PwnCNC Spindle Kit

Don’t just own your CNC, dominate it!

Spindle Kit w/ v4 Enclosure - Manual

Safety Notice

Warning: *In order to reduce risk of injury and possible death, the user must read and understand this document and the manual packed with the VFD before using our product.*

This is industrial equipment that should be installed by a professional.

Please save all warnings and instructions for future reference. Refer back frequently and use them to instruct others who may use this product. Please pass along this document and the VFD manual if you should loan, sell, or otherwise provide this product to someone else.

Work Area Safety

1. Always wear safety equipment
2. Avoid using anything that can impair your reaction time and judgement
3. Disconnect power when not in use
4. Never use blunt bits
5. Check stock for existing metal
6. Never reach near a running spindle
7. Minimize distractions

Personal Safety

Use our products for the purpose they were intended. Using them in a way that's different from those intended could result in a hazardous situation.

To avoid the potential for injury or failures, PwnCNC Spindles and accessories should not be used for other than its intended purpose.

Please regularly inspect your PwnCNC Spindle kit for loose, missing, fatigued parts, cracks or broken parts. If the product appears to be damaged, immediately remove from service to be replaced or repaired. Failure to follow these warnings could result in serious injury or death.

Use common sense regarding what you're doing during installation and while using any of our products.

Do not use the PwnCNC Spindle while you are tired or under the influence of drugs, alcohol or medication. It only takes a fraction of a second for bad things to happen when dealing with industrial and/or manufacturing equipment like a hobby level CNC and the PwnCNC Spindle Kit.

Dress properly. Don't wear loose clothing or jewelry. Keep your hair, clothing, and gloves away from the moving parts of your CNC.

Ensure your spindle wires and coolant tubing, if applicable, are properly secured before plugging in and during any operation.

A wire being dragged around your machine can dislodge or disconnect from your spindle and cause damage or worse.

Please Please Please stay safe and Happy Making!

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Overview

We'd like to personally congratulate you on your choice of a PwnCNC Spindle Kit, the most advanced plug-n-play spindle kit on the market.

Your new spindle kit is designed to fit onto a variety of hobby CNC machine brands and configurations.

There are two main components of your new spindle kit: the VFD and Spindle Motor. Along with various wires which hook everything together for power, coolant, and motor control.

What's Included?

- Spindle Motor of your size preference with a corresponding Spindle Cable
- PwnCNC VFD with Enclosure as well as a Power Cable for either 110v or 220v
- "Automatic" Control Cable depending on your brand of CNC
- 3 of the most common Collet sizes and a Collet-Nut
- Two collet wrenches
- Submersible pond pump and tubes (if you chose water-cooled)
- And… stickers… of course!

What's Required?

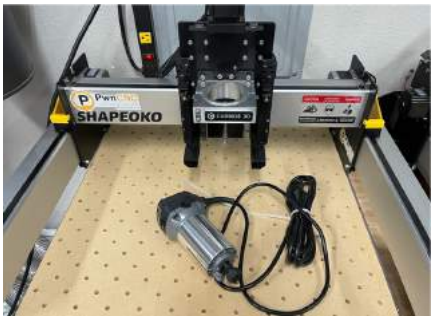
- Correctly sized router/spindle mount.
  You may need to upgrade your router mount, *see your CNC manufacturer for details*
- You may also need to upgrade your Z-Carriage, *see your CNC manufacturer for details*
- Someplace relatively close to your CNC to mount the PwnCNC VFD/Enclosure
- If you chose water-cooling, you'll need to purchase a small bucket to act as a reservoir and some sort of coolant. We recommend window washer fluid as a great choice.
- Also, if water cooling, you may need larger drag chains if you intend to run the inlet and outlet tubes through them.

Installation

Installing your new spindle is extremely easy. We'll cover a few of the higher-level steps here, but your experience may vary slightly depending on which brand of CNC you own.

Step 1: Remove Palm Router

Lower your Z carriage towards the bottom range then remove your current palm router from the router mount as instructed for your brand of CNC machine.



Note: This may involve opening a cable chain to unthread the power cable. If this is the case, keep the chain open as you may be able to thread the spindles wire (and maybe coolant tubes) through that same cable chain.

Step 2: Prepare Spindle Motor

Preparing your spindle is super easy. Locate the spindle motor, collets, and spindle nut. For some these parts will be labeled "ER11", for others it'll be labeled "ER20".

Note: You'll want to wipe down your spindle. Remove any grease on the outer surfaces as well as the spindle shaft. You don't want that grease spinning all over the place when you turn on your spindle.

You'll want to take one of the collets and snap it into the spindle nut, then thread the nut/collet assembly onto the end of your spindle motor.

Step 3: Install Spindle Motor

Insert the spindle motor the same way you removed the palm router from your CNC's router mount. Be sure to tighten the router mount so it properly holds the spindle motor.

Note: If you're replacing a Dewalt with its' 69mm mount with any of our spindles… you will need a different router mount, or a mount "insert" which converts the 69mm mount to a 65mm mount. Additionally, if you're installing one of our 80mm spindles, you'll need a whole new router mount which is most often purchasable from the maker of your CNC machine.
Also note that the older Shapeoko's with 69mm mounts typically shipped with an aluminum spacer insert part, but if you lost it or have a different brand… we recommend contacting the manufacturer of your CNC machine. Alternatively, we have designed a few inserts which are 3d printed and would work perfectly for folks moving from 69mm down to 65mm… if you're only cutting wood and other softer materials, this is a viable option.
https://pwncnc.com/purchase/ols/products/spindle-collars

Step 4: Attach Spindle Cable

You have a few options for connecting the Spindle cable (and tubes):

1. Thread them through an existing cable chain if it's large enough.
2. Setup an "umbilical" cord that comes down to the spindle from a higher location and keeps the spindle's wire and tubes together as it moves around the machines bed.

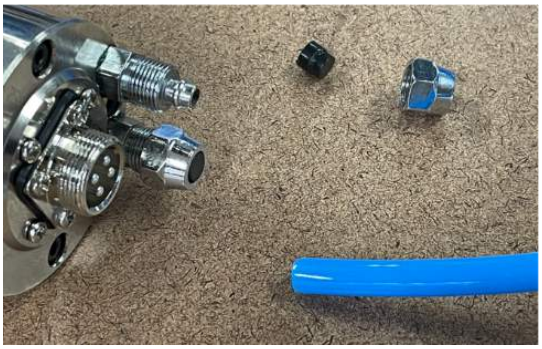
Spindle Cable

The Spindle cable is attached to the spindle motor using an H17 aircraft connector on our 65mm motors and an H20 aircraft connector on all of our 80mm motors. There is only one way these connectors can be inserted into the motor thanks to one or more notches.

The other end of the spindle cable will plug into the side of our VFD enclosure completing the motor installation.

Step 5: Attach Coolant Tubes (if applicable)

If you purchased a water-cooled spindle, now's the time you'll want to attach the tubes to the top of your spindle. Sometimes heating up the tip of the tubing will make it easier to install but remember to use gloves.



There are two tube connection points and they both will act as either an inlet or outlet depending on how your pump is attached. There is no advantage one way or the other when hooking these up.

Unthread the tube nuts and dispose of the black filler piece if it's present. Slide the nut over the tube and press the tube onto the nipple of the connector still attached to the top of your spindle motor. Then thread the nut down over the nipple to securely hold the tube in place.

Note: If you have our no-leak Kool Connectors, your installation will vary slightly.

Step 6: Coolant Pump (if applicable)

If you chose the water-cooled spindle kit option, then there's extra work that you'll need to do.

Your kit will come with two coolant tubes, and a pond-pump. I've added enough tubing to run both tubes through a cable chain if it's large enough to support the tubes.

Blue is intended as the "cool" inlet line and should be plugged into the top of the pond pump. The red is the "hot" outlet line and should simply feed back into the bucket.

Remember to put the suction feet on the bottom of the pump and place the pump at the bottom of a 5gal bucket.

Fill your coolant so the pump is fully submerged.

Tip: Ensure the end of the "hot" line is below the surface of the coolant within the bucket. This will ensure there is no constant water noise being produced when the pump is in operation.

Step 7: Power up your Spindle

Your spindle kit is now fully wired up. The last step is to plug the power cable into a 110v 15amp or 220v 20amp wall outlet.

After plugging in your VFD, you should see the VFD's keypad light up with red letters/numbers. It should be blinking at first which means it is in stop/standby mode.

Step 8: IoT Relay (if equipped)

A very powerful option included only with the PwnCNC Spindle kit w/Enclosure is our IoT Relay plug!

You'll need to supply your own IoT Power Strip as well as a 22awg 2-conductor wire capable of handling up to 5v and <1amp.

This plug provides a voltage output signal to an IoT power strip that will turn on a Shop Vac or other connected device.

You can find the IoT Power Strip here: https://pwncnc.com/products/iot-power-strip

Note that when the Spindle motor reaches >5500rpms the signal is powerful enough to trigger the IoT Power Strip and switching on your shop vac.

Also note if you have the Onefinity Blackbox controller and utilizing the "temporary addendum" to enable automatic control, your IoT will trigger >15000rpms. When the correct firmware is released, it will function normally at >5500rpms.

Using your VFD in Manual Mode

Now that your spindle kit has been fully installed it's time to go over a few of the super simple operations to use it.

Ensure the Manual Override switch on the left side of the VFD/Enclosure is switched to "1" or up. This will let you use your spindle in manual mode which is very similar to how you used your palm router previously. We'll discuss automatic mode later in this manual.

Bit Changes

Ensure your VFD is stopped, and the display is blinking during bit-changes.

Next… install a bit into your new PwnCNC Spindle's collet/nut assembly, use the two wrenches included in your kit. The smaller wrench is to hold onto the spindle's shaft and prevent it from moving. On your old palm router, this job was likely done with a button on the side.
The larger wrench is for the spindles nut.

Tip: When removing bits, there's a two-step loosening operation. After you've released the initial tension, the bit will likely still be secured. If you keep loosening the nut, the bit is libel to fall to your CNC's bed. We recommend putting a kitchen sponge or something below the bit to prevent damage as it falls out of the chuck.

Starting your Spindle Motor

To control your VFD manually, you'll be using the VFD's keypad. This is what it'll look like the picture above. The numbers should be blinking which indicated it is in Stop/Reset mode.

Turn the potentiometer dial just below the numbers. It is how you'll control the RPMs with the Green "Run" and Red "Stop/Reset" buttons used for starting and the spindle motor.

Simple Test: Rotate the dial counterclockwise all the way. Then hit the green "RUN" button. Slowly rotate the dial clockwise until the dot indicator is straight up. This is roughly the 12,000 RPMs setting.

Note: If the numbers displayed does not show roughly 12,000 RPM's then you can hit the (>>) button to cycle the display until it does. The base operation of your VFD is to send the frequency in Hz to your motor. The higher the Hz, the faster your motor goes. Since our motors top-out at 24,000 RPMs… we've programmed your VFD to recognize that 200Hz = 12,000 RPMs and that can be displayed via the (>>) button.

Stopping your Spindle Motor

Stopping your spindle motor is as easy as hitting the red "stop/reset" button. Watch the digital display until it shows 0.0 and that is flashing before reaching your hands towards the bit area.

Using your VFD in Automatic Mode

One of the most powerful features and reasons for upgrading to a spindle kit is allowing your CNC controller to control the RPMs of your spindle motor via gcode. This can be done with your CNC machines controller, our Control Cable, and VFD.

Our VFD can receive automatic spindle control commands in a few ways: PWM/GND or Modbus (e.g., RS485). The method used depends on the CNC machine you told us you had at the time of purchase.

At a high level, PWM/GND control is the most common form of automation with a digital voltage signal of either 0-5v or 0-10v is sent to the VFD which converts that into a 0-24000 rpm response in the motor. Most CNC brand controllers will support this method.

The other method is less common also provides settings feedback. PWM/GND is more of a "fire and forget" method of setting the RPMs, whereas Modbus is a "fire and verify" method. The standard Onefinity "black box" controller as well as controllers from BuildBotics and others provide this advanced automation method.

The method preconfigured into your VFD depends on the CNC machine you told us you had at the time of purchase.

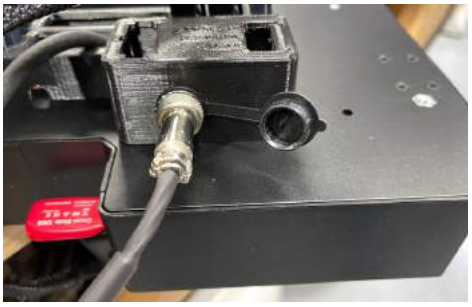
Attach Control Cable for Automatic Control

On the left side of your VFD/Enclosure are two inlet ports, one for PWM the other for Modbus. The control cable that comes with your kit will match the port you plug into. Each port has an alignment notch meaning there's only one way to plug it in.

The other end of this cable will depend on which CNC machine you own. Please find your machine in the next several pages for details.

Onefinity Elite w/Masso Controller

The control cable we provided for your machine includes a GX12 6-pin connector on both ends. It doesn't matter which side you plug into the VFD and which you plug into the Masso Touch Controller.

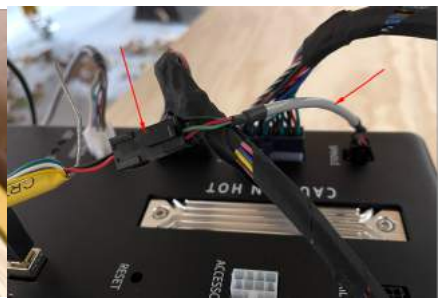



Onefinity w/Blackbox Controller

The cable we provide includes a female DB25 connector on the end. This connector can be opened if you would like to wire other things into your controller, however for Spindle control we utilize pins 13 and 14 as well as the ground to drain the wires shielding.
Attaching the female DB25 connector is easy, press into place and use the included thumb screws to securely attach the connector.


Shapeoko's w/Warthog controllers

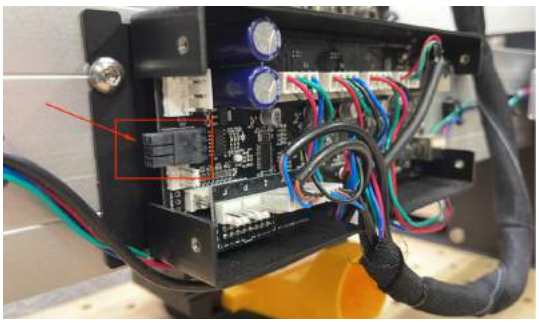
Carbide3d's Shapeoko 5 Pro machine comes with a larger Warthog controller. The 5-pro includes a special 5" spindle adapter cable that will you'll be plugging our control cable with the Molex plug on the end.

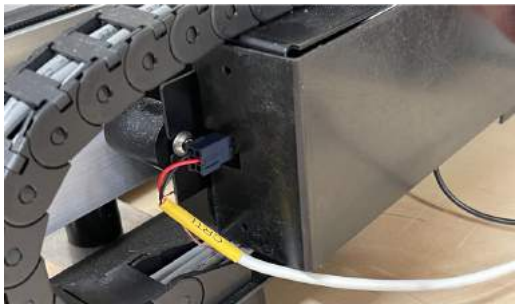



Shapeoko's w/standard controllers

Carbide3d's Shapeoko line of machines (3, 4, and 4-Pro) all have a molex controller plug. If you own a BitRunner, we'll be using that same plug in the side of your controller.

Note: If you have an older Shapeoko 3 (purchased prior to Black Friday 2019) that doesn't have this connector, please reach out to us via support@pwncnc.com. Setup is more complicated, but not impossible.



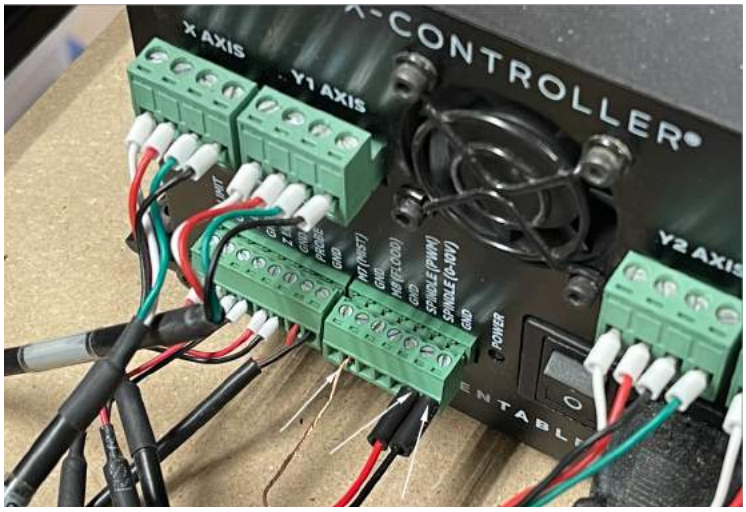


This is a Molex connector and the control cable we include in your kit will have this on the end, so it'll be easy to plug into.

Note that the Molex connector is brand new and will likely be hard to plug in. Consider removing your controllers cover so you can grab the backside of the connector soldered to the controller for additional leverage.

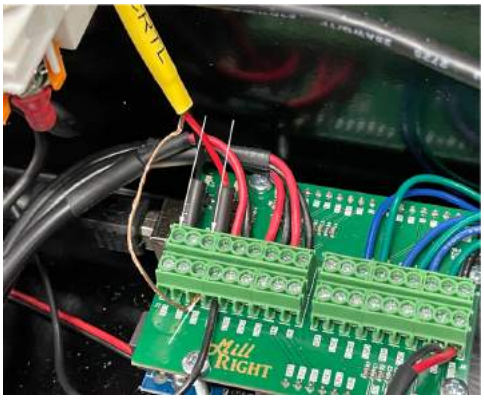
X-Carve

X-Carve is one of the simplest controllers to wire up since it has a similar Phoenix terminal as our VFD and a screwdriver is all that's required. You'll want to attach the RED wire from our control cable into the "Spindle (0-10v)" and the BLACK wire into the "GND" terminals.



MillRight's Mega-V

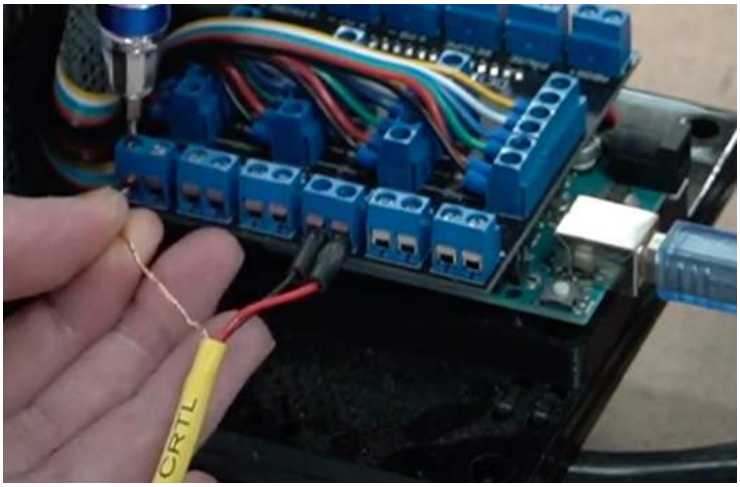
Mega-V's are also pretty easy except you'll need to get inside of the controllers main enclosure. There are a few plugged holes available to pass through our PWM wire in which you can utilize. Once inside the controller, look for the following:

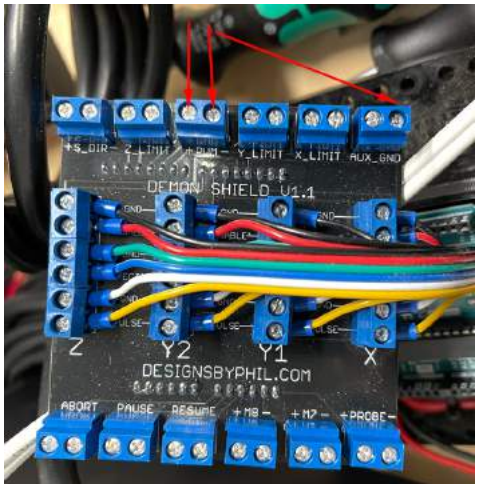


You'll be attaching the PWM cable RED wire into the "PWM" and BLACK into the "GND" pins found along the top-left side of the Mill Right terminal board.

CNC4NEWBIE's Demon Controller

The Demon Controller has two pins and a ground pin we're going to wire our control cable into.





You'll be attaching the PWM cable's RED wire into the "PWM" and BLACK into the "GND" pins found along the left side of the Demon controller's terminal board.

Other Controllers

There are a huge number of CNC machines and controllers out there and it is impossible for us to catalog all of them. Therefore, where to plug in the PWM and GND pins of your control cable will depend on the documentation provided by the CNC manufacturer.

We're happy to help identify that and provide guidance… reach out to us at support@pwncnc.com and we can help further.

Configuring Software for Automatic Control

Configuring your CNC machine for Spindle control depends on the machine you own. Please refer to the included Quick Start card.
If you want additional information, please go to this address in a web browser:

https://support.pwncnc.com/kb/section/9/

If you have additional questions,
please reach out to support@pwncnc.com
We're happy to help!

PwnCNC Spindle Kit - 6-MONTH LIMITED WARRANTY

SAVE THE ORIGINAL SHIPPING MATERIALS FOR WARRANTY REPAIR

Initial 30-Day User Error Warranty

In addition to the Twelve-Month Defect Warranty below, during the first thirty (30) days after your receipt of a PwnCNC Spindle kit, PwnCNC will repair or replace any original "Covered Part" which, after examination, is determined by PwnCNC to have been damaged through a "Covered User Error". "Covered Parts" include (A) all parts of the original PwnCNC Spindle kit as shipped to you; and (B) all PwnCNC branded accessories purchased in the same transaction with your PwnCNC Spindle kit. For clarity, and without expanding the limited scope of coverage, Covered Parts specifically excludes all working materials and all parts or accessories manufactured by any other company, even if purchased from PwnCNC. "Covered User Error" means an error committed by the user in assembling or operating the PwnCNC Spindle kit or any original PwnCNC accessory purchased in the same transaction with the machine after a good faith effort to follow the instructions for the spindle or accessory. Covered User Error does not include any misuse, alterations, abuse, or normal wear and tear; any act that violates any safety warning provided by PwnCNC; or any grossly negligent or intentional error or act.
To obtain warranty service for a Covered User Error, you must first contact PwnCNC for a return authorization and then, if required by PwnCNC in its sole discretion, return the damaged part to PwnCNC. You are solely responsible for the cost of shipping the part to PwnCNC for any damage during shipping. For all valid warranty repairs, PwnCNC will pay for return shipping to you. If your part does not qualify for warranty repair, then PwnCNC will notify you and require a credit card payment to cover the cost of shipping the part back to you.

Twelve Month Defect Warranty

Every PwnCNC spindle kit is warranted to the original purchaser only to be free from defects in material and workmanship. PwnCNC will repair or replace any part of a PwnCNC Spindle kit which, after examination, is determined by PwnCNC to be defective in material or workmanship for a period of six (6) months after the date of purchase. Return of the defective part or spindle kit to PwnCNC may be required. A copy of the proof of purchase must be submitted to PwnCNC.
This warranty does not apply to cutters, collets, waste boards, consumable materials, stock to be cut/shaped, accessories, or software. This warranty does not apply to damage that PwnCNC determines to be from repairs made or attempted by anyone other than PwnCNC, misuse, alterations, abuse, normal wear and tear, lack of maintenance, excessive industrial use, or accidents, any of which will void this warranty. Without limiting the generality of the foregoing, this warranty will be void and no warranty coverage will be provided if you do any of the following: install any firmware in the VFD which is not specifically issued or authorized by PwnCNC; make any change or modification to the electronics or computer components of the Spindle kit; attach any peripheries or accessories to the electronics or computer components of the machine which have not be specifically issued or authorized by PwnCNC; use or attempt to use the spindle kit and/or its electronics or computer components to control or any device or object which is not specifically issued or authorized by PwnCNC.
Warranty registration is not necessary to obtain the applicable warranty. The manufacturing date of the product will be used to determine the warranty period if no proof of purchase is provided at the time warranty service is requested.
To obtain warranty service for a defect, you must first contact PwnCNC for a telephone or video call warranty diagnosis. You may be required to provide pictures and/or video of the claimed defect. If PwnCNC determines that your spindle kit qualifies for warranty repair, then, at PwnCNC's option, PwnCNC will either ship to you a replacement part for you to install or require you to return the spindle kit to PwnCNC for warranty service. PwnCNC also may require you to return the spindle kit if PwnCNC cannot determine from the warranty diagnosis whether your spindle kit qualifies for warranty repair. In this case, you also must provide a credit card to cover shipping charges in the event your spindle kit does not qualify for warranty repair. Your card will not be charged if your spindle kit does qualify for warranty repair. If return of your spindle kit is required, PwnCNC will provide you with a prepaid shipping label and accept responsibility for damage during shipping only if you package the returned spindle kit exactly as it was shipped to you using all the original shipping materials. If you no longer have the original materials, then you are solely responsible for the cost of shipping the spindle kit to PwnCNC. If you do not package the Spindle kit exactly as it was shipped to you using the original materials, then you will be solely responsible for any damage during shipping. For all valid warranty repairs, PwnCNC will pay for return shipping to you. If your machine does not qualify for warranty repair, then the credit card you provided will be charged the cost of shipping to and from PwnCNC.

EXCLUSIONS, DISCLAIMERS AND LIMITS FOR BOTH WARRANTIES

ACCEPTANCE OF THE EXCLUSIVE REPAIR AND REPLACEMENT REMEDIES DESCRIBED HEREIN IS A CONDITION OF THE CONTRACT FOR THE PURCHASE OF EVERY PWNCNC SPINDLE KIT. IF YOU DO NOT AGREE TO THIS CONDITION, YOU SHOULD NOT PURCHASE THE PRODUCT. IN NO EVENT SHALL PWNCNC BE LIABLE FOR ANY INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, OR FOR ANY COSTS, ATTORNEY FEES, EXPENSES, LOSSES OR DELAYS ALLEGED TO BE AS A CONSEQUENCE OF ANY ERROR ASSEMBLING OR OPERATING ANY PRODUCT OR ANY DAMAGE TO, FAILURE OF, OR DEFECT IN ANY PRODUCT INCLUDING, BUT NOT LIMITED TO, ANY CLAIMS FOR LOSS OF PROFITS. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES, WRITTEN OR ORAL. TO THE EXTENT PERMITTED BY LAW, PWNCNC DISCLAIMS ANY IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. TO THE EXTENT SUCH DISCLAIMER IS NOT PERMITTED BY LAW, SUCH IMPLIED WARRANTIES ARE LIMITED TO THE DURATION OF THE APPLICABLE EXPRESS WARRANTY AS DESCRIBED ABOVE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU, THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.