PwnCNC Spindle System

Don’t just own your CNC, dominate it!

Contents

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 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 when your reaction time and/or judgement are impaired
3. Disconnect power when not in use
4. Never use blunt bits
5. Check stock for existing metal (nails, screws ect)
6. Never reach near a running spindle
7. Minimize distractions

Personal Safety

Use our products for the purpose they were intended for. Using them in a way that's different from those intended could result in a hazard that could cause damage to personal injury or damage to equipment.

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 System for loose, missing, fatigued, cracks or broken parts, connectors, or wires. If the product appears to be damaged, immediately remove the system from service and replace or repair the part. 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 CNC and the PwnCNC Spindle System.

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

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

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

Please Please Please stay safe and Happy Carving!

Overview

We'd like to personally congratulate you on your choice of a PwnCNC Spindle System, the first and most advanced plug-n-play spindle system on the market!

Your new spindle system is designed to fit onto a variety of hobby CNC machine brands and configurations and at PwnCNC we've made it as Plug-N-Play as possible.
There are two main components of your new spindle system: the VFD and Spindle Motor. Aside from that, there are various wires which hook everything together for power, coolant, and motor control.

What is Included?

Spindle Motor The work horse of your Spindle System	
Variable Frequency Drive (VFD) (Phase Inverter) and Power Cable The Control Station of your Spindle System	
Spindle Cable (H20 shown) The communication wire between your VFD and Spindle Motor	
Wrenches (in smaller white box) The tool needed to loosen / tighten collet nuts on your motor	
3x Collets (pushed into motor foam) 1/16", 1/8" and 1/4" for ER 11 (65mm) Spindles 1/8", 1/4" and 1/2" for ER20 (80mm) Spindles The holder of the bits	
IoT Plug (in smaller white box) A necessary connection for use with our IoT Strip	

French Cleat and Lock for VFD (in smaller white box) Used to secure your VFD to a vertical surface like a wall.	

- Don't forget… Skittles and Stickers!

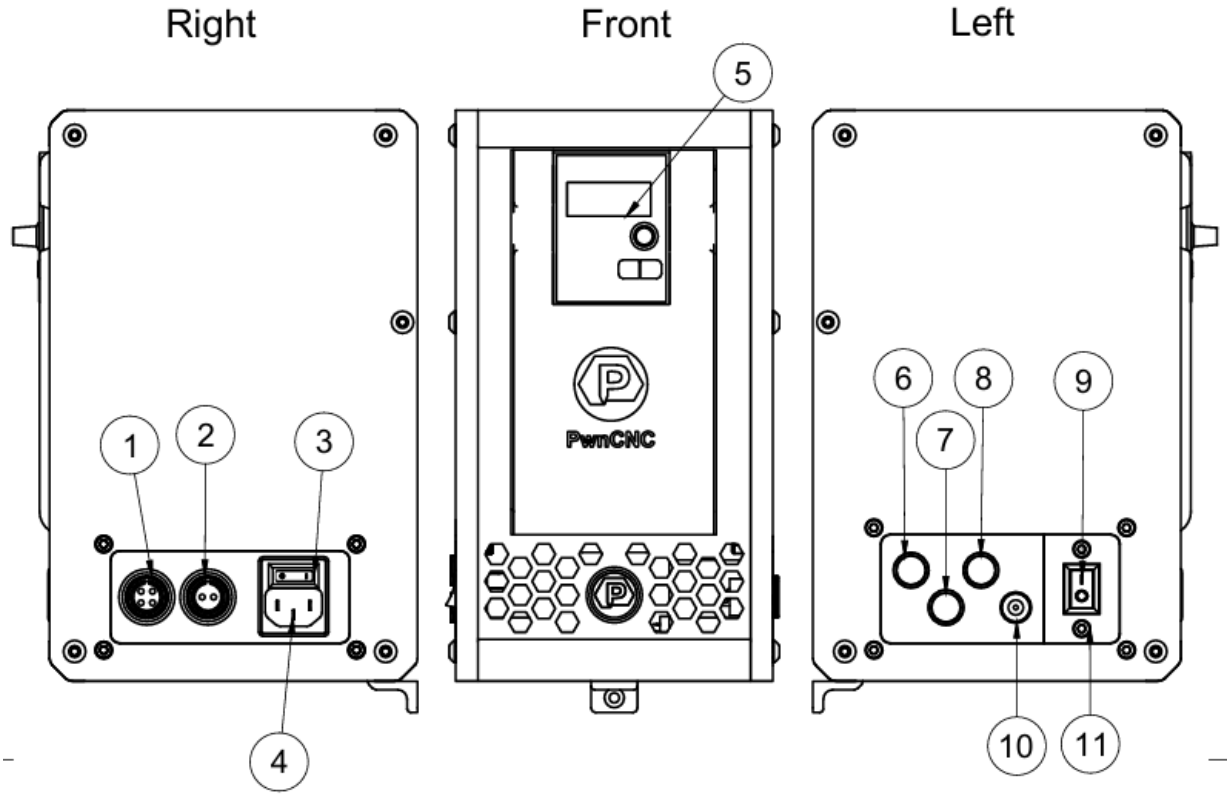
What is recommended but sold separately

- Control cable for your CNC, available in drop down selection for your Spindle System, (for automatic control of RPM's through CNC interface)
- IoT Power Strip and IoT signal wire (for automatic control of powered device ie dust collection)
- Dust boot of some kind. Refer to our Knowledge Base (KB) dust boot section for information on our offerings. *https://support.pwncnc.com/kb/section/6/*
- VFD Keypad Mount / VFD Keypad Extension Cable & MOS Extension Cable (to remove and relocate the control keypad and Manual Override Switch from the VFD)
- Kool Connectors (quick connect/disconnect attachments exclusively for water cooled spindles)
- H20 Spindle Extension Cable (connects from the spindle to the existing spindle cable to the VFD for an extra 6' [H20 is only for 80mm framed spindles])
- VFD/PE Mounting Brackets (allows you to mount your VFD anywhere in any orientation unlike French Cleat and Lock which are only for a vertical orientation)
- Braking Resistor (to reduce the spin down time, actual results may vary)

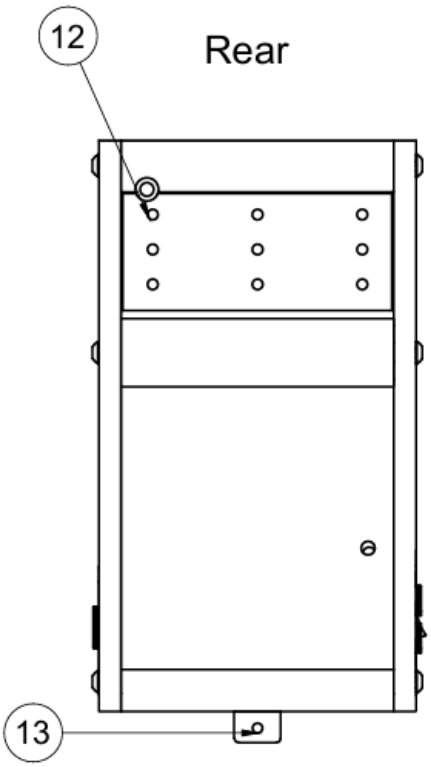
What is Required?

- Correctly sized spindle mount. We have adapter plates and spindle mounts available for ***some*** machines.
- You may need to upgrade your Z-Carriage to carry the extra weight
- Someplace relatively close to your CNC to position the PwnCNC VFD Enclosure with appropriate access to power.
- Water Pump/Chiller and tubing (required for water cooled Spindle Systems)
    - Liquid Coolant, all changed annually. Examples include:
        - Distilled water and Antifreeze (3:1)
        - Automotive Coolant
        - RV Antifreeze
        - Windshield wiper fluid
    - If you choose a water pump, you'll need to purchase a small bucket (preferably with a lid to keep debris out) to act as a reservoir.
    - Also, if water cooled, you may need larger drag chains if you intend to run the inlet and outlet tubes through them or other tube routing aided accessories.

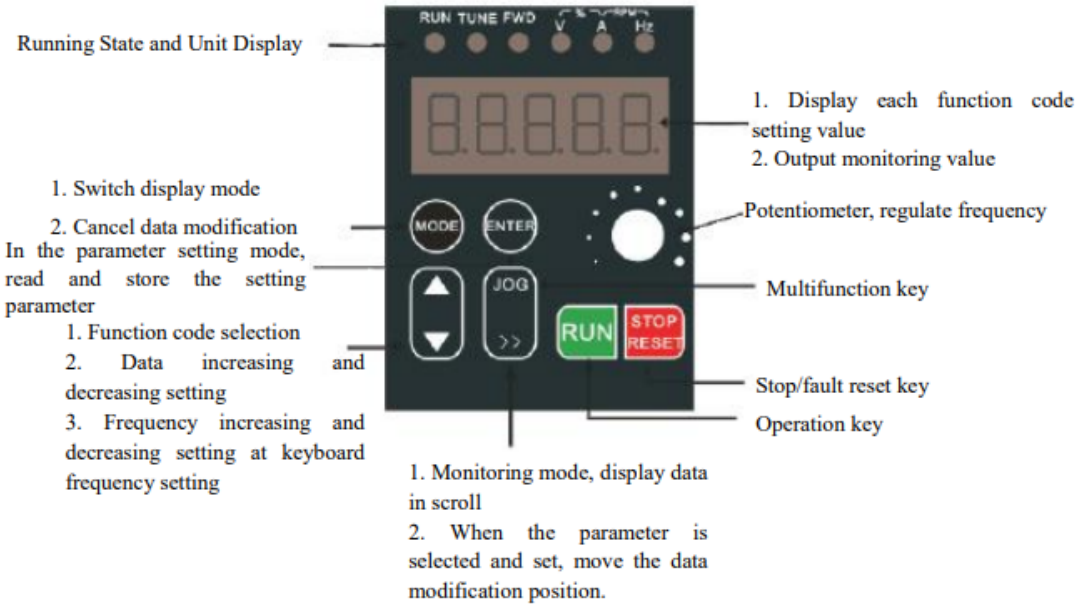
VFD Enclosure



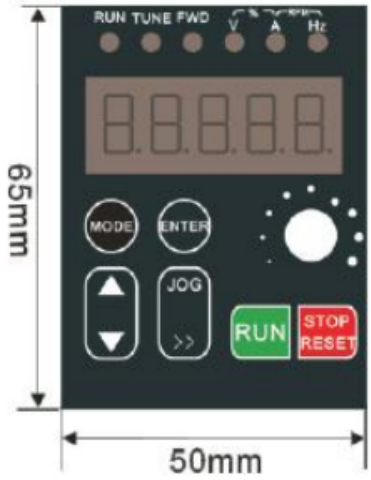
Parts List		
Item	Part Number	Description
1	Spindle Port	WS13 Connector for Spindle Cable
2	Spindle Brake Port	Connector for our spindle decelerator
3	Power Switch	O = Off, I = On
4	Filtered Power Inlet	C13 Power Cable Inlet
5	Keypad	Removable Display and Control Unit
6	GX12-6 Pin (PWM)	Pulse Width Modulation Port (Most Common)
7	GX12-2 Pin (Modbus)	Commonly used for Onefinity Buildbotics
8	GX12-2 Pin (Run)	ATC Only
9	MOS Switch	Manual VFD Control Switch
10	IoT Strip Inlet	IoT Plug Port. For use with IoT Strip
11	MoS Switch Housing	Removable for Relocating Manual Override Switch
12	Cleat	French Cleat for Wall Mount
13	Lock	Use with French Cleat to Lock it to wall



4.3.1 Keys on keyboard and their functions



Operation keyboard size



Indicator lamp function

No.	Name	Function description
1	FWD	The indicator lamp will be on at forward operation and will be off at reverse operation.
2	RUN	When the frequency inverter is at run status, this lamp will be on.
3	V	Indicate voltage
4	A	Indicate current
5	Hz	Indicate frequency
6	V-%-A	Indicate percentage
7	A-RPM-Hz	Indicate rotation speed

Installation

Installing your new spindle is extremely easy, but your experience may vary depending on which brand/model of CNC you own as well as specific circumstances of convenience.

Step 1: Remove Palm Router

Lower your Z carriage towards the bottom range then remove your current spindle shim and/or palm router (if applicable) from the mount as instructed for your CNC manufacturer.

Z-Carriage Photo Placeholder	Z-Carriage Photo Placeholder	Z-Carriage Photo Placeholder
(Photo Description)	(Photo Description)	(Photo Description)

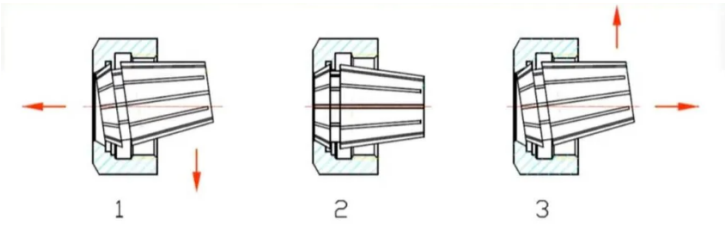
Pro Tip: If this involves opening a cable chain to remove the power cable leave it open if you wish to route your spindle cable here.

Step 2: Prepare Spindle Motor

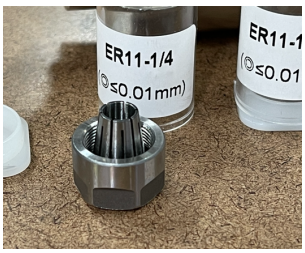
Locate the spindle motor, collets, and spindle nut. These parts will be labeled “ER11” or “ER20”.

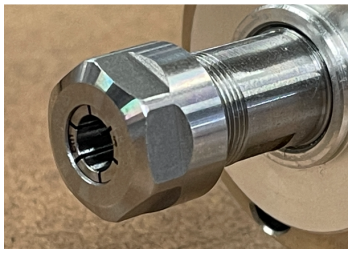
You’ll want to take one of the collets and snap it into the spindle nut, then thread the nut/collet assembly onto the end of your spindle motor. **Do not tighten**, at this point, only a few threads. Note: the offset circle on the nut is a requirement and not a flaw. Do not install a bit at this time.

Offset ring is a requirement



Insert a collet at an angle then straighten, locking in place





What it should look like without a bit

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. Due to the Cylindrical frame you can place it as high or low as you want which requires a give and take. Too high, your shortest bit won’t reach the lowest point. Too low, you won’t clear tall stock with a long bit. The optimal middle ground is situationally depenent.

Z-Carriage Photo Placeholder	Z-Carriage Photo Placeholder	Z-Carriage Photo Placeholder
(Photo Description)	(Photo Description)	(Photo Description)

Note: If you're replacing a Dewalt with its' 69mm mount with our 65mm spindle, you will need a different router mount, or a mount "insert" which converts the 69mm mount to a 65mm mount. We have them available as Spindle Reducer Shim or some CNC Manufacturers include one.

Step 4: Attach Spindle Cable

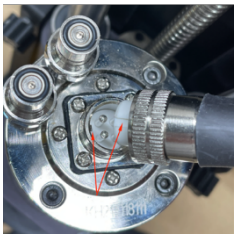
You have a few options for routing the Spindle cable (and water tubes if applicable):

1. Thread them through a cable chain if it's large enough or snap in chain attachment (not currently offered through us).
2. Zip Tie the spindle cable to the cable chain. Do not overtighten and leave loose.
3. String from above with a retainer of some sort that allows for complete movement of your CNC workspace to include up and down of the z carriage at the extreme edges.

Your own setup would dictate what your options are.
You'll want to work your way from your Spindle back towards your VFD leaving enough slack at your spindle to allow for full up and down motion and allow for movement to each corner of your machine bed.

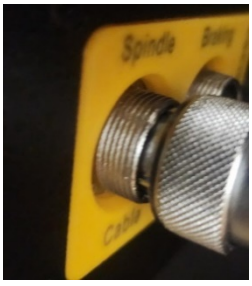
Spindle Cable

The Spindle cable is attached to the spindle motor using an H17 aircraft connector on our 65mm motors and an H20 (H-Twenty) aircraft connector on our 80mm motors. There is only one way these connectors can be inserted into the motor thanks to the notches. The H17 has a white inner piece, and the H20 has a black inner piece on the spindle side of the cable.



Pro Tip: Blue Loctite or Teflon tape the connection as it may come loose through vibrations as found with any level of use over time.
The other end of the spindle cable will plug into the side of our VFD enclosure completing the motor installation.

Identify the Spindle Port



Slip it on, only goes one way

Tighten the nut

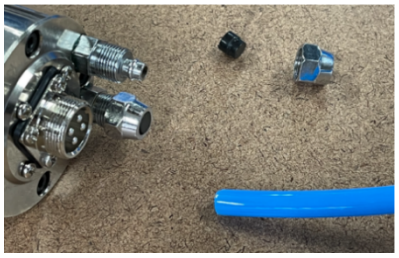
Step 5: Spindle Coolant Delivery (Water Cooled Only)

If you purchased a water-cooled spindle, now's the time you'll also want to attach the tubes to the top of your spindle. The tubes necessary are 10mm Outside Diameter (OD), and 6mm Inside Diameter (ID). Similar sized imperial tube is ⅜" OD, and ¼" ID. There are two tube connection points and they both will act as either an inlet or outlet depending on which connection your pump is attached. There is no advantage one way or the other when hooking these up as inlet/outlet.
Purchasing a length of hose is a single piece, and you are expected to cut it in half.

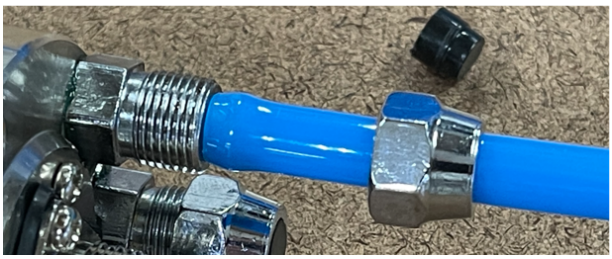
Coolant Options

Distilled water and Antifreeze Concentrate (3:1), water and (prediluted) Coolant (1:1), and windshield wiper fluid (no diluting necessary) are popular options changed annually. It is important not to use tap water due to contaminants that could coat the spindle insides reducing cooling efficiency.

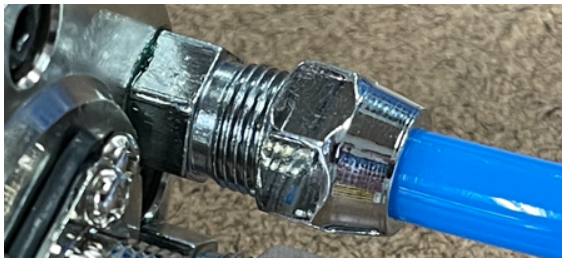
Stock connectors



The stock connectors would require you to:
1: remove the nut
2: remove the inlet cover
3: slide the nut onto the tube with the thread opening facing toward the end of the tube
4: then slip it into the receiving threads on the spindle and tighten the nut down. You may need to warm the tube up to get it to fit on the connector.
5: Tighten the nut using a **X** sized wrench.



Slip the hose through the nut and onto the nipple.



Tighten the nut

Quick Connect/Disconnect (Kool Connectors)

If you purchased Kool Connectors with your Spindle System, the motor side connectors are pre-installed and the stock connectors were included within the motors foam.
If you did not purchase it with your system, you can purchase them separately. To install them yourself be very careful as broken connectors will not to be replaced at our expense. The threads are brass and easily broken. Use care not to overtighten. Think baking, can always add more, but can't take it back.

Motor Side Kool Connectors (if purchased separately from your Spindle System order)

First remove the stock connectors using an 12mm sized wrench
Get a 1” strip of Teflon tape folded in half and wrap it clockwise on the threads. An alternative to Teflon that we use in the warehouse is purple Loctite.
Then using an 5/8” sized wrench gently tightens it only to the point of the metal come really close together. Again, DO NOT OVERTIGHTEN. Broken connectors will not be replaced at our expense.
Video available on our channel “Installing our custom made Kool Connectors”

Hose Side Connectors

Very similar to the stock connectors, you would remove the nut from the end of the hose side connector and push the hose through the nut with the threads facing out. You may need to warm it slightly to accomplish this. Then move the hose onto the nipple of the receiving end of the connector. Then using 15mm & 16mm sized wrenches to tighten the nut down.

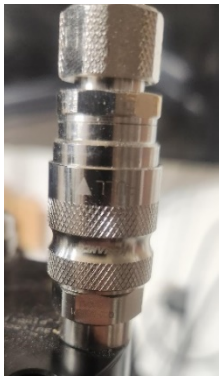
Slip the hose through the nut, threads facing out.

Slip the hose onto the nipple and tighten the nut.

Connecting / Disconnecting the Kool Connectors

Connecting is super simple, and only requires you to slip the hose side connector to the motor side connector together and snap it down until it clicks.
Disconnecting works with a push-pull motion as it is spring assisted. There is a sleeve on the hose side connector that needs to be pushed downward (when installed on a motor) and it’ll spring up slightly allowing you to pull it off. Utilizing these results in a few drops of liquid falling, but without the Kool Connectors, it would result in the liquid pouring everywhere as there is nothing stopping the coolant from escaping the hose or the motor.

*Showing the pull and arrow symbol on hose side connector *upside down*



Installed and connected Kool Connector

Installed and connected Kool Connector

Coolant Pump

If you selected the water pump option, we have two versions available. 110v and 220v. The 220v is reserved for our international customers where 110v is not available. Providing power is equivalent to turning it on, as there is not an onboard on/off switch.

Water hoses denoted with "cold (feed) line" in blue, and "hot (return) line" in red

220v Pond Pump adapter provided with 220v Pond Pumps

Fully submerge the pond pump in your coolant of choice. We *recommend* either distilled water and automotive antifreeze concentrate (3:1 ratio), windshield wiper fluid, RV Antifreeze, or automotive coolant (undiluted)

Feed your lines to and from the spindle in the farthest position (down), and route it via your preferential method, and start/end in the bucket. Slip the hose over the barb, and secure with a hose clamp or zip tie (not included). The spindle's in & out port does not matter

Put the suction cups on the bottom of the water pump by slipping them in place, and adhere it to the bottom of the bucket.

Tip: Save cutting it in half till all the routing is completed.
Tip: Ensure the end of the return 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.

Chiller

The benefit of a chiller is that it is a bucket, pump and radiator fan in one package. The radiator fan allows for passive cooling, as there is no refrigerant involved which if there was, it would define the chiller as an active cooling chiller. Passive cooling is perfectly sufficient for spindles whereas active cooling is meant for equipment such as CO^2 lasers.

The hose barbs on our chiller accept ⅜" hoses. For this we have included two segments of ⅜" tube and two ⅜" to ¼" barb adapters.
Tip: For extra security you can use hose clamps or zip ties to secure the hose clamps on the barbs (not included).

To fill your chiller, unscrew the lid on the top, pour the coolant in, then reinstall the cap. Unlike the water pump, the chiller has a power switch on the front face. Do not turn it on until your feed and return line hoses are installed.
Note: You may need to add more of the same coolant after filling the lines and spindle reservoir or risk low coolant alarms.

CW3000 Front

CW3000 Rear

Hose Barb's Adapters

Step 6: Power up your Spindle

With the installation of your spindle cable, your VFD is almost ready. The last step is to plug the power cable into a 110v dedicated 15-amp, 110v 20-amp or 220v 20-amp outlet as appropriate for your chosen configuration. VFD's do not get along with GFI/GFCI circuits/outlets that are commonly found in garages, consult a licensed electrician for powering options if this situation applies. After plugging in the included power cable to your VFD and flipping the switch at the plug to the rear (on) position, you should see the VFD's keypad light up with red letters/numbers. It should be blinking which means it is in stop/standby mode.

Refer to Page 4 for a the VFD Enclosure Anatomy

On the left side of the VFD Enclosure is the Manual Override Switch which allows you to control the Spindle via the VFD directly, or with G-Code. Flip the switch into the Upward / I / Manual position. The Manual Override Switch allows you to control the RPM from the VFD manually via the knob (potentiometer), and without our control cable (see addendum for Automatic Spindle Control) made for your CNC controller, this is how spindle control will be utilized.

Remove the installed collet nut. Turn the potentiometer on the keypad installed as the face of the VFD all the way to the left. With your spindle installed on your machine or stabilized for bench testing spindle in a safe position and location, hit the green "Run" button on the keypad. The blinking numbers should turn solid. Slowly turn the knob to about the 9 o'clock position, and the numbers should increase, and the spindle should be rotating. To stop it, hit the Stop/Reset button.

Warning: Never ramp up the rpms rapidly with a "cold motor", as a high RPM upon startup can and has resulted in spindle damage.

If the numbers displayed are not in RPM's cycle through the various displays by hitting the double arrow pointed to the right button. After verifying the spindle works in manual mode, you're done as this is the most basic configuration of your spindle as it comes included. For instructions on how to hook up, install and test your Spindle System using Automatic Spindle Control see the addendum included in your package for your controller.

VFD Displaying Hz

VFD Displaying RPM

Normal Operating Procedures

Starting your Spindle Motor

First after plugging in your VFD to a power source, and connecting the Spindle Cable to the VFD, flip the power switch to the on position just above the plug. The rocker should be angled away from you. The display might take a moment to appear / display and likewise disappear. The display would be blinking, and with the Manual Override Switch on the left side in the Up position
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.

Warm-Up Procedure

Regardless of the ambient temperature of your machine, it is imperative to conduct a warmup procedure. With regular use, and warmer temperatures this procedure may be abbreviated. The intent is to evenly distribute and get the oil/grease at a proper viscosity.

With the spindle in a safe location run your spindle starting at 6,000 RPM's and hold that for 10 minutes, then increasing to 12,000 RPM's for 7 minutes, and ending at 18,000 RPM's for 3 minutes. These are only guides, and your requirements may be longer or shorter.

You'll likely hear the spindle "bubble" at a given level, stay at that level, for a little longer. Prolonged down time, and cold environments will prolong this procedure. If you have a water-cooled spindle, you can run it with your pump or chiller not running, but if you notice the motor starting to get hot, your spindle is warmed up. Turn your coolant source on before starting to carve.

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 area where the bit is.

Bit Changes

Ensure your VFD is stopped, and the display is blinking during bit-changes. You may need to hit the stop button on the VFD to get the blinking status.

Next… install a bit into your new PwnCNC Spindle's collet/nut assembly, use the two wrenches included in your system. The smaller wrench is to hold onto the spindle's shaft and prevent it from moving.
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, but you still will hit a stopping point when continuing to loosen it. When you continue loosening the nut, the bit is likely to fall to your CNC's bed when the collet is no longer holding it. We recommend putting something soft below like a kitchen sponge or holding onto the bit shaft with a pinky while continuing to loosen the nut to prevent damage to the bit for when it falls out of the collet.

Using your VFD in Automatic Mode

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

Our VFD can receive automatic spindle control commands from the controller in a couple of ways: Pulse Width Modulation (PWM) or Modbus (e.g., RS485). The method used depends on the CNC controller's capability you told us you had at the time of purchase.

Explanation of PWM vs Modbus

PWM control is the most common form of automation with a digital voltage signal of either 0-5v or 0-10v is sent from your controller to the VFD which converts that voltage into a 0-24000 rpm response in the motor. On a 5v controller 2.5v signal sent to the VFD would result in a commanded 12,000 RPM, where that same 2.5v signal sent from a 10v controller would result in 6,000 RPM's. Most CNC controllers will support this method. PWM is a "Fire and Forget" method of communication. A couple hundred RPM variance is normal and acceptable in the usable range.

The other method is less common but provides direct feedback. The Onefinity "black box" / Openbuilds Buildbotics, and the Super Long Board are controller examples capable of Modbus Connection. Modbus is a "fire and verify" method where there is 2-way communication between the Controller and the VFD. Modbus is closer to actual RPM than PWM due to this 2-way communication.

Your VFD was preprogrammed to your controller depending 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 is 3 inlet ports using GX-12 Connections. If your controller uses PWM you're going to use the PWM Port (6-Pin). If your cable has 2 Pin's, you'll use the ModBus port. The "Run" port is utilized by the ATC system, and currently serves no purpose with our Spindle System. The connector has an alignment notch meaning there's only one way to attach it.

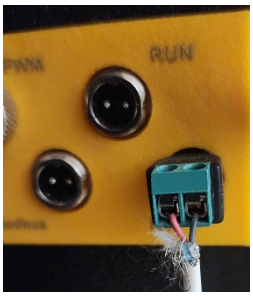
The other end of this cable will depend on which CNC machine you own. Please refer to the included instructions for the specifics of connecting to your controller.

Left Side of VFD Enclosure

Accessory Explanation

IoT (Internet of Things) Power Strip

A very powerful option available with the PwnCNC Spindle system is our IoT Relay plug!



IoT Plug installed in VFD

IoT Strip (sold separately)

There are 4 plugs on the IoT Strip, and 1 of them is always on, meaning if the switch is powered on, that outlet is on. This is suitable for something like a pond pump or chiller. The other (3) outlets are activated/deactivated by the “Trigger” point. The trigger point is about 5500 RPM’s. There are (2) Normally Off plugs and this is most commonly used for shop vac’s or smaller dust collectors and/or a “safe when off” red light. Finally, a Normally-on Plug. This is a plug that will disconnect power when it is triggered and is a special use case and might be used for a “safe when on” green light.

Your Spindle System came with the necessary plug to go into the VFD, you just need to supply a wire to go between the IoT Strip and VFD and the IoT Strip itself. We have wire available to go between the VFD and IoT Switch called Iot Signal Wire, sold by the foot as well as the IoT Strip.

IoT Plug (included with your Spindle System)

IoT Signal Wire

Dust Boot

There is no best dust boot as they all have pros and con's. 2 Questions should be asked:

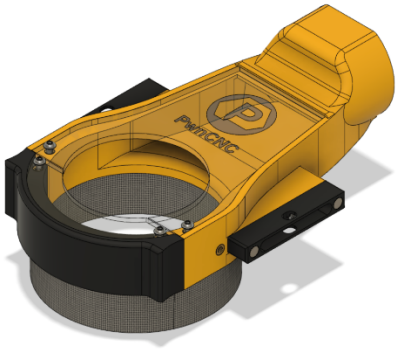
1. 2.5" hose port (we have adapters for proprietary fittings) or 4".
2. Do you want it to raise and fall with the spindle, or do you want it at a fixed height. A fixed height will require Z-Independent Brackets made for your Z-carriage.

The first question only relates to what you intend to hook up for dust collection but is a boot disqualifier.

The second question has considerations that need to be have more weight.

- Considerations of a Z-Independent, stationery style boot, is your boot will need to adjust the height to accommodate different thickness workpieces you have. Note: if the spindle covers the port, the suction will be cut off, this is dependent on the spindles expected travel range. Both of our Z-Independent options have removable front "faces" allowing for viewing the cut as well as changing the bit. A Z-Dependent boot also requires the use of our Z-Independent Bracket system, and they may not be available for your Z-Carriage. Options are: *V3 (2.5") and V9 (4").*
    - Our *Tube Bundle* is an all-included package of everything you need to get your V3 Dust boot up and running, and is available on our historically most popular Z-Carriages.

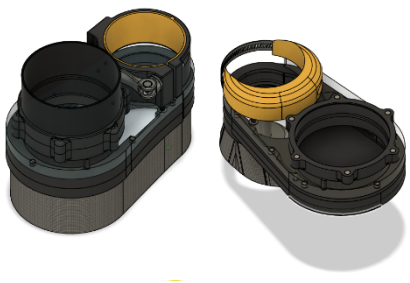
Tube Bundle (All included for your Z-Carriage)



V3, requires Z Independent bracket system at a minimum

- If desiring a Z-Dependent boot, which moves up and down with the spindle, things like bit length and depth of cut need to be taken into consideration. The boot needs to clear the highest point at all locations of the tool path especially in the front part of it generally not accounted for in Computer Aided Design software simulations. Fortunately, this can be achieved by removing or adding spacers. Z-Dependent boots are measured both by the spindle diameter and the hose diameter. If other than a spiral wired flex hose is used we have adapters with the *PwnCNC Boot Adapter* and *Maglock Converter* (2.5" hose required) available. *The V10* is specifically for Onefinity's Z20 axis due to limited clearance and *V7* for any other machine.

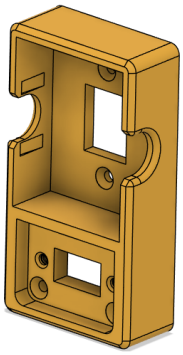
80mm Spindle 4" Hose V7



80mm Spindle (only size currently available) 4" Hose V10

VFD Keypad Mount

The VFD Keypad is the control center of the VFD. We have created a few solutions for you to place them virtually anywhere with our *VFD Keypad Mount*. With our VFD enclosure, we also made it possible to move the Manual Override Switch (MOS). If looking only to relocate the VFD Keypad there are two options, and they are surface mount or flush mount.



MOS Keypad Mount

MOS Extension Cable

VFD Keypad Extension Cable

Manual Override Switch (MOS) Enabled VFD's

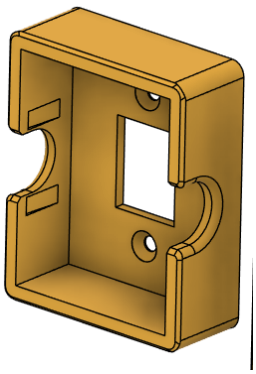
The MOS is the switch on the left side of your VFD and allows you to switch between Automatic and Manual Spindle Control mode. With our V5 Enclosure this is a removable piece allowing you to put your VFD virtually anywhere, and still have full control of it (less turning your VFD off at the onboard power switch). Most of the time you can probably expect to leave it in automatic mode, but the MOS Enabled Keypad comes in handy for those situations where you may want manual control of the spindle's RPM's without disruption. Requires *MOS Extension Cable* available in 3, 6, 9, 12' segments.

MOS Enabled VFD Enclosure (all VFD's currently shipping)

Surface

For a surface mount, you only need to have a hole on the back side about ¾" for the VFD Keypad Extension wire to feed in. You could reasonably expect to remove the keypad for a handheld experience with the surface mount. The surface mount requires the *VFD Extension Cable,* and is available in lengths of 3, 6, 9, 12 feet.

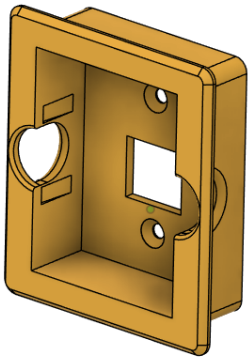
Surface Mounted VFD Keypad Mount



Flush

The flush mount option which would be best used on a control console setup and while the keypad can also be removed, it would require the extra steps of including finger holes to allow for reaching in and . The flush mount requires the *VFD Extension Cable,* and is available in lengths of 3, 6, 9, 12 feet.

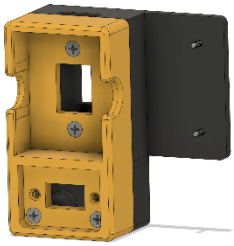
Flush Mounted VFD Keypad Mount

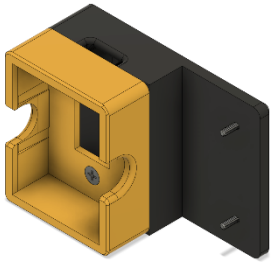


Masso Attachment

We also have a Masso Mount which complements the surface mount and attaches to the left side of the Masso Mount on the back side of the G3 Touch where a relay is attached inside. We picked the left side because it would interfere less with the homing sequence, however it does require removal to open the G3 Touch.

Masso Mounted MoS Extension Keypad Mount





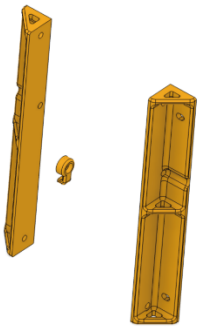
Masso Mounted VFD Keypad Mount

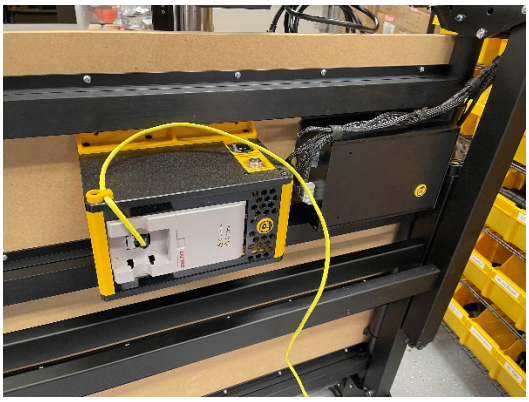
H20 Spindle Extension Cable

The Spindle Extension Cable is only available for our 80mm Spindles which utilize the H20 Connector. They serve as an extension between the Spindle Cable and the Spindle itself. These do not have the necessary connector to connect to the VFD directly, and have a H20 Female, and H20 Male connector and is available in 2m (6') lengths. Very much a suitable option if 20' of spindle cable is not enough.

VFD / PE Mounting Brackets

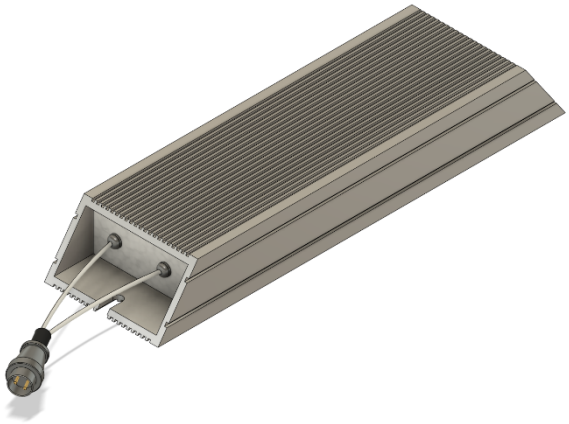
The VFD / PE Mounting Brackets differ from the included French Cleat and Lock commonly referred to as the “Whats this? clip”. The default can only be mounted on a vertical surface like a wall, but with the VFD / PE Mounting brackets you can mount your VFD virtually anywhere, including directly under your table in a horizontal orientation.





Braking Resistor

The Braking Resistor will allow you to reduce your spindles rotational speed. By default the VFD settings are set for 6 seconds, and you can adjust them downward yourself. If you experience an error though, you have exceeded the capabilities of the motor to stop. With the Braking Resistor, you’ll be able to lower this value below that point, and in our testing’s, we have been able to reduce our spin down speed by 2-3 seconds.



PwnCNC Spindle System Warranty

SAVE THE ORIGINAL SHIPPING MATERIALS FOR WARRANTY REPAIR

Six / Twenty Month Defect Warranty

Every PwnCNC Spindle System is warranted to the original purchaser only to be free from defects in material and workmanship.

PwnCNC will repair or replace any component of a PwnCNC Spindle System which, after examination, is determined by PwnCNC to be defective in material or workmanship for a period of six (6) months and twenty (20) months for the Variable Frequency Drive (VFD) after the shipping date or delivery date (only applies internationally). Return of the defective part or spindle system 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 System; 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 system and/or its electronics or computer components to control or any device or object which is not specifically issued or authorized by PwnCNC or open up the enclosure.

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 via support@pwncnc.com and may include a telephone or video call diagnosis. You may be required to provide pictures and/or video of the claimed defect. If PwnCNC determines that your spindle system 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 effected spindle system to PwnCNC for warranty service. PwnCNC also may require you to return the spindle system if PwnCNC cannot determine from the warranty diagnosis whether your spindle system qualifies for warranty repair or not. In this case, you also may need to provide a credit card to cover shipping charges in the event your spindle system does not qualify for warranty repair. Your card will not be charged if your spindle system does qualify for warranty repair. If return of your spindle system 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 system 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 system back to PwnCNC. If you do not package the Spindle System 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 as well as any necessary repairs necessary.

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