Studio by WHITE

EC1 MODULAR

ELECTRONIC KNITTING MACHINE

A SUPPLEMENTARY MANUAL

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THE STUDIO by WHITE
EC1 MODULAR ELECTRONIC KNITTING MACHINE
A Supplementary Manual

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BEGIN WITH A CLEAN MACHINE

The EC1 uses light sensitivity, reflection and electro-magnetism to turn your wildest ideas into knitted fabric!

Light emitting sensors on the back of the carriage read and count the needles on the bed. Use anti-static cotton swabs to keep these sensors clean.

Pattern cards are read by light reflection. Periodically, use the cleaning card that came with the machine to remove dust and lint from the card reader.

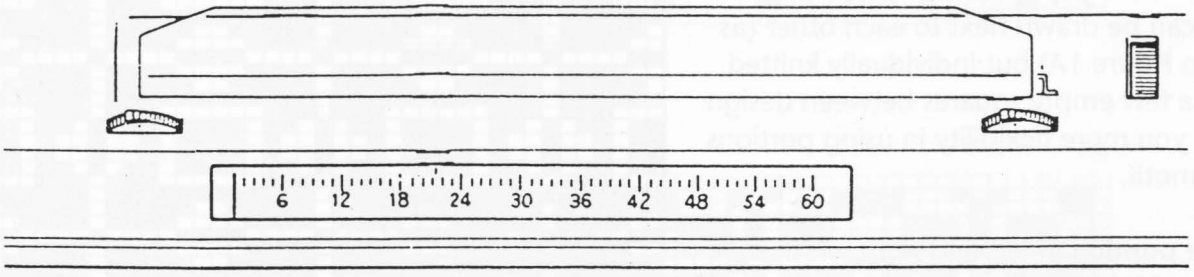
The Point Cams (PCs) and the Needle 1 Cam (N1) are magnetic trips for the electro-magnetic needle selection that takes place where the needle butts enter the underside of the carriage. Make sure none of these builds up a greasy coating.

There is a pair of magnets on the front, underside of the carriage that alerts the card reader when the carriage changes direction. These magnets (connected by a thin metal rod) are located in the white plastic glide at the front of the carriage. Keep this area free of grease and lint because these magnets must be able to slide freely.

Also, remove any lint that builds up on the roller bearings at each end of the carriage; and put a few drops of oil on each of the rollers to keep them free moving and smooth.

To prevent possible damage from a power surge or interference from "line noise", purchase a surge protector from your local electronics store.

Unplug the PE1 unit when it is not in use as it over rides the normal knitting functions of the EC1 and you will be unable to activate the card reader.



The EC1, external control unit, is connected to the carriage by the curl cord and can be used with the SK830, SK840, SK860 or SK890.

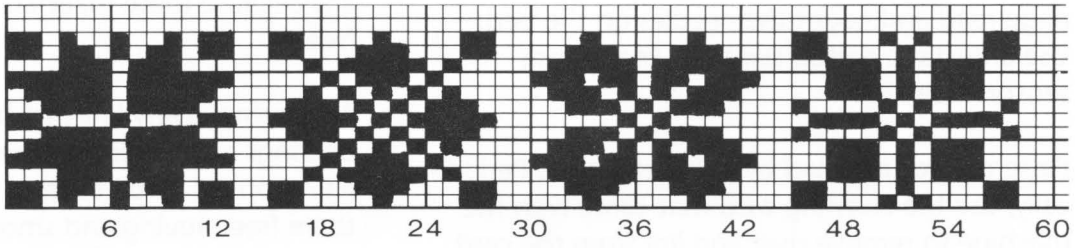
THE WIDTH INDICATOR

The EC1 reads patterns by light reflection. Before each row is knitted, scanners inside the card reader unit whiz across the design card, from left to right and back. Regardless of the direction the carriage is moving, the scanners only read when they travel from left to right and they always start reading with the first square (i.e. stitch) on the left. The left indicator represents "o" and the first square to the right of it indicates the first stitch (i.e. needle #1) of each row of your design. After the scanners have read up to 60 squares representing stitches, they continue to the right to read the buzzer and card movement columns. When the scanners return to the left, they do so without reading. Also, do not try to race the scanners by knitting very fast. You can only knit as fast as the scanners can read, so listen to them a few times before you begin.

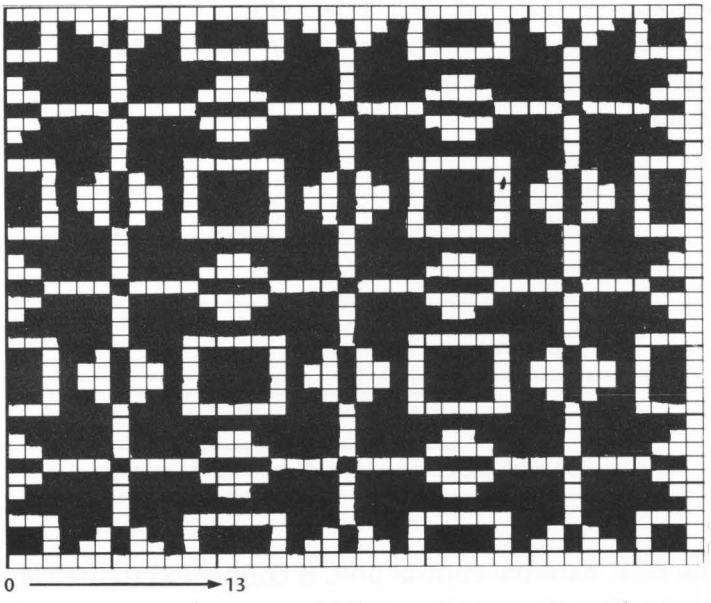
The right hand width indicator simply tells the scanners how far to the right of the first stitch they should read. In effect, turning the width

indicator dials lowers a little window shade so that more or less of a design can be reflected and read by the scanners. When you set the width indicator to read more squares than your design is wide, you add extra, plain stitches between each repeat. When it is set to read fewer squares than your total design—beginning with the first square on the left and continuing to the point you have indicated—will knit. This is a good way to vary designs or to make them fit a specific number of needles, match a garment shape, avoid partial motifs, etc.

1A



1B

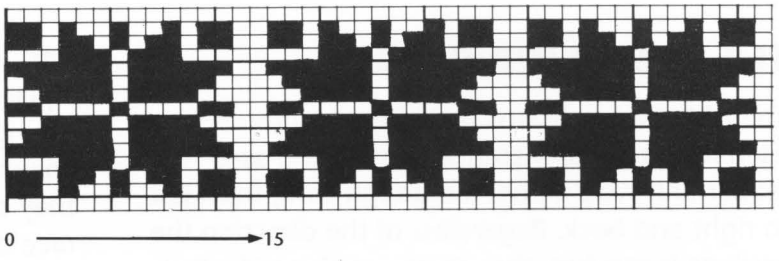


The dual width controls on the EC1 unit allow you to select any portion of a design and eithe repeat it or isolate it on the fabric.

To avoid wasting space on a mylar, small designs can be drawn next to each other (as shown in Figure 1A) but individually knitted. Leaving a few empty squares between design will give you more flexibility in using portions of each motif.

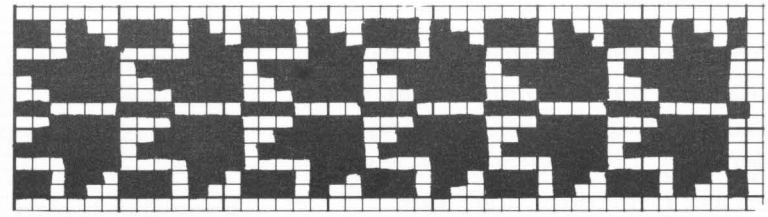
Note the position of left and right width indicators (LWI/RWI) in each of the following examples. When doubling the width of a de (button #4) or knitting a mirror image (button #5) set the width indicator for the exact number of squares in the design. Do not double the number on the width indicator or you will add that many more plain stitches between repeats. The #4 or #5 buttons will take care of doubling or mirror imaging the design as you knit, as long as there are sufficient working needles between the PCs.

1C

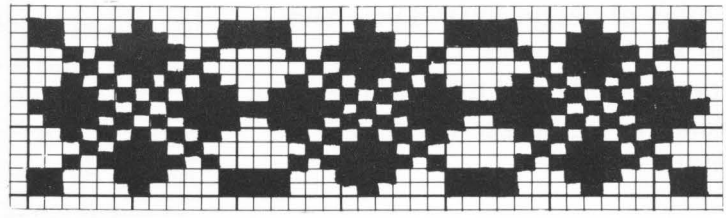


Be aware that when using the PE1, the right width indicator must be set at 60 whether you are reading or knitting a design. However, the left width indicator can be moved anywhere to

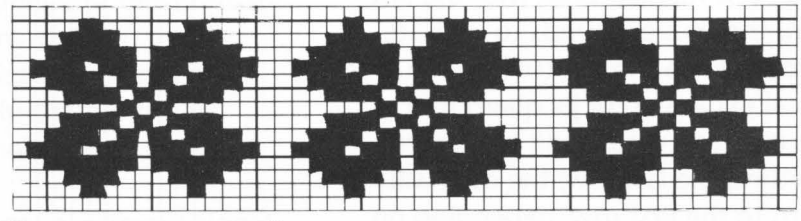
1D



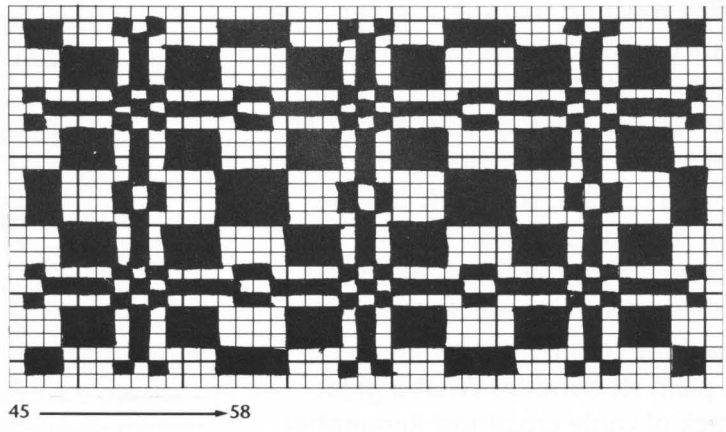
1E



1F



1G

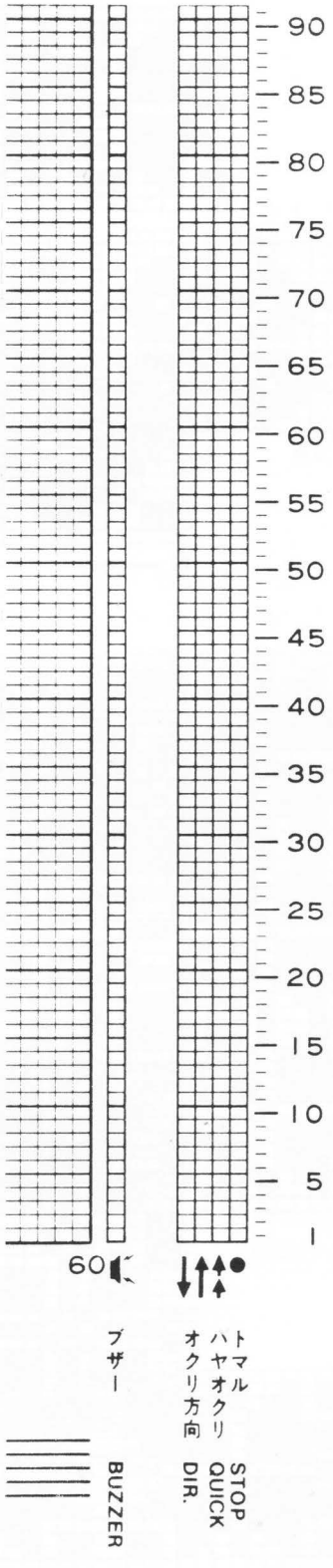


define the first stitch of a design. In order to alter the width of a knitted design, you must re-insert the design card and instruct the PE1 to read a fewer or greater number of stitches. Changing the width indicator will not alter the width of the pattern while you are knitting.

THE DESIGN CARDS

The design cards are numbered from 1 to 60, left to right, across the bottom and the top, with each vertical column of squares representing a single stitch (Figure 2). The cards are 150 rows long (numbered along the right side), but longer designs can be knitted by inserting a second (or third) card when the first is done. The scanners always read from left to right, reading the number of design squares you have specified on the width indicators. Once they have read the design portion of the card they search for markings in the buzzer and card direction columns.

THE BUZZER does not control any machine functions. Rather, it signals you whenever something is about to happen. For example, when the buzzer column is marked even with the last row of a design, the buzzer sounds to indicate that the next row will be the last (unless you are using the vertical expansion or jacquard functions, in which case you would knit two more rows). After knitting the last row, the card will reverse or return to the first row, depending on which direction columns have been marked. In the case of a fast return, do not knit until the buzzer stops, indicating that the card has returned to the first row and that the scanners have had a chance to read it. Because markings in the buzzer column do not affect the knitting in any way, you can use them instead of written directions to tell you when to increase, decrease, change colors, cross cables, scrap off; change stitch sizes, cam settings or design button; transfer stitches, make button holes, or add beads. You can even feed a blank design card through the machine to buzz out reminders when you knit plain stockinette. What a great way to keep track of cable crossings! Remember, you can also add buzzer markings to the preprinted design cards by using the electronic pencil that came with the machine.



2: The scanners read the buzzer and direction columns for each row of the design.

CARD MOVEMENT

The four columns to the right of the buzzer are used to control the direction a card moves and to determine whether it reverses or makes a fast return to the first row. These columns are read every time the scanner reads a row of pattern. If there is no marking for a particular row, the card will continue moving as it was last instructed.

The two arrows on the lighter colored portion of the machine's pattern panel (to the right of the #6 button) are indicators that tell you which direction the card is moving. They change when the card changes direction. These arrows do not control the movement of a card unless the direction columns are blank or unless you begin reading the card somewhere beyond the markings. In order to change the direction a card moves through the card reader you must remark the columns, erase all the markings in the direction columns or specifically over-ride the markings. You cannot simply change the lit arrow to reverse the card movement.

Each of the four columns gives a different signal to the machine:

Column #1: Marks in this column instruct the card reader to move the card down, reading/knitting one row at a time from bottom to top.

Column #2: Marks in this column instruct the card reader to move the card up, reading/knitting one row at a time from top to bottom.

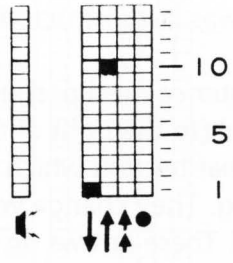
Try to remember that when the card moves down, it is read from bottom to top (up); when the card moves up, it is read from top to bottom (down). This is because the scanners are permanently located ten rows down inside the machine and cannot move up or down to read the rows on the card. Therefore, the card must pass before the scanners, one row at a time.

The marks in columns #3 and #4 control the quick return of the card to the first row of the pattern. Whether the first row is at the top or the bottom depends on the markings in the first

two columns. A mark in column #3 always starts a quick return and must be followed at some point by a mark in column #4 to stop the card. Marks in columns #3 and #4 are always paired with markings in columns #1 and #2 to indicate which direction the card should travel quickly and when to reverse. When a card is marked for quick motion it reads/knits in one direction only and makes a quick return in the other. Mark the buzzer column at the last row to remind you to stop knitting during the quick return.

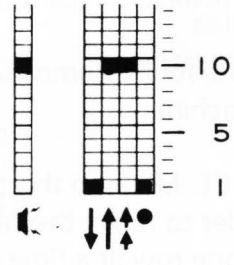
There are three ways to mark a card: **[1]** to read in both directions (Figure 3A), **[2]** to read bottom to top with a quick return to the first row at the bottom (Figure 3B), and **[3]** to read top to bottom with a quick return to the first row at the top (Figure 3C). Knowing which markings to use is essential to taking full advantage of the electronic design features of the EC1.

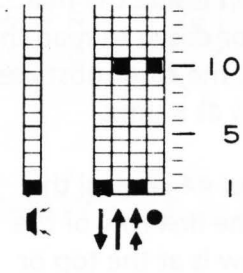
CARD MOVEMENT MARKINGS



3A: The card is marked to read and knit in both directions.

3B: The card is marked to read from bottom to top with a quick return to the first (bottom) row.





3C: The card is marked to read from top to bottom with a quick return to the first (top) row.

Figure 4: This 27-row pattern has been marked to read in both directions. One full repeat of the design is indicated by solid squares; the pattern of X's shows what mirrored repeats in both directions will look like (using button #5.). Begin with the inspection light lit, row #1 of the card aligned with the card reader slot and the down arrow lit on the control panel. When you turn off the inspection light, the card will drop down by ten rows and the scanners will read the first row of the card, including the mark in the first direction column (down arrow). The care will move down into the card reader as each row is knitted. When the scanners read the 27th row of the pattern, they will also read the mark in the second direction column (up arrow) and after the 27th row is knitted, the card will reverse direction, moving up after each row is knitted until the scanners read the mark in the first row again. Then the process will repeat. The lit arrow on the panel will change to tell you which way the card is traveling as the card reverses at the 1st and 27th rows of the design. The 1st and 27th rows will only knit once at each reverse; the buzzer column has been marked to signal each reverse.

4: This card is marked to read in both directions, reversing continuously, so it is only necessary to draw the lower half of the diamond motif.

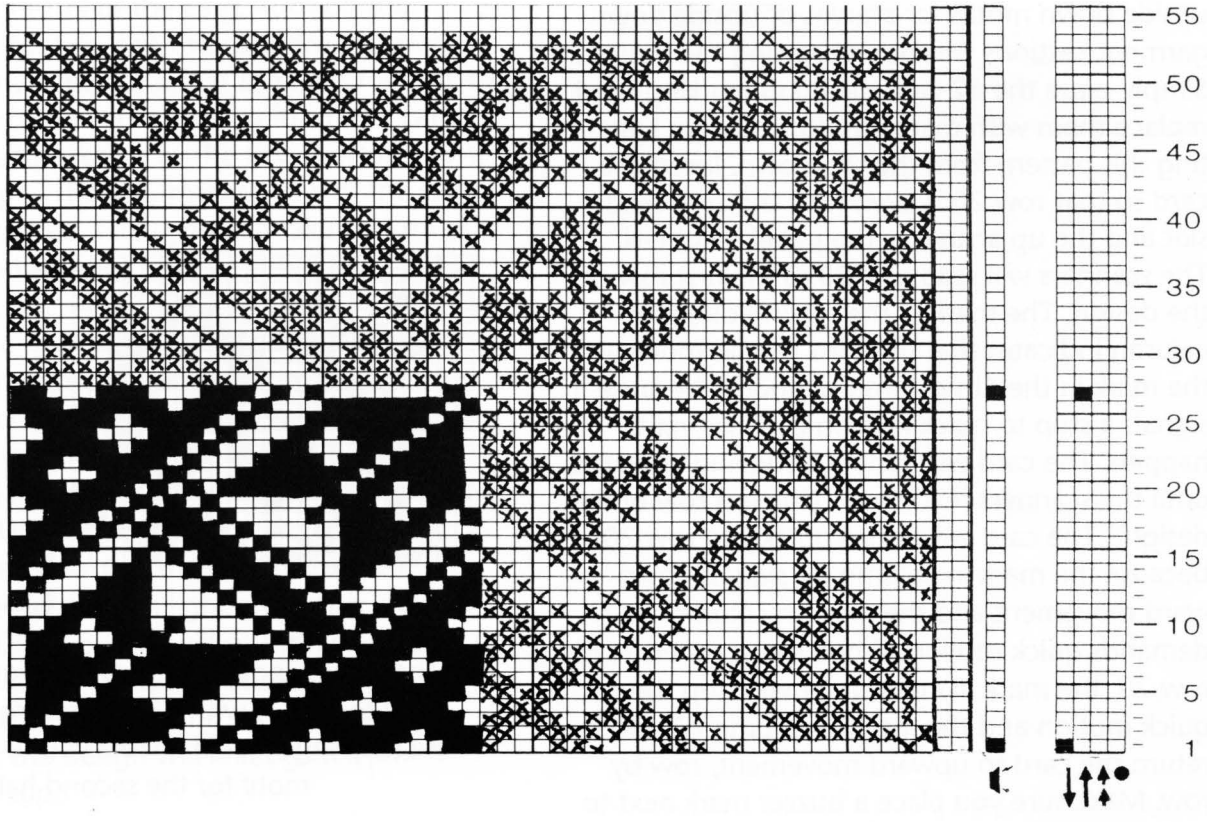
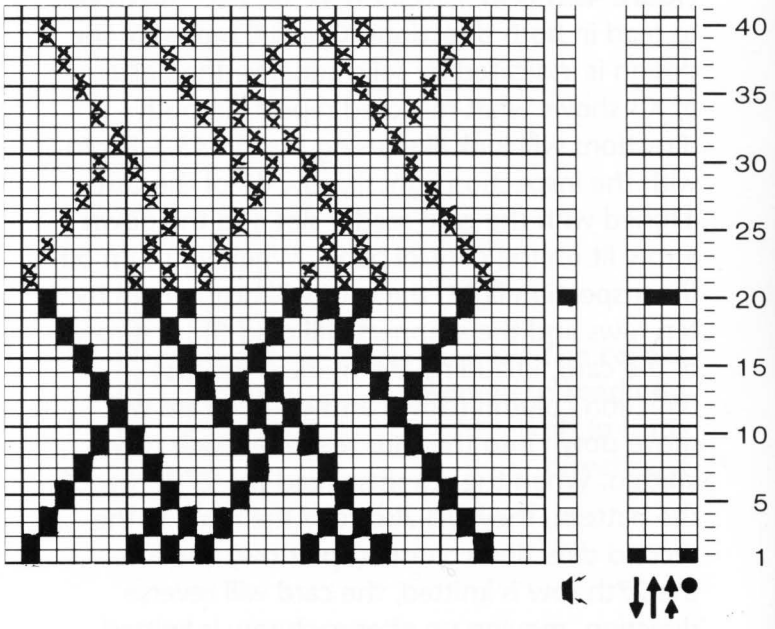
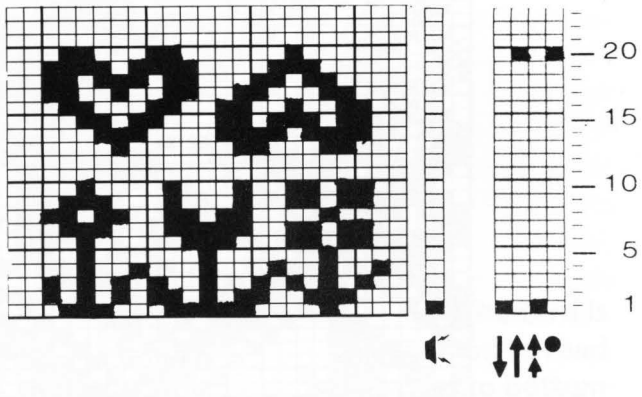


Figure 5: This cable motif is a 20 row pattern, marked to knit from row 1 to 20, then quickly return to row 1. When the scanners read the first row of the pattern card they read the marking in column #1 that signals downward movement of the card; but they ignore the mark in column #4 because it is only used to stop quick motion and there has been no quick motion up to this point. The card will continue moving down into the card reader, reading and knitting one row at a time until the scanners read row 20; where the mark in column #2 signals a change of direction (to move the card up) and the accompanying mark in column #3 indicates quick motion. Once row 20 has been knitted, the card will return quickly to row 1, where the mark in column #4 will stop the movement and the mark in column #1 will return the card to downward movement, row by row for the next repeat.



5: This design will knit from row 1 to row 20 and then the card will quickly return (without knitting) to row 1 for the next repeat.

Figure 6: The hearts and flowers are marked to knit from row 20 to row 1, with a quick return to row 20. These markings will continuously knit upside down motifs for scarves or upside down garment sections without redrawing the design. Simply erase the #2 card direction markings and replace them with markings #3. To begin knitting this pattern from the top down, insert the card so that row 20 is even with the card reader slot and the up arrow on the panel is lighted. The scanners will read row 20 as the first row of the design. The mark in the second direction column indicates that the card should move up; the mark in the 4th column is ignored because it signals a stop to quick motion that has yet to happen. The card will continue moving upwards until the scanners read row 1 (the last row of the design). The card will return quickly to row 20 because the mark in column #1 signals downward movement and the mark in column #3 demands quick motion. When the scanners read row 20, the mark in column #4 will stop the quick motion and the mark in column #2 will return the card to upward movement, row by row. Make sure you place a buzzer mark next to row 1 to alert you to the fast return at the end of each repeat.



6: These markings will knit the design from row 20 to row 1, with a quick return to row 20. These markings would enable you to reverse the motif for the second half of a scarf.

How to over-ride the machine so a card that is pre-marked to read from bottom to top can be read from top to bottom (up-side-down) instead.

For continuously repeating a pattern, it is more practical to re-draw the entire design or re-mark the direction columns as previously explained. However, for a single inverted repeat of a pre-drawn design, you can over-ride the card so that it reads from the top down, regardless of the markings that direct it to read from bottom to top.

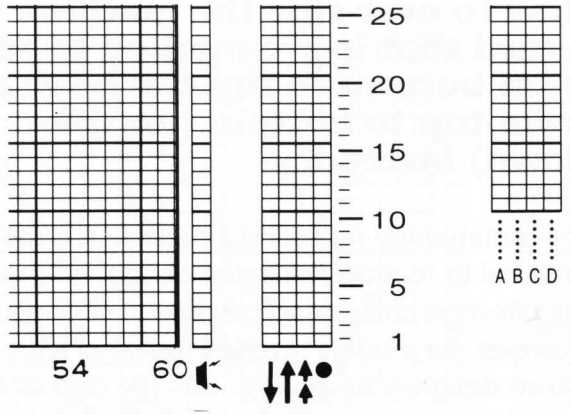
First of all, put a buzzer marking even with the first (bottom) row of the design so you will know when you've knitted a complete repeat and can stop before the card automatically starts reading from bottom to top for the next repeat.

Turn on the inspection light and insert the card so that the last (top) row of the design is aligned with the top of the card reader slot. At this point it doesn't matter which of the arrows on the pattern panel is lit because the markings on the card have control of the card. Turn off the inspection light so that the card drops down. The buzzer will indicate that the next row will be the last and after it has been knitted, the card will make a fast return to the first (bottom) row of the design. The last, marked row of the card has been knitted. Now you can take control of the card movement.

Turn on the inspection light and roll the card down so that the second to last row of the design (second from the top) is aligned with the top of the card reader slot. There are no directional markings in this row so when you light the "UP" arrow on the pattern panel it will assume control of the card movement. Turn off the inspection light and finish knitting the design. The buzzer will sound when you read the bottom (first) row of the design. Knit one more row after the buzzer and then stop knitting or the design will knit again from bottom to top.

THE NOTATION COLUMNS ABCD

The four columns on the extreme right of the card (Figure 7) are outside the sprocket holes of the card and, therefore, beyond the scanners' field of vision. They are not read as part of the information for each row, do not signal any machine functions and are strictly for your convenience. You can mark them with an ordinary pencil or colored pencils to indicate carriage settings or direction for lace knitting, color changes or any other function that you need to keep track of as you knit. Because each row on the notation columns is ten rows above the corresponding row on the design portion of the card, it is still visible when the card drops down into the card reader and always refers to the next row to be knitted.



7: The notation columns, marked A,B,C,D are located outside the sprocket holes, ten rows above the corresponding row of the design.

DESIGNING YOUR OWN MYLAR CARDS

Use the electronic pencils that came with your machine and work on a firm surface so that the pencil doesn't damage the mylar. Filling in the squares darkly enough is more important than totally filling the corners of each square. Use a Mars-Plastic Grand eraser by Staedtler for the cleanest erasures with no greasy residue; Faber Castell makes the same kind of white eraser in a convenient pencil form for erasing just a few squares. Both of these can be purchased at any office supplier. Avoid smudges by keeping a clean sheet of paper over the squares that have been filled in and erase any stray marks or smudges so they don't interfere with the way the design is read.

You can add additional markings to the preprinted cards, but there is no way to remove or cover existing marks. Do not use "White Out" or other correction fluids because they flake and chip and will clog your card reader or cause misreadings. Also, do not use sticky white labels to cover portions of the design, because the heat and slight vibrations in the card reader can cause

them to loosen and be caught inside. It is safer to simply redraw a pre-printed design as you want it.

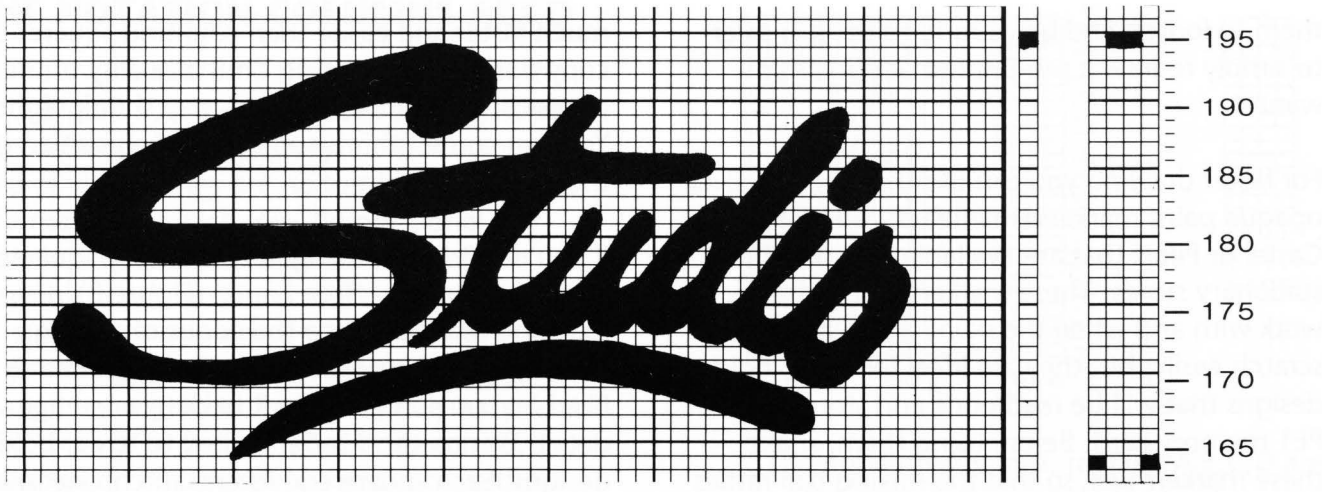
For faster drawing you can use the black or silver opaque paint markers (manufactured by Faber Castel or Pilot) that are available at most office/ stationary stores. These markers can be messy to work with and when the paint is dry, it tends to scratch easily; but they are ideal for large, bold designs that will be read once and stored on a PE1 memory card. Before using them, shake these markers well so that the mixing ball rattles around inside and mixes the paint with the oil base. As you press the tip against the mylar, it will retract and allow the paint to flow. Do not press down continuously, only as you need more paint in the tip, or it will get very messy. Dried mistakes can be corrected with a razor blade, very gently scraping away the paint. However, be careful not to damage the surface of the mylar because the machine may mis-read a pattern where the mylar is scratched. If you use these markers for design cards that you plan on using over and over, store them very carefully so they do not get scratched.

If you use these markers for small, detailed motifs, do not attempt to completely fill in each square. As the color fills the square, the oil tends to seep into adjacent squares and can cause the surface of the mylar to become reflective where it shouldn't. Instead, just touch the tip of the marker to the center of each square to make a dot, which is enough for the scanners to read.

Whatever design you draw on a EC1 mylar should knit accurately to size because the grid on these mylars is proportionally drawn (approximately 5 stitches/7 rows per inch). It is important that you design and plan knits on proportioned graph paper because square grid graph paper will produce designs that distort when they are knitted. Your Studio dealer has pads of proportioned graph paper (200 stitches/ 200 rows) or you can make your own smaller sheets by photocopying a blank mylar. When you've drawn what you want, you can simply place a clean mylar on top of the graph paper and trace the design onto the mylar. This is much faster and easier than counting squares to copy designs. Depending on the quality of the photocopy machine, the grid may shrink slightly. You can correct this by adjusting the position of the mylar as you trace.

If you don't like to filling in all the little squares, you can also draw "free hand" (Figure 8). The machine will determine the edges of a design according to the portion of each square that is filled in, but don't rely on it to determine fine detail. This method is best suited to large, bold designs. Each square equals one stitch/one row, so make sure that all lines are at least one square wide in order to be read. You'll often find that enlarging the design with the #3 and #4 buttons as you knit will make it clearer.

When designing chunky fair isle patterns, be careful not to create extra long floats between motifs. You may need to add spots of color or small motifs between larger ones to tie down the second color. Occasional floats can be secured by lifting them onto needles or wrapping with a strand of the main color—as you would the edges of a single motif. If possible, use a lighter weight yarn to wrap with.



8: Designs like the Studio logo are easy to draw free hand.

You can easily coordinate a sweater to a skirt, reproduce original artwork, magazine photos, wallpaper prints, wrapping paper motifs, etc. Make a photocopy of the design, enlarging or reducing the size of the image as necessary. Then clip a clean mylar on top of the design and photocopy the two together so that the grid is superimposed on the design and acts as a guide for you to refine the design, square off corners, etc. Place a clean mylar on top of the final, gridded design and trace the design onto the mylar with an electronic pencil.

THE INSPECTION LIGHT

The inspection light starts and stops the movement of the design cards. When the red light is lit, it stops the card from moving (just like a red traffic light) and when you turn the light off, the card drops (ten rows) down into the card reader and the scanners read the first row or whatever row was visible above the card reader slot when the inspection light was on.

When the scanners read a row of the design, that row remains in the machine's memory until the next row is read. Moving the carriage across the bed with a free pass is related to the Point Cams and the Needle 1 Cam; it has nothing to do with memorizing the design.

When you turn the inspection light off, the scanners read and memorize one row. If you immediately turn the inspection light back on, the card will be unable to advance and the carriage will repeatedly knit the one row that was memorized. Any single row of pattern that is read and held (inspection OFF/ON) will produce a vertical stripe.

In addition to stripes, you can intermittently release [Light OFF] and hold [Light ON] a card to elongate portions of a design. For example, if you hold a card after knitting nine rows, the tenth row of the pattern will already have been memorized and will repeat until you release the card again. If you wanted to, you could hold every row of a design so it knitted six times, then release the card and let the next row read and hold.

To avoid confusion when dividing patterned necklines, record the row number where the neckline divides, and the pattern row number and indicate whether the inspection light was on or off. This can make a ten row difference when you knit the second shoulder! Let's divide a hypothetical neckline with row 55 of the card even with the top of the card reader and the inspection light off (as it normally is during knitting). To start the second shoulder, with the inspection light OFF, set the card so that row 55

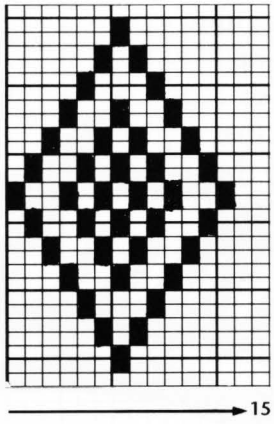
is even with the top of the card reader slot. Turn the inspection light ON so the card moves up, then immediately turn the light OFF again so that the card drops down by ten rows and the scanners can read row 45, which is actually the row being knitted when 55 is visible at the card reader slot.

THE POINT CAMS

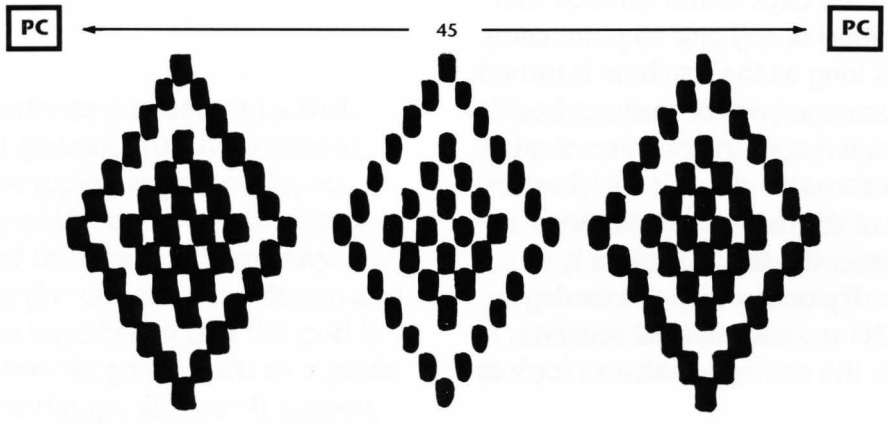
The point cams (PCs) tell the carriage where to begin and end pattern knitting and without them to issue these commands, the machine is unable to knit anything but stockinette. The first PC the carriage passes says "start the pattern" and the next one says "stop the pattern". There are two sensors on the back of the carriage that memorize the position of any and all point cams on the rack and as long as the machine is turned on, whether the carriage knits or makes a free pass, the sensors will record the position of all PCs. Always make sure that the PCs click into place on the rack of the machine; that the carriage totally passes the last PC before it changes direction. Try not to stop the carriage on or between PCs for more than 30 seconds and do not wiggle the carriage back and forth in front of the PCs.

When the PCs are positioned to coincide with the first and last working needles, the entire row will knit pattern. Isolated, single motifs are knitted by moving the PCs closer together to limit the number of needles between them (Figure 9). Any needles outside the field defined by the PCs will knit plain stockinette if the cam lever is set to tuck or slip, or will knit the background color alone if the cam lever is set to Fair Isle.

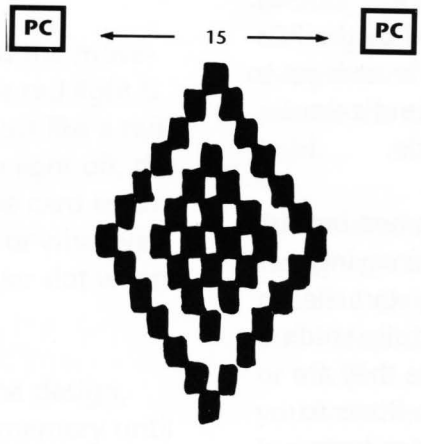
With two sets of PCs you can isolate two motifs. The carriage will read the four PCs as saying: "Start the pattern, stop the pattern, start the pattern, stop the pattern." Tuck and slip stitch are easiest to isolate like this because they are one color methods and there are no floats to worry about. Fair Isle patterns produce long floats between the two motifs but these can be avoided by using a separate pattern yarn for each motif. After you knit the first motif, stop



9: The width indicator for this diamond motif should be set at 15 to include two plain stitches after each diamond.



When the PCs are placed 45 needles apart, the diamond will knit three times.



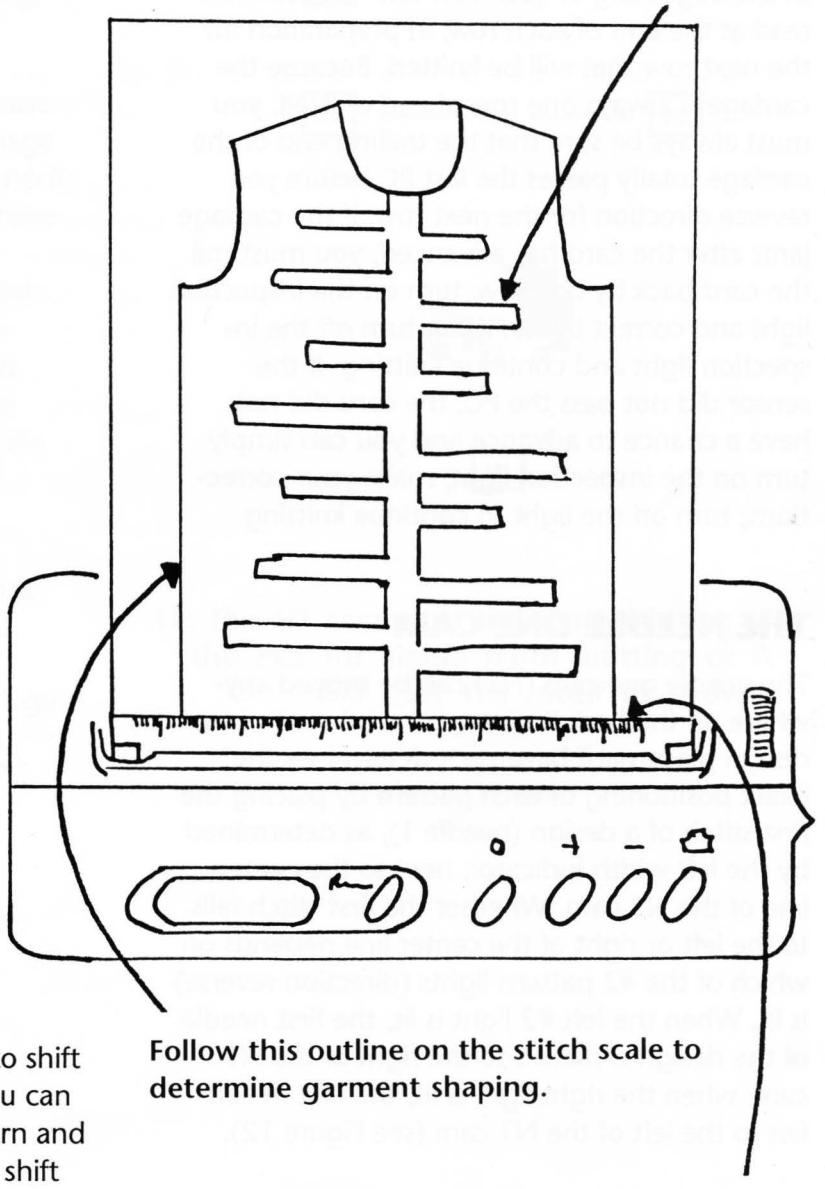
If the PCs are placed 15 needles apart, the diamond will only be able to knit once as an isolated motif.

the carriage and remove the pattern yarn from the front yarn feeder. Replace it with another pattern yarn of the same (or different) color and then finish knitting the rest of the row. The background yarn remains the same, and because the pattern yarn is carried in the front yarn feeder, it is quite simple to switch it. The edges of both motifs must be wrapped to prevent single motif separation. Also, use two Needle One Cams, one for each set of PCs. When you are done with the second set of PCs make sure you remove them from the bed to continue knitting normally with one set. Otherwise, the carriage will continue to record their position and your patterns will be scrambled.

The point cams can be moved while you are knitting to redefine the edges of the patterning area, but you can only move the PC on the side opposite the carriage. The PC on the carriage side is the one that determines the starting position for the patterning in the next row and the carriage has already memorized its position. If you move the PC on the carriage side it changes the starting point and disrupts the pattern. However, if you must move the PC on the carriage side, set the carriage for a free pass, turn on the inspection light to stop the card and pass the carriage across the bed twice to re-memorize the positioning. Typically, PCs are moved to retain plain stockinette seam stitches along the decreased edges of a tuck stitch fabric or to shift the position of a pattern on a garment. You can draw a design right on your contour pattern and rely on the stitch scale to tell you when to shift the PCs. If the design calls for moving both PCs at the same time, move one (the one opposite the carriage) every row (Figure 10).

When the carriage finishes a row and starts back across the bed, the two sliding magnets shift underneath the carriage to signify that the carriage has changed direction. This signals the machine that the next PC on the bed will be the

10: Follow the design edges on the stitch scale to determine PC placements.



start of the next row of patterning. Once the sensor on the leading edge of the carriage passes this first PC, the card reader advances the card to the next row while the carriage finishes knitting the current row. When the leading edge of the carriage passes the last PC in the row, the scanners read the row that just dropped down before them. In other words, the card advances at the beginning of each row and the scanners read at the end of each row, in preparation for the next row that will be knitted. Because the carriage is always one row ahead of itself, you must always be sure that the trailing end of the carriage totally passes the last PC before you reverse direction for the next row. If the carriage jams after the card has advanced, you must roll the card back by one row, turn on the inspection light and correct the knitting; turn off the inspection light and continue knitting. If the sensor did not pass the PC, the card did not have a chance to advance and you can simply turn on the inspection light, make your corrections; turn off the light to continue knitting.

THE NEEDLE ONE CAM

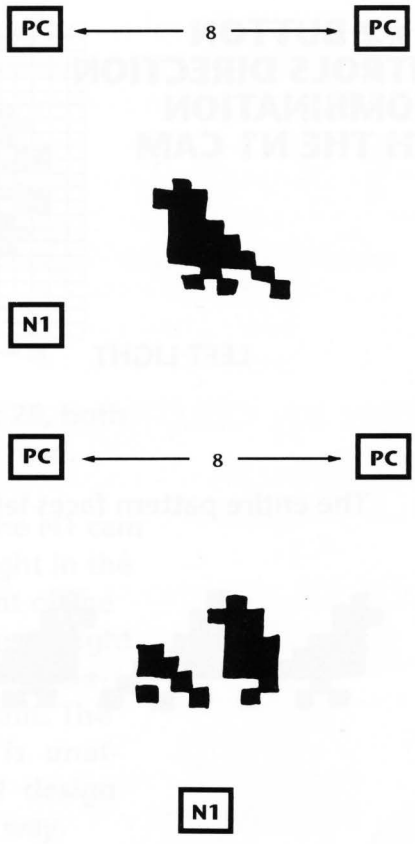
The needle one cam (N1) can be moved anywhere on the bed. It gives you total control over design placement because it determines the exact positioning of each pattern by placing the first stitch of a design (needle 1), as determined by the left width indicator, next to the center line of the N1 cam. Whether the first stitch falls to the left or right of the center line depends on which of the #2 pattern lights (direction reverse) is lit. When the left #2 light is lit, the first needle of the design is placed to the right of the N1 cam; when the right light is lit, the first needle lies to the left of the N1 cam (see Figure 12).

When using two sets of PCs, it's a good idea to use a separate N1 for each set. In fact, you can cause different sections of your design to knit by placing an N1 cam under the left PC in the first set; and the other N1 under the right PC of the second set. (Figure 13)

Generally, you can simply place the N1 cam at the center zero on the bed. For single motifs, however, it must be aligned with one of the point cams or it will split the image (Figure 11).

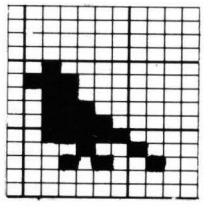
If you forget to put an N1 cam on the bed, the left PC will automatically take over the N1 function. This is fine for small repeating designs, but larger designs rely on the N1 for centering, to prevent half repeats at one edge. More importantly, when the left PC assumes N1 function, you cannot move it in as you decrease and you still have to make sure that the carriage passes it each row. This can be a pain in the neck if you started out using all 110 needles and have decreased down to the center thirty at the neckline. Using an N1 cam gives you the greatest control and flexibility. Also, when you are using an N1 cam and you move the PCs in as you decrease, make sure that the N1 remains between the PCs. Otherwise, if the N1 ends up outside the PCs, the left PC will take over N1 function.

Do not move the N1 cam once its position has been memorized by the carriage. However, if you do accidentally move it, stop the design card, replace the N1 cam and move the carriage twice across the bed without knitting. This is exactly the same procedure used when the PC on the carriage side has been moved.



11: The N1 cam must be even with one of the PCs for single motif knitting or it will split the motif as shown.

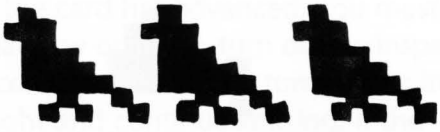
THE #2 BUTTON CONTROLS DIRECTION IN COMBINATION WITH THE N1 CAM



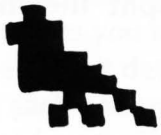
12

LEFT LIGHT

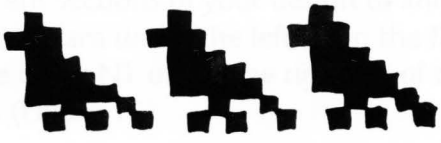
The entire pattern faces left.



The design knits exactly like it looks on the card when seen from the purl side.



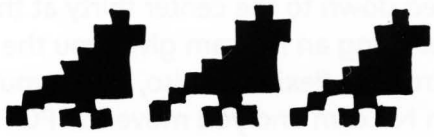
The first needle of the design is located to the right of the N1 cam when seen from purl side.



N1

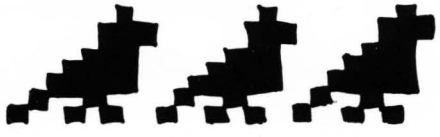
RIGHT LIGHT

The entire pattern faces right.



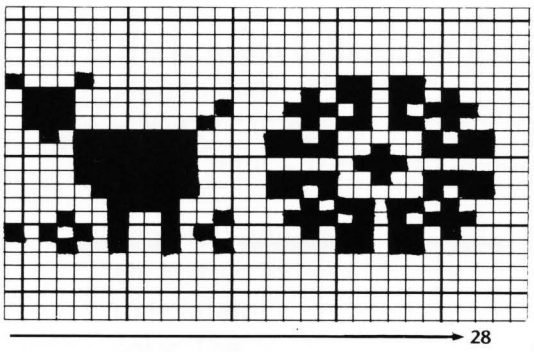
The design knits in reverse of the way it looks on the card when seen from purl side. The design will look right on the right side when knitted with the right light!
So, right is for writing!

The first needle of the design is located to the left of the N1 cam when seen from purl side.



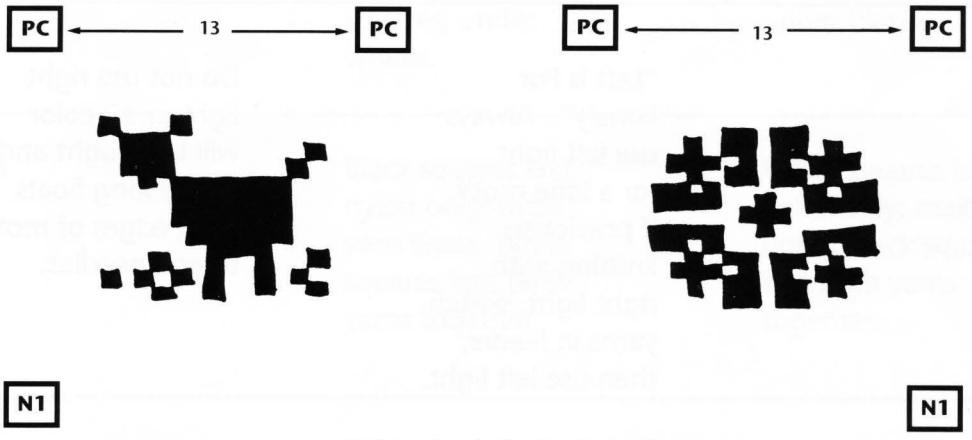
N1

TWO ISOLATED MOTIFS

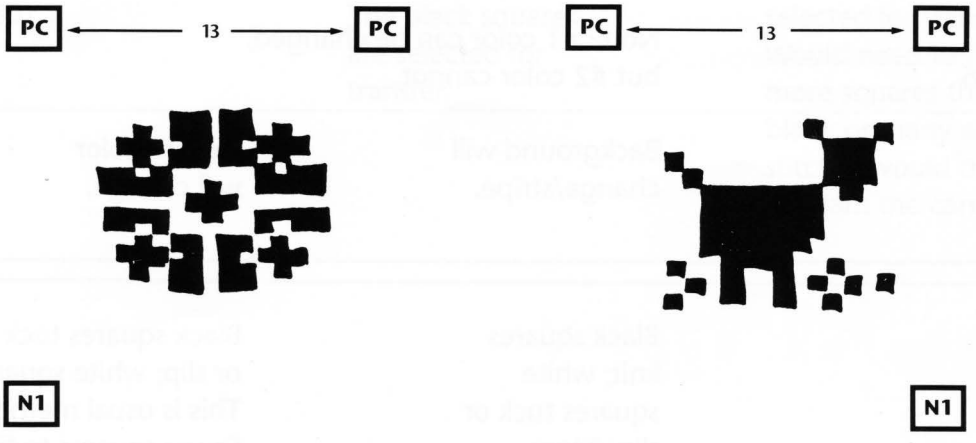


13: With the width indicator set at 28, both the cow and the snowflake are read.

Using two sets of PCs and placing the N1 cam on the left in one set and on the right in the other, the direction and placement of the motifs is ultimately controlled by the #2 light. Make sure you allow enough needles between the PCs for each motif to knit. The direction the snowflake faces is unaffected because it is a mirrored design that reads the same either way.

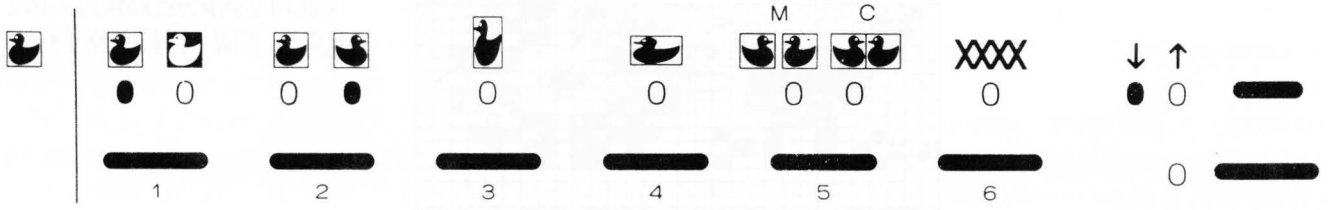


With the left #2 light lit.



With the right #2 light lit.

THE PATTERN PANEL



BUTTON #1: COLOR/SELECTION REVERSER

Either the black or the white squares on the design card are read, depending on whether the left or right #1 light is lit. This light cannot be turned off.

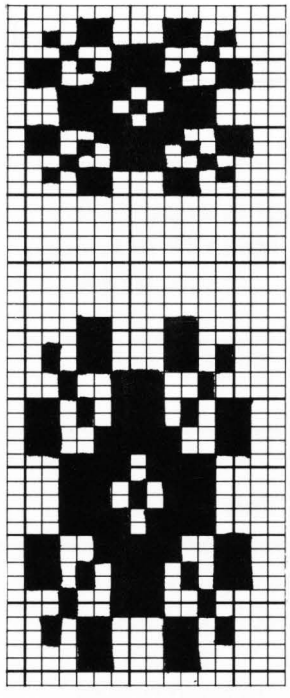
CAM LEVER	LEFT LIGHT	RIGHT LIGHT
Fair Isle	Black squares (pattern) knit in #2 color; White squares (background) knit in #1 color	Black squares (pattern) knit in #1 color; White squares (background) knit in #2 color
Isolated Fair Isle Motif	"Left is For Lonely". Always use left light for a lone motif. If previously knitting with right light, switch yarns in feeder, then use left light.	Do not use right light or #2 color will be caught and create long floats from edges of motif to end needles.
Fair Isle with YC6	Note: #1 color can be changed, but #2 color cannot.	
	Background will change/stripe.	Pattern color will change.
Tuck or Slip	Black squares knit; white squares tuck or slip. More squares to fill in.	Black squares tuck or slip; white squares knit. This is usual method. Fewer squares to fill in. (Abbreviation for right is RT. Think R for right/T for tuck).

Jacquard	The jacquard button is the last one on the right of the pattern panel. The right way to knit jacquard is to start with the carriage on the right and the #1 right light lit. Think "right". The left and right lights will alternate as you knit.	
	The black squares are knitted in the pattern color. The white squares are slipped.	The white squares are knitted in the background color. The black squares are slipped.
Weaving	Whenever the weaving yarn crosses from under to over (or over to under) a needle, it is bound to the surface of the fabric. Wherever a white square is next to a black square, the weaving yarn will be caught. When there are many adjacent black (or white) squares, the weaving yarn will form a float.	
	Weaving yarn crosses over black squares; under whites.	Weaving yarn crosses over white squares; under blacks.
Punch Lace	Black squares knit nylon only; main yarn floats. White squares knit both yarns together.	White squares knit nylon only; main yarn floats. Black squares knit both yarns together.
Lace (LC580)	"Left is for Lace" The black squares are selected for transfer.	White squares are selected for transfer. Would need to fill in more squares than left blank or many adjacent stitches would try to transfer and jam the carriage.

BUTTON #2: DIRECTION REVERSER

The #2 light cannot be turned off. It works in combination with the N1 cam to determine where a design begins and which direction it faces. See Figure 12, page 18 for relationship of N1 cam to #2.

14



BUTTON #3: VERTICAL EXPANSION

This button allows the machine to read each row of the design card twice before it advances, causing designs to knit twice as high as they are drawn. The machine will knit two identical rows from the right (i.e. the card advances as the carriage moves from left to right) if you turn off the inspection light and begin knitting on the right. However, if you begin on the left instead, the card will advance as the carriage knits from right to left.

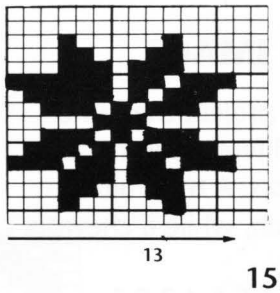
Beginning on the left will also enable you to combine double length with the jacquard function. When the vertical expansion light is lit, the buzzer indicates that there are two more rows to be knitted; if the jacquard light is lit as well, then there are four more rows to complete the pattern repeat.

Two color (mosaic) slip and tuck patterns are based on knitting tow identical rows of pattern in the same color. Many designs are suitable for mosaic patterns when vertically expanded; change colors every two rows.

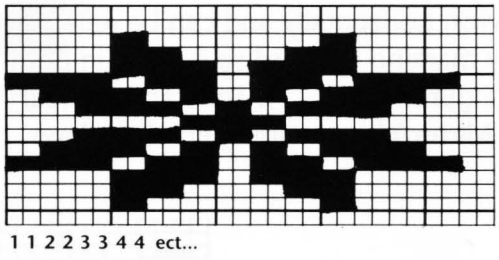
BUTTON #4: HORIZONTAL EXPANSION

Normally, the machine reads each square on a design card as one stitch, but when this light is lit, each square is read as two stitches. Used by itself, designs will usually look rather short and wide, but combined with button #3 you can double both the width and the height to proportionately double designs. This is especially useful with free-hand designs. Do not double the number on the width indicator or you will instruct the machine to read blank squares to the right of the design, but do make sure that you allow twice as many needles between the PCs for isolated motifs.

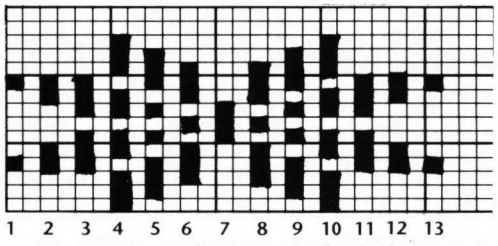
The #4 button gives you incredible design freedom by allowing you to knit heavier yarns on every other needle, using the same design cards you use for knitting on every needle. When you knit on every other needle with the #4 light lit, the machine still wants to knit every stitch twice. However, because every other needle is in non-working position, it can only knit each stitch once. For double bed work this means that you can knit jacquard on 1x1 rib fabrics by using the #4 button in combination with the #6 (jacquard) button. This is a good way to use heavier yarns for jacquard or to knit patterned ribs for cuffs.



15: Set width indicator to 13.



With the #4 light lit, this is what the carriage is instructed to knit.



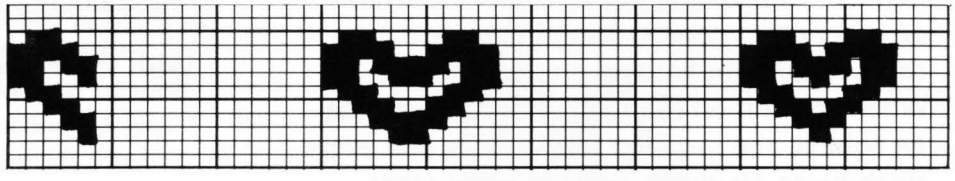
However, if you are knitting on every other needle, only every other stitch will actually knit.

BUTTON #5: MIRROR/CHEVRON IMAGE

Mirror and chevron images project the same way on the machine. The difference lies at the point where the design pivots. A true mirror image repeats the pivot stitch, while a chevron does not.

Mirror Image: 1 2 3 4 5 5 4 3 2 1
Chevron: 1 2 3 4 5 4 3 2 1

Depending on your design, either one can be used to design quarter patterns that mirror/chevron horizontally and can be reflected vertically by marking the card so it reads in both directions (Figures 4 and 17). This can be a real time saver. Mirror/chevron imaging also allows you to knit designs up to 120 stitches wide (60 stitches mirrored). A 50-stitch design mirrored with the #4 button (horizontal expansion) will produce a 200-stitch pattern.

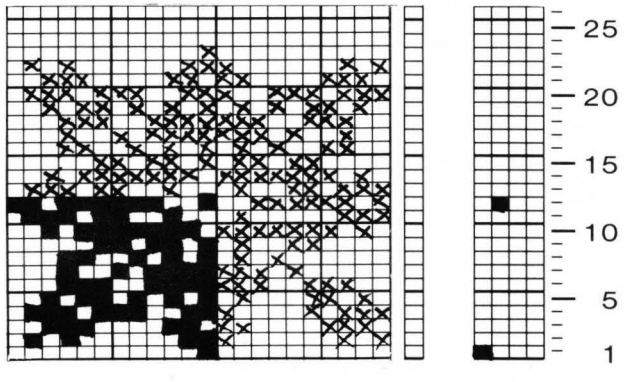


Basic Design **Mirror Image** **Chevron**

16: While the mirror image repeats the fifth stitch, the chevron does not.

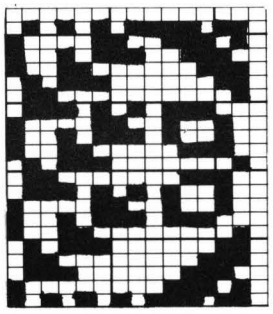
Where a design mirrors on the fabric is controlled by the N1 cam and the #2 light. As you will recall, the #2 light cannot be turned off; either the left or the right light is always lit. Regardless of which light is lit, the overall design will look the same because both edges of the design will mirror. However, the placement and centering of the design will change.

Understanding how a pattern knits with the #2 light alone is important for understanding how the machine mirrors. Regardless of whether the left or right #2 light is lit, the first pattern repeat that knits to the right of the N1 cam becomes the reference pattern that is mirrored at N1 (Figure 18).

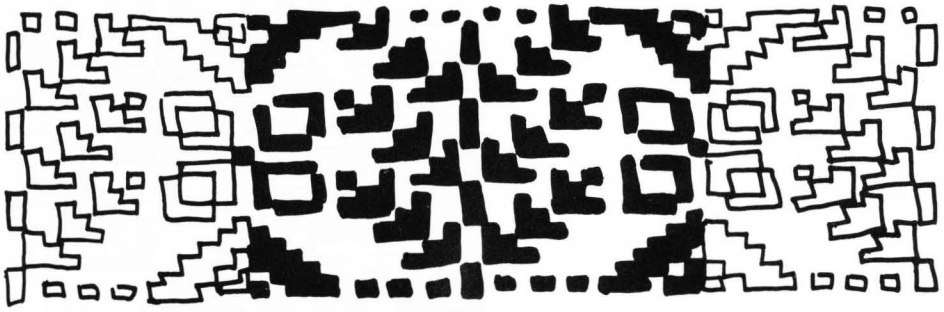


17: You only need to draw one quarter of this snowflake design because the machine can reproduce it in both directions.

MIRROR IMAGE AND BUTTON #2

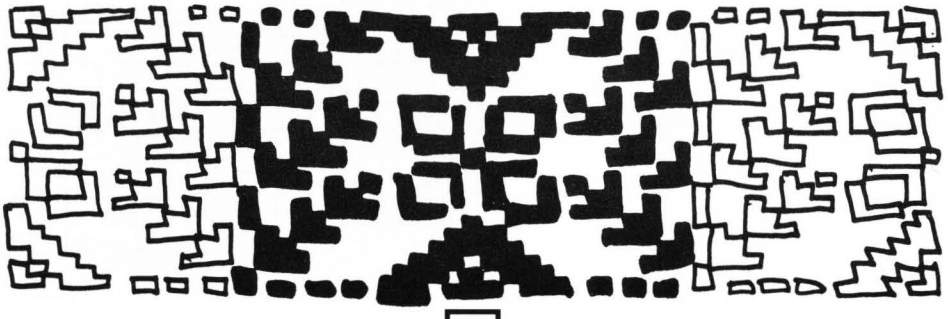


18: Basic design



N1

When the left #2 light is lit, the left edge of the design on the card will mirror at N1.

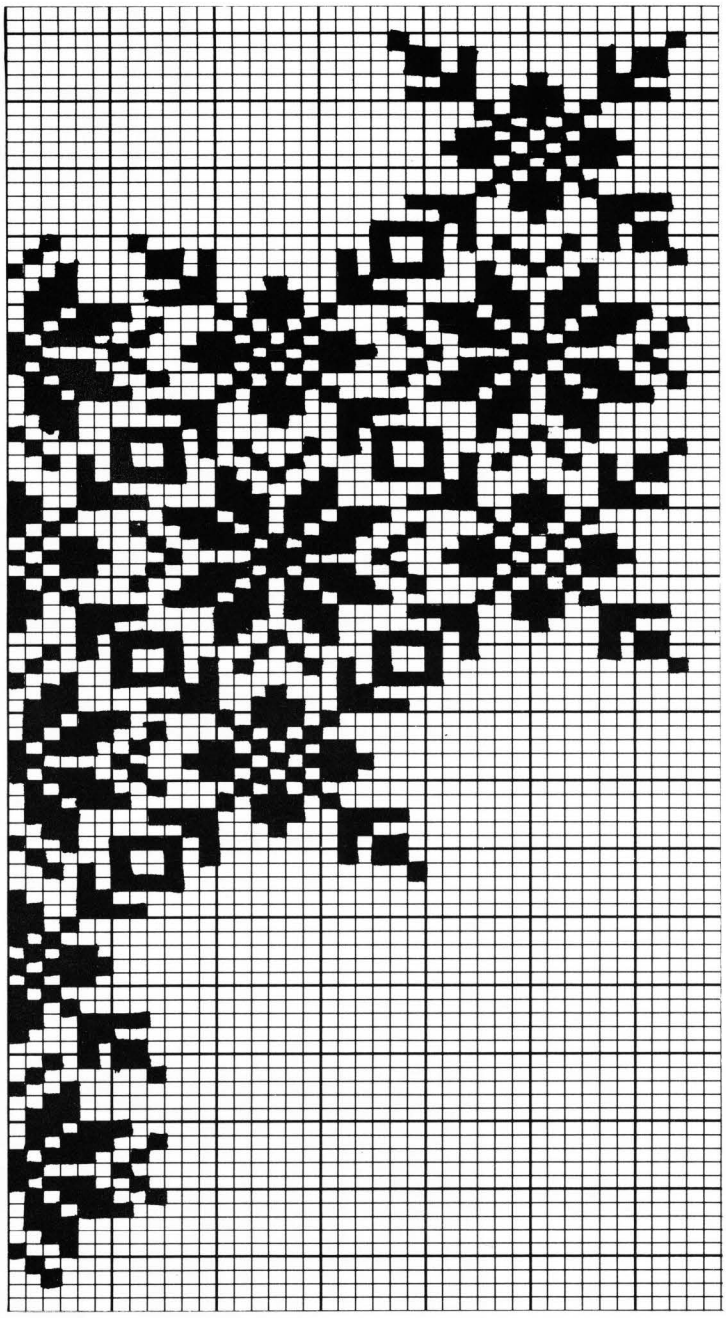


N1

When the right #2 light is lit, the right edge of the design on the card will mirror at N1.

This pattern should be knitted as a chevron (#5). The long floats across the center portion can be wrapped or lifted to bind them down. Or, you can use a separate strand of the contrast yarn for each side, stopping the carriage mid bed to exchange yarns. This will totally eliminate all the floats. All the edges of the design should be wrapped as for an isolated motif.

19



BUTTON #6: DOUBLE JACQUARD

When the #6 button is lit, it takes control of the #1 button, causing it to alternately light left and right. As the light switches, so does the related needle selection. Each row of the card is read twice, but because of the alternating #1 button, it is read first for background and then for pattern. It takes two passes of the carriage to knit one complete row of double jacquard.

Carriage moves	Row	#1 Light	Color
right to left	1	right	background
left to right	1	left	pattern
right to left	2	left	P
left to right	2	right	Bk
right to left	3	right	Bk
left to right	3	left	P

The black squares on the card are slipped while the background yarn knits the white squares. When the #1 light switches, it allows the pattern color to knit the black squares and slip the white ones. From row to row, the knitters slip and the slippers knit so that, after two passes of the carriage, each needle has knitted either a background stitch or a pattern stitch, but never both. This also applies to 1x1 rib jacquard knitted with the #4 button. Similarly, tuck jacquard can be knitted by setting the cam lever to Tuck instead of Slip/Jacquard so that each needle tucks or knits with the first pass of the carriage. With the second pass, the tuckers knit and the knitters tuck. After two passes of the carriage, each needle has knitted once and tucked once. Tuck jacquard produces a softer, stretchier fabric and can accommodate somewhat heavier yarns than regular slip jacquard.

The #6 button is designed to alternate two colors for double jacquard and has no application for 3 or 4 color jacquards. They are simply knitted as 3 or 4 color double bed slip patterns, with each color in every row having its own row on the design card. This kind of multi-color designing is a specialty of the PE1 Designer Extra.

Incidentally, if you like to experiment, try using button #6 to knit single bed Fair Isle. The pattern nearly disappears, but you'll get some interesting colorations.

QUICK REFERENCE CHART FOR PE1

1. To read a pattern on design card. Ex. 50 rows/38 sts.	2. To knit using PE1 or to confirm a pattern.	3. To format a Memory Card or to erase all patterns.	4. To store a pattern into a Memory Card.	5. To recall a pattern from a Memory Card. Ex. To recall 8th pattern.	6. To see how many patterns are in Memory Card.
READ 5 0 F4 3 8 = (Inspection Switch ON) (Set design card) (Inspection Switch OFF) = * Always set the pattern width indicator to 60 when using PE1.	KNIT = = * You can change between the pattern and the row number by pressing = key.	SAVE F1 = ※ = Set Memory Card = ※ To abandon the erase, press C key here.	SAVE = Set Memory Card = * Display shows the reference number of the stored pattern. =	LOAD 8 = Set Memory Card = * Display shows the numbers of rows and stitches of the recalled pattern. =	LOAD F1 = Set Memory Card = * Display shows the number of stored patterns. =

*Use C key if...

1. You make a mistake. (You can delete the last entry, one character at a time.)
2. You want to stop PE1 from reading a pattern.
3. PE1 doesn't work whatever key you press.
4. Display doesn't show OK sign when you want to READ, KNIT, SAVE or LOAD.

*The pattern read into PE1 is not erased by pressing C key.

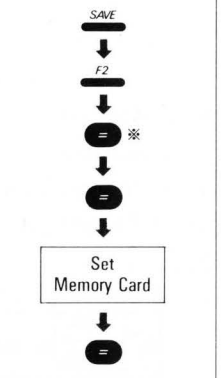
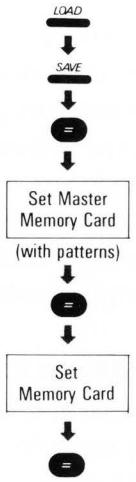
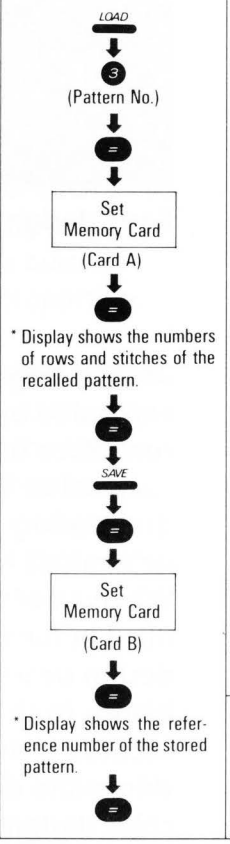
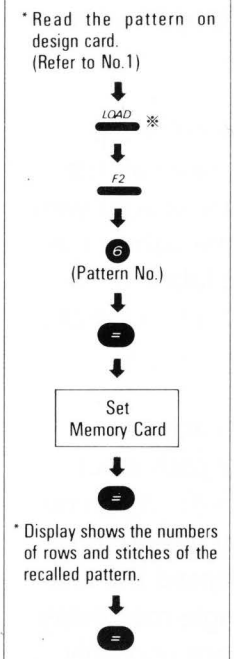
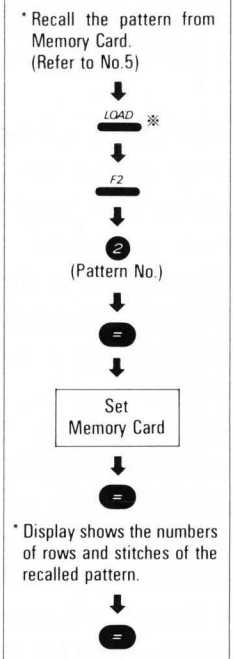
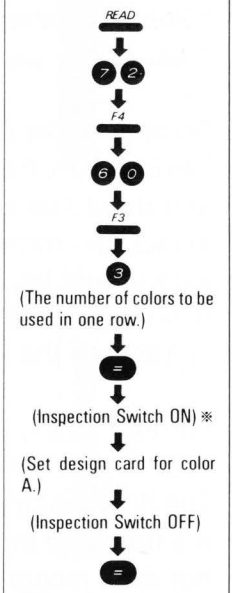
THE PE1

Unplug the PE1 unit when it is not in use because it prevents normal card reader activity. As long as the PE1 is plugged into the machine, the card reader can only read patterns that are programmed through the "Read" key.

The right width indicator must always be set at "60", whether you are reading a design or knitting it. This means that you cannot rely on the width indicator to alter the width of a design repeat. Changing the width indicator will, in fact, have no effect at all on the pattern as it knits. In order to increase or decrease the width of a design, you must re-insert the design card and instruct the PE1 to read a fewer or greater number of stitches.

Don't save your PE1 just for designs larger than 60 stitches. It can be a great timer saver for knitting small, repeating patterns as well. Because of the way the PE1 continuously scrolls patterns, there is no need to pause for the card to quick return to the first row. Designs you use often are more easily and safely stored on a memory card than on a mylar sheet.

You can copy a single pattern from one card to another without any problems. However, be aware that whenever you copy all the patterns from one card (A) to another (B), you erase any patterns that were already stored on the second (B) card. If there are already patterns on card (B), copy the patterns from card (A) one at a time.

7. To erase the last pattern stored in Memory Card.	8. To copy all patterns from Memory Card to another Memory Card.	9. To copy one pattern from Memory Card to another Memory Card. Card A → Card B	10. To combine patterns from design card and Memory Card.	11. To combine patterns from Memory Card.	12. To read for Multi-Colored Jacquard. Ex. 72 rows/60 sts. 3 colored Jacquard.
 ※ To abandon the erase, press C key here.					
			* When combining more than three patterns, repeat from ※ * Make sure that the patterns to be combined always must be the same width.		* When working Multi-Colored Jacquard, always set Cam Lever to Slip and put the left light ON of Pattern Switch No.1.

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You can either erase all the patterns on a card or, progressively working backwards, erase the last pattern stored on the card; but you cannot selectively erase. However, the last pattern that the PE1 reads remains in its memory for up to a week and you can use this feature to help you erase patterns more selectively. For example, let's assume that you want to erase patterns 10, 9, 8, 6 and keep all of the others. Recall pattern #7 from the memory card as if to knit it. Now, erase patterns 10, 9, 8, 7, 6. Even though you have erased pattern #7 from the card, it is currently active in the PE1 and you can simply re-save it on the card, where it becomes the new pattern #6. For selectively erasing more patterns than you are keeping, it is easiest to copy the "keepers" to a second memory card and simply erase the entire first card. The procedure used to format new memory cards is the same one that erases all the patterns on a card, so be careful not to format a card that has been in use. Also, removing the battery will erase everything on a card unless the card remains in the PE1 unit.

One of the PE1 specialties is knitting several colors per row. Although the front of the fabric looks like Fair Isle, it is not. Fair Isle knitting uses only two colors per row, with the carriage carrying both of them together. Multi-color knitting is done with the cam lever set to Slip and the carriage carrying one color at a time. Even when knitted double bed to produce multi-colored jacquards, cam lever is still set to Slip. Do not use the Double Jacquard button because it is only designed to alternate two colors and has no application at all for multi-color jacquards.

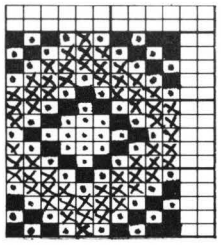
Each color in a row requires a separate pass of the carriage. So, when there are three colors per row, it requires three passes of the carriage to complete one row of the fabric. And, because each needle can only knit one of the three colors, the other two colors are slipped and form floats on the purl side of the fabric.

Because of the extra floats, a three color slip fabric is 50% heavier than a two color Fair Isle and should be knitted with a lighter weight yarn. In fact, the more colors you use, the lighter the yarn should be. The weight of the fabric is the main reason that five colors per row is generally considered the absolute maximum.

Without a PE1, you need to draw each row of your design three times—once for each color. The final design that you feed into the machine is a fractured image of the original design, often not even recognizable. If you collapsed the first three rows of the design into a single row, every square would be accounted for once and only once (Figure 20).

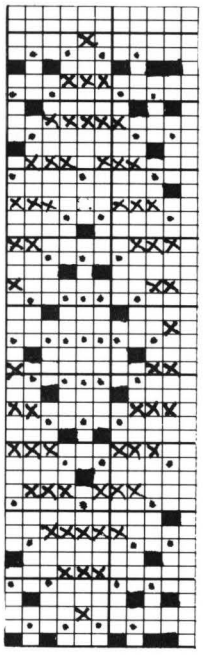
However, when working with a PE1, you simply prepare three separate mylars that the machine reads and shuffles to produce the same kind of fractured image. It is faster, easier and much more accurate (Figure 21)! The basic design shows each color designated by a filled in square, a dot or a blank square. The first pattern mylar accounts for all of the filled in squares and the second mylar represents all of the dotted squares. The third mylar is totally blank because whatever wasn't identified as color 1 or color 2, must be color 3. Even though this is a blank mylar, it must be fed through the machine. When designs are more than sixty stitches wide, you must work from left to right, completing each portion of the design. That is, read the first mylar for color A, the first for color B and then the first for color C. Next, read the second mylar for each color, then the third for each color, until the entire design has been read. If you read all the mylars for color A and then all the mylars for colors B and C, the design will be incorrect. You must work from left to right, completing all the colors in each section as you go.

THREE COLOR DESIGNING WITHOUT PE1

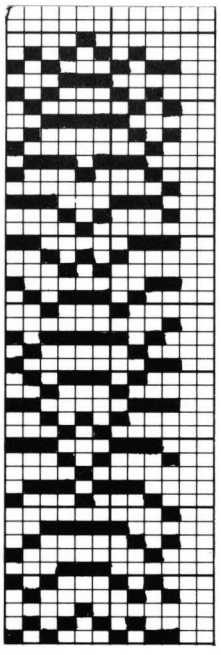


Basic design

20: The original design is expanded by drawing each row three times; once for each color. This is easiest to do by using colored pencils or symbols for each color. When all of the squares are filled in for the mylar, the design bears little resemblance to the original. This method is used for both single and double bed multicolor designs. For a four color design, you would have to draw each row four times.



Expanded design



Final mylar design

Notice that each of the designs is marked in the direction columns to identify which color it represents. When the direction columns are used with multi-color work, they indicate the color number and do not control card movement.

You can knit one row of each color if you have an odd number of colors. You will always find the yarn right where you need it, but with an even number you'll have to keep cutting and restarting. You can also knit 2 rows of each color, using the #3 button. You will probably want to use the #4 button to knit each stitch twice as well in order to keep the design in proportion.

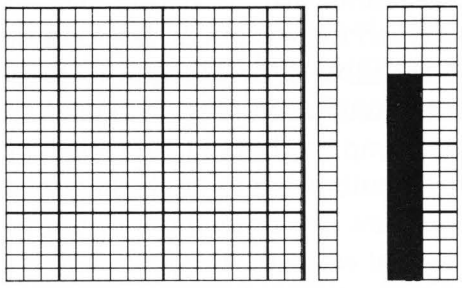
Multi-colored slip stitch is knitted with the LEFT #1 light lit, although this is contrary to the way Slip is usually knitted. This is so that the background stitches of colors 1 & 2 (for example) are slipped while color #3 knits. The slipped background stitches are not the pattern effect in this case—as they would be in one color slip knitting.

The sample design is a 15 row pattern in three colors. When the PE1 reads and shuffles the three mylars, the pattern will actually require 45 passes of the carriage to produce 15 rows of knitted fabric. If you are knitting with the #3 button, it will take 90 carriage rows to produce 30 rows of fabric. Be aware that the PE1 will still indicate 45 rows, rather than 90 because it counts each row once, regardless of the #3 button, so you should keep an eye on the machine's row counter.

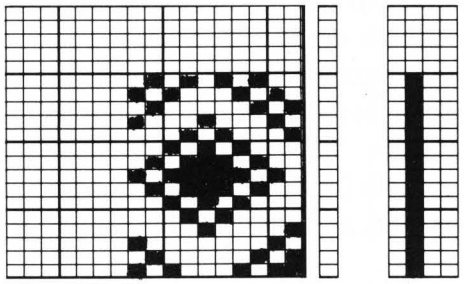
The shuffled multi-color design is useless to knit from, so press the equal button on the PE1 so the display shows the row number on the right and the color number on the left.

Multi-color slip is not difficult to knit if you keep the following points in mind. First of all, knit more slowly and use at least one full stitch size larger than you would for the same yarn in stockinette. Move your edge weights up the fabric regularly and every time color #1 (for example) knits, bring the edge needles out to D position (Russel levers on II) to be sure they knit. If the needles slide forward in their slots after

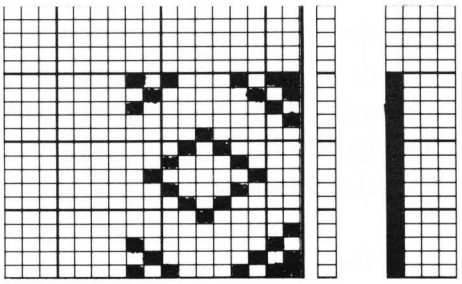
THREE COLOR DESIGNING WITH PE1



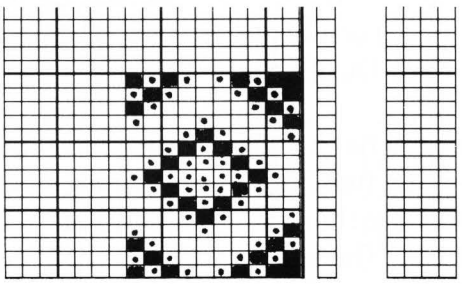
Color #3



Color #2



Color #1



Basic design

21: Each of the colors in the original design is isolated on a separate mylar. The third mylar is always blank because it accounts for any squares that were not filled in for the first two colors.

each row is knitted, you might need to weight the entire fabric. Also, needles tend to float forward when there is not an adjacent needle knitting the same color. Nudge the floating butts back to B position so they don't knock the carriage, dump stitches or cause a jam up. If all the needle butts seem to be floating forward after every row, try loosening the auto-tension. When several adjacent needles knit the same color, they are less likely to float at all, so keep an eye on single stitches of any color.

Multi-color slip stitch enables you to use all kinds of needlework designs that would not be suitable for two-color Fair Isle knitting. The Dover Needlework Series of books is an excellent design source. The example was taken from "Charted Folk Designs" and is just one of many, many borders and small motifs shown in three colors.

NORDIC SKI HAT

Size: Adult (21"-22" head size)
Materials: 1 oz each black and white (any two contrast colors) Heirloom "Century", 2/8 100% wool or equivalent yarn to give gauge.
St Size: Fair Isle, SS8. Knit inside of hem with SS6.
Gauge: Fair Isle 7 STS/12R=1"
Width Indicator: 27 Stitches
Pattern Buttons: #1 Left, #2 Left
Needle 1 Cam: Leave at [0] throughout
Point Cams: Begin with PCs at NDL 82 on each end of bed. Each of the sections is knitted with the PCs at NDL 28L and NDL 1R.

This Fair Isle hat is knitted in six sections. After hanging the hem, the work is scrapped off and each of the sections is knitted and shaped individually. The buzzer column is marked to indicate hanging the hem, scrapping off, decreases for shaping and removing second color from yarn feeder. The shaping eliminates the need to gather the top of the crown and provides a more fitted hat. Because of the Fair Isle patterning, you could not shape this hat with garter bar decreasing.

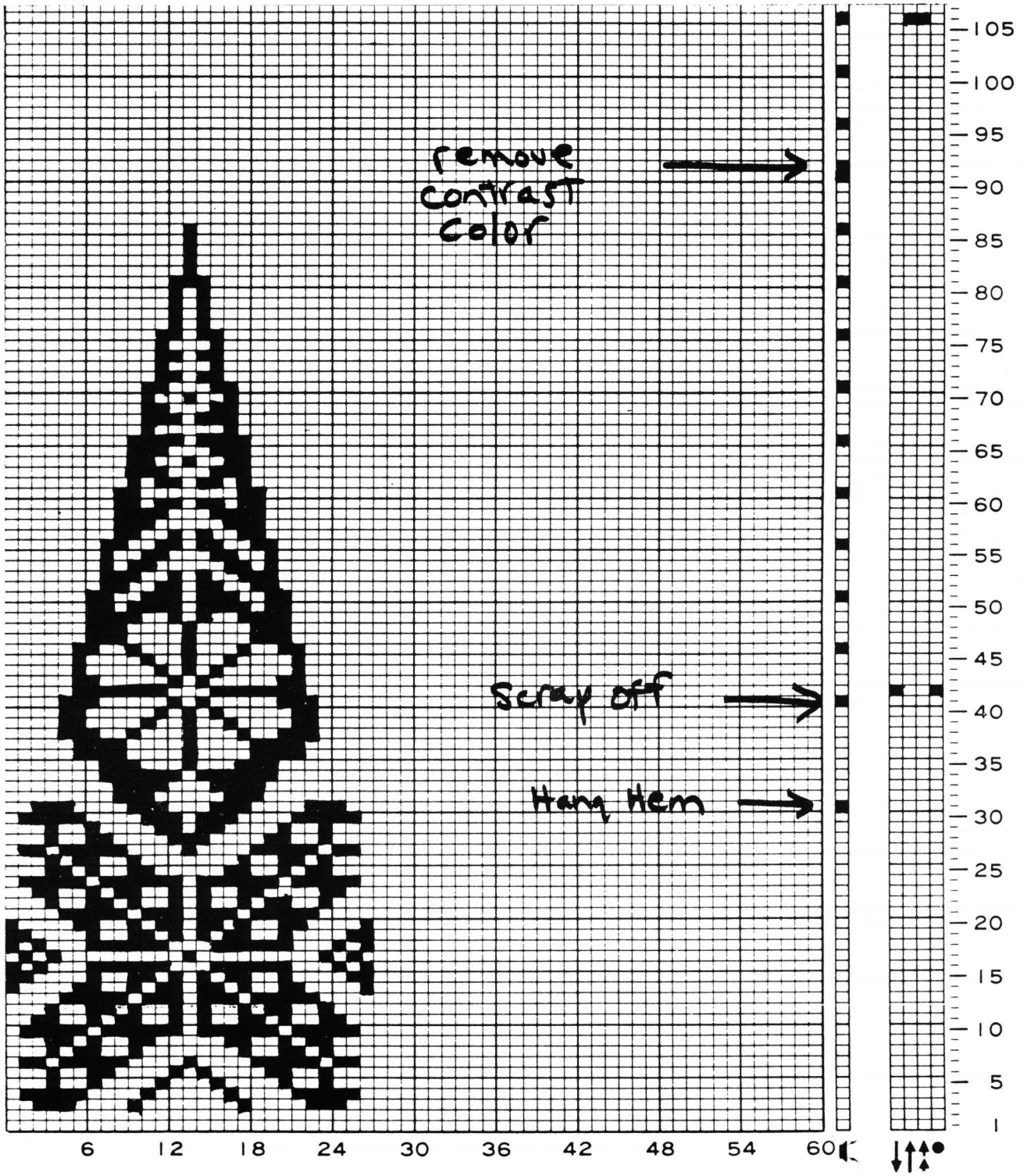
With scrap yarn, C/O 164 STS. This will allow enough stitches for all six pattern repeats, plus 2 extra STS for seams (one each for the first and last end sections of the hat). Knit 10 rows with scrap and then thread carriage with main yarn to knit inside of hem. With SS6 and the work well weighted, knit 34R. Change to SS10 and knit 1R. Turn on machine and memorize N1/PCs. Reset RC000. Thread carriage with second color and change to SS8, Cam lever set for Fair Isle. Knit 31R for border, hanging hem after buzzer sounds (Do not bring NDLS to D position to knit back as it will interrupt the pattern) and knit next row with SS10 to close the hem. Continue with SS8. After the buzzer sounds for R41, turn on the inspection light to hold the design card on R42. Knit 10 rows of waste yarn to scrap off the entire border. Leave the N1 Cam at [0], but move the PCs to 28 Left and 1 Right where they will remain for the rest of the knitting. Release the carriage and move across the bed to memorize the new PC positions. Return to A position all NDLS except the 29 NDLS between the two PCs.

With the wrong side facing you, rehang the first 28STS on the right edge of the fabric on NDLS 27L to 1R. Add a seam ST to NDL 28L by picking up the purl bar from the adjacent ST. Turn off the inspection button to release the card and continue knitting in Fair Isle, wrapping the outside edges of the design. The card will buzz every five Rs to tell you to make a full fashioned decrease at each edge. Use the 3 pronged transfer tool. At R92 there will be an extra buzz to tell you to remove the contrast color from the carriage and continue with the main color alone. At the final buzz, the card will return to R42 to begin the next section. Turn on the inspection light to hold it in this position until you are ready to knit the second section. There will b five STS remaining on the NDLS. Transfer the all to the one NDL in the center and B/O as on stitch

The remaining five sections are knitted the sam way with a minor exception at the edges. Fo sections 2-5, rehang only 27 STS, making a extra seam ST on the first and last NDLS (28L /1R) by picking up the purl loop from the adja-

cent stitch. For the sixth section, hang the remaining 28 STS, making a seam ST only on NDL 1R. The first and last groups were C/O right from the start to include a seam ST on the edge. These two groups each have 28 STS; groups 2-5 each have 27 STS. With seam STS added as indicated, each section should knit with a total of 29 STS.

Finishing: Sew invisible seams to join the sections. Continue back seam to inside of hem; do not sew through both thicknesses of hem as a single seam. Work all ends into seams or edges of design. Finish top with tassel or pom pom.



3: The buzzer column is marked to indicate decreases, hanging the hem and scrapping off.