

# ***Model 53 Bender***

## Assembly and Operating Instruction Manual

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# Uncrating



## Parts included with bender:

- 1 Pressure screw pin (1" diameter)
- 1 U-strap pin and hitch pin clip (7/8" diameter with multiple drilled holes)
- 1 Die bolt (3/4-10 x 1.5" SHCS)
- 1 Die bolt washer (3/4" hole)
- 1 6-7.5v DC power supply (110-120v AC)
- 2 1/2"-13 x 2 1/2" long leveling bolts
- 2 1/2"-13 hex nuts
- 4 1/2" washers

1/2" leveling bolts

*Bender's crate with sides and top removed.*

Forklift access slot

1) Remove the top and sides from the crate. Do not discard the two 1/2" bolts used to fasten the bender to the crate's floor.

2) **Removing the bender with a forklift:** The bender may be lifted from the base using a forklift by inserting the forks into the forklift access slot as shown in the above picture. The forks should be spread out as far as they will go into the slot. The bender is very top heavy and you must be careful not to let it tip and possibly fall off the forks. We recommend you use tie downs and strap it to the forks. Also, make sure no one is around the bender that may be hurt if the bender falls off the forks. **GO SLOW AND BE CAREFUL.**

**Removing the bender without a forklift:** The bender may be rolled off the base using the procedure shown in the next 3 pictures. In order to do this you will need to obtain 2 handles and a some 9/16" or thicker plywood. See the section "**Making and installing the handles**" in the assembly section of these directions. Do not use the wood from the crate's side and top because it will not handle the bender's weight.

- 1) Insert the handles and tilt the bender back. Place the plywood as shown in picture 1.
- 2) Carefully and slowly roll the bender down the ramp as shown in pictures 2 and 3.



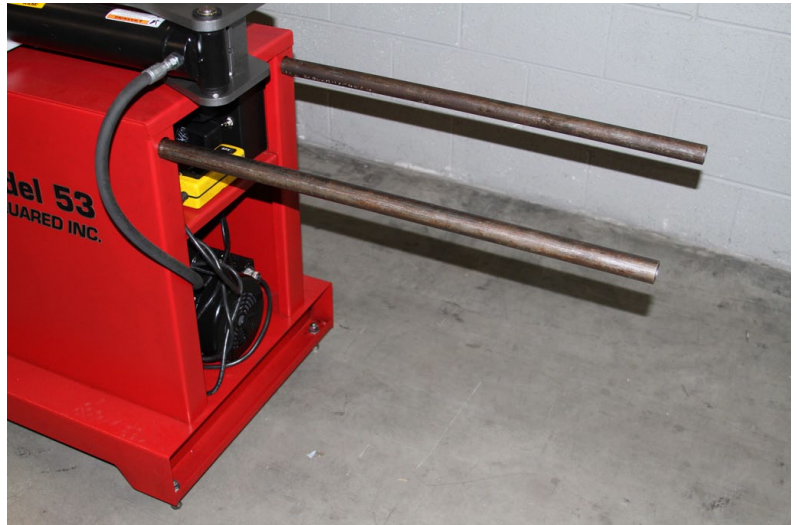
# Assembly

## Moving the bender

In order to save you money, the bender is sold without the moving handles. Why? The 5 1/2 foot long handles will not fit into the bender's crate and therefore must be shipped separately at an average cost of over \$40. The handle material itself however is only around \$10. It's much more economical for you to fabricate them yourself.

## Making and installing the handles

To make the handles, cut 2 pieces of 1" pipe or 1 1/4" tubing to at least 5 1/2 feet long. At the rear of the base near the top are the 2 holes that the handles slide into. Further inside the base are the matching holes for the handles. When you need to move the bender, simply insert both handles into the 2 outer holes and push them past the 2 inner holes until they bottom out. Now you can move the bender around.



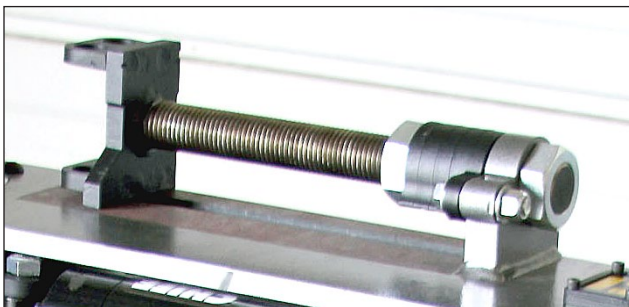
*Bender shown with handles installed. The two rear leveling bolts have also been installed.*

## Rear leveling bolts

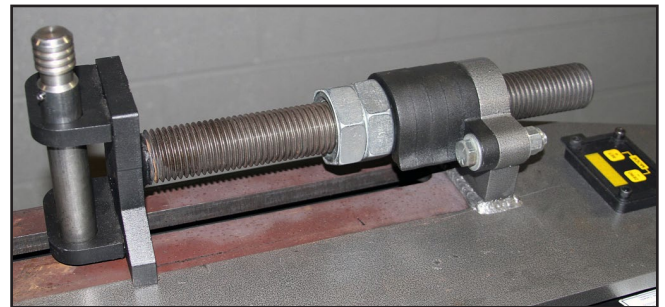
Locate the 1/2" bolts, nuts and washers you removed when uncrating the machine. Install them back into the same holes in the base from where you previously removed them. The head of the bolt must face down. These two bolts are used to level the bender.

## Pressure screw assembly

As shown in the below left picture, the pressure screw is shipped with one of its two nuts installed on the backside of the bender. This prevents it from coming loose while in transit. Remove this nut and slide the pressure screw all the way forward until you can rotate it 90° CCW and remove it from the bender. One of the nuts will have the numbers 1 thru 6 stamped onto each flat side. Install the un-numbered locking nut first and then install the numbered nut so that it will be closest to the flipper. Place the pressure screw back into the bender as shown in the below right picture. Adjust the 1/2" locknut on the flipper so that it pivots easily with minimum play. The locking nut is used to prevent the numbered nut from turning if you're making multiple bends.



*The pressure screw assembly shown as shipped.*



*The pressure screw ready for operation.*

## Fill tank with ISO-68 hydraulic oil

The bender is shipped without hydraulic oil as per regulations. Using commonly available ISO-68 hydraulic oil, fill the pump's oil tank to roughly 1" from the top. In order to make this process easier, you may want to attach a rubber hose to a funnel so that you may snake it into the oil tank. The oil level is easier to see if you shine a flashlight into the bender's cabinet. The oil tank can also be seen clearly through the JD<sup>2</sup> logo cut-out on the front of the bender's cabinet.

## Electrical connections

The bender operates on 115v and requires 2 connections, one for the pump and a separate one for the computer.

PUMP: If you plug the pump into an extension cord, we recommend you use the shortest 10 gauge cable possible.

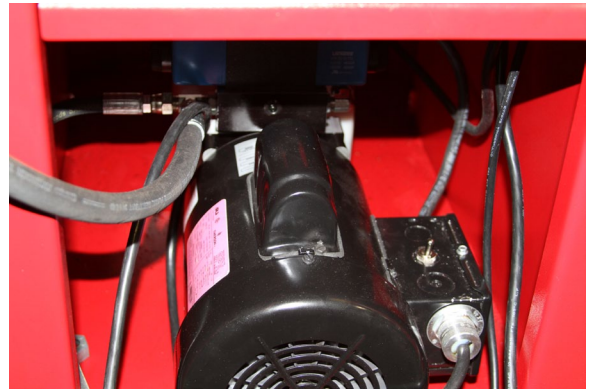
### **NEVER PLUG THE PUMP INTO THE AUTO STOP BOX.**

*Warning: If you use a long cable, such as 50 feet or more, or a smaller gauge cable, the power drop may be significant enough to trip the breaker in your building's fuse box. The pump may also not receive enough power to develop full pressure.*

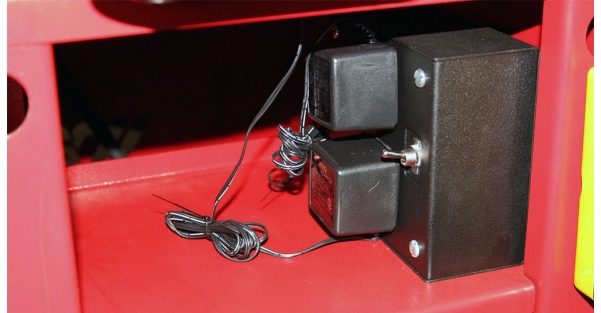
COMPUTER WITHOUT AUTO STOP OPTION: The computer requires a dc power supply of between 6 and 9 volts. It is included with the bender. Plug it into a 115v source. As soon as the power cord is connected the computer will turn on. There is not an On/Off switch without the auto stop option.

AUTO STOP OPTION: Included with the auto stop feature is two dc power supplies. Plug both into the auto stop control box as shown to the right. Plug the AC cable into your 115v source. The switch powers both the auto stop control and the computer.

NOTE: Both the computer and the auto stop control draw very little power. Therefore, an extension cable of only 16 gauge is more than adequate and its length is not a concern.



*Pump's On/Off switch.*



*Auto stop control box with both dc power supplies plugged in. Note the On/Off switch.*

***The bender is now ready for operation.***

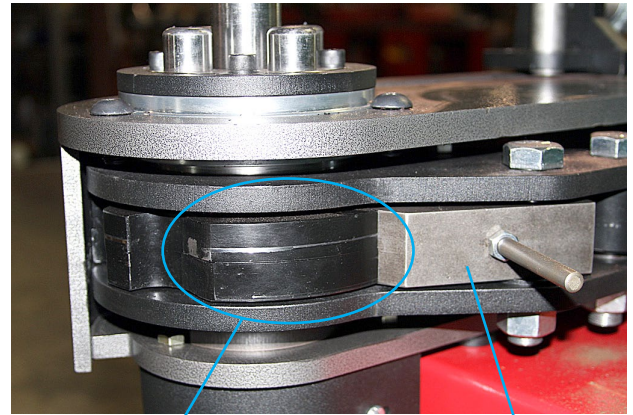
# Loading a Die Set For Tube or Pipe Bending

## Rotate spindle to its start position

- 1) Retract the ram until it stops moving and then move it forward slightly. If left fully retracted, the ram will pull the spindle to the rear and lock it up. This does not harm anything, it just won't let you rotate the spindle by hand.
- 2) The drive hub has 7 teeth. One of them is much larger than the others. This is the first tooth. Pull the spring loaded drive pawl's handle out and rotate the spindle until the drive pawl engages this tooth. This is shown to the right.

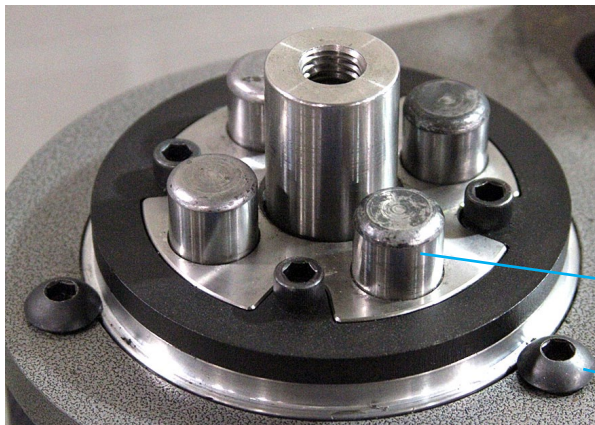
## Install the forming die onto the spindle

- 1) Examine the spindles upper surface and remove any debris that may not allow the forming die to sit flat. Also make sure the four large 1" dowel pins are seated completely.
- 2) Install the forming die with it's u-strap towards the cylinder. Lightly tighten the die bolt and die washer.



Drive hub's 1st tooth

Drive pawl



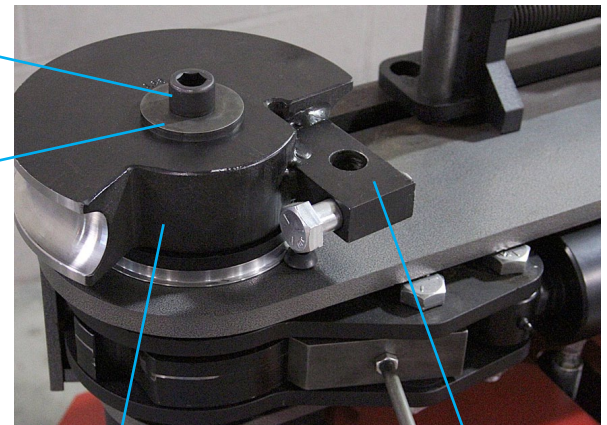
Spindle top view.

Die bolt

Die washer

1" dowel pin

Button head bolt



Forming die

U-strap block

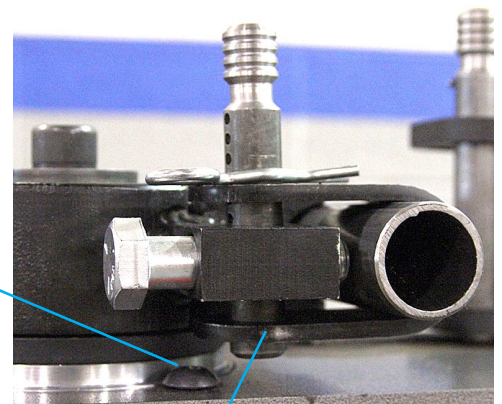
## Install the U-strap

- 1) Position the tube into the groove's die. Later you will learn how to determine how far out it must protrude.
- 2) Install the u-strap and insert the u-strap pin. The u-strap uses a clip pin to limit how far down the pin goes into the u-strap. It is very IMPORTANT that you place the clip pin into a u-strap hole that allows the u-strap pin to protrude past the u-strap's lower surface by a 1/4" or more without the possibility of the pin striking the spindle bearing bolts while rotating. This is shown in the picture to the lower right.
- 3) If bending thin wall tubing (.065" or less) you may need to tighten the U-strap lock bolt to prevent the tube from slipping backwards into the die while bending. If the bolt tries to mar the tube, make a small piece of curved metal and place it between the bolt and the tube.



U-strap pin must clear the button head bolts as shown here

U-strap lock bolt



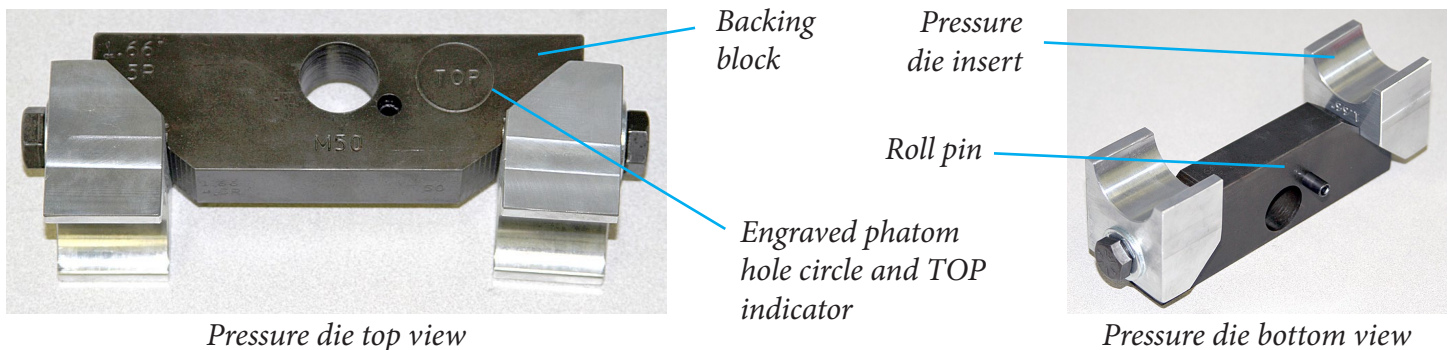
U-strap pin must extend past u-strap's lower surface by a 1/4" or more

## Description of the pressure die assembly

The pressure die is shown in the 2 pictures below. It is sometimes referred to as a 'followbar'. It constrains the outside of the tube while bending in order to produce a high quality bend. It is made up of 2 inserts and the backing block. The inserts are cast and machined from a special type of scratch and wear resistant metal alloy. The inserts are relatively self lubricating but are considered as consumable. They are NOT aluminum. Their typical life span is over 10,000 bends when using clean tubing. The pressure screw has both right and left side pin hole locations. This allows the amount of rear insert force to be tailored to the tube being bent, thus producing a better quality of bend.

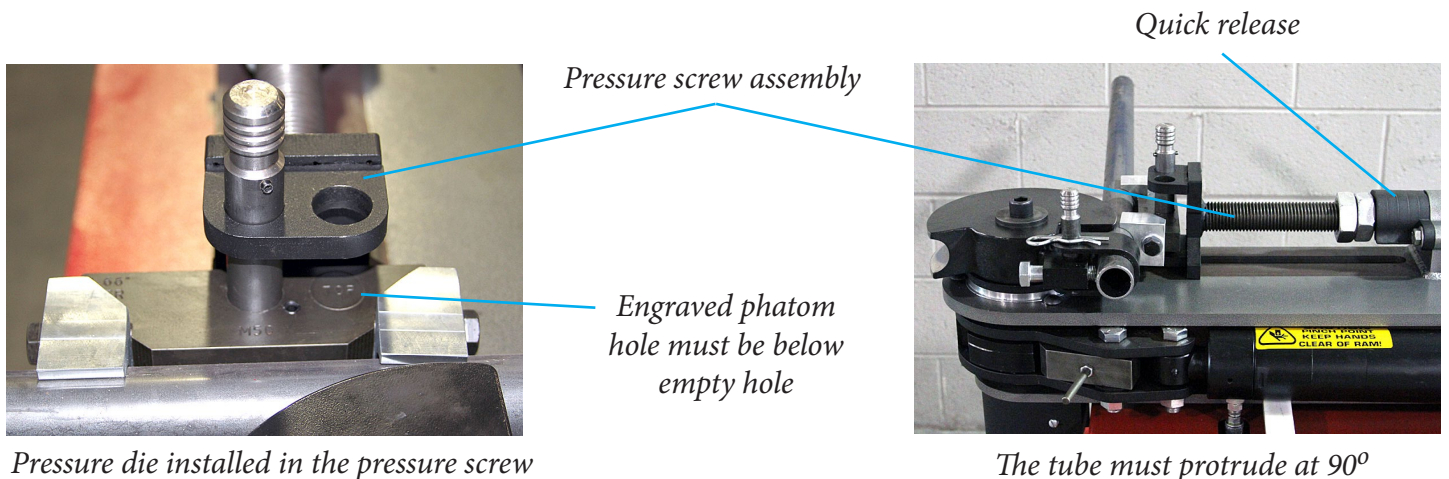
In the left side picture you can see the left insert is in line with the backing block and the right insert is angled. The angled insert is the trailing insert and will always be closest to the u-strap on the forming die. It rides where the tube has already been bent, thus helping to minimize the amount of flattening on the outside of the bend. It is computed to within 1/1000th of a degree at the time of manufacture to produce the best bend conditions for the size of tubing and the radius it is being bent to. Therefore, the pressure die must be installed into the bender correctly in order to take advantage of this design feature or a poorer bend will result.

In the right side picture you see the bottom of the pressure die. The roll pin will hold the pressure die up when the pressure screw is retracted. It must be adjusted so that the insert's grooves are 1/16" or so below the forming die's groove when the tube is not loaded. This will allow the pressure die to rise slightly and level itself when the pressure screw is advanced into the bending position.



## Installing the pressure die into the bender

- 1) Using the 1" pin, place the pressure die into the pressure screw as shown in the lower left picture. The engraved word TOP must be facing up. The backing blocks are engraved with a phantom circle to indicate which of the 2 holes in the pressure screw to insert the 1" pressure screw pin.
- 2) If desired, spray a little lube on the outside of the tubing that the pressure die slides on. Do not lube the inside of the tube facing the forming die or the forming die's groove. If you do, the tube may slip back into the die during bending. This generally leads to much poorer bend quality and makes it difficult to get accurate bends.
- 3) Slide the pressure screw forward and pivot the quick release into position as shown. Pull the back side of the tubing to the rear of the bender to remove any play and adjust the 1 1/2" nuts so that the tube extends out the back of the bender at as close to 90° as you can visually determine. A perfect 90° is not necessary.
- 4) The tube is now loaded and ready to be bent.



# Quick and Easy Bender Operation

It is not necessary to program the computer in order to use the bender. This section shows you how to quickly and easily make a fast bend.

- 1) At start up, the computer is in program selection mode and the display will flash the program number and the angle it is set to when last turned off the bender. To exit this mode and enter the operating mode, press both the ZERO and the SET buttons simultaneously as shown to the right. The display will stop blinking and will show the current angle of the spindle.
- 2) Load the tube and remove the play in the pressure die as described previously.
- 3) Press the ZERO button. The display changes to '0'.
- 4) Press the pendant's up button to begin bending.
- 5) When the display is a few degrees short of your target degree, release the button. Now tap it quickly until the display shows the degree of bend you want. You're done bending.
- 6) Retract the ram a few inches to relieve pressure on the tube.
- 7) Strike the tube's end behind the pressure die so the die rotates counter-clockwise a little. This should dislodge the tube from the pressure die. If it doesn't, hit it harder. Lubricating the tube will help with this.
- 8) Flip the pressure screw's quick release to the open position and slide the pressure screw to the bender's rear.
- 9) Remove the u-strap. The tube can now be removed from the bender.



*Changing computer modes*



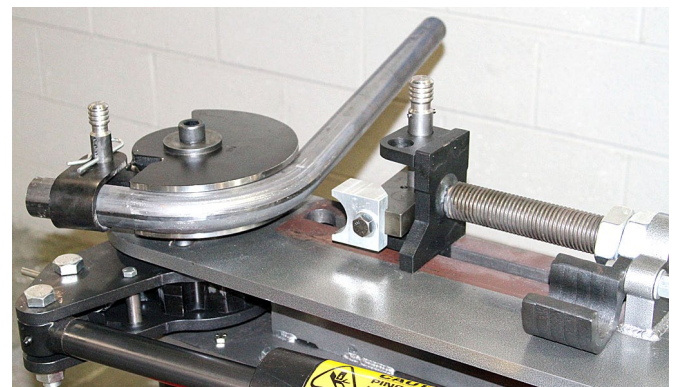
*Computer at 0° ready to start bending*

As an example, if you wish to make a 90° bend and the tube needs 3° of extra bend to account for spring back, you would press the up button on the pendant and when the display is a few degrees short of 93° release the button. Tap it quickly until the display shows 93°. You're done.

If the bender stops rotating before you're at 93° the auto stop has taken control. Don't worry, all that happened was the programmed bend was previously set below 93°. Press both the ZERO and the SET button simultaneously to enter the program selection mode. Press the SET+ button until it indicates a degree of bend greater than 93°.



*Striking the tube's end to loosen it from the pressure die*



*Quick release opened and pressure screw retracted*

# Using The Spindle Lock

During the bending process the forming die rotates clockwise. In order to make high quality bends, it is very important that it does not rotate in the opposite direction until the bend is completed. If this happens, the pressure on the tube relaxes. This allows the tube to lift slightly and can create an air space between it and the bottom of the die's groove. This is the main cause of wrinkling thin wall tubing (.065" or less). The tube may also slide backwards in the die making it very difficult to obtain accurate bends.

The bender is equipped with a spindle lock feature. If activated, at 45° intervals the spindle lock will engage and prevent the forming die from rotating counter-clockwise.

## Making 90° Bends

A single stroke of the ram will advance the spindle approximately 115°. Therefore, if you're making a bend of 90° or less, the spindle lock is not necessary. To disengage it, pull the latch up and rearwards as shown in the picture to the right.

NOTE: To remove the tube from the bender, the spindle lock must be disengaged or you will not be able to rotate the forming die to its starting position.



*The spindle lock in the disengaged UP position.*

## Making Bends Greater Than 90°

Always use the procedure below when making bends greater than 90°.

- 1) Engage the spindle lock by pressing down the latch as shown to the right.
- 2) Press the pendant button and start bending. At approximately 45° you will hear the spindle lock snap into the locked position. You can also see the latch moving back and forth as the bend progresses. When at approximately 90° you will hear the spindle lock engage again. Immediately stop bending. Try to stop the bender as close as possible after the lock has engaged.
- 3) Retract the ram until the drive pawl engages another tooth. If you retract it all the way to its start position, a full 180° bend only requires two shots of the ram.
- 4) When the bend is complete, move the latch to the up position to disengage the spindle lock.
- 5) You can now remove the tube as described in an earlier section.



*The spindle lock in the engaged DOWN position.*



# Using the Computer Control

In order for the computer to control the bender's operation the bender must have the optional Auto Stop Control box installed.

## Auto Stop Control Box

The auto stop control contains a relay that connects to the pump's hydraulic solenoid valve. The computer turns off the relay at the programmed angle of bend. For safety and reliability reasons, the bender's computer is optically isolated from the auto stop's relay board.

Shown to the right is the computer's On/Off switch and the two 110-120v AC power receptacles. The auto stop and the computer each require their own dc power supply and plug into the receptacles.



*Auto stop control box installed in base*

## Computer Display

The computer displays the angle of bend and allows the bend's starting point to be reset to '0'. It has a resolution of 1/10 of a degree. If the bender is equipped with the Auto Stop option, 99 bends may be stored in memory and the computer will control the bending process.

## At Power Up

When the computer first turns on, you will see the letters JD2 briefly and then the display will start blinking. This is because the computer starts in bend selection mode. It will flash the last bend number used and the angle it was set to.

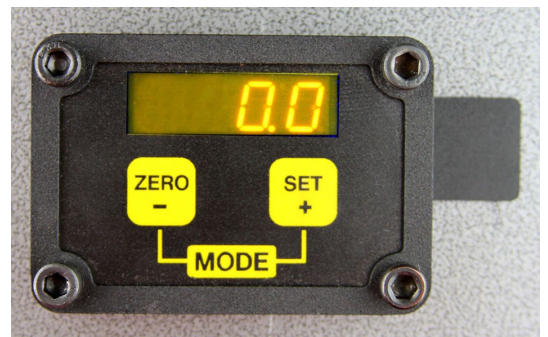
## Computer Modes

The computer has two modes of operation. The mode is changed by pressing both the ZERO and the SET button simultaneously.

## Bend Selection Mode

This mode allows you to only select the bend you want. It is not used to store the degree of bend. You can store up to 99 different bend angles.

The display will flash between the currently selected bend number and the degree of bend where it is will stop bending. To change the bend number, press the '-' or the '+' button until it flashes as a capital letter 'P' along with the bend number you want. If you hold the button down the bend number will change rapidly. Simply tap the button to increment or decrement the bend number by one.



*Computer shown in operating mode*

## Operating Mode:

In this mode the display will not flash and indicates the current angle of bend. This mode is used to store the bend angle you wish to stop at and to reset the display to '0' before starting a bend.

**Zeroing the display:** After the tube has been loaded and the play as been removed as previously discussed, press the ZERO button. The display will change to '0'. The computer will now display the angle of bend as it is being made. You may make as many bends as you want without resetting ZERO as long as you do not re-adjust the pressure screw lock nuts. *NOTE: This is NOT the preferred way to operate the bender. It will get you with in a couple degrees usually but for a more accurate method see the next section "How to Make Repeatable Bends".*

**Storing the bend angle you want to stop at:** The finished bend angle is set by rotating the forming die to the angle desired and pressing the SET button. It is now stored permanently into computer memory. You may store up to 99 bends.

# How to Make Repeatable Bends

**Important Rule:** *If the pressure screw is in the same position and the spindle rotates to the same degree of bend, you will make roughly the same bend every time.*

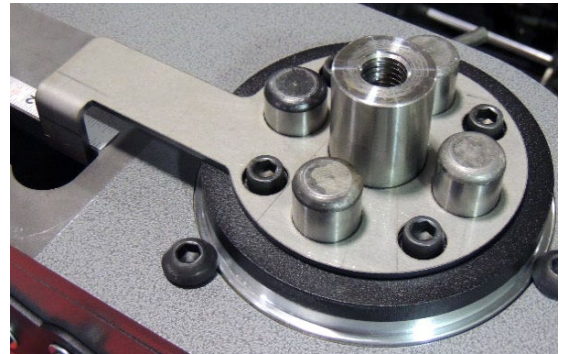
Why roughly? Many factors make it impossible to achieve the EXACT same bend every time on any bender, such as material hardness and other mechanical factors, but you should easily be very close.

As described earlier, you would normally load your tube and rotate the spindle until the play in the tube and the forming die has been removed. For quick bends this normally works very well. However, there is a problem with this method. Whenever the machine is turned off, the zero setting is lost and must be reset in order to start bending again. When setting the zero position, if the operator loads the tube too tight, the bender may have already bent the tube a little. If it's too loose, the bender must remove the play before the tube actually starts bending. So there is a very good chance the bends will vary between jobs. If you want a 90° bend and you know the spring back is 4° you will need to bend to 94°. But since the tube may have been loading differently from the last time you did a bend you may end up with a bend that's a couple of degrees off.

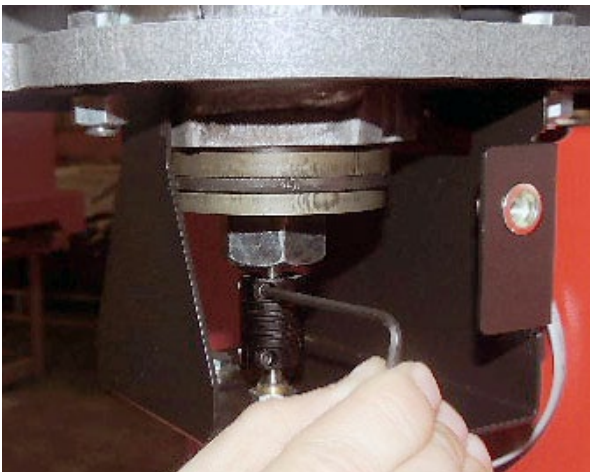
How can this error be minimized? The solution is simple, never press the zero button. To do this we must adjust the bender's encoder to read zero when the spindle is in its start position and the bender is first turned on. We don't care how far the tube springs back after bending. All we care about now is how far past our desired bend angle do we need to rotate the spindle. The factory normally zeroes the spindle but in case your bender isn't, follow the directions below to correct it.

## Setting the spindle to zero

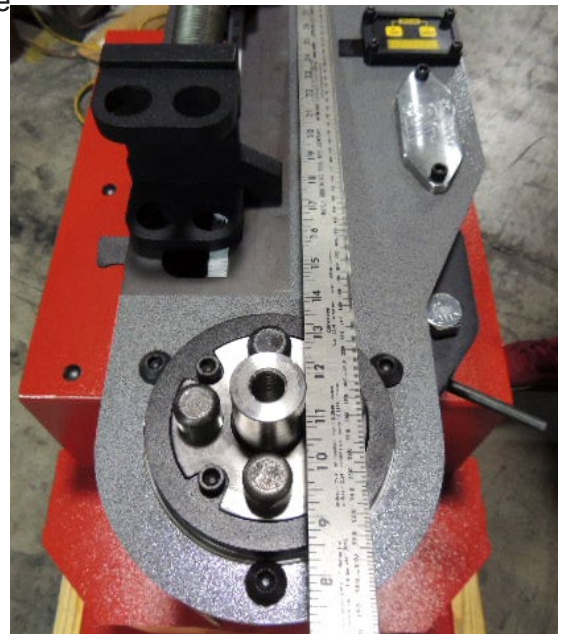
- 1) Rotate the spindle to its normal starting position where the drive pawl will engage the largest drive hub's tooth.
- 2) Rotate the spindle so that the 2 middle dowel pins are lined up with the benders frame. At the factory we use the jig shown on the right. However, you can use a ruler and eye ball it as close as you can. It does NOT have to be perfect. Note you may need to disengage the drive pawl if you can't rotate the spindle back far enough.
- 3) Turn the computer off and then back on.
- 4) As shown below, loosen the encoder coupling's set screw.
- 5) Being sure not to let the spindle move, rotate the encoder until the display reads zero. Tighten the set screw.
- 6) Go to the next page to setup the pressure screw.



*Factory jig installed to zero the spindle*



*Adjusting the encoder's coupling.*

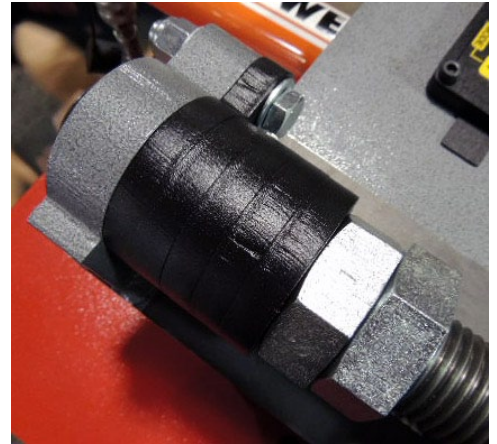


*Using a ruler to zero the spindle*

In order to make repeatable bends it's important that the pressure screw is also adjusted to the same position every time you use a particular die set. It is vital that you write down these positions for future reference.

### Setting up the pressure screw for a particular die set

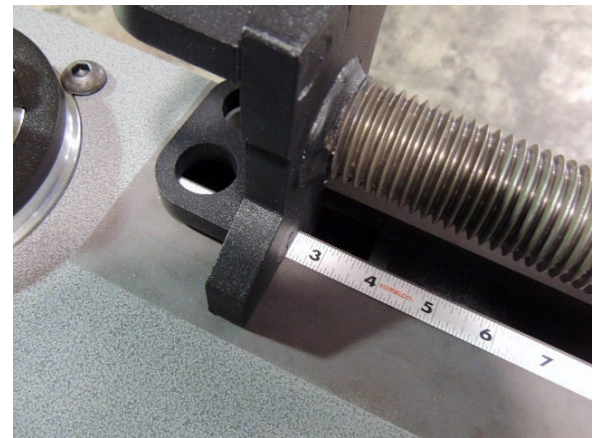
- 1) Load the tube and remove the play in the pressure die as described previously. Remember the tube should be close to 90° to the bender's frame when ready to bend.
- 2) Each side of the pressure screw adjustment nut has 1 thru 6 stamped on them. As shown below, rotate the adjustment nut slightly so that the closest flat side is facing up. Write down that number in your notebook. The tube should still be 90° to the benders frame.
- 3) Write down the reading from the ruler on top of the bender. If your bender does not have a ruler you can contact our sales staff to obtain one. When installing a new taped ruler, position it on the frame so that the 0" mark is at the front edge of the pressure screw slot and slightly left of the slot in the length direction.



*Adjustment nut with #1 facing up*



*Ruler as installed on the bender*



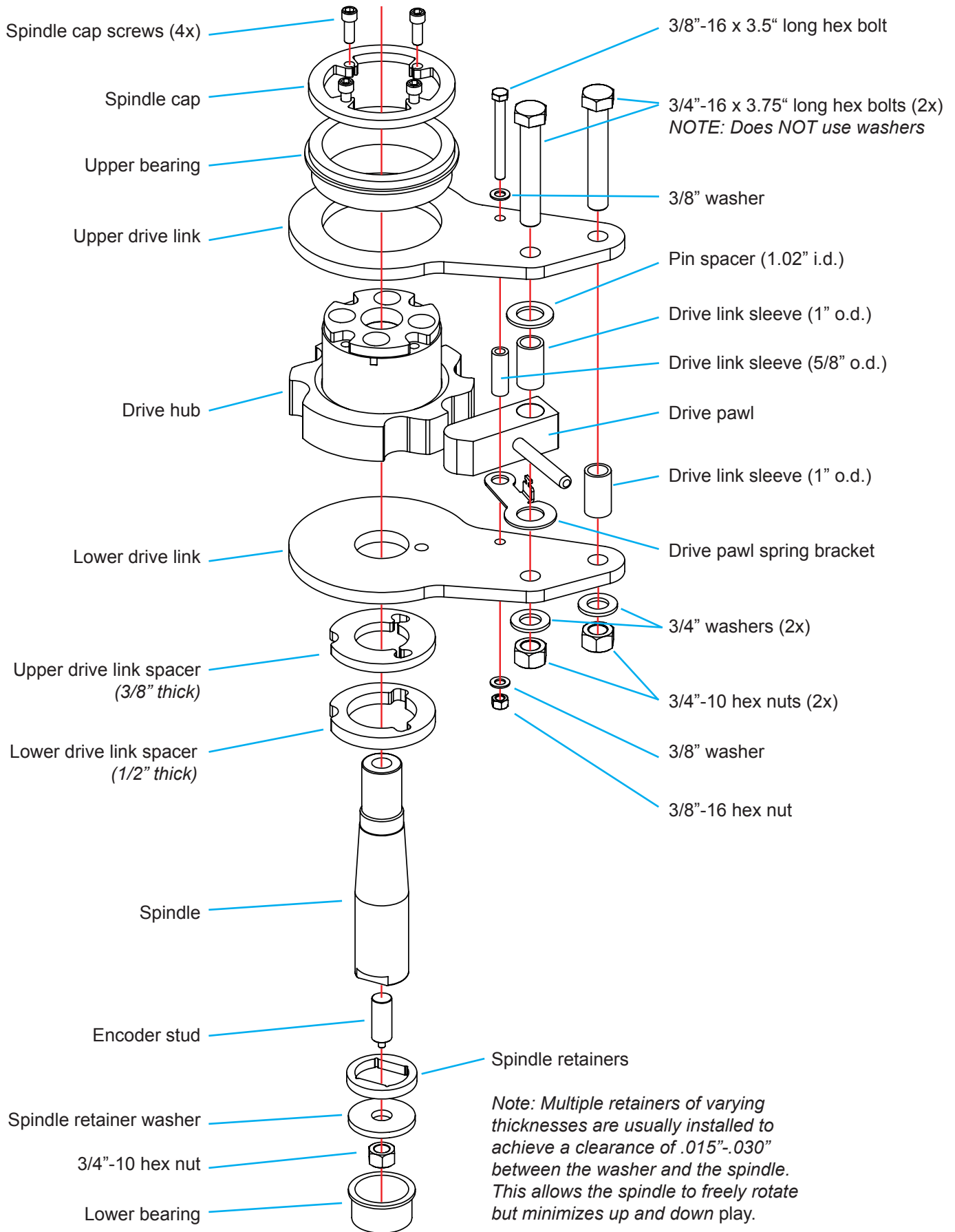
*Reading the ruler*

### Determining the amount of over-bend

Since you are not pre-loading the tubing and resetting zero you will need to determine how much more to rotate the spindle past the desired degree of bend. Follow the procedure below to find this value.

- 1) Slide the pressure screw and nut to the positions you wrote down earlier and tighten up the locking nut.
- 2) Turn on the bender. Do NOT press the zero button.
- 3) Load the tube and install the u-strap and tighten the u-strap bolt if needed.
- 4) Using the pendant, bend the tube until the display reads 90°.
- 5) Remove the tube and using a LONG leg protractor measure the actual degree the tube was bent to. It will be less than 90°.
- 6) The angle of the bend less than 90° is how much your over-bend will need to be. So for example, If the tube measures 82° you need to add (90-82) 8° to the bend target. If we reload the tube and bend to 98° you should obtain the 90° bend you wanted.

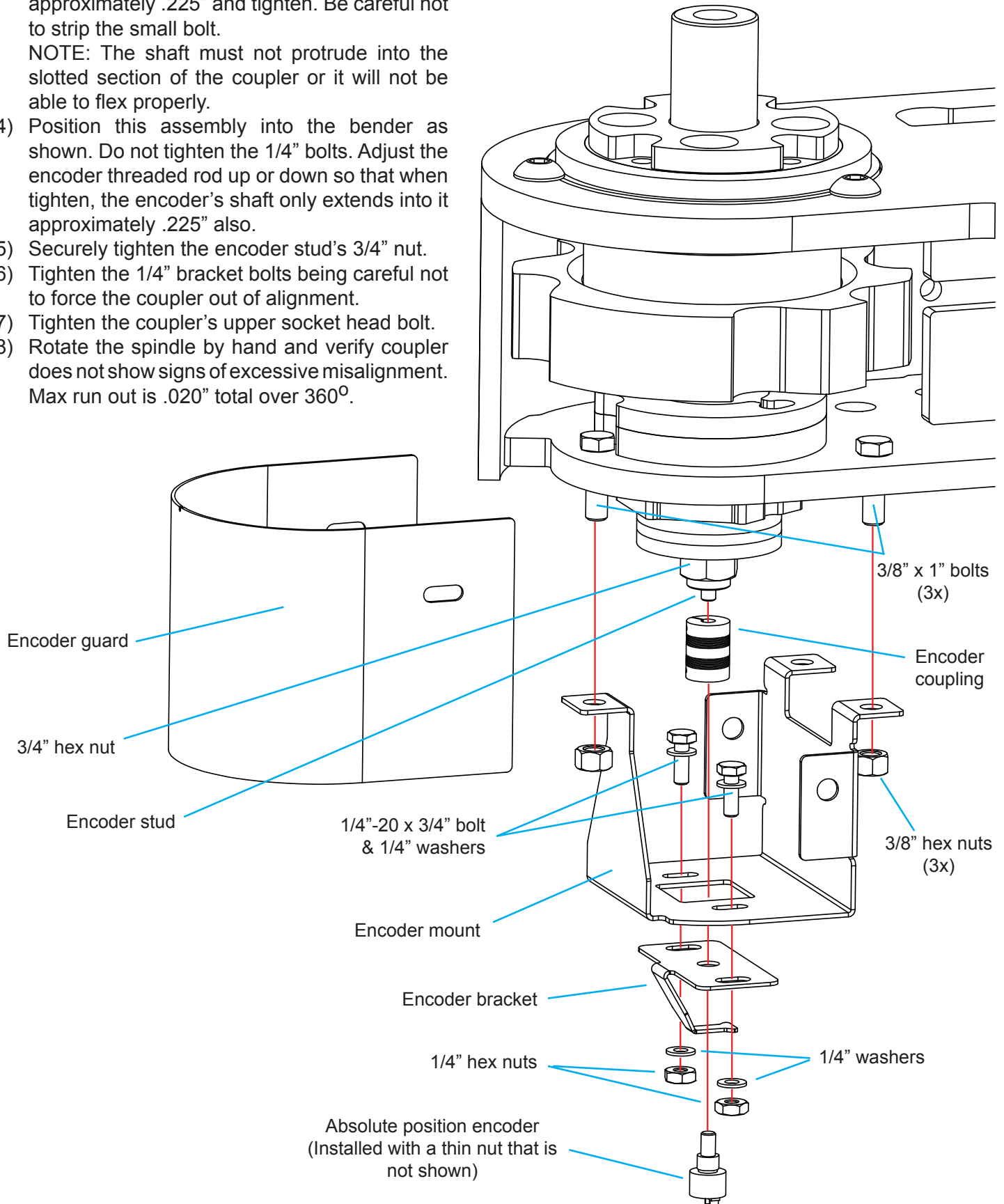
# Exploded view of spindle components

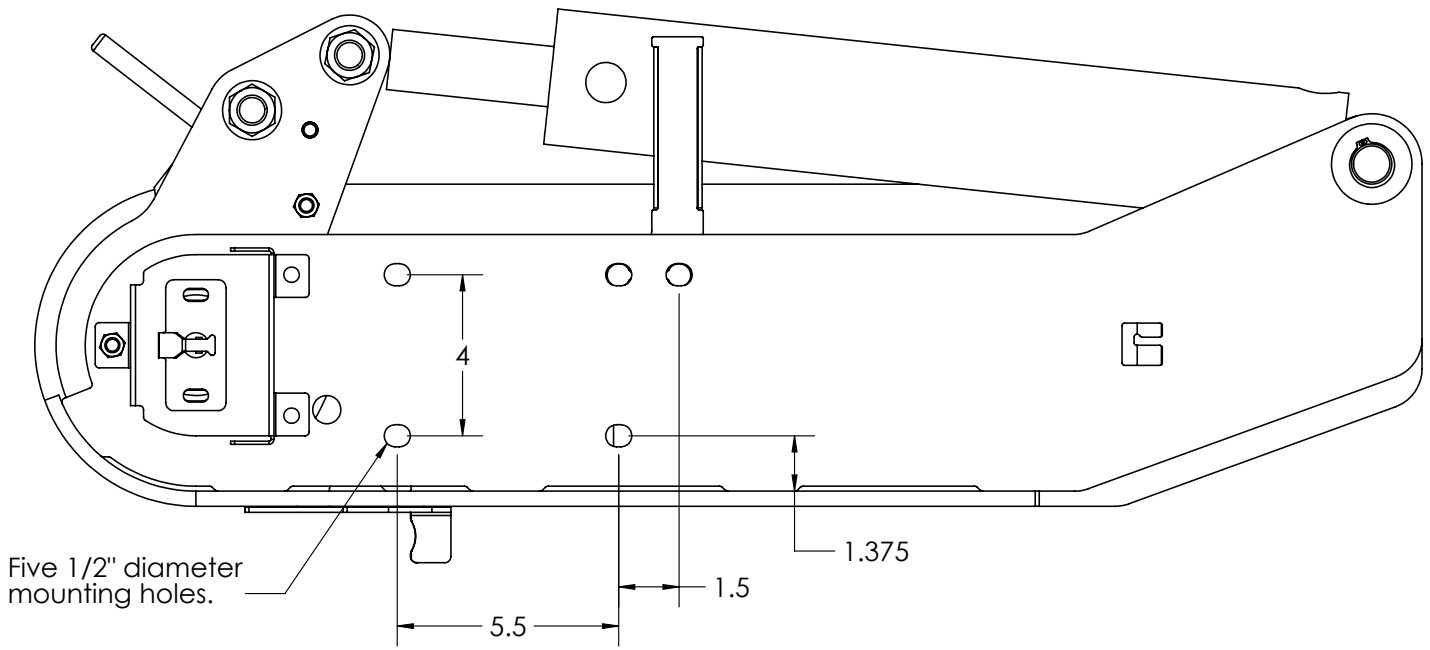


# Encoder components

## 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°.





To fabricate the bender stand yourself, this is the bottom view of bender's mounting holes.

# Bending Tutorial Using Template Bends

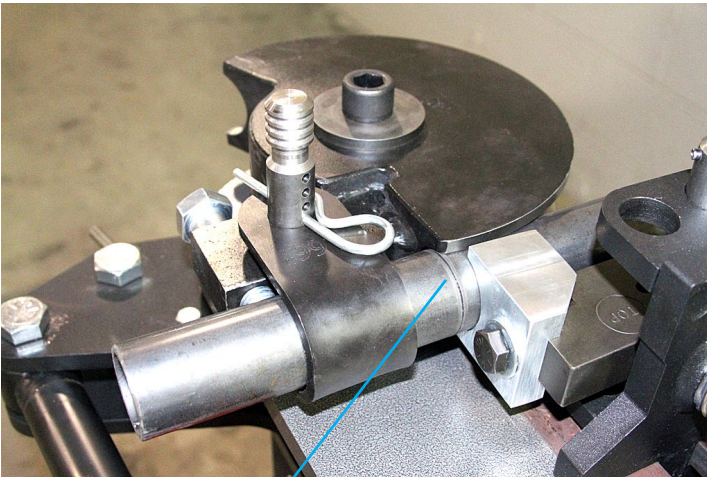
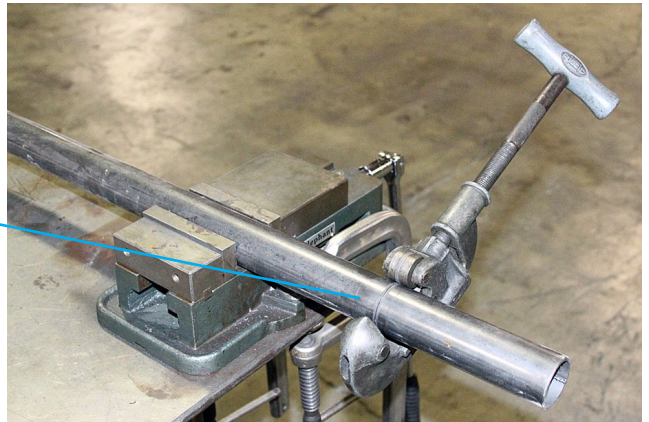
## The Easy Way To Position Bends

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. A reference line cut into the template that allows you to visualize where the benchmarks 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, chromemoly 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.

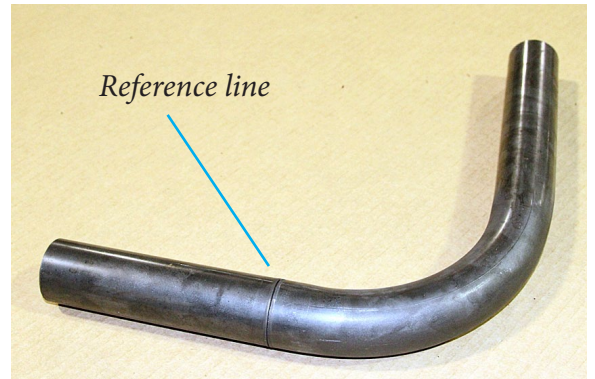
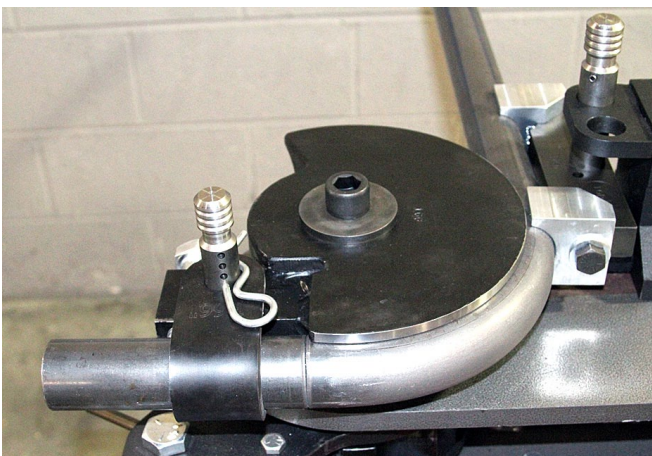
Cut a piece of tubing roughly 30" long. Next, cut an accurate line all the way around the tube 6" from the end. The best way to do this is to use a pipe cutter. Hand scribing this line is difficult and not recommended. To the right is shown the reference line being cut into the tube.

*Cut reference line*



*Reference line installed at the flat side of the forming die*

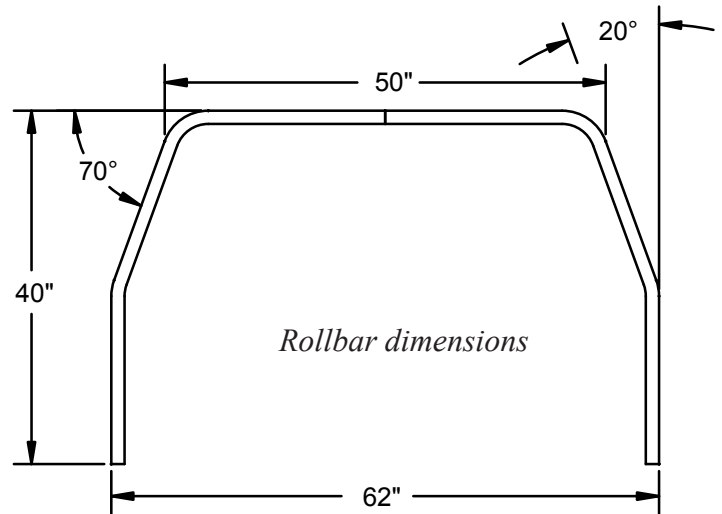
Load the tube into the bender as shown to the lower left. The reference line must be positioned EXACTLY at the flat side of the forming die where the u-strap block has been welded onto the die. You must always use the forming die's flat side as a reference. Bend the tube to 90°. If the forming die has 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.



*The completed template*

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°.

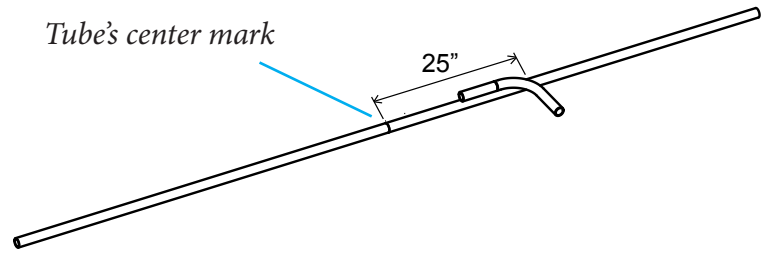
To determine the total length of tubing needed, you could sit down and calculate it. Time usually cost more than tubing, so let's do it the easy way. Take the total width of the rollbar (62") and add it to twice the height (40"). This gives us a length of 142" (62" + 40" + 40"). This is slightly longer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

**BEND 1:**

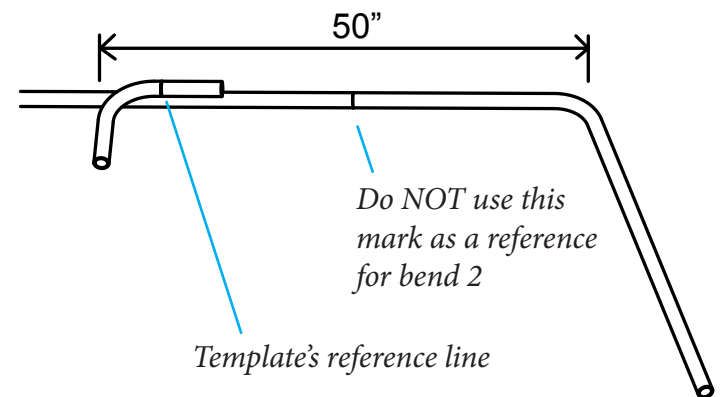
The first bend will be the upper right side bend. The upper dimension of the rollbar is 50". From the center of the rollbar to the outside of the bend is 25" (50" divided by 2). Lay the tube to be bent on the floor and hold the template above and parallel to it as shown below. The scribed side of the 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.



**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.

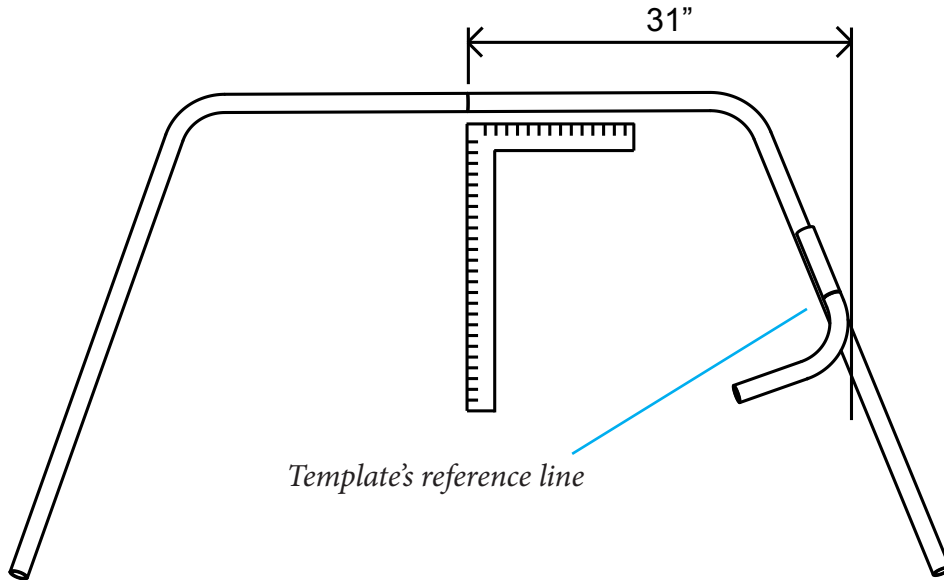
Erase the center mark on the rollbar tube and mark a new center exactly midway between the outside of the two bends. Why? Let's say your measurement shows the two top bends are really 50 1/4" wide instead of the desired 50". In that case, your old center mark could be off by as much as a 1/4". The NEW 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.





**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.

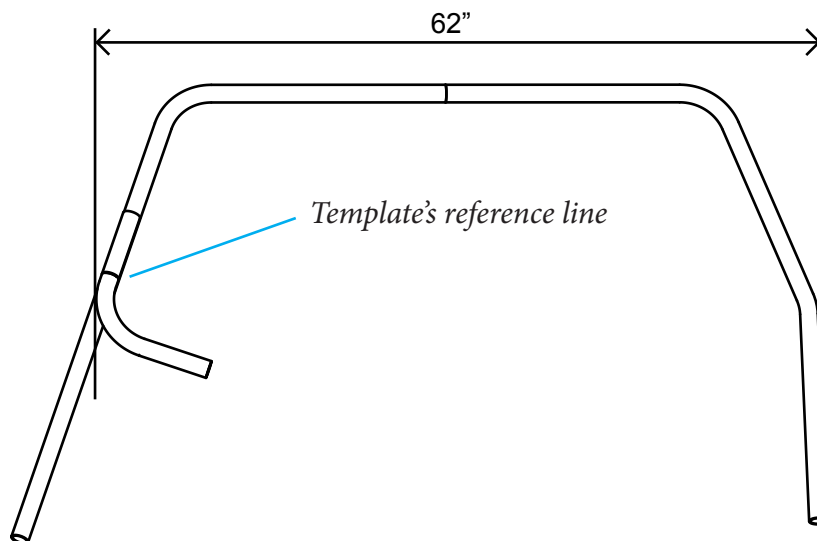


*Template positioned for the 3rd bend.*

**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.

Lastly, cut the ends of the tube to make the rollbar 40" tall and your done.



*Template positioned for the 4th and last bend.*