M54 Tube Bender
Operation Manual

JD Squared, Inc.

2025.12.1

Contents

Important Safety Information

Before using this equipment, read and understand all safety instructions and warnings in this manual.

This product contains components that pose potential hazards if used improperly or without caution. Always follow standard safety practices and wear appropriate protective gear where applicable.

1.1 FCC Statement

Product / Model: M54 Tube Bender

Test Report: F2X35785-01E

Contains FCC ID: 2ABCB-RPIRM0 §2.1074 Identification.

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

1.2 Electrical Hazard

This equipment involves electrical components that may cause shock, burns, or serious injury.

Always disconnect power before servicing or opening electrical enclosures. Only qualified personnel should perform electrical maintenance.

1.3 Pinch Hazard

Certain moving parts may cause pinching or crushing injuries. Keep hands, fingers, and loose clothing clear of moving mechanisms during operation and maintenance.

Failure to observe these warnings may result in personal injury, equipment damage, or voiding of warranty.

Introduction

Thank you for purchasing a Model 54 Tube Bender.

Please read and understand the instructions in this document before assembling and operating your machine.

If you require any assistance, please reach out to our technical support at support@jd2.com or by phone (423) 979-0309.

2.1 Included Parts with Shipment

Description	Quantity
Pressure screw pin (1" diameter)	1
U-strap pin and hitch pin clip (7/8" diameter with multiple drilled holes)	1
Die socket set screw (3/4"-10 x 3.5" long)	1
Die washer (3/4" hole)	1
Die nut (3/4"-10 hex)	1
1/2"-13 x 2 1/2" long leveling bolts	2
1/2"-13 hex nuts	2
1/2" washers	4
WIFI Antenna	1

2.2 Electrical Connection

- Standard Required Power (North America): 115VAC, 60Hz, 1-PH, 15A
- Optional: 230VAC, 50-60Hz, 1-PH, 10A

Important

Extension cords are not recommended for 115VAC supply.

If you must use an extensions cord, use the shortest 10 AWG cord possible. Incorrect extension cord size or length may cause pump stalls under pressure or nuisance breaker tripping.

Removing the Machine from the Crate

3.1 Crate Disassembly

The machine crate also contains extra packing materials and optional tooling that was purchased. Open the crate in the following order to safely access the contents.

- Remove the screws marked with **white** paint from the top and front panels.

Figure 3.1: Top Screw Locations

- Unpack the crate accessory boxes from the areas around the machine.
- Remove the screws in the two side panels marked with **black** paint.

Figure 3.2: Side Screw Locations

- Lift and move the three side panels as a unit off of the crate pallet.

Figure 3.3: Sides Removed

- The rear leveling bolts are inverted and used to attach the machine base to the pallet. Remove the 1/2" leveling bolts using 3/4" wrenches, and keep them for later assembly.

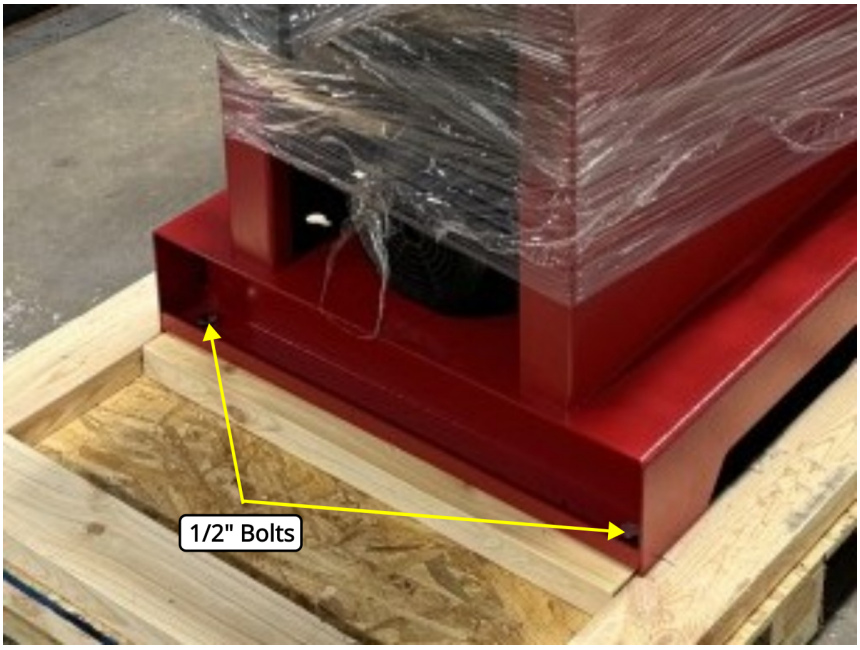


Figure 3.4: Remove Bolts

3.2 Removing the bender without a forklift

Note

The machine is not supplied with handles to manually move the bender.

See *Movement Handles*.

The bender may be rolled off the pallet. You will need:

- *Movement Handles*
- 3/4" or thicker plywood (do not use the crate sides!)

3.2.1 Removal Procedure

- Insert the handles and tilt the bender back.
- Place the plywood as shown in Figure 3.5.

Figure 3.5: Tilt Back to Insert Plywood

- Carefully roll the bender down the ramp.

Figure 3.6: Roll down the ramp

3.3 Moving the bender with a forklift

Warning

Incorrect lifting is a tip hazard!

The machine is both top-heavy and heavy towards the spindle end.

Make sure the forks are correctly positioned in the pocket as shown. We recommend using straps to stabilize the unit on the forklift.

The bender may be moved by lifting the base with a forklift in the fork access slot.

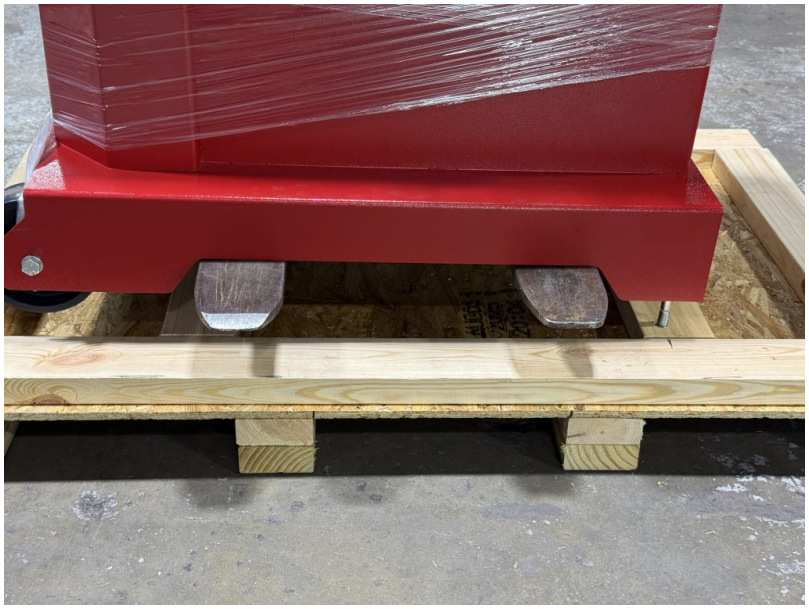


Figure 3.7: Lifting with Forks

Assembly

4.1 Movement Handles

Manual movement handles can be made from 1" Sch. 40 pipe or 1 1/4" round tubing cut at least 5' 6" long.

4.1.1 Using the Movement Handles in the Integrated Supports

Insert the handles into the holes in the upper rear of the machine base. Make sure to insert the handle through the internal support rib before lifting the machine.

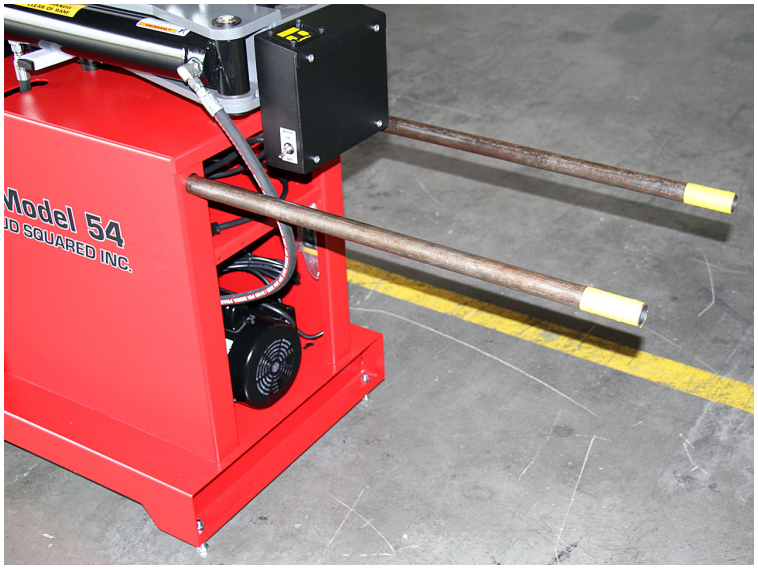


Figure 4.1: Handles in Integrated Supports

4.1.2 Using the Movement Handles in the Exterior Supports

Insert the handles through the holes in the exterior supports. Make sure to insert the handle at least 2" through the second support rib before lifting the machine.

Figure 4.2: Handles in Optional Exterior Supports

4.2 Floor Mounted Installation

The machine must be level to ensure the best results. Floor mounting gives the most adjustment range, and the most rigid setup after installation.

Figure 4.3: M54 Floor Mounted Installation

1. Remove the front wheels.
2. Install four 1/2" threaded anchors using the stand holes or the measurements in Figure 4.5. The stand dimensions may vary slightly after manufacturing. Verify the hole locations against your machine before installing the anchors.
3. Mount the machine using three washers and three nuts per corner.

Figure 4.4: Front Corner, Wheel Removed

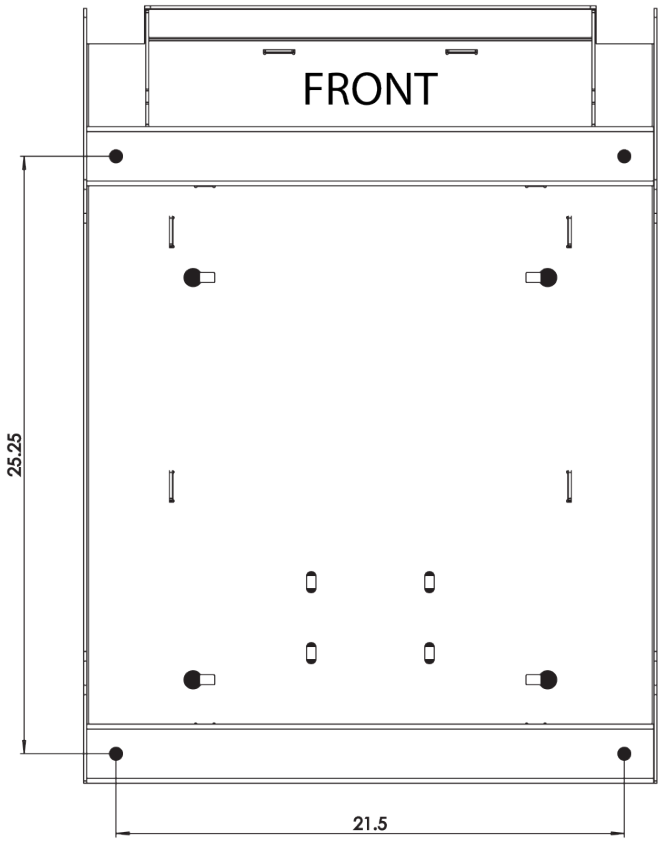


Figure 4.5: Stand Mounting Hole Dimensions

4.3 Wheel Mounted Installation

The machine can remain mounted on the wheels if mobility is desired. Use the 1/2" bolts, nuts, and washers removed from the crate as shown in Figure 4.6. The head of the bolt must face down.

Figure 4.6: Leveling Bolts

4.4 Leveling The Spindle

1. Remove 1 of the 4 socket head cap screws from the top of the spindle.

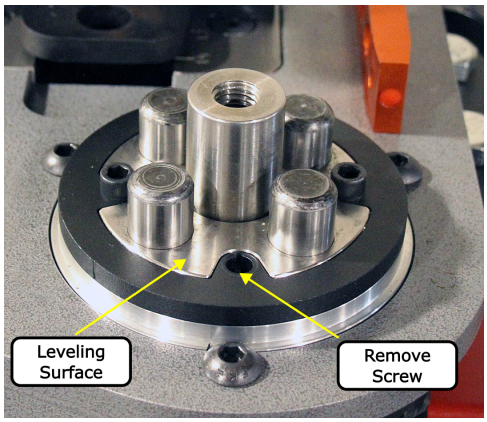
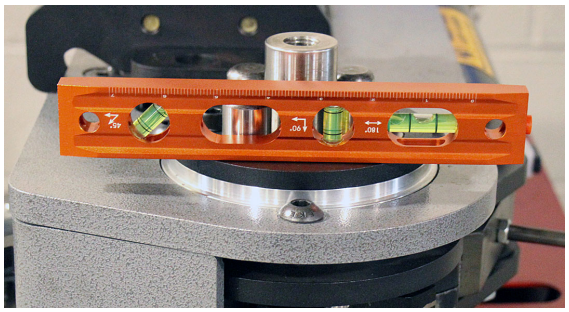


Figure 4.7: Spindle Leveling - Socket Head Cap Screw Removed

2. Place a level on the spindle's upper surface. Do not place it anywhere else, such as the top of the screws or dowel pins.
3. Level the spindle by rotating 90° from the front to the side and adjusting the leveling nuts depending on your installation type.



(a) Level Side to Side

(b) Level Front To Back

Figure 4.8: Spindle Leveling

4.5 Optional: Install the WIFI antenna

Figure 4.9: Wifi Antenna

4.6 Filling The Hydraulic Oil Tank

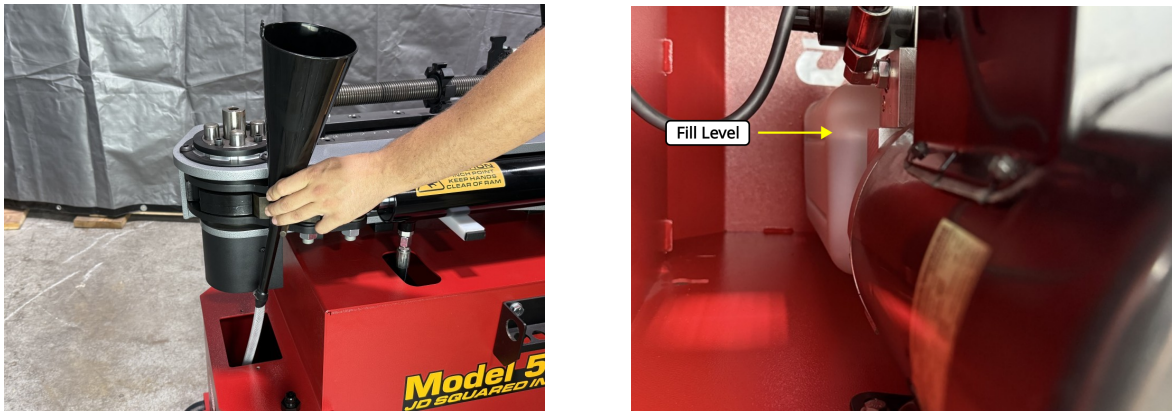
The bender is shipped without hydraulic oil per transportation regulations.

1. Remove the front oil tank access cover.

(a) Access Panel (b) Fill Port

Figure 4.10: Oil Tank Access Panel and Fill Port

2. Fill the reservoir to approximately 1" below the top of the tank with ISO-68 hydraulic oil. ISO-32 is also acceptable. The oil level may be seen easily through the JD2 logo or from the rear of the motor using a flashlight.



(a) Funnel with Tube (b) Minimum Fill Level

Figure 4.11: Oil Filling

4.7 Assembling The Toggle Mechanism

1. Remove the bolts, washers and sleeves from the handle.

Figure 4.12: The Handle Assembly with Bolts, Washers and Sleeves

2. Locate the 2 empty slots and holes. Place a sleeve in each one of the two lower holes.

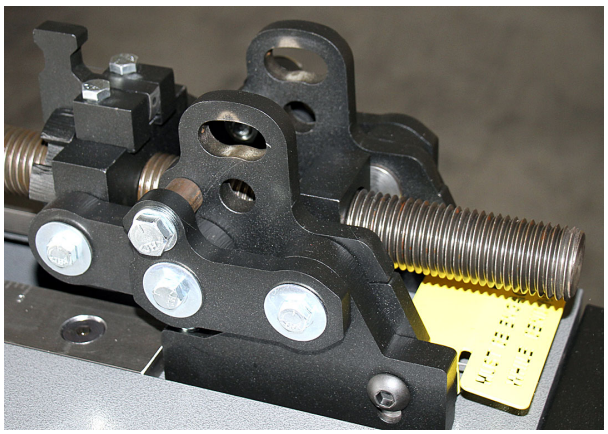
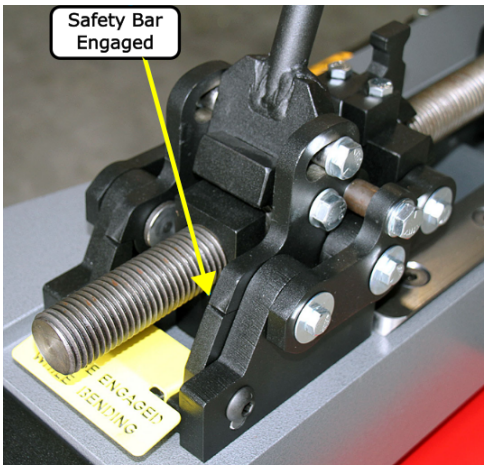
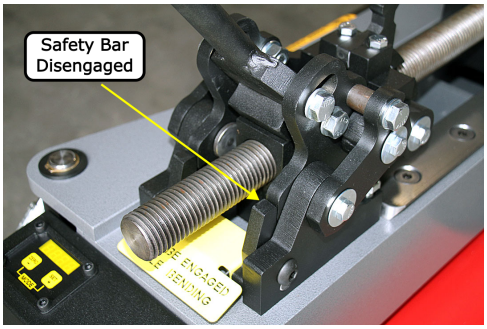


Figure 4.13: Toggle Mechanism Without the Handle Installed

3. Install the handle with the welded block to the rear of the bender using the 2 bolts and washers.
4. Install a sleeve in each slot. Install the remaining two bolts and washers into these sleeves. Tighten all the bolts in the entire mechanism securely.
5. Verify the toggle moves freely and the safety bar engages and disengages smoothly.



(a) Safety Bar Engaged



(b) Safety Bar Disengaged

Figure 4.14: Safety Bar

4.8 Adjusting The Toggle Mechanism Over-Center Distance

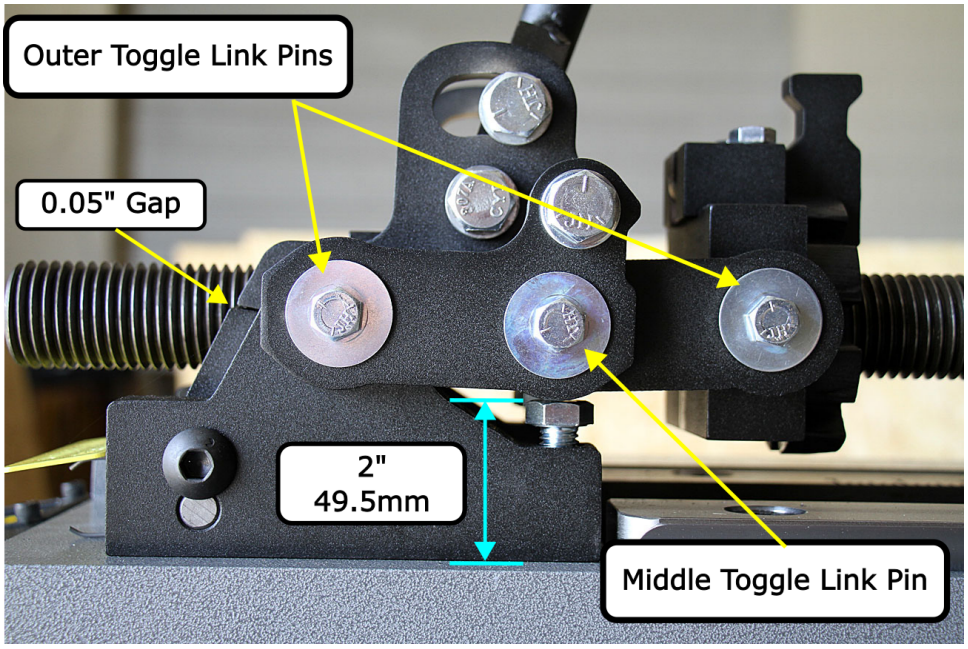
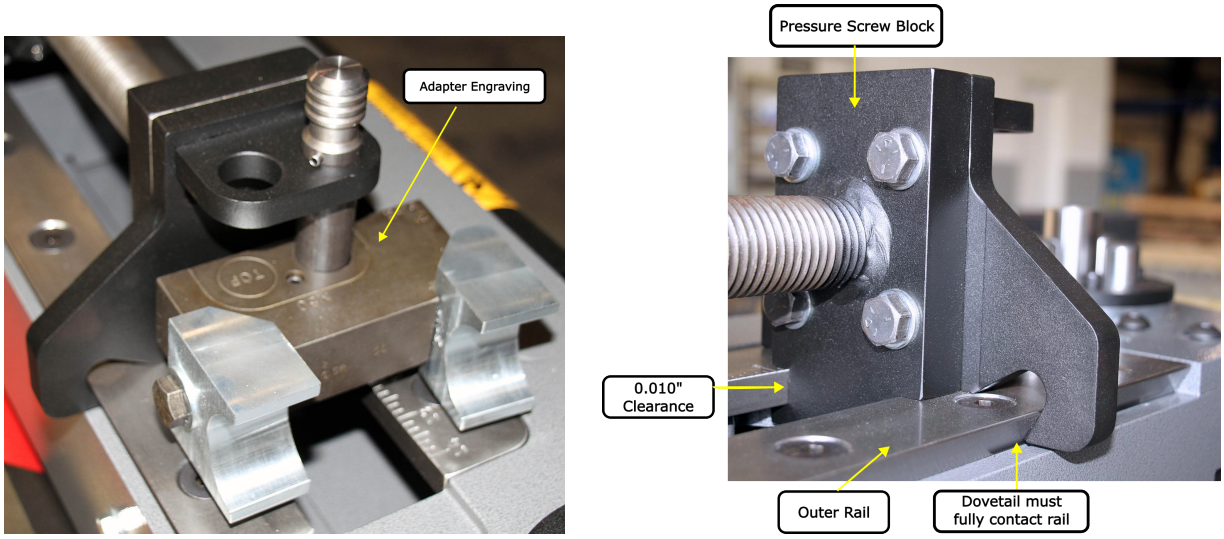


Figure 4.15: Toggle Mechanism Side View

Proper adjustment of the toggle mechanism is critical for safe operation of the bender. The principle of the toggle mechanism is simple. When engaged, the middle pin will be slightly below the outer pins under load creating an over-center condition that prevents the toggle from disengaging.

The distance that the middle pin is adjusted below the outer pins determines how difficult it will be to disengage the toggle mechanism after the bend is complete. The factory setting for the top of the adjuster bolt is 2" above the frame. The middle pin is 0.050" below the outer pins when fully engaged. Always adjust the mechanism to these settings after toggle disassembly or repair.

4.9 Tool Plate Installation



(a) Tool Plate Front View

(b) Tool Plate Rear View

Figure 4.16: Tool Plate

The Model 54 uses various tooling plates that bolt to the pressure screw block depending on the application. The majority of die sets use the standard two hole tool plate included with the bender. This plate accommodates die sets for up to 2.5" tube and 2" pipe. However, a die set such as 3" o.d. tube may require a different tool plate. The correct tool plate for a particular die set can be determined by examining the tooling for the engraved markings.

Note

The dovetailed tool plate design was added to the Model 54 in April 2014. If the bender was purchased before that date it will not have the dovetail tool plate installed. We feel this is a significant improvement to the bender and offer it as a **FREE** upgrade.

Please contact the sales department for more information.

Under load the dovetail in the tool plate will slide down the outer rail dovetail and lay flat ensuring the tool plate pin-holes are correctly aligned.

Important

It is **CRITICAL** that the tool plate and the outer rail dovetailed surfaces are in full contact under load.

4.9.1 Verifying the Dovetails are in Full Contact

1. Remove die set components from the bender.
2. Push the tool plate to the left towards the cylinder and try to raise the side nearest the outer rail. It should not lift or tilt.

4.9.2 Adjusting the Dovetail Contact after Field Installing the Upgrade

If the dovetails do not make full contact, there is not enough clearance between the inner rail and the pressure screw block left side slot.

1. Remove the pressure screw.
2. Use the edge of a file to remove material from the bottom of the left slot until there is a clearance of approximately 0.010". Usually, it is required to remove approximately 0.020" - 0.030" material.

Note

You may also send the pressure screw to the factory, and we will make the necessary modifications.

Contact the support department at support@jd2.com for more information.

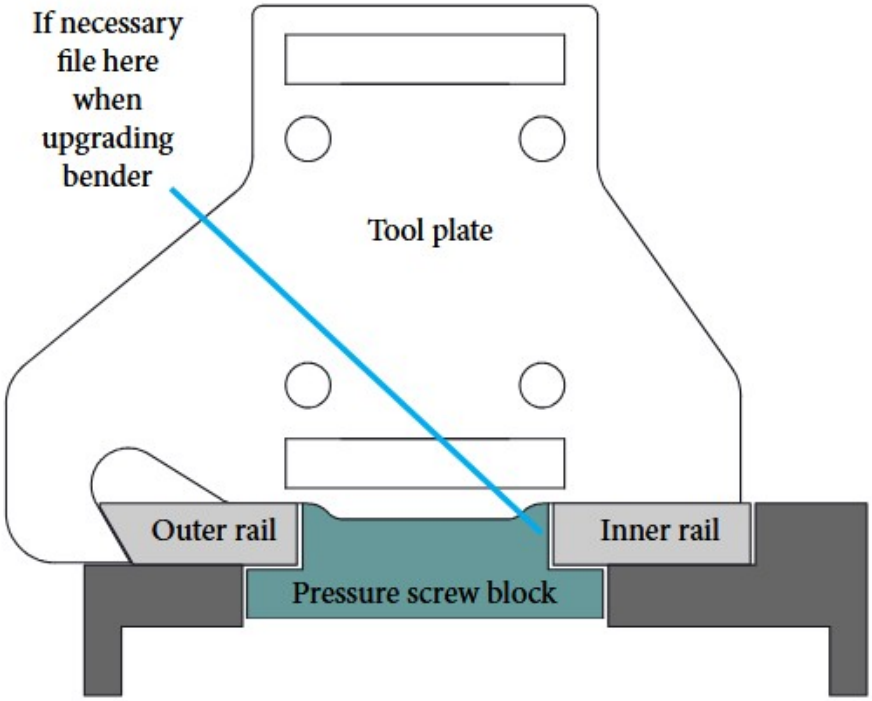


Figure 4.17: Pressure Screw Block Drawing

4.10 Electrical Connection

- Standard Required Power (North America): 115VAC, 60Hz, 1-PH, 15A
- Optional: 230VAC, 50-60Hz, 1-PH, 10A

Important

Extension cords are not recommended for 115VAC supply.

If you must use an extensions cord, use the shortest 10 AWG cord possible. Incorrect extension cord size or length may cause pump stalls under pressure or nuisance breaker tripping.

Operation

5.1 Rotate spindle to its start position

- Retract the ram until it stops moving and then move it forward slightly.

> **Note**
>
> Fully retracted, the ram will pull the spindle to the rear and act as a brake. This does not harm the machine, but rotating the spindle by hand is very difficult.

- The drive hub has 7 teeth. The first tooth is much larger than the others. Pull the spring-loaded drive pawl handle out and rotate the spindle until the drive pawl engages the first tooth.

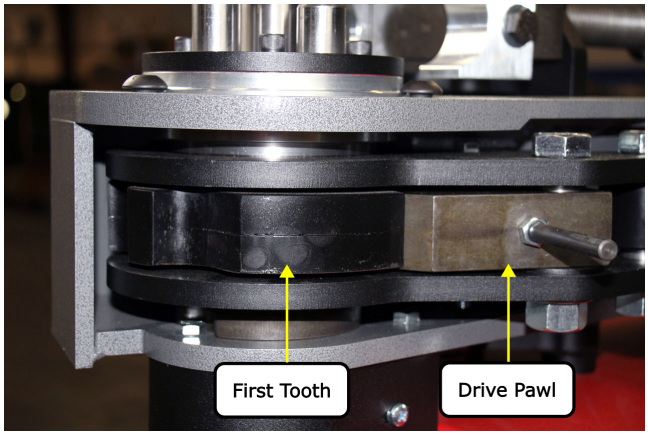
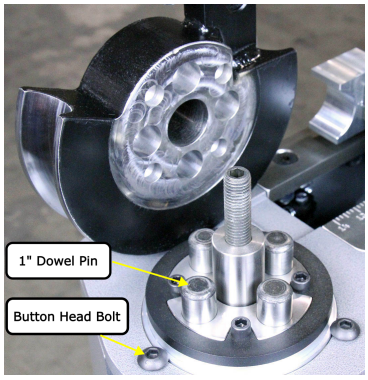


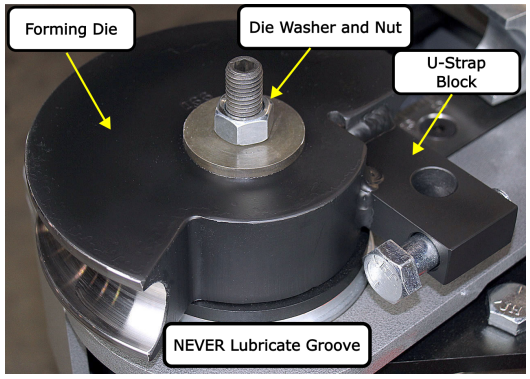
Figure 5.1: Drive Hub and Pawl in Start Position

5.2 Installing the forming die onto the spindle

- Examine the spindles upper surface and remove any debris. Make sure the four 1" dowel pins are seated completely.
- Install the forming die with the u-strap block towards the cylinder.
- Install the die washer and nut. Tighten securely.



(a) Spindle Top Components



(b) Forming Die Components

Figure 5.2: Die Set Nomenclature

5.3 Installing the U-Strap

- Wipe the forming die groove clean.

> **Note**
>
> Never lubricate the forming die groove.
>
> The tube must not slip against this surface during bending.

- Place the tube into the forming die groove.
- Install the u-strap and insert the u-strap pin.

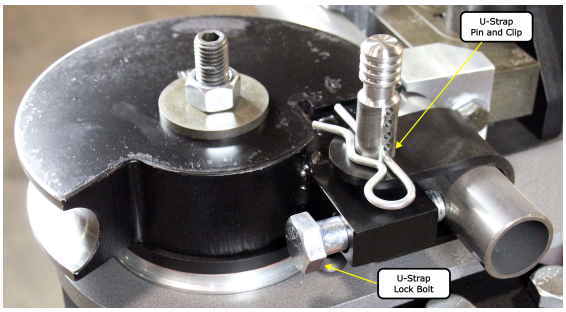


Figure 5.3: U-Strap Installed

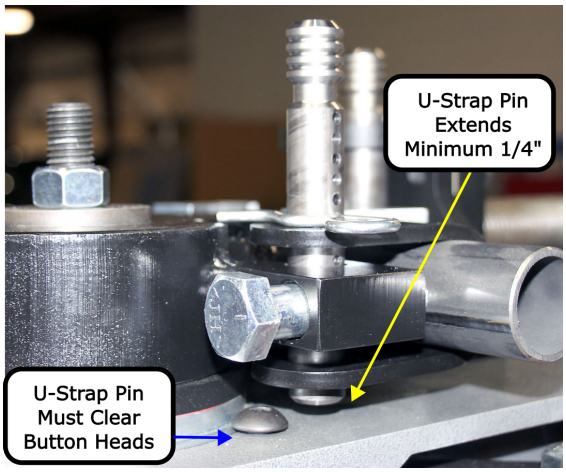


Figure 5.4: U-Strap Pin Adjustment

> **Note**
>
> The u-strap pin uses an adjustable clip to limit how far the pin extends below the lower u-strap surface.
>
> It is very **important** that the u-strap pin extends past the u-strap lower surface by at least 1/4", but still clears the top of the spindle button head bolts.

- Tighten the u-strap lock bolt to help prevent the tube from slipping while bending. Inserting a shim between the bolt and tube can prevent unwanted marks in softer materials.

5.4 Pressure Die Assembly

The pressure die, sometimes referred to as a 'follow-bar', is shown in Figure 5.5. It constrains the outside of the tube while bending.

(a) Top View (b) Bottom View

Figure 5.5: Pressure Die

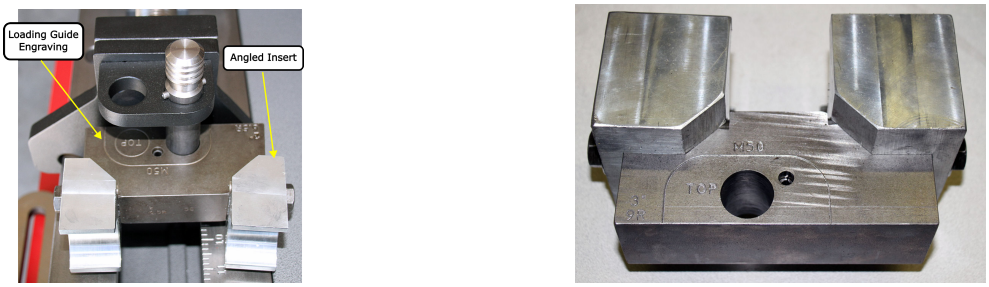
The inserts are cast and machined from a special, scratch and wear resistant metal alloy that is self lubricating and considered a consumable. Typical life span is 1,000s of bends when using clean tubing. The left insert is in line with the backing block and the right insert is angled. The angled insert is the trailing insert and installed closest to the u-strap during bending. It helps to minimize the amount of flattening on the outside of the bend. The insert angle is calculated to 1/1000th of a degree at the time of manufacture to produce the best bend conditions for the size of tubing and the bend radius.

> **Note**
>
> Incorrect installation of the pressure die will cause poor bend quality.

The roll pin installed in the bottom of the pressure die keeps the alignment close to the center of the forming die when the pressure screw is retracted. It must be adjusted so that the insert's grooves are approximately 1/16" below the forming die groove when the tube is not loaded. The pressure die must be allowed to rise slightly and self align when the toggle assembly is advanced to the bending position. The standard tool plate has 2 pin-hole locations allowing the rear insert force to be tailored to the tubing being bent.

5.4.1 Installing the Pressure Die Into the Bender

The top surface of the pressure die is engraved with word TOP, a circle, and tool plate outline. The engraving illustrates which tool plate is needed and what hole to place the 1" pin into.



(a) Pressure Die Installed in Two Hole Tool Plate (b) Pressure Die for Single Hole Tool Plate

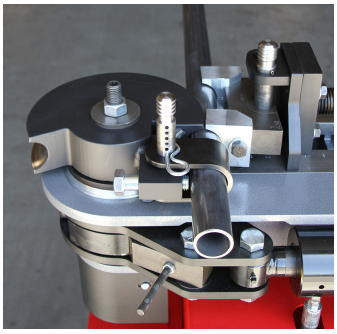
Figure 5.6: Pressure Die Installation

Place the pressure die into the tool plate and align it with the engraved markings aligned with the tool plate's outline. Ensure the 1" pin is completely seated.

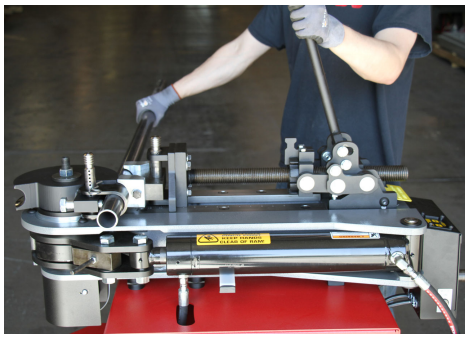
5.5 Adjusting The Toggle Mechanism

The Model 54 has been designed to make it easy to obtain repeatable bend angle, but the toggle mechanism must **ALWAYS** be set to the **EXACT** same position every time a particular die set and tube combination is used. Properly adjusted, the tube to bend will extend out of the side of the bender at 90° to the frame during bending.

- Load the die set, tube and u-strap components as described earlier.
- Install the pressure die.
- Lift the index wheel lever to disengage it from the slot.
- Push the pressure die forward until it wraps over the tube completely as shown in Figure 5.7.



(a) Tube Installed

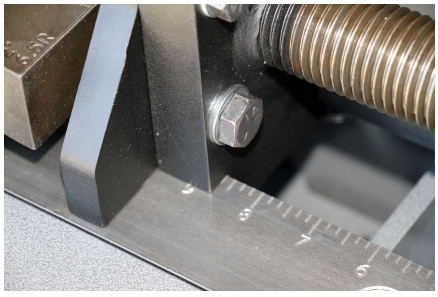


(b) Pulling Rearward on Tubing

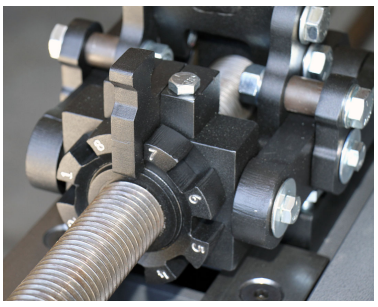
Figure 5.7: Loading Tube

- Push the toggle lever to the full forward locked position. The safety bar will engage. If it doesn't, you may need to unscrew the index wheel to lock the toggle mechanism.
- Adjust the index wheel to the rear of the screw as far as it will go.
- Pull rearward on the right side of the tube as shown in Figure 5.7. If the tube does not stop at 90° to the frame, push the pressure die forward again and readjust the index wheel a little further rearward. Disengaging the toggle to the rear position makes this much easier.
- Lower the index wheel lever into the nearest slot.

  For this particular die set you should **ALWAYS** return the pressure die to this **EXACT** setting every time it is installed. We recommend recording the setting in Figure 5.8 as 8.3.7 and then stamp it into the top of the die. The 8 is the major number from the side scale as shown in the left image. The 3 is the number of **WHOLE** increments past the 8 and the 7 is the slot used in the index wheel. The whole increments increase when the index wheel advances past the 8th mark and returns to 1.



(a) Side Scale at 8.3



(b) Index Wheel in Slot 7

Figure 5.8: Pressure Screw Adjustment

5.6 Making a Bend and Removing the Tube

- Load the tube to be bent and adjust the toggle mechanism to align the tubing 90° to the frame.
- Lubricate ONLY the outside of the tube where the pressure die slides. Cooking spray works surprisingly well.

> **Important**
>
> Do **NOT** oil the groove of the forming die.

- Verify the pressure die 1" pin is fully seated and extends below the lower plate.
- Verify the u-strap pin extends below the u-strap by a 1/4" or more and will not hit the button head bolts or frame during bending.
- Stand well clear of the toggle lever's ENTIRE range of travel.

> **Warning**
>
> Injury may result in the extremely unlikely event the lever snaps back under load.
>
> Never stand in the path of the toggle lever while the machine is under load.

- Press the ram advance button on the pendant to start bending.

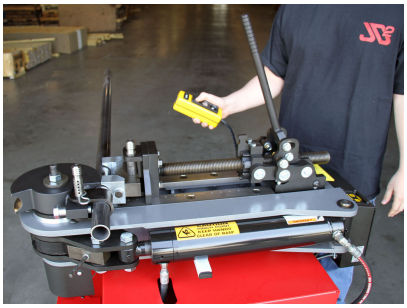
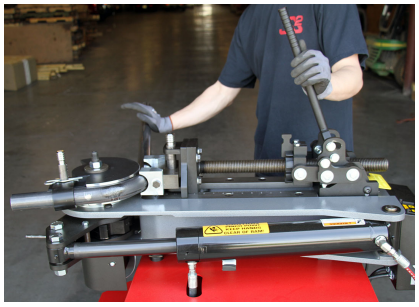
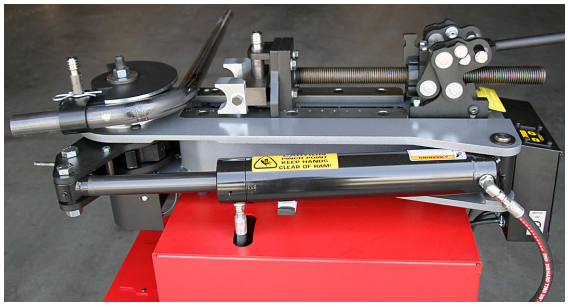


Figure 5.9: Pressing Advance Button

- Upon completion, retract the ram a small distance to relieve the bending pressure. Most of the time the tube will come loose by itself, however, you may hit the rear of the tube to help dislodge it.
- Press the safety bar down and retract the toggle lever. You can now remove the tube.



(a) Striking End of Tube to Release



(b) Toggle Mechanism Disengaged

Figure 5.10: Releasing Toggle Mechanism After Bend

5.7 Spindle Lock

If the spindle is allowed to rotate backwards the pressure on the tube relaxes. The tube can then lift slightly in the die groove causing problems when the bend is continued. This movement is the main cause of wrinkling thin wall tubing (0.065" or less). Bend accuracy also suffers if the tube slides backwards in between ram strokes.

To bend beyond 90°, the spindle lock is engaged to maintain pressure while the ram is being retracted. It locks at 22.5° intervals to prevent the forming die from rotating counter-clockwise.

> **Note**
>
> The spindle lock is not needed for bends up to 90°.
>
> A single stroke of the ram advances the spindle approximately 115°.

Push the spindle lock lever forwards to disengage.

Pull the spindle lock lever to the rear position to engage.

5.7.1 Bending with the Spindle Lock Engaged

(a) Spindle Lock Engaged (b) Spindle Lock Disengaged

Figure 5.11: Spindle Lock

- Engage the spindle lock by moving the lever to the rear position.
- Extend the ram to begin bending. The lever will move back and forth as the bend progresses. Every 22.5° you will hear the spindle lock click into the locked position.
- At approximately 90° of bend you will hear the spindle lock engage again. Immediately stop bending.

> **Note**
>
> Stop the bender as soon as possible after the lock has engaged.

- Retract the ram until the drive pawl engages another tooth. Retract ram fully to its start position to make a 180° bend with only two extensions of the ram.
- When the bend is complete, move the latch to the forward position to disengage the spindle lock.
- Retract the ram and remove the tube.

How to Calculate the Correct Spindle Angle for a Bend

There are three values that need to be added together in order to determine what angle the spindle must rotate to achieve the desired finished bend angle in the tube.

1. Bend Angle: The finished degree of bend we want to make. For this example, 90°.
2. Material Springback: The amount to bend past 90° to account for the spring back of the material. Springback is very dependent upon material shape, thickness, hardness, etc.
3. Loading Angle: The number of degrees the spindle must rotate before the tube actually starts bending. There must be play in the u-strap and pressure die to allow the tube to be loaded.

   Loading angle can also be affected by beginning a bend from any tooth other than the first tooth. Starting at a ram position that maximizes leverage on the drive mechanism is useful when bending near the limits of the machine capacity.

The simple controller requires manual recording of the springback, loading angle, etc. The touch-screen HMI keeps this information stored and automatically applies the values for the selected material combination.

6.1 Finding the Loading Angle

1. Load the tube and die set.
2. Tap the extend button on the pendant to advance the cylinder until the excess play in the tube has been removed.
3. Record the spindle angle displayed as the loading angle.

6.2 Finding the Springback angle

1. Advance the spindle until it is near the desired bend target plus the loading angle (simple controller), or the bend target (HMI1000).
2. Retract the cylinder a short distance to relieve the pressure on the tube.
3. Disengage the toggle and remove the tube.
4. Measure the bent angle. It will most likely be short of the desired angle. For example, if the desired bend is 90° and we measure the tube bend at 85°, the Springback angle will be 5° (90° - 85°).

6.3 Bending to the Desired Bend Angle

The spindle target is calculated by adding the bend angle, loading angle, and springback angle for a specific die set and tube combination.

```
SPINDLE = BEND + LOAD + SPRINGBACK
```

Note

Variations in tube from manufacturers will cause a variance in the finish bend angle.

Bending Tutorial Using Template Bends

7.1 The Easy Way To Position Bends

Learning to operate the bender is fairly easy. The real challenge is accurately placing the tube into the bender so that the bend comes out in the right position. This tutorial will teach you a technique called **Template Bending** to make a rollbar. This is a good example because it's a common request and there are no simple 90° bends.

First, you need to make a template. A template is a piece of tubing bent to 90° with 6" or more of straight tubing left on each side of the bend.

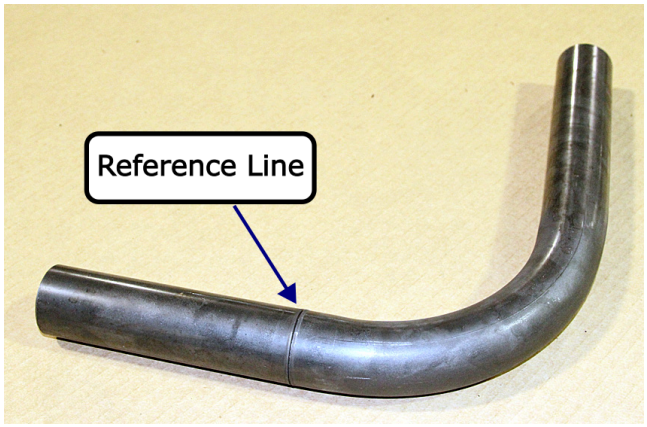


Figure 7.1: Template Bend

A reference line cut into the template that allows you to visualize where the bend marks should be placed on the tube to be bent. After bending your tube will spring out to a larger radius than the forming die's size indicates. The larger the O.D. or the stronger the tube, the greater the springback. For instance, chrome-moly tubing will springback roughly twice as far as the exact same size and wall thickness of welded seam mild steel tubing. By using a template bend of the same kind of tubing you are going to bend, you do not have to worry about this springback because the template has already sprung out to its finished size.

Cut a piece of tubing roughly 30" long. Next, cut an accurate line all the way around the tube 6" from the end.

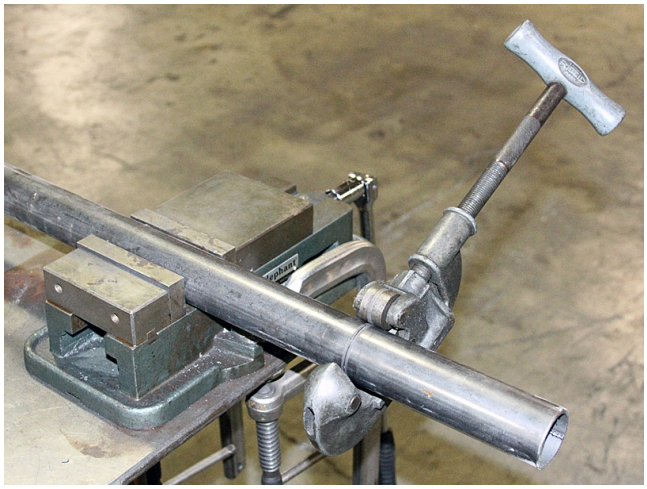


Figure 7.2: Cut Reference Line

The best way to do this is to use a pipe cutter. Hand scribing this line is difficult and not recommended. To the right is shown the reference line being cut into the tube.

Load the tube into the bender as shown in Figure 7.3. The reference line must be positioned EXACTLY at the flat side of the forming die where the u-strap block has been welding onto the die. You must always use the forming die's flat side as a reference.

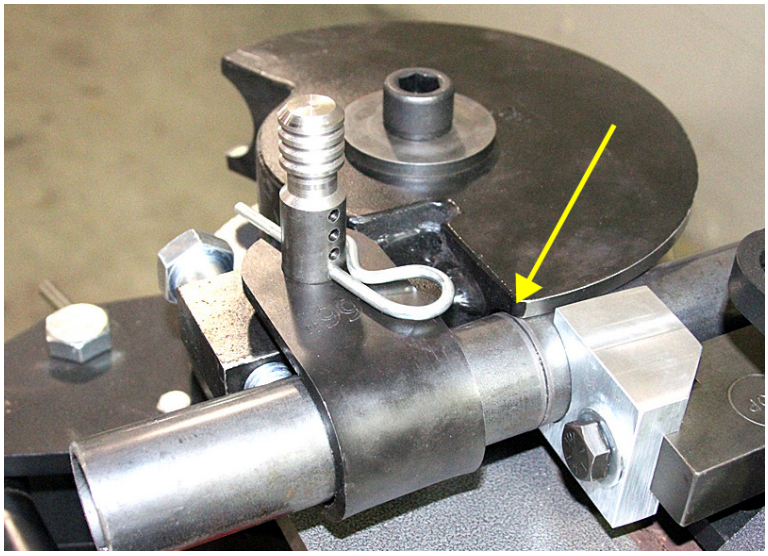


Figure 7.3: Reference Line at Flat Side of Forming Die

Bend the tube to 90°. If the forming die has a lock bolt on it, use it to securely tighten the tubing in place. It's very important that this mark stays in line with the die's flat edge during the bending process or the template will not give you accurate results later.

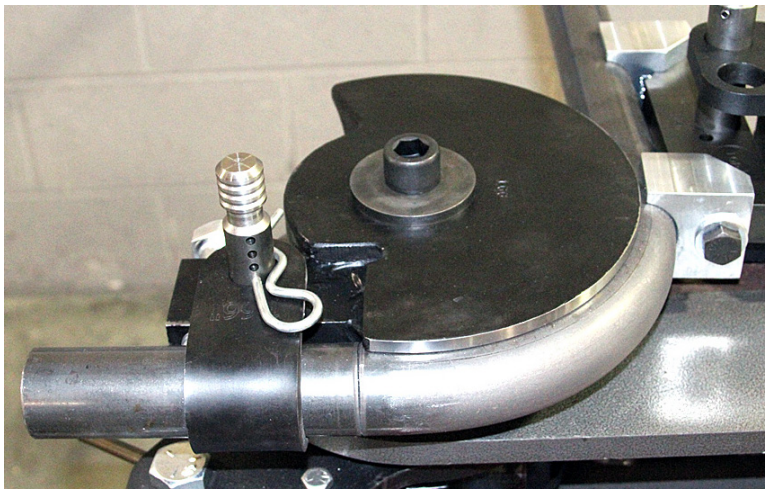


Figure 7.4: Template Aligned After Bending

Note

The distance between the reference line and the beginning of the bend in the tube is called the **Lead-In Length** in the HMI1000 technical library.

7.2 Example Part

The rollbar will be 40" tall from the floor to its UPPER side. It will be 62" wide, outside to outside. The top two bends are 70° and the two lower bends are 20° .

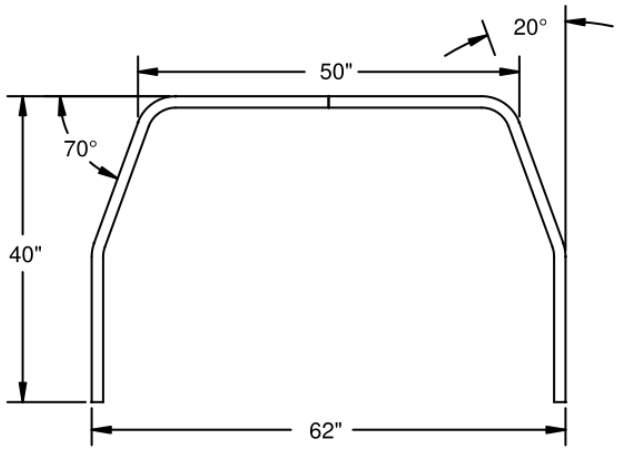


Figure 7.5: Rollbar Dimensions

To determine the total length of tubing needed, you could sit down and calculate it. Time usually cost more than tubing, so let's do it the easy way. Take the total width of the rollbar (62") and add it to twice the height (40"). This gives us a length of 142" (62" + 40" + 40"). This is slightly longer than we actually need, but there's a popular rule in fabricating: It is easier to remove material then to add it. Through experience, you will learn how much extra tubing you must leave to complete the part.

An important rule of bending is, if possible, always make the bends closest to the center first and work your way out. This allows you to make measurement corrections between bends. Based on this rule, place a mark at the center of the rollbar tube.

7.2.1 Bend 1

The first bend will be the upper right side bend. The upper dimension of the rollbar is 50". From the center of the rollbar to the outside of the bend is 25" (50" divided by 2). Lay the tube to be bent on the floor and hold the template above and parallel to it as shown below. The scribed side of the template will always face towards the center of the tube being bent. Using a tape measure, slide the template left or right until it is 25" from its outside edge to the rollbar's center mark as shown to the right. Using a marker, draw a line on the rollbar directly below the scribed line. Since the desired bend is only 70° and the template is 90°, you will have to use your best judgement of when the template is 25" out. This gets easier with experience. Take note of what side of this mark the bend needs to be and draw an 'X' there so that when you load the tube into the bender you'll be bending on the correct side. Now, load the tube into the bender and make the first bend. Don't forget to over bend a little to account for tube springback. For this material 3 to 4 degrees should be sufficient. Once you know the correct over bend required, you may want to record it for future reference.

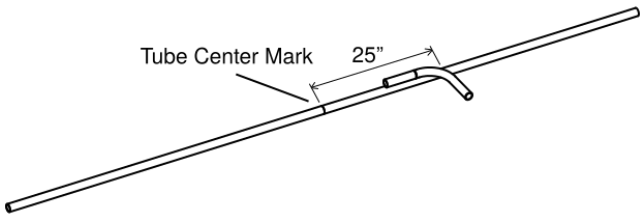


Figure 7.6: Template Positioned for Bend 1

7.2.2 Bend 2

Place the template above the rollbar tube with the reference line facing bend 1 as shown below. Slide it to the desired 50” outside-to-outside of the two top rollbar bends. Do NOT use the tube’s center mark as a reference and place the template 25” left of center. The reason is that if the first bend was not made at the correct position to achieve 25” from rollbar’s center you can correct this error in the second bend’s position. Mark the rollbar tube exactly underneath the template line and make the second 70° bend. Erase the center mark on the rollbar tube and mark a new center exactly midway between the outside of the two bends.

Why?

Let’s say your measurement shows the two top bends are really 50 1/4” wide instead of the desired 50”. In that case, your old center mark could be off by as much as a 1/4”. The NEW center mark corrects this error. With template bending your errors can generally be fixed in the next bend. If you had started bend 2 from the rollbar’s center mark you would not have made the correction. Eventually, every bend adds a little more error and you end up with a rollbar that does not fit.

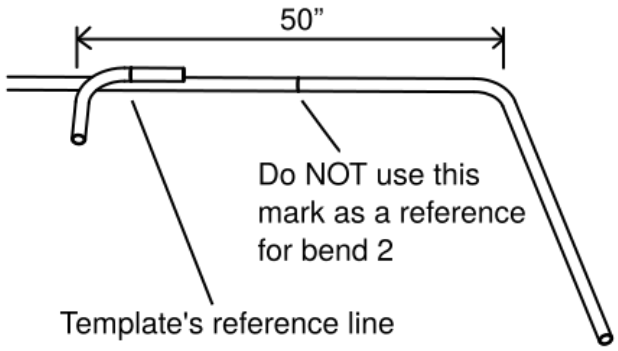


Figure 7.7: Template Positioned for Bend 2

7.2.3 Bend 3

At this step you may want to use a large 90° square to help position the template. Position the template above the rollbar tube with the template line facing up towards the top of the rollbar as shown in to the right. Slide the template up or down the rollbar tube until its outside is 31” from the rollbar’s center. Mark your tube and make the bend.

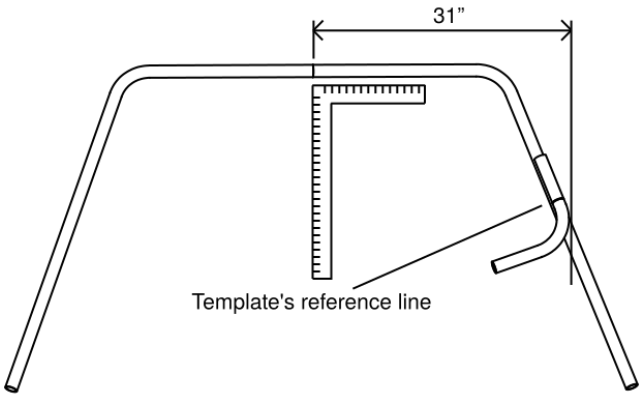


Figure 7.8: Template Positioned for Bend 3

7.2.4 Bend 4

Position the template with the template line facing up towards the top of the rollbar as shown to the right. Slide the template up or down the rollbar tube until its outside is 62” from the outside of the 3rd bend. Also, verify the bend is the same distance down the tube from the top of the rollbar. If all is correct mark the tube and make the bend. Finally, cut the ends of the tube to make the rollbar 40” tall and you are done.

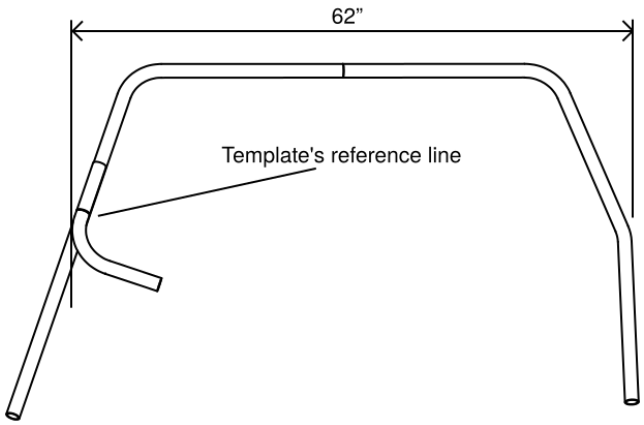


Figure 7.9: Template Positioned for Bend 4

Simple Controller

8.1 Computer modes

The computer has only 2 modes, the program selection mode and the operation mode. In the program selection mode, the display flashes between the selected program number and its degree setting. The operating mode shows the current degree of spindle rotation and the display does not flash. To change from one mode to the other, press both buttons together.

Figure 8.1: Simple Control Mode Selection

8.1.1 Program selection mode

Program selection mode allows you to select 1 of the 100 targets available in the computer. At start up, the computer is in this mode and displays the program in use when the bender was turned off. Select a different program by pressing the + or - key until the one you want is displayed.

Advancing past the program number range shows the cylinder selection menu, encoder calibration menu, and settings values. Do not change the settings values without consulting the factory.

8.1.2 Operation mode

Operation mode displays the current angle of the spindle. To change the target bend press the + or - key until the angle you want is displayed. Two seconds after releasing the button the computer will store this value permanently into memory.

> **Note**
>
> A video of the computer's operation is available online at www.jd2.com

M54 HMI1000

Previous generations of the M54 Tube Bender have required manual management and calculation of spindle parameters for every bend.

The HMI1000 is a 10.1" touchscreen interface that digitizes all of this knowledge and allows for quick recall of parameters, and parts that were created in the past.

Single bend mode reflects the operation of the previous generation control, allowing for a gradual adoption of more advanced features for existing users.

The software includes a Technical Data Library primed with

- All standard manufactured M54 die sets
- A selection of common material specifications such as A513, 4140, etc.
- A selection of common material profiles such as IPS, EMT, round tube, square tube, etc.

Future updates can be installed by connecting the machine to the internet using the WIFI connection, or by manually copying update bundles using a USB drive.

Please see the HMI1000 operation manual supplement for more information.

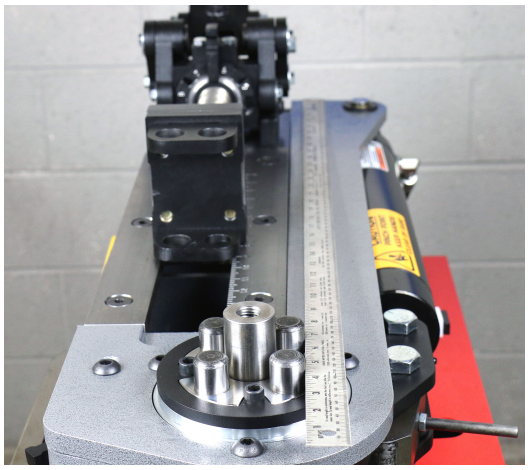
You can download the latest supplement from:

https://apps.jd2.com/m54-hmi1000-op-supplement.pdf

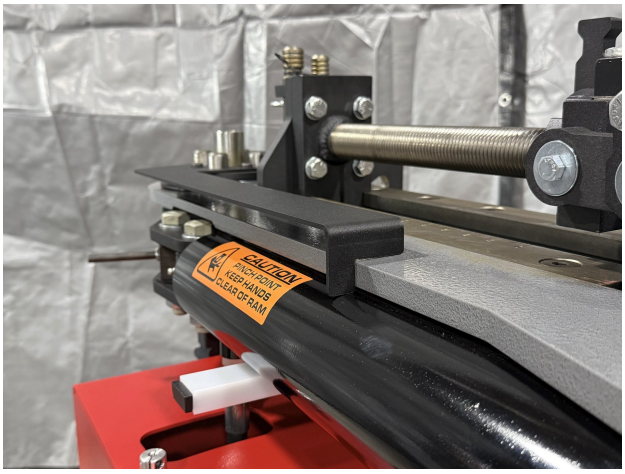
Maintenance

10.1 Calibrating the Spindle Encoder

1. Fully retract the cylinder. This will bind the spindle and lock the spindle in place. To free up the spindle, advance the cylinder slightly until the spindle can rotate freely. Rotate the spindle to its normal starting position where the largest tooth on the drive hub would engage.
2. Rotate the spindle clockwise 45° so that the 2 left side dowel pins are parallel to the bender frame. The drive pawl will be in position to drive the 2nd tooth. Place a straight edge against the 2 dowel pins closest to the cylinder. Rotate the spindle until the ruler is aligned to the side of the bender frame. You may need to disengage the drive pawl if you can't rotate the spindle back far enough to line up the ruler.



(a) Using a Ruler to Align Spindle



(b) Using a calibration gauge.

Figure 10.1: Spindle calibration setup.

> **Note**
>
> We offer calibration gauges for this process.
>
> Contact the sales department for more information.

3. Loosen the encoder coupling **UPPER** set screw.

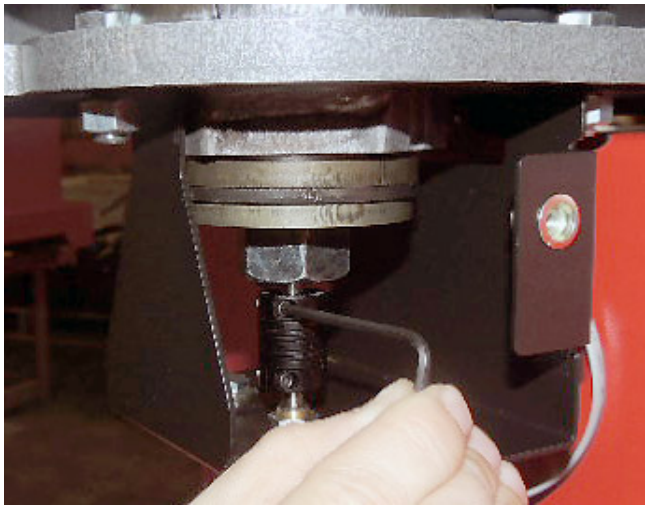


Figure 10.2: Adjusting Encoder Coupling

4. Being sure not to let the spindle move, rotate the encoder until the display reads between 40° to 50°.
5. Tighten the set screw.

10.1.1 Simple Control Interface

1. For the simple control interface, select the encoder calibration menu and press both buttons.
2. Press both buttons again to measure the software offset of the encoder.

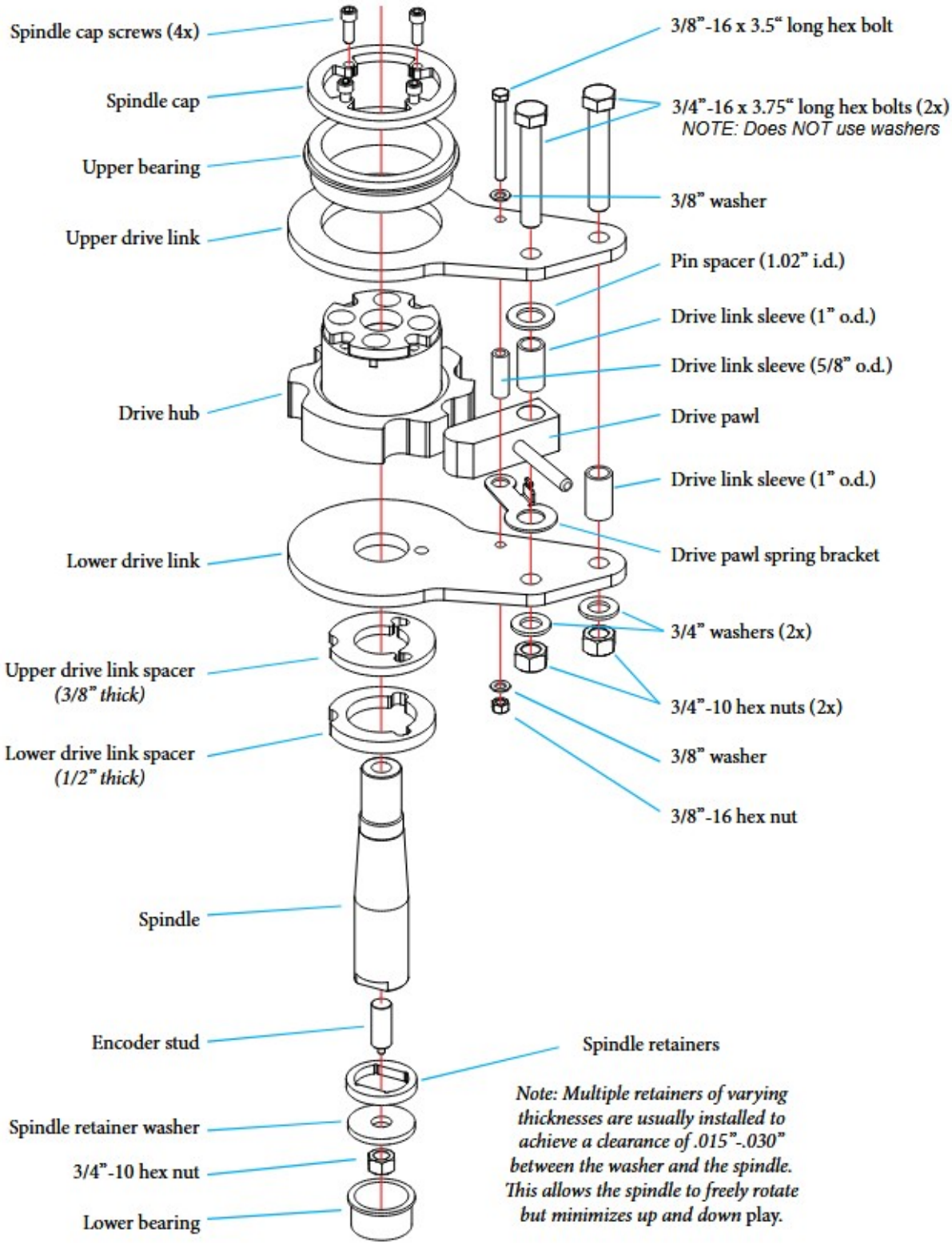
10.1.2 HMI1000 Touchscreen

1. Follow the onscreen prompts in the Spindle settings page.

10.1.3 Verify the Calibration

Verify the calibration by rotating the spindle to known angles and checking the **Spindle** angle displayed.

Exploded view of spindle components



Note: Multiple retainers of varying thicknesses are usually installed to achieve a clearance of .015"-.030" between the washer and the spindle. This allows the spindle to freely rotate but minimizes up and down play.

Installing the Encoder

1) Install the encoder mount.
2) Install the encoder onto the encoder bracket and tighten. Do not place it into the machine.
3) Slide the encoder into the coupling approximately .225" and tighten. Be careful not to strip the small bolt.
   NOTE: The shaft must not protrude into the slotted section of the coupler or it will not be able to flex properly.
4) Position this assembly into the bender as shown. Do not tighten the 1/4" bolts. Adjust the encoder threaded rod up or down so that when tighten, the encoder's shaft only extends into it approximately .225" also.
5) Securely tighten the encoder stud's 3/4" nut.
6) Tighten the 1/4" bracket bolts being careful not to force the coupler out of alignment.
7) Tighten the coupler's upper socket head bolt.
8) Rotate the spindle by hand and verify coupler does not show signs of excessive misalignment. Max run out is .020" total over 360°.

Encoder components