

SHOPMASTER OWNERS MANUAL



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Dear owner, thank you for choosing SHOPMASTER. This owner's manual is being sent to you in .PDF format prior to the delivery of your machine so that you can be prepared for it's setup upon arrival. As the owner, you may print out a hard copy of this manual or have a bound copy done at a local office supply house for your personal use. Copying or printing the manual for sale or distribution to others is prohibited.

INSPECTION OF CRATE UPON ARRIVAL

Your machine will arrive at your destination by truck freight. The driver will ask you to sign the delivery slip. Before you sign, please inspect the crate carefully for any signs of rough handling such as holes, broken pieces etc. Because the machines travel a great distance from the factory to you, scuff marks, scratches and small chips in the crate are normal. However there should not be any panels broken loose or holes punched through the wood exterior. The machine sits on 3 steel tube skids, designed to allow movement by forklifts and some dents on the edges are normal. However, any skids that appear to be bent over or compressed are an indication of the unit having been dropped. The slight dents will not show once the bench assembly is completed. After you have inspected the machine, and if you find anything you feel is out of the ordinary, make a note on the delivery slip when you sign and also document the issues with photos.

OPENING THE CRATE AND TAKING INVENTORY

You will see that the wood crate has bend-over metal locking tabs holding the components together. Using a screwdriver and pliers, straighten out the tabs and remove both ends and the top of the crate. The sides of the crate are secured to the bench legs with 10 mm bolts. You will need a ratchet and socket (17 MM or 11/16) to remove the bolts. Set the bench panels aside and save the bolts. You will find the rear sheet metal panels and the front doors for the bench wrapped and secured inside the machine. Remove them and set them aside. The 2 end panels are already attached. You can now see that the bench leg assembly is mounted upside down on the base, which allows it to form a strong support for the crate.

At this point you should look over the machine for any signs of damage that may not have been apparent while it was crated and document them by photos. You will find the PC and monitor in the box containing the standard tooling, the keyboard, mouse, cables and the digital tachometer are in a separate box.

Open the box and compare the contents to the list of standard accessories that was posted on our website before you placed your order. Make a note of any missing items and send us an e-mail detailing those and any damage you may have found. Also inventory any extra tools that you ordered with the machine which we place inside the crate before shipping.

ASSEMBLING THE BENCH

Now its time to remove the bench leg assembly which is held in place by 6 bolts threaded up from below the bench pan into the 6 legs. Remove these 6 bolts and the leg assembly can be lifted off the pan. The leg assembly is not heavy, but due to its size, its best to have someone help you so you can lift it

straight up and off the machine. Be cautious here that you do not bang the leg assembly against the machine and chip the paint or break any of the control knobs. Once the leg assembly is clear of the machine, flip it over so that it is sitting on the 6 leveling pads. Be sure that it is resting solidly on the pads, not on the casters. Also be sure to orient the leg assembly so that when you lift the machine onto it, the front portion faces the front of the machine. You will see that on one side, the center leg has 2 tabs welded in place on each side. These are the plates for the door latches, so this leg should face the front of the machine. Take the 2 doors from their wrapping and install them on the front of the bench. You will note that the door hinge pins slide in from the top, so that when the machine is placed on the leg assembly, they cannot be removed. Now it's time to lift the machine up onto the legs. If you have a forklift, it will be easy to just pick the machine up and slide the legs under it. If you are using an overhead hoist or a roll around "cherry picker" style hoist, then you will need to place your straps or chains under the bench pan and get them secured in position so that the machine is balanced when lifted. Protect the machine finish by placing towels between the straps or chains and the machine. Also be sure none of the lifting straps bind against handles, sheet metal etc. At this point, move with care and caution as you raise the machine up. Do not get your hands or feet under the machine and keep others away while you proceed. Once the machine is high enough, slide the leg assembly under it, again noting the position of the front of the bench. Slowly lower the machine down until it is almost resting on the legs and then thread the 6 bolts down through the bench pan into the legs. Lower the machine down completely until it is resting solidly on the legs and remove your lifting mechanisms. Leave the 6 bolts just finger tight for now. Don't be concerned if the assembly seems a bit unsteady at this point.

In your box of accessories you will find a bag of fasteners for the rear panels. Place each panel in place and get all the bolts started, but not tight. Take the latch assemblies from your accessory box and install them on the doors as shown in the photo. Now you may go around and begin tightening all the fasteners for the sheet metal panels, all the while checking for squareness and even gaps. Once done, your doors should open and close freely and the latches should catch the tabs on the center leg when closed. You will also now see that the assembly has taken on a very strong and solid feel. Now you can tighten each of the 6 bolts holding the bench pan to the legs, but first, put a bead of silicone sealer around each hole to prevent leaks if you use a coolant system. Once those 6 bolts are sealed and tightened, your bench should be rock solid. Finally, open the front doors and double check the tightness of the 6 bolts holding the machine to the bench pan. The bolts are accessed by holes in the 3 skids. These holes are sealed at the factory against leaks, but it's possible that they may have vibrated loose during transportation.

ADDING SHELVES AND DRAWERS

While your machine is still in the open and accessible from all sides, you may want to add some shelves and/or drawers. A lower shelf is easy to measure and cut, and by removing one end sheet metal panel it can be slipped into place. You can even use the crate material by gluing 2 panels together and stacking some cinder blocks on them while the glue dries and then cutting them to size. You can also buy drawer assemblies, or use one of those low cost toolbox units sold at discount stores placed inside the cabinet and resting on the lower shelf. There are plenty of variations of shelves and drawers to suit your own style. The openings behind the doors are 24" wide, 25" tall and 25" deep.

CHOOSING A LOCATION AND WIRING

Now that your machine is all prepared to move into place, you need to decide on its placement. Keep in mind access for future maintenance and cleaning. Ideally, you should be able to walk around the machine, but we know that many of these machines are going into home garages where space is limited. With the casters, you can easily move the machine around should the need arise. Keep in mind that the access panel for your electronics is on the left as you face the machine and should you be turning long parts in the lathe which protrude through the spindle, you will need some space on the left side. You definitely do not want to place the left side in a corner. Once you have chosen your location, its time to run your wiring. The machine comes with a 3' long cord wired to a NEMA 6-15 220 volt plug. The NEMA 6-15 is a common plug found at any home improvement store and you can find the corresponding outlet as well. You will only need a 15 amp 220 volt circuit for the machine. Do not be concerned if your home breaker is larger than 15 amps, because the machine has its own properly rated breaker inside as well. The cord comes out the back of the machine on the left side about 36" from the floor. Measure out your location and have your outlet wired so the cord can reach. (Use of a 3-4' extension cord of sufficient wire gauge is acceptable if necessary) The outlet should be about 48" from the floor. You will also need a 110 volt outlet near the machine for the computer and monitor and any lights, fans etc. you may want to use.

MOVING INTO PLACE AND LEVELING

Now that you are all wired and ready to move the machine into place, screw the adjustable legs up into the bench legs until the machine is resting on the casters. Now one person can easily roll the machine around. However, be careful and move slowly because the machine is very top heavy, and even a small nut or bolt could stop the caster and cause the machine to tip over if rolling too fast. Sweep up your entire area before beginning the move. If you are mounting the machine close to the back wall, be sure to release the computer mount and swing it out toward the front of the machine before getting up close to the wall. Once you are in the chosen

place, begin screwing the adjustable levelers out of the bench legs until the machine is lifted off the casters. Most shops have concrete floors, but in the unlikely event you are on a wood floor, you should cut some 6" X 6" steel pads to place beneath the levelers to spread the load. Mark the place on the floor with paint or sharpie so you can always return there if you should need to move the machine. If you have a machinist's level, that is great, but a good quality carpenter's level will work as well. Place the level on the top carriage of the machine and begin to adjust the levelers until you are level left to right, forward to back and at 45 degrees to both positions. The machine castings are very rigid, and there is little chance of distortion as long as all 6 legs are planted firmly on the ground. Once the machine is leveled and in place, look to the top corner of the upper cover toward the rear of the machine. You will see 2 holes in the sheet metal cover leading to a tapped hole in the framework. This is for the attachment of an "earthquake" strap. From each of these holes you can run a metal brace back to the wall to tie the top of the machine in place. In the unlikely event of an earthquake, they would keep the machine from tipping over. As a bonus they add greatly to the rigidity of the milling head assembly.

REVIEWING THE CONTROLS

For now, leave the machine unplugged from the wall and take some time to review the controls. You will notice that the DRO display was mounted upside down during shipping in order to clear the bench legs. At this point you can remove the nut from the mounting stud and turn the display right side up. The functions and features of the DRO are covered in the DRO manual itself. The mill head was placed at its lowest level for shipping, so you can now unfold the handle from the wheel and move the mill head upwards manually. There is no lock on the travel, as the stepper motors lock it into place when at rest. You can also move the Y axis forward and back and the X axis left and right, but be sure to loosen the carriage locks. On the front panel to the left are all the controls for the spindles and CNC. Your machine PC has been pre-configured as well as the VFD inverter, so your machine will be fully functional when you get ready to turn it on. Toward the top of the front left panel is the VFD keypad and display. In the delivered setup, all the functions of the VFD are controlled through Mach 3, and the display will simply read the Hz reading going to your motors. Please note, this is not the RPM of the spindle that will read on your Mach 3 screen. This key pad can also be configured for manual control with the small knob and the buttons. This is all covered in the NOWFOREVER manual. Below the VFD Key pad are the machine controls. The top left switch is for selecting which spindle will run. Later on you will note that when selecting the lathe, you will hear a snap sound from the inside of the panel- that is the magnetic contactor engaging. To the right of this switch is your main power switch for the VFD inverter and the spindle motors. When this switch is on, you will also have the red light on. Below these switches in the center is the

E-Stop switch. This switch shuts off all power to the VFD inverter as well as the stepper motors, so in the event of a crash, all you need to do is push the red button in. To re-engage the switch you just turn it clockwise, but be sure to read the instruction and turn off all other switches first. Below the E-Stop and to the left is the power switch for the Gecko drive. When this switch is on, your CNC system is activated. To its right is the stepper motor switch. With the CNC on and the stepper switch on, the stepper motors are locked in position and can only be moved by Mach 3. If you want to move the carriages manually, you must turn the stepper switch off. Check each switch and watch to be sure it is properly “clocked” so the white stripe points to the proper place on the decal. On the panel at 90 degrees to the switches you will find the flow regulator for the air coolant system. You will note the air exits through a flex nozzle on a magnetic base which can be used as a coolant for the cutting tools. Opposite the controls on the rear of the panel you will find the inlet for the coolant air.

Above the air inlet is the Gecko drive to which the computer and stepper motors are attached. You will see that X, Y and Z axes are not hooked up, and A axis is open for use with other CNC tools like the rotary table. You will also see a small slide switch marked CHARGE PUMP. This should remain in the ON position. The charge pump is a safety feature that prevents the machine from moving suddenly if you forget to boot the computer prior to turning on the CNC power. Above the Gecko drive is the auxiliary coolant fan inlet. The system has 3 fans altogether to keep the operating temperature at the proper levels.

INSPECTING THE ELECTRONICS

Before plugging the machine into the power, it's a good idea to look inside the control cabinet. This will give you an idea what's inside and how it all works. Remove the 4 bolts holding the panel in place. Looking inside and starting at top left you will see the auxiliary cooling fan which pulls air from outside, blows it across the electronic components and then it exits out down over the X axis stepper motor. To the right of the fan is the CNC power supply. This converts 220 volts AC into 48 volts DC for the Gecko drive. To the right of the power supply is the module for the spindle sensors which send signals to Mach 3 for RPM reading, threading, tapping etc. To the right of the module is the back side of the VFD keypad with the ribbon cable running back to the VFD inverter. Just below the fan is the Gecko drive with wires running to the inverter, switches and power supply. To the right of the Gecko is the VFD inverter which takes the 220 volt single phase input and converts it to 380 volt 3 phase output for the motors. The inverter also accepts signals from Mach 3 to control the spindle speeds, forward, reverse etc. To the left of the inverter is the magnetic contactor that switches the 3 phase output to either the lathe or mill motor. You will see a breaker just to the left of the inverter. In case of a power overload, this breaker will open like a breaker in your home panel. The inverter and the power supply each

have their own cooling fans as well as temperature sensors that shut down in case of overheating. You will also see the air coolant piping going to the flow regulator. In the central panel where the lathe spindle and drive belt are located you can see the lathe spindle sensor mounted to its bracket. Note that this section is sealed off to prevent any chips or debris from belt wear entering the electronics components. To the far right you see the backs of the control switches and you can see the white tab which allows the switch portion to disconnect from the knob should you need to do maintenance. At the bottom right you see the X axis stepper motor and drive belt going to the pulley on the end of the X axis ball screw.

While the end panel is open and power disconnected you should check the drive belt tension, stepper belt tension and adjust any switch knobs that are not properly “clocked”. When done replace the panel.

CABLE CONNECTIONS FOR STEPPERS AND DRO

To prevent any damage to the cables and the Gecko drive, and due to the position of the DRO display in shipping, the cables are left unconnected but are labelled for proper connection to the machine.

CAUTION- Always turn off the CNC Power switch before disconnecting a cable.

8. Once all the carriages are moving correctly, secure the cables with the securing screws and label them with a sharpie for future reference.

DRO CABLES

The DRO has 2 modes for lathe and mill, but when first powered up it should go into the default Mill mode. So just plug the cables into the display and then watch which display is reading when you move the X axis and move that cable to the X axis port on the display. The same procedure for Y and Z. You can swap cables with power on with no problem. Once the cables are in their proper positions, secure them with the screws.

TEST RUN THE MACHINE

To begin the first test run of the machine, move the X and Y carriages to their mid travel points and raise the mill head to its approximate mid point, this will give you plenty of clearance for your first moves. Bring the computer mount around and adjust it to a comfortable position. Hook up the keyboard and mouse and the monitor and Parallel port cables. Plug the monitor and PC power cables in to the 110 volt wall outlet. Turn the PC on.

It should boot up and on your desktop screen you should have several icons. RECYCLE BIN, MACH LOADER, and a file folder containing USING MILL, USING TURN, GECKO MANUAL, NOWFOREVER MANUAL, VFD DEFAULT CODES and SETTING STEPS PER INCH AND BACKLASH. Double click Mach Loader and then select MILL TURN MILL. The mach 3 screen should load up at this point. Now make sure all your switches on the machine panel are in the OFF position and plug your 220 cord into the 220 outlet. Set the selector switch to MILL mode and turn on the SPINDLE POWER switch. You should get a red light and hear the auxiliary cooling fan running. Turn on the CNC POWER switch and you should get a red light and also hear the power supply fan running. Turn on the STEPPER switch and you should hear the steppers jump to locked position. You should not be able to turn the handles at this point. The DRO display may or may not light up at this point. It is hard wired into the power switch, but also has a separate ON-OFF switch on the back of the display. On the lower left of the Mach 3 screen you will see a reset button flashing- click on this to reset. Note- every time you turn off the stepper switch, the reset will flash and you will need to reset it. Once the reset button is reset, go to the top of the screen and select MDI (Manual Data Input). A bar will open up for data entry. First type G91 and hit enter. G91 is the code for incremental moves. Now type G0 Z1 and hit enter. The mill head should move up 1". Now try G0 Z-1 and hit enter. The mill head should move down 1". Try the same commands for X and Y axes according to the chart on the right sheet metal shield.

PLEASE NOTE: The command is G "ZERO" not G "OH"

Now try a spindle command- type M3 S200 and hit enter. The mill spindle should turn at 200 RPM. Type M5 and enter to stop the spindle. Type M4 S200 and the spindle should rotate the opposite direction. Always use M5 to stop the spindle.

If the carriages or spindle move the wrong direction go to the bottom of this file for instructions.

Close out of MILL TURN MILL and go to Mach Loader- select MILL TURN LATHE. Switch the MODE switch to Lathe (you should hear the contactor snap).

Hit the reset button and in MILL TURN LATHE select manual and type in G 91

Now try some G0 commands as you did in mill, but be aware that the axes have different designations in TURN as shown on the chart. You can also give the spindle some M3, 4 and 5 commands. On your DRO screen, you can set all axes to zero and then compare the readings with commands you have given. As your spindle is running, on the Mach 3 screen you will have a display that shows the RPM you requested and another display showing the true rpm as read from the spindle sensor. These should be very close, but can be adjusted in the CONFIG files. At this point you are ready to begin the final adjustments of the spindle rpm, steps per inch and backlash

compensation. We have included a number of files for these operations on your desktop. We have set the adjustments as close as possible, but every machine will be slightly different and once installed in its final location these fine adjustments must be completed by the operator. The functions of each of the VFD codes are set forth in the Nowforever VFD manual which we have sent as a separate file. Following are a few of the more common adjustments used in daily operations.

Codes P0-000 and P0-002 allow you to change from Mach 3 control of your spindles to manual control.

Codes P0-007 and P0-024 are the Hz settings which control your maximum spindle speeds. Please note, when adjusting these settings, the 2 code settings must always match.

Codes P0-009 and P0-010 control the rate in seconds of the acceleration and deceleration of the spindles. If the setting is too low (.5) it will cause a fault error as the motor cannot accelerate or decelerate that fast. We recommend 1.5 as the setting.

Code P1-000 locks or unlocks the adjustment of all other codes. In some instances, for security you may want to set this code so that none of the other codes can be changed.

Code P1-001 is a reset code which returns all codes to factory defaults in the event that somehow codes have been changed improperly and the inverter is no longer functioning.

POSSIBLE ISSUES:

1. Stepper motors run the wrong direction according to the machine decal.

The steppers have 2 wires that are interchangeable in the plug, and occasionally we find motors with them reversed. Changing the direction is a simple Mach 3 adjustment-

Go to **CONFIG>PORTS & PINS> MOTOR OUTPUTS** and find the column marked **DIR LOW ACTIVE** - simply change the check mark from red to green or vice versa to reverse the motor direction.

Getting the full license from Mach 3. You can purchase the full license from <http://www.machsupport.com/shop/mach3/>

We recommend you download the license only, as downloading the license along with a newer version of Mach 3 will delete all the pre-set XML files we have included. Artsoft is now selling Mach 4, but we suggest you stay with Mach 3 until you have mastered it and then decide if you want further upgrades.

DRO updates:

Machines after serial # 15066 on have a new DRO feature unique to the Shopmaster. Because the axes designations for Lathe and Mill are different, normal DRO displays require you to remember which mode you are reading. For example, when in Mill mode, the X axis is the carriage travelling along the main bed toward and away from the chuck. But in Lathe mode it is called the Z axis. This can be confusing when trying to remember which is which. On those machines after 15066 we have re-designed the DRO display, and now by pressing the EDM button twice, the display switches between Mill and Lathe mode so your readings are always correct.