As with all machinery there are certain hazards involved with the operation and use of your machine. Using it with caution will considerably lessen the possibility of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator may result. If you have any questions relating to the installation and operation, do not use the equipment until you have contacted your supplying distributor.

Read the following carefully and fully before operating the machine.

1. Keep the working area clean and ensure adequate lighting is available.

2. Do not wear loose clothing, gloves, bracelets, necklaces or ornaments.

3. Do wear face, eye, respiratory and body protection devices as indicated for the operation or environment.

4. Ensure that the power is disconnected from the machine before tools are serviced or any attachment is to be fitted or removed.

5. Never leave the machine with the power on.

6. Do not use dull, gummy or cracked cutting tools.

7. Ensure that the keys and adjusting wrenches have been removed and all the nuts and bolts are secured.
Limited Warranty

New machines and accessories sold by Laguna Tools carry a one-year warranty effective from the date of shipping. Machines sold through dealers must be registered with Laguna Tools within 30 days of purchase to be covered by this warranty. Laguna Tools guarantees all new machines and accessories sold to be free of manufacturers’ defective workmanship, parts and materials. We will repair or replace, without charge, any parts determined by Laguna Tools, Inc. to be a manufacturer’s defect. We require that the defective item/part be returned to Laguna Tools with the complaint. Any machines returned to Laguna Tools must be returned with packaging in the same manner in which it was received. If a part or blade is being returned it must have adequate packaging to ensure no damage is received during shipping. In the event the item/part is determined to be damaged due to lack of maintenance, cleaning or misuse/abuse, the customer will be responsible for the cost to replace the item/part, plus all related shipping charges. This limited warranty does not apply to natural disasters, acts of terrorism, normal wear and tear, product failure due to lack of maintenance or cleaning, damage caused by accident, neglect, lack of or inadequate dust collection, misuse/abuse or damage caused where repair or alterations have been made or attempted by others.

Laguna Tools, Inc. is not responsible for additional tools or modifications sold or performed (other than from/by Laguna Tools, Inc.) on any Laguna Tools, Inc. machine. Warranty maybe voided upon the addition of such described tools and/or modifications, determined on a case-by-case basis.

Software purchased through Laguna Tools Inc. is not covered under this warranty and all technical support must be managed through the software provider. Software is non-refundable.

Normal user alignment, adjustment, tuning and machine settings are not covered by this warranty. It is the responsibility of the user to understand basic machinery operation, settings and procedures and to properly maintain the equipment in accordance with the standards provided by the manufacturer.

Parts, under warranty, are shipped at Laguna Tools, Inc.’s cost either by common carrier, FEDEX ground service or a similar method. Technical support to install replacement parts is primarily provided by phone, fax, e-mail or Laguna Tools Customer Support Website. The labor required to install replacement parts is the responsibility of the user.

Laguna Tools is not responsible for damage or loss caused by a freight company or other circumstances not in our control. All claims for loss or damaged goods must be notified to Laguna Tools within twenty-four hours of delivery. Please contact our Customer Service Department for more information.

Only new machines sold to the original owner are covered by this warranty. For warranty repair information, call 1-800-332-4094.
Noise Emission

Notes concerning noise emission:

Given that there exists a relationship between noise level and exposure times, it is not precise enough to determine the need for supplementary precautions. The factors affecting the true level of exposure to operators are clearly the amount of time exposed; the characteristics of working environment; other sources of dust and noise, etc. For example, adjacent machines may impact the level of ambient noise. It is also possible that exposure level limits will vary from country to country.

Specification General

<table>
<thead>
<tr>
<th>Max USB 2.0 maximum capacity</th>
<th>8GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>0.6 lb [0.3 kg]</td>
</tr>
<tr>
<td>Size</td>
<td>4.3/8&quot; x 61/2&quot; x 1 1/4&quot; [111mm x 165mm x 32mm]</td>
</tr>
</tbody>
</table>

Receiving Your Machine

Note: It is probable that your machine will be delivered by a third party. Before you unpack your machine, you will first need to inspect the packing, invoice, and shipping documents supplied by the driver.

Ensure that there is no visible damage to the packing, or the machine. You must do this prior to the driver leaving. All damage must be noted on the delivery documents and signed by you and the delivery driver. You must then contact the seller, [Laguna Tools] within 24 hours. It is advisable to photograph any shipping damage to support an insurance claim.
**Ball End Milling Cutter** - A milling cutter that has a rounded cutting diameter at its end that is equal to the cutting diameter.

**DXF file** - Drawing exchange Format file that was created as a standard to freely exchange 2 and 3 dimensional drawings between different CAD programs. It basically represents a shape as a wire frame mesh of x, y, z coordinates (vectors).

**Encoder** - Typically an optical device that consists of a disk with 100 to 1000 holes on its periphery. The most common is the incremental encoder that has a small LED light source on one side of the disk with a diode detector on the other to allow the disk rotation to be monitored in discrete incremental steps. Hence, a full revolution can be broken up into 100's or even 1000's of position steps.

**G-Code** - The standard machine tool language around the world. It generally consists of specifying the x, y, z (and a, b or c) coordinates that the machine is to move to. Such movement can be linear, circular or even special drilling operations. It is the universal language of all modern machine tools (mills, lathes, edm machines etc.).

**M-code** - The standard machine tool codes that are normally used to switch on the spindle, coolant or auxiliary devices. They can also be used for G-code program control such as repeating the program or ending it.

**Servo Motor** - A motor that is typically a brush or brushless DC type with an optical encoder attached to it. It is used in what is called a Servo Loop system where positioning information is constantly tracked by minimizing the error between the commanded and real position.

**Step Motor** - A motor that derives its motion by receiving input signals (pulses) in a very specific sequence. The most common type is one that rotates 1.8 degrees for each input pulse. This provides a very simple way of controlling motion very precisely with the use of common digital logic circuitry.

**STL file** - Stereo Lithography file format that has traditionally been associated with Stereo Lithography prototyping machines, but is now also being used to represent 3D surfaces for CNC tool path generating programs.

**Tool Path** - A series of vector coordinate positions that define a cutting path. This cutting path can be a simple 2D or sophisticated 3D (even 4D or more) path used to machine out the shape of a desired part.

**Vector** - A line that has both length and direction. It is usually specified by a starting x, y, z coordinate position and ending x, y, z coordinate position.

**DRO** – Digital Read Outs, shows the axis positions in the interface.
MDI – Manual Data Entry, used for entering commands manually, line by line.

CAD – Computer Aided Design, the using of computers to assist and develop design.

CAM – Computer Aided Manufacturing, the use of computers to assist in manufacturing.

CNC – Computer Numerical Control.

Command – A signal or series of signals that initiates one step or series of steps in the execution of a program.

Feed Rate – F A multi character code containing the letter F followed by digits that determine the machines rate of movement.

H.M.I - Human Machine Interface.

O.I.T – Operator Interface Terminal.

Introduction to Hand-held Controller

The hand held controller is designed to give you years of safe service. Read this owner’s manual in its entirety before assembly or use.

The advantage of the CNC machine is that it can, in most cases, fully machine the complete job without it being removed from the table so that you have finished parts of high accuracy that are totally repeatable.

It can, with the purchase of the relevant software, also produce intricate carvings. Nesting is also a valuable feature of CNC machining that saves on waste and cost. It is possible to reduce the amount of different machines in the shop as the CNC will perform multiple functions and is a must for serious wood workers.
Parts of the Hand-held Controller

The hand held controller has the following parts.

**Key Pad**
This is used to input data into the HHC and to select the various functions.

**Display**
This communicates with the operator.

**Cable Interface**
The main interface cable and USB printer cable connect into these sockets.

**USB Socket**
The USB socket is used to plug the memory stick into for downloading programs.

Assembling the Hand-held Controller

**Note:** Never use a memory stick with a greater capacity than 8GB. If you do it will crash your machine computer. It is strongly suggested that you purchase additional memory sticks and mark them CNC machine use only.

Fit the cable to the controller and ensure that the screws are finger tight. The USB printer cable port is used to connect the controller direct into your computer.

**Note:** The connection port socket and plug only fit one way so ensure that the plug is the correct way up prior to assembling.
Controller Button Functions

Note: Controller may vary form that shown.

X+ / 1 = Moves the gantry in the X direction away from the home end of the bed.
Y+ / 2 = Moves the gantry in the Y direction away from the home end of the bed.
Z+ / 3 = Moves the router head in the Z [Up direction] away from the table surface.
XY-0 / 4 = Sets machine “Origin”.
X- / 5 = Moves the gantry in the X direction towards the home end of the bed.
Y- / 6 = Moves the router head in the Y direction towards the home end of the bed.
Z- / 7 = Moves the router head in the Z [Down direction] towards the table surface.
Z-0 / 8 = Used set the tool to the “Zero” surface (tool “touch-off”).
HOME / 9= Causes the machine to move to the “Home” position, First in the Z axis, followed by X and then Y. (Home is a mechanically determined position using mechanical switches/sensors.)
HIGH/LOW / 0 = Toggles jogging speeds between High and Low ranges.
ONOFF/. = Turns the Router Spindle On and Off.
MENU / _ = Provides access to various setup features.
ORIGIN /OK = Use to accept commands (“On”). Origin causes machine to the machine’s “Origin”.
MODE = Toggles between the three jogging modes: Continuous, Step or Distance.
RUN PAUSE / DELETE = Used to load a program from either the USB drive or internal memory. While the program is running, causes the Operation to “Pause”.
STOP / CANCEL = Stops a running program. Also used to cancel commands.

Note: Before you turn on the machine remove all tools and other objects from the machine table.
Switch on the main isolation switch.
Release the emergency stop by twisting clock wise and it will pop out.
Press the green start button that will turn power on to the machine.
Pressing the green button will also power the hand held controller and the display will light up.
The screen will display “Go to Home?”
Make sure that the table surface is clear of obstructions and press the green Origin/OK button.
The router head will move to the home position on the table.

Note: Home is a mechanical position that is a constant that is determined by switches on each of the 3 axes.
X+= Across (from left-to-right when standing in front of the machine)
Y+ = Length (from front-to-back when standing in front of the machine).
Z+= vertical (up).

By pressing HIGH LOW / 0 and MENU / - the display will change to AX=0, AY=0, and AZ=0.

When the X, Y and Z have an A in front, this denotes that the dimensions displayed are in reference to the machine’s home position. When the X, Y, and Z values are displayed with a number (1-9) this indicated the dimensional relationship of the machine from the machine “Origin”.

LAGUNA
To Move the Router Head

There are 3 different methods of moving the router head.

1. **Continuous mode.** Press the mode button until Continuous is displayed. The display will show the changing location of the router head as it moves location. By holding X+ button down the machine will move constantly until the button is released. This is the same for X-, Y+, Y-, Z+ and Z-. The “High/Low” button determines the speed of the jogging moves.

2. **Step mode.** Press the mode button until step is displayed. With step selected, each time X, or Y button is pressed it will move the router head by 0.5mm in high setting and 0.1mm in the low setting.

3. **Distance mode.** Pressing the mode button a third time and Distance is displayed. This allows you to input a position into the controller that you want the router spindle to move to. As an example, if you want to move the router spindle 100mm from the home position in the X and / or Y axis.
   1. Press the mode button until Distance is displayed.
   2. Type in 100 and press OK
   3. Pressing the X+= button will now move the router 100mm in the X+ axis. The router head also move the set distance in the X+, X-, Y+ and Y- depending on the button that is pressed.
   
   To move the router head in the Z axis press the Z+= / 3 [ UP] or the Z- / 7 button [DOWN]. By pressing any of the other X, Y or Z + or – buttons the router head will move 100mm in the selected direction.

**Jogging Speed**

You can select between a Low or High speed. By pressing the HIGH LOW / 0 button you can toggle between the two speeds. The High speed jog setting is approximately 4 times the speed of Low speed jog setting.

**Setting the Work Envelope [Factory Set]**

**Note:** This comes factory set and should not need adjustment.
The Work Envelope is a volume that defines the movement limits of the router spindle. The X0, Y0 corner of the work envelope is determined by the machine’s Home Position. The X+ and Y+ limits of the work envelope are determined by the “Table Size: Settings (MENU/MACHINE SETUP/TABLE SIZE) and provide the “soft limits” for the machine. The Table Size settings prevent the possibility of the spindle assembly/gantry from being jogged into the machine’s frame.

Insure that the controller display is indicating the “Machine Coordinates”. Those numbers correspond to the machine Home position that is determined by physical limit switches. Machine Coordinates are indicated on the screen by the designation “AX, AY, or AZ”. I the Machine Coordinates are not being displayed, depressing the HIGH/LOW and MENU buttons together will toggle between the machine coordinates and ORIGIN coordinates. (e.g. 1-9).

1. Select Low Speed by pressing the HIGH LOW / 0 button. Select Continuous by press the mode button until “Continuous” is displayed. The display will show the position of the router head as it changes at the bottom of the display.
   Move the router spindle to the home position by pressing the Home button.
Resetting the Origin Point

1. Bring the router head to the origin point by pressing origin button.
2. Lower the router bit by pressing Z so that it is just above the spoil board.

   **Note the position of the tip of the router bit point and you will probably find the origin point will have to be adjusted.**
3. Jog the point over so that it lines up with the edge of the spoil board in the X axis.
4. Jog the point over so that it lines up with the edge of the spoil board in the Y axis.
5. Reset the origin point by pressing the top right hand button XY-0 / 4 this will set the origin and the machine has a new datum point.

Setting the Z Origin Point [tool touch off]

The machine needs to know when the router bit is just touching the top of the spoil board. When you fit the router bit into the collet, the tip of the router bit will be at a different height above the spoil board and will have to be zeroed.

Automatic Z Origin Point [tool touch off]

The machine is provided with an automatic tool height adjustment. Place the contact button on the clean spoil board directly under the cutter.

To activate the automatic tool height adjustment press Menu and On/Off at the same time on the control pad. This will cause the cutter to move slowly down. Once the cutter touches the contact button, electrical contact is made and the cutter will move up and away from the contact button. The machine now knows the height of the cutter.

You can also place the contact button on the top of the job being cut to set the cutter to the top height of the job. This is a handy function when you are engraving or carving with the top face of the job has been set as datum in your program.

Manual Z Origin Point [tool touch off]

1. Fit a flat bottom router bit to the spindle.
2. Jog [Z] the tip of the tool down so that it is just above the top of the spoil board using the CONTINUOUS button.
3. Step down in slow mode [0.1mm 0.004”] each time the button is pressed] while turning the router collet by hand in the reverse direction. As you feel pressure, stop jogging down.

   **Note:** Do not turn the router bit by hand, as it is sharp and could cause injury. Only turn the collet.

If an error message is displayed while trying to execute a program indicating an over travel error in one of the Axes, executing the program would require that a tool path fall outside of the machine’s Work Envelope. PLEASE NOTE THAT THE SELECTION OF THE “ORIGIN” ALSO EFFECTS PLACEMENT OF THE PROGRAM WITHIN THE WORK ENVELOPE.
4. Select the distance mode and enter 0.0254mm [0.0001"] Press Z+ [UP] and rotate the cutter in the reverse direction until the cutter is free to move and there is no drag. The cutter is now within 0.001” above the spoil board.
5. Once the router bit is at Zero press the Z-0 / 8 button to set the zero point.
6. Jog the router bit up or press the origin button to move the router bit up and to the origin point.
<table>
<thead>
<tr>
<th>Key Functions</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jog &quot;Positive X&quot; = Scroll &quot;Up&quot; = Key &quot;Number 1&quot;</td>
<td>Jog &quot;Positive Y&quot; = Accelerate &quot;Feed Rate&quot; = Key Number &quot;2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jog &quot;Positive Z&quot; = Increase &quot;Spindle Speed&quot; = Key Number &quot;3&quot;</td>
<td>Set &quot;Origin Point&quot; = Key Number &quot;4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jog &quot;Negative X&quot; = Scroll &quot;Down&quot; = Key Number &quot;5&quot;</td>
<td>Jog &quot;Negative Y&quot; = Decelerate &quot;Feed Rate&quot; = Key Number &quot;6&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jog &quot;Negative Z&quot; = Decrease &quot;Spindle speed&quot; Key Number &quot;7&quot;</td>
<td>Set &quot;Z Origin&quot; = Key Number &quot;8&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Move to &quot;Home&quot; = Key Number &quot;9&quot;</td>
<td>Select &quot;High/Low &quot;When Jogging Manually = Key Number &quot;0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Spindle = start &quot;On/Off&quot; = &quot;Decimal point&quot;</td>
<td>Open &quot;Menu&quot; = &quot;Minus Key&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Move to &quot;Origin point&quot; = &quot;OK&quot; &quot; Yes&quot; &quot; Enter&quot;</td>
<td>Jogging Mode&quot; Continuous, Step, Distance&quot; = Display &quot; Speed, Time or Line&quot; During a run</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select Programs = &quot;Pause&quot; While running = Select and modify values</td>
<td>Parameter adjustment &quot;High/Low&quot; Speed = Stop Program = &quot;Exit&quot;, Cancel&quot;, &quot;Back&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Double Key Functions

<table>
<thead>
<tr>
<th>Buttons</th>
<th>Function</th>
</tr>
</thead>
</table>
| **MENU** - | **X + 1▲** | Switch "Origin Points" 1-9  
Note: When menu and a number are pressed this will take the router to the relevant origin point |
<p>| <strong>RUN/PAUSE DELETE</strong> | <strong>HIGH/LOW 0</strong> | Advance Work Menu |
| <strong>MENU</strong> - | <strong>MODE</strong> | Move to Coordinates |
| <strong>RUN/PAUSE DELETE</strong> | <strong>X + 1▲</strong> | Start program from a saved point |
| <strong>MENU</strong> - | <strong>ON/OFF ●</strong> | Activate C.A.D. [Cutter Adjust Device] Automatic Tool Touch Off |</p>
<table>
<thead>
<tr>
<th>Buttons</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN/PAUSE DELETE</td>
<td>+ HOME 9</td>
</tr>
<tr>
<td></td>
<td>= Run Last Array Work</td>
</tr>
<tr>
<td>MODE + MENU -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= Go to Coordinates</td>
</tr>
<tr>
<td>MODE + Z-0 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= Set Park Position</td>
</tr>
<tr>
<td>RUN/PAUSE DELETE</td>
<td>+ STOP CANCEL</td>
</tr>
<tr>
<td></td>
<td>= Last Work Information</td>
</tr>
<tr>
<td>MENU - + HIGH/LOW 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= The Absolute Origin Point</td>
</tr>
<tr>
<td></td>
<td>The Absolute Origin = Home Position</td>
</tr>
<tr>
<td></td>
<td>Note: The Home position cannot ever</td>
</tr>
<tr>
<td></td>
<td>be changed as it is controlled by the</td>
</tr>
<tr>
<td></td>
<td>micro switches.</td>
</tr>
</tbody>
</table>

The Absolute Origin = Home Position
Loading a Program into the Machine

The controller has a USB slot located to the top.
1. Load your program into your USB drive.
2. Fit the USB into the USB slot in the controller.
3. Press the button RUN PAUSE/DELETE. The display will show U disc.
4. Press the OK button. This will load onto the screen what is in the USB drive.
5. Use the arrow keys to select the file that you need to load into the controller.
6. Select, then press OK button.
7. Once the code / program has been down loaded the machine will start to operate.

Note. Ensure that you are clear of the machine as the spindle will start to turn and could cause injury.

8. The router will just cut the surface of the spoil board the distance that you set in the design software, (We suggest 1.6mm [1/16”]) and cut the outline of the job. This will give you the location of the part on the spoil board.

Getting Started

Note: Before you turn on the machine remove all tools and other objects from the machine table.

Release the emergency stop by twisting clock wise and it will pop out.
1. Have 220volts, 30 amps, of 1 phase power wired to the machine.
2. Make sure the water reservoir is full and the submersible pump is circulating water through the spindle.
3. Make sure the E-stop button is released, (twist to release) before turning the power on.
4. Power machine.
5. After the touch screen has fully booted, it is required that the machine be homed before any other function is allowed.

Note: All measurements and actions are based on the home switch locations. Homing gives the machine a starting point reference.