



# **EL 2002**

## **Manual Elbow Forming Machine**

**GENERAL OPERATING AND MAINTENANCE INSTRUCTIONS**

© Go CNC 2023

**Go CNC**  
**2003 14<sup>th</sup> St.**  
**Emmetsburg, Ia. 50536**

**(712) 298-4781**

**Version: 2.0**  
**Date: 11/23**



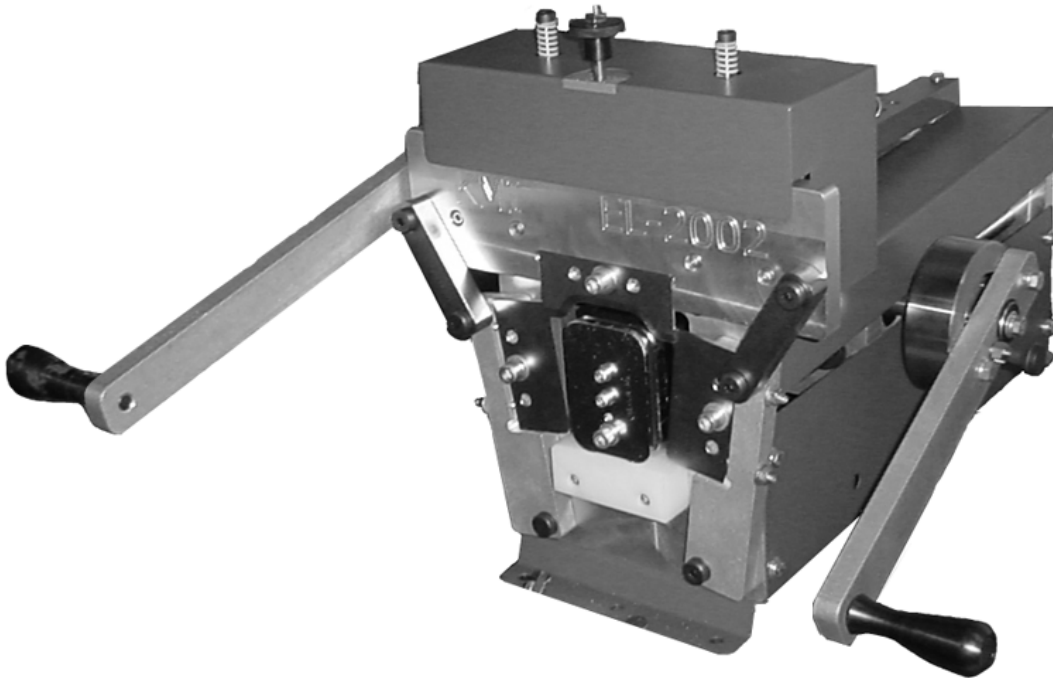
## TABLE OF CONTENTS

1. INTRODUCTION .....	4
2. SAFETY RULES .....	5
4. MACHINE SPECIFICATIONS.....	8
5. TERMINOLOGY .....	10
6. REQUIRED TOOLS AND EQUIPMENT .....	11
7. SUB-ASSEMBLY OVERVIEW .....	12
8. SETUP AND OPERATING PROCEDURES .....	14
9. GENERAL OPERATING PROCEDURES.....	16
10. PROFILE CHANGEOVER PROCEDURES.....	20
11. ADJUSTMENTS AND TROUBLE SHOOTING .....	23
12. GENERAL MACHINE MAINTENANCE .....	28
13. TRANSPORTATION / MOVING THE MACHINE.....	28

# 1. INTRODUCTION

## 1.1. Introduction from Go CNC.

Congratulations!!! You have purchased a top-quality product from Go CNC. Your new EL-2002's high standards of performance and durability will serve you reliably for years to come. Each Knudson Go CNC product is backed by our dedication to high quality manufacturing, commitment to customer service, and innovation in equipment design. Prior to any operations, read this manual thoroughly to familiarize yourself with the machine, its operation, care, and service. Remember to strictly observe all safety requirements.



## 2. SAFETY RULES

### 2.1. General Safety Rules

Read and understand entire Operator's Manual prior to use of this machine.

The operator should stay alert and use common sense when operating this and any machine. The operator should not use machine while tired or under the influence of drugs or alcohol.

Proper dress is recommended. Steel toe boots are recommended. No loose clothing or jewelry. Long hair, loose clothing, and gloves should be kept away from all moving parts. Keep the handles dry, clean, and free of oil and grease.

Do not operate without safety glasses and leather gloves.

Do not operate without adequate training.

### 2.2. Machine Specific Safety Features

This machine is designed to pinch and form sheet metal. During the pinching process, there is the potential to get ones fingers and hands pinched between the knives and mandrel. The risk is such that loss of fingers could result if one is not careful enough. Use extreme caution at all times when operating this machine, especially around the knives and mandrel.

Proper mounting of this machine will also reduce the risk of injury. Ensure that the mounting surface is stable, level, and strong enough to hold the weight of the machine. If the machine is mounted on a table, make sure the table is properly secured to the ground or floor.

This machine is to be used by one operator at a time. **The design of the machine requires that the operator leave both hands on the machine at all times.** Multiple operators greatly increases the risk of finger and hand injury to all involved. Keep others clear of the area of operation.

If the machine crashes (see Section 11), use extreme caution when clearing the crash. A crash presents a potentially hazardous situation for the machine operator. Crashes often produce sharp, jagged metal edges that ultimately require handling. Suitable hand and eye protection, to include leather gloves and safety glasses, should always be worn when clearing a crash.

The machine is equipped with a variety of safety measures:

Item Name	QTY	KMI Part Number
Crimping Asssembly Cover	1	4030701
Bottom Advance Assembly Cover	1	4030702
Top Right Advance Assembly Cover	1	4030703
Top Left Advance Assembly Cover	1	4030704
Crimp Stops	2	4030606
Finger Pinch Warning Sticker	2	STKR-1005
Heavy Lifting Warning Sticker	2	STKR-5101

-four safety covers - three covers encasing the advance assembly and one surrounding the crimping assembly prevent both the operator and foreign objects from being introduced into moving machine components.

-crimp stop – the two crimp stops are attached to the advance plate and prevent the crimp handle from being pulled when the advance assembly is in its furthest forward position. Moving the advance assembly backwards will not allow the crimp stops to function properly and open up the potential for serious injury.

**\*This machine should not be operated without the covers in place. \***

**Despite the presence of safety features, this machine does have exposed knives.**

To remind the operator of the potential risks involved in using this machine, the factory has placed warning stickers on the safety covers. Two finger pinch warning stickers have been placed on the top safety cover at the front of the machine and two heavy lifting warning stickers have been placed near the back of the machine on the advance assembly covers. If these covers are re-ordered, the stickers will be attached to the replacement covers. Refer to the following picture and contact the factory or distributor if the warning stickers are not present. Do not use machine without these warning labels.

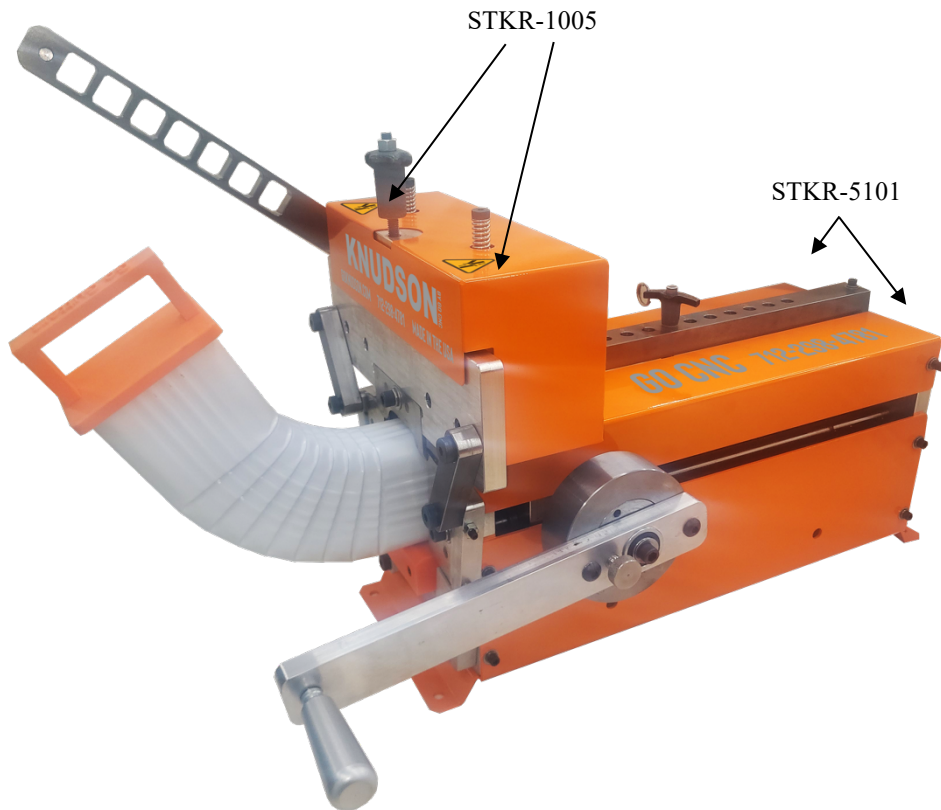


Figure 2-1: Warning labels on the EL-2002



**\*\*Extreme caution must be used at all times but especially when hands and fingers are in the vicinity of the knives and mandrel assembly. \*\***



**\*\*This machine weighs in excess of 85 lbs. Proper Lifting techniques should be executed when moving this machine. \*\***



## 3. PROFILE SPECIFICATIONS

### 3.1. PROFILES

2 X 3 (51-mm x 76-mm)– A Elbow – crimped up to 90 degrees.  
2 X 3 (51-mm x 76-mm)– B Elbow – crimped up to 90 degrees.  
3 X 4 (76-mm x 102-mm)– A Elbow – crimped up to 90 degrees.  
3 X 4 (76-mm x 102-mm)– B Elbow – crimped up to 90 degrees.

### 3.2. MATERIAL TYPES AND THICKNESSES

#### Aluminum/Copper:

0.019-in and 0.027-in Aluminum Downspout Blanks  
16-oz Copper Downspout Blanks

### 3.3. MATERIAL STRENGTH

#### Aluminum/Copper:

Maximum Tensile Strength = 33 ksi (230 MPa)  
Maximum Yield Strength = 28 ksi (195 MPa)

## 4. MACHINE SPECIFICATIONS

### 4.1. STANDARD BASE UNIT SPECIFICATIONS

Length = 20.75-in (525-mm) [mount to mount]  
Width = 22.75-in (575-mm) [handle to handle]  
Height = 26.75-in (680-mm) [base to vertical handle]  
Weight = 74.5-lbs (34-kg) [chassis only]  
Weight = 95-lbs (43-kg) [with four (4) tooling sets]

### 4.2. STANDARD EQUIPMENT FEATURES

#### 4.2.1. Profiles

Each profile requires the use of a specific tooling set, which includes:

- Top Knife
- Side Knife – Left
- Side Knife – Right
- Mandrel assembly

#### 4.2.2. Forming Details

Manually Operated Crimping Mechanism

- Adjustable crimp depth
- Adjustable side knife position
- Rack and Pinion Crimp Gears
- Spring Return to Neutral Position

Manually Operated Advancing Mechanism

- Rack and Pinion Advance Gear
- Locking/Release Pin for Advance Handle
- Crimp Stop in Final Advance Position

#### 4.2.3. Production Speed

Elbows per minute = approximately two (2).

Time required to change tooling sets = approximately 10-min. (See Section 9)

### 4.3. ADDITIONAL EQUIPMENT FEATURES

#### 4.3.3. Accessories

Push Tool  
Multiple Tooling Sets (Optional)  
Side mount/Storage bars for additional tooling (Optional)

### 4.4. INTENDED USE



The EL-2002 Manual Elbow Forming Machine is intended to form the aforementioned specific profiles from the designated material specifications. The machine is in no way intended for any other purpose. Any attempt to use the machine for a different purpose may result in serious personal injury or significant damage to the machine. In particular, the machine is not intended to form partial or different profiles nor intended to run unspecified material gauges or strengths.

## 5. TERMINOLOGY

### 5.1. MACHINE NOMENCLATURE

**Front End** - the end of the machine where the crimping mechanism is located.

**Back End** - the end of the machine opposite the crimping mechanism.

**Left Side** - when viewing the crimping mechanism, the side located to the left

**Right Side** - when viewing the crimping mechanism, the side located to the right

### 5.2. PROFILE SPECIFIC TERMS

*The profile is described as if it were being viewed from the front end of the machine as the material exits the machine:*

**Left Curve**– the profile is horizontally level, but curves to the left as it exits the machine

**Right Curve**– the profile is horizontally level, but curves to the right as it exits the machine.

**Crimp Depth** – depth to which the top, left side, and right side knives press into the blank.

### 5.3. MACHINE SPECIFIC TERMS

**Push Tool** – An accessory used to aid in insertion of the blank.

**Mandrel Assembly**– the rectangular parts that fit inside the downspout blanks, over which the material is formed/crimped.

**Knife** – the flat, contoured bars that push the material between the mandrels in the forming/crimping process.

**Advance Handle** – Handle extending from the right side of the machine responsible for advancing the elbow.

**Crimp Handle** – Handle extending from the left side of the machine responsible for crimping the elbow.

**Crimp Depth Adjustment Knob** – knob used to adjust the crimp depth (see Figure 11-5)

**Return Height Adjustment Nut** – a nut located on the underside of the front plate below the crimp depth adjustment knob that keeps the crimping assembly from moving too far up and causing the crimping dies to become misaligned.

## **6. REQUIRED TOOLS AND EQUIPMENT**

### **6.1. HAND TOOLS**

#### **6.1.1. Combination or Open End Wrenches**

- 7/16-in
- 9/16-in

#### **6.1.2. T-Handle Hex Wrench**

- 1/8-in up to 5/16-in – 1/16-in increments

#### **6.1.3. L-Handle Hex Wrench**

- 1/8-in up to 5/16-in – 1/16-in increments
- Ball-Nose type wrenches recommended
- 3/16, 1/4, 5/16

#### **6.1.4. Cutting Equipment**

- Hack Saw
- Band Saw

## 7. SUB-ASSEMBLY OVERVIEW

### 7.1. CRIMPING ASSEMBLY

The crimping assembly is located at the front of the machine. It extends from the top of the spring returns protruding from the top cover down along the front and includes the three knives, knife adjustment screws, and crimp dies. Most of the moving parts of this assembly are protected by a safety cover. The crimping assembly performs the first step in producing a fold in the blank. Pulling the crimp handle forces the three knives to press into the blank and move the material into the mandrel assembly. The crimp depth can be adjusted by utilizing the knob extending from the middle of the crimping assembly (see Section 10).

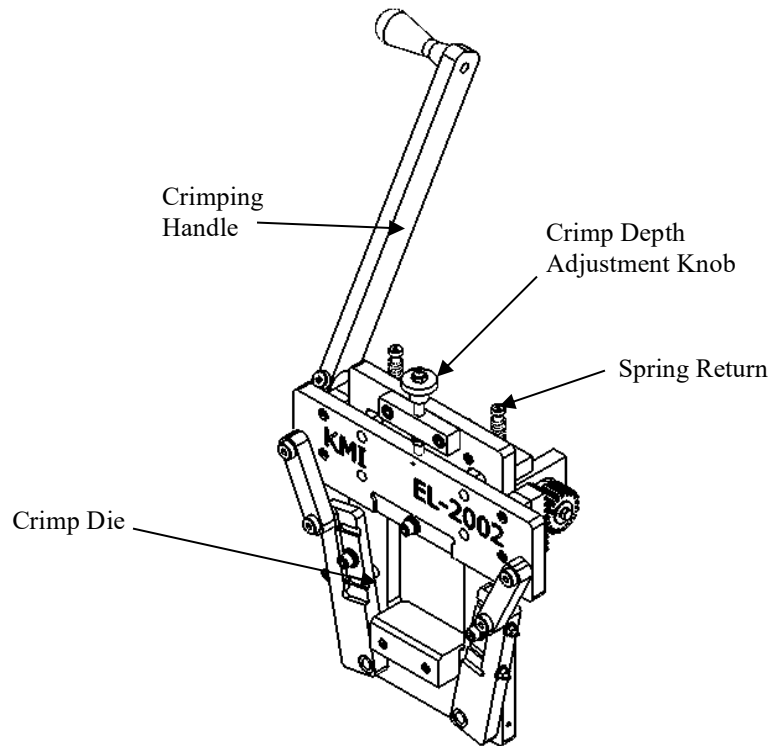


Figure 7-1: Crimping Assembly

## 7.2. ADVANCE ASSEMBLY

The advance assembly is the movable assembly located inside of the enclosure formed by the safety covers. The assembly moves along the two slide shafts and is driven by rack and pinion gears. With the locking/release pin in the proper position, pulling on the advance handle moves the advance assembly forward, completing the final step in producing a fold in the blank while positioning the blank for another crimp. The advance handle is mounted to a cam clutch bearing which enables the advance assembly to only move forward with the handle is pulled. The two painted blocks are the crimp stops. They keep the crimping assembly from moving and adding unwanted crimps when the advance assembly is fully forward. The final component of the advance assembly is the universal advance plate. This is a plate that has four different contours machined into it to allow for four different downspout configurations. This plate makes contact with the blank and forces it out of the machine when the advance handle is actuated.

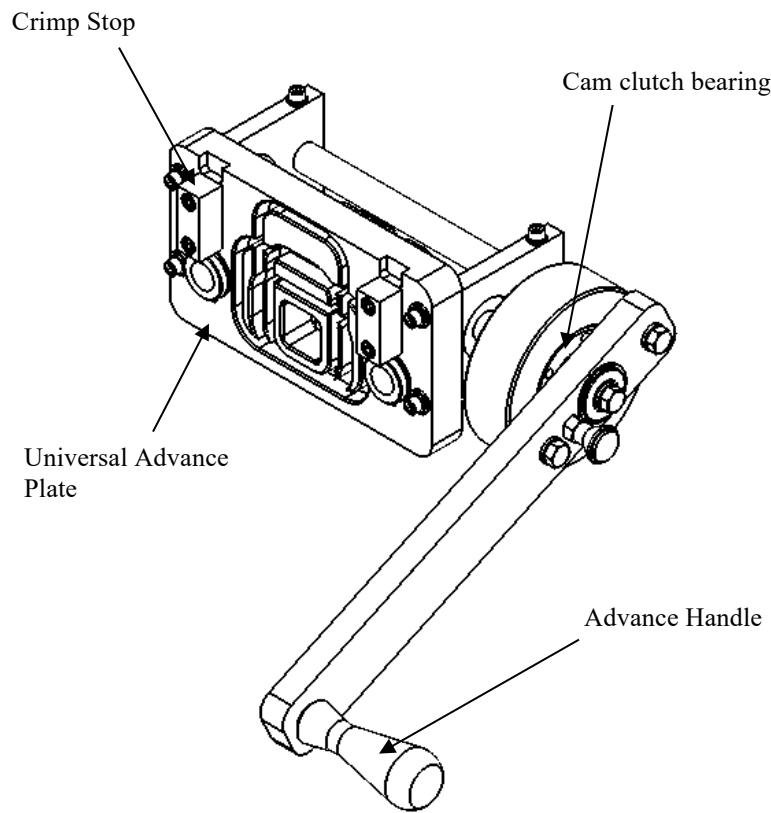


Figure 7-2: Advance assembly.

## 7.3. TOOLING MOUNT/STORAGE BARS

If multiple knife sets are purchased, they will be accompanied by a set/sets of side mount storage bars. These storage bars attach to the sides of the bottom safety cover and allow the knives and mandrel assembly to be secured and all in one place for quick and easy changeover. See section 10.1.3 for more information.

## **8. SETUP AND OPERATING PROCEDURES**

### **8.1. RECEIPT/UNPACKING**

Check the contents of your shipment against the shipping package list. Check for any missing or damaged components. Contact your sales agent if any problems exist.

### **8.2. INITIAL INSPECTION**

#### **\*\*\* INSPECT THE MACHINE BEFORE OPERATING \*\*\***

During transport, parts of any machine may vibrate loose and/or foreign objects may accidentally be directed into the machinery.

It is operator's duty to remove the safety covers and carefully examine the entire machine before operation.

Ensure that:

- 1) No foreign objects are present which could cause damage to machine parts
- 2) All fasteners are tight and in proper position
- 3) Gears, slide shafts, and other moving parts are lubricated, properly adjusted and ready for operation

#### **\*\*\* REPLACE THE SAFETY COVERS PRIOR TO OPERATION \*\*\***

After adjustment or repair, be sure all tools are removed from the machine prior to operation.

### **8.3. INSTALLING THE CRIMPING HANDLE**

In order to save space, the EL-2002 is shipped with the crimping handle removed. The operator will need to reinstall the handle using two 9/16 in combination or open end wrenches. Removed the ½ inch bolt and nut from the shaft and slide the handle over the shaft. Line up the shaft holes and the bolt holes in the handle to the desired orientation and place the bolt through the handle and shaft. Apply the nut and tighten so the handle cinches down around the shaft.

### **8.4. INSTALLING THE ADVANCE HANDLE**

To save space, the EL-2002 is shipped with the advance handle removed also. The operator will need to reinstall the handle using a 5/16 allen wrench. Remove the hex head cap screw and both washers from the advance shaft and make sure the 1/8-in spacer remains on the shaft. The handle and ring stop should be pointed towards the operator and slid onto the advance shaft. Apply the hex head screw with washers and tighten. Make sure the handle operates appropriately. Refer to Figure 7-2 for proper handle orientation.

### **8.5. MOUNTING INSTRUCTIONS**

#### **8.5.1. General**

#### **READ ALL MOUNTING INSTRUCTIONS PRIOR TO MOUNTING THE MACHINE.**

The EL-2002 should be permanently mounted where it will be used (in the bed of a pickup or panel truck, on a trailer, on a special bench). The machine weighs approximately 95 lbs (43kg). The mounting surface must support at least this much weight. The machine should be used only in a level position with the front end and handles of the machine aligned away from any physical interference, such as other equipment, partitions, or walls.

**WARNING:** NEVER force the machine down to match the contour of the mounting surface. Wherever the machine frame does not meet the mounting surface, use leveling pads or suitable shims to achieve a solid mount. Forcing the machine frame to twist or warp to conform to an irregular surface will result in serious loss of alignment and therefore, loss of accurate profile. The machine's chassis is very rigid, and leveling pads or shims should be used to retain the original shape of the machine frame when mounting.

### **8.5.2. Stationary Mounting**

For both safety and stability, securely bolt the machine to the mounting surface. Again, ensure the frame is not cinched down to an irregular base, but rather shimmed to make solid contact at all mounting points. The first step toward production of high quality profiles is a level, stable machine. Contact the factory for further information on specific mounting situations. Information is readily available upon request, free of charge, from the factory.

If the machine is to be mounted to a table, make sure that the table is secured to the floor or ground.

## 9. GENERAL OPERATING PROCEDURES

### 9.1. INITIAL SETUP

#### 9.1.1. General

**\*Knudson by Go CNC strongly recommends sending sample blank material to the factory upon ordering of the EL-2002. This way the factory will be able to set up the machine to the specific needs of the buyer.\***

The machine has been completely set-up, tested, and adjusted at the factory upon ordering. The machine should produce a high quality elbow section with only minor or no adjustments depending on material and material thickness.

**\* Smooth actuation of the handles will produce a more predictable part time and again and will keep the internal mechanisms from wearing out rapidly.\***

#### 9.1.2. Initial Setup Inspection

A rapid yet thorough inspection should be performed prior to set-up and operation. Perform the following checks:

- Inspect the machine for any loose fasteners or components.
- Ensure that the proper knife set is in place for the desired elbow.

If the factory set up does not match the intended starting profile, refer to the appropriate part of Section 10 to set up the machine for the desired profile.

### 9.2. BLANK SIZING

**\*Many of the lengths given in the following section will vary from machine to machine and with differing downspout sizes. Different machines may have different crimp-to-angle ratios and therefore, not as much material will be needed for certain crimps. Experience with the machine and material will give the operator a better feel for its characteristics and a better idea of how to size blanks.\***

The combination of crimping and advancing takes up one inch of material. The distance from the last crimp made to the end of the blank (where it makes contact with the advance plate) will be approximately 3.25-in. The only variable length in the blank is the amount of material after the elbow. This length can be changed to meet the needs of the situation. To size a blank, add the desired length after the elbow to 3.25-in then add one inch per crimp to be made. This will produce the length of blank used. The following table provides recommended blank sizes for making different size and shape elbows. These numbers are provided as a guideline. Varying the depth of crimp and the position of the side knives will allow for steeper angles with less crimps, and hence, shorter blank lengths needed.



<b>2-in x 3-in Downspout Blanks</b>			
<b>Elbow Size</b>	<b>Bend Degress</b>	<b>Blank Length</b>	<b>Blank Length</b>
"A" Elbows	45	8.5 in	216 mm
	60	10 in	254 mm
	75	11.5 in	292 mm
	90	12.5 in	318 mm
"B" Elbows	30	8.5 in	216 mm
	45	10 in	254 mm
	60	11.5 in	292 mm
	75	12.5 in	318 mm
	90	14 in	356 mm
<b>3-in x 4-in Downspout Blanks</b>			
<b>Elbow Size</b>	<b>Bend Degress</b>	<b>Blank Length</b>	<b>Blank Length</b>
"A" Elbows	45	9 in	229 mm
	60	10.5 in	267 mm
	75	14 in	305 mm
	90	15 in	330 mm
"B" Elbows	30	9 in	229 mm
	45	10.5 in	267 mm
	60	12 in	305 mm
	75	14 in	330 mm
	90	15.5 in	368 mm

### 9.2.1. Profile vs. Number of Crimps

In general, two crimps account for approximately 25 degrees of bend in 2 x 3-in downspout. In the case of 3 x 4-in blanks two crimps account for approximately 15 degrees of bend. By adjusting the crimp depth and position of the knives, it is possible to change these numbers by a crimp or two and still retain acceptable elbows.

**\*These numbers will vary from machine to machine. They are provided as a guideline. \***

### 9.2.2. Setting the Number of Crimps

The machine will be set up and adjusted for a specific downspout size at the factory. The desired angle is dependant upon the number of crimps. The numbers running across the top of the enclosure indicate the number of crimps. Place the T-handle pin in the required hole. When the blank is inserted, the T-handle pin will stop the advance assembly from sliding back any further and producing an elbow with too many crimps.

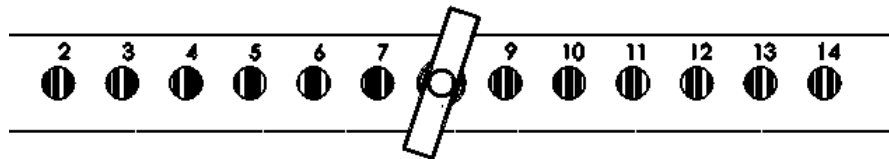


Figure 9-1: Placement of the T-Handle pin determines the number of crimps.

### 9.2.3. Return sizing

When fabricating offsets, the blank size is determined by the angle of elbow to be bent and the length of the overhang that the offset is to fit. The following is an example for a 2 x 3-in A size downspout to be angled at 75 degrees with an overhang of 18-in.

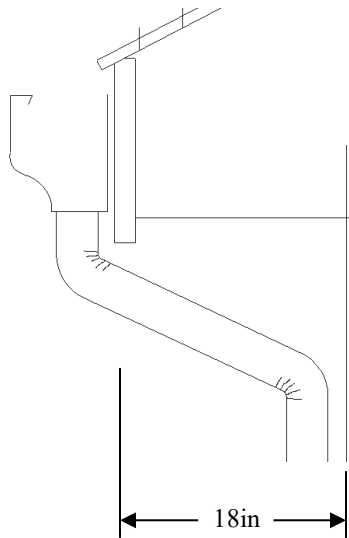


Figure 9-2: Sizing of a blank to create an offset.

The two elbow sections are both 75 degrees (approximately 6 crimps apiece). Measure the distance from the wall to the fascia and add one inch for every crimp in the offset. In this case, the total approximate length of the blank will be 30-in.

**\*These are provided as guidelines. They will vary due to machine and the material used \***

### 9.3. CUTTING ELBOW BLANKS

It is important to cut the ends of elbow blanks squarely. This will ensure a straight crimp and reduce twisting of the blank. Use a fine tooth, high grade, nonferrous metal cutting saw blade. The blade should have between 150 and 200 teeth on a 10" blade.

### 9.4. INSERTING A BLANK

Extend indexing plunger and twist 90 degrees so that when released, it does not reengage. This will allow the advancing assembly to slide towards the back end of the machine. Insert push tool inside one end of the blank. Place opposite end of blank around the mandrel. The advance assembly may also have to be slid towards the back of the machine in order to allow the mandrel to be lifted slightly. The blank may have to be rocked back and forth so that the mandrel lifts up enough to let the blank slide around it. Keep inserting the blank until it has reached the universal advancing plate. Continue rocking the blank back and forth and/or up and down until the back end of it has settled into its intended slot in the advance plate. Continue inserting until the advancing assembly makes contact with the T-handle pin. The blank is now fully inserted and can now be crimped.

**\*It is recommended that the indexing plunger remain in the extended configuration so that the blank is crimped in the fully inserted position. \***

**\*It is also recommended that the push tool stay in the front end of the blank until the first crimp is made. The initial crimp may cause the opening of the blank to become twisted and, as a result, the elbow will not be desirable. Once the initial crimp is made, the push tool may be removed and set aside. \***

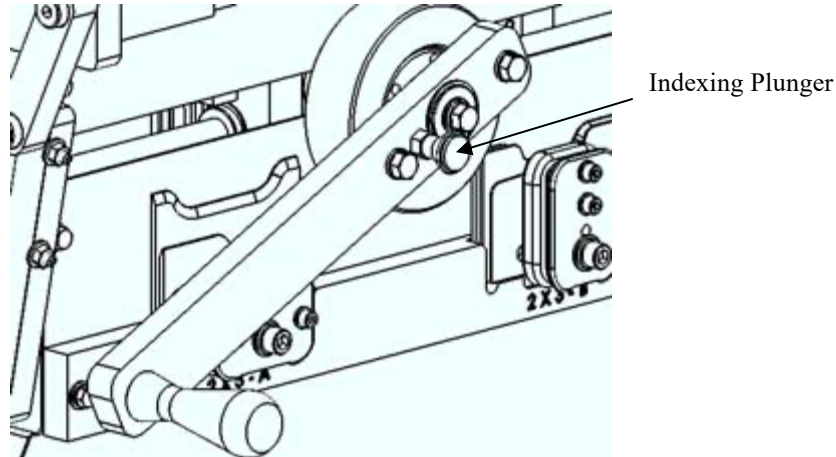


Figure 9.3. Close of up advance handle showing location of indexing plunger.

#### **9.5. PRODUCING A CRIMPED ELBOW**

Once the above steps have been completed, an elbow can be produced. Run the crimp handle through its motion and allow it to return to its initial position. Once the crimp handle is back in the starting position, extend the indexing plunger away from the handle and turn 90 degrees so that the plunger can engage one of the holes behind the handle. Slowly lift the advance handle until the plunger engages one of the holes. Keep lifting the advance handle until it reaches the top of its arc. If the indexing plunger has not engaged a hole, slowly lower the handle until it does and return the handle to the top again. Slowly lower the advance handle through its range of motion and the blank will advance towards the front of the machine. This completes one crimp. If needed, lift up slightly on the push tool as the advance assembly is moving forward to aid the formation of the initial fold. From this point, continue alternating from the crimp handle to the advance handle until the crimp handle will not produce a crimp. At this point, remove the elbow from the front of the machine and prepare another blank.

**\*Once again, it is recommended that the handles are not slammed back and forth between their two positions. This will cause the crimp depth to be somewhat variable and, therefore, the elbow produced will not be consistent. Smooth actuation of the handles will produce a more predictable part time and again and will keep the internal mechanisms from wearing out rapidly. \***

**\*\* WHEN PRODUCING A CRIMPED ELBOW MAKE SURE TO LEAVE BOTH HANDS ON THE MACHINE AT ALL TIMES. FAILURE TO DO SO GREATLY INCREASES THE RISK OF INJURY TO HANDS AND FINGERS. ALSO MAKE SURE TO KEEP ALL LOOSE CLOTHING AND LONG HAIR CLEAR OF THE MECHANISMS. \*\***

## 10. PROFILE CHANGEOVER PROCEDURES

### 10.1. PROFILE CHANGEOVER GENERAL NOTES

The following descriptions and figures show the machine in the 2x3 A configuration. The process and required tools are the same for all four configurations.

A changeover can be performed using a set of L-shaped hex wrenches (see Section 4). Sliding the advance assembly to the back end of the machine can simplify the changeover process. Because the advance assembly is no longer fully forward, the crimp stops cannot function properly and the knives WILL BE ABLE to move increasing the risk for injury.

**\*Insure that the crimp handle is not moved during the changeover process. Failure to do so could result in serious injury. \***

#### 10.1.1. Knives off, Mandrel Assembly Off

Using a 5/16-in hex wrench, remove the three knives before removing the mandrel assembly to reduce the risk of injury. Remove the three 3/8-in socket head bolts that secure the knives to the machine. Once the knives are removed, unscrew the 3/8-in socket head bolt that holds the mandrel in place and slide it off the advance shaft.

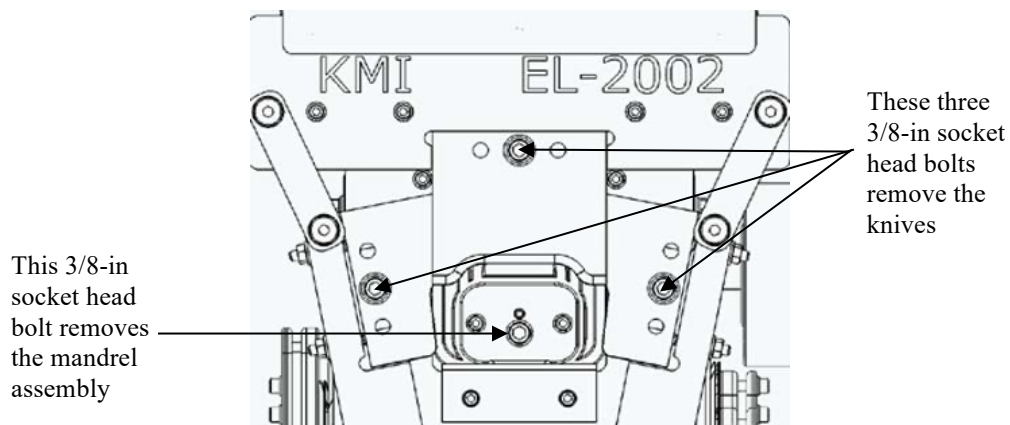


Figure 10-1: Front view of knives and mandrel assembly to be exchanged.

#### 10.1.2. Mandrel Assembly On, Knives On

To mount the new knives and mandrel assembly, use the same four 3/8-in socket head bolts that were used for the previous set-up. To reduce the risk of serious injury, mount the mandrel assembly first, then the side knives, and finally, the top knife. Mount the mandrel assembly first. Make sure the heads of the two 1/4-20 socket head screws are facing the operator and slide onto roller key extending from the gear rack. It may be necessary to slide the advance assembly towards the back of the machine in order to lift gear rack slightly. Once the mandrel is in place, secure with 3/8 x 1.75-in socket head screw. To mount the side knives, make sure to place the beveled side of the knife towards the machine and secure with socket head bolt. The mounting screw needs to be snug, but not too tight that the knife cannot slide side-to-side. This slack will allow the side knives to contour more to the blank during minor adjustment. Figure 10-2 shows the proper orientation for the left knife. The right side is also oriented in this fashion.

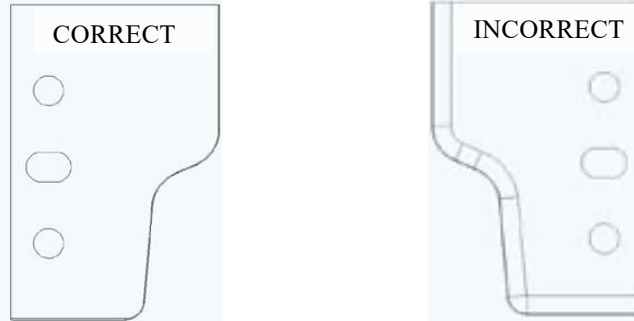


Figure: 10-2: This side of the **left** knife should face operator when mounted

The beveled side of the **left** knife should face away from the operator when mounted.

With the side knives mounted, mount the top knife, beveled side facing the operator as shown in Figure 10-3. The screw mounting the top knife needs to be tight. This will allow the top knife to crimp the blank properly.

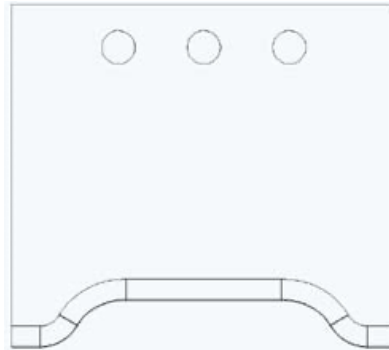


Figure 10-3: This side of the top knife should face the operator when mounted.

### 10.1.3. Storing the Removed Knives and Mandrel on Sides of the Machine.

Available along the sides of the EL-2002 are places to store all four sets of knives and mandrels. One side of the machine holds both configurations of the 3x4 elbow producing tools, while the other side holds the 2x3. Storage locations are clearly marked on the mounting brackets. Locate the proper space for the tools removed in section 10.1.1 and mount them with a 3/8-16-in x 1.75-in socket head screw in the following order. Top knife facing up and closest to the machine, left side knife facing up, right side knife facing up, mandrel assembly, 3/8-in standard washer, and 3/8-in lock washer. Refer to Figure 10-3 for further clarification.

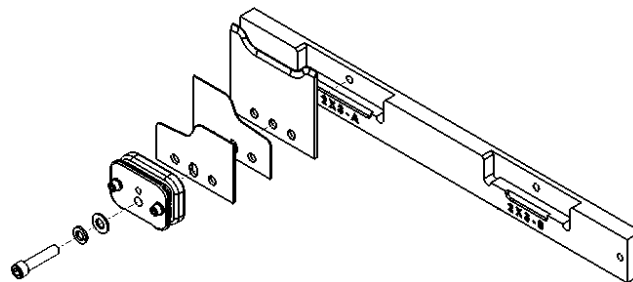


Figure 10-3: Mounting the knives and mandrel assembly to the side of the machine.

### 10.1.4. Adjustment

Adjustment may be required once the new knives and mandrel assembly are installed. Refer to Section 11 for adjustment instructions. Only minor adjustments are to be expected. In general, the only adjustment needed is adjusting the crimp depth when changing from A to B configurations. If major adjustments are needed, recheck crossover instructions to make sure the procedure was carried out properly.

## 11. ADJUSTMENTS AND TROUBLE SHOOTING

**\*\*\* ENSURE ALL SETUP AND OPERATING PROCEDURES IDENTIFIED IN SECTION 7 HAVE BEEN FOLLOWED AND VERIFIED PRIOR TO ADJUSTING THE MACHINE \*\*\***

**\*\*\*READ ALL OF THE SECTION 10 ADJUSTMENT PROCEDURES AND SECTION 11 BEFORE ADJUSTING THE MACHINE \*\*\***

### 11.1. GENERAL OPERATION

Some problems may be caused by inconsistent operation. Make sure handles are being actuated consistently and fully. The first two sub-sections of this section may alleviate inconsistencies in the finished elbow. If a problem still exists, proceed with the knife adjustment steps to adjust to the desired profile.

### 11.2. CRIMPING/ADVANCING

It is recommended that the handles are pushed downward more so than pulled towards the operator. Smooth, consistent actuation of the handles leads to a more predictable part. Slamming the handles from one position to the next will decrease the consistency of the part and increase wear on the machine itself. Proper leveraging will allow operator to move the handles smoothly. If changing the height of the operating surface cannot solve a leverage problem, it is possible to change the orientation of the crimping handle of the EL-2002.

#### 11.2.1. Adjusting Position of Crimping Handle

Adjusting the crimping handle orientation will require a 7/16-in combination wrench and a 5/16-in L-shaped hex wrench.

Begin by removing the blue top cover exposing the crimp shaft and gears. Make note of where the rack gear meets with the pinion gear. In Figure 11-1, the two gears meet up four spaces down the rack. This will need to be where the gears meet again once the handle adjustment is made. Another option would be to turn the crimp depth adjustment knob clockwise until it makes contact with the front so that the crimping assembly does not move when the handle is pulled.

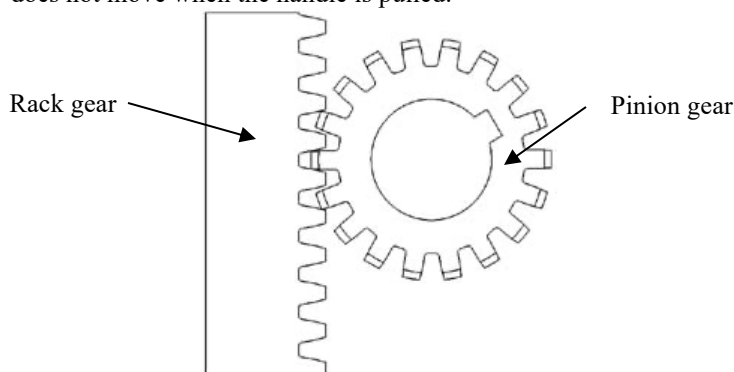


Figure 11-1: The gears fully meet four spaces down the rack gear.

Next loosen the four outermost 1/4-20 x 1.25-in, socket head screws on the front plate (Figure 11-2). Fully remove the two screws on the left. This will cause the rack gear and spacer to come off the back of the front plate. Fully remove the screws on the right side and this will allow the crimping handle to move freely without actuating any of the crimping assembly.

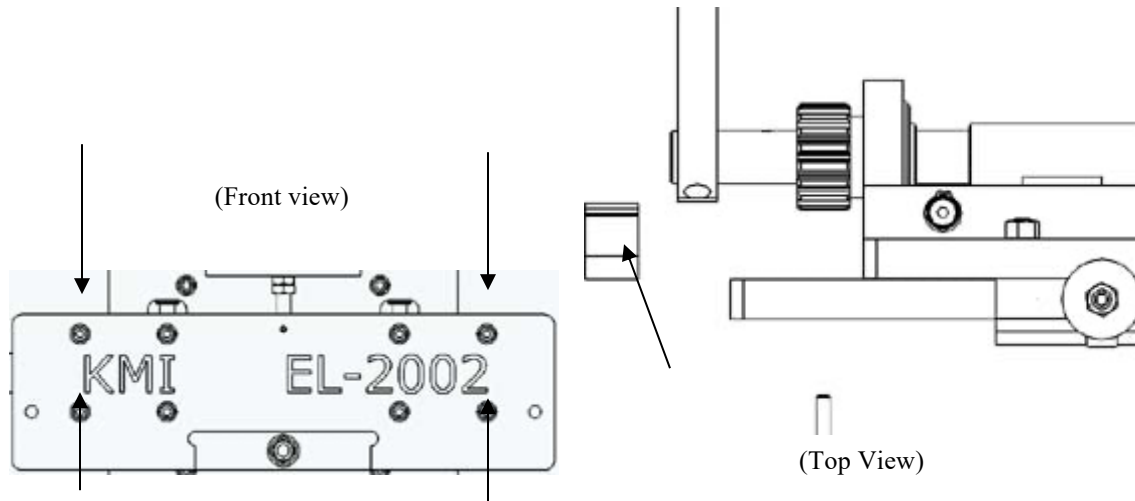


Figure 11-2: Removing the four outermost screws (left) will allow for the removal of the rack gear and the rack spacer (right). Removal of the gear/spacer on the left and right of the front plate will allow for crimp handle adjustment.

Rotate the crimping handle to the desired angle and replace the left side rack gear and spacer taking care to realign gear teeth just as they were before (four spaces down in the case of Figure 11-1). Be sure to have the rack gear situated so that the notched end of the gear is facing up (see Figure 11-1). Replace the rack and spacer on the right side also and make sure all four socket head screws are tight. Turn the crimp depth adjustment knob counterclockwise until it meets the nut above it. Replace blue cover and continue operation as dictated in Section 7.

### 11.3. PROFILE CURVATURE ADJUSTMENTS

**\*Be sure the material specifications identified in Section 3 are closely adhered to. Excessively strong or hard material (base metal) often leads to tearing or other unpredictable results. \***

In order to achieve the proper elbow profile, minor adjustments may need to be made to the side knives and overall crimp depth. Drastic changes in the positions of the adjustment screws will cause even more drastic changes in the resulting crimp. Turn the adjustment screws in small increments and utilize multiple test blanks in order to achieve the desired elbow.



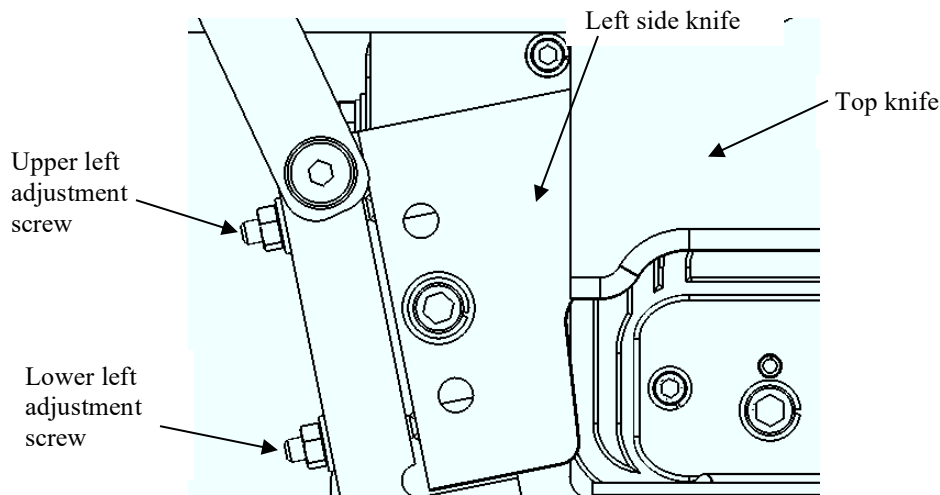


Figure 11-4: This figure shows the location of the two adjustment screws for the left side knife.

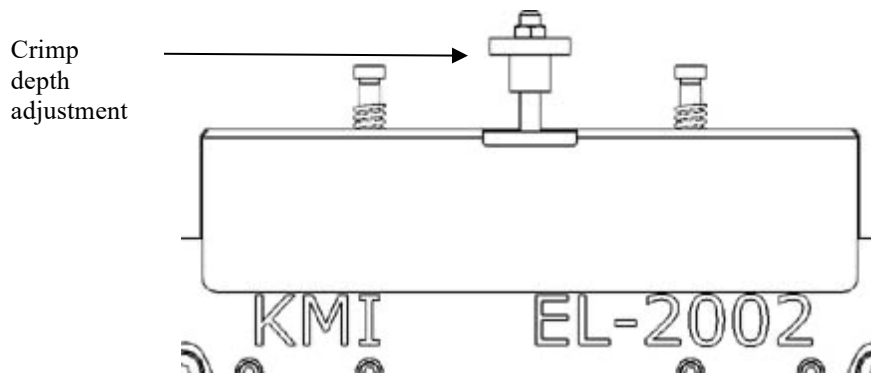


Figure 11-5: This figure shows the location of the crimp depth adjustment knob.

The crimp depth can be altered by adjusting the knob shown in Figure 11-5. To make the crimp deeper (on the top as well as the sides), turn the knob counterclockwise slightly. To make the crimp shallower, turn the knob clockwise.

Complete adjustment of the machine may require adjusting all four side adjustment screws and the crimp depth knob. Multiple practice blanks might be needed to achieve the desired profile and the operator will most likely require a some practice adjusting the machine. If there is any problem understanding the sequence or the function of any of the adjustment knobs, the factory or distributor should be contacted for assistance in adjustments.

**\* Knudson by Go CNC recommends the customer send in several samples of downspout to be formed into elbows. The factory will use the samples to adjust the machine and produce as many finished elbows as possible to ship with the machine. \***

### 11.3.1.Tearing

The crimping process is essentially a controlled folding process. The most typical problem with this process is tearing. Tearing typically results from the knives being set too deep, or from the side knives making asymmetrical contact with the blank (the side knives being set too far in on the top). Be sure the side knives are just barely contacting the bottom corners on the blank. From there, the angle of the side knives may be adjusted to increase crimp or reduce tearing. The top knife must work together with the side

dies to create the correct fold. A visual assessment must be made to determine how to adjust the depth of crimp. An inspection of the inside of the completed elbow must not reveal any cracks in the elbow.

### **11.3.2. Right or Left Curve**

Right or left curve is caused when one of the side knives is crimping more material than the other. In some cases, one side may be crimping too much material and sometimes one side may not be crimping enough. If one side is crimping too much, turn both the upper and lower adjustment screws on that side counterclockwise so as to keep the knife contacting the blank at the same angle it was before. If one side isn't crimping enough material, turn both upper and lower adjustment screws on that side clockwise, keeping the knife angle the same. One indication that a side isn't crimping enough material is the appearance of a bulge instead of a crisp fold. Setting the side knife in slightly should alleviate this problem.

### **11.3.3. Profile Twisting Adjustments**

Twisting will occur if only one of the adjustment screws (either the upper or the lower) on one side of the blank is set too deep. The exit end of the blank will sweep to one side as well as vertically. Adjust the appropriate screw depending on the direction of the twist.

## **11.4. CRASH PROCEDURES**

A crash may include any of several conditions:

- material will not move through the machine.
- material is bent or crumpled against a fixed component in the machine.

In any case, a crash presents a potentially hazardous situation for the machine operator. Crashes often produce sharp, jagged metal edges that ultimately require handling. Suitable hand and eye protection, to include leather gloves and safety glasses, should always be worn when clearing a crash.

Inspect the machine for the cause of the crash. Examine the entire machine, because some obstructions and the crash source may not be either obvious or visible. The safety covers must be removed to conduct an adequate inspection.

### **11.4.1. Clearing the Crash**

Use snips (this may require both right hand and left hand snips) to cut any folded, bent, or crumpled material out of the machine. Removal of the cut out material may require the removal of the knives and mandrel assembly.

A severe crash may require partial machine disassembly to clear, although disassembly is rarely required.

**\*\*\* EXERCISE EXTREME CAUTION WHEN OPERATING THE MACHINE WITH SAFETY  
COVERS REMOVED \*\*\***

**\*A typical crash is caused by adding an extra crimp to the elbow without being able to use the advance assembly to push the elbow over the mandrel. This crash might be able to be cleared by placing a block of wood between the back end of the blank and the advance plate and pulling the advance handle. Usually it requires the operator to remove the knives and mandrel assembly and will likely result in an unusable elbow. \***

#### **11.4.1. Crash Recovery**

A crash indicates a serious problem with existing adjustments or some kind of mechanical difficulty. Once the machine is clear of material, refer to Sections 8 and 9 for Initial Setup and General Operating Procedures. Re-read Sections 9 and 11 completely. **CONDUCT A THOROUGH INSPECTION OF THE MACHINE, THEN PERFORM ALL THE APPLICABLE PROCEDURES NOTED IN SECTIONS 9 AND 11.** Start from the beginning, as if the machine had not been run. After a crash, all adjustments are suspect and must be verified.

**\*\*\* REPLACE THE SAFETY COVERS PRIOR TO CONTINUOUS OPERATION \*\*\***

## 12. GENERAL MACHINE MAINTENANCE

### 12.1. CLEANLINESS / GENERAL

Keep both the machine and the surrounding work area clean and free of dust, dirt and debris. Routine cleaning of the entire machine will help extend the life of all mechanical components. In particular, a clean machine and work area will help prevent the introduction of foreign objects into the machine, which can significantly damage mechanical components.

#### 12.1.1. Factory Assistance

In the event of any difficulties you cannot solve with the aid of the manual, call your distributor or the factory for assistance. We are interested in your satisfaction as a customer.

\*\*\*\*\*

**This maintenance schedule is based on an average operating schedule of intermittent use eight (8) hours per day, five days per week. Change the maintenance schedule as required to match actual machine usage.**

\*\*\*\*\*

### 12.2. INDEX OF PERIODIC MAINTENANCE

Keep your EL-2002 in good condition by following a regular maintenance schedule. Briefly inspect the machine for glaring problems prior to each use and adopt a periodic schedule based on the following set of checklists.

#### 12.2.1. Semi-Annual Checks

Inspect gears and sprockets for wear  
Inspect fasteners for tightness

#### 12.2.2. Monthly Checks

Lubricate gears and sprockets.  
Execute a full range of motion test on the crimping assembly and advance assembly.  
Remove top covers and blow out any dust or debris.  
Conduct a detailed inspection of knives and mandrel components.  
Lubricate/oil both slide shafts.

#### 12.2.3. Weekly Checks

Remove the knives and mandrel components for cleaning and inspection.  
Ensure the work area around the machine is clean and free of any hazards or potential foreign objects that could be conveyed into the machine or struck with hands during operation.

#### 12.2.4. Changeover Checks (performed every time the tooling set is changed)

Conduct a detailed inspection of knives and mandrel components  
Inspect fasteners for tightness

## 13. TRANSPORTATION / MOVING THE MACHINE

### **13.1. GENERAL**

During transport/moving, the machine will experience vibration and shock normally associated with vehicular or trailer transport. Vibration and shock may loosen fasteners.

### **13.2. TRANSPORTATION PROCEDURES**

Ensure that all equipment is secure. Do not leave any loose tools in or around the machine.

Remove any straight or partially bent blanks from machine and discard them.

The machine is now ready for placement onto a trailer, into a truck, or into an appropriate shipping container. Ensure the entire machine is secured to the transportation vehicle prior to any movement.

### **13.3. WHAT TO EXPECT/INSPECT**

After transporting/moving the machine, review the procedures listed in Section 11 and carry out any applicable instructions. **THE INITIAL INSPECTIONS OUTLINED IN SECTION 11 SHOULD BE PERFORMED EVERY TIME THE MACHINE IS TRANSPORTED/MOVED.**