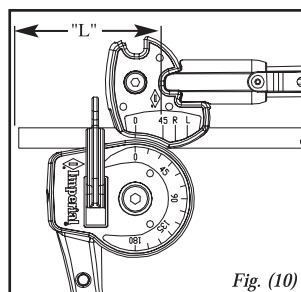
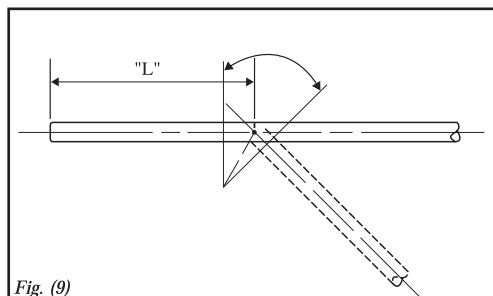


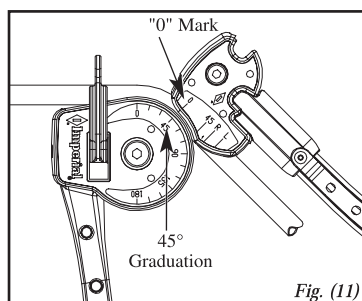
SINGLE 45° BENDS

Determine where you want the center of the 45° bend on the tube. (Dimension "L" Fig. (9)). Measure that distance and place a mark around the tube at "L" distance.



Position tube in bender as shown in Fig. (10). The "L" mark should be directly under positioning line 45°.

With steady motion pull indexing lever around until "0" mark on lever is directly aligned with the 45° graduation line on the form wheel. Fig. (11)

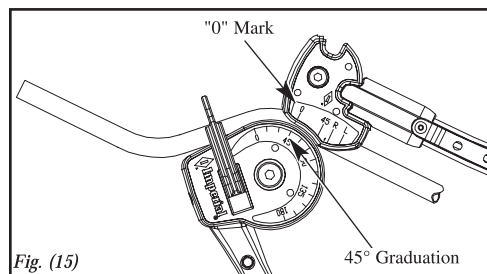
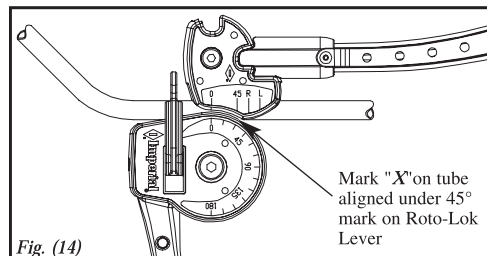
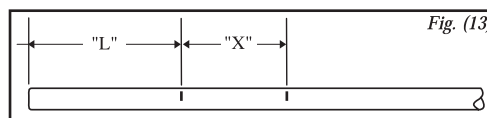
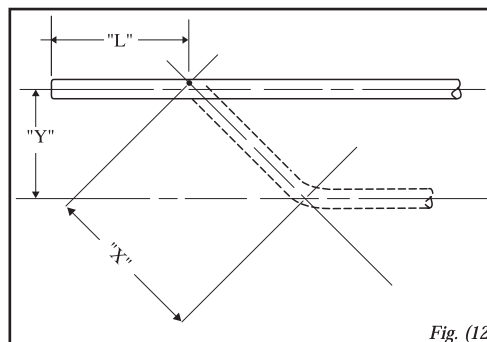


DOUBLE 45° OFFSET BENDS

1. Determine the desired centerline dimension between the legs of the offset (Dimension "Y"). Fig. (12)
2. Determine the center of the first 45° bend. (Dimension "L") Fig. (12). Measure from end of tube and place mark at "L" distance. Fig. (13)
3. Determine center-to-center distance of 45° bend (Dimension "X") in Fig. (12). Multiply offset dimension "Y" by 1.414. Measure from "L" mark on the tube and place a mark at "X" distance. Fig. (13)
4. Follow procedure for Single 45° Bends.

5. Reposition tube in bender as shown Fig. (14). The measured mark "X" should be directly under the 45° graduation line on the Indexing Lever. Insure the bend plane is in the correct relationship to the first bend. With a steady motion pull the Indexing Lever around until the "0" on the Indexing Lever is aligned with the 45° graduation line on the Form Lever. Fig. (15)

Note: Both "L" and "X" marks must be placed on tube prior to bending. Fig. (13)



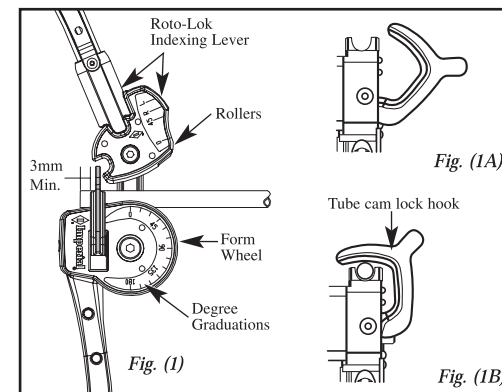
664-FH HEAVY DUTY 180° METRIC TUBE BENDER

The 664-FH Series bender can be used for bending copper, aluminum, steel, stainless steel and other tubing of bending temper (annealed). Avoid use with extremely thin wall and/or hard temper tubing.

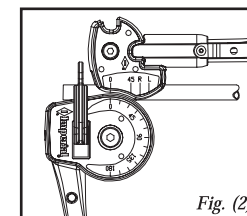
⚠ Warning! Keep body parts away from pinch/bend areas while using. Ensure tubing is secure in tool before bending. Always wear approved eye protection. Broken materials may fly.

Instructions for Use

- 1.) Raise the Roto-Lok™ Indexing Form Lever as shown Fig. (1).
- 2.) Make sure the Tube Cam Locking Hook is away from the Form Wheel Groove area. Fig. (1A)
- 3.) Position tubing in groove and engage the Tube Cam Hook with tube as shown. Insure that a minimum of 3mm is past the hook to prevent flattening at end of tube. Fig. (1) and Fig. (1B)



- 4.) Lower the Roto-Lok Indexing Form Lever to the 90° start position. This is accomplished when the "0" on the Form Lever is aligned with the "0" degree mark on the Form Wheel as shown in Fig. (2).



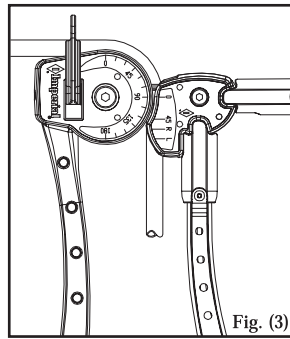
Note: All tubing will exhibit springback after a bend is completed. Springback is when the tube relaxes after being stressed; with soft copper tubing it is so minor compensation may not be necessary. With steel or stainless steel it could be from 2° to 5°.



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5.) Pull the Roto-Lok Indexing Form Lever down until the desired bend angle is obtained. Degree of bend is indicated when the "0" mark on the Form Lever aligns with the desired graduation on the Form Wheel. Fig. (3) (Example 90° Bend)



For ease in completing bends greater than 90° (180° max.) follow below. Pull Roto-Lok Indexing Form Lever to approximately 90°. While maintaining the handle position with your thumb and index finger, reach up to the releasing collar and pull towards the grip. While the collar is in the released position raise lever upwards to approximately 80° and release collar. Collar will snap into position as shown. Fig. (4)

IMPORTANT. Before proceeding with bend ensure the stopping lug on the Index Form Lever is in contact with the link and the Form Shoe rollers are in contact with tube, Fig. (4). This will ensure that you are in the correct position to finish your bend to achieve the correct angle.

Complete the downward motion of Indexing Form Lever until the "0" on lever is aligned with the degree mark on forming wheel desired. Fig. (5) (Example 180° Bend)

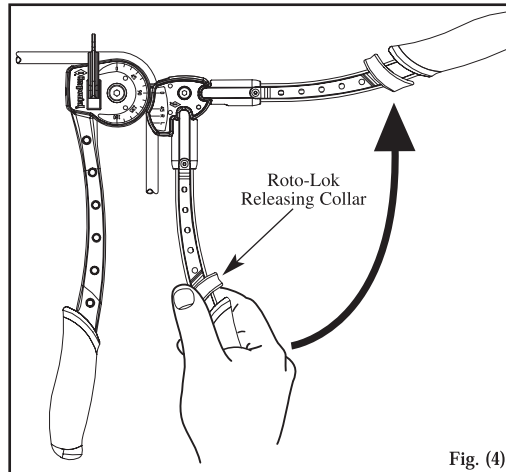


Fig. (4)

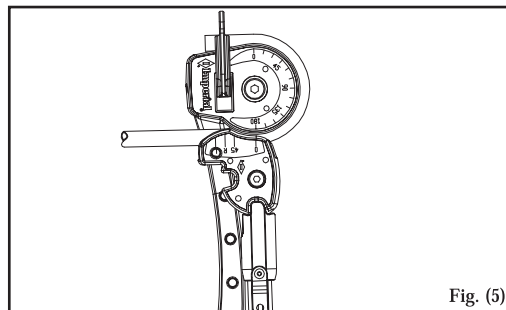


Fig. (5)

INSTRUCTIONS FOR MAKING ACCURATE 90° CENTERLINE BENDS

1. Determine the desired center line dimension. Dimension "L" in Fig. (6).
2. Measure from end of tube (first bend) and place a mark on the tubing at the "L" distance around tube.
3. Position tube in the bender groove as shown in Fig. (2). Move hook to engage tube lightly, but enabling the tube to be moved to position your mark on tube.

The positioning marks are always in the same sequence from left to right on all benders: "45°", "R" and "L". Located on the Indexing Form Lever. Fig. (7)

4. If the end from which you measured is left of the tube cam locking hook, the measured mark on the tube should align with the "L". Fig. (8)

With a steady motion pull Indexing Form Lever until the "0" mark on the Indexing Form Lever is directly aligned with the 90° graduation on the Form Wheel. Fig. (3)

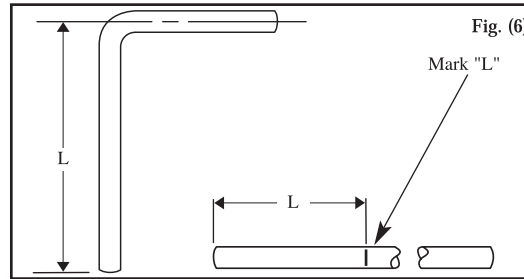


Fig. (6)

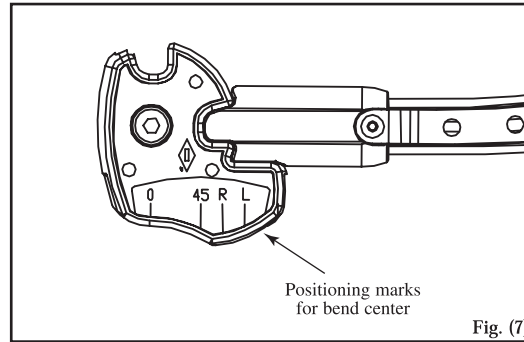


Fig. (7)

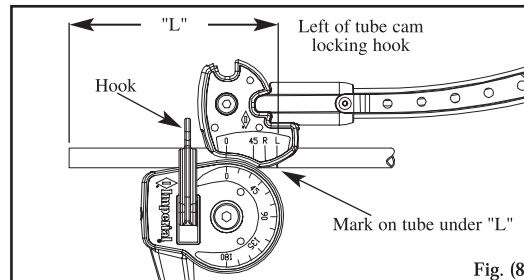


Fig. (8)

5. If the end from which you measured and placed your mark is placed to the right of the tube cam locking hook, position the tube so the mark is directly aligned with the "R" Lever. Fig. (8A). With a steady motion, pull Indexing Form Lever around until the "0" mark on the Indexing Form Lever is directly aligned with the 90° graduation on the Form Wheel Fig. (3).

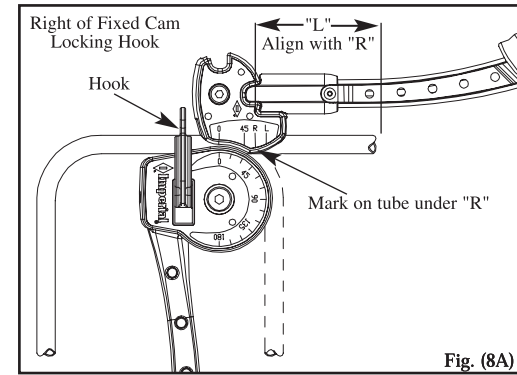


Fig. (8A)

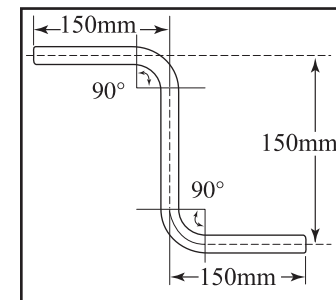
LENGTH CORRECTION FACTORS FOR 45° AND 90° BENDS

To arrive at the exact tube length to fabricate a circuit, the following method may be used.

Add all center-to-center dimensions of tube circuit. For each 90° bend subtract the amount shown in Chart "A". Circuits are usually dimensioned to square corners. Therefore the length of tube required is always less.

Chart A

Tube Diameter	Bend Radius	Correction Factor	
		90°	45°
6mm	15mm	6.443	0.648
8mm	24mm	10.308	1.036
10mm	24mm	10.308	1.036



Example:	Factor	Bends
Tube Size = 6mm	1) 6.443mm x 2 =	12.886mm
Number of bends = 2	Sum	
Bend Radius = 15mm	2) 450mm - 12.886mm =	437.114mm
Sum of Centerline Dimensions = 450mm	3) 437.114mm Tube Length	
Correction Factor = 6.443mm	Required	

NOTE: For better performance, oil all moving parts regularly. **DO NOT** oil form wheel groove.