Ortur Laser Master 3

The Ortur Laser Master 3 (LM3) is the next generation of the popular Ortur Laser Master blue diode laser series (FIG. 1). It incorporates a true 10W laser module composed of two 5.5W lasers focused into a concentrated laser spot of 0.05mm x 0.1mm. This innovative laser design enables cutting wood up to 0.47" (12mm) thick, and acrylic up to 0.39" (10mm) thick, in a single pass. With multiple passes, pine board, up to 0.78" (20mm) thick, and acrylic sheets up to 1.18" (30mm) thick, can be cut. A quite impressive feat for a 10W laser!

FIG. 1. The Ortur Laser Master 3 incorporates all of the features that are presently in demand. Credit: Ortur

Construction

The dark satin gray aluminum frame, providing an engraving area of 15.7" (400mm) x 15.7" (400mm) is strong and relatively light-weight 14.3 lbs (6.5kg). Its rounded edges suggest a sleek and sophisticated design, and distinguish it from other vendors who simply use extruded aluminum rails (FIG. 2). All of the drive belts are safely enclosed in x and y axis frames, shielding them from smoke and debris.

The profile of the machine is very low to the work surface. This is an advantage for the exceptionally high-speed rating of the laser module, which weighs just 8 oz. (235 grams), maintaining a low center of gravity, and minimizing vibration. However, there is no clearance in the frame to insert over-sized workpieces. The unit, however, can be placed over a larger workpiece, or can be raised with the optional set of aluminum alloy Ortur Foldable Feet (FIG. 3).

FIG. 2. These extruded aluminum rails, with corner brackets, are often used on less expensive laser engravers. Credit: Amazon

Mechanical limit switches are no longer used in favor of resistance points that stop the laser module from hitting the frame.

FIG. 3. *The user first needs to remove the four rubber pads and screws in the base of the LM3, and replace them with the Ortur foldable feet. The feet lift the LM3 up 4.6" (118mm).*

Assembly
Assembly instructions are provided on the included TF (TransFlash) card, as well as in videos. https://youtu.be/pzp639Es27c.

Some pre-assembly is handled in the Ortur factory, simplifying the assembly and reducing the number of parts that need to be put together. All-in-all it should take no more than one hour to complete the assembly.

The redesigned belt tensioning system is a big improvement, and simplifies the process should it become necessary to make an adjustment. An adjustment is necessary when the laser is no longer moving smoothly, indicated when square shapes are not produced perfectly square, and round shapes are not produced perfectly round.

Once assembled and powered-on the laser module moves to its home position in the front left corner.

Engraving Platform
The Ortur Laser Engraving Platform is a metal plate 15.75" (400mm) x 12.5" (382mm) that provides a secure non-skid base for engraving and cutting (FIG. 4). Its size is compatible with the bed area on most laser engravers on the market. It protects the surface on which the Laser Master sits, and helps to produce cleaner, smoother cut edges. The platform is designed to easily move the built-in T-square guide, to ensure that any

FIG. 4. *The Ortur Laser Engraving Platform is differentiated from honeycomb metal bases by being solid, and having a movable positioning guide. Credit: Amazon*

substrate or object is placed squarely in alignment with the laser module.

Rotary Attachment
The newly designed Ortur Y-axis Rotary Chuck, made of aluminum alloy material, offers one of the most versatile solutions for engraving cylindrical and round objects. It provides attachments, including a square jaw, stud jaw, and ladder jaw to accommodate a vast variety of objects, some as large as a wine bottle, and as small as a ring (FIG. 5). The jaw components are made of a flexible rubber material that holds objects securely without overly squeezing them, or leaving marks. The tailstock, which holds the end of an object in place, is adjustable, as are a full range of jaw positioning variations. If the object to be engraved is longer than the length of the rotary, the tailstock can be removed entirely.

A toggle switch has been added to the top of the rear frame on the left side, to switch between using the Y-axis motor and the rotary engraver motor (YRR = Y-axis Rotary Roller) (FIG. 6). This saves the step of disconnecting the Y-axis cable. Also, in this area is the port to connect the rotary…much more accessible than connecting it to the motherboard as was the case with the LM2.

To use the rotary, the machine needs to be lifted to accommodate the height of the rotary device and the material it holds. Unfortunately, at the time of release
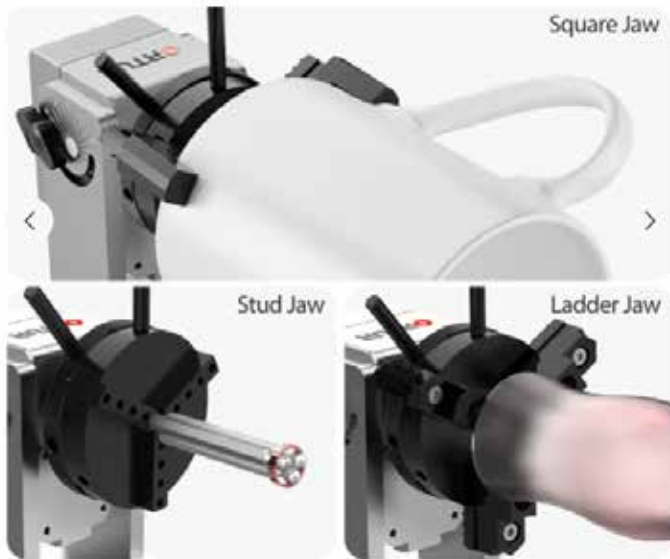
FIG. 5. The various jaw Ortur Y-axis Rotary Chuck positions enable the mounting of a wide variety of objects. Credit: Ortur

FIG. 6. The new rotary motor vs. Y-axis motor switch simplifies changing from one to the other.

the machine was not supplied with a set of risers, so users are left to their own ingenuity to jerry-rig blocks, boxes, cans, or whatnot, to elevate the LM3. As stated, an optional set of folding extension legs is available at additional cost.

The rotary chuck can be adjusted to any angle up to 180°, and held securely in place. During the installation of the Y-axis motor cable, for example, the chuck is set to 90° for easy access to the port. The user then connects the Y-axis motor cable to the YRR motor cable, and the other end to the LM3, and turns the toggle switch to the left.

After an object has been securely placed in the rotary chuck, the user must check to be sure that it is level, using the provided mini level. Adjustments may be necessary, requiring modification of the chuck settings. The rotary is then aligned under the laser head with the focus lever positioned at the highest point of the object. The laser module is moved to the middle of the object, and a series of settings are entered in the software of choice, preferably LightBurn. Among the settings required is the object circumference, which is determined with the provided tape measure.

The work file is imported, resized, and processed using suggested power and speed settings. After the rotary session has finished, all of the software settings must be returned to normal. Ortur has posted a YouTube video of the process at https://www.youtube.com/watch?v=chM-cUsJe2g0.

Speed
The rated speed is up to 20,000mm/min, which is exceptionally fast, although such speeds would be reserved for light engraving or cutting paper or cardboard, or similarly thin or light materials. The higher the speed the more lightly the image will be when engraving, and the longer it will take to cut, if it even can be cut.

Focus
Positioning the laser engraver in focus is a critical step. The laser is most efficient when it is accurately focused, and must be focused reliably each time it is used. Focusing is accomplished by releasing the flip-down lever located conveniently in the front of the laser module (FIG. 7). With the bottom of the lever pulled down and touching the workpiece, and the laser module locked in position, the machine is in focus. The focusing lever is then returned to its original position, out of the way. The benefit of this design is that the focus mechanism is always available, easily accessible, and simple to use.

FIG. 7. The easily accessible focus lever provides an exact measurement between the laser beam and the work object.

Air Assist

The air assist capability is integrated into the laser module, with an intake port in the top for the plastic air hose, and a removable cone nozzle surrounding the laser lens. The nozzle is surrounded with a four-sided amber laser shield to help direct air downward, and contain the power of the laser light, especially useful when working with reflective metal surfaces.

The air assist function is regarded as an essential add-on to reduce charring, and produce cleaner and more precise cuts. The air assist improves the cutting power of the laser and protects the lens, as well as keeps it cleaner. Ortur recommends a pump with an output of at least 40 liters per minute.

The Ortur Air Pump 1.0 provides an air flow of 50 liters per minute, and can be used with other Ortur laser models, as well as those of its competitors (FIG. 8). The pump is relatively quiet, and small (6.7" (170mm) x 7.5" (190mm)) and is operated with a stepless speed control. The kit comes with the flexible tubing, air pipe clip, power adapter, pipe connector, and cable ties.

FIG. 8. *The Ortur air assist provides a strong blast of air at the laser head to blow away smoke and dirty airborne particles, and thereby extend the life of the laser. Credit: Amazon*

Enclosure

The Ortur Enclosure 2.0 is a general-purpose soft-sided enclosure suitable for all laser engraving machines, exclusive of any extended frames. It is designed to be lightweight (5.7 lb., 2.6kg), made of fire-retardant silicone glass fiber material, supported with an aluminum frame, and can be assembled quickly, and re-folded easily for storage (FIG. 9). The enclosure is shipped in a reusable

FIG. 9. *The Ortur Enclosure 2.0 is assembled by snapping a number of straps around pieces of aluminum framing.*

draw-string cloth bag for convenient storage (FIG. 10). The enclosure is compatible with the Ortur Laser Explorer app, which can be used to operate the light and fan controls.

FIG. 10. *The Ortur Enclosure 2.0 is a soft-sided housing that is easily assembled, broken-down, and stored.*

The enclosure, which shields the user from flames, dust, airborne debris, and noise, includes a 6W LED lamp and a smoke exhaust fan. Connections for the power and USB cables are routed through cut-outs in the side (FIG. 11). The fan can be connected directly to the Ortur Smoke Purifier 1.0 to rid the environment of smoke and odors.

The use of the enclosure frees the user from wearing laser goggles, and makes the environment safer for anyone in the immediate area. Without the enclosure in place, everyone in the area must wear a pair of approved laser-safe goggles.

Although the enclosure is made of fire-retardant material, it is not fire-proof. A spoil board or metal engraving platform should be placed under the laser so that the laser beam does not shine directly on the bottom of

FIG. 11. The soft-sided enclosure assembles as easily as a tent, with light-weight supports holding it up.

the enclosure. The laser device itself has a flame detector which will immediately stop the laser if it detects a flame. Nonetheless, the user should keep a fire extinguisher close-by in case of an emergency.

The enclosure makes it easy to install and remove the Laser Master 3. This is handy should the user need to use the laser exclusive of the enclosure, and replace it thereafter. The enclosure is sufficiently large to make the installation and removal process quick and easy (FIG. 12).

FIG. 12. The zippered flaps on the top and front of the enclosure provide a generous opening for placing and removing the laser engraver.

The enclosure, which measures 27.6" (700mm) x 28.3" (720mm) x 14.6" (370mm), includes an eye-safe viewing window on top, so that the engraving/cutting session can be closely monitored (FIG. 13).

FIG. 13. The large vision-safe viewing window ensures that all laser activity can be seen.

The construction and light-weight components of the enclosure make it easy to set-up and breakdown, and the surfaces are easy to clean. This is important because there are times when the laser will need to be used without the enclosure, such as when the laser will need to be raised, when used with the rotary chuck, for example, or in other instances that require the laser to be lifted.

Smoke Purifier
The Ortur Smoke Purifier 1.0 is a small, powerful, relatively quiet (<50dB) air cleaner that is rated to remove 99.97% of airborne particles. The unit incorporates three filters: the primary filter removes large particles, the middle filter removes small particulate matter, and the main filter absorbs harmful gases and obnoxious odors. The smoke purifier can make the work environment more pleasant, while helping to dissipate the heat, all-the-while consuming a low amount of energy (FIG. 14).

The unique design of the machine makes it useful in almost all laser cutter environments due to its unique 360° flexible rotational tube, which is made of a flame-resistant material. The tube can be used open-ended, with a non-enclosed laser, with its suction port directed at the path of the working laser module, sucking up all of the airborne debris and smoke as it is created. It can also be used connected to the Ortur laser enclosure, and those of other laser cutter manufacturers, to form a closed, and cleaner, contained environment.

The device has a small footprint of 15.7" (400mm) x 9.5" (242mm), and a height of just 13.5" (343mm). The

The Laser Explorer start-up page consists of three sections. At the top is the title bar, next is the name of the connected engraving machine, and third is a listing of the available functions: Control, Library, Text, Album, History, File, Bar Code, and QR Code (FIG. 15).
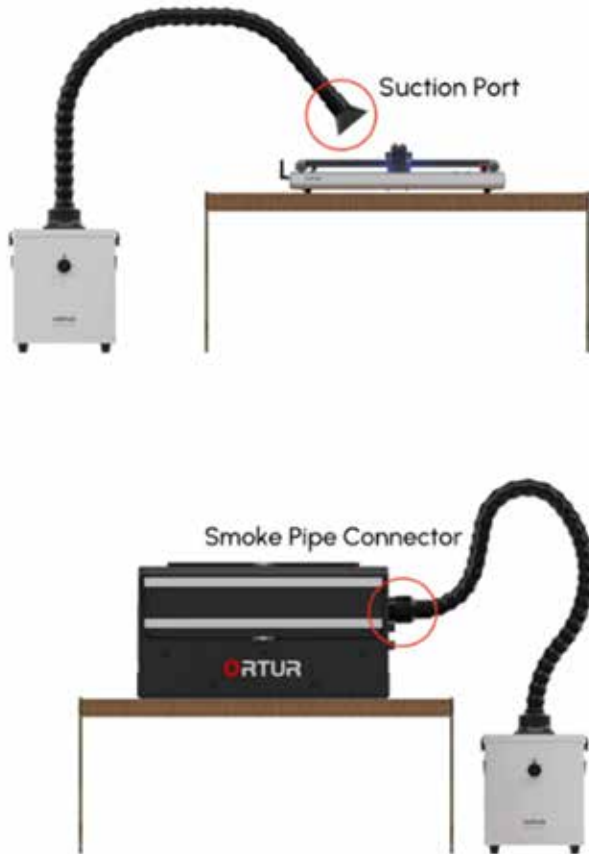

FIG. 14. The Ortur Smoke Purifier 1.0 can be used in either of two ways. First, the suction port can be extended over, but never touching, the laser module work area. Second, it can be connected directly to the Ortur Laser Enclosure 2.0. Credit: Ortur

front control knob has a variable speed range from low to maximum.

Connectivity

In addition to a direct USB connection, the user can connect wirelessly using their local WiFi network.

Software

Ortur provides its own software in the form of an iOS/Android phone and tablet app called Laser Explorer. This software offers basic operations, providing the new user with immediate access to many of the machine functions. The app starts by detecting the LM3 through WiFi. The user identifies the LM3 model to connect, and presses the LM3 power button five times in rapid succession to complete the connection. With the connection successfully accomplished, the user is presented with the Laser Explorer main menu, confirming that the machine is ready to use. The laser module will automatically return to its home position in the front left corner of the frame.
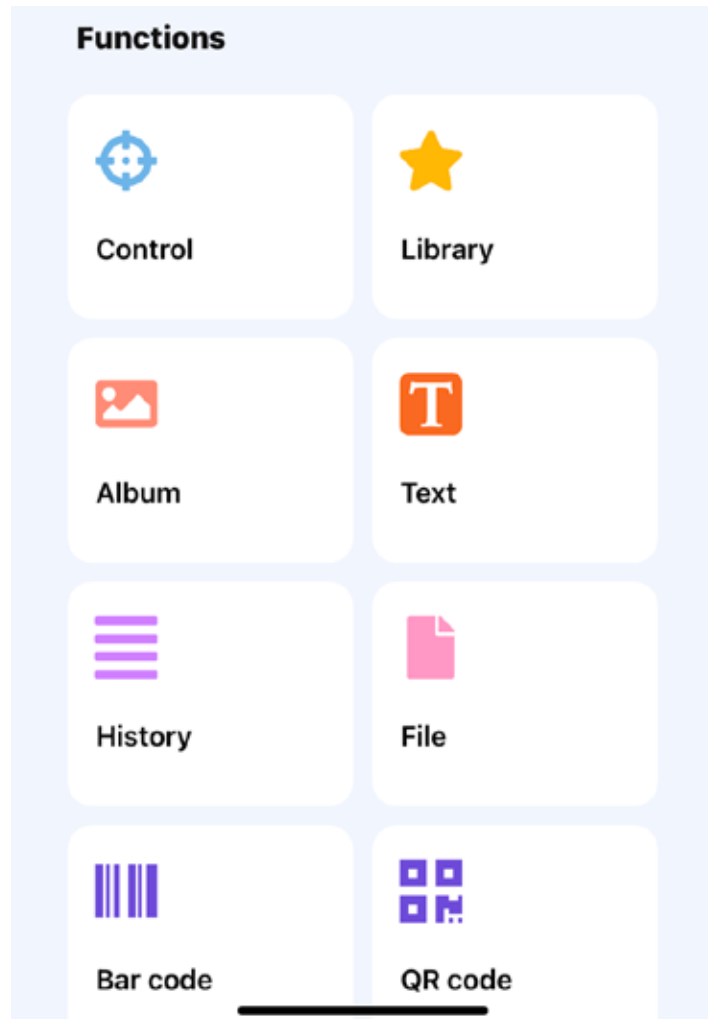

FIG. 15. The major parts of the Laser Explorer software are Control, for moving the laser head, setting the laser power, and more; Album, to take a picture or use an existing one; Text, to enter text, select a typeface variation, and set a size; Library, for selecting a piece of clipart to reproduce; History, to maintain a list of all previous jobs with their parameters; Files, listing local files; Bar Code, for producing a UPC symbol of up to 30 glyphs; and QR Code, supporting up to 300 characters or symbols.

Clicking on the connected machine section reveals the machine model, state of the laser, its imaging area, laser module, WiFi details, available SD card, and firmware version.

The Control interface provides information about the current machine status, including engraving speed, laser power, and the laser module working position. Using directional buttons, the user can remotely control the precise movement of the laser module in chosen

increments (0.1mm to 50mm), and at chosen speeds (2500mm/min to 10000mm/min), and in selected directions.

The user maintains control over the session starting point, laser on/off and power, and the on/off status of the fan, lights, flame detector, and vibration detector. The user can save the state of the engraver by making a custom button.

The Library interface holds more than 100 pieces of clipart representing common objects such as household items, food, modes of transportation, and more (FIG. 16). Any of these objects can be edited for optimum reproduction, resized, positioned, and then sent immediately to the laser (FIG. 17).
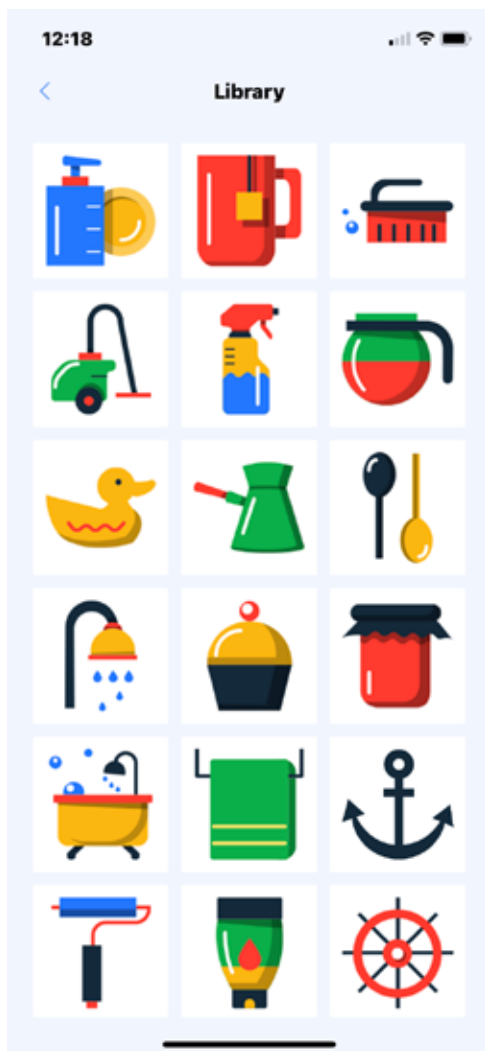

FIG. 16. The Laser Explorer clipart library contains a relatively small variety of common objects.
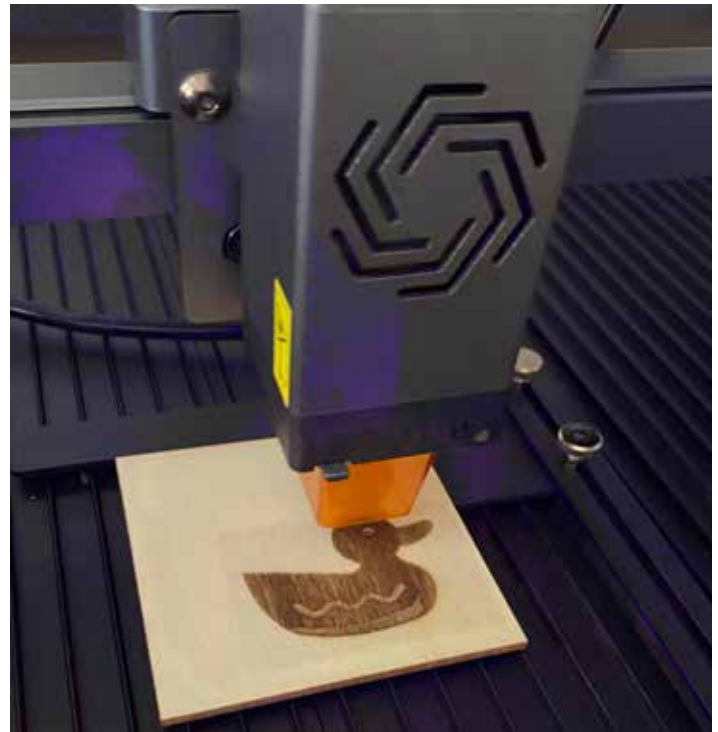

FIG. 17. Clipart from the Library can be engraved quickly from a compatible iOS or Android smart phone or digital pad.

it can be adjusted for size, brightness, contrast, and white threshold. The image position within the work area can be set by dragging and dropping the photo or by setting the X and Y coordinates.

Using the Engraving Configuration interface, the user selects the material, machine mode (Scans, Dotmatrix, Vector), laser power (%), speed (mm/min), times (number of passes), direction (horizontal, vertical, oblique), and quality ((medium (10 lines/mm), high (20 lines/mm), and customized, (1-20 L/mm)).

Before the engraving/cutting operation, the user is prompted to check that the laser is in focus, that the laser head has been returned to its starting position, and that their safety googles are in place. The user can preview (frame) the border of the engraving with the laser set at 0.5% power…strong enough to view the border but sufficiently weak so as to not mark the workpiece surface.

When the position is confirmed, the user presses the Start button to initiate the online engraving/cutting. The engraving/cutting real-time progress is displayed, showing the elapsed and estimated processing times, and spatial information. The user has a control bar available to Stop, Pause, or Run the job. The user also has the option of sending the job to the SD card resident in the

The Album button is used to select a photo from the user's photo album, or to take a new photo. Photos should be selected on the basis of their tonal range so that areas are neither all black nor all white. When a photo is selected it is placed in the picture editing interface where

engraver for off-line processing.

The Text engraving interface consists of two parts: one to enter up to 50 characters, the second to apply formatting: font, hollow (outline), tilt (italic), transform (lc/UC), and underline. After formatting has been applied the text is displayed in the laser engraving preview interface.

The History interface maintains a listing of all of the jobs that have been processed. Each record shows a graphic representation of the job along with the date and time, and processing details, such as speed, power, and material. The records can be searched, renamed, or deleted. Any chosen record can be run again.

The File box interface provides access to saved files that can be modified for processing using different materials.

The Bar Code printing interface enables the user to enter text, of up to 30 characters, and have it translated into a bar code in real-time. The user has the option of including the text below the bar code or not. The bar code can then be saved.

The QR code printing interface supports the conversion of up to 300 text characters or character symbols into a QR code in real-time. The QR code can then be saved.

Safety
The LM3 incorporates a number of important safety features. The first, and perhaps the most significant is the safety lock. The machine requires that a key must be inserted and turned for activation. This is especially important in environments with children, and in any environment where unauthorized users may be present.

The machine can sense if it is moved or tilted while the laser is engaged, and will stop operation immediately. Should the operator determine that the laser needs to be stopped for any reason, he or she can depress the Emergency Stop Switch, a large red and highly visible button in the right front of the machine. The machine will also stop automatically if it detects a flame.

A unique safety feature is the Exposure Duration Detection and Limitation, which safeguards the laser from a malfunction in which the laser remains in the same position for a prolonged period of time, which could start a fire.

The laser will also stop automatically if the connection with the host computer breaks, or if there are anomalies with the incoming voltage.

The package includes a set of laser safety goggles which should always be worn when the laser is in operation and running without the benefit of an enclosure. The goggles have wrap-around lenses for extra protection, and can be worn directly or over prescription glasses.

Further Reading
In-depth coverage of the entire laser engraving and cutting process is available in the new book, **Focusing on Laser Engraving and Decorating:** *Affordable, Versatile, and Creative Marking, Engraving and Cutting* (https://tinyurl.com/2j2kmyc4) sold exclusively on Amazon.com.