

Chapter 1C

Performance of the Machine – MX Series

This section will focus on the different parts of the machine – what they are and what they do. It will also explain how to operate the equipment.

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Special Class Note

There are three different machine models that may be covered in this class, the NEO, HX and the MX. The Neo & the EHX are arm machines, & have a limitation in the embroidery size in the y-axis. It is 360 mm. The major difference is the control panel. The MX is a bridge cylinder machine, & is limited to 450 mm in the y-axis. To accommodate this situation, students will be divided into two groups, based on machine model. One group will focus on threading their machine, while the other group will focus on their machine's control panel functions. Upon completion of the specified tasks, each group will swap tasks, though they will still be focused on their model of equipment. After these tasks are completed successfully, both groups will work together for the remainder of this training session.

Also, the HX and MX Series of machines come in various sizes of head configuration. Though the Training Class will have an HX1501 and MX1501 machine, the same information can be applied to any of the HX and MX Models.

SECTION 1.1 – IDENTIFICATION OF KEY COMPONENTS

Embroidery Machine Operators must be able to recognize key machine components and understand their basic functions. This will ensure that you have a clear picture of how the machine operates. In addition, it will simplify any conversations with Hirsch Technical Support Staff, should a problem be encountered with your machine. Visually identify and discuss the following components:

1.1.1 Data Ports

The MX machine has a USB and a LAN data port on the back of the control panel. This is where the optional networking cables will be connected.

1.1.2 External Power Supply

The master ON/OFF switch is located on the right front of the chassis. (For multi-head machines, the power switch is located on the right front leg directly behind the Control Panel.)

1.1.3 Floppy Disk Drive

The Floppy disk drive is located behind the rectangular door on the right side of the control panel. The disk drive door should always be left closed in order to minimize the entry of dust and dirt and to prevent it from being broken.

1.1.4 Memory Card Drive (MX Only)

The Memory Card drive is also located behind the rectangular door on the right side of the control panel. Remember to leave the drive door closed to help minimize the entry of dust and dirt.

1.1.5 Beam Sensor

The machine is equipped with a special safety feature designed to prevent someone from accidentally coming in contact with the sewing needle during machine operation. The beam sensor incorporates an invisible beam of light, projected from one side of the machine to the other, directly on front of the sewing area. If anything breaks this beam, the machine immediately stops and remains stopped until reset by the Operator. To reset and resume sewing, press the SET key then the START key.

1.1.6 Needle Bar Case

The needle bar case contains the mechanical components that ultimately drive the sewing needle up and down. The needle bar case is mounted on a rail, such that it can be mechanically repositioned by the machine as part of the sewing process.

1.1.7 Needle Bars

The needle bars are vertical drive posts that the needles are attached to. There is one needle bar per needle.

1.1.8 Presser Foot

The presser foot is the “L” shaped vertical bar with a round opening in the bottom that surrounds the lower portion of the needle. During sewing, the presser foot comes down against the garment being sewn and anchors it in place while the needle penetrates it.

1.1.9 Cylinder Bed

The cylinder bed extends forward from the rear chassis of the machine and is located several inches below the Needle Case. It contains the elements of the lower thread path including the bobbin, bobbin case and rotary hook. In addition, the thread trimming blades are housed in this area.

1.1.10 Needle Plate

The needle plate is mounted on the cylinder bed. It supports the fabric that is being sewn, such that as the needle passes through, it can't force the fabric down towards the bobbin. The needle plate is a dividing point of the machine. Everything above it is considered to be elements of the Upper Thread Path, while everything below it is considered to be elements of the Lower Thread Path.

1.1.11 Pantograph

To embroider on a garment, that item must be placed in a special frame or hoop then attached to the drive system on the machine, which is referred to as the pantograph. The pantograph can move left and right – which is referred to as the X movement; as well as in and out – which is referred to as the Y movement. To sew a design, the pantograph moves the hooped garment to a precise position and stops, while the machine creates a stitch in that spot. Then it moves to the next designated position and stops while the machine creates the next stitch. Essentially, each needle penetration has an X and Y coordinate assigned to it by the embroidery design software, which specifies where the pantograph will move.

1.1.12 The Upper Thread Path

A stitch is formed by joining the upper thread and lower thread (bobbin) together. In order for the upper thread to reach the lower thread, it must follow a specific path from the thread cone down to the presser foot where it connects with the bobbin thread. This is referred to as the Upper Thread Path. If you encounter stitching problems such as thread breaks and looping, the Upper Thread Path should be checked closely.

The best way to learn what the key components are in the Upper Thread Path is to thread the machine. To see how this performed, you will watch a short video clip about the process, and then perform it. This video is part of the HX1501 Machine Setup CD.

While watching the video, pay close attention to the following key components:

Thread Stand

#1 Tension Set

Spiral Tube

Tension Discs

Rotary Tensioner

Retractable Thread Holder

Take-up Spring

Take-up Lever

Needle

Presser Foot

Your instructor will now start the Video. (Quick Start – Threading the Upper Thread)

Upon completion of the Video, your instructor will demonstrate the first needle – needle #1 - and then it will be time to participate in a practical exercise.

Trainers Ref. Chapter 2, Section 2.8 - Embroidery Threads.

Training Exercise #1 – Threading the Upper Thread Path

You will only be threading the first needle of the machine. Feel free to use the remaining needles as a visual reference. Perform the following steps to accomplish this task and pay close attention to the components that are underlined.

1. Place a cone of thread over the post on the **thread stand** in the #1 thread position.
2. Feed the thread up through the corresponding overhead eyelet on the thread stand.
3. Thread the top of the tension plate and guide the thread between the two discs of the **#1 Tension Set** in a clockwise direction making a half loop.
4. Slide the threader through the **spiral tube**, pushing it up from the bottom.
5. Hook the thread to the end of the threader and pull down until the end of the thread is out.
6. Pass the thread under the thread presser.
7. Pass the thread around the left side of the first thread post.
8. Wrap the thread clockwise around the right side of the **tension discs**.
9. Wrap the thread around the left side of the second thread post, located at the bottom of the tension discs.
10. Pass the thread underneath the thread guide hook.
11. Pass the thread to the left of the third thread post, located to the left of the **rotary tensioner**.
12. Wrap the thread clockwise around the rotary tensioner. (This device also serves as the thread breakage detector.)
13. Pass the thread to the left of the fourth thread post, located just below the rotary tensioner.
14. Place the thread under the second thread presser.
15. Pass the thread down to the **retractable thread holder, press to the left** and lift the lever attached to the right side of the holder, to rotate it.
16. Pass the thread through the thread holder rollers from right to left, making sure it goes through the thread **take-up spring**. Use tweezers to grasp the end of the thread.
17. Bring the thread up to and through the **take-up lever**, from right to left through the hole.
18. Then pass the thread back down to the retractable thread holder and pass it through the hole just to the left of the thread holder roller.
19. Feed the thread down through the eyelet in the lower thread guide and through the hook of the needle clamp.
20. Thread the eye of the **needle** from front to back.
21. Pass the thread down through the **presser foot**, then pull it back up and wrap it around the thread holder disc.
22. Trim off the excess thread, **press to the left and rotate the retractable thread holder** down.

STOP – Have the Training Instructor verify that the machine has been threaded correctly.

Repeat the above steps for each needle as needed; for even number needles, delete step (7).

1.1.13 The Lower Thread Path

The best way to learn what the key components are in the Lower Thread Path is to thread and install the bobbin. To see how this is performed, you will watch a short video clip about the process then actually perform it. This video is part of the HX1501 Machine Setup CD.

While watching the video pay close attention to the following key components:

Bobbin

Bobbin Case

Tension Clip

Pigtail

Rotary Hook

Your instructor will now start the Video. (Quick Start – Threading the Bobbin Thread)

Upon completion of the Video, your instructor will perform a demonstration and then it will be time to participate in a practical exercise.

Trainers Ref. Chapter 2, Section 2.9 - Embroidery Bobbins.

Training Exercise

1. *Remove the bobbin case from the machine by reaching inside the sewing arm with your fingertips and grasping the bobbin case. Pull out on the small tab to release the bobbin case and remove it from the machine.*
2. *Remove the old **bobbin** by pulling it out of the **bobbin case**.*
3. *To install a new bobbin, hold it in your right hand between your thumb and first finger, so the thread hangs down facing you. In the left hand, grasp the bobbin case between your thumb and first finger, so that the opening is facing the bobbin.*
4. *Place the bobbin in the bobbin case.*
5. *Guide the thread through the slot and up through the **tension clip**.*
6. *Wind the thread through the **pigtail** leaving no more than 2 or 3 inches hanging out.*
7. *Hold the bobbin case as it would go into the **rotary hook** – open side first.*
8. *Pull gently on the bobbin thread and verify the bobbin thread rotates inside the bobbin case in a counterclockwise direction.*
9. *Place the bobbin case into the rotary hook and gently press until you hear it snap into place.*
10. *Trim off the excess bobbin thread, leaving approximately 2 inches hanging down.*

STOP – Have the Training Instructor verify that the thread has been installed correctly.

Repeat the above steps several times until you feel comfortable with the process.

SECTION 1.2 – MACHINE SEWING PROCESS

1.2.1 The Stitch Formation Process

A stitch is formed through a mechanical process that joins the upper thread to the bobbin thread. The stitch cycle begins with the needle, presser foot and take-up lever all moving downward.

First, the presser foot reaches the fabric, and presses the fabric against the needle plate which stops its downward travel. Then, the needle passes through the opening in the presser foot and down through the fabric carrying the upper thread. The upper thread recesses into the groove on the front of the needle such that it doesn't catch on the edges of the hole made by the needle penetration or on the hole in the needle plate.

Meanwhile, the bobbin thread is being guided by the rotary hook, which has a sharp pointed protrusion rotating around the bobbin case. When the needle reaches its lowest point, the take-up lever momentarily relaxes the upper thread tension, such that a loop is formed directly behind the eye of the needle. (This location is the scarf, which is a small cutout in the backside of the needle.) At the same time, the point of the rotary hook rotates through this same area, almost rubbing on the needle, but not quite. The point of the hook engages or catches the small loop in the upper thread and pulls the upper thread down and inside in such a way as to connect it with the bobbin thread. The take-up lever begins to rise, which pulls the stitch taut. In addition, the needle starts to rise, followed by the presser foot. All three components reach their highest point, which marks the end of the stitch cycle. Then, the process starts all over for the next stitch.

1.2.2 Thread Trim

Automatic Thread Trims are a special feature of your machine. During the sewing process, the machine will periodically stop and trim the thread that is currently being sewn. The process occurs when the machine receives a command telling it to perform this action. Commands are received one of three ways:

1. An electronic code embedded in a design file.(three consecutive jump stitches force a trim,)
2. A thread color change takes place.
3. A manual command is set by the machine operator.
4. If a satin stitch is longer than ½ inch, then it will stop and trim on one side of the column, move to other side, stop and trim.

Upon receiving this command, the machine stops the sewing process. A set of fingers, known as the picker, inserts into the bobbin case to prevent the bobbin from moving and helps form a loop. Then a blade located just above the rotary hook, but below the needle plate, swings out and cuts the bobbin thread. Immediately, following this action, the upper thread hook, also known as the grabber, extends down from behind the needle case and hooks the upper thread, pulling it up and away from the sewing area. The machine resumes sewing. This process takes just a few seconds to complete.

1.2.3 Color Change

Automatic Color Changes, allow the machine to switch to a different color of thread without manually rethreading. A color change takes place when the machine receives a command telling it to change color. This is done one of two ways:

1. An electronic code embedded in the design file (Stop Code).
2. A manual command is set by the machine operator.

Upon receiving this command, the machine stops sewing and performs a thread trim automatically. The entire needle case then moves either left or right until the desired color/needle is centered over the needle plate. It is up to the Operator to program the sequence of the colors/needles that are to be sewn.

1.2.4 Thread Break Detection

When one of the sewing threads (upper or lower) breaks or runs out, the Thread Break Detection system senses it and stops the machine so that the problem can be resolved.

The rotary tension detects when this happens and sends a stop command to the machine. In addition, it emits an audible beep which warns the Operator that the machine has stopped sewing. The display panel will indicate the reason. Upon correcting the problem, the machine can be restarted.

The Thread Break Indicator Lamp, located on the Tension Base, will glow red in the event of an upper thread break (error code 291). It will flash red in the event of bobbin thread break (error code 293).

SECTION 1.3 – WORKING WITH THE FRAME SYSTEMS

For the purposes of discussion, the terms hoop and frame may be used interchangeably. However, by definition, a hoop is a device with a detached inner and outer ring which are mated together to hold the garment; whereas, a frame “sandwiches” the garment.

Embroidery Hoops and Frames have two purposes: to stabilize the garment and to attach the garment to the machine. The hooped item is attached to the pantograph on the machine, which moves the garment as per instructions from the programmed design.

1.3.1 Setting Up the Machine for Cap Sewing

There are several styles of cap frames available, however, the 270 degree frame is the only one discussed here, as it is the standard cap frame provided with Tajima embroidery machines. The 270 degree frame allows a horizontal sewing field that covers 270 degrees of an arc which corresponds to “ear to ear” coverage. Though few designs are this wide, the real advantage is that three locations can be sewn using one hoop.

In order to attach the hoop to the machine, you must setup the pantograph to receive the cap style of frame. This is done by installing the Cap Sash.

To better understand the process, you will watch a short video clip. Your instructor will then demonstrate the process for you and then you will participate in the following “hands – on” exercise.

From the Find It Fast tap, select Cap Frames.

Training Exercise

- 1. If installed, remove the Tubular Arms by loosening the two hex screws on each arm using an allen wrench, then pull them off of the pantograph joint plate.*
- 2. Slide the Cap Sash onto the pantograph by lining up the “slide angle” (raised hex screw on each side of the sash) with the “joint plate” (on the pantograph). You may have to slightly lift up on the sash to fit the wing nuts underneath the joint plate as well.*
- 3. Make sure the Cap Sash is pushed completely back.*
- 4. Tighten the wing nuts on the bottom of the Cap Sash. Be sure to look at the wing nuts and make sure they are tightened closed rather than open.*
- 5. Tighten the two “slide angle” screws on the top of the Cap Sash using the hex key (allen wrench).*
- 6. Rotate the pantograph so that the red line of the joint plate is on the 0.*
- 7. To install the cap frame onto the cap sash, rotate the cap frame 90 degrees and slide it onto the cap sash.*
- 8. Turn the cap so as to line up the center slot on the top of the cap frame with the block on the top of the cap sash.*
- 9. Place the palm of your hands on the on the cap frame and wrap your fingers around the cap frame and cap sash.*

10. *Push the cap frame onto the cap sash until it snaps into the two top lock pins and the bottom base frame presser roller.*
11. *Gently tug the cap frame outward and lift up on the two top lock pins to ensure that it is securely locked in place.*
12. *Remove the cap frame by pushing down on the two top lock pins and firmly pulling the cap frame out and away from the cap sash.*
13. *Rotate the cap frame 90 degrees so that the cap visor will clear the needles.*

NOTE: When running cap designs, you must rotate the design 180 degrees before sewing (refer to section 1.4.7 Operation Panel Functions – Rotating the Design)!

1.3.2 Setting Up the Machine for Flat/Tubular Sewing

The Tajima Tubular System is used for sewing most flat and tubular items. Tubular refers to the construction of such items as T-shirts, polo shirts, sweatshirts, sleeves, pant legs, etc. All of these items are essentially large tubes. Even a jacket or dress shirt can fall into this category, as they form a tube shape when fastened. The advantage to a jacket or button-up shirt is that it can be unfastened for easier hooping, while true tubular items such as polo shirts, T-shirts and sweatshirts cannot. Regardless of the item, the Tajima Tubular System can easily handle most flat and tubular applications, due to the variety of hoops that are available for your machine.

In order to attach the hoop to the machine, you must setup the pantograph to receive the tubular style of frame. This is done by installing the two parallel support arms. You will now start the video – Tubular Frames.

To better understand the process, your instructor will demonstrate for you and then it will be time to participate in the following “hands – on” exercise.

Training Exercise

1. *Remove the Cap Sash by loosening the two hex screws on top and the wing nuts on the bottom.*
2. *Slide the Cap Sash off of the machine and set it aside.*
3. *Compare the 15cm and the 30x30cm hoops. These are the two most commonly used tubular hoops. Notice that though they have different sized sewing areas, yet they are both the same width.*
4. *Select the 15cm hoop for this exercise.*
5. *Slide the right tubular arm onto the right side of the 15cm hoop and slide the left tubular arm onto the 15cm hoop. This helps you to properly align the tubular arms into the rectangular slots on the pantograph.*
6. *Tighten the hex screws using the hex key or allen wrench.*
7. *Remove the 15cm hoop and install the 30x30cm hoop. Notice that it fits the same opening without any modification in the location of the tubular arms. With the exception of the border frame, all the hoops you received with your machine have the same tubular arm width.*

1.3.3 Setting Up the Machine for Cylindrical Sewing (optional)

Many garments have small tubular areas which cannot be sewn using any of the standard tubular hoops, including pant legs, sleeves, golf club head – covers, wine bags, etc. These items are classified as narrow tube or narrow cylinder. In most situations they cannot be embroidered without special equipment. To facilitate this, Tajima offers the optional Cylindrical Frame kit.

In order to attach the frame to the machine, you must setup the pantograph to receive the cylindrical frame. In addition, a special needle plate will have to be installed. Start the video – Cylindrical Frames.

To better understand the process, your instructor will demonstrate and then it will be time for the following “hands – on” exercise.

Training Exercise

1. *Remove the Flat/Tubular arms by loosening the two hex screws using an allen wrench, slide them off and set them aside.*
2. *Slide the Cylindrical Sash onto the pantograph by lining up the “slide angle” (raised hex screw on each side of the sash) with the “joint plate” (on the pantograph).*
3. *Make sure the Cylindrical Sash is pushed completely back.*
4. *Tighten the wing nuts on the bottom of the Cylindrical Sash.*
5. *Tighten the two “slide angle” screws on the top of the Cylindrical Sash using the hex key (allen) wrench.*
6. *Remove the two mounting screws in the top corners of the standard needle plate.*
7. *Lift off the needle plate from the sewing arm. It’s a good idea to inspect and clean the exposed area while the needle plate is removed.*
8. *Install the cylindrical needle plate by lifting it onto the sewing arm. Ensure that it is centered by verifying that the positioning pin in the right lower corner of the needle plate opening is aligned with the hole in the lower right corner of the needle plate.*
9. *Re-install the two mounting screws.*
10. *Slide the cylindrical frame onto the cylindrical sash.*
11. *Line up the center slot in the top of the cylindrical frame with the block on the top of the cylindrical sash.*
12. *Push the cylindrical frame onto the cylindrical sash until it snaps into the two top lock pins and the bottom base frame presser roller.*
13. *Gently tug the cylindrical frame outward to ensure that it is securely locked in place.*
14. *Remove the cylindrical frame by pushing down on the two top pins and firmly pulling the cylindrical frame out and away from the cylindrical sash.*

SECTION 1.4 – OPERATION PANEL FUNCTIONS

Tajima machines traditionally offer a wide array of control functions. However, it is only necessary to know the basic commands in order to begin sewing successfully. In fact, many of the functions and controls will never be used. A complete list of all commands is located in your Instruction Manual. For the purposes of this class, you will learn only the most commonly used functions. To see what they are and how they are performed, you will watch a short video clip about the process then actually perform the different functions. This video is part of the HX Series Machine Setup CD. Because of the similarities between the HX and the MX Series machine's operation panel, watching this short video clip will reinforce the functions performed in the following exercises. Start the Video. (Find It Fast – Using the Controller) Upon completion of the Video, it will be time to participate in several practical exercises.

NOTE: The sequence of functions shown on the Video is not necessarily the sequence in which the functions will be taught in class.

Note to instructor: Have them go to the machine and do the following exercises on their own with you floating to answer any questions.

1.4.1 Powering Up the Machine & Centering the Hoop/Frame

The power switch is located along the front right side of the machine frame, just below the sewing area. After the machine is turned on, it is normal to center the frame or hoop that you will be using.

Training Exercise

1. *Select a 15cm hoop.*
2. *Wrap a rubberband around one arm on the side of the hoop, flip in the air and wrap around the opposite arm on the other side of the hoop creating an X in the center of the hoop with the rubberband.*
3. *Install the hoop onto the tubular arms.*
4. *Lift the power bar to turn on the machine.*
5. *Verify that the light next to the horizontal arrows (above the E key) is lit. If not, depress the E key to turn it on. When this light is on, the jog dials can be used to move the hoop left or right.*
6. *Rotate the inner jog dial clockwise for slow left-to-right movement. (The outer jog dial can be used for fast side-to-side adjustment.)*
7. *Rotate the inner jog dial counter-clockwise for slow right-to-left movement. (The outer jog dial can be used for fast side-to-side adjustment.)*
8. *Adjust as needed until the hoop/frame is approximately centered over the hole in the needle plate from left to right in relationship to the X of the rubberband.*
9. *Depress the E key and verify the light next to the vertical arrows (alongside the E key) is illuminated. When this light is on, the jog dials can be used to move the hoop front-to-back.*
10. *Rotate the inner jog dial clockwise for slow front-to-back movement. (The outer jog dial can be use for fast front-to-back adjustment.)*
11. *Rotate the inner jog dial counter-clockwise for slow back-to-front movement. (The outer jog dial can be use for fast back-to-front adjustment.)*

12. *Adjust as needed until the hoop/frame is approximately centered over the needle plate from front-to-back in relationship to the X of the rubber band. This is a crucial step because most all designs have a center origin and this helps prevent from sewing into the hoop.*

1.4.2 Writing A Design to Memory From A Floppy Disk

Design files can be stored in the memory of the machine. However, you must first transfer or “write” the file into the machine. Most embroiderers use Floppy Disks for transferring a design from the computer to their machine, but there is an optional serial cable you can purchase to send designs directly from your computer to the machine.

Training Exercise

1. *Insert the Disk Labeled HIC Training Disk #1 into the Floppy Disk Drive.*
2. *Press the A key once. You will see a list of machine functions to perform.*
3. *Using the Frame Position Arrow Keys, scroll down to 2 Data Input (FD). This means you are reading the designs that are on the floppy disk.*
4. *Press SET once. This is confirming that you want to read one of the designs that are on the floppy disk. Wait until you see the design names appear on the screen.*
5. *Rotate the inner jog dial until you have a green box around the design named TEAM.*
6. *Press SET once (you will see a picture and the design information appear. This is telling the machine that this is the design you wish to write to the machine memory and you will be directed to the machine’s memory window.*
7. *Press SET again. You will see a red box appear that reads “Are you ready? Yes → Set: No →E.” Press the SET key to confirm the location that the design will be written to the machine’s memory. It always selects the first available spot.*
8. *It will immediately direct you back to the main screen where you should see the design TEAM on the screen.*

1.4.3 Selecting the Needle Bar/Color Change Sequence

The needle bars drive the needles which do the sewing. Each needle bar is associated with a different color of thread. Thread number one is controlled by needle bar number

#1; thread number two is controlled by needle number two, etc. After a design is loaded, the operator must choose the sewing sequence for the needle bars to assure that the proper threads are sewn in the proper order. Color sequence information for a design can be found by viewing that design on your computer. You can also print out a design worksheet that contains this information for easy reference. (Design Worksheets are covered during the software training.)

The cones of thread start on the front right side on the first row working their way to the back then coming back up to the front to back again until reaching the end of the colors. The following is the sequence of the Tajima 1501.

15	12	9	6	3
14	11	8	5	2
13	10	7	4	1

1.4.4 Setting the Needle Bar Colors

You can set the needle bar colors to what is loaded on the machine to match the color scheme of your design. Once created, it will be the same for all designs loaded until you make any changes.

Training Exercise

- 1. Press the B key once. You should see a list of machine functions.*
- 2. Using the Frame Position Arrow Keys, scroll down to 10 Needle Bar Color.*
- 3. Press the SET key once. Needle #1 will automatically be selected. Using the Frame Position Arrow Keys, you can select the desired color from the color chart.*
- 4. Press SET once to confirm your desired color.*
- 5. When you are finished selecting your desired colors press the E key a box will come up and ask you are you ready, press the set key for yes this will keep the changes you made for your desired colors.*

The design **TEAM** has the following thread color sequence.

- Royal** (Indigo 1166)
- Yellow** (Straw 1083)
- Kelly** (St. Patrick's Green 1051)
- Black** (Jet Black 1000)
- White** (White 1001)
- Silver** (Nickel) 1011
- Red** (Strawberry 1147)

NOTE: The thread color name in parentheses is the official Madeira color name and number; be sure you know the color that you are using in the design and make a note of it on the design worksheet.

Training Exercise

1. *Find the needle bars associated with these colors and write them down next to the colors listed above.*
2. *Press the B key you will see a list of machine functions. Using the Frame Position Arrow Keys scroll down to needle bar selection press the set key.*
3. *Rotating the inner jog dial clockwise will select a higher number; rotating the inner jog dial counter-clockwise will select a lower number.*
4. *Rotate the inner jog dial to select the desired needle bar # associated with the Royal (Indigo) thread and press the SET key.*
5. *Rotating the inner jog dial go ahead and select the desired needle bar # associated with the rest of the colors in the design, pressing the SET key after each color.*

1.4.5 Manually Changing the Color/Selecting A Needle Bar

There will occasions where you wish to manually select a different Needle Bar than the one that is currently in operation. This is normally done when performing maintenance or **when preparing to center and/or trace a design**. The process is performed as follows:

Training Exercise

1. *Press "D1" once. It will automatically be set on Manual Color Change and you should see the current needle # on the right side.*
2. *Rotate the inner jog dial to #15.*
3. *Press SET. The machine head will move such that needle #15 is centered over the hole in your needle plate.*
4. *Rotate the inner jog dial to #1.*
5. *Press SET. The machine head will move such that needle #1 is now centered over the hole in your needle plate.*

1.4.6 Tracing A Design

The TRACE function will move the hoop/frame such that the outline of the design is traced in relationship to the Selected Needle (Needle #1 in this case). This will ensure that the design will fit within the hoop/frame.

Training Exercise

1. *Ensure that Needle #1 is selected and that Needle #1 is in the center of your hoop. (If not, perform the steps in section 1.4.5.)*
2. *Press the D1 key.*
3. *Use the Frame Position Down Arrow Key to select Trace.*
4. *Press Set.*
5. *Rotate inner jog dial to select frame travel speed (- Not to perform; Low Speed / High Speed).*
6. *Press SET once again and watch the hoop/frame will move such that the outline of the design is traced in relationship to Needle #1.*

NOTE: Use caution not to accidentally activate the beam sensor during the TRACE mode as this will cause the machine to stop in mid – cycle. (To correct this problem, press the Set button 1 time. Press the D button and scroll down to select Manual Origin Return. Turn the “-” to a “o” and press Set. This will return to the origin of the design.)

7. *Verify that the design fits within the parameters of the hoop. Needle #1 should not go closer than 1” to the inside parameter of the hoop.*
8. *If the design appears to be off-center, then perform steps 5 – 12 of section 1.4.1.*

1.4.7 Starting / Stopping The Machine

Once you are confident that the design is setup properly, simply press the START key to start sewing.

If you press and hold the Start key, the machine will continue to sew at a very slow speed (inching) until the start button is released. If for any reason you need to stop the machine, you can press the STOP key; break the beam sensor; or press the Emergency Stop Button and this will immediately stop the sewing process.

*****AT THIS POINT YOU ARE READY TO SEW. *****

1.4.8 Rotating the Design

In some cases it will be necessary to rotate the design such that it sews upside down. **This is always true for caps.**

Training Exercise

1. Press the "B" key once.
2. Using the Down Frame Position Arrow Key, scroll down to Data Conversion.
3. Press SET. Using the Frame Position Down arrow key scroll down to the third option 0~359.
4. Now rotate the inner jog dial to get to 180. The inner jog dial goes through the range slowly, while the outer jog dial goes through the same range rapidly.
5. Press SET – The design has been rotated 180 degrees and will sew upside down. To get back to the main screen press the E key two times and you will see your design upside down.
6. Press the "B" key once again.
7. Using the Down Frame Position Arrow Key, scroll down to Data Conversion.
8. Press the SET key. Using the Frame Position Down Arrow key scroll down to the third option 0~359.
9. Now rotate the inner jog dial to get back to 0.
10. Press the SET key the design is now back to the original orientation.

1.4.9 Reading A Design From Memory

Up to 256 designs or 2,000,000 stitches can be stored indefinitely in the machine memory as long as the CPU battery is charged by turning on the machine. However, most Embroidery Shops clear the memory at the end of each shift, though it's acceptable to store commonly used designs in the memory for easy retrieval.

Training Exercise

1. Press the "A" key one time.
2. IT will say Data Input Memory Press the SET key.
3. Rotate the inner jog dial until the green box is around the design named TEAM.
4. Press the SET button.
5. You will see a red box appear "Are you ready. Press SET again to confirm, "E" to cancel.

1.4.10 Manually Trimming the Tread

The machine can be used to manually trim the thread on the currently selected needle at any time. The trim sequence creates a lock stitch, trims the thread and pulls the excess up and out of the way.

Training Exercise

1. Press the "D1" key once.
2. Using the Down Frame Position Arrow Key, scroll down to Manual Thread Trimming.
3. Rotate the inner jog dial until "o" is selected.
4. Press the SET key to execute the manual thread trim.

1.4.11 Frame Forward / Frame Backward

This function will allow you to move the hoop/frame forward or backward through a design, by color or by stitches, without sewing. This is typically used only when a thread breakage has occurred or a certain section of a design needs to be re-sewn without having to sew the entire design. On the control panel above the display there is a series of letters/icons with lights underneath them (AS, FB, etc). When the machine is in the backward mode the green light is on. When the machine is in the forward mode the green light is off.

Training Exercise – Using the Red Stop Button

1. Press the C button once.
2. Use the Down Frame Position Arrow Key to scroll to Frame Back/Frame Forward. Press the set key.
3. Rotate the inner jog dial as needed to select “FF” (forward).
4. Press the SET once – ONLY ONCE.
5. Depress and hold the STOP key to verify that the machine starts moving through the design one stitch at a time in the forward direction. The motion will start slow, and then speed up as the automatic mode is engaged.
6. Release the STOP key and allow the machine to continue “stepping” for a few seconds and then press the STOP key to end the process.
7. Rotate the inner jog dial to select “FB” (backward).
8. Press the SET once – ONLY ONCE.
9. Depress and hold the STOP key to verify that the machine starts moving through the design one stitch at a time in the backward direction. The motion will start slow, and then speed up as the automatic mode is engaged.
10. Release the STOP key and allow the machine to continue “stepping” until it stops automatically. It went back to the beginning of the design.

Training Exercise – Using the F/B Control Settings

11. Press the C button once.
12. Use the Down Frame Position Arrow Key to scroll to Frame Back/Frame Forward.
13. Press SET.
14. Rotate the inner jog dial as needed to select the “FF” for forward.
15. Press Set.

To Move By Color Changes

16. Choose “FF” or “FB”.
17. Press SET.
18. Turn the inner jog dial to change “-“ to “o” next to “STOP CODE”.
19. Press SET.

To Move By Number of Stitches

20. Choose “FF” or “FB”.
21. Press SET .
22. Turn the inner jog dial to desired number of stitches.
23. Press SET.

To Move by 1/3/5 stitches at a time (great for take down after thread breakage)

24. Choose “FF” or “FB”.

25. Press SET.
26. Turn the inner job dial to select 1, 3, or 5.
27. Press SET.

1.4.12 Returning the Frame to the Design Start Point

There will be situations where the sewing process is stopped before the design is finished. In order to re-start the design from the beginning, you could use the Frame Backward Function to back up the design to the start, but this is time consuming. Instead, it is customary to use the Return Origin function to quickly move the frame back to the starting point of the design.

Training Exercise

1. In the previous exercise, the frame was left in a position that was several stitches into the design.
2. Press the "D1" key once.
3. Use the Down Frame Position Arrow Key and scroll down to Manual Origin Return.
4. Rotate the inner jog dial until "o" is selected.
5. Press the SET key. The frame will move back to the physical start point of the design.

NOTE: It does not reset the design back to the beginning stitch. To do this, you must reload the design again (section 1.4.9) or Frame Back to stitch #1 (section 1.4.11):

1.4.13 Deleting A Design From Memory

After you are finished using a particular design, you should delete it from memory of the machine in order to prevent unwanted memory overload. However, if the design is used on a regular basis, it is acceptable to leave it in the memory.

Training Exercise

1. Press the "A" key once.
2. Using the Down Frame Position Arrow Key, scroll down to "8 Memory Delete".
3. Press SET.
4. Make sure you are selected on ONE. Press SET again.
5. Rotate the inner jog dial until you have a green box around the design named TEAM.
6. Press the SET.
7. You will see a red box prompting "Are you ready?" Press SET to confirm, "E" to cancel.

1.4.14 Erasing All Embroidery Data In Memory

Rather than erasing one design at a time, you may desire to clear the entire memory at once. This is referred to as initializing the memory.

Training Exercise

1. Press the "A" key once.
2. Using the Down Frame Position Arrow Key, scroll down to "8 Memory Delete".
3. Press SET.
4. Change "ONE" to "ALL". With the inner jog dial. Press SET again. All designs in machine's memory will be erased.

1.4.15 Resetting the Stitch Counter/Design Timer

The control panel keeps a running total of stitches sewn. There are times when you may want to keep a running tally of the stitches that you sew in a day or a week for a particular job. The Design Timer will automatically reset when new design is loaded. To reset the counter to zero, perform the following steps:

Training Exercise

1. Press "C" once.
2. Using the Down Frame Position Arrow Keys, scroll to "2 – Total Stitch Counter/Design Timer".
3. Press SET.
4. Rotate the inner jog dial until it reads 0.
5. Press SET.

1.4.16 Common Error Codes

If the machine encounters an operational error or malfunction, it will indicate the reasons by displaying a code in the operation panel screen. Some of the common error codes are:

2CE	Beam Break while sewing. Press the E key, Then press START
291	Upper Thread Break. Fix thread break, press the Red Stop button a couple times to back up the design a few stitches, then press START
293	Bobbin thread break or bobbin has run out. Fix thread break, press the Red Stop button a couple of times to back up the design a few stitches, then press START.
211	Can't detect the fixed position. Perform a thread trim "ATH" (D – 2), need instructions, then press START.
BC4/B04	Error reading a disk. Ensure that disk is inserted properly and you wait until green light goes off. It may be necessary to record the design to a different disk.

SECTION 1.5 – ADJUSTING THE THREAD TENSION

Thread tension is one of the most critical elements of machine performance. In order to form a stitch correctly and ensure quality sewing, the amount of tension or drag placed on both the upper thread and the lower thread must be precise and balanced.

Think of the stitch process as a tug-of-war between the upper and lower threads. The desire is that neither overpowers the other. Too much tension on the upper thread or too little on the bobbin thread will result in bobbin thread being pulled up from below, such that it's visible in along the edges of the area being stitched. Too little tension on the top or too much on the bobbin thread leads to loops forming in the area being stitched.

For the beginner, setting thread tensions can be a frustrating chore, as adjustments will have to be made periodically depending upon sewing conditions.

The best way to learn how to set the thread tension is to perform the required steps. To see how this is performed, we will watch a short video clip about the process then actually perform it. This video is part of the HX1501 Machine Setup DVD.

While watching the video pay close attention to the following key components:

Tension Gauge
Tension Spring

Start the Video. (Quick Start – Adjusting Thread Tension)

Upon completion of the Video, your instructor will demonstrate for you and then it will be time to participate in a practical exercise.

NOTE: The video covers both the upper and lower thread tensions.

1.5.1 Setting the Lower Thread Tension

Each time you install a new bobbin, you must check the tension because different type garments have different characteristics so you may need to compensate for that. Also, the last 10% of a bobbin thread tends to have a rapidly changing degree of tension, so it's acceptable to discard the bobbin before it completely runs out, in order to avoid this problem.

NOTE: If dirt or lint builds up under the Thread Tension Spring on the bobbin case, it will cause the tension to be too loose, no matter how much the screw it tightened. It is good practice to inspect and clean the bobbin case each time you change out the bobbin.

Also note that an optional bobbin tension gauge can be purchased for your machine, the tension can be accurately set using what's known as the "drop test". Perform the following steps to learn this simple process:

Training Exercise

1. Remove the bobbin case from the rotary hook.
2. Unwind the bobbin thread from the pigtail, but do not remove it from under the tension spring.
3. Place the bobbin case, with the bobbin installed, in the palm of one hand. With the other hand grasp the end of the bobbin thread, and gently pull out about 12 inches of thread.
4. Gently lift up and suspend the bobbin case above the palm of your hand.
5. The bobbin should not drop, but remain suspended in the air about an inch above your hand.
6. Gently bob your wrist (hand holding the bobbin thread) and check that the bobbin drops a few inches then stops.
7. If the bobbin does not drop, then the tension is too tight. Adjust the tension screw (the larger one) on the **tension spring** counterclockwise to reduce the bobbin tension. If the bobbin drops freely, then the tension is too loose. Adjust the tension screw clockwise to increase the bobbin tension.

STOP – Have the Training Instructor inspect your results

8. Wrap the bobbin thread back around the pigtail and install the bobbin case into the rotary hook.

1.5.2 Setting the Upper Thread Tension

Each time you install a new cone of thread, you must check the tension for that specific thread. Also you may need to make some adjustments for different types of garments being sewn.

Training Exercise

1. Make sure that the upper thread path is correct and complete.
2. Pick up the **thread tension gauge** and hold it so that you can clearly see the numbers.
3. Verify the gauge is set to Zero. If not, turn the middle knob near the hook end of the gauge to unlock the gauge adjustment knob. Turn the inner knob until the red line is at the zero point. Adjust the middle knob to lock the adjustment knob in place.
4. Take the thread out from underneath the thread clamp just before it goes behind the hook above the eye of the needle.
5. Wrap the thread of Needle #1 around the hook at the end of the tension gauge in a way so that it won't slip.
6. Gently pull the gauge straight out, horizontally away from the machine with the numbers facing you. Pull no further than 2 feet.
7. The tension should read:
 - a. 100 – 130 grams for rayon thread
 - b. 110-150 grams for polyester thread
8. If the upper thread is too loose, adjust the #1 Tension and the Rotary Tension by twisting the knobs in a clockwise direction, which will increase the amount of tension.
9. Recheck the thread tension with the gauge.

10. *If the upper thread is too tight, adjust the #1 Tension and the Rotary Tension by twisting the control knobs in a counterclockwise direction, which will decrease the amount of tension.*
11. *Recheck the thread tension with the gauge.*
12. *Return the thread behind the thread clamp.*

STOP – Have the training instructor inspect the results.

1.5.3 The FOX Test

Once you have adjusted both the Upper and Lower Thread Tensions, you should perform the FOX test. This involves sewing the word FOX in 1” tall, block letters on a test sample of fabric. Upon completion, examine the backside of the embroidery. You should see 1/3 of Upper Thread on the left side, 1/3 of Lower Thread in the middle and 1/3 of Upper Thread on the right side – also referred to as the “thirds” test.

If there is more Lower Thread visible than Upper Thread, then the Upper Thread Tension is too tight or the Lower Thread Tension is too loose.

If there is more Upper Thread visible than Lower Thread, then the Upper Thread Tension is too loose, or the Lower Thread Tension is too tight. Different fabrics can affect the balance of the thread tensions, so it is customary to periodically review and adjust the thread tension when running a job.

Training Exercise

You will load the design from disk into memory, then set the thread colors, manually select needle #1, perform a trace and sew the design.

1. *Insert the Disk labeled HIC Training Disk #1 into the Floppy Disk Drive.*
2. *Press the DATA key.*
3. *Make sure that you have selected FD (Floppy Disk).*
4. *Press the SET key.*
5. *Use the UP and DOWN ARROW keys to find the design named FOX on the floppy disk.*
6. *Press the SET key.*
7. *This will transfer the design into the machine memory.*
8. *Load the proper Needle Bar/Color Change sequence. For this exercise, assume the FOX design has the following thread color sequence:
Needle 1
Needle 2
Needle 3*
9. *Press SET after the complete color sequence has been setup.*
10. *Select the 15cm hoop and hoop a piece of backing and felt. The Trainer will assist you with this. (Hooping will be covered in a later session.)*
11. *Install the 15cm hoop into the machine.*
12. *Ensure that Needle #1 is selected. Refer to Section 1.4.5.*
13. *Ensure that Needle #1 is in the center of the hoop. Refer to Section 1.4.1.*
14. *Press the D key 5 times until you see 5M_TRC, rotate the inner jog dial until you hear an audible beep and change the (-) to an (o).*
15. *Press set and be sure to stay clear of the beam sensor.*

16. *The hoop/frame will move such that the outline of the design is traced in relationship to the Selected Needle (Needle #1 in this case). Verify that the design fits within the parameters of the hoop.*
17. *Make sure there is at least 1" of space between the needle and all sides of the hoop.*
18. *Press the START key and the machine will begin running the FOX design, which will take several minutes to complete.*
19. *Upon completion, remove the hoop from the machine, turn it over and inspect the threads on the backside. You should see three parallel sections of thread, from left to right across each column as follows – Upper/Lower/Upper – in even thirds. The outer sections are composed of the upper thread, while the middle section is the bobbin thread. If they are balanced, the tension is ok. If not, it will have to be adjusted as follows:*

More Upper Thread than Bobbin Thread – Increase Upper Tension

More Bobbin Thread than Upper Thread – Reduce Upper Tension

SECTION 1.6 – CHANGING A NEEDLE

Sewing needles should be changed as needed and the old needle should be discarded so as not to mix old and new needles together. The lifespan of a needle is dependent on several factors including the type of fabric sewn on and the speed of the machine when sewing. Heavyweight fabrics like denim, canvas, caps, etc. will dull the needle quicker than lightweight fabrics like your t-shirts, piques, etc. Higher sewing speeds cause more friction causing the needle to heat up, which in turn can dull it quicker. There is no established frequency for changing out needles; some shops do it monthly, while others do it weekly.

There are a variety of needles available and different fabrics require the use of different needles. Your embroidery machine comes standard with 75/11 Sharp needles already installed.

1.6.1 Needle Orientation

There are two sides to a needle: front and back. To properly insert the needle, first locate the straight side with the long groove – this is the front. It should be facing you when it's inserted into the machine. The purpose of this groove is to guide the thread to the eye during the sewing process. The groove runs the entire length of the needle and its width is 40% of the needle width. This limits the maximum diameter of the sewing thread that can be used.

The back of the needle contains the “scarf”, which is a short indentation above the eye. Its purpose is to enable the bobbin hook to pass close to the centerline of the needle without actually touching the needle. The rotary hook contains the bobbin case and rotates around it while sewing.

Trainers Ref. Chapter 2, Section 2.7.3 - Needles

Training Exercise

- 1. Obtain a small flathead screwdriver from the machine toolbox.*
- 2. Slightly loosen the screw located just above needle #1 (where it inserts to the needle holder).*
- 3. Remove the needle by sliding it down through the presser foot.*
- 4. Hold the needle up and examine it. Notice the long groove – this is the front. Notice the cut out or indentation on the opposite side of the needle. This is the scarf, which is the back of the needle.*
- 5. Install the needle back into the machine. If you have needle grippers or hemostats available, use these to grip the needle while installing.*
- 6. Ensure that the long groove is facing the front.*
- 7. Tighten the needle screw.*
- 8. Place a white paper behind the needle to help you see the eye and verify that the needle is installed correctly. You should be able to see directly through the eye of the needle.*

SECTION 1.7 – BASIC MAINTENANCE

It is imperative that your embroidery machine get oiled and cleaned on a daily basis. The best time of the day to perform daily maintenance is before you begin using the machine each day. Don't oil at night. The machine should run after oiling so that the lubrication can work its way completely into the parts.

The best way to learn how to perform basic maintenance is to watch a short video clip. This video is part of the **HX1501 Machine Maintenance CD**.

Start the Video. (Find-It-Fast – Preventive Maintenance)

1.7.1 Cleaning the Machine

Wipe off the entire machine daily. Lint, dust, thread build-up, and a lock of oil can bring a 2000 pound embroidery machine to a halt. Also remove needle plate and with compressed air blow out the lint, dirt and thread build – ups.

1.7.2 Oiling the Rotary Hook

Place a single drop of oil at the bottom edge of the Rotary Hook using the pinpoint oiler and special sewing machine oil. The Rotary Hook should be re-oiled after every 4 hours of sewing time.

1.7.3 Oiling Via the Oil Ports

There are several other locations that should be oiled on a regular basis. These oil ports are marked in red. Refer to your Owner's Manual for location and frequency of oiling.

SECTION 1.8 – REVIEW AND TESTING

1. What is the safety device that stops the machine if you get too close to the needles during sewing?
 - A. Needle Plate
 - B. Bobbin Hook
 - C. Beam Sensor
 - D. Sewing Arm

2. Where is the bobbin located?
 - A. Inside the Needle Case
 - B. Inside the Rotary Hook
 - C. Inside the Tensioning Base
 - D. Inside the Pantograph

3. Improper Thread Tension can cause:
 - A. Poor quality sewing
 - B. Thread Breaks
 - C. Looping
 - D. All of the above

4. Before performing a Trace, you should always:
 - A. Check the upper thread tension
 - B. Change the bobbin
 - C. Center the Hoop & Manually select Needle #1
 - D. Oil the rotary hook

5. Bobbin Tension is checked by:
 - A. The drop test
 - B. A visual inspection of the rotary hook
 - C. Removing the needle plate
 - D. Changing the needle

6. Upper Thread Tension is checked by:
 - A. The drop test
 - B. A visual inspection of the upper thread path
 - C. Using a Thread Tension Gauge
 - D. Changing a needle

7. If the Thread Break Indicator Lamp is flashing red it means:
 - A. The machine needs to be oiled
 - B. It's time to change needles
 - C. The bobbin thread has broken or run out
 - D. The beam sensor has been activated

8. After the beam sensor has been activated, what button must be pressed before resuming sewing?
 - A. SET
 - B. STOP
 - C. F4
 - D. F1

9. How often should the Rotary Hook be oiled?
 - A. Once a year
 - B. Twice a day
 - C. Weekly
 - D. Once every 4 hours

10. If the Thread Break Indicator Lamp is solid red it means:
 - A. The machine needs to be oiled
 - B. The upper thread has broken or run out
 - C. It's time to change needles
 - D. The beam sensor has been activated