

2D Laser Engraver

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Abstract—Laser engraver is machine that takes the input from a device as 0 & 1 and engraves on surface. The engraver device requires high tolerance to keep the machine leakage free. It has better life system than cnc machine which are of hydraulic and pneumatic. It has many advantages over older technologies like hot stampings and pad printing.

It can draw any picture, data on the given material. A good example of where laser engraving technology has been adopted into the industry norm is the production line. This is particularly useful for printing dates, expiry codes, and lot numbering of products traveling along a production line.

Laser marking allows plastic and glass to be marked while material is moving. The location where the marking takes place is called a "Making Laser Station".

1. INTRODUCTION

A laser engraving machine can be thought of as three main parts: a laser, a controller, and a surface. The laser is like a pencil - the beam emitted from it allows the controller to trace patterns onto the surface. The controller usually a computer controls the direction, intensity, speed of movement, and spread of the laser beam aimed at the surface. The surface is picked to match what the laser can act on.

There are three main genres of engraving machines: The most common is the X-Y table where, usually, the workpiece surface is stationary and the laser optics move around in X and Y directions, directing the laser beam to draw vectors. Sometimes the laser is stationary and the workpiece moves. Sometimes the workpiece moves in the Y axis and the laser in the X axis. A second genre is for cylindrical workpieces or flat workpieces mounted around a cylinder where the laser effectively traverses a fine helix and on/off laser pulsing produces the desired image on a raster basis. In the third method, both the laser and workpiece are stationary and galvo mirrors move the laser beam over the workpiece surface. Laser engravers using this technology can work in either raster or vector mode.

The point where the laser the terms "laser" and "laser beam" may be used interchangeably touches the surface should be on the focal plane of the laser's optical system, and is usually synonymous with its focalpoint. This point is typically small, perhaps less than a fraction of a millimeter depending on the optical wavelength. Only the area inside this focal point is significantly affected when the laser beam passes over the surface. The energy delivered by the laser changes the surface of the material under the focal point. It may heat up the surface and subsequently vaporize the material, or perhaps the material may fracture known as s-glassing or glassing up and flake off the surface. Cutting through the paint of a metal part is generally how material is laser engraved.

2. BLOCK DIAGRAM

The laser engraver machine's block diagram consists of two axes, controller, stepper motor and an engraving laser. The laser is a Blue ray laser which has a wavelength of 450nm.

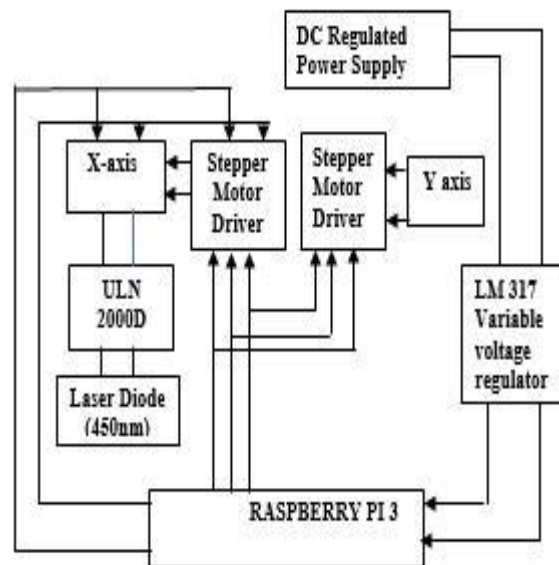


Fig 1 Block Diagram

A regulated power supply is an embedded circuit; it converts unregulated AC into a constant DC. With the help of a rectifier it converts AC supply into DC. As linear regulators, the LM317 are used in DC to DC converter applications. Linear regulators inherently waste power, the power dissipated is the current passed multiplied by the voltage difference between input and output.

The ULN2000D is known for its high-current, high-voltage capacity. The drivers can be paralleled for even higher current output. Even further, stacking one chip on

top of another, both electrically and physically, has been done.

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first generation. Raspberry Pi. Additionally, it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

The high-power density results in rapid heating, melting and partial or complete vaporizing of the material. When cutting mild steel, the heat of the laser beam is enough to start a typical "oxy-fuel" burning process, and the laser cutting gas will be pure oxygen, just like an oxy-fuel torch. When cutting stainless steel or aluminium, the laser beam simply melts the material and high-pressure nitrogen is used to blow the molten metal out of the kerf. On a CNC laser cutter, the laser cutting head is moved over the metal plate in the shape of the desired part, thus cutting the part out of the plate. A capacitive height control system maintains a very accurate distance between the end of the nozzle and the plate that is being cut. This distance is important, because it determines where the focal point is relative to the surface of the plate. Cut quality can be affected by raising or lowering the focal point from just above the surface of the plate, at the surface, or just below the surface.

There are many, many other parameters that affect cut quality as well, but when all are controlled properly, laser cutting is a stable, reliable, and very accurate cutting process.

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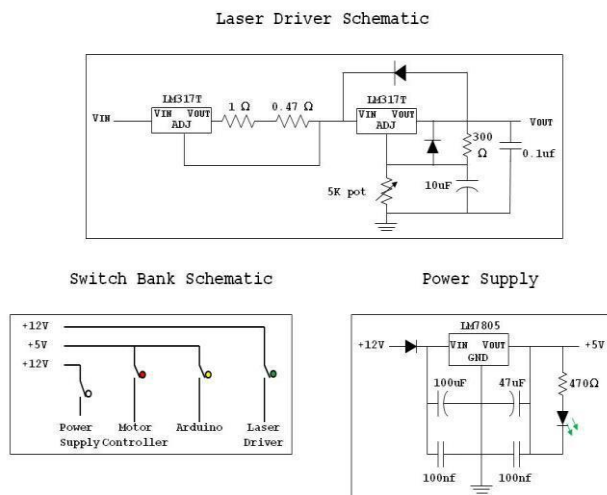


Fig 2 Circuit Diagram

The laser beam is a column of very high intensity light, of a single wavelength, or colour. In the case of a typical CO2 laser, that wavelength is in the Infra-Red part of the light spectrum, so it is invisible to the human eye. The beam is only about 3/4 of an inch in diameter as it travels from the laser resonator, which creates the beam, through the machine's beam path. It may be bounced in different directions by a number of mirrors, or "beam benders", before it is finally focused onto the plate. The focused laser beam goes through the bore of a nozzle right before it hits the plate. Also flowing through that nozzle bore is a compressed gas, such as Oxygen or Nitrogen.

Focusing the laser beam can be done by a special lens, or by a curved mirror, and this takes place in the laser cutting head. The beam has to be precisely focused so that the shape of the focus spot and the density of the energy in that spot are perfectly round and consistent, and centred in the nozzle. By focusing the large beam down to a single pinpoint, the heat density at that spot is extreme. Think about using a magnifying glass to focus the sun's rays onto a leaf, and how that can start a fire. Now think about focusing 6K Watts of energy into a single spot, and you can imagine how hot that spot will get.

3. RESULTS

The output which get engraved on wooden sheets as shown in fig.5 is get done by laser which burns the upper surface of the wooden sheets. The engraving pattern is mechanism of dot-matrix printer, as dot matrix printer prints the character from left to right by point as shown in fig.3, laser also engraves the surface from left to right & top to bottom.

The laser engraver engraves the surface up to 0.8mm on wooden surface as shown in fig.4. Its engraving speed is depending upon the accuracy. If the speed is fast the accuracy is little bit less and vice versa.



Fig 3 Laser Engraver Setup



Fig 4 Engraving Proce



Fig 5 Engraved on Wooden Sheet

4. CONCLUSION

Hence laser engraver can draw any picture, data on the given material. A good example of where laser engraving technology has been adopted into the industry norm is the production line. This is particularly useful for printing dates, expiry codes, and lot numbering of products traveling along a production line.

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