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## **Warping a Sectional Beam with a Tension Box**

The AVL Sectional Beam can be warped in sections with the use of a Tension Box. The yarn travels directly from cones or spools, which are mounted on a rack behind the loom, through the Tension Box, and onto the Beam.

Throughout the warping process, the Tension Box automatically keeps a constant and uniform tension on the warp. The Tension Box allows you to make longer warps than other methods.

## **Setting the Tension Box on the loom**

The Track and Mount system is designed to hold your tension box securely on the back of the loom. See the Assembly Manual for your loom for instructions on installing the Track and Mount system.

Mount the Tension Box in the groove, with the Counter facing into the loom. The Tension Box is fastened to the Track and Mount with a small cross piece and wing nuts. This will stabilize the Tension Box and allow it to travel smoothly from one section to another. The wing nuts can be released for the Tension Box to move easily from side to side. Each time the Tension Box is moved and centered properly for a particular section, the wing nuts must be tightened again.

## **Tension Box Heddles**

The polyester heddles for your tension box come attached to each other and will need to be cut apart. The heddles are shipped in bundles of 100. There are two twist ties on the bottom and two twist ties on the top.



**Figure 1 - Polyester Heddle Bundle**

These go through the space for the harness. Do not remove the twist ties until you have placed the heddles on the harness. They will keep the heddles properly contained until they are on the harness.

**Note:**

**You will need to cut the bundle of heddles apart. You can do that either before you place them on the tension box, or after. Do not remove the twist ties until the heddles are on the tension box.**

**Tension Box Heddle Installation Instructions**

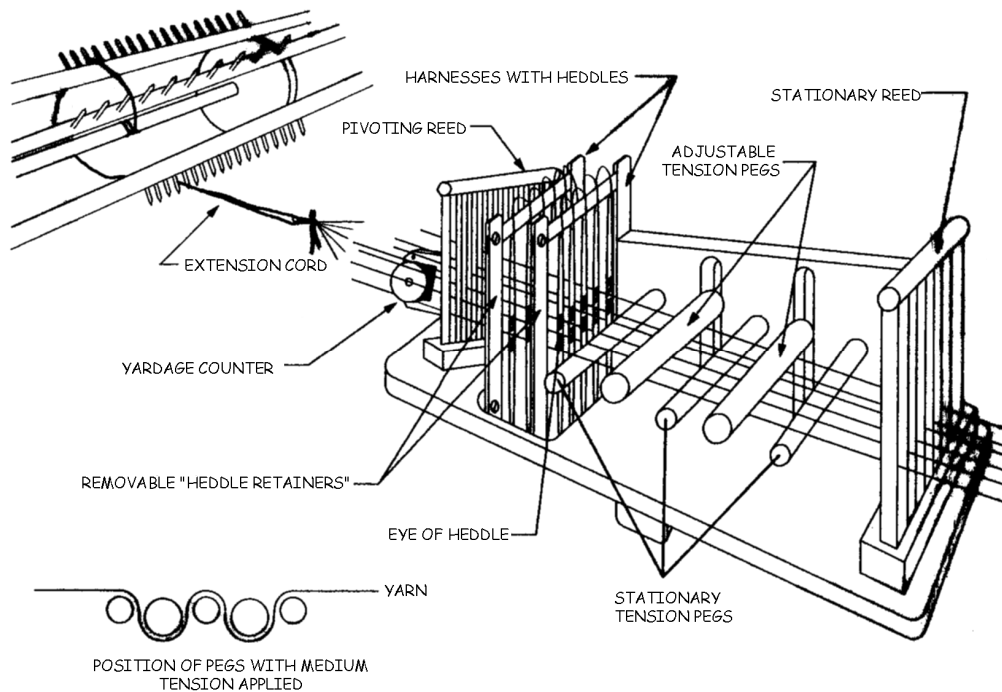
The first time you use a Tension Box, you need to install heddles on the harnesses of your Tension Box.

Your Tension Box is delivered with one bundle of one hundred heddles. These are held together with twist ties. Leave these on for now. Refer to the following diagram to familiarize yourself with the Tension Box and its parts. Push down on one of the harnesses until it stops. This causes the other harness to go up. You will use that later for making a Threading Cross. Right now we'll need to use it to help put the heddles on the harnesses.

- 1) Remove the "heddle retainer" of the harness that is up, using a Phillips head screwdriver.
- 2) Notice there are four twist ties holding the heddles together. Separate the top two. Insert the top bar (of the harness that is up) into the space created by pulling apart the twist ties. Insert the bottom bar (of the harness that is up) into the space created by pulling apart the bottom two twist ties, making certain that the heddles aren't twisted. Now remove the twist ties.



- 3) Count off fifty heddles and cut the loop at the top between the 50th and the 51st heddle.
- 4) Now put the four twist ties back on the fifty heddles that were the last to go on the harness.
- 5) Remove these fifty and reattach the "heddle retainer".
- 6) Now push down on the harness that is up, making the other harness come up.
- 7) Remove the heddle retainer.
- 8) Pull apart the top two twist ties and insert the top of the harness (which is up) into the space created. Pull apart the bottom two twist ties and insert the bottom of the harness into the space created.
- 9) Reattach the heddle retainer.



**Figure 2 - Tension Box**

### Sectional Beam Calculation

First, you must calculate the number of spools or cones of yarn you will need. Each section is wound onto the Sectional Beam separately; therefore, you'll need to have one spool or cone for each end in that section. For



example, if your section is 2" wide, with sixteen E.P.I., you would need thirty-two spools or cones of yarn.

To prepare for Sectional Beam warping, we need to calculate:

- how many spools we need to wind
- how many yards do we need to wind on each spool
- total yardage for the project

- **NUMBER OF SPOOLS?**

Sectional Beaming requires the use of as many spools loaded with thread per individual section as your Ends Per Inch, or planned sett in the reed, dictates.

To calculate the actual number of spools required, we need to know:

- how many EPI (this is the sett) are you going to use in the warp
- what SIZE of SECTIONS (1" or 2") will you use on the Beam

If your warp is set at 24 epi per 1", you will need 24 spools for a Sectional Beam with 1" sections or 48 spools for a Beam with 2" sections.

**# OF SPOOLS = EPI x SIZE OF THE SECTION**

- **NUMBER OF YARDS PER SPOOL?**

To calculate the number of yards per spool, we need to know:

- the LENGTH OF THE WARP
- NUMBER OF SECTIONS on the Beam

We calculate the number of sections by dividing the WIDTH OF THE WARP by the SIZE OF THE SECTION. If the warp width is 30" and we are using 2" sections, our number of Sections is 15.

**# OF YARDS PER SPOOL = LENGTH OF THE WARP x # OF SECTIONS**

- **TOTAL YARDAGE?**

If it is a single color warp or if a color sequence is repeating in each section, the same spools or cones can be used to wind all the sections needed for the warp.

**TOTAL YARDAGE = # OF SPOOLS x # OF YARDS PER SPOOL**

It is important to make these calculations in advance so that you can purchase your yarn in spools or cones corresponding to the amount of yardage needed on each. Sometimes this is not possible and you will need to wind your own spools from yarn that is in larger packages. For doing this,



you will need empty plastic spools, a bobbin winder (preferably electric), and a yardage counter. These items are available from AVL.

### Feeding the Spool Rack

Next, place a spool (or cone rack) about 5' or 6' behind your loom. Place the spools (or cones) for the first warp sections on the cone rack.

Make sure you put each thread through the metal eye on the spool rack so the threads do not get tangled.

When arranging the spools on the spool rack, it doesn't matter whether you go top to bottom or bottom to top, the important thing is to be consistent in vertical columns and to place the spools in the order that the threads are in the warp.

### Adjusting the Tension Device

Before winding the sectional beam, make sure to disengage the tension system so that the beam will turn counterclockwise swiftly. To do this, unlock the tension rope from the spring and completely unwrap the plastic cord from around the tension beam drum. Also, remember to remove the weight from the tension arm.

### Threading the Tension Box

The best way to thread the tension box is to take one thread from the cone rack and thread it all the way through all the parts of the tension box, then the next thread all the way through. It works best to use the threads from the rack in a vertical order rather than a horizontal order.

Now let's go through the sequence for threading the tension box.

- 1) First, move the two adjustable tension pegs up above the stationary pegs as shown above or remove them completely.
- 2) Now sley the thread through the rear (stationary) reed section using a sley hook. Since this reed is 8 dents per inch, you will divide the E.P.I. into 8 to find out how many ends will be in each dent (with 16 E.P.I., put two ends in a section). If your E.P.I. does not divide equally by 8, you can either vary the number of ends in each dent (with 20 E.P.I., alternate two and three ends in the dents) or thread the dents a little wider than two inches (with 20 E.P.I., put two ends in each dent; with 40 ends, the reed will be sleyed 2-1/2" wide).
- 3) Next, bring the thread straight through the tension peg section in-between the larger adjustable tension pegs and the smaller



- stationary pegs or just above the smaller stationary pegs if you have removed the larger ones.
- 4) Thread the end through the two sets of heddles. The first thread goes through the front set of heddles and the next thread goes through the rear set of heddles.
  - 5) Repeat this alternating heddle threading for the rest of the ends. The heddle system will be used later to create the threading cross.
  - 6) Now thread the end through the front pivoting reed. Here you have a choice of using an 8 dent or 10 dent reed. Pick the one that can be sleyed evenly and as close to the desired section width. If you cannot get the exact width of the section, sley your reed slightly wider. This will make it just slightly wider than the space between the pegs. The section will be narrowed down by pivoting the reed. Never sley the reed narrower than the section on the beam. There is no way to expand it.
  - 7) After the tension box is completely threaded, the larger pegs are moved downward to apply tension. The further down they are moved, the more tension will be applied to the yarn. This is an adjustable system as different yarns require more or less tension. With a heavy wool, the pegs may only need to be moved half way down, whereas with a fine silk, the pegs may need to be moved all the way down and the yarn wrapped an extra time around one of the stationary pegs to get the proper tension. Once you have adjusted the tension correctly, do not change it during the winding of the beam, as long as you are using the same type of yarn.

Once the tension box has been threaded, it is not always necessary to rethread it. If you need to change spools or cones, simply tie the new ends on to the old ends just before the rear stationary reed, then gently pull on the old ends until the new ends have come all the way through the box.

## Winding the Warp

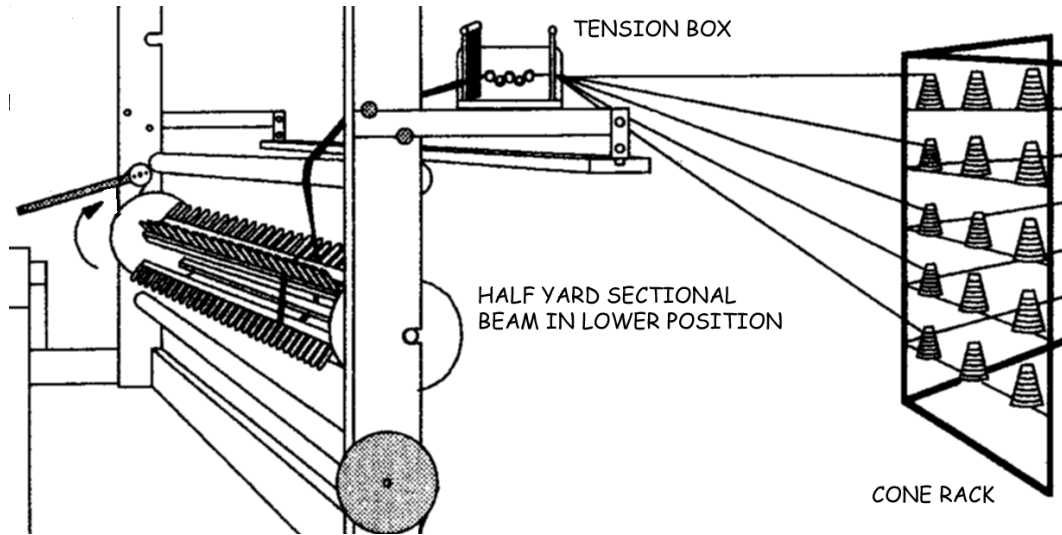
Before you start winding the warp, attach the section of the warp to an extension cord, tie an overhead knot in the warp threads from one section and slip that knot into the opening of the larkshead knot you created in the extension cord. Pull it tight.

### Note:

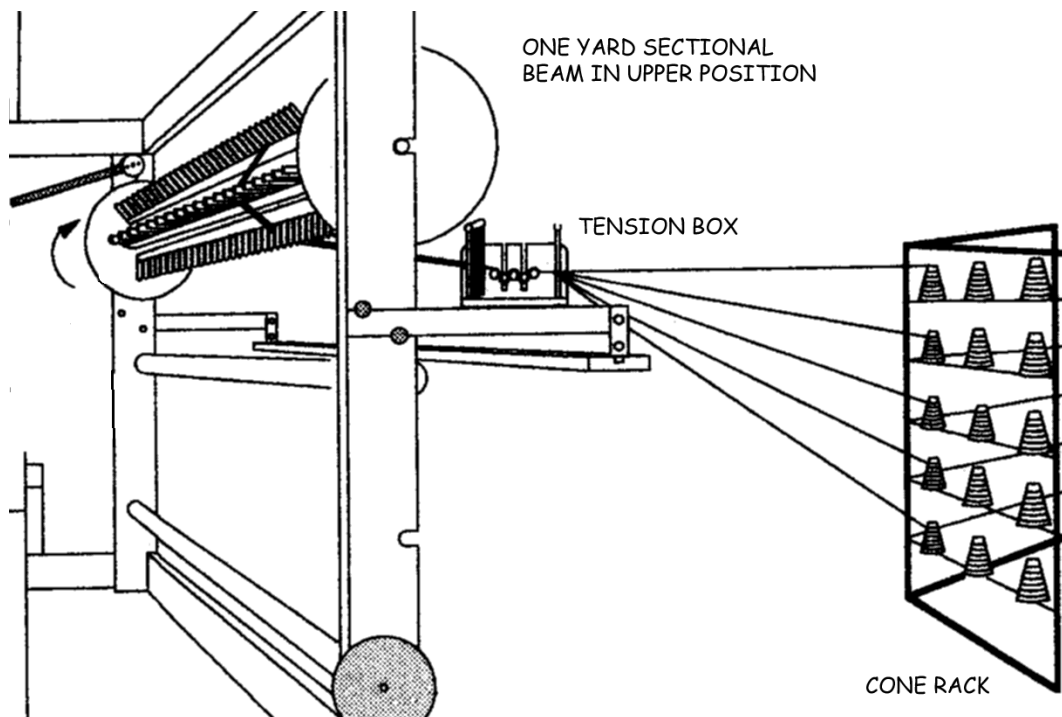
**If you will be using a flyshuttle and are planning a narrow warp, you need to offset the warp instead of centering it. This offset will ensure even selvages.**



See the following diagrams for routing the extension cords towards the tension box from the bottom beam position and the top beam position.



**Figure 3 - Warping the Half Yard sectional beam in the lower position**

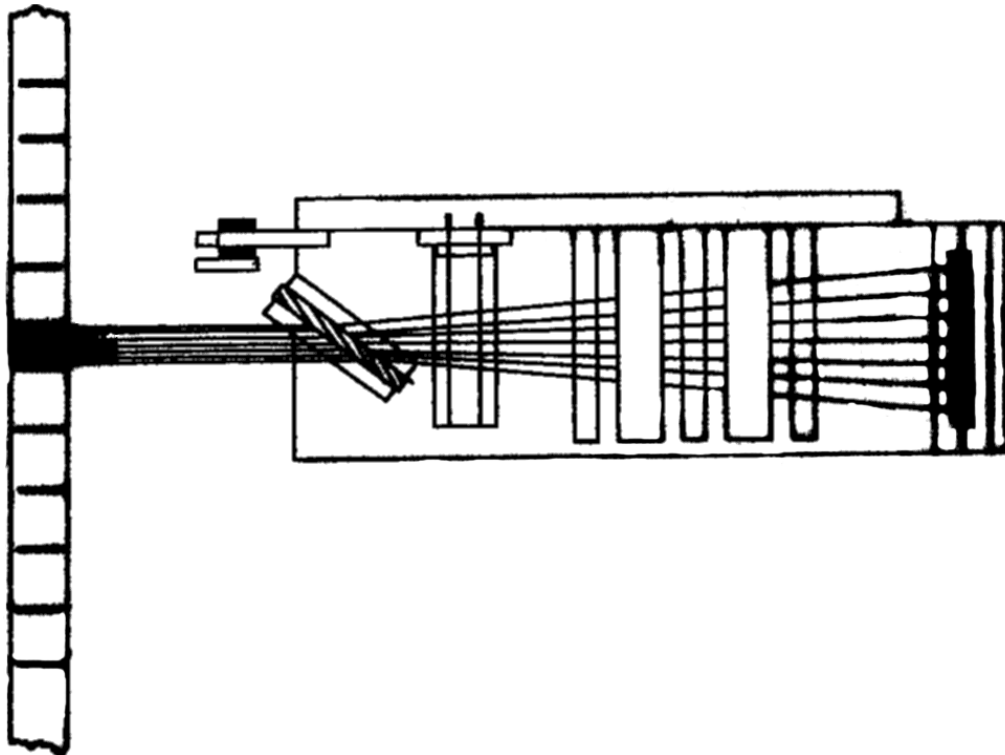


**Figure 4 - Warping the one yard sectional beam in the upper position**



### Adjusting the size of the section

Line up the tension box approximately behind the section you will be winding. Now wind about one yard onto the beam. As you wind, you will need to fine tune the placement of the tension box along the track. When it is centered properly, tighten down the wing nuts under the tension box. At this point, you can pivot the "pivoting reed section" so that the yarn comes close to, but doesn't quite touch, either the peg to the left or the peg to the right. Now tighten the wing nut under the pivoting reed. This shouldn't need to be readjusted until you are using yarn of a very different size.



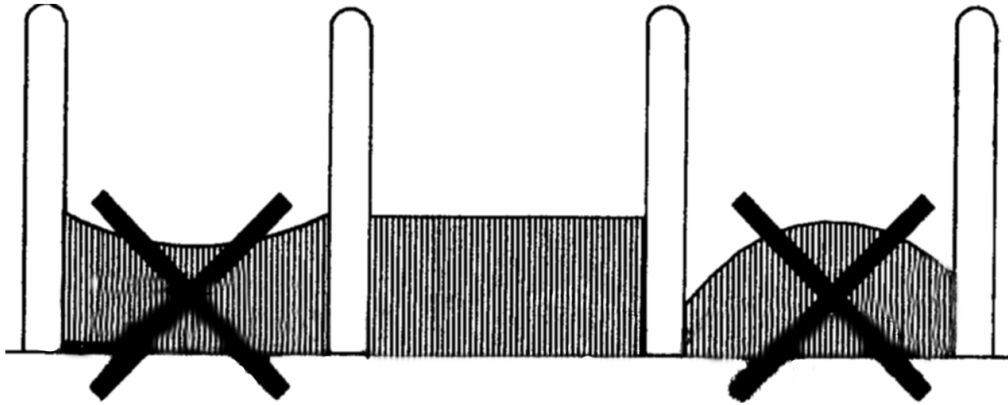
**Figure 5 - Adjusting the size of the section**

Extra care to correctly center and adjust the width of each warp section will result in more perfect tension while weaving.





Make sure that the threads are going on to the beam in flat layers. If you notice that warp piles up at the pegs, the section of the warp is too wide. If the warp falls down at the pegs, the warp section is too narrow.



**Figure 6 - Have flat layers in sections**

If any of the above is happening, go back and pivot the front reed on the tension box again until you get perfectly flat layers. This is very important, otherwise you will end up having different length threads in one section, since the circumference of the beam within the section is not going to grow evenly. Therefore, you will end up having lots of tension problems.

### Counting Turns or Yardage

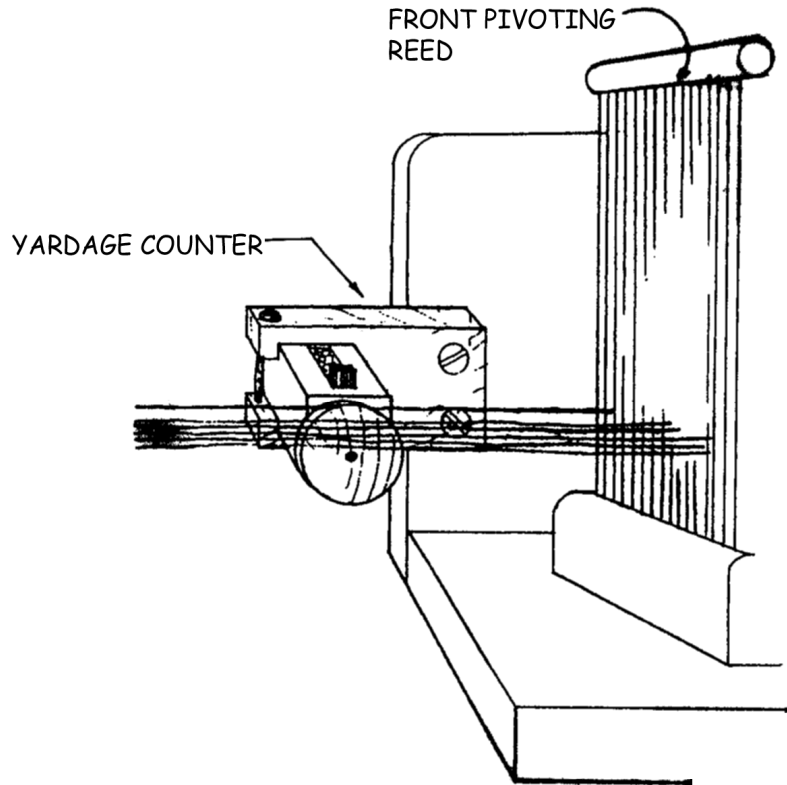
To determine the length of the warp you are putting on the beam, you need to count either turns, revolutions, or yards.

To count turns, you can do it in your head, but it is more reliable to use a digital or mechanical revolution counter.

Counting revolutions even with a digital counter will still give the approximate warp length only, because the circumference of the beam will increase slightly with each rotation. This is called beam build up.



To count yards with a yardage counter while warping the sectional beam, you need to place the yardage counter at the front of the tension box. You should use an extra thread for measuring yardage, because if you use one of the threads from your warp section, that particular thread would have a different tension once you start weaving. The extra thread you use for measuring purposes only can be reused for each section.



**Figure 7 - Attaching Yardage Counter to Tension Box**

### Creating the Cross

When there is about a half-yard left to be wound onto the beam, it is time to make the threading cross. Simply push on the rear heddle frame of the tension box, making half of the threads go up and the other half go down.

Now slip in an 8" piece of contrasting thread (called a marking thread) through the opening (called a shed) created between the threads above and the threads below. Locate this marking thread about half way between the tension box and the separation roller.

Now push on the front heddle frame, making the other half of the threads go up. Now take one end of your marking thread and bring it through this shed. The two ends of the marking thread should now be together. Tie them in a bow knot. Wind the rest of the first section on, cut the ends, and secure to the wound on thread using a rubber band over the pegs.



Continue winding all the sections in the same manner by moving the tension box along its track.

### **Inserting Sticks in the Threading Cross**

When all the winding is complete, remove the rubber bands, unwind a few feet of warp, and slip one lease stick through the path created by the upper portion of each marking tie. Now slip another lease stick through the path created by the lower portion of each marking tie. Secure the lease sticks together, leaving about 2" between them, using masking tape or string through the end holes of the lease sticks. Now bring the lease sticks, with the warp ends, around the separation rollers.