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General Information

These Instructions Are Used For The Following Bender
Models.

The bending steps remain the same regardless of model used. The only
difference is the amount of tubing bent with each bending stroke

Models Dy-10, C-10, EC-10 & PF-10 Hoop Bending Tools

Inventors and pioneers of these amazing Greenhouse bending
tools,

www.buildmyowngreenhouse.com

Email info@hoopbenders.net or herbs@lostcreek.net
Phone 903-497-1158

Mounting Your Hoop Bender

Horizontal Mounting For All “DY” & “C” series mount using two ¼” bolts in the 2 holes drilled & provided here. We offer an optional vertical leg kit for all C-Series



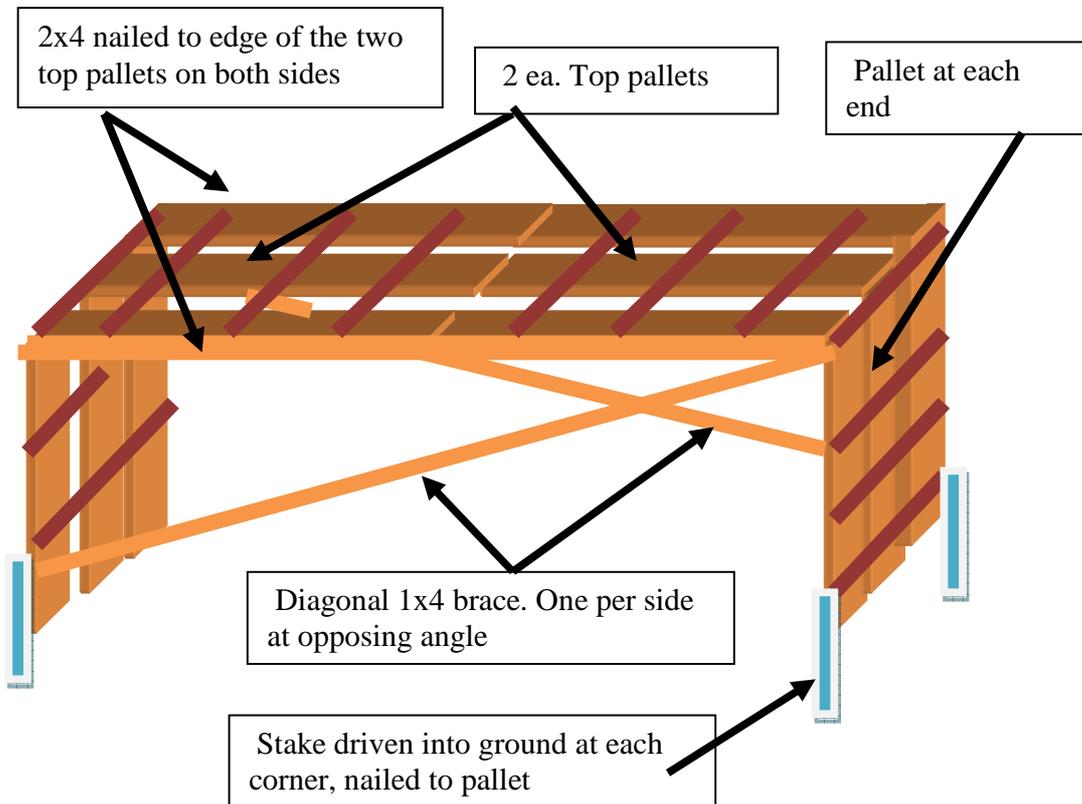
IMPORTANT: PLEASE READ ALL INSTRUCTIONS BEFORE BEGINNING



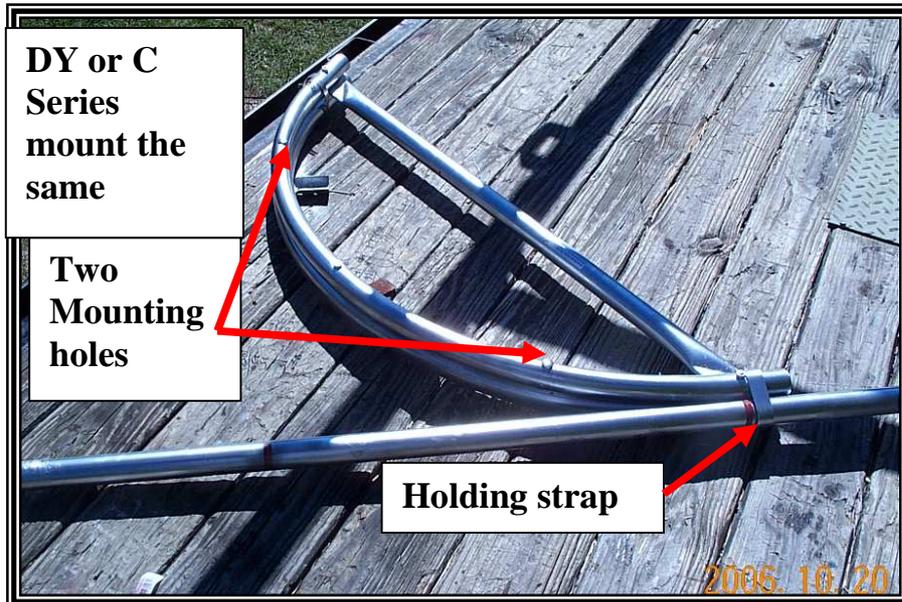
Our DY, C, RC, & MH Series benders are designed to be mounted to a table or other stable surfaces.

The C-series is the exception as it can be mounted to our optional vertical leg set sold separately. The commercial PF-series come with its own leg set.

The mounting table doesn't need to be elaborate. In fact the first example is a simple and effective table constructed with four wooded pallets shown below in the drawing, two 8 ft. 2x4s and a few 1x4 boards.



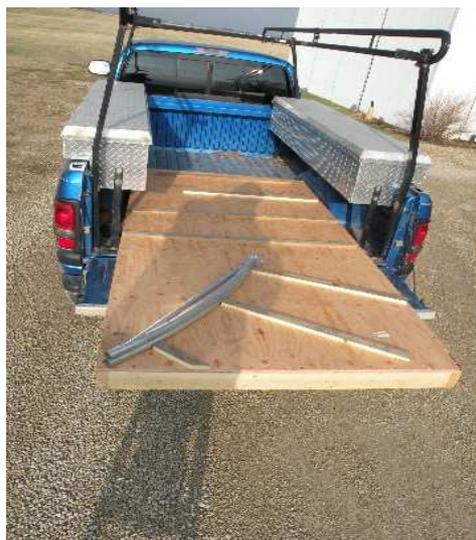
This pallet table does not require any plywood for the top. Just mount bender directly to the pallets in position shown for a plywood table top on page 3.



The following photos are of benders mounted in different ways. We recommend mounting your bender horizontally (flat) on a 4'x8' table or suitable flat surface.

In the photos it is simply lag bolted to a flat bed truck.

Perhaps the simplest table mount ever used was supplied by one of my customers. He simply bolted the bender to a 4'x8' sheet of plywood and slide the plywood into his pickup bed, with the tail gate down he let the plywood overhang the tailgate. Short wood blocks can be used to further wedge the unit between the fender wells of the pickup.

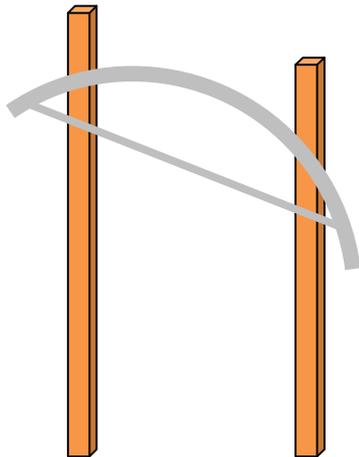




Vertical mounting can also be performed several different ways without a lot of cost and labor.

The picture above is an ingenious mounting configuration sent in by another customer if you have a tractor with a front bucket, if not you get the ideal. This allows easy changing of bender angle and height.

Another quick vertical mount is simply two post with the bender bolted to them see drawing below. Vertical mounting can be made to any available, existing wall or fence, as long as it is stable and does not move.



All greenhouse hoops must be 12 to 18 inches wider across the base than the Installed Width.

After bending the hoops, connect the sections together laying flat on the ground and measure across the base. Bending a 10 ft wide hoop using any of our 10 ft benders, then the hoop must measure at between 11 to 12 feet across the base, when the two sections are connected and laying flat on the ground, This extra width is necessary because the hoops must be compressed inward to install into the ground anchor tubes. This is referred to as “post tension” which strengthens and smooth’s out the hoops.

To start with purchase only enough tubing to build one or two test hoops.

The reason for this is simple; some tubing these days, can be made from a softer base metal. Because tubing springs back (rebounds) after being bent, tubing made from softer metal than normally does not spring back as much after bending, which can result in a hoop that is under size. EXAMPLE: If your hoop is to be a 10 ft wide hoop. As discussed on the previous page, your finished width after bending must be between 11 and 12 feet wide. The extra foot or two

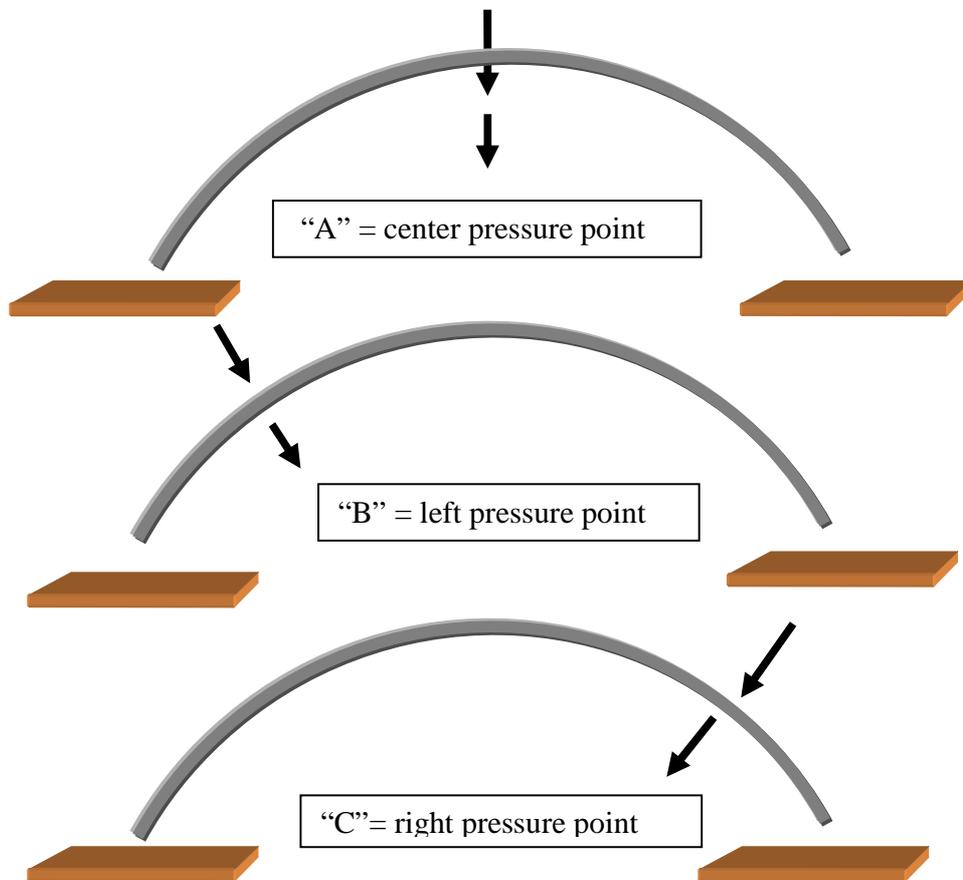
will be compressed inward when installed into the post anchors. Let's say you bent the hoop and its 9 1/2 feet wide. The hoop must never be pulled outward to install, it must always be compressed inward. So what do you do about this problem?

Actually there is a fast and simple method to get the hoop out to the get the required uncompressed width of 11 foot, which can then be compressed and installed to the required 10 ft hoop. We refer to this method of resizing as "Tune Out" it has been proven to work every time and produce good hoops. Never attempt to resize a hoop by any other method other than the following method, the result will be "well let's say not good".

One hoop section is 10'6" long, that is the standard length of 1 3/8" fence tubing each 10ft hoop will have 2 sections.

If your first test hoop measurement is less than 10 feet loose on the ground. Take the sections apart and spring out both section's as follows. Place two small wood planks or thick cardboard on the ground so that each is positioned under the ends of a hoop section. While holding the section at the center (point "A") shown below, push the center of section down about two inches and release. The wood planks allow the hoop to slide outward as you push downward. Now move to point "B" on the same section, pushing downward about two inches, at the angle shown by arrows. Now move to, point "C" and repeat this step again. Resize each section. Reassemble the sections and measure the width. The hoop will be wider now, if it still is a little narrow repeat the three point spring out steps above, reassemble and check hoop width. When the target width is achieved mark this hoop and use it as a pattern for resizing all other hoops hoop's. It is not necessary for all of the next hoop sections to match the pattern exactly, just as long as they or close, within a few inches. When all are compressed and installed, they will all look exactly the same.

**NOTE: That the resized sections do not have to all be the same width as long as the fall between 11 and 12 feet.
Refer to drawing on next page.**



The three pressure points are the same on all 10' 6" long hoop sections. Applying pressure at these three points on each section and by allowing the ends to slide freely when pushing down, each section will uniformly be resized into wider hoops. After a few hoop sections this method will resize a section in about 20 seconds each. AGAIN, NEVER attempt to resize using any other method or press down in more places other than the three points shown above.

Determine the spacing of the hoops. Hoops can be spaced 4, 5 or 6 feet apart, four feet being most often used, although you can space them closer if desired. Example if you plan for a 12'x 24' greenhouse, then the best spacing is four feet apart so 24 ft. (the greenhouse length) divided by 4 ft. (the hoop spacing) equals 6, this is the spaces required not the hoops required. Plus 1 to start with. You will require seven (7) hoops to build a 12x24 using 4 ft. spacing.

Simply put; Number of hoops required equals the greenhouse length divided by the hoop spacing plus one (1 hoop). As each 12 ft. hoop requires two 10'6" lengths you would need fourteen lengths of tubing, refer to the tube orientation page preceding this chapter for tube preparation before bending.

IMPORTANT:

During the manufacture of this tubing, one end is swaged (made smaller) sometimes the machines that perform this job causes the swaged end to cant (tilt) slightly to one side. By looking down the length of tubing while turning it slowly you will be able to determine if your tubing has this slight cant. If it does mark or note the direction of cant. Then when you begin the bending process make sure that the cant direction is pointed in the same direction as you are pulling (bending) the tube.

With the bender mounted, all tubes will have one painted end. Start bending by inserting the painted end into and through the holding strap **24" inches**. Pull the tubing around the bender stopping about 4 or 5 inches before you reach the end of the bender, now push one half of the tubing you just bent through the holding strap about 12 to 14 inches, then pull tubing again around the bender always stopping a few inches from the end of bender. Repeat this bend and push through adding the lever bar when needed until the very end (unpainted end) is aligned so it will contact the bender itself about 5 or 6 inches from the end of the bender,



Here I'm completing the final bend on one section for a 12 foot hoop section. Note the already bent tubing being supported at the opposite end with the 1"x2" wood strips

Choosing The Tubing For Your Hoops

Our benders are fixed radius (not adjustable) First a little information on the properties of this metal tubing you will be working with. RULE # 1...Metal like many materials will rebound (spring back) after being bent. This rebound is directly influenced by the hardness of the metal and to a lesser extent on its thickness and over all size. With this in mind we have built each of these benders to produce its designated hoop size provided that you are bending the gauge and diameter pipe size we recommend.

We are often ask, “will your bender bend smaller, larger, heavier or thinner tubing” The answer is yes it will bend many other gauges and even diameters, however if you do so then RULE #1 above applies and there is no way I can tell you what the finished radius of the material will be. EXAMPLE if you purchased a DY-10 bender which produces a 10 foot wide hoop using the tubing we recommend for that hoop, small diameter EMT electrical tubing may result in to tight of a radius, 1”emt will produce a 10 foot wide hoop, but use the connection for 1” emt not 1 3/8”. The rebound of the smaller thinner tubing affects the finished radius which in this case would produce a much smaller radius. So please, unless you just want to experiment, use the tubing we recommend for your bender and greenhouse.

Below are specifications for the required tubing for each hoop size regardless of bending it on our “DY” or “C” series benders.

**The 10 foot wide hoops require two lengths of 18 or 17 gauge by 1 3/8” outside diameter chain link fence top rail tubing in 10 ft. 6 inch lengths, 21 foot lengths may be cut in half to get the correct lengths.
The next page will show you how to mark tubes using precut 10’6” or cutting 21’ lengths in half yourself to get the 10’6” lengths.**

**Orientation of tubes for precut factory 10’ 6” lengths is shown as “A” See next page
Orientation of tubes for factory 21 ft. lengths which must be cut in half is shown as “B”
See next page**

I’m often ask “Can I bend the 21 ft lengths without cutting them in half?” The answer is yes, but don’t try it. It seems that most people reason that it

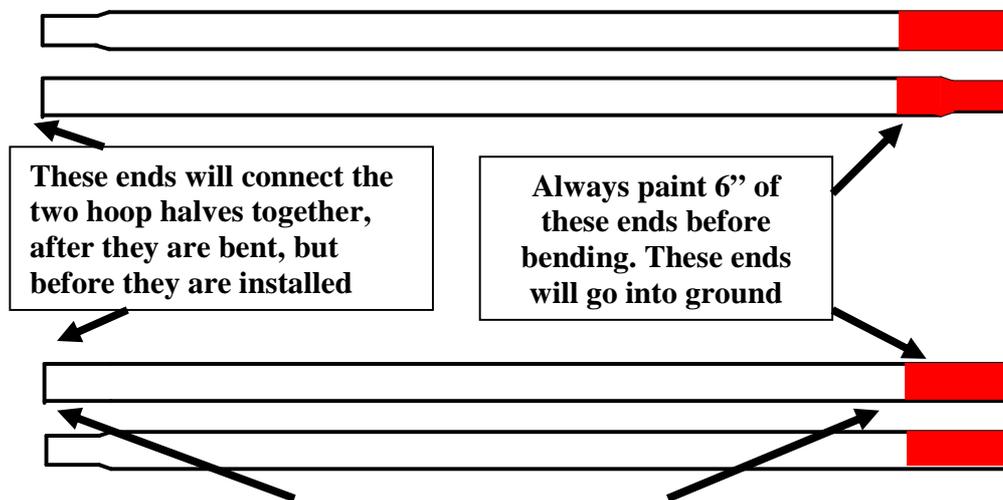
would be faster to skip the cutting in half and just bend the full 21 ft length. Controlling a 21 ft length while bending it is to say the least a nightmare and will 99% of the time end up in disaster and a very long wine bottle cork screw. Most factory made hoops are made using 10' 6" or shorter lengths. Please take my work for this.

Pre-Bending Tube Orientation

Tube Orientation for 10 ft. Hoops

NOTICE: The swaged (small ends) on all 1 3/8" fence tubing

"A" Using factory pre-cut 10' 6" lengths, 1 3/8" 18 or 17 ga.



"B" Using factory 21 ft. lengths 1 3/8" 18 or 17 ga. cut in half.

Using Your 10 Hoop Bender

With the bender mounted to a stable platform described in mounting instructions. Determine the spacing of the hoops. Hoops are spaced 4, 5 or 6 feet apart, although you can space them closer if desired. 4 ft being used most often.

Example if you plan for a 10' x 20' greenhouse, the best spacing is four feet apart so 20 ft. (the greenhouse length) divided by 4 ft. (the hoop

spacing) equals 5, this is the spaces number of 4 ft spaces required, not the hoops required. So the total hoops required for a 10x20 is 6 hoops. Simply put; the

number of hoops required equals the greenhouse length divided by the hoop spacing, in this case its 20 ft length divided by 4 ft spacing, plus one (1 hoop.). As each 10ft. hoop requires two 10'6" lengths you would need 12 lengths of either 18 or 17 gage by 1/38" od chain link fence tubing top rail tubing, refer to the tube orientation page above for tube preparation before bending.

During the manufacture of this tubing, one end is swaged (made smaller) sometimes the machines that perform this job causes the swaged end to cant (tilt) slightly to one side. By looking down the length of tubing while turning it slowly you will be able to determine if your tubing has this slight cant. If it does mark or note the direction of can't. Then when you begin the bending process make sure that the cant direction is pointed in the same direction as you are pulling (bending) the tube.

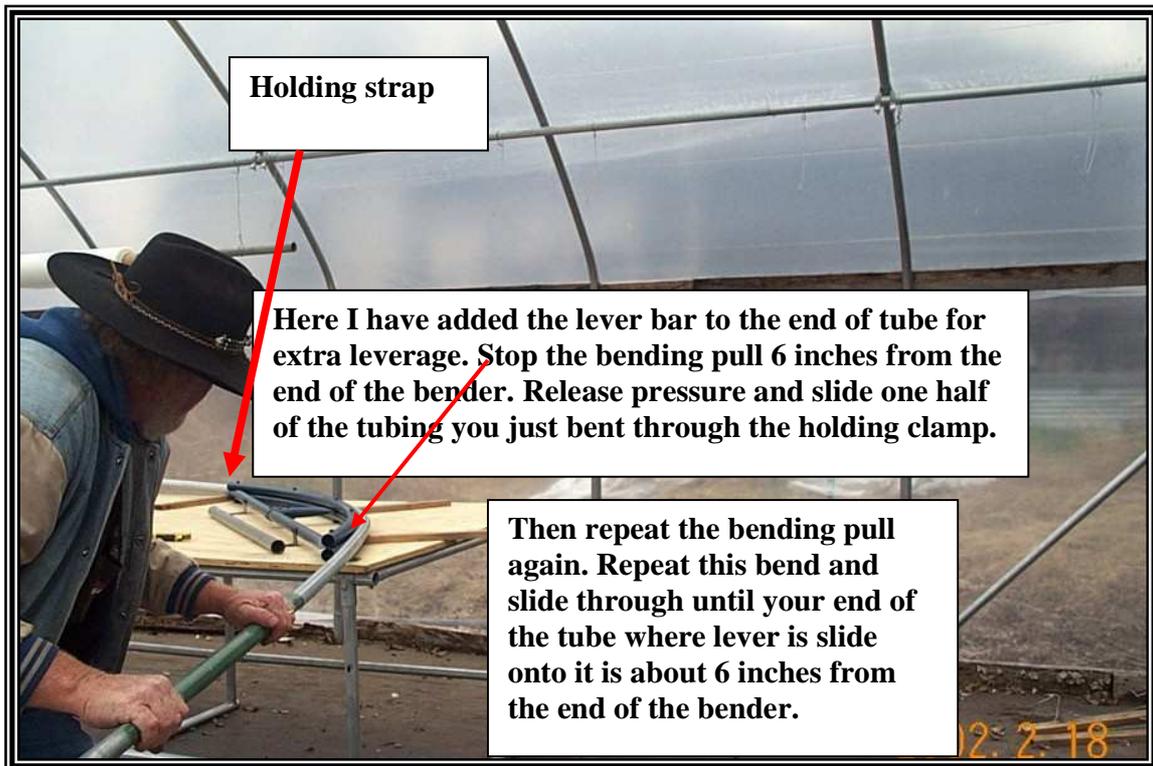


Insert **about twenty four (24) inches** of the tube end indicated by red paint (see tube orientation page) through the holding strap of the bender.

Bender shown is painted red and is "C-10" series but the "DY-10" series is mounted and used the same way

Remember the 10 wide frame is a two piece (section) hoop. The photo at left shows placing one of these 10'6" tubes with large end painted red into bender, When you bend the other half section tube you will push the small end painted (red) through the holding strap twenty four (24") And bend as instructed. When both sections are completed they will join together at the top of the hoop, described later.

Now pull the tubing around the bender.



Holding strap

Here I have added the lever bar to the end of tube for extra leverage. Stop the bending pull 6 inches from the end of the bender. Release pressure and slide one half of the tubing you just bent through the holding clamp.

Then repeat the bending pull again. Repeat this bend and slide through until your end of the tube where lever is slide onto it is about 6 inches from the end of the bender.

Always start the bending with the painted ends of both sections inserted through the holding strap **twenty four (24 inches)**. In the case of bending never place the un-pained ends into holding strap first when bending these 10 ft hoop sections.

Let's start with one pipe section, pick one tube with a small end painted. Push through strap twenty four (24 inches). Pull the tubing around the bender, **STOPPING** about 4" or 5 inches before reaching the end of the bender, release pressure and slide one half (1/2) of the tubing you just bent through the holding strap, **CAREFUL never push more than one half of the previous bent portion thru the holding strap between strokes. Doing so will cause flat spots in your hoop.** As you began bending the first tube fasten 1x2 inch wood strips to the table as shown in most all photos under the end of the bent tubing after you slide it through the strap. Then repeat this bending and pushing through the strap, adding more 1x2 wood strips as needed each time you push more bent tubing through strap. Fasten each wood strip to the table as you install them.

These wood strips are only installed one time as the first tube is bent and they are very important. They hold the bent tubing in alignment to the bender, without them your hoop section will resemble a cork screw (not desirable for greenhouses) adding the small end lever bar into the tube when needed as you near the end of the tube being bend, (the last

12 to 16 inches on the DY-10), it will vary depending on the model of 10 ft bender you are using. Be sure that the last pull, at the connection point where the lever bar slides onto tubing makes contact with the bender about 4 or 5 inches from the end of bender. **A slight raised ridge can be felt or seen on the outside curve 3 ¼ “from the end. You have just completed one half of the hoop. Some people may need a second person on the out put side to help insure the bent portion remains on the 1x2 wood strips between bending strokes.**

Now let's do the other half. Pick one tube that is painted on the large end.

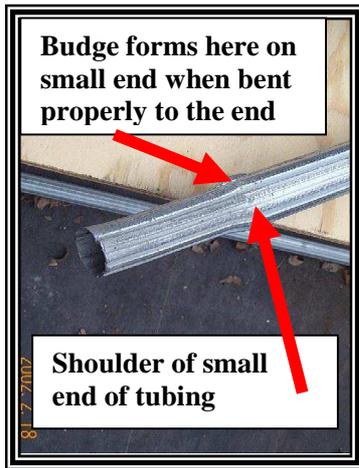
Look down the length of the tubing as you would when checking the straightness of a wood 2x4. Look as you rotate the tubing to see if the small (unpainted) end is canted to one side slightly. Make a note of or mark the direction of this cant in the small end.

Push the painted large end through the holding strap twenty four (24 inches.) Then bend this tubing as you did for the first tubing. As you near the end of tubing (the last 12 to 16 inches), with large end of the lever bar slide over the small end of the tube, making sure that the connection junction of the tube and lever bar will contact bender about 4 or 5 inches from the end of the bender same as before.

Pull the lever bar steadily and slowly around the bender when finishing off the bending at the small ends. As the lever bar nears the bender on this last pull you will feel a slight give in the lever bar. STOP, release pressure. Slide the lever bar back off of the small end of tube using your thumb feel of the shoulder of the small end along the inside of the curve. You should feel a slight budge on the inside of the curve at the shoulder. If a slight budge is not present then slide lever back onto tube and bend a little more, always being on the alert and stopping when you feel any give in the tubing, stop and recheck for budge. When this budge is present you have bend the tubing as far as it can be bent, (It's Complete) do not bend more.

Now you have successfully completed one complete bending one complete hoop. So now let's put it together. Choose a level spot of ground and place the two hoop halves flat with the two painted end pointing away from you, slide the two un-painted ends together and using a #10 X ¾” tech (self drilling) screw secure the two halves together as shown below.

Photos Of finishing off the small (swaged) ends of hoops



Budge shown above, tubing shown is armadillo Brand tubing and is fluted tubing not smooth as is most.



Lever bar show pulled back from small end of tube to better show the shoulder of small end



Every bending stroke should end about 5 inches from the end of the bender

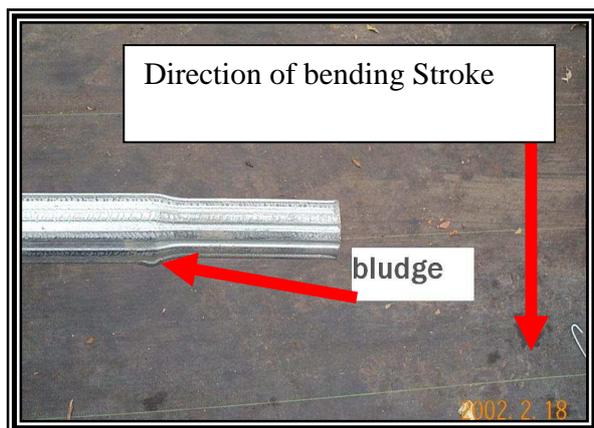


Photo Of finishing off the large) ends of hoops

Ridge forms here, when finishing off the large end of tubing. It is created by the tip of small end of lever bar inserted into large end of tubing and bending pressure brings the two into contact with the bender body.



In this photo the junction of the lever bar (GREEN) makes contact with the bender 4" before the junction reaches the end of the bender. The contact point of the Junction can be anywhere on the bender but should never be closer than 4 inches from the end on the bender

The term JUNCTION is where the lever bar meets the tube you are bending Lever bar is green,, tube is silver,, bender is blue

In this photo the junction of the lever bar (GREEN) makes contact with the Bender (Blue) 4 " or 5" before it reaches the end of the Bender (Blue). The contact point of the junction can be anywhere on the bender but should never be closer than 4 inches from the end on the bender

Connecting The Hoop Sections Together

Here a wood block is used to support the two ends because the ground is un-level, it's not need if level ground is used.



You can also stand the hoop sections up against the side of a building then connect the joints with tech (self drilling) screws same as shown in the photo above (right) if you were using the flat ground method for assembly. Using the side of a building is a very good method if a suitable one is nearby

Anchor Stake Layout

This hoop is designed to use 24 foot wide greenhouse poly covering using 17 or 18 gage 1 3/8” tubing for hoops and 1 5/8” O.D. fence post tubing for ground stakes extending not more than 6 inches above ground.

Anchor stakes must not exceeding 36” extended above ground. Doing so exposes your greenhouse to potential structural failure. If you use stakes taller than 6” above ground, that changes the covering requirement and 24 foot poly will not cover it. Alternate ways to piece the side in are covered later in these instructions.

Most Greenhouses will lay out the stakes using a string line. Stakes can be driven into the ground or anchored in concrete. If driving, use stakes that are 12 “ longer than needed, drive them in tight then cut them off level with the others. Driving caps can be purchased but my experience is that you still mess up the stake tops on many of them leaving you having to cut it anyway but ending up with a short stake.. NOT GOOD

Below this customer installed anchor stake post extending 24” above ground.

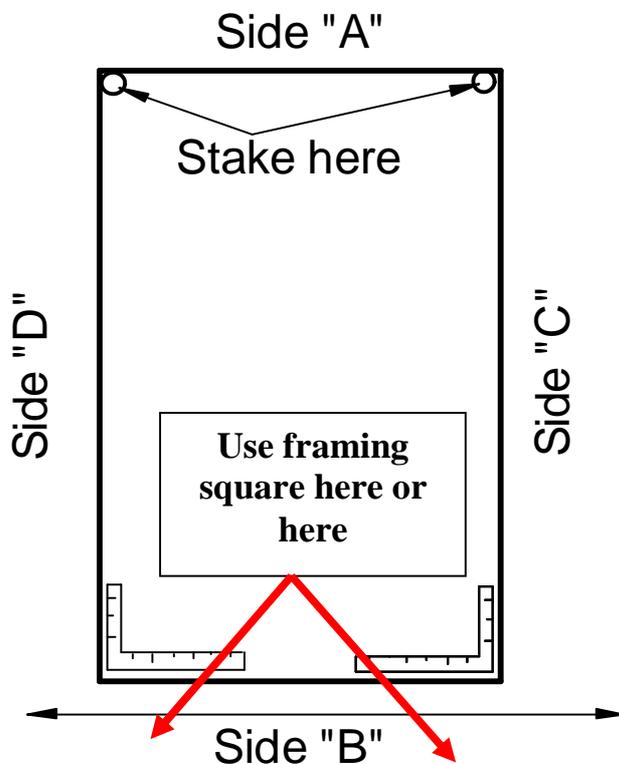


An alternate method for smaller in ground anchored greenhouses is simply build a sand box with 2x4s, level it, square it, then drive the stakes inside the sand box, using the box as a guide for stake spacing and alignment. Install hoops in stakes, fasten with tech screws from inside the greenhouse opposite the 2x4. After hoops are installed drill through the 2x4, stake & hoop and bolt them all together using 1/4"x4" carriage bolts or skip the drilling and use longer tech screws



Here I am setting up a 10' X 16' ground work.

The treated 2x4s are cut to length and ends are fasten together forming what is similar to a large sandbox for the kid's.



Side "A" is anchored with the two permanent 1 5/8" Tubing stakes, and then temporarily fastened to the stakes.

Then side "B" is then shifted to the left or right while holding a framing square in either of the two corners of "B/D" or "B/C". Shift "B" until B/D or B/C is square. Then drive stakes into corners B/D & B/C



Ground stakes are made of 1 5/8" fence post cut to 30 inch lengths. Loose soil may require longer stakes. As you can see we have already installed the ground cloth in a large area inside and out side of greenhouse. The ground is sloping towards this corner. After installing the 1 5/8 inch ground stakes I leveled the wood frame then blocked the frame up where needed to keep it level. Next step is to install the hoops.



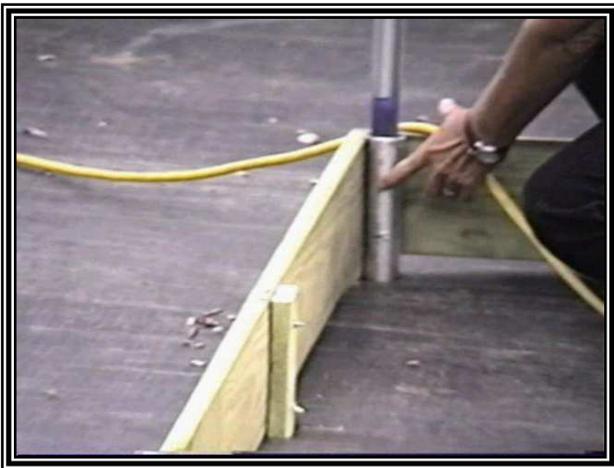
Installing the last 1 5/8 " pipe stake corner stake.



Installing the last hoop. Hoops should be inserted into the 1 5/8" ground stakes 6 inches, then a #10 by 1 1/2" long self drilling screw is run through the wood into the 1 5/8" metal stake and hoop. This screw locks the frame in level position as well as connect the hoop to the stake. Two treated wood stakes at each end serve to stabilize the end frame boards. They are permanent so use treated wood.



Install the self drilling (Tech) screws from outside wood into the 1 5/8" stake and hoop



Pushing the hoop down into the 1 5/8" O.D ground stake. Here you can see the top of painted end. Top of paint is 6"



The gap at front right corner will be filled in with treated wood later, leaving a screened outlet hole for water to escape the greenhouse. On longer house you may want to install stakes using a string line and level then hoops and add the wood band last.

Attaching The Purlin



Attach the purlin at each end by flattening out the ends then bending the flat portion of tubing up about 30 degrees, drilling a 5/16 hole and using a band clamp made for 1 3/8" fence tubing. If you can not locate these fence clamps just make the purlin 1 3/8" longer on each end, flatten as shown, Holding the flat portion under the hoop and drill 5/16 hole thru the hoop and flatten end of purlin, then bolt with 2" X 5/16 bolt.



A simple stainless steel hose clamp is used to connect all hoops to the purlin except for each end hoop, which is bolted.



However we recommend using factory purlin clamps on greenhouse especially larger 16 ft or wider houses

Corner Sway Braces



Here we have prepared the cable braces. Which are regular 1/8" steel cable from the lumberyard folded into a loop at each end and clamped with a 1/8" cable clamp also found at the lumberyard.



Here we are using those handy 1 3/8" fence band clamps. Any chain link fence supply can order these clamps if you can't find them. Also some success has been noted using heavy metal plumbers tape with holes punches in it. Or solid tubing braces can be used, cut the tubing to desire length flatten the ends and tech screw it to the inside of hoops at the four corners. In place of the cables



Here the cable brace has been clamped securely to the bottom of the first hoop back from each corner.



Here we are attaching cable to the end hoop at one end. Tighten the band clamp securely on the lower cable end at left and just sung up the band clamp at end hoop, leave some slack it cable for now. Install cables on opposite end same way



Purlin must be installed before proceeding in case you skipped that step. All four corner cables are installed and our frame is out of plumb (leaning) to the right. We have left slack in all cables. To pull the frame to the left (into a plumb position) she taps the band clamp upwards until cables on this end become tight. Continue to tap both band clamps upward, this will pull the frame to the left. Watch the cables on the other end as you do this and make sure they always have slack in them. Once the frame is plumbed tap the clamps up until cable is taught on the other end. **CAUTION DO NOT OVER TIGHTEN THE CABLES.** You can damage the end hoops. Just get the good and snug.



Sway braces can be made from the same tubing as used in the hoops, flatten the ends and bolt them in same locations as the cable braces, You will need to plumb up the ends first.

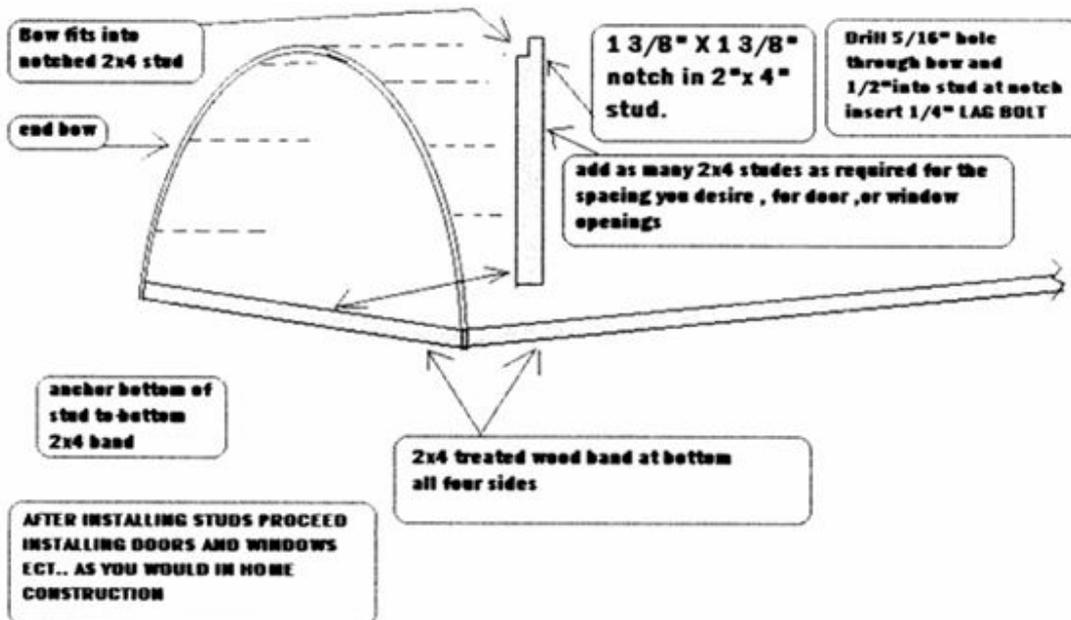
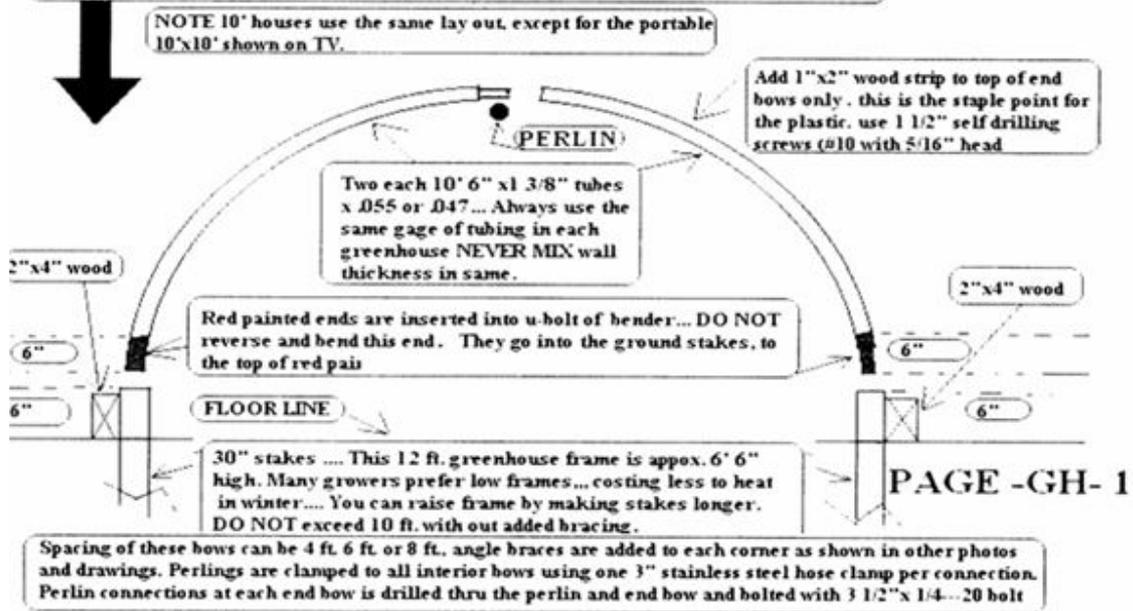
End Wall Framing

Here are a few photo examples of end wall framing with wood
These are all from our customers using our benders and system.





Basic 10ft. and 12ft. coldframe greenhouse

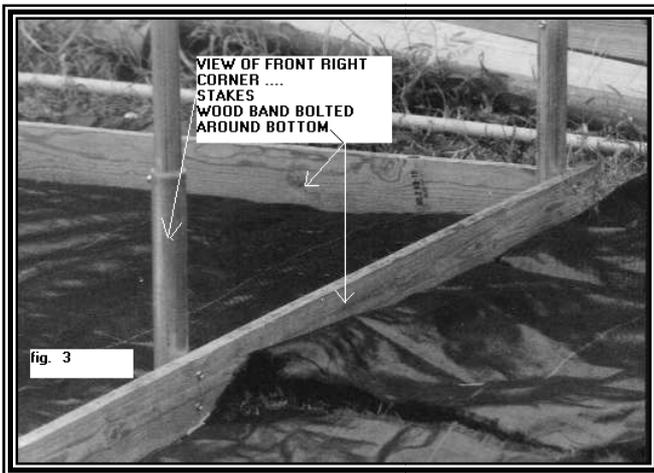


Wood framing is attached to end hoops with a number of different methods, usually simply bolted with ¼” carriage bolts or lag screws

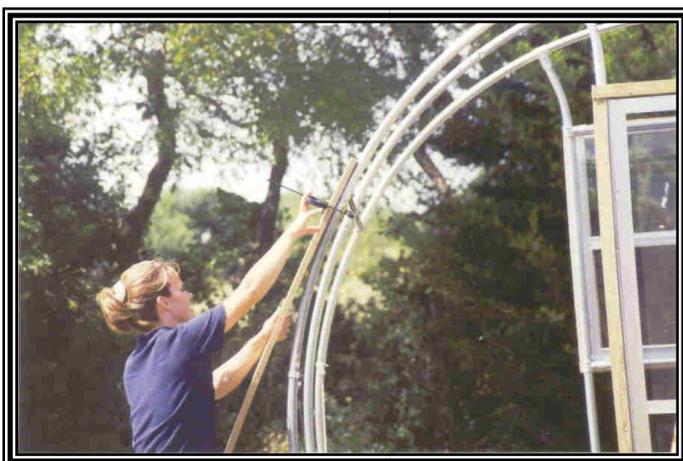




This is such a good example of GH construction I had to add it again. Note also the earth grade work inside the frame work. Slightly raised above outside grade.



Close up of wood 2x4 band.



Clamps can be used to hold 1x2 wood strips as the are bent around the end hoops. Remember only the end hoops get the 1x2 strips. If wood is hard to bend, you can kerf the strip. This is simply cutting across the strip about 1/3 through every 1 to 2 inches.



Close up of bar clamp aiding installing strips. I soaked these strips in a nearby pond for several days before installing them so I did not need to kerf them.



Bending the strip all the way down to the 2x4 base board.

Kerfing Wood Strips For Easier Bending Use Only If Necessary

The kerfing spacing will vary from wood types and densities, cross cuts 1/3 of the way through about every 1 to 2 inches along the entire length when using regular treated pine 1x2 works fine. Be sure to purchase 1x2s with out knots if possible, if this is a problem purchase a 12 foot long 2x8 treated board (one with as few knots as possible then rip 3/4 inch thick slices from it, to produce your own 1x2s. Many times this is better because starting with a good board you can discard any sections having knots. Be sure if you kerf the strips to kerf it from end to end at uniform spacing and depth. NOTE pre-drill holes every 12 inches through the strips before starting the self drilling screws, you only pre-drill the wood not the metal frame, if you don't the screw head will bottom out against the wood before it has a chance to drill itself into the frame. **Install the kerfed cuts down onto the metal hoops attach with #10 by 1 1/2"tech screws**

covering on your greenhouse. About half of the commercial greenhouses use the simple fold it and staple it method and that is the method I will describe. However there are several different channel lock methods available, the most widely use of these is the “wiggle wire” which is used by pulling the poly over a small channel which has been fasten to the wood bands then a zig zag shaped wire is worked into the channel, locking the poly securely in place. I don't use any of these channel lock methods because #1 they cost more that the wood bands, which must be installed anyway for supporting the channel, #2 While channel locks provide quick installation they tend to damage the poly for more than acceptable, “in my view”.



Trim off any excess poly you need about 12 inches to fold several times.



Fold and roll the poly as you pull it snug across top of GH, then staple.





There are many different Poly Latching systems on the market from Wiggle Wire poly lock to Aluminum track lock. Most all of these must be installed over the top of wood frame for strength. Snap clamps are only recommended for smaller 10x10 or 12x12 portable garden units and are not recommended for larger in ground units. For use of our plastic snap clamps on small units please refer the specific unit you are building.

Lever Bar

Lever bar's will wear and bend and will need to be replaced from time to time depending on the hardness of the tubing being bent. This is very simple to do. Just use the desired length of new 1 3/8" OD tubing 17 to 18 gage thicknesses. It can be longer than the one shipped with this bender if desired.

Cut new lever bar the desired length, remove the short, small 1 1/8" OD pipe from the end of the old lever bar and slide it into one end of the new lever bar tube. Attach the two together with a single tec screw in the same manner as the old lever bar. Be sure to leave the smaller pipe protruding from the lever bar 3 1/4"

You can also quickly strengthen the lever bar even more by adding a short section of one inch O.D. EMT tubing (electrical metal tubing) found at any hardware stores. This should be inserted into the other end of the lever bar opposite end of the smaller short pipe.

The EMT should be recessed into the opposite end of lever bar 3 1/4"

