between the proper two.

Once you have set the angle, the saddle block can be locked into place with the locking lever located on top of the saddle block. Very little pressure is required to securely lock the saddle block. **DO NOT OVER TIGHTEN**. Over tightening can damage the protractor, the saddle block, or both. If after locking the saddle block, the lever is in the way of the dop spindle assembly, you can move this lever without unlocking the saddle block. With the thumb and forefinger, grasp each side of the lever base. Pull upward against the spring pressure and rotate the lever in the direction you wish, then release the lever and it will again engage the locking shaft.

Because the stone is nearly at the center of the quadrant radius there is very little elevation change when the facet angle is changed. Therefore, it is not necessary to make great changes in vertical settings every time the facet angle is changed. Sometimes the vertical setting will be the same as for the previous row of facets. So the 2.0 inches of vertical travel of the column will be enough to cut nearly any stone. A one inch riser plug may be purchased as an accessory to increase this range if needed.

D. THE INDEX PLATE

The FAC-ETTE GEM MASTER II index plate is a precision machined part. It has been manufactured under very precise conditions and very close tolerances. Special packaging was designed to protect it from damage.

Care during use and handling will maintain the accuracy and life of this part. Handle it with care and keep it clean. Avoid dropping it and prevent the "v" grooves from striking other materials, because impact damage can destroy the accuracy of the index plate. The index plate divides a circle into a number of precisely equal parts and any damage to the "v" grooves will destroy its purpose.

When not in use, store the index plate in its container to keep it from contamination with foreign material or other damage. Before storing, clean the index plate, including the "v" grooves, with a soft-bristle toothbrush to remove any particle accumulated during use. **DO NOT BRUSH PAINTED SURFACES**. The brush may damage the paint.

INDEX PLATES AVAILABLE:

4	Position	72	Position
5	Position	77	Position
6	Position	80	Position
8	Position	84	Position
32	Position	96	Position
64	Position	120	Position

Each position on an index plate represents one index division. The index plates are known by the maximum number of positions they have. For example, an index plate with 64 positions is known as a 64 index plate.

The index plates are marked with numbers from the lowest incremental number of that plate to the highest number of positions the plate has. Example: 64 and 0 (zero) are at the same position since the index plate is circular, but zero is never marked. Most facet designs have their starting point at the highest index number.

Your instrument comes with one 96 index plate installed.

The index plate is located at the top end of the dop spindle. A brass lever, called the index lever, holds the index plate in the position you have set. Pushing down on the front part of the lever releases the index plate position and the dop spindle is free to revolve. Releasing the lever locks the plate into position.

If you tilt the dop spindle up so that the index plate is now at the bottom (the position at which you would inspect a stone), you will see a red line on the index plate window and the numbers on the index plate position are clearly visible on the inside. This is the index indicator. When cleaning the window, care should be exercised to avoid scratching it.

Here is the proper and fastest method for changing the index setting: Hold the dop spindle with the left hand. The thumb and forefinger should be on the knurled portion of the dop spindle (the one farther from the dop). The other end of the index lever should come to rest at the base of your little finger where the finger meets the palm of your hand. With your hand in this position, you can depress the index lever with your little finger and turn the dop spindle with the thumb and forefinger. After cutting, raise the dop spindle to inspect the stone. If the cut is good, your hand is already in position to change the index setting. You

now have a one-handed operation from cutting to changing to the next index position, all without any extra movement of your hand or the dop spindle. The stone inspection position (with the head tipped up) is the same position as that used to change the index setting.

ALWAYS BE SURE TO DOUBLE CHECK THE INDEX SETTING BEFORE LOWERING THE DOP SPINDLE FOR MORE CUTTING. ONE WRONG TOUCH ON THE LAP CAN MEAN STARTING A STONE ALL OVER.

The 32, 64 and 96 position index plates are color coded for easy identification of the facets of a standard brilliant cut. The colors are RED for the mains, YELLOW for the star or table facets, and GREEN for the girdle facets. The color will aid the user in selecting the proper position more quickly.

You may have noticed that each index setting is actually not on an index position peak, but at the space between two peaks. Also, at the highest plate number, there is a 1/8" diameter hole. This hole can be used to help identify zero. This is also a red facet color code position.

Sometimes it is necessary to let the dop spindle "free wheel" as if there were no index plate installed or when changing index plates. A pin is provided for this purpose. The index lever lockout pin is permanently mounted in the index lever block. To operate it, depress the index lever and press the pin in. While holding the pin in this position release the index lever and it will hold the lockout pin in place, keeping the index lever from contacting the index plate. The dop spindle can now turn freely and the index plate can be removed or installed.

To release the index lever lockout pin, press the index lever and the spring on the lockout pin will return the pin to the original position.

E. CHANGING INDEX PLATES

Before removing or installing an index plate, place the dop spindle in the free wheeling mode by pressing the index lever and locking it out with the index lever lockout pin.

The index plate is held in place with a knurled nut. **NEVER ADJUST SCREW AT END OF SPINDLE SHAFT, THIS WILL ALTER THE DOP KEY ALIGNMENT.** This nut can be removed with your fingers: hold the knurled collar located just above the dop collet, and turn the index plate nut counterclockwise. **NEVER HOLD THE DOP SPINDLE WITH THE INDEX LEVER WHEN REMOVING THE KNURLED NUT; IT CAN DAMAGE THE MECHANISM.** After the nut is removed, remove the spacer below it and put these two items aside. Next, grip the raised boss on the index plate out of the holder. It should move easily and freely. Use care to keep the edges of the index plate from striking any hard object. Once the index plate is removed, examine the side with the numbers and lines. You will see three cone-shaped holes. The holes are for precisely locating the plate on the dop spindle shaft. There is a key way on the index plate and a small set screw on the dop spindle shaft. The key must align with the set screw to install the index plate in order for the numbers on the plate to be aligned properly.

Look at the end of the dop spindle shaft where you just removed the index plate. You will notice three cone-shaped pins. The cone-shaped pins fit into the recesses in the index plate. **It is important to keep these parts free of grit and foreign material to insure the accuracy of the index plate positions.**

To replace the index plate, hold it by the raised boss on the side opposite the numbers. Position the key way in the index plate over the small set screw holding the mounting flange. Lower the index plate into place and rotate gently back and forth. If the plate is seated properly, no movement should be detected. Next, install the spacer. Install the knurled nut only hand tight. **DO NOT FORCE IT**.

F. INDEX OFFSET ADJUSTMENT

The INDEX OFFSET ADJUSTMENT (often referred to as the CHEATER) is the knob located halfway between the dop and the index plate. It may be rotated in either direction. Only two fingers are required to rotate the index offset adjustment. There is no locking required.

The index offset adjustment is a screw adjustment that rotates the dop spindle assembly approximately 27 degrees. By turning the dop spindle with the collet end raised as if you were examining a stone, a small opening on the index offset adjustment knob housing will allow you to view the numbers on the index offset adjustment knob which are marked 0-9. When not in use, this knob should be set at zero. For the correct setting, turn the index offset adjustment knob fully clockwise then turn the knob counterclockwise to zero with the index mark on the dop spindle housing aligned.

When using the keyed dop system, the index offset adjustment index should be set to "0". This can be accomplished by turning the index offset adjustment knob clockwise. The index mark on the index housing will rotate upward. Turn the index offset adjustment knob clockwise until the index offset adjustment index mark on the index housing is about 1/2 line above the index mark on the pivot body. Now rotate the index offset adjustment knob in a counterclockwise direction until the "0" on the index offset adjustment knob is in the center of the window and the index marks on the index housing and pivot body are matched. After transferring the stone very little or no index offset adjustment should be necessary.

The index offset adjustment seldom needs to be used on the GEM MASTER II unless you are aligning a stone that has been redopped or a stone that is being set up for removing scratches or other damage. It is built using a spring loading feature which keeps the parts in constant contact to reduce backlash.

When starting a new stone check and make sure the offset adjustment is on zero. If not at zero or mark on housing is not in alignment. It is recommended to go beyond the index mark and bring back in alignment turning in a counter clockwise direction to zero.

G. COLLET AND DOP SPINDLE

The collet is a precise means of holding the dops securely and accurately. The collet is housed inside a ground seat with a long taper to provide rigid and accurate positioning. Only finger tightening of the collet nut is required to securely hold the dops in place. **DO NOT USE TOOLS FOR TIGHTENING. DO NOT TIGHTEN THE COLLET NUT WITHOUT A DOP IN THE COLLET.** Tightening the collet nut without a dop in the collet could distort or damage the collet. To loosen the collet, loosen the collet nut until it makes contact with the retaining ring. (At this point you will notice the nut gets a little harder to turn.) Then turn the collet nut a little further until it unseats the collet. The unseating of the collet will be apparent. The dop can then be easily removed. In order to install a dop and have it fit properly it is

necessary for the collet to be in this same position. Make sure the dop key slot sets securely on the pin in the spindle.

There is a groove in the rear of the dops. This groove seats on a pin installed in the dop spindle, thus "keying" the dop to a specific position with respect to the index plate. This feature allows removal of the dop at any time during faceting and permits the operator to reinsert it later and still maintain alignment with the index plate. It also permits transferring from crown to pavilion while still having the facets aligned with no other adjustment necessary.

The dop spindle is made of stainless steel and is rust resistant. There are five bearings supporting the dop spindle, three sealed radial bearings, and two thrust bearings. A separate seal is installed to protect the bearings from abrasive materials. The bearings are spread for maximum rigidity of the shaft. The dop spindle is one piece construction from the collet through the index plate hub. THE DOP SPINDLE BEARINGS DO NOT NEED OIL. The dop spindle is not designed to be disassembled in the field and should require no maintenance.

H. MOTOR AND ELECTRONIC CONTROLS

The GEM MASTER II is equipped with a hi-torque, ball bearing direct current motor which is electronically controlled. The GEM MASTER II uses an electronic solid-state motor controller designed and built especially to power permanent magnet motors.

The lap is driven by a round polyurethane belt and does not require adjustment. The top speed of the lap is about 1,725 R.P.M., the minimum speed about 60 R.P.M. The top motor speed is about 3,100 R.P.M.

Reverse position is used when grinding and polishing at the 0 degree settings. This keeps the thrust in the correct direction to keep the pivot body against the stop key. This will prevent grinding a large radius on the side of the table of the stone. **Extreme caution must be taken at any time that the stone is pointing into the direction of lap rotation**. The stone will have a tendency to dig into the lap. This may cause the stop key to slam against the EMS strain gauge, rendering it inoperative.

The GEM MASTER II is equipped with a reversing switch as standard equipment. The lap should not be reversed when turning. To prevent reversing the motor when turning, there is a center, OFF position. This prevents damage to the circuit components or the motor by an instant reversal of the rotation. Reversing the lap spindle when turning at any speed may damage either the motor or motor controls. Be sure the lap is stopped when applying power.

To replace a fuse, unplug the GEM MASTER II, and then open the fuse holder by pressing down on the cap and turning it gently but firmly counterclockwise. Then lift the cap off and the fuse should come with it. Pull the fuse from the cap. **BE SURE THE PLUG IS DISCONNECTED FROM THE POWER SOURCE BEFORE OPENING THE FUSE HOLDER.** To install a new fuse, insert it in the cap, and reverse the procedure.

Power cords for use in countries outside the United States are available in 120 or 240 volt configuration, whichever is applicable to the country where it will be used.

I. PIVOT SHAFT

The pivot shaft connects the dop spindle assembly with the saddle block and allows the dop spindle assembly to pivot. The pivot shaft is made of stainless steel, and held in place with sealed ball bearings. A separate seal is installed to prevent any foreign material from entering the bearing bores. No lubrication is necessary on this assembly.

J. MAST SLIDE AND DOVETAIL BASE

The mast base is mounted on a hard-coat anodized tooling plate assembly. **DO NOT REMOVE OR ATTEMPT TO ADJUST BLACK BASE PLATE.** The plate should be cleaned before and after each use to remove abrasives and assure continued accuracy of the mast alignment. A good practice is to place a hand towel over the slide and around the mast, to keep abrasive material from accumulating in this area during faceting. The dovetail slide members can be lubricated with a light coating of lubricant, but then wipe the surface as dry as possible with a soft cloth.

K. LAMP

A permanently mounted goose-neck lamp is supplied with the instrument and wired to the instrument base electrical system. The switch for the lamp is located on the top of the light bulb socket.

A clear 100 watt light bulb is supplied with the lamp. However, a smaller light bulb may be a better compromise between adequate brightness and excessive heat. Some faceters prefer a frosted bulb and others prefer a clear bulb. Those who prefer a clear bulb usually use the reflection of the filament to check a facet's flatness during polishing. Decide what works best for you.

L. THE ELECTRONIC MICRO-STOP

1. GENERAL OPERATION

The GEM MASTER II Electronic Micro-Stop (EMS) is a precision instrument designed and built to be used as a measuring tool for cutting and polishing gems. It is the most accurate tool available to the professional and hobbyist alike. With it you can produce professional quality as hobbyists.

This unit has been designed to operate on standard U.S. household voltage (120 Volts, AC, 50 or 60 HZ) or for use in countries outside the United States (240 Volts, AC, 50 or 60 HZ).

The Electronic Micro-Stop is the most important innovation unique to the GEM MASTER II. It brings accuracy and repeatability in faceting to a level never before achievable. The EMS replaces the standard steel stop in (which keeps the dop arm from cutting beyond the angle set on the protractor) with a sensitive strain gauge transducer. As the stop key makes contact with the strain gauge, the needle on the meter starts to move. Assuming you stop cutting at the same point on the meter, you can cut each facet to the same depth with an accuracy of approximately fifty millionths of an inch (.000050")! Since the EMS is such an important part of the GEM MASTER II, we are going to discuss it and its use in detail.

The EMS is calibrated at the factory for a full scale meter reading of one thousandth (.002) of an inch of movement at the stone. Therefore, each division on the meter is equal to approximately fifty millionths (.000050) of in inch. Expressed in terms of degrees, this equals four ten-thousandths (.0004) of a degree.

Once the first facet in a group (like the crown main) is cut correctly, all the rest in the same group may be cut to the same stop point (meter reading) with unbelievable speed and accuracy, without even looking at the stone. This saves a great amount of time and frustration. No more measuring the girdle facets with a micrometer to make sure they are all the same size. No more constant re-cutting to even up the mains or to get a good center point. The need to establish a center point for some designs is even eliminated, saving valuable rough.

As we have mentioned in several places previously, the strain gauge is sensitive to shock. Never, ever, allow the dop spindle to bang into the strain gauge. This can, and usually does, break the strain gauge. The strain gauge can take a lot of pressure, such as that applied during girdle or table grinding and polishing, as long as it is applied slowly and gently. The strain gauge can withstand many years of hard use, but no abuse.

2. ALARM ADJUST

The EMS is equipped with an audible signal that can be set to any desired meter reading on the meter scale. Assuming that you are cutting facets to a meter reading of zero, you would watch the meter needle approach zero. When the needle reached zero, you would stop cutting. However, you can set the audible signal to "alarm" when the needle reaches zero and you would not have to watch the meter at all.

To set the audible signal, depress the button marked DISPLAY ALARM POINT on the face of the EMS. Turn the knob marked ALARM POINT ADJUST either clockwise or counterclockwise to the meter setting where you want the audible signal (in the previous example, this would be zero). Whenever the meter needle reaches this point, the alarm will sound.

On the back panel of the EMS is a screwdriver operated control marked ALARM VOLUME. Turning this control clockwise will increase the alarm volume and counter-clockwise will decrease the alarm volume. If you do not want the alarm to sound, turn the ALARM POINT ADJUST fully clockwise which puts the alarm point out of range of the meter.

3. USING THE ELECTRONIC MICRO-STOP

Power to the EMS is controlled separately from the rest of the GEM MASTER II. The ON/OFF switch for the EMS is located on the back of the EMS enclosure. The EMS is on when the "I" on the switch is depressed. It is a good idea to turn the EMS on about 10 minutes before you want to use it. This lets it stabilize to the temperature in the room, which will minimize the amount of drift in the meter over time (which, by the way, is normal).

After initially setting the EMS meter needle to 40, it will occasionally need to be readjusted to 40. **Readjustment should never be done in the middle of cutting a set of facets.** The METER ADJUST KNOB is located to the left of the meter face. It is a

ten-turn control, which means it will turn ten full turns from one end to the other. This allows very fine adjustment of the meter.

It is not necessary to set the needle to exactly 40 on the meter. Any setting near 40 will do. This is not an absolute adjustment, but a relative one. Whether beginning at 40 or at, say 20, it is the relative distance of the needle from the starting point to zero that insures identical facets in a set.

The best way to explain how to use the EMS is to show you by an actual faceting example. Suppose you are trying to fix the width of the stone at 6mm by cutting opposite girdle facets at 90 degrees. First, adjust the meter to 40 after setting the protractor to 90 degrees. Once you have adjusted the meter to 40, it should never be changed until you have finished that group of facets. Cut a facet until the needle on the meter just starts to move. At that point, back off on the pressure and continue cutting again until the needle reaches 0 on the meter. Stop cutting and check the facet.

Does it look like it is cut enough? If not, lower the mast height and cut again to zero on the meter. Repeat this until the first facet looks right. Next, index the stone to the opposite facet and cut to the exact same point on the meter. You have now cut two facets on opposite sides of the stone to the exact same depth (or at least within 0.00005 inches!). Now measure the stone with a micrometer. Assuming it is now exactly 6.5mm wide, you could keep lowering the mast height little by little, but to the same stop point (meter reading) on both facets and measure, until you reached 6mm. Just dial the mast height down exactly 0.25mm (easy on the GEM MASTER II) and cut to the stop on both facets. You will now have removed exactly 0.5mm of material and the stone should be 6mm wide. Now cut all other facets in the same group to the same meter reading. They will all be cut to the exact same depth and you should have a perfect girdle outline.

Since the EMS is so accurate and sensitive, a few new cutting methods must be used along with the EMS. The perfectly flat lap does not exist in the real world and you must use a wide variety of settings to cut a stone. The EMS will actually give quite different readings for different spots on the same lap. This is the reason for doing the rough cutting at high speeds because it dampens the fluctuations caused by lap surface dips and hollows. Variations in laps show up quite noticeably because of the GEM MASTER II sensitivity. A few useful techniques can be used with the EMS to minimize these effects.

The first is to cut each group of facets at the same place on the lap. To make this easier, we suggest marking the lap in concentric circles at about one-half inch intervals with a permanent marking pen, making narrow bands. This is easily done with the lap rotating at a low speed. Now cut each group of facets within the same band. **Be sure to alternate bands for different groups of facets to avoid wearing grooves in you laps.** Second, we recommend that you cut at the highest lap speed recommended for the type of stone being cut. This not only makes the faceting go faster, but minimizes the vibrations of the meter needle (which are actually the hills and valleys in the lap surface). Be careful not to allow the lamp to radiate too much heat on the strain gauge as it will change the meter setting, due to expansion of the metal in the strain gauge housing.

M. THE LAP SPINDLE

The lap spindle shaft is used to center and fasten the laps. The lap rests on the brass disc known as a platen and is secured in place with a screw.

The GEM MASTER II eliminates the need for a nut, and with it the hazards associated with it, like running the stone, fingers, etc. into the nut.

The lap screw has a RED plastic top that can be tightened or loosened with the finger tips.

The brass disc or platen (part of the spindle) is hand fitted at the factory to run perfectly true, much truer than the tolerances to which laps are made. Laps are supported directly by this platen without the need for "master" or "sub" laps (which are really seldom true and expensive if they are). By eliminating the need for a master lap, we have increased the accuracy of the instrument and your cutting. It is important not to drop a lap on the platen or bump the platen as it can destroy the accuracy of the instrument.

The lap spindle shaft is equipped with a replaceable thread. Past experience has shown that the frequent removal and inserting of the lap spindle screw required when changing laps will wear the threads in the lap spindle shaft. FAC-ETTE has included a feature which will allow the operator to restore this shaft to like-new condition without expensive shaft replacement or time consuming disassembly and reassembly.

N. DRIP CAN AND COOLANT

The drip can, which is made of 304 stainless steel (the same as kitchen sinks), which can tolerate almost any type of water or additive. It is used to provide a constant flow of coolant to the lap surface. The drip can is provided with a 304 stainless steel cover to keep foreign material from getting into the drip can and contaminating the coolant.

The flow of coolant keeps the lap flushed of material ground off the gem stone, cools the stone, and prolongs the lap life. The drip can is mounted on a locator pin attached to the top of the motor housing. (A recess in the drip can bottom matches the locator pin.) There are three rubber feet cemented to the bottom of the drip can. They keep the motor cover finish from becoming scratched. The feet also keep the can from rotating from the position in which the operator places it.

A plastic sight level gauge is mounted on the outside of the drip can to indicate the liquid level in the can. Water and water with detergents or soaps is an acceptable coolant for the GEM MASTER II. We would like to note here that the previous manufacturer recommended oil only for the Gem Master. **WE DO NOT RECOMMEND OIL,** because it can be a carcinogen.

To use the drip can, turn the flow control valve off (fully clockwise) and fill the can with coolant to the desired level and replace the cover. Next, position the drip tube close to the center of the lap. It should just touch the lap surface. The closer you get it, the less distance the coolant has to drop resulting in fewer splashes. Open the flow control valve until the coolant starts to flow slowly down the drip tube. Once the coolant has reached the end of the tube and starts to run onto the lap, adjust the flow control valve to achieve the

desired drip rate. One drop every four to five seconds or so is probably adequate. Turn on the lap at a slow speed and spread the coolant over the lap with your finger. Now increase the lap speed and start cutting.

To stop the flow of coolant momentarily, such as when changing facet angles or changing laps, simply rotate the drip tube up to a vertical position rather than turning the flow control valve on and off. This will maintain the same drip rate. To start the flow again, rotate the tube back into position. This is much faster than trying to get the flow just right each time. One caution: Be careful of the tube in the upright position. It will remain full of coolant to the level in the drip can and if you hit the tube, it may splash the coolant. The drip tube is plastic and will stay in position at any angle placed.

O. SPLASH PAN

The splash pan is also made of 304 stainless steel. It is used to catch the coolant and ground gem material that is thrown off the lap when cutting or polishing. A drain tube installed in the bottom may be used to connect a drain hose. (See the section on unpacking and setting up the GEM MASTER II for more information.) The drain tube fits into a slot in the base. The splash pan contains a cutout that normally faces the mast. For normal cutting, this cutout is covered by a device called a gate. When grinding the girdle, the gate is moved to one side to allow access by the dop spindle housing. A certain amount of coolant will be thrown out through the cutout, so keep the opening as small as possible. You should also run the lap in the reverse direction so that any excess coolant is thrown towards the back rather than forward and all over you. A few pieces of judiciously placed facial tissue in the gate will catch most of the thrown coolant, making cleaning up much easier.

P. TRANSFER TOOL

A precision transfer tool is supplied with the instrument. The transfer tool is used to transfer a stone from one dop to another dop while maintaining precise alignment. Precise alignment is maintained because the dop is firmly clamped and keyed slots in the dops are matched to alignment pins in the transfer tool.

To transfer a stone, clamp the dop with the stone attached to the transfer tool, making sure the “v” notch in the end of the dop is perfectly aligned snugly against the pin in the transfer tool. Separate the two sliding dop mounts sufficiently to allow room for a dop to be inserted in the other half of the transfer tool. Make sure the dop is placed snugly against the pin with the “v” notch in the dop properly aligned with the pin. Apply the desired adhesive to the stone (and/or to the dop) and slide one dop toward the other gently but firmly until the dop and stone make contact. Once the adhesive has set, both dops may be removed from the transfer tool.

This completes the section describing the function and use of the various parts of the GEM MASTER II. The next section is a step-by-step description of how to cut a standard round brilliant with the GEM MASTER II. If any of the previous sections were unclear, following these instructions during the actual cutting of a stone should clarify things considerably.

IV. FACETING THE ROUND BRILLIANT CUT ON THE GEM MASTER II

A. SELECTION OF ROUGH

We wish to acknowledge at this point that there is more than one way to dop a stone, cut a stone, preform a stone, or orient rough. We are not debating the pros or cons of any method, but will describe the one used by the author.

To get the maximum yield for the round brilliant, it is necessary to select a piece of rough that is more rounded or square in shape. (Note: An oblong piece of rough might be better used to cut an oval, marquis, or emerald cut for maximum yield.) The average amount of rough lost when cutting a stone is 75% to 80%.

B. HAND PREFORMING

After determining the top or table area, holding the rough in your hand, grind a flat facet with a course grit lap. This will now be the table. From this point, grind the outline into a round shape (it does not have to be perfectly round). Grind the bottom to a cone approximately 60% of the width (it does not have to be perfect). If your rough is very large it will save time and material to use a thin trim saw to slice off the excess material before hand preforming. Keep in mind you should have a minimum of 60% overall depth. (Example: a preform 10mm wide should be a minimum of 6mm deep). This same procedure may be performed with the rough glued to a dop.

C. DOPPING

Choose a dop that is preferably the same size or a little larger in diameter than the preformed rough and place it in the transfer tool. This dop we will call the target dop since it will be used to center the preform rough to the dop for faceting using a small amount of dopping clay on the table of the preform. Push the preform onto the target dop. Take care to see that the stone is centered on the target dop. Using a cone dop 2/3 the diameter of the preform, fill the cone with a mixed two part epoxy and place in the transfer tool. Push the cone onto the part of the stone that will be the pavilion and lock in place. Allow the epoxy to cure taking care to catch any drip with a piece of scrap paper placed under the stone. Since heat and ultra violet light are both catalysts for curing epoxy, the heat from a light bulb may be used to speed the curing process. Once cured the dops may be removed from the transfer tool and separated because the modeling clay will let go very easily. It should be noted that epoxy works well on stones that are clean, so wash the preform with acetone or alcohol before dopping.

D. MACHINE PREFORMING

With the stone properly dopped, you can use the GEM MASTER II to make it perfectly round. Insert the dop in the collet and make sure the keyed end of the dop is resting snugly against the pin in the collet. Depress the index lever, then push the index lever lockout pin in and release the index lever which now will be in the open position. This will put the index plate in the free wheel position. With firm hand pressure, tighten the collet chuck. Never use tools to tighten the chuck. Slide the mast to the left of the instrument. Set the protractor to 90 degrees and tighten the mast base. This will position the arm parallel to the grinding lap. With a 64 tooth index plate installed, align number 64 on the index plate with the line inscribed on the index plate housing window. Release the index lever lockout pin by pushing

the index lever down and the lockout pin, which is spring loaded, will return to the unlocked position. This will allow the index lever to engage with the index plate.

Slowly lower the head, using the vertical adjustment on top of the mast, until the stone just touches the lap. (The grit size for the lap can vary from 100 grit for large stones to 360 for small stones.) With the index plate set at 64 (red dots), begin cutting the first facet and watch the needle on the EMS meter start to climb and note where it stops when you stop cutting. This number on the EMS meter is the point to which you'll want to cut the other facets. Let's assume the needle climbed to zero. You will now use the index plate numbers 8-16-24-32-40-48-56 in order and cut to zero on the meter. The numbers are all identified by the red dots. Once these facets have been cut, using the same meter setting of zero cut eight more facets using the numbers 4-12-20-28-36-44-52-60. These numbers will be identified by the yellow dots. This will give a total of 16 cut facets, and the preform will be perfectly round at this point.

When cutting the crown mains or pavilion mains, you use the numbers with the red dots for speed and as a double check for accuracy. The same is true with the yellow and green dots and numbers.

E. TABLE FACET

With the lap stopped, move the mast to the extreme right position, clamp the mast tight and set the protractor on 0 degrees. With the stone above the wheel (never place the stone directly on wheel), turn on the instrument and slowly lower the stone using the vertical adjustment. Cut only a small amount at a time until the grinding stops. To check for flatness, **raise the head with the vertical adjustment until the stone is well off the lap before examining it**. If it is not completely flat, repeat this step until it is and repeat with finer laps to prepare for polishing.

F. FACETING THE CROWN

Depending on the size of the stone, it might be wise to use the course grit lap to place the first row of facets. (This not only saves time but laps.)

The main facets are cut first, starting with index number 64 (red dots) at an angle of 35 degrees. These are quartz angles. Cut the first facet to approximately 25% of the width of the stone, and with the needle setting on the EMS cut the remainder of your 8 main facets at 64-8-16-24-32-40-48-56. The ideal table width is between 50% and 60% of the diameter of the stone.

G. STAR FACETS

The star facets are cut at index numbers 60-52-44-36-28-20-12-4 (yellow dots). The angle for the stars is 15 degrees less than the main angle, or 20 degrees. With the protractor set at 20 degrees and index at 60, cut your facet until it comes almost halfway across the top of the main facet. It actually spits the top of the main facet. Using the same EMS needle setting index at 52 and cut to the same EMS setting. Cut these two facets back and forth, slowly lowering the vertical adjustment until they meet at the top of the main facet. Then proceed to cut the remaining facets 44-36-28-20-12-4, still using the same EMS needle setting.

H. GIRDLE FACETS

Girdle facets are 16 facets indexing at 62-58-54-50-46-42-38-34-30-26-22-18-14-10-6-2 (green dots). The angle of the girdle facets will vary from stone to stone, according to the size of the table facet. The average angle will be 5 degrees more or less than the main angle.

Set the protractor at 40 degrees and the index at 62. Cut this facet until it almost meets the tip of the star facet. Set the index on 2, and using the same EMS needle setting cut this facet. If the angle is correct, the facet will form a kite with the tail closing at the girdle and the top touching the star facet. If it is too open or closed at the top or bottom, adjust the angle until it closes properly. With these two facets correctly cut, continue to cut the remainder at the same EMS setting (58-54-50-46-42-38-34-30-26-22-18-14-10-6).

I. POLISH

If the first cuts were made with a course lap, it is necessary to repeat all the above steps using a 1200 grit lap for pre-finishing or final cutting.

Polishing can then be satisfactorily performed on many types of laps using many types of polish powder. For quartz, we prefer a phenolic lap with a spray of cerium oxide.

When polishing, always start with the smallest angle first (or polish from the stars to the girdle). Polishing should be done at a much lower speed than the cutting speed.

Always set the angle for polishing at exactly the same angle that the facet was cut. With the facet set properly you should be able to polish the entire row with no more adjustments on the head until you are ready for the next row of facets.

Use the same polishing method on the remaining rows to be polished. Polish the table at this point, using the same setting as for cutting the table.

J. REDOPPING TO THE PAVILION

Place the dop with the stone in one end of the transfer tool and a flat head dop in the other end. The flat dop should be a little smaller than the diameter of the stone. Make sure that both dops are resting snugly with the pin in each slot of the keyed dop.

To transfer the stone, use a tiny drop of crazy glue or epoxy and push the flat dop to the table of the stone. After the glue cures, remove the other dop by heating the dop slowly. The heat will travel along the dop softening the epoxy. There are several ways to remove the excess epoxy but the safest way is to grind it off with 260 grit lap while making the first cuts on the pavilion facets.

K. LOWER GIRDLE FACETS

Place the keyed dop in the chuck, making sure that the keyed end is firmly in place with the pin in the chuck. This will align the top and the bottom perfectly, and the index offset adjustment will not be needed. Tighten the chuck as before in the free wheel position with firm hand pressure.

Girdle facets are cut using the green dots. These 16 facets indexed at 2-6-10-14-18-22-26-30-34-38-42-46-50-54-58-62.

Set the protractor at 43 degrees and the index at 2. Cut this facet until you have reached the desired girdle width. Continue to cut the remaining facets using the same EMS needle setting.

L. PAVILION MAINS

Pavilion mains are cut using the red dots. These facets are indexed at 64-56-48-40-32-24-16-8. Use great caution when cutting these main facets as they are very small and it is very easy to over cut. On some small stones these facets might be polished in.

M.POLISHING THE PAVILION

Use the same technique as for the crown.

N. POLISHING THE GIRDLE

Polishing the girdle can be done by sliding the mast to the position furthest from the lap, setting the protractor at 90 degrees and repeating the steps used in the preforming. Or, you can use a 3000 grit lap and free wheel the girdle to a smooth semi-polish.

O. REMOVE THE STONE FROM THE DOP

Place the dop with the stone in a closed container of acetone until the drops off. It is a good idea to cover the inside bottom of the container with cotton to guard against chipping the stone. Caution should be used not to force the stone from the dop; this could result in a nicked table.

This completes the round brilliant cut. **Congratulations!**

V. MAINTENANCE

A. MAST BASE/MAST

1. MAST BASE

The slide friction of the mast base is controlled by the gib pin spring and set screw on each end of the mast base. The set screws when screwed in flush with the surface of the mast base should apply adequate pressure. The middle screw is the locking screw. This may be left in the loose position. If needed, this screw may be locked. Do not tighten it more than just slightly. It is important to keep the slide area for the mast base clean at all times. This assures that the mast is square to the base. The dovetail slide area should be lightly coated with the lubricant then wiped dry with a soft cloth or tissue.

2. MAST

The mast and mast barrel must be kept absolutely clean. Apply a few drops of lubricant to the mast and spread the oil evenly over the surface.

B. MACHINE BASE

The machine base is an alloy of aluminum. The alloy was used because of its superior quality of strength and stability. The structural design resists any movement of the base. The design incorporates a grid pattern on the bottom of the casting and a bar beam around the top edge of the casting. This bar beam with the side forms an “L” shape beam for greater strength

and stability. The bar beams purposely over hangs the outside of the casting. Its purpose is to form a lip so the base can be hung in a cut out in a desk or bench. After precision machining, the base casting was powder coated rather than painted. Powder coating is a very tough finish which bonds well to the castings. The only maintenance required is to wipe clean with a paper tissue wet with water and wiped dry with a dry facial tissue. **DO NOT USE ABRASIVE CLEANERS** as they will scratch the finish.

C. PROTRACTOR

The protractor dovetail slides should be kept clean and coated with lubricant and wiped dry with facial paper tissues or cotton swabs.

D. DRIP CAN

Keep the drip can clean because this holds the liquid you will be applying to the lap.

E. ELECTRONIC MICRO-STOP UNIT

The EMS should require very little maintenance. The outer case should be cleaned by wiping it with a damp facial tissue and wiping dry with a dry facial tissue. Be careful not to get any moisture in the case or scratch the meter lens. **Do not use any cleaners on the meter lens as it may remove the antistatic properties of the plastic causing improper readings.**

If the EMS meter becomes erratic, the four prong plug on the signal cable coming from the strain gauge should be cleaned with denatured alcohol and wiped with a soft tissue to remove oxidation. After cleaning the plug prongs, wet the prongs with denatured alcohol and plug it in and out of the socket on the EMS a couple of times, then wipe the prongs dry again with a soft tissue. Be sure the power switch on the EMS is in the off position before removing or installing the plug.

F. LAP DRIVE MOTOR

The drive motor needs very little attention. Brushes may be replaced after many long hours of running. To replace the motor brushes, remove the motor as follows:

1. Loosen the two screws in the euro terminal to disconnect the two wires going to the motor.

2. Remove the four slotted head screws from the motor frame. The motor should then be removed from the machine base. The brushes can be replaced by removing the brush caps from the outside of the motor. This procedure requires some talent and may have to be performed by a motor repair shop or the factory.

G. DRIVE BELT

The lap spindle drive belt may require periodic cleaning with alcohol and a soft cloth or paper towel. Apply alcohol to the cloth and wipe the belt clean of any debris from the aluminum pulleys. You will know when to clean the belt from a squeaking or unusual noise under the base.

H. DOP SPINDLE/INDEX LEVER AND SADDLE BLOCK ASSEMBLY

The dop spindle requires no maintenance and should not be disassembled in the field. It was assembled at the factory using special tools. On the side of the index lever assembly,

there are two nylon tipped set screws. These set screws may be adjusted to remove any side play from the index lever. If they are set too tight, they will bind the lever movement. Located on the top of the saddle block are two socket head screws. These screws are adjusted to maintain the minimum clearance from the protractor. These screws may be adjusted as the parts wear to maintain this like new clearance, or where you can have little or no resistance while moving the saddle block. Over tightening can lock the saddle block to the protractor preventing the saddle block from being moved.

I. PIVOT SHAFT

The pivot shaft requires no maintenance; it is manufactured with 316 stainless steel and has 2 bearings and a seal. This should not be disassembled in the field, because it is assembled at the factory using special tools and techniques.

J. LAP SPINDLE ASSEMBLY

This should not be disassembled in the field. It is also made of 316 stainless steel and assembled at the factory using special tools and techniques. The lap spindle has a replaceable female thread. In the event it is badly worn, the thread can be removed and replaced.

K. MOTOR SPEED CONTROL UNIT

The motor speed is controlled by a solid state circuit board. There are adjustments on this board which are set at the factory for proper operation. It is best left alone, so as not to damage the circuitry, the motor, or void the warranty.

L. WATER CONTROL VALVES

This valve requires no maintenance. It was designed to keep the liquid from the threads, thus eliminating corroded threads. This valve should not be disassembled in the field because there is an “O” ring on the stem which can be cut and defeat its purpose. It is assembled to prevent damage to this “O” ring.

M.FUSE

The holder, on the top side to the right rear of the instrument, is furnished with a 6 amp fuse. Do not use a slo-blow fuse. It can damage either the circuitry or the motor and void the warranty.

N. UNDERSIDE PROTECTIVE COVER

This cover was designed to protect the instrument from you and you from the instrument when the cover is in place. As designed, it will keep anyone from accidentally receiving an electric shock or becoming entangled in a moving pulley or belt. By the same token, it can prevent the circuitry from being shorted or other damage to the belt or pulleys.

The cover should always be in place to protect yourself and your machine, except when servicing the components it protects. **Before removing the cover, all electricity should be disconnected. All servicing should be done by qualified personnel.**

O. SPECIFICATIONS

Motor Controller Voltage: 120 VAC USA (or 240 VAC)
Electronic Micro-Stop Voltage: 120 VAC USA (or 240 VAC)
Motor Controller Fuse: 6 AMP 250 V
Motor: 90 VDC Permanent Magnet - Ball Bearings

Shipping Weight: 70 Pounds
Motor Speed: No Load - 3100 Approximately
Lap Speed: No Load - 2000 Approximately
Size: 24-1/2" long X 11-1/2" wide X 18-1/4" high

Mast Height Adjustment: 48 MM
Lap Size: 6" or 8"
Dop Shaft Size: 1/4"
Drive Belt: Polyurethane

FAC-ETTE Manufacturing, Inc. reserves the right to make changes without prior notice.