

GARMENT-DESIGN DETAILS

I haven't the slightest idea how real knitwear designers figure out sizes and compute the number of stitches and rows for sweaters and other garments. Since I needed my own design to avoid copyright issues, I muddled through the best I could, using the information and steps here. (You may be glad to know I had to redo the whole thing four or five times!¹)

Before we get to specific measurements and stitch counts, we have to deal with three key issues.

Issue 1: Symmetry

If our project is supposed to be mirror-image left and right, then we need to make sure it has the proper number of stitches at its widest point so that the two halves do indeed wind up symmetrical.²

Project Symmetry

In a V-neck sweater or vest, for example, we want the bottom of the V to be in the exact center of the front. That means that there must be an equal number of stitches on both sides of the V's point. Even in worsted weight, a V-neck misplaced a stitch or two from the exact center may well be noticeable.

Motif Symmetry

If there is a motif on the project, we probably want it to be exactly centered side to side between the left and right edges. We may also want the motif centered vertically between the top and bottom.

If the motif is repeated across the entire width of the garment, as with Fair Isle and other stranded knitting, then we have to position it properly so that the left and right halves of the project are mirror-image.

Same Basic Motif but Two Symmetries

There are two ways a project can be symmetrical about the vertical centerline. Either there must be a single center stitch, or there must be two center stitches. Let's look at two similar motifs to see the difference.

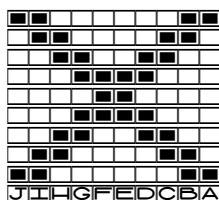
This first chart for an intarsia letter X has exactly **one** stitch of symmetry, right where the lines cross at stitch D, because stitches A through C exactly mirror stitches E through G.

¹ There are computer programs and apps that do all the hard work, but I'm apparently a glutton for punishment.

² Asymmetrical garments would of course not have symmetry. The techniques here could be adapted for such garments.

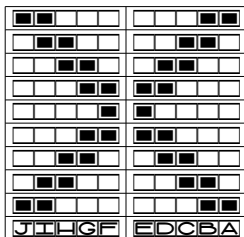


After we do some swatching, we decide our X looks a little spindly, so we make the arms twice as wide.



We swatch our new X and decide it's perfect. But this second X, with the wider arms, has **two** stitches of symmetry, stitches E and F, because stitches A through E exactly mirror stitches F through J.

We could also say it has **no** symmetry stitches, because it's symmetrical about the **vertical line** between stitches E and F. In fact, we could put our second X motif in a two-column chart, with each half in its own column.



Tweaking the Project's Numbers

We need to understand symmetry in both motifs and projects so that we don't wind up with finished items that are lopsided. Some of us may not care, but for those of us who do, we have to plan ahead just a little bit so that we get the result we desire.

Depending on the number of symmetry stitches in our motif, we have to adjust the number of project stitches so that we get the motif's symmetry stitch(es) exactly in the project's symmetry stitch(es).

Let's work with our two X motifs in a small project.

COASTER

CO 15.

Row 1 (RS): K.

Row 2 (WS): P.

Rpt rows 1–2 9 more times (20 rows total).

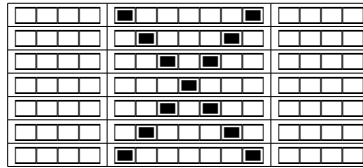
BO.

Can we put our two X motifs into these as-written instructions, or do we have to make adjustments in the cast-on stitch count and/or rows worked for one or both of the motifs?³

Motif with One Stitch of Symmetry

Our first X, with one stitch of symmetry, is seven stitches wide. Our coaster is fifteen stitches wide. Since there's a difference of eight stitches, we can center our first X by working four stitches on either side of the motif.

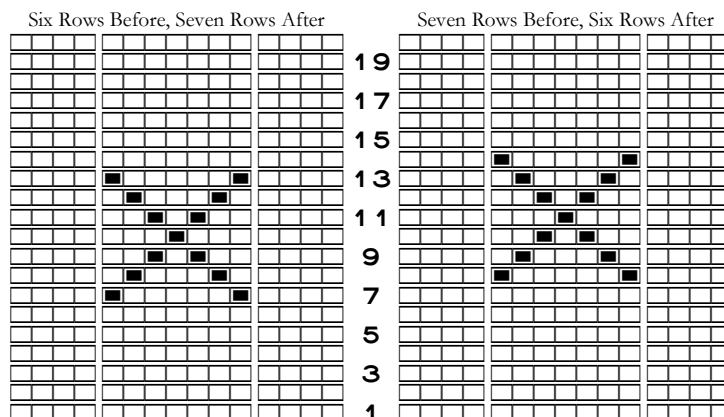
For the seven rows of the motif, we would work four stitches, work the seven stitches of the X, then work four stitches. With the directions as written, we can center our one-stitch-symmetry X in the project horizontally.



Before and after we work the motif rows, we would have rows just in the background color. But how many rows would there actually be both below and above the motif?

The motif is seven rows tall, and the coaster is written for twenty rows. Since that difference is thirteen rows, then we work six rows before the X and seven after it, or we work seven rows before the X and six after it.

³ Yes, I am completely ignoring the fact that stockinette edges curl if they don't have non-curling borders like seed stitch or garter stitch.



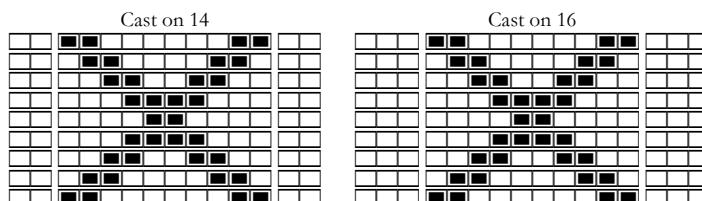
Either way, our X is not centered vertically. If we do the version on the left, then we ought to work one less row after we complete the motif so there are six rows above and below it. That means we'd work nineteen rows total.

For the version on the right, we ought to work one extra row after the motif, so that there are seven rows below and above the X, giving us twenty-one rows total.

One row more or less is not a deal-breaker, at least not in worsted weight. If we're using a very bulky yarn at two rows per inch, then we have to see if the finished object will be an acceptable size when we add or remove a row to get vertical symmetry.

Motif with Two Stitches of Symmetry

The second X motif is ten stitches wide. Since the coaster instructions have us cast on fifteen stitches, then in our attempt to center the second X across the coaster's width, we'll have two stitches on one side and three on the other. We need to either subtract a stitch from or add a stitch to the number we cast on, so that there are the same number of stitches on both sides of the motif.



How do the rows work out with this motif? We are supposed to work twenty rows total for the coaster. The motif is nine rows tall. That leaves eleven rows to be split into groups below and above the motif. As with the first X motif, we'd want to do either five rows before and after the motif, or six rows before and after. With either choice, we get our second X centered in the coaster in both directions.

Slight Changes Are All That's Necessary

A motif with **one** stitch of symmetry requires an **odd** number of stitches at the maximum width of the project, and a motif with **two** stitches of symmetry requires an **even** number of stitches at the project's widest spot.

Depending on the motif we want to put in a specific project, we might need to make adjustments to the number of stitches at the widest spot, and we may have to change the number of rows worked before and/or after the motif. The adjustments will usually be just a few stitches and rows either higher or lower.

Issue 2: Ribbing

Ribbing around the edges of garments can be considered, for the purpose of positioning the knit ribs properly, as a motif in its own right.

Ordinarily, we put a K1 rib of 1x1 ribbing and a K2 rib of 2x2 ribbing at the center of the front neck, regardless of the neck's shape (V neck, crew neck, square neck, etc.). But we may not have the right number of symmetry stitches in our garment for the particular ribbing we want. Let's look at the four combinations that could result when we try to match our garment's symmetry stitch(es) to the width of the ribbing's knit ribs.

The Easy Cases

If we have a garment with a single symmetry stitch, then a K1 rib of 1x1 ribbing will fit nicely in that single stitch.

If our project has two symmetry stitches and we want 2x2 neck ribbing, once again we're ready to go without any further work, because a K2 rib fits perfectly in those center two symmetry stitches.

The Hard Cases

If we have a project with a single symmetry stitch and we want 2x2 ribbing, then how do we put a K2 rib in the center of the front neck when there's only one project symmetry stitch available?

A similar thing happens if we have a project with two symmetry stitches but want 1x1 ribbing. The central K1 rib will have to be placed off-center in just one or the other of the project's two symmetry stitches.

The Hard-Case Solutions

For a rounded or square neck of some kind, having the central K1 or K2 rib a stitch away

from the exact center of the front may not be very noticeable, especially on a plain garment in good old stockinette.

The bottom of a V-neck, though, is a highly visible area of a garment, so we'd want to have an exact solution to our project and ribbing mismatches in the two hard cases.

If we have a symmetric motif near the neck opening, any mismatch between the project's symmetry stitch(es) and the ribbing's central knit rib may be even more obvious.

Single Symmetry Stitch with 2x2 Ribbing

If the motif is fairly narrow, then depending on how close the top of the motif comes to the bottom of the neck (and especially a V-neck), it might be obvious if we position a K2 rib in the single symmetry stitch and in one of the stitches on either side of it.

If that's the case, then we can work 2x2 ribbing all the way around the neck **except** at the very center. Instead of working an off-center K2 at the bottom of the V, we can work a K1 rib in that single center stitch. Then we keep the harmony between the single stitch of symmetry in both the project and any motif while maintaining symmetry on the 2x2 ribbing.

If we're really set on having a true K2 rib at the bottom of the V but we absolutely must have a single stitch of symmetry for our garment and/or motif, then instead of leaving just one stitch at the bottom of the V, we start off with **three** stitches there. Then we do the very smooth 3-into-2 symmetric decrease on the first round of ribbing, which will magically turn those three stitches into two without being even the tiniest bit lopsided.

There's a link to a YouTube video demonstrating two versions of this decrease in Jolie Elder's extensive blog post at

<http://jolieaelder.blogspot.com/2015/08/symmetrical-yarn-over-net-pattern.html>

Even though the blog post is not about ribbing per se, the 3-into-2 decrease works perfectly for our situation here.

Two Symmetry Stitches with 1x1 Ribbing

The first solution in this situation is similar to the first solution for the other mismatch case: we work 1x1 ribbing all the way around the neck **except** at the center front, where we have a K2 rib growing out of the project's (and any motif's) two stitches of symmetry.

If we really want a K1 rib above a motif and/or in a project with two symmetry stitches, then we have to work a non-leaning single decrease at the center of the neck. Since I found no such thing when I searched the Internet, I asked the Ravelry community. They gave some great responses, so if you find yourself in this situation, I recommend checking out this thread:⁴

⁴ You will have to be a member of Ravelry to see the discussion.

www.ravelry.com/discuss/techniques/3417568

Higher-Order Ribbings

If we want 3x3 or 4x4 ribbings, we treat them the same way as the 1x1 and 2x2, respectively, except that each one has two more stitches than their counterparts.

Issue 3: Seams

For any garment worked flat in separate pieces, we have to consider the fact that we'll lose width because of stitches used in seaming. In some projects at some gauges, the loss of a stitch or two in the seams won't make any difference. But in other cases, the finished item may end up too small or at least smaller than we'd like.

We must take into account three separate things:

- ☉ We need either one stitch or two stitches for symmetry.
- ☉ We need either one stitch or two stitches for seaming.
- ☉ We may get either an odd or an even number of stitches when we multiply the design width times the design stitch gauge.

Dealing with all three factors means we have eight (two times two times two) possible combinations. And as we'll see, we occasionally have to consider the thickness of the project yarn and the size of the garment as well.

Some combinations will force us to adjust the number of stitches we need at the largest width so we get the desired result.⁵

One Symmetry Stitch: Even Number of Stitches

If multiplying width times stitch gauge results in an even number of stitches, we need to add one to the stitch count to be the symmetry stitch, because a motif with a single stitch of symmetry (even if the only "motif" is 1x1 neck ribbing) requires an odd number of project stitches.

Half-Stitch Seaming

The added symmetry stitch will make up for the half-stitches lost on the edges for the seams, so no additional stitches are needed.

⁵ Throughout this section I'm referring to the number of stitches at the maximum width (of either the chest or around the upper arm) instead of the number of cast-on stitches, since we often work bottom ribbings on fewer stitches.

Full-Stitch Seaming

In addition to the symmetry stitch we've already added, we may need to add two more stitches that will be used for the seams. If we're using bulky yarn or working a fairly small garment, we may need to add two stitches to be consumed in the sewing-up. In that case, we add three stitches total to the calculated stitches.

One Symmetry Stitch: Odd Number of Stitches

If multiplying width times stitch gauge results in an odd number of stitches, the odd stitch will serve as the symmetry stitch.

Half-Stitch Seaming

The odd stitch **might** be able to make up for the half-stitches lost on both edges in the seams. This is a case where it depends on the thickness of the yarn and/or the size of the garment.

In thinner yarns, perhaps worsted or smaller, and in larger garments, the loss of one stitch total in the seams probably means no additional adjustment to the stitch count is needed.

In bulkier yarns (or in any yarn if we want to be sure) or for smaller garments, we might need to make up for the width lost in seaming by adding two stitches.⁶ The extra stitch left after seaming will make the item slightly wider, which is probably a good thing for any size of yarn.

Full-Stitch Seaming

Because we already have a symmetry stitch, we only need to add two stitches to the stitch count to make up for the stitches lost in the seams.

Two Symmetry Stitches: Even Number of Stitches

If multiplying width times stitch gauge results in an even number of stitches, no adjustments to the stitch count are needed for symmetry.

Half-Stitch Seaming

In finer yarns, we probably don't have to do anything. Unless the garment is very small, losing one stitch to the seams is not likely to make enough of a difference to worry about.

In bulkier yarns, we might want to add two stitches to the stitch count, since the loss of

⁶ We have to add two stitches, not just one, because we must have an odd number of stitches for one-stitch symmetry. If we start with an odd number, we have to add two—not one—to get to the next odd number.

half a stitch at each seam might affect the finished width noticeably.⁷ The extra stitch will make the garment a bit wider.

Full-Stitch Seaming

In finer yarns or for larger garments, we probably don't have to do anything, since losing the width of two stitches won't make much difference. If we want to be sure, though, regardless of the yarn we're using or the size we're making, we add two to the calculated stitches.

Two Symmetry Stitches: Odd Number of Stitches

If multiplying width times stitch gauge results in an odd number of stitches, we need to add one to the stitch count so we have two symmetry stitches.

Half-Stitch Seaming

The symmetry stitch that was added will make up for the two half-stitches lost at each edge in the sewing, so no additional stitches need to be added.

Full-Stitch Seaming

Having added a stitch so we have two-stitch symmetry, we may need to add two more stitches to be used in the seams. If we're using thinner yarn to make a large-size garment, we may not need to add stitches. If we're using a bulkier yarn or if we're making a smaller garment, we may need to add two stitches to sew with. If so, we must add three stitches total to the calculated stitch count.

Stitch Adjustment Summary

The table shows how many stitches to add for symmetry and seaming.

	For One-Stitch Symmetry				For Two-Stitch Symmetry			
	even		odd		even		odd	
If width × gauge is	even		odd		even		odd	
then add	1		0		0		1	
If seaming type is	half	full	half	full	half	full	half	full
then add	0	0 or 2	0 or 2	0 or 2	0 or 2	0 or 2	0	0 or 2
Total to Add	1	1 or 3	0 or 2	0 or 2	0 or 2	0 or 2	1	1 or 3

When the total number of stitches to add is shown as a choice between two numbers, we take into account the width of the project and the thickness of the yarn. For smaller garments in bulkier yarn, we add the higher number to the calculated number of stitches. For larger garments in thinner yarn, we add the lower number.

⁷ As before, we have to add two stitches, not one, to get to the next even number.

If we really want to be sure, regardless of the yarn thickness and garment size, we add the larger number.

Do Not Try to Make This Vest!

This V-neck vest is worked flat in two pieces. Even if we wanted to work in the round with steeks, all the planning for the shaping still has to be done. It's just easier to explain what's going on by using separate pieces for the front and back.

Remember that I'm not a designer, so a vest made from these instructions probably won't fit well.

The Yarn

I assumed worsted-weight yarn worked at a design gauge of five stitches per inch. Let's not even bother about the row gauge for right now. The stitch gauge will give us plenty to think about and work through.

Project Symmetry

I made a command decision to have a single stitch of symmetry, which means the bottom of the V neck will have just one stitch.

Side Seams

I decided on half-stitch seams, so half a stitch on the left and right edges of the front and back will both be consumed when the two pieces are sewn together.

Neck and Armhole Ribbing

To go along with the single stitch of symmetry, I decided on 1x1 ribbing around all the openings to keep things simple.

I then had to decide how wide/deep/tall the ribbing would be, because that measurement comes into play at several places. I decided on an inch of ribbing.

No Stitch Pattern

Just to keep things as simple as possible, this vest is going to start out as plain old stock-inette. Chapter 430 gives an example of using charts for intarsia, and chapter 460 describes the adjustments needed for stranded colorwork and texture patterns.

Shoulder Shaping and Joining

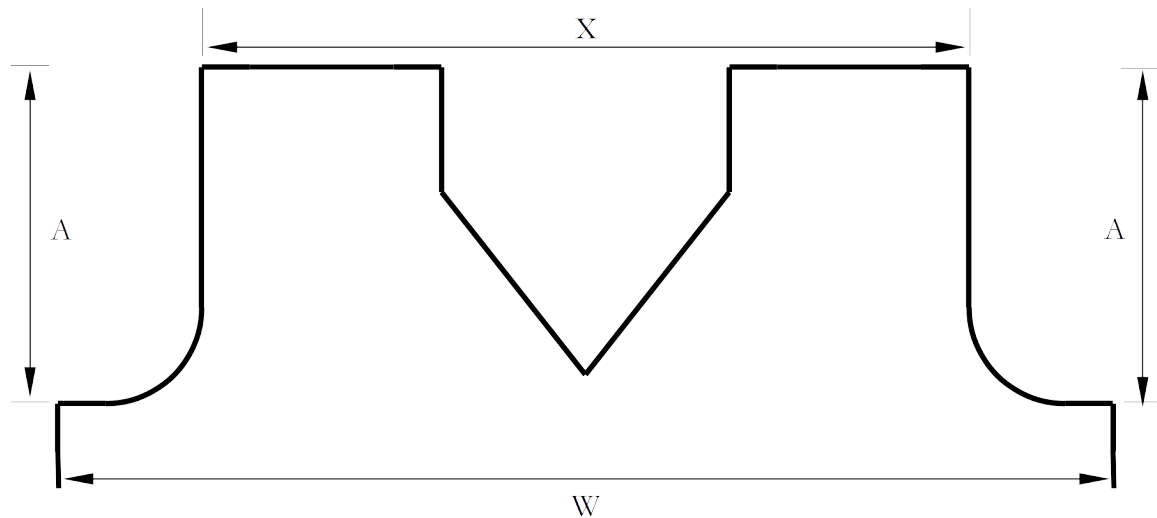
Some knitters don't have an issue with the typical bind-off shaping for shoulders. Others don't like the look of the stairsteps, so they prefer to do short rows for the shaping, then use

a three-needle bind-off or Kitchener/grafting/weaving to join the shoulders' live stitches together. We can chart both situations, as shown in chapters 430 and 432.

Note that the schematics for this vest have unshaped shoulders for simplicity. The shaping is in the written-out instructions in chapter 410 and shown in the charts in chapter 430.

The Measurements

The first schematic shows the locations of some key measurements.



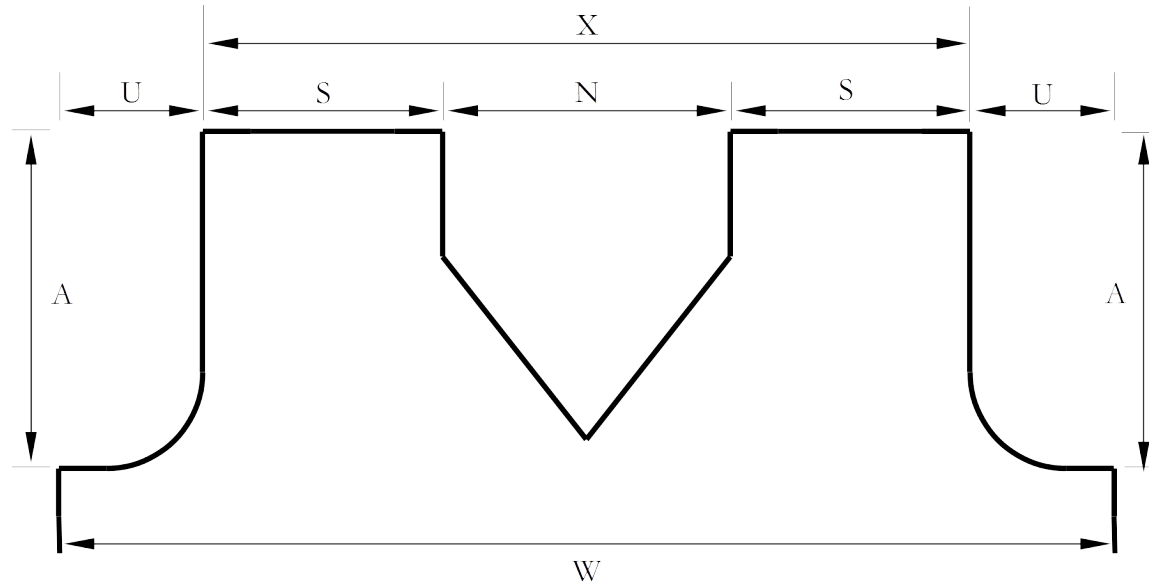
I used finished measurements for the chest width W , armhole depth A , and cross-back width X from the standard chart for women's sizes at YarnStandards.com,⁸ adding two inches of ease to the larger chest measurement and one inch of ease to the underarm depth. As we go along, measurements will all be rounded to the nearest quarter inch.

	Small	Medium	Large	XL	XXL	XXXL
Total Chest	36	40	44	48	52	56
Front/Back Width W	18	20	22	24	26	28
Cross-Back Width X	15	16.5	17.5	17.5	18	18
Armhole Depth A	8	8.5	9	9.5	10	10.5

⁸ Craft Yarn Council, Yarn Standards, Woman Size Charts, www.craftyarncouncil.com/womansize.html.

Neck and Shoulders

Now we need to decide how wide the neck opening (N) and the shoulders (S) will be, as shown in the next schematic.



Many designs use a third of the cross-back width X for each of those measurements, but let's leave a bit more space for the head opening, using 40 percent of X for the neck width and splitting the remaining 60 percent of X between the shoulders. We will use two very easy calculations to determine these widths:

$$N = 0.4 \times X$$

$$S = 0.3 \times X$$

Using these simple equations, here are the rounded-off neck and shoulder widths for all six sizes.

	Small	Medium	Large	XL	XXL	XXXL
Cross-Back Width X	15	16.5	17.5	17.5	18	18
Neck Width N	6	6.5	7	7	7.5	7.5
Shoulder Width S	4.5	5	5.25	5.25	5.25	5.25

The schematic also contains the new measurement U . U is the width of the total under-arm shaping at each armhole, and it's half of the difference of the front/back width W and the cross-back width X .

To make that statement absolutely clear, we can see from the schematic that

$$U + X + U = W$$

When we rearrange to get U by itself, we see

$$U + X + U = W$$

$$U + U = W - X$$

$$U = (W - X)/2$$

Let's determine U for all sizes.

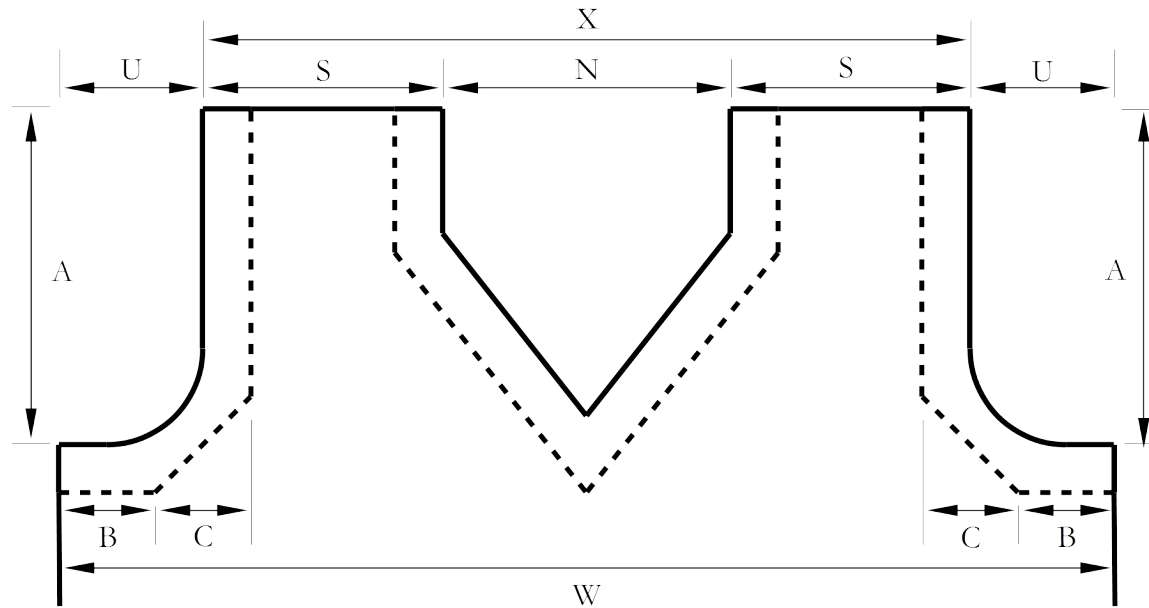
	Small	Medium	Large	XL	XXL	XXXL
Front/Back Width W	18	20	22	24	26	28
Cross-Back Width X	15	16.5	17.5	17.5	18	18
Underarm Width U	1.5	1.75	2.25	3.25	4	5

The schematics so far are really more for a sweater with set-in sleeves, and the neck hasn't shown the ribbing that would ordinarily be there on the finished garment. Since we're doing a vest, we need to account for the ribbing around the neck **and** around the armholes.

Accounting for the Ribbing

Notice that our values for the neck and shoulder widths are the final dimensions **after** the ribbing has been added. Since the ribbing is taking the place of the main fabric in those areas, we need to change the various widths accordingly.

The plain stockinette part that we work for the body of the vest has to exclude and thus leave space for the ribbing, so in the next schematic, the **dashed** lines show where stitches will be picked or knitted up to work the ribbing. The underarm shaping has been split into its two components: the bind-offs B, all of them done on a single row, and the curve C, representing stitches decreased over several rows.



When we add the two measurements B and C to get the width of the underarm shaping, that sum is wider than measurement U by the width of the ribbing. Since

$$B + C = U + \text{width of ribbing}$$

and the ribbing is one inch wide, then

$$B + C = U + 1$$

Let's determine the combined values of B and C.

	Small	Medium	Large	XL	XXL	XXXL
Underarm Width U	1.5	1.75	2.25	3.25	4	5
Bind-Off B + Curve C	2.5	2.75	3.25	4.25	5	6

Finalizing the Underarm Shaping

Now I had to decide on individual values for both B and C, because the combined value is only so helpful. The measurements for each part of the underarm shaping are, well, simply educated guesses, which is why this vest probably won't fit well if worked up.

In the smaller sizes, I made B and C nearly equal, but in the larger sizes, I increased the width of the underarm bind-off more than the width of the curved portion. Since the curve

stitches are decreased over the course of several rows, it seemed better to keep that number of rows fairly consistent between all the sizes, since a bigger chest measurement doesn't always mean we need a drastically taller armhole. Here's how I divided the combined widths into individual widths.

	Small	Medium	Large	XL	XXL	XXXL
Bind-Off B + Curve C	2.5	2.75	3.25	4.25	5	6
Underarm Bind-Off B	1.25	1.5	1.75	2.5	3	4
Underarm Curve C	1.25	1.25	1.5	1.75	2	2

Complete Table of Measurements

Let's put all the individual measurements in one place. Remember, these measurements are for the **finished** vest, including the neck and armhole ribbing.

Finished Widths	Small	Medium	Large	XL	XXL	XXXL
Total Chest	36	40	44	48	52	56
Front/Back Width W	18	20	22	24	26	28
Cross-Back Width X	15	16.5	17.5	17.5	18	18
Armhole Depth A	8	8.5	9	9.5	10	10.5
Neck Width N	6	6.5	7	7	7.5	7.5
Shoulder Width S	4.5	5	5.25	5.25	5.25	5.25
Underarm Width U	1.5	1.75	2.25	3.25	4	5
Bind-Off B + Curve C	2.5	2.75	3.25	4.25	5	6
Underarm Bind-Off B	1.25	1.5	1.75	2.5	3	4
Underarm Curve C	1.25	1.25	1.5	1.75	2	2

Stitch-Count Schematic

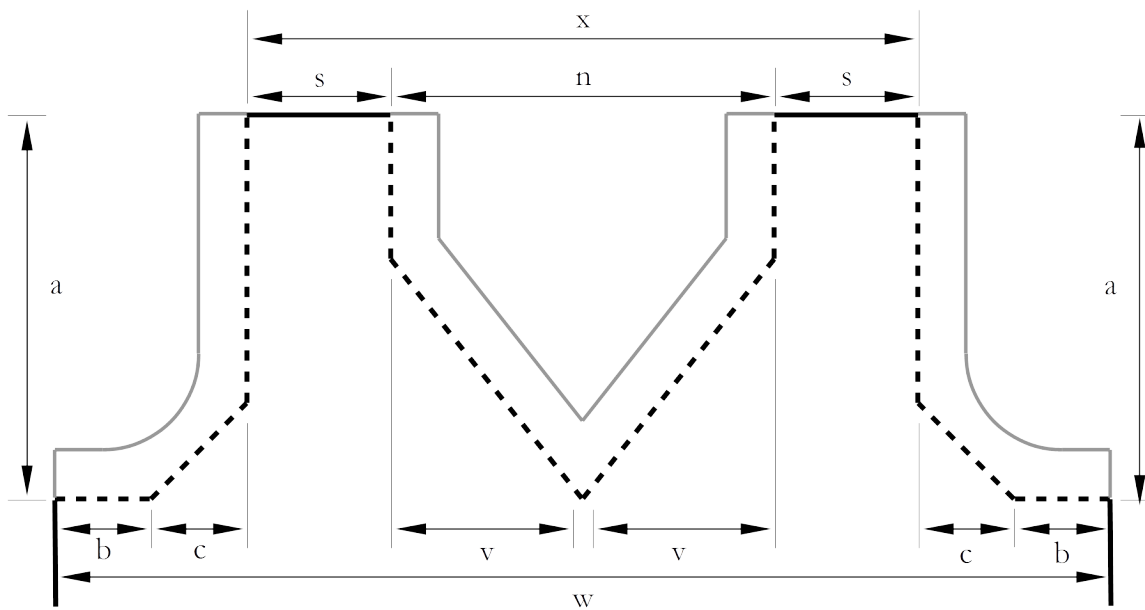
Now that we know all the widths of the various sections of the vest, the obvious step is to multiply each one by our design stitch gauge to determine how many stitches wide each part will be, so that's exactly what I did. You might guess that all those fractions of an inch in the measurements will cause trouble, and you would be quite right. There were so many fractions of stitches in so many places that it was just ridiculous.

But the umpteenth time I edited this appendix, I realized that we don't need to use all of the numbers in the measurements table, or even most of them, to figure out how many stitches we need for each part of the vest.

In fact, we actually need only five values:

- ☉ the front/back width W from the standard
- ☉ the cross-back width X from the standard
- ☉ the width/depth/height of the ribbing, which we get to choose
- ☉ the proportion of the cross-back width X used for the neck width N , which we get to choose
- ☉ the proportion of the cross-back width X used for the shoulder width S , which we get to choose

The stitch-count schematic uses lowercase letters for the corresponding uppercase measurements to avoid confusion. The edges of the finished vest (after the armhole and neck ribbings have been added) have been changed to gray. The solid and dashed black lines show the boundaries of the vest's stockinette fabric.



There are some key differences between the spans of the stitches' lowercase values compared with the uppercase widths shown in the earlier schematic:

- ☉ The stitch count s of each shoulder is narrower than the corresponding measurement S by the combined width of the neck and armhole ribbing.
- ☉ The back neck n is wider than the finished measurement N , because the neck opening is narrower after the neck ribbing is added.

- ☉ Lowercase *a* is now the standard underarm depth *A* plus the height of the ribbing around the armhole. Since this value actually depends on the row gauge, we need to make sure that the number of rows we work past the underarm bind-off allows for the fact that the ribbing will shorten the armhole opening.
- ☉ Lowercase *v* is the new stitch span that will be decreased on each side of the V neck. Remember my command decision that I'll have a single stitch of symmetry at the bottom of the V neck, so the number of stitches decreased on each side is half the neck stitches *n*, not including the single symmetry stitch at the center of the V.

Determining the Stitch Counts

I was quite surprised when I—finally!—figured out that I didn't need all those calculated widths to determine the number of stitches in all the different stockinette areas of the vest. You might be surprised too.

Front/Back

Ordinarily, the number of chest stitches on the front and back are the desired chest width (including ease) times the design stitch gauge.

$$w = W \times \text{design stitch gauge}$$

Since we want a single symmetry stitch in the center of the front and back, we need to have an odd number of stitches for *w*, even if multiplying *W* inches times the design stitch gauge results in an even number of stitches. So if in any size we wind up with an even number for *w*, we'll add one to it.

It just so happens that for all six sizes, we have to add one stitch to *w* to give us a center symmetry stitch.

	Small	Medium	Large	XL	XXL	XXXL
Front/Back Width <i>W</i>	18	20	22	24	26	28
Width × Stitch Gauge	90	100	110	120	130	140
Front/Back Stitches <i>w</i>	91	101	111	121	131	141

When we use half a stitch at each side in the sewing up, each size will have the exact number of stitches we got from multiplying chest width by design stitch gauge.⁹

⁹ If we wanted seams that used a full stitch from each edge, then we'd need an additional two stitches to make up for the ones lost in seaming, so we'd have to increase *w* by three stitches total instead of by just one.

Cross-Back Width

The number of stitches between the vertical edges of the armholes is the width X minus the width of ribbing at each armhole, then multiplied by the design stitch gauge.

$$x = [X - (2 \times \text{width of ribbing})] \times \text{design stitch gauge}$$

When we use this equation for all six sizes, three sizes have a fraction of a stitch.

Initial Values	Small	Medium	Large	XL	XXL	XXXL
Cross-Back Width X	15	16.5	17.5	17.5	18	18
Cross-Back Stitches x	65	72.5	77.5	77.5	80	80

How do we deal with fractions of a stitch? In the first place, we need an odd number for x. Since our front/back has an odd number of stitches to get a single symmetry stitch, we need an odd number of stitches for x so that the shoulders are exactly in the middle of the front/back. That means we need to round the fractions to the nearest odd number, and we need to adjust an even number of stitches either up or down by one. I always like to add a stitch instead of subtracting a stitch, because then the garment will be a bit larger rather than a bit smaller.

Final Values	Small	Medium	Large	XL	XXL	XXXL
Cross-Back Width X	15	16.5	17.5	17.5	18	18
Cross-Back Stitches x	65	73	77	77	81	81

Neck Width

The neck and shoulder widths come from the proportions we select. I chose 40 percent of X for the neck width and 30 percent of X for each shoulder.

Remember that n is wider than N by the width of the ribbing on both sides of the neck. Our easy equation is

$$n = [N + (2 \times \text{width of ribbing})] \times \text{design stitch gauge}$$

Initial Values	Small	Medium	Large	XL	XXL	XXXL
Neck Width N	6	6.5	7	7	7.5	7.5
Neck Stitches n	40	42.5	45	45	47.5	47.5

Again, we have fractions of a stitch, and of course n must be a whole number. But the neck stitches must also be an odd number. Why? Because just as we want the cross-back

stitches to be exactly in the middle of the chest stitches, we want the neck stitches to be exactly in the middle of the cross-back stitches (which automatically puts them in the exact middle of the chest stitches also). Since w and x both have an odd number of stitches to allow for a single symmetry stitch, then n also has to be odd so it too has a single symmetry stitch.

We'll do the same thing here that we just did for the cross-back stitches x : round fractional stitches to the nearest odd number, and increase even numbers up to the next higher odd number.

Final Values	Small	Medium	Large	XL	XXL	XXXL
Neck Width N	6	6.5	7	7	7.5	7.5
Neck Stitches n	41	43	45	45	47	47

Shoulder Width

If we look again at the stitch-count schematic, we see that

$$s + n + s = x$$

which we can rearrange to find s :

$$s + n + s = x$$

$$s + s = x - n$$

$$s = (x - n)/2$$

Since we're now working with stitches instead of measurements, we don't get any annoying fractions of a stitch.

Final Values	Small	Medium	Large	XL	XXL	XXXL
Cross-Back Stitches x	65	73	77	77	81	81
Neck Stitches n	41	43	45	45	47	47
Shoulder Stitches s	12	15	16	16	17	17

V-Neck Decreases

If we look at the stitch-count schematic, we can see that the two V-neck decrease stitch counts v plus the single symmetry stitch between them is the number of neck stitches n . We can rearrange

$$v + 1 + v = n$$

to find v from the number of neck stitches:

$$v + 1 + v = n$$

$$v + v = n - 1$$

$$v = (n - 1)/2$$

Final Values	Small	Medium	Large	XL	XXL	XXXL
Neck Stitches n	41	43	45	45	47	47
V-Neck Decreases v	20	21	22	22	23	23

Underarm Shaping

We need to figure out how many stitches we'll bind off at the underarms and how many more stitches we'll decrease along the underarm curve before we work the armhole edges straight to the shoulder.

From the stitch-count schematic, we can see that the number of stitches for the underarm shaping plus the cross-back stitches is equal the front/back stitches. We can then rearrange to find the number of total stitches in b and c .

$$b + c + x + c + b = w$$

$$(b + c) \times 2 = w - x$$

$$b + c = (w - x)/2$$

Final Values	Small	Medium	Large	XL	XXL	XXXL
Front/Back Stitches w	91	101	111	121	131	141
Cross-Back Stitches x	65	73	77	77	81	81
Bind-Off b + Curve c	13	14	17	22	25	30

In the smaller sizes, I split the stitches evenly. As explained earlier, in the larger sizes, I decided to bind off more stitches at the underarm than are decreased away in the curve.

Final Values	Small	Medium	Large	XL	XXL	XXXL
Bind-Off b + Curve c	13	14	17	22	25	30
Bind-Off Stitches b	6	7	8	12	15	20
Curve Stitches c	7	7	9	10	10	10

The Final Stitch Counts

Let's put all the stitch counts together to see if they make sense.

Final Values	Small	Medium	Large	XL	XXL	XXXL
Front/Back Stitches w	91	101	111	121	131	141
Cross-Back Stitches x	65	73	77	77	81	81
Neck Stitches n	41	43	45	45	47	47
Shoulder Stitches s	12	15	16	16	17	17
V-Neck Decreases v	20	21	22	22	23	23
Bind-Off Stitches b	6	7	8	12	15	20
Curve Stitches c	7	7	9	10	10	10

Do These Numbers Work Together?

If we look back at the stitch-count schematic, we can see that on each side of the center symmetry stitch, we have b, c, s, and v stitches. If we add those four stitch counts together and double it for the right and left halves of the vest, then when we add one to that value, it should equal w, the front/back stitches.

So for each size, we'll double-check our stitch counts with the easy equation

$$[(s + v + b + c) \times 2] + 1 = w?$$

For the size small, we have

$$\begin{aligned} [(s + v + b + c) \times 2] + 1 &= w? \\ [(12 + 20 + 6 + 7) \times 2] + 1 &= 91? \\ [45 \times 2] + 1 &= 91? \end{aligned}$$

So our stitch counts for size small are right. When we do the same check in the other sizes, we find that all the stitch counts add up properly.

Widths from the Final Stitch Counts

If we divide all the stitch counts by the design stitch gauge, we get all the widths of the stockinette portions of the different parts of the vest. Let's see what those exact, not rounded-off, values are. Again, these values are for the main fabric of the vest, so they do not include the ribbing around the neck and armholes.

Stockinette Widths	Small	Medium	Large	XL	XXL	XXXL
Front/Back Width W	18.2	20.2	22.2	24.2	26.2	28.2
Cross-Back Width X	13	14.6	15.4	15.4	16.2	16.2
Neck Width N	8.2	8.6	9	9	9.4	9.4
Shoulder Width S	2.4	3	3.2	3.2	3.4	3.4
Bind-Off Width B	1.2	1.4	1.6	2.4	3	4
Curve Width C	1.4	1.4	1.8	2	2	2

Let's now add or subtract the ribbing width as needed in each location:

- ☉ The cross-back width X needs to be increased by the width of ribbing on both ends.
- ☉ The neck width N needs to be decreased by the width of the ribbing on both ends.
- ☉ The shoulder width S needs to be increased by the width of the ribbing on both ends.
- ☉ The total width of the underarm shaping U is the sum of the bind-off and curve widths minus the width of the ribbing.

Finished Widths	Small	Medium	Large	XL	XXL	XXXL
Front/Back Width W	18.2	20.2	22.2	24.2	26.2	28.2
Cross-Back Width X	15	16.6	17.4	17.4	18.2	18.2
Neck Width N	6.2	6.6	7	7	7.4	7.4
Shoulder Width S	4.4	5	5.2	5.2	5.4	5.4
Underarm Width U	1.6	1.8	2.4	3.4	4	5

These numbers are within the quarter-inch round-off we found for the widths initially. Since the initial group of calculated widths has “friendlier” fractions, the vest schematic included with the written instructions in chapter 410 uses the initial set of measurements.