Users' Guide of Spring System 4-Harness Attachment for SAORI CH60, SX60, WX60 and WX90

For the attachments manufactured in and after January 2020

The above photo is SX60 with the Spring System 4-Harness Attachment.

Product Overview

SAORI's original Spring System 4-Harness Attachment ensures very smooth treadling and control of the weaving sheds. With the spring system separately controlling the movement of each harness, this 4-harness conversion kit is specifically suited for unbalanced weaves, such as double cloth or double weave and 1/3 or 3/1 twill weaving. The attachment includes 6 pedals and 4 lamms, with which you can enjoy very flexible tie-ups. The pegs and hooks attached to the pedal cords make the process of changing tie-ups simple and easy. The SAORI Spring System is a sinking shaft loom which makes pedaling light and easy.

We ultimately believe that the original 2-harness SAORI looms are best suited for the practice of SAORI because they actively encourage an experience unlike that encouraged by any other looms, including our own SAORI 4-harness models. We offer the Spring System 4-Harness Attachment as one of the supplementary tools to add ways for you to express yourself and explore color, texture and innovative clothes-making.

When you would like to explore your own creativity through plain weaving, **we strongly recommend you convert the loom back to the original 2-harness loom**, which was carefully designed to make an unparalleled flow of weaving possible and enjoyable for anyone regardless of age, previous experience, and physical and intellectual capability. Instructions on how to achieve this conversion are available on pages 7-9 of this guide.

The products are available with 8 variants listed below. Select the appropriate product variant, which is compatible with the model and height of the SAORI loom to be used with.

Product Description	Variant
Spring System 4 Harness Attachment (for 60 Series)	For CH60, SX60 and WX60 with standard height
	For SX60H
	For CH60 and WX60 with Height Extender 5cm / 2"
	For WX60 with Height Extender 10cm / 4"
	For CH60A-2
Spring System 4 Harness Attachment (for 90 Series)	For WX90 with standard height
	For WX90 with Height Extender 5cm / 2"
	For WX90 with Height Extender 10cm / 4"

Tools to Prepare for Assembly

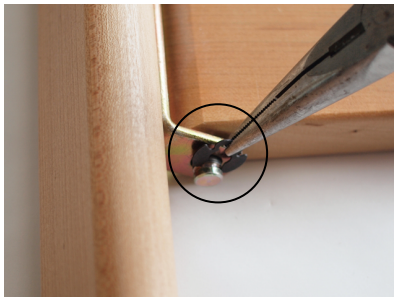
Needle-nose pliers x 1
Phillips head screwdriver x 1

Included Parts & Accessories

1. Spring system wire kit x 1
2. Harness (incl. 105 wire heddles with small holes for 60 Series; incl. 160 wire heddles with small holes for 90 series) x 4 (since January 2020)
3. Lamm (incl. eye bolts x 6, eye bolts with hook x 2) x 4
4. Pedal x 6
5. Pedal cords x 12 (2 pcs per pedal)
6. Pedal mounting hardware x 1 (pedal spindle x 1/ washer x 12 / pipe x 18 / stabilizing ring x 2)

Assembly Guide

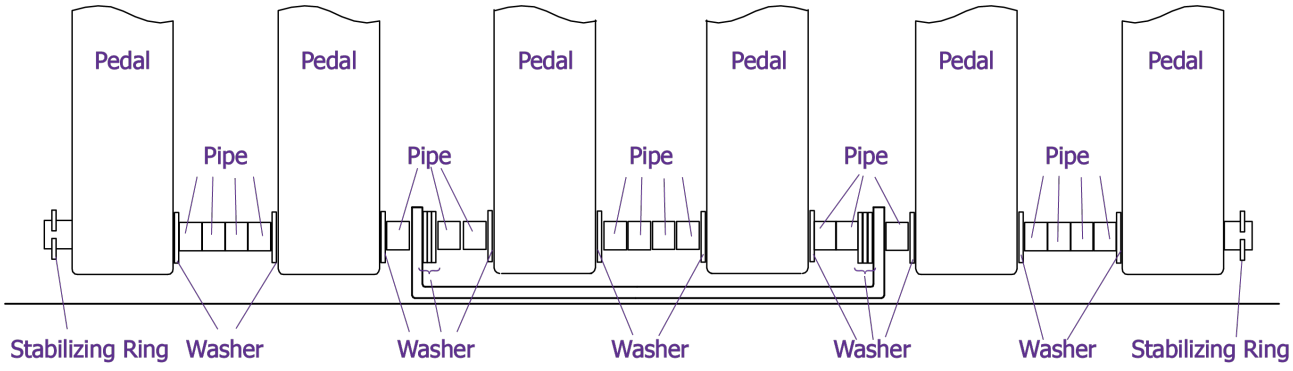
1. Replace the pedals on your 2-harness loom.



1) Use needle-nose pliers to remove the **Stabilizing Ring** at one end of the pedal spindle. Then, remove the whole set of pedals from the loom.

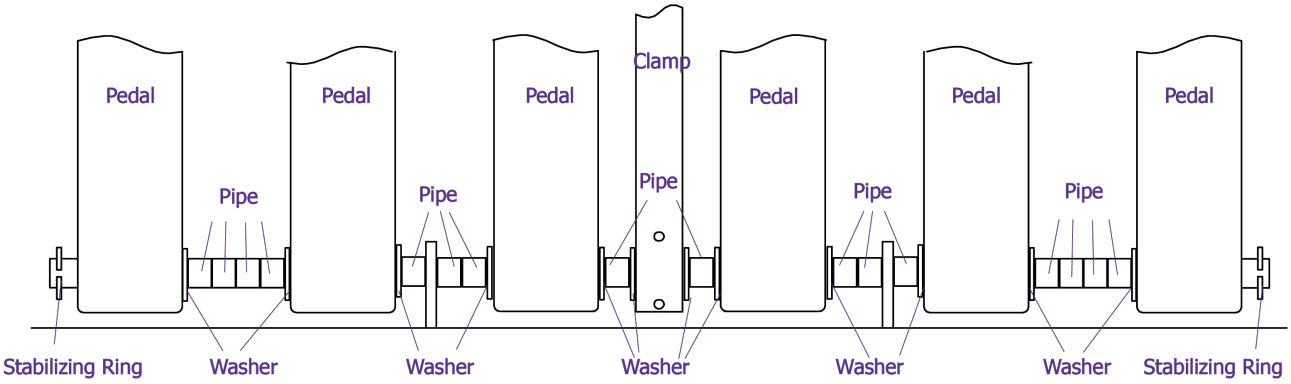
2) See the diagrams below and set the 6 pedals enclosed in this product onto your loom. Set a pair of washers around each wooden pedal and around the clamp to protect these parts from the metal pipes set between them. Only the leftmost and rightmost pedals should not have a washer on the outermost ends, as shown in the diagram. After you set all the pedals, check again that the arrangement matches the diagram associated with your specific loom model. If all is correct, set the Stabilizing Ring back into the groove at the end of the pedal spindle.

<SAORI CH60>

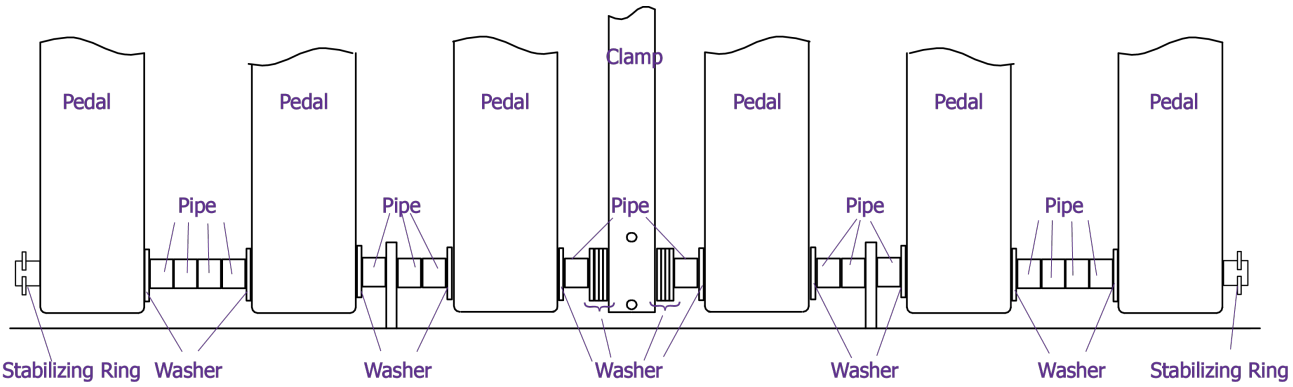


**Set three washers each around the both inside ends of the bracket.You may reduce the number of washers if you feel the space is tight and removing one washer or two out of three will make the assembly process easier for you.*

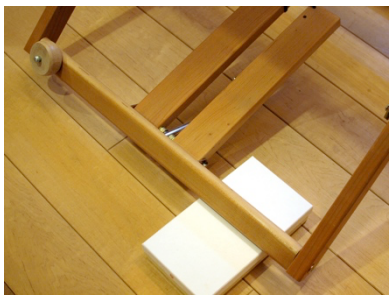
<SX60 & SX60H>



<WX60 & WX90>



**Set four washers each around both sides of the clamp.*



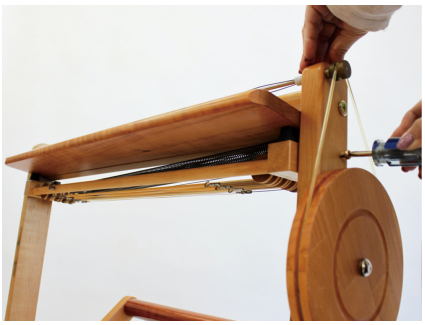
* Raising the pedal beam a little bit away from the floor by placing a durable box or copies of magazines underneath may make the process of attaching the pedals a little easier.

2. Set the wire kit onto the loom.

1) Using a phillips head screwdriver loosen the screw stabilizing the heddle roller (the screw right above the Bobbin Winder on the loom's main frame) by about 1 cm.

   *If your loom is relatively old and does not have the screw or the groove to ease the conversion, loosen the screws attaching the heddle roller onto both vertical wooden posts of the loom's main frame.

2) Remove the heddle roller from the loom.



3) Insert the spindles that stick out of the square-shaped wooden piece on both sides of the wire kit into the holes that normally hold the heddle roller. Make sure that the long rubber nubs on the wire kit face the front and top of the loom. Removing the shelf of the loom might make this step easier.

4) Re-fasten the screw(s) you removed in Step 1 of this section to stabilize the wire kit on the loom.

3. Set the harnesses.

1) Check the orientation of the harnesses. (The coloured end-loops of the wire heddles should mark the top of each harness.)

2) Hang the harnesses onto the wire kit one at a time, starting with the furthest at the back of the loom and moving towards yourself at the front of the loom. For each harness, remove the rubber band connecting the two hook ends of a wire and thread a hook through each hole on the top of the harness.

3) After hanging all the harnesses, check that all the wires are positioned correctly on the wooden pulleys inside the wire kit. **If these wires are not sitting correctly within their positions inside the wire kit while you weave, they may break easily.**

4. Set the lamms.

The lamms provide a connection point for the pedals of the loom.

1) Hook up each lamm onto the harnesses one by one, moving from the farthest to the closest to you.

5. Tie up the pedals.

- Tie up the pedals onto the lamms according to the weaving structure that you would like to weave with. Four Harness weaving uses pattern draft notation for the threading, pedal tie-up and treadling (pedals to use in weaving). A pattern draft is a guide to managing more harnesses and pedal options.
- The following instruction is an example. More examples are available in the pattern drafts shown on the page 14

1) Name the pedals from the left to the right, 1, 2, 3, 4, 5, 6.

2) Name the holes on each pedal from the front to the rear, 1, 2, 3, 4.

3) Name the lamms from the front to the rear, 1, 2, 3, 4.

4) Following the pattern draft below, insert all the pegs on the pedal cords into the appropriate pedal holes; Pedal holes #1 and #3 on the Pedal #1, holes #1 and #2 on Pedal #2, etc.

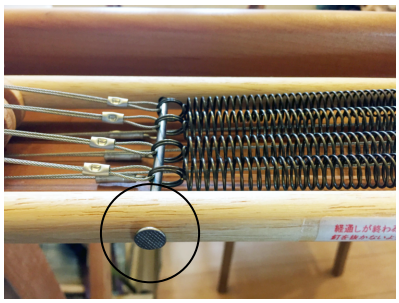
Pedal

Pedal hole	1	2	3	4	5	6
4				X	X	X
3	X		X	X		
2		X	X			X
1	X	X			X	

5) Hook up the cord from Hole #1 of Pedal #1 onto the corresponding eye-bolt on Lamm #1 and the cord from Hole #3 onto the corresponding eye-bolt on Lamm #3. Similarly, hook up the cords connected to Pedal #2 onto the second eye-bolts from the left onto Lamms #1 and #2.

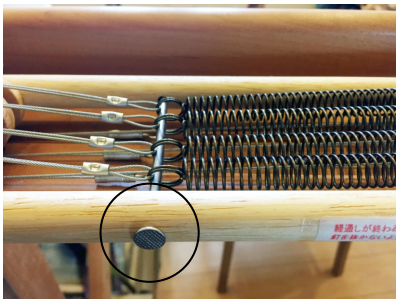
6) Continue in the same way for Pedals #3~#6.

7) After you finish tying up the pedals, push down lightly on all the harnesses with your hand, and pull out the nail that has been inserted through the rings of the springs (marked in the photo to the right). Hold onto this nail even when it is not in use with the product because you will need it again when you thread the harnesses, change tie-ups or remove harnesses from the wire kit as instructed in the following pages.



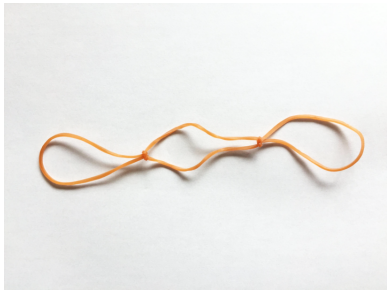
8) The loom is now set up and ready to warp, beam and thread for weaving. This pattern draft will produce plain weave with a 4,3,2,1 threading and using pedals 1 vs 6 repeat. A 2/2 twill pattern will be produced using the other four pedals (2,3,4,5 repeat).

How to Remove the Harnesses from the Wire Kit



1) Pushing down on the 4 harnesses, insert the nail, which originally came with the product, into the hole on the front, wooden frame of the wire kit. Push the nail through the rings of the springs to the hole on the back, wooden frame. The nail will keep the springs stretched and stable.

2) Remove the lamms from the harnesses.



3) Prepare four sets of rubber bands in order to properly store the wire kit after you remove the harnesses. These rubber bands will connect the two hook ends of each wire and keep the tension so that the wires lie correctly within the pulleys inside the kit. Tie multiple rubber bands together to create one, long set. Starting with the harness closest to you, remove one of the two hooks holding the harness frame and hook this end of the wire into one loop end of a rubber band set. Remove the second hook from the harness frame and hook that end into the other loop end of the same rubber band set. Repeat these steps, removing all the harnesses and holding the wire tension over the pulleys with the rubber bands.

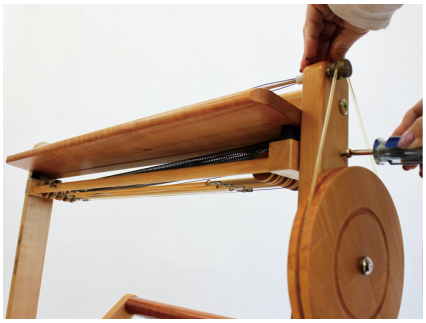
How to convert the loom back to the original 2-harness loom

1) Prepare the parts for conversion, which are compatible with the loom model to be changed to work with two harnesses and two pedals. When you order the parts for conversion, please name the loom model to be used with because the specifications and sizes of these parts differ depending on the compatible loom models.

   1 x Heddle Roller with Cords, Hooks and Stoppers
   1 x Pedal Mounting Spindle and Hardware for the original two pedals
   2 x Original Pedals
   2 x Original Pedal Cords + 2 x Hooks for Pedal Cords

2) Remove the harnesses by following the instructions above.

3) Loosen the screw that is securing the wire kit (the screw right above the Bobbin Winder on the loom's main frame) by about 1 cm.



*If your loom is relatively old and does not have the screw or the groove to ease the conversion, loosen the screws attaching the heddle roller onto both vertical wooden posts of the loom's main frame.

4) Remove the wire kit from the loom.

5) Set the heddle roller for the original 2-harness model back onto the loom.

6) Re-fasten the screw you loosened in Step 2 to secure the heddle roller onto the loom.

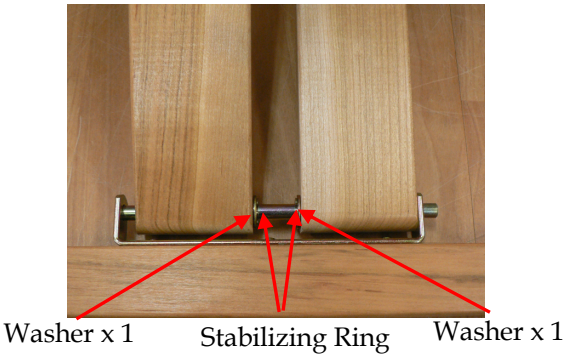
7) Remove the set of 6 pedals together with the mounting hardware and replace them with the original 2 pedals. Prepare a pair of pliers and remove the stabilizing ring attached to one end of the pedal-mounting spindle.

8) Pull out the pedal-mounting spindle from the bracket attached to the pedal beam, and remove the whole set of pedals, hardware (spacers and washers) and clamp (if the loom is foldable) from the loom.

* Raising the pedal beam a little bit away from the floor by placing a durable box or copies of magazines underneath may make the process of attaching the pedals a little easier.

9) Insert the spindle for the original 2 pedals into the metal brace attached to the pedal beam of your loom and set the pedals and corresponding hardware as shown in the photos below. The pedal mounting construction for the CH60 models was modified in/about August 2021. Refer to the corresponding photo depending on the pedal mounting hardware you own.

[CH60]
supplied until July 2021



[CH60]
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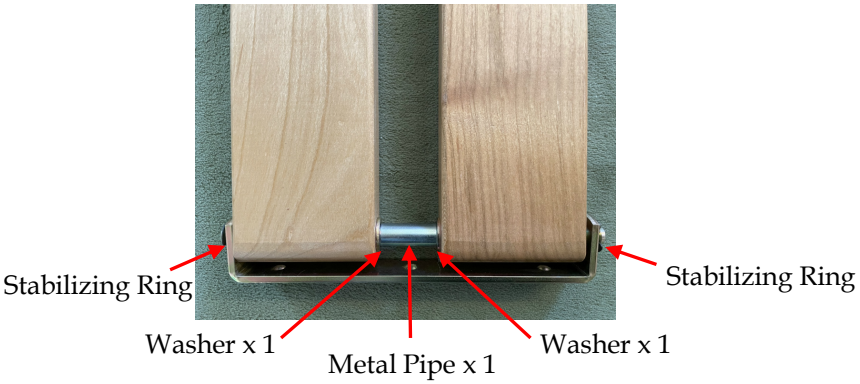
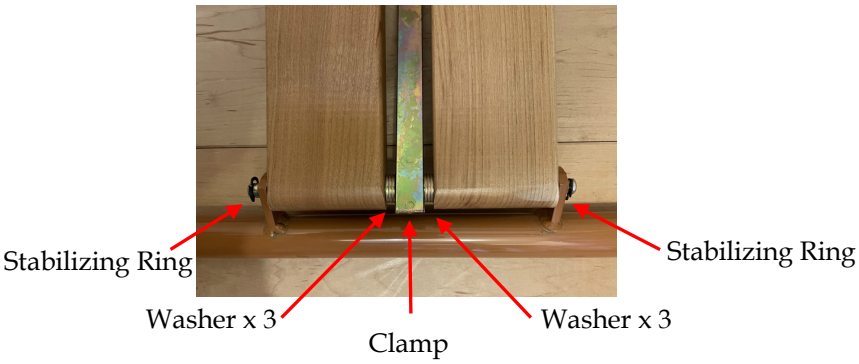
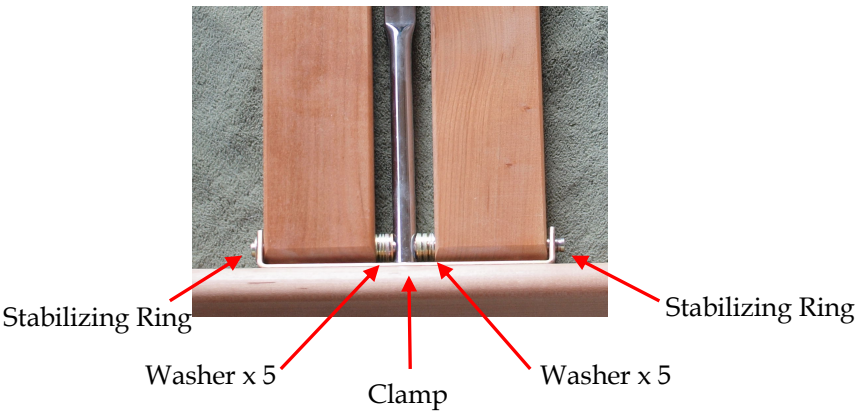


[SX60/SX60H]



[WX60/WX90]

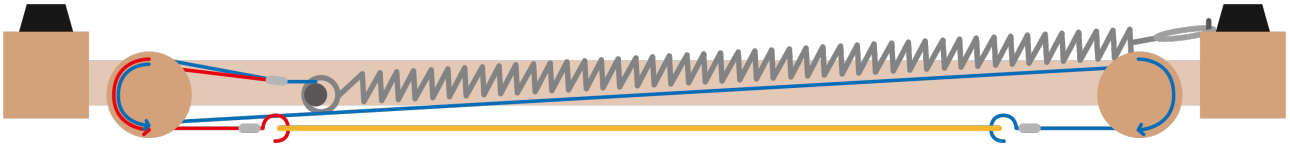


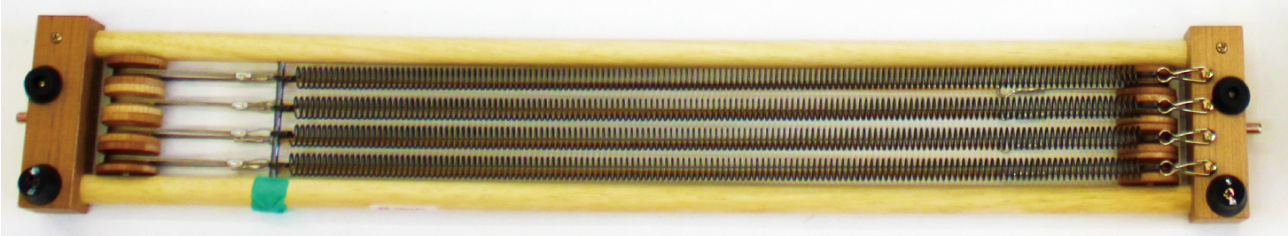
Tips for threading the harnesses and changing tie-ups

When you thread the harnesses and change tie-ups, push down on the 4 harnesses, insert the nail originally included with the product into the front, wooden frame of the wire kit. Push the nail through the rings of the springs to the back, wooden frame. The nail will keep the springs stretched and stable.

How to replace the wires in the wire kit

Wires within the wire kit may break easily if they are not sitting correctly within their positions inside the pulleys while you weave. If you experience a broken wire, order the replacement wires and reference the diagram and photo below when setting up the new wire.





Weaving with Two Warp Beams

***Available only with SAORI SX60H**

Two warp beams provide a way to control different tensions and excessive take-up of parts of the warp within a single cloth. For example, supplementary warp threads may not weave with the ground weave all of the time, sometimes skimming over the surface, and will require a different tension to the main cloth. Supplementary threads can add texture and interest in many ways and the second warp beam will control the tension on these threads independently of the main cloth.

Commonly, creative Double Weave can also require two different tensions in the two layers. For example, when using different yarn thickness, different fibre types or different setts to a contrast loose vs dense weave.

Optional parts required for using Two Warp Beams on the SX60H loom

1 x Latch and Bolt for Second Warp Beam for SX60H
1 x Additional Warp Beam and Disc for SX60H

Calculating warp requirements
As a general rule, to determine warp length for weaving you must allow for take-up (shrinkage in the actual weaving process), shrinkage after washing and loom waste which is the amount of yarn needed when tying onto the loom. These amounts need to be added to the desired length of the finished woven cloth. It is fairly standard for the take-up and shrinkage to add 20% and additionally the loom waste to be about 50cm.

The supplementary warp should be a percentage longer than the main warp to allow for differential tensions.

Tips for using Two Warp Beams
The main cloth should be set up on the higher warp beam with the warp control pedal. If you would like to give a strong tension to the second warp, set the latch on to the warp beam.

The supplementary or second warp should be set up on the lower warp beam and is basically controlled manually by the latch release. Each time you need to wind the woven cloth onto the cloth beam release the tension with the warp control pedal then get up and release the tension on the second warp beam at the back of the loom. Adjust tension on both warp beams separately ready to weave again.

If you would like to give a moderate tension to the second warp, you can do it also by winding a rope around the warp beam or around the disc on the warp beam, and attach a weight such as a bottled water at the end of the rope.

Similarly, you could give a moderate tension to the first (main) warp too by removing the loop end of the brake wire from the brake pedal, and attach a weight to the end of the wire (as the one described in the above) instead of setting it onto the brake pedal.

And you can also adjust the tension given on each warp by changing the orientation of how the rope or wire are wound around the disk attached to the warp beam. If you wind the rope/wire in the usual orientation in which the brake wire is normally set up, the tension given onto the corresponding warp becomes relatively stronger. If you wind them in the opposite direction, the tension on the warp will be weaker. This pedal releases the tension from the sitting position at the front of the loom.

Threading the warp for Two Warp Beams
When threading the loom it is common to thread and beam the main warp first and attach the ends to the front rod. When threading the main warp on the loom you should leave the appropriate dents in the reed and heddles in preparation for the second warp to be threaded. Then thread and beam the second warp. You can attach the ends of the second warp to the same front rod.

Normally each of the warps will be threaded on two harnesses each. For example, warp one will be threaded on Harness 1 & 2, and warp two will be on Harness 3 & 4. Another tip is to raise specific shafts for threading the second warp by raising them with the nail in the spring system allowing the already threaded ones to drop.

Weaving Glossary of Terms

Sinking shaft/shed – This means that when you step on a pedal/treadle, the harness(es) tied to it will move down. The SAORI Spring System produces a sinking shaft/shed, and the pattern drafts included in this guide is based on this mechanism. There are other looms based on different shed movement such as rising shaft/shed. When you refer to the pattern drafts available from different sources, you must pay attention to which type of shed movement they are based on.

Lamm – This is an addition to the loom to allow more pedals to be attached and operate the harnesses.

Beam a warp – This is the process of winding the warp onto the loom as is part of dressing the loom.

Pattern Draft – This is pattern notation to show you how thread the loom, how to connect the pedals to the harnesses and what pedals to use for each row to produce a given pattern in the cloth.

Treadling – This is the sequence of pedals to step on to produce the pattern according to the pattern draft.

Tie-up – This information shows you how to attach each of the pedals to the harnesses to produce the pattern.

Additional Reference

There are a variety of books available for you to learn more about the weave structures possible with 4 harnesses. Hereunder we list some of the books you may find useful for your additional practice and learning. Having some foundational understanding and experience in weave structures possible with 4 harnesses may help your experimental and intuitive practice with 4 harnesses. While referring to the pattern drafts included in the following and other books, pay attention to which type of shaft/shed movement they are based on. If the pattern drafts are based on rising shaft/shed mechanism, they need to be reversed for weaving with the SAORI Spring System, which is based on the sinking shaft/shed mechanism.

- *A Handweaver's Pattern Book* – by Marguerite P. Davison
- *The Handweaver's Pattern Directory* – by Anne Dixon
- *Designing Woven Fabrics* – by Janet Phillips
- *Contemporary Weaving Patterns* – by Margo Selby
- *Double Weave* – by Jennifer Moore

Pattern Drafts

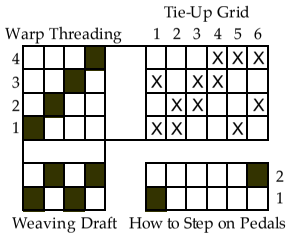
We include the Pattern Drafts for the Spring System 4-Harness Attachment on the next page. They are intended to assist you to set up your loom for you to explore colour, texture and innovative clothes-making also in weaving with 4 harnesses. As in weaving with two harnesses, we strongly encourage you to be bold and adventurous while weaving with four harnesses, once you learn the basics of how to actualize these drafts.

Hereunder we summarize our comments about each weave structure illustrated in the Pattern Drafts.

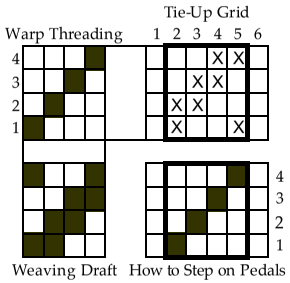
Name of Draft	**Comments**
Plain Weaving	As shown in the drafts on the next page, these 10 weaves are possible with the same Warp Threading. You can practice all these weaves on the same warp by changing the tie-ups only. Plain Weaving and Tatami-Ori (Weft Faced Weaving) is possible with both 2 and 4 harnesses. If you do each or both of these two types of weaves only, we strongly recommend you convert your SAORI loom back to the original counter-balance 2-harness loom to create your best comfort and free-flowing experience while weaving. Double Cloth Weave allows you to weave a fabric wider than the loom width. The Tube Weaves expand your possibility of innovative garment design, as it allows you to weave a cloth requiring less sewing to stitch a wearable garment.
Tatami-Ori (Weft-faced Weaving)	
Twill (2/2, 3/1, 1/3)	
Double Cloth (Left-hand opening)	
Double Cloth (Center opening)	
Double Cloth (Two-colour Interlock)	
Double Cloth (Three-colour Interlock)	
Single Tube	
Double Tubes	
Three Sections	
Waffle Weave	Waffle Weave produces a deep three-dimensional texture while allowing you to play with weft colours spontaneously. Waffle Weave requires different Warp Threading from the above 10 kinds of weaves and a little more complex treadling and weaving procedure to create the waffle like cells.

Pattern Drafts for the Spring System 4-Harness Attachment

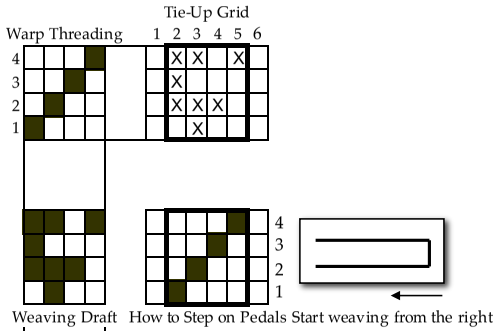
Plain Weaving



2/2 Twill

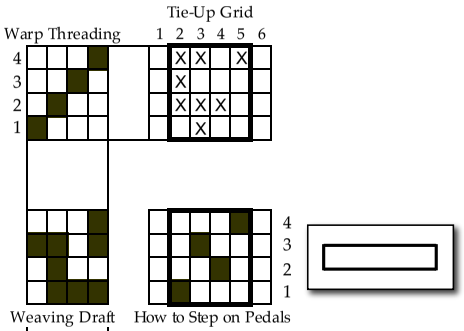


Double Cloth (Left-hand opening)

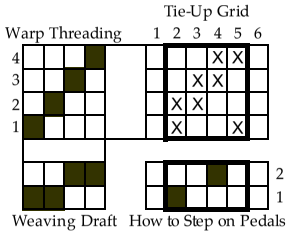


Single Tube

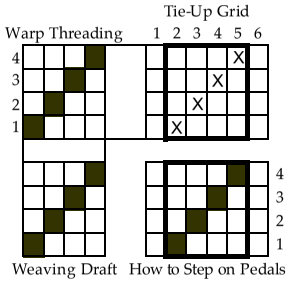
Odd number of warp threads



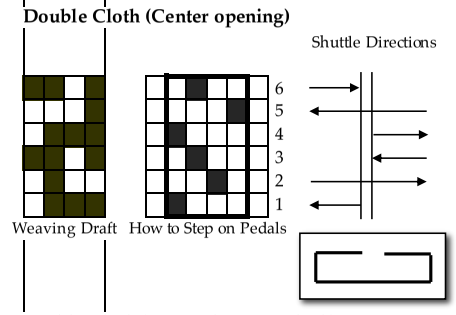
Tatami-Ori (Weft-faced Weaving)



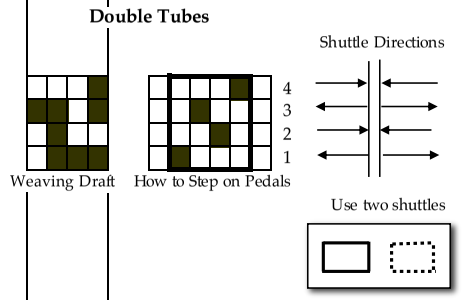
3/1 Twill



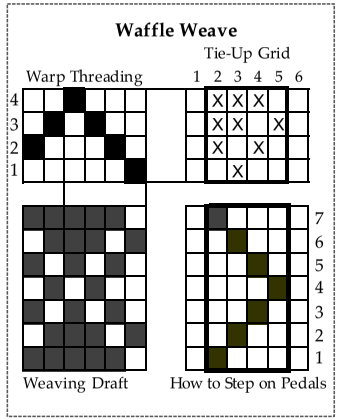
Double Cloth (Center opening)



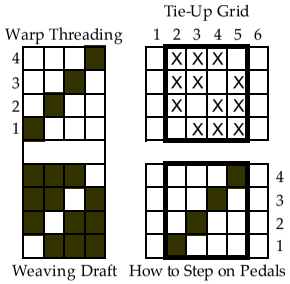
Double Tubes



Waffle Weave

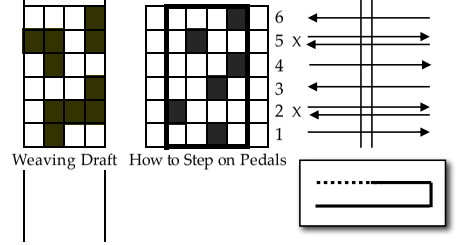


1/3 Twill

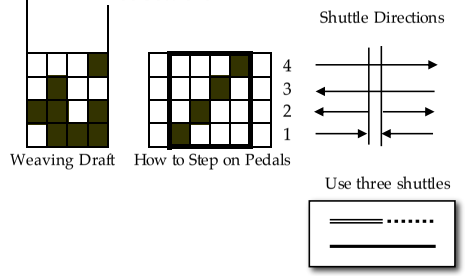


Double Cloth (Two-colour Interlock)

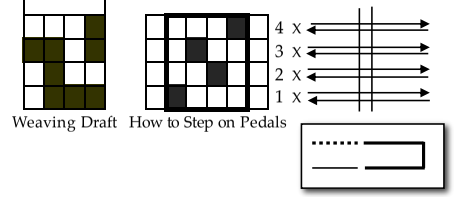
X…Reverse the direction of shuttle without changing the shed



Three Sections



Double Cloth (Three-colour Interlock)



Note:
The SAORI 4 Harness Spring System produces a sinking shed.

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