Technical Manual for
the CH 1
chenille peripheral

- Single Needle Chenille Head

Part Number 110171-01, Revision B

Melco
Embroidery Systems
A Company of Saurer Textile Systems
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General Index
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1. Introduction

Scope Of Manual

The CH 1 Chenille Peripheral Technical Manual is designed to provide you, the user, with information necessary to perform repairs beyond routine operator maintenance.

The Melco CH 1 Chenille Peripheral is one of several peripherals in Melco’s family of products. The CH 1 is designed for creating custom designs and lettering directly on garments or on separate patches. The CH 1 has seven different needle height settings which allow you to produce a wide range of multi-level chenille looks.

This technical manual is presented in four basic sections: 1) an overview of general information, 2) service adjustments, 3) mechanical disassembly and replacement of the major components, and 4) a theory of operation section.
Page Layout

The illustration below represents an open section of the manual. Each page is marked in the manner shown in the illustration. (Introductory and supplemental pages may be marked differently.)

A. Page number (chapter - page)
B. Major Heading
C. Minor Heading
D. Page number (chapter - page)
E. Chapter name
F. Manual part number and revision letter
G. Melco company name
H. Manual title

Lubrication

There are several important areas that must be lubricated.

The Rotary Hook
Standard Conventions Used In Manual

Throughout this manual several abbreviations and specific terms may be used. The following explains some of this terminology:

The terms "Chenille Peripheral" and "Sewing Peripheral" may both be used to identify the same item. The meaning of the two terms is identical.

When speaking of a "printed circuit board," the item may quite often be referred to as a "PCB."

The terms "X Beam", "Y Beam", "Beam", "Carriage", "Carriage Assembly" and "Pantograph" may all refer to the same general area. Specifically, the Pantograph consists of the Y Beam (the part that moves forward and backward) and the X Carriage (the part within the Y Beam that moves left and right, and to which the hoop is attached).

Certain procedures in the manual require actions such as pressing a certain key, or typing some letters at the computer keyboard. The following is a list of some of the more commonly used conventions found in this manual.

- To indicate a key on the computer keyboard, it is referred to as simply the key in question, for example: Press the Enter key to initiate the application.

- Square brackets around an all-caps word indicates a key on a peripheral keyboard. The same word without the brackets means a function or description is intended. An example is: 

"[ENTER]" indicates the ENTER key on the peripheral; and

"ENTER" means to perform the function meaning "to go into."

- Typing with the computer keyboard is referred to in BOLD letters, for example: Type: run and press Enter to start.

- To indicate that two keys must be pressed simultaneously the following conventions are used: with the computer keyboard, the first key to be pressed and held down is simply referred to, then the second key which needs to be pressed while the first key is held down is referred to after a comma, for example: Press Shift,8 to type an asterisk (*).

- To indicate two keys with the peripheral keyboard, the above holds true except there is no comma between the keys, for example: Press [ALT][⇒] to lower the needle height one level.
Occasionally in the manual, special attention by the user is required. In this situation, "attention getters" are used to indicate the need for the user to be aware of a situation that is above and beyond the normal or routine. Three standard attention getters are explained below:

**WARNING!**

This term is used to call to the users attention that the procedure following must be performed with care and accuracy to avoid possible danger or harm to the operator or other persons in the area.

This term is also used to announce important regulatory information.

**CAUTION!**

This term is used when the procedure following it may cause damage to the equipment if not properly performed by the user.

**NOTE:**

This term is used when additional information is required beyond the normal steps for communicating the information. It may be used to clarify certain portions of text or to call attention to other items previously mentioned or mentioned later in the procedure.

**Glossary Of Terms**

Several words or terms are used in this manual that are unique or specialized in use with the embroidery industry or Melco embroidery and chenille equipment. A glossary of these terms is located in the appendix section of the CH 1 Operation manual. Refer to that appendix for information on terms that may be unfamiliar to you.
Maintenance Philosophy

The maintenance philosophy used in this manual, and practiced at Melco, is to isolate potential problems with the system to a "practical" replacement assembly. Therefore, components are not replaced, but rather, a circuit board or a mechanical "assembly" may be replaced.

In the process of isolating problems in the machine, the person performing the troubleshooting must also practice good troubleshooting techniques. Good troubleshooting techniques include, but are not limited to, guarding against static electricity damaging machine components.

CAUTION! The CH 1 Chenille Peripheral electronics are sensitive to static electricity. To avoid possible damage to the equipment, Melco suggests that steps be taken to prevent static charges coming from personnel working on these machines. Therefore, Melco recommends that personnel utilize a static grounding strap when performing maintenance on the CH 1 electronics.

Warranty Considerations

Some areas of maintenance require factory trained personnel to assure proper service. If unauthorized personnel attempt to service these areas, the FACTORY WARRANTY MAY BE VOIDED.

Therefore, it is recommended that Melco factory trained personnel be consulted whenever the "FACTORY SERVICE ADVISED" statement is noted with a procedure.

Although areas marked specifically for factory service are subject to voiding the warranty if performed improperly, any service that is improperly performed may cause the warranty to be voided.
Configuring the CH 1

Occasionally during the operation of the CH 1, situations may arise when the peripheral software simply "locks up" or does not respond to the user input.

You may often recover from this type of situation by turning the chenille peripheral off, waiting for a moment, then turning it back on again. If cycling the power does not work, you most likely may fix the "lock up" by performing what is called "Configuring" (or Re-configuring) the unit.

Note: When this type of situation happens with a computer, you are usually asked to perform a "soft reboot" (Ctrl, Alt, Del), or push the reset button.

You must also configure the peripheral any time you install a new CPU (Central Processor Unit) PCB (Printed Circuit Board).

**NOTICE:** Re-configuring your CH 1 will also clear the power fail rescue function for the current situation.

There are three things that must be set in each CH 1 Chenille Peripheral before it is used in the Melco system for the first time.

**CAUTION! If the CH 1 is not configured with the correct Peripheral Program, it will not run properly, and may become damaged.**

First you must set the Peripheral Program. The CPU PCB used on the CH 1 Chenille Peripheral may also be used in other peripherals produced at Melco. Therefore, you must tell the CPU board what peripheral it is being used in. Configuration is initially set at the factory. If the CPU PCB is ever replaced, you must reconfigure the peripheral before using it again.

If for any reason the Peripheral Program is not set properly, or if you have replaced the CPU board, you should know how to set the Peripheral Program to avoid problems and possible damage to the unit.

The second configuration item is the network address (or Unit Number). The Unit Number must be set and be different for each peripheral attached to an EDS system or network. There may be up to 64 (16 if using EDS II software) total peripherals attached to any one computer, and each must have its own Unit Number. The number is selected from the peripheral keyboard and is between 1 and 64 (16 if using EDS II software).
The third and last configuration item is to choose if you want the Display Language to appear in English or Spanish.

The “configuration mode” in the CH 1 is accessed by pressing a certain keystroke combination while switching on the power. When the CH 1 is initially turned on, and any time you wish to change the configuration status of the machine, refer to the following steps:

**Configuration Procedure**

1. Before you turn on the CH 1 (or if the unit has not yet been "downloaded" by the EDS operating software), locate the 10-key keyboard (peripheral keyboard) and LCD (Liquid Crystal Display) in the upper right area of the peripheral unit.

2. Locate the power switch at the right rear of the unit. It is the rocker switch mounted in the Power Input Module, as Figure 1-1 below shows.

   **NOTE:** If the CH 1 is already on but the Peripheral Program has not yet downloaded (the program and unit number alternately show on the display), you can enter into the configuration mode without turning the machine off, then on again.

3. Find the 3 keys on the peripheral keyboard marked: [ALT], [Up Arrow], and [Down Arrow]. Press and hold all three keys at the same time.

4. While holding these three keys down, turn on the CH 1 by pressing the rocker switch to the ON position. Hold these keys depressed until the unit “beeps” and the display shows a message depicting the Peripheral Program currently selected.

   ![Figure 1-1](image-url)
The peripheral will now be in the “configuration mode,” and you can release the 3 keys.

NOTE: If the unit is already ON, but has not yet "downloaded," you need only to press and hold the 3 peripheral keyboard keys until the unit beeps to get into the configuration mode. Then proceed. You do not need to turn the CH 1 off, then on again.

When the CH 1 is in the “configuration mode,” you can set (or change) the Peripheral Program, Unit Number, and Display Language for the machine.

**Peripheral Program**
5. To set the Peripheral Program, simply press the [Up Arrow] or [Down Arrow] keys on the peripheral keyboard until the correct program shows on the display. The program specific to the CH 1 is: CH-1. After getting the proper program name showing on the display, press the [ENTER] key on the peripheral keyboard to "set" the program.

**Unit Number**
6. After the [ENTER] key is pressed the configuration item will go to the Unit Number selection. To select a Unit Number, again simply press the [Up Arrow] or [Down Arrow] keys on the peripheral keyboard until the desired Unit Number shows on the display. (You cannot have two peripherals with the same Unit Number.) After the desired number is showing on the display, press the [ENTER] key on the keyboard.

**Display Language**
7. The last item you may select in the configuration mode is the language used for showing the information in the display. Again, press the [Up Arrow] or [Down Arrow] keys on the peripheral keyboard until English or Spanish appears on the display.

8. After the desired language is showing on the display, press the [ENTER] key on the peripheral keyboard.

The CH 1 configuration is now complete.
2. Service Adjustments

General

This section of the manual provides detailed information for performing machine adjustments required during maintenance or parts replacement. The procedures are guidelines for performing service maintenance, and must be used by personnel practicing good maintenance technique. Good maintenance technique includes, but is not limited to, adhering to all precautions and safety considerations when working on the unit; and using the correct tools for the job being performed.

NOTE: Please note that some tools recommended for adjustments are not in the basic tool kit supplied by Melco and must be purchased separately.

It is recommended that some procedures in this section be performed by factory trained personnel to obtain best results. This reference is indicated by stating "FACTORY SERVICE ADVISED" at the start of the procedure.

Functional Arrangement

The CH 1 is functionally arranged into six areas: the Controller, the Keyboard, the Power Supply, the Carriage, the Chenille Head, and the Cabinet (yarn handling system).

![Figure 2-1 CH 1 Chenille Peripheral with Cabinet](image-url)
Drive Belt Tensions

"FACTORY SERVICE ADVISED"

CAUTION! Damage to the machine may result if belt tensions are improperly performed.

All drive belts require special procedures and tools for setting the proper tensions. If the tension settings are attempted without using the proper procedures and tools (and without proper training in some cases), machine components may be damaged. If a belt tension adjustment is needed, follow the procedure in the manual or, if "factory service is advised," contact your local factory trained service representative.

Using The Gates 5M Tensiometer

When using the Gates 5M Tensiometer refer to the instructions included with the tool. If the instructions are not available, refer to these directions:

1. Place the tool mid-range on the belt with the middle tab resting on outside edge of the belt.

2. Position the tool forward until the rear tab is touching the under side of the belt.

3. The forward tab will be above the belt but not touching it.

4. Pull the spring forward with your finger until the forward tab just touches the belt.

5. While the tool is in the position with the forward tab touching the belt, read the belt tension in pounds where the spring aligns on the scale.
Static Electricity / Grounding Strap Use

As with all computerized equipment, the CH 1 Chenille Peripheral is extremely sensitive to static electricity. Therefore it is essential that the following warnings and cautions be understood and followed. If there is any contents in these statements that is not understood, please contact the Melco technical representative in your local service area for assistance.

**WARNING!** It is very important that the CH 1 power cord be plugged into a properly wired electrical outlet. Failure to have a properly wired outlet may result in damage to the equipment and injury to personnel. It is recommended that a licensed electrician be consulted to assure that the electrical outlet is properly wired and grounded.

**CAUTION!** If a properly wired electrical outlet is not used for the source supply voltage to the Epicor System, electrical failures may result.

Any time work is performed inside the covered areas of the chenille peripheral, the person performing the work **MUST** be using a static grounding strap.

The grounding strap must be connected in the proper manner to insure the static charge on the persons body is neutralized to the chassis ground level of the chenille peripheral when working in the electronic areas under the covers.

**WARNING!** Failure to use a grounding strap, or failure to practice other good maintenance/repair techniques can cause damage to the machine and possible harm to personnel.

**DO NOT** attempt to use any grounding strap that is not specifically designed for static use. A "straight-wire" grounding device (one without built-in resistance) will place the operator in extreme danger of exposure to dangerous voltages. It is **ALSO RECOMMENDED** that the static strap be checked during daily use for proper resistance protection.
Figure 2-2, below, shows the recommended location for attaching the grounding strap when working inside the controller area of the CH 1.

After removing the controller cover (as described on the next page), locate the ground wire stud on the Z drive motor mounting bracket. This bracket is located directly behind the rear of the chenille head. The ground stud protrudes enough to allow the alligator clamp to be attached effectively. After placing the wristband over your wrist, attach the alligator clamp of the grounding strap to this ground wire stud (or any other metal which is proven to have chassis electrical ground level).

When working inside the area under the keyboard and display, attach the grounding strap to any metal which is proven to have chassis electrical ground level, but on that side of the machine.

**CAUTION! Always connect static control grounding straps to chassis (hardware) ground. NEVER use any ground connections on printed circuit boards.**
Removing The Covers

There are two covers at the rear of the machine, the controller cover and the keyboard cover (see Figure 2-3 below). These covers are attached to the machine with cover catches in the rear and angled tabs in front. The front angle tabs slip into slots at the rear edge of the sewing area. The rear cover catches lock the covers in place.

**Turn off the peripheral before removing any covers.**

To remove either cover, place a small bladed screw driver under the center of, first one locking tab at the rear, and then the other, and pry up. The cover comes off in one motion toward the front.

**Caution:** When the controller cover is removed, the CPU, the 4 axis driver, and the backplane boards are exposed. **DO NOT TOUCH THESE BOARDS WITHOUT USING ANTISTATIC PRECAUTIONS.**

**IMPORTANT:** Do Not operate the chenille peripheral with the controller cover removed. This cover provides the top of the EMI shielding for reducing RF interference. Operating the equipment without the shield (cover) can be a violation of FCC regulations.
**End Cap Removal**

The 2 end caps (or side panels) of the CH 1 are removable to gain access to the areas covered by each. The Y drive belts and adjustments for each are accessible only with the end caps removed.

There are 3 cap head screws that must be removed, and 2 cap head screws that must be loosened to remove each end cap (refer to Figure 2-4).

Remove the 3 horizontal cap head screws first, then loosen the 2 outer cap head screws.

![Figure 2 - 4](image-url)
Controller Section

Although no adjustments are performed inside the controller section of the CH 1, there are occasions when reference is directed to this section to monitor or measure the results of other adjustments.
Keyboard Section

Display Screen Intensity

Adjusting the intensity of the display in the keyboard/display assembly requires the removal of the keyboard cover to gain access to the adjusting potentiometer on the side of the keyboard printed circuit board. During the adjustment of the display intensity the CH 1 must be turned on so the result of the adjustment may be observed.

1. Refer to specific instructions for removing covers, then remove the keyboard cover.

NOTES: DO NOT lift the cover so far the display ribbon cable is pulled out. DO NOT allow the keyboard/display to come in contact with any portion of the machine that will short circuit any voltages. DO NOT touch the components on the printed circuit board.

2. Set the keyboard cover on the peripheral table top.

3. Install the static strap as explained in the specific instructions.

4. Locate the intensity adjustment pot on the right side of the printed circuit board as shown in Figure 2-5. (The pot may only be partially visible.)

5. Turn on the power switch to the CH 1.

6. Rotate the adjustment potentiometer clockwise to increase intensity on the display, or counterclockwise to decrease the intensity on the display.

7. After the desired intensity is obtained, reinstall the keyboard cover using the same precautions as before.
**Power Supply (5 Volt Setting)**

"FACTORY SERVICE ADVISED"

Note: This procedure requires the use of specific service tools: a Digital Voltmeter (DVM) and an insulated potentiometer adjustment tool.

The power supply for the CH 1 is located under the keyboard cover. The power supply is a sealed unit, and if it fails, the whole unit must be replaced. (See Section 3 for removal and replacement.) If a new power supply is installed, the +5 volt setting must be adjusted before using the machine.

1. Turn OFF the peripheral power and remove the power plug from the wall.

2. Refer to specific instructions for removing covers and remove the controller cover.

**CAUTION! Potentially dangerous voltages are present in and around the CPU. Use extreme care not to touch any printed circuit board components or short any components to each other or the chassis.**

3. Inside the controller section, locate the 4 axis driver board directly in front of the CPU PCB. This board has a row of test points near the top left area of the board. Set the DVM to the 10 Volt DC scale. Connect the DVM black test lead to test point TP12 (GND) and the red test lead to test point TP13 (+5v).
4. Refer to specific instructions for removing covers, then remove the keyboard cover, using care not to damage the keyboard ribbon cable.

5. Locate the adjustment potentiometer directly next to the connector block of the power supply (See Figure 2-7 below).

6. Turn ON the peripheral.

7. Using an insulated alignment tool, adjust the screw in the potentiometer to obtain a reading on the DVM between +5.00 and +5.05 volts DC.
Carriage Assembly

X Drive Belt Tension

Note: This procedure requires the use of a special service tool: a one pound weight.

1. Move the X carriage assembly all the way to the left of the beam until it mechanically stops.

2. Attach the Melco one pound fixture (p/n 995357-01) to the belt, midway between the X carriage assembly and the idler pulley assembly on the right end of the beam.

3. Measure the distance from the under side of the beam channel and the top of the belt where the 1 pound fixture is pulling it down.

4. The measurement should be 1 inch.

5. Tighten the socket head cap screw in the idler assembly clockwise to increase the belt tension (shorten the measurement).

   Loosen the socket head cap screw in the idler assembly counterclockwise to decrease the belt tension (lengthen the measurement).
Y Drive Belt Tension

Note: This procedure requires the use of a special service tool: the Gates 5M Tensiometer, available from Melco, part number 992165-01.

Caution: Over-tightening The Y Drive Belt Tension May Cause Irreparable Damage To The Chassis

1. Refer to specific instructions for removing covers, then remove both end cover to access the Y drive belts.

2. Move the Y carriage and beam all the way to the rear.

3. Properly attach the Gates 5M Tensiometer to the belt, midway between the beam and the idler pulley tensioning assembly and check the tension.

4. The tension scale should read 10 plus or minus 1/2 with the Gates tensiometer.

Figure 2 - 9
5. Adjust as described below, checking the tension with the tensiometer frequently until the proper value (10 ± 1/2) is measured.

   a) Tighten the belt tension screw at the front of the idler pulley bracket clockwise to increase the belt tension (shorten the measurement).

   b) Loosen the belt tension screw at the front of the idler pulley bracket counterclockwise to decrease the belt tension (lengthen the measurement).

6. Repeat the above procedure for both belts to ensure that they are "balanced" (tensioned the same).

7. Reinstall the covers that were removed earlier.
X Motor Belt Tension

Note: This procedure requires the use of a 0 to 20 pound pull gauge. This tool may be purchased locally in many hardware stores.

1. Loosen the four X motor screws enough to move the motor on the motor bracket.

2. Wrap a piece of small, strong cable or cord around the X motor drive pulley to the side of the belt nearest the motor.

3. Form loops in the ends of the cable or cord and hook a 0 to 20 pound pull gauge into the loops.

4. Pull straight up on the pull gauge until it reads 9 pounds.

5. While holding the pull gauge at the 9 pound reading, tighten the 4 motor screws to secure the motor with the belt tensioned at 9 pounds of pull.

6. Remove the cable or cord.

Figure 2 - 10
X Carriage Assembly Movement

1. Move the X carriage assembly to the middle of the beam.

2. Hold the beam secure, then grasp at one end, then the other, and push backward and forward seeking any movement of the X carriage inside the beam channel.

3. There should be no back and forth movement in the above step (however there will be up and down movement).
   
   a) If no back and forth movement is detected, locate the rectangular brackets with the small tabs at one corner on the under side of the X carriage, and insure the 2 socket head cap screws in each of the brackets are tightened.

   b) If there is movement, locate the rectangular bracket with the small tab at one corner on the under side of the X carriage at the end that appears loose. Loosen the 2 socket head cap screws in the bracket and push on the tab away from center of the carriage. This should take the back and forth play out of the X carriage assembly.

   NOTE: Too much pressure on the tab may "load" the roller bearings too tightly and cause the X carriage to bind during movement. Only push on the tab until you just feel carriage movement goes away, and do not put any additional pressure against it.

4. Tighten the 2 socket head cap screws.
5. Position the X carriage assembly to the left side of the beam.

6. Hook the 0 to 20 pound pull gauge onto the X carriage hoop holder actuator lever (see figure below).

![Diagram showing X carriage assembly and 0 to 20 pound pull gauge.]

7. Pull the pull gauge to the right slowly until the X carriage begins to move.

8. The pull gauge value should read no more than 4 pounds when the X carriage begins to move.

9. Continue to pull on the pull gauge through the entire movement of the X carriage to the right end of the beam.

10. If the gauge reads more than 4 pounds at any time, you must adjust the X carriage assembly slightly.

11. To adjust the X carriage, refer to Step 3 and loosen the 2 socket head cap screws in each of the brackets.

12. Next apply less pressure on the tabs than you did in Step 3b originally, and tighten the 2 screws again.

13. Check the X carriage movement with the pull gauge again as described in Steps 5 through 9.

14. When the pull is less than 4 pounds and the X carriage does not move back and forth in the beam channel, the adjustment is correct.
Chenille Sewing Head

General

Figure 2-13 shows several areas of the chenille head that may require adjustments over the life of the machine.

These adjustment areas are discussed in the following pages.

Z Encoder System Introduction

The ability to place stitches precisely at high speed is dependent on the accurate operation of the electronics and electro-mechanical assemblies. The "key" to this is the Z encoder. The information provided to the CPU and 4 axis driver by the Z encoder is the basis for the timing of much of the chenille head activity.

The Z Encoder is a two channel quadrature output with index pulse. If you send the output to an oscilloscope you will see two square wave signals, one slightly ahead of the other. You will also see a third signal, the index pulse. The CPU interprets these signals to determine position, speed, and head up.
The CPU uses this information to determine when to move the beam, when to stop the chenille head for a color change or height change, when setting home position is allowed, how fast the chenille head is running, how many stitches have been sewn, etc.

It is important for the technician to understand that the peripheral operational software handles the motor control circuitry differently when the Z axis is running than it does when the Z axis is stopped. When running, the motor control circuitry allows the X,Y, and Z axis motors only minute errors in rotation. Any error greater than the allowed error will cause the motor to be driven to eliminate the error. When the peripheral is stopped however, the software that controls the Z motor allows a larger "window" of error. The purpose of this window is to keep the motors from oscillating around the null, hunting for absolute position.

The green LED on the CPU, can be used by the technician to see if the CPU is in fact receiving a head up (or mark) pulse from the encoder (indicating that the encoder and associated cables are functional). It should be noted however, that "the headup LED does NOT have to be lit when the peripheral is stopped, and the LED CANNOT be used to make a determination of the Z encoder alignment status." If used in conjunction with the proper headup tool, the LED can be used to see if the head up pulse is triggering early or late as compared to absolute mechanical headup.

The use of the procedures described in the following pages will result in the most proper, accurate alignment and repair of the Z encoder system that is possible and or feasible for use in the field by a technician.

It can be seen that the proper alignment of the Z encoder can result in maintaining chenille quality and proper machine operation. Slight Z encoder misalignment can cause many kinds of erratic operation. A larger misalignment can be the cause of equipment damage and subsequent electronic or mechanical failures. The careful application of the Z encoder procedures by a factory trained technician will result in a machine that will operate correctly and reliably.
Z Encoder Inspection

"FACTORY SERVICE ADVISED"

This procedure is a guide for determining the condition of the optical encoder. If unauthorized personnel attempt to service this area, the FACTORY WARRANTY MAY BE VOIDED if the work is improperly performed and damage occurs.

Inspect the Z shaft encoder following the steps below. If the requirements of this process are not met, replace the encoder by following the Z Shaft Encoder Installation procedure in Section 3 of this manual.

1. Remove the controller cover and the Z motor cover.

**CAUTION!** It is important that the computer not download a design to the peripheral during this procedure. You may assure this by disabling the peripheral from the computer by disconnecting the network interface cable from the peripheral.

2. Disconnect the network interface cable from the rear of the CPU.

3. Turn on the CH 1 chenille peripheral.

4. Locate the 4 red LEDs and 1 green LED on the left side at the top of the CPU PCB (see Figure 2-14 below).

---

**Figure 2 - 14**
5. Rotate the chenille head manually in a clockwise direction from the rear of the machine. This rotation can be performed by rotating the shaft pulley that is driven by the motor belt (see Figure 2-15).

![Figure 2 - 15](image)

6. While slowly rotating the chenille head, check that the green LED blinks once each revolution (this is the "index" or "headup" mark).

7. Inspect the electrical connectors (encoder cable plug and encoder body) for loose wires, loose fits, and any visual damage. Clean connections and/or replace components as necessary.

If the "test" above fails or is in question, contact your local Melco service representative for advise. Refer to Section 3 of this manual for the installation procedure for a new Z shaft encoder.
Z Shaft Encoder Calibration

"FACTORY SERVICE ADVISED"

CAUTION! Failure to properly calibrate the Z shaft encoder after replacing it, may cause damage when attempting to operate the machine.

Note: This procedure requires the use of a special service tool: the Melco CH 1 head up setting fixture (p/n 001729-24).

1. Install the Z shaft encoder as described in Section 3 of this manual.

2. With the peripheral turned OFF, remove the electronic cover as described earlier in this manual. This will expose the row of LEDs along the top left of the CPU.

Note: To perform this procedure, it is important that the peripheral does not "download." To insure this condition remove the network cable (or boot disk if the disk drive option is installed).

3. With the network cable removed (or boot disk not inserted into a disk drive option), turn ON the peripheral.

4. Locate the green LED on the top left edge of the CPU. Most likely this LED will not be glowing. It is only supposed to glow for a 1 degree duration each revolution of the Z shaft encoder.

5. Remove the cap that is screwed into the top of the chenille head near the rear of the arm. Install the Melco CH 1 head up setting fixture (p/n 001729-24) into the threads where the cap was removed (see figure on the next page).

6. While gently pushing down on the fixture pin, slowly rotate the chenille head at the Z drive pulley until the pin inserts into the notch in the collar on the horizontal shaft. This is the "mechanical" head up position.

7. Now loosen the two encoder shaft coupler socket head cap screws at the chenille head Z shaft (see Figure 2-15) and slowly rotate the coupling in either direction until the green LED glows.

8. When the green LED is glowing, tighten one of the encoder coupler socket head cap screws to the chenille head Z shaft.
9. Remove the head up fixture and replace the threaded cap removed earlier.

10. Rotate the Z shaft until you can tighten the second socket head cap screw on the encoder coupling to the Z shaft.

11. Turn the peripheral OFF and attach the network cable.

12. Turn the peripheral ON again and allow its program to download.

13. Go to the head timing menu and check that when the chenille head is brought to head up, that the green LED on the CPU glows within plus or minus 1.5 degrees of rotation.

14. Turn the peripheral off and reinstall all covers removed during this procedure.
Chenille Nipple Height

"FACTORY SERVICE ADVISED"

Nipple height is factory adjusted to approximately 0.005 inch above the needle plate. To further adjust the nipple height refer to the following steps:

1. Remove the Front Head Cover.
2. Go to the Head Timing Menu.
3. Press the [ALT]+[LEFT ARROW] keys, to turn head one revolution.
4. Press the [ALT]+[DOWN ARROW] keys, display should read "NEEDLE DEPTH."
5. Loosen nipple bell crank eccentric pin set screw 1/2 turn. Be careful not to remove the set screw.
6. Place a .005 inch feeler gauge between the nipple and the needle plate.
7. Install a small diameter allen driver into the set screw hole and rotate the eccentric pin until the nipple contacts the feeler gauge.
8. This will set the Nipple height to be .005" +/- .001".
9. Tighten the set screw.

10. Go To "Head Up".

11. Replace the Front Head Cover.
Nipple Pressure Tube Adjustment

"FACTORY SERVICE ADVISED"

CAUTION! The nipple upper pressure tube stop is factory adjusted. If further adjustment is attempted by untrained personnel, overall deterioration of the chenille stitching quality may result!

If you choose to further adjust the stop after reading the above caution, refer to the following steps:

1. Go To "Head Up"
2. Remove Needle Assembly.
3. Locate the Nipple Tube Stop Screw and Locking Lever (see figure below).
4. Loosen the Locking Lever (gently push back towards the rear).
5. Loosen the Nipple Tube Stop Screw (CCW).
6. Place a .030" feeler gage between the Nipple Tube Bushing and the step on the Needle Rotation Shaft (under the Front Horizontal Bevel Gear).
7. Raise or lower the nipple bushing using the Stop Screw.
8. When the gap is properly adjusted, tighten the locking lever (pull forward until lever is snug DO NOT over tighten).

Figure 2 - 18
Presser Foot/Nipple Lifting Lever Adjustment

"FACTORY SERVICE ADVISED"

The presser foot/nipple lifting lever is factory adjusted. To further adjust the lever refer to the following steps:

1. Remove the Front Head Cover.
2. Lift the Presser Foot/Nipple Assembly (push the Nipple Lever down).
3. Loosen the Upper Lever Mounting Screw, about 1/2 turn.
4. Raise the Lever and loosen the Lower Lever Mounting Screw, about 1/2 turn.
5. Lift up on the Lifting Lever Mounting Block.
6. Lift up on the Lifting Lever Arm until it stops moving.
7. While holding the Lifting Lever Arm, lower the Lifting Lever Block until it just touches the Arm.
8. Tighten the Lower Mounting Block Screw.
9. Press the Lifting Lever down and tighten the Upper Mounting Block Screw.
10. Refer to the presser foot detection switch adjustment on the next page.
11. Replace the Front Head Cover.

Figure 2 - 19
**Presser Foot Detection Switches**

"FACTORY SERVICE ADVISED"

1. Remove the Front Head Cover.

2. To adjust the "lower switch" (presser foot up), loosen the mounting screws attaching the switch to the Lifting Lever mounting block.

3. Push the Lifting Lever DOWN.

4. Adjust the switch until it actuates by contact with the lever (a click may be heard when the actuation is made).

5. Tighten the switch mounting screws.

6. To adjust "upper switch" (presser foot down), loosen the switch mounting screws.

7. Push the Lifting Lever UP, and adjust the switch until actuation is made by contact with the lever (a click may be heard when the actuation is made).

8. Tighten the switch mounting screws.

9. Replace the Head Cover.

**Figure 2 - 20**

![Diagram of Presser Foot Detection Switches](image-url)
Presser Foot Height

"FACTORY SERVICE ADVISED"

To adjust presser foot height, refer to the following procedure:

1. Raise the Lifting Lever to move the presser foot to its full down position.

2. With the machine ON, go to the head timing menu, make one revolution, then turn the machine OFF.

3. Remove the Front Head Cover.

4. Check that the Presser Foot is fully seated into the Presser Foot Arm and that the wing nut is tightly securing it.

5. With a feeler gauge, measure for a .050 inch clearance between the Presser Foot teeth and the Needle Plate.

6. If adjustment is required, loosen the lower set screw in the flexible coupling and reposition the presser foot arm to obtain the .050 inch dimension.

NOTE: Ensure the presser foot assembly does not rotate during the height adjustment causing the nipple to be out of the center of the presser foot.

7. Retighten the set screw to lock the presser foot assembly in its new height position.
**Presser Foot Pressure**

A "fine tuning" adjustment for presser foot height (or sometimes called presser foot pressure) can be performed by rotating the Presser Foot Bell Crank Eccentric Pin to make slight vertical movements in the presser foot assembly.

1. Lower the Lifting Lever to gain access to the Presser Foot Bell Crank Eccentric Pin Set Screw through the hole in the mounting block (see figure below).

2. Slightly loosen the Presser Foot Bell Crank Eccentric Pin Set Screw.

3. Raise the Lifting Lever.

4. Hold the Presser Foot, and rotate the Eccentric Pin to vary the height gap around the .050 inch dimension.

5. Lower the Lifting Lever.

6. Tighten the Pressure Foot Bell Crank eccentric pin set screw.
Presser Foot Solenoid

"FACTORY SERVICE ADVISED"

1. Remove the Front Head Cover.

2. Remove the Head Side Cover.

3. Loosen the Solenoid Retaining Screws.

4. With solenoid loose push the solenoid forward until the solenoid plunger cap just makes contact with the rear end of the Stop Shaft.

5. Tighten the retaining screws.

6. Raise the Lifting Lever.

7. Observe that the Stop Shaft engages the Presser Foot Bell Crank when the solenoid energizes.

8. Replace the Front and Side Covers.

Figure 2 - 23
"FACTORY SERVICE ADVISED"

1. Remove the controller section cover, the Z drive cover, the front head cover, and the side head cover.

2. Disconnect the network cable going into the CPU so the machine will not "download" when it is turned on.

3. Turn the CH 1 ON.

4. Rotate the Z drive pulley until the green "head-up" LED on the upper left edge of the CPU PCB (rear board in the controller section) is glowing. This indicates that the chenille head is at the head up position.

5. Rotate the theta motor belt until the green "theta index" LED on the upper right edge of the 4 axis PCB (front board in the controller section) is glowing. This indicates that the chenille theta motor is at the electronic theta position.

6. Position the theta shaft coupling with both cap head screws accessible for tightening.

7. Check that the two green LEDs are still illuminated, then tighten the rear theta shaft coupling cap head screw.
8. Rotate the needle height adjustment mechanism until the actuator end of the lock plate is pointing toward the rear of the machine. Align this end "square" to the front of the linear actuator block. (See Figure 2-28 in the Linear Actuator Adjustment procedure).

9. Again, check that the two green LEDs are illuminated, then tighten the forward cap head screw in the theta shaft coupling.
**Theta Motor Belt**

The theta motor belt is adjusted for as tight as possible while still allowing for free, smooth movement of the theta drive system.

1. Turn the machine OFF and remove the chenille head right side cover.

NOTE: During the steps below, the theta motor shaft must remain parallel with the theta shaft at all times.

2. With the theta motor mounting screws slightly loosened, push the motor downward to draw the belt taut.

3. While holding the motor downward, rotate the vertical theta shaft at the rear of the head.

4. Apply downward pressure on the motor while rotating the theta shaft until you feel a slight bind in the theta drive system.

5. Release the pressure on the motor slightly and continue to rotate the theta drive system until there is no longer any binding.

6. Tighten the 4 theta motor mounting screws and recheck the theta drive system for bind-free and smooth operation.

7. Readjust as needed to obtain the desired belt tension.

8. Replace the cover removed earlier.
Theta Bevel Gear Mesh Adjustment

**CAUTION! Turn OFF the peripheral power before making the gear mesh adjustments.**

The bevel gears at the ends of each of the theta drive shafts must engage with a sound mechanical union. The coupling relationship between these gears is called the gear mesh.

The gear mesh must be tight enough to avoid excess "backlash" between the gears, while not binding.

To adjust the gear mesh, reposition the collar located against the front side of the casting which holds the rear bushing on the horizontal theta shaft.

When adjusted properly (approximately .003 to .005 inch gear spacing), you should be able to "feel" the free movement between the mating gears, while you may not be able to "see" the movement.
Looper Hole Position/Looper Timing

NOTE: This procedure requires the use of the Melco Looper Fixture, part number 001728-01.

CAUTION! The following adjustment must only be performed when the sewing head is set at both the proper "Head Up" and "Theta Index" positions.

1. Locate the position of the Looper Drive Gear Retaining Collar Set Screws (see Figure 2-25).

2. If one of the set screws is not accessible (located near the top):
   a) Turn OFF the Machine.
   b) With the power OFF rotate the Looper Drive Gear by hand to access the set screw.
   c) Loosen the set screw.

3. To access the second screw:
   a) Turn the machine ON. The head rotates one revolution at power up, this should make the second set screw accessible.
   b) Hold the Looper Drive Gear in place and loosen the second set screw.

4. Lift the presser foot and nipple. (Press DOWN on the Lifting Lever.)

5. Remove the Needle Plate to expose the Looper (see Figure 2-26).

6. Rotate the Looper Drive Gear by hand until the Looper Hole is at approximately 110 degrees as shown in Figure 2-26.

NOTE: You may have to remove the nipple to use the Looper Setting Fixture in the following steps.
7. Using the Melco Looper Setting Fixture (part number 001728-01, available through Melco service parts) place the three pins of the side stamped (B) into the needle plate attaching hole and the two looper holes as shown in Figure 2-26.

DO NOT force the fixture!

8. If the fixture does not line up exactly with the holes, adjust the looper hole by carefully twisting the Looper Drive Gear back and forth until the fixture fits into all three holes. Also check that you are using the (B) side of the fixture.

9. While holding the fixture in place, rotate the Looper Drive Gear until the "knurled" edge of the Drive Gear is even with the front edge of the bed casting.

10. Tighten the accessible looper drive gear set screw snugly, DO NOT OVERTIGHTEN.

11. Remove the Looper Setting Fixture and reinstall the nipple if remove earlier to use the fixture.

12. To tighten the second looper drive gear set screw turn off the peripheral and rotate the looper drive gear by hand to access the screw. Tighten the screw snugly without overtightening.
Linear Actuator Adjustment

"FACTORY SERVICE ADVISED"

The linear actuator is adjusted to disengage the height adjustment lock plate "just" enough to allow the needle bar to rotate inside the mechanism. It is assumed that the technician performing this procedure is factory trained and understands the interrelationship of the various head parts. After removing the front cover of the sewing head, refer to the following steps.

1. With the machine OFF, remove the front head cover and the right side head cover.

2. Locate the theta motor power harness in-line connector, and disconnect it.

3. Turn the machine ON.

4. Loosen the linear actuator mounting bracket screws to allow the linear actuator assembly to be repositioned.

5. Press the [ALT] and [MENU] keys until the NEEDLE MENU is on the display. Then press [ENTER]. The display will read "go to height 1:4."

6. Press [UP ARROW] once for the display to read ENGAGE/DISENGAGE.
7. Press [ENTER] to "engage" the linear actuator (the block will come out of the guide bracket).

8. Hold the linear actuator mount and assembly flat against the head as you center it left and right with the height adjustment mechanism.

9. Rotate the height adjustment mechanism until the actuator end of the lock plate is pointing toward the rear of the machine. Align this end "square" to the front of the linear actuator block.

10. Continue to hold the linear actuator mounting bracket flat to the head when performing the next steps.

11. Slide the "engaged" linear actuator assembly (keeping it flat against the head) toward the front of the machine, engaging the height adjustment lock plate.

12. Move the lock plate with the actuator assembly until it slides far enough to allow the needle bar to be rotated within the height adjustment mechanism.

   At the point the needle bar is released to rotate, slide the linear actuator assembly and height adjustment lock plate "just" a little farther.

13. Tighten the linear actuator mounting bracket screws while holding the linear actuator mount and assembly flat against the head.

14. Turn the machine OFF and reattach the theta motor power harness.

15. Reinstall the covers removed earlier and test the machine for proper actuator adjustment. Readjust as necessary.
**Z Drive Belt Tensioning**

"FACTORY SERVICE ADVISED"

The tensioning of the Z drive belt requires a "modified" L-shaped 6mm hex wrench and a Gates 5M belt tensiometer (p/n 992165-01). To modify the hex wrench, cut the shorter arm of the wrench to approximately 3/8" in length to allow access to the motor mount mounting/adjusting screws. This procedure assumes that machine power is off and the Z axis components are "accessible."

1. Properly attach the Gates 5M Tensiometer onto the drive belt mid-way between the motor pulley and head drive pulley/Shaft assembly pulley.

2. Verify the belt tension measures 6-7 pounds with the tensiometer.

3. To adjust, follow steps (a) through (c) below:

   a) Using a modified hex wrench, loosen the Z motor mounting/adjusting screws just enough to allow movement of the motor mount in a vertical plane.

   b) Move the Z motor in the appropriate direction to increase or decrease belt tension to obtain a reading of 6-7 on the tensiometer.

   c) Tighten the motor mount mounting/adjusting screws.

4. Perform steps (1) through (2) to check belt tension.
Cabinet Section

Yarn Tensioner And Pretensioners

The yarn tensioner and pretensioners are preset at the factory to a nominal tension. Some readjustment will most likely be required to obtain proper tensions because of the variables that exist with yarn characteristics.

Rotate the tensioner or pretensioner knob clockwise to increase tension, counterclockwise to decrease tension.

Refer to the CH 1 Operation Manual for complete information on proper yarn threading and tension adjustments.
**Tensioner Check Spring Adjustment**

The tensioner check spring must be adjusted whenever you remove or replace the check spring or the entire tensioner assembly.

1. Position the tensioner assembly into the mounting bracket.

2. With the set screw in the top of the mounting bracket slightly loosened, rotate the tensioner assembly to the position where the check spring is just touching the left side of the thread break contact (brass post). (See Figure 2-30.)

3. Observe the position of the check spring, then rotate the tensioner assembly clockwise at least the distance of the diameter of the contact post. Do not go farther than 1/4 turn (90 degrees).

4. Tighten the set screw in the top of the tensioner bracket.

---

**Figure 2 - 30**

[Diagram showing tensioner components and adjustment range]
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3. Mechanical Disassembly

General

This section of the manual provides detailed information for performing parts replacements that may be required during the life of the product. The procedures are guidelines for performing repair maintenance; and must be used by personnel practicing good maintenance and repair technique. Good maintenance technique includes, but is not limited to, adhering to all precautions and safety considerations when working on the unit; and using the correct tools for the job being performed.

With certain areas in this section it is recommended that the procedure be performed by a factory trained technician. This reference is indicated by stating "FACTORY SERVICE ADVISED" at the start of the procedure.

WARNING! Failure to practice good maintenance and repair technique may result in injury to personnel performing the work, and damage to the equipment!

NOTE: The Epicor System Warranty is exclusive of, and may be VOID if, poor maintenance practices have caused damage to the equipment.
Static Electricity / Grounding Strap Use

As with all computerized equipment, the CH 1 Chenille Peripheral is extremely sensitive to static electricity. Therefore it is essential that the following warnings and cautions be understood and followed. If there is any contents in these statements that is not understood, please contact the Melco technical representative in your local service area for assistance.

**WARNING!** It is very important that the CH 1 power cord be plugged into a properly wired electrical outlet. Failure to have a properly wired outlet may result in damage to the equipment and injury to personnel. It is recommended that a licensed electrician be consulted to assure that the electrical outlet is properly wired and grounded.

**CAUTION!** If a properly wired electrical outlet is not used for the source supply voltage to the Epicor System, electrical failures may result.

Any time work is performed inside the covered areas of the chenille peripheral, the person performing the work **MUST** be using a static grounding strap.

The grounding strap must be connected in the proper manner to insure the static charge on the persons body is neutralized to the chassis ground level of the chenille peripheral when working in the electronic areas under the covers.

**WARNING!** Failure to use a grounding strap, or failure to practice other good maintenance/repair techniques can cause damage to the machine and possible harm to personnel.

**DO NOT** attempt to use any grounding strap that is not specifically designed for static use. A "straight-wire" grounding device (one without built-in resistance) will place the operator in extreme danger of exposure to dangerous voltages. It is **ALSO RECOMMENDED** that the static strap be checked during daily use for proper resistance protection.
Figure 3-1, below, shows the recommended location for attaching the grounding strap when working inside the controller area of the CH 1.

After removing the controller cover (as described on the next page), locate the ground wire stud on the Z drive motor mounting bracket. This bracket is located directly behind the rear of the chenille head. The ground stud protrudes enough to allow the alligator clamp to be attached effectively. After placing the wristband over your wrist, attach the alligator clamp of the grounding strap to this ground wire stud (or any other metal which is proven to have chassis electrical ground level).

When working inside the area under the keyboard and display, attach the grounding strap to any metal which is proven to have chassis electrical ground level, but on that side of the machine.

CAUTION! Always connect static control grounding straps to chassis (hardware) ground. NEVER use any ground connections on printed circuit boards.
Removing The Covers

There are two covers at the rear of the machine, the controller cover and the keyboard cover (see Figure 3-2 below). These covers are attached to the machine with cover catches in the rear and angled tabs in front. The front angle tabs slip into slots at the rear edge of the sewing area. The rear cover catches lock the covers in place.

**Turn off the peripheral before removing any covers.**

To remove either cover, place a small bladed screw driver under the center of, first one locking tab at the rear, and then the other, and pry up. The cover comes off in one motion toward the front.

Caution: When the controller cover is removed, the CPU, the 4 axis driver, and the backplane boards are exposed. DO NOT TOUCH THESE BOARDS WITHOUT USING ANTISTATIC PRECAUTIONS.

**IMPORTANT:** Do Not operate the chenille peripheral with the controller cover removed. This cover provides the top of the EMI shielding for reducing RF interference. Operating the equipment without the shield (cover) can be a violation of FCC regulations.
End Cap Removal

The 2 end caps (or side panels) of the CH 1 are removable to gain access to the areas covered by each. The Y drive belts and adjustments for each are accessible only with the end caps removed.

There are 3 cap head screws that must be removed, and 2 cap head screws that must be loosened to remove each end cap (refer to Figure 3-3).

Remove the 3 horizontal cap head screws first, then loosen the 2 outer cap head screws.

![Figure 3-3](image-url)
Controller Section

Replacing the CPU PCB and 4 Axis Driver Board

**CAUTION!** In removing any PCBs from the CH 1, use extreme care in handling. Portions of the boards are very sensitive to static charges and handling them must be done using a static grounding strap as instructed in specific procedures in this manual.

The CPU PCB and the 4 axis driver board are positioned inside the controller area of the peripheral (see Figure 3-4).

To replace either of these assemblies requires the removal (or at least partial removal) of the other. Refer to the following procedure for the replacement of either assembly.

**TURN THE MACHINE POWER OFF AND DISCONNECT THE POWER CORD FROM THE POWER SOURCE!**

1. Remove the controller cover and set up a proper static grounding strap arrangement as described in an earlier procedure in this section.

2. Refer to Figure 3-5 on the next page, then remove the ground cable and associated hardware from the middle front of the RFI shielding panel located inside the controller opening just in front of the 4 axis driver board.
3. Grasp the RFI shielding panel at the top and pull it out of the controller opening.

4. Disconnect the Z motor harness at the top right hand corner of board 4 axis driver board.

5. Disconnect the Z encoder cable at the top right hand corner of the CPU.

6. Disconnect the network cable, and terminator (if present) from the rear of the peripheral at the CPU card edge mounting bracket.

7. Disconnect the 26 pin interface cable connected at the bottom left of the 4 axis driver board.

8. Remove the screws and washers at the card edge mounting brackets (near the chenille head) for the CPU and 4 axis driver board.

9. Grasp the 4 axis driver board at the top corners and gently rock it up and out of its card edge connectors in the bottom backplane board.

Do not attempt to remove the 4 axis driver board at this time.
10. Grasp the CPU at the top corners and gently rock it out of its connectors in the backplane board.

11. Remove the CPU from the controller section, using care not to catch the 26 pin interface ribbon cable on any 4 axis driver board components.

12. Move the 4 axis driver board to the rear of the controller section so the ejection levers on the connector in the card edge mounting bracket will clear the chassis bracket when the board is removed.

13. Carefully remove the 4 axis driver board from the controller section.

14. Replace the 4 axis driver board, then the CPU PCB, in that order by reversing the previous steps.
   a) Insert the 4 axis driver board into the controller section and position it forward without installing it in the backplane board.
   b) Insure the 26 pin interface cable is securely connected to the bottom left of the CPU PCB.
   c) Lift the 4 axis driver board slightly, then carefully lower the CPU into the card edge connectors of the backplane board. Make sure the 26 pin interface cable routes itself under the 4 axis driver board.
   d) Insert the 4 axis driver board into the card edge connectors of the backplane board.

15. Install the screws and washers at the card edge mounting brackets to secure the CPU PCB and 4 axis driver board.

16. Connect the 26 pin interface cable connection to the bottom left of the 4 axis driver board.

17. Reconnect the Z motor harness at the top right corner of the 4 axis driver board.

18. Reconnect the Z encoder cable at the top right corner of the CPU.

19. Reinstall the network cable, and terminator (if present) to the rear of the peripheral at the CPU card edge mounting bracket.

20. Reinstall the RFI shielding panel in front of the 4 axis driver board in the controller section.
21. Reinstall the ground cable and associated hardware at the middle front of the RFI shielding panel.

22. Replace the controller cover.

23. If during this procedure, the CPU has been replaced with a different one, you must "configure" the chenille peripheral. Refer to Section 1 of this manual for information regarding the configuration process.
**Backplane PCB Replacement**

The backplane PCB sits on bottom of the controller section, and contains the connector where both the CPU and 4 axis driver PCBs are inserted.

1. To remove and replace the backplane PCB, first remove the controller cover, the RFI shielding wall, and CPU PCB & 4 axis driver board as earlier described. (Refer to the previous section titled Replacing the CPU PCB and 4 Axis Driver Board.)

2. Disconnect the cables from the backplane PCB and remove the 6 screws holding the PCB to the base of the controller section (see figure below).

3. Lift the PCB out of the controller section.

4. Replace the backplane PCB using the previous steps in reverse.
Keyboard Section

Keyboard/Display Replacement

To remove the keyboard/display assembly from the cover, refer to Figure 3-7 and the following procedure:

1. Turn off the power switch to the CH 1 and remove the power cord from the power source electrical outlet and the rear of the machine.

2. Remove the keyboard cover (refer to specific instructions) and carefully slide the flat ribbon cable off the keyboard PCB edge connector.

3. Place the cover (with keyboard/display assembly) onto a surface which is free of static electricity.

4. Install a static grounding strap between the working surface and the personnel performing this procedure. Refer to the Figure 3-7 to perform the next steps.

5. Locate and loosen the two screws (indicated in Figure 3-7) that secure the PCB at the top.

6. Locate and remove the two screws that secure the PCB near the bottom as indicated in the figure.

NOTE: Locate the nylon insulating washer under the head of the left screw as shown in the figure. This washer must be reinstalled with a new PCB to avoid the possibility of causing electrical circuit damage.
7. Remove the PCB from the keyboard cover. Lift at the bottom and the top will follow.

8. Transfer the key caps from the old PCB to the new PCB by simply lifting them off of the keys by using finger pressure only. It is recommended that this be done one key at a time to avoid errors in key cap arrangement on the new PCB.

9. When the key caps are transferred, reinstall the keyboard/display assembly by reversing the preceding steps. Insure that the nylon insulating washer is installed under the left screw on the PCB.

Refer to the Adjustment Section of this manual for information in adjusting the intensity of the display, if required.
**Power Supply Replacement**

1. Turn OFF the peripheral, and unplug the power cord from the source.

2. Remove the keyboard cover. Disconnect the keyboard ribbon cable, and set the cover aside.

3. Disconnect the power distribution cable from the connector on the power supply.

4. Remove the two cap head screws (one on each side of the power supply at the rear). These 2 screws hold the mounting bracket to the chassis.

5. Remove the 4 phillips screws holding the mounting plate to the power supply.

6. Remove the mounting bracket from the chassis by swinging the bottom of the mounting bracket away from the chassis and pulling down.

![Power Supply Replacement Diagram](Image)

**Figure 3 - 8**
7. Slide the power supply partially out of the slot and disconnect the power harness from the power supply.

8. Remove the grounding cables and hardware attaching them to the power supply.

9. Grasp the power supply and slide it out of the rear cutout in the chassis.

10. Put the new power supply partially into place in the rear of the chassis.

11. Attach both of the grounding cables to the new power supply with the existing hardware.

12. Re-attach the power harness to the new power supply connector, then push the power supply all the way into the chassis.
13. Insert the bottom end into the cutout slot on the chassis, then push the top part of the bracket toward the chassis and pull it up into proper position.

14. Install the power supply to the mounting bracket with the four screws removed earlier.

15. Attach the mounting bracket to the bottom of the chassis with the 2 cap head screws that were removed earlier.

16. Attach the power cord to the new power supply.

Refer to the Adjustments section of this manual to check and adjust (if needed) the +5 volt value.
Y Drive Motor Replacement

"FACTORY SERVICE ADVISED"

NOTE: When replacing the Y drive motor, the drive belt tension adjustment is very sensitive and may cause damage to the peripheral chassis if not performed properly.

To replace the Y drive motor, refer to the following procedure:

1. Turn off the power switch to the CH 1 and remove the power cord from the power source electrical outlet and the rear of the machine.

2. Remove the keyboard cover (refer to specific instructions for removal).

3. Refer to the previous procedure for removing the power supply, if you must remove the Y motor mounting bracket.

4. Refer to Figure 3-10 and disconnect the encoder harness (the harness with the 4 small green, red, white, and black wires) from the Y drive motor encoder.

5. In Figure 3-10 locate and remove the drive belt adjusting screw and the Y motor support bracket locking screw (under the motor).

![Figure 3 - 10](image-url)
6. The motor mounting bracket rotates upward, pivoting on the pin. Carefully maneuver the motor (with bracket still attached) upward and out of the chassis slot in the front; and the block at the rear.

NOTE: The bracket is slotted in the rear to allow it to detach from the pin in the block without the need to remove the pin.

**CAUTION!** It is advised to label the wires with appropriate means so you will understand exactly where the wires are to be replaced during reinstallation. Identify which of wires goes to which motor terminal before removing the wires in the next step.

7. Before the assembly can be completely removed, identify and disconnect the two motor power harness connections (one connector wire is red and the other one is black).

**WARNING!** If the two motor power harness connectors are reversed from the original connections, the motor will drive the beam to the mechanical stops of the sewing field with no regard to speed control when machine is first operated.

8. Reverse the previous steps to reinstall a new motor.

**CAUTION!** DO NOT adjust the tension of the Y drive motor belt too tightly. Over tightening the attaching/adjustment screw will result in damage to the chassis.

9. When adjusting the Y drive motor belt, it is suggested that you only snug the belt to the point where the looseness of the Y axis beam is eliminated. If Y axis sewing problems persist after adjusting the Y motor belt, contact the Melco service representative in your area for recommendations.
Carriage Section

X Beam Removal

The purpose of this procedure is to remove the X beam as an assembly for field replacement and factory rebuild (or bench top repair/adjustment). Refer to the specific replacement procedures for replacement of the X motor, X motor belt, or X drive belt.

1. Turn off the power switch to the CH 1 and remove the power cord from the power source electrical outlet and the rear of the machine.

2. Remove the left and right end caps from the chenille peripheral. (Refer to specific instructions for removal.)

3. Remove the X motor cover by loosening the two button head cap screws (see Figure 3-11 below) just enough to slip it off.

4. Remove the four button head cap screws (2 at each end) that attach the belt clamps to the carriages. (See Figure 3-11)

NOTE: The Y drive belt clamps have four button head screws: two fasten the belt to the clamps, and two fasten the clamps to the carriage. Remove only the screws that hold the clamps to the carriage!

Figure 3 - 11
5. Turn the pulley in the back and move the belt clamps out of the way towards the rear of the machine (see Figure 3-11).

6. On the keyboard side of the beam, locate the hex nut (under the beam) connected to the grounding strap (see Figure 3-11). Loosen, but do not remove the hex nut.

7. On the keyboard side of the beam, remove the four socket head cap screws from the right carriage (see Figure 3-11).

8. Slide the grounding strap and bearing block towards the front of machine and away from the beam (see Figure 3-11).

9. Disconnect the X beam harness from the connector of the X drive harness located under the left carriage (see Figure 3-12).

10. Remove the X drive harness from the bracket by first pressing in on the tabs then pulling on the connector. (See Figure 3-12)

11. Remove the 3 phillips head screws on the connector bracket and remove the bracket from the bottom of the bearing block. (See Figure 3-12.)

12. Remove the 4 socket head cap screws from the left Y carriage. (See Figure 3-12)

13. Carefully remove the beam assembly, guiding the harness up between the belt and chassis.

Figure 3 - 12
X Beam Installation

1. Place the X beam carefully into position, being sure to guide the X motor harness down between the belt and the chassis.

2. Slide the right side bearing block (with the grounding strap) under the beam, positioning the grounding strap between the hex nut and star washer and the underside of the beam.

NOTE: Do not tighten the nut at this time, but remember to go back and tighten it after the next step.

CAUTION! DO NOT over tighten the screws in the following step, to avoid possibly cracking or breaking the Y carriage brackets!

3. Attach the right side Y carriage to the bearing block with the four socket head cap screws (see Figure 3-12). Use Loctite 222 hardware adhesive, or equivalent, and tighten these screws.

4. Now tighten the nut securing the ground strap from step 2 above.

5. Slide the left side bearing block under the beam and attach the left side Y carriage to the bearing block with the four socket head cap screws (see Figure 3-12). Refer to the precaution for step 3 above, then, using Loctite 222 hardware adhesive or equivalent, tighten these screws.

6. Position the X motor harness under the left side bearing block.

7. Position the connector bracket under the bearing block with the X motor harness between the bracket and the bearing block (see Figure 3-12). Attach the connector bracket with the 3 phillips head screws.

8. Squeeze in the tabs on the X drive harness and snap it into the slot in the connector bracket. (See Figure 3-12)

9. Connect the X beam harness to the X drive harness. Place the X beam harness into the strain relief and snap it closed. (See Figure 3-12)

10. Push the beam to the back of the machine so that it rests against the back stops. Turn the rear pulley and align the belt clamps with the Y carriages.

11. Install, but do not tighten, the two button head cap screws attaching each belt clamp to the bearing blocks on each side (see Figure 3-11).
12. Square up the belt clamps with the Y carriage when the beam is against the back stops on each side, then tighten the screws.

13. Slip the X motor cover back in position and tighten the two button head cap screws (see Figure 3-11).

14. Install the end caps removed earlier.
**X Motor Replacement**

"FACTORY SERVICE ADVISED"

This procedure requires using a specific adjustment tool (0 to 20 pound pull gauge) for proper adjustment. Refer to the motor belt tensioning procedure in Section 2 of this manual for additional information.

1. Turn off the power switch to the CH 1 and remove the power cord from the power source electrical outlet and the rear of the machine.

2. Remove the left end cap. (Refer to specific instructions for removal.)

3. Remove the black plastic X motor cover, by loosening the two (2) hex button head screws attaching the cover to the beam (see Figure 3-11).

   **CAUTION!** The Y drive belt clamp has four button head screws 2 fasten the belt clamp, and 2 fasten the clamp to the Y carriage. LOOSEN ONLY THE SCREWS THAT HOLD THE CLAMP TO THE CARRIAGE!

4. Remove the 2 screws that secure the Y drive belt clamp to the Y carriage (see Figure 3-11).

   NOTE: These screws, lock washers, and flat washers MUST NOT BE MIXED WITH or SUBSTITUTED BY other hardware. The exact dimensions are very critical in the smooth operation of the carriage.

5. Identify the locations in the X drive harness connector where the red and black X motor wires are inserted. (The red wire is in position #8, the black wire is in position #4.) See Figure 3-13.

   ![Figure 3 - 13](image)

6. Extract the old motor wires from this connector.
7. Carefully disconnect the X motor encoder harness from the encoder body on the old X motor (see Figure 3-14 below).

8. Remove the 4 phillips screws and associated hardware attaching the X motor to the mounting bracket. Tilt the motor to take the belt off the pulley, then remove the motor.

9. With a hex driver loosen the X motor drive pulley set screw and remove the pulley from the old motor.

10. Remove the set screw from the pulley and apply LocTite 222 (or equivalent) screw adhesive to the set screw. Reinstall the set screw.

11. Install the drive pulley onto the new motor shaft.

12. Tighten the pulley set screw leaving a gap of at least .020" between the back of the pulley and the motor bracket to ensure there is no bind.

13. Place the new motor in the bracket and put the belt onto the pulley that has been transferred from the old motor.

14. Install, but do not tighten, the four phillips mounting screws and associated hardware.

15. Refer to the motor belt tensioning procedure in the Service Adjustments section of this manual for information in tightening the mounting screws.

16. Replace the covers removed at the beginning of this procedure.
**X Motor Belt Replacement**

"FACTORY SERVICE ADVISED"

To replace the X motor belt, the motor end of the beam assembly must be disassembled. This procedure requires specific adjustment tools (the Melco one pound weight and a 0 to 20 pound pull gauge) for proper adjustment.

1. Remove the X beam by referring to the specific procedures in this manual.

2. Remove the X motor by referring to steps 1, 2, 3, 4, and 7 in the specific procedures for removal in this manual.

   NOTE: Do not remove the red and black wires from the X drive harness connector as described in steps 5 and 6 in the X Motor Replacement procedure. Also, there is no need to disconnect the X motor encoder harness from the encoder body on the old X motor. In addition, you will not be transferring the motor drive pulley.

3. At the right end of the beam assembly, loosen the X drive belt idler pulley assembly by rotating the socket head cap screw at the end of the assembly counter-clockwise. (See Figure 3-20.)

4. At the X motor end of the beam, remove the 2 socket head cap screws and 1 button head screw (with the ground wire attached) and take the motor mount off the beam (see Figure 3-15).

   NOTE: There is star washer on each side of the ground lug at the above button head screw. Be sure to replace this hardware in the same order when replacing these parts.

![Figure 3 - 15](image-url)
5. The Y carriage bracket at the X motor end of the beam will now be loosened and able to be removed from the end of the beam.

To replace the X motor belt, you must disassemble the pulley system inside the Y carriage bracket. These parts consist of the X drive pulley and belt, the motor pulley and belt, a spacer at each end, and the shaft that all these parts fit onto.

6. To disassemble the Y carriage pulley system, you must keep the pulleys in their relative arrangement, then loosen the set screws in each pulley and remove the shaft (see Figure 3-16 below).

7. Place the new motor belt around the motor pulley, then reinstall the shaft into the assembly parts in the following order: the front facing side of the Y carriage bracket, a spacer, the X drive pulley and belt, the motor pulley and belt, another spacer, and then the back side of the Y carriage bracket. (Insure that both belts are installed.)

8. With the shaft centered in the bracket, apply force on one pulley to its respective Y carriage bracket wall and against the spacer.

9. Apply LocTite brand 222 screw adhesive (or equivalent) and tighten the set screws in the pulley against the flats on the shaft.

10. Repeat the 2 previous steps with the other pulley.

11. After reassembling the Y carriage bracket pulley assembly, there should be no end to end movement of the pulleys and shaft, both belts should be installed, and the shaft ends should not be extended beyond the bracket at either end.
12. Reattach the Y carriage bracket assembly and X motor mount to the end of the beam with the 2 socket head cap screws and 1 button head screw (with the ground wire and hardware attached). Before tightening the screws, ensure the motor mount is positioned forward as far as it will go and the Y carriage bracket assembly is aligned evenly on the end of the beam. Also, ensure there is star washer on each side of the ground lug at the button head screw before tightening. (See Figure 3-15.)

13. Reattach the X motor to the beam following the X motor replacement and motor belt adjustment procedures found earlier in this manual.

14. Refer to Section 2 of this manual and adjust the X drive belt tension.

15. Reinstall the X beam by referring to the specific procedure in this manual.
X Drive Belt Replacement

"FACTORY SERVICE ADVISED"

If the need arises for the X drive belt to be replaced, it is recommended that the entire X beam be replaced with one that has been refurbished at the factory. Other components in the beam should be evaluated during X drive belt replacement, and factory trained technicians are equipped to perform this procedure properly.

For X beam replacement, refer to the X beam procedure in this manual.

If you decide, however, to go ahead and replace the X drive belt only, refer to the following procedure. This procedure requires specific adjustment tools (the Melco one pound weight and a 0 to 10 pound pull gauge) for proper adjustment.

1. Remove the X beam by referring to the specific procedures in this manual.

To replace the X drive belt, you must remove the X carriage assembly from the beam and turn it over to get to the X drive belt fastening clamps.

2. At the right end of the beam assembly, remove the X drive belt idler pulley assembly by removing the socket head cap screw at the end of the assembly (see Figure 3-20).

3. On the X carriage assembly, loosen the 2 socket head cap screws in each of the 2 rectangular brackets with small tabs at one corner (see Figure 3-17 below).

---

**Figure 3 - 17**

- X-Carriage Assembly
- 1 of 2 rectangular brackets
- 1 of 2 socket head cap screws in each bracket
4. Move the tabbed end of these brackets toward the center of the assembly. This should free the assembly to be removed from the beam.

5. Remove the X carriage assembly from the beam and turn it over to gain access to the X drive belt clamps (see Figure 3-18 below).

![Figure 3-18](image)

6. Note how the old belt is attached to the clamps, then remove the 2 screws securing the belt clamp at one end only. Working with one end at a time will allow you to use the other end as a guide when installing the new belt.

7. Install one end of the new belt into the clamp that was removed in step 6. Refer to the following steps and Figure 3-19 on the next page. Use the end of the X carriage assembly that still has the clamp holding the old belt as a guide.
a) Position the belt clamp with the recessed middle area facing up.

b) From the bottom of the clamp, put the end of the belt through the slot in the middle of the clamp. Allow 6 or 7 grooves of the belt to show through the clamp slot.

c) Fold the clamp and end of the belt over and onto the portion of the belt that is directly in front of the clamp. The grooves and teeth of the end of the belt will mesh with the grooves and teeth of the portion of the belt that is directly in front of the clamp thus causing the clamp to be captured by the belt. (Check that the length of the belt that overlaps around the clamp is approximately the same as what is shown at the old belt that is still clamped.)

8. Center the belt in the slot in the clamp and attach it securely in place with the 2 screws.

9. Disassemble the other end of the old belt from the remaining end of the X carriage assembly and remove it from the idler pulley and drive pulley.
10. Route the new belt into place through the pulleys. Refer to Figure 3-20 and the following precautions:

   a) Remember that the X carriage will be turned over for installation when the belt is attached at the remaining end of the carriage. Therefore, insure that you compensate for this and do not allow the belt to have any incorrect twists.

   b) Also refer to the note below to orient the X drive belt idler pulley assembly correctly when you route the belt through it.

   NOTE: The idler pulley does not lie directly in the middle of the U-shaped bracket. The pulley flanges come almost even with one side of the bracket, but are located some distance inside the bracket when viewed from the other side. When reinstalling the idler pulley assembly, it must be oriented so the side with the pulley flanges even is facing outward (or downward when the beam is installed).

11. Refer to the previous installation process for attaching the first belt end to the X carriage assembly and attach the second end of the belt to the remaining end of the carriage in the manner.

12. Turn the X carriage assembly over and reposition it into the beam.

13. Orient the X drive belt idler pulley assembly so the side with the pulley flanges even with the edge of the bracket is facing outward (or downward when the beam is installed). See Figure 3-20 above.

   NOTE: If you can not attach the idler assembly as described above without creating improper twists in the belt, you must correct the problem with the new belt installation before proceeding.
14. Secure the X drive belt idler pulley assembly to the end of the beam with the socket head cap screw at the end of the assembly. **DO NOT over-tighten the screw causing the belt to become too tight.**

15. Move the tabbed end of each of the rectangular brackets on the X carriage assembly outward to remove any end play from the carriage between the channel edges of the beam.

16. Snug the 2 socket head cap screws in each of the rectangular brackets.

17. Refer to Section 2 of this manual for adjusting the X drive belt tension.

18. Refer to Section 2 of this manual for adjusting the X carriage movement.

19. Reinstall the X beam by referring to the specific procedure in this manual.
Y Drive Belt Replacement

"FACTORY SERVICE ADVISED"

This procedure requires the Gates 5M Tensiometer for proper adjustment.

1. Turn off the power switch to the CH 1 and remove the power cord from
   the power source electrical outlet and the rear of the machine.

2. Remove the CH 1 end caps. (Refer to specific instructions for removal.)

3. Loosen the belt tension adjustment screw at the front of the idler pulley
   bracket. This will allow the old belt to become slack for ease in
   replacement (see Figure 3-21 below).

4. Remove the two screws, flat washers, and lock washers at the top of the
   Y-belt bracket. These screws go through the belt and into the belt clamp
   underneath the belt to secure the Y drive belt between the two pieces.

   Caution: Overtightening the screws in the next step
   may cause the belt clamp to be damaged.

5. Place the new belt around the two pulleys and secure both ends of the
   belt between the Y-belt bracket and the belt clamp piece with the two
   screws and associated hardware removed in the previous step.

6. Refer to Section 2 of this manual for adjusting the Y drive belt tension.

7. Replace the end caps and test the machine for proper chenille stitching
   quality.
Chenille Head Section

General

The MELCO chenille head is made up of several physical sections, some of which perform multiple functions.

One of three major physical sections is bed casting (1). The bed casting provides a base for attaching the following items: the arm casting (2), the looper shaft, the looper mechanism, the Z drive mechanical interface, and the theta drive mechanical interface.

The arm casting is the second major physical section, and provides for further attaching the following items: the Z drive motor, Z drive shaft, theta motor, theta drive vertical shaft, theta drive shaft bearing housing, theta drive horizontal drive shaft, presser foot solenoid and shaft, theta encoder buffer PCB, linear actuator assembly, and needle drive assembly.

The third major physical section is the needle drive assembly (3). This assembly attaches to the front of the arm casting, and provides the following functions: Z axis needle movement, theta axis needle movement, nipple tube assembly movement, and presser foot assembly movement.
**Needle Drive Assembly Removal**

"FACTORY SERVICE ADVISED"

The needle drive assembly can be removed from the arm casting as an assembly. To remove the needle drive assembly, perform the steps below.

1. Turn off the power switch to the CH 1 and remove the power cord from the power source electrical outlet and the rear of the machine.

2. Remove the keyboard cover. (Refer to specific instructions.)

3. Remove the chenille head side cover by removing the two screws as shown in the figure below.

4. Remove the needle drive cover attaching screw as shown in the figure above.

**NOTE:** Step number references are made in the appropriate figures in the next few pages. In some situations, a step reference is specifically called out, in other situations, the steps are aided only by descriptive callouts that are noted in the figures.

5. Position the presser foot/nipple lifting lever to the up position, and lift the needle drive cover straight up until the rear of the cover clears the actuator assembly and needle height adjustor.

6. Tip the top of the cover forward, and lower the cover until the bottom section of the cover can be turned slightly to the right and removed from the needle drive assembly.
7. Remove the large needle drive assembly retaining screw.

8. Remove the small upper needle drive assembly retaining screw.

9. Remove the presser foot/nipple lifting lever pivot plate retaining screw, and press the lift lever assembly mounting bar down to gain access to the lower needle drive assembly retaining screw.

10. Remove the lower needle drive assembly retaining screw.

11. Lift the lifting lever mounting bar into position and reinstall the pivot plate retaining screw removed two steps back.
12. Disconnect the linear actuator and lifting lever position detection switch harnesses at their in-line connectors.

13. Loosen the collar set screw between the theta shaft coupling and the arm casting. (When reinstalling the assembly, position this collar against the bushing allowing about 0.0015 inch shaft end movement after tightening the needle drive assembly securely onto the face of the arm casting.)

14. Loosen the cap head screw in the front clamp of the theta shaft coupling. (When reinstalling the assembly, refer to the Theta Index Adjustment procedure in Section 2 of this manual to reset the coupling properly.)

15. Position the presser foot/nipple lifting lever in the down (presser foot and nipple up) position to release the presser foot/nipple spring tension from the presser foot/nipple bell cranks.
CAUTION! Use extreme care when separating the parts in the next few steps. DO NOT pry the parts apart more than is necessary in each step.

16. Carefully tap and pry the top portion needle drive assembly-to-arm casting mating surfaces (pry out to just make a visible crack).

17. Carefully tap and pry the lower portion needle drive assembly-to-arm casting mating surfaces (pry out to just make a visible crack).

18. Alternately repeat the previous two steps until the needle drive assembly alignment pins are completely disengaged. (The alignment pins become visible only after the needle drive assembly comes away from the arm castings.)

19. When the needle drive assembly is removed in the next step, the drive cam roller will become exposed at the cam post. Remove, inspect, and replace the roller if required.

20. Carefully pull the needle drive assembly and theta drive shaft out of the front of the machine, ensuring the theta drive shaft is not bent as it is pulled out of the arm casting area.

21. As the theta shaft come through the arm casting, retrieve the theta shaft collar located against the inside of the arm casting between the casting the theta shaft coupler. (You loosened the set screw in this collar several steps back.)

22. Reverse the previous steps to reinstall the needle drive assembly. Refer to the Theta Index Adjustment procedure in Section 2 of this manual to set the theta shaft coupling properly. Contact the Melco factory trained service representative in your area if you should encounter problems.
Needle Drive Assembly Disassembly

"FACTORY SERVICE ADVISED"

NOTE: Most of the hardware used in the chenille head is in metric measurements. Use the appropriate tools.

NOTE: Always use the correct size and good quality screw drivers when loosening or tightening the screws in the chenille head.

CAUTION! Use care in handling the assembly in the following steps not to allow the theta shaft to become bent.

1. Remove the needle drive assembly as described in a previous procedure.

2. Remove the needle drive mechanism (needle assembly) if not already removed.

NOTE: Reference to the appropriate figure or figures in the next few pages of text is not specifically called out for each step. Each step operation, however, is aided by one or more figures within this procedure.

3. Remove the presser foot bell crank by first positioning the presser foot/nipple lifting lever up to gain access to the presser foot bell crank set screw.

4. Loosen the set screw only about 1/4 of a turn, unless you are going to remove it.

5. Remove the eccentric pin holding the bell crank and remove the bell crank.

NOTE: Keep the eccentric pin and bell crank together.

6. Raise the presser foot/nipple lifting lever to obtain access to the nipple bell crank set screw. (Refer to the figure on the next page.)

7. Lower the presser foot/nipple lifting lever to release the spring pressure on the bell crank.

8. Remove the eccentric pin holding the bell crank and remove the bell crank.

NOTE: Keep the eccentric pin and bell crank together.
9. Raise the presser foot/nipple lifting lever again to release the spring tension inside the spring pressure tubes.

10. Unscrew the spring pressure tube thumb screws and remove the springs (larger spring is for presser foot, smaller spring is for nipple).

11. Remove the two phillips screws holding the locking plate retainer cover and lift off the locking plate. Be sure not to lose the lock springs and pins under the locking plate.

12. Remove the one phillips screw holding the bearing cage and then extend the needle drive cam plate all the way to top dead center.
13. Lift the needle drive cam plate out to the rear and off of the end of the shaft.

14. Slide the height mechanism out the top of the unit in three parts: bearing and housing, slider block, and internal needle height mechanism.

15. Remove one screw to release the harness for the presser foot/nipple lifting lever position detections switches.

16. Position the presser foot/nipple lifting lever to mid-range.

17. Remove the two screws holding the presser foot/nipple lifting lever and switch block; and remove the assembly.

**CAUTION!** To avoid putting accidental pressure against the theta shaft when removing the screw in the next step, slide the nipple tube lifter mechanism down to position the nipple tube lifting screw as far from the theta shaft as possible.

18. Remove the nipple tube lifting screw.

19. Remove the screw in the top of the assembly that holds the shaft retainer plate. Remove the plate.

20. Carefully rotate the theta shaft until the theta shaft bevel gear set screw is accessible. Loosen the set screw.

21. Remove the screw that holds the presser foot/nipple lifting lever pivot plate.

22. Loosen the outside set screw that holds the presser foot tube.

23. Remove the 2 screws at the bottom of the assembly, that hold the needle drive case and nipple tube guide bushing plate together.

24. Carefully tap and pry the plate and case apart. When the guide pins disengage, the nipple tube guide bushing will be able to be moved off the bottom end of the remaining assembly.

25. Inspect the parts for possible wear and replace as necessary.
26. Loosen the drive bar adjust screw so the gripping action is released.

27. Place a screw driver blade (or other similar prying device) into the tightening groove and carefully twist a small amount to release more grip on the presser foot pressure adjusting tube. Pull the tube out the top of the assembly.
28. Remove the presser foot drive bar assembly by lifting it out forwards.

29. Pull straight upward on the needle rotating shaft and remove it out of the top of the remaining mechanism. At the same time, the theta vertical shaft bevel gear will become free to be removed.

30. Remove the nipple tube bushing from the fork in the nipple pressure adjusting tube.

31. Slide the lifting lever arm and block assembly and nipple drive tube assembly downward until the lifting arm on the block can be raised to let the nipple drive tube assembly be rotated enough to disengage with the block assembly. Slide the nipple drive tube assembly out the bottom. Remove the lifting lever arm and block out of sliding track that it is resting in.

32. Manipulate the nipple pressure adjusting tube until the bevel gear on the theta shaft will disengage and be able to slide out of place. Use care not to mar the teeth on the bevel gear.

33. Carefully slide the theta shaft and bevel gear out of the bearing.

34. Pull the nipple pressure adjusting tube out of the remaining casing.

To reassemble, reverse the previous steps.

Lubricate the pieces appropriately as you reassemble the mechanism.

Contact the Melco factory trained service representative in your area if you should encounter problems.
Theta Drive Belt Replacement

"FACTORY SERVICE ADVISED"

To replace the theta drive belt the needle drive assembly must be removed. To remove the needle drive assembly, refer to that specific procedure earlier in this section of the manual. Notice that "Factory Service is Advised" for the needle drive assembly removal, as it is for this procedure.

NOTE: When replacing the theta belt, do not move the theta motor or bracket. By not moving the motor or bracket, the theta belt tension very likely will not need adjustment after replacing the belt.

1. Refer to the specific procedure earlier in this section of the manual and remove the needle drive assembly.

2. Loosen the theta shaft coupling rear cap head screw to remove the coupling. Set the coupling aside for re-installation later.

3. Loosen the theta drive timing pulley on the rear portion of the theta shaft. Also loosen the theta motor pulley.

4. Slide the two loosened pulleys and the theta belt to the rear until the theta motor pulley comes off the motor shaft. Remove the belt from the pulley and set it aside to reinstall later.

5. Loosen the bevel gear at the rear of the theta shaft.

Figure 3 - 30
6. Slide the theta shaft forward until the rear end comes out of the casting. (Retrieve the bevel gear and set it aside for reinstallation later.)

7. Slip the old belt off the theta drive timing pulley and the rear end of the theta shaft.

8. Put the new belt over the rear end of the theta shaft and onto the theta drive timing pulley.

9. Place the bevel gear in its position behind the theta shaft rear support casting.

10. Slowly push the end of the theta shaft through the casting and into the bevel gear.

11. Push the theta shaft to the rear until the small collar between the theta drive timing pulley contacts the casting.

12. While holding the theta shaft to the rear, push the bevel gear against the rear side of the casting and snug the set screw.

13. Check for about 0.0015 inch shaft end movement and tightening the bevel gear securely when the end shaft movement is obtained.

14. Rotate the theta shaft by hand for several rotations to check for no binding in the bevel gear mesh.
15. Refer to the Theta Gear Train Backlash Adjustment in Section 2 of this manual if binding occurs.

16. Place the new theta belt around the theta motor pulley (removed earlier) and position the pulley at the end of the theta motor shaft.

17. Slide the theta drive timing pulley and theta motor pulley forward with the belt until the the theta motor pulley is fully onto the motor shaft.

18. Ensure the two pulleys are aligned with each other so the belt will ride evenly within each, then tighten each of the pulleys securely.

19. Refer to the Theta Motor Belt Adjustment in Section 2 of this manual to check for proper belt tension. If you did not move the theta motor, most likely the belt tension will be satisfactory.

20. Place the theta shaft coupling onto the front end of the theta shaft, but do not tighten the set screw to hold it.

21. Refer to the Theta Index Adjustment in Section 2 of this manual to set the position for the theta shaft coupling.
**Theta Drive Motor Replacement**

"FACTORY SERVICE ADVISED"

When the theta drive motor is replaced, the theta drive belt tension may require adjustment. The adjustment of the belt tension is best performed by a factory trained technician.

1. Turn the machine OFF.

2. Remove the Side Head Cover.

3. Locate the theta motor in about the middle of the side of the head.

4. Block any openings in the bed casting under this area to prohibit any hardware removed from accidentally falling into the bed.

5. Disconnect the theta motor encoder harness.

6. Remove the four (4) mounting screws attaching the theta motor to the motor bracket.

7. Slip the theta belt off the motor pulley and remove the theta motor.

---

![Diagram of theta drive motor replacement](image)

**Figure 3 - 31**
8. Transfer the motor pulley from the old theta motor to the new theta motor, leaving the pulley set screw only slightly snug. You must align the two belt pulleys after putting the new motor into proper position.

9. Position the new theta motor into the motor bracket and place the theta belt around the theta drive timing pulley and the theta motor pulley.

10. Install the four mounting screws. Finger tighten the screws, allowing you to slide the motor on the bracket.

11. Reposition the theta motor pulley as needed to align it with the theta drive timing pulley so the belt will ride evenly within each, then tighten the motor pulley securely.

12. Refer to the Theta Motor Belt Adjustment in Section 2 of this manual to set the proper belt tension.

13. Replace the chenille head side cover.
Presser Foot Solenoid Removal and Replacement

1. Turn the machine OFF and remove the Side Head Cover.

2. Disconnect the harness and remove the screws securing the theta encoder buffer board (see Figure 2-22). Remove the board and set it aside.

3. Locate the Presser Foot Solenoid, just behind the Presser Foot Shaft and disconnect the solenoid harness in-line connection.

4. Remove the two (2) mounting screws attaching the Solenoid Assembly Bracket to the inside of the Head Casting.

5. Remove the Solenoid Assembly.

6. Remove the Plunger Cap.

7. Remove the Large Locking Nut.

8. Remove the solenoid, and replace with the new solenoid.

9. Reassemble, reversing steps above.

10. Reinstall the theta encoder buffer board and reattach the harness.

11. Refer to the Presser Foot Solenoid adjustment procedure in Section 2 of this manual to position the solenoid properly.
**Linear Actuator Replacement**

1. Turn the machine power OFF.

2. Remove the Front Head Cover.

3. Locate the Linear Actuator, and disconnect the wire harness connector.

4. Remove the two (2) lock nuts and screws attaching the actuator to its mounting bracket.

5. Remove the "old" actuator, and replace with the new one.

6. Adjust the new actuator following the Linear Actuator Adjustment procedure in Section 2 of this manual.

![Figure 3 - 33](image)
**Z Motor Replacement**

NOTE: After replacing the Z motor, there may be a requirement during the belt tensioning procedure for using a modified 6mm bent allen wrench. For your information, the following modification information is included: Due to the limited space between the Z motor inner surface and the Z motor mount bracket, a "modified" (cut down) 6mm bent arm hex wrench is required to properly adjust the motor mount position (and the Z drive belt tension). If there is not a need to remove the motor mount, it is recommended that the bracket be left in the factory adjusted position.

1. Turn the main power OFF, and remove the line cord from the power source.

2. Remove the rear head cover and the controller cover.

3. Disconnect the Z motor harness from the 4 axis driver board.

4. Remove the four cap head screws attaching the motor to the bracket standoffs.

5. Lift the motor away from the standoffs and allow the drive belt to slip off the motor drive pulley.

6. Loosen the pulley set screws and remove the pulley from the motor shaft.
7. Place the pulley on the new motor shaft with the set screw lands towards the head (away from the motor), then slightly tighten one of the pulley set screws.

8. Place the motor into position on the four standoffs.

9. Be sure that the bottom loop of the drive belt is below the motor pulley, then reattach the motor to the standoffs with the four cap head screws, removed earlier. Tighten the screws securely.

10. Make sure that the bottom loop of the drive belt is centered in the motor pulley.

11. Check the pulley alignment by rotating the chenille head clockwise (from the front) and reposition the motor pulley until the drive belt rides in the center of the motor pulley and the Z shaft timing pulley.

12. If the pulleys are not aligned, loosen the motor pulley set screw and adjust the pulley so that the pulley is directly below the Z shaft timing pulley.

13. Hold the motor shaft and rotate the chenille head to align the set screws on the pulley with the flat(s) on the motor shaft.

14. Apply Loctite 222 (RED) to both Z motor pulley set screws and tighten.

15. Check that the belt tension is 6-7 pounds using the Gates Tensiometer. If the tension is not correct, refer to the Z Drive Belt Tension Adjustment procedure in Section 2 of the manual.

16. Connect the Z motor harness to the 4 axis driver board and replace both the controller cover and the rear head cover.
**Z Shaft Encoder Installation**

The Melco CH 1 Chenille Peripheral uses a shaft encoder on the rear of the chenille head to provide the information required by the CPU.

"FACTORY SERVICE ADVISED"

**CAUTION!** If the Z shaft encoder is replaced, DO NOT OPERATE THE EMBROIDERY PERIPHERAL until the new Z shaft encoder is properly calibrated!

If you feel that you may have a problem with the Z encoder, first contact your Melco service representative for advice. It may be that the encoder is not the problem. To replace the encoder follow these steps:

1. Turn the machine OFF, then disconnect the power from the power source.
2. Remove the controller cover and the keyboard cover.
3. Remove the Z drive cover from the top, rear of the chenille head.
4. Using proper antistatic precautions, disconnect the encoder cable from the CPU board.
5. Loosen the two coupler socket head cap screws that secure the coupling to the Z encoder shaft.

![Figure 3 - 35](image)
6. Loosen and unthread the jam nut on the encoder shaft.

7. Pull the encoder out of the shaft coupling and encoder mount. Capture the jam nut and washer as the encoder shaft is removed.

8. Insert the new encoder/shaft into the hole of the encoder mount, place the washer and then the jam nut onto the encoder shaft as you insert the shaft through the mounting plate.

9. Insert the encoder shaft into the shaft coupling.

10. Tighten the jam nut, and then snug the coupling socket head cap screws onto the encoder shaft.

11. Connect the encoder cable to the CPU board.

**CAUTION! DO NOT OPERATE THE EMBROIDERY PERIPHERAL until the Z shaft encoder is properly calibrated!**

12. Calibrate the Z encoder per section 2 of this manual.
**Z Drive Belt Replacement**

"FACTORY SERVICE ADVISED"

1. Turn the machine OFF, then disconnect the power from the power source.

2. Remove the controller cover and the keyboard cover.

3. Remove the Z drive cover from the top, rear of the chenille head.

4. Using proper antistatic precautions, disconnect the encoder cable from the CPU board.

5. Loosen the two socket head cap screws that secure the coupling between the head Z shaft pulley and the Z encoder shaft (See Figure 3-35).

6. Remove the 3 cap head screws that secure the encoder mounting plate to the three standoffs, and remove the Z encoder and mounting plate from the head Z shaft pulley. (The coupling may or may not come with the encoder, depending on which shaft offers the least resistance to the coupling.)

7. Loosen the four (4) cap head screws that secure the Z motor to the standoffs that support it.

8. Move the Z motor away from the standoffs and upward enough to remove the drive belt from the motor pulley (the belt may need to be twisted to fit between the head and the motor drive shaft).

9. Take the old drive belt from around the head Z shaft pulley and place the new drive belt into position on that pulley. Ensure the belt is under the top two standoffs and on either side of the bottom (middle) standoff.

10. Orient the Z encoder and mounting plate to reinstall it to the three standoffs.

11. Place the coupling between the head Z shaft pulley and the Z encoder shaft and slowly move the Z encoder and mounting block into position against the three standoffs. Ensure the Z drive belt remains in the proper position.

12. Secure the Z encoder mounting plate to the standoffs with the three cap head screws and tighten the screws.
13. Slide the new belt onto the Z motor pulley and tighten the four cap head screws tightly to secure the Z motor in place.

14. Perform the Z Drive Belt Tensioning procedure in Section 2 of this manual.
Cabinet Section

Replacing A Yarn Pretensioner

Each of the three thread pretensioners is secured to the bracket by directly threading the tensioner post into the bracket.

1. To remove a yarn pretensioner, use a standard blade screw driver in the slot at the end of the pretensioner middle post to rotate the pretensioner counter-clockwise out of the bracket.

2. Insert the new pretensioner into the appropriate threaded hole in the bracket and with a standard blade screw driver, rotate the pretensioner middle post clockwise until tightened into the bracket.
Replacing The Yarn Tensioner

The yarn tensioner is secured by a set screw against the thread tensioner shaft inside the thread tensioner bracket. The set screw is accessible at the top of the tensioner bracket, directly above the tensioner assembly.

1. Using an open end wrench, loosen the locking nut around the tensioner assembly set screw at the top of the tensioner bracket.

2. Using an allen wrench, loosen the tensioner assembly set screw.

3. Pull the tensioner assembly out of the tensioner bracket.

4. To reinstall the tensioner assembly, follow the procedure on the next page for changing a check spring.

5. After inserting the thread tensioner into the tensioner bracket, perform the tensioner assembly check spring adjustment from Section 2 of this manual. This adjustment procedure, not only adjusts the check spring tension, but secures the tensioner assembly in the tensioner bracket by tightening the set screw previously loosened in this procedure.
Changing The Check Spring

1. As described previously in this manual, remove the tensioner assembly.

2. Remove the old check spring and discard it.

3. Attach the new check spring as follows:
   a) Position the check spring around the end of the tensioner shaft as shown in the figure below.
   b) Insert the straight length of spring wire that is inside the check spring coil into the groove cut in the tensioner shaft as shown.

4. While holding the check spring in position, place the thread tensioner into the tensioner bracket. Insure the tensioner shaft seats into the hole in the bracket with the check spring still positioned on the tensioner shaft properly.

5. After inserting the tensioner assembly into the tensioner bracket, perform the tensioner assembly check spring adjustment from Section 2 of this manual. This adjustment procedure, not only adjusts the check spring tension, but secures the tensioner assembly in the tensioner bracket by tightening the set screw loosened to remove the tensioner assembly.
4. Theory Of Operation

System Overview

The Melco Chenille Stitching system consists of two basic components: the EDS Computer and the CH 1 Chenille Peripheral.

EDS Program

This manual is dedicated solely to the CH 1 Chenille Peripheral and only those portions of the EDS operations that are directly associated with operating the chenille system.

For detailed information on operating the EDS program, refer to the operation manual associated with your specific version of EDS software.

CH 1 Peripheral

The CH 1 Chenille Peripheral is configured as a single head chenille machine.

The CH 1 operates only when connected to a Melco EDS system. There is no “stand-alone” capability, i.e., it cannot generate any stitches on its own. The CH 1 Chenille peripheral has on-board memory (RAM) so that expanded stitch data can be down-loaded from the EDS.

The CH 1 is functionally arranged into six sections: the Keyboard, the Controller, the Sewing Head, the Carriage, the Power Supply, and the Cabinet.

---

Figure 4 - 1

---
The Keyboard section consists of a ten key keyboard and a simple one line LCD display for displaying status messages and other useful information.

The Controller section, for the most part, occupies the upper left portion of the unit, and contains the operating CPU Printed Circuit Board and several other electronic components used in controlling the operation of the CH 1.

The Sewing Head section is the mechanical operating portion of the machine that performs the actual stitching. The sewing head works in conjunction with the Carriage section to perform the mechanical layout of the design.

The Carriage section provides the mechanism for moving the material; and in conjunction with the sewing head these two areas perform the mechanical work of the Melco chenille system.

The Cabinet is a required portion of the CH 1 Chenille system. The cabinet houses the yarn distribution components and provides support for the peripheral unit itself.
Stitch Sequence

The CH 1 stitch sequence refers to the relative motion between six elements: looper rotation, needle rotation, needle motion, nipple motion, presser foot motion, and x-y motion.

Looper Rotation

There are two types of rotation that the looper performs.

1) The looper rotates clockwise and counter-clockwise a specific amount during each stitching cycle to perform its basic function of wrapping the yarn around the needle hook.

2) The second type of rotation is a requirement to keep in constant relationship with the needle rotation. This rotation is termed the theta (θ) angle rotation.

Needle Relationship Rotation

In performing its wrapping function, the rotation of the looper is caused by a push-pull action of the looper drive worm gear as it meshes with the looper body worm gear. This push-pull action is driven by the looper drive shaft. The looper drive shaft is controlled by the Z axis drive motor. As the shaft (thus the looper drive gear) moves horizontally, the top of the looper (held in place vertically) will rotate clockwise and counter-clockwise. See Figure 3-2.
The degree of looper rotation is determined by the amount of throw the looper drive gear provides (or the distance the looper drive shaft travels during a stitching cycle). This degree of rotation is directly proportional to the distance of shaft travel.

The top of the looper contains a hole through which the yarn is pulled. As the looper rotates in time (or synchronized) with the other stitching components, the yarn will follow this hole and wrap (or "loop") around and be captured by the hook of the needle.

Generally speaking, the looper makes its wrapping rotation during the needle upstroke motion prior to the needle hook coming through the needle plate hole.

**Theta (θ) Angle Rotation**

The theta angle rotation is performed by the theta motor to always keep the looper functionally oriented with the needle hook. This is required so the yarn will consistently be wrapped around the needle hook no matter what direction the stitch is being made. As the theta motor rotates the needle hook position in relation to the stitch direction, it will also rotate the looper drive worm gear. This in turn rotates the looper as it meshes with the looper body worm gear. This rotation is in direct proportion to the needle rotation, and thus a constant relationship with the needle hook is maintained.

![Figure 4 - 3](image-url)
**Theta Index**

Theta index is a term used for identifying the position of the needle hook and looper hole in reference to the other mechanics of the sewing head. Theta index location is when the hook of the needle is at 270 degrees (facing left) and the hole in the looper is at 110 degrees (facing nearly right). (0 degrees is to the rear of the machine and 180 degrees is to the front.)

![Theta Index Diagram]

**Figure 4 - 4**
**Needle Rotation**

The needle is required to rotate clockwise and counter-clockwise between each stitch in order to maintain a yarn wrap around the needle hook with all changes of stitching direction. Also, the needle must be able to rotate up to +/- 180 degrees on any given stitch in order to generate the specified stitch type. (Needle hook position is 180 degrees different between a chain stitch and a moss stitch of the same direction). This rotation is termed the theta (θ) angle rotation and is controlled by the theta motor.

The needle rotation cannot begin sooner than just before the end of the looper wrap, and end no later than just after the start of the looper wrap. If the needle rotates while the looper is wrapping the yarn around the needle, then the looper will not do a complete wrap, and the needle will tend to drop the loop.

The CH 1 will calculate the needle rotation based on the angle between the current stitch and the next stitch.
**Vertical Stitching Movements**

The movements of the Needle, Nipple, and Presser Foot are synchronized through a combination of a cam and an offset drive pin that is fixed to the Z Drive Shaft. The movement of this arrangement causes the basic vertical motions in the stitching process.

Generally speaking, the needle downstroke follows the nipple downstroke very closely, but continues to go through the needle plate hole and into the looper area, while the nipple stops approximately .005 inch above the needle plate. The needle upstroke leads the nipple upstroke by approximately 60 degrees at the needle plate plane. The operation of the presser foot is practically opposite to the motion of the other two with its opposing motion basically lagging the needle motion by about 50 degrees.

---

**CH1 Stitch Cycle**

*Motion Relationships*

<table>
<thead>
<tr>
<th>Degrees Z Rotation from Head Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Looper yarn hole position relative to Z rotation.</td>
</tr>
<tr>
<td>Theta angle at “index” position.</td>
</tr>
</tbody>
</table>

*Figure 4 - 5*
Needle Motion (Vertical movement)

The offset drive pin is used to cause the needle drive cam plate to move in its vertical motion. This plate is engaged with the needle height adjustment mechanism which contains the needle. As the needle height adjustment mechanism is driven, the needle will penetrate the material and when raised out of the material, depending on the height setting, will determine the chain stitch length or moss stitch height.

Through various mechanical and electromechanical methods, the needle is adjustable to 7 relative sewing heights within a specific range, plus the needle home position, within the needle height adjustment mechanism. For the operation theory of this mechanism, refer to the section entitled "Needle Height."

Nipple Motion (Vertical movement)

The nipple encases the needle and holds the material in place while the needle is extracted during the sewing sequence. At the same time, it prevents the previously formed loop from being pulled out, by holding the tail end down. To perform this function of "smashing" the yarn tail into the material, the nipple height of .005 inch above the needle plate becomes very critical.

The downstroke motion of the nipple follows the needle downstroke until the needle plate plane. Just above the needle plate plane, the nipple will stop and remain until slightly after the needle has come back to the needle plate plane. Approximately 60 degrees after the needle tip (hook) passes through the needle plate plane and into the body of the nipple, the nipple will then go into its upstroke and raise with the same motion as the needle. After the needle and nipple have raised out of the material, the pantograph can then move the material to the next stitching location.
Presser Foot Motion (Vertical movement)

The presser foot is used to hold the material down to the table plane in the general stitching region, while the material is moved to the next stitching location. In this way, the nipple and needle will not catch the material during the movement of the pantograph.

To accomplish its task, the presser foot vertical movement is basically opposite to the vertical motion of the needle and nipple (so it will be down when the needle and nipple are up).

Therefore, the presser foot needs to be able to flex in all directions, the distance of one stitch length, during the movement of the pantograph, since the presser foot is resting on the material at that time. Since the presser foot follows the material during its movement to the next stitch position, it needs to raise off of the material during the stitch so it will center itself again and be ready for the next material movement cycle.
**X-Y Motion**

The x-y motion cannot begin sooner than just before the nipple removes pressure from the cloth. The nipple must stay down while the needle is moving up and pulling the yarn through the cloth in order to assure a consistent loop height, especially with loose or floppy materials. If the x-y motion starts substantially before the nipple releases the cloth, then the cloth will tend to stretch. Since the presser foot is able to flex with the longest stitch, the presser foot pressure does not need to be released for the x-y motion to occur, and in fact it is not released during x-y motion.

The x-y motion must end just before the needle penetrates the cloth. The exact timing for needle penetration is a function of needle height - a shorter loop provides less time. If the x-y motion ends after the needle penetrates the cloth, then the needle will tend to break.

In chain stitch mode, the maximum x-y motion is a function of the maximum needle height (5.0 mm). In moss stitch mode, the maximum x-y motion is a function of the maximum definable stitch length (12.7 mm), or whatever lesser limit might be imposed.
**Needles, Nipples, and Needle Plate Holes**

To choose the various sizes of needles or nipples or needle plate holes, depends on several other variables such as yarn size, material type, and stitch length. Some information on these parameters can be found in the CH 1 Operation Manual, but these elements in the art of chenille embroidery must be learned through practice and individual experience with the specific combinations of the operation at hand.

**Needle Size**

Needles are available in several sizes and have hooks at the tip, similar in appearance to hand crochet needles. Needle sizes also vary between manufacturers, and generally are of two numbering systems. One system uses rather high numbers, typically from 70 to 150. The other system uses very small numbers, typically No. 1 to No. 9.

A rule-of-thumb conversion method from the large numbers to the small is to subtract 60 from the large number, then divide by 10 to get the small number. Example: A No. 100 needle in one numbering system equals No. 4 in the other (100 - 60 = 40, 40 / 10 = 4). Below is a simple conversion table comparing the two needle numbering systems:

<table>
<thead>
<tr>
<th>Large Numbered Needles</th>
<th>Small Numbered Needles</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>= #1</td>
</tr>
<tr>
<td>80</td>
<td>= #2</td>
</tr>
<tr>
<td>90</td>
<td>= #3</td>
</tr>
<tr>
<td>100</td>
<td>= #4</td>
</tr>
<tr>
<td>110</td>
<td>= #5</td>
</tr>
<tr>
<td>120</td>
<td>= #6</td>
</tr>
<tr>
<td>130</td>
<td>= #7</td>
</tr>
<tr>
<td>140</td>
<td>= #8</td>
</tr>
<tr>
<td>150</td>
<td>= #9</td>
</tr>
</tbody>
</table>

The needle must be selected according to the thickness of the thread (or yarn) used. The thread must fill the opening of the hook in the needle, but must also slide back and forth freely.
**Needle Type**

There are also 3 different types of needles that may be used in a chenille operation. Melco classifies these three types of needles as: Chain, Moss, and Combo. Each of these types may be used for both stitch types, but a needle that is designed specifically for a certain stitch type may give problems with the other stitch type.

**Nipple Size**

A suitable nipple must be selected to correspond to the size of needle being used. Generally speaking, the needle must fit inside the nipple and be able to move freely in the vertical motion with negligible side play. Nipples, too, are available in sizes similar to needles.

Typically, nipple sizes are selected according to the combination of the needle size selected and the type of material and yarn being used. For fine cotton threads and work that is performed with smaller needles, the nipple should usually be the same size as the needle. For medium yarn and needle sizes, choose a nipple that is one size larger than the needle. When using heavy yarn and largest needle sizes, a nipple that is two sizes larger than the needle size is usually an accepted practice.

**Needle Plate Hole Size**

A general guideline for selecting needle plate hole size is for the hole size to be one size larger than the needle size. This usually provides a hole that is large enough to allow clearance for the yarn to pass through the hole when the yarn is wrapped around the needle.

**Summary**

A typical selection method for selecting the three items used in handling the yarn is to first choose the needle based on the yarn size and sewing material. Then, select the needle plate hole one size larger than the needle size; and the nipple two sizes larger than the needle size.
Stitch Functions

Stitch Modes

The CH 1 recognizes two stitching modes: Chain Stitch and Moss Stitch.

Chain Stitch

The CH 1 will create a Chain Stitch, which is formed by holding the loop onto the cloth as the pantograph moves to the next stitch. This is accomplished by facing the needle hook away from the x-y motion (into the design motion), so the loop of yarn will stay on the needle during the stitch.

The maximum needle height (5.0 mm) defines the maximum Chain Stitch length.

Chain Stitch is the default power-up mode.

The CH 1 will enter into the Chain Stitch mode when the operator selects "Chain Stitch" from the keyboard entry, or when the CH 1 detects a toggle stitch mode command in the design data while in the Moss Stitch mode.

Moss Stitch

The CH 1 will create a Moss Stitch, which is formed by releasing the yarn from the needle as the pantograph moves to the next stitch. This is accomplished by facing the needle hook toward the x-y motion (away from the design motion). This causes the yarn to be dropped from the needle (leaving a loop of yarn) during the stitch.

The maximum definable stitch length (12.7 mm) defines the maximum Moss Stitch height.

The CH 1 will enter into the Moss Stitch mode when the operator selects "Moss Stitch" from the keyboard entry, or when the CH 1 detects a toggle stitch mode command in the design data while in the Chain Stitch mode.
**Needle Jump Stitch**

The Needle Jump Stitch is used for moving the needle about the design without leaving a trail. It will feed the yarn below the cloth, and cannot be used to make “longer” stitches. It will not stop the Z-axis, but the needle may slow down.

The CH 1 will do a Needle Jump Stitch by rotating the needle 360 degrees plus the calculated stitch angle CCW (counter-clockwise) while the looper is rotating CW (clockwise). This will prevent the looper from wrapping the yarn around the needle and creating a stitch.

The CH 1 will interpret an embroidery Jump Stitch code as the Needle Jump Stitch command.

**Needle Up Stitch**

The CH 1 will do a Needle Up Stitch by stopping the needle at TDC (Top-Dead-Center), releasing yarn tension, and moving the x-y rack to the desired location.

**Needle Clear**

Needle Clear is used to raise the needle to Needle Home, as an aid in installing and removing hoops.

The CH 1 will perform a Needle Clear by generating a Needle Jump Stitch to drop the yarn from the needle, then stopping the Z-axis at TDC, retracting the needle into the nipple to Needle Home, and sounding the beeper.

The CH 1 will perform Needle Clear when the operator selects “Needle To Home” from the keyboard entry, or when the CH 1 detects a Needle Clear command in the design data.

If the CH 1 is not at Needle Home on power-up, it will perform the Needle Clear sequence.

When the CH 1 is at Needle Home and the operator presses the Start key, the needle will rotate to the programmed needle height and orientation before starting to sew. The default needle height is 4 (with the range of heights from 1 to 7). The default needle orientation is for Chain Stitch.
Lock Stitch

Because chenille has no bobbin, the CH 1 must make special effort to anchor the yarn to the cloth at certain points in the design. These points may include, but are not limited to, end of design, color change, stop, change in stitch mode, at the beginning and end of Needle Jump.

The CH 1 will perform a Lock Stitch by sewing two short chain stitches, stopping the needle at TDC, and then moving to Needle Home without dropping the loop. This will pull the first chain stitch tightly around the second, and hold the yarn in place.

The CH 1 will perform a Lock Stitch when it detects a Lock Stitch command in the design data.
**Needle Height (Loop Length)**

Different needle heights create a different look in the finished design. The proper needle height is a function of stitch mode, stitch length, and yarn stiffness.

**The CH 1 will change the needle height only when head rotation is stopped and the needle height mechanism is at the “theta index” position.**

The operator may change the needle height by generating the keystroke command to cause the needle bar to move up or down inside the needle height mechanism. Needle height may also be changed through commands put into the design data.

**Needle Height Mechanism**

The needle is adjustable to 7 specific sewing heights, plus the needle home position, within the needle height adjustment mechanism. These needle height positions are accomplished through a combination of several mechanical principals used in the needle height mechanism.

The needle bar (with needle) is installed into a needle bar adjustor. The needle bar adjustor has threads which allow it to be threaded (rotated) into the needle bar holder. The needle bar holder is part of the needle rotation shaft. When the needle bar holder and the needle bar adjustor are threaded together, they and the attached parts become the needle height mechanism.

The theta motor is used to rotate the needle rotation shaft as the needle bar adjustor holds the needle bar (with needle) from rotating. The needle bar adjustor is held from rotating by sliding a retaining block into the needle bar adjustor by means of a linear actuator. This action disengages a locking plate located on top of the sliding block. As the needle rotation shaft rotates, it raises or lowers (depending on the direction of rotation) the needle bar adjustor (thus the needle bar and needle) through the thread engagement of the needle bar adjustor inside the rotating needle bar holder. The desired needle height position is determined by the amount of rotation of the theta motor which is detected by the theta board and controlled by the CH 1 CPU.
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