Operating Manual

Cap Attachment

Version 2.1

Published by:

ZSK Stickmaschinen GmbH
- Dokumentation -
D-47800 Krefeld-Gartenstadt
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Contents

BASIC PRINCIPLES

The cap attachment allows ready-made baseball and other caps to be embroidered on a ZSK cylinder arm embroidery machine.

Baseball caps

Embroidering caps is made difficult by the curvature of the cap, which prevents the embroidery material from being placed flat on the needle plate. Provided you abide by the **basic rules of cap embroidery**, you can overcome this problem and obtain satisfactory embroidery quality.

Stiffness of the cap material

The stiffness of the cap material, especially in the front area (the backings), is an important factor in achieving a pleasing embroidery effect. Material which is flimsy and easily creased should be reinforced before embroidering using non-woven stiffening and/or by pressing. Special presses are available for pressing caps. Existing backings made from coarse gauze should be supplemented by a layer of non-woven material. Try to include backing stitches in the design in order to enhance the stiffness of the area being embroidered (see “Notes on punching”).

Cap front

The maximum size of the design depends on the height of the front area. The area above the peak that is curved only horizontally can be embroidered; a surface that also incorporates a vertical curve cannot be clamped without creasing.

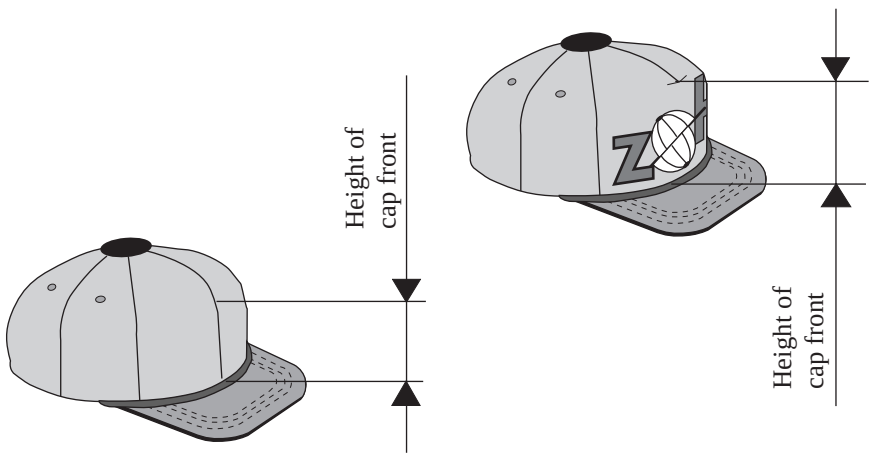


Figure 1.1:
Height of the cap front on six-panel (left) and five-panel (right) caps

Clamping

Exercise great care when clamping the caps in order to avoid creases and bulges and to prevent misalignment when embroidering. Install the cap frame window that matches the design and height of front of the cap being used (six or five-panel cap). Adapt the clearance between the hinged window and the rest to suit the cap being embroidered so that the frame closes easily.

Needle and embroidery speed

Select a suitable needle and keep to a moderate speed when embroidering. Abide by the following basic rule: **the stiffer the embroidery area, the stronger the needle and the lower the embroidering speed**.

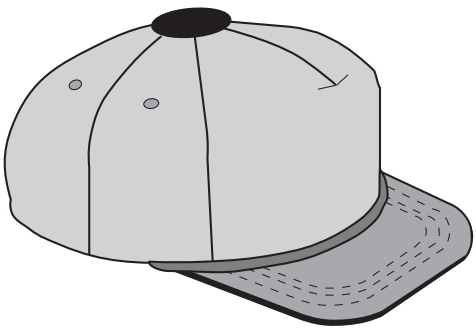
Designs

Use designs compiled specifically for caps or adapt existing designs accordingly. Follow the “Notes on punching” contained at the end of this manual.

Cap shape

Caps are available in a wide range of different shapes. The ZSK cap attachments are designed for the following two basic cap shapes:

a) The five-panel cap



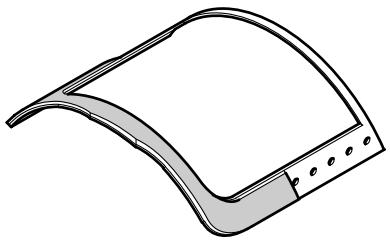


Figure 1.2 (left): Five-panel cap

Figure 1.3 (right): Six-panel window

The five-panel cap has four equal-sized sections covering the back of the head and a larger section at the front of the cap. The front section has no seam or has a half-seam that stops near the crown.

Because they have no center seam, five-panel caps are ideally suited for embroidering. The front area is tall and large and is generally reinforced with non-woven fabric, foam or gauze.

The sweatband on the inside edge can pose problems, however, if it protrudes too far into the embroidery area. Avoid positioning the design too low so that the sweatband is not stitched down when embroidering.

Five-panel caps generally have a large peak which can, in certain circumstances, impede embroidery and cause the clamped cap to become pulled. If difficulties are encountered with long peaks, reduce the embroidering speed.

The quality of embroidery obtained depends on how carefully the cap is clamped. Choose the appropriate size of hinged window (72 mm for an embroidery field depth of 55 mm, or 82 mm for an embroidery field depth of 65 mm).

b) The six-panel cap

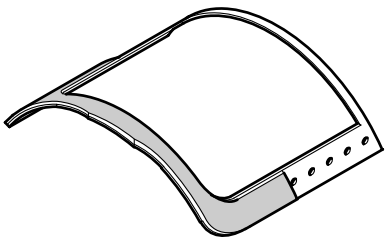


Figure 1.4 (left):
Six-panel cap

Figure 1.5 (right):
Six-panel window

The six-panel cap has six equal-sized sections. The front section has a center seam which can pose problems when embroidering, especially if it is double-stitched or very thick. The center seam demands the use of a stronger needle and must be borne in mind specifically when punching (see “Notes on punching”).

Six-panel caps generally have a short peak. The front area is smaller and rounder than on five-panel designs, which makes clamping more difficult. A special **six-panel window** was therefore developed for clamping six-panel caps. It should be used in conjunction with the most suitable size of hinged window (62 mm for an embroidery field depth of 45 mm, 72 mm for an embroidery field depth of 55 mm or 82 mm for an embroidery field depth of 65 mm).

Other caps

The most popular other cap designs generally comprise the flat cap, circular knit cap or stocking cap and are made of coarse knitted material.

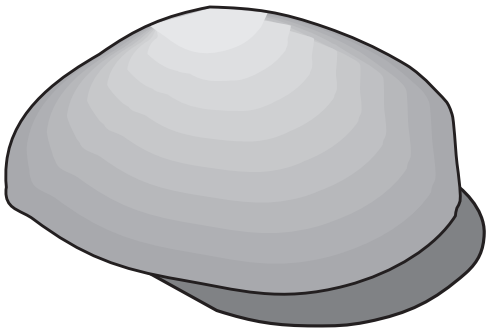


Figure 1.6:
Flat cap

Flat caps have a very small peak and are generally embroidered on the back owing to the difficulty of clamping the rather low front section in conventional frames.

Stocking caps and circular knit caps on the other hand can be embroidered all round. The embroidery is usually applied to the turned-up edge of the cap. The motif is applied upside down on the wrong side of the cap so it appears the right way round when the edge is turned up.

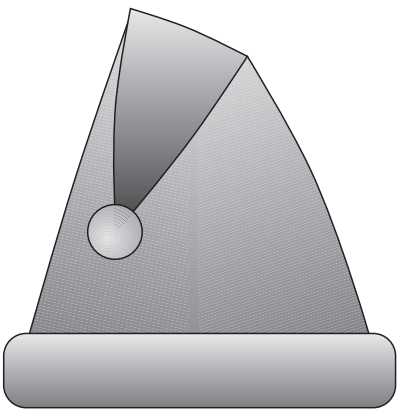


Figure 1.7 (left):
Stocking cap

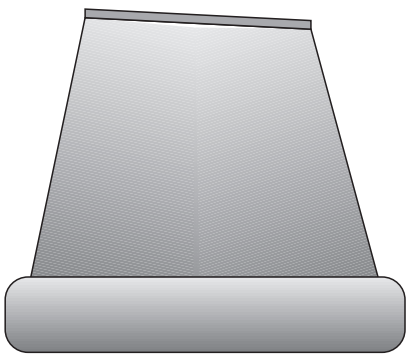


Figure 1.8 (right):
Circular knit cap

The cap material is generally soft and must be stiffened by non-woven material for embroidery purposes.

When clamping caps other than baseball caps, users can almost always choose the largest available window of the cap frame; the cap shape does not demand the use of one specific window size.

THE CAP ATTACHMENT

General overview with cap frame

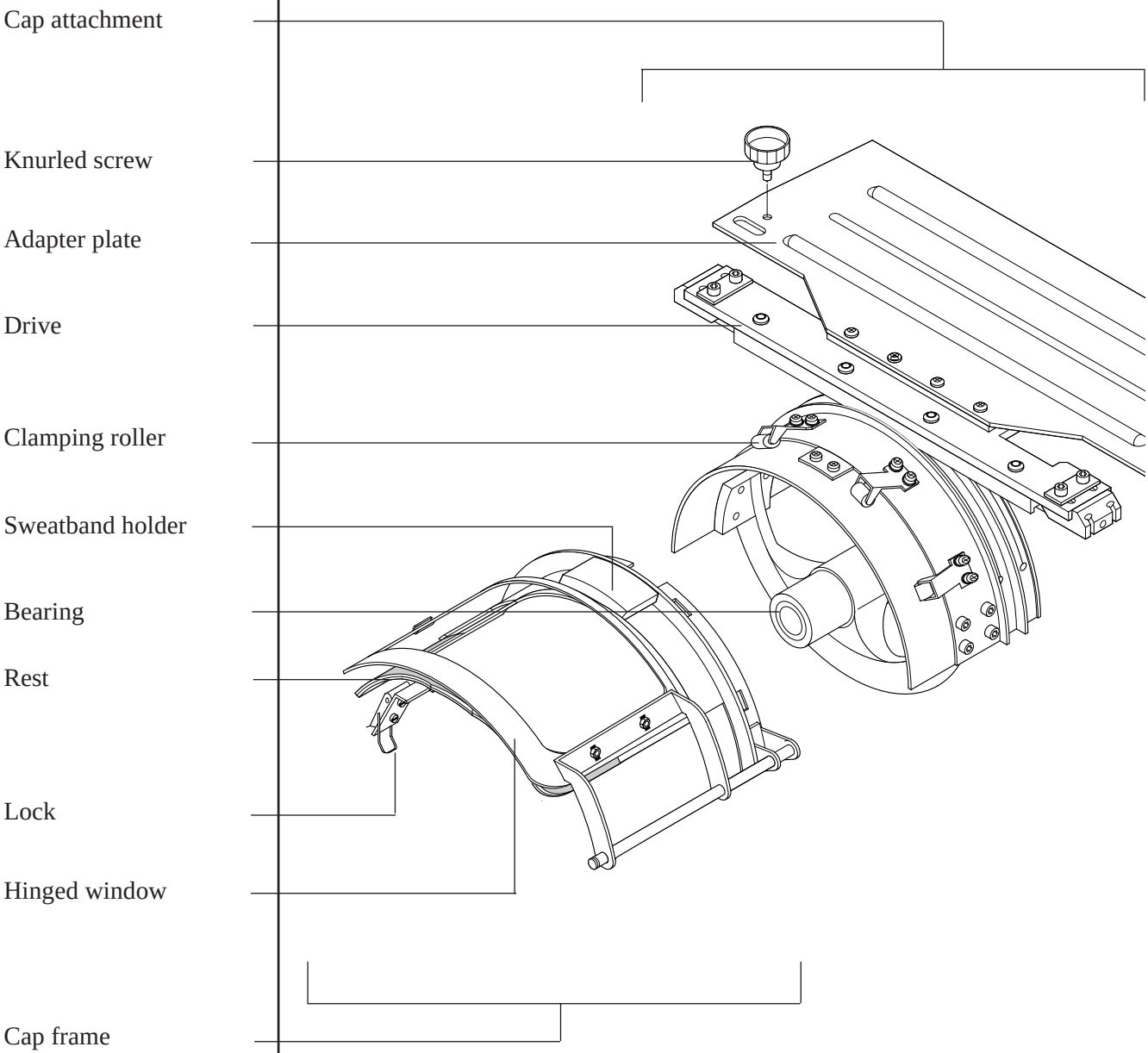
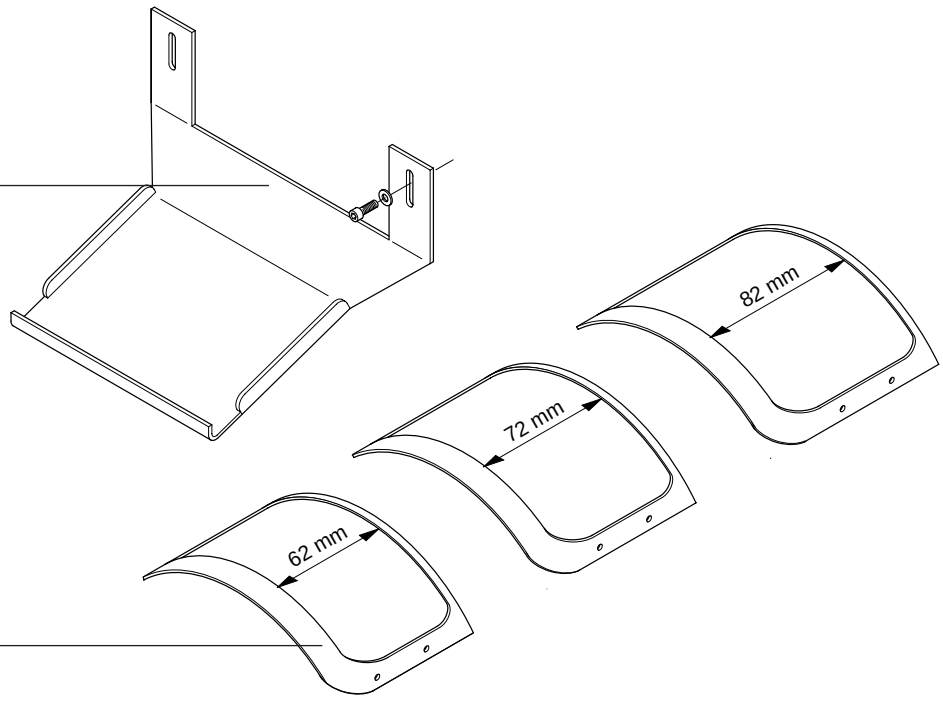


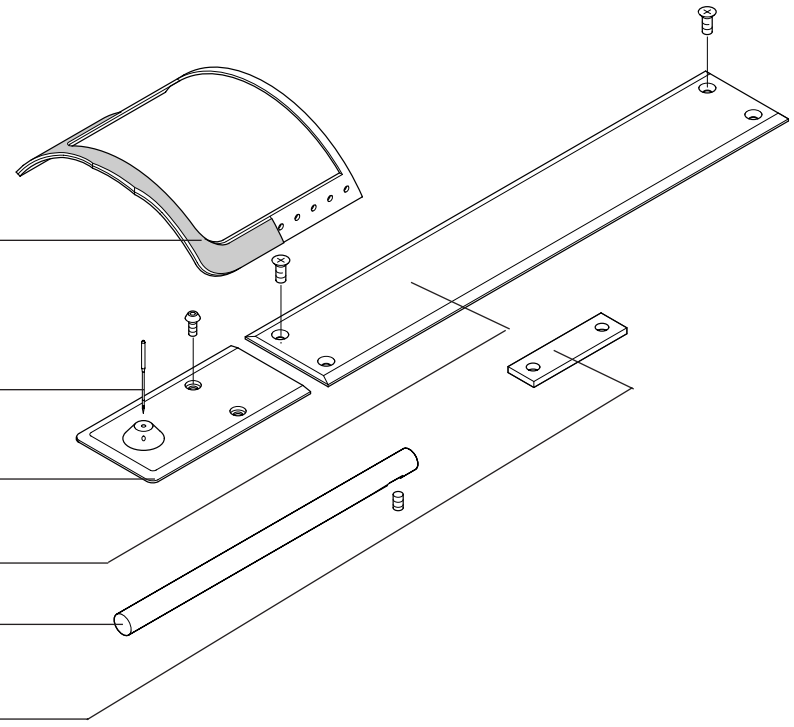
Figure 2.1:
Cap attachment and cap frame with six-panel window

Accessories



Guard

Hinged windows in various sizes



Six-panel window (rest)

Needle type 1738 KK SA (short holder) DBxK5

Needle plate with insert for cap embroidery

Center cover plate

Shaft

Spacer

Figure 2.2: Accessories for cap embroidery

Optional accessories

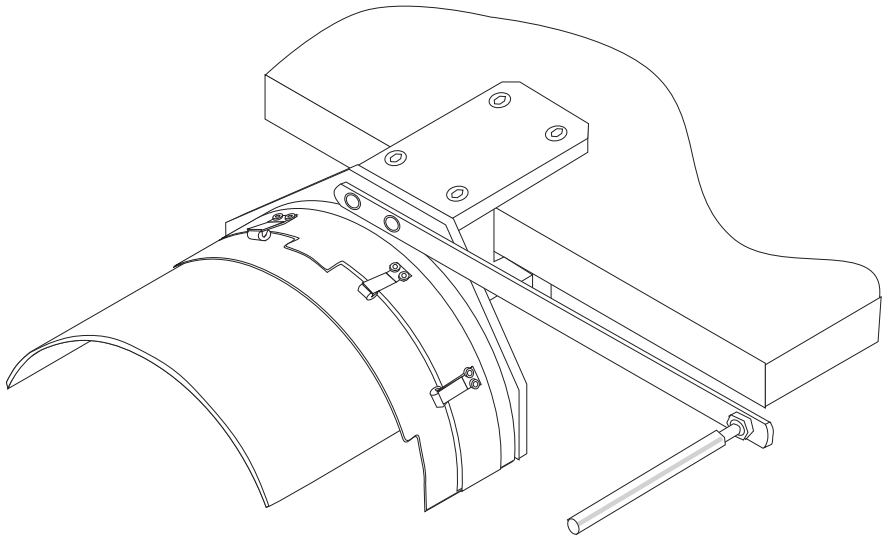


Figure 2.3:
Cap clamping aid

INSTALLING THE CAP ATTACHMENT

One-off retrofitting tasks

When the machine is being fitted with cap attachments **for the first time**, the guards and shafts required for the cap attachment must be installed. These have already been installed on machines supplied with cap attachment. They do **not** have to be dismantled for border and cylinder arm embroidery.

Installing the guards

T series machine: **J series machine:**

Machine girder

Screw

Embroidery head, drive unit

Guard

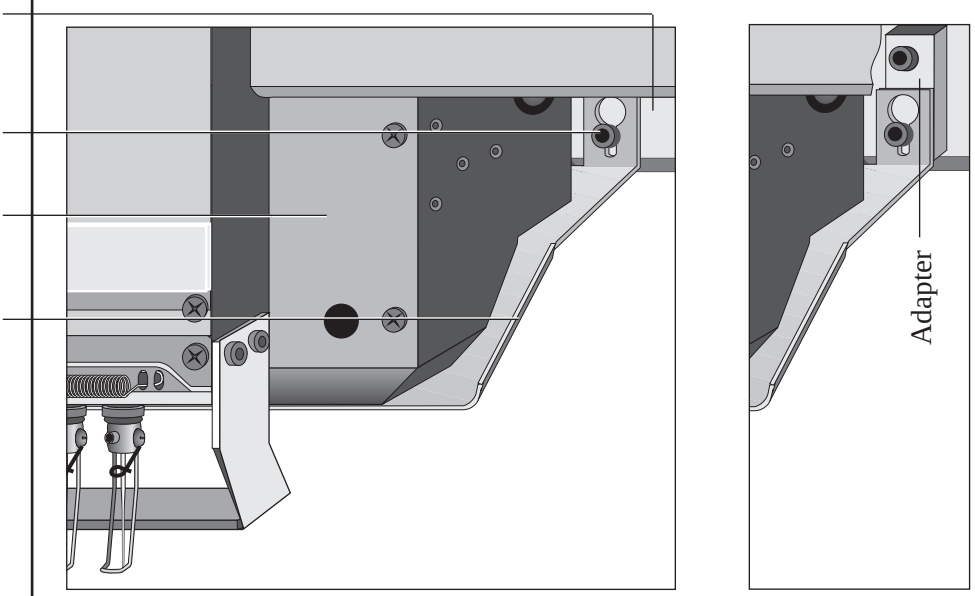


Figure 3.1 (left): Installing the guard on the T machine

Figure 3.2 (right): Installing the guard on the J machine

- First mount the screws (together with the adapters in the case of the J machine) as illustrated. Insert the guard and slide it upwards. The guard should be installed as close as possible underneath the drive unit but must not impede the movement of the catcher. Tighten the screws to secure the guard in the correction position.

Installing the shafts

A shaft is mounted under each cylinder arm for installing the cap attachment:

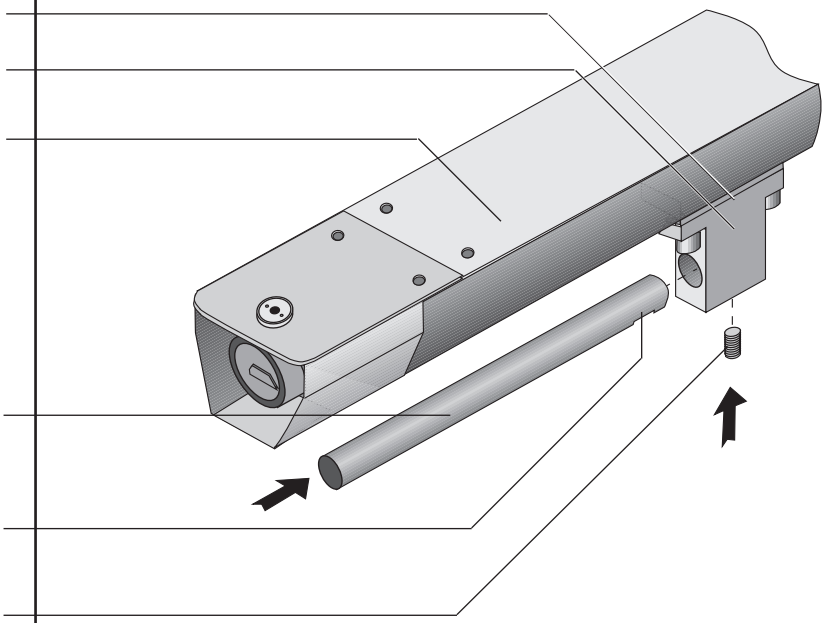


Figure 3.3:
Mounting the shafts for cap embroidery

- Install shaft holder with spacer under the cylinder arm.
- Slacken off the threaded pin in the shaft holder.
- Insert the shaft so that the recess is facing the threaded pin.
- Tighten the threaded pin securely.

Regular tasks before each cap embroidery session

Preparations

The cap attachment is mounted with the machine set up for **cylinder arm operation**, i.e.:

- The upper work table has been lowered.
- The cylinder arm frame holder is installed but no cylinder arm frame is fitted.

If the machine has previously been used for border frame embroidery, it must first be converted for cylinder arm operation (as described in the operator's guide for your tubular system machine).

CAUTION

For safety reasons, dismantle any borers that are installed as well as the cord feet of double roller cord and cord-loop embroidery attachments. If a needle equipped with a cord foot or replaced by a borer is activated owing to a setting error at the control, damage may occur to the machine, cap attachments and embroidery material.

NOTE

The borer, sequin, double roller cord and cord-loop attachments cannot be used while caps are being embroidered owing to the height of the needle plate insert.

Dismantling the needle plates and center cover plates

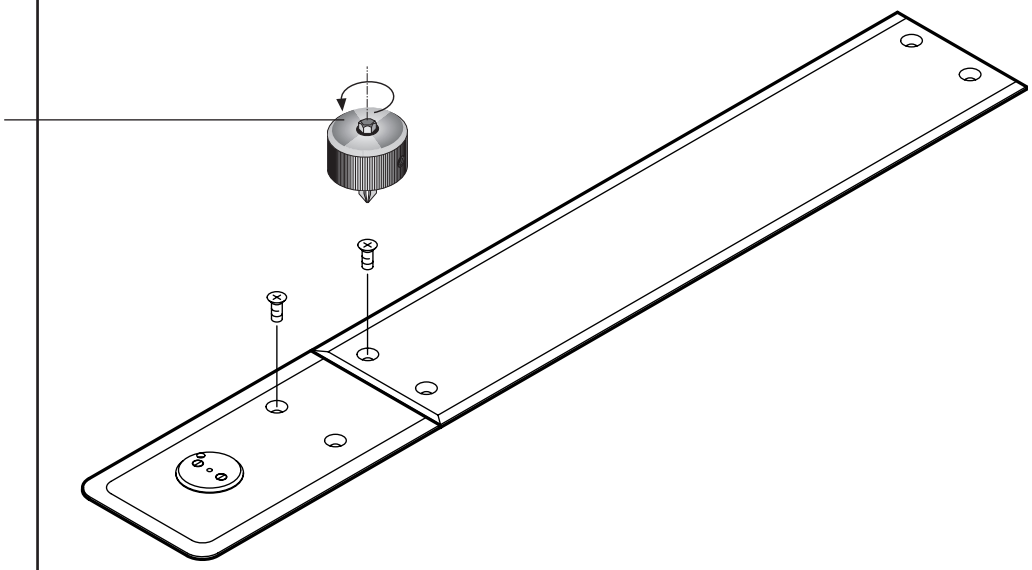


Figure 3.4:
Dismantling the needle plate and center cover plate

- Slacken off the screws with the special wrench provided and remove the needle plate and the center cover plate.

Installing the center cover plate for cap embroidery

- Re-install the **center cover plate for cap embroidery**.

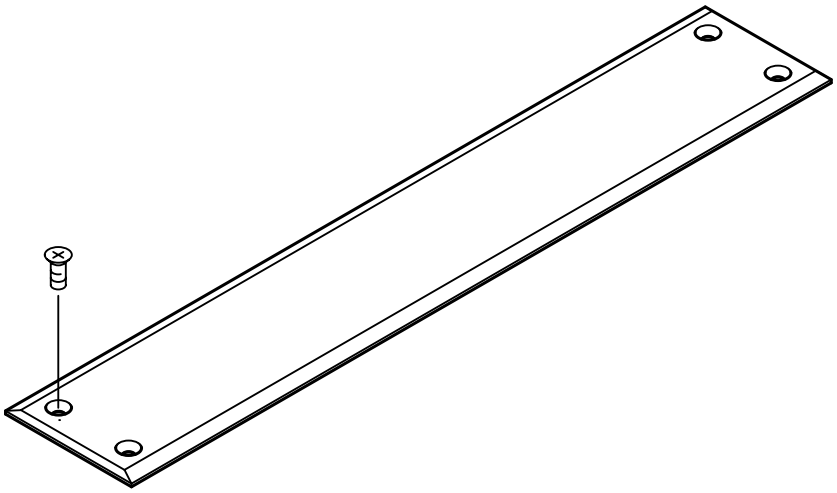


Figure 3.5:
Installing the center cover plate

Inserting the cap attachments

- Spray a little oil onto the shaft (use the oil can provided).
- Slide the bearing of the cap attachment onto the shaft from the front.
- At the same time, guide the adapter plate under the clamps of the cylinder arm frame holder until it engages.
- Secure the joint between the cylinder arm frame holder and cap attachment with the two screws provided for this purpose.

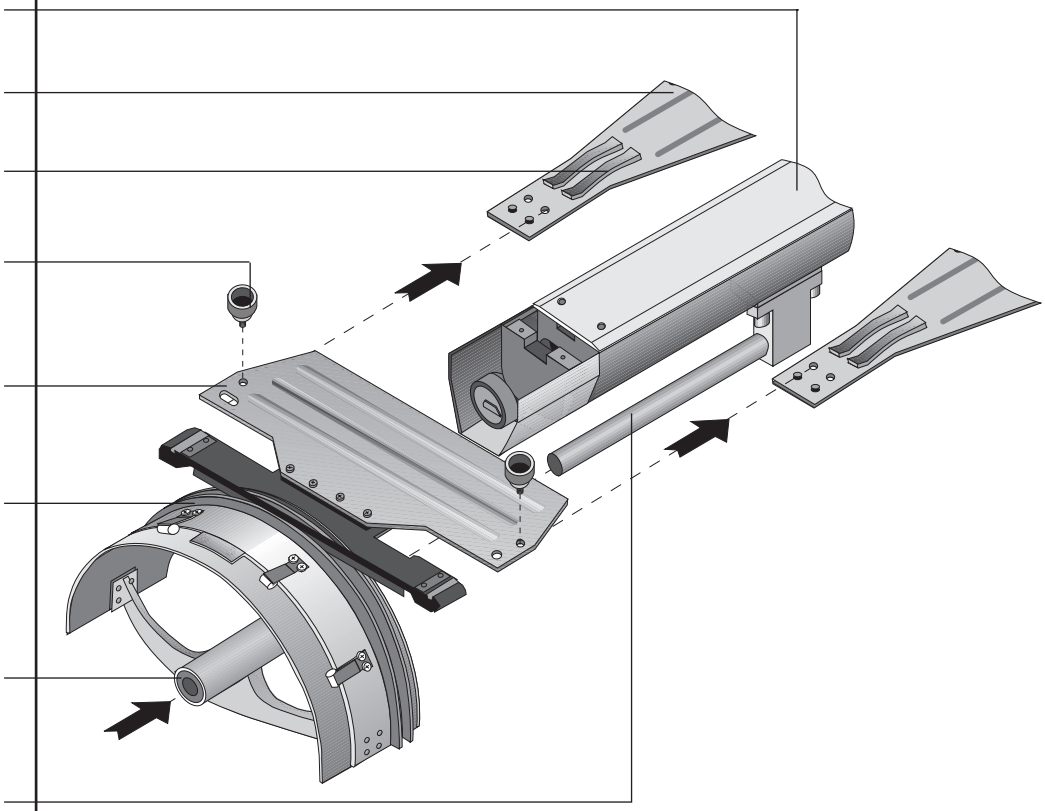


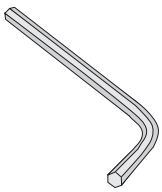
Figure 3.6:
Sliding the cap attachment onto the shaft and under the clamps of the cylinder arm frame holder

CAUTION

The shaft must be oiled every day.

Installing the needle plates for cap embroidery

Replace the previously dismantled needle plates with the special needle plates for cap embroidery. These are taller than those used for border frame and cylinder arm operation.



- Use the two screws provided to install the needle plate (do not use countersunk screws). Secure the needle plate for cap embroidery only lightly at first.
- Align the needle plate so that the needle hole is exactly below the needle point. Turn the handwheel to check that the needle enters the needle hole in the middle without touching the needle plate.
- Tighten the screws securely.

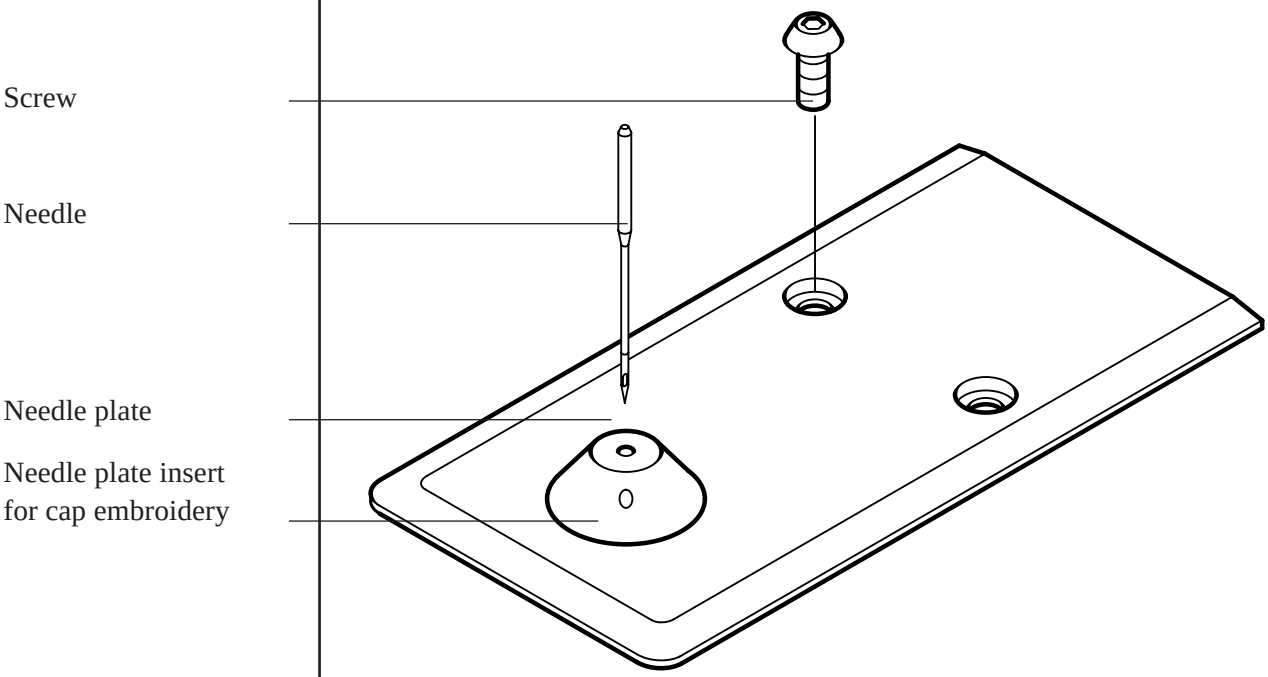


Figure 3.7:
Needle plate alignment and tightening

Needles

1738 KK SA (DB x K5)

Cap embroidery requires the use of needles with a short holder (KK). We recommend the use of the type 1738 KK SA (DB x K5) needles provided. These needles are also suitable for border frame and cylinder arm embroidery.

If you use different needles for border frame and cylinder arm embroidery, remember to change the needles when preparing to embroider caps.

NOTES

The stiffer the material being embroidered, the stronger the needle that you should choose. Stronger needles are required with caps with center seam in particular.

When embroidering caps, do not use needles with a gauge of less than 80.

Control settings

NOTE

A separate operating manual is issued for your control containing detailed information on the control structure and operation.

SET UP menu (MACHINE module)

- Select the PANTOGRAPH **HEAVY** setting for cap embroidery.

Machine type T:	Machine type J:
• Set the **EMBROIDER** speed to **750 rpm.**	With the PANTOGRAPH HEAVY setting, the speed is automatically reduced to a suitable speed for cap embroidery.

MACHINE SERVICE menu (MACHINE module)

Machine type T:	Machine type J:
• Set the PANTOGRAPH START to **270**° for cap embroidery (border frame and cylinder arm embroidery 255°).	No changes are necessary with this machine.

CLAMPING THE CAP

The quality of the finished embroidery depends on the cap being clamped free from distortion and creases, and reliably secured against slipping. Take particular care to equip and adjust the cap frame correctly in order to eliminate problems before you start embroidering.

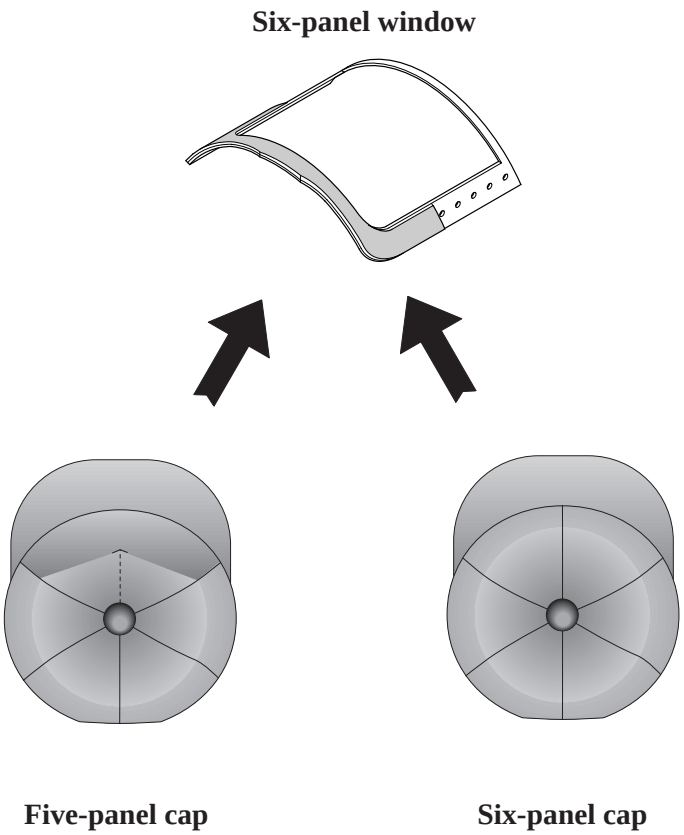


Figure 4.1:
Choosing the correct rest (six-panel window)

Hinged window size

Choose the window size that best suits the cap. **The window height must not exceed the height of the cap front that can be embroidered.** This is the area above the peak that is curved only horizontally; a surface that also incorporates a vertical curve cannot be clamped without creasing.

The window size defines the available embroidery field. Always choose the smallest possible cap window for your motif. This helps to avoid clamping problems.

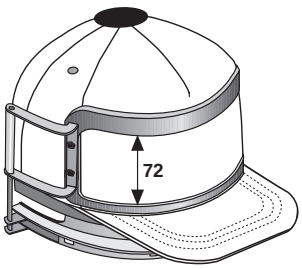
CAUTION

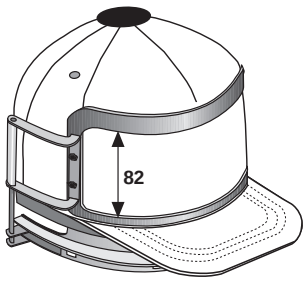
Before starting to embroider a new design, make sure that it fits inside the available embroidery field.

NOTE

Please note that the embroidery field of the windows is restricted in the corners by the corner radii of the underlying rest.

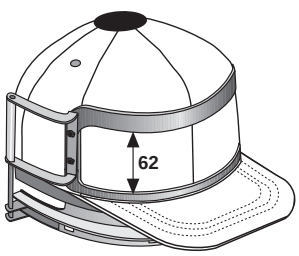
Window sizes for five-panel caps

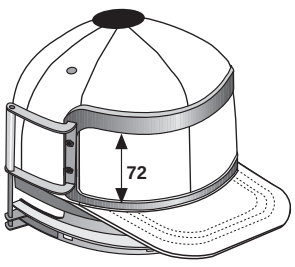


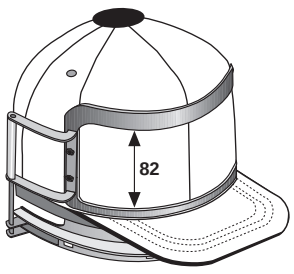


Window height	72mm	82mm
Embroidery field	55mm x 135mm	65mm x 135mm

Window sizes for six-panel caps







Window height	62mm	72mm	82mm
Embroidery field	45mm x 135mm	55mm x 135mm	65mm x 135mm

Mounting the frame

a) Changing the hinged window

Narrow edge of window

Window

Nut

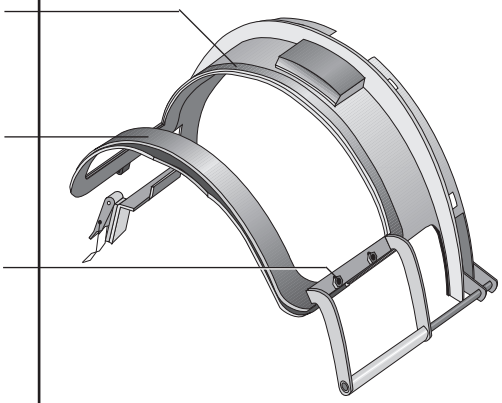


Figure 4.2:
Cap frame, mounting the hinged window

- Slacken off the four bolts and nuts which secure the hinged window on both sides and remove the window.
- Mount the new window so that the narrow edge is positioned on the sweatband side.

NOTE

The window mounting is designed with slots. This allows the clearance between the window and the rest to be adjusted to suit the cap material being embroidered.

b) Rest

Hinged window

Rest

Screw

Threaded hole

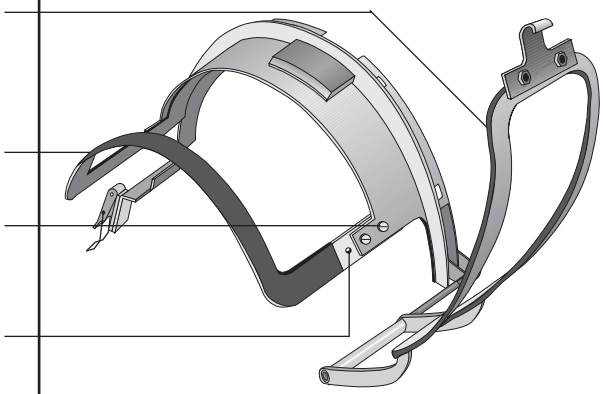


Figure 4.3:
Cap frame opened, mounting the rest

The rest is attached to the cap frame with four bolts. The threaded holes allow the rest to be secured in various positions.

- Mount the rest so that the opening between the rest and the frame corresponds to the selected window size.

Clamping the cap

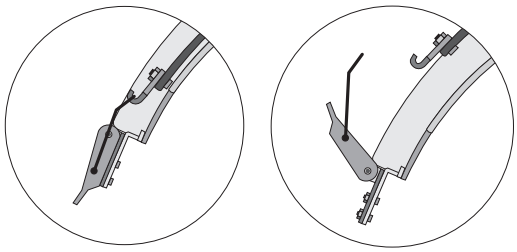


Figure 4.4:
Catch,
Left: closed,
Right: open

- Open the catch on the cap frame.

Figure 4.5:
Folding open the cap frame

- Open up the cap frame.

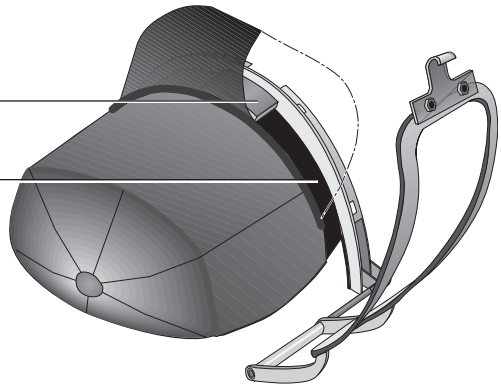


Figure 4.6:
Inserting cap in frame (peak cut away)

- Fold back the cap sweatband.
- When inserting the cap (peak upwards), push the sweatband under the sweatband holder. Stretch the cap across the rest.

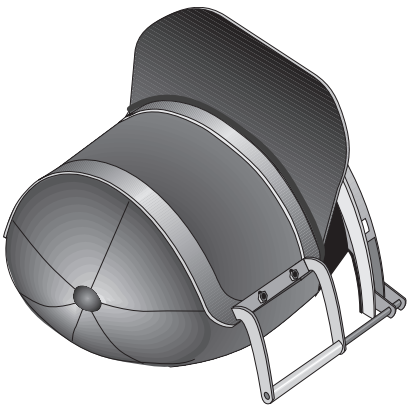


Figure 4.7:
Closing cap frame

- Shut the frame and close the catch. The material must now be clamped inside the cap window without any creases.

NOTE

The cap frame must close easily. Do not force the cap into the frame. Once the hinged window has been closed, the peak should be perpendicular to the cap frame, not at an angle.

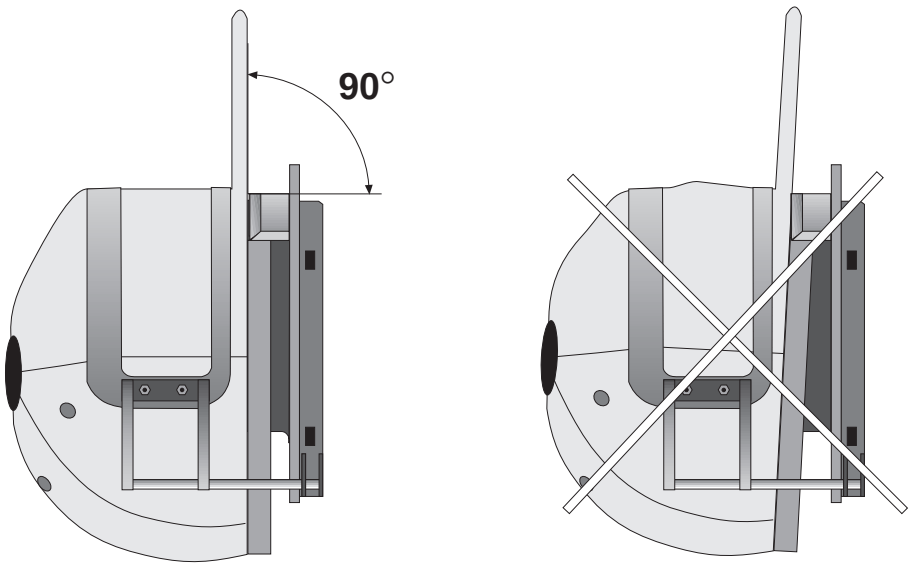


Figure 4.8 (links): Cap is clamped correctly, peak perpendicular to frame

Figure 4.9 (right): Incorrect clamping: the cap is at an angle

If clamping the cap is proving difficult or if the frame is hard to close, one of the following faults may be the cause:

- The selected hinged window is too large.
- The clearance set between the window and the rest is too small.

NOTE

The sweatband holder can be unscrewed in order to help clamp caps incorporating an extremely long sweatband.

NOTE

A clamping aid is available for the cap attachment. Since fitting the cap frame with the various caps can be extremely time-consuming, the use of two or three clamping aids is recommended, particularly on machines with a large number of embroidery heads. This device allows machine set-up times to be reduced.

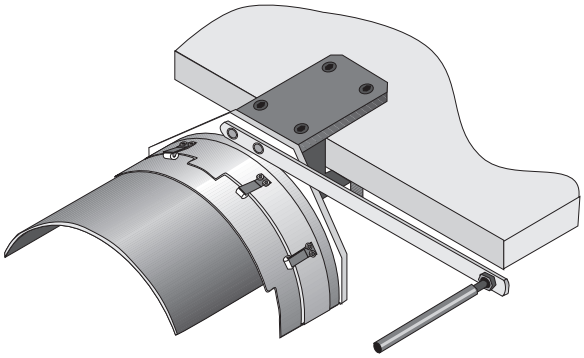


Figure 4.10:
Clamping aid

TRAVEL LIMIT

Your machine is equipped with initiators specifically for embroidering caps. The initiators limit the travel of the pantograph. They prevent the available embroidery field from being exceeded and stop the needle coming into contact with the frame when embroidering.

CAUTION

The depth of the available embroidery field varies according to the size of the cap frame window. If the window is changed, therefore, the forward travel limit must be reset.

Setting the forward travel limit

a) On machine type T:

The initiator for limiting forward travel is located at the back of the right pantograph guide.

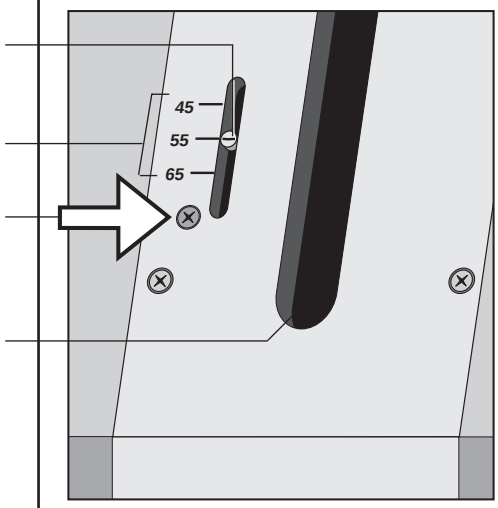


Figure 5.1:
Forward travel limit (cap embroidery) on machine type T (set for 72mm window in this case)

- Slacken off the locking screw.

  ⇒ The initiator can now be moved easily with the aid of a screwdriver.

- Slide the initiator to the desired position. The scale indicates the set embroidery field depth.

- Engage the initiator by tightening the locking screw.

Window height [mm]	62	72	82
Required embroidery field depth [mm]	45	55	65

b) On machine type J:

WARNING

Make sure that no one starts the machine while you are working under the work table.

Needle holder

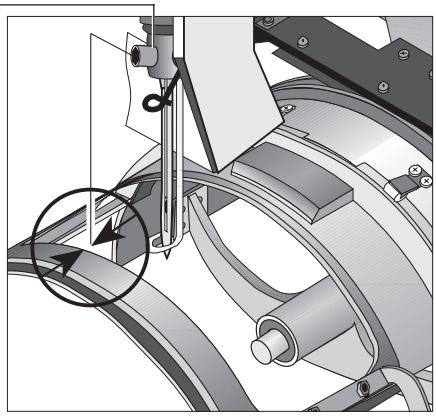
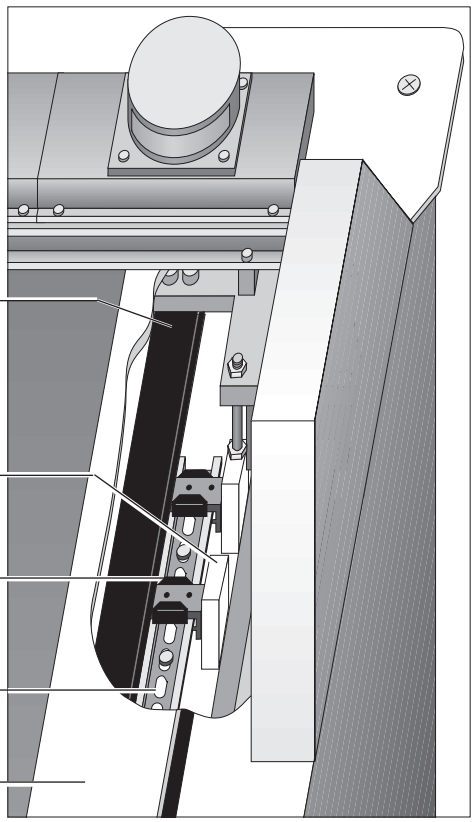


Figure 5.2:
Needle holder just in front of the front inside edge of the window (illustrated here without cap)

- Insert the cap frame with the window installed.
- Move the pantograph forward until the front edge of the needle holder is positioned just in front inside edge of the window.

Figure 5.3:
Initiators for limiting forward travel (cap embroidery) on machine type J



The initiator for limiting forward travel is located on the girder next to the right side panel. It is located in an accessible position under the work table, so that the pantograph guide cover need **not** be removed.

The initiator is secured on the guide rail by a leaf spring and can be moved by pressing the two ends of the leaf spring together.

- Move the front initiator until the display light comes on (slide backwards to adjust to a smaller window and forwards for a larger window).

Switching on the travel limit for cap embroidery

- Switch on the travel limit for cap embroidery.

Machine type T:

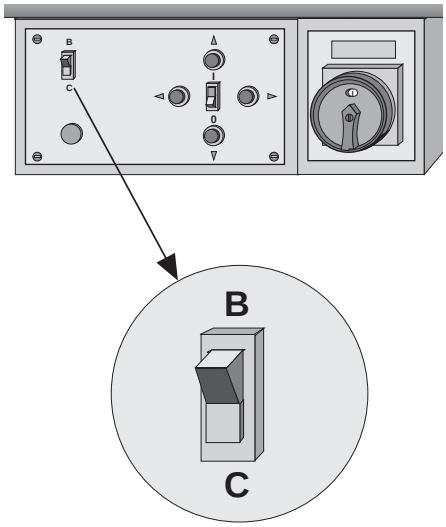


Figure 5.4 (left): Positioning switches, travel limit for cap frame switched on

Machine type J:

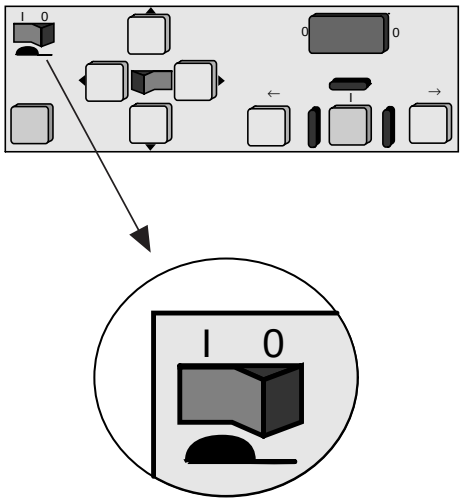


Figure 5.5 (right): Control panel on machine type J, travel limit for cap frame switched on

NOTE

Switch the travel limit for cap embroidery off again when you convert the machine for border or cylinder arm embroidery.

Monitoring procedure with framing

CAUTION

Before embroidering a new design, check whether it fits inside the chosen window.

- Move the pantograph to the correct starting position (refer operator's guide to your machine).
- Trace the outline of the design with the DESIGN RANGE function (refer to the control operating manual).

⇒ If the framing procedure is interrupted, then the design is either larger than the available embroidery field or the pantograph starting position is incorrect.

⇒ If the cap frame moves outside the allowed embroidery field during framing (the active needle is no longer over the window aperture), then the travel limit has been set incorrectly.

CAUTION

If the travel limit is incorrectly set, the needle may come into contact with the frame during embroidering, causing damage to the embroidery material, needles, cap attachments, frame and machine.

INSERTING THE CAP FRAME

The cap frame is held in the cap attachment by means of four clamping rollers.

- Slide the frame onto the cap attachment so that the clamping rollers engage in the recesses at the rear edge of the cap frame.

CAUTION

Do not tilt the frame more than is necessary when inserting or removing it. If tilted too much, the leaf springs of the clamping rollers may break.

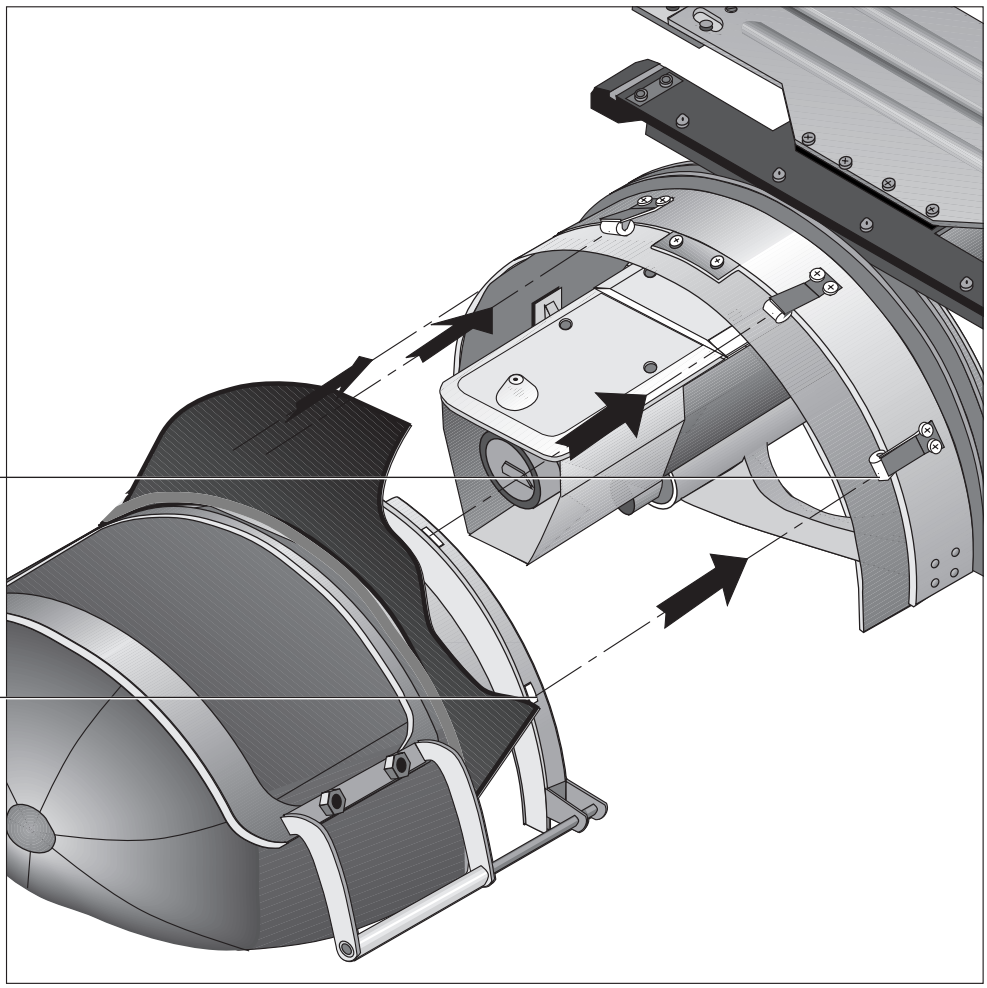


Figure 6.1:
Inserting the cap frame in the cap attachment (cap peak cut away)

NOTES ON PUNCHING

Cap embroidery is made difficult by the curvature of the cap, which prevents the area being embroidered from being placed flat on the needle plate. An additional problem arises in the case of six-panel caps owing to the center seam.

To counteract these problems, you should abide by the following basic rules when punching cap designs. Edit existing designs for “conventional” embroidery accordingly before using them on caps. The use of suitable designs not only improves the quality of the resultant embroidery but also helps to avoid malfunctions such as thread breaks, thus enhancing the productivity of your machine.

Choosing designs

Whenever possible choose a **symmetrical design**. As well as causing pulling when being embroidered, designs which are one-sided look imbalanced on caps.

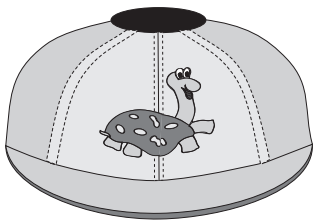


Figure 7.1:
Asymmetrical design on cap

The curvature of the cap can make **round motifs** appear oval. This optical illusion can be corrected by slightly widening the design.

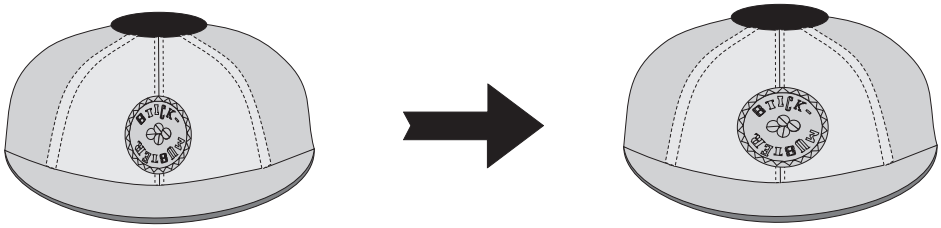


Figure 7.2:
Round design on cap
Left: unchanged (appears oval)
Right: widened slightly (appears round)

Cap designs in general

Always begin and end the design in the middle. Embroidering from one side to the other has a negative effect: the material is pressed to one side and the motif is subsequently shifted to the side. **For this reason, always begin in the center, even with monogram designs.** Start from the center in one direction and then go back to the center to embroider in the other direction.

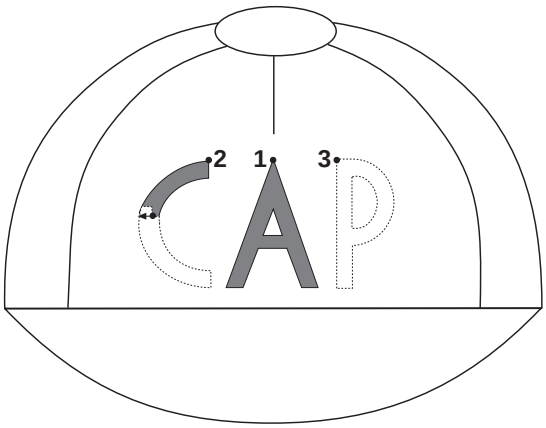


Figure 7.3:
Embroidery sequence as exemplified by a monogram design

Where possible, underlay step stitch sections with **backing stitches** running at an angle of 45° to the step stitches. The backing stitches help to stiffen the cap material and counteract bulging.

When choosing the backing stitches, always bear the material being embroidered in mind. Design elements (e.g. monograms) being applied to existing embroidery (step stitch section) do not require backing in a separate operation.

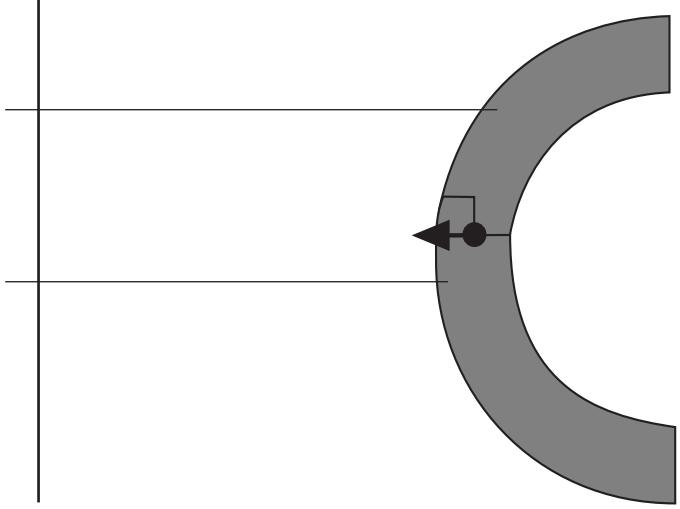


Figure 7.4:
Backing stitches under step stitch section

Do **not divide the embroidering into several operations**, in other words do **not** apply all the backing stitches first, followed by all the step stitch sections and finally the outlines. This approach causes the design to be pulled. Instead, complete **small sections of the design one after the other**. Begin at the center and work outwards, first to one side. Return to the center and work out towards the other side.

Sections 1 and 2:
Backing stitches, step stitch section and outline completed

Section 3:
Backing stitches completed, step stitch section started

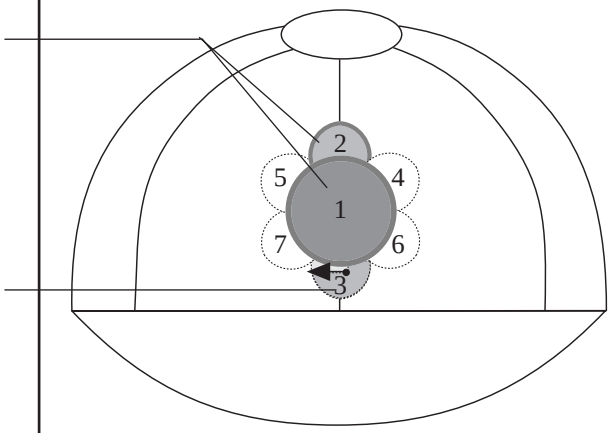


Figure 7.5:
Embroidery sequence, successive completion of design sections

Sequence:

1a) Backing stitches
1b) Step stitch section
1c) Outline

2a) Backing stitches
2b) Step stitch section
2c) Outline

3a) Backing stitches
.
.
.

Avoid unnecessary **color changes and thread trimming**. Most caps are made from stiff material and are harder for the needle to penetrate than in most conventional applications. Since each special function (thread trimming, color change) is associated with a considerable drop in speed, this often causes problems when the needle next enters the material.

Avoid excessively high **stitch density** and extremely short **stitch lengths**. Match the stitches (including backing stitches) to the material from which caps are generally made, which tends to be very stiff and strong.

Widen **round designs** at the punching stage (see Page 7-1).

Caps are clamped with the peak towards the rear. To obtain the design correctly on the cap, therefore, if must be displayed upside down on the screen. If necessary, rotate the design through 180° before saving.

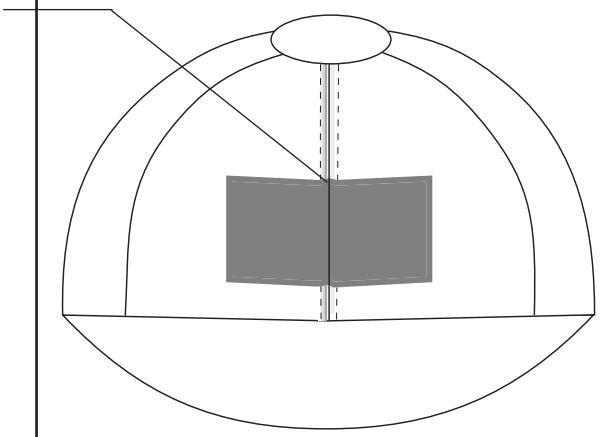
Designs for six-panel caps

Six-panel caps have a center seam in the area being embroidered. Often this has been stitched two or three times and is extremely hard. This must be borne in mind when punching or preparing designs for six-panel caps.

Avoid thread trimming and color changes in the vicinity of the seam since this can cause problems when starting embroidery on the seam.

If the seam is going to be embroidered with step stitches, it is a good idea to include backing stitches in the design under the step stitch area, running at an angle of approximately 45° to the step stitches. If the step stitches follow the direction of the seam, a “furrow” may otherwise be created next to the seam.

“Furrows” alongside the seam



Sequence:

1) Backing stitches
2a) Step stitch section from center to left
2b) Step stitch section from center to right
3) Outline

Figure 7.6:
Furrow formation alongside the center seam

Designs for caps other than baseball caps

When embroidering woolen caps, bear in mind that the cap material is very soft and must be stiffened specially by backing stitches.

TROUBLESHOOTING

Fault	Possible cause/remedy
Thread break	The selected machine speed is too high. Embroider at a slower speed.
	The PANTOGRAPH START is incorrectly set. Correct the PANTOGRAPH START setting in the MACHINE SERVICE menu.
	The wrong needle plate was fitted. Install the needle plate for cap embroidery.
	The wrong ramp was set. Call the SET UP menu and set to PANTOGRAPH HEAVY.
	The rotary hook was damaged by an earlier thread break. Install a new rotary hook.
	The design contains too many stitches. Reduce the stitch density.
	The cap has a coarse gauze backing in the area being embroidered. Line the gauze with non-woven material.
	The yarn quality is inadequate. Use a stronger yarn.
	The cap attachment shaft was not oiled.
	The upper thread tension is too high.

Fault	Possible cause/remedy
False stop. Bobbin thread monitor has incorrectly reported a thread break	The bobbin thread monitor wire is misaligned or bent. Replace the wire (if necessary) and reset the bobbin thread monitor.
	The bobbin thread tension is too low. Reset tension at the bobbin case.
	An unsuitable needle was used.
	Incorrect settings were made at the control (see “Installing the cap attachment”).
Needle break	The wrong type of needle was used. Use the type **DBxK5 KK** needles provided, gauge 80 or 90. These needles can also be ordered as spare parts.
	The needle gauge does not match the cap material. Use a stronger needle.
	The wrong needle plate was fitted. Install the needle plate for cap embroidery.
	The needle is not positioned in the middle of the needle hole. Adjust the needle plate.
	Incorrect settings were made at the control (see “Installing the cap attachment”).

Fault	Possible cause/remedy
The embroidery routine was aborted in the middle of the design	The embroidery routine was stopped by the travel limit because: a) The travel limit is incorrectly adjusted. Set the travel limit to match the chosen design window size. b) The design is larger than the available embroidery field. Reduce the design by up to 5% in size. Alternatively, install a larger window (if possible) and adjust the travel limit accordingly. **Note: Use the DESIGN RANGE function to check whether the design will fit inside the available embroidery field before commencing embroidery.**
Needle comes into contact with the frame while embroidering	The travel limit was incorrectly set and the design is too large for the selected window. Set the travel limit correctly. Reduce the design by up to 5% in size or use a larger window (if possible). **Note: Use the DESIGN RANGE function to check whether the design will fit inside the available embroidery field before commencing embroidery.**

Fault	Possible cause/remedy
Misalignment in design	The cap was not properly clamped in the cap frame. Check that the cap frame is correctly equipped and adjusted and re-clamp the cap.
	The design was not prepared for cap embroidery. Modify the design as described in the “Notes on punching”.
	The shafts of the cap attachments are soiled and/or have not been lubricated. Clean and oil the shafts.
	The area of the cap being embroidered is not stiff enough. Line this area with non-woven material or fine gauze.
	The cap frame has sprung open. The clearance set between the rest and the hinged window has possibly is too small (frame tension too high).
	The cap drives are not moving freely.
	The cap frame was not inserted properly in the cap attachment (clamping rollers not engaged properly).

Fault	Possible cause/remedy
Bulging in the embroidered area	The cap was not properly clamped in the cap frame. Check that the cap frame is correctly equipped and adjusted and re-clamp the cap.
	The design was not prepared for cap embroidery. Modify the design as described in the “Notes on punching”.
	The area of the cap being embroidered is not stiff enough. Line this area with non-woven material or fine gauze.
Cap pulled, design off-center	The design was not prepared for cap embroidery. Modify the design as described in the “Notes on punching”.
	The cap was not properly clamped in the cap frame. Check that the cap frame is correctly equipped and adjusted and re-clamp the cap.
“Furrows” in the design	The design did not contain backing stitches in the vicinity of the cap seam. Prepare the design as described in the “Notes on punching”.
Cap attachment is noisy	The play of the cap attachment drive is too great.
	The screws used to secure the cap attachment to the cylinder arm frame holder were not properly tightened. Re-tighten the screws.

Index

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