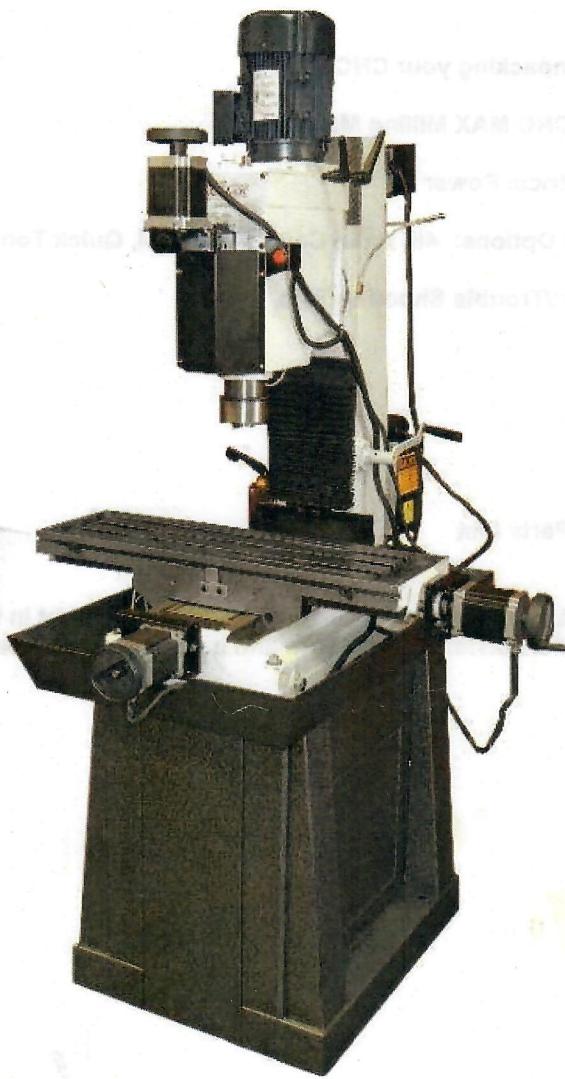




**CNC MASTERS, Inc.**

## **CNC MAX TABLE TOP MILLING MACHINE**



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**THANK YOU FOR YOUR PURCHASE OF THE CNC MAX MILL. WE WISH YOU MUCH SUCCESS IN THE MANY APPLICATIONS THIS CNC SYSTEM CAN ACCOMPLISH.**

**IMPORTANT: PLEASE READ ALL INSTRUCTIONS IN THIS USER MANUAL TO BECOME FAMILIAR WITH YOUR CNC MAX Mill. NOT FOLLOWING THE INSTRUCTIONS MAY RESULT IN THE DAMAGE OF YOUR PRODUCT AND VOID OUT YOUR WARRANTY WITH CNC MASTERS. IT MAY ALSO CAUSE SERIOUS INJURY OR UNNECESSARY DOWNTIME SINCE YOU MAY NOT BE COMPLETELY FAMILIAR WITH THIS PRODUCT.**

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**MX SOFTWARE MANUAL – (Begins with the “Orange” colored sheet in this hard copy manual.)  
---Installation of the Master MX Software and instructions on how to use it.**

## **SEC 1. Receiving and Unpacking your CNC MAX**

Use protective gloves and eyewear. Carefully uncrate and unwrap the CNC MAX. Watch out for nails and staples sticking out of the wood. Practice common sense safety procedures when un-crating and properly discard these materials to avoid injury to others. If damage has occurred during shipment take pictures of the damage and contact CNC MASTERS by email and within the next business day.

Follow the procedure for the MAX regarding the lifting of the machine:

1. Be sure to lower the machine head as close to the machine body as possible by cranking the right side column handle. Be sure to loosen the two hand screws on the left side of the machine head when cranking the head into position. Use an engine hoist if a forklift is not available. Use straps that are rated over 1000 lbs. Strap around the machine head as well as lift from the four large bolts located at the left and right side the base of the machine. While moving the CNC MAX, make sure to keep it balanced.
2. Do not place the CNC MAX in direct sunlight to avoid warping the machine, which can cause lack of accuracy.
3. Mount the CNC MAX to a solid concrete foundation. If your concrete surface is not leveled you can use leveling feet to level the machine stand.
4. Thoroughly clean the machine, and then coat all bright metal with a light lubricant to prevent corrosion. CAUTION: DO NOT USE flammable cleaners to clean your machine. Any spark from machining can cause a fire.

Bolt the CNC MAX Mill on either the optional machine stand or a sturdy workbench with four 3/8" or 1/2" diameter bolts. It is recommended that the workbench height be about 30 inches high depending upon the operator's preference and can hold over 1000 lbs.

## **SEC 2. Setting up Your CNC MAX Milling Machine**

If your machine was crated, the X and Y axis motors are not mounted. The X and Y motors are already connected to the Control Unit, but need to be mounted on each axis accordingly. The brackets and motors are labeled with matching colors.

Next, using a 3/16" Allen wrench, loosen the collar clamps at the end of each axis until collar clamp rotates freely. Do not loosen the large jam nut inside the motor bracket.

With the cable pointing downward on the motor, fit the motor shaft with key into the bored hole of the ball screw aligning to the keyway. Work the motor to rest against the rubber grommets.

Next, secure the motor body first to the bracket using four pan head #10 screws, lock washers, and wing nuts. Each screw should be inserted through a tubing spacer at each grommet.

Tighten the collar clamp hard to keep the motor shaft from any slight slippage at the ball screw that will create backlash on the axis.

Plug in the limit switch communication line to each limit switch spade connector at the motor brackets.

**Do NOT do the following with the control unit plugged into power:** Once you are facing the square fan of the control unit, there are two screws on the left side of the control cover. Slightly loosen those two screws and swing the cover open to the right. If you ordered your machine with coolant control, it is possible that the coolant pump may be plugged into the bottom side of the control unit. In this case you will need to unplug the pump first before swinging open the cover.

Once you have the control unit cover swung open, re-seat all motor cable connections. Looking at the control box and centering on the fan, the order of motor cables go from *left to right* --- X Y Z. (If you purchased the fourth axis, this will plug in separately coming in from the right side the box access plate.)

Make sure they are all pressed into their own connectors. Re-seat the RJ and/or Ethernet looking connections and make sure they snap into place at the USB board. The USB board uses a USB B type connector. When closing the control cover, give all these cables a little slack as you close the control cover over these cables.

**WARNING:** In the event a cable is pulled from the control unit, or partially pulled off a connector--- IMMEDIATELY POWER OFF. Plugging in a cable or fixing it from a partial pull can damage the control unit if the control unit is powered on. If damage does occur as a result of this action, the warranty does not cover service or replacement of parts.

**IMPORTANT NOTE REGARDING MOTION IN X, Y, Z MOTORS:** When operating the machine manually, be advised that resistance or hesitation from the motors may be felt if turning the hand wheels too fast. Resistance can be avoided by turning the hand wheels slow or removing the motor connectors from the Control Unit while having the Control Unit powered down. Circular movement of the motor body is normal during the jogging of the X and Y axis. The circular movement in the motor removes the stress on the motor shaft. Please allow for this flexibility in the motors which is why you will note the rubber grommets and tubing spacers serving as a cushion between the motor and the motor bracket on the X and Y. If this circular movement is larger on one axis more than the other, you may be able to reduce this motion with this action: Remove the axis motor from motor bracket. Slightly loosen the three cap screws on the motor bracket to the machine. Place back the motor and secure it with the four pan head screws. Then tighten the collar clamp. Rotate the motor hand crank until the motor finds its own center with its bracket and ball screw bore. Re-tighten the cap screws that secure the bracket to the machine.

If you hear any clicking sounds in the movement of the X and Y, that is normal. The clicking sound are the ball bearings moving inside the ball nuts of your X and Y. Also, do not replace the hand wheels on the X and Y with heavier hand wheels. Heavier hand wheels can cause play during CNC movement.

### SEC 3. Connecting Electrical Power

Three components of your CNC MAX require electrical power. These components are the:

- Control Unit
- Spindle Motor
- PC - Windows

**The Control Unit:** Follow each check box to avoid damages and complications below.

- Requires standard 110-115 VAC with true ground, 60Hz power. (50Hz for most countries outside of the USA.) Upon request at time of ordering, your control unit can also be rewired for 220-240 VAC single phase with true ground.
- IT IS RECOMMENDED THAT YOU USE A 600 WATT "MINIMUM" BATTERY BACK UP SURGE PROTECTOR FOR THE CONTROL UNIT OF YOUR CNC MILL. THE CONTROL UNIT IS AS SENSITIVE AS A COMPUTER. A BATTERY BACK UP SURGE PROTECTOR WILL ALSO KEEP ELECTRICAL POWER CONSISTENT AND CLEAN TO AVOID ANY BRIEF POWER INTERRUPTION DURING A PROGRAM RUN OF YOUR CNC MACHINE.**
- Separate the control unit power from the spindle motor power to prevent spikes from the spindle motor power cable to the control unit power cable. Do not share the same power lines between the control unit and the spindle motor. Do not tie wrap and bundle these cables together or bundle these cables to the USB cable.
- Use a DEDICATED circuit for the control unit. Do not share this circuit with other electrical devices or machinery as this can cause a disturbance during running of a tool path program. The only exception is a battery backup surge protector and computer which can be used on the same circuit.

- If AC voltage is close to 125v at outlet, use a minimum 600 watts line conditioner to maintain voltage at 110-115.** A good recommendation for a low-cost line conditioner is to visit this site: [http://www.apc.com/resource/include/techspec\\_index.cfm?base\\_sku=LE1200](http://www.apc.com/resource/include/techspec_index.cfm?base_sku=LE1200). Please check with your electrical supply company if your supply is on the high end. Electrical companies may adjust voltage seasonally to compensate for amount of usage, which may over-power the control unit if voltage was found to be on the higher end previously. Voltage can swing up and down throughout the day especially in most rural country areas. So if your voltage is already deemed on the higher end around 123-125, a line conditioner is required to avoid damaging the control unit should the voltage swing higher. The CNC MASTERS warranty on the control unit does not cover high voltage damage. Keep in mind certain battery back up surge protectors are ONLY surge protectors and NOT line conditioners. Be sure the tolerance level of the line conditioner is at an acceptable range to give you the power protection you need for the control unit.
- If your control unit is wired at 220-240, use a line conditioner if your voltage is 235 or higher. Your voltage should not exceed 240.**
- CAUTION: BEFORE POWERING ON CONTROL UNIT, ENSURE THAT EACH AXIS MOTOR CABLE IS PROPERLY PLUGGED INTO THE CONTROL UNIT. POWERING ON CONTROL UNIT WHILE MOTOR CABLES CONNECTIONS ARE SLIGHTLY UNPLUGGED MAY CAUSE DAMAGE TO THE AXIS DRIVER IN THE CONTROL UNIT. THE WARRANTY DOES NOT COVER THIS TYPE OF DAMAGE TO DRIVER.** You may need to unplug power cable, USB cable and optional coolant and hand held cables from the bottom of control unit before opening. Slightly loosen the two large phillips pan head screws on left side and swing cover open to the right to check.
- CAUTION: DO NOT USE A HIGH FREQUENCY WELDER IN THE SAME AREA YOUR CNC MACHINE IS IN OPERATION AS THIS MAY CAUSE A DISTURBANCE IN THE CONTROL AND COMPUTER.** Radio CB antennas, military aviation equipment, or anything that emits of high frequency near the operation of your CNC machine may cause a disturbance during the operating your tool path program. Take steps to shield the machine if necessary.
- When powering the control unit — axis motors do become very HOT during operation and remain constant. This is normal. Keep small children away from the machine and especially axis motors during operation if this machine is used in a home environment.
- When not in use, unplug the control unit.
- Do not shut down the system at electrical panel circuit breaker. Powering up at the circuit breaker can cause a brief surge while the system is resetting itself, which may cause damage. If powering up at circuit breaker is needed, be sure the system is unplugged first.

**The Spindle Motor:** Follow each check box to avoid damages and complications below.

- 220-240 Volt, single phase with ground, 60Hz (50Hz is acceptable), 15 amp service. Use a NEMA 6-15 receptacle.
- Be sure to unplug the spindle motor after the day's use or install a manual ON/OFF power switch at the power source for the spindle motor. This will prolong the life of the inverter on the machine.**
- The spindle motor label will read that it requires three phase 220. The mounted inverter ONLY requires 220-240 single phase power. The inverter will output three phase into the spindle motor. So you will only need "single phase" to power up the spindle motor through the inverter.
- Low service and/or long extension power cables may cause circuit breaker to shut off. Use the proper amp circuit to compensate if necessary. Use a licensed electrician in this case.
- CAUTION: Proper ground/earth is important and dangerous without. Be sure ground is connected at your outlet before plugging in.** Use a licensed electrician if you are not sure about your grounded line. Plugging in the spindle motor without a proper ground may cause shock and injury. CNC MASTERS is not responsible for users not taking proper safety precautions to avoid electrical shock.
- Be sure this ground connection is the same ground connection used for your control unit at your electrical service panel.**
- Three Phase 220 Power:** If you only have 220-240 three-phase power, use two leads only from the circuit along with ground for single phase power. It is recommended to use a licensed electrician to safely make this connection to your spindle motor.

- If you have 208v, it is best to use a step-up transformer to bring the voltage up 5% close to 220v. Contact us for a low-cost step-up transformer recommendation that easy to install yourself.

## SEC 4. Accessories and Options: 4th Axis, Coolant Control, Quick Tool Change

### A. Fourth Axis Rotary Table

The CNC MAX has true 4 axis capabilities using the rotary table option. Mount the rotary table to mill table with T-nuts. The rotary table can be controlled by the MASTER software using "W" commands.

**IMPORTANT: Do not carry the fourth axis by the bracket or motor alone. Carry the fourth axis by its table only.** Oil the rotary table as needed. Adjustment to remove backlash on the rotary table has already been made. Do not try to adjust the table if it does not need to be adjusted for backlash error. The W axis must be checked and saved at the SETUP window in the Master MX Software to function correctly. The center sleeve of rotary table is a MT-2.

### B. Coolant Supply

**WARNING: For your protection always unplug the control unit or coolant pump from its power source before installing or servicing. Should the pump appear not to be working, do not reach for it, remove, or disassemble before you disconnect power.**

**Do not use pump for oil, solvent, or gasoline or warranty will be voided. Always make sure pump is submerged. The pump's motor will burn out in a moment's time when not submerged and is operating. This is not covered under the warranty. So be sure to check that pump is fully submerged before operating each job.**

**Use a general light duty oil concentrate water mixture only for machine coolant control. Be sure to mix the coolant before using and always wipe down the machine afterwards.**

The coolant option has an electrical pump which is submerged in the container which you can store inside the machine's base. This container can hold over a gallon. With the control unit off, plug the pump into the 115 VAC outlet which you will find on the bottom side of the Control Unit. **Warning: Do not use this outlet to drive a load larger than 0.7 amps or the Control Unit will be damaged. THIS ACTION WILL NOT BE COVERED UNDER THE WARRANTY.** The COOLANT ON and COOLANT OFF commands will turn this pump on and off on your Master MX Software display and can also be controlled with G-code commands. Always check fluid levels at the start of a new job and mix the solution at the start of a new day.

### C. Easy Change Quick Tool System

This system uses a master tool holder which features an R8 taper design. Tools can be easily secured and removed. Tool setup can be entered in the tool length compensation section under Setup of the MASTER software. The Quick Tool Change system is a worthy investment, which will cut downtime if the user needs several tool changes during the machining of a part.

### SEC 5. Self Help Support/Trouble Shooting Tips

#### Servicing:

We strongly advise to communicate directly with us by phone or email before attempting to diagnose and repair the control unit or the mechanics on the machine. A five-minute phone call or a quick email to double check things out can save hours of troubleshooting and making faulty repairs that leads to costly damages on the machine. If your company is the original buyer of this machine, support is included until you sell the machine. Just give us a call or send us an email. (There is a nominal fee per support ticket if you purchased this machine or inherited it from another party.)

The following are some common issues that you may resolve without our assistance:

**PROBLEM: P****SOLUTION: S**

P1: Backlash or Play is found on the x and/or y. The axis does not repeat or go back to 0.00. The axis appears to "bind up" and/or then "springs/jumps" as if its skipping movements during its travel losing its position.

P2: Same error window keeps popping up after opening the Master software. The machine's control unit is shut down too. The software is stuck on this error msg. It is cyclical.

P3: No USB connection. There is no communication between the Control Unit and the software. It reads "CNC: no connection" at the bottom right of the screen.

P4: Backlash or error is found on the z of the CNC MAX.

P5: Backlash or Play is found on the x, y, z, or w and the error is repeatable every time.

P6: My circle applications are coming out with a flat at both opposite ends of the circle. This flat anomaly repeats itself accurately and is repeatable on every circle. It is not losing its zero position. There is no backlash on my three axes.

P7: There is a vertical line with a bit of an arc from the bottom to the top of my part. It is as if the cutter slightly went deeper to the side wall of the part. It is repeatable. It happens at the start point of a new pass every time.

P8: When machining arcs, circles, and very tiny lines – but it appears that axes are skipping steps, the axis motor is hesitating and buzzing intermittently and no longer in sequence to the counters on the screen.

P9: The X Y Z are moving, but the spindle does not work.

P10: The machine head appears to flex and is not rigid when the Z axis drives into the material.

S1: Be sure to adjust the gib strips. Make sure that the gib is not too tight, nor too loose. If the gib is too tight this will bind the movement of the axis. In this case, you may experience the axis "spring" or jump forward during a movement. This is the pressure being released that is that being bound up from a tight gib. If the gib is too loose, you will see the axis wobble side to side. If the problem persists after the gib strips have been adjusted, be sure to oil the table and saddle ways prior to the start of every job. Make sure that any locking screws are removed from the table and saddle. At times, users forget to unlock these screws. If you would like direct detailed instructions on how to adjust the gibs, send an email to [customerservice@cncmasters.com](mailto:customerservice@cncmasters.com) to request how to adjust the gib on the Max Mill.

If the axis is not repeatable, check to see that the large jam nuts are secured inside the motor brackets of the x and y. It may be possible that the jam nut has loosened causing backlash and inaccurate results. Re-tighten the jam nut, but do not over-tighten. Over tightening will cause the ball screw not to rotate smoothly. You can get to the jam nut by removing the axis motor off the bracket. Place a  $\frac{1}{2}$  bolt into the ball screw and secure with collar clamp. Loosen the set screw on the jam nut. Use a wrench to hold the bolt. This will keep the ball screw from rotating. Use another wrench to secure the jam nut. Tighten until you cannot freely rotate the ball screw. Once the ball screw has drag or is binding in its rotation the slop has been removed. Now using your wrenches ease up on the jam nut just a hair to allow for the free rotation of the ball screw. Tighten the set screw back on the nut. Re-test using a dial indicator and gently crank the axis back and forth by hand. The needle on indicator should have simultaneous motion with the

hand cranking back and forth. Do not hand crank the axis fast. This will cause a hesitation in the axis motor which is normal.

Another reason that can lead to backlash is if you replaced the original hand wheels that were on the x and y. Make sure the hand wheel weighs 9.5 oz or less. Heavier hand wheels can also cause backlash because of the extra weight and the rotational force on the motor shaft.

S2: Read this manual in its entirety. It may very well be a problem in how you are writing your tool path program. There may be G-codes in your tool path that are not supported by the software. Verify the G-codes in your program according to our list. You can find this G and M Code list by going to the MX software and look under Tools on the top left side of the screen.

Check the characters in your program. You may have a letter "o" instead of number "0" in your program. Also, double-check the MATH at each line of your program. Be sure that each line in your program does not contain lettering outside of our G and M code list. After doublechecking that the program appears to be accurate, or this is a PROVEN PROGRAM that has worked before on the machine then you may need to do an "internal refresh" of the Master software to de-bug it. Please note this process will bring the software to a new state as if you just downloaded it for the first time. All settings and stored figures will be restored to a default state. To do this procedure, go to Tools at the top left of the screen and click on Delete ConfigMX. On the backend if your software is already shut down, you can go into the Master MX Files folder located on your Desktop. Look for the ConfigMX file and delete it. This file will re-generate it when you open the software.

S3: Do not use a USB cable longer than 8 feet. Make sure the cable from end to end has not been smashed or slightly severed. Use a well shielded USB cable or with double chokes. Make sure your USB cable is connected at both ends. Check the connecting ports to make sure the port itself is not broken or cracked. Plug the USB cable directly into the computer port.

Refer to the MX Manual to properly load in the USB drivers. If you received a hardcopy of this manual, the MX manual begins with the orange colored page. Follow "Section 1, Connecting PC to the Control Unit." This will walk you step by step to downloading the correct USB drivers for connection to your machine. If you mistakenly loaded in USB drivers from another source than following the instructions in the MX manual, it will be best to do a "system restore" of the computer to earlier restore point and begin the process again to download the software and USB drivers accordingly to the steps provided in the MX manual.

S4: Remove the cover plate on the z axis bracket. Inspect for any loosening of the allen button screws of the entire assembly bracket. Inspect to see if the two bolts on the quill link—the part that connects the ball screw to the quill of the machine is loosened. Re-tighten and grease the z ball screw. Also, inspect that the belt has not worn out, or adjust the Z motor to create tension on the belt. The belt should not have more than 1/8" deflection. If the belt is loose, loosen the four screws that secures the Z motor, and pull the Z motor away from the machine head and re-tighten the four screws. (Do not remove the assembly off the face of the machine head, if so, please contact us so we can walk you through how to properly install it. Improper installation will lead to play on the Z axis.)

S5: Go to your setup on the Master program. You will then see the "scales" and the value for each of the axes. Enter a very small value to compensate for the error on that axis, and re-test. Adjust the value on the scale +/- as needed until the error is compensated. If this does not resolve the problem, please refer to other solutions regarding backlash or errors of the axes.

S6: Tram the machine head to the application and to the table. The machine head must be square to the table. If there is a bit of a tilt, side to side or front to back on the machine head – this will translate to the cutter not being square to the part. The cutter will in essence be cutting with the same tilt as on the head which will leave repeatable flats at opposites ends of a circle application. Do not visually tram the machine head. Always use a dial indicator to properly square the machine head to the table. YouTube also provides several videos on "trammimg a milling machine" if you need some additional help. If you

discover a front to back tilt, you will have to shim to offset between the machine head and its mounting dovetail bracket. Contact CNC MASTERS if you need further support. There are three nuts that will need to be slightly loosen in order to square the head into position. There is a large nut exposed on the both sides of the head. The third nut is located under the machine head facing the mounting dovetail bracket.

Also, tighten the vertical gib on the left side machine head mounting dovetail. This will add rigidity to the machine head. If you have to tighten the gib, you will need to remove the accordion way cover and loosen the bottom gib screw first. After you tighten the gib from the top screw, then tighten back the bottom gib screw. Having a loose gib can lead to inaccurate results on the Z plane. A loose gib can cause the machine head to bounce up and down while machining your application.

S7: Re-write the program making sure your cutter does not start and stop at the same point for each X/Y pass. If the Z axis goes down a bit to begin a new pass at the same start and stop point as the previous pass your application will finish with a "tool run-out" vertical line. It will appear as if the side of the cutter drove into the material leaving a small radius vertical line on the part.

S8: Re-write the program with slower feed rates. If your program is a high-resolution program, please note that the max resolution is 0.0002" or 0.006 mm. You cannot machine smaller than 0.0002" or 0.006 mm movements. Linear lines this small, or interpolated movements such as arcs cannot run at a fast feed rate. There is a lot of load on the X and Y which requires you to adjust the feed rate accordingly to the application. Begin your program conservatively regarding feeds. Once you have a successful run, then you can gently increase the feed rates with each subsequent run in order to discover through trial and error the optimum feeds for your particular program.

S9: The VFD must reset itself daily. Shut it all down including the computer. Unplug the 220v power cord or shut down its circuit, wait five minutes, and then turn it all on again and re-test. Generally, after the day's use, unplug this 220v power or shut down its circuit. Do this regularly.

S10: Watch your speeds and feeds. You may have to lower z axis feed rate depending on the material, size of cutter, and keep in mind it is 2HP motor. Also be sure tighten the vertical gib on the left side machine head mounting dovetail. This will add rigidity to the machine head. If you have to tighten the gib, you will need to remove the accordion way cover and loosen the bottom gib screw first. After you tighten the gib from the top screw, then tighten back the bottom gib screw. Having a loose gib can lead to inaccurate results on the Z plane. A loose gib can cause the machine head to bounce up and down while machining your application.

## **SEC 6. Maintenance**

The proper maintenance of the CNC MAX is vital to a long life of the machine.

The proper maintenance of the CNC MAX is vital to a long life of the machine. Lubricate the axes' ways with oil prior to the start of a new day of using the machine. The MAX will come with a one-shot oiler located on the side of the knee. Fill the one-shot oiler with way oil ISO 68. As you give the one-shot a few pumps, gently jog the X and Y axes to allow the oil to spread through the ways. Brush oil on the Z axis quill and run the Z up and down a couple of times to allow the oil to spread.

For the X Y Z ball screws, use a general-purpose lithium grease. Do not use an axle or heavy type grease that can become "tacky/sticky" which can lead to play on the axis. If you plan to run the machine full time, forty hours a week, grease the ball screws every other month. For the X, grease the exposed ball screw under the table. For the Y, crank the knee high enough so you can have access under the knee. There is a cavity under the knee exposing the Y screw. For the Z, remove the face cover plate from the quill ball screw bracket.

For the spindle spline, drive the Z axis as far up as it can go and gently apply a thin coating of the same grease every other month.

At the end of the day, vacuum the chips from the machine and wipe clean. It is recommended not to air blow the machine to keep debris from lodging into ball screws, in between ways, and the control unit. Do not let chips pile up on the control unit or VFD. Vacuum the chips off at the end of the day's use. It is always a good idea to unplug power to the spindle, control unit, and computer when not in use. If your machine is in a dusty environment, cover the machine when not in use for a long period of time to keep the oil and the grease on the machine from becoming gummy due to the dust collected on the ways and ball screws.

#### **Control Unit Maintenance**

Clean the fan filters on the control unit as needed and keep debris away from the control unit. If you do use air, **DO NOT BLOW IN THE DIRECTION OF THE CONTROL UNIT**. Any metal debris could create an accidental short in the control unit. Any wood dust that builds up over time inside the control unit could also absorb moisture and create an accidental short in the control unit. It is recommended to open the control unit and air blow debris away from circuitry and electrical components if the cnc machine is being used in high production on a regular basis.

To do this properly, **FIRST TOUCH GROUND OR USE ANTI-STATIC DEVICE TO KEEP STATIC AWAY FROM CONTROL UNIT AND COMPUTER**. Next, power off control unit and unplug power.

If you have coolant control, you may need to unplug this cable at the bottom of the control unit. Facing the control unit, open the cover by slightly loosening the two large pan head phillips screws on the left side of the control box.

Swing the cover to the right. Air blow any debris build up from the fan, and inside the cover itself. Blow out debris away from circuitry. Next, blow the circuitry in the control unit in the DOWN DIRECTION ONLY. This will prevent metal fragmentation from accidentally lodging between electrical components and creating a short. Be mindful of your computer as well especially if it is a desktop computer. Be sure to periodically air blow and clean the inside of the computer. Build-up of dust can keep the computer from properly connecting to the control unit. **HIGH HUMIDITY IN THE SHOP CAN CAUSE A DISTURBANCE IN THE PERFORMANCE OF THE YOUR COMPUTER AND CONTROL UNIT AS A RESULT OF DUST BUILD UP**. As a result, a pop-up note may appear on the Master software that USB line is not found. In this case, both control unit and computer may be need to be powered off, cleaned and re-booted.

Power off the control unit of the MAX in between jobs. Do not leave idling. Remember to shut down the Master Software first before powering off control unit. Allow the control unit and motors to cool off for 20 minutes if the machine is operating for more than eight hours at one time. The axis motors do become hot, and remain constant. This is normal.

#### **SEC 7. Safety Warnings**

1. READ ALL INSTRUCTIONS BEFORE USING THE CNC MAX.
2. KEEP SPINDLE BELT GUARDS IN PLACE AND IN WORKING ORDER.
3. KEEP WORK AREA CLEAN. CLUTTERED AREAS INVITE INJURIES.
4. KEEP CHILDREN AND VISITORS AWAY FROM WORK AREA.
5. DRESS PROPERLY. DO NOT WEAR LOOSE CLOTHING, NECKTIES OR OTHER JEWELRY THAT CAN BECOME CAUGHT IN MOVING PARTS SUCH AS THE HANDWHEELS. WEAR PROTECTIVE HAIR COVERING TO CONTAIN LONG HAIR.
6. ALWAYS WEAR EYE PROTECTION. USE FACE OR DUST MASK IF OPERATION IS DUSTY. BREATHING IN DEBRIS FROM MACHINING CAN LEAD TO SERIOUS HEALTH ISSUES.
7. REMOVE ADJUSTING KEYS AND WRENCHES FROM TOOL BEFORE STARTING.
8. BE SURE DRILL BIT OR CUTTING TOOL IS SECURELY LOCKED IN THE CHUCK OR COLLET.
9. AVOID UNINTENTIONAL STARTING.
10. KEEP PROPER FOOTING AND BALANCE AT ALL TIMES, **DO NOT REACH OVER OR**

ACROSS RUNNING MACHINES.

11. MAINTAIN TOOLS WITH CARE. KEEP TOOLS SHARP AND CLEAN FOR BETTER AND SAFER PERFORMANCE. DO NOT USE DULL CUTTERS.
12. DO NOT OPERATE THE CNC MAX WHILE UNDER THE INFLUENCE OF DRUGS, ALCOHOL OR ANY MEDICATION.
13. USE THE RIGHT TOOL FOR THE JOB. DO NOT ATTEMPT TO FORCE A SMALL TOOL OR ATTACHMENT TO DO THE WORK OF A LARGER INDUSTRIAL TOOL.
14. ENSURE THE CNC MAX IS PROPERLY GROUNDED THROUGH YOUR SPINDLE PLUG IN AND CONTROL UNIT PLUG IN. IF YOUR MACHINE IS IN A NOISE EMI AREA ADD AN EXTRA 12 - 10 GAUGE GROUND LINE BY TAPPING INTO ONE OF THE BOLTS THAT SECURES THE ONE-SHOT OILER AND ROUTE THE OTHER END OF THE LINE TO A STRONG GROUND IN YOUR SHOP SUCH AS THE METAL CONDUIT AROUND YOUR 220 SPINDLE MOTOR POWER OUTLET TO AVOID EMI.
15. SECURE WORK PIECE TO KEEP WORK PIECE FROM ROTATING WITH THE DRILL BIT OR CUTTING TOOL.
16. REMOVE SMALL HANDLES OFF X AND Y HANDWHEELS DURING CNC OPERATION TO AVOID CONTACT TO CLOTHES OR HAIR.
17. DO NOT USE THIS MACHINE FOR OTHER THAN ITS INTENDED USE.
18. UNPLUG THE SPINDLE MOTOR WHEN CHANGING THE BELT AT THE MACHINE HEAD AND MAKE SURE THE CONTROL UNIT IS OFF.
19. MAKE SURE TO UNPLUG THE SPNINDEL MOTOR AND THE CONTROL UNIT IS OFF BEFORE CHANGING OUT A TOOL.
21. NEVER PUT YOUR FINGERS CLOSE TO A ROTATING TOOL AT THE SPINDLE. A CUTTER ANY SIZE CAN EASILY CUT OFF A FINGER.
20. DO NOT USE PAINT THINNER, ACETONE OR ANY OTHER FLAMMABLE LIQUID TO CLEAN YOUR MACHINE. ANY SPARK FROM MACHINING OR SPARKS FROM A SHORT IN THE CONTROL UNIT CAN CAUSE A FIRE. KEEP DIRTY RAGS AWAY FROM THE ELECTRONICS.

# WARNING

Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:

- Lead from lead-based paints.
- Crystalline silica from bricks, cement, and other masonry products.
- Arsenic and chromium from chemically treated lumber.

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.

**WARNING: Cancer - [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)** This product contains Di(2-ethylhexyl)phthalate(DHEP), a chemical known to the State of California to cause cancer.

## SEC 8. Specifications

Model	CNC MAX
X Axis: Left/Right table travel	21.5" (546 mm)
Y Axis: Front/Back saddle travel	10.5" (266.7 mm)
Z Axis: Spindle Up/Down travel	4.5" (114.3 mm)
Maximum Distance from Spindle nose to table	18" (450 mm)
Swivel Angle of Headstock at Perpendicular direction	+/- 90 Degrees
Drilling Capacity	0.75" (19.05)
Face mill capacity	3.25" (82.550)
End mill Capacity	0.75" (19.05)
Working area of table	31.5" x 9.5" (800 mm x 240 mm)
Spindle taper	R8 Collets
Spindle Motor and Power	2 HP; 208, 220-240vac single phase
Spindle 2 Speeds	60 HZ: 1680, 4500 RPMs (approx) 50 HZ: 1360, 3640 RPMs (approx)
Machine Height (without machine stand)	42" (1060 mm)
Machine Stand Height	30" (760 mm)
Overall length (left end of table to right end of X motor handle)	42" (1067 mm)
Overall width (back of machine to front end of Y motor handle)	46" (1067 mm)
Weight	900 lbs.

## SEC 9. Operations and Parts List

**NOTICE: CHECK ALL PARTS AND SAFETY PRECAUTIONS FOR PROPER CONDITION BEFORE OPERATION.**

### 1. USE OF MAIN MACHINE PARTS

1. Raise and lower headstock on it rack and pinion mechanism by using the head crank. When the desired height is reached, tighten the bolts to avoid vibration.
2. Head may be rotated 360 degrees by loosening the same bolts mentioned above. Adjust the head to the desired angle, and then tighten the heavy-duty head lock nuts.
3. The knob is set for MILLING & DRILLING AND STOP. The mushroom head red push button for emergency stop while milling and drilling, and the green push button is for starting.
4. Feed the spindle using the spindle-feeding handle, micro feed the spindle using the spindle micro-feeding handle.
5. Move the table from side to side by using the lengthwise table feed wheel, and from front to back using the cross table feed wheel.
6. Adjust the positive depth stop gauge according to working depth.

7. Adjust the scale size according to working need.

## 2. DRILLING OPERATION

1. For drilling a blind hole (which does not pass through the work piece), turn off the knob, loosen the taper body of worm gear and spring base, then adjust the positive depth stop gauge so that the distance from the tip of the drilling bit to the end of the blind hole is equal to the desired depth.
2. For drilling a pass hole (which passes through the work piece), set the positive depth stop gauge in its uppermost position.

## 3. MILLING OPERATION

1. Adjust the positive stop gauge top its uppermost position.
2. Using the spindle-feeding handle, adjust the cutter to approximately the correct height, turn off the knob, and tighten the taper body of the worm gear and spring base.
3. Set the working depth by using the micro-feeding handle.
4. Lock the rack sleeve at the height with the fixed bolt.
5. When longitudinal feed milling, it is a good idea to lock the across feeding table to ensure the accuracy of your work. To do this, tighten the two screws located on the right side of the table base.
6. When cross feed milling, lock the longitudinal feeding travel, do this by tightening the two screws on the front of the table base.

## 4. ADJUSTMENT

1. Adjustable moveable fixed rings are mounted on the front of the table to limit cross travel.
2. The CNC MAX is equipped with gib strip adjustment to compensate for wear and excess slack on cross and longitudinal travel.
3. Rotate the gib strip bolt slightly clockwise to tighten the gib trip. Rotate it slightly counter-clockwise to loosen the gib trip.
4. Adjust the gib trip bolt until very slight drag is felt when moving the table.

## 5. CHANGING MACHINE SPEED

1. Turn the power off.
2. To select proper speed, move the speed lever to the desire position. Refer to chart on face of machine. USA is 60 Hz.
3. If the gears are not engaged, remove the arbor bolt cover. Rotate the spindle slightly to engage the gears, and then replace the arbor blot cover.
4. Recheck the lever setting, and then turn the power on.

## 6. INSTALLING AND CHANGING TOOLS

**WARNING: BE SURE THE POWER IS TURNED OFF AND THE CNC MAX IS UNPLUGGED BEFORE INSTALLING OR CHANGING TOOL BITS.**

1. To remove arbor bolt/draw bar, remove arbor bolt cover. Lock spindle by changing gears to the lowest setting L-1. Loosen the arbor bolt at the top of the spindle shaft approximately 2 turns with a wrench. In some cases, if more torque is needed to loosen or tighten arbor bolt, use thin rubber on a wrench to prevent damage and hold the spline of the spindle. Tap the top of the arbor bolt with a rubber mallet. After taper has been broken loose, holding the chuck arbor on one hand, and turn the arbor bolt with the other hand.
2. To install face mill or cutter collet: Insert cutter and cutter collet into the taper of spindle. Tighten arbor bolt securely, but do not over tighten.

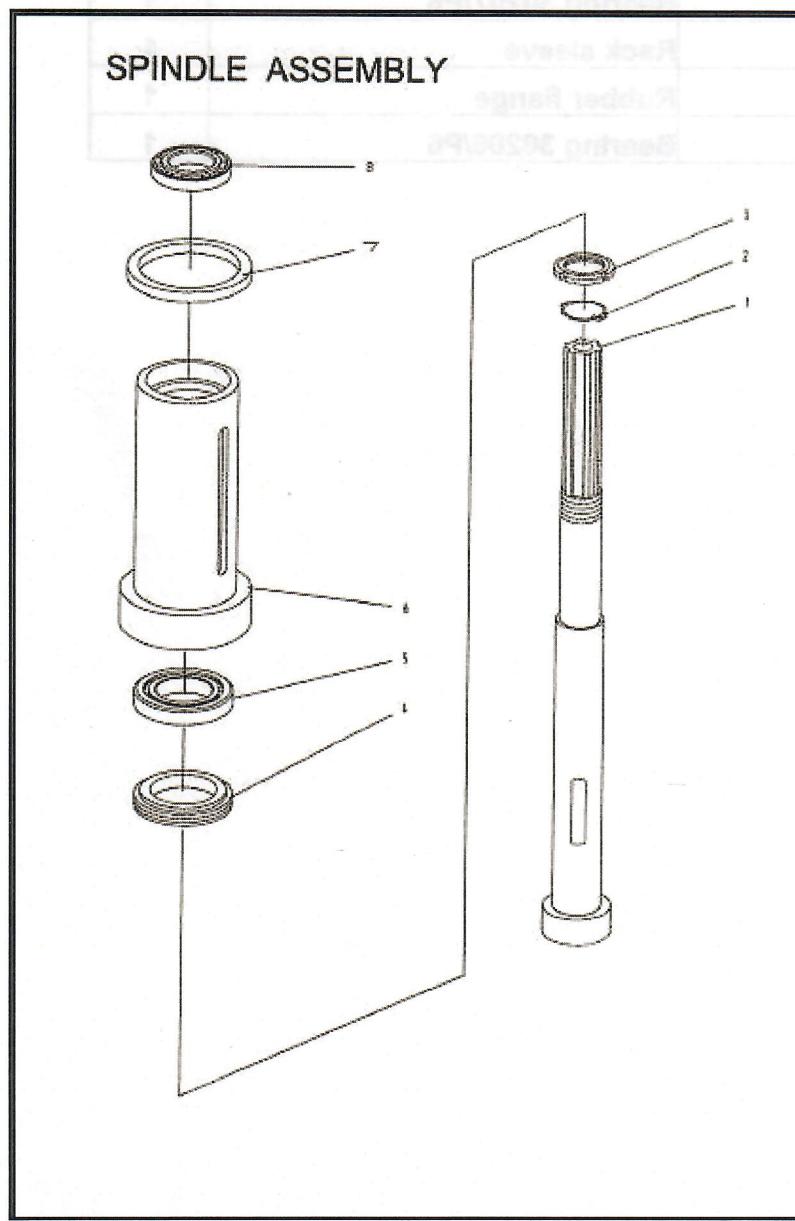
## 7. ORDERING REPLACEMENT PARTS

Complete parts list is attached, if parts are needed, contact CNC Masters by phone at (626) 962-9300 or by email at sales@cncmasters.com.

# CNC MAX

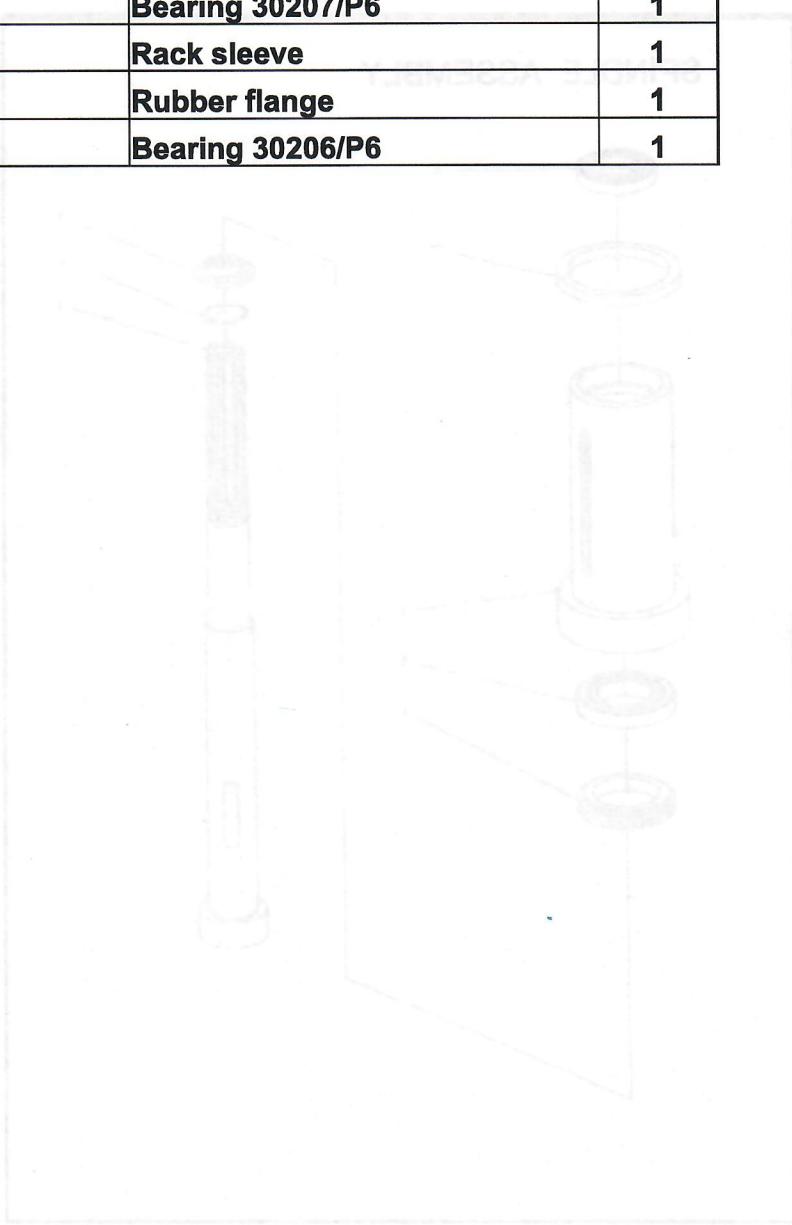
## BENCH MILLING & DRILLING MACHINE

### PARTS LIST

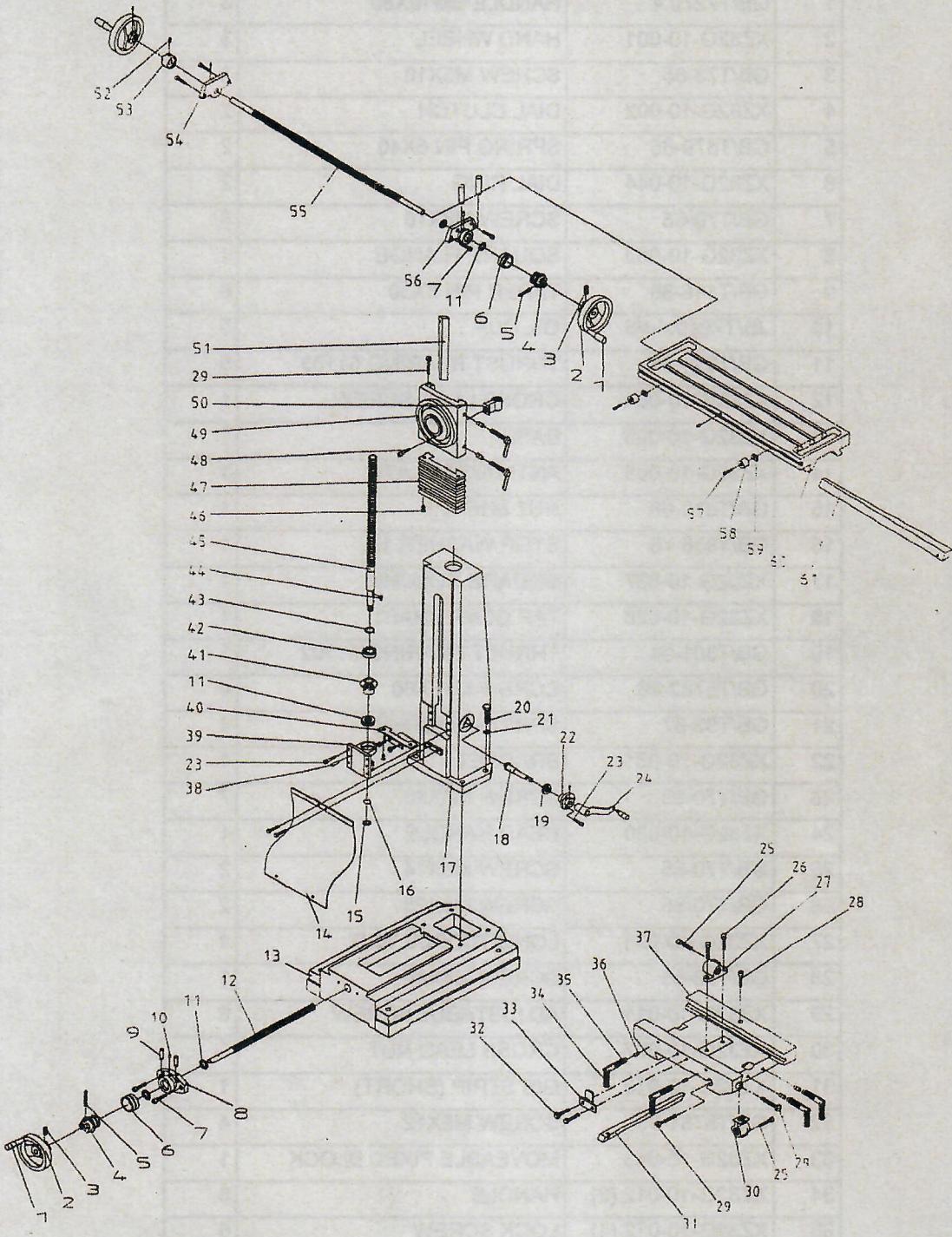


## SPINDLE ASSEMBLY

NO.	PART No.	DESCRIPTION	QTY.
1	XZ32G-21-001	Spindle	1
2	GB/T858-88	Stop washer 30	1
3	GB/T810-86	Nut M30×1.5	1
4	XZ32G-21-002	Anti-dust cover	1
5	GB/T297-94	Bearing 30207/P6	1
6	XZ32G-21-005	Rack sleeve	1
7	XZ32G-21-004	Rubber flange	1
8	GB/T297-94	Bearing 30206/P6	1



## TABLE ASSEMBLY

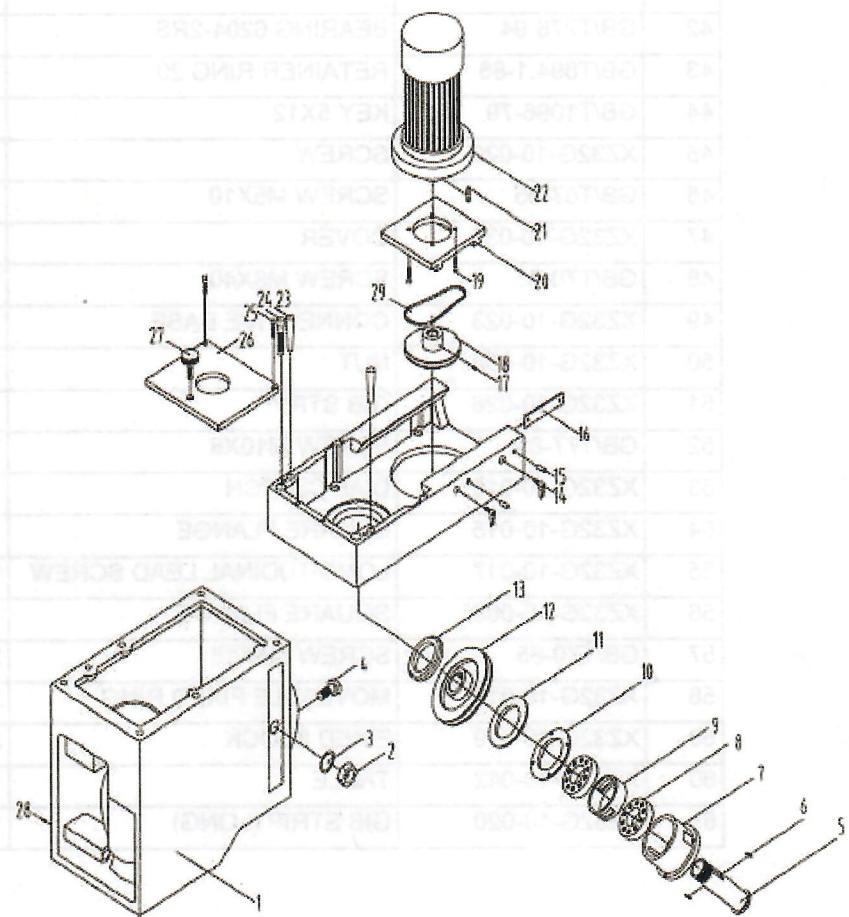


## TABLE ASSEMBLY

NO.	PART NO.	DESCRIPTION	QTY
1	GB/T7270.4	HANDLE BM10X80	3
2	XZ32G-10-001	HAND WHEEL	3
3	GB/T73-85	SCREW M6X10	3
4	XZ32G-10-002	DIAL CLUTCH	2
5	GB/T879-86	SPRING PIN 5X40	2
6	XZ32G-10-044	DIAL RING	2
7	GB/T70-85	SCREW M8X16	6
8	XZ32G-10-003	SQUARE FLANGE	1
9	GB/T118-86	TAPER PIN 8X30	6
10	JB/T7940.4-95	OIL CUP	5
11	GB/T301-94	THRUST BEARING 51103	5
12	XZ32G-10-004	CROSS LEAD SCREW	1
13	XZ32G-10-005	BASE	1
14	XZ32G-10-008	ANTI-DUST PLATE	1
15	GB/T810-88	NUT M16X1.5	1
16	GB/T858-76	STOP WASHER 16	1
17	XZ32G-10-037	SQUARE COLUMN	1
18	XZ32G-10-028	TAP GEAR SHAFT	1
19	GB/T301-94	THRUST BEARING 51102	1
20	GB/T5782-86	SCREW M16X60	4
21	GB/T93-87	SPRING WASHER	4
22	XZ32G-10-031	BRACKET	1
23	GB/T70-85	SCREW M6X20	7
24	XZ32G-10-030	HEAD HANDLE	1
25	GB/T70-85	SCREW M5X14	2
26	GB/T70-85	SCREW M8X25	2
27	XZ32G-10-006	LONGITUDINAL NUT	1
28	GB/T70-85	SCREW M8X45	1
29	XZ32G-10-011	ADJUSTABLE SCREW	6
30	XZ32G-10-007	CROSS LEAD NUT	1
31	XZ32G-10-013	GIB STRIP (SHORT)	1
32	GB/T5781-85	SCREW M8X12	4
33	XZ32G-10-043	MOVEABLE FIXED BLOCK	1
34	XZ32G-10-012 (2)	HANDLE	6
35	XZ32G-10-012 (1)	LOCK SCREW	6
36	XZ32G-10-020	PIN	6
37	XZ32G-10-014	CENTER BASE	1

NO.	PART NO.	DESCRIPTION	QTY
38	GB/T119-86	PIN 8X20	2
39	XZ32G-10-021	SUPPORT	1
40	XZ32G-10-041	CONNECTIVE PLATE	1
41	XZ32G-10-032	TAPER GEAR	1
42	GB/T276-94	BEARING 6204-2RS	1
43	GB/T894.1-86	RETAINER RING 20	1
44	GB/T1096-79	KEY 5X12	1
45	XZ32G-10-022	SCREW	1
46	GB/T67-85	SCREW M5X10	12
47	XZ32G-10-039	COVER	1
48	GB/T70-85	SCREW M8X40	1
49	XZ32G-10-023	CONNECTIVE BASE	1
50	XZ32G-10-038	NUT	1
51	XZ32G-10-026	GIB STRIP	1
52	GB/T77-85	SCREW M10X8	1
53	XZ32G-10-016	DIAL CLUTCH	1
54	XZ32G-10-015	SQUARE FLANGE	1
55	XZ32G-10-017	LONGITUDINAL LEAD SCREW	1
56	XZ32G-10-009	SQUARE FLANGE	1
57	GB/T70-85	SCREW M6X15	2
58	XZ32G-10-018	MOVEABLE FIXED RING	2
59	XZ32G-10-019	FIXED BLOCK	2
60	XZ32G-10-042	TABLE	1
61	XZ32G-10-020	GIB STRIP (LONG)	1

## HEADSTOCK ASSEMBLY



## HEADSTOCK ASSEMBLY

NO.	PART NO.	DESCRIPTION	QTY
1	XL32-02-025	Head body	1
2	GB/T6182-86	Locknut M16	3
3	GB/T93-87	Spring washers 16	3
4	GB/T5782-86	Bolt M16*65	3
5	XL32-02-005	Splined sleeve	1
6	GB/T1567-79	Thin flat keys 6*32	2
7	XL32-02-006	Bearing seat	2
8	GB/T281-94	Bearing 2207/P6	2
9	XL32-02-020	Spacer	1
10	XL32-02-015	Bearing gland	1
11	XL32-02-024	Bearing gland	1
12	XL32-02-001	Spindle pulley	1
13	GB/T810-86	Round nut M35*1.5	2
14	HY8310.12-2	Adjustable bit tight given the handle B-M12*95*32	2
15	GB/T119-2000	Cylindrical pin 6*20	2
16	XL32-02-011	Inlaid tune	1
17	GB/T78-2000	Screw M6*12	2
18	XL32-02-002	Motor pulley	1
19	GB/T70-85	Screw M8*20	4
20	XL32-02-004	Motor base	1
21	GB/T1096-79	Key 8*45	1
22		Motor	1
23	GB/T120-2000	Internally threaded cylindrical pin 6*32	2
24	GB/T70-85	Screw M8*55	2
25	GB/T70-85	Screw M4*25	4
26	XL32-02-007	Cover	1
27	XL32-02-023	Screw the handle	1
28	GB/T78-2000	Screw M8*25	1
29	SPZ	3V250	1