

# From Slabs to Cabs

Creating beautiful, polished cabochons from slabbed rock is a rewarding process that (with a bit of practice) anyone can master. This guide will help you work through all of the steps required. You will need the user guides included with indicated machines for basic assembly and general operating instructions. We strongly suggest that you work through the process with practice pieces first. PLEASE, save that special slab for when you have a bit of experience with the machine. Remember to spend the necessary time at each step eliminating scratches before going on to the next step. There is no exact calculated time for each step, but with experience you will get a solid feel for what amount of grinding is necessary at each step of the process. No matter which step you are on, the following safety precautions and guidelines always apply:

- It is extremely important to wear proper eye protection when using any machine. We highly recommend that you wear full coverage safety goggles rather than just glasses.
- DO NOT wear loose clothing or any accessories (long necklaces, bracelets, shirts with long fringes, and similar) that might get caught by the machines during operation.
- Use only in a properly grounded and tested outlet. Under NO circumstances should you override the grounding system or modify the plug. Most surge suppressors have a green light indicating that the plug is properly grounded.
- Set up your machine on a sturdy, level work surface that is water tolerant and at a comfortable height for your frame.
- Take care to prevent water from running down the shaft and into the electric motor. Fill reservoirs only to the indicated levels and keep all drains open and running free.
- Always unplug your machine when switching between set-ups, changing blades or discs, making adjustments, or when not in use.
- **Never use any of the diamond discs, blades, or drums dry.** Doing so will permanently damage them and may well damage the slabs you are working.
- Make sure to read carefully through the appropriate user guides before operating any of the set-ups.

## MATERIAL SELECTION

Today there is a wide variety of pre-slabbed rocks available from which you can create beautiful cabochons. You want to:

- Select slabs that are free of fractures, cracks, and pits that could potentially cause the piece to come apart in the process. Make sure to check both sides of the material. Inclusions may enhance or detract from the finished project.
- Pick a slab size and thickness that suits the size of the cabochons you want to create. You will find most cabs are made from 1/8" to 1/4" slabs. Larger cabs may be made from material closer to 3/8" thick.
- Look for pieces with interesting colors, patterns or design that you can bring out in the cabbing process. If the material is translucent, look at it through a strong light. Hold it up to the sun to look for colors and interesting banding. It is important to remember that your finished cab will be significantly thinner and even more translucent than the original slab. Wet the material to see what it may look like when polished.
- Gemstones come in varying "hardness's" which will effect how you grind and polish them. In general, harder materials (like agates) take a nice polish easier than softer stones (like opal). Initially you will have more success and better results if you use harder stones such as Brazilian Agates. Knowing the hardness of the material you are working will help you obtain the best results in the sanding and polishing steps.



## CREATING THE ROUGH CABOCHON

**Machine Set-up: SwapTop™ Trim Saw following the instructions included with the unit.**

If you're going to use the cabochon in a commercial finding designed to hold a standard sized stone, it's important to cut it accurately to a specific outline so it will fit. Templates are available to help layout specific sizes and shapes. Move the template around on your slab to find the most pleasing pattern for your finished cabochon. Take a permanent marker, aluminum or brass marking stylus and run it around the inner edge of the template as close to the edge as possible. Another option is to use the marker or stylus to layout a freeform shape.



The next step is cutting the slab close to the desired outline on the trim saw. When you trim away excess material keep in mind that some of it could be used to create other cabochons or be used for inlay, intarsia beads or tumbled. So, as you cut away the excess material, do so in a manner that will maximize the rough remaining.

Always start the flow of the coolant before beginning your cuts. Coolant lubricates the diamond and keeps the working area of the blade clear of debris. You should not have water flooding the saw table. If a paste forms around the cutting area, increase the coolant flow; sawing dry will severely affect the life and performance of diamond blades. With practice you will soon develop a feel for the speed that does not slow the motor while giving you a good sawing rate. An alternative to this trim saw is to use a diamond band saw to rough shape the cabochon. Accurately cutting using a band saw can minimize the grinding step, allowing you to create more intricate shapes while conserving precious and expensive rough.



Take your time and carefully cut close to the outline using a series of eight or so cuts. Some stones will lend themselves to fewer cuts, and some will require more than just eight. All cuts should be made outside but close to your template line. Allow enough space, about 1/16" – 1/8", for the material that will be removed in the grinding, sanding and polishing process. Careful cutting now will make successive steps easier and greatly enhance the appearance and quality of your final product.



After sawing, clean the cab and check your work. The next step in the process is to establish a smooth and accurate outline using the SwapTop grinder set-up to remove any margins or small corners of material left over from the sawing operation.

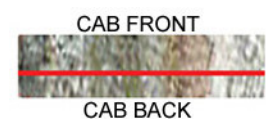
## CREATING THE PREFORM

**Machine Set-up: SwapTop Grinder / Shaper following the instructions included with the unit**

Now you want to remove any margins or corners so that the cabling "blank" is the shape and size desired. Place the cabochon flat on the grid surface. Turn the machine on and slowly move the material into the grinding head. Use a back and forth motion to remove material and shape the piece. Periodically check the stone's size with the template or the mounting. It should be just slightly larger (1/32") to allow for material removed in the sanding and polishing processes. Do not grind until it slides through the template, or it will end up being too small.

Any time a paste forms around the grinding area, stop and make sure adequate coolant is being supplied to the diamond drum. Grinding dry severely affects the life and performance of any diamond product. With some practice you will get a feel for the optimal grinding action and pressure. You may want to try this technique using a piece of scrap material first.

Finally you will want to establish a reference mark, or girdle line around the perimeter of the cab. It marks the outermost edge of the cabochon, helps you judge the progress and obtain more uniform material removal during the shaping process. Make the line using a permanent marker or aluminum pencil at about two thirds of the slab's thickness and closest to the back side of the cab, leaving at minimum 1/16". The girdle height should be narrow enough to fit down into the finding and if it has a bezel, you should be able to roll the bezel of the finding over it.



## ATTACH THE PREFORM TO A DOP STICK

**MACHINE SET UP: Dop pot with wax brought up to temperature following the instructions included with the unit**

Dopping is the process of securing the stone to a stick (dop stick) using a special (dop) lacquer wax. Doing this gives your cabochon a handle so you can more easily manipulate the stone on the flat lap machine. Dop sticks can be fashioned from a variety of materials; the most simple is a piece of wood dowel about 4"-5" inches long.

1. It is important that the stone be clean and dry.
2. To create a good bond, the cab needs to be warmed by placing it on top of the wax heater. A good bond between cab and stick is important: If this bond breaks while a cab is being worked, it is possible for it to be thrown and possibly broken or irreparably marred. It's also possible that you or someone else could be struck by a flying rock. This is also why the prudent lapidary always wears eye protection while working with these tools!
3. When the cab is sufficiently warmed, place the dop stick into the wax and spin it around to pick up a gather of wax and then push it down on the **back side** of the cab. With the wax still liquid, wet your fingers and blend the wax from the dop stick down to the surface of the cab making a nice fillet. This feathering creates a supporting platform and insures a secure bond between cab and dop stick.
4. NOTE: Dop wax is hot and will burn your fingers if it sticks to them! Have a small container filled with cool water handy to wet your fingers so that you can shape the wax and properly secure the dop stick to the cabling stone. Alternately, you can feather the wax out with something that the wax will not readily stick to, such as a cold knife blade.
5. The cab and dop stick are returned to the heater for a few more minutes, giving the wax time to flow and bond. Then the assembly is removed and allowed to cool to room temperature.
6. Test to make sure the cab is securely bonded to the stick. Once satisfied that all is properly prepared, the next step is grinding the face of the cab to a dome shape and generally rounding and smoothing it.
7. Many lapidaries do not rely on the dopping system, and instead simply hold the cabs in their hands for the grinding, shaping, and polishing steps. However, it takes a lot of experience to enable you to do this safely and effectively.

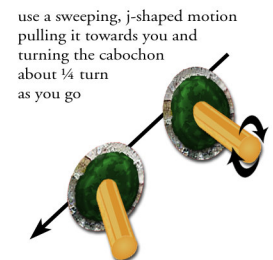


## CREATING THE CABOCHON SHAPE

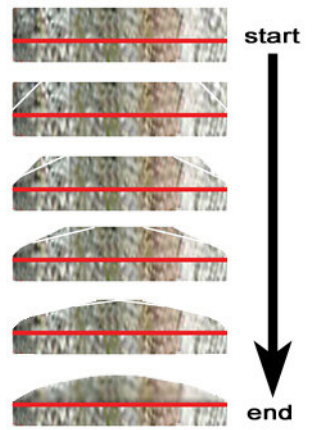
**MACHINE SET UP: SwapTop 6" Flat Lap Machine following the instructions included with the unit**

To establish the basic cabochon shape you will begin with the 170 grit diamond lap. Refer to the instruction guide for mounting it to the master lap and installing it onto the machine. Spin to make sure that it is centered on the master lap.

1. The goal in cabling is to produce a smooth and properly domed surface on the face of the cab while creating uniform wear on the diamond disc (to optimize its life). Use light to moderate pressure and inspect your progress frequently. You want to use a sweeping, j-shaped motion with the cab, pulling it towards you and turning the cabochon (about ¼ turn) as you go. Always keep the contact points moving on both the cab and the diamond disc. This is probably the most difficult part of cabling to learn. There's a certain feel when the motion and the pressure are correct. With a bit of practice you will learn that feel.
2. Always start the coolant drip and then turn on the machine. Any time white powdery residue appears on the lap it means that you are not using enough coolant and may risk damaging the diamond lap and/or your cab. Increase the coolant flow accordingly.
3. You can control how fast you grind by using the speed controller and the position of the cab on the lap. You will grind and sand more slowly near the center and more quickly as you move closer to the outer rim. Practice will help you determine the optimum speed and position for each step of the process.



4. Start by holding the cab about 45° to the lap. Grind completely around the cab at this angle until you reach the girdle line. This will make a smaller flat area on the top of the cab. Watch the tendency to grind down the corners too much: The girdle reference line helps you avoid this pitfall.
5. Now increase the angle (so that your dop stick is closer to the vertical) and repeat the process, grinding from the edge of the flat toward the girdle line. Each time you repeat this process, the size of the flat area (in the center of your cab) will decrease until it is completely gone and you will then have a domed cabochon.
6. When you have formed the dome, work up and down over the center of the cab to the girdle line. This can be accomplished by rocking the dop stick back and forth like a pendulum, as you rotate the cabochon slowly from end to end. Do it in one direction, then turn the dop stick 90° and do it again. Repeat this process two more times so that you are blending out the grinding lines developed during the grinding process. When you reach the point where you now have a relatively uniform domed shaped it is time to move on to fine grinding and final shaping. Thoroughly rinse the stone, dop stick, and your hands.



Now that you have the cabochon shape it is time to fine tune it and remove the scratches left from the rough grinding.

1. Replace the 170 grit diamond lap with the 325 grit lap. Refer to the instruction guide for mounting it to the master lap and installing it onto the machine. Spin to make sure that it is centered on the master lap.
2. Use the same motion as before to continue to refine the shape; check the cabochon as you grind to be sure you are grinding symmetrically. You want to end up within a fraction of the girdle marking line. Frequently rinse and dry the stone to reveal the remaining scratches. When you no longer have any scratches from the 170 wheel and the surface appears uniform you are ready to move on to sanding. Thoroughly rinse the stone, dop stick and your hands.

Depending on the hardness of the rock and the desired finish you may wish, this may be a single or multi-step process. Practice, the type of material, and experience will determine just when your cabochon is ready for the final polishing step. When starting out we suggest you use both the 600 grit and 1200 grit laps included with your kit. You may find that some stones will be ready for polishing after the 600 grit step while others may require even finer grit laps or sanding media. These are available from Inland Lapidary as additional accessories.

1. Replace the 325 grit diamond lap with the 600 grit lap. Refer to the instruction guide for mounting it to the master lap and installing it onto the machine. Spin to make sure that it is centered on the master lap.
2. Work the cabochon as before until you have removed all the 325 grit scratches. It is also time to check size against the template or mounting and make any necessary adjustments. The cab will now begin to have a satiny appearance. Depending on the hardness of the rock, you can either move on to the polishing step or finish this process on the 1200 grit lap. Rocks of Hardness 6 or less (using Moh's Scale) should be sanded on the 1200 grit lap before moving onto the polishing step. If you are unsure of the hardness of your rocks, we recommend you continue onto the 1200 grit lap and then go to polishing step.
3. Replace the 600 grit diamond lap with the 1200 grit lap. Refer to the instruction guide for mounting it to the master lap and installing it onto the machine. Spin to make sure that it is centered on the master lap.
4. Continue fine tuning the cabochon shape on the 1200 grit lap. Double check size against the template or mounting. It should fit the template or mount precisely at this point. The stone should have a semi-gloss appearance as you now have only 1200 grit scratches. Rinsed and dried you should not see any scales (aka dimples, facets, flats, etc) or scratches. Check by holding the stone up to a bright light and look for sparkles or deep lines. Scales are most easily observed by watching the piece dry. Because the "scales" will have deeper puddles of water, they will evaporate more slowly. Wet your piece and watch for this phenomenon. If you see any scratches or scales, you may not have smoothed long enough. If after additional smoothing you can still see scratches or scales, they are too deep to remove. If they are present, you must return to the 325 grit lap step and follow through the steps, always using the complete order of grits.

## POLISHING THE CABOCHON

### MACHINE SET UP: SwapTop 6" Flat Lap Machine following the instructions included with the unit

This is where your cabochon is polished to a high sheen using optical grade cerium oxide on a felt polishing pad. You will need to mix the cerium oxide according to the instructions on the bottle.

1. Thoroughly wash the cabochon. We recommend you also rinse and dry the flat lap reservoir and master lap before starting polishing; you don't want to bring any grit from the previous steps into the polishing process.
2. Mount the felt polishing pad to the master lap and install on the machine. The polishing pad has a pressure sensitive adhesive and backing. You can leave the protective liner on and mechanically clamp it to the master lap as in previous steps or you can remove the liner and apply the felt pad directly to the master lap. (if you have a second master lap)
3. Wet down the felt pad with water and then turn the machine on briefly to throw off excess water. With the machine turned off, use the sponge brush to apply a small amount of cerium oxide onto the pad. Using the brush to paint radial lines that divide the pad into thirds or quarters (like a small pizza!) should be sufficient. When a felt pad is new, it may need additional cerium oxide applied until the pad becomes "charged" with polishing grit. Once the pad is charged you should only need to apply additional cerium oxide occasionally when you notice that use of the pad is no longer polishing.
4. You do not use the water drip during polishing as you would quickly rinse away all of your polishing powder. Polishing requires you to run the lap at a faster speed than the grinding and sanding stages. How much faster will depend on the material, the size of the cabochon, and your ability to control it on the dop stick. Because of this increased speed, polishing is also where heat fractures are most possible. Polish and rinse often to minimize the temperature build up at the contact point.
5. Turn on the machine and begin rocking and rotating the stone, working up and down over the center of the cab to the girdle line using medium pressure. If the cerium oxide cakes up on your cabochon, add water to the piece simply by rinsing it with water.
6. Periodically dry the piece and check your progress for scratches or scales. Remember, these scratches and scales can never be polished out and must be taken out by grinding / sanding. Continue with this polishing process until you achieve the desired degree of shine. Harder gem materials take a higher polish while softer ones will have a satiny finish.
7. When you are satisfied with the finish of your cabochon, you will need to remove it from the dop stick. Put the cabochon, dop stick and all, into a freezer for 10 minutes or so. Then, just peel the cab off of the wax. It will pop right off leaving you with a beautifully polished cab and a dop stick that can be re-used. Any remaining wax can be carefully scraped off with a knife.
8. Use a tissue or other type of soft paper with alcohol to remove any film from the wax.



## FINAL FINISHING OPTIONS

### MACHINE SET UP: SwapTop 6" Flat Lap or Shaper / Grinder following the instructions included with the unit

What you plan to do with your cab will help you decide if you are now done or whether you will need to finish the back side of your cabochon. It is recommended that you avoid leaving a sharp edge around the base of the stone as sharp edges chip more easily. It is a good idea to create a slight reverse bevel to the edge on the back side of the cab to help prevent such chipping. It also makes it easier to insert the cab into the finding as many have a small curve in the bottom. You can accomplish this using the Flat Lap machine or the Shaper / Grinder.

- Using the SwapTop Shaper / Grinder: Set up the machine as you did in when shaping the preform. Turn on the machine. Hold the back side of your cabochon at a 45° angle to the drum and carefully grind a small bevel around the back side perimeter. With a bit of practice it will be a uniform width around the cab.
- Using the SwapTop Flat Lap: Set the machine up with the 600 grit diamond lap. Refer to the instruction guide for mounting it to the master lap and installing it onto the machine. Spin to make sure that it is centered

on the master lap. Hold the back side of your cabochon at a 45° angle to the drum and carefully grind a small bevel around the back side perimeter. With a bit of practice it will be a uniform width around the cab. If you are planning to polish the back (see below) you can complete this step with the cab attached to a dop stick and then polish the back and bevel at the same time.

You may choose to polish the back of your cab. If the cab is being mounted and the back will not be seen you can opt not to finish the back side. However, if you want the back to have the same finished look as the front, then you will need to sand and polish the back side on the flat lap machine.

1. To do this you will need to re-attach the cab to the dop stick, **this time attaching the dop stick to the front of the cab**. Follow the same steps used when attaching the dop stick to the back side. (see page 3)
2. You will follow the same steps for sanding and polishing as you did to complete the dome. Start by setting up with the 325 grit diamond lap and follow the same series of steps all the way through the polishing step. (see pages 4 and 5)
3. Remove the dop stick from the front of the cab as outlined before. (see page 5)



## ADVANCED TECHNIQUES

The Inland polishing system described above uses an optical grade cerium oxide (approximately 14,000 grit) on a natural wool felt pad of medium hardness. With some materials (like softer rocks) you will find that this method (cerium oxide on a felt wheel) does not offer a shine to your liking. The number of combinations of pads and grits used in polishing is almost endless:

- Some possible polishing compounds include standard cerium oxide (approximately 8,000 grit), diamond grit / powder from as “coarse” as 8,000 grit to as “fine” as 100,000 grit, tin oxide (approximately 14,000 grit), and other polishes like fine aluminum oxide, Linde A, et c.
- Alternate media, which will provide different results to the felt pads, include synthetic fibers, leather pads, cork, woods, ceramics, and even copper plates (into which diamond grit has been pressed).

One of the most exciting parts of this lapidary field is the opportunity to discover new rocks, techniques, and styles of presentation. We encourage you to join a lapidary club. Many of these clubs offer classes in lapidary. We encourage you to take as many of these classes as your time allows. Many of these clubs can further offer you the camaraderie and social network of folks who have been involved in this rewarding hobby for many, many years.

## ADDITIONAL LAPIDARY SUPPLIES AVAILABLE

In some cases, you may find that your work requires alternate or additional steps to accomplish your desired results. Inland offers diamond flat laps in additional grit sizes. In some cases, you may find that your work requires alternate or additional steps to accomplish your desired results. Inland Lapidary also offers a broad range of diamond grinding wheels and drums, diamond saw blades, diamond flat laps, and other diamond tools. We are proud to offer these and other lapidary supplies, including diamond grinding bits for doing wire wrapping, electroplated and brazed diamond core drills, dressing sticks, diamond drill bits, carbide wheel cutters, and other tools for professional rock cutters and gem makers as well as casual rock and mineral hobbyists / collectors.



Inland's lapidary equipment, diamond tools, and lapidary supplies are available to lapidary hobbyists and rockhounds all over the world. Our line of lapidary equipment includes diamond band saws and trim saws, plus diamond grinders and flat lap machines, - all designed specifically for use on rocks and minerals. All Inland Lapidary machines are sold complete with everything you need to begin using them--the motor, the diamonds, everything.

Please visit [inlandlapidary.com](http://inlandlapidary.com) for our complete line as well as a comprehensive resource library of lapidary links and information . . . including this how to!