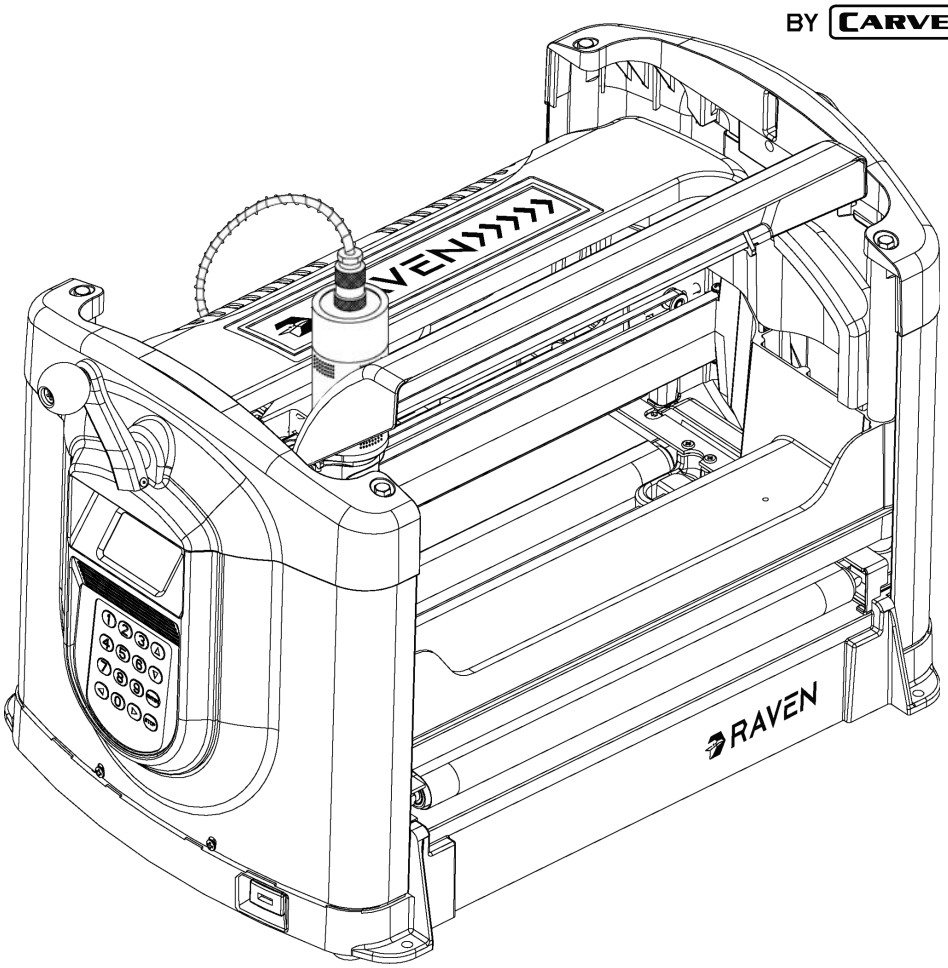
Owner's Manual

MODEL RVN.01.01

RAVEN

BY CARVEWRIGHT



Manual Revision 1.00 (RAVEN) This manual is revised regularly. Please visit us at carvewright.com to download the latest version of this manual.

CAUTION: Read and follow all Safety Rules and Operating Instructions before using this product.

Please keep the box and packaging foam from your machine. This box will be used for return shipping in the event that the unit needs servicing.

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SPECIFICATIONS

- Capabilities
  - Full three-axis CNC
    - 3D carving, cutting, and routing
  - Build Volume (max project size)
    - 15.5in (39.37cm) x 5.5in (13.97cm) x 12ft (365.76cm)
    - Total Z Travel = 2.85”
  - Max Encoder Resolution
    - 0.0003in (0.000762cm)
  - Speeds
    - Spindle – 3,000-22,000 rpm
    - Carving speed – up to 6 ips (15.24 cps)
    - Jogging speed – 9.3 ips (23.622 cps)
- Software
  - Software Bundle
    - Designer™ 5
    - 50 Included 3D carving patterns
  - File Types
    - RVN, PTN, MPC, MPW
    - Imports STL, SVG, PNG, JPG, BMP, and GIF
    - Addons import DXF, OBJ
  - Operating Systems
    - Windows (10+)
    - Mac OS X (10.6+)
  - Connectivity
    - USB Flash Drive
  - Controller
    - ServoSmart™ 2 Advanced Motion Control
      - Five feedback loops
      - LCD graphics screen
      - Easy, guided zeroing setup
      - Problems anticipated automatically
      - Pre-calculated backlash
      - Auto-corrected slipping
- Mechanical
  - Chassis

        - Cast aluminum head and trucks
    - Body
        - Painted steel and ABS plastic
    - Feed-through Belts
        - Heavy-duty rubberized PVC
    - Linear Bearings
        - Double-row precision roller bearings
    - CarveTight™ Spindle Chuck
        - Single-piece hardened steel
        - High-speed phenolic cage bearings
        - Single clamping paw
    - Servo Motors
        - Mabuchi motors
        - 1296 encoder counts per revolution
    - Brushless Spindle Motor
        - 675 w continuous output motor
        - Peak 1.25hp
        - Speed range 3,000–22,000 rpm
        - Dust-free air cooling design
- Operational
    - Storage Temperature
        - 32°–105° F (0–41° C)
    - Operating Temperature
        - 50°–105° F (10–41° C)
    - AC Input – Universal Power Supply
        - 90-240V, 50–60 Hz
- Dimensions
    - Product Dimensions
        - 19in (45.72cm) x 13in (33.02cm) x 15in (38.1cm)
    - Shipping Package Dimensions
        - 29in (73.66cm) x 21in (53.34cm) x 20in (50.8cm)
    - Product Weight
        - 65 lbs (29.5 kg)
    - Shipping Weight
        - 70 lbs (31.75 kg)

RULES FOR SAFE OPERATION

CAUTION: Read and follow all Safety Rules and all Operating Instructions before using this product.

General Safety Rules For Power Tools

ALWAYS WEAR EYE PROTECTION. The operation of any power tool can result in foreign objects being thrown into the eyes, which can result in severe injury. Before beginning tool operation, always wear safety goggles or safety glasses with side shields and a full-face shield when needed. A Wide Vision Safety Mask is recommended for use over eyeglasses or standard safety glasses with side shields. Always wear eye protection that is marked to comply with ANSI Z87.1.

ALWAYS WEAR EAR PROTECTION. Power tools can generate high levels of noise that cause permanent hearing loss. Before beginning tool operation, always don hearing protection to minimize the risk of Hearing damage.

ALWAYS BE ALERT. Operating electrically powered machinery poses a risk of serious physical injury to hands and fingers. Always operate machinery with ALL guards in place and in good working order. DO NOT attempt to defeat safety guards!

- **KNOW THE POWER TOOL**. Read the operator's manual carefully. Learn the machine's applications and limitations as well as any specific potential hazards related to this tool.
- **MAINTAIN TOOLS WITH CARE**. Keep cutting tools sharp and clean for better and safer performance. Follow instructions for lubricating and changing accessories.
- **USE THE RIGHT TOOL FOR THE JOB**. Do not force the tool or attachment to do a job for which it was not designed. Use it only the way it was intended.
- **DO NOT OVERREACH**. Keep proper footing and balance at all times.
- **KEEP WORK AREA CLEAN**. Cluttered work areas and workbenches invite accidents. Keep floors clean and free of accumulated dust. DO NOT leave tools or pieces of wood on top of the machine or on support extensions while it is in operation.
- **KEEP WORK AREA WELL-LIGHTED**. Good lighting promotes safety and good output.
- **DO NOT USE IN DANGEROUS ENVIRONMENT**. Do not use power tools near gasoline or other flammable liquids or explosive fumes. Do not use it in damp or wet conditions.

- **WEAR A DUST MASK** to keep from inhaling fine particles. Use wood dust collection systems whenever possible.
- **NEVER LEAVE A RUNNING TOOL UNATTENDED**. Turn the power off and do not leave the tool until it comes to a complete stop.
- **USE THE PROPER EXTENSION CORD**. Make sure the extension cord is in good condition. Use only a cord heavy enough to carry the current the product will draw (see under Electrical Connections the proper gauges and lengths to use).
- **DISCONNECT TOOL** from the outlet when not in use or before servicing.
- **DRESS PROPERLY.** Do not wear loose clothing, gloves, neckties, rings, bracelets, or other jewelry near a running machine. They can get caught and draw the user into moving parts. Wear protective hair covering to contain long hair. Non-slip footwear is recommended.
- **GUARD AGAINST ELECTRICAL SHOCK** by preventing body contact with grounded surfaces such as pipes, radiators, or appliances while using the tool.
- **GROUND ALL TOOLS**. When using an external dust collection system or vacuum make sure to use only grounded equipment to reduce the risk that harmful static electricity will accumulate due to the airflow. (Also See Electrical Connections)
- **DO NOT ABUSE POWER CORD**. Never yank the cord to disconnect it from the receptacle. Keep the cord from heat, oil, and sharp edges. Inspect power cords regularly and repair or replace them if damaged.
- **PROTECT VISITORS AND CHILDREN**. All visitors should wear safety glasses, hearing protection, and be kept a safe distance from the work area. Do not let visitors contact the tool or extension cord while it is operating.
- **MAKE WORKSHOP CHILDPROOF**. Use padlocks and master switches, and remove switch keys
- **AVOID ACCIDENTAL STARTING**. Be sure the switch is off when plugging in the tool.
- **DO NOT OPERATE ANY POWER TOOL WHILE UNDER THE INFLUENCE OF DRUGS, ALCOHOL, OR ANY MEDICATION AFFECTING ALERTNESS.**
- **STAY ALERT AND EXERCISE CONTROL**. Stay alert and use common sense. Do not operate the tool when tired. Do not rush.

Specific Safety Rules & Precautions For RAVEN

WARNING: Look for this symbol throughout this manual. It points out important safety precautions. It means attention -- Personal safety is involved!

- **WHILE USING MACHINE**, make sure that the power to the machine is kept constant. Using other high power draw machines on the same power leg may cause the machine to lose position and damage the workpiece.
- **BEFORE MAKING A CUT**, be sure that all mechanical adjustments and settings are secure. Until you are thoroughly familiar with the operation, it is a good idea to create a checklist to help ensure all are secure.

- **REMOVE WRENCHES AND ADJUSTING KEYS AND BIT PLATE**. Get in the habit of checking - before turning on the tool - that any hex keys or adjusting wrenches, bit plate, or other items are removed from the tool.
- **CHECK FOR DAMAGE**. Before using the tool, routinely check for any damaged parts, including guards. Look for anything that could interfere with proper operation and performance, such as any binding or misalignment of moving parts or any sign of instability in the carving system. A damaged part must be properly repaired or replaced by a qualified service technician at a repair center to avoid risk of personal injury.
- **BE SURE THE BIT CLEARS THE WORKPIECE**. Never start the system with the bit touching the workpiece.
- **NEVER ATTEMPT TO DEFEAT SAFETY DEVICES OR INTERLOCKS**. Guards and other safety devices protect the user from injury; do not try to bypass or remove them.
- **KEEP HANDS AWAY FROM CUTTING AREA**. When the machine is running, never reach underneath the workpiece or into the blade-cutting path for any reason.
- **DO NOT PLACE HANDS ON THE GRIT SURFACE DRIVE BELTS DURING OPERATION**. Belts in motion could drag a hand into the machine and cause injury.
- **AVOID AWKWARD OPERATIONS AND HAND POSITIONS** where a sudden slip could cause hands to move into the cutting area.
- **TURN OFF THE SYSTEM IF A STRANGE NOISE OR HEAVY VIBRATION OCCURS.** Immediately turn off the system. Then locate and correct the source of the problem before restarting.
- **USE A SUPPORT FOR LONG WORKPIECES.** To minimize the risk of over-stressing the machine, use a sturdy “outrigger” support when carving a long workpiece more than 36 inches in length. Never substitute a person for proper support.
- **USE RECOMMENDED ACCESSORIES**. Using improper accessories may risk injury. Consult the accessories section for recommended accessories.
- **USE ONLY APPROVED CUTTING BITS** to ensure quality and to avoid equipment damage or injury.
- **KEEP BITS CLEAN AND SHARP.** Sharp bits minimize workpiece burning, poor cut quality, and stress to the system. Keep bits free of rust, grease, and pitch.
- **USE GLOVES TO HANDLE HOT CUTTING BITS**. Recently used cutting bits are hot, and all bits have sharp edges; gloves will help prevent cuts and burns.
- **USE ONLY ORIGINAL REPLACEMENT PARTS**. Repairs using other than original replacement parts may create a hazard as well as damage to the machine. To ensure proper repair using original replacement parts, a qualified service technician at a CarveWright service center should make all repairs, whether electrical or mechanical.
- **DO NOT USE THE TOOL IF THE POWER SWITCH DOES NOT TURN IT ON AND OFF.** Have defective switches replaced by a CarveWright service center.
- **CUT ONLY WOOD, PLASTIC OR WOOD-LIKE MATERIALS.** Do not cut metal.
- **NEVER** cut more than one piece at a time.
- **DO NOT STACK** more than one workpiece at a time.
- **BE SURE THE WORKPIECE PATH IS FREE OF NAILS.** Inspect for, and remove all nails, staples, and protruding features from the lumber before cutting.

- **KEEP TOOL DRY, CLEAN, AND FREE FROM OIL AND GREASE**. Always use a clean cloth when cleaning. Never use brake fluids, gasoline, petroleum-based products, or any solvents to clean the system.
- **DO NOT STAND ON TOOL**. Serious injury can occur if the tool is tipped or if the cutting tool is unintentionally contacted.

WARNING: Operation of this tool should not be attempted until all instructions, safety rules, etc. contained in this manual have been read thoroughly and understood completely. Failure to do so can result in accidents involving fire, electric shock, or serious personal injury. Save the operator's manual and review it frequently for continuing safe operation and for instructing others who may use this tool.

WARNING! Some dust created by power sanding, cutting, and drilling contains chemicals known to cause cancer, birth defects, allergic reactions, or reproductive damage. Some examples of these chemicals are: Lead from lead-based paints, Arsenic, copper, and chromium from chemically treated lumber, Wood resin, Plastic solvents, and Silica Dust. To reduce exposure to these chemicals: 1) Work in a well ventilated area, 2) Work with approved safety equipment, such as dust masks that are specially designed to filter out microscopic particles AND 3) Keep the machine and work area clean.

IMPORTANT NOTE: Servicing requires much care and specialized knowledge of the system and should be performed only by a qualified service technician. For service, return the machine to the nearest repair center in the original packaging.

GLOSSARY

- **Raster Carving** - A carving produced by taking many small passes with the carving bit, building the 3D image one line at a time. This uses bitmapped based imagery.
- **Vector Cut** - A cutting operation that is composed of a group of strokes from one point to another along a path. These can be lines, circles, splines or any other number of geometric vector elements.
- **Rout** - To hollow, scoop or carve out.
- **Workpiece** - Is the item on which the cutting operation is being performed. The surfaces of a workpiece are commonly referred to as faces, ends, and edges.
- **Snipe** - An unwanted depression formed near the end of a workpiece caused by the uneven transition of the workpiece from one support surface to another. Minimize snipe by ensuring that the auxiliary outfeed supports are properly adjusted. The free end of the workpiece should also be well supported so that its weight does not place lifting pressure at the end of the workpiece being carved.
- **LCD** - Liquid Crystal Display – The two-line text display found above the keypad.
- **Pitch** - A sticky, sap-based substance found in some woods.

ELECTRICAL CONNECTIONS

POWER SUPPLY

The RAVEN machine is controlled by precision electronics. It should be connected only to a power supply that is 120 volts nominal, 60 Hz, AC (normal household outlet). It should not be connected to a 240-volt power supply. This tool will not operate on direct current (DC). the machine does not operate when plugged into an outlet, check to see that the fuse or circuit breaker for the outlet is not open and that the outlet has power available. The plug has polarized terminals so make sure that it is inserted properly into the outlet.

EXTENSION CORDS

When using the RAVEN at an extended distance from the wall outlet, use an extension cord heavy enough to carry the current that the tool will draw without inducing a large resistance load. An undersized extension cord will cause a drop in line voltage, which can result in a momentary loss of power. This will cause the machine sensors to work intermittently and can even cause damage to the machine. This may show itself in random machine stalls or even a full electronics reboot. Additionally, only connect to a dedicated AC circuit. Circuits with other large loads (AC units, other tools, dust collection systems, etc.) can also cause a momentary voltage drop when operating at the same time (especially at startup).

Use the chart provided below to determine the minimum wire size required in an extension cord. Only jacketed cords listed by Underwriters Laboratories (UL) should be used.

Length of Extension Cord vs. Minimum Wire Size (American Wire Gage - AWG)

Up to 10 feet - 14 AWG
10 to 50 feet - 12 AWG
Over 50 feet – not recommended

When working with the tool outdoors, use an extension cord that is designed for outside use (This is indicated by the letters WA on the power cord's outer jacket). Before using an extension cord, inspect it for loose or exposed wires and cut or worn insulation.

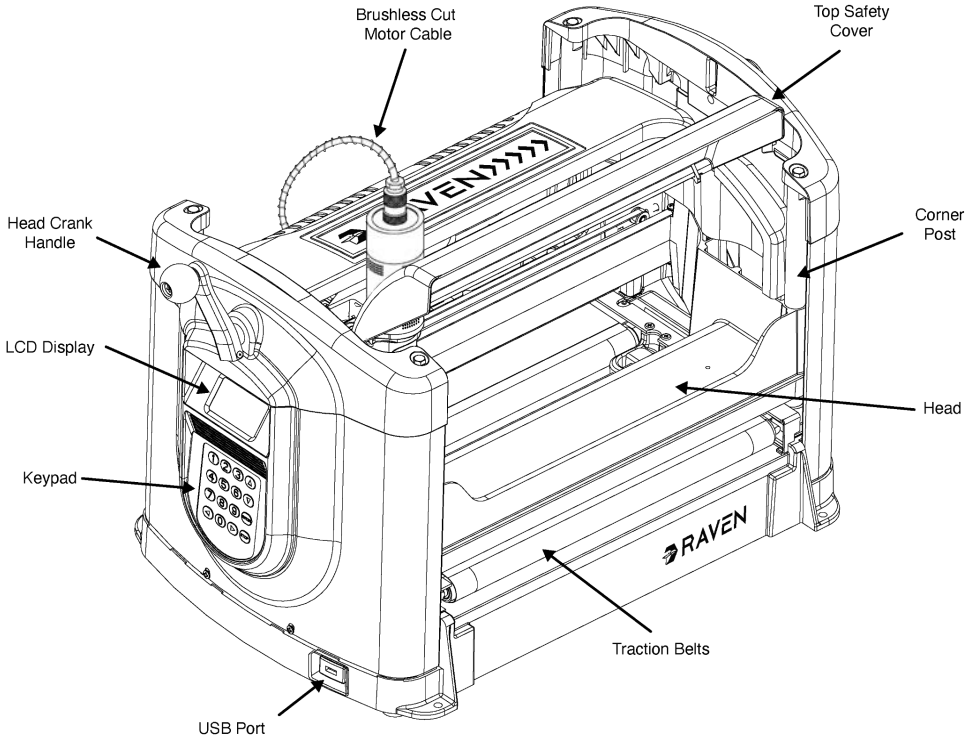
STORING THE MACHINE

It is important that the CarveWright be stored indoors in a low humidity environment. Never expose the machine to temperatures of over 110 degrees Fahrenheit for any extended period of time. The machine should not be used in an environment with a temperature of less than 40 degrees Fahrenheit. Make sure that all exposed metal surfaces on the chuck and bit adapters are well oiled for operation and storage.

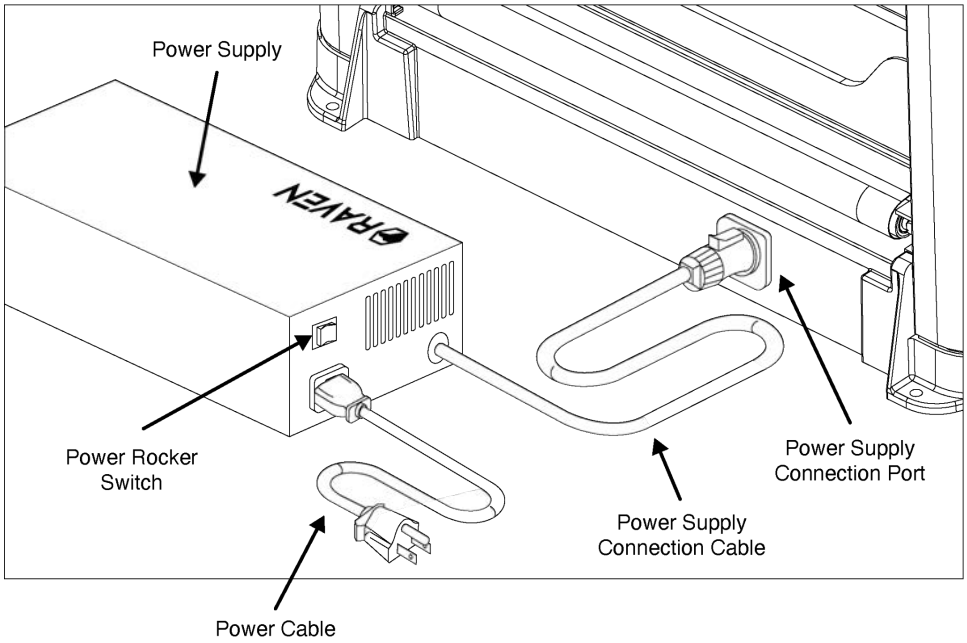
Be sure to keep the box and packing foam should the machine needs to be returned for service.

HARDWARE FEATURES

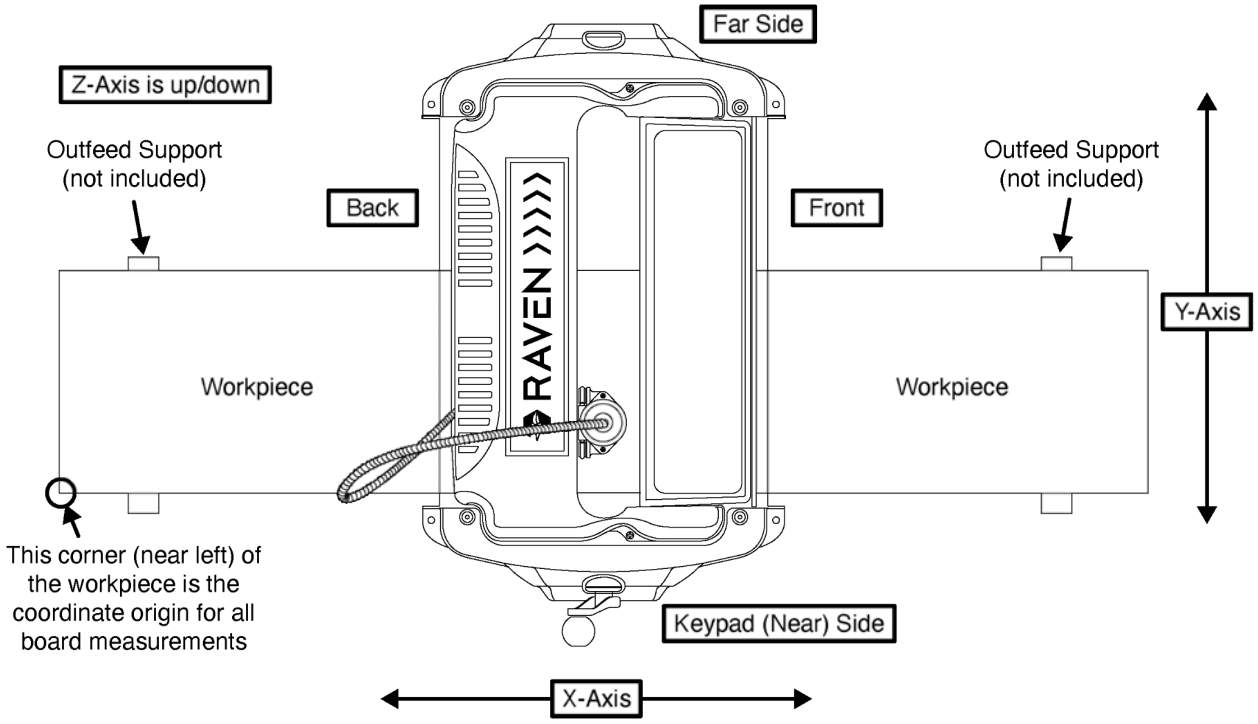
Front View



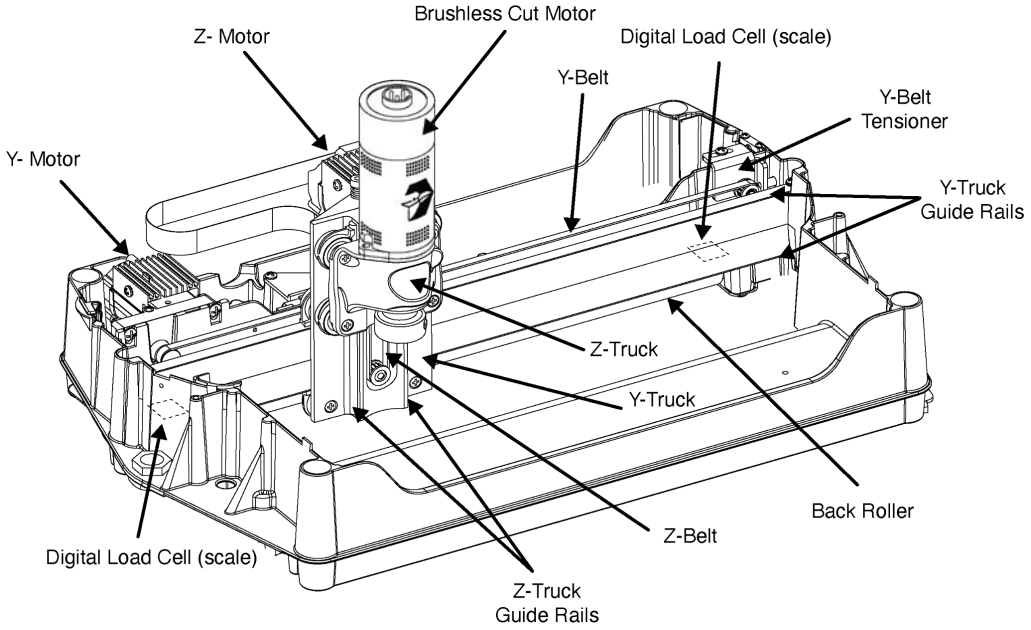
Rear View



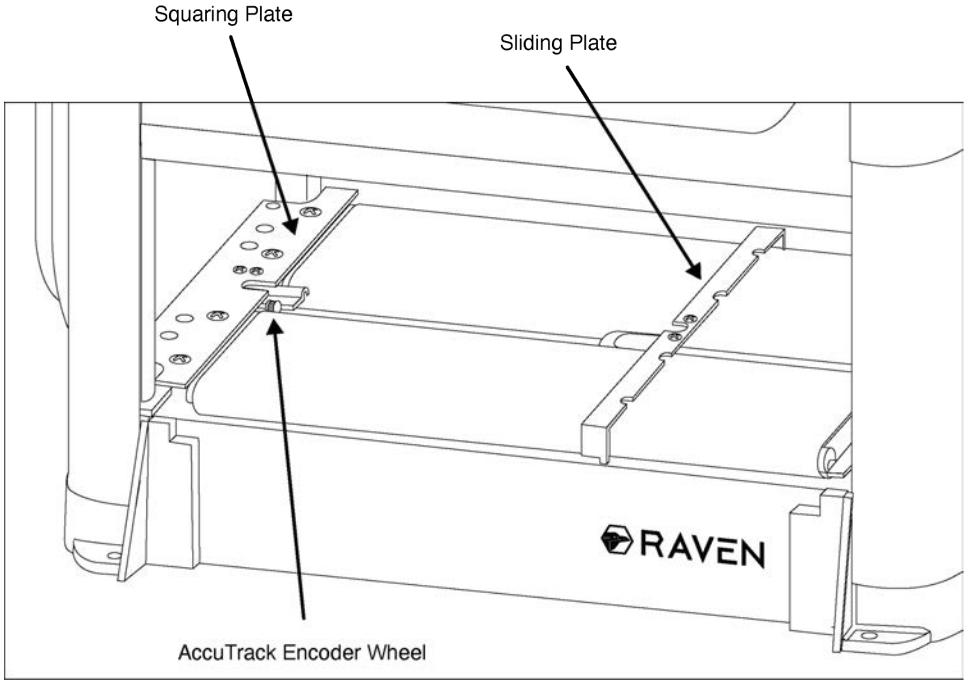
Top View



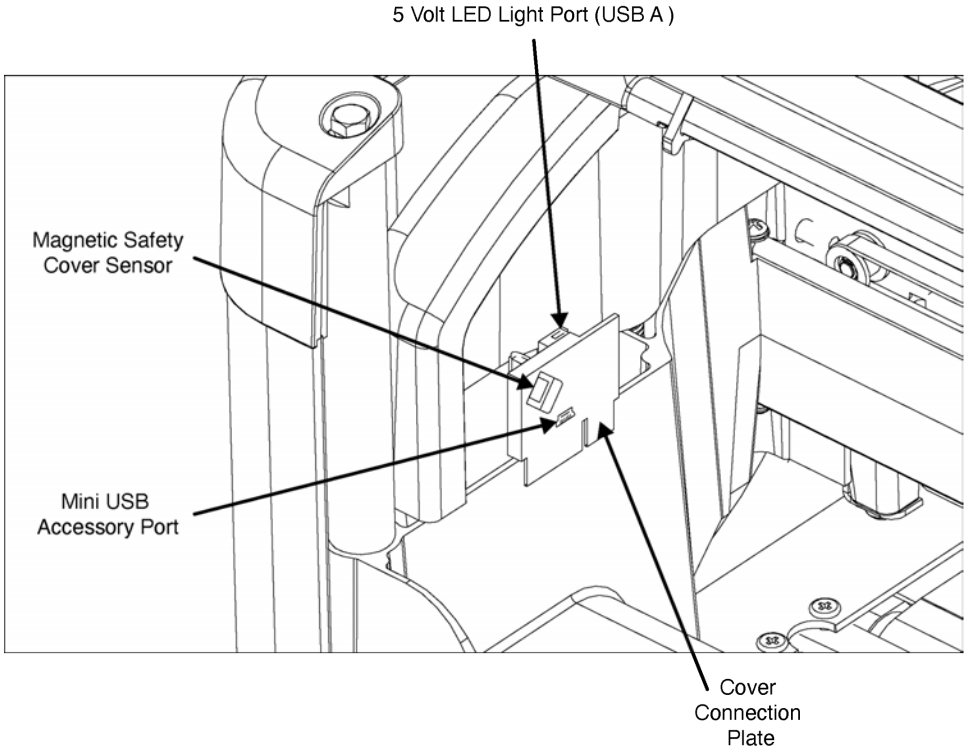
Head Assembly



AccuTrack Assembly

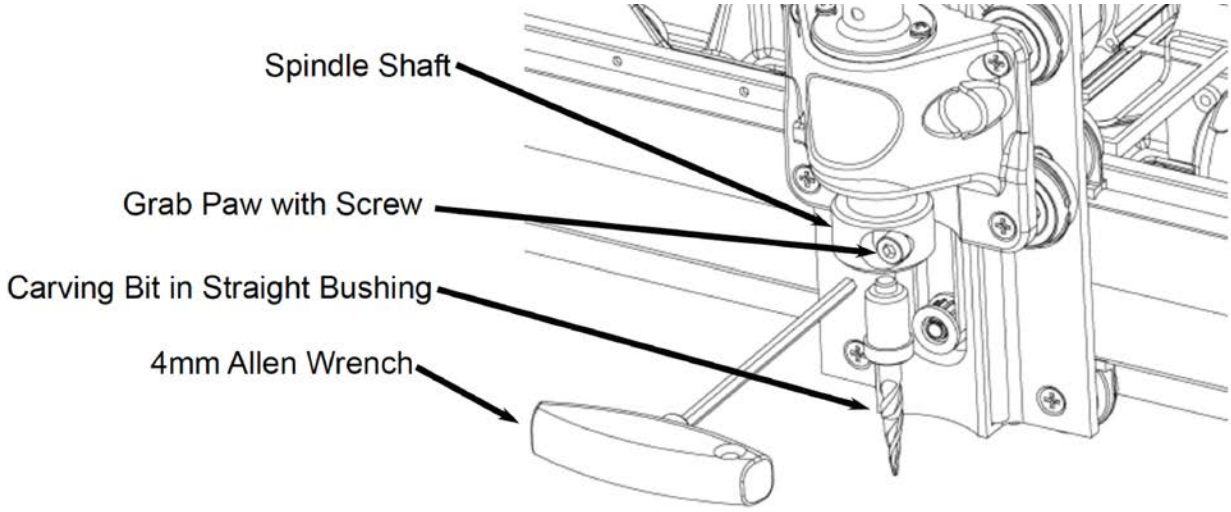


Cover Connection Plate

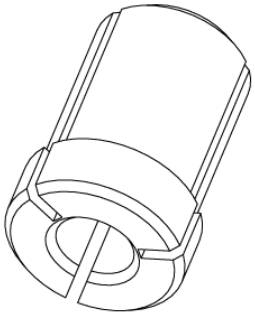


CarveTight Chuck

The CarveTight spindle system allows the user to switch between bits quickly and easily. The system consists of a 1/2" straight bore spindle shaft and an off-center friction paw that grabs the bit. The bits are inserted into the shaft and the paw is tightened with a 4mm Allen wrench.



Steel shank bits with a 1/2” shank diameter can be inserted directly into the bore of the spindle. Bits with a 1/4" steel shank will first need to be inserted into a split collet before being inserted into the spindle bore. It is recommended to use a stop collar to provide a roughly constant depth reference from use-to-use of the bit.



Solid carbide bits are not recommended for use with the split collet. The split collet is not able to grab the hard carbide sufficiently to guarantee it won’t slip or pull out of the collet. It is recommended to purchase solid carbide bits with hard pressed no-slip adaptors directly from CarveWright.

Bits

The RAVEN comes with a 1/16” tip diameter carving bit mounted in a 1/2" hard pressed no slip adapter. Additional bits and bit adapters, made to RAVEN’s specifications, are available through the CarveWright web site. You may also program your own bits in the Designer software.

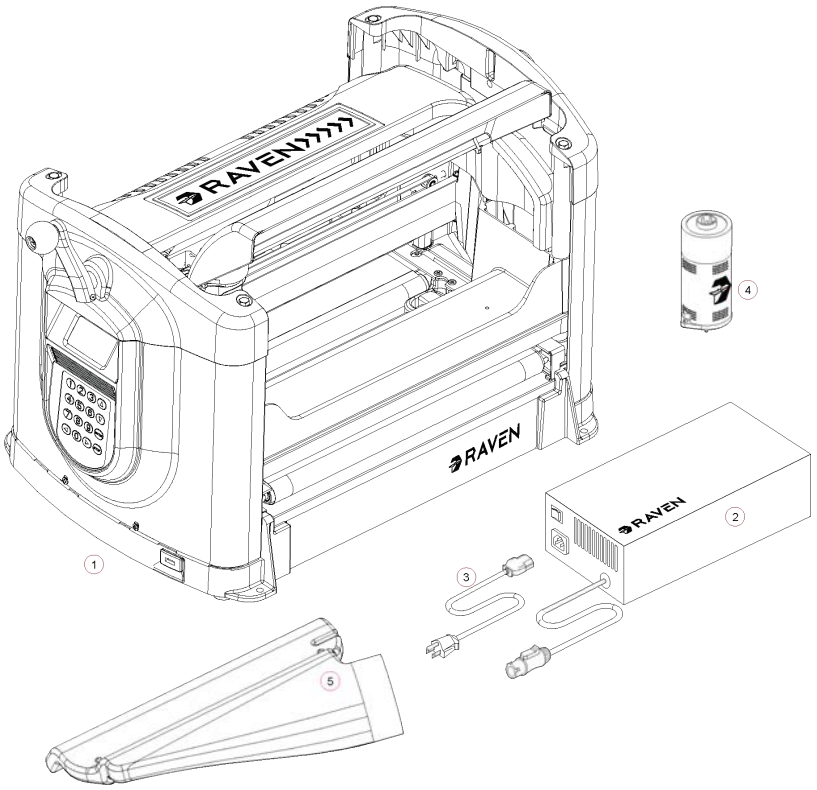
WARNING: Piloted bits can NOT be used in the machine even if the pilot bearings have been removed.

WARNING: NEVER CUT DEEPER THAN THE LENGTH OF THE SHARPENED CUTTING SURFACE OF YOUR BIT. If you program the project to go deeper than it’s specified depth you will most likely damage your machine or bits

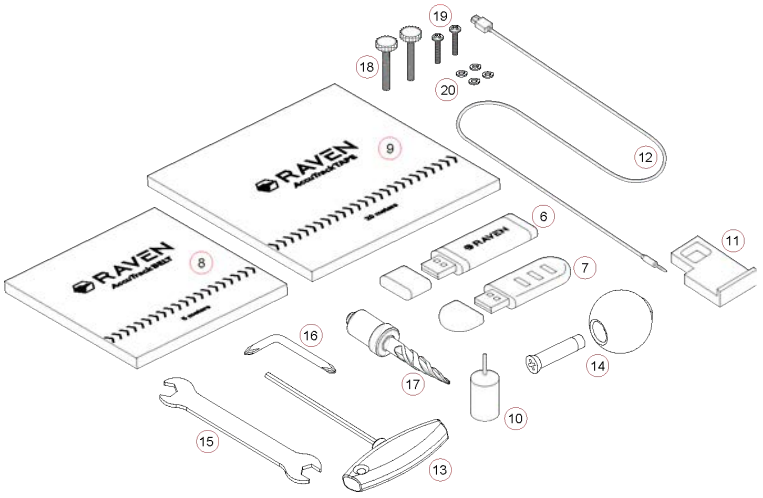
RAVEN SETUP

This section is also found with each RAVEN as a quick Start Guide

Items Included

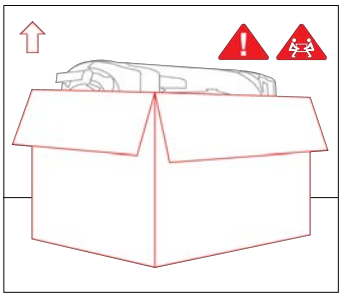


1. RAVEN CNC Machine
2. Power Supply
3. Power Cable
4. Brushless Spindle Motor
5. CarveWright Dust Hood
6. USB Thumb Drive
7. USB LED Light
8. AccuTrack Belt (5 meters)
9. AccuTrack Tape (20 meters)
10. AccuTouch Probe
11. AccuTouch Plate
12. AccuTouch Plate Cable
13. 4mm T-Handle Allen Wrench
14. Crank Handle Ball & Shoulder Bolt
15. Cam Roller Bearing Wrench
16. Offset Y-Belt Tensioning Phillips Head
17. 1/16” Carving Bit
18. 2 Thumbscrews
19. 2 M5 cut motor mounting screws
20. 4 Lock Washers
21. RAVEN Quickstart Guide

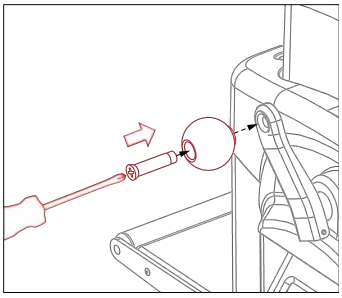


Quick Start Guide

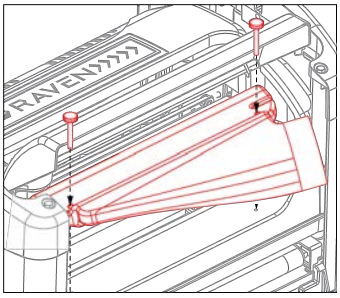
1. REMOVE THE MACHINE FROM BOX
    a. Remove accessory box and top foam. Lift the machine and place it on a sturdy table or bench. Remove the plastic film covering the clear top cover, and remove the packing foam from inside the machine.



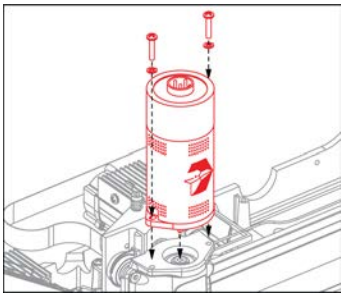
2. ATTACH THE CRANK HANDLE
    a. Attach the crank handle ball to the crank lever using the supplied shoulder bolt.



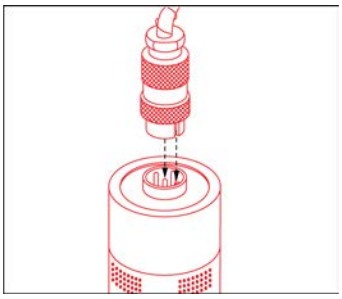
3. INSTALL DUST HOOD
    a. The dust hood sits on the front ledge of the machine head and is secured using the included thumbscrews.



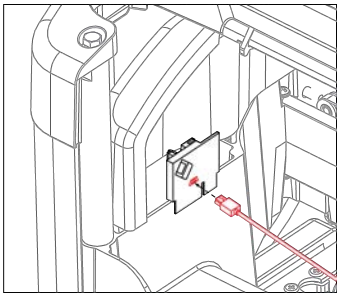
4. INSTALL THE BRUSHLESS CUT MOTOR
    a. Line up and insert the square of the motor drive into the top of the spindle. Use the 2 screws, with only 1 lock washer each, to mount the motor to the top of the Z truck.



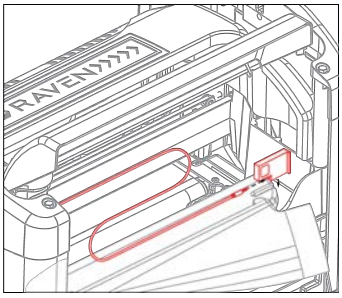
5. PLUG IN THE SPINDLE MOTOR
    a. Line up the notch and plug in the power cable to the spindle motor, then securely tighten the threaded fitting.



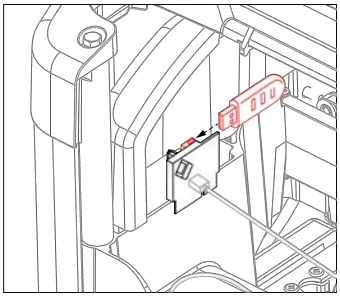
6. PLUG IN BIT PLATE CABLE
    a. Plug the mini usb end of the touch plate cable into the cover connection port.



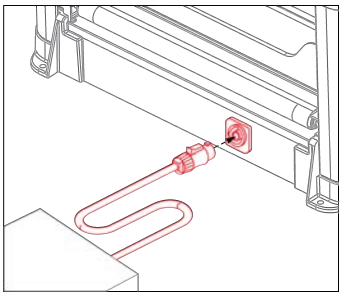
7. CONNECT BIT PLATE
    a. Plug the banana clip end of the touch plate cable into the AccuTouch plate. Place the touch plate into the notch on the dust hood.



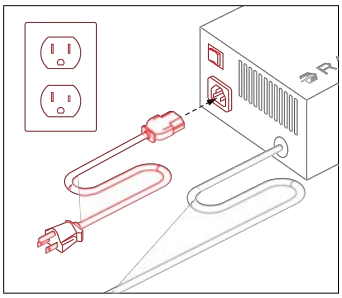
8. PLUG IN LED LIGHT
    a. Insert the USB LED light into the USB port in the back of the cover connection plate.



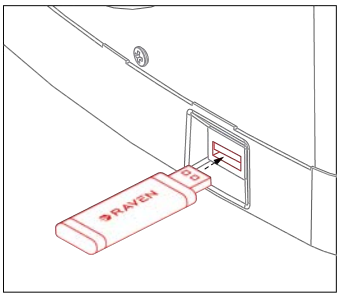
9. INSERT POWER CABLE TO RAVEN
    a. Insert the power cable into the back of the RAVEN machine using the blue connector. Be sure to rotate it until it snaps into place.



10. PLUG IN THE POWER SUPPLY
    a. Attach the power cable to the power supply and plug into a standard outlet. Power on the RAVEN using the power rocker switch on the back of the power supply.

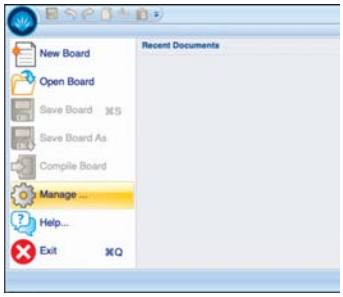


11. GET REGISTRATION KEY
    a. With the power on, insert the USB drive into the side port. The machine will automatically add a key file to the USB drive. Repeat this for every RAVEN you wish to register. Remove the drive and take it to the computer where the Designer software is installed.
    b. **Note:** The USB can safely be inserted and removed while the machine is powered.

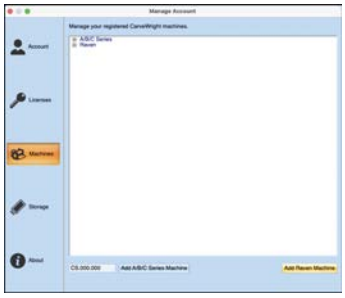


12. INSTALL SOFTWARE
    a. If you have not already done so, download and install the Designer software from the CarveWright website. Follow the installation instructions to ensure it is registered and licensed. https://www.carvewright.com/download-designer/
    b. **Note:** Machine registration will not work if the software is not licensed.

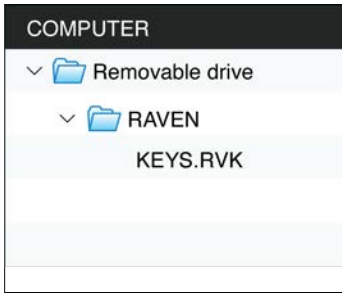
13. OPEN MANAGE
    a. In Designer, navigate to “Manage” under the blue shell icon file menu.



14. ADD RAVEN MACHINE
    a. In Manage, click on “Machines” and find the button labeled “Add Raven Machine”.



15. LOCATE KEY FILE
    a. Use the file menu to locate the USB drive and select the key file (KEYS.RVK) in the RAVEN folder. This file will automatically add all RAVEN machines to your account that have been added to the USB drive.



YOUR RAVEN SETUP IS COMPLETE!

OPERATION

Creating Projects with the DESIGNER Software

Discussion of the usage of the CarveWright Designer software is beyond the scope of this manual and is covered separately. Please refer to the Designer software manuals and tutorials available at CarveWright.com under the Help/Learn

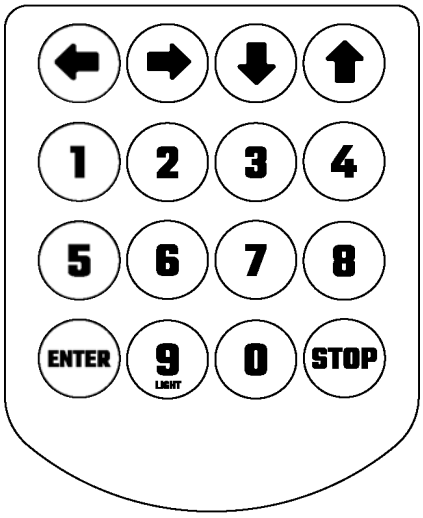
At any point during operation the RAVEN machine can be stopped by pressing the STOP key or by lifting the cover. If desired the machine can be restarted by closing the cover and pressing ENTER. The machine will resume cutting at the point where it was stopped. Pressing the STOP button a second time will abort the project, so be careful when restarting.

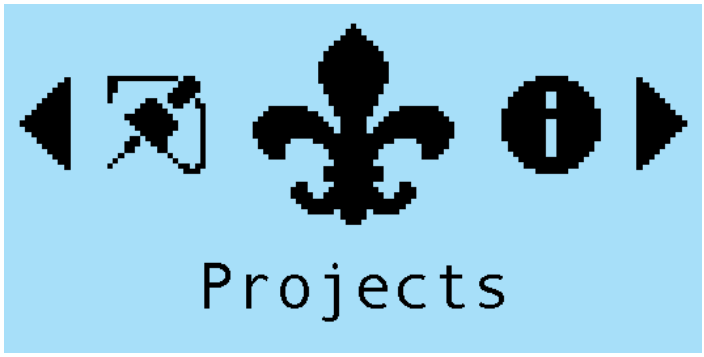
Note for reading this manual: all keypad button selections will be shown in bold and all LCD menu displays will be shown in italics.

It is advisable to have a supply of suitably sized scrap wood on hand for trial cuts. Very often it is desirable to tweak details in a design before doing a final carving.

Navigating the Menus Via the Keypad and LCD

For input and display of information the RAVEN machine employs a tactile keypad and LCD display. The layout of the keypad is shown below.



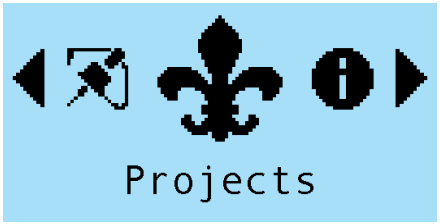


Use the keypad arrows to navigate the menu structure. Browse the top menu by using the LEFT-RIGHT ARROWS to scroll and press the ENTER button to make a selection.

When a subsection is displayed, browse the menu options with the UP-DOWN ARROWS on the keypad. To return to a previous screen, press the STOP button.
To turn on and off the LED light inside the machine hold the “9” button.

Projects Menu

This displays the projects that have been saved to the USB drive for carving with the RAVEN. This menu will be further explored in the *Project Setup* Section

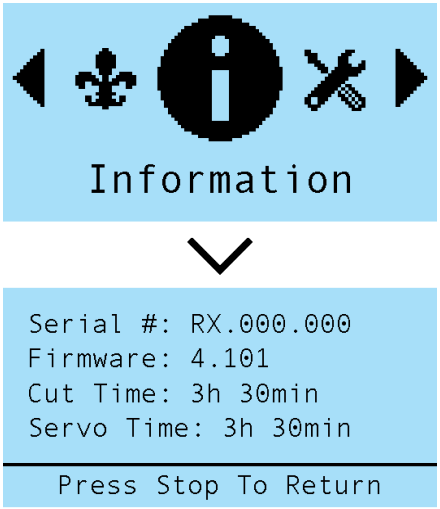


Information

The information selection displays all the pertinent information about your RAVEN machine. This information will be needed when contacting support to help the technician understand the machine.

The information it will display:

- Serial #
- Firmware version
- Cut motor time
- Servo time

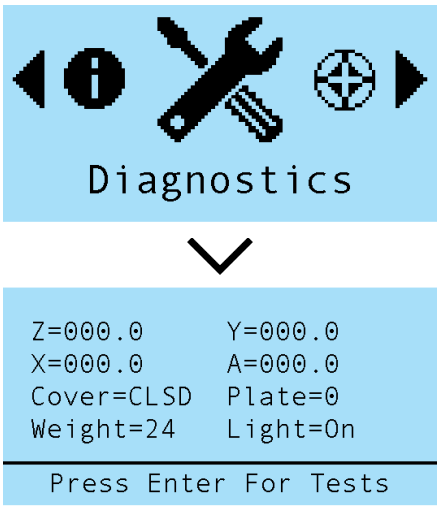


Diagnostics

The diagnostics selection displays the state of the RAVEN's sensors and motors. This screen can show you if anything is not reporting information properly and it leads to another menu where you can test the components.

The tests available:

- Test Z
- Test Y
- Test X
- Test Cut Motor

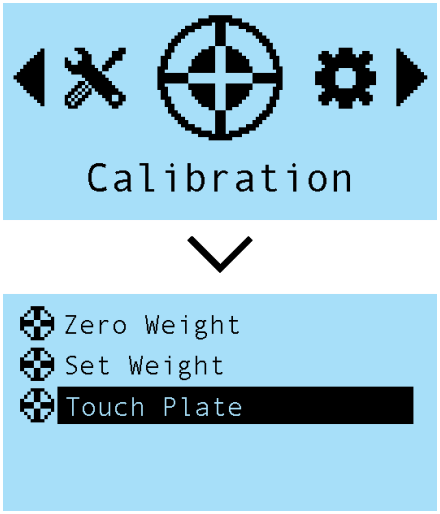


Calibration

RAVENs are pre-calibrated at the factory and it is unlikely that a machine will require further calibration, but some calibrations are included that may be used at some point.

The Calibrations available:

- Zero Weight
- Set Weight
- Touch Plate

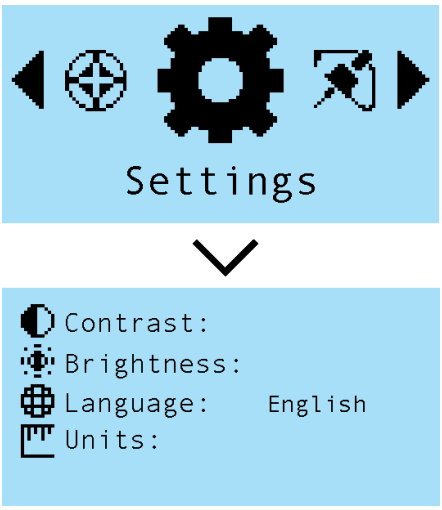


Settings

The settings menu allows for the user to make adjustments to their RAVEN.

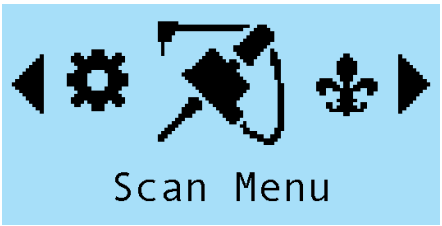
The Settings available:

- Contrast
- Brightness
- Language
- Units



Scan Menu

The scan menu is for setting up the scanning probe. See a more detailed description of the scan menu in the Scanning Probe manual.



Workpiece Selection and Preparation

The RAVEN can work in machinable materials including wood, plastics, foam, and more. Different materials will often require experimenting with bit settings within the Designer software. See the Bit Builder tutorials for more information about bit settings. Please use caution when experimenting. Damage occurred through experimental usage will not be covered under warranty.

Workpieces need to have a consistent width to ensure it doesn't become wedged during the carve. Double check and parallel your boards before applying tape and belt.

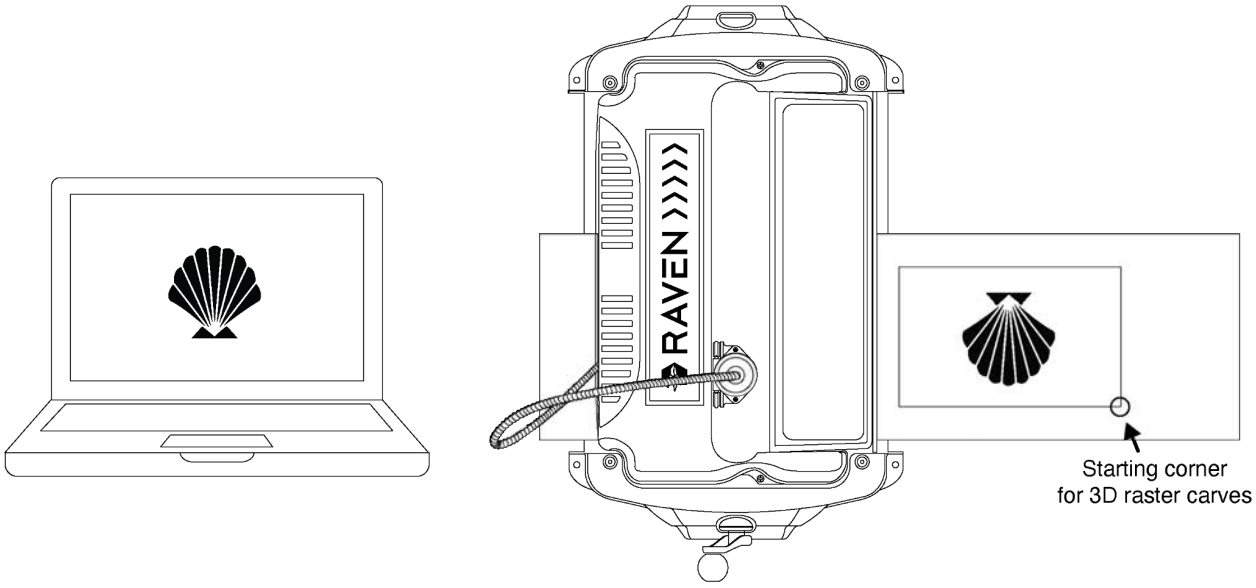
Do not attempt to load a workpiece that varies in thickness by more than 1/16” along its entire length. Using a workpiece with a larger thickness variation than 1/16” can result in inconsistency in carving depths.

Project Placement on Workpiece

All of the positioning and jig information is determined during the compile process in the software. It is important to remember your settings and to insert the proper workpiece and/or jig. The RAVEN will display the board size it is expecting on the LCD.

Before starting, it is important to note the orientation of the project as viewed on the computer screen as compared to the orientation of the project as it is being carved on the machine. **The top of the computer screen is the keypad side of the machine.** This is important in the event that a specific orientation or location of the project on the material is desired.

Also, raster carvings will be completed from the front to the back of the machine beginning at the Starting Corner.



Preparing the Workpiece

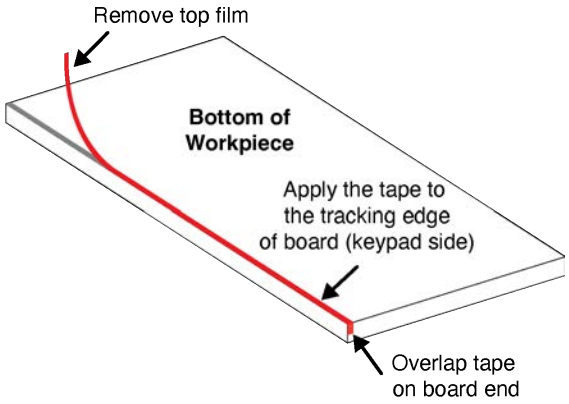
The workpiece (board) will need to be prepared before inserting it into the RAVEN machine. There are two ways to prepare a board.

1. Apply the AccuTrack Tape and Belt.
2. Secure the workpiece into a jig. (see Jigs section)

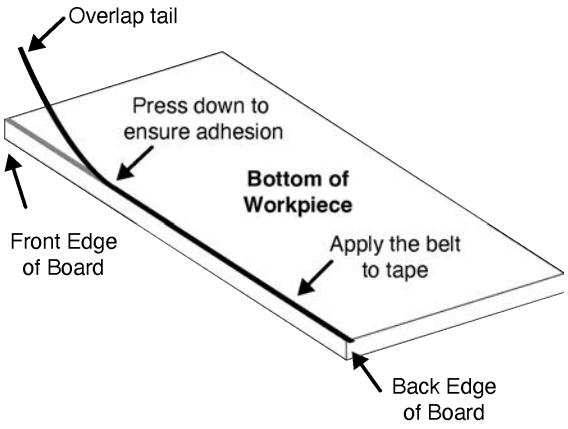
Apply the AccuTrack Tape and Belt

The AccuTrack tape is a flexible and resilient double stick tape used for securing the Accutrack belt to the tracking edge of a workpiece. The tracking edge is the BOTTOM EDGE that will be up against the squaring plate on the KEYPAD SIDE. This will align the teeth of the belt to the teeth of the AccuTrack Encoder wheel.

To apply the tape, lay the workpiece on a flat surface with the bottom side up. Inspect the edge you wish to track on to be flat and straight. Anything that prevents the belt from adhering will result in errors. With the edge selected, start at one end and carefully run the tape along the entire edge of the workpiece pressing firmly along the way to ensure adhesion. Be sure to overlap the tape over the end of the workpiece, then cut using scissors or other blade. This overlap will help with removing the top film. Completely remove the top film to expose the adhesive.



To apply the belt, start at one end of the tape and carefully adhere the belt to the tape. Press firmly as you go to ensure proper adhesion. When you get the end of the workpiece, trim the belt. You can leave a small overlap of the belt on the ends.



Tip: Reuse longer belts without cutting them by leaving an overlap tail off of the front edge of the board. Just be careful not to let the extra length snag on anything or sag too much.

To remove the belt and tape, simply pull it off. Both the belt and tape come off easy and the belt is free to use again.

NOTE: The tape is non-marking unless it is left on for a significant amount of time. If you don't wish to leave any residue, remove the belt and tape promptly.

Jigs

A jig is a carrier for holding your workpiece as it is transported through the machine. Jigs can come in many different configurations, but we will cover some basics in this section.

Why Would I Use A Carving Jig?

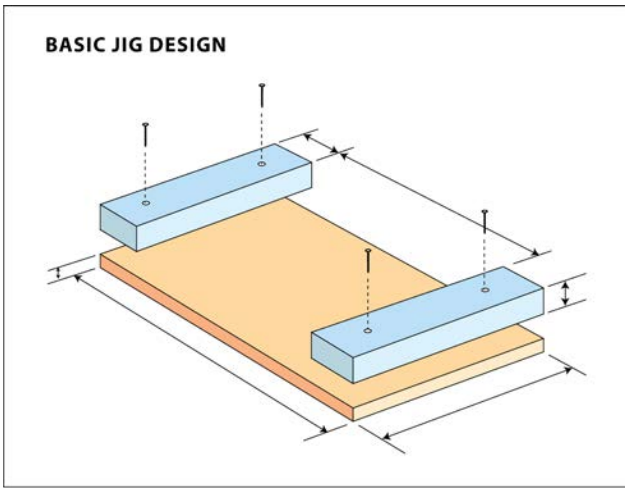
A carving jig is used for many reasons, such as:

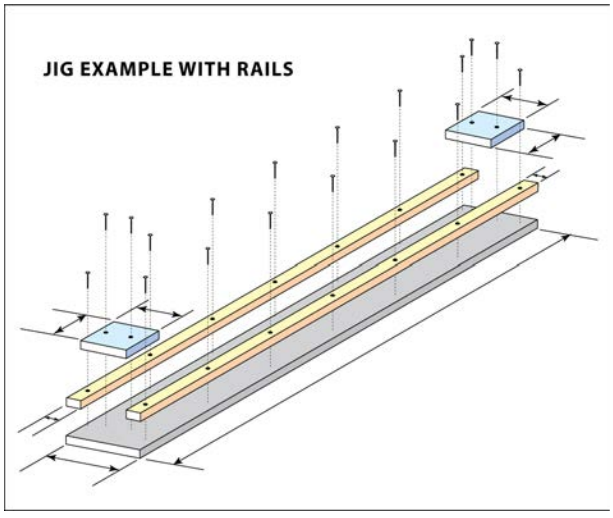
- Board too thin to run through machine by itself
- Board is too narrow to run through machine by itself
- Irregular shaped board
- Minimize board waste
- Repeatable project

Jig Terms

Carrier Board – This is simply a board that is placed under the carving material to run along the belts and AccuTrack wheel.
Rails – These are side pieces that either add width, help hold carving material in place, or maintain roller support.
Spacers – Spacers can be used to help establish margins in some situations.
Stop Block – A stop block is something used to quickly locate an edge of a workpiece so that the operation can be performed quickly and repeatedly.

Examples of Jig Plans

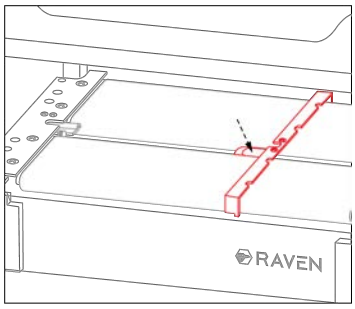




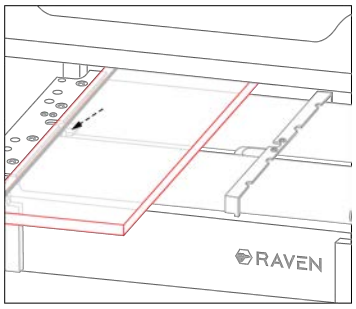
Inserting a Board

Proper installation of the workpiece is critical to the performance and continued operation of the machine. To properly insert a workpiece:

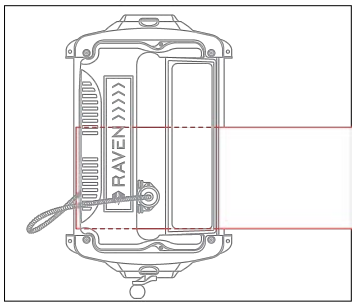
1. Press down on the sliding guide plate release lever and move the sliding guide plate to the right so that it will clear the width of the workpiece.



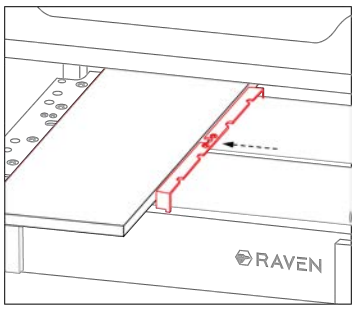
2. Lay the workpiece on the traction belts and push the AccuTrack tape edge firmly up against the squaring plate. This ensures the belt meshes with the tracking encoder below.



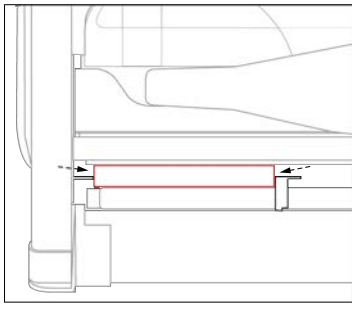
3. Position the back edge of the board just past the back rollers and crank the head just enough to hold the workpiece in place.



4. Push the sliding plate up against the inside edge of the workpiece. DO NOT push the sliding plate against the workpiece with significant force. The sliding plate is used to guide the workpiece and is not intended to lock the piece in position.

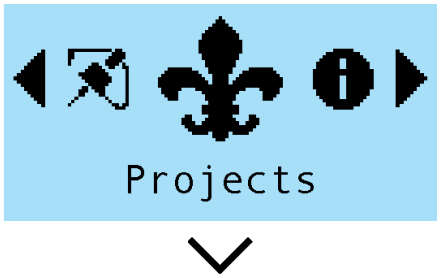


5. Double check the board is against the squaring plate and sliding plate on the front and back side.



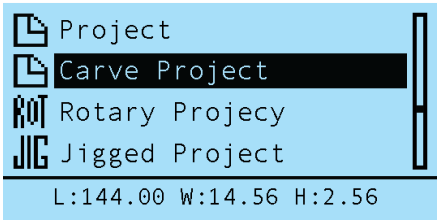
Project Setup

A project is a set of related design elements (patterns or figures) created with the Designer software and transferred via the USB drive.



These projects are accessed from the keypad under the Projects Menu. Browse the projects by using the UP-DOWN ARROWS, and press ENTER to make a selection.

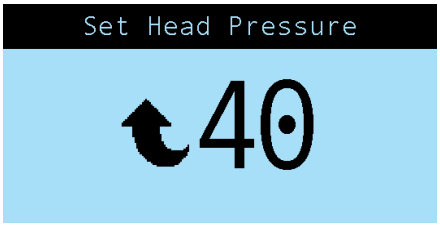
The projects will display an icon indicating what type of project they are. Size information pertaining to each project file is displayed at the bottom of the screen.



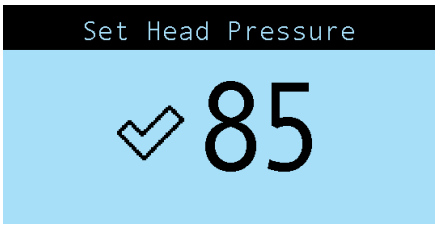
Once a project has been selected, the RAVEN will lead the user through the preparation process.

Set Head Pressure

The RAVEN has built in digital scales (load sensors) along the back roller. Simply crank the head in the indicated direction to set the head pressure within the acceptable range (83-86 lbs).

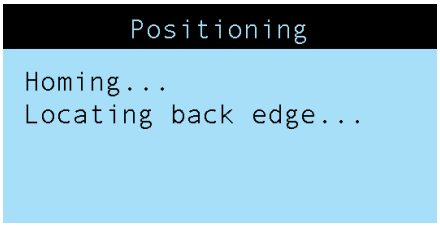


Once it is in range, stop cranking and the RAVEN will automatically move to the next step.



Positioning

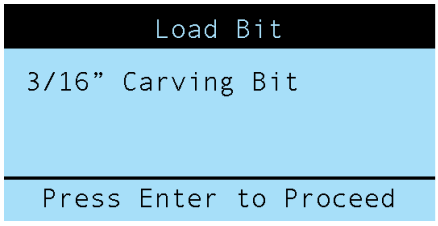
The RAVEN will locate its home position and then locate the back edge of the board using the scale sensors. It moves slowly to do this and is why we initially position that back edge just beyond the back roller. The shorter the distance the board needs to travel the faster it finds the back edge and moves to the next step.



If “Use AccuTouch” was checked during compile, see AccuTouch section.

Load Bit

The RAVEN then moves the cutting head to the middle of the machine and asks for the first bit it needs for the project.

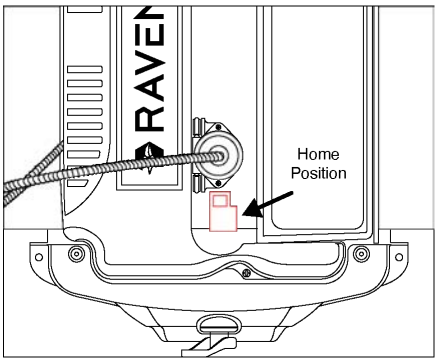


Load the bit into the CarveTight chuck and press enter to proceed.

Place Touch Plate

The RAVEN then asks for the bit touch plate. This is how it measures how long the bit length is and finds the surface of the board all in one maneuver. You have 2 options for how you want to position the touch plate.

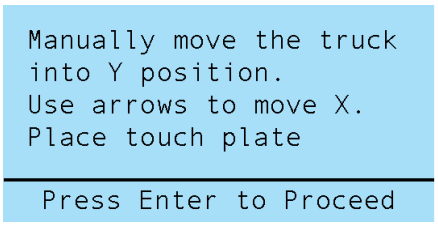
Home Position



Home position is located on the keypad side of the machine above the spot where the AccuTrack encoder resides. Place the touch plate in that position and press enter to select Home Position.

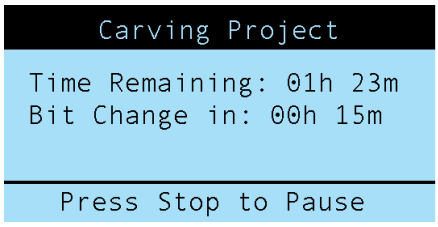
The machine will then proceed to touch the bit off of the touch plate's surface.

Jog to Location



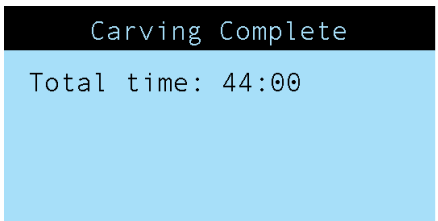
You may choose your own position to place the touch plate. This is particularly useful when using a jig that has rails taller than the surface of the workpiece. Simply move the cutting truck by hand in the Y and Z directions, or use the LEFT-RIGHT ARROWS to move the X drive belts. Once you've located the position, Press ENTER and the machine will then proceed to touch the bit off of the touch plate's surface.

Carving Project



With the bit and surface located, the machine will carve the project. A timer appears with the time remaining and the time to the next operation.

Carving Complete



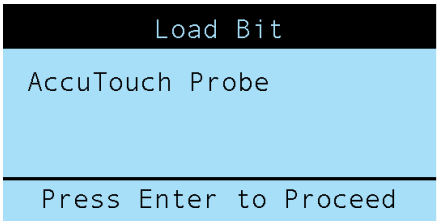
When the carving is complete, the machine will display the total time of the project. You may now crank the head up and remove the workpiece.

AccuTouch

The AccuTouch process ensures accurate indexing of your board edges for the most accurate project positioning. This process will appear between the board positioning and load bit screen where it asks for the actual bit.

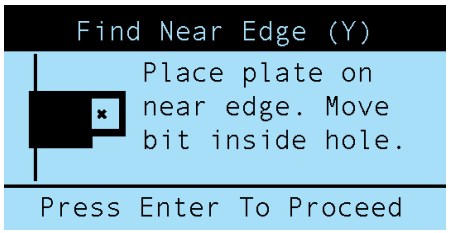
Load Bit

The RAVEN then moves the cutting head to the middle of the machine and asks for the first bit it needs for the project. In the case of a 2 sided project, it will ask for the AccuTouch Probe. Load the AccuTouch probe bit into the CarveTight chuck and press enter to proceed.



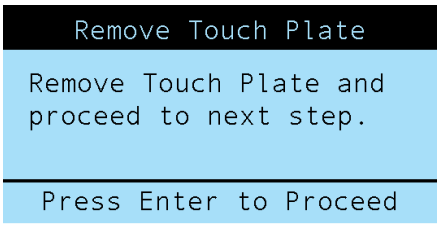
Find Near Edge (Y)

The near edge is the keypad side of the machine. This location is also the same as the home location. Use the lip of the touch plate to hook firmly to the edge of the board. Then, manually move the cutting truck to the plate and lower it to be inside of the hole. Press ENTER and it will touch the surface of the plate and then move to touch the inside edge of the hole.



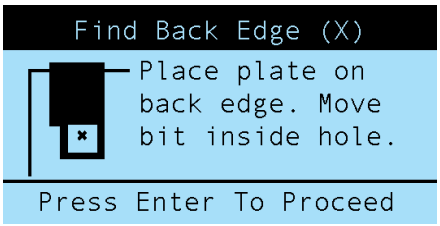
Remove Touch Plate

After it has finished locating the Near Y Edge, the machine will instruct you to remove the touch plate and press Enter to proceed to the next step.



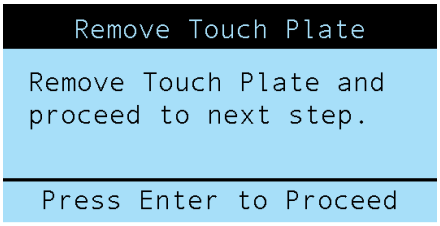
Find Back Edge (X)

The back edge is the left side of the machine when standing at the keypad side. The machine will move the board so you can access this back edge. Use the lip of the touch plate to hook firmly to the edge of the board. Then, manually move the cutting truck to the plate and lower it to be inside of the hole. Press ENTER and it will touch the surface of the plate and then move to touch the inside edge of the hole.



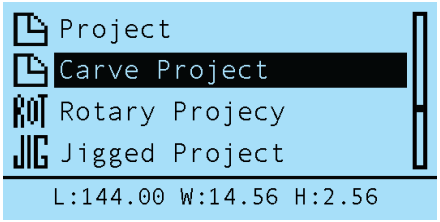
Remove Touch Plate

After it has finished locating the Back X Edge, the machine will instruct you to remove the touch plate and press Enter to proceed to the next step.



Two Sided Carving Setup

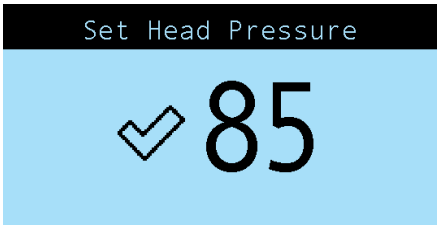
Select a 2 sided project from the projects menu. Once the project has been selected, the RAVEN will lead the user through the AccuTouch process. The AccuTouch process ensures accurate indexing of your board edges for repeatable 2 sided operations.



NOTE: 2 sided projects will always start with the back side of the board. Prepare your board with the AccuTrack belt or place it in a jig with what you want to be the back of your project facing up.

Set Head Pressure

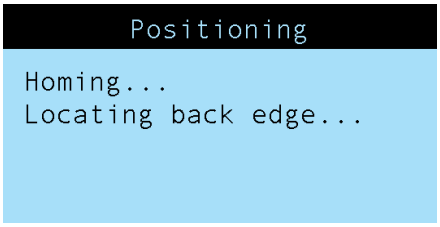
Load your workpiece and rank the head in the indicated direction to set the head pressure within the acceptable range (83-86 lbs).



Once it is in range, stop cranking and the RAVEN will automatically move to the next step.

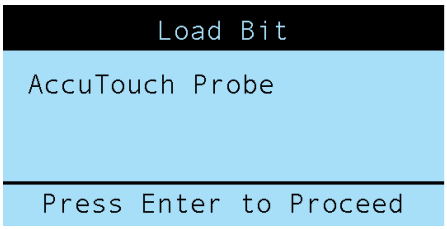
Positioning

The RAVEN will locate its home position and then locate the back edge of the board using the scale sensors. It moves slowly to do this and is why we initially position that back edge just beyond the back roller. The shorter the distance the board needs to travel the faster it finds the back edge and moves to the next step.



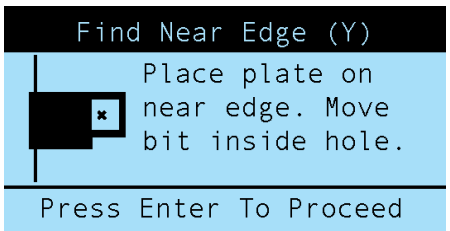
Load Bit

The RAVEN then moves the cutting head to the middle of the machine and asks for the first bit it needs for the project. In the case of a 2 sided project, it will ask for the AccuTouch Probe. Load the AccuTouch probe bit into the CarveTight chuck and press enter to proceed.



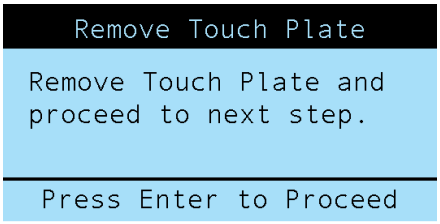
Find Near Edge (Y)

The near edge is the keypad side of the machine. This location is also the same as the home location. Use the lip of the touch plate to hook firmly to the edge of the board. Then, manually move the cutting truck to the plate and lower it to be inside of the hole. Press ENTER and it will touch the surface of the plate and then move to touch the inside edge of the hole.



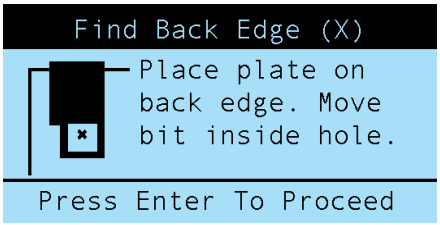
Remove Touch Plate

After it has finished locating the Near Y Edge, the machine will instruct you to remove the touch plate and press Enter to proceed to the next step.



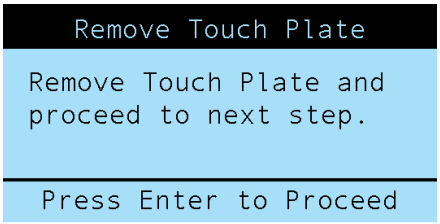
Find Back Edge (X)

The back edge is the left side of the machine when standing at the keypad side. The machine will move the board so you can access this back edge. Use the lip of the touch plate to hook firmly to the edge of the board. Then, manually move the cutting truck to the plate and lower it to be inside of the hole. Press ENTER and it will touch the surface of the plate and then move to touch the inside edge of the hole.



Remove Touch Plate

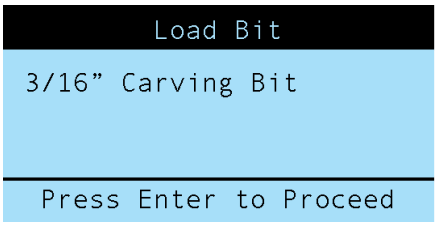
After it has finished locating the Back X Edge, the machine will instruct you to remove the touch plate and press Enter to proceed to the next step.



Load Bit

The RAVEN then moves the cutting head to the middle of the machine and asks for the first bit it needs for the project.

Load the bit into the CarveTight chuck and press enter to proceed.

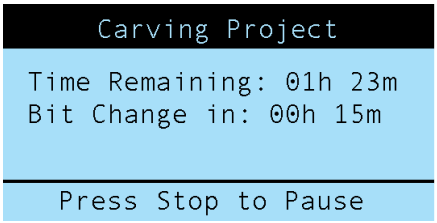


Place Touch Plate

The RAVEN then asks for the bit touch plate. Place the touch plate and select your location.

Carving Project

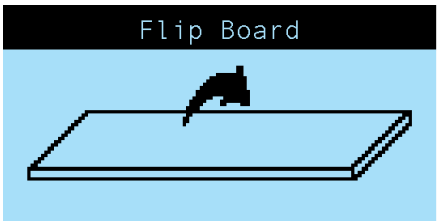
With the bit and surface located, the machine will carve the project. A timer appears with the time remaining and the time to the next operation.



Flip Board

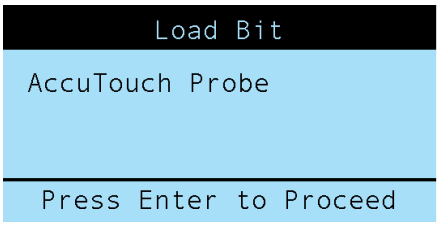
Once the backside carving operations are complete, the machine will instruct you to flip the board.

Note: Flip the board across its width, not the length.



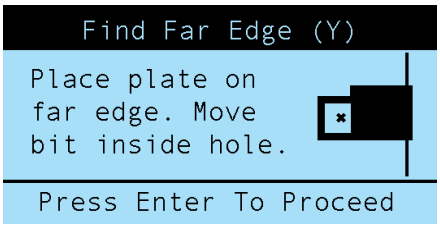
Load Bit

The RAVEN then moves the cutting head to the middle of the machine and asks for the first bit it needs for the project. It will again ask for the AccuTouch Probe. Load the AccuTouch probe bit into the CarveTight chuck and press enter to proceed.



Find Far Edge (Y)

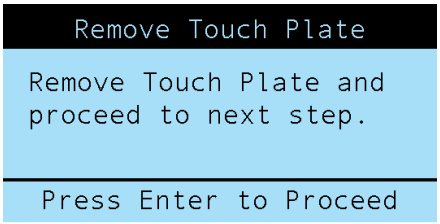
The Far edge is the opposite of the keypad side of the machine. Use the lip of the touch plate to hook firmly to the edge of the board. Then, manually move the cutting truck to the plate and lower it to be inside of the hole. Press ENTER and it will touch the surface of the plate and then move to touch the inside edge of the hole.



Note: You want this to be as close to the same position as possible to where you located the near edge in case there are any fluctuations in your board width.

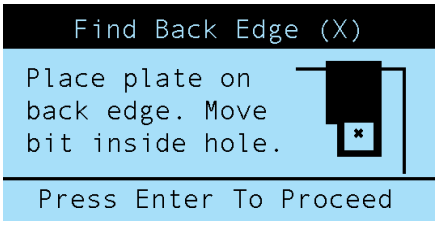
Remove Touch Plate

After it has finished locating the Far Y Edge, the machine will instruct you to remove the touch plate and press Enter to proceed to the next step.



Find Back Edge (X)

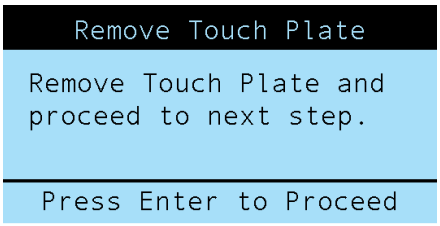
The back edge is the left side of the machine when standing at the keypad side. The machine will move the board so you can access this back edge. Use the lip of the touch plate to hook firmly to the edge of the board. Then, manually move the cutting truck to the plate and lower it to be inside of the hole. Press ENTER and it will touch the surface of the plate and then move to touch the inside edge of the hole.



Note: Again, you want this to be as close to the same position as possible to where you located the back edge previously to reduce any variables in your board dimension from affecting your accuracy.

Remove Touch Plate

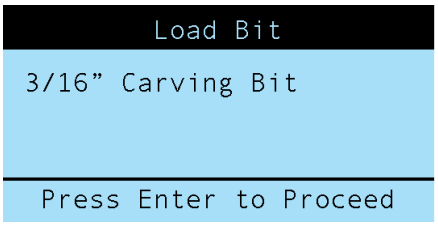
After it has finished locating the Back X Edge, the machine will instruct you to remove the touch plate and press Enter to proceed to the next step.



Load Bit

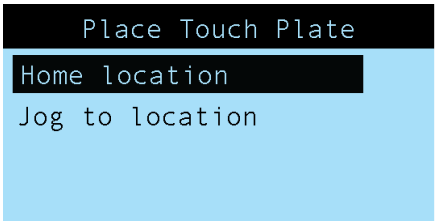
The RAVEN then moves the cutting head to the middle of the machine and asks for the first bit it needs for the project.

Load the bit into the CarveTight chuck and press enter to proceed.



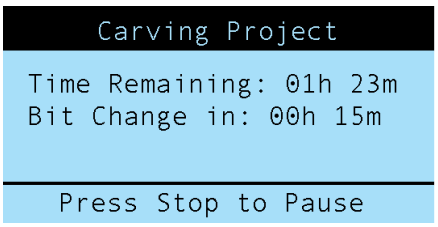
Place Touch Plate

The RAVEN then asks for the bit touch plate. Place the touch plate and select your location.



Carving Project

With the bit and surface located, the machine will carve the project. A timer appears with the time remaining and the time to the next operation.



Care and Maintenance

The RAVEN is a precision machine tool. With proper care and maintenance it will provide long, reliable service.

WARNING: Always unplug the machine before attempting any maintenance on the machine.

- **Dust Removal:** The RAVEN is designed to tolerate a considerable amount of carving system dust, but to ensure proper operation it should be kept free of debris as much as possible. Each unit is equipped with a dust collection hood with a 4” port. It is recommended to connect the dust hood to at least a 600 CFM dust collection system. It is NOT RECOMMENDED to use a shop vacuum system as they are generally not designed to run continuously. Even with the dust hood, there will be dust remaining in the machine. Periodically blow or vacuum out any dust or debris from the recesses of the unit. Be sure that your vacuum systems are properly grounded because of the large static charge that they tend to generate.
- **Check the Cutting Trucks for Looseness.** As a matter of regular maintenance, check that the Y and Z Cutting Trucks are tight and do not have any play in them. Simply grab each one by hand and wiggle back and forth. If either of these trucks is loose they will need to be tightened. Failure to tighten these trucks will result in decreased carving quality. Find detailed instructions on tightening at Support.CarveWright.com.
- **Pitch Removal:** Pitch is a sticky substance found in wood that can buildup on your cutting tools and linear rails. It is generally not a big problem, but it is easily removed using a mild solvent such as mineral spirits.
- **Lubrication and Oiling:** Several areas of the RAVEN machine will require occasional cleaning and re-lubrication.
    - The guide rods/rails upon which the cutting head assembly rides need to be kept free of cutting debris. A thin coat of light oil will help to keep these from accumulating surface rust.
    - The vertical guide rods at the corners of the machine also need to be clean and rust free for smooth operation. Use a PTFP based spray-on dry lube.
- **Replacement Items:** Occasionally, due to wear or accident, some components of the machine will need replacement:
    - **Axis Bearings:** The bearings for the X and Y truck can wear out over time. Mostly due to dust getting into them and causing them to seize.
    - **X-Drive Gears:** If a board becomes wedged in between the squaring plate and the sliding plate, the X-drive gears can break.
    - **Servo Motors Packs:** The motors can wear out over time. In particular, the bearings in the motors tend to wear out from overly aggressive speeds and feed rates.
    - **Axis Belts:** The toothed belts used for X and Y motion functions are expected to last the life of the machine, but they can become damaged or worn over time.

- **Accessories and Parts Source:** All the available accessories, cutting bits, and user-replaceable parts can be obtained through the CarveWright website at CarveWright.com.

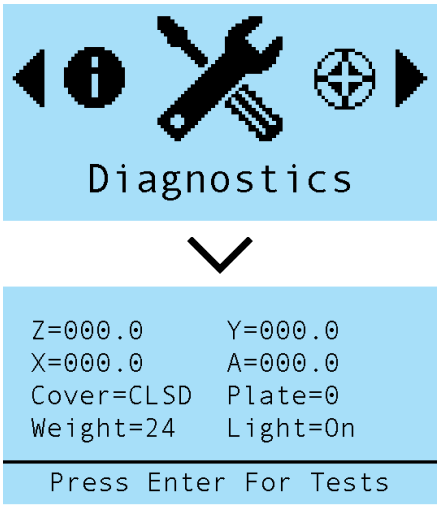
General Tips and Helpful Reminders

- **ALL MOTORS ARE DISABLED** when the front safety cover is open. The cover must be closed before the machine can proceed.
- **WHENEVER POSSIBLE KEEP THE WORKPIECE UNDER BOTH ROLLERS.** It is recommended to allow for a 3.5 inch margin on either side of your project length in order to keep the project under both compression rollers to prevent the possibility of slight depth changes.
- **PROPERLY PREPARE WORKPIECE**:
    - Do not attempt to load a workpiece that has a significant taper to the sides. A tapered workpiece will bind between the sliding plate and the squaring plate and can damage the X-drive gears.
    - Do not attempt to load a workpiece that varies in thickness by more than 1/16” along its entire length without loading into a jig.
    - Warped, bowed, or cupped pieces should be used only if this condition is minor and if the AccuTrack encoder wheel can follow it. A workpiece with slight cups or bows should be inserted, curved down or loaded into a jig.
    - Any workpiece smaller than 1.5 inches wide x 0.5 inches thick x 7 inches long will require jigging.
    - Make sure that any hardware used to affix the plastic to the backer board resides outside of the cutting area.
- **USE OUTFEED SUPPORT**: Use outfeed roller stands for a long workpiece. Any workpiece over 3 feet long will require that additional stand-alone outfeed rollers be used to support the workpiece. Make sure the rollers are adjusted properly to avoid letting the workpiece sag or rise up against the upper rollers. Any uneven transition going on and off the rollers will be seen in the finished carving, similar to snipe effects from a power planer.
- **WHEN CARVING LARGE PIECES**, the RAVEN machine should be secured to the bench for stability. Holes are provided in the four corners to bolt the machine down.
- **USE ONLY QUALITY TOOLS**. Be sure cutters are sharp and not damaged.
- **MAKE TEST CUTS**, when carving a new project test the project on scrap wood to ensure that the settings produce desired results.
- **WHEN USING EXTERNAL DUST COLLECTION**, make sure that the equipment is grounded according to the manufactured specifications. Electronics failure can occur if these procedures are not followed.

Troubleshooting

Sensor Checks

The diagnostics selection displays the state of the RAVEN's sensors and motors. This screen displays the current state of each sensor and motor on the machine. It updates in real time to allow you to see it working.



- **Z=** This will display the coordinates of the Z-axis. You can manually move the truck up and down to verify the encoder is working by seeing if the numbers go up and down.
- **Y=** This will display the coordinates of the Y-axis. You can manually move the truck left and right to verify the encoder is working by seeing if the numbers go up and down.
- **X=** This will display the coordinates of the X-axis. You can manually move the traction belts back and forth to verify the encoder is working by seeing if the numbers go up and down.
- **A=** This will display the coordinates of the AccuTrack encoder wheel. You can manually move the tracking wheel back and forth to verify the encoder is working by seeing if the numbers go up and down.
- **Cover=** You can verify the magnetic cover switch is working by opening and closing the cover and seeing it change from OPEN to CLSD
- **Plate=** You can verify the touch plate is receiving a signal by touching a bit to it and seeing the 0 change to a 1
- **Weight=** When you crank the head down, the weight reading will change as the load sensors are engaged.
- **Light=** Verify the 5 volt USB for the LED is working by turning it off and on.

Testing the X, Y, Z and Cut Motors

The RAVEN has a series of independent motor tests in order to quickly facilitate the resolution of customer mechanical issues. There are many instances during troubleshooting when it is advantageous to activate a single drive axis and obtain feedback from the control system. These tests provide independent axis commands and provide quantitative feedback on the drive parameters.

Navigate to the Diagnostics menu and press ENTER to access the tests.
1) Test X
2) Test Y
3) Test Z
4) Test Cut Motor

Testing the X Drive

In order to test only the X drive (the traction belt drive) choose option Test X. The display will instruct the user to remove the bit and board from the machine. As an additional precaution, move the Z truck to the center of its left/right travel and to the top of its up/down travel and crank the head up a couple of inches. The machine will drive the belts both forward and backward. Diagnostic data is shown on the LCD.

Testing the Y Drive

In order to test only the Y drive (the left to right motion of the cutting truck) choose option Test Y. The display will instruct the user to remove the bit and board from the machine. As an additional precaution, move the Z truck to the top of its up/down travel and crank the head up a couple of inches. The machine will move the cutting truck to the left of the machine to find the home position. It will then slowly move the cutting truck from the left side of the machine to the right and back. Diagnostic data is shown on the LCD.

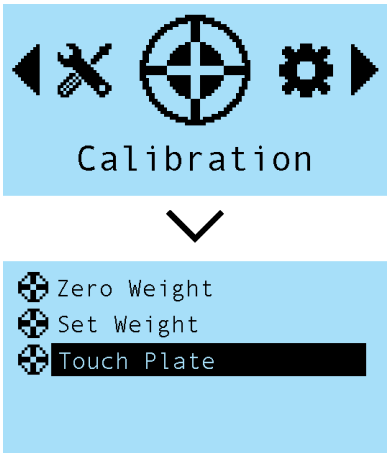
Testing the Z Drive

In order to test only the Z drive (the up and down motion of the cutting truck) choose option Test Z. The display will instruct the user to remove the bit and board from the machine. As an additional precaution, move the Z truck to the center of its left/right travel and crank the head up a couple of inches. The machine will move the cutting truck upward to find home. Then it will slowly move down to the bottom of travel, reverse and come back to the top position. Diagnostic data is shown on the LCD.

Testing the Cut Motor

There are many times when a customer may want to test the cut motor directly without having to spend the time setting up a project. This test will simply command the cut motor to switch on. The machine will home as normal, then move to the center on its left/right travel and prompt the user to load “Any size board” and remove all bits from the machine. Press any key to turn the cut motor on and press any key to stop the motor.

Calibrations



It is unlikely that a machine will require further calibration, but some calibrations are included that may be used if needed.

The Calibrations available:

- Zero Weight
- Set Weight
- Touch Plate

For More Information visit
www.carvewright.com

For Sales, Technical or Software Support
Call 713-473-6572
Or email support@carvewright.com