

# 99-353 SolidWorks and Laser Cutting

## Laser Cutter Intro

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# How a laser cutter works (1)

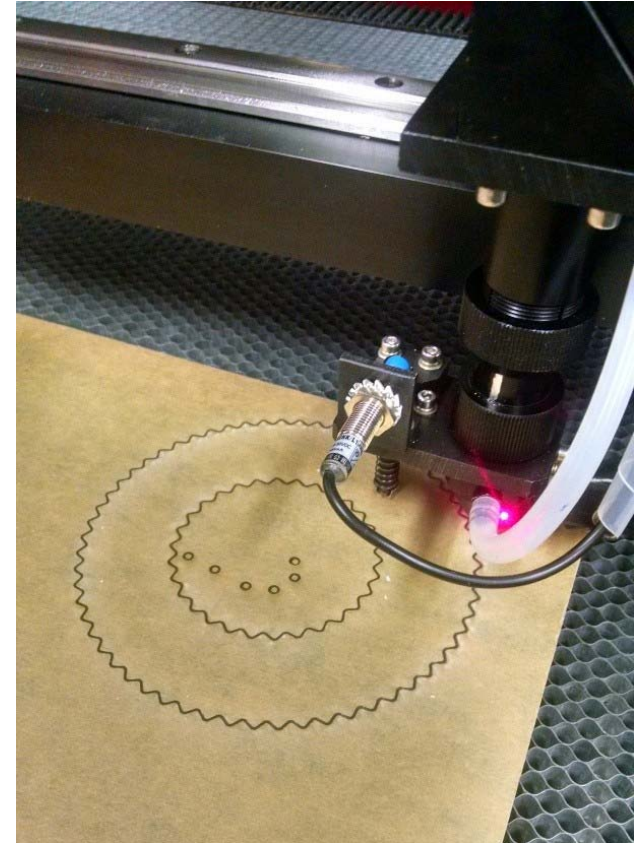
- A laser produces a small, focused beam of energy
- Material struck by a laser beam absorbs the energy; the amount of energy absorbed depends on the properties of the material and of the laser beam.
- The properties of a CO<sub>2</sub> laser, like the IDeATe laser cutter, are well matched to the material properties of plastic and wood.
- A piece of material (usually wood or plastic) is placed on the horizontal bed

# How a laser cutter works (2)

- The laser beam is directed at the material by a sequence of mirrors
- The mirrors are driven by computer-controlled motors so that the laser beam can move in the x, y (along the plane of the bed) or z (vertical) direction. The speed of the laser beam is also computer controlled.
- The speed and power of the laser can be varied so that the laser either cuts through or only etches the material
- The depth of the cut is controlled by the color of the lines in the dxf file.

# How a laser cutter works (3)

- Pointing laser (red, low power)
- Cutting laser (invisible, high power, dangerous!)
- Coolant chiller (stay below 32° F)
- Compressed air to clear debris
- Exhaust system with filtration
- Settings based on type of material:
  - Power level (never go above 85%)
  - Cutting speed (slower speed cuts deeper)



# Rabbit Laser RL-80-1290

- 80 watt CO<sub>2</sub> laser
- 1200x900 mm bed
- Exhaust filter
- Chiller



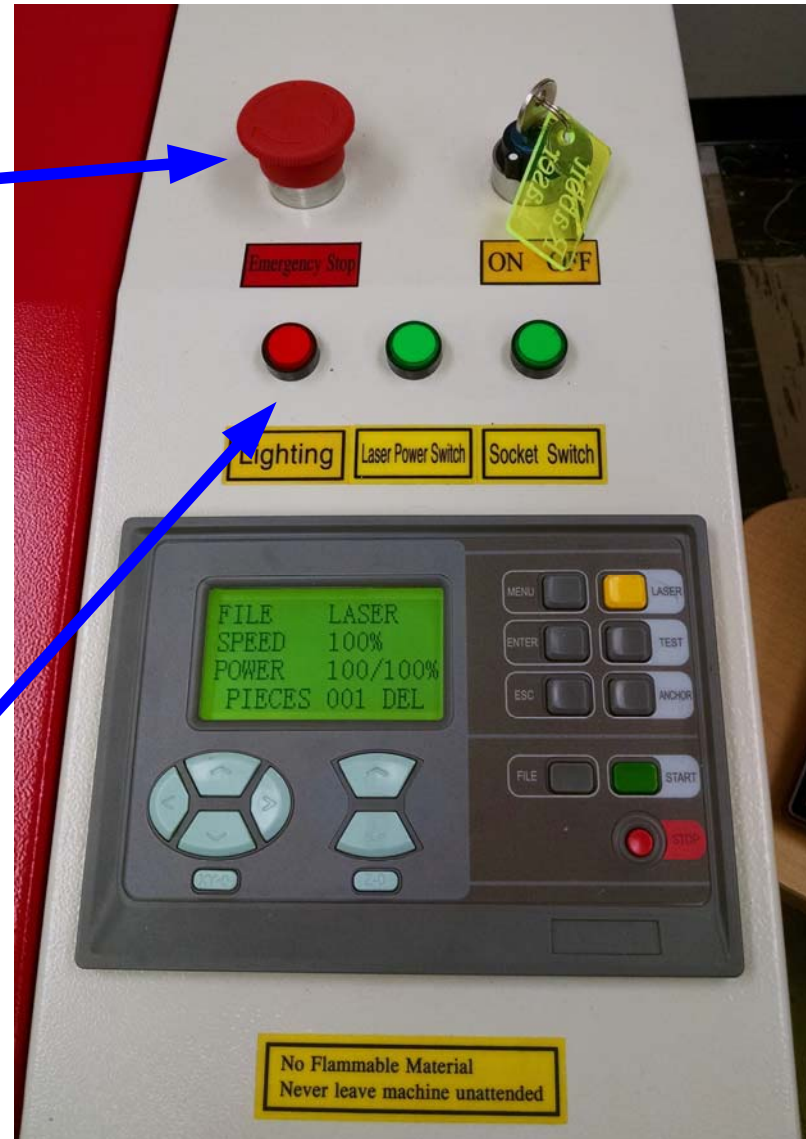
# Operating the Laser

- Full instructions are available in a binder in the laser cutter room
- Posters on the wall have a short version with the operating instructions
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# RL-80-1290 Control Panel

Emergency Stop  
(E-Stop) Button

- Leave the E-Stop on.
- Leave the key turned on.
- Use the three small buttons to turn the lighting, laser tube, and blower on or off.



# RL-80-1290 Control Panel



The laser cutter control panel has two modes. Press the Escape button on the control panel (not the computer keyboard) to switch modes.



# Preparing Material to Cut

- Remove paper backing if necessary.
- Lower the bed.
- Place material on the bed and position the cutting head over the material.
- Press the Z-0 (Z-home) button to set the bed height to focus the laser.

# Laser Client Program (1/3)

- Start the client program on the computer next to the laser.
- Select File→Import (not File→Open) and import your DXF file.
- Select Tools→Unite Lines and accept the default tolerance of 0.01.
- Press Escape to deselect everything.

# Lasercut53 Client Program

The screenshot displays the Lasercut53 Client Program interface. The main workspace shows a blue laser cut path on a light blue grid. A dimension line indicates a width of 50 mm (~ 2 inches). The path includes a vertical section with four circular holes, a central wavy section, and a right-side section with five circular holes. A red outline shows the final cut shape. The control panel on the right includes a table for layer settings, navigation buttons, and machine controls.

layer	Mode	Speed	Power
Cut	Cut	16.00	80.0
Cut	Cut	16.00	80.0

Control Panel:

- Buttons: Up, Down, All, Calculate
- Axis controls: Y+, Z+, X-, Datum, X+, Z Datum, Y-, Z-
- Options:  Slow,  Step, Length: 50.00
- Laser: Power: 10.00
- Times: 1, Delay: 0
- Buttons: Run Box, Clip Box,  Immediate
- Buttons: Start, Pause, Stop
- Machine: [Dropdown], Download

# Laser Client Program (2/3)

- Set the cut order for the colors using the Up and Down buttons. *Do this after the “Unite Lines” step.*
- For each color, program the speed and power level. Leave the corner power at 10%.
- Press the Download button to send your file to the laser cutter.
- In the dialog box, press “Delete all” and then “Download Current”.
- On the laser, press the Test button on the control panel to see the bounding box for the cut area.

# Laser Client Program (3/3)

- Move the material or the cutting head so that the bounding box is completely within your material.
- Close the lid and press the Start button.
- Wait for the beep indicating cutting is done, or press the little red Stop button to stop it.
- When you're done for the day, leave the laser cutter turned on, but turn off the three small buttons.
- Clean up your mess. Don't leave junk on the bed or laying around on the tables.

# Cutting Wood

- We're using 1/8 inch plywood.
- Recommended power settings:
  - Cut: speed 12 mm/sec, power 80%
  - Engrave: speed 80 mm/sec, power 30%
- Cover the surface with masking tape to protect the wood from scorch marks.
- To cut thicker wood (up to 1/2 inch), use multiple passes.

# Safety

- Know where the fire extinguisher and the E-Stop button are. Know how and when to use them
- Chiller temp must be below 32° F.
- Never open the door while the laser is active.
- Never cut materials not on the approved list:
  - Acrylic, Delrin, cardboard, thin wood, MDF (fiberboard), and Yupo paper are all okay.
  - Ask about other materials.
- Lots of stuff that's bad to cut:
  - ABS plastic will catch fire
  - PETG produces oily smoke that dirties the lens and mirrors
  - Anything with chlorine, e.g. styrofoam, vinyl: poison gas!