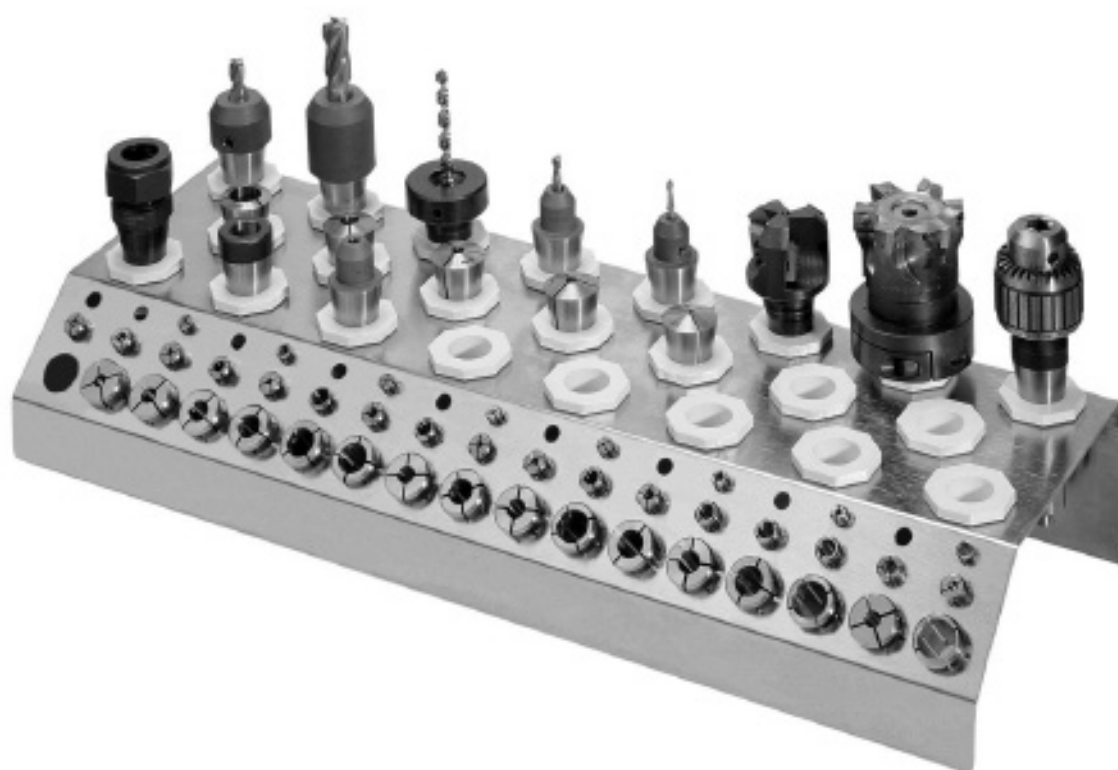


# ***mach-1***

QUICK CHANGE TOOLING SYSTEM



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REFERENCE MANUAL



MACH-1 SYSTEMS INCORPORATED  
27 TOZER ROAD, BEVERLY, MA 01915  
978/922-0268 FAX 978/921-0208

Congratulations for purchasing the MACH-1 Quick Change Tooling System.

The MACH-1 Quick Change Tooling System is a complete, cost-effective system designed to improve your efficiency and productivity for every milling project. Tool changes that once took several minutes can now be accomplished in seconds. Inserting a tool holder into the patented locking mechanism is as simple as pushing and then releasing the quill handle...it's that easy!

The MACH-1 system's special drawbar assembly replaces your machine's existing drawbar and installs directly into the R-8 spindle. A preset die spring included with the drawbar assembly ensures precise tool retention and maximum repeatability with every tool change. Durable and reliable, the MACH-1 system is maintenance free and backed by a comprehensive warranty.

Your new system includes a complete set of R8 collets, collet closers, tool holders, hardware and a tool tray...everything you need to perform a variety of milling functions. Plus there is no need to buy special tools. The MACH-1 system's full-size tool holders are versatile enough to hold the single and double ended tools you already own. And because the MACH-1 is built with a minimal spindle nose projection, it can handle even your most heavy-duty milling projects.

Thank you for choosing the MACH-1 Quick Change Tooling System.

Sincerely,

Marc Boisvert  
President

**MACH-1 Quick Change Tooling System****Table of Contents**

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### MACH-1 Quick Change Tooling System

#### Limited Warranty

The MACH-1 Quick Change Tooling System has a limited warranty against defects in material and workmanship, for the drawbar only, for a period of five (5) years from the date of purchase. All other system components and accessories for the MACH-1 Quick Change Tooling System have a limited warranty against defects in material and workmanship for a period of ninety (90) days from the date of purchase.

MACH-1 Systems will at its option and expense, repair or replace any component(s) of the MACH-1 Quick Change Tooling System in question which fail(s) to satisfy this warranty provided that MACH-1 Systems shall have received notice of the claimed defect(s) during the limited warranty period.

The limited warranty covers all components and accessories and applies only to those MACH-1 Quick Change Tooling System products which have been installed and operated in accordance with the instructions in the MACH-1 Quick Change Tooling System reference manual(s). MACH-1 Systems shall have no obligation with respect to any defect(s) or other condition(s) caused in whole or in part by the end user's incorrect use, improper maintenance, modification of the product(s), or by the repair or maintenance of such product(s) by any person except persons deemed qualified to do so by MACH-1 Systems.

Responsibility for loss in operating performance or other conditions beyond MACH-1's control cannot and will not be accepted by MACH-1 Systems.

The foregoing limited warranty obligations are in lieu of any and all expressed and/or implied warranties of fitness or merchantability or otherwise, and state MACH-1 System's entire liability and the end user's exclusive remedy, under any circumstances, for any claim of damage.

## INTRODUCTION

### MACH-1 Quick Change Tooling System

#### IMPORTANT:

Your MACH-1 Tooling package is intended to be used on a manual or 2 axis milling machine. If you intend on installing one on a 3 axis machine it is important that the milling machine has a limit switch on the "Z" axis. The limit switch needs to be adjusted to stop the spindle from advancing past the point of activating the drawbar unintentionally and ejecting a tool from the spindle while the machine is running. If your 3 axis control does not have limit switches, install one or return the tooling system for a refund.

Begin by comparing the items that were shipped with your system to the components list that follows. After you've verified that your MACH-1 System is complete, we suggest that you gather the tools required to install the MACH-1 Quick Change Tooling System.

#### List of Components (full kit shown)

##### Setting Gage



##### Red Cap



##### Drawbar Assembly

Acorn nut  
7/16"-14 spring compression nuts (2)  
Die spring assembly  
Top spring washer  
1" x 4" die spring  
Bottom spring spacer  
Drawbar coupling assembly

##### Press Ring



## MACH-1 Quick Change Tooling System

### Actuator Assembly

Actuator cap  
1/4"-20 soft tip set screw  
5" diameter actuator plate



### Positioning washer material



### Pin Spanner Wrench



Installation Hardware  
1/4"-20 x 3/4" BHCS (3)  
6mm x 3/4" SHCS (3)



### Tightening Fixture Assembly

Tightening fixture  
3/8" x 2" carriage bolt  
3/8" x lock washer  
3/8"-16 nut



### R-8 Collet Set

1/8", 3/16", 1/4",  
5/16", 3/8", 7/16",  
1/2", 9/16", 5/8",  
11/16", 3/4"



### R-8 Collet Closers (4)



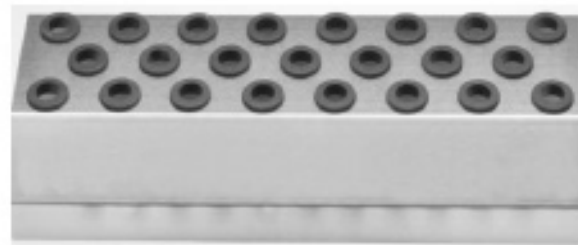
### R-8 End Mill Holder Set 1/4", 3/8", 1/2"



### R-8 Jacobs Chuck Adapter (J33)



### Tool Tray



## INTRODUCTION

### MACH-1 Quick Change Tooling System

#### Tools Required

Adjustable face spanner wrench (3/16" pins)  
Vernier caliper or feeler gage  
Vise  
Hex key sets (standard and metric)  
Hacksaw  
Adjustable wrenches (2)  
Magic Marker

**Note:** Please read this manual in its entirety and familiarize yourself with the installation procedure before continuing.

#### Removing the Drawbar Assembly from Your Machine

The MACH-1 Quick Change Tooling System replaces the drawbar that's currently installed in your milling machine. Follow the instructions below to remove the existing drawbar assembly and other components.

##### Power down your milling machine

Remove the drawbar assembly from your machine.

Look down the spindle from the top. Remove all items that are remaining inside, including spacers.  
(You should be able to see the top of the spindle spline.)

#### Installing the press ring

1. Lower the quill until the bearing cover set screw (usually located on the rear of the quill) is exposed. Remove the set screw.



**Do not let the spindle fall out when you are removing the bearing cover!**

## MACH-1 Quick Change Tooling System

2. Insert an adjustable face spanner wrench into the unthreaded holes beneath the bearing cover.

**Note:** Use caution when loosening the bearing cover. Some covers have right handed threads, some have left handed threads.

3. After you've removed the bearing cover, you should see a special locking set screw. This set screw secures the collet alignment screw underneath. Remove the locking set screw and back off on the collet aligning screw so it is flush on the inside of the spindle. This will prevent the rubber coated coupling from entering the threaded hole and chipping the rubber.



### IMPORTANT:

**Note:** Some milling machines will have only one set screw.

**Note:** Some milling machines may require heat on the set screw to break the grip of the thread lock material. (loctite)



4. Install the press ring between the quill and bearing cover. Reinstall the bearing cover but the set screw in the back of the quill does not have to be installed at this time.

5. Tighten the bearing cover against the press ring.

6. Raise the quill so that the press ring touches the casting of the spindle and lock the quill in position.





## INSTALLATION

### MACH-1 Quick Change Tooling System

#### Installing the Positioning Washer

To properly position the drawbar coupling, you need to clean the inside of the R-8 spindle so you can get an accurate measurement for the next operations below.

1. Loosen the top of the setting gage approximately  $\frac{1}{2}$ " or 12mm (Fig. 1).
2. Insert the setting gage up into the spindle (Fig. 2).
3. Turn the setting gage into the spindle until the tapers fit snugly together and there is no play between the tapers. (Fig. 3).
4. Carefully remove the setting gage.

**Note:** Be careful not to adjust or twist the setting gage during removal.

5. Using a Vernier Caliper or feeler gage, measure the space between the top threaded portion and the solid body of the setting gage (Fig. 4).
6. Use the supplied shim stock or using a lather, make a spacer with .860 O.D. - .750 I.D. (Fig. 5) to within  $\pm 0.005$ " of your measurement.  
If the spacer material is needed, use a piece of steel and turn O.D. to .860 & I.D. to .750
7. Remove the acorn nut, two (2) 7/16"-14 spring compression nuts and die spring assembly from the drawbar assembly and set them aside, they will be needed later during installation.
8. Using the supplied shim stock spacers, mix and match spacers to get the thickness needed to match the space of the setting gage. Apply grease to spacers to keep them together and in place when you slide the spacer(s) over the end of the drawbar until flush against the body of the drawbar coupling (Fig. 6).

**Note:** If the top threaded portion of the setting gage is bottomed out against the solid body and there is still space between the tapers, then the spindle needs to be drilled a little deeper. Place a 7/8" drill in a V block and hold it in a vise. Make sure the drill is centered before drilling. Bring the quill down by hand and slowly remove what you need from the bottom of the spindle and recheck the size with the setting gage.

**MACH-1 Quick Change Tooling System**



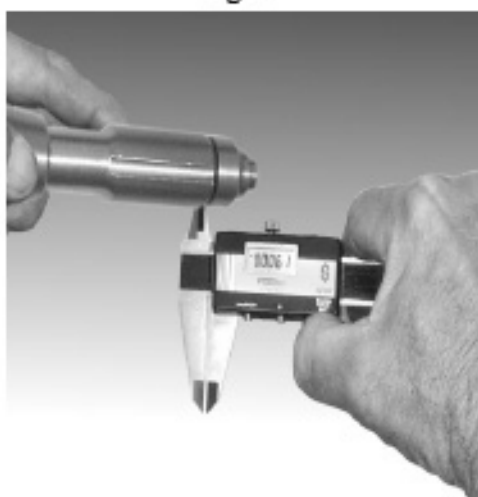
**Fig. 1**



**Fig. 2**



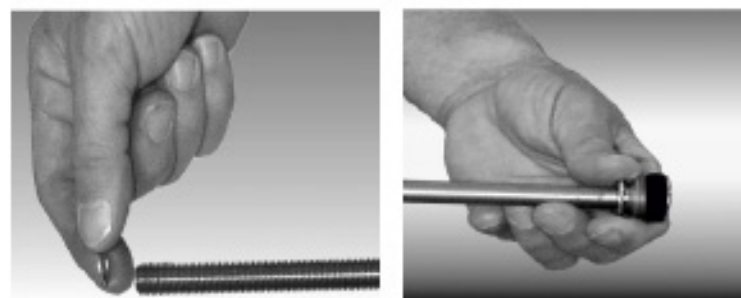
**Fig. 3**



**Fig. 4**



**Fig. 5**



**Fig. 6**

## INSTALLATION

### MACH-1 Quick Change Tooling System

#### Installing the Drawbar Assembly

1. Using a wrench, loosen the four (4) column bolts (there should be two on each side of the machine. (Fig. 13)
2. Swing the spindle past the table until there's enough room for you to insert the drawbar into the spindle from below.
3. Insert the drawbar up into the spindle. (Fig. 14)
4. While holding the drawbar in the spindle, swing the spindle back over the table until the column scale read 0 degrees. (Fig. 15)
5. Slowly lower the drawbar until it rests upon the table.
6. Tighten the four (4) column bolts.



Fig. 13



Fig. 14



Fig. 15

## MACH-1 Quick Change Tooling System



Fig 16

### Seating the Drawbar

1. Place vise onto the table, directly below the spindle.
2. **Remove the top of the setting gage (Fig. 16)** and set it Aside.
3. Lift the drawbar up into the spindle and place the setting gage under the drawbar. Hold the setting gage and drawbar in place.

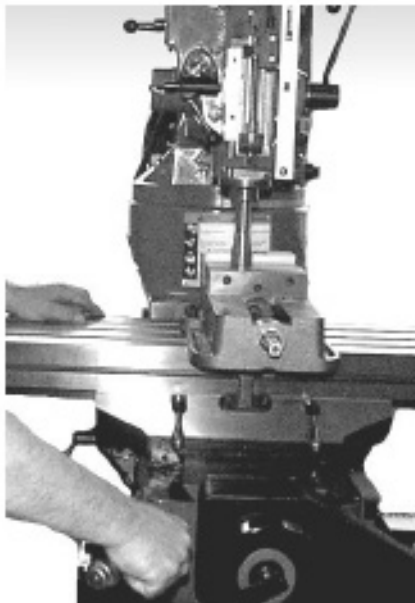


Fig. 17

4. Using the handcrank, raise the table until the top portion of the setting gage is even with the spindle nose. **(Fig.17)**  
Continue raising the knee until the drawbar has been seated in the bottom of the spindle and the spindle taper mates with the setting gage taper.  
Make sure the setting gage taper touches the spindle taper. **(Fig. 18).**

5. Remove the setting gage.



Fig. 18

## INSTALLATION

### MACH-1 Quick Change Tooling System

#### Testing the Drawbar

**Test the drawbar to ensure that it has been installed properly.**

1. Place an End Mill Holder into the spindle (Fig 19 & 20).

**NOT A COLLET! COLLETS NEED COLET CLOSERS  
AND WITHOUT ONE IT WILL BE LOOSE IN SPINDLE !**

2. Pull up on the threaded portion of the drawbar (located on the top of the spindle) and try to move the end mill holder from side to side (Fig. 20).
3. Check that:  
The drawbar is holding the end mill holder securely in place.  
There isn't any space between the end mill holder and the tapered portion of the spindle.
4. Release the drawbar and remove the end mill holder.



**Fig. 19**



**Fig. 20**



FIG 21



Fig.22



Fig. 23



Fig. 24

### Installing the Die Spring Assembly

1. Insert the setting gage back into the spindle. Raise the quill up until it bottoms out and lock it.
2. Crank the knee up to position the table so that there is pressure on the setting gage. This should hold the drawbar securely in place and keep it from turning while installing the spring.(Fig. 21)
3. Install the die spring assembly onto the drawbar the large spring spacer on the bottom. (Fig. 22). (the small spring washer should be on the top and
4. Thread one (1) 7/16"-14 spring compression nut onto the drawbar until it touches the die spring.
5. Turn the spring compression nut twelve (12) revolutions (Fig. 23).  
  
short spring for step pulley machine 2 1/2" long spring is seven 7 revolutions.
6. Thread a second spring compression nut onto the drawbar. Use one wrench to hold the bottom spring compression nut while you tighten the top nut (Fig. 24).

## INSTALLATION

### MACH-1 Quick Change Tooling System

#### Cutting the Drawbar to Length

After the drawbar has been installed, you will need to cut it to length to fit your machine.

Place the actuator plate over the top of the threaded portion of the drawbar. Slide it down on to the top of the spindle (Fig. 25 & 26)

Slide the red plastic cap over the drawbar and down on to the threaded portion of the actuator plate (Fig. 27).

Using a hacksaw, cut the drawbar to length evenly along the top of the red plastic cap (Fig. 28). Discard the cap and the excess piece of drawbar.

Remove the actuator plate (Fig. 29). and set it aside.

Using a file, remove any burrs from the remaining portion of the drawbar (Fig. 30).

**Wipe clean any metal shavings from top of machine.**

Install the acorn nut onto the top of the drawbar. (The acorn nut will keep the drawbar in the center of the actuator cap as you change tools.)

Tighten the acorn nut while holding the bottom spring compression nut in place (Fig. 31). Tighten the locking set screw on the acorn nut.

Lower the knee and remove the setting gage.



Fig. 25



Fig 26



Fig. 27



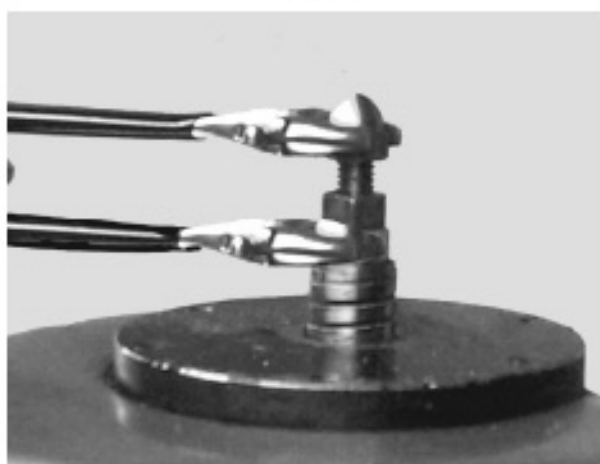
**Fig. 28**



**Fig. 29**



**Fig. 30**



**Fig. 31**



## INSTALLATION

### MACH-1 Quick Change Tooling System

#### Installing the Actuator Cap



Fig 32



Fig.33



Fig 34

1. Remove the bearing cover and press ring. Then reinstall the bearing cover. (Fig 35)
2. Raise the quill all the way up and lock it in position.
3. Install the actuator plate onto the spindle using the three (3)  $\frac{1}{4}$ "-20 X  $\frac{3}{4}$ " BHCS or three (3) 6mm X  $\frac{3}{4}$ " SHCS depending on machine you own (Fig. 32).
4. Screw the actuator cap down until it bottoms out on the acorn nut. Lower the quill approximately 1" or 25mm.

Turn the actuator cap clockwise 3 more revolutions.

Raise the quill and slowly push the quill handle all the way back so that the die spring is compressed.

5. With the quill handle all the way back, insert an end mill holder into the spindle (Fig.33).
6. While supporting the end mill holder, slowly release the quill handle – the end mill holder should stay in place. If it doesn't, adjust the actuator cap until the tool fits into the drawbar coupling.

#### Do not over tighten the set screw

7. After the actuator cap has been properly adjusted, tighten the lower set screw (Fig. 34). Finger tight is all you need.
8. Remove the end mill holder.

## INSTALLATION

### MACH-1 Quick Change Tooling System

#### Reinstalling the Collet Alignment Screw.

**Do not let the spindle fall when removing bearing cover in fig. 35**

1. Remove the bearing cover (Fig. 35).

**Note:** The MACH-1 Quick Change Tooling System requires a collet alignment screw. If the screw is missing or damaged, replace it with a new one.

Insert the setting gage into the spindle.  
(make sure the top threaded piece is removed)

Thread the collet alignment screw in until it touches the gage then back off  $\frac{1}{4}$  turn.

Align the slot on an end mill holder with the collect alignment screw.

Insert the end mill holder into the spindle, then turn the holder slightly – this should keep the collet alignment screw straight and aligned with the slot on the end mill holder.

While holding the end mill holder in place, insert the locking set screw (removed previously) directly behind the collet alignment screw (Fig. 36). Tighten the locking set screw. If there is no locking set screw, use thread lock to keep the collet aligning screw from moving and working its way loose.

**Note:** Be careful not to tighten the locking set screw to the point where the collet alignment screw begins to move in during tightening.

**Make sure the alignment screw is not too deep or it will drag on bottom of collet keyway and cause collet to run out !**



Fig. 35



Fig. 36

## INSTALLATION

### MACH-1 Quick Change Tooling System

#### Reinstalling the Bearing Cover

1. Using a marker, indicate where the small indentation (within the threaded area on the outer portion of the bearing cover) is located (**Fig. 37**).
2. Install the bearing cover onto the quill. Align the mark you made in step 1 with the set screw hole.
3. Insert the bearing cover set screw (removed previously) into the set screw hole behind the quill.
4. Check that:
  - The set screw is seated in the small indentation in the threads of the bearing cover (**Fig. 37**).
  - The end of the set screw is below the surface of the quill.
5. **Lightly tighten the bearing screw cover set screw.** (Over tightening the set screw could force the quill to lose concentricity, making it difficult to retract the quill into the quill casing.) Finger tight is just right.



**Fig. 37**

**Drawbar Installation Complete.**

### MACH-1 Quick Change Tooling System

#### Installing the Tightening Fixture

1. Loosen the 3/8" X 2" carriage bolt (attached to the tightening fixture) approximately 1/4" or 6mm.
2. Slide the head of the carriage bolt into the groove along the front of the table (Fig. 40).
3. Position the tightening fixture so that it is flush with the table.
4. While holding the tightening fixture in place, secure the 3/8" lock washer and 3/8"-16 nut (Fig. 41).
5. Use a wrench to tighten the nut and washer (Fig. 42) .

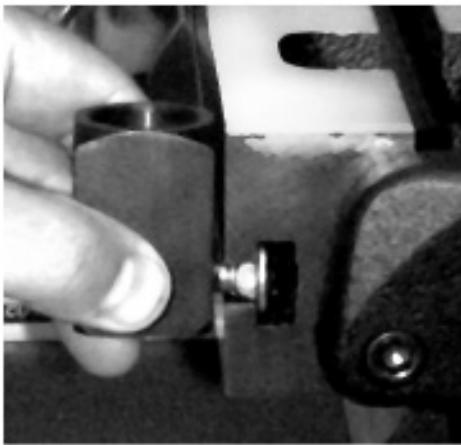


Fig.40



Fig. 41

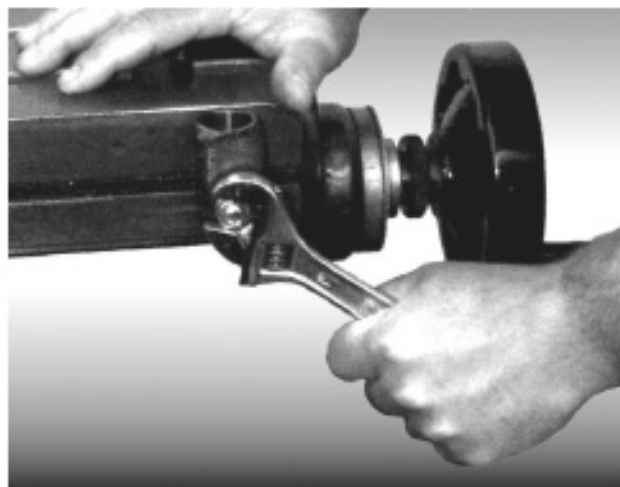


Fig. 42

## INSTALLATION

### MACH-1 Quick Change Tooling System

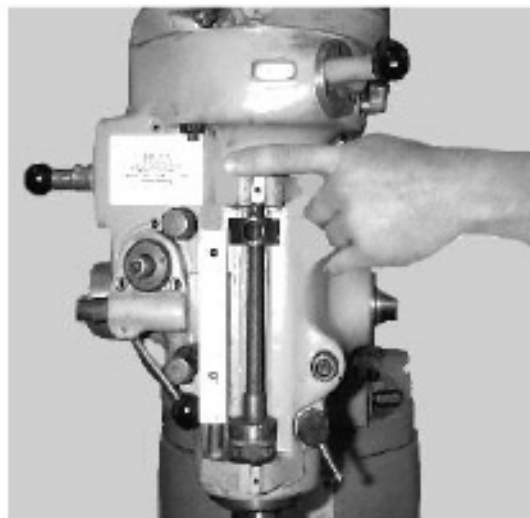
#### Warning Label

Place the warning label (provided) in a visible area on the machine's spindle.

#### ( CAUTION )

- 1- STOP SPINDLE WHEN CHANGING TOOLS
- 2- MAKE SURE TOOL IS SECURE IN SPINDLE BEFORE STARTING SPINDLE MOTOR
- 3- INSERT TOOL FROM BOTTOM OF HOLDER TO AVOID PINCHING OF FINGER OR SKIN.
- 4- DO NOT LEAVE SPINDLE RUNNING WITH QUILL UP , BRING DOWN 1/8" FROM TOP.

Please attach caution decal here



---

#### Warnings are attached to tooling trays

( WARNING ) --- DO NOT LEAVE CUTTING TOOLS IN HOLDERS WHEN STORING HOLDERS IN TRAY !

( WARNING ) --- TOOLING TRAY MUST BE FASTENED TO WORK BENCH !  
HOLES PROVIDED BEHIND TRAY WILL ACCEPT COMMON WOOD SCREWS  
AND KEEP TRAY FROM SLIDING OFF BENCH.

## MACH-1 Quick Change Tooling System

### Operation

#### Using Your MACH-1 Quick Change Tooling System

You should always:

- Check that power to the spindle is off before changing tools.
- Check that the quill lock is disengaged before changing tools.
- Use the correct feed rate and spindle speed for each job.
- Reduce the feed rate and spindle speed immediately if unusual noise or vibrations occurs while machining.

#### Inserting a Tool Holder (Collet, End Mill Holder, Jacobs Chuck Adapter, etc.)

**Note:** All collets require a collet closer.

1. Insert a tool into the tool holder (refer to "Using a Tool Holder" for instructions).
2. Check that the quill is all the way up and that the quill handle is in a upright position.

#### Caution:

**Always support the tool holder near the bottom. Never grip the tool holder above the tapered section when inserting it into the spindle.**

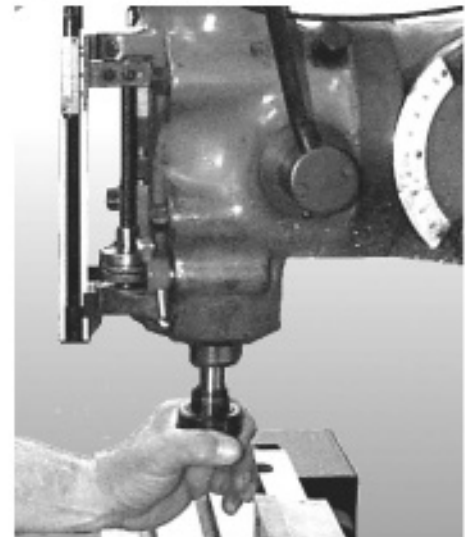


Fig. 43

3. Slide a tool holder(e.g. collet or end mill holder) into the spindle, aligning the slot on the tool holder with the collet alignment screw inside the spindle (Fig. 43).
4. Push up on the bottom of the tool while lifting the quill handle (Fig. 44). The tool holder will slide into the drawbar coupling.
5. Slowly allow the quill handle to return to its original position.

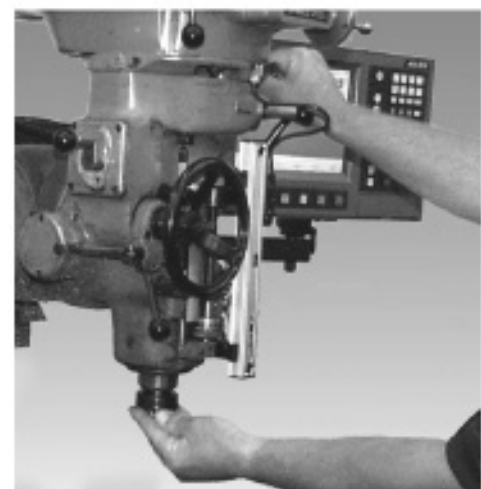


Fig. 44

## OPERATION

### MACH-1 Quick Change Tooling System

6. Tighten the drive collar (if the tool holder includes one).
7. Check that the tool holder is firmly in place before starting the spindle.

**Note** To extend the life of the bearings in the actuator cap, do not run the spindle for an period of time with the quill all the way up. Drop the quill down approximately 1/8" or 3mm.

#### Removing A Tool Holder

1. Check that the quill is all the way up and that the quill handle is in an upright position.
2. Loosen the drive collar (if applicable).
3. While supporting the tool holder, lift the quill handle.
4. Remove the tool holder from the spindle.
5. Slowly allow the quill handle to return to its original position.

**Note:** If you need to remove the tool, refer to "Using a Tool Holder" For instructions.

## MACH-1 Quick Change Tooling System

### Using a Tool Holder

Avoid sharp edges when reaching for tools.

### Collet Closer

**Note: All collets require a collet closer.**

1. Select a collet that matches the size of the shank of the tool you're going to use.
2. Place the collet into the collet closer sleeve (Fig. 45), then slide the sleeve up to the tapered end of the collet (Fig. 46).
3. Screw the collet cap (Fig. 47), onto the sleeve.



Fig. 45



Fig. 46



Fig. 47



## OPERATION

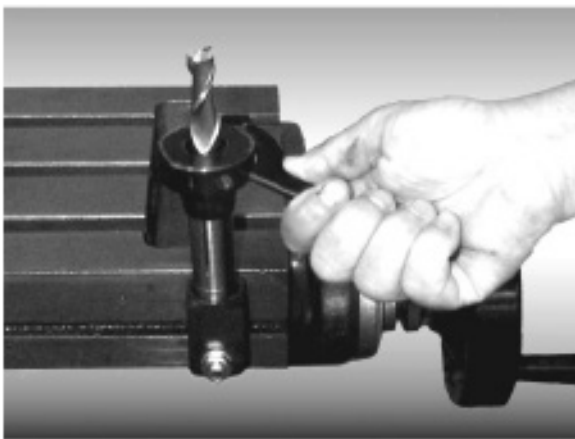
### MACH-1 Quick Change Tooling System



**Fig. 48**



**Fig. 49**



**Fig. 50**

4. Inset the tool into the collet (**Fig. 48**).
5. Tighten the collet closer cap by hand to hold the tool in place (**Fig. 49**).
6. Place the collet into the tightening fixture.
7. Using a pin spanner wrench, finish tightening The collet closer cap (**Fig. 50**).

### Removing a Tool

1. Place the collet into the tightening fixture.
2. Using a pin spanner wrench, loosen the closer cap 1-2 turns.
3. Tap the top of the collet closer with a soft hammer until the tool can be removed.
4. Remove the tool.

### MACH-1 Quick Change Tooling System

#### End Mill Holder

##### Inserting a Tool

1. Select an end mill holder that matches the size of the shank of the tool you're going to use.
2. Insert the tool into the end mill holder (**Fig. 51**), aligning the flat surface on the shank with the set screw in the end mill holder.
3. Using a hex key, tighten the set screw to secure the tool in to position.

Note: You may use the tightening fixture to hold the end mill holder as you tighten or loosen the set screw (**Fig. 52**).

4. Using a hex key, tighten the drive collar of the end mill holder (if applicable) onto the spindle (**Fig. 53**).

##### Removing a Tool

1. Using a hex key, loosen the set screw on the drive collar (if applicable).
2. Loosen the set crew on the end mill holder.
3. Remove the tool.



Fig. 51

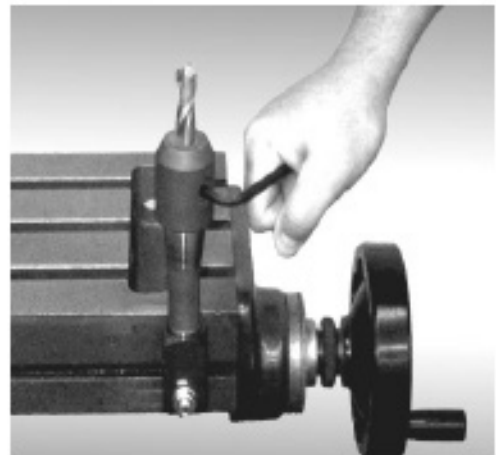


Fig. 52



Fig. 53

## OPERATION

### MACH-1 Quick Change Tooling System

#### Jacobs Chuck Adapter

##### Inserting a Tool

1. Place a Jacobs chuck onto the tapered end of a Jacobs chuck adapter (Fig. 54).
2. Tap the Jacobs chuck with a soft hammer until the chuck is securely in place.



Fig. 54

##### Removing a Tool

**Note:** You do not need to remove the Jacobs chuck unless it becomes damaged.

1. Using a Jacobs chuck removal tool, remove the Jacobs chuck from the adapter.

#### Accessories

#### Shell Mill Tool Holder

##### Inserting a Tool

1. Place a shell mill onto the shell mill tool holder, aligning the groove with the key (Fig. 55).
2. Thread the retaining screw into the shell mill holder (Fig. 56).
3. Place the shell mill tool holder into the tightening fixture. Using a hex key, tighten the retaining screw (Fig. 57).
4. Tighten the drive collar of the shell mill tool holder onto the spindle (Fig. 58).



Fig. 55



Fig. 56



Fig. 57



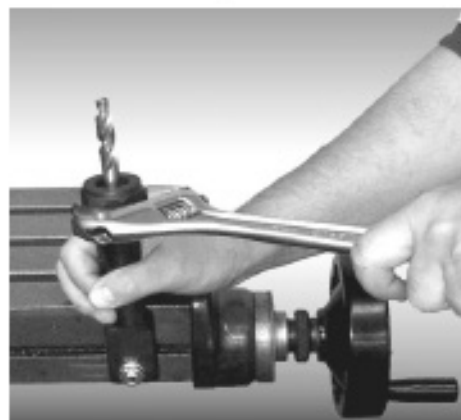
Fig. 58

##### Removing a Tool

1. Using a hex key, loosen the set screw on the drive collar.
2. Place the shell mill holder into the tightening fixture.
3. Loosen the set screw on the shell mill tool holder.
4. Remove the shell mill.

**MACH-1 Quick Change Tooling System****180 Mode Erickson Collet Holder****Inserting a Tool**

1. Choose a 180 model Erickson collet that matches the size of the shank of the tool you're going to use.
2. Place the collet into the Erickson collet holder (Fig. 59).
3. Loosely thread a collet closer nut onto the collet (Fig. 60).
4. Insert the tool into the collet and then tighten the closer nut (Fig. 61).
5. Place the collet holder into the tightening fixture.
6. Using a wrench, tighten the collet closer nut (Fig. 62).

**Fig. 59****Fig. 60****Fig. 61****Fig. 62**

## **OPERATION**

### **MACH-1 Quick Change Tooling System**

#### **Removing a Tool**

1. Place the Erickson collet holder into the tightening fixture.
2. Using a wrench, remove the collet closer nut.
3. Tap the side of the collet with a rubber hammer.
4. Remove the tool.

#### **Boring Head Tool Holder**

##### **Inserting a Tool**

1. Tighten the boring head onto the boring head tool holder (Fig. 63).

##### **Removing a Tool**

1. Loosen the boring head and then remove it.



**Fig. 63**

## MACH-1 Quick Change Tooling System

## Troubleshooting Guide

Symptom	Probable Cause	Recommended Corrective Action
Spindle does not move up and down freely.	The bearing cover set screw is too tight against the bearing Cover.	Loosen the bearing cover set screw.
	The bearing cover set screw is not seated in the indentation in the threads of the bearing cover.	Reseat the bearing cover set screw (refer to "Reinstalling the Bearing Cover").
Tool stops halfway up in the spindle.	The collet alignment screw is not properly aligned in the spindle.	Remove the special locking set screw and realign the collet alignment screw (refer to "Reinstalling the Collet Alignment Screw").
Tool wobbles (not concentric).	The collet alignment screw is inserted too far into spindle.	Remove the special locking set screw. Loosen the collet alignment screw one 1/2 turn, then check for proper alignment (refer to "Reinstalling the Collet Alignment Screw").
Tool does not lock in to drawbar coupling.	The drawbar coupling does not open enough.	Adjust the actuator cap.

Symptom	Probable Cause	Recommended Corrective Action
Tool does not release	The collet alignment screw is inserted too far into the spindle.	Remove the special locking set screw and realign the collet alignment screw (refer to "Reinstalling the Collet Alignment Screw".)
	The drive collar is still secured on the spindle.	Loosen the drive collar.
	The drawbar coupling does not open enough.	Adjust the actuator cap.
Tool holder locks in to drawbar coupling, but does not fit snugly into the spindle.	A collet closer is not being used.	Place the collet into a collet closer (refer to "Using a Tool Holder – Collet") before inserting it into the spindle.
	The drawbar has moved and the distance between the center of the pullstud on the tool holder and drawbar coupling has changed.	



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