CHICAGO LATHE

AMERICAN BRIDGEMILL
SETUP MANUAL 2020

Dear owner, thank you for choosing the BRIDGEMILL. 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 the top first, followed by both ends. 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 his 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.
Open the boxes 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.

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 and the outer legs have the door hinge pins welded on, 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. 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.

If you install toolboxes with drawers, you may leave the doors in place to utilize their locking feature, or simply leave them off for fast access to your tools.

EXAMPLE OF MACHINE WITH DOORS REMOVED AND TOOLBOXES INSTALLED (Old Color)

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 6' 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. The computer and DRO are both 220 volt units and their cords are hard wired into the machine control box, so you only need to have a single 20 amp 220 outlet for the machine.

NOTE: THE NEW STYLE COMPUTER OPERATES ON A 12 VOLT TRANSFORMER THAT CAN ACCEPT 110 OR 220 VOLT INPUT.

   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 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 the "earthquake" straps. From each of these holes you can run the metal braces 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.
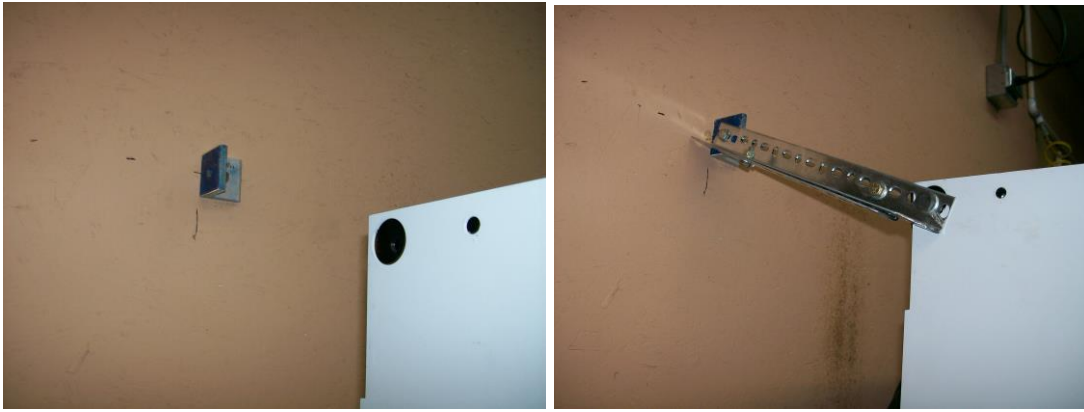
COMPUTER AND GECKO DRIVE SHIPPED SEPARATLY IN 2020

In 2019 new tariffs were placed on CNC machines raising them to a total of 30% which greatly increased prices. However there is an exception in the tariffs for manual machines which only carry a 4% tariff. Therefore we have shipped the machines without the computer and CNC driver installed in order to maintain stable pricing. We have designed the unit so that the controller and computer can be attached in only minutes and no wiring is necessary. The computer is fully configured and only needs to be attached to its mount. The GECKO CNC driver installs with 4 screws and only needs to have the pre-wired plug attached to it, and then the labelled stepper motor cables attached. There is also the decal for the machine, because we could not apply it before shipping and receive the exemption from tariffs. Please follow the simple Instructions below.

Disconnect the machine from the power source and remove the end panel which covers the electrical components by removing the 4 allen type fasteners. Looking to the left of the VFD inverter you will see a green plug wired with various wires. Note that each connection is labelled from 1-12. #1 should be at the bottom. Your Gecko 540 drive has a corresponding label and the green plug simply plugs into the Gecko. The gecko is held in place with the 4 included screws. Once installed, the DB25 cable and the stepper cables can be attached to the gecko.

NOTE: The sheet metal company that made the control box made an error. In the picture you can see a cutout just to the right of the DB 25 cable. This should have been solid with the cutout just above it to allow the Gecko drive to fit into place with the plug attached. So, the plug must be installed from the inside after the gecko is attached to the housing. We apologize for this inconvenience. If the plug does not seem to fit correctly or the numbers on the Gecko and the plug do not align properly, please contact us first- DO NOT disconnect wires from the plug or force the plug into the Gecko drive.

All cables must be securely attached with the holding screws, because a loose connection can cause Mach 3 to fault out during a program.
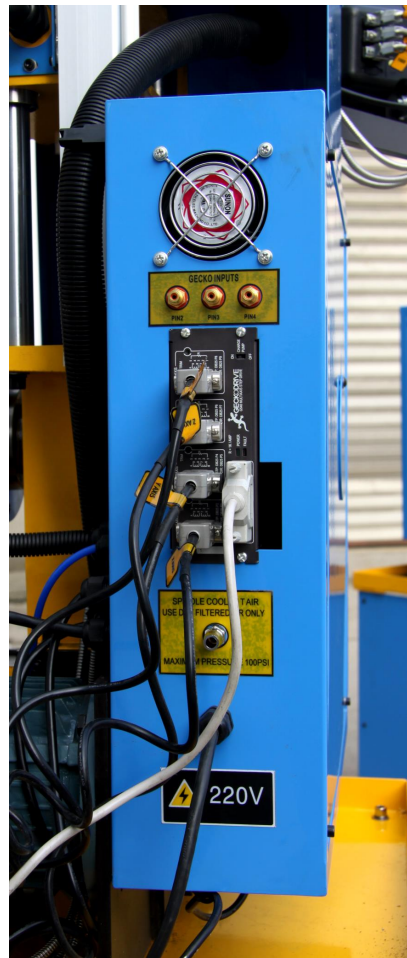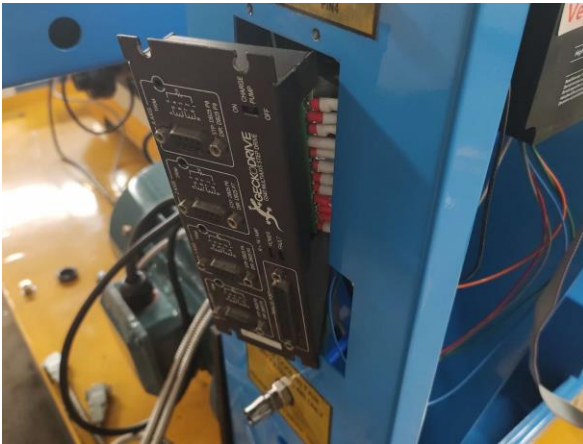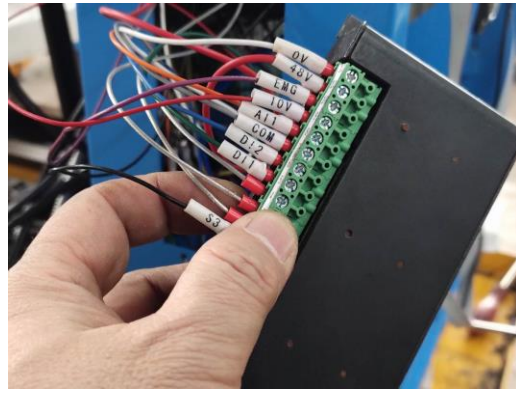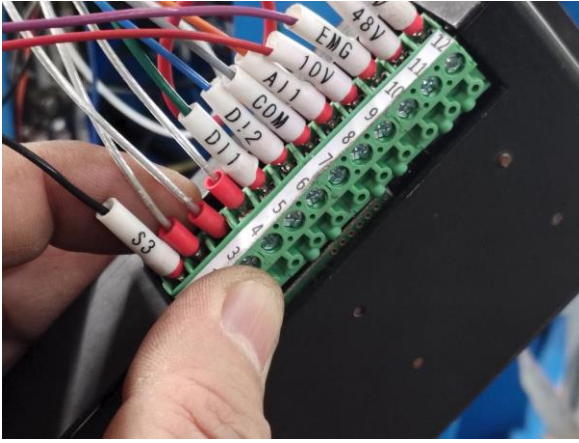
REVIEWING THE CONTROLS

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. There is a decal telling how to change the codes between manual and Mach 3 control. This is all covered in the V-8 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 either lathe or mill, 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 OFF 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 you will find 3 plugs marked pins 2,3,4. These are input pins for the Gecko to be used if you want to attach home and limit switches. The corresponding male plugs are included in your accessories. Just above these plugs 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. Just below the fan is the Gecko drive with wires running to the inverter, switches and power supply. To the right of the fan is the VFD inverter which takes the 220 volt single phase input and converts it to 220 volt 3 phase out put for the motors. The inverter also accepts signals from Mach 3 to control the spindle speeds, forward, reverse, etc. To the right of the inverter are the 2 magnetic contactors that engage the lathe and mill spindle motors. To the right of the contactors is the CNC power supply. This converts 220 volts AC into 48 volts DC for the Gecko drive. Just below the gap between the contactors and 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 CNC power supply is the back side of the VFD keypad with the ribbon cable running back to the VFD inverter. 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 each switch has a 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.

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 DRO 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 and PC power cable in to the computer.

DO NOT hook your machine computer to the internet-while a program is running. Always download any internet files to a thumb drive for installation on your machine. Mach 3 is sensitive to any programs running in the background and false signals can cause errors in your G code programs.

Upon receipt of your computer you should hook to the internet and download ADOBE READER- it's a free program that will allow you to read various Adobe.PDF files.

Your desktop screen will have several icons. RECYCLE BIN, MACH LOADER. Double click Mach Loader and then select 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 be sure your E-Stop switch is engaged by twisting it. 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 X1 and hit enter. The carriage should move 1".   Now try G0 X-1 and hit enter. The carriage should move 1" in the other direction. Try the same commands for Y axis according to the chart on the right sheet metal shield.
PLEASE NOTE: The command is G "ZERO" not G "OH"

When testing any axis, if you hear a whining noise and there is no motion, don't worry- that is just the stepper stalling and it won't hurt anything. Contact us for help with diagnosing the problem.

SPECIAL INSTRUCTIONS FOR Z AXIS MILLING HEAD

The Z axis has a special function for achieving higher speeds with a dual motor drive. In order to drive 2 motors from the Gecko 540 we use the SLAVE AXIS function and 1 motor is plugged into the Z axis port and the other motor in the A axis port. In the SLAVE axis mode, any command given to the Z axis is also given to the A axis, so both motors operate in tandem.   The parameters of each axis are set with identical settings in CONFIG>MOTOR TUNING, so anytime you make any adjustment to Z axis, you must make the same adjustment to A axis as well. All the stepper motors come from the same factory and are wired the same, so they should always turn the same direction. However in the unlikely event a motor is wired in the opposite turning direction, then the Z axis motors would be fighting each other and cause the mill head to not move-accompanied with some vibrating noises. Should this occur, hit the ESC key on your key board. The solution is a simple software change in Mach 3. Just go to CONFIG>PORTS & PINS > MOTOR OUTPUTS and look for the column

marked DIR LOW ACTIVE. You will see that for Z and A they should be checked green. To solve the issue simple change the check on one of the motors from green to red. Be sure to hit APPLY before exiting.

What about if I want to use my CNC rotary table or CNC toolpost- where do I attach it?

We have created 2 XML files for the Mill function, 1 is called MILL and the other is called MILL ROTARY. MILL has the dual motor function just described. MILL ROTARY has the settings for the mill head to operate on only 1 motor at a lower speed and the A axis port specially configured for your rotary table. So if you want to use the CNC Rotary table, simply open the MILL ROTARY in Mach loader, unplug the A stepper cable and plug in your CNC rotary table.

When you open LATHE mode, it is already preconfigured for the use of the CNC Toolpost and the A axis cable can be unplugged and the toolpost plugged in.

Now you can test your Z axis using the same procedure as with the X and Y above.

Now try a spindle command- type M3S200 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 and go to Mach Loader- select LATHE. Switch the MODE switch to Lathe (you should hear the contactor snap).

Hit the reset button and in LATHE screen select MANUAL and type in G91 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 our website. 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 V-8 VFD manual which we have on our website. Following are a few of the more common adjustments used in daily operations.

Codes P0-02 and P0-03 and P0-11 allow you to change from Mach 3 control of your spindles to manual control according to the settings on the decal. Codes P0-08 , P0-10 and P0-12 are the Hz settings which control your maximum spindle speeds. Please note, when adjusting these settings, the 3 code settings must always match. The factory default setting is the maximum allowable of 120.

Codes P0-18 and P0-19 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.

The V-8 inverter allows you to select the proper settings to match your motor. These settings are done at the factory according to the nameplate on the motor. However you may want to compare the inverter settings to the name plate on your motors.   These codes are found in P1-00 through P1-05.

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.

Your machine comes with an operating demo version of Mach 3 which will run up to 500 lines of G-code. In order to use more lines or the special wizards, you will need to purchase the full Mach 3 license.

You can purchase the full license from
DMAUCH@SEANET.COM

DRO NOTES:

Machines have a DRO feature unique to the BRIDGEMILL. 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 our

machines we designed the DRO display so that by pressing the EDM button twice, the display switches between Mill and Lathe mode so your readings are always correct. A full manual for the DRO is included.

GECKO INPUTS

PIN2　PIN3　PIN4

GECKODRIVE
G540 MULTIAXIS STEP DRIVE

CHARGE
PUMP

ON

OFF

TRIM

Z AXIS

Y AXIS

R x 1K / AMP

POWER
FAULT

SPINDLE COOLANT AIR
USE DRY FILTERED AIR ONLY

MAXIMUM PRESSURE 100PSI

⚡ 220V

!!!! CAUTION !!!!
DO NOT HIT VFD SPACE OR
SPEED CONTROL KNOB
WHEN LIFING BENCH LEGS

AMERICAN BRIDGEMILL
SERIAL#
MS-01900217

MODE
MILL   LATHE

SPINDLE POWER
OFF   ON

EMERGENCY STOP
PUSH TO STOP TWIST TO-ENGAGE

STOP

CAUTION: ALWAYS TURN OFF ALL SWITCHES
BEFORE RE-ENGAGING THE~STOP SWITCH

CNC POWER
OFF   ON

STEPPER MOTORS
OFF   ON

SPINDLE AIR COOLANT
OPEN TO INCREASE FLOW

LOSE DRY FILTERED

TYPE	M-C9212
YEAR	202002
VOLTAGE	220V
FREQUENCY	60Hz
POWER	4.5kW

K11-160
2500 rpm

TRAMMING THE BRIDGEMILL

Your BRIDGEMILL was trammed at the factory, but after a long voyage here, handling by various forklift and truck drivers, it is possible that it has lost some of its original position. Tramming is not difficult.
1. Get your machine moved into its final location and fully levelled. We recommend you add "earthquake" straps to a wall behind the machine if possible. On the upper rear corner of your machine on each end you will see a hole in the sheet metal cover and a 10 MM X 1.5 tapped hole in the support frame. You can run a bar or angle iron from this point to the wall behind to attach the machine to the wall. It would prevent the machine from tipping over in an earthquake, but it also adds a lot of stability to the mill head and machine.

2. Once your machine is in position as above, do a "self- align" of the 6 linear rail posts by-

A. Using your manual handle, drop the mill head down to its lowest position- the mill head should come to rest on the casting that holds the lathe spindle, and also on the 2 clamps around the linear rail columns on the tailstock end. You can adjust the clamp locks to get both ends resting at exactly the same point.   Now loosen all 6 bolts holding the linear rail columns at their bottom point, then re-tighten them. This will allow them to shift a bit in the mounting holes and self- align to the mill head.

B. Now manually raise the mill head to its highest position and loosen the 6 top bolts of the linear rail columns and re-tighten them. That will also self -align them at the high position. Run the column down to the lowest position again and back up until it is about 4" from the top just to check that the motion is smooth and no binding.

3. Now measure the distance from the top of the linear rail to the top framework on each end- these distances should be the same. If they are off by any significant amount 0.050" or more, you will need to adjust the drive pulley synchronization.
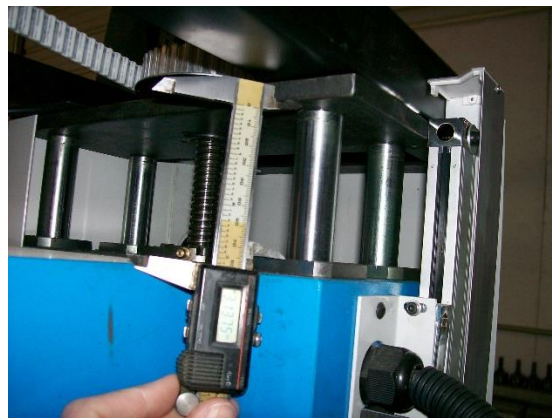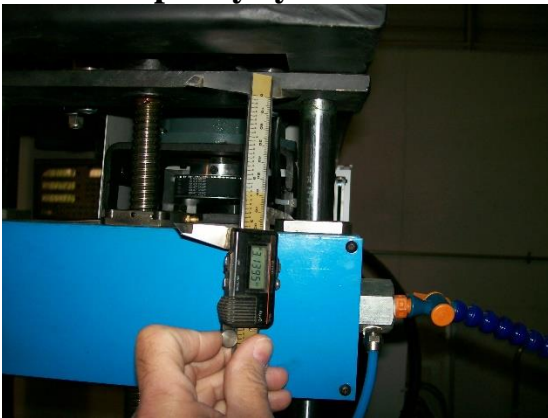
4. Remove the top cover to expose the pulley and belt drive system. Do a general look over to see all the mechanisms and how they work. The ball screws are metric, but essentially a 5 threads per inch pitch, meaning that 1 turn of the screw will give you 0.200" motion. The pulley is a 72 tooth pulley, so each tooth increment would give you 0.200" divided by 72 = 0.00278" or in round number 3 thousandths. So, for example, if you needed to raise or lower one end of the mill head by 20 thousandths, you would need to move the belt by about 7 teeth.

5. Moving the belt is fairly easy you can loosen the idler pulley located in the center of the framework and release the belt tension enough to move the belt around the pulley as much as you need. Use a sharpie to

mark the belt and pulley on each end and also to mark the point you want to move to.   After you have moved the belt, re-tension the idler so that you have about a ¼" deflection in the space between the motor and idler pulleys. Too much tension drags the motor down and reduces your speeds- too little tension can result in jumping teeth .
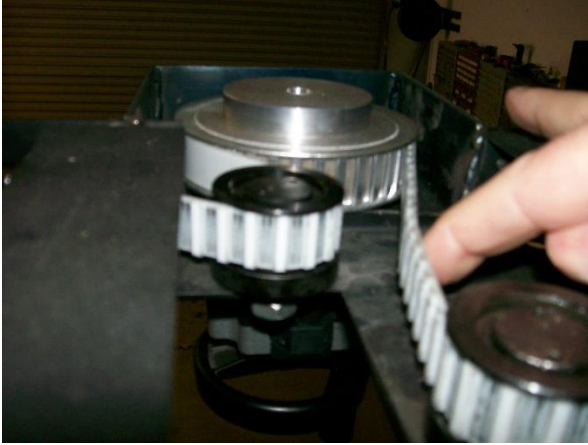
6. Once your belt is back in place, run the mill head down a bit then back up and measure the distance again to see if you got it right.   That covers the main adjustment.

7. Now it's time to check the actual tram of the mill spindle to the table. Move the carriage under the mill spindle and put your dial indicator holder in the collet so that the dial indicator will sweep the full with of the table. Crossing your dial probe across the T slots is tedious, so if you have a good piece of flat material to put on the table that will help- a piece of plate glass will work.

8. Sweep your indicator around in a circle and use a sharpie to mark the variations at every 45 degrees.

9. You will see that the mill spindle cartridge is held in place by 6 bolts at the bottom and a large clamp collar at the top. The hole through the mill head casting is made slightly oversize to allow shimming of the cartridge. Loosen the large clamp lock on top, then loosen the 6 lower bolts and place shims between the casting and cartridge in places where you need to adjust the tram. Tighten the 6 lower bolts and sweep your indicator again and re-mark your variations. Continue this process until you are satisfied with the result. Then fully tighten everything. If you don't have shim stock, a cheap feeler gauge set from an auto parts store will work, as the thickness is written on each gauge and the thin ones can be cut with scissors.

SETTING STEPS PER INCH AND BACKLASH COMPENSATION

To get the best results from your machine these settings must be done to the best possible settings. Because the machine is new, it will wear in a bit after a certain amount of run time and may loosen up. We suggest that your first step is to take some time to run all your axes back and forth their full travel for about an hour. After this procedure is done, check your gib adjustments and the adjustments on your thrust bearings to be sure there is no looseness from the assembly grease having been displaced. In the attached folder is a simple G code program named **REPEAT TEST MILL** that will cycle the machine 30 times to help you break in the carriages before doing the steps per inch settings. Copy this program to your thumb drive and then download it to your **DOCUMENTS** file on the machine computer. When you open your Mach 3 Mill screen you will see a box marked **LOAD G CODE**, click on that box and find the program and open it. Click on **CYCLE START** to run the program.

SETTING STEPS PER INCH

1. Go to **CONFIG> NATIVE UNITS** and set to **INCH**
2. Go to **BACKLASH** and be sure it is not enabled
3. In your MDI screen, choose an axis to start and put a slight amount of drag on your carriage lock. First give a G91 command for incremental mode. Move the axis in any direction – this will take out any inherent lash in the screw.
4. Now Zero your DRO in Mach 3 and also your machine DRO. Now give your mach 3 a G code command to go 1 inch (G0 X1)
5. Read the actual motion on your DRO. If the travel was less than 1 inch, you need to add steps in your steps per inch settings in **MOTOR TUNING**. If the travel was more than 1 inch, then you need to subtract steps.
6. Suppose your 1" command resulted in a true motion of only 0.999" that means you were one thousandth short, so you need to add enough steps to increase the travel by 0.001". Go to **CONFIG>MOTOR TUNING** and you will find the steps per inch box. For example, Z axis is set to 10157 steps. You need one thousandth more, or 10157 divided by 0.001 = 10.157 (10 in round numbers)
7. Add the 10 steps to the factory setting and set the steps to 10167, hit the **SAVE SETTINGS** button and go back to your MDI screen.

8. Move your carriage back __PAST__ the start point, then forward to the start point to take out any inherent lash again and repeat the procedure. Once you have the steps per inch set such that the travel matches your command, move on to the other axes and repeat the procedure.

BACKLASH COMPENSATION

Once you have the steps per inch adjusted on all 4 axes, you can now measure your backlash and set the compensation.
1. Go to BACKLASH and enable the backlash compensation
2. Using the same procedure as before, move your carriage to a start point taking out the inherent backlash. Set you DRO to Zero and give the carriage a command to go 1". If your steps per inch settings are correct, it should go exactly 1".
3. Now give the carriage a command to go 1" in the opposite direction and read the result on your DRO. If the return move was only 0.998", then you have 0.002" backlash.
4. Go to CONFIG>BACKLASH and select the axis and put in the backlash amount, SAVE SETTINGS and repeat the test until your carriage moves exactly 1" in both directions when given the command. Repeat this procedure for all 4 axes.

Once you have done this in MILL, you can simply copy the settings over to LATHE, remembering that in turn, the axes have different designations-
Y axis will take the settings from Z axis in mill
Z axis will take the settings from X axis in mill
X axis will take the settings from Y axis in mill

After you have completed all these settings run the previous G code repetition program again by setting your machine axes to zero and your DRO axes to zero and comparing the readings at the end of the program. This will give you a good idea how well your machine is repeating.

SETTING SPINDLE PULLEYS

1. Set the Hz settings in your VFD to your preference from 50 to a maximum of 120. (the factory setting is 120)

2. Set your Hz setting to its maximum amount and read the spindle RPM with your tachometer.
3. Go to CONFIG>SPINDLE PULLEYS
4. In the Minimum speed set it to ZERO
5. In Maximum speed put in the reading from your tachometer. Set the Pulley Ratio to 1.
6. Now test your spindle with various M3S commands(M3S500, M3S750 etc.) and check the STrue readings on your Mach 3 screen.
With some tweaking of the MAX speed settings you should be able to get the Mach 3 screen settings within a few RPMs of your tachometer reading.

NOTE: If you change the Hz amount in your VFD, you will need to test your RPM again and adjust the Max speed in your settings.

OPERATING THE MACHINE IN MANUAL MODE

All TURNADO and BRIDGEMILL machines can be operated manually with a simple change in the VFD codes.   This will unlock the stepper motors so that you can turn them by hand and allow you to control the spindle speeds and direction from the VFD keypad.

1. Turn your CNC POWER and STEPPER MOTOR switches to the OFF position.
2. On the VFD key pad, press PRG and the display will read P0.
3. Use the UP arrow to go to P0-02 and change it to 1.
4. Now press the UP arrow until you reach the next code you want to change, and follow the same procedure for Po-03 and PO-11 and set them according to the decal on the machine.
5. Press the PRG button twice to exit setup.
Your display should now be reading all zeros.
Press the RUN button and turn the small speed control knob and your spindle should begin to turn. If it is going the wrong direction, press the MF.K button.
You can now control the speed and direction of the spindles with the speed knob and operate the carriages by hand.
When you are running in MACH 3 mode, you can make yourself a speed chart by asking the spindle to go 1000 rpm, and then recording the Hz reading on the keypad. Then you will have an easy reference point to set the Hz settings for various spindle speeds under manual control.

THREADING TIPS FOR THE BRIDGEMILL and TURNADO

Following are some settings and tips to make threading easier on your BRIDGEMILL machine. Remember the axes designations used here are for lathe mode.
1. STEPS PER INCH AND BACKLASH COMPENSATION.

Be sure you take the time to do these settings according to the file provided. Because the distance between threads can be very small, any error, especially on the Z axis can cause the threads to be wrong pitch or even wiped over by subsequent passes. Once you have made the adjustments and your machine can repeat accurately, be sure that backlash compensation is turned on while threading. Also set your % of Max to about 50-70 to insure a smooth transition from backlash move to the cutting move.

2. CONSTANT VELOCITY V EXACT STOP

Constant Velocity setting means that the axis moves at the same rate from the beginning of the program line to the end. Exact Stop is used when you want to turn up to a shoulder and the axis must stop exactly at that point each time. In the Exact Stop mode, in order to be sure the axis can stop at a fixed point, the axis will begin to decelerate before reaching the end. So while threading this would cause the pitch to change as the axis slows down. Therefore, while threading, always set your machine to Constant velocity so the axis feed remains the same for the entire cut. These settings are found in CONFIG>GENERAL CONFIG.

3. DISTANCE, IJ AND ACTIVE PLANE MODES

When using the threading wizard in Mach 3, these settings will be set automatically, but if writing your own program, be sure they are set as follows;
Distance- absolute
IJ   - incremental
Active plane- X, Z
These settings are found in CONFIG>GENERAL CONFIG

4. SPINDLE SETUP SETTINGS

Your settings should be as follows:

USE SPINDLE MOTOR OUTPUT   CHECKED
PWM CONTROL   CHECKED
STEP/DIR MOTOR   UNCHECKED
USE SPINDLE FEEDBACK IN SYNC MODE   CHECKED
CLOSED LOOP SPINDLE CONTROL   UNCHECKED
SPINDLE SPEED AVERAGING   CHECKED
These settings are found in CONFIG>PORTS & PINS> SPINDLE SETUP

5. FEED RATES AND SPINDLE RPM

The VFD drives and motors are more consistent at higher rpm's, so we try to cut threads with the spindle as fast as possible. However, this can change with material type etc. In your Z axis settings under CONFIG>MOTOR TUNING, you have established your feed rates from your previous tuning setups. For most PATRIOT and MILL TURN machines, the Z will be about 40 IPM max. Mach 3 synchronizes the spindle rpm and the feed rate to achieve the proper thread pitch. Course threads require faster feed rates than fine threads. In the threading wizard you may encounter an error message stating "Over Max Feed Rate !!!!". This is saying that the spindle rpm is too fast for the maximum feed rate of your Z axis. Simply begin reducing the RPM setting down until the error message disappears.
NOTE: When making changes in the thread wizard settings you must hit ENTER on your keyboard to save the setting.

6. SETTING THE SPINDLE RPM FOR THREADING

Mach 3 has 2 functions working during threading. It receives signals from the spindle sensor to calculate the actual rpm – this is shown on the line marked S TRUE, while the rpm you set in the wizard is shown on the S line. Mach 3 uses the

signals from the spindle sensor to match these lines. However you will see that S TRUE will fluctuate up and down by a few rpm.   The other function that Mach 3 does is to adjust the feed rate according to the rpm it is reading from S TRUE in order to keep the thread pitch constant. HOWEVER, we have found that trying to coordinate both of these functions is beyond the speed of the computer and Mach 3, because it simply cannot react fast enough to the spindle slowdown under load and try to adjust the spindle back to the proper rpm while changing the feed rate to match. Therefore we have found that by eliminating one of these functions, Mach 3 can keep the rpm/feed rate ratio at a much more consistent level.   Therefore, for threading we go into a semi-manual mode. On the VFD keypad we change the settings so the spindle is controlled by the keypad and the speed is set by the speed knob.

7. SETTING UP YOUR THREADING WIZARD
   Once you have entered all your settings in the wizard and have selected the rpm you will use, click on SAVE SETTINGS and POST CODE then EXIT. That will download your threading file to the AUTO mode. On the bottom right you will see CYCLE, click on that and then you will see a box marked EDIT- click on that and the G Code file will show in a window. You want to put a pause in the program so that you can adjust your rpm.
You will see a line that reads M0 3 S??? (The S number will be the rpm you set in the wizard)
Hit enter and on the blank line type in M1.   M1 is a code to stop the program.
Close the edit window and say "yes" to save the changes.   Now you are ready to run the threading program- on the lower left selections you will see "CYCLE START" click on it and the program will begin. You will see a couple of quick Z, X moves, then nothing because you have come to the M1 command which has stopped the program. Now it's time to set your spindle rpm.
Go to your VFD key pad and press RUN and then turn the speed control knob to start the spindle. Watching your S TRUE line on the Mach 3 screen and adjust the control knob until the rpm matches the speed you selected on the S line.   It won't be possible to get the match absolutely perfect, but within 5-10 rpm is fine. Now you can go back to the Mach 3 screen, hit cycle start again and the program will run its full course. By setting the spindle speed manually, what you have accomplished is to eliminate one of the functions of Mach 3 and freed it up to "concentrate" on adjusting the feed rate to match the rpm.

SAMPLE CODES FOR TAPPING

   Here are some simple Sample G-Code programs We made for you to demonstrate the above optional functions (you may need to tweak for your own situation):

   (EXAMPLE FOR TAPPING ON MILL AND LATHE)

   (FOR TAPPING ON "MILL" SET PLANE TO X-Y)
   (IE: FOR 5/16-UNC TAP)

   G00G90
   X0.0 Y0.0 Z1.0
   S200M3

```
G84 Z-.5 R.2 F11.11111
X1.0 Y-1.0
Y1.0
G00X0.0 Y0.0 Z1.0
M30
```

(FOR TAPPING ON LATHE MODE USING MACH3 "MILL" SET PLANE TO Y-Z)
(IE: FOR 5/16-UNC TAP)

```
G00G90X1.0
S200M3
G84 X-.5 R.2 F11.11111
G00X1.0
M30
```

(IF YOU USE MACH3 "LATHE", THEN THE PLANE SHOULD BE X-Z, AND "Z" WOULD REPLACE "X" IN THE EXAMPLE)

(HERE IS A STANDARD G CODE FORMAT FOR "STANDARD TAPPING" WITHOUT USING G84)

```
G00G90Z1.0
S200M3
Z.2
G01Z-.5 F11.1111
M5
M4Z.2
G00Z1.0
M30
```

(EXAMPLE FOR TAPPING ON MILL AND LATHE)

First... you need to set the spindle to not delay in Mach3 Mill.
Go to:
"Config->Ports and Pins->Spindle Setup->General Parameters->Set all 4 to "0" and check the box "Immediate relay off before delay" (Not sure if you really need that box checked because the delay times are now off)

Then you need to "Set the plane" depending on whether your tapping using the "Mill" or the "Lathe"

"Plane Settings" can be found in "Config->General Config->Active Plane of Movement"

For Tapping on "Mill" set the Plane to X-Y
For Tapping on "Lathe" set the Plane to Y-Z (When using Mach3 Mill)

You will need a small floating holder because this is "Standard Tapping" NOT "Rigid Tapping"
You don't need to install a tach on the mill spindle for this type of tapping.