

CNC Router facts and myths

CNC stands for computer numerical control. A CNC router is like a printer with a cutter instead of ink. It's really simple.

The setup is a computer, control box, and machine.

Computer

Any PC running win xp and above will work. If you do not have a parallel port there is a USB adapter.

The computer needs 3 types of software, CAD or drawing, CAM or tool path design, and last is the software to run or control the machine.

CAD is a drafting tool or Drawing program. CAD stands for computer aided design. Once you have the drawing now it is time to generate the tool paths.

Software referred to as CAM is computer aided machining. Some software will do both CAD and CAM, mostly for doing art work, 2.5D, reliefs, etc. For parts, 2D or 3D stuff you need separate programs for CAD and CAM.

The software to control the machine can be any software that runs on a PC or Linux machine.

The Control box

The control box gets data from the computer and sends data to the computer. The data is mostly X, Y, Z coordinates just like graph paper or the Cartesian system. The 3 or more axes require parallel data and

normally the parallel port is used. This is required for simultaneous movement.

A USB device gets data serially then sends it to the control box as parallel data if a parallel port is not available.

The Machine

The machine is made from basic parts; motors, linear drives, and frame. The best motor option for the dollar is the stepper motor. These motors are designed for this application. They are accurate yet simple, powerful, and affordable.

The linear drive uses a slide and motion generated in a variety of ways. The slides we use are rails of the highest quality, designed for this purpose with very high load rating and ground to tight tolerances. We use Ball screws to generate motion because this is the most accurate and the most rigid method of driving a CNC machine. The screws we use are the same grade and pitch you find in a machine shop.

The frame is the skeleton that holds it all together. We use 6061 aircraft grade aluminum that is made for building machines. The design is based on what works best for machining items as tough as carbon fiber yet precise enough to engrave fine pitch circuit boards. To work with heavy loads in 3 dimensions you need a thick stout frame. We use extruded aluminum for a rigid 3d structure and 6061 plate for accuracy, and hardened steel for massive load handling capabilities.

Myths

Anyone can design a CNC

Not all designs are equal. Low cost components will not function properly under the extreme loads of a router or spindle. Giving your machine a ferocious name does not make it so. The Pilot Pro CNC is way above designs like shark, bulldog, Fireball, etc. These other machines are entry level so a comparison **doesn't make sense**. The Pilot Pro compares more to professional milling drilling machines that can carry a 5th axis with a heavy duty spindle while backpacking a CO2 laser and carrying other options! We use the Same Rails, Same screws, Same design standards, Same everything you find in a quality machine shop.

You can see those others are not going to give you the performance you want and need. Look at their pictures, note the thin gantry, end supported table, center lead screw, motor coupling, rod bearings, acme lead nutz, plastic and wood parts, etc. These designs are designed for minimum performance and maximum profit.

These machines are under engineered and use components not designed for this application. Chinese made machines are no different, they too use items that underperform, often use defective parts, craftsmanship is also lacking. And where do you go for assistance?

Aluminum structure

The difference between plate, architectural, and structural aluminum is important. Plate aluminum is soft aluminum. Architectural aluminum is very similar to plate; both are pretty to look at but too soft to make a good machine, however, these alloys are used by others as structural components. We use Structural 6061 aluminum each batch is certified. Because it is structural it is not handled as nicely by the suppliers as the other alloys, but this stuff is what you need for this job.

Using a CNC

Using a CNC is not as difficult as it may seem, check out all the youtube vids and online tutorials, remember CAD, CAM, then run. Work with us and you will be an expert after your first project.

Speed

Speed is inversely proportional to torque and precision for all systems, even your car. Speed can dictate design and function. We use the most common setup for a general purpose CNC, this gives focus to Force and Precision. If you change the lead screw you change the Speed, Force, and Precision. A change in NEMA frame or motor size will only change torque.

Multi Use Tool

CNC machines generally are single use, a router, 3D printer, laser, milling, drilling, plasma, etc. The Pilot is so well designed that it handles all these jobs and more. NOW You can plan on using any machining method and configuration with just 1 machine, the Pilot Pro CNC.

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